

Water for life and livelihoods



River basin management plan for the Severn River Basin District Habitats Regulations Assessment Updated December 2015

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Executive summary

A Habitats Regulations Assessment (HRA) of the River Basin Management Plan for Severn River Basin District has been carried out jointly by the Environment Agency and Natural Resources Wales, in consultation with Natural England and the Strategic Assessment Team of Natural Resources Wales.

The purpose of a River Basin Management Plan (RBMP) is set out in UK Ministerial Guidance: 'An RBMP should be a strategic plan which gives everyone concerned with the river basin district a measure of certainty about the future of water management in that district. It will include objectives for each water body and a summary of the programme of measures necessary to reach those objectives'.

The Severn River Basin District is cross-border and responsibility for planning the future of the River Basin District is shared between the Environment Agency and Natural Resources Wales. The same general approach has been used to produce the Habitats Regulation Assessment for areas of the River Basin District in England and Wales. In some areas government direction or local policy has resulted in differences in the supporting data sets of measures. Where this is the case the adapted approach to the assessment is explained.

At this high-level plan stage, the detail of precisely where and how the programme of measures will be implemented has not yet been developed. This assessment informs any subsequent lower tier plan or project level HRA of the key risks to European sites and the range of potential control and mitigation techniques that could be applied. The assessment has identified potential hazards associated with implementation of the measures in the RBMP. These hazards are associated with the types of measures that are related to each significant water management issue (SWMI) in the RBMP and indicate the potential levels of risk to the range of features of the network of European sites. The level of detail of the plan does not allow detailed consideration of effects on individual European sites. However, at this strategic level, the assessment undertaken still allows confidence that the measures could go ahead without harm to European sites, subject to more detailed scrutiny of mitigation options at the lower tier plan or project level. This conclusion is primarily drawn because the RBMP does not constrain where or how the measures are implemented, and the process for deferring HRA to lower tier plan or project level, where necessary, will provide for a range of mitigation options to be pursued at the lower tier plan or project level.

The assessment demonstrates that controls are in place to identify any risks to European sites when the actions required to implement the measures are developed. The RBMP itself also makes it clear that before any measures in the plan are implemented they must be subject to the requirements of the Conservation of Habitats and Species Regulations 2010 (Habitats Regulations).

It is determined that, at this strategic plan level, the range of potential mitigation options available allow a conclusion that the RBMP is not likely to have any significant effects on any European sites, alone or in combination with other plans or projects. Given this conclusion, there is no requirement, at this strategic plan level, to progress to the next stage of the Habitats Regulations Assessment (an 'appropriate assessment' to examine the question of adverse effects on the integrity of European sites).

Acceptance that this Plan is consistent with the Habitats Regulations is on the basis of the level of detail of the plan. This conclusion does not guarantee that any plan or project

derived from the Plan will also be found to be consistent. As local actions are developed at a project level and the details of their scope and scale are known, this may identify additional effects on European sites that have not been assessed here, or were not appropriate to consider at this spatial scale of plan.

This conclusion does not therefore remove the need for later Habitats Regulations Assessment of any other plans, projects, or permissions associated with, or arising out of, the measures identified in the Plan. As the RBMP does not give weight to lower tier plans or projects, it is important to note that inclusion of projects within the RBMP should not have any influence on the lower tier or project level HRA conclusions. Any HRA at the lower tier for which adverse effects on site integrity cannot be ruled out, and cannot be mitigated, must consider the merits of the individual project to determine whether there are imperative reasons of overriding public interest for its implementation. Inclusion in this plan does not give any weight to any such conclusions.

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1 Introduction

1.1 Introducing this report

This report sets out the results of a Habitat Regulations Assessment (HRA) into the likely significant effects on designated 'European sites' of the 2015 updated River Basin Management Plan (RBMP) for the Severn River Basin District updated in December 2015. This report has been produced by the Environment Agency and Natural Resources Wales (NRW) as the 'competent authorities' for the HRA as part of preparing the updated RBMPs for approval by the Secretary of State for Environment, Food and Rural Affairs and the Welsh Minister for Natural Resources. In preparing the HRA report the Environment Agency and NRW has consulted with Natural England and the Strategic Assessment Team of NRW.

RBMPs provide a long-term framework for the management of all issues that affect the water environment in a River Basin District (RBD). They rely on a range of more detailed plans that government or key sectors are responsible for developing to enable the objectives of the RBMP to be achieved. The HRA has been carried out at the level of detail published in the RBMP, which is high-level and does not include specific details of actions on the ground. The HRA informs subsequent lower tier plans and/or project level HRAs of the likely risks and possible need for mitigation and controls that will need further consideration once measures are developed as specific local actions. Potential mitigation and control techniques that could be applied are described, but will need further investigation at the lower tier project/plan level.

This report describes each of the main stages and results of the updated RBMP HRA as follows:

- Describing the European sites within the RBD
- The approach to the HRA
- Screening, assessing likely significant effects and consideration of further HRA stages
- In combination effects of other plans and projects
- Conclusion and future HRAs.

1.2 Background to the RBMPs

The purpose of a River Basin Management Plan (RBMP) is set out in UK Ministerial Guidance: 'An RBMP should be a strategic plan which gives everyone concerned with the river basin district a measure of certainty about the future of water management in that district. It will include objectives for each water body and a summary of the programme of measures necessary to reach those objectives. The RBMP should also be a gateway, providing easy access to relevant supporting information.' It goes on to say that RBMPs should:

- record outcomes from the river basin planning process
- set the policy framework for how regulatory decisions affecting the water environment in that river basin district will be made
- report to the public and the European Commission on the implementation of the Water Framework Directive (WFD)

The Water Framework Directive (WFD) requires member states to meet the following objectives:

- Prevent deterioration in the status of surface waters and groundwater
- Achieve 'Protected Area' objectives and standards
- Aim to achieve good status for all water bodies
- Aim to achieve good ecological potential and good surface water chemical status for artificial and heavily modified water bodies.

In preparing the updated RBMPs the Environment Agency and NRW consulted in June 2013 on the range of 'Significant Water Management Issues' (SWMIs) that the RBMP would need to address to meet WFD objectives. There was a further consultation in October 2014 on the range of interventions (measures) that would be worthwhile to prevent deterioration, achieve protected area objectives and meet water body status objectives. Worthwhile measures are those that have been assessed as cost-beneficial without funding or timescale constraints. In Wales, measures were assigned to individual water bodies within management catchments, but the monetary costs and benefits were not considered at this stage. Following these consultations, the range of SWMI required measures has been reviewed and set out in the updated RBMP as proposed programmes of measures, under the following headings:

- Measures to prevent deterioration
- Measures to deliver 2021 outcomes
- Measures to achieve outcomes for 2027 or beyond
- Additional measures for protected areas.

The focus of the updated RBMP is on programmes of measures that will deliver outcomes for 2021. These have been drawn from proposed investment plans of government and key sectors and set out measures where there is confidence that they are affordable, planned for 2021 and expected to deliver a WFD outcome.

1.3 The Severn RBMP

The Severn RBD has a varied landscape extending from the uplands of Wales in Powys and the Brecon Beacons, down through the valleys and rolling hills of Herefordshire, Shropshire, Monmouthshire and Cwmbran to the lowlands and the Severn Estuary, and west to include parts of Warwickshire, Gloucestershire, Somerset and Wiltshire. As well as the River Severn and its main tributaries, the Warwickshire Avon and the Teme, the RBD includes the Bristol Avon and rivers of south east Wales including the Wye, Usk and Taff. Although predominantly rural in character, the RBD has a population of over 5 million people with major urban centres including Bristol, Coventry, Cardiff, the South Wales Valleys and parts of the West Midlands conurbation. The Severn RBD is made up of 10 management catchments (see map below). Two management catchments, the Usk and South East Valleys, are entirely within Wales, whilst three management catchments are cross-border and comprise the Severn Uplands, Teme and Wye catchments. The next level down comprises the operational catchments. These cover a number of smaller water bodies based around the same local geography or affected by common pressures on the water environment. There are also operational catchments specific to certain larger water bodies,

for example groundwaters, which, due to their size, can cross management catchment boundaries and even river basin districts.

The updated Severn RBMP provides a summary of the extent of Significant Water Management Issues (SWMIs)¹, as follows:

- **Physical modifications** – affect 27% of water bodies in the river basin district
- **Pollution from waste water** – affect 29% of water bodies in the river basin district
- **Pollution from rural areas** – affect 40% of water bodies in the river basin district
- **Changes to the natural flow and level of water** – affect 7% of water bodies in the river basin district
- **Pollution from towns, cities and transport** – affect 12% of water bodies in the river basin district
- **Negative effects of non-native invasive species** – affect <1% of water bodies in the river basin district.
- **Pollution from abandoned mines** - affect 2% of water bodies in this river basin district

Further details of the measures proposed to address the Significant Water Management Issues for the Severn RBD are described in section 4.1.

¹ Pollution from mine waters is not identified as a significant water management issue. However, in places within the Severn RBD it is an important local issue as, for example, in the South East Valleys management catchment.

Figure 1 Map of the Severn river basin district and management catchments



1.4 Background to Habitats Regulations Assessment

In England and Wales, the Conservation of Habitats and Species Regulations 2010, as amended, commonly termed the Habitats Regulations, implements the European Union Habitats Directive (Directive (92/43/EEC) on the Conservation of natural habitats and of wild flora and fauna, and of the Wild Birds Directive (2009/147/EC). This legislation provides the legal framework for the protection of habitats and species of European importance in England.

European sites protected under the Habitats Regulations comprise Special Protection Areas (SPA), Special Areas of Conservation (SAC), candidate SACs (cSAC), Sites of Community

Importance (SCI) and, as a matter of government policy, to potential Special Protection Areas (pSPA) , areas formally provided as compensation for European site loss and Ramsar sites (sites designated under the 1971 Ramsar Convention for their internationally important wetlands). These sites are referred to collectively in this report as ‘European sites’.

Regulation 9(3) of the Habitats Regulations requires that a ‘competent authority’ must consider the requirements of Habitats Directive in exercising any of its functions. Article 6(3) of the Habitats Directive and Regulations 61 and 62 of the Habitats Regulations, define the requirements for assessment of plans and projects potentially affecting European sites. This requires that a competent authority, before deciding to undertake, or give any consent or authorisation for a plan or project which is likely to have a significant effect on a European site, and is not directly connected with or necessary to the management of that site, must carry out an appropriate assessment. The term commonly referred to for the whole, step by step assessment process is, ‘Habitats Regulations Assessment’ or HRA.

The Severn RBMP is considered to fit within the definitions of a ‘plan’ as defined by the Habitats Directive, and requires a HRA. The RBMP is a high-level planning document for the Severn RBD, therefore the HRA needs to be tailored to be appropriate for the spatial area of coverage and the strategic nature of the plan.

The HRA has followed a framework of four distinct stages, only moving to the next stage if required by the results of that stage of the assessment. The four stages are:

Stage 1: Screening and Likely Significant Effects is the process which initially identifies the likely impacts upon a European site of a plan or project, either alone or in combination with other plans or projects, and considers whether these impacts may be significant. This stage also includes the development of mitigation to avoid or reduce any possible effects.

