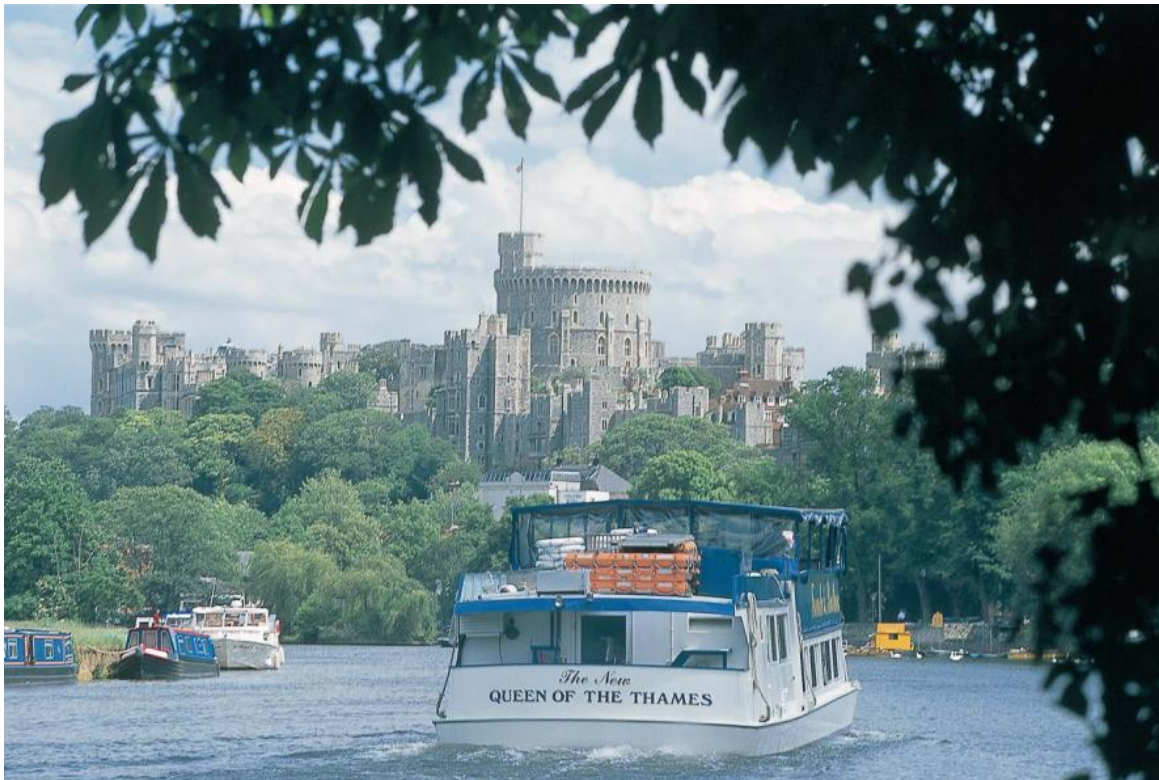




Water for life and livelihoods



Part 1: Thames river basin district River basin management plan

Updated: December 2015



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We are the Environment Agency. We protect and improve the environment and make it a better place for people and wildlife.

We operate at the place where environmental change has its greatest impact on people's lives. We reduce the risks to people and properties from flooding; make sure there is enough water for people and wildlife; protect and improve air, land and water quality and apply the environmental standards within which industry can operate.

Acting to reduce climate change and helping people and wildlife adapt to its consequences are at the heart of all that we do.

We cannot do this alone. We work closely with a wide range of partners including government, business, local councils, other agencies, civil society groups and the communities we serve.

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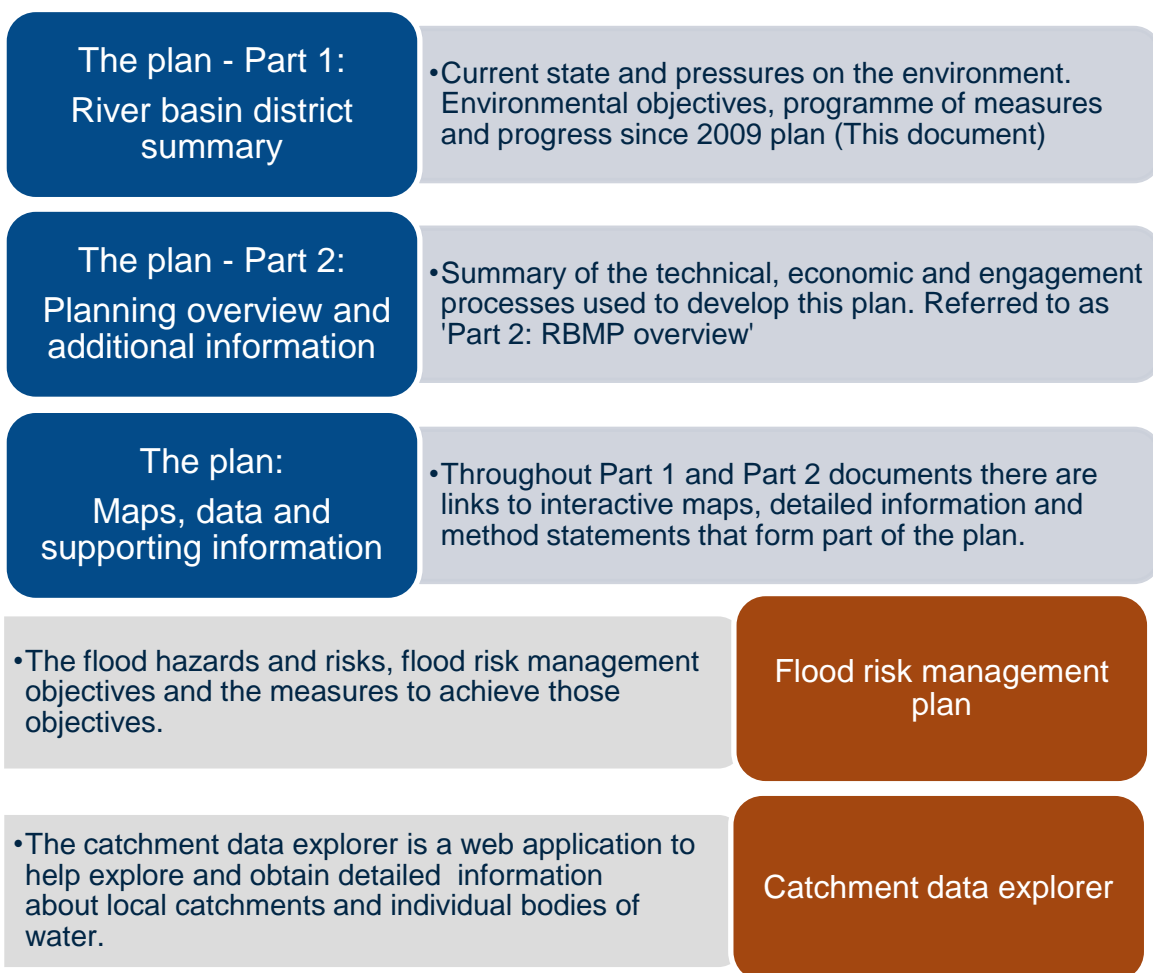
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Using the plan: accessing the most relevant information

The river basin management plan consists of a number of different documents, maps and datasets, of which this is just one. Below is a summary of the statutory components of the river basin management plan (in blue) along with associated documents and data sources outside of the official plan that support the plan (in brown):



Throughout this document there are light green boxes containing links to the further information relevant to each section.

Further information

- You can access the river basin management plan and associated documents through the river basin management [web pages](http://www.gov.uk/government/collections/river-basin-management-plans-2015) (www.gov.uk/government/collections/river-basin-management-plans-2015).
- A guide to accessing river basin management data and supporting information is available on the river basin management [web pages](http://www.gov.uk/government/collections/river-basin-management-plans-2015) (www.gov.uk/government/collections/river-basin-management-plans-2015).

1. Introduction

This section provides an explanation of the purpose of this plan, who it is for and how the river basin district is managed.

1.1. The purpose of a river basin management plan

Water is essential for life and livelihoods. It allows the natural environment to flourish, and businesses, agriculture and the economy to grow and prosper.

Rivers, lakes, estuaries, coastal areas, wetlands and water under the ground 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 a source of recreation that promotes wellbeing.

It is critical that this precious resource is managed properly to ensure that the needs of society, economy and wildlife can be met and maintained over the long-term.

The purpose of a river basin management plan is to provide a framework for protecting and enhancing the benefits provided by the water environment. To achieve this, and because water and land resources are closely linked, it also informs decisions on land-use planning.

This plan contains 4 sets of information that groups who manage land and water should pay particular attention to:

- **Baseline classification of water bodies** - One of the main purposes of this plan is to prevent water bodies deteriorating. The first step to preventing deterioration is to understand the baseline status for all the quality elements in each water body. Deterioration from the baseline is not permitted, except in very specific circumstances that are described in this plan. Preventing deterioration is one of the biggest challenges in managing the water environment.
- **Statutory objectives for protected areas** - This plan highlights the areas of land and bodies of water that have specific uses that need special protection. These include waters used for drinking water, bathing, commercial shellfish harvesting and those that sustain the most precious wildlife species and habitats. The plan ensures that these areas have the legally binding objectives in place that protect those uses from potentially harmful activities and new developments.
- **Statutory objectives for water bodies** - This plan sets out legally binding objectives for each quality element in every water body, including an objective for the water body as a whole. The default objective is good status. Less stringent objectives have been set in some cases where natural conditions, technical feasibility or disproportionate cost make improvement impractical. The default deadline for achieving objectives is 2021. However, extended deadlines of 2027 or beyond have been set in some cases where it would be more appropriate, have less impact on existing activities or where the environment will need more time to respond to the planned measures.
- **Summary programme of measures to achieve statutory objectives** - This plan provides a framework for action and future regulation. To do this it summarises the existing mechanisms, both statutory and voluntary, that are used to manage the quality of the water environment. It also summarises the types of action and who needs to do this, to achieve the statutory objectives. Although it is not a detailed action plan it provides a clear signal to those who use and affect water about what they can do to make sure there is enough good quality water for life and livelihoods in England.

The river basin management plan has been approved by the Secretary of State for the Environment, Food and Rural Affairs. It has been prepared in line with ministerial guidance and fulfils the requirements of the Water Framework Directive and contributes to the objectives of other EU directives. It is an update of and replaces the river basin management plan published in 2009 (referred to as the '2009 plan' in this document).

1.2. Who is responsible for implementing this plan

Many organisations are responsible for managing the water environment in the river basin district. These organisations are often grouped into sectors, such as water companies, agriculture and industry. Table 1 identifies these sectors and describes their role in managing the water environment.

The roles in managing the water environment are:

- **Regulator** - regulates and enforces the activities of operators
- **Operator** - undertakes activities that could potentially influence either directly or indirectly the quality of the water environment. Many of these activities are regulated.
- **Influencer** - educates, influences or advises others on how to reduce their impact on the water environment
- **Undertakes projects** - undertakes environmental improvement projects (for example, habitat restoration) to reduce the damage caused by others, usually in partnership with other groups

Table 1: Main sector groups involved in river basin management

Sector	Role in managing the water environment			
	Regulator	Operator	Influencer	Undertakes projects
Agriculture and rural land management - farming, forestry and horticulture		X	X	X
Government and agencies:				
Central government departments	X		X	
Environment Agency	X	X	X	X
Natural England	X	X	X	X
Forestry Commission		X	X	X
Marine Management Organisation	X		X	
Highways England		X	X	
Network Rail		X	X	
Industry, manufacturing and other business - including chemicals, construction, food and drink, power generation, paper, textiles and metals		X	X	
Internal drainage boards	X	X	X	X
Local government - includes local councils, national park authorities and Inshore Fisheries and Conservation Authorities	X	X	X	X
Mining and quarrying - coal mining, non coal mining and quarrying		X	X	

Sector	Role in managing the water environment			
	Regulator	Operator	Influencer	Undertakes projects
Navigation - inland waterways (Canal & River Trust), port and harbour authorities	X	X	X	X
Non-governmental organisations - user groups, catchment groups and environmental organisations (including local wildlife trusts and rivers trusts)		X	X	X
Waste treatment, transfer, storage and disposal - landfill, biowaste, waste treatment and transfer		X		
Water industry - water supply and sewage treatment activities	X	X	X	X

1.3. The Thames River Basin District

The Thames river basin district (Figure 1) covers over 16,200km². It encompasses all of Greater London and extends from north Oxfordshire southwards to Surrey and from Gloucester in the west to the Thames Estuary and parts of Kent in the east.

In total over 15 million people live in the Thames district with many entering daily to work or visit. In addition to Greater London, other urban centres in the river basin district include Luton, Reading and Guildford.

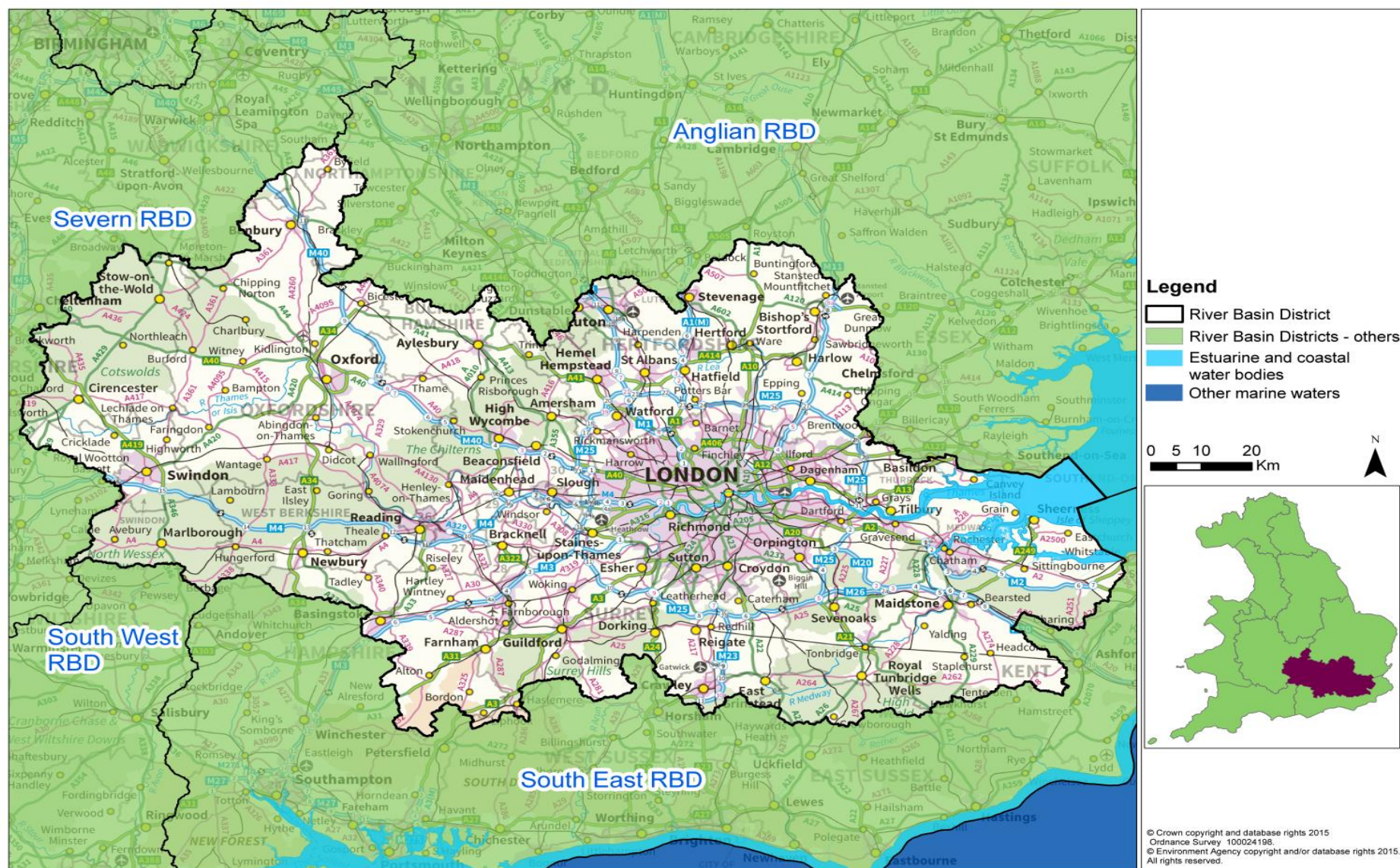
The Thames river basin district has a rich diversity of wildlife and habitats, supporting many species of global and national importance from chalk streams such as the River Kennet to the Thames Estuary and salt marshes.

There are 17 management catchments that make up the river basin district, which include many interconnected rivers, lakes, groundwater and coastal waters. These catchments range from chalk streams and aquifers to tidal and coastal marshes.

The river basin district is mostly rural to the west and very urban to the east where it is dominated by Greater London. Around 17% of the river basin district is urbanised and the rural land is mainly arable, grassland and woodland. The economy is dominated by Greater London and the finance sector.

To support economic growth and development, significant or large scale infrastructure projects will occasionally take place within the river basin district. These projects must take account of the environmental objectives within this river basin management plan. Similarly, the potential benefits and impacts of such projects will, where relevant, be considered during future reviews and updates of the plan, including updates to the environmental objectives.

Figure 1: Map of the Thames river basin district



1.4. Significant water management issues

The significant water management issues are the main issues that limit the uses and potential benefits of managing the water environment in the river basin district in a sustainable way. They have been identified based on the results of public consultation and assessments of the pressures caused by people now, in the past, and predicted in the future.

Many of these issues arise from current activities that provide a wide range of benefits. It may therefore not be possible or desirable to fully resolve the issues.

- **Physical modifications** - affecting 44% of water bodies in this river basin district

People have made many physical changes to rivers, lakes and estuaries, for example, flood defences and weirs, and changes to the size and shape of natural river channels for land drainage and navigation. These modifications alter natural flow levels, cause excessive build up of sediment in surface water bodies and the loss of habitats and recreational uses. In many cases the uses and associated physical modifications need to be maintained. In these circumstances it may not be possible to achieve good ecological status.

- **Pollution from waste water** – affecting 45% of water bodies in this river basin district

Waste water, or sewage, can contain large amounts of nutrients (such as phosphorus and nitrates), ammonia, bacteria, harmful chemicals and other damaging substances. It can enter water bodies where sewage treatment technology to remove enough of the phosphorus and harmful chemicals doesn't exist, from leakages from privately owned septic tanks and, in wet weather, storm overflows can discharge untreated sewage having a significant impact on bathing waters. Population growth and changes in rainfall patterns are increasing the pressure on the sewer network.

- **Pollution from towns, cities and transport** - affecting 17% of water bodies in this river basin district

Rainwater draining from roofs, roads and pavements carries pollutants, including grit, bacteria, oils, metals, vehicle emissions, detergent and road salt drains to surface water, including estuaries and coastal waters. Many homes and workplaces have 'misconnected' drains, meaning that dirty water often enters surface waters and groundwater rather than foul sewer drains.

- **Changes to the natural flow and level of water** - affecting 12% of water bodies in this river basin district

Reduced flow and water levels in rivers and groundwater caused by human activity (such as abstraction) or less rainfall than usual can mean that there is not enough water for people to use and wildlife might not be able to survive. Reduced flow affects the health of fish and exaggerates the impacts of barriers such as weirs. Climate change research shows that by 2050 England can expect significant seasonal variations, with higher winter and lower summer flows, and a reduction in flow overall. In the long term, there will be less water available to abstract for drinking, industry and irrigating crops.

- **Negative effects of invasive non-native species** - affecting 3% of water bodies in this river basin district

Non-native invasive species can have significant economic impacts. The cost of controlling invasive species to make sure that flood defences and the natural environment are not compromised is rising. American signal crayfish are becoming widespread and affect animals such as fish and invertebrates. Other species such as mitten crabs destroy habitats like reed beds and can cause banks to collapse by burrowing into them. Climate change is thought to drive certain species northwards, increasing their frequency and variety in the future and affecting the condition of water bodies.

- **Pollution from rural areas** - affecting 27% of water bodies in this river basin district

Some approaches to land management have increased the amount of soils and sediment that are being washed off the land carrying phosphorus into waters which can cause excessive algae growth called 'eutrophication'. A changing climate means that more intense rainfall is likely to occur, increasing the risk of impacts further. Nitrate from fertilisers has built up in groundwater over decades and will take a long time to reduce. Sedimentation from erosion, forestry practices, saturated and compacted fields and livestock trampling on river banks has affected river ecology by smothering fish spawning grounds. Other impacts include bacteriological contaminations from animal faeces, and inappropriately stored and applied livestock slurry being washed off the land and pesticides from farming, forestry, golf courses and parks. These contaminants pose a particular threat to bathing waters, shellfish waters and drinking water.

Taking account of climate change

The climate is changing as a result of greenhouse gas emissions caused by human activity. Latest UK climate projections show that temperatures will continue to rise, with increased winter rainfall and more rain falling in intense storms and continuing sea level rise. The impact on river flows, water quality and ecosystems is less clear. Studies to learn more about the effects of climate change on the river basin district are underway. In the meantime, it makes sense to implement measures that are flexible or increase resilience to extreme weather events and future warming.

Risk assessments

Risk assessments are used to help identify significant water management issues by identifying where pressures could change in the future, potentially leading to a deterioration or reducing the effectiveness of measures to meet their objectives. The Environment Agency has reviewed and updated, where necessary, the risk assessments since the 2009 plan.

The risk assessments forecast risk up to 2027. Because of the relatively short timescale, the specific risks from climate change have been considered mainly in the faecal indicator organisms risk assessment and the abstraction-flow risk assessment.

Further information in this document

- You can find a summary of the impacts of significant water management issues by sector in section 5.

Information elsewhere in the river basin management plan

- You can find GeoPDF maps, statistics and main findings for each risk assessment on the Environment Agency's [ShareFile service](https://ea.sharefile.com/d-s25aecb60c464ccd9) (<https://ea.sharefile.com/d-s25aecb60c464ccd9>).
- More detail on risk assessments and links to the method statements behind them can be found in section 4.4 of [Part 2:RBMP overview](http://www.gov.uk/government/collections/river-basin-management-plans-2015) (www.gov.uk/government/collections/river-basin-management-plans-2015).
- The [Inventory of emissions, discharges and losses of priority and priority hazardous substances](https://ea.sharefile.com/d-sab675d1e4d74e5e8) (<https://ea.sharefile.com/d-sab675d1e4d74e5e8>) provides information on priority substances at the river basin district scale.
- You can find more detail on how the inventory has been compiled in section 4.4 of [Part 2: RBMP overview](http://www.gov.uk/government/collections/river-basin-management-plans-2015) (www.gov.uk/government/collections/river-basin-management-plans-2015).

1.5. Working with others

River basin district liaison panel

The river basin district has a liaison panel. Members share their views as the representative of a sector that is responsible for implementing measures and carrying out projects.

The role of the liaison panel is to:

- contribute evidence to enable decision making and reporting on river basin management plans
- devise and track measures and projects as part of a programme of work to prevent deterioration and improve the environment
- work with members and their sectors to ensure a broad base for decision making and communication
- assist and champion the implementation of the catchment based approach

Catchment partnerships and the catchment based approach

Taking a catchment based approach helps to bridge the gap between strategic management planning at river basin district level and activity at the local water body scale. The catchment based approach aims to encourage groups to work together more effectively to deal with environmental problems locally.

Catchment partnerships are groups of organisations with an interest in improving the environment in their local area and are led by a catchment host organisation. They inform the river basin management planning process and help implement measures by:

- providing local evidence
- targeting and coordinating action
- identifying and accessing funding for improvements in the catchment
- incorporating river basin management planning into the wider environmental management of the catchment

Some of the partnerships will produce their own catchment or local plans.

The partnerships work on a wide range of issues including, but not restricted to, the water environment and river basin management. Catchment partnerships also cover coastal and marine waters.

Table 2 lists the partnerships in this river basin district. Some partnership groups are in the early stages of being set up, while others have been active for years. Members from some catchment partnerships also sit on the river basin district liaison panel.

Table 2: Catchments and partnership groups

Catchment	Partnership group host
Cherwell	Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust (BBOWT)
Colne	Groundwork South
Cotswold - Evenlode (Oxfordshire)	Wild Oxfordshire
Cotswold - Gloucestershire and the Vale - Upper Thames	Farming Wildlife and Advisory Group South West
Darent	North West Kent Countryside Partnership and South East Rivers Trust
Gloucestershire and the Vale - Ock	Freshwater Habitats Trust
Kennet & Pang	Action for the River Kennet
Loddon	Hampshire and Isle of Wight Wildlife Trust
London - Beverley Brook	South East Rivers Trust
London - Brent	Thames21
London - Crane	Green Corridor
London - Hogsmill	South East Rivers Trust
London - Lower Lea North	Hertfordshire and Middlesex Wildlife Trust
London - Lower Lea South	Thames 21
London - Marsh Dykes (Woolwich)	London Wildlife Trust and Thames21
London - Ravensbourne	Thames21
London - Wandle	The Wandle Trust
Maidenhead to Sunbury (Lower Thames)	Thames21
Medway	South East Rivers Trust and Kent Countryside management partnership
Mole	Surrey Wildlife Trust and South East Rivers Trust
North Kent	Medway Swale Estuary Partnership and South East Rivers Trust
Roding, Beam & Ingrebourne	Thames21
South Essex	Thames Chase Trust
Thame and South Chilterns - South Chilterns	Foundation for Water Research
Thame and South Chilterns - Thame	Freshwater Habitats Trust and River Thame Conservation Trust
Thames (tidal)	Thames Estuary Partnership, Thames21, Thames Landscape Strategy and Thames Strategy Kew to Chelsea
Upper Lea or Lee	Groundwork East
Wey	Surrey Wildlife Trust

Incorporating information from others in river basin management planning

Some organisations have asked for the opportunity to share their environmental data to help improve river basin management and catchment planning. For example, sharing data and information to improve local evidence on the cause of a problem, such as the reason for not achieving good status, or a new response to a problem. The Environment Agency is working with the Catchment Based Approach National Support Group and others to confirm data sharing priorities. To learn more about sharing your information contact your local catchment partnership, see further information box.

Further information in this document

- You can find a map showing the location and boundaries of the catchments in section 3.4.
- Contact details for the catchment partnerships as well as a summary of the measures they are carrying out can be found in section 3.4.

Information elsewhere in the river basin management plan

- You can find more information about the catchment based approach in section 3.4 of [Part 2: RBMP overview](http://www.gov.uk/government/collections/river-basin-management-plans-2015) (www.gov.uk/government/collections/river-basin-management-plans-2015).

Supporting information

- You can find more information on the liaison panel and details about membership in the [Record of consultation and engagement](http://www.gov.uk/government/collections/river-basin-management-plans-2015) (www.gov.uk/government/collections/river-basin-management-plans-2015).
- You can find examples on how the Environment Agency has used information from others in the [consultation response document](http://www.gov.uk/government/collections/river-basin-management-plans-2015) (www.gov.uk/government/collections/river-basin-management-plans-2015).
- You can find more information on the catchment based approach on the catchment based approach [web pages](http://www.catchmentbasedapproach.org/) (<http://www.catchmentbasedapproach.org/>).

1.6. Links to other major plans affecting water management

This plan provides a long-term framework for managing the issues that affect the quality of the water environment in the river basin district. However, many water management issues are so significant or complex that they demand their own more detailed plans. The public bodies that prepare these plans are bound by the Water Environment (Water Framework Directive) Regulations 2003 to have regard to the river basin management plan when exercising their functions and in the case of many of the functions exercised by the Environment Agency and the Secretary of State for the Environment, Food and Rural Affairs to exercise those functions so as to secure compliance with the requirements of the WFD.

Table 3 summarises the important water management issues that have their own planning processes and plans.

Table 3: Other plans affecting water management

Issue	Plans	Primary responsible bodies in England
Flooding and coastal erosion	Flood risk management plans Local Flood Risk Management Strategies Shoreline management plan	Environment Agency Lead local flood authorities Coastal groups (risk management authority partnerships)
Climate change adaptation	UK National Climate Adaptation Strategy and Adaptation Plan	Government's Committee on Climate Change Public bodies and utility companies
Water supply	Water resources management plans Drought management plans	Water companies
Biodiversity	Biodiversity 2020: A strategy for England's wildlife and ecosystem services Natura 2000 site improvement plans	Defra Natural England
Invasive non-native species (INNS)	The Great Britain Invasive non-native species strategy and implementation plan	Defra's Great Britain invasive non-native species secretariat
Marine waters	Marine Strategy Framework Directive Marine plans	Defra Marine Management Organisation

Supporting information:

- More information about the flood risk management plans can be found on the flood risk management plan [web pages \(https://www.gov.uk/government/collections/flood-risk-management-plans-frmps-2015-to-2021\)](https://www.gov.uk/government/collections/flood-risk-management-plans-frmps-2015-to-2021).

1.7. Reporting progress on this plan

A formal assessment of progress with meeting the objectives in this plan will be reported in the 2021 update to this plan. An interim report on making measures operational will be produced and reported to the European Commission in 2018.

The Environment Agency and other organisations have extensive monitoring programmes to assess the state of the water environment. To help monitor progress with this plan and show how the quality of the water environment is changing, the Environment Agency will report on a range of quality indicators. These could include:

- status or risks facing protected areas: drinking water protected areas, Natura 2000 sites, bathing waters, shellfish waters, nutrient sensitive areas
- ecological status plus individual status of some quality elements: fish, macrophytes, invertebrates, diatoms, phosphorous, dissolved oxygen, ammonia, specific pollutants, acidity
- chemical status plus individual status of some quality elements
- the annual change in status of each of the individual ecological status elements

This will be used as an indicator of overall progress towards good ecological status.

As well as monitoring the state of the environment, the Environment Agency also plans to report on important activities that will eventually bring positive results. For example:

- numbers of fish passage improvements
- length of shoreline and river bank habitat enhancements
- area of priority habitat created or improved
- extent of new mitigation measures implemented on heavily modified and artificial water bodies

Those implementing measures should monitor and report their own progress. The following groups will be particularly important:

- catchment partnerships - progress on partnership projects, progress on securing additional funding and influencing others
- water companies - progress on implementing national environment programme schemes and other measures that relate to environmental performance agreed by the water company with their customer challenge group
- agriculture and rural land managers - progress on uptake of Countryside Stewardship schemes that benefit water and other sector related initiatives, for example, Campaign for the Farmed Environment
- local councils - opportunities taken to encourage growth by green infrastructure and habitat enhancement
- ports and navigation authorities - implementing mitigation measures
- Highways England - progress on environmental aspects of their £15 billion road investment strategy

The liaison panel, as a collective group representing the river basin district as a whole, provides an opportunity for monitoring progress against the plans, sharing best practice and helping catchment partnerships. As such, positive actions taken by partners to implement this plan can be reported and collated through the panels

2. Current state of the environment, environmental objectives and outcomes

This section describes the current state of the environment and the environmental objectives for the river basin district. It also describes the planned progress towards achieving those objectives by 2021.

2.1. Current state of the environment

The WFD indicator of the health of the water environment is whether a water body is at good status or potential. This is an assessment of a range of quality elements relating to the biology and chemical quality of surface waters and quantitative and chemical quality of groundwater. To achieve good ecological status or potential, good chemical status or good groundwater status every single element assessed must be at good status or better. If one element is below its threshold for good status, then the whole water body's status is classed as less than good.

Surface water bodies can be classed as high, good, moderate, poor or bad status. Table 4 gives a description of each of those status classes.

Table 4: Definition of status in the Water Framework Directive

Status	Definition
High	Near natural conditions. No restriction on the beneficial uses of the water body. No impacts on amenity, wildlife or fisheries.
Good	Slight change from natural conditions as a result of human activity. No restriction on the beneficial uses of the water body. No impact on amenity or fisheries. Protects all but the most sensitive wildlife.
Moderate	Moderate change from natural conditions as a result of human activity. Some restriction on the beneficial uses of the water body. No impact on amenity. Some impact on wildlife and fisheries.
Poor	Major change from natural conditions as a result of human activity. Some restrictions on the beneficial uses of the water body. Some impact on amenity. Moderate impact on wildlife and fisheries.
Bad	Severe change from natural conditions as a result of human activity. Significant restriction on the beneficial uses of the water body. Major impact on amenity. Major impact on wildlife and fisheries with many species not present.

Table 5 shows the number of water bodies in the river basin district. It shows whether these are natural, artificial (such as canals and reservoirs) or have been modified ('heavily modified') for particular uses.

Table 5: Number of water bodies in the river basin district

Water body categories	Natural	Artificial	Heavily modified	Total
Rivers, canals and surface water transfers	287	21	106	414
Lake	7	47	19	73
Coastal	0	0	1	1
Estuarine	1	4	5	10
Groundwater	47	0	0	47
Total	342	72	131	545

Tables 6 and 7 summarise the current status of surface and groundwater water bodies in the river basin district.

Table 6: Ecological and chemical 2015 classification for surface waters

No. of water bodies	Ecological status or potential					Chemical status	
	Bad	Poor	Mod	Good	High	Fail	Good
498	27	112	320	39	0	5	493

Table 7: Chemical and quantitative 2015 classification for groundwaters

No. of water bodies	Quantitative status		Chemical status	
	Poor	Good	Poor	Good
47	22	25	18	29

The 2015 water body classification is the baseline from which deterioration is not permitted unless certain and specific conditions apply.

A summary of the current state of protected areas is included in section 2.4.

Information elsewhere in the river basin management plan

- For more information on how the current status of the water environment is assessed see section 4 of [Part 2: RBMP overview](http://www.gov.uk/government/collections/river-basin-management-plans-2015) (www.gov.uk/government/collections/river-basin-management-plans-2015).
- You can access GeoPDF maps showing the current status of water bodies on the Environment Agency's [ShareFile service](https://ea.sharefile.com/d-s25aecb60c464ccd9) (<https://ea.sharefile.com/d-s25aecb60c464ccd9>).
- To obtain the 2015 classification results for each water body, download the [water body spreadsheet](https://ea.sharefile.com/d-s0faa355450243538) (<https://ea.sharefile.com/d-s0faa355450243538>).

2.2. Environmental objectives

The environmental objectives of the WFD are:

- to prevent deterioration of the status of surface waters and groundwater
- to achieve objectives and standards for protected areas
- to aim to achieve good status for all water bodies or, for heavily modified water bodies and artificial water bodies, good ecological potential and good surface water chemical status
- to reverse any significant and sustained upward trends in pollutant concentrations in groundwater
- the cessation of discharges, emissions and losses of priority hazardous substances into surface waters
- progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants

Environmental objectives have been set for each of the protected areas and water bodies in the river basin district. They were identified through a process involving technical and economic appraisals and formal public consultation. Achieving the objectives will optimise the benefits to society from using the water environment.

The environmental objectives summarised in this section are legally binding. All public bodies must have regard to these objectives when making decisions that could affect the quality of the water environment.

In certain specific circumstances, exemptions from some of these objectives may be applied. These exemptions are considered in the process used to set these objectives.

Information elsewhere in the river basin management plan

- You can find more information on the process of setting objectives in section 5 of [Part 2: RBMP overview](http://www.gov.uk/government/collections/river-basin-management-plans-2015) (www.gov.uk/government/collections/river-basin-management-plans-2015).

2.3. Preventing deterioration

To protect the many uses and benefits the water environment provides it is essential to prevent it deteriorating. The water industry and many of the businesses essential to the economy have invested billions of pounds in infrastructure that rely on secure supplies of clean water. Preventing deterioration also protects wildlife and people's health and wellbeing.

The requirement to prevent deterioration was taken into account when setting the water body status objectives. Each water body status objective in this plan is set no lower than the 2015 classification result for the water body. This applies to a water body's overall status and to the status of each element used in classification.

Section 3 contains a summary of the programmes of measures to protect and improve the beneficial use of the water environment in the river basin district. Without these measures, the quality of the water environment would deteriorate with associated loss of benefits. It is estimated that without these controls, 32% of surface waters in the river basin district would deteriorate by 2027 due mainly to an increase in the unmitigated physical modification of rivers and the spread of invasive non-native species. The increase in physical modification is driven by climate change and population growth resulting in the need for increased flood protection, land drainage, and the spread of urban areas.

An assessment of whether deterioration has occurred from the 2015 classification baseline will be carried out in 2021.

Further information in this document

- You can find an assessment of whether deterioration in water body status occurred between 2009 and 2015 in section 4.3.

Information elsewhere in the river basin management plan

- You can find information on preventing deterioration in section 3.1 of [Part 2: RBMP overview \(www.gov.uk/government/collections/river-basin-management-plans-2015\)](http://www.gov.uk/government/collections/river-basin-management-plans-2015).

2.4. Protected area compliance and objectives

There are many areas where the water environment is especially valued. These areas include rare wildlife habitats, bathing waters and areas where drinking water is abstracted. These areas are known as 'protected areas' and their uses are given particular legal protection. Protected areas are a priority for action to make sure they achieve their objectives and protect the benefits they provide.

This section presents information on the extent to which protected areas are compliant with their current standards and objectives.

Drinking water protected areas

The objectives for drinking water protected areas are to ensure that:

- under the water treatment regime applied, the drinking water produced meets the standards of the Drinking Water Directive plus any UK requirements to make sure that drinking water is safe to drink
- the necessary protection to prevent deterioration in the water quality in the protected area in order to reduce the level of purification treatment required

These objectives are at risk when increasing pollution levels caused by human activity could lead to more treatment being needed in the future and where measures are needed to reduce pollution. For groundwater bodies only, not meeting these objectives may also mean the water body is classed as poor chemical status. Safeguard zones are non statutory areas identified for 'at risk' abstractions where land use management practices and other activities can affect the quality of the untreated water. Measures to prevent and reduce pollution are targeted within these zones.

Table 8: Drinking water protected areas current status and at risk

Water body type	Number of drinking water protected areas	Number 'at risk'	Number at poor chemical status for drinking water protected area objectives
Surface water	46	14	Does not apply to surface waters
Groundwater	47	25	12

Economically significant species (shellfish waters)

Some areas of estuarine and coastal waters are designated as shellfish waters. Shellfish waters are areas requiring protection or improvement to support shellfish life and growth in order to contribute to the high quality of shellfish for people to eat.

Table 9: Shellfish water protected areas current status and objectives

Number of shellfish waters	Objective	Currently achieving objective	Achieving objective by 2015	Achieving objective by 2021	Achieving objective by 2027
2	<300 <i>E.coli</i> /100ml in the shellfish flesh and intravalvular fluid	1	1	0	1

Recreational waters (bathing waters)

Bathing waters are designated waters and beaches that large numbers of bathers use. The objective for bathing waters is to preserve, protect and improve the quality of the environment and to protect human health by meeting the 'sufficient' water quality standards of the Bathing Waters Directive and to take such realistic and proportionate measures considered appropriate with a view to increasing the number of bathing waters classified as 'excellent' or 'good'.

Table 10: Bathing water protected areas current status and objectives

Number of bathing waters	Objective	Number which met at least the sufficient classification in 2014*	Number expected to achieve at least sufficient in 2015	Number at risk of not achieving sufficient in 2015
18	At least sufficient classification	17	18	0

* This is the number that would have met at least the sufficient class if the new 2015 standards had been in force

Nutrient sensitive areas (Nitrate vulnerable zones)

The objective of the Nitrates Directive is to reduce water pollution caused by nitrates from agricultural sources and to prevent further such pollution occurring. Nitrate Vulnerable Zones (NVZs) are designated where nitrate concentrations in water bodies are high or increasing, or water bodies are, or may become, eutrophic due to agricultural nitrate pollution. Farmers within NVZs must comply with mandatory action programme measures to reduce agricultural nitrate losses. In addition, a code of good agricultural practice has been established for voluntary implementation by all farmers.

Table 11: Nitrate vulnerable zone protected areas extent

Reason for designation	Number of NVZs	Land area(ha) covered by NVZ type	% of RBD covered by NVZ type
High nitrate in surface water	66	899,125	57
High nitrate in groundwater	21	357,496	23
Eutrophication in lakes or reservoirs	1	200	<1
Eutrophication in estuaries or coastal waters	0	-	0

Nutrient sensitive areas (Urban Waste Water Treatment Directive)

The objective of the Urban Waste Water Treatment Directive is to protect the environment from the adverse effects of waste water discharges. Sensitive areas are designated for water bodies affected by eutrophication or where surface water abstraction is affected by elevated nitrate concentrations. Reductions or emission standards for nutrients in sewage effluent must be met within areas sensitive to nutrient pollution.

Table 12: Urban Waste Water Treatment Directive protected areas type and extent

Reason for designation	Number of sensitive areas	Length (km)/Area (km2) designated
Eutrophication in rivers	9	483
Eutrophication in canals	N/A	N/A
Eutrophication in lakes / reservoirs	13	15.87
Eutrophication in estuaries or coastal waters	N/A	N/A
High nitrate in surface fresh water	N/A	N/A

Natura 2000 sites: Water dependent Special Areas of Conservation or Special Protection Areas

The overall objective of the Habitats Directive is to maintain or restore, at favourable conservation status, natural habitats and species of wild fauna and flora of community importance. The network of protected areas established under the Wild Birds and Habitats Directives is known as Natura 2000. Site conservation objectives are designed to maintain or restore Natura 2000 sites to favourable conservation status. The provisions of the WFD only relate to water dependent Natura 2000 sites or water dependent habitats and species on sites that combine wet and dry features. The objective is to protect and, where necessary, improve the water environment to achieve favourable conservation status for the water dependent features for which the site was designated as set out in the site's conservation objectives.

Natural England determines what favourable conservation status means in terms of the environmental conditions (targets) and ecology expected for designated habitats and species. The targets required are based on UK Common Standards Monitoring Guidance (CSMG), published by the Joint Nature Conservation Committee. Some of the conservation objectives for attributes of Natura 2000 sites are the same or equivalent to objectives for elements of water bodies. Natural England reports on compliance with these objectives. Where there are CSMG targets for flow and water quality elements, they have been taken into account when setting water body status objectives. Where the deadline for achieving Natura 2000 water body objectives (CSMG target) has been extended beyond 2021, the Environment Agency has agreed interim goals locally with Natural England.

Ramsar sites are wetland sites of international importance. For the purposes of river basin management planning, Ramsar sites are considered in the same way as Natura 2000 sites.

Table 13 contains a summary of the current condition and objectives for Natura 2000 protected areas.

Table 13: Natura 2000 water dependent protected areas current condition and objectives

Current condition			
Area of SSSI underpinning Natura 2000 sites (Ha)			
WFD - favourable		24708	
WFD - unfavourable recovering		7357	
WFD - unfavourable no change		227	
WFD - unfavourable declining		131	
WFD - destroyed/partially destroyed		0	
Total areas		28612	
Objective	Number of protected areas		
	By 2015	By 2021	By 2027
All measures complete to enable conservation objectives to be achieved	6	5	6

Further information in this document

- You can find a summary of the protected area action planning process and links to action plans for each protected area in section 3.6.

Information elsewhere in the river basin management plan

- For more information on all of the protected areas see section 4.2 of the [Part 2: RBMP overview \(www.gov.uk/government/collections/river-basin-management-plans-2015\)](http://www.gov.uk/government/collections/river-basin-management-plans-2015).
- For a list of all the protected areas, associated objectives and information see the [register of protected areas \(https://ea.sharefile.com/d-s487ae61bf2a4b4fb\)](https://ea.sharefile.com/d-s487ae61bf2a4b4fb).
- You can find detailed interactive maps of the different protected areas in the river basin district showing location, current status and monitoring points on the Environment Agency's [ShareFile service \(https://ea.sharefile.com/d-s25aecb60c464ccd9\)](https://ea.sharefile.com/d-s25aecb60c464ccd9).

Supporting information:

- The CSMG and interim progress goals for flow and water quality elements in Natura 2000 is available on the Environment Agency's [ShareFile service \(https://ea.sharefile.com/d-s25aecb60c464ccd9\)](https://ea.sharefile.com/d-s25aecb60c464ccd9)

2.5. Water body objectives

For surface waters, objectives are set for ecological and chemical status. For artificial or heavily modified water bodies, objectives are set for ecological potential and chemical status. For groundwater, objectives are set for quantitative and chemical status.

Water body objectives consist of 2 pieces of information: the status (for example, good) and the date by which that status is planned to be achieved (for example, by 2021).

The status part of an objective is based on a prediction of the future status that would be achieved if technically feasible measures are implemented and, when implemented, would produce more benefits than they cost. The objective also takes into account the requirement to prevent deterioration and achieving protected area objectives.

The date part of an objective is the year by which the future status is predicted to be achieved. The date is determined by considering whether the measures needed to achieve the planned status are currently affordable, and once implemented, the time taken for the ecology or the groundwater to recover.

Aiming to achieve good status or potential by 2021 is the default objective for this plan. Where certain and specific conditions apply, alternative objectives (to good status by 2021) have been set. These either involve taking an extended time period to reach the planned status (for example, good by 2027) or aiming to achieve a lower status (for example, moderate by 2015).

The water body objectives in this plan are:

- **‘x’ status by 2015:** 2015 status matches the predicted future status or potential. Here the predicted future status has already been achieved and no further improvement in status is expected. The main environmental objective is to prevent deterioration in status between 2015 and 2021.
- **‘x’ status by 2021:** there is confidence that, as a result of the programme of measures, the water body will improve from its 2015 status or potential to achieve the predicted future status by 2021.

The ‘by 2015’ date has been used to clearly distinguish water bodies and elements where the reported 2015 status matches the predicted future status (and so no further improvement is expected) from water bodies and elements where an improvement from the reported 2015 status is required to achieve the predicted future status by 2021.

- **‘x’ status by 2027:** the deadline for achieving the status or potential has been extended to 2027. Where the time extension is due to ecological or groundwater recovery time, there is confidence that the measures needed to achieve the improvement in status are already in place or will be in place by 2021. Where the time extension is due to practical constraints delaying implementation of the measures, there is confidence the process of implementing the measures will begin before 2021. For the remaining objectives with a 2027 date, there is currently not enough confidence that the improvement in status can be achieved by an earlier date.
- **‘x’ status by 2040 or ‘x’ status by 2050 or ‘x’ status by 2060:** the deadlines for achieving the planned status or potential have only been extended beyond 2027 where either ecological recovery time or groundwater recovery time will delay the achieving of the planned status. In these cases there is confidence that the measures needed to achieve the improvement in status are already in place or will be in place by 2021.

Where the status is less than good, this means that a less stringent objective has been set.

The following two tables summarise the status objectives for water bodies, indicating how many of these are alternative objectives.

Table 14 summarises the ecological and chemical status objectives that have been set for the 498 surface water bodies in the river basin district. It shows for instance, that:

- 289 water bodies have an objective of maintaining or aiming to achieve good ecological status between 2015 and 2027
- 143 water bodies have already achieved their objective of moderate ecological status (a less stringent objective)
- 29 water bodies have been set an objective of reaching moderate ecological status (a less stringent objective) by 2027 (an extended deadline)

Table 14: Summary of ecological status or potential and chemical status objectives for surface water bodies (number of water bodies) including those with less stringent objectives and extended deadlines (blue shaded cells)

	Ecological status or potential						Chemical status			
	Bad	Poor	Mod	Good	High	Total	Fail	Good	Total	
By 2015	7	27	143	39	0	216	2	493	495	
By 2021	0	0	1	11	0	12	0	0	0	
By 2027	0	2	29	239	0	270	0	3	3	Extended deadline
Beyond 2027	0	0	0	0	0	0	0	0	0	
Total	7	29	173	289	0	498	2	496	498	
	Less stringent						Less stringent			

Table 15 summarises the quantitative and chemical status objectives that have been set for the 47 groundwater water bodies in the river basin district. It shows for instance, that:

- 31 water bodies have an objective of maintaining or aiming to achieve good quantitative status between 2015 and 2027
- 45 water bodies have an objective of maintaining or aiming to achieve good chemical status between 2015 and 2027
- 16 water bodies have already achieved their objective of poor quantitative status (a less stringent objective)

Table 15: Summary of quantitative and chemical status objectives for groundwater (number of water bodies) including those with less stringent objectives and extended deadlines (blue shaded cells)

	Quantitative status			Chemical status			
	Poor	Good	Total	Poor	Good	Total	
By 2015	16	25	41	2	29	31	Extended deadline
By 2021	0	3	3	0	0	0	
By 2027	0	3	3	0	16	16	
Beyond 2027	0	0	0	0	0	0	
Total	16	31	47	2	45	47	
	Less stringent			Less stringent			

Although 42% of water bodies have a less stringent objective for ecological status or potential, only 11% of elements have a similar objective. The difference is because the overall objective's status is determined by the lowest of the element level objectives. Therefore for many of the water bodies with a less stringent objective, most of the elements still have an element level objective of good status.

Justification for alternative objectives

Table 16 shows how many times the different reasons for justifying the setting of alternative objectives (extended deadlines and less stringent objectives) were used across all water bodies (surface water and groundwater) in this river basin district. More than one reason may have been used to justify the alternative objective for any particular water body and therefore the numbers in the table do not equal the total number of water bodies.

The table also shows the reasons extended deadlines have been set for some shellfish waters and Natura 2000 protected areas.

Table 16: Summary of the justifications for alternative objectives for water bodies, shellfish waters and Natura 2000 protected areas

Alternative objective reason	Sub-reason	Number of water bodies or protected areas where reason has been used		
		Water bodies	Natura 2000	Shellfish waters
Technically infeasible	No known technical solution is available	149	4	0
	Cause of adverse impact unknown	148	3	0
	Practical constraints of a technical nature	0	1	1
	Number of water bodies or protected areas where technically infeasible has been used	263	6	1
Disproportionately expensive	Unfavourable balance of costs and benefits	105	0	0
	Disproportionate burdens	301	1	0
	Number of water bodies or protected areas where disproportionately expensive has been used	343	1	0
Natural conditions	Ecological recovery time	5	0	0
	Groundwater status recovery time	0	0	0
	Background conditions	5	0	0
	Number of water bodies or protected areas where natural conditions has been used	10	0	0
Total number of water bodies or protected areas with an alternative objective (extended deadline and/or less stringent status objective)		474	6	1

Information elsewhere in the river basin management plan

- More information on alternative objectives, including explanations of the justifications for alternative objectives can be found in section 5.4 and 5.5 of [Part 2: RBMP overview](http://www.gov.uk/government/collections/river-basin-management-plans-2015) (www.gov.uk/government/collections/river-basin-management-plans-2015).
- A GeoPDF map of the types, location, boundaries, monitoring sites and current status of water bodies in the river basin district is available on the Environment Agency's [ShareFile service](https://ea.sharefile.com/d-s25aecb60c464ccd9) (<https://ea.sharefile.com/d-s25aecb60c464ccd9>).
- The current status and objective for each water body is available in a spreadsheet on the Environment Agency's [ShareFile service](https://ea.sharefile.com/d-s0faa355450243538) (<https://ea.sharefile.com/d-s0faa355450243538>).