Stage 2: Appropriate Assessment is the detailed consideration of the impact on the integrity of the European site of the plan or project, either alone or in combination with other plans or projects, with respect to the site’s conservation objectives and its structure and function. This is to determine whether there is objective evidence that adverse effects on the integrity of the site can be excluded. This stage also includes the development of mitigation to avoid or reduce any possible impacts.

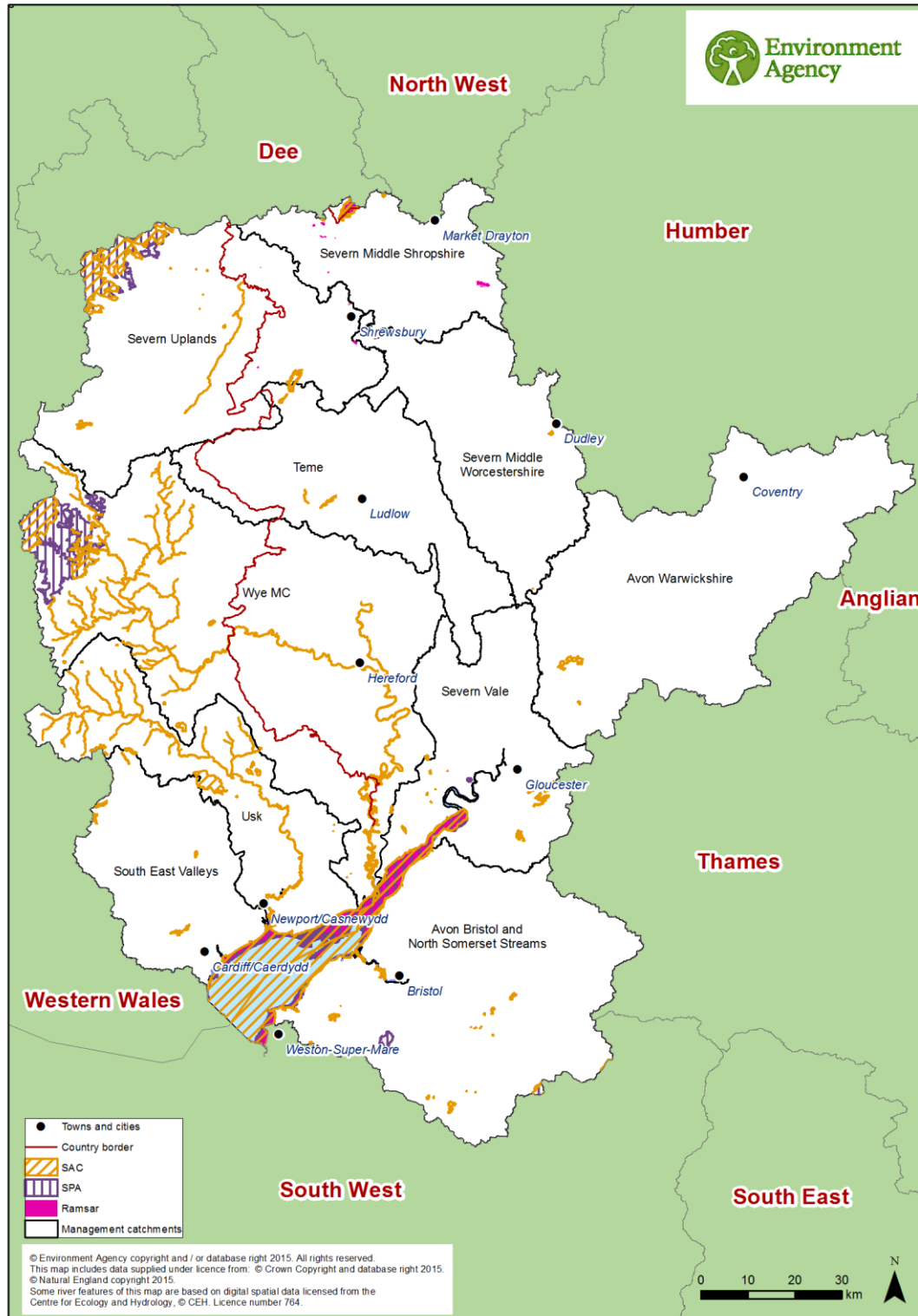
Stage 3: Assessment of alternative solutions is the process which examines alternative ways of achieving the objectives of the plan or project that would avoid adverse impacts on the integrity of the European site, should avoidance or mitigation be unable to avoid adverse effects.

Stage 4: Assessment where no alternative solutions exist and where adverse effects remain is made with regard to whether or not the plan or project is necessary for imperative reasons of overriding public interest (IROPI) and, if so, of any required compensatory measures.

2 European sites in the Severn RBD

Within the Severn RBD there are 43 SACs, 6 SPAs, and 4 Ramsar sites. Some of the sites have more than one designation such as the Severn Estuary, parts of which are designated as SPA, SAC and Ramsar.

Figure 2 - Map of the European sites in the Severn River Basin District



The European sites within the Severn RBD encompass a wide diversity of habitat types. In addition to freshwater habitats such as rivers, lakes, canals and other wetlands, the RBD includes sites with estuarine, coastal and marine habitats. Other frequently occurring habitat types are woodlands, grasslands and heathlands.

Of the 4 Ramsar sites within the RBD the most extensive is the Severn Estuary, which is also designated as a SPA and SAC. The estuarine and river system of the Severn is one of the most diverse in the UK for fish species, as an important feeding and nursery ground, and a key migration route for species that use the estuary to reach spawning grounds in the many tributaries such as the Wye and Usk rivers. The large tidal range of the Severn Estuary results in extensive areas of intertidal habitats, comprising mudflats, sandflats, sandbanks, shingle and rocky platforms, together with adjacent areas of saltmarsh and lowland grazing marsh, which also support internationally important assemblages of overwintering and migratory birds.

The inland Ramsar sites, such as the Midlands Meres and Mosses, are characterised by a complex of wetland, lowland open water and peatland sites that support nationally important flora and fauna. Located within the South West RBD, the Somerset Levels and Moors SPA/Ramsar site is situated immediately south of the Severn RBD border and is closely associated with the Severn Estuary SAC/SPA/Ramsar site. The site comprises a series of designated sites that cover extensive areas of flood plain drained by a large network of ditches, rhynes, drains and rivers, and represents the largest area of wetland / lowland wet grassland habitat in the UK, supporting internationally important numbers and assemblages of overwintering birds as well as breeding waders.

The SPAs within the RBD and the migratory and breeding bird populations they support are highly variable, ranging from the artificial reservoir of Chew Valley Lake near Bristol to extensive upland sites of Berwyn and Elenydd - Mallaen in. In addition to the extensive lowland sites of the Severn Estuary, designated SPAs within the RBD include parts of the open grasslands of Salisbury Plain.

Across the RBD there is a wide variety of SACs; some designated primarily due to the species they support, such as the populations of great crested newts at Granlyn in Wales and Fens Pools in Dudley. A number of sites within the RBD are designated for supporting important populations of bat species, and for supporting important invertebrate species. A primary reason for the designation of the River Wye and Usk SACs is the range of Annex II fish species they support, including sea, brook and river lamprey, bullhead, twaite shad and Atlantic salmon in addition to their well established otter populations.

Many of the sites within the RBD are also designated in respect of their qualifying habitats, such as riverine habitats of the Wye, the lakes, ponds, mires and bogs of the West Midlands Mosses, woodlands such as the Wye Valley and Avon Gorge, and the chalk grasslands of Salisbury Plain. Designated upland habitats and heathlands are also represented in the Brecon Beacons and Berwyn and South Clwyd Mountains together with the transitional dry heathland habitats of the Stiperstones and Hollies. Within the RBD sites designated for their wetland habitats range from the upland mires of Elenydd to the lowland raised bogs at Fenn's Whixall, Bettisfield, Wem and Cadney Mosses and Llangorse Lake, the largest lake in South Wales.

Appendix 4 contains a summary of the European sites present within the Severn RBD. This includes their geographic area and whether they are identified as 'Natura 2000 protected

areas' under the WFD. It is worth noting that in some cases only part of the European site is within the Severn RBD and therefore not all interest features may lie inside the RBD boundary.

2.1 European sites that could be affected by the RBMP

The RBMP is a long term plan for the water environment that could potentially affect both water dependent and non-water dependent European sites and their qualifying features.

Water dependent sites are classified as protected areas under the WFD; each protected area European site has specific objectives to ensure their favourable conservation status. Supporting measures within the RBMP should therefore predominantly be beneficial for the conservation status of water dependent European sites. However, this does not mean that water-dependent sites may not be adversely affected, since other measures within the RBMP could still have unintended consequences for these sites.

Effects on non water dependent European sites and their qualifying features are also possible. Measures proposed within the plan take a wide variety of forms, including interventions on land as well as water bodies. Potential effects on non water dependent European sites therefore cannot be ruled out and are considered as part of the assessment.

2.2 European sites and their status for RBMPs

The RBMP provides summary information on the current status and baseline for water dependent European sites as part of its monitoring data. These are Protected Areas under the Water Framework Directive, and provide an indicator of those that are most likely to be influenced by changes to the water environment.

European sites in England and Wales, with the occasional exception, are also designated as SSSIs. Natural England monitors the conditions of SSSIs and their component units using six reportable condition categories: favourable; unfavourable recovering; unfavourable no change; unfavourable declining; part destroyed and destroyed. NRW monitors the condition of Welsh European sites in a slightly different way; this is explained further below.

The current status of water-dependent European site protected areas (in England) for the Severn RBD is summarised in the table below (Table 1a). This gives the current area of water-dependent SSSI units of European protected areas in different condition categories as currently recorded on Natural England's designated site data system. SSSI units underpin European protected areas and Natural England collects data at a SSSI unit level, but those assessments have regard for the current condition of European features as well as SSSI features. When SSSI units are in favourable condition, they are usually deemed to be meeting their European level conservation objectives. Caution is required however, as the SSSI condition assessment is a snapshot in time, and achievement of European level conservation objectives is reliant upon long term maintenance.

This shows that for those sites in England within the Severn RBD, 13% (by area) of water-dependent SSSI units of European protected area sites currently do not meet their SSSI conservation objectives.

Table 1a WFD status of water dependent SSSIs for the Severn RBD (England)²

Condition	Severn RBD (ha)
Favourable	11,668
Destroyed / Part destroyed	2
Unfavourable declining	208
Unfavourable no change	337
Unfavourable recovering	1,125
Total Area Unfavourable	1,670
% Unfavourable	13

In Wales the reporting approach is different; the condition of designated habitats and species features in SACs / SPAs for the Habitats and Birds Directives cycle (2007-2012) was reported to the Joint Nature Conservation Committee (JNCC), on a designated habitat or species feature basis, rather than SSSI unit status. In addition there are slight differences to some of the categories used for reporting. Table 1b summarises the data for the Welsh section of the Severn RBD based on the number of designated habitats and species features in each category. The table indicates that for the parts of the RBD in Wales, over half of designated habitats and species features are in unfavourable condition.

Table 1b Natura 2000 protected areas current condition for the Severn RBD (Wales)³

Current condition Number of Natura 2000 designated habitats and species	
Favourable: Maintained	4
Favourable: Recovered	3
Favourable: Un-classified	9
Unfavourable: Recovering	4
Unfavourable: No change	4
Unfavourable: Declining	1
Unfavourable: Un-classified	34
Destroyed: Partially	0
Destroyed: Completely	0
Not assessed	24
Total	83

The generic pressures on such sites in the Severn RBD include forestry, inappropriate woodland and scrub management, for example, the cessation of traditional management practices such as coppicing and wood pasture, and agricultural practices such as levels of

² Source: Extract from Natural England databases August 2015.

³ Source Severn RBMP (2015 Proposed Update).

grazing. These pressures can affect the condition, quality and diversity of habitats present on a site as well as the particular species they support. Pressures associated with overgrazing can lead to peat erosion as is the case in a number of sites, and also serve to degrade the habitats of qualifying species, such as the terrestrial foraging habitats for amphibian populations. More generally, changes in land management in areas surrounding designated sites can also impact qualifying features, such as feeding and roosting areas used by overwintering bird populations.

Other pressures typically linked to river and wetland sites in the RBD include diffuse water pollution and siltation as a result of surface water runoff from surrounding agriculture and areas of clear cut forestry, hydrological changes arising from abstractions and alterations to the drainage network, and physical modifications such as weirs presenting barriers to fish migration. The Severn Estuary is also subject to pressures from commercial and recreational fisheries and from development impacts (such as aggregate extraction, energy and residential and industrial development) within and adjacent to the estuary, and coastal squeeze habitat losses due to the presence of flood defences.

Invasive non-native species is a commonly identified pressure for a range of sites across the RBD, as is pressure from public access and disturbance, for example, through disturbance to species and habitats from recreational activities such as canoeing and angling. Habitat fragmentation is also an identified pressure for certain sites, such as the West Midlands Mosses, where the lack of habitat connectivity can hinder re-colonisation and affect species diversity.

There are also long term national threats to habitats and especially species, including climate change, alterations in hydrological and coastal processes and invasive non-native species.

2.3 European sites and their management

As part of a new strategic approach to managing all England's European sites, new measures needed to achieve favourable conservation status for all European sites interest features in England have been developed by Natural England. These are collectively referred to as Site Improvement Plans (SIPs), and have been developed by the Improvement Programme for England's Natura 2000 sites (IPENS). For every European Site in Wales (apart from cross-border sites) NRW is leading on the development of equivalent Prioritised Improvement Plans (PIPs).

In relation to RBMPs, which include objectives and actions specifically for WFD Natura 2000 Protected Areas, these Protected Areas' objectives and actions are informed by the SIPs developed by Natural England, in conjunction with NRW for sites that cross the border, and inform the RBMP. Water dependent / protected area sites in the Severn RBD are referenced in the table in Appendix 4.

3 Approach to HRA

The steps undertaken to complete the HRA are as follows:

- Describe the plan and the measures proposed.
- Screen and assess the likely significance of any effects on European sites.
- Consider need for further stages of assessment (i.e. appropriate assessment, alternative solutions and IROPI)
- Determine a conclusion.

3.1 Description of the RBMP Measures

RBMPs set out long-term objectives for sustainable use of the water environment, covering rivers, lakes, coasts and groundwater. They are strategic documents which set the framework for local action to be taken to meet long-term objectives for the water environment. The RBMP is underpinned by a programme of investigations that determine: Whether there is a problem (i.e. Significant Water Management Issue, SWMI) with the current status of water bodies; if so, the reasons the water body is failing; and the types of measures required for the water body to attain good status.

The RBMPs do not include the detail of local actions, but are a high level summary of measures, developed through consultation about how society and specific sectors should contribute to their long-term objectives. There are sources of information about the implementation of RBMP actions that have informed the RBMP but are not part of the published plan, including the Environment Agency's Catchment Data Explorer⁴ and government and other sector investment programmes.

Consultation of the updated RBMP

For the consultation on the updated RBMP, a proposed set of measures for those parts of the RBD in England were assessed as worthwhile and put forward to address significant water management issues (SWMIs) to achieve the long-term objectives for the water environment. These also included measures that would prevent deterioration and support protected area objectives. Worthwhile measures are those that have been assessed as cost-beneficial without funding or timescale constraints, as summarised in Table 2 below. In Wales, measures were assigned to individual water bodies within management catchments, focused on the positive and negative effects on ecosystem services, the monetary costs and benefits were not considered at this stage.

Table 2 SWMI required measures in the RBMP

Categories of Significant Water Management Issue	SWMI Required Measures (may be referred to as tier 2 measures)
Physical modification	Removal or easement of barriers to fish migration
	Removal or modification of engineering structure
	Improvement to condition of channel/bed and/or banks/shoreline

⁴ A web-based interactive map to navigate to catchments and water bodies, view catchment summaries and download data, to support updates to the river basin management plans.

	Improvement to condition of riparian zone and /or wetland habitats Vegetation management Changes to operation and maintenance
Manage pollution from waste water	Mitigate/remediate point source impacts on receptor Reduce point source pollution at source Reduce point source pollution pathways (i.e. control entry to the water environment) Reduce diffuse pollution at source
Manage pollution from towns, cities and transport	Reduce diffuse pollution pathways (i.e. control entry to the water environment) Mitigate/remediate diffuse pollution impacts on the receptor, Reduce diffuse pollution at source Reduce diffuse pollution source
Improve the natural flow and level of water	Control pattern/timing of abstraction Water demand management Improvement to condition of channel/bed and/or banks/shoreline Use alternative source/relocate abstraction or discharge
Manage invasive non-native species	Prevent introduction 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)
Manage pollution from rural areas	Reduce diffuse pollution at source Mitigate/remediate diffuse pollution impacts on the receptor Reduce diffuse pollution pathways (i.e. control entry to the water environment)
Manage pollution from mines⁵	Mitigate/Remediate point source impacts on receptor

Publication of the updated RBMP

For the 2015 updated RBMP, the SWMI required measures are set out as programmes of measures lead by government and key sectors and related to more specific WFD objectives within the river basin planning cycles⁶ as follows:

- Measures to prevent deterioration
- Measures to deliver 2021 outcomes
- Measures to achieve outcomes for 2027 or beyond
- Additional measures for protected areas.

⁵ Manage pollution from mines is not identified as a significant water management issue. However, in places within the Severn RBD it is an important local issue as, for example, in the South East Valleys management catchment.

⁶ RBMPs are required to be reviewed every 6 years. These 6 year periods are called cycles. Cycle 1 was 2009-15, cycle 2 is 2015-21 and cycle 3 will be 2021-27.

The programmes to deliver 2021 outcomes have taken forward those SWMI required measures that were assessed as worthwhile but only where there is confidence in government and key sectors over funding and planned delivery by 2021. Some of these measures have predicted water body improvements that will achieve specific WFD objectives. Other measures will make a contribution to improvements but without predicted WFD outcomes. All other SWMI required measures that were assessed as worthwhile, but not planned to deliver outcomes by 2021 have been carried forward as requirements for future programmes for 2027 and beyond.

3.2 Screening and Likely Significant Effects

The screening and assessment of likely significant effects has involved the following steps:

1. Consider measures not requiring assessment (to be screened out)
2. Assess the effects of SWMI required measures in the consulted on updated RBMP
3. Consider the programmes of measures in the 2015 updated RBMP.

Measures that have been screened out at this stage are on the basis of the current level of information available. However, this does not mean that they are automatically screened out at the project level. Therefore, when they are implemented, further consideration should be given to any potential effects on European sites.

3.2.1 Screening for SWMI required measures that will have potential effects

There are over 20 categories of SWMI required measures in the Severn RBMP. Of these, the following 3 measures have been screened out as having little or no effect on European sites:

- Reduce waste water point source pollution at source
- Prevent introduction of invasive non-native species
- Building awareness and understanding to slow the spread of invasive non-native species.

Measures to reduce waste water point source pollution at source are considered likely to be implemented within the confines of existing waste water treatment works, and therefore not give rise to significant hazards. The measures relating to invasive, non-native species are based around preventative measures and education and awareness, will not give rise to significant interventions on the ground, and therefore are not considered likely to give rise to significant hazards to which European sites could be susceptible.

Additionally, for the Usk and South East Valleys management catchments, local measures referring to the completion of first cycle and new investigations were screened out as they relate to the ongoing monitoring programme for the RBMP.

3.2.2 Screening of measures managing European sites

If there are measures in the plan that are directly connected with or necessary for the management of European sites, then these are normally screened out of consideration in the HRA, provided that there is no likely significant effect on the designated features of other European sites.

While the RBMP as a whole is not considered to be directly connected with or necessary for the management of European sites, the RBMP includes measures for a number of designated Protected Areas, which includes water dependent European sites (SACs and SPAs). The measures for those water dependent sites will incorporate the information from the Site Improvement Plans (SIPs) published by Natural England and Prioritised Improvement Plans (PIPs) being developed by NRW. The plans outline the priority measures required to improve the condition of the sites' qualifying features, and are thus directly necessary for their management. For HRA purposes these Protected Area measures are therefore not required to be considered further.

3.2.3 Assessment of SWMI required measures

The HRA has been carried out on the range of SWMI required measures to achieve long-term WFD objectives, as set out in the updated RBMP for consultation. These are measures that prevent deterioration, achieve protected area objectives, meet water body status objectives, and in the case of England, for the consultation stage of preparation are assessed as cost-beneficial without any constraints on affordability or timescales of delivery.

The SWMI required measures are high level summaries of the range of actions required to address the SWMIs, without any specific details as to the precise location, design and method of implementation. At this strategic level, there are significant constraints as to the extent to which the effects on European sites can be assessed. The RBMP HRA provides a high level assessment of potential hazards and risks to European sites, which subsequent plans or projects will be able to use to inform assessment in more detail, along with the types of mitigation that may be required to enable a measure to be implemented in accordance with the Habitats Regulations. The results of the assessment are provided in section 4.1 and 4.2; further consideration of the highest risk measures for the RBD is provided in section 4.3.

The potential effects from the SWMI required measures on European sites was assessed by identifying their potential hazards and relating these to the range of features for which the sites in the RBD are designated, using the national tables from the Environment Agency's Habitats Directive Handbook. Appendix 1 (Table A1a and A1b) sets out the potential hazards to qualifying features of European sites in the Severn RBD. The tables show the frequency of different SWMI required measures (across catchments) and the frequency of occurrence of qualifying features (within SACs, SPAs and Ramsar sites) within the RBD. Where the measure have greater potential for hazards on the European site features in the RBD, this is illustrated by the numbering and colour coding within the tables. Table A1a covers the 8 management catchments (including 3 cross-border), and their constituent operational catchments. Table A1b separately covers the two management catchments entirely within Wales, since the measures in these catchments were assigned to individual water bodies rather than operational catchments. The high level categories of measures for these catchments / water bodies have been aligned to the SWMI measure types used in the assessment, in order to provide an assessment of their main potential hazards / risks to site qualifying features⁷.