2.6. Reversal of trends

Actions to reverse any significant and sustained upward trends in pollutant concentrations in groundwater must be implemented as soon as a trend has been identified. It is not possible to propose an alternative that is less stringent or extend the deadline for this objective.

2.7. Progressive reduction of pollution of groundwater

Hazardous substances must be prevented from entry into groundwater and the entry into groundwater of all other pollutants must be limited to prevent pollution. Hazardous substances means 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.

2.8. Environmental outcomes for 2021

To help determine the water body status objectives summarised earlier, a prediction was made about what the status of each element will be in 2021. Predicted improvements in status are based on measures where there is confidence that the:

- measures will happen by 2021
- location of the measures and the water bodies that will benefit are known
- change in element status will occur as a result of the measures

Confidence in this context means there is at least a reasonable expectation (more confident than not) that the measures will happen and the outcome will be met. Environmental processes are complex and investment plans of both public and private sectors change. Some of the predicted outcomes may therefore not be achieved. However, there will be opportunities to implement additional measures and potentially achieve further outcomes by 2021. These opportunities are discussed in section 3.5.

The water body status objective does not always show whether an improvement in status is predicted to occur by 2021. For example, an element or water body may require an extended deadline to reach good status and so have an objective of 'good by 2027'. However, it might be predicted to improve from poor to moderate status by 2021.

To help understand the improvements predicted to occur as a result of measures in this plan, the tables 17, 18 19 and 20 summarise the current status and the predicted status in 2021 for:

- surface water bodies (ecological and chemical status)
- groundwater (quantitative and chemical status)
- all elements for all surface water bodies in the river basin district
- selected elements that contribute to the ecological status of surface waters

Table 17: Current and predicted 2021 ecological and chemical status of surface water bodies (number of surface water bodies)

	Ecological status				Chemical status	
	Bad	Poor	Mod	Good or better	Fail	Good
Current status	27	112	320	39	5	493
Predicted 2021 status	22	109	317	50	5	493
Predicted change	-5	-3	-3	11	0	0

Table 18: Current and predicted 2021 quantitative and chemical status of groundwater bodies (number of groundwater bodies)

	Quantitative status		Chemical status	
	Poor	Good	Poor	Good
Current status	22	25	18	29
Predicted 2021 status	19	28	18	29
Predicted change	-3	3	0	0

Table 19: Current and predicted 2021 status of ecological elements and chemical elements (number of elements in surface water bodies)

	Ecological status				Chemical status	
	Bad	Poor	Mod	Good or better	Fail	
Current status	110	350	538	2670	5	1178
Predicted 2021 status	95	328	551	2691	5	1178
Predicted change	-15	-22	13	21	0	0

The predicted status in 2021 for all of the classified elements for each water body are available in a comprehensive data set that forms part of this plan. Table 20 summarises the current and predicted 2021 status for biological elements in surface waters.

Table 20: Current and predicted 2021 status for biological elements in rivers (number of times element assessed)

		Bad	Poor	Mod	Good or better
Fish	Current status	25	64	51	55
	Predicted 2021 status	21	64	51	59
	Predicted change	-4	0	0	4
Invertebrates	Current status	12	37	84	237
	Predicted 2021 status	10	38	83	239
	Predicted change	-2	1	-1	2
Plants (macrophytes and phytobenthos)	Current status	2	44	167	65
	Predicted 2021 status	1	44	162	68
	Predicted change	-1	0	-5	3

Further information in this document:

- Further summaries of current status, 2021 predicted outcomes and water body objectives are presented in section 5.

Information elsewhere in the river basin management plan:

- The 2021 predicted outcomes for each water body are available to download on the Environment Agency's [ShareFile service](https://ea.sharefile.com/d-s0faa355450243538): (<https://ea.sharefile.com/d-s0faa355450243538>).

Additional environmental outcomes for 2021

For some measures, although there is confidence that the measure will happen by 2021, there is not enough confidence about the location or the scale of improvement to be able to predict outcomes for specific elements in specific water bodies.

These additional 2021 outcomes, which are not included in the tables above, are:

- Improvements to protected areas such as the quality of raw water at 78 safeguard zones due to actions targeting pesticides, reduced nutrient pollution at 6 Natura 2000 protected areas and bathing and shellfish water quality as a result of 3 water company improvements to waste water discharges.
- Ecology is expected to improve in at least 30 water bodies as a result of habitat improvements, including over 388ha of wetland creation and over 28km of river improvements, as a result of flood risk management schemes. This ranges from small-scale restoration, for example, on the River Kennet to extensive habitat improvement work, for example, in the River Ver, Upper Lee and Thames Estuary areas, and new flood risk management schemes.
- Improvements in fish populations, including eels, are expected in over 25 water bodies as a result of fish passage and habitat improvement work, for example in the Middle Kennet and Lambourne.
- Several catchments will benefit from reductions in pollution from sediment, nutrients and chemicals as a result of projects focusing on agriculture and land management, road and urban run-off, misconnections and sewage treatment. For example, improvements to discharges from 2 sewage treatment works and, where adopted, Countryside Stewardship.
- Dissolved oxygen levels will improve in the River Lea as a result of water company investment.
- Improvements to the flow and level of water are expected in several catchments, for example, the River Misbourne due to reduced abstraction and more efficient use of water.

The environmental objectives in this plan will drive additional improvement in the water environment by 2021. Opportunities include the periodic review of water company price limits in 2019, government spending reviews, major infrastructure projects and the routine review of environmental permits.

Supporting information:

- To see a summary of the effects of this plan on the wider environment read the [strategic environmental assessment](http://www.gov.uk/government/collections/river-basin-management-plans-2015) (www.gov.uk/government/collections/river-basin-management-plans-2015).
- The impact assessment for the river basin management plans in England provides further information on the benefits this plan will achieve. It is available on the river basin management plan [web pages](http://www.gov.uk/government/collections/river-basin-management-plans-2015) (www.gov.uk/government/collections/river-basin-management-plans-2015).

3. Measures to achieve the environmental objectives

This section provides a summary of the programme of measures that are needed to manage the significant water management issues and achieve the objectives of this plan. The benefits of action and those involved are identified.

3.1. Programme of measures: background

This section provides a summary of the programmes of measures used to achieve the environmental objectives of this plan.

Table 21 provides an overview of the summary programmes of measures.

Table 21: Overview of the programme of measures

Measures to prevent deterioration		
Summary of the programmes of measures to control the significant water management issues	<p>These ongoing measures play a significant role in preventing deterioration.</p> <p>They protect all the current uses of the water environment and the benefits that society gets from it.</p> <p>The ongoing measures represent substantial investment and all sectors with an interest in the water environment have a role to play.</p> <p>These measures apply across the river basin district.</p>	Section 3.2
Measures to achieve outcomes by 2021		
Main programmes of measures for 2021 outcomes (Summary of the programmes of measures that will improve the water environment by 2021)	<p>The main programmes have discrete funding streams to deal with particular issues.</p> <p>These programmes will achieve the biggest improvements in the water environment by 2021.</p> <p>They include the measures predicted to improve specific water bodies by 2021 and additional measures where it has not been possible to predict the geographic extent and/or size of environmental change they will result in by 2021.</p> <p>These measures apply in either specific locations or across the river basin district.</p>	Section 3.3
Local measures (Summary of the local measures identified by catchment partnerships)	<p>Each catchment partnership has identified the measures they will implement by 2021.</p> <p>Some of the measures are reflected in water body specific outcomes by 2021.</p> <p>These measures apply within specific catchments.</p> <p>Catchment partnerships also identify what more they could achieve if additional resources could be realised in future.</p>	Section 3.4

Forward look at measures beyond 2021		
Summary of the programmes of measures to meet objectives for water bodies with extended deadlines	<p>A summary of the additional measures needed to achieve objectives beyond 2021.</p> <p>These will be reviewed when the plans are next updated in 2021</p> <p>These measures are not linked to predicted outcomes for 2021.</p>	Section 3.5
Additional measures to achieve protected area objectives		
Summary and links to the action plans containing measures for protected areas	A summary of and links to the action plans to meet protected area objectives in specific locations.	Section 3.6

Many of these measures, for example, land-based controls on pollutants, will also lead to improvements in marine waters not covered by the WFD.

Information elsewhere in the river basin management plan

- You can find a summary of the process for identifying of measures, including how costs and benefits were assessed in section 5 of the [Part 2: RBMP overview](#) (www.gov.uk/government/collections/river-basin-management-plans-2015).
- More information about the mechanisms used to implement measures is available on the Environment Agency's [ShareFile service](#) (<https://ea.sharefile.com/d-sabbd14301a44d5e9>).

3.2. Measures to prevent deterioration

This section summarises the ongoing measures that help prevent deterioration and protect the many uses of the water environment and the benefits it provides. Many of these measures also help improve the quality of the water environment.

The measures are presented for each of the significant water management issues described in section 1.4.

To identify which sectors are involved in implementing the measures, the main roles in managing the water environment (identified in section 1.2) are referred to below.

Physical modifications

Physical changes such as widening, deepening and straightening rivers, estuaries and coasts help to meet the needs of society and the economy. Physical modifications allow the water environment to be used and valued for many purposes, including for navigation, flood risk management, fishing and other recreational activities that improve people's wellbeing and quality of life. These changes have helped towns and cities to develop and the economy to grow, but this can sometimes be at the expense of the water environment.

There are benefits to controlling new modifications and reducing the impacts of existing ones. While many modifications are, and will continue to be important to society, their potentially harmful impacts can be reduced and the resilience of aquatic communities improved. Taking action to address the impacts of physical modifications can have benefits for protected areas, in particular Natura 2000 sites. There is increasing evidence that in some cases, addressing the impacts of modifications (for instance by using natural water retention measures such as wetland creation and coastal realignment) could help alleviate flooding by slowing flows and making more space for water.

How the issue is managed

Regulators and operators use and apply relevant legislation and policy:

- **Local government and internal drainage boards** grant land drainage consents under the Land Drainage Act 1991. **Government and agencies (Environment Agency)** grant flood defence consents under the Water Resources Act 1991. Subject to parliamentary approval, flood defence consents will be replaced with flood risk activity permits from April 2016. All these authorities assess applications for schemes or activities for their potential effect on local flood risk and the environment.
- **Government and agencies (Environment Agency)** make sure new abstraction and impoundment licences and environmental permits include protection for freshwater and migratory fish where relevant and use powers to ensure fish passes and screens are in place where appropriate.
- **Government and agencies (Marine Management Organisation)** use marine licensing controls under the Marine and Coastal Access Act 2009 for activities including construction, alteration or improvement works, dredging and removing substances or objects from the sea or sea bed.
- **All sectors** to consider the Marine Policy Statement and marine plans in decisions that affect marine and coastal environments. These plans set out the strategic framework for sustainable development of the sea.
- **Navigation (harbour authorities)** license dredging and works within harbour limits.

- **Government and agencies (Environment Agency)** work with partners and interested groups to identify appropriate mitigation measures to achieve WFD objectives in artificial and heavily modified water bodies. Mitigation measures are practicable steps that can be taken to mitigate adverse impacts from beneficial human activities such as impoundments for water resources, or structures that provide flood defence.
- **Local government** consider impact on hydromorphology when preparing spatial plans and local flood risk management plans, decisions on development management, new buildings and infrastructure.

Operators and project undertakers apply the following guidance:

- **Navigation (ports and harbours), industry, manufacturing and other business, non governmental organisations and central government** use the e-learning site for flood risk management to access expert information on mitigation measures.
- **All sectors** apply the Environment Agency's WFD compliance guidance, which covers a range of activities in estuaries and coasts.
- **Industry, manufacturing and other business** use the Environment Agency's 'Hydropower development: guidance for run-of-river hydropower'.
- **Navigation (ports and harbours), government and agencies (Environment Agency) and local government** use industry developed best practice guidance.

Influencers and regulators consider future management activities:

- **Local government, central government (Environment Agency)** refresh the strategic overview of sea flooding and coastal erosion to better manage environmental risk in the long term using shoreline management plans.
- **Government and agencies (Environment Agency)** to explore effectiveness of existing approach to planning guidance on development in flood plains and coastal erosion risk areas.
- **Government and agencies (Environment Agency)** to review flood defence design standards for WFD and Natura 2000 sites.
- **Government and agencies (Environment Agency)** to carry out feasibility studies and designs for flood storage areas for environmental benefits.

Further information in this document

- Section 3.3 includes further information on flood risk management investment.

Information elsewhere in the river basin management plan

- You can find more information about managing flooding and flood risk management plans in section 2 of the [Part 2: RBMP overview](http://www.gov.uk/government/collections/river-basin-management-plans-2015) (www.gov.uk/government/collections/river-basin-management-plans-2015).

Supporting information

- More information on marine plans can be found on the gov.uk [webpages](https://www.gov.uk/government/collections/marine-planning-in-england) (<https://www.gov.uk/government/collections/marine-planning-in-england>).
- The Environment Agency's compliance guidance for activities in estuaries and coasts can be found on the gov.uk [webpages](https://www.gov.uk/government/publications/complying-with-the-water-framework-directive-marine-dredging) (<https://www.gov.uk/government/publications/complying-with-the-water-framework-directive-marine-dredging>).
- The Environment Agency's guidance for hydropower development can be found on the gov.uk [webpages](https://www.gov.uk/government/collections/hydropower-schemes-guidelines-and-applying-for-permission) (<https://www.gov.uk/government/collections/hydropower-schemes-guidelines-and-applying-for-permission>).

Managing pollution from waste water

Waste water, or sewage, can contain:

- nutrients such as phosphorus and nitrates
- harmful chemicals, including ammonia and metals and those used in homes and industry
- other harmful substances, including viruses and bacteria

Pollutants in waste water can affect the dissolved oxygen levels within the receiving waters and can impact on ecology. Nutrients can disturb the natural ecological balance of a water body and cause excessive growth of vegetation and algae, which may starve the water of oxygen. Other pollutants such as metals and everyday chemical used in products around the home which are discharged in sewage may be directly toxic to plants or animals. Humans can also be affected, for example, through chemicals that accumulate in food or bacteria and viruses in waste water affecting bathing waters

Reducing the impact of pollution from waste water will provide many benefits and help support a wide range of water uses that society values. These uses include drinking water supply, agriculture (including commercial shellfish harvesting), water sports, angling, conservation, and wider benefits such as tourism and quality of life. Addressing pollution from waste water will have benefits for a large number of protected areas including bathing waters, shellfish waters, Natura 2000 sites and sensitive areas under the Urban Waste Water Treatment Directive. It also benefits marine waters under the Marine Strategy Framework Directive.

How the issue is managed

Regulators, operators and influencers use and apply relevant legislation and policy:

- **Government and agencies (Environment Agency)** grant and review environmental permits under the Environmental Permitting Regulations (England and Wales) 2010 to the **water industry, manufacturing and other business and other sectors** to protect the environment from pollutants such as chemicals, nutrients, bacteria, viruses, ammonia and organic material in discharged effluent.
- **Government and agencies (Environment Agency)** work with the **water industry** to develop a long-term strategy for sewerage to prevent deterioration of permitted discharges (for example, combined sewer overflows), resulting from pressures such as climate change, growth and ageing infrastructure; and to develop a long term strategy to reduce and minimise risks to the water environment from misconnected sewerage (foul sewage wrongly connected to surface water).
- **Government and agencies (Environment Agency)** grant environmental permits for small sewage discharges in designated sensitive areas. In other areas, small sewage discharges (including septic tanks) are exempt from the need for a permit if they can meet a number of criteria.
- **Government (Environment Agency)** to carry out a review of areas sensitive to eutrophication, in relation to the Urban Waste Water Treatment Directive (UWWTD) and make recommendations to Defra.
- **Government and agencies (Environment Agency and Health and Safety Inspectorate)** enforce restrictions and bans on the use of certain chemicals

- **Local government** considers the impact on water quality in their preparation of spatial plans, decisions on spatial planning, development management, new buildings and infrastructure.
- **All sectors** to consider the Marine Policy Statement and marine plans in decisions that affect marine and coastal environments. These plans set out the strategic framework for sustainable development of the sea.

Further information in this document

- You can find more information on water company investment in section 3.3.

Information elsewhere in the river basin management plan

- You can find more information on the National Environment Programme in Section 2 of [Part 2: RBMP overview](http://www.gov.uk/government/collections/river-basin-management-plans-2015) (www.gov.uk/government/collections/river-basin-management-plans-2015).

Managing pollution from towns, cities and transport

Rainwater draining from roads and pavements carries many pollutants. These include metals, vehicle emissions, silt, grit, bacteria from animal faeces and oil. Other issues arise from pollution from households and business, for example, misuse of the drainage network. Pollution can enter surface water sewers that discharge to rivers, estuaries and coastal waters, causing harm to animals and plants.

Dealing with pollution from towns, cities and transport is a complex task. Costs for the measures tend to be higher and ownership of the problem is less clear. Existing legal powers are designed to address specific sources of pollution rather than small-scale or cumulative impacts from many different sources. However, there are some ways in which the challenge can be addressed. Benefits from action include improved flood resilience, climate change adaptation, increased biodiversity and social cohesion. In addition, protected areas, particularly certain bathing waters and shellfish waters, can be improved when enough resources are targeted at a specific issue.

How the issue is managed

Regulators and operators use and apply relevant legislation and policy:

- **Local government** uses planning conditions, legal agreements and enforcement powers under the Town and Country Planning Act 1990 to prevent or stop pollution from developments, roads and other infrastructure.
- **Local government** makes sure that new developments address potential pollution problems by using sustainable drainage systems to manage surface water.
- **Local government** uses powers under the Building Act 1984 to rectify misconnected waste water pipe work, and statutory nuisance powers under the Environmental Protection Act 1990 to stop water pollution from unauthorised operations such as transient car wash operations.
- **Government and agencies (Environment Agency)** use anti-pollution works powers (including service of notices) under the Water Resources Act 1991 to prevent or clean up small scale pollution, for example, ensuring storage tanks are bunded or repairing misconnections.
- **Industry, manufacturing and other business** comply with existing regulations (for example, the Environmental Permitting (England and Wales) Regulations 2010) to make sure that chemicals are properly managed and surface water drainage is appropriately used and maintained.

Operators take action, where appropriate:

- **Industry, manufacturing and other business (construction industry)** use sustainable drainage systems to remove silt and minimise other chemicals to prevent polluting run-off.
- **Local government** considers urban diffuse pollution pressures when developing spatial plans, determining planning applications and designing and constructing local council owned buildings, infrastructure and grounds. These should incorporate sustainable drainage schemes and water efficiency measures where practical and affordable.
- **Local government** incorporates green and blue infrastructure into regeneration schemes where possible.

- **Local government and industry, manufacturing and other business** reduce the impact of pesticides by using Amenity Assured registered weed control contractors under the Voluntary Initiative.

Regulators and operators plan and work together:

- **Government and agencies (Environment Agency) and Highways England** apply the memorandum of understanding agreement covering the strategic road network and remediation of high risk outfalls.
- **Government and agencies (Environment Agency) and urban and transport (Network Rail)** operate under the terms of a memorandum of understanding covering contaminated land, water discharge and use of pesticides.
- **Government and agencies (Environment Agency and water industry)** investigate and deal with misconnections, for example, through the National Misconnections Strategy group and in accordance with Defra's diffuse urban action plan.
- **All sectors** to consider the Marine Policy Statement and marine plans in decisions that affect marine and coastal environments. These plans set out the strategic framework for sustainable development of the sea.
- **Industry manufacturing and other business, local government, navigation and general public** follow codes of conduct and non-statutory estuary and coastal management plans to protect and improve the water environment in specific locations.
- **Local government** works with **industry, manufacturing and other business (Local Enterprise Partnerships)**, and **non governmental organisations** (catchment partnerships and Local Nature Partnerships) to develop joint improvement programmes.
- **Industry, manufacturing and other business (Local Enterprise Partnerships)** work in partnership with **all sectors** to help identify where money from the European Growth Programme is invested to develop local economies and enhance the environment.

Further information in this document

- You can find more information on Highways England's environment fund in section 3.3.

Changes to natural flow and levels of water

Taking too much water from freshwater or tidal rivers, canals, lakes and groundwater damages the environment. Changes in the natural flow and level of water could affect some Natura 2000 sites; particularly water dependent Special Areas of Conservation. Improving the way water resources are managed will make sure that there is enough good quality water for a healthier water environment and secure supplies of water for people, businesses and agriculture. It will also provide more leisure opportunities and increase the amenity value of natural environments, leading to health benefits for people.

How the issue is managed

Regulators and operators use and apply relevant legislation and policy:

- **Government and agencies (Environment Agency)** grant licences under the Water Resources Act 1991 to regulate how much water is taken from rivers, lakes estuaries and groundwater. The Environment Agency reviews the sustainability of time-limited abstraction licences as they expire and the licence holders seek replacement licences. The Environment Agency will take action to curtail time-limited licences that are not sustainable. Replacement licences are granted on a sustainable basis in line with water body objectives.
- **Government and agencies (Environment Agency)** change or revoke permanent licences to protect the environment from actual or potential damage, including serious damage under the Water Resources Act 1991.
- **Government and agencies (Environment Agency)** work to bring a number of currently exempt abstraction activities into regulation following public consultation and formulation of government policy and legislation. This includes dewatering, transfers for inland navigation and previously exempt irrigation activities. Some reductions in currently exempt abstractions that are causing serious damage to the environment may be necessary. This may result in an improvement in groundwater and flow in affected water bodies.
- **All sectors** consider the Marine Policy Statement and marine plans in decisions that affect marine and coastal environments. These plans set out the strategic framework for sustainable development of the sea.

Regulators and operators take action:

- **Government and agencies (Environment Agency)** identify water resource pressures due to abstraction and restore sustainable flows and groundwater levels through changes to abstraction licences and physical changes to river channels to improve flows. New licences must be sustainable and prevent future impacts.
- **Government and agencies (Environment Agency)** implement the Restoring Sustainable Abstraction (RSA) programme. This programme identified, investigated and is solving environmental risks or problems caused by unsustainable licensed water abstraction. The Environment Agency takes action to curtail abstraction licences that have been identified as causing an environmental problem under the RSA programme. The Environment Agency aims to complete the programme by the end of March 2020.

Regulators and operators plan and work together:

- **Water industry** complete statutory Water Resource Management Plans, setting out how supplies and demand for water will be managed over a 25 year period, and takes action to restore sustainable groundwater and flows where impacts due to abstraction have been confirmed.
- **Water industry** produce drought plans to make sure that public water supplies are maintained while minimising the environmental impact of drought.
- **Government and agencies (Environment Agency)** produce abstraction licensing strategies to help ensure a consistent approach to managing water resources and balancing the needs of water users and the environment.
- **Government and agencies (Environment Agency)** revoke unused licences where the licence holder does not have a reasonable need for the water.
- **Water industry** carries out Adaptive Management trials, to determine the best measures for improving heavily modified water bodies used for water supply.

Regulators, operators, influencers and project undertakers make sure water is used efficiently:

- **All sectors** take up or encourage water efficiency measures, including water industry work on metering, leakage, audits, providing water efficient products, promoting water efficiency and education.
- **Local government** sets out local plan policies requiring new homes to meet the tighter water efficiency standard of 110 litres per person per day as described in Part G of Schedule 1 to the Building Regulations 2010.
- **Industry manufacturing and other business** implement tighter levels of water efficiency, as proposed by changes to the Building Regulations.
- **Agriculture and rural land management** manage demand for water and use water more efficiently to have a sustainable water supply for the future.
- **Local government** commissions water cycle studies to inform spatial planning decisions around local water resources.

Further information in this document

- You can find more information on water resources sustainability measures and water company investment in section 3.3.

Information elsewhere in the river basin management plan

- You can find more information about the management of abstraction and flow in [Part 2: RBMP overview](http://www.gov.uk/government/collections/river-basin-management-plans-2015) (www.gov.uk/government/collections/river-basin-management-plans-2015).

Managing invasive non-native species

Some non-native animals and plants are invasive and can have significant social, economic and environmental impacts. Where they lead to greater erosion some plants, such as Himalayan balsam, can increase flood risk. Others like American signal crayfish can decrease river bank stability and most have negative impacts on ecology and leisure activities such as angling and water sports. There are also significant costs in controlling and safely disposing of invasive species such as Japanese knotweed on development sites and managing species such as zebra mussels, which can block pipes, intakes and other structures.

Many invasive non-native species spread rapidly and once they are established control is often prohibitively expensive or technically infeasible and ultimately unsuccessful.

The approach to dealing with invasive non native species is set out in the GB Invasive Non-native Species Strategy. The strategy aims to minimise the risk posed by, and reduce the negative impacts of invasive non-native species. It adopts a hierarchical approach stressing prevention, followed by early detection and rapid response and finally long-term management and control.

The most effective and least expensive measure is to reduce the number of new species introduced and slow the spread of those that are already present by applying good biosecurity (measures which reduce the risk of spreading diseases and invasive non-native plants and animals) and promoting the 'Check, Clean Dry' and 'Be Plantwise' campaigns.

Natura 2000 protected areas can be vulnerable to certain invasive non-native species. Intensive and often expensive control measures may be required to actively manage or eradicate them in specific circumstances. For example, at sites designated for their wetland habitat interest, Himalayan balsam can dominate and reduce the habitat space available for native plant species. Controlling the Himalayan balsam by targeted and intensive hand pulling or cutting over a number of years can reduce the pressure from this species and prevent further deterioration of the habitat.

How the issue is managed

Regulators and operators use and apply relevant legislation and policy:

- **Government and agencies (Environment Agency and Natural England)** use the Keeping and Introduction of Fish Regulations 2015 and Wildlife and Countryside Act 1981 to control movements of invasive non-native species. A change in legislation, implemented in April 2014, introduced a ban on selling 5 high-risk plant species including water primrose and floating pennywort.
- **Agriculture and rural land management** is aware of the Wildlife and Countryside Act 1981 and does not allow certain species to escape into the wild.
- **Government and agencies (Marine Management Organisation)** use policies within emerging marine plans and marine policy statements to support controlling and mitigation against invasive non native species.
- **Government and agencies** implement EU Regulation 1143/2014 on Invasive Alien Species. Implementation of the regulation is gradual and will take place throughout the period of this plan.

Regulators, operators, influencers and project undertakers plan and work together:

- **Government and agencies (includes Environment Agency and Natural England), non governmental organisations (including angling, conservation and recreation)** implement the updated Great Britain strategy on invasive species, which includes species impact risk assessments, action plans and rapid response.
- **All sectors work together to develop and implement codes of practice** to reduce the spread of invasive non-native species.

Regulators, operators, influencers and project undertakers take action:

- **Government and agencies (includes Environment Agency and Defra), non governmental organisations (angling, conservation and recreation) and navigation** implement rapid responses to contain and eradicate new invasions where practicable. This measure is aided by the addition of powers to make Species Control Agreements and Orders in the Wildlife & Countryside Act 1981 as amended by the Infrastructure Act 2015.
- **Government and agencies (Natural England)** manage invasive non native species at selected protected sites as appropriate.
- **All sectors** can form Local Action Groups to deal with invasive non native species and raise awareness.

Regulators, operators, influencers and project undertakers build awareness and understanding:

- **Government and agencies (includes Environment Agency and Natural England), non-governmental organisations (including angling, conservation and recreation), local government and navigation** work in partnership to influence recreational users to slow the spread of invasive non native species by promoting 'Check, Clean, Dry' actions.
- **Government and agencies (Defra) and all sectors** raise public awareness of the risk of transferring non-native species accidentally and of preventative approaches.
- **Central government** helps the non-native species secretariat co-ordinate alert systems, species records and a central repository for information, including public online and smart phone submission of species records.

Information elsewhere in the river basin management plan

- You can find more information about the management of invasive non-native species in section 2 of [Part 2: RBMP overview](http://www.gov.uk/government/collections/river-basin-management-plans-2015) (www.gov.uk/government/collections/river-basin-management-plans-2015).

Supporting information

- The GB Invasive Non-native Species Strategy can be found on the GB non-native species secretariat [webpages](http://www.nonnativespecies.org/index.cfm?sectionid=55) (<http://www.nonnativespecies.org/index.cfm?sectionid=55>).

Manage pollution from rural areas

Pollution from rural areas comes from the combined effects of numerous sources, including agriculture, roads, recreational land use such as golf courses and forestry activities. It is mainly caused by nutrients, contaminants, chemicals such as pesticide and sediment entering water bodies as a result of land management activities.

Dealing with pollution from rural areas will help society reap the benefits of a healthy water environment. Farmers will benefit from making sure soil and nutrients are retained on the land rather than losing them, through run-off, to water. Controlling this run-off will help reduce localised flooding, reduce the sedimentation of lakes and harbours, improve fisheries and reduce the amount of harmful chemicals entering water bodies. Water companies will spend less money treating water for colour, pesticides and nitrate contamination. A reduction in nutrients will also benefit water quality and habitat in estuaries and coastal waters.

A wide range of protected areas will see benefits, including bathing water, shellfish waters, drinking water protected areas, Natura 2000 sites and nutrient sensitive areas designated as nitrate vulnerable zones.

How the issue is managed

Regulators and operators use and apply relevant legislation and policy:

- **Government and agencies (Environment Agency)** check and ensure compliance against environmental permits under the Environmental Permitting (England and Wales) Regulations 2010 and against requirements of a wide range of environmental legislation.
- **Agricultural and rural land management (farm businesses)** comply with permits granted under the Environmental Permitting (England and Wales) Regulations 2010. Permitted activities include some discharges to groundwater, spreading of waste to land for agricultural benefit, pig and poultry units over a certain size and safe recovery of agricultural waste.
- **Agricultural and rural land management (farm businesses)** comply with the action programme measures within the Nitrate Pollution Prevention Regulations 2015 in all nitrate vulnerable zones.
- **Agricultural and rural land management (farm businesses)** comply with the requirements of the Control of Pollution (Silage Slurry and Agricultural Fuel Oil) Regulations 2010 (SSAFO).
- **Agricultural and rural land management (farm businesses)** ensure that polluting matter is not present at a place where it has or is likely to enter controlled waters to avoid enforcement action under Water Resources Act 1991.
- **Government and agencies (Farming Advice Service)** advise farmers on general requirements of cross compliance and regulations required under the WFD.
- **Government and agencies (Environment Agency and Natural England)** provide site-level advice on the specific requirements of regulations.
- **Government and agencies (Natural England)** provide advice on the specific requirements of regulation that relate to designated sites, and can prevent or stop potentially damaging activities.
- **Government and agencies (Environment Agency and Natural England)** provide advice and training to farmers in some priority catchments through an approach such as Catchment Sensitive Farming.

- **Government and agencies (Environment Agency)** review the effectiveness of measures within catchments, and where there is sufficient need, consider whether further action should be proposed.
- **Government and agencies (Forestry Commission)** comply with the UK Forestry Standard, the government's approach to sustainable forestry.
- **Local government** uses planning conditions, legal agreements and enforcement powers under the Town and Country Planning Act 1990 to prevent or stop pollution from rural developments, roads and other rural infrastructure.
- **Local government** considers the impact of pollution when preparing spatial plans, minerals and waste plans and making decisions on development management, new rural buildings and rural infrastructure.

Operators, influencers and project undertakers take action:

- **Agricultural and rural land management (farm businesses)** meet cross compliance requirements of the Basic Payment scheme funded by the Common Agricultural Policy.
- **Agricultural and rural land management (farm businesses)** voluntarily participate in Countryside Stewardship and Countryside Productivity schemes to prevent deterioration, improve water quality and reduce flood risk.
- **Agricultural industry manufacturing and other business** participate in sector led approaches including farm assurance and the Campaign for the Farmed Environment schemes.
- **Water industry and rural land management** work together in drinking water safeguard zones to reduce the need for water treatment as a result of nutrients or pesticides to meet drinking water standards.
- **Government and agencies (Forestry Commission and Environment Agency)** use opportunity mapping to identify and promote locations where woodland creation can achieve multiple benefits for the environment.

Further information in this document

- You can find more information on Countryside Stewardship in section 3.3.

Information elsewhere in the river basin management plan

- You can find more information about the management of pollution from rural areas in section 2 of [Part 2: RBMP overview](http://www.gov.uk/government/collections/river-basin-management-plans-2015) (www.gov.uk/government/collections/river-basin-management-plans-2015).

3.3. Main programmes of measures for 2021 outcomes

This section provides a summary of the main programmes of measures, grouped by funding sources, which will improve the water environment by 2021. The outcomes of these measures fall into 2 categories:

- measures which the predicted improvements in the status of water bodies by 2021 are based upon
- measures which will happen by 2021 and achieve environmental outcomes, but there is not enough confidence (in location or scale of improvement) to predict specific outcomes

The main programmes are:

- water company investment programme
- Countryside Stewardship
- Highways England's environment fund
- flood risk management investment programme
- catchment level government funded improvements
- water resources sustainability measures

Supporting information

- You can find a list of the measures used to predict improvements in status by 2021 for specific elements in specific water bodies, and a summary of the measures expected to result in additional environmental outcomes for 2021 on the Environment Agency's [ShareFile service](https://ea.sharefile.com/d-sabbd14301a44d5e9) (<https://ea.sharefile.com/d-sabbd14301a44d5e9>).

Water company investment programme

Ofwat, the economic regulator of the water companies, reviews water industry investment plans every 5 years. As part of this process, known as the price review, the Environment Agency works with water companies, Ofwat and others to make sure that investment protects the water environment, increases resilience and secures long-term benefits for society and the economy. The Environment Agency sets out the environmental obligations, including work required to prevent deterioration and achieve protected area and water body status objectives.

Across England and Wales, water companies will be investing £3.5 billion in environmental improvements between 2015 and 2020. This equates to, when forecast over a 37-year period, a total of approximately £350 million being invested in this river basin district, plus additional investment specifically on the Thames Tideway and the Lee tunnel in London.

Significant investment will go into addressing point source impacts from sewage treatment works and discharges from the sewer network. This will reduce pollutants such as ammonia and nutrients that disturb the natural ecological balance of water bodies and cause excessive growth of vegetation and algae.

Further investment will deal with abstraction and flow pressures. This includes reducing the amount of water that can be taken or measures to enhance habitats to compensate for damage caused by abstraction.

Habitat improvement schemes are planned to reduce the impact of physical modifications caused by water company operations and action is planned to deal with invasive non-native species on water company land. Further measures will ensure compliance with the Eels Regulations, which require water intakes to be screened to prevent eels and other fish from being drawn out of the river into drinking water treatment works.

Climate change adaptation and mitigation is an integral part of water company planning and is an essential part of assessing scheme options. This is particularly important for water resources planning, where water companies must plan up to 25 years in advance to make sure that there is enough water to meet future demands.

Most of the measures are well-established engineering solutions that are proven to be effective. Changes are secured through amendments to environmental permits.

There are some catchment and habitat improvement schemes that are less well established, including measures to reduce pesticide pollution. Some of these schemes rely on voluntary behavioural change affecting agricultural practice. These can be less effective when compared to engineering solutions.

A 'fair share approach' is applied to the selection of measures, which assumes there is a proportional reduction in polluting load from each of the contributing sectors. For example, when identifying measures for phosphorus in a catchment, the amount coming from sewage treatment works and the amount from other sources, such as rural diffuse pollution was calculated. If the sewage works was responsible for 70% of the phosphorus load, then the measure identified is to achieve 70% of the required phosphorus reduction. In this situation achieving an improvement in status is reliant on other sectors putting additional measures in place.

Water company investment will directly contribute to predicted improvements in status by 2021 for specific elements in specific water bodies. A large proportion of this will be achieved by installing phosphate-stripping equipment at sewage treatment works. In addition, measures to reduce the amount of water taken out of the environment for public water supply will make sure that there is enough water left in rivers and lakes to support good ecological status. This will be achieved through changes to water company abstraction licences.

A wide range of measures will secure additional outcomes for the environment, but are not linked to specific improvements in element status by 2021 because there is insufficient confidence about the scale of improvement. This includes measures for eel passage, measures to protect drinking waters and improve bathing waters and measures to improve river habitat and flow regime where it is affected by impoundment for public water supply.

Water companies are also investing in the Chemicals Investigation Programme, a multi-million study to better understand the impacts of chemicals in treated sewage and to trial new treatment technologies and catchment measures to reduce these impacts. The results from the Chemicals Investigation Programme will be used to implement measures to reduce the impacts of chemicals discharged in sewage in the future.

Examples of these measures in the Thames river basin district

Water resources

The Affinity Water supply area within the Thames river basin district is home to a significant number of chalk streams flowing off the Chiltern Hills and North Downs. Affinity Water has agreed to help protect these rare chalk streams by reducing the amount of water that it abstracts from groundwater sources by 69.8 million litres a day by the end of asset management plan (AMP) 7 (2025). It will continue to meet demand for water by a number of planned initiatives, including its water saving programme that includes metering, leakage reduction and water efficiency. As well as reducing abstraction, the company will be carrying out river restoration and habitat enhancement work on 7 chalk streams together with the Environment Agency and catchment partnerships, to improve ecology and habitat diversity.

Affinity Water will also be carrying out a detailed programme of monitoring to assess the effectiveness of both in-channel works and abstraction reductions. With this significant reduction in abstraction, it is important to protect the water available for public water supply. There will be a comprehensive catchment management programme to support the abstraction reductions. The programme will investigate pollution risks and Affinity Water will work with local communities to address issues such as diffuse pollution from agriculture affecting raw water quality.

Water quality

The water quality concerns for the Thames Estuary centre on the impacts of storm discharges from the 5 major sewage works that serve London, and from the combined sewer network. These discharges to the estuary frequently result in low dissolved oxygen levels, pose a risk to health and kill fish. It is also aesthetically unsightly and detrimental to the image of the River Thames.

Improvements to the sewage treatment works along the tidal River Thames and the construction of the London Tideway tunnels are planned to be completed by Thames Water over the next 2 river basin cycles, with tunnelling beginning in 2017 and all work will be completed by 2023.

These major projects represent the main measures to address point source pollution from the sewerage system and are fundamental to achieving good status in this catchment.

The Thames Tideway tunnel will provide 1.6 million cubic metres of capacity via a 25 kilometre interception, storage and transfer tunnel that will run up to 65 metres below the River Thames. It will improve water quality, ecology and public health plus wider benefits in terms of creating new riverside open spaces.

The scheme will be implemented by a new infrastructure provider, Thames Tideway Tunnel Limited, and will cost £4.4 billion. Of this, £2.8 billion will be provided by Thames Tideway Tunnel Limited, with the remainder funded by Thames Water Utilities Limited. Thames Tideway Tunnel Limited will build, own, finance and maintain the project.

Countryside Stewardship

Countryside Stewardship is a new scheme that is open to all eligible farmers, woodland owners, foresters and other land managers through a competitive application process. It is entirely voluntary and is part of a wider investment of £3.5 billion in England under the Common Agricultural Policy for 2016 to 2020. It will contribute £900 million of new funds to enhance the natural environment, particularly the diversity of wildlife and water quality. Of this funding, about £400 million will be invested over a 5-year period to improve water quality and increase resilience against flooding.

By 2020, it is expected that 30% to 40% of rural England could be part of a Countryside Stewardship agreement. Countryside Stewardship supports the implementation of measures over and above legal requirements and good practice. It will address soil management and reduce the effect of nutrients, sediment and faecal contamination. This will reduce the impact of eutrophication and benefit bathing waters, shellfish waters and drinking water. This is achieved through measures categorised by the following groups:

- enhanced field management, including seasonal livestock exclusion, winter cover crops, buffer and riparian management strips next to watercourses and reduced nutrient applications from fertilisers
- land use change, including woodland and wetland creation or converting arable land to grassland which requires less fertiliser
- water and woodland capital grants, including sediment traps, fencing of watercourses and tree planting
- re-naturalising rivers and coast defences, including making space for water and coastal realignment

Countryside Stewardship will support climate change resilience, for example, by planting trees next to rivers and streams, which can reduce river temperature and the risk to salmonid fisheries. It will also reduce sedimentation of rivers, making rivers better able to store more flood water.

Individually these measures can be effective at a field scale but a number of land managers need to take up measures across the whole catchment for the measures to be really effective. As a result, improvements to the environment from Countryside Stewardship are not linked to specific improvements in water body element status by 2021. The uptake of measures is voluntary, with the first agreements commencing in January 2016.

The individual nature of catchments including soils, topography and rainfall make it difficult to quantify the benefits of these measures. Countryside Stewardship is expected to achieve additional environmental outcomes for 2021. Preliminary research suggests that for nutrients and sediment it may provide elemental improvements of approximately 2 to 10% from the current position where supported with advice. In some discreet locations an improvement of up to 18% may be achieved, but the precise locations will depend on the level of uptake of measures by farmers and the supporting advice provided. Further research is planned that will help to evaluate the likely benefits of Countryside Stewardship for water.

It is not yet possible to describe the detail of schemes or exact location of investment, however improvements are anticipated within the river basin district.

Highways England's environment fund

Highways England is the government company that manages motorways and major A roads. It manages around 6,500 miles of trunk roads that accommodate 33% of all road travel and 50% of lorry travel. Over the next 5 years, Highways England's environment fund will invest £300 million in the existing strategic road network for environmental improvements. A proportion of this will address pollution from highway run-off.

Highway run-off is waste that collects on roads made up of silt and grits mixed with contaminants, including metals from brake pads and oil from engines and vehicle emissions. During storms this is washed off the road and can reach rivers, lakes or groundwater without being treated. The metals, nutrients and sediments can harm the ecology of the water environment. This is made worse by the effects of physical modifications required by the road network, such as bridges and culverts.

Highways England take a risk based approach to decide how and where to invest, using modelling that looks at factors including road length drained and climatic conditions. The actual impact of a measure on the receiving water body can't be entirely predicted, although the standard techniques are relatively reliable and well understood.

Outfalls will generally be treated with sustainable drainage systems (SuDS), which is a broad term of measures from those that can trap pollutants at the side of the carriageway through a swale (shallow grassy ditch) to large balancing ponds that regulate flow quantity as well as allowing pollutants to settle out. To address physical modification pressures, techniques such as fish and eel passes are installed to allow fish migration.

SuDS are moderately resilient to climate change as they use natural processes and cope well with fluctuations, although prolonged drought may restrict their effectiveness. They can achieve a range of benefits, when used on the strategic road network these include water quality improvements, flood risk reduction and water availability.

Improvements to the environment from Highway England's investment programme are not linked to specific improvements in water body element status by 2021. Highways England has not yet announced the location of investment so improvements in specific locations cannot be predicted. Further detail is expected during 2016.

Implementing the programme will result in additional environmental outcomes for 2021. The pressure from sediment and chemical loadings will be reduced by an order of magnitude and there will be reductions in metals and nutrients alongside improvements in dissolved oxygen levels. Eel passes on culverts will allow upstream migration resulting in more sustainable eel populations.

It is not yet possible to describe the detail of schemes or exact location of investment, however improvements are anticipated within the river basin district by 2021.

Flood risk management investment

The Environment Agency's Flood and Coastal Erosion Risk Management capital investment programme aims to reduce the risks of flooding and erosion to people's homes and the economy over the next 6 years to 2021. Projects will focus on protecting people and avoiding other economic damage (including farming business). Some may also contribute towards improving the status of water bodies, protecting valuable wildlife sites and creating new habitats.

Flood and coastal erosion risk management is a legitimate use of many water bodies but has in some cases resulted in significant modification and alterations in hydromorphology. Activities to improve water body conveyance and reduce flood risk, such as construction and reinforcement of banks, channel re-sectioning and vegetation management often have a negative impact on the condition of water bodies.

The capital investment programme aims to reduce the impact of these activities by, where possible, working with natural processes. This includes using natural flood management measures to slow, store and filter floodwater. This will achieve more sustainable flood risk management schemes, often with significant additional environmental and social benefits. This approach is used together with traditionally constructed hard defences to increase the resilience of communities to extreme events, both floods and drought.

In identifying and designing schemes the impacts of climate change, such as more winter rainfall, more intense rainstorms and sea level rise are taken into account.

Meeting statutory obligations, improving the natural environment and mitigating climate change will be achieved through 'win-wins' at the same time as reducing flood and coastal erosion risk (for example, through natural flood management). Achieving environmental outcomes is integral to flood and coastal risk management, for example, where possible when improving defences opportunities to reduce any barriers to eel passage will also be sought.

Examples of these measures in the Thames river basin district

Oxford flood alleviation scheme

The Environment Agency are working with their project partners, local stakeholders and environmental groups to develop a scheme to reduce flood risk in Oxford. The scheme is in development with the project team gathering the evidence needed to gain government approval for the scheme. If the scheme is approved construction will begin in 2018.

Options include the construction of new channels or enlargement of existing channels in the western floodplain. A new channel would provide additional capacity and would work with the natural processes of the local watercourses and the flood plain to help manage the movement of water through Oxford. In addition to the scheme design, work is also being undertaken to influence land management in the upper Thames catchment. This work will help to reduce diffuse pollution and sediment entering our rivers, as well as reducing flood risk. Climate change predications have also been taken into account which, in the future may result in the creation of an upstream storage area, complimenting the flood relief channel and mitigating the increased risk of flooding.

This scheme presents an opportunity for Oxfordshire communities to create an inspiring new natural resource. The project team aim to ensure that any scheme would be as natural, wildlife-rich and attractive as possible. They aim to embed Water Framework Directive improvements in the development of the proposed flood alleviation scheme.

Wealdstone Brook project

The Wealdstone Brook is an urban river catchment in North London (Brent and Harrow) that responds very quickly to rainfall. There have been several flooding incidents over the last 30 years, particularly due to the foul sewerage system backing up as a consequence of being overloaded with surface water.

A computerised model of the wastewater, storm water and watercourse network in the Brent and Harrow catchment is currently being developed. Interested groups that are involved in the project will use this model to map out planned investment in the catchment and to work together on solutions. A sustainable urban drainage system in local parks is one of the solutions being considered in the Brent catchment to store surface water, alongside habitat enhancement works and, where possible, de-culverting the Wealdstone Brook.

Catchment level government funded improvements

As part of the commitment to the catchment based approach, Defra has made £10.1 million available during 2015 to 2016 for voluntary action to improve the water environment through the Catchment Partnership Action Fund (CPAF) and the Environment Agency's Environment Programme. The Environment Agency will invest £4.64 million through its Environment Programme, with more than 50% of this being specifically for partner-led projects.

CPAF will invest £5.1 million in 2015 to 2016. £1.3 million of this supports the role of catchment hosts with the remainder going to projects carried out by voluntary groups. Of the CPAF and Environment Programme funding, at least £2 million will be used for dealing with urban pollution issues.

A wide variety of measures are funded at a catchment level. This includes advisory and action based schemes to reduce the impact of pollution from rural and urban areas along with habitat improvement measures to increase biodiversity.

Natural England will continue to invest in protected areas measures. This will focus on safeguarding and, where necessary, improving the condition of Natura 2000 sites using measures such as river restoration, lake restoration, diffuse pollution, management of freshwater invasive species and habitat restoration on wetland sites.

The effectiveness of measures within this programme is variable. Measures such as removing barriers to fish migration are well established engineering solutions and are effective. However, there are some catchment and habitat improvement schemes that are less well established, including measures to reduce pesticide pollution or undertake wider river habitat enhancements. Some measures rely on behavioural change in agricultural practice, so may be less effective compared to engineering solutions.

Projects need to be resilient to a changing climate, performing under a variety of conditions and supporting the long-term health of the catchment. When developing its investment programme, the Environment Agency considers the contribution each action will make to reduce climate change risks and works with partners to manage these risks and help catchments adapt.

The outcomes of a number of projects will directly contribute to predicted improvements in status by 2021 for specific elements in specific water bodies. This includes habitat creation and fish passage actions. Other catchment level government funded improvements address a range of pressures and will secure a variety of improvements to the environment, but are not linked to outcomes for 2021 because of insufficient confidence about the scale of improvement.

Examples of these measures in the river basin district

Upper Lee sustainable urban drainage systems (SuDS)

Working with Luton Borough Council and Groundwork Luton, the local partnership will invest multi partner funding of approximately £200,000 to construct at least one SuDS in a greenspace, which will help reduce flood risk and improve habitat and water quality of the River Lea in Luton. The project will be complemented by £70,000 of funding from Thames Water for the development and support of a community engagement programme to connect people to the River Lea and to support volunteer environmental monitoring.

The Wey fish pass and wetland delivery project

This project has been developed collaboratively to provide the range of measures identified for the Water Framework Directive. The project is being led by Wey Landscape Partnership and carried out by the Environment Agency and Surrey Wildlife Trust, as well as maximising opportunities to collaborate with others on specific projects identified within the strategy. Over the next 6 years the project will result in multiple benefits along the 7 water bodies of the River Wey corridor. It will also link in with smaller projects on the tributaries in the wider catchment strategy.

Feasibility and design has already been undertaken and elements of the project are underway, with partners already involved and implementing initiatives on the ground. The project is also being aligned with the flood and coastal risk management programme. The total cost of the project is expected to be approximately £2 million over the next 6 years.

The project will prioritise efforts on protected areas, while providing improvements to river habitats, fish passage, reductions in urban and rural diffuse pollution, reduction in treatment costs for abstractions used for public drinking water supplies and some flood resilience benefits. The project will also provide wider benefits through increased access and recreational use of the river as well as greater partnership working with local communities and volunteer groups.

Water resources sustainability measures

Abstraction and other changes to river flows and groundwater levels are putting pressure on the water environment, and, in some cases, are causing environmental damage. Dealing with abstraction and flow pressures now will address damage that is already occurring and also help support sustainable supplies of water for the future.

Measures grouped within this programme are based on applying existing provisions under the Water Resources Act 1991. Current tools will be fully used to achieve environmental objectives ahead of abstraction reform which will create a system that has built in long-term flexibility to help deal with future challenges of changing climate, population and economic growth whilst protecting the environment and trying to ensure water is used efficiently.

Most measures will be applied through the current abstraction licensing system and involve the following types of action:

- constraint or refusal of applications to renew time limited licences
- changes to or revocation of abstraction licences necessary to protect the environment from serious damage
- working with licence holders to voluntarily apply to change licences to make them sustainable
- bringing previously exempt abstractions under regulation (new authorisations)
- implementing the Restoring Sustainable Abstractions (RSA) programme
- revoking unused licences

The existing abstraction licence charge scheme funds these measures. (Note water company actions are included in the section titled 'Water company investment programme').

Licence change measures are well established and proven to result in environmental benefits once the change becomes effective, and will achieve environmental outcomes. Some water bodies will respond quickly to changes in timing and volume of water abstracted. Surface water bodies suffering from serious damage will see flows increased, and the damage being caused will be stopped. However, for licence changes made to groundwater abstractions, benefits may take longer to take effect, and can be over many years. This is particularly true when considering groundwater recovery times within some major aquifers.

Climate change will affect the future demand for water as well as its availability and quality. Rivers and groundwater water bodies are already under pressure. Demand for water is increasing due to population growth, urban development and land-use change. Climate change is expected to alter the frequency and distribution of rainfall, increasing temperatures and increasing the frequency and severity of extreme weather events. Dealing with unsustainable abstraction and implementing water efficiency measures is essential to prepare and be able to adapt to climate change and increased water demand in future.

Not all of the measures can be linked to outcomes in specific water bodies by 2021 because there is insufficient confidence in the exact scale and timing of improvement. However, classification change may be seen in some, as yet unspecified, water bodies. All the measures will bring about additional environmental outcomes, these are described below:

- Through the RSA programme, the Environment Agency will take action to change or revoke abstraction licences that have already been identified as causing an environmental problem.
- The Environment Agency is using government guidance and evidence to take a prioritised approach to assessing whether licence changes are needed to protect the

environment from serious damage. All abstractors should anticipate changes to their licences in water bodies suffering from serious damage.

- Following public consultation and formulation of government policy, a number of currently exempt abstraction activities are expected to come under regulation. This will give greater ability to control the environment and prevent damage.

RSA is a programme of work that identifies, investigates and solves environmental risks or problems caused by unsustainable licensed water abstraction throughout England and Wales. RSA work is undertaken by the Environment Agency, water companies, local authorities, conservation bodies and site owners.

The Environment Agency works with abstractors to find solutions that will increase water levels in certain rivers, streams, lakes and other natural wetland habitats. It is an umbrella programme of work required under the European Habitats and Wild Birds Directive (HD), designated Sites of Special Scientific Interest (SSSI), Biodiversity Action Plans (BAP) and designated sites of local importance. It focuses on sites where plants and animals are dependent on good levels of water.

For all river basin districts there are 81 non-water company licences in the RSA programme.

Examples of these measures in the Thames river basin district

There are 2 non-water company licences in the Thames river basin district RSA programme. Both of these licences are for industrial, commercial and public services and are driven by the Biodiversity Action Plan. These will both be implemented by March 2020.

3.4. Local measures

Catchment partnerships are a major initiative to encourage local action to protect and enhance the water environment. The catchment based approach allows flexibility in the geographic scale at which catchment partnerships operate. Most catchment partnerships operate at the water 'management' catchment scale. Some operate at a smaller catchment scale. The partnerships consist of a wide range of stakeholders with an interest in the water environment. This includes, but is not limited to local government, angling interests, wildlife organisations, water companies, land managers, business representatives and government agencies. Figure 2 shows the management catchments in the river basin district.

Figure 2: Management catchments within the Thames river basin district



Each catchment partnership is committed to working collaboratively to share evidence, develop common priorities and carry out work on the ground. Many partnerships are producing catchment plans that will detail local actions related to the measures in this plan. Partnerships are at different levels of maturity, so while some may have a detailed plan for measures in their catchment, others may be newly formed and may not have such a detailed view at this stage.

The following section has been developed by the catchment partnerships (plus other interested groups) and reflects their views on current priorities and future ideas. It includes a summary of the main measures that partnerships are contributing to.

These ideas for local measures have been suggested by catchment partnerships and reflect local priorities which can often be around achieving 'multiple benefits' for shared outcomes through collaborative working. Such multiple benefits include improved water quality, habitat and biodiversity as well as contributing to some flood and climate resilience.

The catchment partnerships seek funding for these local measures from a range of sources including government, other national and international providers such as the Big Lottery or EU LIFE as well as local partners and stakeholders who have an interest. Normally, to secure funding, projects would need to be fully developed with all the necessary permissions secured in advance.

Each catchment summary page sets out measures that are linked to water body outcomes for 2021 and also measures which will improve the environment, but cannot be linked to water body outcomes for 2021 (for example, because the exact outcome or location is not confirmed). These measures are mainly funded through local funding streams and where this is not the case it is explained within the text.

This is followed by a description of some of the additional measures the partnerships would like to pursue if they were able to secure additional funding. They have presented their initial ideas of what they would do with £100,000 per year and with £1,000,000 per year to help to show local ambition in the short and longer term.

Supporting information

- More information on the location of water bodies and catchments, along with associated data, can be found on the [Catchment data explorer](http://environment.data.gov.uk/catchment-planning/) (<http://environment.data.gov.uk/catchment-planning/>).

Measures in the Cherwell catchment

Catchment partnerships: The Cherwell and Ray catchment partnership is hosted by the Berks, Bucks and Oxon Wildlife Trust (BBOWT) and consists of the Environment Agency, Natural England, Cherwell District Council, Banbury Town Council, Thames Water, the RSPB, Upper Thames Fisheries Consultative, and the National Farmers' Union (NFU).

The priority river basin management issues to tackle in this catchment, affecting both surface water and groundwater, are diffuse pollution from agricultural run-off, pollution from waste-water (including from sewage treatment works) and heavily modified channels.

Contribution to environmental outcomes for 2021

- **Cherwell:** A project focusing on restoring a more natural river channel and fish passage through Spiceball Country Park in Banbury, a well-used public amenity, will result in improvements in the status of fish, invertebrates, macrophytes and sediment in the River Cherwell by 2021. It will also engage with local communities to raise awareness about sustainability, water quality and biodiversity.
- **Oxon Ray:** A project to implement measures described following a walkover survey will reduce diffuse pollution and sediment input from agriculture.

Future aims

Ideas for additional measures with £100,000 per year:

- **Cherwell:** Action on the River Cherwell to create more backwaters between Banbury and Oxford, involving landowners, BBOWT and community groups. This will re-naturalise the river corridor, attenuate water flow and provide habitat for fish and invertebrate species. (If £100,000, one backwater; if more funding available then more sites will become possible).
- **Oxon Ray:** Initiate landowner engagement and advisory programme similar to Catchment Sensitive Farming in the Ray catchment. This will reduce agricultural diffuse pollution and increase resilience to flooding events.
- **Cherwell:** Action on River Cherwell to monitor and quantify abstraction issues with the Oxford Canal.

Ideas for additional measures with £1,000,000 per year (as above plus the following):

- **Cherwell:** Major infiltration project in the catchment, with involvement of Thames Water and the NFU, involving landscape interventions designed to increase surface water infiltration, increase water storage capacity and attenuate overland flow during peak rainfall events (with potential benefits for some flood alleviation). This will help to resolve rural diffuse pollution and phosphate failures.
- **Oxon Ray:** Major restoration projects along the River Ray re-instating natural river features and riparian habitat. This will improve water quality and nutrient cycling, increase habitat for fish and invertebrates, provide some benefits for flood alleviation, ecosystem services and benefits for leisure, education and public access.

Further information on the partnership is available from: <mailto:info@bbowt.org.uk>.

Measures in the Colne catchment

Catchment partnership: The Colne Catchment Action Network (ColneCAN) core group includes Affinity Water, Thames Water, Colne Valley Fisheries Consultative, Hertfordshire and Middlesex Wildlife Trust, Hertfordshire County Council, Buckinghamshire County Council, Chilterns Conservation Board, Colne Valley Park, River Chess Association and the Environment Agency. The ColneCAN is working with many others to address the challenges in the catchment, an area of serious water stress and significant growth demands.

Priority issues include changes to natural level and flow of water, pollution from waste water, transport infrastructure and rural areas, and the extent of physical modifications such as weirs and concrete channels.

Contribution to environmental outcomes for 2021

- To support ambitious abstraction reductions, Affinity Water will invest over £2,000,000 to improve river morphology and habitat, and undertake other improvements with local people and landowners. The work, together with Environment Agency investment of £190,000 in 2015/16 (raised from abstraction licence fees), will improve river function and resilience, which will secure public benefits and contribute to improved status of the Misbourne, Ver and Gade chalk rivers in Buckinghamshire and Hertfordshire.
- With a £10,000 contribution from the Box Moor Trust (the riparian landowner), the partnership is supporting a £54,000 project to restore and enhance connectivity, river function and provide some flood resilience benefits to a 1km stretch of the river Bulbourne in Hertfordshire.

Future aims

Ideas for additional measures with £100,000 per year:

- Devise and implement phase 2 of the river Bulbourne restoration project to achieve a further 1km of improved water body.
- Support a programme to produce or update flood modelling for priority water bodies in the catchment, in order to support and facilitate decision making for river restoration projects.
- Establish a new programme, 'Weir today Gone tomorrow' to focus on removal or adaptation of modifications. Addressing a minimum of 3 barriers per year and opening up a minimum of 2km of impacted river per year to contribute to status/element level improvements.

Ideas for additional measures with £1,000,000 per year (as above plus the following):

- Lead 'Catching the Colne', a programme to increase engagement and enjoyment of key sites along the Colne Valley, (River Colne and tributaries) improve access for local communities, and implement a minimum of 10km of river and riparian improvement per year.
- Establish and co-lead a national chalk streams restoration and stewardship programme to build capability, encourage support and secure funding for additional improvements to UK chalk streams. Establish a chalk streams discovery centre on the River Chess to showcase and celebrate the water environment, and to secure interest and commitment towards chalk stream stewardship and improvement.

Further information on the partnership is available at: <http://www.colnecan.org.uk/>.

Measures in the Cotswold catchment

Catchment partnerships:

Evenlode – hosted by Wild Oxfordshire with a group that includes the Environment Agency, Natural England, the Forestry Commission, West Oxfordshire District Council, Atkins, The Cotswolds Fly Fishers, Cotswolds Rivers Trust, Berks, Bucks and Oxon Wildlife Trust (BBOWT), Wychwood Project, Oxford University and the Sylva Foundation.

Windrush – hosted by BBOWT and consists of a similar mix of statutory organisations, non-government organisations, councils and local interest groups such as the Evenlode.

The priority river basin management issues to tackle in both catchments, affecting both surface water and groundwater, are diffuse pollution from agricultural run-off, point source pollution and poor habitat.

Contribution to environmental outcomes for 2021

- **Evenlode** - tackling rural diffuse pollution and impoundments to improve the status of fish, sediments and phosphate in the River Glyme. Engage in community-based actions to benefit water quality and biodiversity. 25% of the £100,000 project fund comes from government grant in aid. A Payment for Ecosystem Services scheme is being developed for a landscape-scale infiltration project.
- **Windrush** - preventing rural diffuse pollution at source (for example, cattle poaching) and repairing associated bankside damage in the upper catchment will result in improvements in the status of fish, sediments and phosphate. A landscape-scale river restoration project and a wetland creation project are being developed.

Future aims

Ideas for additional measures with £100,000 per year:

- **Evenlode** - to mitigate remaining impoundments and re-naturalise the Glyme from Stratford Bridge to Glympton involving the local authority, landowners and community groups. This will join up restored areas and tackle rural diffuse pollution.
- **Evenlode** - address barriers to fish passage and create in-channel habitat enhancements at Charlbury. This will help resolve failures in fish, invertebrate and macrophyte populations and improve amenity and recreational value.
- **Windrush** - a fish passage and wetland creation project at the confluence of Great Brook and Thames; this will create a backwater refuge for fish and invertebrates and provide some additional flood storage and resilience capacity.
- **Windrush** - further action to address rural diffuse pollution and channel damage.

Ideas for additional measures with £1,000,000 per year (as above plus the following):

- **Evenlode** - infiltration project, involving strategic woodland planting and other landscape interventions to attenuate overland flow during peak rainfall events (with potential benefits for flood alleviation and climate change resilience). It will tackle rural diffuse pollution and phosphate failures, and contribute to Biodiversity 2020 targets. It is part of a wider partnership project across the Upper Thames tributaries.
- **Windrush** - major project to restore degraded ecosystems along the river from the source of Thames to Oxford. It would target connectivity of riparian and aquatic habitats and contribute to improving flood management, water quality, soil quality and recreation. It would seek to establish more integrated environmental governance across the Upper Thames and promote further academic research.

Further information on the Windrush partnership is available at: <mailto:info@bbowt.org.uk> and for the Evenlode: <mailto:hilary@wildoxfordshire.org.uk>.

Measures in the Darent catchment

Catchment partnership

The Darent and Cray are co-hosted by the North West Kent Countryside Partnership (NWKCP) and the South East Rivers Trust (SERT). There are 2 Catchment Improvement Partnerships, one for the Darent and one for the Cray. Members of these include, Dartford Borough Council, Sevenoaks District Council, the London Boroughs of Bexley and Bromley, Westerham Town Council, Farningham Parish Council, Kent Wildlife Trust, Thames21, the Environment Agency, Campaign for the Protection of Rural England, the National Farmers' Union, Kent Downs Area of Outstanding Natural Beauty, Darent River Preservation Society, Dartford and District Angling Preservation Society, Kent Fisheries Consultative Association, Darent Valley Consortium, Darent and Cray Valley Catchment Consultative, West Kent Cycle Touring Club, the Darent Valley Trout Fishery, the Kent Fisheries Consultative Association and the Darent and Cray Catchment Consultative.

The priority issues identified in the catchment are diffuse pollution, improve modified physical habitats, and invasive non-native species (INNS).

Contribution to environmental outcomes for 2021

- Thames21 River Keeper team will continue to provide community engagement and educational activities, which raise awareness of the importance of the Cray, its habitats and ecology. They will deliver habitat improvements within the river. Thames21 provides over £30,000 to the catchment per year.
- NWKCP and SERT are working together on a £41,000 project to improve fish passage on the upper Darent. The creation of a bypass channel around a large structure will reconnect over 1.5km of the river near Sundridge.
- Angling clubs will continue to provide habitat improvements to the river and lakes. Projects include reduction of shading, creation of low flow channels, pool and riffle features, artificial margins, and monitoring of invertebrates and water levels within the river. This voluntary work contributes over £20,000 to the catchment each year.

Future aims

Ideas for additional measures with £100,000 per year:

- Expansion of the INNS control programme focusing on both flora and fauna. Increasing the survey areas, treatments, provide training and develop a volunteer surveyor programme and providing an awareness raising campaign.
- Development of Ecosystems Services projects to improve aquifer recharge.
- Investigation and project development to reduce impacts of physical modifications such as the weirs at Hawley and Hall Place.

Ideas for additional measures with £1,000,000 per year (as above plus the following):

- Improve opportunities for fish passage on large structures in the river and provision of extensive channel restoration.
- Implement the Marlborough Park Master Plan, which includes reinstating meanders of the River Shuttle, re-profiling of the river banks and removal of hard engineering.
- River restoration at Eynsford, working with local landowners to develop traditional grazing regimes and habitat management for the benefit of local wildlife and communities.

Further information on the partnership is available at: www.nwkcp.org/darent-and-cray-catchments.

Measures in the Gloucestershire and the Vale catchment

Catchment partnerships:

Upper Thames: The partnership is hosted by the Farming and Wildlife Advisory Group and includes the Countryside and Community Research Institute (CCRI) and a broad and inclusive partnership made up of 210 members covering public, private and third sector organisations with an interest in the catchment.

Ock: The partnership is hosted by the Freshwater Habitats Trust and includes the Environment Agency, Natural England, the Forestry Commission, Vale of White Horse District Council, Berks, Bucks and Oxon Wildlife Trust, Abingdon Naturalist Society, Ock Valley Flood Group, South Abingdon Flood Action Group, Upper Thames Fisheries Consultative, Oxford University and 3 independent expert ecologists.

The priority river basin management issues to tackle in both catchments, affecting both surface water and groundwater, are rural diffuse pollution, point source pollution and poor habitat.

Contribution to environmental outcomes for 2021

- **Upper Thames:** The Water with Integrated Local Delivery (WILD - <http://www.fwagsw.org.uk/what-we-do/projects/>) project works with local communities, farmers and environmental groups to improve water quality, reduce flood risk and enhance biodiversity.
- **Ock:** A river restoration project to improve the status of invertebrates in the Sandford Brook by 2021. Located in the town of Abingdon, it will also increase public access, provide recreational benefits and engage the local community to take ownership of their water environment through environmental monitoring and practical river restoration days.

Future aims

Ideas for additional measures with £100,000 per year:

- **Upper Thames:** To continue to roll out the implementation of the Community Guide to the Water Environment (<http://www.acre.org.uk/cms/resources/comm-guides/communityguidewater.pdf>) to engage land managers and communities in delivering integrated water management, increase resilience and deliver multiple benefits for the water environment, improving water quality and reducing flood risk.
- **Ock:** Engage landowners to adjust land management through land use models to reduce flood risk, diffuse pollution, taking into account the effect of sewage treatment work (STW) improvements. Take an upstream to downstream approach and protect and build out from the freshwater, standing water and wetland 'hot-spot' locations.

Ideas for additional measures with £100,000 per year (as above plus the following):

- **Upper Thames:** To test and implement innovative solutions to pollution from STW and land management in order to reduce the impact of rural diffuse pollution and point source pollution. Prioritising coordinated action to enhance river habitats and increase the natural resilience (for example, non-native invasive species) across the whole river system.
- **Ock:** Extend downstream existing river 'hot-spot' sections, create water quality buffers around key freshwater and wetland sites, implement measures for species of conservation concern and install clean water ponds and wetlands across the catchment.

Further information on the partnership is available at:

Upper Thames: <http://www.fwagsw.org.uk/what-we-do/projects/esters-page/>

Ock: <http://www.freshwaterhabitats.org.uk/>

Measures in the Kennet catchment

Catchment partnership: The Kennet catchment partnership is hosted by Action for the River Kennet and includes representatives from the local community, Atkins, the Canal and Rivers Trust, Centre for Ecology and Hydrology, the Environment Agency, the Kennet and Avon Canal Trust, the Kennet and Pang Fishery Action Plan Stakeholder Group, Kennet Valley Fishery Association, Natural England (NE), Reading and District Angling Association, Thames Water and West Berkshire District Council. The priority river basin management issues to tackle in this catchment are interrelated and are nutrients, sediments and algal growth; channel modification and degradation of habitats; and pressures from abstractions within the catchment.

Contribution to environmental outcomes for 2021

- Significant habitat restoration and fish passage projects are underway and planned in the Middle Kennet and Lambourn. These will improve fish populations and improve hydromorphology by reducing the impact of impoundments. Funded by combination of the Environment Agency, NE and private funds.
- Small scale restoration projects in the middle and lower Kennet with volunteer input are joining the gaps between significant scale habitat restoration works.
- Projects working with farmers to reduce nitrate and phosphate pollution are underway and planned in the Middle Kennet and tributaries with funding from NE and the Environment Agency bolstered by additional funding and 'in kind' assistance from partners.
- Public outreach projects (for example, Yellow Fish and 'You poo too') to reduce pollution from sewers and roads are underway for the entire catchment.
- Water efficiency projects 'Care for the Kennet' are helping households to use less water in the Upper and Middle Kennet.
- A cross catchment partnership project, funded by Defra, will improve understanding of the impact of septic tanks and develop ways to reduce pollution from them.
- Urban habitat restoration and fish easements to address low fish populations are planned for the Lower Kennet.
- Continue to work with Thames Water on abstraction issues in the Kennet, including the construction of pipeline from Axford to Swindon to be completed in 2016.

Future aims

Ideas for additional measures with £100,000 per year:

- complete the Upper Kennet Habitat Restoration Plan projects
- implement a Lower Kennet Habitat Restoration plan to bring the poorest water bodies to good status by resolving failures in fish, invertebrate and plant populations and improving amenity and recreational value
- improve understanding of the relationship between water quality and algal growth and implement a plan to reduce the problems of algae and its impact on plants
- agree a strategy for resolving the issue of the interaction between the Kennet and Avon canal and the River Kennet

Ideas for additional measures with £1,000,000 per year (as above plus the following):

- improve water quality in Kennet and Avon canal to reduce its impact on the river
- take actions to improve treated waste water from small point source inputs
- review water management in the upper Kennet and improve water efficiency

For current information on the Kennet catchment partnership contact ARK: <mailto:info@riverkennet.org> and see the partnership website: www.kennetcatchment.org

Measures in the Loddon catchment

Catchment partnership(s): The Loddon catchment partnership is formed of a steering group made up of Hampshire and Isle of Wight Wildlife Trust, the Environment Agency, the Loddon Fisheries and Conservation Consultative, the Loddon Basin Flood Action Group, Affinity Water (also representing Thames Water and South East Water), Natural England, Hampshire County Council, Wokingham Borough Council, the National Farmers' Union, Berkshire Buckinghamshire and Oxfordshire Wildlife Trust and the University of Reading.

The priority river basin management issues to tackle in this catchment are:

- habitat and biodiversity, including channel structure and function, barriers to fish passage, habitat management and flood plain connectivity
- water quality. in particular phosphorus, sediment and pesticides
- water quantity (flooding and abstraction)

Contribution to environmental outcomes for 2021

- The Loddon Farm Advice Project focuses on rural diffuse pollution across the catchment. The project aims to improve the status of phosphate and fish in 3 water bodies by 2021 as well as reducing the impacts of pesticides on public drinking water abstractions. Currently 80% of the funding comes from government grant although alternative funding streams are being investigated. The cost of the measures will be in the region of £200,000 over 6 years.
- Several projects currently in place include action to reduce the impact of invasive non-native species, raising awareness of riparian habitat management with landowners and holding an annual 'Rivers Week' to increase engagement with the public.
- The Loddon catchment partnership is also involved in a joint project with other nearby partnerships to raise awareness of the issues of phosphorus from domestic waste water inputs and to address problems associated with septic tanks and misconnections contributing to algal blooms in the rivers.

Future aims

Ideas for additional measures with £100,000 per year:

- Carry out a River Whitewater structures and habitat improvement project to improve the status for fish in the River Whitewater.
- Increase the scope of the Loddon Farm Advice Project to address rural diffuse pollution across the catchment to help protect public drinking water abstractions.
- Work with the Loddon Basin Flood Action Group to develop flood mitigation projects that also deliver river basin management objectives.
- Influence and encourage sustainable development for the water environment to aid climate change adaptation and mitigation.
- Engage with communities to take ownership of their local water environment and provide education and training opportunities.

Ideas for additional measures with £1,000,000 per year (as above plus the following):

- Return water corridors in the Loddon catchment to a near natural state providing social, flood risk mitigation and biodiversity action plan habitat benefits.
- Identify and reduce pollution in water bodies across the catchment, with the University of Reading developing tools for evaluation and planning. These will be used in the Loddon catchment and could also be made available for use in other catchments.

Further information on the partnership please email: <mailto:Loddon.Catchment@hiwwt.org.uk>

Measures in the London – Beverley Brook catchment

Catchment partnership

The Beverley Brook Catchment Partnership is hosted by the South East Rivers Trust. The Steering Group is made up of the Environment Agency, The Royal Parks, Wimbledon Common Conservators, Friends of Barnes Common, London Boroughs of Richmond, Wandsworth, Sutton and Merton, Royal Borough of Kingston, Wildfowl and Wetlands Trust, Thames21, London Wildlife Trust and Thames Water.

The priority river basin management issues to tackle in this catchment are:

- poor water quality due to diffuse pollution from road run-off and misconnected pipes
- high phosphate levels originating from effluent from the sewage treatment works
- physical modifications that have been made to the river leading to a uniform channel with poor hydromorphological and habitat diversity

Contribution to environmental outcomes for 2021

A project to enhance the Beverley Brook through Richmond Park has been funded by the Environment Agency's Environment Programme, the Catchment Partnership Action Fund, Friends of Richmond Park and other sources. This project will enhance river habitat throughout the park with the creation of a backwater, bank softening, 500m of in-channel improvements and measures to control the impacts from deer and dogs. The project also aims to improve water quality by working on outfalls to reduce silt and other contaminants entering the river.

Future aims

Ideas for additional measures with £100,000 per year:

- Habitat and hydromorphological enhancements throughout the Beverley Brook and its tributaries to support fish, plant and invertebrate populations as well as enhance natural processes ecosystem and flood resilience. Measures include removal of redundant bank reinforcements, bank softening, tree management, installation of woody material, backwater creation and habitat restoration. Key locations include Barnes Common, Vine Road Recreation Ground, Leaders Gardens, Palewell Common, Richmond Park (additional to the above), Wimbledon Common, Malden Park Golf Course, Beverley Park, Worcester Park, and Morden Cemetery as well as Motspur Park and Morden Park on the Pyl Brook tributary.
- Locally targeted campaigns to raise awareness among domestic properties and businesses about misconnections, only flushing water down sinks and drains, and promoting water efficiency measures.

Ideas for additional measures with £1,000,000 per year (as above plus the following):

- Retrofitting of sustainable drainage systems (SuDS) and other water management measures throughout the catchment to improve water quality and reduce the flashy nature of the river due to high volumes of run-off.
- Control and reduce road run-off through the installation of sediment interceptors, such as hydrodynamic vortex chambers, on all surface water drains.
- Full river restoration through Richmond Park, Beverley Park and Barnes Common.
- Fish passage enhancement at Horne Way Weir through full removal with re-routing the sewer pipe or low flow fish passage enhancement measures.

Further information on the partnership is available at: [The South East Rivers Trust \(SERT\) | Part of the Wandle Trust: Reg. Charity No. 1091000w.](#)

Measures in the London - Brent catchment

Catchment partnership: The Brent catchment partnership is an informal group of organisations committed to working together to improve the rivers, the Grand Union Canal and the Brent Reservoir in the Brent catchment in north and west London. The members include charities, community groups, borough councils, private businesses and government agencies.

The partnership's priority Water Framework Directive issues are reducing pollution, making rivers more natural, and tackling invasive non-native species.

Contribution to environmental outcomes for 2021

- A £500,000 project funded by the London Borough of Harrow and the Big Green Fund is creating wetlands as part of a flood storage and river restoration project at Stanmore Marsh, including mitigation measures and improvements to invertebrates, macrophytes and water quality elements in 1 water body.
- With £4,000 River and Wetland Community Day funding, Thames 21 is working with the London Borough of Ealing to engage volunteers in installing in-channel enhancements on the lower Brent through Ealing, contributing to putting mitigation measures in place and to improvements in fish and invertebrates in 1 water body.
- Two more improvement projects are planned. A backwater will be created and a weir will be notched at Greenford Island, while £50,000 of Section 106 funding will contribute to improving a reach of the Brent in Hendon. These mitigation measures will benefit fish and invertebrates in 2 water bodies.

Future aims

Ideas for additional measures with £100,000 per year:

- Catchment-wide engagement and training of community volunteers in invasive species management and removal techniques, with benefits for macrophytes and putting mitigation measures in place in 8 water bodies.
- Habitat projects across the catchment involving volunteers, removing timber bank reinforcement and enhancing banks and margins, with benefits for macrophytes, fish and invertebrates in 4 water bodies.
- Citizen science water quality monitoring and training to do 'walkovers', to record and report pollution incidents, to gather information on the state of the rivers and target further action to improve water quality elements.

Ideas for additional measures with £1,000,000 per year (as above plus the following):

- Transforming up to 10 km of heavily modified river to a more natural condition, including restoration projects in Tokyngton Park and Queensbury Rec, managing invasive species and engaging and educating the community. This will result in improvements for fish, invertebrates and macrophytes in at least 2 water bodies, with benefits for flood storage and improved access along the river corridor.
- Install reed beds or other pollution interceptors at priority sites such as Coston's Brook, the Mutton Brook and the Crouch Brook, resulting in improvements in phosphate, dissolved oxygen and ammonia in 4 water bodies.
- Strategic review of barriers to fish, and implementation of fish passage at priority weirs. This will improve fish populations and angling opportunities in 3 water bodies.

Further information on the partnership is available at:

<http://www.brentcatchmentrivers.org.uk/>

Measures in the London - Crane catchment

Catchment partnership: The Crane Valley Partnership is a collaboration between charities, community groups, private businesses, government agencies and the 5 borough councils that border the River Crane and Yeading Brook (Harrow, Hillingdon, Ealing, Hounslow and Richmond-upon-Thames).

Priority Water Framework Directive issues for the partnership are clean, clear water; monitoring to identify issues and evaluate projects; and an accessible, natural looking and functioning river, rich in habitats and wildlife.

Contribution to environmental outcomes for 2021

- 8 confirmed projects will create backwaters and wetlands at Crane Meadows, Donkey Wood, Mill Road and the middle River Crane; selective tree removal, appropriate aquatic planting and installation of woody debris berms at Cranebank and Gutteridge Woods; eel passage at Kidd's Mill and Mogden. Cost of measures is £350,000, contributing to improvements in the status of fish, invertebrates and macrophytes in 2 water bodies.
- Duke's River enhancements downstream of Kneller Gardens, supported by the Big Green Fund and Section 106 funding, costing £420,000 - mainly improving access and amenity value, but will also put 50% of mitigation measures in place in 1 water body.
- 'Citizen Crane' community monitoring projects for phosphorus levels, invertebrates, and polluted outfalls, resulting in identification of pollution hotspots and incidents; improvements to Heathrow Airport's Eastern Balancing Pond. Action as a result will improve water quality elements in 3 water bodies.

Future aims

Ideas for additional measures with £100,000 per year:

- Ongoing, co-ordinated programme for the catchment-wide control of invasive species and planting of indigenous species to slow the spread of invasive plants and increase the abundance of indigenous marginal plants.
- Natural River Project along 4km of the River Crane and Yeading Brook: in-channel habitat enhancements, backwater creation, tree works and removal of wooden bank protection to put mitigation measures in place and resolve failures in fish, invertebrate and macrophyte populations; improve amenity and recreational value; and improve resilience during pollution incidents.

Ideas for additional measures with £1,000,000 per year (as above plus the following):

- 'Only Rain in Rivers' pollution awareness campaign throughout the Crane catchment to reduce the impact of pollution from misconnections and incidents.
- Strategic review of barriers to fish passage and implementation of fish passage at priority weirs. This will improve fish populations, with improved angling opportunities, in 3 water bodies.
- Lower Crane River Restoration: removal of 2km of concrete channel in public open spaces downstream of Mereway Road. This will improve fish, invertebrate and macrophyte populations in 1 water body, with benefits for flood storage, access and recreation, and education.

For further information on the Crane Valley Partnership see their website <http://www.cranevalley.org.uk/> or contact <mailto:ilse@greencorridor.org.uk>

Measures in the London - Hogsmill catchment

Catchment partnership

The Hogsmill catchment partnership is hosted by the South East Rivers Trust. The Steering Group is made up of the Environment Agency, Royal Borough of Kingston Upon Thames, Epsom and Ewell Borough Council, Surrey County Council, Sutton and East Surrey Water, Thames Water, Kingston University, The Environment Trust, Kingston Environment Centre, the Zoological Society of London, Surrey Wildlife Trust, London Wildlife Trust, the Lower Mole Project and representation from Quadron, the Thames Angling Conservancy and the London Bat Group.

The priority river basin management issues to tackle in this catchment are:

- poor water quality due to diffuse pollution from road run-off, point source pollution from misconnected pipes, and phosphate from the Hogsmill sewage treatment works (STW)
- physical modifications such as reinforced bed and walls, the installation of weirs, channel straightening and disconnection from the flood plain
- poor hydromorphological and habitat diversity

Contribution to environmental outcomes for 2021

- A habitat enhancement project in the upper reaches of the Hogsmill in Ewell has been funded by the Catchment Partnership Action Fund. This project will enhance the habitat for fish, invertebrates and other wildlife.
- Volunteers will help to monitor the condition of the river through the Riverfly Monitoring Initiative and a pollution monitoring programme. Volunteers will also help deliver river and catchment based enhancements.
- Fish passage will be enabled past the weirs and concrete channel at the Hogsmill sewage treatment works through a project funded by Thames Water.

Future aims

Ideas for additional measures with £100,000 per year:

- Identify sources of pollutants and contaminants using citizen science such as phosphate upstream of STWs. Locally targeted campaigns to raise awareness with domestic properties and businesses about misconnections, what goes down drains, and promoting water efficiency measures.
- Begin tackling urban diffuse pollution through the installation of sediment interceptors, like hydrodynamic vortex chambers, on surface water drains.
- Habitat and hydromorphological enhancements throughout the Hogsmill to improve natural processes for fish, plant and invertebrate populations. Control of Himalayan balsam and Japanese knotweed to prevent sediment ingress.

Ideas for additional measures with £1,000,000 per year (as above plus the following):

- Major river enhancement and restoration projects at Chamber Mead and Elmbridge Meadows. This could provide significant flood alleviation benefits.
- Retrofitting of sustainable urban drainage systems throughout the catchment to improve water quality. Design and delivery of collaborative projects to reduce flood risk by natural flood management.
- Replacement or modification of the Kingston Gauging weir to enhance fish passage and provide replacement gauging.

Further information on the partnership is available at: www.southeastriverstrust.org

Measures in the Lower Lea North catchment

Catchment partnership

The Lower Lee catchment partnership comprises Hertfordshire and Middlesex Wildlife Trust, the Environment Agency, Affinity Water, Groundwork Hertfordshire, Herts County Council, Natural England, Lea Valley Regional Park, the Rt Honourable Charles Walker MP, Fishers Green Angling Consortium, Waltham Abbey AC, Rural Angling Society, Kings Weir Fishery, Cheshunt Natural History Society, Hoddesdon Society, London Anglers' Association, Kings Arms and Cheshunt and the Palmers Green Angling Societies and the Hertford Angling Club.

The priority issues in the catchment are poor water quality from waste water treatment, pollution incidents and misconnections, pollution and poor water quality from urban run-off and historic land use and physical modifications for urbanisation and flood protection.

Contribution to environmental outcomes for 2021

'Conserving Slimy Wrigglers' aims to address the specific issue of structures on the Lower Lea that prevent the movement of eels as many of the rivers in the catchment are failing to meet their ecological potential due to poor fish populations. This collaboration with the Upper Lea catchment partnership will aim to design, build and install features to ease eel movement on a maximum of 3 structures.

Future aims

Ideas for additional measures with £100,000 per year:

- Lea tributaries catchment walkover project would aim to improve knowledge and understanding of the tributaries and their importance to the River Lea by monitoring pH, nitrates, phosphates, flora, fauna, turbidity and siltation. This could then be used to identify problems and help develop further projects to improve the status of the water body.
- Establish a Lower Lea riverfly monitoring group to sample and identify a range of freshwater invertebrates on a monthly basis to build up a picture of the river's health, improve knowledge of the catchment, increase public engagement and participation, reduce the frequency and severity of pollution and improve the status of the water body.
- The River Lea fish shelter project would help to restore in-channel diversity, improve habitats and provide shelter for fish during high flows. It aims to reduce the need for restocking by making fish populations self-sustaining, improving the status of the water body.

Ideas for additional measures with £1,000,000 per year (as above plus the following):

- Promote and encourage the use of sustainable drainage systems in new developments and retrofitting existing sites within the catchment to reduce the impacts of urban diffuse pollution on water quality and flood risk.
- River bank and channel enhancements in the catchment to reduce sediment input and improve wildlife habitat. Promoting the use of willow spiling, deflectors and coir rolls to improve the status for fish, invertebrates and macrophytes.
- Cornmill Stream restoration project to reinstate flow by removing silt and vegetation to improve the status for fish, macrophytes, invertebrates and recreational value.
- The Red House Fishery and the Barbel Spawning Beds projects aim to improve fish spawning habitats by removing silt and using in-channel features to provide areas of clean gravel to improve the status for fish, invertebrates, macrophytes and recreational value.

Further information is available at: <http://www.hertswildlifetrust.org.uk/contact-us> and <http://www.riverleacatchment.org.uk/>

Measures in the Lower Lea South (London Lea) catchment

Catchment partnership: There is not currently a formal catchment partnership for the London Lea. As catchment host, environmental charity Thames21 is listening to the wishes and contributions of their Love the Lea campaign supporters and other organisations including the Greater London Authority, All London Green Grid, London Wildlife Trust, Lee Valley Park, Canal and River Trust, Environment Agency, Natural England, and the London boroughs of Enfield, Haringey, Tower Hamlets, Waltham Forest and Hackney. In time, these conversations will inform the development of the Catchment Management Plan.

The priority issues in the London Lea are: water quality, biodiversity, and raising awareness of the rivers of the catchment and how we impact them.

Contribution to environmental outcomes for 2021

- Working with the local community to install reed beds on the Lee Navigation and at Grovelands Park in the Salmon Brook Catchment. These projects will contribute to improvements in water quality elements.
- Installing 'Rain Planters' on schools and community buildings, contributing to improvements in water quality elements.
- Collating information on projects, news and events across the catchment and publicising them on the London Lea catchment website.

Future aims

Ideas for additional measures with £100,000 per year:

- Employ a full-time independent community Partnership Officer to further engage communities, provide volunteering opportunities, coordinate 'friends of' groups and river champions across the catchment in a community focused, 'grassroots' partnership.
- Develop and provide a 'skills through training' programme as part of Thames21's existing accredited training programme; to empower members of the community to effectively engage and raise issues with statutory bodies.

Ideas for additional measures with £1,000,000 per year (as above plus the following):

- Reduce the frequency and severity of pollution, increasing surface water management at source, leading to improvements in water quality elements in all water bodies (including: 'Rain Planter' (mini SuDS) programme, downpipe disconnection programme, and large scale sustainable drainage projects)
- Restore an ecologically complex structure to the river channels, improving riverine and riparian habitat, river function and sustainability. This will improve macrophytes, invertebrate and fish populations in all water bodies.
- Engage people and communities by improving their knowledge and understanding of the catchment, and of the impact of their behaviour on the water environment. This will result in greater public engagement and participation in improving the catchment's ecology.

Further information on the London Lea is available at:

<http://www.riverleacatchment.org.uk/index.php/london-lea-home>

Measures in the London Marsh Dykes catchment

Catchment partnership

The Thamesmead and Marsh Dykes catchment partnership is co-hosted by Thames 21 and the London Wildlife Trust. The steering group is made up of the Environment Agency, local angling groups, London Borough of Bexley, Royal Borough of Greenwich, Peabody Group (in particular Gallions Housing, Tilfen Land, and Trust Thamesmead), and Thames Water.

The priority river basin management issues to tackle in this catchment are:

- de-silting and physical modifications to the Thamesmead canal and lake system
- water quality improvement and community engagement to accrue social and economic benefits
- addressing diffuse pollution and litter

Contribution to environmental outcomes for 2021

- A project to enhance the habitat of the Waterfields Canal has been funded by the Catchment Partnership Action Fund and will be delivered by London Wildlife Trust and Thames 21. This project will enhance habitats for fish and help to improve flow in the canal.
- The Environment Agency's environment programme will provide additional funding for further enhancement works to the watercourses throughout 2015.

Future aims

Ideas for additional measures with £100,000 per year:

- Working in collaboration with the Peabody Group, Thames Water and local authorities complete a canal de-silting programme and introduce a silt prevention regime.
- Work in partnership with current projects to improve community access and engagement with watercourses in the catchment to include linking the Tump 53 and Crossness Nature Reserves.

Ideas for additional measures with £1,000,000 per year (as above plus the following):

- Major lake and canal restoration projects to improve water quality, fish and invertebrate populations and deliver benefits for public amenity and education.
- Natural watercourse projects along the dykes in the east of the catchment to improve water vole habitat and promote natural habitat awareness among local communities.
- Development of the derelict ecology centre at Tump 52 and Crossway Canal.
- Development of a catchment streams restoration project to improve water bodies within Borstal Woods, and Bedens Stream at the outer areas of the catchment.

Further information on the partnership is available at: www.thames21.org.uk

Measures in the London Ravensbourne catchment

Catchment partnership

The Ravensbourne catchment partnership is hosted by Thames21. The steering group is made up of Thames21, the Environment Agency, London boroughs of Lewisham, Bromley and Greenwich, the London Wildlife Trust and the Quaggy Waterways Action Group.

The priority river basin management issues to tackle in this catchment are the physical modifications made to the river, diffuse pollution from urban areas and point-source pollution of sewage.

Contribution to environmental outcomes for 2021

- Creating easier access for eels in the Ravensbourne by installing eel passes on weirs. This project is funded through the catchment partnership action fund.
- Reducing the flooding impact of heavy rain in this urbanised catchment along with improving water quality entering the river through the sustainable urban drainage (SuDS) project. This project was funded by the Environment Agency's environment programme.
- Identify suitable sites for SuDS throughout the catchment. This project has been funded by Patagonia and will be carried out within the 2015/16 financial year.
- Engage with user groups and the wider community for citizen science water-quality testing. This project was funded by the River and Wetland Community Days scheme. It was started during the 3 Rivers Clean Up 2015 and concluded in the autumn.

Future aims

Ideas for additional measures with £100,000 per year:

- Cator Park restoration. Project to include improvements to Cator Park, the Beck and Chaffinch Brook. The River Pool at Cator Park is presently fenced off from public view in a deep, linear concrete channel. This project will reconnect the river with Cator Park for the benefit of wildlife, recreation, aesthetic improvement and an enhanced level of flood protection. It will also include improvement to the river and a Site of Importance for Nature Conservation (SINC) by the removal of weirs and concrete, the reintroduction of meanders and in-stream enhancements and increased marginal vegetation.
- Catchment-wide interpretation boards. These will include a catchment map, an overview of the local biodiversity, links to local groups and volunteering opportunities. There will also be a hotline number to the Environment Agency and Thames Water for reporting pollution, misconnections and incidents.

Ideas for additional measures with £1,000,000 per year:

- Riverview Walk, Sydenham. The project would create a natural river by removing its concrete channel and introducing meanders. This would improve biodiversity, help flood alleviation and create links to the River Pool project.
- Weir removal or modification at Keston Common, Hayes Lane, Dainford Close, Ford Mill, Beckenham Hill at Homebase, Glassmill Lane, 'Steps' Croydon Road, Keston Mark, Padmall Wood and Lewisham to Ladywell. This will improve passage along the river for fish (including eels) and invertebrates.

Further information on the partnership is available at: www.thames21.org.uk

Measures in the London Wandle catchment

Catchment partnership

The Wandle catchment partnership is hosted by the Wandle Trust, part of the South East Rivers Trust. The steering group is made up of the Environment Agency, the London boroughs of Sutton, Merton and Wandsworth, Thames Water, Sutton and East Surrey Water, London Wildlife Trust, the Wandle Valley Regional Park Trust, the National Trust and Beddington Farmlands.

The priority river basin management issues to tackle in this catchment are:

- physical modifications made to the river, including impoundments from weirs that prevent fish passage
- urban diffuse pollution, in particular contaminants from road run-off and misconnected pipes
- high nutrient levels due to phosphate introduced from Beddington sewage treatment works

Contribution to environmental outcomes for 2021

- Removal of the Half Tide Weir by the London Borough of Wandsworth, enhancing connectivity and tidal habitat at the confluence of the Wandle and Thames.
- The Trewint Street fish passage project, funded by Thames Water, the Environment Agency and the Catchment Partnership Action Fund, will enhance fish passage over the concrete aprons and structures at Trewint Street in Earlsfield, London.
- River habitat enhancements in Ravensbury Park and other locations as part of the Living Wandle Landscape Partnership Scheme funded by the Heritage Lottery Fund.
- Control and removal of invasive species (undertaken by several partners and a variety of funding sources) including those contributing sediment ingress.
- A sustainable urban drainage project has been funded by the Environment Agency environment programme. The scheme will improve water quality from urban run-off as well as provide flood alleviation benefits.

Future aims

Ideas for additional measures with £100,000 per year:

- removal of all remaining small weirs, such as the weir on the Croydon arm of the Wandle, wherever possible to enhance habitat and restore fish passage
- enhancement of in-stream channel diversity with bank re-grading and the creation of low flow channels and backwaters at multiple locations throughout the river
- a citizen science based water quality and pollution monitoring scheme as well as river enhancement monitoring to help inform the targeting of water quality improvement measures and effective design of river enhancements

Ideas for additional measures with £1,000,000 per year (as above plus the following):

- removal of Shepley Mill, Watermeads, Goat Bridge, Topps Tiles and EDF weirs, with the installation of appropriate structures passable to fish, such as a rock ramp or stepped pool pass where water levels need to be maintained
- full river restoration through Beddington Park, including sustainable lake enhancement, and King George's Park
- installation of sediment traps, such as hydrodynamic vortex chambers, on all significant surface water drains discharging into the river and their incorporation into all new developments

Further information on the partnership is available at: www.wandletrust.org

Measures in the Maidenhead to Sunbury catchment

Catchment partnership: The Lower Thames catchment (also known as the Maidenhead to Sunbury catchment) is made up of a steering group consisting of Thames21 (hosts), Thames Landscape Strategy, River Thames Alliance and British Canoeing, the Environment Agency. The wider partnership includes all local authorities from each of the boroughs in the catchment, River User Group 8, 3 angling groups, 10 local community organisations, 1 Local Nature Partnership, and Natural England.

The priority river basin management issues to tackle in this catchment are habitat and biodiversity (including channel structure and function, barriers to fish passage, habitat management), water quality (in particular phosphorus, sediment and pesticides) and collecting evidence.

Contribution to environmental outcomes for 2021

- Many member organisations are currently operating their own projects on the catchment, which implement river basin management mitigation measures and more, such as Thames21 community and volunteer engagement project funded by the Royal Bank of Canada, Thames Landscape Strategy - the Arcadian flood plain, and the River Thames Alliance - Waterways Plan. Opportunities to implement multiple benefit river basin management mitigation measures (e.g. reduce water quality and biodiversity impacts and flood risk) identified in partnership members' own projects will be shared and promoted.
- The Thames Landscape Strategy Project, which will improve connectivity from Home Park to the Thames via the installation of a sustainable urban drainage system (SuDS). This will also give an opportunity to local people to learn about their river and SuDS. This has been funded by a government grant.

Future aims

Ideas for additional measures with £100,000 per year:

- engagement and training of community volunteers in river restoration, invasive species management and putting mitigation measures in place
- small-scale habitat projects with consideration for cross catchment mutual gains involving volunteers to re-naturalise a river corridor and improve water quality, habitat, biodiversity and flood resilience by removing hard banking and planting with marginal native macrophytes, and installing a small scale SuDS reed bed on a priority surface water body

Ideas for additional measures with £1,000,000 per year (as above plus the following):

- high media level promoting of the Lower Thames, for catchment-wide engagement of people and business
- citizen science and accredited training for community volunteers in the catchment area
- strategic review of barriers to fish, and back waters and scope implementation of new design fish passages at priority weirs (for example, Salthill stream and Roundmoor Ditch). This will improve fish populations and habitat for refuge

Further information on the partnership is available at: <http://www.thames21.org.uk/the-maidenhead-to-teddington-catchment/>

Measures in the Medway catchment

Catchment partnerships

The Medway co-hosted by the South East Rivers Trust and the Kent Countryside Management Partnerships, with support from Kent Wildlife Trust in the Eden and Upper Medway.

The priority issues identified by the partnership are physical modifications to the river, water quality, and water flows and availability.

Contribution to environmental outcomes for 2021

- The partnership will implement a project to make Harper's Weir fish passable, improving fish passage in the Lesser Teise by linking 3.5km of the river which was previously disconnected.
- The Kent Wildlife Trust has secured funding to carry out restoration and creation of wetland habitats and provide landowner advice for the Eden operational catchment.
- Medway Valley Countryside Partnership (MVCP) has established an invasive non-native plant species (INNS) control and management programme across the Medway catchment.
- MVCP is leading a project to provide 2km of riparian habitat improvements to restore fish habitat and river function on the Hammer Stream in the Beult operational catchment.
- 4 schemes are proposed to remove artificial structures in the Eden, Teise and Beult operational catchments. These are barriers to fish movement and are contributing to problems with flow dynamics, resulting in a build up of fine sediment, pollutants and an impoverished habitat for aquatic life.

Future aims

Ideas for additional measures with £100,000 per year:

- Wetland habitat creation scheme and removal of retention boards along the River Eden. Kent Wildlife Trust working with local landowners and user groups will tackle diffuse pollution, fish passage and river habitat. This will lead to element status improvement in 2 water bodies. Weir removal along 4km of the Lesser Teise, removal of 3 fixed crest weirs, in-channel mitigation and habitat enhancement works. This will help to resolve failures in fish, invertebrate and macrophyte populations and improve water quality.
- Continuation of the control of INNS programme.
- Citizen Science projects to collect data, observations and early warnings. Funding will provide workshops and training events, walkover surveys, sampling, INNS.

Ideas for additional measures with £1,000,000 per year (as above plus the following):

- Fish pass or removal of 5 structures (East Farleigh lock, Yalding, Leigh, Chafford auto sluice and Ashurst Weir), allowing migratory fish and eels to access 93km of the 112km length of the main river and opening up 14 tributaries for spawning.
- Improve the quality, quantity and connectivity of riparian habitats across key sites in the catchment. Element improvements to 12 water bodies would be possible.
- Maintaining a Healthy Catchment project aims to improve water quality by tackling aggravated erosion, river restoration to make low-flow river channels, which would allow the ecosystem to be more resilient, and improving species diversity by increasing the complexity of aquatic habitats. This will be delivered through education and training of river restoration to empower the community.

Further information on the partnership is available at: <http://www.medwayvalley.org>, <http://www.southeastriverstrust.org/>, <http://www.kentwildlifetrust.org.uk/>, <http://www.khwp.org.uk>.

Measures in the Mole catchment

Catchment partnership

The River Mole partnership is jointly hosted by the Surrey Wildlife Trust and The South East Rivers Trust. The steering group includes the Environment Agency, Natural England, Surrey County Council, district councils, Countryside Partnerships, Thames Water, Sutton and East Surrey Water and Sussex Wildlife Trust. The wider partnership is made up of a number of interested organisations, local community groups and landowners.

The priority issues in the catchment are:

- man-made modifications in the river
- pollution from waste water
- diffuse pollution from farmland

Contribution to environmental outcomes for 2021

- Greater fish passage on the lower section of the Pipp Brook, a tributary of the Mole, funded by the Catchment Partnership Action Fund will improve the fish status of the water body.
- East Surrey Rivers Project includes a series of tasks on the Redhill Brook to improve fish passage and habitat. This is funded by the Environment Agency.
- Creation of wetland habitat at Ashted Rye Meadows to improve habitat diversity and flood protection.

Future aims

Ideas for additional measures with £100,000 per year:

- Modification of Horley Weir to allow fish passage into the upper reaches of the Mole.
- Diffuse Pollution and Sustainable Urban Drainage Advice Project to operate throughout the catchment. This would greatly extend a proven mechanism of reducing the impacts of rural and urban diffuse pollution, partially resolving catchment-wide phosphate failures.
- Develop a comprehensive strategy for tackling non-native invasive species.
- Mapping opportunity areas for natural flood management in the catchment to allow implementation of small-medium scale projects such as pond and hedge creation and grass margins.

Ideas for additional measures with £1,000,000 per year (as above plus the following):

Catchment-wide projects with multiple benefits with principal aims to:

- Remove barriers that are impeding fish passage and contributing directly to the local recovery of populations of threatened priority fish species, such as brown trout, Atlantic salmon and European eel, with associated recreational and fisheries benefits.
- Restore natural morphology where man-made modifications exist with channel habitat creation, gravel reintroduction, tree works and back waters, allowing naturalised flow regimes and sediment transport and associated flood management benefits.
- Install fish bypass structures on the 5 weirs of the Lower Mole flood alleviation scheme.