These matrices of potential hazards have been developed from the Environment Agency Habitats Directive Handbook's national tables, shown in Table A2 and A3 (Appendix 1). An extract from Table A1a is provided in Table 3 below to illustrate the approach.

⁷ This alignment of measures is summarised in Table A4 in Appendix 1, with the potential hazards arising from each measure presented in Table A1b.

Although the proposed measures are set out according to management and operational catchments, the details of where the measures will be implemented and their methods of implementation are not included within the plan. The measures have been assessed on the basis of the potential hazards they may give rise to, combined with the potential sensitivities of site features present in the RBD. The assessment identifies potential risks to European sites and their features, but cannot determine at this stage whether those risks would lead to impacts on specific European sites and features, or the nature and scale of those impacts. Therefore, the assessment is not accurate indication of cumulative impact, but it flags where there may be greater risk due to frequency. The assessment also identifies the range of controls and mitigation that more detailed plans and projects will need to consider to address the potential risks (see section 4). This gives confidence that there are options available at the lower tier to adequately mitigate for any potential impacts, notwithstanding the fact that lower tier HRA will still be required.

Table 3 Potential Impacts of Measures on qualifying features of European Sites in the Severn RBD (England) (extract of Table A1a in Appendix 1)

		SEVERN [8 Management Catchments in England with cross border areas]		RBMP MEASURES for RBD	Physical modifications (to improve habitats)							
		No of impacts (hazards) from measures on qualifying features	water dependent features Y/N	no. of occurrences of the feature within RBD	Measure type							
					Removal or easement of barriers to fish migration	Removal or modification of engineering structure	Improvement to condition of channel/bed and/or banks/shoals	Improvement to condition of riparian zone and/or wetland habitats	Change to operations and maintenance	Vegetation management		
		No. of EUROPEAN SITES in RBD (33)			26	25	34	30	14	16		
					43%	41%	56%	49%	23%	26%		
Total number of European sites (SAC, SPA, Ramsar) present in the RBD	Site qualifying features: habitat / species groups present within the RBD and whether water dependent	Qualifying features										
		SAC (34)	Ramsar (4)	1.1 Fens and wet habitats not acidification sensitive*	Y	6	9	9	8	8	5	2
				1.2 Bogs and wet habitats, acidification sensitive*	Y	11	6	6	6	6	5	2
				1.3 Riverine habitats	Y	5	10	10	9	9	6	2
				1.4 Standing Waters acidification sensitive*	Y	5	7	7	7	7	4	1
				1.5 Standing waters not acidification sensitive*	Y	6	9	9	8	8	5	1
				1.6 Dry woodlands*	N	14	3	3	2	2	2	1
				1.7 Dry Grassland*	N	12	3	3	2	2	2	1
				1.8 Dry heathland habitats*	N	10	2	2	2	2	2	1
				1.9 Upland*	N	2	4	4	4	4	4	2
				1.10 Coastal habitats*	N	7	6	6	5	5	4	2
				1.11 Coastal habitats sensitive to abstraction*	Y	4	6	6	6	6	3	1
				1.12 Estuarine and intertidal habitats	Y	5	8	8	8	8	5	2
				1.13 Submerged marine habitats	Y	5	5	5	5	5	2	1

Type of measure

SWMI required measures

Number / %-age of operational catchments where the SWMI required measures are proposed

Colour coding used to indicate risk, assuming higher risk is associated with a higher number of hazards.
1 = 1 hazard / qualifying feature sensitivity
10 = 10 hazard / qualifying feature sensitivities

Number of times the SAC / SPA / Ramsar qualifying feature occurs within sites in the RBD

The number of hazards associated with the SWMI required measure to which the qualifying feature group is sensitive. The SWMI required measure highlighted is considered to give rise to 8 hazards that Estuarine and intertidal habitats are sensitive to.

3.2.4 Assessment of proposed programmes of measures

Following the consultation on the updated RBMP SWMI required measures, the RBMP has drawn on government and key sector plans to identify more specific programmes of measures that will deliver specific WFD objectives in specific timescales for the 2015 updated RBMP, as follows:

- Measures to prevent deterioration – these are national regulations or mechanisms that operate to safeguard the water environment
- Measures to deliver 2021 outcomes – these are specific programmes of investment planned by government and key sectors to deliver improvements in the 2nd cycle of the RBMP
- Measures for 2027 and beyond – these are future required levels of investment nationally by government or sectors to achieve the objectives of water bodies
- Measures for protected areas – these are the national set of action plans in place for different designated protected areas, including drinking water protected areas, shellfish waters, bathing waters, nutrient sensitive areas and Natura 2000 (European) Sites.

In preparing the updated RBMP programmes of measures, any likely significant effects of SWMI required measures on European sites, as identified from the HRA, were highlighted so that programmes of measures could take account of required controls and mitigation.

The HRA further considered each of these programmes of measures to assess if any further detail was given about their nature and scope, beyond what has been assessed for the SWMI required measures. The main focus is on the measures delivering 2021 outcomes, where there are a series of national programmes related to different funding sources, and a range of local measures developed by catchment partnerships across the RBD. The HRA considered each of these in order to identify any more specific risks of the proposed measures, and any more specific controls and mitigation that would be required as more detailed plans and projects are developed.

The main national programmes are:

- Water company investment programme
- Rural investment (comprising Countryside Stewardship in England and Glastir in Wales)
- Highways England's environment fund
- Flood risk management investment programme
- Catchment level grant in aid funded improvements in England
- NRW funded improvements
- Abandoned metal and coal mine programmes (local issue in the Severn RBD)
- Water resources sustainability measures.

The range of local measures proposed by the catchment partnerships were considered together as a bundle of measures across the RBD.

3.2.5 Controls and mitigation

Assessing likely significant effects on European sites for the RBMP requires consideration of the scope for controls and mitigation to avoid significant effects. These will be required if lower tier HRAs determine that adverse effects cannot be ruled out in the absence of mitigation. The detail of the control and mitigation will be set out as part of more detailed plans and projects during the implementation of the RBMP, led by different sectors and investment programmes.

Controls: The principal controls on measures proposed within the RBMP are the subsequent tiers of regulation and consenting, and the further requirement for HRA on more detailed plans/projects. The Habitats Regulations require that the competent authority⁸ for any plan or project to ensure the requirements of the Habitats Regulations are met before undertaking or permitting any project. Any project developer is required to provide the competent authority with information necessary for the HRA of that project. The competent authority must consult Natural England, and Natural Resources Wales where European sites in Wales are potentially affected, as statutory conservation adviser on the HRA and its conclusions before it can undertake the measure or authorise consent for another to do so. It should be noted that in the context of the Habitats Directive and Habitats Regulations, the term 'project' is widely defined. Projects are not limited to construction works, and may include variations in the use, or the intensity of use of land or water. In cases where activities cease, potential effects on European sites will be taken into account and the statutory conservation body consulted.

Mitigation: A subsequent tier of plan or project, if deemed likely to result in significant effect on one or more European sites, will need to include mitigation to avoid or reduce potential effects. The precise specification of mitigation measures is best determined at project level, where greater detail is known about the design, location and extent of the project, and its potential influences on European sites and their qualifying features.

Appendix 2 sets out generic examples of mitigation / approaches that can be applied to the RBMP measures. These include statutory planning, regulatory and consenting processes, and project level mitigation options to avoid and/or reduce potential adverse effects.

3.3 Considering the need for further stages of assessment

The assessment of likely significant effects on European sites from measures in the plan will result in a conclusion as to whether the effects may be significant or not. If they are, then this would trigger the need for more detailed consideration of effects in a further stage of HRA called Appropriate Assessment. Where any adverse effects are unable to be avoided or mitigated fully, then consideration of alternative solutions is required. In the event there are no available alternatives, then a case for imperative reasons of overriding public interest (IROPI) would have to be made to the Secretary of State for Environment, Food and Rural Affairs and / or Welsh Government. This would need to include proposals for compensatory measures. The HRA report sets out the requirements for these levels of further consideration (see section 4.5).

⁸ A competent authority, as defined by the Habitats Regulations, is a Minister, government office, statutory undertaker or public body, with authority to give consent, or with authority to carry out projects (or plans) themselves.

4 Screening and Likely Significant Effects

This section reports on the results of screening and consideration of likely significant effects. These are summarised under the following headings:

- The range of SWMI required measures (as set out in the consultation)
- The highest risk SWMI required measures for the Severn RBD
- The specific programmes of measures in the updated RBMP
- Likely Significant Effects conclusion.

4.1 Summary of SWMI required measures

We have considered the likely significant effects on European sites of the full range of SWMI required measures that were considered worthwhile and put forward for **consultation in the updated RBMP**. Table 4 below summarises the results of this, with section 4.2 reporting on each type of measure related to SWMIs. The summary draws directly from the potential hazards matrix – Tables A1a and A1b in Appendix 1, and focuses on the measures with highest numbers of potential hazards, and the European sites with features likely to be most vulnerable to these hazards.

Table 4 Summary of potential risks to European Sites in the Severn RBD (based on the 8 management catchments in England including cross-border areas)

SWMI required measures and their numbers of hazards to European Sites and frequency across catchments	Measures with higher no of hazards to European sites (10-8)		Measures with medium no of hazards to European sites (7-4)		Measures with lower no of hazards to European sites (3-1)	
	SWMI measures (no of)	Occurring in % of RBD catchments	SWMI measures (no of)	Occurring in % of RBD catchments	SWMI measures (no of)	Occurring in % of RBD catchments
Physical modification	4	41-56%	1	23%	1	26%
Pollution from waste water					3	20-56%
Pollution from towns, cities and transport			1	23%	2	15-38%
Changes to natural flow & levels of water	1	8%	1	11%	2	10-23%
Invasive non-native species					2	7-10%
Pollution from rural areas			1	49%	2	34-70%
Pollution from mines					1	7%
<p>The 5 highest risk measures are (% occurrence in the 8 English catchments in the RBD):</p> <p>Physical modification:</p> <ul style="list-style-type: none"> • Removal or easement of barriers to fish (43%) • Removal or modification of engineering structure (41%) • Improvement to condition of channel/bed and/or banks/shoreline (56%) • Improvement to condition of riparian zone and/or wetland habitats (49%) 						

Changes to natural flow and levels of water:

- Improvement to condition of channel/bed and/or banks/shoreline (8%)

Measure types with similar potential risks/hazards are also represented across the Usk and South East Valleys management catchments (see Table A1b in Appendix 1).

The most frequently occurring qualifying features in the RBD (England and Wales) that would potentially be most affected by these measures are (no of sites in RBD with qualifying features):

- (1.1) SAC/Ramsars with fens and wet habitats, not acidification sensitive (up to 10 sites)
- (1.2) SAC/Ramsars with bogs and wet habitats, acidification sensitive (up to 13 sites)
- (1.10) SAC/Ramsar coastal habitats (up to 9 sites)
- (2.5) SAC/Ramsar Anadromous fish (up to 9 sites)
- (3.4) SPA/Ramsars with birds of lowland wet grassland (up to 9 sites)
- (3.6) SPA/Ramsars with birds of lowland freshwater and their margins (up to 10 sites)
- (3.8) SPA/Ramsars with birds of coastal habitats (up to 10 sites)
- (3.9) SPA/Ramsars with birds of estuarine habitats (up to 9 sites)

See section 4.3 for summary of highest risk SWMI related measures.