Further information is available at: www.surreywildlifetrust.org/what-we-do/living-landscapes/partnership-and-advocacy

Measures in the North Kent catchment

Catchment partnership

The North Kent Catchment Partnership is co-hosted by the Medway Swale Estuary Partnership and South East Rivers Trust. The members include the Environment Agency, Medway Council, Swale Borough Council, Kent County Council, Southern Water, Elmley Conservation Trust, Kent Wildlife Trust, the Royal Society for the Protection of Birds (RSPB), Peel Ports Medway, Faversham Creek Trust, the National Farmers' Union, Friends of the Westbrook Stream, Kent Wildfowling and Conservation Association, Farm for Wildlife, Kent and Essex Inshore Fisheries and Conservation Authority, Rochester Floating Oyster Fisheries and the Medway and Swale Boating Association.

The partnership has identified priority issues in the catchment as:

- water quality, in particular point source pollution from the water industry, rural diffuse pollution and urban diffuse pollution
- physical modifications to the river - changes to the shape and position of the rivers have dramatically altered the river habitat and have introduced barriers to fish movement
- invasive non-native species (INNS) - these have an adverse impact on plants, invertebrates and fish communities within the fresh water bodies and the estuary

Contribution to environmental outcomes for 2021

In order to address the priority issues, the partnership is:

- Carrying out a £41,000 project to start to tackle rural pollution and appraise options to deal with urban diffuse pollution from road run-off on the White Drain.
- Carrying out a project that enhances water vole habitat and reduce rural pollution.
- Liaising with the RSPB on its Seasalter Masterplan to ensure multiple benefits for the catchment. This project involves farm advice to target land management practices for the benefit of breeding birds.

Future aims

Ideas for additional measures with £100,000 per year:

- 4 projects have been identified on the White Drain to improve the aquatic habitat, reduce abstraction, create better fish and eel passage and improve pollution prevention
- land management project to improve water quality and habitat in a Site of Special Scientific Interest (SSSI) nature reserve, currently in unfavourable condition
- continued awareness raising and monitoring of marine non-native invasive species, working closely with local groups such as the RSPB, Kent Wildlife Trust and marina owners

Ideas for additional measures with £1,000,000 per year (as above plus the following):

- Catchment-wide wetland project, including the creation of new fresh and brackish wetlands. This will focus on improving biodiversity and creation of on-farm treatment of diffuse and point source pollution from farming activity.
- Saltmarsh creation in the Medway Estuary.
- Increase recreational opportunities like sailing and rowing as well as contributing to Biodiversity 2020 targets.

Further information is available at: www.msep.org.uk/your-estuary-catchment-improvement-plans/ and www.southeastriverstrust.org/

Measures in the Roding, Beam and Ingrebourne catchment

Catchment partnership: The Roding, Beam and Ingrebourne catchment partnership includes Thames21, Thames Chase Trust, the Environment Agency, Thames Water, London boroughs of Havering, Redbridge and Barking and Dagenham, the Forestry Commission, Essex Wildlife Trust, London Wildlife Trust, Epping Forest District Council, the RSPB, Friends of the Ingrebourne Valley and Hornchurch Marshes and Brentwood Borough Council.

The priority issues in the catchment are pollution and poor water quality from urban and agricultural run-off and physical modifications for urbanisation and flood protection.

Contribution to environmental outcomes for 2021

The Ingrebourne Sustainable Drainage (SuDS) project focuses on an urban drainage outfall near Squadrons Approach in Hornchurch, impacting on the Ingrebourne marshes, which are a Site of Special Scientific Interest (SSSI). The project aims to reduce phosphates, ammonia, heavy metals and silt from urban run-off entering the SSSI marshes. This involves the creation of a network of pools and swales to slow the water flow, giving time for silt to drop out and enable planted vegetation to filter the water, removing pollutants prior to water entering the main river channel and the SSSI.

Future aims

Ideas for additional measures with £100,000 per year:

- Connecting Communities; encouraging communities to take ownership of water quality in their area. Practical conservation days, training events, misconnection awareness and littering prevention campaigns, water quality monitoring and an Ingrebourne Valley mobile app.
- Development and implementation of a water body wide invasive species identification, monitoring and eradication programme. Surveying for invasive non-native species (INNS) such as mink, Himalayan balsam, floating pennywort and Japanese knotweed.
- Promote and encourage the use of sustainable drainage systems (SuDS) in new developments and retrofitting to existing sites within the catchment to reduce the impacts of urban diffuse pollution and phosphate run-off from fertilisers and herbicides.

Ideas for additional measures with £1,000,000 per year (as above plus the following):

- Implementation of the Havering Wildlife Project Ingrebourne Restoration Plan. Flood management using natural processes, climate change adaptation, reconnecting people to the environment, improved recreation access and enhanced habitats. This project will improve the status of fish, macrophytes and invertebrates and improve amenity and recreational value.
- Modelling and design proposals for the Harrow Lodge Park Restoration Plan on the Ravensbourne. Ultimately, this will improve the status of fish, invertebrate and macrophyte populations and amenity and recreational value.
- Development and implementation of a water body wide culvert awareness and removal programme. Promoting alternatives to culverting, influencing planning policy and encouraging sustainable development without culverts. This will resolve failures in fish and invertebrates, increase recreational opportunities and contribute to biodiversity.

Further information is available at: <http://www.catchmentbasedapproach.org/thames/roding-ingrebourne>

Measures in the South Essex catchment

Catchment Partnership: The South Essex Catchment Partnership (SECP) includes: Thames Chase Trust, Environment Agency, Anglian Water, Essex & Suffolk Water Ltd, Thurrock Council, Essex Wildlife Trust, RSPB, Davy Down Trust, and local volunteers.

The priority issues to tackle in this catchment are: pollution; poor water quality from urban and agricultural run-off; and physical modification due to urbanisation and flood protection.

Contribution to environmental outcomes for 2021

The partnership has a master plan for restoration of the Lower Mardyke. Current funding will improve 1km of the Mardyke by:

- creating new berms to form a narrower river channel with faster flow exposing river gravels and creating new breaches/channels to enhance and restore 20 hectares of riparian habitat
- increasing habitat quality of the Mardyke Valley
- creating a raised viewing point
- raising awareness of issues affecting river catchments and river restoration by hosting public events in the Mardyke Valley
- increasing knowledge and awareness within Thurrock Open spaces staff and the wider public

£31,000 has been awarded by the Catchment Action Partnership Fund to deliver this project.

The SECP aim to enhance and restore a wider part of the lower Mardyke in the future.

Future aims

Ideas for additional measures with £100,000 per year:

- introduce more sustainable urban drainage systems e.g. to reduce the impact of misconnections, road run-off, urban drainage and rural diffuse pollution
- development and implementation of a water body wide invasive species identification, monitoring and eradication programme. Surveying for Invasive Non Native Species
- encourage communities to take ownership of water quality in their area. Practical conservation days, training events, misconnections and littering campaigns, water quality monitoring and a Mardyke Valley mobile app

Ideas for additional measures with £1,000,000 per year (as above plus the following):

- Flood management using natural processes, climate change adaptation, reconnecting people to the environment (possible creation of new paid Community Engagement Officer post), improved recreation access and enhanced habitats. This project will improve the status of plants and animals and improve amenity & recreational value.
- Development and implementation of a water body wide culvert awareness and removal programme. Promoting alternatives to culverting, influencing planning policy and encouraging sustainable development without culverts.
- Improve links to the RSPB Purfleet which is currently land-locked in terms of access up to the Mardyke Valley.

More information can be obtained from the Catchment Based Approach (CaBA) website <http://www.catchmentbasedapproach.org/thames/south-essex>

Measures in Thame and South Chilterns catchment

Catchment partnerships: There are two partnerships in this management catchment. The Thame partnership is hosted by the Freshwater Habitats Trust and the River Thame Conservation Trust. The South Chilterns partnership is hosted by the Foundation for Water Research. The partnerships include the Environment Agency, Chilterns Chalk Stream Project, Revive the Wye and the Chiltern Society, West Berkshire Countryside Society, West Berkshire Farming and Countryside Project, Aylesbury Vale Council Natural England, Thames Water, Berks, Bucks and Oxon Wildlife Trust (BBOWT), the National Farmers' Union (NFU), Wycombe District Council, Thame Fisheries Consultative, the Royal Yachting Association, Withymead Nature Reserve, North Wessex Downs Area of Outstanding Natural Beauty, Thame Valley Fisheries Preservation Consultative, Cuttlebrook Conservation Volunteers, Save the River Thame and the Watlington Environment Group.

The priority river basin management issues to tackle in both catchments are diffuse pollution from both rural and urban sources; point source pollution and habitat degradation.

Contribution to environmental outcomes for 2021

- **South Chilterns:** Habitat improvement projects on the Wye and Pang, creating a significant number and range of new habitats for fish and invertebrates. The work will also help address poor riverine habitat caused by diffuse pollution from urban surface water drainage and rural diffuse pollution sources, and will reduce flood risk. To date, the projects have been mainly funded by government grants.
- **Thame:** Working with partners in the Lower Thame (including the Chalgrove Brook, the Holton Brook and Kingsey/Cuttle Brooks) to improve water quality and habitats by reducing impacts from point source and diffuse source pollution as well as providing habitat improvement, extending clean water ponds and increasing the amount of wetlands across the catchment. Funding for the project has been provided by government grants and Thames Water.

Future aims

Ideas for additional measures with £100,000 per year:

- **South Chilterns:** Development of recreational access on the Thames at Reading, providing social and economic benefits.
- **Thame:** Assisting the delivery of the overarching strategy for the Thames on this stretch of the river, in partnership with the Earth Trust, including reduction in flood risk.

Ideas for additional measures with £1,000,000 per year (as above plus the following):

- **South Chilterns:** The partnership would help Wycombe District Council implement the 'Remaking the Wye' project. An extensive project looking to rejuvenate the Wye and High Wycombe town centre, providing environmental, social and economic benefits.
- **Thame:** Work to remove fish barriers along the Thame river corridor. This will include coordinating improvements to the riverine habitat around Aylesbury and creating areas for biodiversity and community access.

Further information on the partnership is available at:

- **South Chilterns:** <http://www.fwr.org/Catchment/index.htm>
- **Thame:** <http://www.freshwaterhabitats.org.uk/or>
<http://www.riverthameconservation.org/>

Measures in the Thames (tidal) catchment

Catchment partnership: The Your Tidal Thames partnership is made up of a Steering Group of catchment hosts, the Thames Estuary Partnership, Thames21, Thames Strategy Kew to Chelsea, and the Thames Landscape Strategy. The Environment Agency and the Port of London Authority also help to steer the partnership. The Steering Group supports a wider partnership, the Strategy Group, which involves many public, private and voluntary sector partners.

The priority river basin management issues to tackle in this catchment are

- the Water (including habitat enhancement, water quality, and flood risk)
- the human element (education, access, and public awareness)
- planning and economic development (including river traffic, commerce, fishing, and riverside redevelopment)

Contribution to environmental outcomes for 2021

- A misconnections project is being rolled out over 2015-16 targeting the issue of waste water going into the surface water network. The partnership will work with Thames Water to identify the polluted outflows in the Upper and Middle Tidal Thames water bodies. The partnership will engage with volunteers, schools and builders merchants to deliver sustainable drainage systems (SuDS).
- The partnership is liaising with the Environment Agency's Thames Estuary 2100 project to achieve greater public access and habitat restoration, particularly inter-tidal habitat in the estuary, from any capital works on flood defence.
- An EU Horizon 2020 bid, worth £0.5 million to the catchment, is in the second stage. It will focus on ecosystem services and suitable mitigation measures for estuaries. It will include intertidal habitat creation, opportunities for vertical or artificial foreshore, and retrofitting of existing structures. For an update on this project visit www.yourtidthames.org

Future aims

Ideas for additional measures with £100,000 per year:

- Develop the infrastructure needed to deliver and maintain community led projects within the tidal Thames. This will include maintaining the momentum and monitoring successes. Projects could involve ecologically functioning community gardens and SuDS.
- Work with the planning departments of all 17 riparian local authorities along the tidal Thames and the numerous community development organisations. Maximise sustainable development through innovative partnerships between developers, NGOs and local community groups and 'honest broker' support by the catchment partnership.

Ideas for additional measures with £1,000,000 per year (as above plus the following):

- Major intertidal habitat restoration projects where large scale habitat creation opportunities exist. 37 hectares could be created, with sites at either end of the catchment, both estuary and tidal limit. These would include pre and post monitoring to ensure data is contributed to river basin management targets and to build a robust scientific database for the estuary with evidenced improvements.

Further information on the partnership is available at: <http://www.yourtidthames.org>

Measures in the Upper Lee catchment

Catchment partnership: The Upper Lee catchment is home to a number of partnership groups. Membership varies, but at their core are landowners, angling groups, campaigning groups, and local interest organisations. Membership also includes Affinity Water, Thames Water, Groundwork Luton and Beds, Hertfordshire and Middlesex Wildlife Trust, Luton Borough Council, Hertfordshire County Council, Cranfield University, Luton Airport, Vauxhall and the Environment Agency. All have assisted a better understanding of problems and the health of the water environment in an area of serious water stress and significant growth expectations.

Priority issues include low flows in rivers, pollution from waste water and from rural and urban areas, and modifications, structures and changes to the natural form of rivers.

Contribution to environmental outcomes for 2021

- Affinity Water will invest over £1,000,000 to improve river morphology and undertake other improvements with landowners and local communities. Together with additional investment of £265,000 in 2015/16 (raised from abstraction licence fees), the work will improve river function and resilience, contributing to improved status of the Mimram and Beane chalk rivers in central Hertfordshire.
- Working with Luton Borough Council and Groundwork Luton, the local partnership will invest multi partner funding of around £200,000 to construct at least 1 sustainable drainage system (SuDS) in a public green space, which will help reduce flood risk and improve habitat and water quality of the River Lea in Luton. The project will be complemented by £70,000 of funding from Thames Water for the development and support of a community engagement programme to connect people to the River Lea, and to support volunteer environmental monitoring.

Future aims

Ideas for additional measures with £100,000 per year:

- Build further green space SuDS connecting to the Lea in Luton, to mitigate the impact of polluted urban run-off and improve the quality of water entering the Lea and its tributaries. Remove or adapt a minimum of 3 barriers/weirs per year, opening up a minimum of 2 km of impacted river per year.
- Support and develop a network of Living River Champions for every water body in the catchment to lead community level rivers groups. Harness local effort to shape a funding bid to achieve and monitor improvements on at least 1 water body, and engage more people with the health and history of their river.
- Support a programme to produce or update flood modelling for priority water bodies in the catchment, to support and facilitate timely and confident decision making for river restoration projects.

Ideas for additional measures with £1,000,000 per year (as above plus the following):

- Build a network of SuDS in a further 6 urban green spaces across the catchment to contribute to status improvement of at least 3 water bodies.
- Establish and co-lead a national chalk streams restoration and stewardship programme to improve understanding, build capability, encourage support and secure funding to achieve additional improvements to UK chalk streams. Secure improved protected status designation for all chalk streams in the catchment.

Further information on the partnerships is available at:

<http://www.riverleacatchment.org.uk/index.php/london-lea-home>

Measures in the Wey catchment

Catchment partnership(s): The Wey Landscape Partnership is made up of the Environment Agency, Natural England, relevant local authorities and utilities, the Wey Valley Fisheries Consultative Association, Surrey and Hampshire Wildlife Trusts, the National Trust, River Wey Trust and Northern Wey Trust. The priority river basin management issues to tackle in this catchment are diffuse pollution from rural areas, barriers to natural fish movements and migration, and invasive non-native species.

Contribution to environmental outcomes for 2021

- Guildford Borough Council's Slyfield Area Regeneration project, incorporating re-location/upgrade of the local sewage treatment work and a major river restoration scheme at Burpham Court Farm on the Lower Wey (Shalford-Weybridge) water body, with significant improvements to multiple biodiversity elements as well as phosphate failures. Additional benefits include improved local flood alleviation and recreational opportunities.
Several ongoing cross-catchment advisory projects will continue to operate throughout this cycle, including Wey RiverSearch (a voluntary river wardening project using trusted citizen science data collection techniques to inform, prioritise and implement local riparian habitat enhancement measures); as well as the Wey Diffuse Advice Project (land-use diffuse pollution risk-analysis and follow-up land-owner engagement).

Future aims

Ideas for additional measures with £100,000 per year:

- Implement Lower Wey Oxbow Restoration Project to enhance and restore the main Wey river channel. This would enhance riparian habitats and restore river function on several heavily modified water bodies in the lower catchment, improving approximately 15 km of river.
- Wey Diffuse Advice Project throughout the catchment. This would greatly extend a proven mechanism of reducing the impacts of rural and urban diffuse pollution, thus helping resolve catchment-wide problems with high levels of pesticides, phosphates and sediments impacting on river life and public drinking water abstractions.

Ideas for additional measures with £1,000,000 million per year (as above plus the following):

- Major river restoration projects at Bishops Meadow and Snails Lynch on the North Wey in Farnham, and at Woking Palace on the Lower Wey. These would help improve fish, invertebrate and macrophyte communities; offer increased local flood alleviation; increase recreational opportunities; and contribute to local delivery of Biodiversity 2020 priority habitat restoration/creation targets and help tackle invasive non-native species.
- Fish passage mitigation projects on all key identified migratory barriers throughout the catchment, contributing directly to the local recovery of populations of threatened priority fish species, such as brown trout, Atlantic salmon and European eel, with associated recreational and fisheries provisioning benefits.

Further information on the partnership is available at: <http://www.surreywildlifetrust.org/what-we-do/living-landscapes/partnership-and-advocacy>

3.5. Forward look at measures beyond 2021

This section provides a summary of the measures which are envisaged as necessary for protected areas and water bodies to achieve their objectives for 2027 and beyond. It also describes opportunities which could enable additional measures to be implemented by 2021.

Measures to 2027

Table 22 contains a summary of the types of measures which are envisaged to be necessary to address each significant water management issue up to 2027. This is not exhaustive and will inevitably change. Change can occur for a variety of reasons including, new evidence, changes in water body status, funding availability, government policy changes, development impacts and climate change.

The measures in table 22 are required in addition to the measures to address the significant water management issues described in section 3.2.

The summary programmes of measures and environmental objectives in this plan will be reviewed and updated in 2021. The WFD does not generally allow the timescale for the achievement of environmental objectives to be extended beyond 2027. Therefore as part of the plan update in 2021, choices will have to be made about the appropriate use of less stringent objectives.

Table 22: Summary of types of measures envisaged as necessary to achieve objectives for each significant water management issue

Types of measures envisaged in the river basin district	Main sectors involved in implementing the measures
Measures to address physical modification	
<ul style="list-style-type: none">• Improvement to condition of channel/bed and/or banks/shoreline• Improvement to condition of riparian zone and/or wetland habitats• Removal or easement of barriers to fish migration• Removal or modification of engineering structure• Vegetation management• Change to operations and maintenance	<ul style="list-style-type: none">• Government (central and local government)• Industry services and infrastructure (non governmental organisations, navigation, industry, manufacturing and other business)• Rural land management• Water industry

Types of measures envisaged in the river basin district		Main sectors involved in implementing the measures	
Measures to address pollution from waste water			
<ul style="list-style-type: none">• Mitigate/Remediate point source impacts on receptor• Reduce point source pollution at source• Reduce diffuse pollution at source• Reduce point source pathways (i.e. control entry to water environment)		<ul style="list-style-type: none">• Government (central and local government)• Industry services and infrastructure (urban and transport, industry, manufacturing and other business, waste treatment, transfer, storage and disposal)• Rural land management• Water industry	
Measures to manage pollution from towns, cities and transport			
<ul style="list-style-type: none">• Reduce diffuse pollution pathways (i.e. control entry to water environment)• Mitigate/Remediate diffuse pollution impacts on receptor• Reduce diffuse pollution at source		<ul style="list-style-type: none">• Government (central and local government)• Industry services and infrastructure (urban and transport, industry manufacturing and other business, non governmental organisations, navigation)• Rural land management• Water industry	
Measures to address changes to natural flow and level of water			
<ul style="list-style-type: none">• Improvement to condition of channel/bed and/or banks/shoreline• Control pattern/timing of abstraction• Water Demand Management• Use alternative source/relocate abstraction or discharge		<ul style="list-style-type: none">• Government (central and local government)• Industry services and infrastructure (non governmental organisations)• Rural land management• Water industry	
Measures to address pollution from rural areas			
<ul style="list-style-type: none">• Reduce diffuse pollution at source• Mitigate/Remediate diffuse pollution impacts on receptor		<ul style="list-style-type: none">• Government (central and local)• Industry services and infrastructure (urban and transport)• Rural land management• Water industry	

Types of measures envisaged in the river basin district	Main sectors involved in implementing the measures
Measures to manage invasive non-native species	
<ul style="list-style-type: none"> • Mitigation, control and eradication (to reduce extent) • Building awareness and understanding (to slow the spread) • Early detection, monitoring and rapid response (to reduce the risk of establishment) 	<ul style="list-style-type: none"> • Government (central and local) • Industry services and infrastructure (non governmental organisations, navigation, industry, manufacturing and other business) • Rural land management • Water industry

Section 3.6 contains further information on measures to achieve protected area objectives, including those with extended deadlines.

The cost of programmes of measures provides a good indication of the scale and phasing of action. Table 23 shows the current assessment of the potential costs of measures to achieve the water body and protected area objectives in this plan. The costs of measures are broadly allocated to the sectors whose activities cause the problem in line with the 'polluter pays principle'. Beyond the known funding to 2021, no decision has been made on where the costs will fall. In some cases, the sectors may not pay their own costs. Note figures are rounded to the nearest £10 million.

Table 23 Summary of estimated costs and phasing of action

Sectors	Total cost of measures over 37 years (undiscounted) to achieve objectives (£m)	Phasing to 2021 (% of total cost envisaged to 2021)	Phasing post 2021 (% of total cost envisaged after 2021)
Government	1270	<10%	>90%
Rural land management	1350	<10%	>90%
Industry, services and infrastructure	130	<10%	>90%
Water industry	1990	10-20%	80-90%

The rural land management costs are based on a range due to different scenarios of cost allocation. The midpoint is presented here to be consistent with other costs.

Opportunities for additional measures

There will be greater certainty on the measures that will be required between 2021 and 2027 when this plan is updated in 2021. Before then, a number of strategic reviews and funding streams could enable additional measures to be confirmed and/or implemented before 2021. Some of these opportunities are described below.

External funding sources

The following funding sources could be used to implement measures.

- The LIFE Regulation, which was published on 20 December 2013, sets a budget for 2014 to 2020 of €3.4 billion for projects to invest in the environment and climate change. Calls for applications are annual, for priorities including nature, biodiversity, water, floods and drought.
- The Heritage Lottery Fund invests £375 million each year, a portion of this being available to environmental improvement projects through the 'Parks for People' (£100,000 - £5 million) and 'Landscape Partnerships' (£100,000 - £3 million) programmes. Calls for applications can be once or twice a year and are often a 2 stage process.
- The government has asked Local Enterprise Partnerships to prepare economic strategies to inform the allocation of domestic and European 'growth funds', for example, the Single Local Growth Fund and the European Structural and Investment Funds. The criteria for allocation of these funds include environmental protection and sustainable development, providing an opportunity for water infrastructure that supports efficient and sustainable use of water.

Review of Urban Waste Water Treatment Directive designations

The Urban Waste Treatment Directive aims to protect the water environment from the adverse effects of discharges of urban waste water and certain industrial discharges by specifying minimum treatment requirements as well as more stringent tertiary treatment when needed to protect designated sensitive receiving waters.

Sensitive area designations are currently reviewed every 4 years, the next review was completed in December 2015. The Environment Agency would like to see a move towards 6 yearly cycles to align with WFD but this would require changes to legislation.

EU Priority Substances Directive

The 2013 revisions to the Priority Substances Directive have been transposed into domestic legislation. To comply with the new requirements, by 22 December 2018, the Environment Agency will submit a supplementary monitoring programmes and a preliminary programme of measures to the European Commission, with the aim of achieving good chemical status by 2027. The required measures will need to be considered in water company investment plans, as part of the 2019 Price Review and will be finalised in the 2021 update of the river basin management plans. All of the required measures will be made operational by 2024.

Preliminary investigations of chemicals with new European standards indicate that they could have a significant impact on good status in future. Sewage may be a significant source of some of these chemicals. Whilst sewage treatment is generally effective at reducing inputs this may not always be sufficient. Some substances have restrictions or bans on usage but these may take many years to result in lower environmental concentrations.

Review of water company price limits

Ofwat is expected to review the prices that water companies can charge their customers in 2019. As part of this process, water companies will need to update their business plans to include (amongst other things) additional environmental improvements agreed with their customers and the Environment Agency.

Common Agricultural Policy

The current agreement for funding from the Common Agricultural Policy, including the basic payment scheme and rural development programme that encompasses Countryside Stewardship, ends in December 2020. Negotiations for continued funding for the period 2021 to 2027 have not yet begun.

Water resources management plans

Water companies will publish new plans in 2019. These plans set out how they will balance supply and demand for water over a 25 year period. The new plans will enable them to take account of expected changes in demand for water and in their available supply as a result of climate change and population growth as well as any new measures needed to deliver environmental objectives.

Review of nitrate vulnerable zones designations and action plans

Every 4 years, the UK is required to review the evidence in relation to the extent of nitrate vulnerable zones (NVZ) and the effectiveness of the action programme introduced by the Regulations and to implement changes where required. NVZs are a means of reducing or preventing water pollution caused by nitrates from agricultural sources. The next review is underway and any changes are expected to be implemented in January 2017.

Further information in this document

- You can find more information on the ongoing measures to prevent deterioration for each significant water management issue in section 3.2.

Information elsewhere in the river basin management plan

- You can find more information about the catchment economic appraisal in section 5.5 of [Part 2: RBMP overview](http://www.gov.uk/government/collections/river-basin-management-plans-2015) (www.gov.uk/government/collections/river-basin-management-plans-2015).

Supporting information

- You can find a list of the measures needed to achieve water body objectives for 2027 and beyond on the Environment Agency's [ShareFile service](https://ea.sharefile.com/d-sabbd14301a44d5e9) (<https://ea.sharefile.com/d-sabbd14301a44d5e9>).
- You can find the impact assessment on the river basin management plan [web pages](http://www.gov.uk/government/collections/river-basin-management-plans-2015) (www.gov.uk/government/collections/river-basin-management-plans-2015).

3.6. Additional measures to achieve protected area objectives

Measures have been developed for protected areas that are at risk of or do not currently meet their objectives. Table 24 summarises the action planning process.

Table 24: Summary of measures for protected areas

Protected area	Programme
Drinking water protected areas - surface water and groundwater	Safeguard zones have been established for water sources in drinking water protected areas where extra treatment is likely to be required in the future. Safeguard zone action plans have been developed including measures needed to manage activities that may threaten raw water quality for surface waters and ground waters.
Economically significant species (shellfish waters)	Shellfish water action plans have been produced for all designated shellfish waters, which include measures aiming to observe the microbial shellfish flesh standards.
Recreational waters (bathing waters)	Bathing water profiles have been produced for all designated sites. They include details of the measures needed to achieve compliance with the revised standards that came into force in 2015. Further information is available on the measures for those bathing waters at risk of not achieving sufficient in 2015 in the bathing water action plans (continuing at risk).
Nutrient sensitive areas (Urban Waste Water Treatment Directive)	Measures have been identified to make sure that all relevant discharges from waste water treatment plants within the sensitive area have appropriate phosphorus or nitrogen emission standards.
Nutrient sensitive areas (nitrate vulnerable zones)	The objective of the Nitrates Directive is to reduce water pollution caused by nitrates from agricultural sources and to prevent further such pollution occurring. Nitrate Vulnerable Zones (NVZs) are designated where nitrate concentrations in surface and/or groundwaters are high or increasing, or where waters are, or may become eutrophic, due to agricultural nitrate pollution. Farmers within NVZs must comply with mandatory action programme measures to reduce agricultural nitrate losses. In addition a code of good agricultural practice has been established, for voluntary implementation by all farmers.
Natura 2000: Water dependent Special Areas of Conservation (SACs) and Special Protection Areas for Wild Birds (SPAs)	Natural England has developed site improvement plans (SIPs) for water dependent sites. SIPs provide an overview of issues affecting the site condition; identify priority actions, timescales for implementation and potential funding sources. Natural England monitors, reviews and updates SIPs where appropriate.

Supporting information:

- You can find more information on the measures in protected areas at the following locations:
 - For drinking water protected areas for [surface water](https://ea.sharefile.com/d-scac3ff7da4a424eb) (<https://ea.sharefile.com/d-scac3ff7da4a424eb>) and for [groundwater](https://ea.sharefile.com/d-sa22fd79de304532a) (<https://ea.sharefile.com/d-sa22fd79de304532a>).
 - For [economically significant species](https://ea.sharefile.com/d-s84c5554e50947dbb) (<https://ea.sharefile.com/d-s84c5554e50947dbb>).
 - You can access more information on recreational waters on the [Bathing Water Explorer](http://environment.data.gov.uk/bwq/profiles/) (<http://environment.data.gov.uk/bwq/profiles/>) and in the bathing water action plans (continuing at risk) on the Environment Agency's [ShareFile service](https://ea.sharefile.com/d-s2c9919e38f04798b) (<https://ea.sharefile.com/d-s2c9919e38f04798b>).
 - For Nitrate vulnerable zones visit the [NVZ web pages](https://www.gov.uk/nitrate-vulnerable-zones) (<https://www.gov.uk/nitrate-vulnerable-zones>).
 - The Natura 2000 site improvement plans are available on Natural England's [website](http://publications.naturalengland.org.uk/category/4878851540779008) (<http://publications.naturalengland.org.uk/category/4878851540779008>).

4. Changes from 2009 to 2015

This section contains an assessment of what has been achieved and what has happened since the first river basin management plan was published in 2009.

It includes a summary of the improvements made to the evidence used in river basin management planning, a report on the implementation of measures, and a summary of progress towards achieving the environmental objectives in the 2009 plan and where progress has not been made.

4.1. Improvements in evidence

Over the last 6 years the Environment Agency has done much to improve the understanding of the water environment. The quantity and quality of the evidence available has grown because of significant investment.

- In England, an additional £4.7 million pounds has been invested in a new ecological monitoring programme for rivers and an additional £1.5 million pounds invested in chemical monitoring technology. This means that the number of classification element results in the river basin district has increased from 5,000 in 2009 to 5,956 in 2015.
- In the river basin district, more than 2,600 investigations have been carried out to identify the reasons (pressures, and the sources of the pressures) why good status and protected area objectives have not been achieved.
- The actions that would be needed to achieve good status and protected area objectives have been identified.
- Through detailed economic appraisal, there is an improved understanding of the benefits the water environment can provide and the cost of the measures needed to realise the benefits.
- The latest generation of environmental assessment criteria has been introduced in collaboration with a range of partners and leading scientists. These improvements to methods mean that the classification results are now a better interpretation of the general health of the water environment. These changes include:
 - new standards for additional chemical substances
 - updated standards for existing physico-chemical elements
 - new and improved biological assessment tools and new intercalibrated biological classification boundary values.
- Improvements have been made in mapping of the water body network.
- Improved risk assessments have been introduced to help target future monitoring programmes, and predict and help prevent potential deterioration in the water environment.

This new evidence was used in the review and update of the environmental objectives in the 2009 plan.

Further information in this document

- You can find summaries of the latest water body classification results and the reasons for not achieving good status in section 5.
- You can find more information on risk assessments in section 1.4.

Information elsewhere in the river basin management plan

- You can find more information in [Part 2: RBMP overview](#) available on the river basin management plan web pages (www.gov.uk/government/collections/river-basin-management-plans-2015) for:
 - the process used to review and update the environmental objectives in the 2009 plan, in section 5.2
 - measures identification in section 5.2
 - economic appraisals in section 5.3
 - review of the water body network in section 4.1
 - review and update of heavily modified water body designations in section 4.1
 - revised risk assessments in section 4.4
- GeoPDF maps showing the latest classification results can be found on the Environment Agency's [ShareFile service](#) (<https://ea.sharefile.com/d-s25aecb60c464ccd9>).
- You can find a spreadsheet containing the reasons for not achieving good status on the Environment Agency's [ShareFile service](#) (<https://ea.sharefile.com/d-s0faa355450243538>).

Supporting information

- You can find the full description of changes to environmental standards on the [UKTAG website](#) (<http://www.wfduk.org/>).
- The full description of changes to biological methods can be found on the [UKTAG website](#) (<http://www.wfduk.org/>).

4.2. Measures implemented

Planned measures implemented since 2009

Most of the measures (over 99%) summarised in the 2009 plans have been completed.

A few measures have not been completed in the river basin district for the following reasons:

- 2 measures have been reassessed and are no longer needed or considered effective
- 5 were not funded (funding withdrawn)

Additional measures implemented since 2009

As well as the measures in the 2009 plans, a significant number of other measures have been implemented. For instance in England, the government provided £90 million between 2010 and 2015 for additional measures to improve the physical water environment, reduce pollution, and reduce the impact of invasive non-native species.

It is estimated that the additional measures in the river basin district represent a further investment of at least £8.9million. Table 25 gives a summary of the issues addressed and an indication of the scale of additional measures.

Table 25 – Summary of additional measures in the river basin district

Significant water management issue	Number of measures	Cost (£Million)	Number of water bodies benefitting
Physical modifications	76	6.1	121
Pollution from rural areas	10	1.3	41
Pollution from town, cities and transport	12	0.8	26
Pollution from abandoned mines	0	0	0
Non-native invasive	3	0	4
Other	9	0.6	18
Total	110	8.8	210

Supporting information

- You can download a spreadsheet of the additional local measures implemented from 2009 from the Environment Agency's [ShareFile service](https://ea.sharefile.com/d-s13e5e39caef432d9) (<https://ea.sharefile.com/d-s13e5e39caef432d9>).

Effectiveness of measures implemented since 2009

Most of the measures implemented between 2009 and 2015 have resulted in improvements to the quality of the water environment, providing significant additional benefits. However, the scale of the improvements has not always been enough to fully secure compliance with WFD environmental objectives (protected area and water body status objectives) set in the 2009 plan. Section 4.3 identifies some of the reasons for this.

Table 26 contains a summary of how effective the measures implemented since 2009 were at achieving WFD environmental objectives. Measures are grouped by each significant water management issue. The assessment is based on the measures implemented across England and not just in this river basin district.

Table 26: Summary assessment of the effectiveness of measures for each significant water management issue (England level assessment)

Physical modifications
Obstructions Removing or lowering weirs and building fish passes has generally been effective. In some cases, it has not been possible to fully remove the pressure because of the obstruction's historic value or the need to prevent erosion or mobilisation of contaminated sediments. In some cases full compliance with WFD environmental objectives has not yet been achieved because other barriers elsewhere in the catchment are still present.
Habitat improvement Habitat improvements, from large-scale river restoration to relatively minor schemes on small watercourses, have generally been effective. They have led to improvements in fish populations and other wildlife. The effectiveness of these schemes at achieving compliance with WFD environmental objectives will only become apparent once the new habitat and associated wildlife has matured. In some cases, it is expected that additional restoration elsewhere in the catchment will be required to support a fully functioning ecosystem.
Pollution from waste water
There were over 300 improvement schemes implemented at sewage treatment works since 2009. These have been effective at helping to achieve compliance with WFD environmental objectives.
Pollution from rural areas
Government advice Catchment Sensitive Farming was effective at encouraging farmers to take up measures to help achieve WFD environmental objectives (mainly for protected areas). In areas where Catchment Sensitive Farming was targeted, between 2006 and 2013, the estimated quantity of pollutant (including phosphorus, nitrate, sediment and faecal indicator organisms) released from agricultural sources reduced by between 4% and 12% (on average).
Regulation Regulation has reduced the impact of pollution incidents and helped to prevent deterioration. There is some evidence that action plans for nitrate vulnerable zones helped to reduce pollution from nutrients. The overall effectiveness can only be assessed over a longer period.

Industry initiatives

A number of schemes have promoted voluntary action including, advice and grants through local catchment groups, advice through the Campaign for the Farmed Environment, and work lead by water companies to improve the quality of water they abstract for public water supply. Advice is effective at promoting good farming practice. Measures that go beyond good practice greatly increase where grants have been provided. Many of these schemes resulted in improvements to the local water environment.

Environmental stewardship (2006 to 2014)

There was good uptake of measures to protect the water environment. Measures were not always placed where most benefit could be gained or the uptake sufficiently concentrated within a catchment to reduce pressures enough to achieve compliance with WFD environmental objectives.

Cross compliance

Compliance with environmental conditions attached to the Single Farm Payment was high. The environmental conditions were strengthened in 2010 and 2015. The associated measures had a small impact on the quality of the water environment

Changes to the natural flow and level of water

Changes in abstraction licences

The national Restoring Sustainable Abstraction programme has been effective at improving habitat for fish and other wildlife. Voluntary and compulsory action has resulted in changes to over 200 abstraction licences (by the Environment Agency and government). As a result of this, 27 billion litres of water has been returned to the environment.

Nationally this programme has been effective at helping to achieve compliance with WFD environmental objectives, in particular those for Natura 2000 protected areas

Demand management

Demand management and water efficiency techniques have been implemented by many sectors including government, water industry, independent bodies and trade associations.

Local Development Plans / Frameworks have been introduced which set out local plan policies requiring new homes to meet the tighter water efficiency standard of 110 litres per person per day as described in Part G of Schedule 1 to the Building Regulations 2010.

Water companies have reduced leakage from their supply networks and increased the number of homes with meters across water stressed areas.

Most of these have been effective at a local scale.

Pollution from towns, cities and transport

A variety of measures have been implemented to reduce pollution from urban areas. These include contaminated land restoration; installation of sustainable drainage systems for new and existing developments; treatments to remediate road run-off; regulatory action following pollution incidents; initiatives to resolve misconnected foul drainage systems; and pollution prevention advice to occupiers of industrial estates.

Most of these measures have been effective at the local scale. However, in some cases the effectiveness is low, as there needs to be more measures within an area if improvements are to be sustained over the long term. Given the scale, cost and complexity of this issue, the measures have not been effective at reducing the pressure enough to achieve compliance

with WFD environmental objectives.

Invasive non-native species

A variety of measures have been implemented to prevent the introduction and spread of invasive non-native species. These have been moderately effective and have slowed the deterioration in the biodiversity of affected waters and the spread to unaffected waters. Measures to remove invasive non-native species from affected waters are only effective for a minority of species where a rapid response to their presence is possible. Evidence gathered in cycle 1 has confirmed that it is technically infeasible to remove most species once they are established. At locations such as Natura 2000 sites, intensive (and ongoing) action can mitigate the pressure, but not remove it.

4.3. Progress towards achieving the environmental objectives in the 2009 plan

Preventing deterioration

To assess compliance with the WFD objective of preventing deterioration, 2015 classifications results (based on data up to the end of 2014) using the standards and classification tools used in 2009, were compared with the 2009 classification baseline. The assessment considered whether the water body had deteriorated from one status class in 2009 to a lower one in 2015. This was applied to a water body's overall status and to the status of each element used in classification.

The results of this assessment for water bodies in the river basin district are summarised in Table 27. Table 34 in section 5 provides a breakdown by elements.

Table 27: Water bodies that have deteriorated (at >75% confidence)

Water bodies	Number	Percentage
Surface water ecological status	27	5%
Surface water chemical status	2	<1%
Groundwater quantitative status	0	0%
Groundwater chemical status	0	0%

Where deterioration of status has occurred, the cause needs to be identified and measures to restore the water body to its previous status put in place as soon as possible.

In some cases, reported deterioration may be a result of changes to monitoring programmes or be an artefact of monitoring and assessment processes (sampling error). Distinguishing these changes from real deterioration in the quality of the environment that has been caused by a new activity or a change in an existing pressure in a catchment can be difficult.

Table 34 in section 5 contains a summary of the causes of deterioration that have already been identified. This summary is for each element by pressure and sector. You can also download a spreadsheet containing the water body elements that have deteriorated in status since 2009 (see further information box at the end of this section).

In certain and specific circumstances deterioration of status is permitted. These circumstances are described in Article 4.6 (temporary deterioration) and Article 4.7 (new modifications) of the WFD. No cases that meet these requirements have been identified in this river basin district.

Protected area objectives

Drinking water protected areas

The Drinking Water Inspectorate is the competent authority for the drinking water directive. They publish an annual report detailing compliance with the directive's water quality requirements.

The Environment Agency has established safeguard zones and produced associated action plans for all relevant drinking water protected areas to manage the risk of water quality deteriorating.

Following improvements in the knowledge of the pressures in catchments, improved monitoring programmes for chemicals and new abstractions which have come about, the number of drinking water protected areas classified as at risk of water quality deterioration or at poor chemical status (for groundwater only) has increased. Measures such as providing advice and guidance to stakeholders, capital grants for infrastructure improvements (for example biobeds) and payment for ecosystem services have been used to protect water quality in drinking water protected areas.

Economically significant species (freshwater fish)

The freshwater fish directive was repealed in December 2013. Environmental objectives for freshwater fish protected areas ceased to have effect from that date. An equivalent level of protection is provided by the water body objectives in this plan.

Economically significant species (shellfish waters)

The shellfish water directive was repealed in December 2013. Shellfish waters protected areas have been maintained and an equivalent level of protection is being provided by domestic legislation. Monitoring used to assess compliance with the shellfish flesh standards has significantly increased. Although there has been no significant change in the quality of the water environment in the protected areas, the improved monitoring has led to a reduction in reported compliance.

The current status of shellfish protected areas is summarised in section 2.4.

Recreational waters (bathing waters)

A revised bathing water directive introduced new water quality objectives for bathing water protected areas from 2015. Projected classification of bathing waters against the new standards is summarised in section 2.4. Compliance with the water quality standards of the old bathing water directive was assessed for the final time in 2014. These results are summarised in Table 28. This shows an increase in compliance since 2009.

Table 28: Bathing water compliance with old (1976) Bathing Water Directive objectives:

Year	Number of bathing waters	% compliant with mandatory standards	% compliant with guideline standards
2009	17	100	35
2014	18	100	61

Natura 2000 sites: Water dependent Special Areas of Conservation or Special Protection Areas

In 2009 17 Natura 2000 protected areas in the river basin district had an objective of maintaining or achieving their water dependent conservation objectives by 2015 (assessed on basis of measures being underway/complete, known pressures, anticipated measures and likely improvements in condition). Of these, 6 had all measures completed (i.e. no further intervention is required) to enable their water dependent objectives to be achieved by 2015, based on knowledge of current pressures on the sites.

Water body status objectives

As a result of the improvements in monitoring, standards and classification tools described in section 4.1, it is not possible to identify environmental change by simply comparing the 2009 and 2015 classification baselines. Instead, a set of 2015 classifications results (based on data up to the end of 2014) has been produced using the standards and classification tools used in 2009. This helps identify where they may have been an actual environmental change since 2009.

Table 29 shows the percentage of water bodies at good status for the:

- 2009 baseline
- predicted outcomes in 2015 envisaged in the 2009 plans
- 2015 classification results produced using the 2009 methods

Table 29: Comparison of 2009 baseline with 2015 predicted and actual results (using the standards and classification tools used in 2009)

Percentage of water bodies at good or better status	2009	2015 predicted	2015 actual
Surface water ecological status	23	25	14
Surface water chemical status	13	14	18
Groundwater quantitative status	35	35	57
Groundwater chemical status	43	46	63
Overall status	23	25	17

Although many of the measures completed over the last 6 years are providing benefits for the local environment, the comparison shows a slight reduction in the number of water bodies at good status. After 2009 the Environment Agency put additional biological monitoring in place and improved the design of the monitoring network. The new monitoring has revealed more symptoms of environmental issues. The change between 2009 and 2015 reported in the table above does not necessarily constitute a real environmental deterioration. Over this period 416 water body elements improved by one or more class.

The reasons why the predicted improvement in status has not yet been seen include:

- the measures have not been as effective at reducing pressures at the water body scale as expected
- the environmental standards which the measures were designed to achieve were not tight enough to fully protect the biological elements
- there are pressures acting on the water bodies that were not known in 2009
- improvements in the monitoring network identifying that pressures are having more impact than previously detected
- the pressure has been reduced but the biology has yet to fully improve
- some classification elements have improved in status, but no improvement in the status of the water body has been reported due to the use of the 'one out all out' classification rule

Further information in this document

- You can find a summary of the causes of deterioration that have already been identified in section 5.

Information elsewhere in the river basin management plan

- A more detailed explanation of the approach to preventing deterioration can be found in can be found in section 2.2 of [Part 2: RBMP overview](http://www.gov.uk/government/collections/river-basin-management-plans-2015) (www.gov.uk/government/collections/river-basin-management-plans-2015).
- You can find detail on the circumstances in which deterioration may be permitted (temporary deterioration and new modifications) in section 3.1.4 of [Part 2: RBMP overview](http://www.gov.uk/government/collections/river-basin-management-plans-2015) (www.gov.uk/government/collections/river-basin-management-plans-2015).
- You can download spreadsheets containing:
 - a spreadsheet containing the 2009 classification baseline, predicted and actual results for 2015 using the standards and classification tools used in 2009
 - a map of the 2015 classification results using the standards and classification tools used in 2009
 - a spreadsheet containing the water body elements that have deteriorated in status since 2009from the Environment Agency's [ShareFile service](https://ea.sharefile.com/d-s13e5e39caef432d9) (<https://ea.sharefile.com/d-s13e5e39caef432d9>).

5. Summary statistics

This section provides a summary of the key statistics for the river basin district at water body and quality element level.

Summary statistics tables

The tables in this section provide a summary of the plan data for the river basin district and can be used for quick reference. To understand the purpose of the data and how it has been generated see the relevant sections earlier in this document. The detailed data behind the summaries can also be accessed by following the links in the relevant sections.

The following descriptions explain the content of the tables and the further information box shows where more information can be accessed.

- **Table 30: Summary statistics for the Thames river basin district: Water bodies:** shows the status, by percentage, of the different types of water bodies in the river basin district. It also shows the predicted outcome by 2021 and the objective.
- **Table 31: Summary statistics for the Thames river basin district: Elements:** shows the status, by percentage, of the water body elements in the river basin district. It also shows the predicted outcome by 2021 and the objective.
- **Table 32: Pressures preventing waters reaching good status and the sectors identified as contributing to the impact (reasons for not achieving good status):** shows the number of reasons for water bodies not achieving good status for each pressure and which sector is contributing to this. The table shows individual counts and there may be more than one reason in a single water body.
- **Table 33: Significant water management issues (SWMIs) preventing waters reaching good status and the sectors identified as contributing to the impact (reasons for not achieving good status):** shows the number of reasons for water bodies not achieving good status because of each significant water management issue and which sector is contributing to this. The table shows individual counts and there may be more than one reason in a single water body.
- **Table 34: Reasons for deterioration by one or more status class between 2009 and 2015 and the sectors identified as contributing to the impact:** shows the number of reasons for water body elements deteriorating by one of more status class, with 75% confidence, for that pressure and which sector is contributing to the deterioration. The table shows individual counts, if there is more than one element deteriorating in a water body, then there will be more than one reason assigned.

Further information in this document:

- You can access the detail behind Table 30 and Table 31 on the current status, predicted outcomes and objectives for water bodies and elements in section 2.
- The detail behind Table 33 on the significant water management issues can be found in section 1.4.
- You can find more information on Table 34 and the reasons for deterioration in section 4.3.

Table 30: Summary statistics for the Thames river basin district: Water bodies

	Rivers, Canals and SWTs*	Lakes	Estuaries	Coastal	Surface Waters Combined	Ground water	All Water Categories
% of water bodies at good or better ecological status/potential now	6%	15%	50%	0%	8%		
% of water bodies predicted to be at good ecological status/potential or better by 2021	8%	18%	50%	0%	10%		
% of water bodies with an objective of good ecological status/potential or better	56%	68%	60%	0%	58%		
% of water bodies at good chemical status now	99%	100%	100%	100%	99%		
% of water bodies predicted to be at good chemical status by 2021	99%	100%	100%	100%	99%		
% of water bodies with an objective of good chemical status	>99%	100%	100%	100%	>99%		
% of water bodies at good chemical (groundwater) status now						62%	
% of water bodies predicted to be at good chemical (groundwater) status by 2021						62%	
% of water bodies with an objective of good chemical (groundwater) status						96%	
% of water bodies at good quantitative status now						53%	
% of water bodies predicted to be at good quantitative status by 2021						60%	
% of water bodies with an objective of good quantitative status						66%	
% of water bodies at good or better overall status now	6%	15%	50%	0%	8%	40%	11%
% of water bodies predicted to be at good or better overall status by 2021	8%	18%	50%	0%	10%	45%	13%
% of water bodies with an objective of good or better overall status	56%	68%	60%	0%	58%	64%	59%

*SWTs are surface water transfers

Table 31: Summary statistics for the Thames river basin district: Elements

	Rivers, canals and SWTs*	Lakes	Estuaries	Coastal	Surface waters combined	Ground- water	All water categories
% of ecological elements at good or better status now (biological, physico-chemical and specific pollutants)	73%	60%	88%	67%	73%		
% of ecological elements predicted to be at good status or better by 2021 (biological, physico-chemical and specific pollutants)	74%	62%	88%	67%	73%		
% of ecological elements with an objective of good status or better (biological, physico-chemical and specific pollutants)	89%	80%	91%	67%	89%		
% of chemical elements at good status now	>99%	100%	100%	0%	>99%		
% of chemical elements predicted to be at good status by 2021	>99%	100%	100%	0%	>99%		
% of chemical elements with an objective of good status	>99%	100%	100%	0%	>99%		
% of chemical (groundwater) elements at good status now						89%	
% of chemical (groundwater) elements predicted to be at good status by 2021						89%	
% of chemical (groundwater) elements with an objective of good status						99%	
% of quantitative elements at good status now						81%	
% of quantitative elements predicted to be at good status by 2021						85%	
% of quantitative elements with an objective of good status						89%	
% of elements at good or better status now	79%	68%	95%	67%	79%	85%	80%
% of elements predicted to be at good or better status by 2021	80%	70%	95%	67%	80%	87%	80%
% of elements with an objective of good or better status	92%	84%	96%	67%	92%	95%	92%

*Surface water transfers

Table 32: Pressures preventing waters reaching good status and the sectors identified as contributing to the impact (reasons for not achieving good status) in the Thames river basin district

Pressure	Agriculture and rural land management	Industry	Mining and quarrying	Navigation	Urban and transport	Water Industry	Local & central government	Domestic general public	Recreation	Waste treatment and disposal	Other	No sector responsible	Sector under investigation	Total
Abstraction and flow	6	5	1	3	5	58	1	0	0	0	7	24	0	110
Chemicals	21	5	0	1	14	3	0	0	0	0	6	0	1	51
Biochemical oxygen demand	1	0	0	0	3	2	0	1	0	0	0	1	0	8
Dissolved oxygen	48	8	0	2	56	68	3	11	0	0	3	24	0	223
Ammonia	2	2	0	0	47	62	1	3	0	0	2	0	3	122
Fine sediment	59	2	2	1	28	6	2	0	1	0	3	4	2	110
Invasive non native species	0	0	0	0	0	0	0	0	0	0	0	18	0	18
Nitrate	2	0	0	0	0	2	0	0	0	0	0	0	3	7
Phosphate	166	6	0	0	151	352	0	32	0	1	26	10	13	757
Physical modification	54	3	1	23	196	41	95	2	54	0	46	3	9	527

Table 33: Significant water management issues preventing waters reaching good status and the sectors identified as contributing to the impact (reasons for not achieving good status) in the Thames river basin district

Significant water management issue	Agriculture and rural land management	Industry	Mining and quarrying	Navigation	Urban and transport	Water Industry	Local & central government	Domestic general public	Recreation	Waste treatment and disposal	Other	No sector responsible	Sector under investigation	Total
Physical modifications	79	4	0	24	237	43	116	3	56	0	55	0	14	631
Pollution from waste water	11	22	0	1	30	499	0	58	0	1	19	0	1	642
Pollution from towns, cities and transport	1	5	0	0	275	18	0	0	0	0	3	0	2	304
Changes to the natural flow and level of water	14	6	1	5	3	70	2	0	1	0	8	0	0	110
Invasive non-native species	0	0	0	0	0	0	0	0	0	0	0	21	0	21
Pollution from rural areas	297	0	0	0	0	0	0	0	0	0	6	0	0	303
Pollution from abandoned mines	0	0	2	0	0	0	0	0	0	0	0	0	0	2

Table 34: Reasons for deterioration from one or more status class between 2009 and 2015 and the sectors identified as contributing to the impact in the Thames river basin district

Pressure causing deterioration	Agriculture and rural land management	Industry	Mining and quarrying	Navigation	Urban and transport	Water Industry	Local & central government	Domestic general public	Recreation	Waste treatment and disposal	Other	No sector responsible	Sector under investigation	Total
Abstraction & Flow	1	0	0	0	0	1	0	0	0	0	0	0	0	2
Chemicals	0	0	0	0	0	1	0	0	0	0	0	1	0	2
Biochemical oxygen demand	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dissolved Oxygen	2	0	0	0	0	4	0	1	0	0	0	7	21	35
Ammonia	1	0	0	0	1	5	0	0	0	0	0	1	7	15
Fine sediment	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Invasive non native species	0	0	0	0	0	0	0	0	0	0	0	2	0	2
Nitrate	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phosphate	0	0	0	0	0	0	0	0	0	0	0	0	5	5
Physical Modification	2	0	0	0	0	0	1	0	1	0	1	0	0	5

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Water for life and livelihoods



River basin management plans

Part 2: River basin management planning overview and additional information

Updated: December 2015

We are the Environment Agency. We protect and improve the environment and make it **a better place** for people and wildlife.

We operate at the place where environmental change has its greatest impact on people's lives. We reduce the risks to people and properties from flooding; make sure there is enough water for people and wildlife; protect and improve air, land and water quality and apply the environmental standards within which industry can operate.

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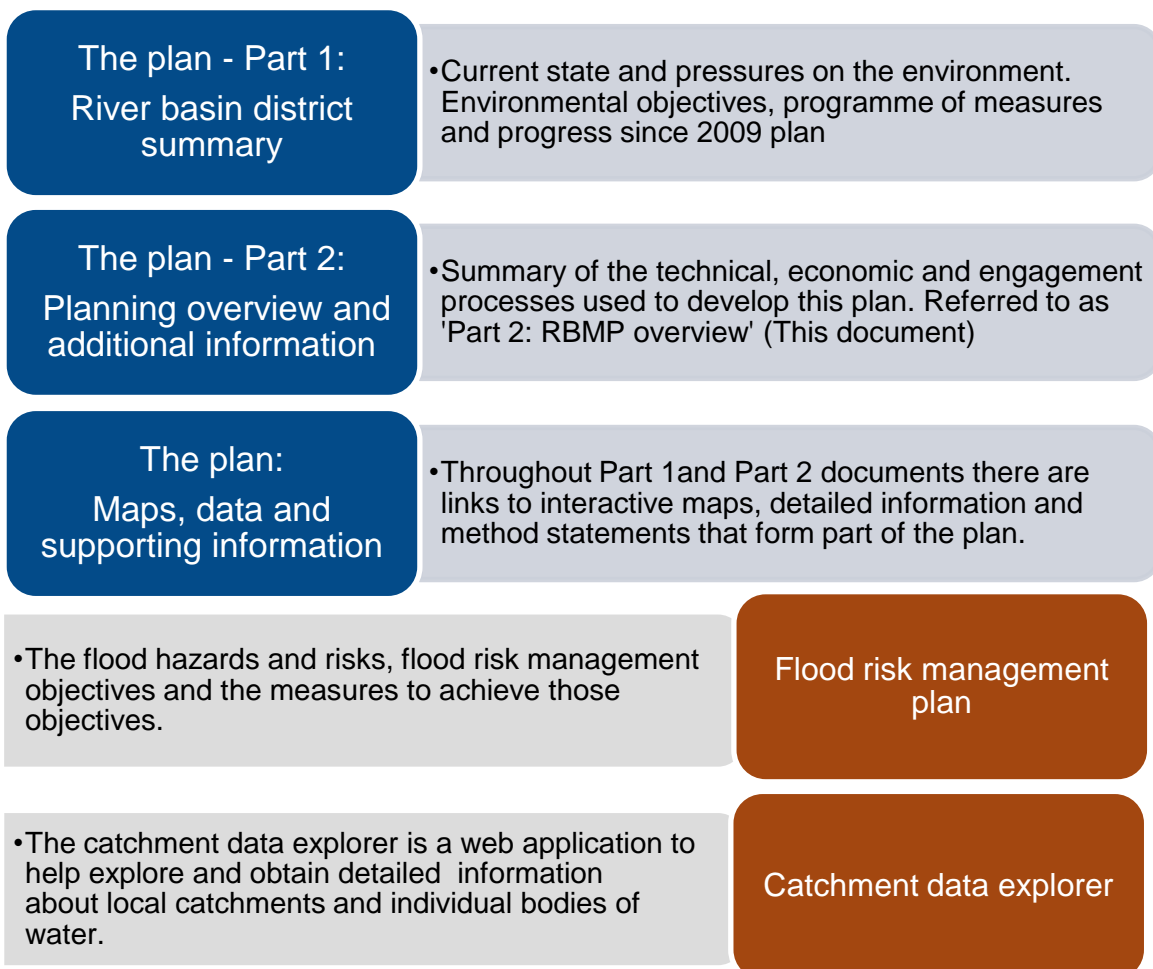
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Using the plans: accessing the most relevant information

The river basin management plans consist of a number of different documents, maps and datasets, of which this is just one. Below is a summary of the statutory components of the river basin management plans (in blue) along with associated documents and data sources (in brown) that are not part of the river basin management plans:



Throughout this document there are light green boxes containing links to the further information relevant to each section.

Further information

- You can access the river basin management plans and associated documents through the river basin management web pages here: <https://www.gov.uk/government/collections/river-basin-management-plans-2015>.
- A guide to accessing river basin management is available on the river basin management web pages here: <https://www.gov.uk/government/collections/river-basin-management-plans-2015>.

1. Introduction

The European Water Framework Directive, referred to in this document as the WFD, established a legal framework for managing the water environment across Europe. At its heart is an ecosystem approach requiring measures to be taken to encourage the sustainable use of water and to protect and improve inland surface waters, groundwater and coastal waters 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.

The WFD calls for a management plan to be developed for each river basin district. In England the Environment Agency is the competent authority for the WFD and it published the first river basin management plans in December 2009 (referred to within this document as the 2009 plans). The 2009 plans outlined the measures needed to bring more waters to good status by 2015 and what needed to be investigated to test whether all waters could justifiably achieve this aim by 2021 or 2027.

The plans, including the objectives and measures they contain, must be reviewed and updated every 6 years. The Environment Agency, working with others, started the process of updating the 2009 plans in 2012. A consultation on a draft update to the plans was published in October 2014. The consultation ran for 6 months and closed in April 2015. The updated plans were published and submitted to the Secretary of State for their consideration, and if content approval, at the end of October 2015.

The approved plans were published alongside a wide range of supporting information that was made available online at the same time. The plans will be reported to the European Commission by 22 March 2016.

The plans complement the work underway to develop a wider 25-year plan for the environment. This will harness the potential of data, local partnerships, environmental technology and environmental markets to deliver more improvements to our environment in tandem with economic growth

This document contains, or links to, information that the WFD requires to be part of each plan; see 'Using the plans' for more information. It also provides more detail about the process the Environment Agency and others have followed in reviewing and updating the plans. This will help the reader understand how the objectives and programmes of measures have been derived. This document also puts river basin management planning and the plans into the wider context of managing the water environment in England.

Section 2 'Managing the water environment' describes why water is such an important resource and summarises the policies, both European and domestic, which shape how the water environment in England is managed.

Section 3 'The Water Framework Directive' describes the aims and objectives of the WFD including the application of exemptions. The river basin management planning process used in England is summarised, including how the Environment Agency is working with others. This section also describes how the plans were developed following the consultation on the draft update to the plans.

Section 4 'Defining and describing the water environment' describes how the water environment is divided up and characterised for the purposes of implementing the WFD. It sets out how the environment is monitored and how results of that monitoring are used to assess and report on the status of the water environment. The later parts of the section describe the main challenges affecting the management of the water environment in England, how future risks have been assessed and the current causes of problems identified.

Section 5 'Identifying measures and updating objectives' sets out the overall process used for determining environmental objectives, including water body status objectives. It describes the role of economic appraisal and the objectives that are included within the plans.

Section 6 'Programme of measures' describes the background to the programme of measures. It also contains links to further information on programmes of measures and supporting documents.

Further information

The following data for every water body in England is available in Excel spreadsheet format:

- 2015 status assessments
- reasons for not achieving good status
- objectives
- reasons for alternative status objectives

The data is listed for each water body and each element for which a status and objective is available. You can access the data here: <https://ea.sharefile.com/d/s7e378d3187741f2b>

1.1. Components of the river basin management plan

The WFD stipulates that river basin management plans must contain certain information. These are set out in Annex VII of the directive. The table below lists these requirements and identifies where these can be found within this plan.

WFD Annex VII requirement	Location within plans
A1. a general description of the characteristics of the river basin district required under Article 5 and Annex II. This shall include: A1.1 for surface waters: - mapping of the location and boundaries of water bodies - mapping of the ecoregions and surface water body types within the river basin - identification of reference conditions for the surface water body types	 Linked data (GeoPDF on sharefile) from Part 1 section 2.1; Part 2 section 4.3 Linked data (GeoPDF on sharefile) from Part 1 section 2.5 Part 2 section 4.1.1 and linked documents
A1.2 for groundwaters: - mapping of the location and boundaries of water bodies	 Linked data (GeoPDF on sharefile) from Part 1 section 2.1; Part 2 section 4.3
A2. a summary of significant pressures and impact of human activity on the status of surface water and groundwater, including: - estimation of point source pollution - estimation of diffuse source pollution, including summary of land use - estimation of pressures on the quantitative status of water including abstractions	 Part 1 section 1.4 and 3.2; Part 2 section 4.4 Part 1 section 1.4 and 3.2; Part 2 section 4.4 Part 1 section 1.4 and 3.2; Part 2 section 4.4

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WFD Annex VII requirement	Location within plans
- analysis of other impacts of human activity on the status of water	Part 1 section 1.4 and 3.2; Part 2 section 4.4
A3. identification and mapping of protected areas as required by Article 6 and Annex IV	Part 1 linked data from section 2.4 and 3.6; Part 2 section 3.1.2 and linked document
A4. a map of the monitoring networks established for the purposes of Article 8 and Annex V and a presentation in map form of the results of the monitoring programmes carried out under those provisions for the status of:	
A4.1 surface water (ecological and chemical)	Linked data from Part 1 section 2.5
A4.2 groundwater (chemical and quantitative)	Linked data from Part 1 section 2.5
A4.3 protected areas	Linked data from Part 1 section 2.4
A5. a list of the environmental objectives as established under Article 4 for surface waters, groundwaters and protected areas, including in particular identification of instances where use has been made of Article 4.4, 4.5, 4.6 and 4.7 and the associated information required under that Article	Part 1 section 2 (summary and linked data); Part 2 section 5 and linked data set from section 1
A6. a summary of the economic analysis of water use as required by Article 5 and Annex III	Part 2 section 5.3 and linked document
A7. a summary of the programme or programmes of measures adopted under Article 11, including the ways in which the objectives established under Article 4 are thereby achieved	
A7.1 a summary of the measures required to implement Community legislation for the protection of water	Part 1 section 3
A7.2 a report on the practical steps and measures taken to apply the principle of recovery of the costs of water use in accordance with Article 9	Part 2 section 3.6
A7.3 a summary of the measures taken to meet the requirements of Article 7	Part 1 section 3
A7.4 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 under Article 11.3(e)	Part 1 section 3
A7.5 a summary of the controls adopted for point source discharges and other activities with an impact on the status of water in accordance with the provision of Article 11.3(g) and 11.3(i)	Part 1 section 3
A7.6 an identification of the cases where direct discharges to groundwater have been authorised in accordance with the provision of Article 11.3(j)	Part 1 section 3
A7.7 a summary of the measures taken in accordance with Article 16 on priority substances	Part 1 section 3
A7.8 a summary of the measures taken to prevent or reduce the impact of accidental pollution incidents	Part 1 section 3

WFD Annex VII requirement	Location within plans
A7.9 a summary of the measures taken under Article 11(5) for bodies of water which are unlikely to achieve the objectives set out under Article 4	Part 1 section 3
A7.10 details of the supplementary measures identified as necessary in order to meet the environmental objectives established	Part 1 section 3
A7.11 details of the measures taken to avoid increase in pollution of marine waters in accordance with Article 11.6	Part 1 section 3
A8. 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
A9. a summary of the public information and consultation measures taken, their results and the changes to the plan made as a consequence	Part 2 section 3.3 and linked document
A10. a list of competent authorities in accordance with Annex I	Part 2 section 3.8
A11. the contact points and procedures for obtaining the background documentation and information referred to in Article 14.1 and in particular details of the control measures adopted in accordance with Article 11.3(g) and 11.3(i) and of the actual monitoring data gathered in accordance with Article 8 and Annex V	Part 1 and Part 2 contain contact details on page 2; links to further information in 'Using the Plans' section in Part 1 and Part 2; measures in Part 1 section 3, Part 2 section 6 and links from those sections
B. the first update of the river basin management plan and all subsequent updates shall also include	
B1. a summary of any changes or updates since the publication of the previous version of the river basin management plan, including a summary of reviews to be carried out under Article 4(4), (5), (6) and (7)	Part 1 section 4
B2. 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	Part 1 section 4
B3. a summary of, and an explanation for, any measures foreseen in the earlier version of the river basin management plan which have not been undertaken	Part 1 section 4
B4. a summary of any additional interim measures adopted under Article 11(5) since the publication of the previous version of the river basin management plan	Part 1 section 4

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 highlights the policies (European and domestic) that shape how the water environment is managed in England.

Topics covered:

Importance of water management; management of the water environment in England; the Environment Agency's role.

2.1. Water – a vital resource

Water is essential for life and livelihoods. It allows the natural environment to flourish, and businesses, agriculture and the economy to grow and prosper.

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 a source of recreation that promotes wellbeing.

It is critical that this precious resource is managed properly to ensure that the needs of society, economy and wildlife can be met and maintained over the long-term.

2.2. Managing the water environment in England

Much of the policy relating to water management results from European Directives that have been introduced over the last 40 years, resulting in major improvements in the quality of the water environment and the protection of some of its most valued uses. Over recent years there has been a move to introduce a more strategic approach to water management policy. The WFD (see section 3) provides an overarching framework for river basin management. The Floods Directive (see section 2.2.2.) sets out a strategic approach to flood risk management planning. As competent authority for implementing these directives, the Environment Agency has an important role in coordinating their implementation in England (see section 2.3). The Marine Strategy Framework Directive (see section 2.2.3) establishes an integrated policy for achieving good environmental status in European seas.

The European Commission's Blueprint to safeguard Europe's water resources is overseeing a programme to develop measures to enable member states to improve the way they manage water. These measures include addressing over abstraction, managing leakage and improving the potential for natural water retention measures. It also aims to draw together measures under the Water, Floods and Marine Strategy Framework directives.

The Department for Environment, Food and Rural Affairs (Defra) is the main government department responsible for policy on water management in England. Defra developed several policy initiatives that are important in shaping the future of water management. The Water White Paper, 'Water for Life', sets out a vision for managing water as a valued and finite resource. Important commitments include reforming the water abstraction system and a new catchment-based approach to water quality and wider environmental issues.

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In parallel with the development of river basin management plans, the government is considering future policy mechanisms needed to protect and improve the water environment.

Some directives relate to the quality of water such as drinking water and bathing waters. Some set requirements to protect wildlife such as the Habitats Directive and Birds Directive. Others concern the control of pollution from particular chemicals such as nitrates and hazardous substances.

There is also EU legislation that sets standards for the performance of sewerage systems and wastewater treatment plants and emissions from industrial processes.

The Climate Change Act 2008 legally binds the UK to reduce emissions of carbon by at least 80% by 2050, compared to 1990 levels. It also sets the legal framework for adaptation policy in the UK. It requires a UK Climate Change Risk Assessment (CCRA) to be conducted and a National Adaptation Programme (NAP) to be developed to tackle the most pressing climate change risks to England. The first NAP was published in July 2013. It outlines the use of the WFD as an important element in helping the water environment adapt to climate change. In the current NAP the Environment Agency commits that “the second cycle of the river basin management plans will integrate climate change risk assessment and adaptation”.

The UK government’s 2012 CCRA identifies impacts on water as a high risk across each of its 5 central themes as shown in the table below.

Table 1: Impacts on water as a high risk identified in the UK Climate Change Risk Assessment 2012

Theme	Main risks
Agriculture and forestry	Drier soils, reducing crop and timber yields, extra demand for water for irrigation, loss of agricultural land for flood plain.
Business	Flooding, increased competition for water, disruption of transport networks and communication links and indirect risks from changes in agriculture and the natural environment.
Health and wellbeing	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 and urban heat island effect in urban areas.
Natural environment	Lower summer river flows may lead to poor water quality. Warmer rivers and lakes 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.

The Natural Environment White Paper, ‘The Natural Choice’, sets out the government’s ambitions to protect and improve the natural environment, to support sustainable growth and to re-connect people with nature. The England Biodiversity Strategy describes how the government will implement EU and international commitments on biodiversity. Both of these policies introduce important changes, placing more emphasis on the need for an ecosystem approach in managing catchments and the waters that flow through them.

Supporting information

- The European Commission's Blueprint to safeguard Europe's water resources can be found here: http://ec.europa.eu/environment/water/blueprint/index_en.htm
- The Climate Change Act 2008 can be found here: <http://www.legislation.gov.uk/ukpga/2008/27/contents>
- The UK Climate Change Risk Assessment can be found here: <https://www.gov.uk/government/publications/uk-climate-change-risk-assessment-government-report>
- The National Adaptation Programme can be found here: <https://www.gov.uk/government/publications/adapting-to-climate-change-national-adaptation-programme>
- The government's Water White Paper 'Water for life' can be found here: <https://www.gov.uk/government/publications/water-for-life>
- The government's Natural Environment White Paper 'The natural choice: securing the value of nature' can be found here: <https://www.gov.uk/government/publications/the-natural-choice-securing-the-value-of-nature>
- The England Biodiversity Strategy 'Biodiversity 2020: A strategy for England's wildlife and ecosystem services' can be found here: <https://www.gov.uk/government/publications/biodiversity-2020-a-strategy-for-england-s-wildlife-and-ecosystem-services>

2.2.1. Government guidance on river basin management planning

The government issued updated statutory guidance to the Environment Agency on the practical implementation of the WFD in July 2014. The guidance set out government's expectations in relation to the steps and principles of the river basin management planning process and the content of the documents the Environment Agency has to produce.

The guidance considers an increased emphasis on the catchment based approach (CaBA), impacts of climate change, the transition to new environmental standards and revised water-body classifications, details on objectives and exemptions (following the repeal of the Shellfish Waters Directive and the Freshwater Fish Directive), integrating requirements relating to protected areas, introduction of beneficiaries to pay for ecosystem services under certain circumstances, and a requirement for coordination between the implementation of the WFD and the Floods Directive.

There is also guidance on river basin planning within the government's Statement of Obligations for the 2014 Price Review (PR14). This Statement of Obligations outlines the main environmental statutory obligations that apply to water only and water and sewerage undertakers over 2015-2020.

Supporting information

- The Ministerial guidance to the Environment Agency on river basin planning can be found here: <https://www.gov.uk/government/publications/river-basin-planning-guidance>
- The Defra Statement of Obligations can be found here: <https://www.gov.uk/government/publications/statement-of-obligations>

2.2.2. Managing flooding in England

The Flood and Water Management Act 2010 sets out the roles and responsibilities for managing flood and coastal erosion risk in England. The Act gives the Environment Agency a strategic overview role for all forms of flooding and coastal erosion and specific responsibility for managing flooding from main rivers, the sea and large raised reservoirs. The act gives Lead Local Flood Authorities (County Councils and Unitary Authorities) responsibility for managing local flooding from surface water, groundwater and ordinary watercourses. Coastal Authorities have responsibility for coastal erosion. It also sets out the requirement for the Environment Agency to develop, maintain, apply and monitor a national strategy for flood and coastal erosion risk management. The national strategy was published in 2011 and provides the national policy framework for managing flood and coastal erosion risk in England.

i. Implementing the European Floods Directive

The European Floods Directive (EFD) aims to provide a consistent approach to managing flood risk across Europe. The EFD is implemented through the Flood Risk Regulations 2009 which require some Local Lead Flood Authorities (LLFAs) and the Environment Agency to publish flood risk management plans (FRMPs). These plans are important because they set out how Risk Management Authorities and communities will work together to manage and reduce the risk of flooding. FRMPs set out the main objectives and measures for the 6 year planning cycle to 2021.

The Environment Agency published FRMPs for flooding from main rivers, the sea and reservoirs for England. LLFAs must publish FRMPs covering local sources of flooding for those locations identified as Flood Risk Areas. The latter have largely been incorporated into FRMPs published by the Environment Agency.

The main milestones in the preparation of FRMPs have included:

- **December 2011** - LLFAs published Preliminary Flood Risk Assessments (PFRAs). These identified areas at significant risk of flooding from groundwater, surface water runoff and ordinary watercourses (Flood Risk Areas). The PFRAs were reported to the European Commission in March 2012. There are 8 Flood Risk Assessments (FRAs) wholly in England plus 1 cross-border FRA with each of Wales and Scotland, covering 65 LLFAs.
- **December 2013** - flood hazard and flood risk maps covering flooding from main rivers and the sea were published for each river basin district in England. Surface water flood risk maps were produced for FRAs only. The Environment Agency's updated Flood Map for Surface Water (uFMfSW), also published in 2013, contains the flood hazard information. Maps showing the extent of and hazard from flooding from reservoirs were published in December 2013 and April 2014 respectively. The flood hazard and flood risk maps were reported to the European Commission in March 2014.
- **October 2014** – a 3 month consultation on draft FRMPs was launched alongside the draft river basin management plans. A joint summary of the responses received was published in autumn 2015.

ii. The approach to developing flood risk management plans

Guidance on what FRMPs are, who is responsible for them and how to prepare them was developed by Defra, Welsh Government, Environment Agency and Natural Resources Wales. It was published in May 2014 and sets out the need to coordinate with the river basin management plans.

The Environment Agency consulted on the approach to developing FRMPs in August 2012. At the same time, the Environment Agency launched a consultation called 'challenges and

choices' to update the river basin management plans. Both consultations asked how to coordinate consultation on the river basin management plans and the FRMPs. As a result of the feedback the first FRMPs were developed separately from the river basin management plans but they were aligned to ensure objectives and measures were as consistent as possible. Subsequent work in 2015 has aligned the plans further by describing the main areas where outputs contribute to the other plans objectives and deliver integrated outcomes.

The consultation on FRMPs also considered the best ways of coordinating FRMPs for each river basin district with the plans for FRAs prepared by LLFAs. The results of the consultation were published in June 2013.

In June 2014, the Environment Agency published scoping reports for each FRMP. These set out where LLFAs would prepare FRMPs for local sources of flooding separately from the plans prepared by the Environment Agency. The scoping reports also set out the timescales for consultation.

Both the river basin management plans and FRMPs are subject to strategic environmental assessment (SEA), with reporting requirements at a common river basin district scale. Separate SEA reports have been produced for each plan. Common approaches to SEA have been used and the environmental effects of the plans are reported in a consistent way, for example, by:

- using a common ecosystem services method of environmental assessment to identify potential wider benefits or adverse effects of both plans
- using the same evidence base for the current environmental context for the river basin district
- reviewing other organisations' plans for how they relate to both plans
- identifying where the implementation of the FRMP may result in opportunities or risks to the improvement of water bodies and where further assessment of these at a project level would be required.

Supporting Information

- The Flood and Water Management Act is available here: <http://www.legislation.gov.uk/ukpga/2010/29/contents>
- The European Floods Directive is available here: http://ec.europa.eu/environment/water/flood_risk/
- The Flood Risk Regulations are available here: <http://www.legislation.gov.uk/uksi/2009/3042/contents/made>
- A map of Flood Risk Areas and the Preliminary Flood Risk Assessments published for England are available here: <https://www.gov.uk/government/publications/preliminary-flood-risk-assessments-and-flood-risk-areas>
- Flood Risk Maps published for river basin districts in England are available here: <https://www.gov.uk/government/collections/river-basin-districts-flood-risk-maps>
- Information and guidance on flood risk management plans is available here: <https://www.gov.uk/government/collections/flood-risk-management-plans-frmps>
- You can view a summary of the consultation responses on the draft FRMPs here: https://consult.environment-agency.gov.uk/portal/ho/flood/draft_frmp/consult
- Final FRMP documents are available here: www.gov.uk/government/collections/flood-risk-management-plans-frmps-2015-to-2021

2.2.3. Estuarine and coastal waters and the Marine Strategy Framework Directive (2008)

The Marine Strategy Framework Directive (MSFD) establishes an integrated policy for the protection of the marine environment in a similar manner to the WFD and requires the achievement of 'good environmental status' in marine waters. The scope of the MSFD is broader than that of the WFD, covering a greater range of environmental components and indicators. There are some significant areas of overlap with the WFD, particularly in relation to chemical quality, eutrophication and aspects of ecological and hydromorphological quality. Where both directives apply in coastal waters, the MSFD covers those aspects not covered by the WFD, including noise, litter and aspects of biodiversity.

Most of the human activities which cause significant pressures relating to contaminants and eutrophication are either terrestrial in nature or are taking place in the coastal zone. It is therefore considered likely that measures taken under the WFD and related directives will be sufficient to achieve and maintain good environmental status under the MSFD across the UK's wider marine area.

For hydrographical conditions, it is considered that the application of the WFD in the coastal area, plus the wider application of the Environmental Impact Assessment Directive through the marine licensing process will be sufficient to achieve good environmental status under the MSFD.

In recognition of the role that the WFD measures will play in achieving MSFD objectives, the reporting on programmes of measures to the European Commission under both directives is closely linked.

The MSFD is implemented by the Marine Strategy Regulations 2010. The Secretary of State is the competent authority. The Environment Agency is working with Defra and others to ensure complementary implementation of both directives. The UK targets and indicators in MSFD for good environmental status have been aligned, as far as possible, with existing WFD assessment tools.

The UK's overall approach to implementing the MSFD is set out in the UK Marine Strategy Part 1. The UK's marine monitoring programme to monitor progress towards good environmental status was completed in July 2014 with the publication of the UK's Marine Strategy Part 2. The third stage is the implementation of management measures to maintain or achieve good environmental status by 2020. A public consultation on the programme of measures was run from January to April 2015. The aim is to publish the final programme by December 2015 and implement it by December 2016.

The Marine and Coastal Access Act 2009 established the Marine Management Organisation (MMO) to produce marine plans, administer marine licensing and manage marine fisheries. It introduced marine planning in the UK through production of a marine policy statement and more detailed marine plans setting spatial policy at a more local level. It is anticipated that there will be 11 marine plans covering English waters by 2021.

Marine plans will inform and guide marine users and regulators across England, managing the sustainable development of marine industries such as wind farms and fishing, alongside the need to conserve and protect marine species and habitats. At its landward extent, a marine plan will apply up to mean high water springs, including estuaries and the tidal extent of rivers. All public bodies making authorisation or enforcement decisions capable of affecting the marine area must do so in accordance with the marine policy statement or marine plans (where they are in place) or state reasons for not doing so.

The East Inshore and East Offshore areas were the first marine plans to be produced in England and were adopted by government in April 2014. Planning is currently underway in the South marine plan areas.

The Act also enabled the introduction of national marine protection areas called ‘marine conservation zones’. These will help to protect nationally important biodiversity, supporting the achievement of MSFD and also WFD objectives in protecting important parts of estuaries and coastline. Some nursery grounds for juvenile fish have already been designated.

Supporting information

- A definition of marine waters can be found here: <http://www.legislation.gov.uk/ukxi/2010/1627/regulation/3/made>
- Further information on the Marine Strategy Framework Directive including consultation processes, timescales and links with the Water Framework Directive can be found here: <https://www.gov.uk/government/policies/protecting-and-sustainably-using-the-marine-environment/supporting-pages/implementing-the-marine-strategy-framework-directive>
- You can find more information on Marine Planning here: <http://www.marinemanagement.org.uk/marineplanning/>
- You can find more information on Marine Licensing here: <https://www.gov.uk/topic/planning-development/marine-licences>
- Further information on Marine Conservation Zones can be found here: <https://www.gov.uk/government/publications/2010-to-2015-government-policy-marine-environment/2010-to-2015-government-policy-marine-environment#appendix-4-marine-protected-areas>

2.2.4. Abstraction and flow

Sustainable abstraction is important to support growth in businesses, the wider economy and population. It is the Environment Agency’s role to make sure that abstraction is sustainable and does not damage the environment; how much, where and when water is abstracted is managed through the abstraction licensing system. This system was introduced by the Water Resources Act 1963 and has been refined and changed as a result of the Water Resources Act 1991 and the Water Acts 2003 and 2014. Abstraction licensing is one of several mechanisms in place that support WFD objectives. Some abstractors will need to take action to contribute to improving and protecting the environment.

The Environment Agency recognises the challenges faced in addressing environmentally unsustainable abstraction licences and the importance of not licensing new abstractions that damage the environment under existing powers and duties. Action is being taken on abstraction and flow pressures to support a healthy ecology, protect special sites including Natura 2000 and Sites of Special Scientific Interest (SSSIs), maintain a healthy groundwater balance and ensure the passage of fish and eels through river systems. Progress has been made in addressing unsustainable abstraction licences through the Restoring Sustainable Abstraction (RSA) programme (as of 31 March 2015, the Environment Agency has made changes to over 200 abstraction licences). There remains however, a significant environmental challenge that must be addressed to achieve sustainable water resources within all catchments.

During the period of the second cycle river basin management plans the Environment Agency will:

- Ensure abstraction licensing strategies and actions fully incorporate all environmental objectives and align with river basin management plans helping stakeholders understand the risks to the environment from current and future abstraction.
- Assess all licence applications and only issue licences that adequately protect and improve the environment.

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- Only grant replacement licences where the abstraction is environmentally sustainable and abstractors can demonstrate they have a continued need for the water and that they will use it efficiently. The Environment Agency is aware that around 2300 time limited licences are due to end, either wholly or partially, during the period covered by the plans. This means that many abstractors will be seeking replacement licences.
- Take risk based action to revoke licences that have not been used for over four years to reduce future risk and the scale of action that might be needed on other abstractions licences.
- For existing licences, prioritise actions to protect and improve Natura 2000 sites and address the most seriously damaging abstractions during this plan period. Where serious damage occurs, or may occur, and investigations show the need to take action, abstraction licences will be constrained. All abstractors in surface water and groundwater bodies where serious damage is occurring or could occur without action should expect that their licences will be constrained over the next 6 years.
- Take action to address any outstanding issues from about 200 licences remaining in the RSA programme by March 2020. Those abstractors whose licence is associated with Natura 2000 sites will need to have either offered a voluntary change to their licence or notice will be served to compulsorily change their licences by 22 December 2015.

Required water company infrastructure investment changes will be funded through customer bills (price reviews) and licences will be changed, setting out clear actions required by specified dates. Where infrastructure changes take time, water companies will be expected to better manage systems to minimise pressure on the most sensitive areas. Improved demand management and water efficiency is expected from all abstractors.

Government is preparing to implement the Water Act 2014 which makes a number of reforms to help society face future challenges arising from a growing population and changing climate. The Act includes reforms to increase resilience to help ensure water is always available to supply to customers without damaging the environment and a new Ofwat duty to promote long-term resilience in the water supply and sewerage sector.

Defra currently anticipate bringing currently exempt abstractions under regulatory control (New Authorisations). It is estimated there could be as many as 5000 applications. The extent of environmental issues that will be addressed has been subject to government consultation.

The Environment Agency is also supporting government in developing its proposals for Abstraction Reform to meet the challenges of an increasingly varied climate, increasing demand for water and a growing population supporting economic growth and increased resilience of water supply.

2.2.5. Agriculture

A healthy water environment and healthy soils are fundamental to the rural economy and the sustainable production of food. In order to achieve this, actions to address pollution will need to be taken up in sufficient numbers at a catchment scale. Government has made available a mix of advice, regulation and incentives, as shown in Figure 1. When underpinned by local knowledge and leadership these measures can deliver the environmental protection and improvements society needs.

i. Adoption of good practice

A range of good practice actions will provide baseline levels of protection for the water environment and are applicable to all farmers and land managers.

More farmers and rural land managers will take significant steps towards adopting good practice through routine business decisions, participation in farm assurance schemes, and

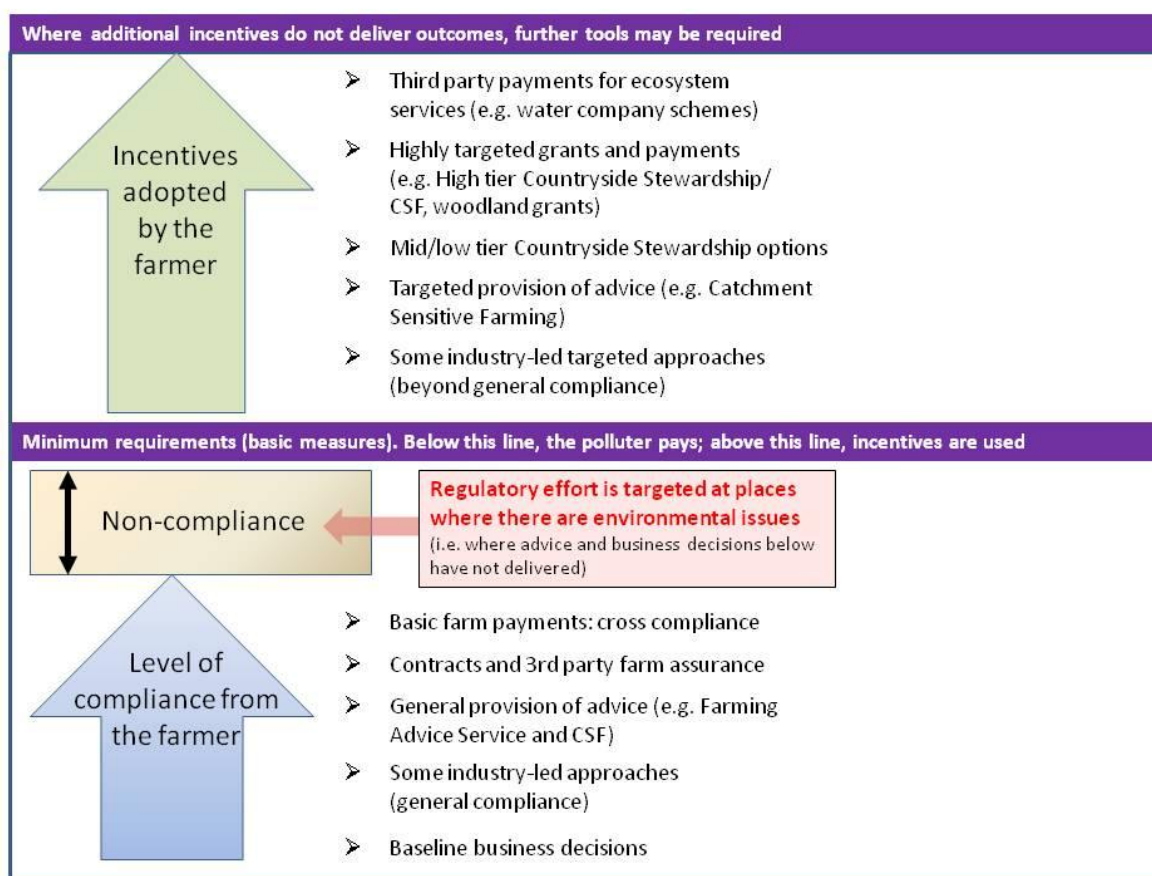
through industry initiatives designed to provide advice on efficient use of water, nutrients and pesticides.

Common Agricultural Policy includes fiscal incentives to meet basic environmental protection conditions, for example, managing land to prevent soil erosion and providing small buffer strips. Government supports an advice service to help recipients of these payments to comply with these rules.

Where agricultural businesses fall short of the standards required engagement and enforcement of regulation is needed to ensure the minimum of good practice. Compliance with regulation will be improved as a result of:

- improved data sharing between Defra delivery bodies
- better targeting of farm inspections
- enforcement that is risk-based and recognises good performance

Figure 1: Farming and the water environment – the delivery landscape



The main requirements of domestic legislation to address agricultural pressures on the water environment are set out in section 3.2 of Part 1 the river basin management plans. These include:

- Safe and adequate storage for slurry, silage, manure and chemicals
- Compliance with the nitrates action programme where a farm is in a designated Nitrate Vulnerable Zone
- Operating within the terms of licences and permits (for example, complying with conditions in abstraction licences, and permits relating to the application of pesticides and operation of sheep dips)

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ii. Additional actions

Additional actions will help achieve protected area objectives and improve water bodies not achieving good status.

This includes actions that go beyond the minimum level of good practice and incentives from government, for example, Countryside Stewardship and the private sector encouraging land managers to adopt best practices or to provide ecosystem services.

These incentives will encourage beneficial practices through voluntary action, such as sensitive management of fields or targeted land use change. Incentives are prioritised where the greatest environmental benefits can be achieved. Examples include creating sediment traps and wetlands, and utilising some land for the many benefits of woodland creation. Countryside Stewardship measures will bring benefits to water quality, improve biodiversity and ensure landscape is more resilient to flooding.

A Catchment Based Approach that encourages catchment scale engagement with farmers, such as Catchment Sensitive Farming, can and has made significant reductions in some pollutants where farmers engage and are effectively encouraged by workshops, capital grants and one-to-one advice. These schemes also assist with improved targeting of supplementary measures and facilitate better practice in soil and nutrient management.

Farming industry led initiatives such as the Campaign for the Farmed Environment have engaged in voluntary action by motivating farmers to implement measures to protect water. Their work to promote voluntary retention of expiring environmental stewardship options can help reduce the risk of any deterioration and raise awareness of other schemes that will improve water quality.

Action through initiatives from the water industry, rivers and wildlife trusts and farming industry led campaigns supplement government led initiatives. In some cases additional funding is available but in all cases local initiatives are used to engage with land owners, explore water quality issues and target the best measures to the right place.

iii. Additional regulation

Government keeps regulatory measures under review. Defra has been working with interested parties to identify some basic actions farmers could take which reduce diffuse pollution from agriculture.

Supporting information

- Further information on Cross Compliance can be found here:
<https://www.gov.uk/government/publications/cross-compliance-guidance-for-2015>
- Further information on Countryside Stewardship can be found here:
<https://www.gov.uk/guidance/countryside-stewardship-manual>
- Further information on Catchment Sensitive Farming can be found here:
<https://www.gov.uk/catchment-sensitive-farming-reduce-agricultural-water-pollution>
- Further information on Farm Advice Service can be found here:
<https://www.gov.uk/government/groups/farming-advice-service>
- Further information on Campaign for the Farmed Environment can be found here:
<http://www.cfeonline.org.uk/home>

2.2.6. Chemicals

Chemicals are used extensively in modern lifestyles, whether it is to increase agricultural productivity or in businesses or everyday products used in the home, such as flame retardants applied to household items to prevent fires. Many of these useful chemicals pose

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little risk to humans or the environment but a few can be very harmful. The WFD takes a 'precautionary approach' to reducing risks presented by chemicals, in which the primary goal is to prevent harm. The approach to "source control", limiting the availability of chemicals to minimise risks to humans and the environment, is mainly determined at European Union (EU) level. For chemicals used in everyday products and industrial processes, the main way this is done is through 'REACH', an EU Regulation concerning the Registration, Evaluation, Authorisation and restriction of Chemicals. REACH aims to ensure that companies demonstrate how to safely use the chemicals they supply, and that the use of chemicals of the greatest concern is tightly controlled (and phased out if appropriate). Many chemicals are already subject to legally-binding control measures set at EU level, and the list is expected to grow as more data become available for chemicals that have been poorly studied up until now.

Monitoring chemicals under WFD is one of the main ways of assuring the effectiveness of EU chemicals source control legislation for reducing environmental risks. There will however, always be a time delay between controls being imposed and changes being observed in the environment. This can take decades for some chemicals that persist in the environment, such as mercury and organic chemicals such as polychlorinated biphenyls.

Harmful chemicals presenting a significant risk to or via the water environment may be identified as priority substances under the WFD. Compliance with environmental quality standards (EQS) for priority substances is used to determine chemical status of water bodies on a pass or fail basis. Risk and status assessments, together with trend information, enable the success of EU measures to be reviewed and to drive national measures. The EC list of priority substances is reviewed every 6 years to ensure that relevant pollutants and their EQSs are up to date.

Member States are also required to identify other significant national pollutants (specific pollutants) and include these in assessment of good ecological status.

The Environment Agency uses EQSs to characterise, monitor and classify water bodies and establish measures to progress water bodies to good status.

Improvements in the contaminant load of chemicals in water bodies and their potential environmental effects will be achieved by a combination of:

- EU or national reduction strategies and source control (e.g. REACH)
- Tackling pollution from prioritised sources such as abandoned metal mines and highway drainage
- Application of best available technologies under the Industrial Emissions Directive
- Applying numeric permits on local point sources

Supporting information

- You can find more information on the EU REACH regulation here: <http://www.hse.gov.uk/reach/>
- You can find the amended Environmental Quality Standards Directive here: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32013L0039>

2.2.7. Managing pollution from abandoned mines

Mining has taken place across the country for hundreds of years and has left a legacy of pollution from abandoned waste and mine water drainage tunnels which impact over 1,700km of rivers. Almost all mines closed before 2000 and legislation provides that no one can be required to clean up land or water contaminated by mines in such cases.

Abandoned metal mines damage aquatic life and cause many water bodies to fail to achieve good chemical and ecological status, particularly in the Northumbria, Humber, North West and South West River Basin Districts. The main pollutants are cadmium, lead, zinc, copper and iron. Defra is working in partnership with the Coal Authority and Environment Agency to develop a programme of measures to address this source of pollution; this 'Water and Abandoned Metal Mines Programme' is described in more detail in Part 1 of the relevant RBMPs. In 2015 to 2016, £4.5 million was allocated to this programme; further funding to 2021 is subject to the government spending review.

In the Humber, Northumbria and North West River Basin Districts, abandoned coal mines cause significant, but localised, pollution of rivers which can severely affect fish and river insects. In some areas, aquifers that lie above abandoned coal mines and supply drinking water are threatened by pollution. In 2015 to 2016, the Department of Energy and Climate Change (DECC) has allocated £10.5 million to the programme. Further funding to 2021 is subject to the government spending review. This funding would be used to implement 4 schemes that will reduce the impact of iron in 11km of river, prevent new pollution of rivers and protect groundwater used for drinking water supplies.

The Environment Agency and Coal Authority have prioritised discharges from abandoned coal mines causing significant pollution for clean-up, and identified where schemes are needed to prevent new pollution of rivers or groundwater. The Coal Authority carries out studies to identify feasible measures at priority sites, and where funding allows and the environmental and economic benefits outweigh the costs, builds minewater treatment schemes.

- In the Humber RBD, 14 existing discharges remain on the priority list. 4 measures are being developed to prevent deterioration and clean up existing pollution and could be built by 2020 if funding is available.
- In the Northumbria RBD, 3 existing discharges remain on the priority list. 1 new measure is being implemented to protect a drinking water supply aquifer in 2015.
- In the North West RBD, 7 existing discharges remain on the priority list. No new measures are planned by 2020.

Most treatment schemes harness natural processes to remove iron from the minewater, particularly settlement ponds and engineered wetlands. These wetlands provide a rich habitat for birds, significantly enhance biodiversity, are visually attractive and can also be used as a public amenity. Co-treatment of minewater with sewage or other effluents is considered where appropriate. The Coal Authority carries out research to improve the efficiency of its programme, and investigates opportunities for minimising costs and raising revenue from each scheme. In identifying treatment options, climate change mitigation is considered.

2.2.8. Taking account of climate change

River basin management planning is a long-term process and climate change needs to be incorporated throughout. This is a view widely supported in responses to the 'Challenges and choices' consultation. European Common Implementation Strategy guidance on 'river basin management in a changing climate' guides member states to integrate climate change adaptation into each of the steps of river basin management planning, in particular in the assessment of pressures and selection of measures. Information on how this has been done can be found in the following sections:

- section 3.7.1 Assessments of the river basin management plans
- section 4.4.1 Significant water management issues
- section 6 Programme of measures

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The evidence base available to assist climate change related decision making relevant to river basin planning is continually growing. Sources include:

- UK Climate Change Risk Assessment (UK CCRA): This is the first comprehensive assessment of the main risks and impacts of climate change on different sectors.
- Living with Environmental Change (LWEC) water and biodiversity report cards. These are summaries of impacts and issues for the water and terrestrial environment based on a number of scientific papers from leading experts inspired by the existing marine climate change report cards.
- Research such as the Future Flows and Groundwater Levels projects. This 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. There are different patterns of change but annual low flows (Q95) are expected to decrease under all scenarios and in almost all locations by 2050. Outputs from the Future Flows project can be used to inform catchment scale planning.
- A growing body of academic research examining the impact of climate change on the UK environment

Initial light touch assessments for each management catchment in England have been undertaken by the Environment Agency. These use local expert judgement to consider which aspects of climate change are likely to pose a long-term risk for the catchment. The Environment Agency will review the provision of these assessments and other information during cycle 2.

Supporting information

- For further information on UK CCRA see here: <https://www.gov.uk/government/publications/uk-climate-change-risk-assessment-government-report>
- You can find the LWEC water and biodiversity report cards here: <http://www.lwec.org.uk/resources/report-cards> and the marine report cards here: <http://www.mccip.org.uk/annual-report-card.aspx>
- Further information and flow projections from the Future Flows and Groundwater Levels project can be found here: http://192.171.153.213/sci_programmes/Water/FutureFlowsandGroundWaterLevels.html
- To find out more about the light touch catchment climate change assessments, contact the National Customer Contact Centre by email at: enquiries@environment-agency.gov.uk

2.2.9. Water industry and the National Environment Programme

The National Environment Programme (NEP) is a multi million pound water company investment programme developed by the Environment Agency through consultation with the water industry and a number of other stakeholders. The NEP lists the environmental improvement measures that ensure that water companies contribute to meeting the obligations of EU Directives including WFD and national legislation related to the water environment. The NEP forms part of the final Asset Management Plan (AMP) that determines the overall level of investment that water companies need to make over a five year period, which is set by Ofwat and funded through customer bills. The NEP is an important element of the river basin management plans and helps deliver the requirements of the WFD.

The NEP is made up of a programme of monitoring and improvement measures that will bring about water quality, water resources, and biodiversity outcomes. For water quality, the

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NEP includes both continuous discharges, for example, from sewage treatment works, and intermittent discharges such as combined sewer overflows. NEP water quality measures could include action to protect the waters where shellfish are commercially harvested, improving the quality of bathing waters, reducing the risk of eutrophication (excessive plant growth and decay), improving the quality of water that is discharged from sewage treatment works as well as improving inland waters for fish. The NEP includes specific schemes to achieve good status through improvements to the quality of the water environment. The water companies are also funded to implement schemes to ensure that their activities do not result in a deterioration of water body status.

The NEP also includes measures to reduce the impact of water abstraction on the environment. The aim is to achieve a balance between the water companies' requirements to maintain public water supply and adequate protection of the environment. Part of this is to ensure water company abstraction is sustainable and does not impact on the aims of the WFD.

Over-abstraction of water can create low river flows that in turn can cause deterioration in river quality and a reduction in wildlife. Continuing to change the way water is abstracted; the treatment of sewage and the upgrading of sewers will significantly improve the quality of rivers and coastal waters, and help to achieve improvements in water bodies and overall improvement in status.

The NEP also includes actions to ensure water companies meet their obligations under the Eel Regulations by installing screens on river abstractions and fish passage routes.

The Environment Agency monitors and reports on water company performance against the NEP to ensure that the outcomes are achieved and to inform the next programme of measures.

2.2.10. 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 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 river basin districts. These plans are currently being reviewed.

These plans aim to achieve an increase in escapement of adult 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. The UK must continue to implement the actions described in the eel management plans. A report on progress is sent to the European Commission every 3 years. The latest report was produced in June 2015.

Supporting information

- You can see the European Council Regulation, EC 1100/2007 here: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:248:0017:0023:EN:PDF>
- You can find the 15 UK eel management plans and the 2012 progress report here: www.gov.uk/government/policies/managing-freshwater-fisheries/supporting-pages/increasing-eel-stocks

2.2.11. Biodiversity conservation

Implementing the WFD contributes to outcomes for nature conservation and biodiversity by improving the water environment. The WFD also includes specific requirements to meet the objectives of water dependent aspects of Natura 2000 sites. These requirements are detailed in section 3.1.2.

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The river basin management plans provide an opportunity to integrate other requirements for improvements in biodiversity such as national legislation and policy to meet the objectives for water dependent Sites of Special Scientific Interest (SSSIs) and priority habitats and species identified in 'Biodiversity 2020: a strategy for England's wildlife and ecosystem services'.

i. Biodiversity 2020

The river basin management plans will contribute to achieving habitat quality, habitat creation and restoration outcomes of Biodiversity 2020 for priority water dependent species and habitats. UK priority species and habitats are those listed under Section 41 of the Natural Environment and Rural Communities Act (2006) as being of principal importance for conserving biodiversity. Priority habitats cover a wide range of semi-natural habitat types, and can exist within or outside Natura 2000 protected areas or SSSIs.

New priority river and lake habitat maps have identified streams, rivers and lakes that are still the most natural in character, containing a dynamic mosaic of habitats and associated species. These maps can be used to help avoid deterioration and to target restoration measures to help conserve and enhance these habitats within a wider programme of action to improve ecological status.