4.2 The assessment of SWMI required measures

Each section below sets out the HRA assessment on each type of measure related to SWMIs and a list of more specific measures by drawing on the potential hazards matrix (Table A1a and A1b in Appendix 1). The risks of each measure on the features of European sites are considered, as well as the range of controls and mitigation that may be required for more detailed plans and projects that will implement these measures.

4.2.1 Measures required to address physical modifications

Physical modifications affect 27% of water bodies in the Severn RBD. The measures required to address this are present in up to 56% of operational catchments. For the consultation of the updated RBMP the following measures were proposed to address these in the 8 management catchments in England, including their cross-border areas:

Type of measure	Description of measures	Number of operational catchments where measure proposed (England)
Physical modification	Removal or easement of barriers to fish migration	26 (43%)
	Removal or modification of engineering structure	25 (41%)
	Improvement to condition of channel/bed and/or banks/shoreline	34 (56%)
	Improvement to condition of riparian zone and /or wetland habitats	30 (49%)
	Vegetation management	14 (23%)
	Changes to operation and maintenance	16 (26%)

With respect to the two management catchments within Wales, measures associated with physical modifications (to improve habitat) were proposed for half of the 69 water bodies within the Usk catchment, whilst in the South East Valleys catchment measures were proposed for approximately a quarter of its water bodies (total of 69).

Consideration of effects

Of the measures proposed within the Severn RBD, the measures that make up the physical modifications (to improve habitats) have the greatest potential to lead to hazards, which could in turn present potential risks to designated site features. In particular, measures for removal/easement of barriers to fish migration, the removal or modification of engineering structures and improvements to the condition of channel/bed and or banks/shoreline and riparian zone/wetland have the potential to lead to a similar range of hazards that could affect water levels, flows and quality, alter physical processes and result in noise and visual disturbance, habitat loss and physical damage. Increased competition from non-native invasive species is also identified as a potential hazard in relation to the measures for the removal or easement of barriers to fish migration and the removal or modification of engineering structures. Overall, these measures have a similar occurrence, proposed in 41% to over 50% of the England and cross-border operational catchments. Measures within the scope of physical modifications are proposed for half of the 69 water bodies within the Usk management catchment, whilst in the South East Valleys catchment measures are proposed for approximately a quarter of its water bodies.

Many of the SAC qualifying species are considered susceptible to these types of physical modification measures. These include anadromous fish, as well as non-migratory fish and invertebrates of rivers, with fish species overall showing a consistently high level of sensitivity to the potential hazards. Other species considered vulnerable are mammals of river habitats and amphibia, and to a slightly lesser extent vascular plants of aquatic habitats and vascular plants, lower plants and invertebrates of wet habitats. These qualifying features have broadly similar levels of occurrence across the RBD (between 7 to 9 sites). Qualifying species within the RBD considered less vulnerable to such measures include liverworts, mammals and invertebrates of wooded habitats and also marine mammals.

SPA bird populations such as birds of lowland freshwaters and their margins, birds of coastal and estuarine habitats and, to a slightly lesser extent, birds of lowland wet grassland are also considered to be particularly susceptible to measures proposing physical modifications. All these groups of qualifying bird species have similar levels of occurrence in the RBD (between 9-10 sites). In general, the sensitivities in relation to birds are more likely to relate to hazards arising from construction activities, and therefore of a short term nature, but less likely once the construction of those physical modifications has been completed.

Within the RBD the SAC habitats that are considered particularly susceptible to measures for physical modifications are riverine habitats, fens, bogs and wet habitats (not acidification sensitive), standing waters (not acidification sensitive), estuarine and inter-tidal habitats and to a slightly lesser extent coastal and submerged marine habitats, standing waters (acidification sensitive) and bogs and wet habitats (acidification sensitive). The majority of these qualifying features have broadly similar levels of occurrence (between 6 to 7 sites) across the RBD, although fens and wet habitats (not acidification sensitive) and bogs and wet habitats (acidification sensitive) tend to have a higher occurrence and represented in 10 to 13 sites. By contrast habitats such as dry woodland, grassland and heathland as well as upland habitats are considered less at risk from these types of measures. Across the RBD, the qualifying features for dry woodland, grassland and heathland habitats have some of the highest levels of occurrence (between 13 to 19 sites).

Other measures involving physical modifications to improve habitat include vegetation management. This measure is proposed in a quarter of the operational in England and their cross-border areas and, in general, is considered to present a much lower potential risk to designated site features. This is because of the much more restricted number of potential hazards, which in the main relate to disturbance and physical damage. Changes to operations and maintenance are proposed in just under a quarter of the operational catchments in the management catchments in England (and cross-border areas). However, this type of measure is considered to present a slightly higher potential risk to designated site features with a similar pattern across qualifying habitats, species and birds as the more hazardous grouping of the measures outlined above. This reflects the greater number of potential hazards that could affect vulnerable qualifying features and include changes in water levels and flows, changes to physical processes, disturbance and habitat loss and physical damage.

Controls and mitigation

The main mechanisms for controlling hazards arising from these measures are project level HRA where European sites are identified as affected, and would include planning permission where significant schemes are involved. Some work can be undertaken under permitted development rights and where a European site may be affected the statutory consultation body is consulted. Should the measures be found to have likely significant effect then the application for consent is made to the local planning authority. Any physical modifications on or near a main river or river / sea flood defences would require flood defence consent from the Environment Agency, or NRW for Wales, or its equivalent consent for ordinary watercourses from the relevant Internal Drainage Board (IDB) or Lead Local Flood Authority (LLFA). In the marine context, for any measures involving works below the mean high water spring (MHWS) tidal limit, a marine licence would be required from the Marine Management Organisation (MMO) or from NRW in Wales. These consenting organisations would be the competent authority⁹ under the Habitats Regulations, and would consult with Natural England/NRW on the HRA, including any proposals for mitigation.

Project-level mitigation for these measures would focus on appropriate controls for the hazards identified, along with consideration of any site specific sensitivities of the affected qualifying features. From the hazards identified from this HRA (Table A2 in Appendix 1), the hazards are broadly similar across the different SWMI required measures, reflecting potential for changes in water levels, flows / velocities and physical regime, (noise or visual) disturbance, loss of habitat, physical damage and potential changes to water quality (salinity / siltation / turbidity), and to a slightly lesser degree the potential for increased competition from non-native invasive species.

For potential loss of habitat, physical damage and disturbance, key project-level mitigation would focus on the avoidance of working on, or in proximity to sensitive habitats; the use of fencing and screening to minimise visual and noise disturbance, and also segregation / prevention of construction activity on or near sensitive habitats. Works can also be timed to avoid ecologically sensitive periods, such as breeding or migratory passage periods for birds, fish and other species. Such mitigation can best be developed by consideration of the existing habitats and species and their sensitivities, carried out as part of the project-level

⁹ Where multiple consents are required a single authority is identified as the 'lead competent authority'.

HRA, supported by appropriate survey as necessary, and informed through site specific knowledge, established through early consultation with Natural England or NRW.

Changes in water levels, flows / velocities and physical regime, and potential water quality changes, may be temporary, arising from construction, or more long term due to the changed behaviour of flows / sedimentary regime due to the removal of a structure or changed profile of the riparian zone / channel / banks or shoreline. Impacts of temporary changes during construction can be mitigated through sensitive timings and construction methods of working, for example, the removal of a fish barrier during low flow conditions to minimise risk of silt plumes, or breach of a bank for a managed realignment during neap tides to minimise scour / erosion of inter-tidal habitat at the breach location. Consideration of longer term / operational impacts would be considered through building of mitigation in to the design. Taking, for example, the measure ‘removal or easement of barriers to fish migration’, the design of the project would consider potential upstream and downstream effects of changes to the hydrodynamic regime, any potential consequences for European site habitats, and build in mitigation. Such mitigation may include design of the scheme to reduce potential changes in flow velocities, and erosion / accretion downstream effects.

To address the potential risk of works leading to increased competition from non-native invasive species, the project proposals would be informed by appropriate surveys and site-specific knowledge of the watercourse and catchment. This would help to identify the potential risk and inform the project design in addition to the use of appropriate bio-security measures during construction.

4.2.2 Measures required to manage pollution from waste water, from towns, cities and transport and from mines

Pollution from waste water affects 29% of water bodies in the Severn RBD. The measures required to address this are present in up to 56% of operational catchments. For the consultation of the updated RBMP the following measures were proposed to address these in the 8 management catchments in England, including their cross-border areas:

Type of measure	Description of measures	Number of operational catchments where measure proposed (England)
Manage pollution from waste water	Mitigate/remediate point source impacts on receptor	34 (56%)
	Reduce point source pollution at source	10 (16%)
	Reduce point source pollution pathways (i.e. control entry to the water environment)	12 (20%)
	Reduce diffuse pollution at source	18 (30%)

With respect to the two management catchments within Wales, measures associated with managing pollution from waste water are proposed for just under a fifth of the water bodies within the South East Valleys catchment, with a slightly smaller proportion in the Usk catchment.

Consideration of effects

Measures to manage pollution from waste water are proposed in approximately a quarter to just over a half of the operational catchments in England (including cross-border) and associated with less than a fifth of water bodies in the Usk and South East Valleys management catchments. Such measures are considered in broad terms to present a relatively low risk to European Site qualifying features due to the focus of actions at the source of the pollution such as installing and or improving waste water treatment infrastructure. Potential hazards of measures to manage waste water are generally confined to disturbance, habitat loss and physical damage.

Pollution from towns, cities and transport and other activities affects 12% of water bodies in the Severn RBD. The measures required to address this are present in up to 38% of operational catchments. For the consultation of the updated RBMP the following measures were proposed to address these in the 8 management catchments in England, including their cross-border areas:

Type of measure	Description of measures	Number of operational catchments where measure proposed (England)
Manage pollution from towns, cities and transport	Reduce diffuse pollution pathways (i.e. control entry to the water environment)	23 (38%)
	Mitigate/remediate diffuse pollution impacts on the receptor, Reduce diffuse pollution at source	14 (23%)
	Reduce diffuse pollution at source	9 (15%)

In the Usk management catchment measures supporting sustainable access and recreation management and waste management are widely distributed and proposed for nearly half its water bodies. In the South East Valleys management catchment measures for waste management, urban diffuse pollution and sustainable access and recreation are proposed for approximately 10 water bodies.

Consideration of effects

Given the predominantly rural character of the Severn RBD, measures proposed to manage pollution from towns, cities and transport show a more limited occurrence across the catchments in England, proposed in less than a fifth to just over a third of the operational catchments. Broadly related measures are more widely proposed for water bodies in the Usk management catchment, although with a more limited occurrence in the South East Valleys catchment.