The Biodiversity 2020 strategy recommends that habitat creation and funding needs to be refocused by putting larger and more cost effective schemes in the most appropriate places. For example, wetlands should provide multiple benefits such as flood storage, mitigating diffuse pollution, restoring more natural hydrological regimes, storing carbon, and protecting groundwaters. This is in addition to the government's Biodiversity 2020 outcomes which target floodplain restoration activities on sites identified as having greatest potential for development as priority wetland habitat.

Supporting information

- More information on Biodiversity 2020 can be found here: <https://www.gov.uk/government/publications/biodiversity-2020-a-strategy-for-england-s-wildlife-and-ecosystem-services>
- Supporting information for priority habitats can be found here for rivers: <http://publications.naturalengland.org.uk/publication/5104941191397376?category=432368> and here for lakes: <http://publications.naturalengland.org.uk/publication/5630174502584320?category=430388>
- Detailed maps can be found here: <http://publications.naturalengland.org.uk/publication/6722357675687936?category=432368>
These include the maps of priority river and lake habitat; restoration priorities beyond mapped priority habitat; and lakes requiring further evaluation.
- You can find information on UK Biodiversity Action Plans here: <http://jncc.defra.gov.uk/page-5718>
- Opportunities for wetland creation can be viewed at: www.wetlandvision.org.uk

ii. Ramsar sites

Ramsar sites are wetland sites of international importance. The Environment Agency applies the same considerations to environmental water objectives for Ramsar sites as to WFD protected areas (designated under Article 6 and annex IV of the WFD). Most Ramsar sites in England are also Natura 2000 protected areas and it is likely that, for the majority of these sites, only a few additional measures will be required to meet Ramsar site objectives, in addition to the measures required for the Natura 2000 designation. This is because meeting the conservation requirements for water dependent Natura 2000 protected area interest

features will also meet the conservation requirements for any overlapping water dependent Ramsar features.

For sites that are Ramsar only, criteria are generally broader than for Natura 2000 protected areas. Natural England's designated site database should be used as the principal reference for determining the required measures under the WFD, for any Ramsar sites that are not also Natura 2000 protected areas.

Supporting information

- More detailed information on the measures being used to maintain or restore Ramsar features can be obtained from your local Natural England area team:
http://www.naturalengland.org.uk/about_us/contact_us/

iii. Other non-Natura 2000 and non-Ramsar Sites of Special Scientific Interest (SSSIs)

SSSIs that are not designated as Natura 2000 or Ramsar sites are not treated as WFD 'protected areas'. SSSIs are designated under UK national legislation. Many water dependent SSSIs (except some wetlands and smaller waters) are also WFD 'water bodies'. The attainment of good ecological status for these water bodies, whilst not necessarily equivalent to a SSSI achieving its conservation objectives (as targets for SSSIs may in some case be more stringent), is likely to be an important step towards meeting objectives on those sites and will therefore contribute to delivery of 'Biodiversity 2020'.

The Environment Agency and Natural England work together to ensure the setting of WFD ecological status objectives on these water bodies also complements the requirements for meeting SSSIs objectives and does not present any risk to their achievement.

Supporting information

- For more information on SSSI see:
<http://www.sssi.naturalengland.org.uk/Special/sssi/search.cfm>

2.2.12. Invasive non-native species

An invasive non-native, or "alien", species (INNS) is defined as a species introduced outside its normal past or present distribution. INNS are those which threaten ecosystems, habitats or species with environmental or socio-economic harm. The presence of most invasive species is the result of human activity. The presence of high impact INNS prevent a water body achieving high ecological status and the impacts of many INNS prevent water bodies achieving good ecological status.

Water body risk assessments found over 70% of water bodies across all surface categories in England are at risk of deterioration as a consequence of INNS. Reducing the risk of the introduction and spread of INNS can make space for other WFD measures, which in turn will increase the resilience of water bodies to new invasions of INNS and lessen their impacts.

River basin management planning supports the delivery of the aims of the Invasive Non-native Species Framework Strategy for Great Britain which underpins action on invasive species. The key aims of the strategy are: prevention; early detection; surveillance; monitoring and rapid response; mitigation, control and eradication. Control or eradication of an invasive species once it is established is often extremely difficult and costly, while prevention and early intervention have been shown to be more successful and cost-effective.

During cycle 2 of the WFD, the EU invasive Alien Species Regulation will come into force and, depending on the species listed, could help deliver aspects of the Invasive Non-native Species Framework Strategy for Great Britain.

Supporting information

- For more information on invasive species and a link to the Invasive Non-native Species Framework Strategy for Great Britain see: www.nonnativespecies.org
- Species considered high impact for the WFD are listed here: <http://www.wfduk.org/resources/classification-alien-species-according-their-level-impact-revised-list>
- More information and progress updates on the EU invasive species regulation can be found here: http://ec.europa.eu/environment/nature/invasivealien/index_en.htm

2.3. The Environment Agency's role in managing the water environment

The Environment Agency was established under the Environment Act 1995. It is the lead organisation for water management and environmental regulation in England and its principal aim is to protect or improve the environment, and to contribute towards achieving sustainable development.

The Environment Agency's responsibilities include:

- managing flood risk to protect people and property
- overseeing the strategic planning of water resources so that supplies of water are secure and environmental impacts are minimised
- maintaining, improving and developing salmon and freshwater fisheries
- maximising the social, economic, environmental and heritage benefits of the waterways for which the Environment Agency 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

The Environment Agency works within a framework of government policy and legislation (see section 2.1) that defines its powers and duties and environmental aims, objectives and standards. Much of this is based on EU legal requirements.

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

- monitoring the environment to understand the state it is in and the reasons for this
- planning the measures needed to achieve agreed objectives
- taking action and working with others to achieve these objectives
- checking compliance with standards and permit conditions, and carrying out enforcement activities, if necessary, to make sure that legal requirements are met

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Some of these water management responsibilities are summarised in the diagram below.

Figure 2: Environment Agency regulatory activities



3. The Water Framework Directive

Summary of this section

This section provides an introduction to WFD and gives an overview of the approach to river basin management planning in England. The important role of stakeholders and work in catchments is discussed. The impact assessment and strategic environmental assessment that support the updated plans are discussed.

Topics covered:

WFD and its objectives, river basin management planning, working with others, catchment based approach, river basin management planning timetable, assessments to support the updated river basin management plans

3.1. The Water Framework Directive

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

The WFD is implemented through river basin management and planning that involves setting environmental objectives for groundwater and surface waters (including estuaries and coastal waters) and devising and implementing programmes of measures to meet those objectives.

The WFD also requires that other environmental priorities, economic considerations and social issues are considered and taken into account when setting water management objectives.

WFD aims (Article 1)

- 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 and phasing out of priority hazardous substances
- prevent the deterioration in the status and to progressively reduce pollution of groundwater
- contribute to mitigating the effects of floods and droughts

WFD environmental objectives (Article 4)

- prevention of deterioration in status of surface waters and groundwater
- achievement of objectives and standards for protected areas
- aims to achieve good status for all water bodies by 2015. Where this is not possible and subject to the criteria set out in the Directive, aim to achieve good status by 2021 or 2027 or set a less stringent objective
- aims to achieve good ecological potential and good surface water chemical status for heavily modified water bodies and artificial water bodies

WFD environmental objectives (Article 4) continued

- 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

WFD additional objectives (Article 7)

- to prevent deterioration in the water quality in the protected area in order to reduce the level of purification treatment required
- the water treatment regime will meet the requirements of Directive 80/778/EEC as amended by Directive 98/83/EC

3.1.1. Preventing deterioration

Under the WFD member states must prevent deterioration of the status of water bodies, except in specified circumstances. Deterioration is formally assessed and reported over the 6 years of a river basin management planning cycle. Sections 4 and 5 of Part 1 of the river basin management plans summarise the cases where deterioration of status has occurred between 2009 and 2015. Measures to prevent deterioration and restore the status of water bodies that have deteriorated are summarised in section 3 of Part 1.

For the updated 2015 plans, the environmental baseline from which the preventing deterioration objective applies is the 2015 classification status for each water body. The 2015 classification status replaces the baseline reported in the plans published in December 2009.

In line with government guidance (see section 2.2.1), the main aspects of the Environment Agency's approach to implementing the preventing deterioration requirements of the WFD are:

- 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, (except for Drinking Water Directive parameters in drinking water protected areas, and provided that the objectives and requirements of other domestic or European Community 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, poor groundwater quantitative status or protected area not achieving relevant standards) no deterioration will be permitted.
- The preventing deterioration requirements are applied independently to each of the elements that come together to form the water body classification as required by Annex V of the WFD and Article 4 of the Groundwater Daughter Directive. This requirement may not apply to elements at high status.
- To manage the risk of the deterioration of the status of the biological elements for surface waters, the preventing deterioration requirements are applied to the environmental standards for the physico-chemical elements, including those for the moderate/poor and poor/bad status boundaries.

- To manage the risk of deterioration from water abstraction by ensuring river flows continue to support the existing biological elements status and environmental objectives.
- For groundwater the preventing deterioration requirements are applied to each of the 4 component tests for quantitative status and the 5 component tests for chemical status.
- Elements at high status may be permitted to deteriorate to good status provided:
 - the water body's overall status is not high
 - the river basin management plans have not set an objective for the water body of high status
 - the objectives and requirements of other domestic or European Community legislation are complied with
 - action is taken to limit deterioration within the high and good status classes as far as practicable
- As an exception, where the morphology element is at high status, deterioration to good status is not permitted.

Article 4(7) can be used to justify deterioration caused by new modifications to the physical characteristics of a surface water body or alterations to the level of groundwater in specified circumstances.

As the climate changes there may be fundamental alterations to the character of some water bodies. For example, streams might become ephemeral (only flowing in winter) or coastal freshwater water bodies might become saline due to sea-level rise. Without better information on the direction and timing of these changes it is not appropriate to proactively change the objectives that river basin management plans seek to achieve. The priority is on building a baseline understanding of the state of the water bodies and monitoring the performance of measures (such as fish passes, abstraction changes) to ensure they deliver the benefits and resilience required. This approach is in line with European guidance. In line with Defra's catchment based approach the Environment Agency wants to work with catchment partners to clarify the impacts of climate change and implement appropriate measures accordingly. This adaptive management approach is consistent with Defra's guidance on river basin planning and the National Adaptation Programme.

3.1.2. Protected areas

The objectives for protected areas are either governed by the other EU legislation under which they are designated, such as the Habitats Directive for Natura 2000 protected area sites, or under WFD, for example Drinking Water Protected Areas.

The WFD requires member states to establish a register of protected areas. The types of protected areas that must be included in the register are:

- areas identified for the abstraction of water for human consumption (Drinking Water Protected Areas)
- areas designated for the protection of economically significant aquatic species (Shellfish)
- bodies of water designated as recreational waters, including Bathing Waters
- nutrient-sensitive areas, including areas identified as Nitrate Vulnerable Zones under the Nitrates Directive and areas designated as sensitive under Urban Waste Water Treatment Directive (UWWTD)
- 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 Natura 2000 protected area sites

Information elsewhere in the river basin management plans

- The register of protected areas was first published in 2004 and has been updated for this plan. You can access the register at <https://ea.sharefile.com/d-s487ae61bf2a4b4fb>

i. Drinking Water Protected Areas

The objectives for drinking water protected areas are to ensure that:

- under the water treatment regime applied, the drinking water produced meets the standards of the Drinking Water Directive plus any UK requirements to make sure that drinking water is safe to drink
- the necessary protection to prevent deterioration in the water quality in the protected area in order to reduce the level of purification treatment required

These objectives are at risk when increasing pollution levels caused by human activity could lead to more treatment being needed in future and where measures are needed to reduce pollution. Safeguard zones are non statutory areas established for 'at risk' abstractions where land use, management practices and other activities can affect the quality of the raw water. Measures to prevent and reduce pollution are targeted within these zones. Safeguard zone action plans are available that detail the issues in the safeguard zones and the work planned to address these issues.

Information elsewhere in the river basin management plans

- You can access surface water safeguard zone action plans here: <https://ea.sharefile.com/d-scac3ff7da4a424eb>
- You can access groundwater safeguard zone action plans here: <https://ea.sharefile.com/d-sa22fd79de304532a>
- You can access DrWPA Safeguard Zones pressure maps here: <https://ea.sharefile.com/d/s7530ff39d5b452db>

ii. Economically Significant Species

In the 2009 plans, waters containing freshwater fish and shellfish were designated as protected areas under their respective European directives. Since then both directives have been repealed and their requirements transferred to the WFD. Designated shellfish protected areas are being retained but there will not be any freshwater fish protected areas and there are no further requirements for areas that were designated under the Freshwater Fish Directive. The WFD is designed to give more relevant and up to date standards for protection of freshwater fish.

The objective for waters designated as shellfish waters protected areas is to protect and, where needed, improve the quality of shellfish waters in order to support shellfish (bivalve and gastropod molluscs) life and growth, and thus contribute to the high quality of shellfish products directly edible by humans. This objective will be achieved by aiming to observe relevant microbial shellfish flesh standards.

Action plans have been drafted for the 97 shellfish waters in England. These action plans describe the issues at each shellfish water and work planned to address these issues.

Information elsewhere in the river basin management plans

- You can access shellfish water action plans here: <https://ea.sharefile.com/d-s84c5554e50947dbb>
- To access maps of shellfish waters for each river basin district please refer to Section 2.4 in the relevant river basin district Part 1 document and use link for the Environment Agency's ShareFile platform

iii. Recreational Waters (Bathing Waters)

The objective for bathing waters as defined by the Bathing Water Directive (BWD) (2006/7/EC) is to preserve, protect and improve the quality of the environment and to protect human health by complementing the WFD. The BWD requires designation of bathing waters which are used by large numbers of people; the bathing waters are then monitored and classified according to standards in the directive for 4 classes “poor”, “sufficient”, “good” and “excellent”. The objective is to ensure that all bathing waters achieve at least the “sufficient” class, and to take such realistic and proportionate measures considered appropriate with a view to increasing the number of bathing waters classified as “excellent” or “good”.

The Environment Agency is focusing on bathing waters that are likely to be poor at the end of 2015, to ensure that the bathing waters with the most severe problems are addressed, but waters at risk of deteriorating in quality are also being prioritised. Plans are in place that include water company improvements, working with the agricultural sector, tackling urban runoff and misconnections and making investigations in those areas where causes and effects of pollution are uncertain.

Measures including water company actions are also being developed to increase the number of bathing waters that are classified as good or excellent.

Information elsewhere in the river basin management plans

- You can access more information on recreational waters on the bathing water explorer here: <http://environment.data.gov.uk/bwq/profiles/>
- You can also access information on recreational waters in the bathing water action plans (continuing at risk) here: <https://ea.sharefile.com/d-s2c9919e38f04798b>

iv. Nutrient Sensitive Areas (Urban Waste Water Treatment Directive)

A sensitive area in the Urban Waste Water Treatment Directive (UWWTD) is a water body identified as affected by eutrophication, or having a surface water abstraction affected by elevated nitrate concentrations from waste water 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 UWWTD is to protect the environment from the adverse effects of urban waste water discharges and waste water discharges from certain industrial sectors.

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

v. Nutrient Sensitive Areas and Nitrate Vulnerable Zones

The general objective of the Nitrates Directive is to reduce water pollution caused or induced by nitrates from agricultural sources and prevent further such pollution. Nitrate pollution is of concern because it has to be removed before water can be supplied to consumers. It can also cause eutrophication (excessive growth of weeds and algae which starves the water of oxygen). Over 60 per cent of nitrate enters water from agricultural land, particularly as

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nitrates are spread on agricultural land as fertiliser. Manures and man-made fertilisers all contain nitrates.

This objective is to be achieved either through designating Nitrate Vulnerable Zones (NVZs) within which action programmes to reduce agricultural nitrate losses are implemented, or by applying measures throughout the national territory. In addition a code of good agricultural practice must be established for voluntary implementation by all farmers. In England, instead of designating the whole country for the application of measures, NVZs have been identified which comprise all land draining to 'polluted waters' or waters which may become polluted, as defined by the Directive. 'Polluted waters' are fresh surface waters or groundwaters which do, or could, exceed 50 mg/l nitrate. They are also defined as waters which are, or may become, eutrophic due to nitrates from agricultural sources.

Supporting information

- You can access more information on Nitrate vulnerable zones here: <https://www.gov.uk/nitrate-vulnerable-zones>

vi. Natura 2000 Protected Areas

Natura 2000 is the centrepiece of EU nature and biodiversity policy. It is an EU wide network of nature protection areas established under the 1992 Habitats Directive. The aim of the network is to assure the long-term survival of Europe's most valuable and threatened species and habitats. It is comprised of Special Areas of Conservation (SAC) designated by Member States under the Habitats Directive, and also incorporates Special Protection Areas (SPAs) which they designate under the 1979 (as amended) Birds Directive. Natura 2000 is not a system of strict nature reserves where all human activities are excluded. Natura 2000 sites make a significant contribution to achieving favourable conservation status of the habitats and species of European interest in England and the UK.

Natural England is the statutory nature conservation body for England and has responsibility for ensuring that England's unique natural environment including its flora and fauna, land and seascapes, geology and soils is protected and improved. This includes ensuring the protection, improvement and management of Natura 2000 protected areas to meet the requirements of the Habitats and Wild Birds Directives. Natural England has a lead role in implementing these directives and oversees the appropriate management for Natura 2000 protected area sites and provides advice on complying with their objectives.

There are approximately 540 thousand hectares of terrestrial and coastal Natura 2000 protected areas (241 sites) in England which have water dependent features (there are an additional 10 marine Natura 2000 protected areas that fall partly within the WFD 1 nautical mile boundary). Terrestrial and coastal Natura 2000 protected area sites are underpinned by SSSIs that are broken down into management units.

Approximately 96% by area of the underpinning SSSIs units are either in 'favourable condition' or 'unfavourable but recovering condition', whilst 4% are unfavourable and not yet recovering. To achieve favourable condition, and so ensure that the conservation objectives of the Natura 2000 sites are being met, further or ongoing action will be needed on some 42% of recovering sites by area. Continued management of some of those currently in 'favourable' condition (54% by area) may also be required to ensure they maintain this status.

Since the first river basin management plans were published in 2009 the Improvement Programme for England's Natura 2000 Sites (IPENS) has developed site improvement plans (SIPs) for all Natura 2000 sites in England, including the subset that are protected areas under WFD. IPENS also published 'theme plans', which are high-level plans aimed at improving the way in which the Natura 2000 network issues are managed.

SIPs, along with information on existing measures to maintain or restore Natura 2000 sites (held in Natural England's designated site database), need to be considered together to understand the full range of pressures and measures relevant to these sites.

Supporting information

- Further information on the Natura 2000 protected areas is available here: <http://jncc.defra.gov.uk/page-4> and <https://www.gov.uk/protected-or-designated-areas>
- The Natura 2000 site improvement plans are available on Natural England's web site here: <http://publications.naturalengland.org.uk/category/4878851540779008>

3.1.3. Artificial and heavily modified water bodies

Some water bodies contain features that provide valuable social and economic benefits or uses, for instance 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, installing a weir or a dam. To achieve good ecological status in many of these water bodies, the existing modifications would have to be altered to such an extent that their function was compromised, such as removing a weir installed for flood defence purposes. It is important to protect the uses that benefit society and the economy. Therefore these water bodies can be designated as artificial or heavily modified (under Article 4.3 of the WFD) and their objectives determined accordingly. An exception to this is if there are other options for achieving the same benefits for society. In these cases designation would not be allowed (European Union CIS guidance document 4, 2003).

Once designated, artificial and heavily modified water bodies are required to reach the objective of good ecological potential. Good ecological potential provides a sustainable balance between the socio-economic, heritage or conservation interests that cause hydromorphological pressures and doing all that can be done to improve the ecological condition of the water body.

To assess ecological potential the pressures, impacts and mitigation measures within a water body are identified by answering a simple set of questions. This mitigation measures assessment was applied to each artificial or heavily modified water body and identified the issues relevant to the physical characteristics of that water body. The mitigation measures assessment is considered alongside the classification of the other elements to determine whether the water body has an overall status of good ecological potential.

For a water body to be able to reach good ecological potential, all of the reasonable mitigation measures to improve and protect the environment have to be in place and functioning. Some mitigation measures may already be in place, but one or more may be missing. If this is the case, the mitigation measures assessment would not support good ecological potential and the water body can only be classified at moderate ecological potential at best.

If a specific mitigation measure would have a significant adverse impact on the designated use or the socio-economic benefits of that water body it is excluded from the classification process and thus would not prevent a water body from achieving good ecological potential. If every possible mitigation measure would create a significantly adverse impact on socio-economic, heritage or conservation interests, then a sustainable balance has already been reached and the mitigation measures assessment in the water body is considered to support good ecological potential.

Artificial and heavily modified water bodies are still required to aim to achieve good chemical status and, if also designated as a protected area, the protected area objectives.

Information elsewhere in the river basin management plans

- Further information on how significant adverse impact on use is assessed is available here: <https://ea.sharefile.com/d-s68d152d0d2e4bb09>

Supporting information

- Further Information on the Mitigation Measures Assessment is available here: <http://www.wfduk.org/resources%20guidance-defining-good-ecological-potential>

3.1.4. Exemptions to the environmental objectives

i. Alternative objectives

In specific circumstances (set out in Article 4.4 and 4.5 of the WFD) member states may deviate from achieving the default objectives. Objectives which are different from the default objectives are referred to as alternative objectives.

Use of alternative objectives is the mechanism which the WFD provides for:

- considering other environmental, social and economic priorities alongside water management priorities
- prioritising measures over successive river basin management planning cycles

The alternative objectives and their conditions are the only relevant considerations when justifying the prioritisation of action under the WFD.

The types of alternative objective are:

- an extended deadline (for example, achieving good status by 2027)
- a less stringent objective (for example, achieving moderate status by 2021)

In some circumstances both may apply to a water body objective (for instance, achieving moderate status by 2027). The table below lists the reasons that can be used for setting alternative objectives.

Table 2: Reasons for setting alternative objectives

Reason	Sub-reason	Guidance notes
Technically infeasible	No known technical solution is available	Applies where there is no practical technique for making the necessary improvement. Does not include financial considerations. Techniques which may be under development but which are not yet known to be effective in practice will fall into this category.
	Cause of adverse impact unknown	Applies where a water body is classed as worse than good but the reason (the pressure or the specific source of the pressure) for this failure has not yet been determined. This may signal the need for an investigation or may reflect genuine scientific uncertainty. Consequently, a solution cannot feasibly be identified.

Reason	Sub-reason	Guidance notes
	Practical constraints of a technical nature prevent implementation of the measure by an earlier deadline	Includes administrative constraints in terms of commissioning, gaining permission for, and undertaking the necessary works. Does not include constraints due to a lack of legislative mechanisms or of funding.
	Problem cannot be addressed because of lack of action by other countries	<p>Application expected to be very limited in the UK. May possibly be applicable:</p> <ul style="list-style-type: none"> (a) in the international river basin districts shared between Northern Ireland and the Republic of Ireland if the problem cannot be resolved through the established partnership working arrangements for those basins. (b) where problems are caused by aerial deposition of transboundary pollutants and (a) local mitigation cannot solve the problem; and (b) discussions with the other countries have not led to effective action. <p>Where this reason is applied, the Commission must be informed about the issue under Article 12.</p>
Disproportionately expensive	Unfavourable balance of costs and benefits	Attaining the default objective is not justified because the costs of the measures exceed the benefits, taking into account qualitative as well as quantitative information.
	Disproportionate burdens	<p>Applies where the measure would be:</p> <ul style="list-style-type: none"> (a) unaffordable to implement within a particular timetable without creating disproportionate burdens for particular sectors or parts of society; or (b) the only solution would be significantly at odds with the polluter pays principle.
Natural conditions	Ecological recovery time	<p>Applies where there is expected to be a delay before the biological quality of the water body recovers.</p> <p>The delay may be due to the time taken for the plants and animals to re-colonise and become established after the hydromorphological, chemical and physicochemical conditions have been restored to 'good'; or the time taken for the habitat conditions to stabilise after improvement works.</p>

Reason	Sub-reason	Guidance notes
	Groundwater status recovery time	Applies where the climatic or geological characteristics dictate the rate at which groundwater levels recover or saline (or other) intrusions reverse once over-abstraction has been addressed.
	Background conditions	Applies where natural background levels of a substance in the environment are such that the level in water body cannot be reduced sufficiently to meet WFD standard.

When applying exemptions for the reasons listed above, additional conditions under Article 4.4 and 4.5 must also be met:

- Article 4.4(b) requires that the reasons for any extension of the deadline are set out and explained in the river basin management plans:
 - Water body and element objectives, including the reasons for any extended deadlines, are summarised in section 2.5 of Part 1 of the river basin management plans
 - Water body and element objectives for every water body in England are available on the Environment Agency's Sharefile service via links in the Part 1 and Part 2 documents.
 - The circumstances in which the above reasons have been used to justify extended deadlines are described in section 5.4.3 of this Part 2 document.
- Article 4.4(c) states that deadlines cannot be extended beyond 2027 except in cases where natural conditions are such that the objectives cannot be achieved by that date:
 - The objective setting process described in section 5.2 of Part 2 takes this condition into account and extensions beyond 2027 have only been set in cases where groundwater or ecological recovery time mean that the objective cannot be achieved before 2027.
- Article 4.4(d) requires a summary of the measures envisaged as necessary to bring water bodies progressively to the required status by the extended deadline to be set out in the river basin management plan:
 - A summary of the programmes of measures to meet objectives for water bodies with extended deadlines is provided in sections 3.2 and 3.5 of Part 1 of the plans.
 - A list of the measures needed to achieve water body objectives for 2027 and beyond is available on the Environment Agency's Sharefile service via links in the Part 1 and Part 2 documents.
 - More information about the mechanisms used to implement measures is available on the Environment Agency's Sharefile service via links in the Part 1 and Part 2 documents.
- Article 4.5(a) states that less stringent objectives can only be set where the environmental and socioeconomic needs served by the human activity that is preventing the achievement of good status cannot be achieved by other means which are a significantly better environmental option not entailing disproportionate costs:
 - The circumstances in which less stringent objectives have been set are described in section 5.4.3 of this Part 2 document, including identification of the human activities for which no significantly better environmental option can be identified.

- Article 4.5(b) requires that once allowance has been made for the impacts of the human activity or pollution that cannot be avoided, the best possible status must be achieved for the water body
 - The objective setting process described in section 5.2 of Part 2 takes this condition into account. Justifications for alternative objectives are applied at the element level. All elements in a water body that do not have a less stringent objective will have an objective of reaching good or better status.
- Article 4.5(c) requires that no further deterioration occurs in the status of the water body:
 - The objective setting process described in section 5.2 of Part 2 takes this condition into account.
- Article 4.5(d) requires that the reasons for the establishment of less stringent objectives are specifically mentioned in the plans and are reviewed every six years:
 - Water body and element objectives, including the reasons for any less stringent objectives, are summarised in section 2.5 of Part 1 of the river basin management plans
 - Water body and element objectives for every water body in England are available on the Environment Agency's Sharefile service via links in the Part 1 and Part 2 documents.
 - The circumstances in which the above reasons have been used to justify less stringent objectives are described in section 5.4.3 of this Part 2 document.
 - All water body objectives, including less stringent objectives, will be reviewed and where necessary updated as part of the next update of the river basin management plans in 2021.

Information elsewhere in the river basin management plan

- You can view the status objectives for all water bodies in England here: <https://ea.sharefile.com/d-s0faa355450243538>
- You can find a list of the measures needed to achieve water body objectives for 2027 and beyond and more information about the mechanisms used to implement measures on the Environment Agency's ShareFile service here: <https://ea.sharefile.com/d-sabbd14301a44d5e9>

ii. Temporary deterioration in status

In certain circumstances (set out in Article 4.6 of the WFD) 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

- a summary of the effects of the circumstances and the measures taken are included in the next update of the river basin management plans

Prolonged droughts

The Environment Agency is responsible for safeguarding water resources in England and protecting the environment. As the regulator of the water environment, the Agency has overall responsibility for safeguarding the environment during drought and overseeing the actions water companies take to secure public water supplies. Water companies are ultimately responsible for managing water supplies to meet the needs of customers.

It is the role of the Environment Agency to monitor, report and act to reduce the impact of drought on the natural environment. The Environment Agency takes specific actions to manage environmental droughts, where low river flows and lake levels have the potential to cause damage to the natural environment and ecology. Water companies are also responsible for maintaining supply while protecting the natural environment. The decision to take action is based on a range of factors, including present and forecast weather conditions and how effective the measure would be. The sequence of measures will differ as all drought events need to be managed on an individual basis.

Prolonged and severe droughts may affect water body status through reduced river flows, damage to or loss of habitat, alterations to bio-chemical composition of the river and impact on 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 effects of drought or prevent temporary deterioration in water body status throughout a prolonged drought.

Water company drought plans set out the measures that should be taken to minimise environmental impacts and maximise available supplies during a drought, without causing deterioration where possible. Effective monitoring of environmental indicators also helps to differentiate between the natural impacts of drought and the impacts caused by human activity such as the implementation of drought permits and orders. This is important to show that any temporary deterioration resulted from the natural impacts of the drought.

If the impacts of a drought temporarily cause deterioration to water body status and all the criteria in Article 4.6 can be met, this defence can be used as a justification why an objective set in a river basin management plan has not been met. This is always done on a case by case basis.

Supporting information

- You can find more information on managing drought here:
<https://www.gov.uk/government/policies/maintaining-secure-water-supplies-high-standards-of-drinking-water-and-effective-sewerage-services/supporting-pages/water-resource-management>

Extreme floods

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

Severe floods may have an impact on water body status through effects such as the loss of habitat (for example, by 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.

The condition of water bodies is assessed on an annual basis and therefore any changes 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) (England) Regulations 2015 implement the Environmental Liability Directive in England. Under the Regulations, environmental damage includes water damage which is defined as damage to surface waters or groundwater causing a change to water body status.

This means either a deterioration of water status overall or a deterioration in status of any of the individual elements or parameters used to classify the water body.

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.

iii. New modifications or new sustainable development

New modifications or new sustainable human development activities may be permitted even though they might compromise the achievement of certain WFD objectives (Article 4.7 of the WFD). Certain new developments provide valuable benefits to society that outweighs the environmental or societal benefits of achieving WFD objectives. Such benefits may include those provided by activities such as:

- public water supply
- flood defence
- navigation and transport
- urban development
- rural land management

Any modifications or activities considered likely to compromise WFD objectives must undergo a thorough assessment before they can be permitted under Article 4.7 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 conditions:

- 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 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 must be specifically explained in the river basin management plans and relevant objectives are reviewed every 6 years.

The Environment Agency works with public bodies, developers and its own operational functions to ensure WFD objectives (including the correct application of Article 4(7)) are met.

3.2. River basin management planning

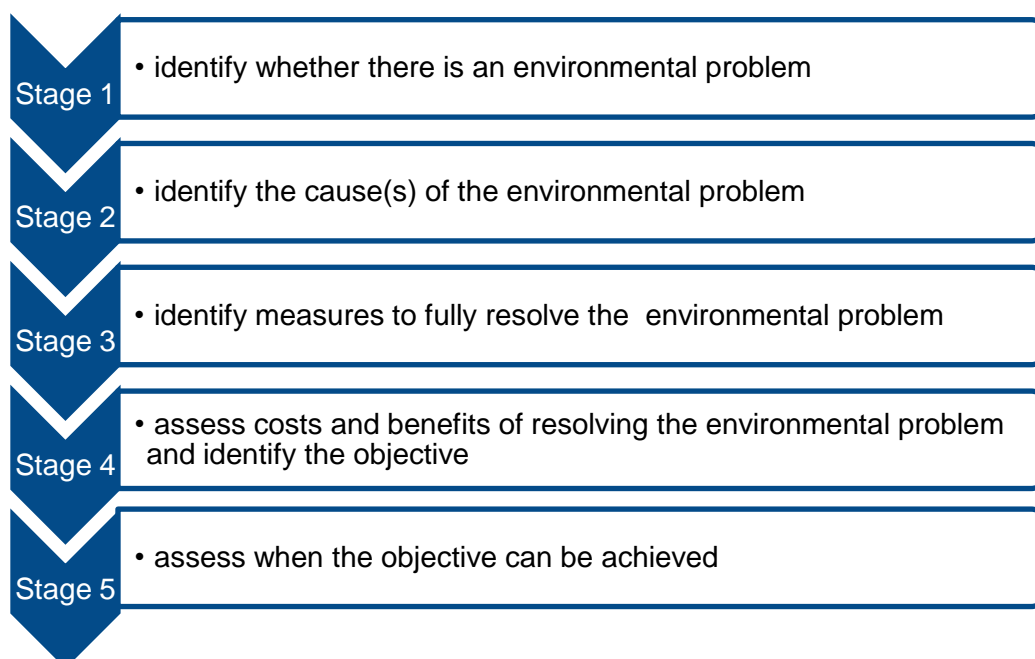
River basin management planning is a continuous, cyclical process that is punctuated at intervals by the formal consultation and reporting that is required by the WFD. This is illustrated in the diagram below. The consultation and reporting required as part of updating the plans are described in section 3.5.

Figure 3: River basin planning cycle



This ongoing river basin management planning process can be broken down into five main stages as shown below.

The different stages in this process are described in more detail in this document and additional information. Where a section of this document is relevant to a particular river basin management planning stage, this is indicated by an icon next to the section heading, for example,



Depending on the specific objectives being considered, not all stages of the overall process may be relevant. For example, for preventing deterioration stage 4 does not apply because no cost-benefit assessment of the actions needed to prevent deterioration is required.



Stage 1 of river basin management planning is to assess whether there is an environmental problem. Possible problems might include the failure of a protected area to achieve its objective, a water body that has deteriorated in status (or is at significant risk of deteriorating), or a water body that is assessed as being at less than good status

The condition of Natura 2000 protected areas are assessed by Natural England. The condition of all other protected areas is assessed by the Environment Agency. The current status of water bodies is assessed mainly through the process of classification. Comparison of these results over time will indicate whether any deterioration in that status is occurring. Classification results are one of the pieces of information that can indicate whether there is an environmental problem in a water body but other information, including information from stakeholders, can also be used to help determine whether or not, there is a problem.



Where a protected area is failing to achieve its objective, where deterioration in water body status occurs or where elements in water bodies are failing to achieve good status, the cause of the problem must be determined in order to identify appropriate solutions (stage 2).

In order to understand the causes of problems the Environment Agency has carried out thousands of investigations since the 2009 plans were published. These have greatly improved the understanding about why water bodies are not at good status. Additional investigations are required to understand new failures to achieve water body objectives and also where deterioration is detected and the reasons for that deterioration are not known.



Measures 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 the most cost effective approach is selected (stage 3). All of the measures required to fully resolve the problem are identified.



The cost effective and technically feasible measures needed to achieve good status across all water bodies in each catchment are grouped together and subject to economic appraisal to identify those measures where implementation is justified because the benefits to society from implementing the measures exceed the costs of putting the measures in place (stage 4).

While it is important to understand the costs and benefits of measures needed to achieve protected area objectives and those to address deterioration in water body status, the objectives for protected areas and preventing deterioration must still be achieved, even where costs outweigh benefits. The requirements for shellfish water protected areas have been subsumed into the Water Framework Directive. As a result objectives for these protected areas are subject to the same tests of disproportionate cost and technical feasibility as water body objectives.

The outcomes that will be achieved from implementing the measures are used to identify the best future condition or status that could be achieved for protected areas and water bodies. The 'best' future status, which may be less than good status (that is a less stringent objective), is the status that is expressed in the water body status objectives in the plans.



When this future condition or status can be achieved is determined by considering how and when the measures to achieve the objectives will be funded and implemented and the time it will take for the environment to recover (Stage 5).

Information on the sectors that are responsible for the pressures on protected areas and water bodies and the costs of the measures needed to achieve the objectives are summarised in the impact assessment that accompanies the river basin management plans.

This 5-stage process identifies the objectives published in the plans. Monitoring and classification will be used to assess compliance against the objectives and the planning cycle is repeated.

3.3. Working with others

Responsibility for improving the water and wider environment cannot rest exclusively with government. As the WFD encourages, all of society has an impact upon and so needs to play a part in its protection and improvement. By working effectively with others better solutions are agreed and the things that matter most to people are protected. Working with others is therefore at the heart of a successful river basin management planning process. To support this, the Catchment Based Approach has been established to engage with local communities and jointly plan action on an on-going basis.

The WFD includes legal obligations (under Article 14) on consultation and engagement. This includes encouraging the active involvement of all interested parties in the implementation of the directive, in particular in the production, review and updating of the river basin management plans. As part of updating the 2009 plans, the Environment Agency carried out 3 formal consultations in each river basin district and ongoing engagement with stakeholders to gather input from others to help improve the plans. The results have been used to ensure that the plans set out the best ways to protect and improve the water environment. The consultations and engagement have helped build understanding about the value of integrated river basin management, and helped build support from others to drive action.

Working with others is an ongoing process. It aims to build collaborative, long-term relationships through a journey of continual conversation with those who have an interest in or responsibility for river basin management planning.

Supporting information

- For information about consultations and engagement in each river basin district and at a national level please see the 'Summary of public information and consultation taken' here: <https://www.gov.uk/government/consultations/update-to-the-draft-river-basin-management-plans>

3.3.1. National liaison panel for England

Representatives of major sectors and national organisations make up the national liaison panel for England. The panel takes an active role in the implementation of the WFD at a national level to:

- contribute to the implementation of national measures
- enable and encourage action by others
- track general progress of implementation of the river basin management plans

The national liaison panel also has an Estuaries and coasts sub group, made up of representatives from those sectors that can help deliver the measures in estuarine and coastal waters.

Supporting information

- The full terms of reference for the national liaison panel for England are available to access here: <https://ea.sharefile.com/d-sb837ac69be84a70a>

3.3.2. River basin district liaison panels

Representatives of major sectors, organisations and catchment partnerships make up the 8 river basin district liaison panels.

The role of liaison panels is to:

- contribute evidence to enable decision making and reporting on river basin management plans
- devise and track measures and projects as part of a programme of work to prevent deterioration and improve the environment
- work with members and their sectors to ensure a broad base for decision making and communication
- assist and champion the implementation of the catchment based approach

To carry out this role, liaison panel members communicate with, and through, their organisations and sector or catchment networks.

Supporting information

- The full terms of reference for river basin district liaison panels are available to access here: <https://ea.sharefile.com/d-s45f582279384593b>

3.4. Working at the catchment scale

Since March 2011, Defra, the Environment Agency and a variety of other organisations have been developing a Catchment Based Approach (CaBA). Central to CaBA is engagement of local stakeholders to establish common ownership of problems and their solutions, building partnerships to implement actions at the local level. The CaBA aim is to balance environmental, economic and social demands and align funding and actions within river catchments to bring about long term improvements.

Following a successful pilot phase Defra published their CaBA Policy Framework in June 2013. A practical guide for catchment management was developed as a handbook to translate the lessons learned from the pilot phase into useful guidance and reference material. An independent National Support Group and website were established to assist innovation and further evolution of the approach in England.

There are now over 100 Catchment partnerships actively working in all of England's catchments. More than 1,500 organisations, including water companies and environmental charities are engaged, supported by a network of dedicated Environment Agency catchment coordinators. The partnerships share evidence and agree, co-fund and deliver strategic priorities for their catchment.

Supporting information

- To access a copy of the Natural Environment White paper discussion document: record response, please see: <https://www.gov.uk/government/news/natural-environment-white-paper-discussion-document-record-response>
- To access the UK National Ecosystem Assessment website, please see: <http://uknea.unep-wcmc.org/Resources/tabid/82/Default.aspx>
- To access the Water for Life market reform proposals please see: <https://www.gov.uk/government/publications/water-for-life-market-reform-proposals>
- To access the Defra evaluation of the catchment based approach pilot stage please see: <http://www.catchmentchange.net/wp-content/uploads/2012/10/Baseline-Report.pdf>
- To access the 'organisational understandings and commitments for collaborative catchment management: a survey of local initiatives' final report please see: <http://ccmhub.net/wp-content/uploads/2012/10/Defra-WT0997-Final-Report-July-2013.pdf>
- To access the 'Catchment Based Approach: Improving the quality of our water environment' policy framework please see: <https://www.gov.uk/government/publications/catchment-based-approach-improving-the-quality-of-our-water-environment>
- To access the list and map of catchment partnerships in operation please see: <https://www.gov.uk/government/publications/catchment-partnerships-in-operation-list-and-map>
- You can find more information on the liaison panel and details about membership in the record of consultation and engagement here: <https://www.gov.uk/government/collections/river-basin-management-plan-update>.
- You can find examples on how the Environment Agency has used information from others in the consultation response document here: <https://www.gov.uk/government/collections/river-basin-management-plan-update>.
- You can find more information on the catchment based approach on the catchment based approach web pages here: <http://www.catchmentbasedapproach.org/>
- You can find a copy of the handbook for catchment management here: <http://ccmhub.net/wp-content/uploads/2012/10/The-Guide.pdf>

3.5. River basin management planning timetable

Most of the river basin management planning activities are continual and iterative. There are defined points for consultation and reporting as part of developing and updating the river basin management plans. The timetable for the steps required is shown in the diagram below.

Figure 4: River basin planning consultation and reporting process

Stage	Date and duration	What's the purpose?
Working together - consultation	June 2012 6 months	"How should we all work together to update the river basin management plans?" Asking how you want to be involved Explaining the key steps in the river basin management planning process for Cycle 2 Establishing a network of contacts for cycle 2 planning
Challenges and choices - engagement	June 2012 to May 2013 Approx 12 months	"What are the most significant water environment issues, what are the options for tackling them and which do you prefer?" Improving the evidence base that will be used to inform the review of the river basin management plans Seeking broad agreement about the principles behind taking action
Challenges and choices - consultation	June 2013 6 months	"Have the significant issues been fairly summarised and what can be done about them?" Sharing the latest evidence including results of investigations and assessment of the risk of water bodies deteriorating or not achieving their objectives Seeking views on how to prioritise action Explaining catchment plans and how they relate to the river basin management plans
Follow up engagement	October 2013 to May 2014 Approx 8 months	Following the consultation, the Environment Agency will consider the responses and where necessary facilitate further engagement for groups of stakeholders where there are areas which need further discussion.
Draft river basin management plans - consultation	October 2014 6 months	"Does this draft plan set the right level of ambition for the water environment and a strong commitment to deliver?" Estimating the likely state of the water environment in 2021 and 2027. Proposing water body objectives Outlining who would be involved to achieve these outcomes in 2021 and 2027, how much it will cost and the benefits
Follow up engagement	April 2014 to August 2015 Approx 5 months	Following the consultation, the Environment Agency will consider the responses and where necessary further develop the content of the plans with delivery partners to ensure the updated plans are the best possible and fully supported
Published river basin management plans	October – December 2015	"This is the plan to address the issues" Publishing proposed river basin management plans in October and submitting to Government for approval. The approved RBMP will be published in December. These plans will be used as a framework to direct planning and action and to track progress in each river basin district
Implementation and ongoing engagement	January 2016 onwards	Following publication of the updated RBMP the Environment Agency will continue to work with delivery partners to achieve the objectives set out in the plans

3.6. Recovery of costs for water services

Article 9.2 of the WFD requires that river basin management plans report on the contribution made by various water uses to the recovery of costs for water services. This section describes the steps taken by the water industry and its regulators.

3.6.1. Economic regulation

Public water supply and sewerage services in England were privatised in 1989. Since privatisation the water industry has been regulated to protect consumers and the environment. Ofwat is the independent economic regulator for the water industry in England and Wales. Every five years Ofwat sets price limits based on water company business plans, produced in dialogue with the Environment Agency, the Drinking Water Inspectorate, NGOs, customers and others. These plans set out in detail how much each company needs to charge its customers to provide water and sewerage services where relevant and to comply with its statutory obligations.

The water company business plans and charges therefore reflect the cost of:

- collecting or abstracting water
- building and maintaining pipes and ensuring a secure supply of drinking water to businesses and households
- treating water and sewerage to meet environmental standards.

Thus the costs of providing resilient water and sewerage services are recovered through customer bills.

Ofwat's approach under PR14 also introduced changes that will help improve ecosystem resilience, such as a focus on outcomes and the use of a total expenditure (totex) approach to cost assessment. The totex approach seeks to address a potential incentive towards capital solutions, which may have a less favourable impact on the environment than operating cost solutions.

Actions associated with water company business plans for the period 2015 to 2019 will result in:

- 6000km of rivers and 50 bathing waters across England and Wales being improved or protected
- £70 million for better protection of migrating eels and other fish
- a reduction in diffuse pollution across more than 180 river catchments

For other abstractors, as well as covering the costs of managing water resources, current charges for water abstraction include an element to fund licence changes to address unsustainable abstraction. This is done using the abstraction charges scheme which is made up of a Standard Unit Charge and the Environmental Improvement Unit Charge.

3.6.2. Water metering

One way water companies can help to reduce the environmental costs of public water supply and provide appropriate incentives is to make cost of supplying water more visible to consumers by encouraging households and businesses to install water meters. The current situation on uptake of water meters across England is as follows:

- Current meter penetration in England is over 50% and this is expected to rise to 66% by 2020 and 82% by 2040 (as reported in the water companies' water resources management plans).

- Water companies in areas of 'serious water stress' (where current or likely future household demand is a high proportion of the water available to meet that demand) may choose to introduce universal metering programmes through their water resources management plans, if the evidence shows that this is the most cost-beneficial way to address the issue.
- Seven water companies: Affinity, Anglian, Essex and Suffolk, South East, Southern, Sutton and East Surrey, and Thames are in areas designated as being in serious water stress.
- Of these, four have universal metering programmes in place: Affinity (currently at 47% meter penetration), South East (65%), Southern (77%) and Thames (34%).
- Universal metering programmes are not the only way that water companies can encourage uptake of meters. Anglian and South West currently have 74% and 76% metering penetration respectively, as a result of customers opting to switch to a metered charge.

3.7. Assessments of the river basin management plans

3.7.1. Strategic Environmental Assessment

A strategic environmental assessment (SEA) has been undertaken to fulfil the requirements of the Environmental Assessment of Plans and Programmes Regulations 2004 (known as the 'Strategic Environmental Assessment Regulations'). This requires plans within certain sectors (including the water sector) that provide a framework for future development to be subject to a SEA to ensure that the environment is considered from the outset.

The objective of a river basin management plan is to improve the water environment. As a result it is anticipated that most environmental effects are likely to be positive. Nevertheless, the plans have the potential to have intended or unintended consequences for people and the wider environment. The Environment Agency used SEA to assess the potential effects of the plans and reported the results in an Environmental Report that accompanied the consultation on the updated plans. The approach to SEA is summarised below.

i. Scope of SEA

The scope of the SEA was to include all measures being proposed for catchments but to consider the significance of their effects at a river basin district scale. This was set out in scoping reports as part of the 'Challenges and choices' consultation in 2013. As part of the agreed scope and approach to SEA, the assessment was integrated with the RBMP preparation and appraisal process to record where benefits or disbenefits to ecosystem services were likely to occur. This enabled the SEA to influence the results of the appraisal locally.

ii. SEA Consultation and links to the Environmental Reports

The SEA Environmental Reports were published alongside the consultation on the draft updated river basin management plans. Consultees were asked to comment on the scope and conclusions of the SEA for each plan. The RBMP consultation response document includes a summary of the main comments received on the Environmental Report and how these have been addressed.

Supporting information

- The Environmental Report can be found here:
<http://www.gov.uk/government/consultations/update-to-the-draft-river-basin-management-plans>

iii. SEA Statement of Particulars

A SEA Statement of Particulars (SoP) has been produced for each plan. The SoP sets out how the RBMP has taken into account the findings of the SEA Report (for the draft RBMP) and of the views expressed from the consultation. It also sets out how the implementation of the plans will be monitored for its effects on the wider environment.

Supporting information

- The SEA Statement of Particulars can be found here:
<https://www.gov.uk/government/collections/river-basin-management-plans-2015>

3.7.2. Habitats Regulations Assessment

A Habitats Regulations Assessment of each river basin management plan has been carried out by the Environment Agency, in consultation with Natural England and Natural Resource Wales. This is to fulfil the requirements of the Conservation of Habitats and Species Regulations 2010, the Habitats Regulations. The assessment considers whether each plan is likely to have a significant effect on any designated European sites (Natura 2000 sites) or Ramsar sites based on the level of detail in the plan.

The assessment demonstrates that sufficient controls are in place to identify any potential risks to European sites when the actions required to implement the measures are developed. The controls and the range of potential mitigation measures available allow a conclusion to be made, at this strategic plan level, that there is no likely significant effect from the river basin management plans on European sites. Before any measures in the plans are implemented they must be subject to the requirements of the Habitats Regulations and any plans, projects or permissions required to implement the measures must undergo an 'appropriate assessment' if they are likely to have a significant effect.

Supporting information

- The Habitat Regulations Assessment Report can be found here:
<https://www.gov.uk/government/collections/river-basin-management-plans-2015>

3.7.3. Impact Assessment

The plans are supported by an impact assessment that reports an analysis of the costs and benefits of two options: continuing with the objectives in the 2009 plans ('baseline option') or implementing the objectives of the plans ('proposed option'). Information on the costs and benefits is summarised for 4 sector groupings for England and for each river basin district. Further information on the updated economic analysis of the programme of measures is in section 5.3 of this document.

Supporting information

- A copy of the impact assessment is available to access here:
<https://www.gov.uk/government/collections/river-basin-management-plans-2015>

3.8. Competent authorities for river basin management planning

In England the appropriate authority for the implementation of the WFD is the Secretary of State for Environment, Food and Rural Affairs. The appropriate authority:

- has general responsibility for ensuring the WFD is given effect
- has specific responsibilities for ensuring that appropriate economic analysis is carried out, approving proposals for environmental objectives and programmes of measures and approving the river basin management plans
- may give guidance or directions to the Environment Agency, and any other public body, on the practical implementation of the WFD
- has the duty to ensure that the requirements of the WFD are given effect in relation to each river basin district as a whole

The Environment Agency is the competent authority for producing and updating the river basin management plans in England. The Environment Agency:

- is responsible for identifying, characterising and in certain circumstances monitoring Drinking Water Protected Areas, and identifying measures where water quality is deteriorating and establishing a register of those waters and other protected areas
- has to prepare proposals for environmental objectives and programmes of measures for each river basin district and prepare draft river basin management plans
- must also ensure public participation in preparation of the river basin management plans and make certain information required under the WFD accessible to the public

Secretary of State

The Secretary of State is legally part of the Crown and is not established in legislation.

Secretary of State for Environment, Food and Rural Affairs, Nobel House, 17 Smith Square, London, UK SW1P 3JR

Environment Agency

The Environment Agency is a non-departmental public body established by the Environment Act 1995.

Environment Agency, Horizon House, Deanery Road, Bristol BS1 5AH

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 for WFD. 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 England, how future risks have been assessed and causes of current problems identified.

Topics covered:

River basin districts and water bodies, typology, designation of artificial and heavily modified water bodies, protected areas, monitoring networks, classification methodologies, recent changes to how classification is carried out, significant water management issues, risk assessments and reasons for not achieving good status.