In general, the management of pollution from towns, cities and transport and other activities is considered to present a relatively low risk to European Site qualifying features. The main potential hazards associated with these types of measures typically include disturbance, habitat loss, physical damage and changes in turbidity and surface water flooding. Measures targeting the impacts of diffuse pollution from these sources on receptors may

present a slightly higher risk for some SAC species, such as mammals of riverine habitats, amphibia and fish species, as well as for birds of estuarine and coastal habitats and lowland freshwaters and their margins. These measures also pose a slightly higher risk for fen, wetland, riverine and estuarine/intertidal habitats. These measures, however, are proposed in less than a quarter of the operational catchments in England and their cross-border areas.

Pollution from abandoned mines affects 2% of water bodies in the Severn RBD. In places it is an important local issue, for example in the South East Valleys catchment in Wales. The measures required to address this are present in up to 7% of operational catchments. For the consultation of the updated RBMP the following measures were proposed to address these in the 8 management catchments in England, including their cross-border areas:

Type of measure	Description of measures	Number of operational catchments where measure proposed (England)
Manage pollution from mines	Mitigate/Remediate point source impacts on receptor	4 (7%)

In the Usk and South East Valleys management catchments measures for remediating mine water and contaminated land are proposed for 3 water bodies.

Consideration of effects

Measures proposed to manage pollution from mines within the Severn RBD are represented across a number of management catchments in the RBD, including the Severn Uplands, Wye, Usk and South East Valleys. Within these areas, however, the measures are relatively restricted and localised in their distribution. The measures are focused on addressing the impacts of point source pollution from these sources on receptors, and, in terms of potential risks to European site features, reflect a similar pattern to that of managing pollution from waste water, and are considered generally to present a relatively low risk.

Controls and mitigation

Management of pollution from towns, cities and transport, from waste water and from mines all involve consenting / regulatory mechanisms. Relevant consenting and regulatory regimes are likely to be similar to those for the management of pollution from rural areas. Where significant schemes are involved, planning permission may be required and would be the principal consenting mechanism. Measures in relation to waste water and mine water pollution may also require environmental permits under the Environmental Permitting Regulations.

Predicted hazards from these measures are varied and therefore mechanisms / project-level mitigation approaches will have different areas of focus or emphasis given the particular context of the measures, as for example, urban, transport, mine water, waste or associated with recreational activities. Generally at the project level, mitigation measures would typically include avoidance of works on, or in close proximity to sensitive habitats as well as considering the timing of the activity to avoid sensitive periods and appropriate working

practices, this depending on the European sites and qualifying features potentially affected. Additionally, measures proposed for managing pollution from mine water at the project level would also need to consider whether any specific designated site features are adapted to the unique conditions provided by the mine workings and could potentially be adversely affected by the proposed remediation.

In view of the potential range of contexts for these types of measures, potential mitigation should be tailored to the specifics of the measure, and developed in relation to the specifics of the project and sites / features potentially affected. Proponents of projects and/or competent authorities should seek the advice of Natural England or NRW at an early stage in the development of a project; that way any mitigation can be agreed early on, built into the project's appraisal and design, and incorporated within sensitive construction methods of working.

4.2.3 Measures required for pollution from rural areas

Pollution from rural areas affects 40% of water bodies in the Severn RBD. The measures required to address this are present in up to 70% of operational catchments. For the consultation of the updated RBMP the following measures were proposed to address these in the 8 management catchments in England, including their cross-border areas:

Type of measure	Description of measures	Number of operational catchments where measure proposed (England)
Manage pollution from rural areas	Reduce diffuse pollution at source	43 (70%)
	Mitigate/remediate diffuse pollution impacts on the receptor	30 (49%)
	Reduce diffuse pollution pathways (i.e. control entry to the water environment)	21 (34%)

With respect to the management catchments in Wales, measures in support of sustainable agricultural practices are proposed for over a half of the water bodies within the Usk catchment, whilst other measures associated with sustainable woodland and forestry management are proposed for nearly half of the catchment's water bodies. These types of measures are much less prevalent in the South East Valleys catchment due to its more urban nature. Measures promoting sustainable agricultural practices, for example, are proposed for less than a fifth of its water bodies.

Consideration of effects

Measures to manage pollution from rural areas are some of the most prevalent type of measures across the 8 management catchments in England and their cross-border areas, and occur in over a third to nearly three quarters of the constituent operational catchments. This high occurrence is also true for the Usk management catchment, although much more limited for the South East Valleys catchment.

The management of pollution from rural areas is considered overall to present a relatively low risk to European site designated features. As indicated from the assessment, the level of risk does not vary significantly across the SWMI required measures, although measures

to address diffuse pollution impacts on receptors may present a slightly higher risk to some qualifying features. In particular, this includes some SAC species, such as mammals of riverine habitats, amphibia and fish species, as well as birds of lowland freshwaters and their margins and coastal and estuarine habitats. Also at slightly higher risk are fen and wetland (not acidification sensitive) and riverine habitats. The main potential hazards associated with these types of measures include disturbance, habitat loss, physical damage and changes in turbidity and surface water flooding.

Controls and mitigation

Consenting / regulatory mechanisms may vary, depending on their nature and location. For example, remediation measures may consider physical interventions such as sediment removal or river restoration, which is subject to flood defence consent, or requires a marine licence in a marine context, with physical works in or next to rivers subject to the requirements of the EIA (Land Drainage Improvement Works) Regulations. Other measures comprise agricultural and land use management, which may not necessarily require a specific consent for their implementation. However, where operations or activities are within / in proximity to, or will impact on SSSIs (which underpin the majority of European sites in England) the Countryside and Rights of Way (CRoW) Act 2000 requires the prior assent from Natural England or NRW before those operations can commence. Any public body seeking assent is required to undertake their own HRA.

Project-level mitigation would consider timing of management activities to avoid sensitive periods, implementation methods to reduce disturbance, habitat loss and physical damage. Advance consultation with Natural England and / or NRW would ensure any new / changed management practices were checked against the list of operations likely to damage affected SSSI/s and inform changes to SSSI management agreements, where appropriate. Similarly, consultation in relation to relevant Site Improvement Plans (SIPs), or equivalent Prioritised Improvement Plans (PIPs) in Wales, for European sites affected would establish priority issues and pressure on sites, particularly any related to water quality / diffuse pollution. This would inform whether proposed actions or methods of working may exacerbate these issues and allow tailoring of site-specific mitigation, but also potentially optimise management activity to help deliver actions proposed in the SIPs and PIPs to remedy these issues.

4.2.4 Measures required to manage changes to natural flow and levels of water

Changes to the natural flow and level of water affects 7% of water bodies in the Severn RBD. The measures required to address this are present in up to 23% of operational catchments. For the consultation of the updated RBMP the following measures were proposed to address these in the 8 management catchments in England, including their cross-border areas:

Type of measure	Description of measures	Number of operational catchments where measure proposed (England)
Improve the natural flow and level of water	Control pattern/timing of abstraction	14 (23%)
	Water demand management	6 (10%)
	Improvement to condition of channel/bed and/or banks/shoreline	5 (8%)
	Use alternative source/relocate abstraction or discharge	7 (11%)

With respect to the management catchments in Wales, in the Usk catchment measures generally associated with improving flows and water levels are proposed for nearly half of its water bodies, whilst in the South East Valleys catchment associated measures are proposed for only 8 water bodies. The Usk catchment also has a higher number of water bodies (5) where measures are proposed in relation to drainage and water level management.

Consideration of effects

The types of measures proposed to improve the natural flow and level of water are variable in their potential for hazards and consequent risks to European site features. Measures relating to water demand management and controlling the pattern or timing of abstraction are considered to present a relatively low risk to European site features. The potential hazards associated with these types of measures are confined to changes in water levels/table and flows or velocity. For the catchments in England (including cross-border areas) these types of measures are the most frequently proposed tier 2 measure for improving the natural flow and level of water. Measures relating to controls on abstraction are represented in just under a quarter of the operational catchments, whilst water demand management measures are more restricted in their distribution - proposed in 6 operational catchments. Measures considering sources / locations of abstractions or discharges are considered to present a higher risk to European site features, in generally equal measure across the features. However, these measures are proposed in less than a fifth of the operational catchments in England.

Measures proposed to improve the condition of channel/bed and/or banks/shoreline are considered to present the highest potential risk to European site features. The range of potential hazards for this type of measure is similar to those associated with physical modifications. The majority of SAC features are considered more susceptible to these hazards, with the exception of dry woodland / heathland / grassland habitats and vascular grassland plants. Some of the SPA features are likely to be more sensitive, particularly birds of freshwaters and their margins and coastal / estuarine habitats, and to a lesser extent birds of wet grasslands and uplands. However, this type of measure is comparatively restricted - only proposed in 5 of the operational catchments in England.

Controls and mitigation

For measures proposing changes to natural flow and levels of water, those targeting the improvement in condition of channel/bed and/or banks/shoreline, and to a lesser extent, measures considering alternative sources / locations of abstractions or discharges, were

identified as having the greatest potential to lead to hazards. Principal consenting mechanisms for these measures, prompting the requirement for project level HRA where European sites are identified as affected, include: planning permission where significant schemes are involved; some work can be undertaken under permitted development rights and should the measures be found to have likely significant effect on a European site then the application for consent is made to the local planning authority; flood defence consent / ordinary watercourse consent where these measures involve building or removal of structures or alteration to river channel/bed/bank profiles; and marine licence for any measures below MHWS. Alternative sources / locations of abstractions are subject to an application for a water abstraction licence, whilst for discharges require environmental permits from the Environment Agency or NRW under the Environmental Permitting Regulations. Measures involving changes to natural flow and levels of water may also require an impoundment licence from the Environment Agency or NRW.

Hazards identified for channel/bed/banks/shoreline improvement are essentially the same as the equivalent measure under physical modifications, and project-level mitigation for these measures are hence also likely to be similar. Hazards from alternative sources / locations of abstractions / discharges are more limited in and include habitat loss, physical damage and disturbance, as well as changes to water levels and flows / velocity regime. In general terms, construction mitigation would focus on avoidance of working on / near sensitive habitats, fencing / screening / segregation of activity as well as the sensitive timing of works. At the project level it would be particularly important to consider potential operational changes in water levels, flows / velocities and physical regime that may occur due to new or changed abstractions or discharges. As part of the project appraisal and design process for example, depending on the nature and scope of the proposed changes, modelling may be required to understand the potential changes to the flow regime, any potential secondary effects on channel morphology, and how this in turn may influence dependent habitats and species.

4.2.5 Measures required to manage invasive non-native species

Negative effects of non-native invasive species affects less than 1% of water bodies in the Severn RBD. The measures required to address this are present in up to 10% of operational catchments. For the consultation of the updated RBMP the following measures were proposed to address these in the 8 management catchments in England, including their cross-border areas:

Type of measure	Description of measures	Number of operational catchments where measure proposed (England)
Manage invasive non-native species	Mitigation, control and eradication (to reduce extent)	6 (10%)
	Building awareness and understanding (to slow the spread)	4 (7%)
	Early detection, monitoring and rapid response (to reduce the risk of establishment)	5 (8%)
	Prevent introduction	0 (0%)

With respect to the management catchments in Wales, measures for the management of invasive non-native species are proposed for half of the water bodies in the Usk catchment. By contrast similar measures are only proposed for 3 water bodies within the South East Valleys catchment.