4.1. River basin districts and water bodies

The WFD covers all waters, including inland surface waters, groundwater, estuaries and coastal waters, independent of size and characteristics.

For the purpose of implementing the WFD, waters were assigned to geographical or administrative units: the river basin, river basin district and water body.

The river basin is the area of land 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 river basin district is the main unit for management of river basins under the WFD. River basin districts in England were identified by the Secretary of State in 2003. A river basin district includes the area of land and sea made up of one or more neighbouring river basins together with their associated groundwaters and coastal waters. The river basin districts in England and those that are cross border with Wales and Scotland are shown on the map below.

Water bodies are the units used for reporting and assessing compliance with the principal environmental objectives of the WFD. The environmental objectives of the WFD 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 set out in the directive.

The WFD defines 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.

[illegible]

Water bodies in England were identified as part of a 'characterisation' process in 2003.

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 all lengths of river, stream or drainage channel in the defined catchment areas of a water body are protected and managed, reporting uses a river line within that catchment.

For the 2009 plans this river line (often referred to as the 'blue line') was derived from the 1:50,000 scale river network. This has been updated using the 'detailed river network'. This river line is purely a reporting network and it is this river line which appears on maps in the river basin management plans.

The original water body 'building blocks' used in the 2009 river basin management plans have been revised for the updated plans. This has resolved a number of errors and removed a large number of very small streams that are less than 1km in length or with a catchment of less than 10 km². These non-reportable water bodies are not reported to Europe.

The WFD covers all bodies of surface water not just those represented as a blue-line on WFD maps. Where a stretch of water is too small to be formally a water body, or is too small to show up on a map of the water body it is still protected by law from pollution, modification and abstraction and can still be improved where local actions and assessments deem it to be a priority.

Using catchments for river basin management planning in England

Taking a catchment based approach helps to bridge the gap between management planning at river basin district level and activity at the local water body scale. The catchment scale is large enough to add value at a strategic level but small enough to encourage local scale engagement and action.

In England each RBD is divided into a number of management catchments to facilitate presentation of data and information. These are large catchments with many, often interconnected, water bodies. They are based on the catchments used for managing the availability of water for abstraction and flood risk management. Seventy five catchment partnership groups work at this management catchment scale.

These management catchments have been further divided into operational catchments covering a small number of water bodies (typically 1 to 10) based around the same local geography or sharing specific pressures. Economic appraisals (see section 5.3) have been based on operational catchments. Twenty four catchment groups work at a level similar to the 'operational catchment' scale.

Information elsewhere in the river basin management plans

- You can view the number of water bodies in England for the second cycle of river basin management planning here: <https://ea.sharefile.com/d-s9a6aac8d0f444e38>

4.1.1. Surface water body types and reference conditions

The sorts of animals and plants found in upland, rocky, fast-flowing streams are naturally very different to those found in lowland, slow flowing, meandering rivers. Therefore, to predict the animals that would be found in high status surface water bodies they are grouped into different types according to their physical and chemical characteristics.

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. These types are the ones that have been used in the characterisation of each river basin district. In some cases there are no sites in reference condition in the UK and descriptions are based on similar types in other member states, extrapolation from modelling studies, or historic data and/or expert opinion. For some methods more detailed site specific reference conditions have been used.

Reference conditions and the conditions found in high status waters are the same. The ministerial directions on environmental standards give the values for high status for biological and physico-chemical elements and include screening approaches for high status hydrology and morphology. To be in overall reference condition or high status, a water body needs to comply with all the criteria monitored: biology, physico-chemical, hydrological regime, morphological and chemical criteria.

Information elsewhere in the river basin management plans

- To access maps of the water body typology for each river basin district please refer to Section 2.5 in the relevant river basin district Part 1 document and use the river basin district data download link.

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 here: <http://www.wfduk.org/>
- The reference conditions descriptions for rivers, lakes, groundwater, estuarine and coastal waters are given in detail on the UKTAG website here: <http://www.wfduk.org/resources/category/characterisation-water-environment-3>
- The ministerial directions on environmental standards are available here: <http://www.legislation.gov.uk/uksi/2015/1623/resources>

4.1.2. Designation of artificial water bodies and heavily modified water bodies

In the 2009 plans water bodies were designated according to their specified use and the current extent of that use. This followed a series of consultations, cross-references and quality checks, including river basin district liaison panel involvement.

The Environment Agency has reviewed the designations of water bodies. Changes to designations are being proposed in response to a changing environment, stakeholder comments or where errors have been identified in the current designations.

As a result of the review of designations 43% of water bodies are now considered to be 'artificial' or 'heavily modified'.

Information elsewhere in the river basin management plans

- You can view the number of water bodies in England considered to be ‘artificial’ or ‘heavily modified’ and the specified uses that have led to this designation here: <https://ea.sharefile.com/d-s9a6aac8d0f444e38>
- For more information on the designation review that has taken place you can access the document ‘Revised HMWB designations and proposed designations of new water bodies’ here: <https://ea.sharefile.com/d-s68d152d0d2e4bb09>

4.2. Assessing the current state of the water environment

4.2.1. Protected areas

Protected areas are parts of the environment requiring special protection under EU legislation for the protection of their surface water and groundwater or for the protection of habitats and species directly dependent on water. The Environment Agency has routine monitoring programmes in place for assessing compliance for Bathing Waters, Habitats Directive Sites and Drinking Water Protected Areas, and under WFD for Shellfish Protected Areas. Other information is also used to assess compliance in protected areas including conceptual models and modelling data, some of which are from third parties such as water companies.

Information elsewhere in the river basin management plans

- You can find the detailed current status of bathing waters, shellfish waters, drinking water and water-dependent Natura 2000 protected areas here: <https://ea.sharefile.com/d-s487ae61bf2a4b4fb> and summary tables here: <https://ea.sharefile.com/d-s9a6aac8d0f444e38>

Supporting information

- The condition of the SSSI units underpinning Natura 2000 protected areas can be viewed at <http://www.sssi.naturalengland.org.uk/Special/sssi/search.cfm>
- Definitions of the condition categories can be found here: <http://www.sssi.naturalengland.org.uk/Special/sssi/glossary.cfm>
- Detailed information on the measures being used to maintain or restore condition of these sites can be obtained from your local Natural England area team http://www.naturalengland.org.uk/about_us/contact_us/

4.2.2. Water body status monitoring networks

A network of monitoring sites is used to establish the status of all water bodies within each river basin district in terms of their ecology, chemistry, hydromorphology and groundwater level.

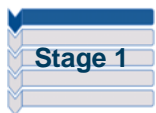
In surface waters, a small network of surveillance monitoring sites is used to provide information on long-term natural and anthropogenic trends. In rivers and lakes an additional, larger network is used to classify water bodies according to the pressures acting on the environment. In coastal and estuarine waters the operational monitoring programme has traditionally focussed on two priority pressures, nutrients and chemicals from point source discharges.

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.

Information elsewhere in the river basin management plans

- To access a map of the monitoring network for each river basin district please refer to Section 2.5 in the relevant river basin district Part 1 document and use the river basin district data download link.

4.2.3. Assessment of water body status



Water bodies are assessed by classifying data collected from a monitoring network. For a particular point in time a classification will show 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 improvement measures might be needed. Additional information is sometimes required to assess whether a classification result is really indicative of an environmental problem; this is known as a weight of evidence approach. Additional evidence may also indicate where problems exist which are not apparent through classification results alone. The Environment Agency's weight of evidence approach to assessing environmental problems is described in more detail in section 4.2.4.

For surface water bodies there are two separate classifications; 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 bodies there are two separate classifications; 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 which may lead to a future deterioration in status.

i. Ecological status

Ecological status classification consists of:

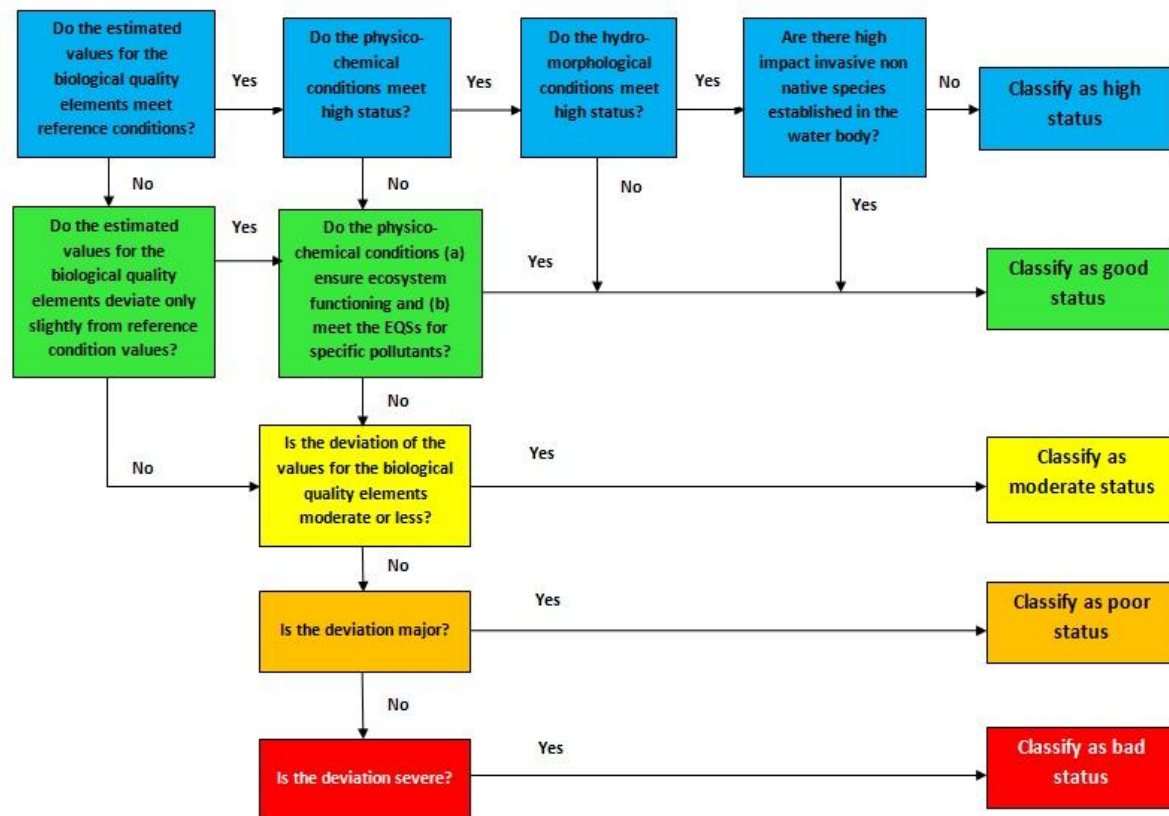
- the condition of biological elements such as fish and invertebrates, including the presence of any invasive non-native species at high status water bodies
- concentrations of supporting physico-chemical elements, for example, phosphate and ammonia levels
- concentrations of specific pollutants, for example, copper
- and for high status, largely undisturbed hydromorphology

The decision tree below illustrates the criteria used to determine the different ecological status classes.

Ecological status is reported 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 assessment is determined by the worst scoring quality element.

Hydromorphological elements (hydrology and morphology) are supporting elements of ecological status and are used to define high ecological status.

Figure 6: Criteria to determine ecological status classes



ii. Surface water chemical status

Chemical status is determined by assessing compliance with environmental standards for chemicals that are listed in the Environmental Quality Standards (EQS) Directive (2008/105/EC) as amended by the Priority Substances Directive 2013/39/EU. Good chemical status is achieved if every EQS is met: a single EQS failure means good status for the water body cannot be achieved.

Supporting information

- You can find the amended Environmental Quality Standards Directive here: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32013L0039>

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 (2000/60/EC) and the Groundwater Directive (2006/118/EC). 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 5 chemical and 4 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. The worst case classification of the quantitative tests reported as the overall quantitative status for the groundwater body. Groundwaters are classified as either at good or poor status.

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Groundwater threshold values have been set for all groundwater bodies as triggers to aid risk, status and trend assessment. These are not the boundary between good and poor status, rather exceeding these values prompts further investigation to determine whether the conditions for good status have been met. These values are set at a national level except for those used for wetlands and for surface water where they are water body specific. The threshold value for nitrate has decreased and the method for calculating the threshold value for surface water has changed. In addition threshold values for wetlands based on nitrate concentrations in groundwater have been used. These replace previous thresholds which were based on phosphorus concentrations.

Further information in this document

- You can find out more detail about risk assessments for the river basin management plans in section 4.4.3 of this document.

Information elsewhere in the river basin management plans

- You can find more detail on threshold values and the process undertaken for defining risk assessment for chemical groundwater bodies here: <https://ea.sharefile.com/d-s907bd03e9e74b74a>

iv. Groundwater trend assessment

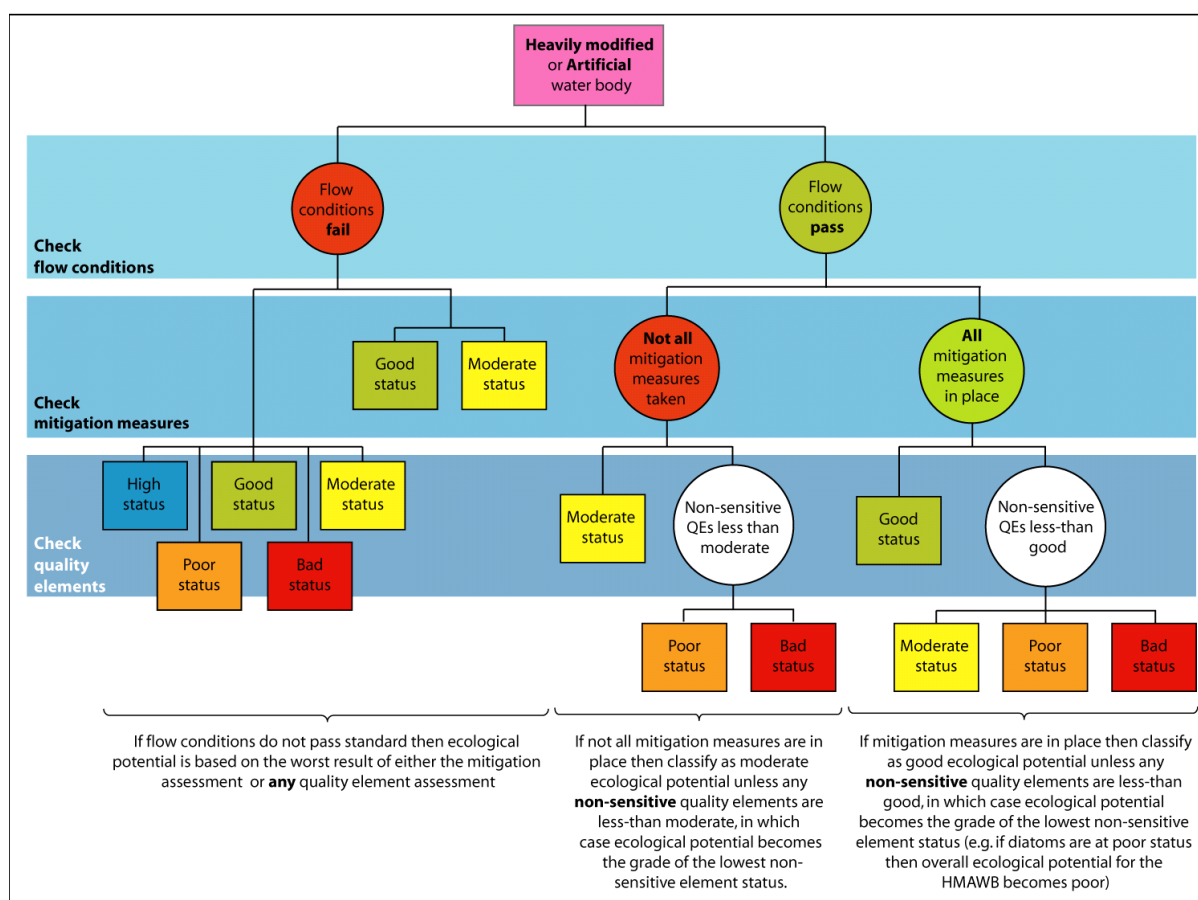
For groundwater bodies that have been identified as being at risk of failing to meet their environmental objectives for groundwater chemical status there is a requirement to identify any significant and sustained upward trends in pollutant concentrations. A significant trend is one that could lead to a groundwater body failing to meet its environmental objectives before 2021 (the end of two river basin management planning cycles) 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, the Environment Agency must classify according to their ecological potential rather than status. The UK has adopted the mitigation measures approach for classifying heavily modified and artificial water bodies.

A number of different factors are considered when making an assessment of the ecological potential of heavily modified or artificial water bodies. These factors are an assessment of river flow, the presence or absence of mitigation measures, and the status of other quality elements. These come together to provide an overall assessment of ecological potential as shown in the diagram below.

Figure 7: Factors considered in overall assessment of ecological potential



The Environment Agency 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 the biological evidence will be reviewed and where there is high confidence in the longevity of the ecological status the heavily modified water body designation will be recommended for removal.

Information elsewhere in the river basin management plans

- A method statement for the classification of surface waters can be accessed here: <https://ea.sharefile.com/d-s7966eb23d114a32b>
- A method statement for the classification and trend assessment of groundwater can be accessed here: <https://ea.sharefile.com/d-s4547016291542349>
- You can download the latest assessments of status for water bodies and elements in England in spreadsheet format here: <https://ea.sharefile.com/d/s7e378d3187741f2b>

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 really 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 3 categories of very certain, quite certain and uncertain. These definitions are based on statistical certainty from analysis of the monitoring data used to

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derive the classification results: very certain $\geq 95\%$, quite certain $\geq 75\%$ $< 95\%$, uncertain $> 50\%$ $< 75\%$.

The level of certainty needed to make sure an element is at less than good status is influenced by the measures required to resolve the environmental problem. In general, justifying costly or targeted regulatory measures requires a higher degree of certainty than is needed to justify low cost, voluntary type measures. This reflects the relative risk of wasting resources and investment in taking unnecessary action.

Classification and statistical certainty derived from operational monitoring may be unable, on their own, to provide the certainty needed to justify the measures 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, based on a weight of evidence approach. This additional evidence could come from pollution incident or investigative monitoring data or from a catchment-scale assessment of available evidence and information.

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

i. Weight of evidence 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 weight of evidence within eutrophication assessments. These assessments do not affect classification, which is done element by element, but are used to target measures to reduce nutrients.

The nutrient standards used for WFD classifications are based on an understanding of the links between nutrients and the biological impacts associated with eutrophication. There is uncertainty in the ability to use this knowledge to predict the impacts in particular water bodies; exceeding WFD nutrient standard alone is considered insufficient to judge the risk of impacts on the biology. As a result, the Environment Agency uses a weight of evidence approach in assessing eutrophication and targeting control measures.

The one-out-all-out principle for WFD status classification means that if nutrients are at less than good status then a water body is classed as moderate status, regardless of whether the biology is less than good status. Using the weight of evidence approach the Environment Agency assesses the evidence of the nutrients and also their impacts, using the plant and algal quality elements sensitive to nutrients and the certainty that these are, or are not, less than good status.

Wider evidence of eutrophication, for example, from investigations, is also taken into account, including gathering information from stakeholders, to increase certainty. This assessment of certainty of eutrophication does not affect the classification result but informs decisions on subsequent measures 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.

The Environment Agency has developed eutrophication assessments for water bodies at risk from nutrients for rivers, lakes, estuaries and coastal waters. These combine the latest classification results with wider evidence in a structured way to make best use of all relevant evidence in identifying whether there is a problem to solve in a given water body.

Initial assessments developed and made available for the consultation on the draft update to the river basin management plans have been updated to account for more recent

classification data and other evidence. These water body level assessments of eutrophication have been used in targeting the measures to tackle nutrients in the river basin management plans. The assessments are particularly important to the targeting of expensive regulatory measures such as phosphorus reduction at sewage treatment works.

Information elsewhere in the river basin management plans

- You can access the Weight of Evidence for Eutrophication method statements and results here: <https://ea.sharefile.com/d-s507566230314e438>

4.3. Changes since first cycle (new building blocks)

Water body status classifications are based on a set of building blocks. These building blocks are:

- the water body and monitoring networks
- the designation of artificial and heavily modified water bodies
- the standards and boundaries used in assessment
- the tools used to derive classification results for individual elements from monitoring data

A number of significant changes to these building blocks have been introduced for the second cycle of river basin management planning. These are:

- Updated standards are being used to determine good status for nutrients and some chemical substances. These new standards were developed as part of a UK-wide collaboration and were widely consulted upon.
- New chemical standards have been introduced as a result of the 2013 Environment Quality Standards Directive (EQSD) amendments.
- A second generation of biological classification tools to ensure biological classifications are better at reflecting local conditions.
- The size and shape of some water bodies have changed so that they become more logical management units.
- The process to designate heavily modified water bodies has been improved.

All of these changes have been introduced now so that the plans can be based on the best possible evidence.

Across England an extra £4.7 million has been invested in a new ecological monitoring programme for rivers. This means more biological surveys in more places and an emphasis on fixed sampling locations, making it easier to identify and report environmental improvement. An additional £1.5 million has been invested in new chemical monitoring.

For 2013, 2014 and 2015 the Environment Agency has produced two sets of WFD classification results:

- **Old Building Blocks:** these results are based on the same methodologies that produced the classification results reported in the 2009 plans. They are used to assess progress against the objectives set in the 2009 plans, including improvements in the quality of water bodies, as well as check for any potential deterioration against the 2009 baseline.
- **New Building Blocks:** these results contain the changes outlined above and set the baseline for the updated river basin management plans. They will help to inform future investigations and help determine appropriate measures and objectives.

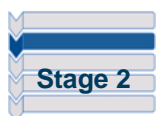
These changes will make a difference to the number of water bodies reported as being in high, good, moderate, poor and bad ecological status.

Supporting information

- The full description of changes to environmental standards can be found here: <http://www.wfduk.org/sites/default/files/Media/Environmental%20standards/UKTAG%20Environmental%20Standards%20Phase%203%20Final%20Report%2004112013.pdf>
- The full description of changes to biological methods can be found here: <http://www.wfduk.org/resources/category/biological-standards-200>
- You can view maps showing the changes to water bodies for the second cycle here: <https://ea.sharefile.com/d-s2d26ecc6c334298a>

4.4. Challenges

4.4.1. Significant water management issues



In 2013, the Environment Agency 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 river basin district. These significant water management issues are described in Part 1 of the river basin management plans as follows:

- **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 invasive non-native species:** the effect on the health of the natural environment of plants and animals from outside the UK introduced to UK waters and associated habitats.
- **Physical modifications:** changes made by people to rivers, lakes and estuaries, such as 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, and the loss of habitats.
- **Pollution from mines:** contaminated water draining from mines, most of which are now abandoned.
- **Pollution from rural areas:** the effects of poor agricultural practice and rural land management on the water environment (also known as 'diffuse rural pollution').
- **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 waste water:** waste water can contain a variety of pollutants including nutrients (such as phosphorus and nitrates), ammonia, faecal bacteria and harmful chemicals.

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 agriculture 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 water.
- A wide range of chemicals used in everyday life, some of which can adversely affect the environment, enter watercourses from point sources (i.e. industrial and sewage treatment effluents) as well as diffuse sources such as road run-off.
- Sewage treatment works and storm overflows are also important point sources of phosphorus, nitrate, faecal bacteria and sanitary pollution.

The sources of the main pressures acting on the water environment are summarised in the table below.

Table 3: Main sources of pressure on the water environment

		Significant water management issues – activity/source based						
		Changes to the natural flow and level of water	Negative effects of invasive non-native species	Physical modification	Pollution from mines	Pollution from rural areas	Pollution from towns, cities and transport	Pollution from waste water
Significant water management issues – pressure based	Abstraction and flow	✓						
	Chemicals				✓	✓	✓	✓
	Faecal contamination and sanitary pollutants					✓	✓	✓
	Fine sediment			✓	✓	✓	✓	✓
	Invasive non-native species		✓					
	Nitrates					✓	✓	✓
	Phosphorus and freshwater eutrophication					✓	✓	✓
	Physical modifications			✓				

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

Information elsewhere in the river basin management plans

- More information on significant water management issues, the ongoing measures that help prevent deterioration and protect the environment and the sectors that are involved in implementing the measures is available in Part 1 section 1.4 and 3.2.

i. Abstraction and flow

Abstraction is the removal of water, permanently or temporarily, from rivers, lakes, wetlands, canals, reservoirs or from groundwater. Water is abstracted to meet a wide range of uses. 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. Some current abstraction is unsustainable and causes environmental damage. Some abstractions also have associated impoundments, which can alter the water level or flow of rivers. The Environment Agency manages most abstraction and impoundment through a system of licensing. Abstraction licences specify how much water can be taken, over what period, where and when. Licences often contain other conditions to help protect the environment or other water users; breaching these conditions, abstracting without a licence when one is required, or taking too much water from rivers and groundwater may result in lower groundwater and flows and reduced river levels. This can affect wildlife and the look of a river as well as impacting on other water users.

In the short term, the current measures being taken to help restore sustainable abstraction are reducing the impact on some rivers and groundwaters. There are still significant challenges in addressing existing unsustainable abstraction. In future, population growth and development are likely to require or increase pressure for more water to be abstracted. A changing climate may affect both the demand for water and the amount present in rivers and groundwater. If abstraction continues at current rates, or increases, and natural water resources become depleted due to climate change, the existing impacts of abstraction on the water environment will be magnified. Large parts of England do not have any reliable new supplies of water available from rivers and groundwater to meet potential increased future demand.

The ecological condition of some rivers is forecast to deteriorate by 2030 unless further measures are taken to reduce or limit increases in 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.

Information elsewhere in the river basin management plans

- More detailed information about abstraction and flow as a significant water management issue then a technical summary ('pressure narrative') is available here: <https://ea.sharefile.com/d-s13685d2d8754fe29>

ii. Chemicals

Sources of chemicals

A vast range of chemicals are used every day, both at home and at work, some of which can adversely affect the environment. Many of these chemicals get into the water environment via sewers and sewage treatment works. Use of chemicals in everyday products is controlled through specific European legislation and although sewage treatment is generally very good at reducing the concentrations of many of these substances entering the environment, this is sometimes not enough to achieve the required Environmental Quality Standards (EQS) in rivers and lakes. This can be particularly challenging in some parts of

River basin management plans:

Part 2: River basin management planning overview

England that are urbanised and where sewage treatment plants discharge into small rivers. The challenge here is to strike the right balance between source controls and affordable ways to improve sewage treatment to help meet current and future EQS.

The Environment Agency is working with the water industry in England and Wales on a Chemicals Investigation Programme (CIP). This is a £multi-million programme that will analyse chemicals in discharges from 600 prioritised sewage treatment works and the rivers and coastal waters they discharge into. This will provide better understanding of emissions of chemicals from these sewage works and their effects on river quality. This programme also includes testing of new treatment technologies to see if innovative solutions might be cost effective, along with trials of ways to reduce chemicals from other sources such as urban run-off. The results will be used to inform measures to reduce the impacts of chemicals discharged from sewage treatment works in future planning cycles.

Other sources of chemicals include industrial activity and runoff from roads or farms. Some substances are already widespread in the environment as a result of historic use and so are difficult to tackle. Such historic use has resulted in contaminated land and sediment. Evidence suggests mining has led to significant emissions of metals into the water environment.

Understanding chemical risks and their effects on status

Some substances can cause localised environmental impacts in the water body they are discharged into, but others can accumulate in the food chain with potential impacts far away from their sources. Environmental Quality Standards (EQS) are concentrations of harmful chemicals in the water, or in animals that may be eaten, that should be safe for people or animals. These are used to assess the environmental risks and determine if the status of water bodies is good or whether it needs improvement. Some chemicals can also threaten the long-term sustainability of drinking water sources and lead to increased costs of drinking water treatment. Pollution of water sources with these chemicals may also hinder the transfer of water from areas with abundant supplies to those where supplies are scarce.

The Environment Agency has developed national risk assessments for the harmful substances with the widest potential environmental exposure in England. These have been used to target monitoring to confirm risks in the aquatic environment.

Based on water column EQSs about 97% of water bodies in England achieve good chemical status in 2015.

Until recently, assessing chemical status was based entirely on monitoring of water samples. Whilst this remains the case for most substances, for certain substances that can accumulate in food chains the European Commission (EC) has, since 2008, been introducing EQSs based on chemical concentration standards in the flesh of aquatic biota such as fish or mussels. This is a new approach and the EC developed guidance in 2014 which Member States are starting to implement. Applying biota standards may significantly affect good chemical status in the future. Exploratory work is however, first needed to find a robust approach to implement biota standards. This will ensure that decisions about classification and the action required can be made with confidence. In addition to utilising long-term data sets from the marine environment, the Environment Agency has undertaken a pilot monitoring programme for these substances at selected freshwater sites. A preliminary assessment of data from freshwater sites over 2014-15 and transitional and coastal water datasets indicate that two substances (Hexachlorobenzene and Hexachlorobutadiene) will have no impact on good status. The situation for polycyclic aromatic hydrocarbons (PAHs) is less clear although the indications at this stage are that failures of the biota EQSs for benzo-a-pyrene and fluoranthene may be more localised. Significant and widespread failures are predicted for some chemicals which are banned or highly regulated, notably mercury and brominated flame retardants (BFRs). Biota levels are

yet to be assessed against standards for five new priority substances (and groups of substances) that are due to be introduced in 2018.

The Environment Agency has developed 'chemical narratives' for mercury, PAHs and BFRs because of the complexity in assessing their environmental risks. These collate information on emissions, risk assessments, trends and monitoring (in the water column and where available in biota). These provide a more in depth assessment of the current state of knowledge of these chemicals.

Emissions Inventory

The Environment Agency has been developing an Emissions Inventory, which is available for the first time in these river basin management plans, to provide a better understanding of the sources of priority substances. The inventory will be updated in each successive river basin planning cycle. In time this will allow observation and reporting to the European Commission on trends in emissions, discharges and losses for these substances.

Information elsewhere in the river basin management plans

- You can access the emissions inventory and chemicals narratives for some of the key pollutants as well as information on the performance of analytical methods used when monitoring chemicals here: <https://ea.sharefile.com/d-sab675d1e4d74e5e8>

Supporting information

- Estimates of emissions, discharges and losses for each priority substance have been determined according to the guidance set out in Technical Guidance document number 28 here: http://ec.europa.eu/environment/water/water-framework/facts_figures/guidance_docs_en.htm

iii. Faecal contamination and sanitary pollutants

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 in surface waters. Climate projections suggest that there is likely to be increased contamination from farmland and urban runoff due to compacted soils and less frequent but more intense summer rainfall events. These events may also cause an increased frequency of combined sewer overflow operation and sewage treatment plant 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 means that shellfish harvested for consumption have to be treated 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, but less so in shellfish flesh because shellfish filter feed and accumulate bacteria.

Ammonia, dissolved oxygen and biochemical oxygen demand (BOD) 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 BOD, 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. Although a small number of estuaries and coastal waters have problems from reduced amounts of dissolved oxygen, sanitary pollutants are generally an issue for rivers. 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. The Environment Agency is working with the Drinking Water Inspectorate and local councils to see how the need for purification treatment at private supplies can be managed.

Information elsewhere in the river basin management plans

- If you would like more detailed information about faecal contamination and sanitary pollutants as a significant water management issue then technical summaries ('pressure narratives') are available here: <https://ea.sharefile.com/d-s13685d2d8754fe29>

iv. Fine sediment

Too much fine sediment causes a range of problems such as damaging wildlife, increasing the costs of treating drinking water and increasing risk of flooding from silted up drains. Sediment has direct impacts (smothering plants, fish eggs and freshwater invertebrates) and indirect impacts such as 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 runoff) and the erosion of riverbanks and road verges.

Climate projections 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 upland stream systems which may affect fish spawning grounds.

Information elsewhere in the river basin management plans

- If you would like more detailed information about fine sediment as a significant water management issue then a technical summary ('pressure narrative') is available here: <https://ea.sharefile.com/d-s13685d2d8754fe29>

v. Invasive non-native species

Invasive non-native species (INNS) of plants and animals are one of the biggest threats worldwide to biodiversity after habitat loss and destruction. The annual cost of INNS to the English economy is estimated at £1.3 billion. These costs include control and eradication, structural damage to infrastructure or loss of production due to the presence of INNS. The pressure from INNS is increasing due to more species being introduced, through increasing international trade and travel, and due to the spread of established species. Climate change may increase the survival, proliferation and spread of these species further. Managing invasive non native species by preventing their introduction, spread and establishment reduces the risk of deterioration, and allows measures for other pressures to achieve their objective of good.

Information elsewhere in the river basin management plans

- If you would like more detailed information about INNS as a significant water management issue then a technical summary ('pressure narrative') is available here <https://ea.sharefile.com/d-s13685d2d8754fe29>

Supporting information

- The non-native species secretariat website provides tools and information about non-native species: <http://www.nonnativespecies.org/home/index.cfm>

vi. Nitrates

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

In 2009, 46% (124 out of 268) of groundwater bodies in England were classified as being at poor status, with nitrate implicated in 57 of these. In 2015, 45% (123 of 271) of groundwater bodies are now at poor status, with nitrate being responsible for 100 (81%) of those failures. Nitrate is the biggest single water quality issue in groundwater drinking water protected areas (DrWPAs). Of the groundwater safeguard zones that have been set up to reduce risks to particular drinking water abstractions, 84% are affected by high nitrate concentrations.

Around 58% of the land area of England is designated as nitrate vulnerable zones (NVZs) under the Nitrates Directive because fresh surface waters or groundwater have elevated nitrate concentrations or waters are affected by eutrophication. The Nitrates Directive aims to prevent and reduce nitrate pollution from agricultural sources.

Nitrate is a concern in the context of drinking water resource protection, with a 50 mg/l standard to be met in tap water. It is also the main nutrient involved in eutrophication of estuaries and coastal waters, one of the main issues for these waters. Recent scientific evidence 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.

Information elsewhere in the river basin management plans

- If you would like more detailed information about nitrates as a significant water management issue then a technical summary ('pressure narrative') is available here: <https://ea.sharefile.com/d-s13685d2d8754fe29>

vii. Phosphorus and freshwater eutrophication

The main sources of phosphorus in freshwaters are sewage effluent and agricultural drainage. Sewage effluent remains the largest source entering rivers, contributing about 70% of the loading nationally. There are several sources of phosphorus within sewage, notably human metabolic wastes, food additives, detergents and the dosing of drinking water with phosphorus to control lead levels.

Estimates vary but agriculture is likely to be responsible for about 25% of phosphate in water, where good status standards are not achieved, with significant variation between and within catchments. For lakes, drainage from agricultural land is generally the largest source of phosphate. Preliminary findings indicate that a reduction in agricultural load of 45% would

be needed to meet current river phosphate standards and 56% to achieve revised phosphate standards.

Concentrations of phosphorus in English rivers have been falling since 1990, supported by major reductions in phosphorus inputs from sewage treatment works through investment by the water industry to meet EC directives. Despite this progress, phosphorus remains the most common cause of water quality failures in England, with 44% of monitored river water bodies exceeding the original phosphorus standard for good status and 58% exceeding the new (2015) river phosphorus standards based on the 2014 WFD classifications. In addition, 74% of monitored lake water bodies currently exceed the phosphorus standard for good status. Population growth will increase the amount of phosphorus entering sewage treatment works in some areas which, without intervention, may slow or reverse improvements. Climate change may exacerbate the future extent and severity of eutrophication problems.

Information elsewhere in the river basin management plans

- If you would like more detailed information about phosphorus as a significant water management issue then a technical summary ('pressure narrative') is available here: <https://ea.sharefile.com/d-s13685d2d8754fe29>

viii. Physical modification

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 affected if the quantity and quality of water flows is altered and if habitat quality is reduced. Modifications such as straightening river channels, building weirs and reinforcing banks with concrete can constrain and stabilise the physical nature of water bodies, reducing the development and diversity of physical habitats. This can 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.

Most rivers, lakes and a large part of England's coasts 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, while also reducing their potentially damaging 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.

Information elsewhere in the river basin management plans

- If you would like more detailed information about physical modification as a significant water management issue then a technical summary ('pressure narrative') is available here: <https://ea.sharefile.com/d-s13685d2d8754fe29>

4.4.2. Issues affecting protected areas

Protected areas are a priority for action. The same pressures that lead to water bodies not being in good status frequently also lead to protected areas not meeting their objectives.

i. Drinking water protected areas

There are 486 surface water DrWPAs in England. All groundwater bodies have been identified DrWPAs. The main substances affecting surface water DrWPAs are pesticides, colour and nutrients. The main issue for groundwater DrWPAs is excessive nitrate.

Information elsewhere in the river basin management plans

- You can access a DrWPA technical evidence summary ('pressure narrative') here: <https://ea.sharefile.com/d-s13685d2d8754fe29>

ii. Economically significant species

Faecal contamination of shellfish waters originates from multiple points and diffuse sources including:

- sewage treatment works
- combined sewer overflows (CSOs)
- emergency sewer overflows
- urban surface water runoff
- rural diffuse pollution from wildlife, farm livestock and human sources.

Data on reasons for not achieving good status indicate that CSOs contribute to 27%, sewage treatment works 29% and agriculture 22% of failures in shellfish protected areas. Shellfish protected areas that do not robustly meet the relevant shellfish flesh standard each have an action plan which specifies the cost-beneficial measures required to improve water quality.

Information elsewhere in the river basin management plans

- You can access the shellfish action plans here: <https://ea.sharefile.com/d-s84c5554e50947dbb>

iii. Recreational Waters (Bathing Waters)

The most significant sources of pollution affecting bathing water compliance are:

- sewage treatment works
- combined sewer overflows (CSOs)
- faeces from grazing animals
- urban drainage including misconnections and urban surface water run-off which contains dog and bird faeces
- birds and animals on the beach

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. There have been many improvements to sewage treatment works near bathing waters. Current source apportionment suggests agriculture could contribute anything from 30-80% of the risk depending on the site, while sewage treatment works and CSOs contribute to the remainder.

The Environment Agency is focusing on bathing waters that are likely to be poor at the end of 2015 to ensure that the bathing waters with the most severe problems are addressed but any waters at risk of deteriorating in quality are also being prioritised. Plans are in place that include water company improvements, working with the agricultural sector, tackling urban runoff and misconnections and making investigations in those areas where causes and effects of pollution are uncertain. Measures including water company actions are also being developed to increase the number of bathing waters that are classified as good or excellent.

iv. Nutrient sensitive areas (sensitive areas under the UWWTD)

There are two types of sensitive areas involving nutrients. Firstly freshwaters, estuaries or coastal waters adversely affected by eutrophication due wholly or in part to urban waste water discharges. Secondly surface freshwaters used for drinking water abstraction that have high nitrate concentrations and which are downstream of large waste water discharges. The number of designated areas is summarised in section 4.2.1.iv.

v. Nutrient sensitive areas (nitrate vulnerable zones under the Nitrates Directive)

58% of England is designated as nitrate vulnerable zones due to elevated nitrate concentrations in freshwaters or eutrophication. Agriculture is estimated to account for some 60% of nitrate entering surface water and 45% in groundwater in England, with significant variation between and within catchments. There have been widespread but modest improvements in river nitrate levels, but for groundwater the picture is more mixed. In some water bodies there are improvements but in others there is continued deterioration as nitrate continues its journey to deeper aquifers.

vi. Natura 2000 protected areas

Natura 2000 protected area sites are affected by a wide range of issues including diffuse water pollution, modified habitats, invasive non-native species and abstraction and changes to flow and water levels.

4.4.3. Assessing risk

i. General approach to assessing risk



Article 5 of the WFD requires member states to identify pressures acting on each water body. 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 directive.

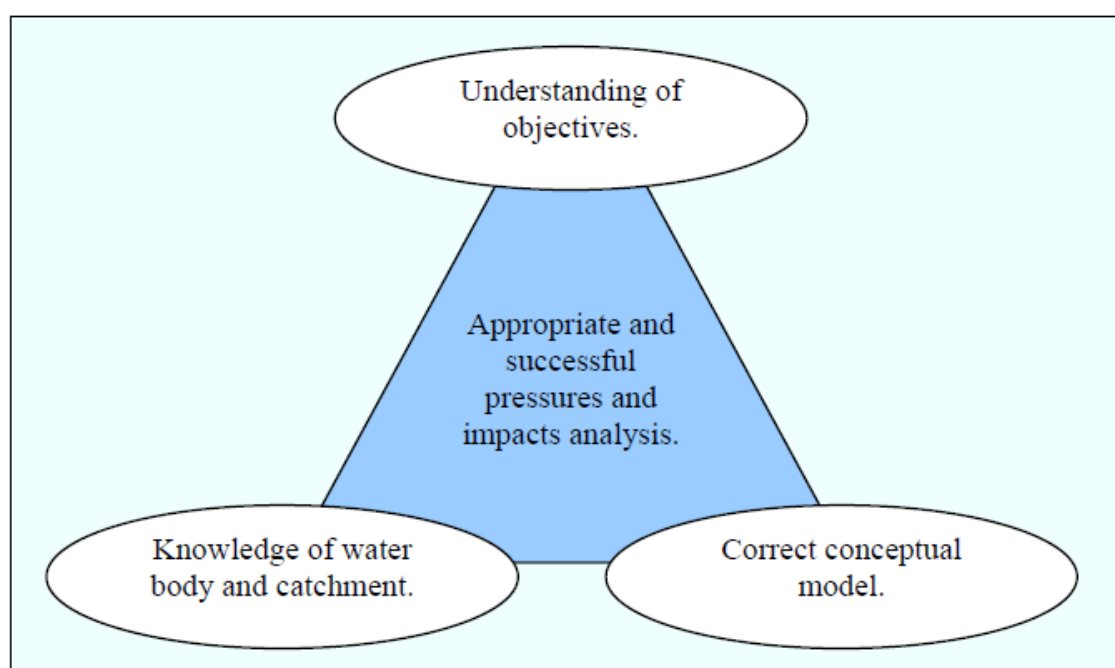
Risk assessments produced for the 2009 plans have been reviewed. Where new data and information was available the risk assessments have been updated. The table below shows the updated risk assessments that are available for the plans and the environmental objectives to which they relate.

Table 4: Updated risk assessments

	Environmental Objective						
	Aim to achieve good ecological status			Prevent deterioration			
Risk Assessment	2015	2021	2027	2015	2021	2027	2050
Chemicals & metals	✓						
Eutrophication	✓						
Phosphorus				✓	✓		
Faecal indicator organisms						✓	✓
Sanitary pollutants				✓	✓		
Sediment	✓						
Abstraction & Flow			✓			✓	
Physical modification	✓						
Groundwater Chemical			✓			✓	
Groundwater Quantitative			✓			✓	
Invasive non-Native Species				✓	✓	✓	✓
Acidification (Wales)				✓	✓	✓	

A successful risk assessment is one in which there is a proper understanding of the objectives, a good description of the water body and catchment area (including monitoring data), and knowledge of how catchments function, as illustrated in the diagram below.

Figure 8: Elements of a risk assessment



The current risk of failing to achieve good status or the risk of deterioration in status by 2015 can be informed by classification results and by an understanding of pressures acting upon a water body and the sensitivity of that water body to those pressures. Projections of risk beyond 2015 are more reliant on forecasts of future changes in activities and associated pressures such as changes in population size, land use and climate.

Each updated risk assessment followed a 4 step process:

1. Describing the driving forces such as land use, urban development, industry, agriculture and other activities which lead to pressures, without regard to their actual impacts.
2. Identifying activities or changes in activities that may result in a significant pressure or changing magnitude of the pressure acting on a water body (presenting a risk of failing to meet WFD objectives).
3. Considering the susceptibility of a water body to an impact that might result from the pressure.
4. Evaluating the likelihood of failing to meet a WFD objective.

Where information such as data, modelling outputs or expert judgement was available an estimation of the magnitude of the pressure could be made. The confidence associated with each risk assessment varies relative to the level of understanding, availability of information and the geographical scale at which information was available. For example, robust local data provides greater confidence for a water body assessment than regional or national data.

ii. Using risk assessments

WFD requires risk information to be used to optimise the design of the monitoring programmes (Article 8) and the programmes of measures (Article 11). Many other aspects of catchment scale planning will also be partly informed by the water body risk assessments:

- 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

Information elsewhere in the river basin management plans

- Risk assessment method statements are available here: <https://ea.sharefile.com/d-s907bd03e9e74b74a>
- Maps showing risk assessment results are available here: <https://ea.sharefile.com/d-sd0f63dc4a3b4f008>

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 measures that could be taken to improve the status to good. In order to identify appropriate measures 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 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, the type and source of the problem are also identified. This consists of 3 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, such as arable field, sewage discharge (continuous) or flood protection structures
- tier 3: sector, for example, agriculture and rural land management, water industry or Environment Agency

If more than one reason for not achieving good 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. So 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 reason for not achieving good 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 reason for not achieving good 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 reason for not achieving good status. The available evidence should demonstrate cause and effect in a way that would be compelling to all stakeholders.
 - No further investigations into the reasons for not achieving good 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 measures to address the problem. The source apportionment information informs the targeting of effort and where appropriate, the analysis of the costs and benefits of any measures. The same approach is used for recording reasons for deterioration.

Information elsewhere in the river basin management plans

- You can view a summary of the reasons for not achieving good status for water bodies in England here: <https://ea.sharefile.com/d-s9a6aac8d0f444e38>
- You can find a summary of the reasons for not achieving good status for water bodies in the river basin district in Part 1 Section 5 Summary Statistics

5. Identifying measures and updating objectives

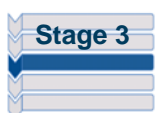
Summary of this section

This section sets out the overall process for reviewing and updating objectives for Natura 2000 protected areas and water body status objectives. It describes the role of economic appraisal in the process and describes the objectives.

Topics covered:

Process for reviewing and updating objectives; economic appraisals; water body status objectives; alternative objectives and justifications

5.1. Reviewing and updating objectives for Natura 2000 protected areas



Under WFD the objectives for Natura 2000 protected areas are to protect or improve the status of the water environment to the extent necessary to contribute to the maintenance of, or restoration to, favourable conservation status of the water dependent interest features.

Where a Natura 2000 protected area coincides with one or more water body, WFD ecological status objectives apply in addition to the requirement to achieve favourable conservation status of the water dependent interest features.

Where objectives can be aligned, the most stringent objective applies. For example, if a certain concentration of phosphorus is needed to achieve good ecological status and a more stringent value is needed to achieve a site's conservation objectives, then the latter applies. Where Natura 2000 protected areas and water bodies coincide, the objectives will be complementary, so that good ecological status will support achievement of conservation objectives and vice versa.

It is possible for a water body to meet the objectives for good status but fail the Natura 2000 protected area objective where that objective may be more stringent. It is also possible to meet the Natura 2000 protected area conservation objectives (for example, for a Special Protection Area (SPA) for wetland birds) but fail to achieve good status in a coincident water body because the WFD may require action to protect and restore a wider range of ecological elements.

5.1.1. Aligning objectives for Natura 2000 rivers, lakes, estuaries and coastal waters

Following a review by the UK Government's statutory nature conservation advisor the Joint Nature Conservation Committee (JNCC) of 'common standards monitoring guidance' (CSMG) for rivers, targets for flow and some water quality parameters, including phosphorus, have changed for some Natura 2000 protected areas. The application of revised CSMG on relevant sites has been reviewed and where possible agreed through local discussions between Natural England and Environment Agency.

For a limited number of lake sites the only parameter where alignment of standards was reviewed was phosphorus and so this work was undertaken jointly at a national level.

The relevant targets, determined by reference to CSMG, WFD or local agreement for these river and lake sites are identified in documents linked from the Site Improvement Plans that are hosted on Natural England's 'Access to Evidence' pages.

These are target values for restoration of water quality and flow in order to meet the conservation objectives for the Natura 2000 protected areas. Achieving the conservation objective targets may take longer than the next six years therefore, where possible, interim progress goals have also been agreed locally. The aim is to achieve the interim progress goals by 2021. Where there is confidence that the interim goals can be achieved the corresponding water body element objectives reflect this. Unlike CSMG based objectives, water body element objectives are expressed as a status class, each of which represents a range of values, for example, phosphorus concentrations. This means that the water body element objective can only give an indication of the numerical standard that has been determined as necessary for Natura 2000 protected areas. Therefore the agreed numerical values for the interim goals and CSMG targets for Natura 2000 protected areas are also being made available (see box below). These numerical values will inform planning and permitting decisions during the second cycle of river basin management planning and reflect the advice of Natural England about the quality of the environment needed to achieve the objectives of Natura 2000 sites.

Where feasible, the same approach to locally agreeing objectives on SAC rivers has been taken for some non-Natura 2000 protected area SSSIs rivers, with the aim of ensuring that targets agreed to achieve WFD objectives also support achievement of CSMG targets for these nationally designated SSSIs.

In estuaries and coastal waters one of the main concerns is the impact or risk of eutrophication. The objectives for relevant elements in these water bodies will be broadly similar across WFD and Natura 2000 protected areas and a comparable weight-of-evidence based approach to identifying affected waters is being applied. The objective of good ecological status for key biological elements will generally meet the needs of Natura 2000 sites (except where the objective is to maintain high status). Local discussion will be needed to refine and determine the objectives for each particular estuary and coastal water body.

Supporting information

- High level Natura 2000 site conservation objectives can be found at: <http://www.naturalengland.org.uk/ourwork/conservation/designations/sac/conservationobjectives.aspx>
- For more information on the review of Common Standards Monitoring for freshwaters see: <http://jncc.defra.gov.uk/page-2232>
- For information on the evidence for assessing flow, nutrients and organic pollution targets for protected river habitat see: <http://publications.naturalengland.org.uk/category/432368>
- To access the numeric targets for specific Natura 2000 river and lake sites (and some non-Natura 2000 rivers) see the document linked from within the SIP: <http://publications.naturalengland.org.uk/category/4878851540779008>
or directly here for rivers: <http://publications.naturalengland.org.uk/category/432368>
or here for lakes: <http://publications.naturalengland.org.uk/publication/4841829396643840?category=430388>
- For details of Natural England local offices see: <https://www.gov.uk/government/organisations/natural-england#org-contacts>
- For details of Environment Agency local offices see: <https://www.gov.uk/government/organisations/environment-agency>

5.2. Reviewing and updating water body status objectives



Water body status objectives describe the long term aim for specific parts of the water environment. Identifying appropriate water body status objectives and the measures that are needed to achieve them is at the heart of the river basin management planning process.

The water body status objectives in the plans are legally binding; that is, the Secretary of State and Environment Agency must exercise their functions to comply with the WFD and this includes the environmental objectives. All public bodies must have regard to the river basin management plans which sets out water body status objectives when exercising their functions that could affect the quality of the water environment

Water body objectives consist of two pieces of information: the status (such as 'good') and the date by which that status is planned to be achieved (for example, 'by 2021').