Consideration of effects

Measures proposed to manage invasive non-native species, are considered generally to present a low risk to European Site qualifying features, with two of the four SWMI required measures screened out, having been determined as likely to have little or no effect on European Sites (see section 3.2.1). The remaining two SWMI required measures have identical patterns of potential risk to European site features. The main potential hazards associated with such measures are disturbance and physical damage. Measures proposed for early detection, mitigation, control and eradication of non-native invasive species are confined to the Wye, Severn Vale and Teme catchments (less than 10% of the operational catchments). In the Usk catchment, measures for the management of invasive non-native species are proposed for half the water bodies, whereas only 3 water bodies in the South East Valleys management include these measures.

Controls and mitigation

Measures for managing invasive non-native species may not necessarily require a specific consent for their implementation. However, where operations or activities are within / in proximity to, or will impact on SSSIs (which underpin the majority of European sites in England and Wales) the Countryside and Rights of Way (CRoW) Act 2000 requires the prior assent from Natural England or NRW before those operations can commence.

Project-level mitigation would consider timing of management activities to avoid sensitive periods, implementation methods to reduce disturbance and physical damage. Advance consultation with Natural England or NRW would ensure any management practices were checked against the list of operations likely to damage affected SSSI/s and inform changes to SSSI management agreements, if / where appropriate.

4.3 The highest risk SWMI required measures for the Severn RBD

Of the SWMI required measures proposed within the updated RBMP, those identified with the highest potential risk for SAC / SPA / Ramsar site features were as follows:

- Removal or easement of barriers to fish migration
- Removal or modification of engineering structure
- Improvement to condition of riparian zone and/or wetland habitats
- Improvement to condition of channel/bed and/or banks/shoreline.

All 4 measures relate to the 'physical modification' SWMI, and 'improvement to condition of channel/bed and/or banks/shoreline' also relates to the 'changes to natural flow and levels of water' SWMI. Each of these measures are required in approximately half the Severn RBD's operational catchments in England (including their cross-border areas), although under the 'changes to natural flow and levels of water' SWMI, the measure is proposed in only 5 operational catchments.

In Wales, the Usk catchment also has a high proportion of measures for improving fish passage/habitat - proposed for 35 of the 69 water bodies. There is a lower, but still notable

proportion of measures proposed in the South East Valleys catchment, with improvements to fish passage/habitats proposed for 18 water bodies.

4.3.1 Identification of the most sensitive European Site features within the RBD

The potential hazards of these measures to European Site features present in the Severn RBD are highlighted in table 5, below.

Table 5 Potential hazards and sensitivities of site features of the highest risk measures proposed in the Severn RBMP (England including cross-border areas)

	Hazards:	Change in water levels or table	Changes in flow or velocity regime	Changes in physical regime	Competition from non-native species	Disturbance (noise or visual)	Habitat loss	Killing/injury or removal of fish or other animals	Physical damage	Salinity	Siltation	Turbidity
RBMP Measures												
No opr'l catchments												
Removal or easement of barriers to fish migration	26	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
Removal or modification of engineering structure	25	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
Improvement to condition of channel/bed and/or banks/shoreline	34 / 5	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
Improvement to condition of riparian zone +/- wetland habitats	30	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
Habitats												
No. of occurrences in RBD (England and Wales)												
Fens and wet habitats not acidification sensitive	10	✓	✓		✓	✓	✓		✓	✓	✓	✓
Riverine habitats	7	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
Standing waters not acidification sensitive	7	✓	✓	✓	✓		✓		✓	✓	✓	✓
Estuarine and intertidal habitats	7	✓	✓			✓	✓		✓	✓	✓	✓
Species												
Anadromous fish	9	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Non-migratory fish and invertebrates of rivers	8	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
Mammals of riverine habitats	7	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
Amphibia	8	✓	✓			✓	✓		✓	✓	✓	✓
Bird Species												
Birds of lowland freshwaters & their margins	10	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
Birds of coastal habitats	10	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
Birds of estuarine habitats	9	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓

The following **habitat groups** of the European sites within the RBD were considered to be particularly sensitive to the hazards that may occur as a result of these measures:

- fens and wet habitats (not acidification sensitive)
- riverine habitats
- standing waters (not acidification sensitive)
- estuarine and intertidal habitats.

The following **species groups** of the European sites within the RBD were considered to be particularly sensitive to the hazards that may occur as a result of these measures:

- anadromous fish
- non-migratory fish and invertebrates of rivers
- mammals of riverine habitats
- amphibia.

The following SPA/Ramsar **bird species groups** within the RBD were considered to be particularly sensitive to the hazards that may occur as a result of these measures:

- birds of lowland freshwaters and their margins
- birds of coastal and estuarine habitats.

Of the most sensitive features identified, the most commonly occurring in the RBD are the birds of lowland freshwaters and their margins, birds of estuarine and coastal habitats, occurring in 9 / 10 designated (SPA / Ramsar) sites within the RBD.

Overall, these groups of bird species, together with birds of lowland wet grassland, are the most commonly occurring qualifying feature for SPA/Ramsars in the RBD and shown to occur in 9 / 10 designated (SPA / Ramsar) sites. The hazards for which they were identified as sensitive were: change in water levels or table; changes in flow or velocity regime; changes in physical regime; disturbance (noise or visual); habitat loss; killing/injury or removal; physical damage; salinity; siltation and turbidity.

4.3.2 Potential project-level mitigation for highest risks

For the 8 management catchments in England and their cross-border areas, the available information on the proposed measures in the RBMP is the SWMI required measures descriptions and their distribution across the constituent operational catchments. In the case of the Usk and South East Valleys management catchments in Wales, the available information for proposed measures is the summary list of local measures and their distribution across the number of the water bodies with each catchment. At this level of RBD detail, it is not possible to define the precise locations of the substantial majority of the measures, their spatial scale or the nature of their implementation. Specification of mitigation should be tailored to the specifics of the projects / proposals for implementing the measures and the particular sites and features that could be affected, and hence should be identified as part of any required project level HRA process, in consultation with Natural England and NRW. This should take place as early as possible in a project's appraisal and design so that that mitigation can be incorporated as part of the initial consideration of options, design, construction and operation/maintenance. In this way the mitigation hierarchy can be effectively applied throughout all stages of the project cycle seeking to avoid/remove potential adverse effects in the first instance and then aiming to reduce potential adverse effects through appropriate site specific mitigation, which can be tailored to the specifics of the site/s and their qualifying features .

Mitigation of risks to bird and fish species

With regard to the groups of commonly occurring bird species in the RBD that have been identified as particularly vulnerable to the hazards arising from the highest risk tier 2 measures, project-level mitigation would typically consider potential impacts associated with the construction and operation/presence of the proposed project/measure and how these might affect (directly or indirectly) the qualifying features of a particular designated site and, where necessary, its wider surrounding area. Similar considerations would also apply to anadromous fish species, such as allis and twaite shad, Atlantic salmon and river and sea lamprey that are also identified as being highly sensitive to these types of measures.

In order to determine the likely implications of a project/measure for birds of lowland freshwater and coastal and estuarine habitats and to identify appropriate mitigation measures, at the project level it may be necessary to review and understand the presence / abundance and distribution (spatial / temporal) of a site's qualifying bird species, and the nature and functioning role of habitats that support these species. This information may be available from existing data sources and surveys, but may also need to be updated and or expanded through additional site surveys, depending on the site and the location / nature of a proposed project/measure.

Understanding the distribution and ecology of a site's qualifying fish species would also be important at the project level. Early liaison with Natural England, NRW and the Environment Agency would help to identify available data sources on fish species, such as migration routes, the general distribution of species within water bodies and important spawning areas/habitats used by different species.

Construction activities associated with a project/measure could result in disturbance to bird populations, through noise as well as visual disturbance, with potential to result in disturbance responses (which may vary with different species). To avoid potential disturbance mitigation should, where necessary, seek to avoid works during sensitive periods, such as the breeding season and the main period for overwintering or migratory passage birds, the exact timings of which may vary depending on the bird assemblages present. In the Severn RBD sites such as the Severn Estuary are designated due to regularly supporting at least 20,000 waterfowl and avoiding construction activities during the key overwintering period (October to March) should be considered. In addition to this it would be necessary to consider other potentially sensitive periods associated with a site's assemblage of bird species as well as bird species that are a specific qualifying feature. In the case of the Severn Estuary, for example, the internationally important assemblage of water birds includes significant numbers of migrant waders, such as ringed plover, on passage during the spring and autumn up the west coast of Britain. Early consultation with Natural England and NRW would enable local knowledge of the sites and wider areas of usage by qualifying species to be established and help to inform the project-level HRA process.

Project-level mitigation to avoid or reduce potential disturbance to bird species through noise or visual intrusion could include the use of site screening and minimising use of artificial lighting or night time working; establishing appropriate buffer zones within which no works or access would be allowed; restricting the timings for high disturbance construction activities.

Although measures associated with removing barriers to fish migration and or the removal or modification of an engineering structure will primarily serve to benefit migratory fish species, the construction or implementation of the measures could adversely affect fish species, depending on the timing of the works and the method of working. Projects involving in-channel works would need to take account of the migration and spawning times of different species in order to avoid potential disruption to migration routes and impacts on spawning areas. On-site working practices should also be considered at the project level, such as avoiding night-time working when certain species, such as twaite shad, are known to spawn.

Mitigation of risks to habitats

Potential impacts on habitats may be through direct habitat loss or physical damage, or indirectly resulting from changes in physical processes such as changes in water levels, flow or velocity regime or changes in water quality. Changes in water quality and the physical regime can in turn lead to changes in salinity and or erosion and deposition that can affect the type of habitats present as well as their extent, diversity and species composition. In turn, these changes in habitat can affect the species they support. Proposed measures may also serve to increase competition from non-native invasive species, such as non-native cord grass, through accidental introduction or facilitating their spread, which in turn could have implications for the habitat mix and or food sources on which the qualifying bird species depend.

With respect to potential loss of habitat and physical damage, key construction focused mitigation would focus on the avoidance of working on or in proximity to sensitive habitats and the development of site sensitive construction techniques, such as avoiding the use of heavy machinery in sensitive areas.

Potential operational changes in physical processes, such as water levels, flows and velocities as well as potential changes in salinity and water quality would need to be considered at the earliest stage during project appraisal and as part of supporting HRA. Proposals, such as the removal of a structure or existing barrier, may need to be subject to modelling to determine the likelihood and or extent of any changes both upstream and downstream physical processes, and potential implications for habitats. Specific investigations may also be needed, such as confirming whether there is a risk that removing an existing structure/barrier could serve to mobilise sediments. Mitigation for potential changes in physical processes may include refinement of a project's design and the programme for implementation so to avoid significant changes in the existing regime, or to allow for a staged approach to the works to enable valued habitats such as saltmarsh to re-establish. During construction mitigation measures such as pollution prevention procedures may also be appropriate to address potential temporary increases in siltation, sedimentation and turbidity.