The status part of an objective is based on a prediction of the future status that would be achieved if technically feasible measures are implemented and, when implemented, would give rise to more benefits than they cost. The objective also takes into account the requirement to prevent deterioration and, as far as practicable, the requirements of protected areas. For example, some elements in water bodies that are part of a Natura 2000 protected area site are also important in supporting the conditions on which the protected area depends. In these cases appropriate objectives for the relevant elements have been set. In most cases this will be to achieve at least good status, but could mean aiming to achieve high status.

The date part of an objective is the year by which the future status is predicted to be achieved. The date is determined by considering whether the measures needed to achieve the planned status are currently affordable and, once implemented, the time taken for ecology or the groundwater to recover.

The default status objectives for the second cycle river basin management plans are:

- where good status has already been achieved, to maintain this status to comply with the requirement to prevent deterioration
- in other cases to aim to achieve good or better by 2021
- in addition, where first cycle objectives for 2015 have not been met these must be met as soon as practicable.

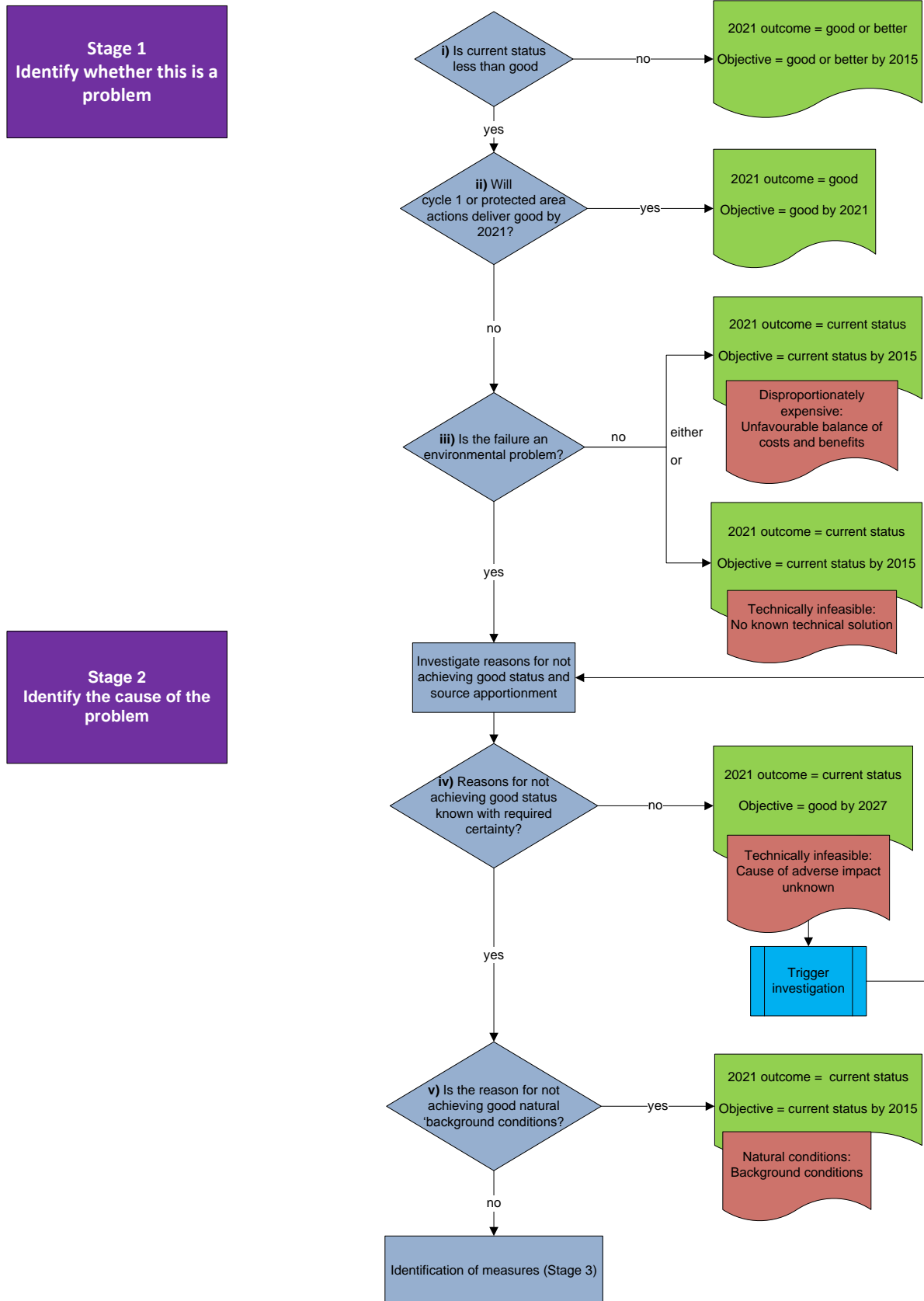
For surface waters objectives were reviewed and updated for ecological and chemical status. For artificial or heavily modified water bodies objectives were reviewed and updated for ecological potential and chemical status. For groundwater objectives were reviewed and updated for quantitative and chemical status.

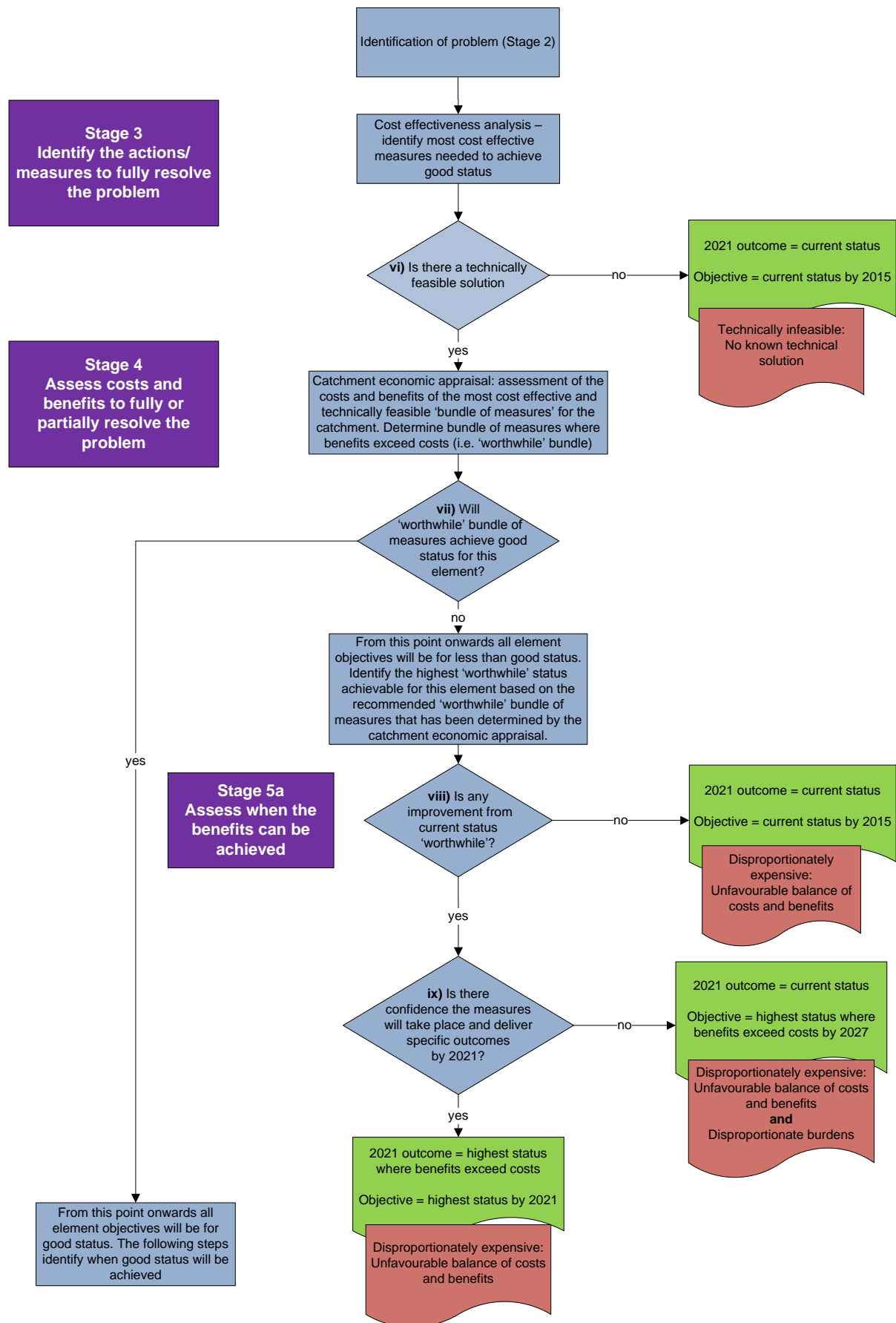
The overall process for reviewing and updating water body status objectives is set out in the flow chart below.

Information elsewhere in the river basin management plans

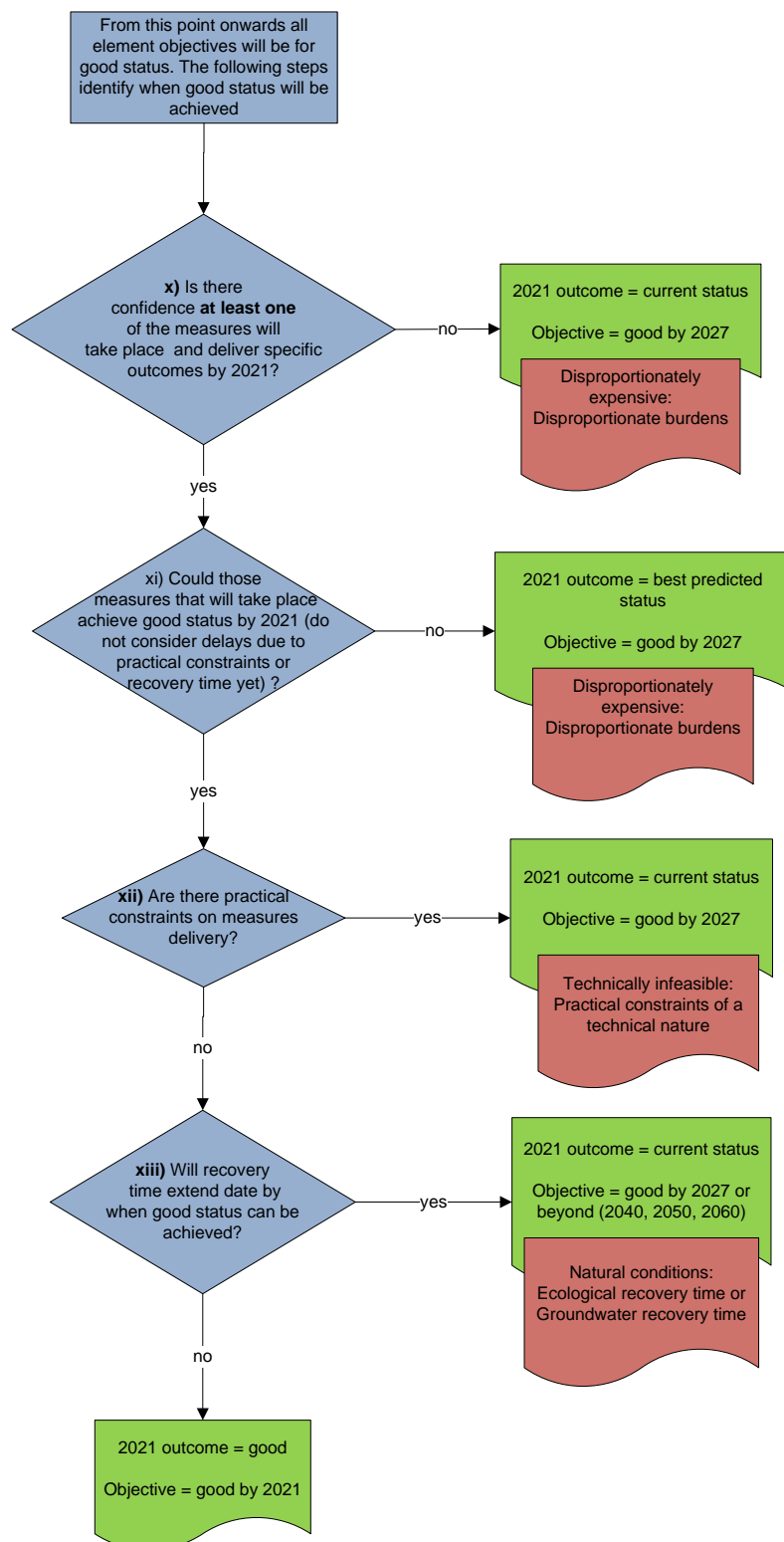
- You can view the status objectives for all water bodies in England here: <https://ea.sharefile.com/d-s0faa355450243538> and summary tables of the information here: <https://ea.sharefile.com/d-s9a6aac8d0f444e38>
- The Environment Agency's internal guidance on objective setting is available here: <https://ea.sharefile.com/d-sd34a710e1734b368>

Figure 9: Process for reviewing and updating water body status objectives





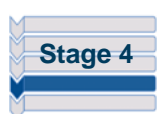
Stage 5b
Assess when the benefits
can be achieved



5.3. Economic appraisals

In 2005, in preparation for the 2009 plans, a wide-ranging economic analysis was carried out and reported through a collaborative research programme overseen by UK authorities (in England this was undertaken by Defra) and stakeholder organisations. As a result Article 5 'Economic Analysis of Water use' reports were produced that describe the socio-economic characteristics of each river basin district and sectors' use of water. These reports have been reviewed for the river basin management plans but not updated as the socio-economic characteristics have not significantly changed.

Defra and the Environment Agency will continue to develop an economic analysis to provide evidence for water policy development. Future economic analysis will include projections of bills for water and sewerage services for household and non-household customers using a commissioned model. Where new policies or changes in water-related policy are considered, in line with government practice, appropriate economic analysis will be carried out.



The Environment Agency, as a public body seeks to identify those areas where money could be spent to achieve the best outcomes for society.

Stage 4 of the objective setting process is catchment economic appraisals to assess the benefits, cost and any negative impacts of implementing measures to improve the water environment. The Environment Agency has designed a robust approach, based on HM Treasury guidelines, that is proportionate and fit for purpose. The approach is designed to aid decision making on setting objectives.

Water Appraisal Guidance and associated cost benefit analysis tools have been developed in consultation with a range of stakeholders. The features of the economic appraisal approach are that:

- It is catchment based, covering all water body types. This is important to help achieve integrated and cross pressure management of the water environment.
- It is about identifying the greatest level of improvement that is justified where the benefits to the environment and society outweigh the cost of implementing measures.
- It builds up a broad picture of the environmental outcomes and benefits of measures in a descriptive way, using an ecosystem services framework, and includes a monetary estimation of the major benefits.
- It is a systematic and transparent framework that helps engagement with others in managing the water environment.

The results of the economic appraisals help ensure that wider benefits and the value of the water environment are taken into account in decision making.

Information elsewhere in the river basin management plans

- You can access Article 5 'Summary of economic analysis of water use' reports for each of the current river basin management plans here: <http://webarchive.nationalarchives.gov.uk/20080305115859/http://www.defra.gov.uk/environment/water/wfd/economics/index.htm>

Supporting information

- You can access a training package on the economic appraisal approach followed by the Environment Agency here: <https://ea.sharefile.com/userinvitations-register.aspx?id=ia2938a7e56f442aa>
- You can access the economic appraisal tools and guidance here: <https://ea.sharefile.com/download.aspx?id=s6301ad0ba704e9b9>

5.3.1. Measures assessed in economic appraisals

The measures included in economic appraisals are considered to be technically feasible and the most cost effective way of improving the water environment. Measures for a catchment are grouped together into a bundle so all costs and the range of benefits can be taken account of and assessed together. This approach recognises the interdependencies within a catchment.

The catchment economic appraisals focused particularly on measures to achieve improvements in water body status, where information on costs and benefits are required to inform objective setting. Other measures (and their costs and benefits) relating to certain protected area objectives and measures that specifically prevent a water body deteriorating were considered at national level rather than in the catchment economic appraisals. Different considerations apply to different categories of protected areas.

Costs are from local and national sources and are based on previous experience of implementing similar measures. Where more specific, local cost information is available this has been used in place of national estimates.

If the bundle of measures to improve all water bodies in the catchment to good status or potential is not considered to be justified (the cost of implementing the measures outweighs the benefits to the environment and society), or would have significant adverse effects on the wider environment, an alternative bundle of measures has been appraised.

5.3.2. Consideration of disproportionate cost

In some cases it is considered disproportionately expensive to get water bodies to good status or good potential by 2021. Disproportionate cost is a political judgement informed by economic information. Among the economic information relevant to assessing disproportionate costs are: costs, benefits and “affordability” or available resources.

Evidence that the negative consequences of actions (compliance costs, impacts on non-water outcomes) outweigh the positive consequences (benefits of water environment improvements) tends to suggest disproportionate cost.

Consideration of costs and benefits of a bundle of measures is used to identify the long term objectives that are justified. Availability of resources is more relevant to the speed at which the objectives can be achieved. In some cases, even if the benefits are greater than costs for a bundle of measures, an extended deadline has been proposed because of affordability issues. Therefore consideration of costs and benefits helps to determine the status part of a proposed water body objective and information on affordability helps to propose the date by which that status can be achieved.

Where affordability is an issue, alternative financing mechanisms are considered. This might mean moving from the preferred option of the ‘polluter pays’ approach to a ‘beneficiary pays’ approach. If the beneficiary (those who directly benefit from the improved water status) is unable or unwilling to pay, other sources of funding may need to be considered.

The hierarchy for funding measures to resolve or mitigate an environmental problem is:

1. Polluter pays - the person whose activity causes (is at risk of causing or has caused) an environmental problem pays.
2. Beneficiary pays - the person who will benefit from the improvement (or reduced risk) to the environment pays (sometimes called payment for ecosystem services; PES).
3. Government pays - the UK government directly or indirectly (via EU, central and local government) pays.

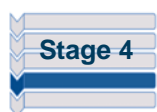
Table 5: Potential funding sources

Funding Stream	Use/restrictions
Polluter pays	
Private/business finances (power generation, ports, mines and quarries)	Fund improvements to the environmental performance of a business's own activities.
Water company customer bills	Reduce the impact on the environment of water company activities.
Defra grant-in-aid for flood and coastal risk management (FCRM)	Funds maintenance and enhanced flood and coastal risk management activities, including reducing or mitigating the environmental impact of FCRM activities.
Environmental mitigation and enhancement associated with a new permitted activity	Implement environment enhancements to mitigate the potential damage caused by a new or modified permitted activity. For example requirement to install a fish pass on an existing weir associated with a hydropower application.
Voluntary industry funded initiatives (for example the Pesticide Voluntary Initiative)	Funds voluntary action to reduce the potential environmental impact of potentially damaging activities.
National and regional supporter funded organisations and charities (for example the Campaign for the Farmed Environment, CFE)	Fund advice on the environmental performance of their members and the wider industry.
Environment Agency Water Resources standard unit charge	Water Resources Capital Programme - reduce the environmental impact of Environment Agency water resources regulatory activities, for example improved fish passage around gauging stations.
Environment Agency's Environmental Improvement Unit Charge (EIUC)	Pay compensation for Environment Agency initiated abstraction licence changes (Restoring Sustainable Abstraction programme) to reduce licensed volume. Compensation is no longer applicable for water companies as a result of provisions in the Water Act 2014
Beneficiary pays (payment for ecosystem services)	
Water company customer bills	Catchment initiatives where water company is the primary beneficiary, for example providing advice or direct payments to farmers to restrict the use of pesticides in drinking water catchments.
Business plans of national and regional supporter funded organisations and charities (for example National Trust, RSBP, Canal & River Trust)	Fund improvements or advice on the environmental performance of their own assets and operations or elsewhere. Provides benefits for their supporters and the wider community.
Developer contributions (community infrastructure levy)	Payment for environmental enhancements associated with land use development.
Local voluntary funding	Funding sourced and agreed locally to undertake environmental enhancements.
Environment Agency rod licence	Fish stocking and improvements of direct benefit to anglers such as habitat improvements, fish passes, fisheries development and improvement.

Funding Stream	Use/restrictions
Government pays	
Common Agricultural Policy (CAP), New Environmental Land Management Scheme	Agri-environment funding supplementary WFD & biodiversity improvement measures. Includes small capital grants to improve efficiency of voluntary adoption in targeted areas.
CAP - Basic Farm Payment (BFP)	Funding dependent on cross compliance measures, for example soil protection review.
CAP – Greening	Funding as part (30%) of Basic Farm Payment. 5% of agricultural land in ecological focus areas. Mandatory if claiming BFP.
National Growth Programme (covering European Structural Funding including ERDF and ESF)	Local Enterprise Partnerships (LEPs) have written EU Structural and Investment Fund Strategies according to government guidance, some regeneration activities include actions to protect the environment and promote resource efficiency.
Government contribution to water company customer bills (currently South West Water)	Short term funding of water company activities to reduce the impact of water customer bills on vulnerable groups.
Defra grant-in-aid for flood and coastal risk management (FCRM)	Environmental enhancements beyond those connected directly with Environment Agency FCRM activity where FCRM provides the most cost effective way of addressing the issue.
Defra Water and Abandoned Metal Mines programme	Funds environmental improvement to reduce the environmental impact of abandoned metal mines, undertaken by Environment Agency and the Coal Authority.
DECC Coal mine water environment programme	Funds environmental improvement to reduce the environmental impact of abandoned coal mines, undertaken by the Coal Authority.
Defra grant-in-aid for Water Framework Directive	Environment Agency, Natural England and Forestry Commission implementation of WFD non-baseline improvements, either directly or via third parties.
Defra WFD Catchment Partnership Action Fund	Fund WFD non-baseline improvements by third sector groups, administered by Environment Agency with specific grant giving powers.
Defra grant-in-aid for Canal and Rivers Trust (CRT)	Reduce the impact of CRT activities.
National Lottery - HLF, BIG	Funds projects with outcomes for people, communities and heritage which include natural heritage and environment.
EU LIFE	Projects demonstrating innovative approaches at EU level to WFD implementation.
EU INTERREG	Growth driven partnership projects that improve local economies.
European Marine and Fisheries Fund (EMFF)	Administered by the Marine Management Organisation. UK priorities will include measures to promote sustainable fisheries and aquaculture.
European Social Fund (ESF)	Can fund work undertaken by voluntary and community organisations for environmental improvements etc.
Landfill Tax Credits Scheme	Where Trust supports this and local group eligible to apply.

5.4. Alternative objectives

5.4.1. Alternative objectives for water bodies



Where certain conditions apply (see section 3.1.4) and are met then alternative objectives have been set for water bodies; these involve taking an extended time period to reach the objective or meeting a lower status or a combination of both.

In some water bodies it is recognised that time constraints on putting actions in place, or the time taken for the environment to respond once actions are implemented, mean that the objective will only be achieved over more than one river basin management planning cycle.

An objective of less than good status is set where:

- there is currently no solution to the problem
- the costs of taking action exceed the benefits
- background conditions in the environment mean achieving good status is not possible

Finally, where there is genuine scientific uncertainty about the causes of problems, or where the causes are still being investigated, the objective remains one of aiming to achieve good status but with an extended deadline.

Information elsewhere in the river basin management plans

- You can view the status objectives for all water bodies in England here: <https://ea.sharefile.com/d-s0faa355450243538> and summary tables of the information here: <https://ea.sharefile.com/d-s9a6aac8d0f444e38>

5.4.2. Alternative objectives for Natura 2000 Protected Areas

For the purposes of these river basin management plans Natural England consider a Natura 2000 site to be meeting its conservation objectives when all the necessary water-related measures have been completed, that is, no further intervention is required, so that only time is needed for the biological features of the site to recover. Not all the measures necessary to achieve Natura 2000 protected areas objectives were completed in time for the December 2015 deadline required by WFD. As a result of reviewing these objectives the deadline for achieving the objectives for some Natura 2000 protected areas has been extended.

For many sites the time needed for recovery may be considerable, potentially decades. Despite this, ecological recovery time has not been used as a reason for extended deadlines because until all the measures have been implemented it is difficult to determine how long sites will take to recover.

Since the 2009 plans were published, the Improvement Programme for England's Natura 2000 Sites (IPENS) has developed site improvement plans (SIPs) for all Natura 2000 sites in England, including those that are protected areas under WFD. SIPs are a new approach to capturing the issues and identify new measures that are required to achieve favourable conservation status, manage threats and prevent deterioration. SIPs also identify the date by when new measures are likely to be implemented. The IPENS project also published 'theme plans', which are high-level plans aimed at improving the way in which the Natura 2000 network issues are managed.

The information in SIPs and theme plans, along with advice from Natural England has been used to identify which measures could not be completed before 2015. Where SIPs along with expert opinion indicate that not all of the measures necessary to achieve these

protected area objectives will be implemented before 2021 and the information in the SIPs supports an extended deadline under Article 4.4 of the WFD, the deadline has been extended to 2027.

The information on extended deadlines for Natura 2000 protected areas summarises the reasons for an extended deadline on each site.

The specific reasons for extended deadlines for each Natura 2000 protected area are provided in a linked data table (see supporting information below) and draw on the information in SIPs and national expert understanding of the actions required.

The information from objective setting for water bodies, the new information from SIPs and the IPENS theme plans and the expert advice of Natural England provide a more complete picture of the use of, and reasons for, extended deadlines for achieving Natura 2000 objectives.

Supporting information

- The Site Improvement Plans and Theme Plans for Natura 2000 protected areas are available here: <http://publications.naturalengland.org.uk/category/4878851540779008>
- For more detail on the proposed deadline extensions for specific Natura 2000 protected areas please see here: <https://ea.sharefile.com/d-s487ae61bf2a4b4fb>
- Interim goals and CSMG targets for Natura 2000 sites can be found here for rivers: <http://publications.naturalengland.org.uk/category/432368> and here for lakes <http://publications.naturalengland.org.uk/publication/4841829396643840?category=430388>

5.4.3. Justification of alternative objectives

The table below describes the circumstances in which alternative objectives have been set for water bodies and some Natura 2000 sites and Shellfish Waters under Articles 4(4) and 4(5) of the WFD. The table sets out the general circumstances in which each reason has been applied and also, where relevant, gives more specific circumstances for particular elements.

Justifications for alternative objectives are determined for individual elements and then applied to the overall water body objective. Unless an alternative objective is justified for an element in a water body it retains the default objective for the second cycle river basin management plans of aiming to achieve good or better by 2021, irrespective of the overall water body objective.

Table 6: Explanation of circumstances under which exemptions to the environmental objectives have been applied in accordance with Articles 4(4) and 4(5) of the WFD

Reason alternative objective has been set	What the alternative objective applies to	Explanation for use of exemption
Technically infeasible: No known technical solution is available	General approach	<p>This reason has been used to justify setting less stringent objectives for water bodies under Article 4(5) and in a limited number of cases it has been used to justify extending the deadline for achieving protected area objectives under Article 4(4).</p> <p>As well as being applied where there is no known practical technique for making the necessary improvement, this reason has also been used in cases where:</p> <ul style="list-style-type: none"> techniques are under development but are not yet known to be effective in practice there is a known technical solution but that solution cannot be applied in a specific location due to specific local conditions
	Biological elements	<p>Invasive non-native species (INNS) may impact upon biological elements resulting in them being at less than good status. For many established INNS, such as American signal crayfish, there is no known technical solution to eradicate them.</p> <p>In these circumstances a less stringent objective is set for the impacted biological element under Article 4(5), provided that the water body is not also a Natura 2000 protected area (see below). For example, American signal crayfish are present in water body GB105030062450 in the Witham Catchment in Anglian RBD and as a result a less stringent objective has been set for the biological elements affected by the signal crayfish and for the water body overall.</p>
	Biological elements Hydrological regime	<p>Flows in some rivers and streams can vary naturally on a seasonal basis (for example ephemeral streams and winterbournes) or due to features like swallow holes. These are natural phenomena but can result in a water body being classified at less than good status. In these instances there is no technical solution to the failure to reach good status and a less stringent objective is set under Article 4(5).</p>
	Fish	<p>Natural barriers to fish migration sometimes result in fish being classified at less than good status in a water body. In these situations there is no technical solution to the fish failure since natural barriers do not require removal or easement and a less stringent objective is set under Article 4(5).</p>
	Fish	<p>The natural physical characteristics of a water body may be unsuitable for certain fish species which, although expected to be present by the fish classification tools, are in fact absent, resulting in fish being reported at less than good status. There is no technical solution in these circumstances since the absence is due to the natural characteristics of the water body and therefore a less stringent objective is set under Article 4(5). As an example, in water body GB104027057500 in the Don and Rother catchment (Humber RBD), bullheads are absent due to the steep gradient and a less stringent objective has been set for fish.</p>

Reason alternative objective has been set	What the alternative objective applies to	Explanation for use of exemption
	Groundwater quantity	<p>In some areas public water supply is mainly by abstraction from groundwater. Although the groundwater may be at poor quantitative status as a result of the abstraction it may not be technically possible to transfer the abstraction to another groundwater body, surface waters or an area of low environmental sensitivity. In such cases a less stringent objective has been set under Article 4(5).</p> <p>This exemption has been used when the environmental and socioeconomic needs served by the supply of public water cannot be achieved by other means which are a significantly better environmental option not entailing disproportionate costs, as required by article 4(5)(a).</p>
	Groundwater chemical	<p>There is not always a technical solution to improve a groundwater body to good chemical status where:</p> <ul style="list-style-type: none"> • There are multiple small diffuse discharges from abandoned mines stretching across a groundwater body which are causing it to be at poor status. These discharges can be so numerous that it is technically infeasible to put in place measures to improve all the discharges to get to good chemical status. • A large mining discharge is in a highly constrained location, such as in the middle of a village, and land is not available for treatment schemes. This situation occurs in water body GB40302G701500 in the Northumbria RBD. <p>In these circumstances a less stringent objective has been set under Article 4(5).</p>
	Phosphate Phytobenthos Macrophytes	<p>In England it is generally currently considered to be technically infeasible to build a sewage treatment works that will reduce phosphate in discharges to less than 0.5mg/l.</p> <p>If a water body requires discharges of less than 0.5mg/l phosphate to achieve good status then this reason has been used to justify a less stringent objective under Article 4(5), for example in the Long Eau water body (GB105029061670) in the Anglian RBD.</p> <p>Where good or high status is required to support Natura 2000 protected area objectives then this reason has been used to justify an extended deadline to achieve the objective under Article 4(4). The exemptions apply to the phosphate and the impacted biological elements such as phytobenthos and macrophytes.</p> <p>Trials are underway involving water and sewerage companies to investigate sewage treatment technologies that could be used to reduce phosphate below 0.5 mg/l. The trials will determine how effective these technologies are and are due to be complete by 2017. The results of the trials will inform the review and update of river basin management plans in 2021.</p> <p>This exemption has been used when the environmental and socioeconomic needs served by the sewage treatment works to dispose of sewage cannot be achieved by other means which are a significantly better environmental option not entailing disproportionate costs, as required by article 4(5)(a).</p>

Reason alternative objective has been set	What the alternative objective applies to	Explanation for use of exemption
	Biological elements – Natura 2000 protected areas	<p>The control or eradication of INNS is required on many Natura 2000 protected areas. For some INNS control methods are not yet available but may become available following further research, for example the anticipated biocontrol measures for Himalayan balsam. Timescales for achieving Natura 2000 protected area objectives where INNS are involved are therefore often very long term and dependent on the success of future research.</p> <p>In these circumstances the deadlines for achieving Natura 2000 objectives have been extended under Article 4(4).</p>
	Nutrients – Natura 2000 protected areas	<p>Some Natura 2000 lake sites are impacted by eutrophication. In addition to reducing phosphate inputs from diffuse or point sources, in-lake measures may also be needed to reduce internal cycling of nutrients and reduce re-suspension of sediments.</p> <p>For some lakes the in-lake measures would require the removal of nutrient rich sediment, for example, at Oak Mere SAC. Depending on the site the removal and disposal of nutrient rich sediments is considered to be technically infeasible.</p> <p>In these circumstances when there is no known technical solution the deadline for achieving the Natura 2000 objectives have been extended under Article 4(4).</p>
Technically infeasible: Cause of adverse impact unknown	General approach	<p>This reason has been used to justify setting extended deadlines for achieving objectives for water bodies and some protected areas under Article 4(4).</p> <p>It has been applied when a water body is at less than good status and the evidence is insufficient to identify the reason or reasons for not achieving good status with the required level of certainty to support identification of the measures needed to improve status.</p> <p>This exemption has been used where:</p> <ul style="list-style-type: none"> genuine scientific uncertainty remains despite investigation work having been carried out there has been insufficient time to complete the necessary investigation work since the water body was classified at less than good status <p>An investigation in this context includes desk studies drawing on existing data and knowledge about the water body and wider catchment, engagement and consultation with catchment partners and bespoke field investigations.</p>
	Metals	<p>Some groundwater bodies are at poor status because of polluted mine waters entering the groundwater. Whilst it is known that abandoned mines are the general source of the metals more investigations are needed to determine exactly where the metals are coming from so that the necessary measures can be identified and appraised.</p> <p>In these circumstances an extended deadline for achieving good status has been set under Article 4(4).</p>

Reason alternative objective has been set	What the alternative objective applies to	Explanation for use of exemption
	Sediment and nutrients – Natura 2000 protected areas	<p>Nutrient enrichment of Natura 2000 sites can be complex to understand and address and although understanding has improved since 2009 there are still some sites that will require further investigation to identify the precise causes or sources before solutions can be identified.</p> <p>This applies to sites like the River Avon which is suffering from eutrophication and the Ouse Washes SAC/SPA where further investigation is needed to refine understanding around specific sources and impacts so actions can be targeted effectively.</p> <p>In these circumstances an extended deadline for achieving Natura 2000 protected area objectives has been set under Article 4(4).</p>
Technically infeasible: Practical constraints of a technical nature prevent implementation of the measure by an earlier deadline	General approach	<p>This reason has been used to justify setting extended deadlines for achieving objectives for water bodies and some protected areas under Article 4(4).</p> <p>In some cases, although the appropriate measures to achieve the water body or Natura 2000 site objectives have been identified, there are constraints on commissioning and undertaking the necessary works that will extend the time taken to achieve the objectives.</p> <p>This exemption has only been applied where there is confidence (a reasonable expectation) that the implementation of the measures necessary to achieve the objectives will start by 2021, that is, the appropriate measure has been identified, funding has been agreed and there is a mechanism in place to deliver it and work will start during this cycle of river basin management planning.</p>
	Hydrological regime	<p>Some water company schemes are large and complex, for example, building a new reservoir and so installation will happen over a long time frame. A water company measure may be programmed for implementation during cycle 2, but the measure will not be delivered until after 2021 because it involves the installation of a large complex scheme.</p> <p>In these circumstances an extended deadline of good by 2027 has been set under Article 4(4).</p>
	Total phosphorus (lakes)	<p>Physical habitat restoration in lakes can be complex, large-scale and often involves more than one organisation. It often requires significant work to secure stakeholder consensus and cooperation. Actions may need to happen in a specific order to be effective, such as tackling diffuse sources of pollution before carrying out physical restoration works to the lake. Implementation of lake restoration action plans may therefore take place over a number of years.</p> <p>In these circumstances an extended deadline for achieving good status has been set under Article 4(4).</p>

Reason alternative objective has been set	What the alternative objective applies to	Explanation for use of exemption
	Hydrological regime – Natura 2000 protected areas	<p>Physical habitat restoration in rivers and lakes can be complex, large-scale, and often takes place over a number of years. It often requires significant work to secure stakeholder consensus and cooperation. In some cases, particularly river restoration, it can be detrimental to carry out all of the works required to restore hydrology over a short time period as this can result in damaging ecological disturbance to the majority of a SAC river length.</p> <p>This exemption has been used for sites that have unfavourable river and lake hydromorphology, unfavourable water levels on wetland and over abstraction. The necessary measures can be technically very complex and the planning, commissioning and delivery of the necessary actions to address these aspects of Natura 2000 site condition will require continued effort over long time scales.</p> <p>In these circumstances extended deadlines for achieving the Natura 2000 protected area objectives have been set under Article 4(4).</p>
	Physical modifications – Natura 2000 protected areas	<p>In some locations changes to coastal and estuary morphology are impacting on Natura 2000 protected area objectives. For example, coastal realignment and coastal squeeze on sites like the Humber Estuary SPA. The measures needed to address these pressures can be technically complex, involving large scale engineering works which take a long time scale to implement.</p> <p>In these circumstances extended deadlines for achieving the Natura 2000 protected area objectives have been set under Article 4(4).</p>
Disproportionately expensive: Unfavourable balance of costs and benefits	General approach	<p>This reason has been used to justify setting less stringent objectives for water bodies under Article 4(5).</p> <p>This exemption has been used in situations where:</p> <ul style="list-style-type: none"> • There is no environmental problem to solve and therefore the costs of taking any action would exceed the benefits. <p>Although WFD classification tools and the monitoring programme represent best science, due to the varied nature of the environment they sometimes flag a problem where no problem exists. Additional information including risk assessments and information from third parties can be used to establish if there is an environmental problem.</p> <ul style="list-style-type: none"> • Economic appraisal has determined that the costs of implementing the most cost effective and technically feasible measures needed to reach good status are greater than the benefits to be gained from achieving good status <p>In some cases, although a less stringent objective has been set action will still happen to improve the water body to the best possible status, as required by Article 4.5(b). Measures will be implemented up to the point where doing more would be disproportionately expensive. In these cases pressures may be partially resolved or, where there are multiple sources in a catchment, some may be addressed whilst others are not.</p>

Reason alternative objective has been set	What the alternative objective applies to	Explanation for use of exemption
	Fish	<p>In some cases the fish classification tool gives a result of less than good status due to the absence of a certain species but it is known from other data, such as angling match records, that the species is both present and at expected densities in the water body. Therefore there is no environmental problem to solve and action to take.</p> <p>In these circumstances a less stringent objective has been set under Article 4(5).</p>
	Hydrological regime	<p>In some water bodies there are multiple small abstractions or a large abstraction from either groundwater or surface water, or a combination of the two, which is affecting surface water flows. The potential compensation costs of changing abstractions, either the abstraction regime or decreasing abstraction volumes overall, can be relatively high.</p> <p>In these circumstances a less stringent objective has been set under Article 4(5).</p> <p>This exemption has been used when the environmental and socioeconomic needs served by the supply of public water cannot be achieved by other means which are a significantly better environmental option not entailing disproportionate costs, as required by article 4(5)(a).</p>
	Fish Invertebrates Mitigation Measures Assessment	<p>The costs of implementing some mitigation measures to address pressures from physical modifications are very high. For example, in urban areas where improvement works are often technically and spatially challenging there are increased costs for ground works and securing land availability as well as spatial limitations.</p> <p>In these circumstances a less stringent objective has been set under Article 4(5). The exemption applies to the Mitigation Measures Assessment and the impacted biological elements.</p> <p>This exemption has been used when the environmental and socioeconomic needs served by the physical modifications cannot be achieved by other means which are a significantly better environmental option not entailing disproportionate costs, as required by article 4(5)(a).</p>
	Groundwater quantitative	<p>The groundwater body is at poor status but the groundwater is a confined aquifer that has no direct or indirect link to environmental features or problems.</p> <p>In these circumstances a less stringent objective has been set under Article 4(5).</p>
	Groundwater chemical	<p>In some groundwater bodies which are failing the General Chemical Test for nitrates, farming would need to stop across a very wide area of land in order to meet the good status objective. The costs of implementing such measures have been judged to exceed the benefits.</p> <p>In these circumstances a less stringent objective has been set under Article 4(5).</p>

Reason alternative objective has been set	What the alternative objective applies to	Explanation for use of exemption
	Phosphorus Ammonia Dissolved oxygen Macrophytes Phytobenthos	<p>Engineering measures and technologies to improve water quality of discharges from sewage treatment works can have high costs relative to other measures within a catchment bundle of measures. Although these measures can be technically feasible, the cost of implementation can exceed the benefits to be gained from achieving good status. This is especially true in cases where improvements are limited to an individual water body which limits the overall relative benefit in the catchment.</p> <p>In these circumstances a less stringent objective has been set under Article 4(5).</p> <p>This exemption has been used when the environmental and socioeconomic needs served by the sewage treatment works to dispose of sewage cannot be achieved by other means which are a significantly better environmental option not entailing disproportionate costs, as required by article 4(5)(a).</p>
	Nutrients	<p>For phosphate failures in freshwater and dissolved inorganic nitrogen in estuaries and coastal waters, targeted regulatory measures (for example, water industry nutrient removal schemes) require sufficient evidence of a eutrophication problem to justify the measure. If a water industry sewage works is a major source of relevant nutrient and nutrient removal would be required to improve status to good but there is insufficient evidence of biological eutrophication impacts within the downstream water body or catchment then there is no environmental problem to solve and the costs of taking action would exceed the benefits.</p> <p>In these circumstances a less stringent objective has been set under Article 4(5).</p> <p>Less certainty of eutrophication does not preclude consideration of non-regulatory or voluntary approaches to address other nutrient sources.</p>
	Hydrological regime	<p>If hydrological regime is classified as not supporting good status but investigations have not shown any evidence of impacts upon biological elements then there is no environmental problem to solve and the costs of taking action would exceed the benefits.</p> <p>In these circumstances a less stringent objective has been set under Article 4(5).</p>
	Metals	<p>The cost of mine remediation measures are often relatively high within a catchment bundle of measures and in some cases, where the extent of the benefits are less certain and limited to specific water bodies, the cost of implementation exceeds the benefits.</p> <p>In these circumstances a less stringent objective has been set under Article 4(5).</p>
	Physico-chemical elements Chemicals	<p>The complex nature of pressures and pollutant pathways in urban areas along with spatial challenges mean that the costs of implementing successful and worthwhile sustainable urban drainage measures can be high. These costs can exceed the benefits, especially if the benefits are limited to specific, small urban water bodies.</p> <p>In these circumstances a less stringent objective has been set under Article 4(5).</p>

Reason alternative objective has been set	What the alternative objective applies to	Explanation for use of exemption
	Shellfish waters protected areas	<p>For some shellfish waters the benefits to be gained from achieving compliance is less than the cost of implementing the most cost effective and technically feasible measures needed to deliver the improvements by 2021. Such measures include, for example, installation of UV disinfection at sewage treatment works and action to reduce the pollution of run-off from agricultural land.</p> <p>In these circumstances an extended deadline for achieving the objectives has been set under Article 4(4).</p>
Disproportionately expensive: Disproportionate burdens	General approach	<p>This reason has been used to justify setting extended deadlines for achieving objectives for water bodies and some protected areas under Article 4(4) for the purposes of phased achievement of the objectives.</p> <p>This reason has been used in two situations:</p> <ul style="list-style-type: none"> • The programme of measures to achieve improvements in water body status by 2021 consists of measures where there is confidence that there is a mechanism (for example a piece of legislation or voluntary agreement) in place to implement the measure and funding is available. Confidence in this context means at least a reasonable expectation that funding is available during the second cycle. <p>Where funding has not been confirmed and there is not a reasonable expectation that it will become available, it is assumed that the measures are therefore unaffordable to implement in the second cycle without creating a disproportionate burden on the relevant sector or fall outside government spending limits. This will be subject to consideration by Ministers in finalising the plans.</p> <p>In these circumstances an extended deadline for achieving the objectives has been set under Article 4(4).</p> <ul style="list-style-type: none"> • In some cases, although there is confidence that the measures envisaged as being necessary to achieve the objectives are funded for the second cycle there is low confidence about: <ul style="list-style-type: none"> ○ exactly which measures will take place and where they will be implemented, for example, where implementation of measures is voluntary ○ the element-level improvements in status that will be achieved by 2021 <p>It is assumed that a different approach to implementing the measures cannot be taken without placing a disproportionate burden on the relevant sector. In these circumstances an extended deadline for achieving the objectives has been set under Article 4(4).</p>

Reason alternative objective has been set	What the alternative objective applies to	Explanation for use of exemption
Natural conditions: Ecological recovery time	General approach	<p>This reason has been used to justify setting extended deadlines for achieving water body objectives under Article 4(4).</p> <p>Generally speaking the ecology of aquatic systems recovers quickly when pressures are removed. However, in some cases there may be a delay before the biological quality of the water body recovers.</p> <p>The delay may be due to the time taken for the plants and animals to re-colonise and become established after the hydromorphological, chemical or physicochemical conditions have been restored or the time taken for the habitat conditions to stabilise after improvement works.</p> <p>The natural recovery of biological populations is typically achieved through re-colonisation. Where impacted habitats are hydrologically connected to un-impacted locations, recovery can occur quickly. This is particularly true for species that show mobility through their life history (for example, fish and invertebrates). Here, recovery can happen within a limited number of generations and therefore years. Where habitats lack this connectivity, or where species are no longer present, recovery may take much longer.</p> <p>Other circumstances where ecological recovery time may be delayed are:</p> <ul style="list-style-type: none"> • measures to remove the activity giving rise to a pressure are successful, but the pressure takes time to reduce. Here the ecology cannot recover quickly as it is still impacted by a pressure, albeit reducing in magnitude. Recovery of ecosystems from prolonged exposure to increased nutrients provides a good example. In such cases it may take tens of years for the plant communities to return to those expected under near reference conditions once all improvement measures are implemented. In such cases deadlines can be extended beyond 2027. • measures to remove pressures are successful, but the ecology does not return to the community expected to be seen under near reference conditions. Instead the ecology assumes a different ecological stable state. In these cases, further management of the ecosystem may be needed to trigger a change back to good status. <p>Ecological recovery time is only used as a justification for an extended deadline if there is confidence that the measures necessary to achieve the improvement in status will be implemented by 2021.</p> <p>In these circumstances an extended deadline for achieving the objectives has been set under Article 4(4).</p>

Reason alternative objective has been set	What the alternative objective applies to	Explanation for use of exemption
Natural conditions: Groundwater status recovery time	General approach	<p>This reason has been used to justify setting extended deadlines for achieving water body objectives under Article 4(4).</p> <p>Groundwater bodies can take many decades to recover from chemical pressures once measures to reduce the pressures are in place. This is mainly because of the delay as water travels downwards through the unsaturated zone to the water table. The length of this delay will depend on many factors including the rate of recharge, properties of the pollutant and the nature of the hydrogeological setting.</p> <p>The recovery time delay can vary between several years to many decades. In the majority of cases where this exemption has been used the substance causing poor status was nitrate. Groundwater status recovery time has mainly been used for groundwater chemical pressures.</p> <p>In these circumstances an extended deadline for achieving the objectives has been set under Article 4(4).</p>
	Dissolved inorganic nitrogen	<p>In some cases nitrates from groundwater bodies are leaching into surface water bodies such as estuaries resulting in dissolved inorganic nitrogen failures. As nitrate can take a long time to move through groundwater, it will correspondingly take a long time for the surface water to recover.</p> <p>For example nitrates in groundwater in Hampshire are leaching into surface waters, resulting in dissolved inorganic nitrogen in Portsmouth Harbour (water body GB580705140000) being classified at moderate status.</p> <p>In these circumstances an extended deadline for achieving the objectives has been set under Article 4(4).</p>
Natural conditions: Background conditions	General approach	<p>This reason has been used to justify setting less stringent objectives for water bodies under Article 4(5).</p> <p>It has been applied when the natural background level of a substance in the environment is such that the level in a water body (in the absence of any man made inputs) cannot be reduced sufficiently to meet the WFD standard.</p> <p>In these circumstances a less stringent objective has been set under Article 4(5).</p>
	Phosphate	<p>The Upper Greensand aquifer in the south-west of England contains high concentrations of natural phosphate. Groundwater assessments have been adjusted for this background level but it is also one of the reasons for phosphate levels in surface waters failing to reach good status.</p> <p>In these circumstances a less stringent objective has been set for the relevant surface water bodies under Article 4(5).</p>

6. Programme of measures

Summary of this section

This section provides background to the programme of measures, and links to further information and supporting documents.

Topics covered:

Programme of measures, and mechanisms to implement measures

i. Basic and supplementary measures

The summary programme of measures is made up of both basic and supplementary measures, as defined in Article 11 of the WFD.

Basic measures are associated with the implementation of other legislation for the protection of waters such as the Urban Waste Water Treatment Directive, the Marine Strategy Framework Directive and the Habitats Directive. They also include regulatory instruments such as permit regimes and general binding rules.

When basic measures alone are not sufficient to achieve the environmental objectives, supplementary measures are required in addition. Supplementary measures can be very diverse in nature and include negotiated agreements, economic tools and habitat restoration schemes.

For ease of reading, Part 1 presents basic and supplementary measures together with measures summarised based on the outcomes they achieve, as follows:

- ongoing measures to prevent deterioration
- main programmes of measures for 2021 outcomes (including national investment programmes and local investment through catchment partnership groups)
- measures to achieve objectives to 2027 and beyond
- additional measures to achieve protected area objectives

ii. Considering climate change

Climate change has been taken into account in the design of the programme of measures:

- For most significant investment programmes, such as water company investment, climate change adaptation and mitigation is an important consideration in the design and planning of projects, taking into account the most up-to-date scenarios for a changing climate at the time of implementation
- For less significant projects, a flexible step-by-step approach to install measures that are capable of being adapted or extended as required in the future, is more appropriate. Where there is a choice of potential solutions, climate change resilience is a factor in decision making.
- Measures resulting from the long-term environmental plans, such as water resources management plans and flood risk management plans include consideration of climate change in their assessment of actions to be taken.

ii. Mechanisms

For measures to be translated into effective action on the ground there needs to be appropriate 'mechanisms' in place to facilitate this.

River basin management plans:

Part 2: River basin management planning overview

Measures are brought about through a range of policy, legal or financial mechanisms. These include:

- legislation
- economic instruments
- codes of good practice
- negotiated agreements
- promotion of good practice
- education

Information elsewhere in the river basin management plans

- More information about the mechanisms used to implement measures is available here: <https://ea.sharefile.com/d-sabbd14301a44d5e9>

Supporting information

- You can find a list of the measures used to predict improvements in status by 2021 for specific elements in specific water bodies here: <https://ea.sharefile.com/d-sabbd14301a44d5e9>
- You can find a summary of the measures that will deliver additional environmental outcomes by 2021 (not linked to predicted outcomes because of a lack of confidence in specific location or outcome) here: <https://ea.sharefile.com/d-sabbd14301a44d5e9>
- You can find a summary of water company measures here: <https://ea.sharefile.com/d-sabbd14301a44d5e9>
- You can find a summary of the measures needed to achieve water body objectives for 2027 and beyond here: <https://ea.sharefile.com/d-sabbd14301a44d5e9>
- You can find information on The Improvement Programme for England's Natura 2000 sites (IPENS) is available here: <https://www.gov.uk/government/publications/improvement-programme-for-englands-natura-2000-sites-ipens>
- You can access the Site Improvement Plans for Natura 2000 sites here: <http://publications.naturalengland.org.uk/category/6287197783195648>

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