Habitat loss and changes in physical processes, water quality and water levels and flows can also affect migratory fish species and would need to be considered as part of a project level HRA process. Works to improve the channel/bed and or banks/shoreline, for example, could result in direct habitat loss of aquatic and bank-side vegetation, whilst changes in physical processes might serve to indirectly affect important spawning habitats, for example through increased levels of siltation. At the project level relevant mitigation would include appropriate construction measures for trapping sediment and avoiding its introduction to the water environment, undertaking works during periods of low flow to minimise sediment transfer; and operational mitigation, such as sympathetic design to address any potential changes in physical processes with consequences for upstream / downstream habitats.

4.4 The specific programmes of measures in the updated RBMP

The updated RBMP sets out specific programmes of measures to meet the following WFD objectives:

- Measures to prevent deterioration
- Measures to deliver 2021 outcomes

- Measures to achieve outcomes for 2027 or beyond
- Additional measures for protected areas.

4.4.1 Measures to prevent deterioration

The updated RBMP sets out the range of regulations and operations that are in place nationally under various government and sector bodies, and will continue to operate to prevent deterioration across water bodies generally. The level of detail in the plan does not relate to SWMI required measures, and so the HRA is unable to consider any further specific risks related to these programmes.

4.4.2 Measures to deliver 2021 outcomes

The updated RBMP gives summaries and examples of the following sector specific programmes of measures and local measures that are expected to deliver outcomes by 2021. They are proposed investments to improve the water environment and achieve WFD objectives from government and key sectors having reviewed the SWMI required measures for long-term objectives, and considered the priorities related to funding, outcomes and delivery timescales. The measures for each programme are described in relation to whether they are likely to directly contribute to predicted improvements in water body element status by 2021; or will secure additional outcomes for the environment, but are not linked to specific improvements in element status by 2021. The programmes of measures for both outcomes are assessed in the following sub-sections, referred to as 'contributing to water body element improvements' and 'securing additional outcomes for the environment'.

- National Measures include:
 - Water company investment programme
 - Rural investment (Countryside Stewardship in England and Glastir in Wales)
 - Highways England's environment fund
 - Flood risk management investment programme
 - Catchment level grant in aid funded improvements (England)
 - Abandoned metal and coal mine programmes
 - NRW funded improvements
 - Water resources sustainability measures
- Local Measures are proposed measures from 10 catchment partnerships and groups.

Some of these programmes will or have undergone their own HRA, or more likely, be part of a wider plan that is subject to HRA. To maintain a consistent approach to all of the programmes these individual assessments have not been taken into account at this strategic level. Nevertheless, these will have a significant influence at the lower tier plan or project level and should be taken into account.

The HRA has considered the range of SWMI required measures that make up these programmes, how these may give rise to any more specific risks to European sites, and any required mitigation, based on the assessment in the previous section (4.2) of the report.

The numbers of measures referred to in the HRA are from supporting information to the updated RBMP and may not be directly referred to in the published plan. It allows the

programmes of measures to be summarised into groups of measures of each SWMI required measure type. The levels of potential risks of each group of measures can therefore be considered, based on the risks assessed for SWMI required measures in the previous steps of the HRA (sections 4.2 and 4.3).

4.4.2.1 Water company investment programme

Water Company Investment Programme (England)

The RBMP measures from the water company investment programme, identified as contributing to water body element improvements, comprise 59 measures for water bodies in the areas of the Severn RBD within England. The vast majority of the measures (56) relate to mitigating / remediating point source impacts on receptors, with a further 2 measures relating to controlling the pattern/timing of abstraction and a single measure relating to the improvement to condition of channel/bed and/or banks/shoreline.

There are 23 measures to secure additional outcomes for the environment. Of these, 18 measures are to improve modified habitat, specifically through removal or easement of barriers to fish migration; 3 measures are to control or manage point source inputs in 7 locations, through mitigating / remediating point source impacts on receptors; and 1 measure to control or manage diffuse source inputs, by reducing diffuse pollution at source. In addition, there is 1 national measure to control and manage abstraction, targeting 7 locations in the Severn RBD; the nature of these measures, e.g. whether controlling the pattern / timing of abstraction or improving the condition of channel / bed / banks, is not defined.

Water Company Investment Programme (Wales)

RBMP measures from the water company investment programme for Wales are not yet available and as such cannot be assessed. It is likely, however, that the type of measures will be similar to those reviewed and assessed for the programme in England; likely to focus in the main on mitigating / remediating point source impacts on receptors, improving modified habitat, through the removal or easement of barriers to fish migration, and controlling the pattern / timing of abstraction. The potential range of hazards / risks to European site features are therefore likely to be similar, as are the consenting regimes and the likely types of mitigation for the construction and operation of associated projects developed to implement these measures (described below).

Potential risks from the programme to European Sites and features vary depending on the nature of the measures. The measures required to mitigate / remediate point source impacts on receptors and controlling the pattern/timing of abstraction, which make up the majority of the programme, are considered to present a relatively low risk to European sites and features, as is the measure to reduce diffuse pollution at source.

The measures to remove or provide easement of barriers to fish migration and to improve the condition of channel/bed and/or banks/shoreline are considered to present a higher risk, with water-dependent European site features more vulnerable to the potential hazards. The nature, scale and details of implementation of these measures are not included in the plan, although the potential hazards, such as disturbance, habitat loss, physical damage and siltation / turbidity, are likely to arise principally during their construction, and therefore likely to be short term in nature. The risks during operation may result in changes in flow patterns

/ velocities, water levels / water table and physical regime, to which sensitive site features, where in proximity (upstream or downstream) to the measures may be sensitive. Another potential risk is increased competition from non-native invasive species.

Upstream / downstream water-dependent habitats are considered susceptible to these types of higher risk measures, in particular the riverine, fens, bogs and wet habitats and standing waters, and also potentially coastal, estuarine and inter-tidal habitats where measures are to be implemented in coastal / estuarine locations. Water-dependent species considered particularly vulnerable to these measures are mammals of river habitats and amphibia and to a slightly lesser extent vascular plants of aquatic habitats and vascular plants, lower plants and invertebrates of wet habitats. Bird species groups, such as birds of lowland freshwaters and their margins, birds of coastal and estuarine habitats, and to a slightly lesser extent, birds of lowland wet grassland, are also considered to be particularly susceptible to potential hazards arising from these measures. Whilst fish species groups are also considered particularly susceptible, this would be mainly associated with the construction phase and once completed fish species are likely to benefit, because the main aim of the measure is to improve habitat / connectivity and supporting physical processes. Similarly, the sensitivities in relation to birds, mammals and amphibia are more likely to relate to hazards arising from construction activities, and therefore of a short term nature, with long term effects likely to principally be positive.

Project level HRA would be required where a European site or sites were identified as potentially being affected by these measures, triggered by the consenting process. For measures addressing point source pollution, this is likely to be the environmental permits from the Environment Agency (and / or NRW) under the Environmental Permitting Regulations. For measures involving any physical works / modifications on or near a main river¹⁰, flood defence consent from the Environment Agency and / or planning permission from the local planning authority would trigger the requirement for project level HRA where European sites were potentially affected. Additionally, improvement measures to channel/bed and/or banks/shoreline in marine or estuarine areas that may involve works below the mean high water spring (MHWS) tidal limit would require a marine licence, which would also trigger the requirement for project level HRA where European sites were potentially affected.

Mitigation of measures involving the removal or easement of barriers to fish migration or improvements to channel/bed and/or banks/shoreline relates to the consideration of operational changes in water levels, flows / velocities and physical regime. This would be mitigated through consideration of flow / water level requirements for European site features as part of any appraisal to support the consent applications. For example, depending on complexity of the proposed changes to the flow regime on river flow patterns, modelling may be required to assess changes to the flow and physical regime, potential secondary effects on channel morphology, and how this in turn may influence dependent European habitats and species.

Construction-related mitigation would consider the avoidance of working on or in proximity to sensitive habitats; the use of screening and sensitive working methods to minimise visual

¹⁰ For works on or near ordinary watercourses, the equivalent ordinary watercourse consent from the Lead Local Flood Authority (LLFA) or Internal Drainage Board (IDB) would be required, which would also trigger the need for HRA where European site/a were potentially affected.

and noise disturbance to sensitive species, and also provision of segregation / prevention of construction activity on or near sensitive habitats. Appropriate timing of works would reduce potential risks by avoiding ecologically sensitive periods, such as breeding or migratory passage periods for birds, fish and other species. Specific investigations may also be needed, such as confirming whether there is a risk that removing an existing structure/barrier could serve to mobilise silt plumes or historically contaminated sediments that might present a risk to bird and fish species. At the project level, relevant mitigation would include appropriate measures for trapping sediment / minimising silt introduction to the water environment and undertaking works during periods of low flow, as well as sympathetic design to address any potential changes in physical processes that could potentially affect upstream / downstream habitats.

Such mitigation can be tailored at the project level, informed by project-level HRA, to the habitat types, affected species and their sensitivities, in order to build mitigation in to the design of the scheme and the methods of working at the earliest stage.

4.4.2.2 Countryside Stewardship (England)

The Countryside Stewardship programme is an entirely voluntary national scheme to enhance the natural environment, increase biodiversity and improve water quality. At this stage the programme does not identify outcomes contributing to water body element improvements because the uptake of measures is voluntary and the exact location of measures and their outcomes are not yet known. However, measures are expected to contribute significantly to securing additional outcomes for the environment, with 30% to 40% of rural England expected to be part of a Countryside Stewardship agreement by 2020.

Countryside Stewardship is expected to principally address diffuse pollution from rural areas, through soil management and reducing the effect of nutrients, sediment and faecal bacteria pollution on water bodies. Measures to address diffuse pollution are considered to be relatively low risk, with any effects on European sites and features are considered likely to primarily be beneficial, particularly for water-dependent sites.

Measures are also anticipated to comprise physical modifications, such as tree planting, re-naturalising rivers and coast defences, including making space for water and coastal realignment. As the uptake of measures is voluntary and the exact location of measures and their outcomes are not yet known, it is not possible to predict the likely impacts on European sites. Because the measures are to target improvements in water bodies, the effects on European sites are expected to be primarily beneficial. However, such measures and interventions have the potential to generate unintended consequences for European sites where in proximity of the measures. Measures for such physical modifications are expected to generate hazards similar to those identified for flood risk management (see section 4.4.2.4).

Such measures would be subject to HRA by Natural England prior to finalising the agreement (as it is a form of consent), and then subsequently project level HRA where required, such as planning permission or flood defence consent.

As part of the Countryside Stewardship programme, further research is planned that will help to evaluate the likely benefits of the programme for water. Such research could help in

targeting mitigation to avoid adverse effects of the programmes of measures for European sites, and how the measures could be tailored to maximise the benefits for improvements in condition of European sites.

4.4.2.3 Highways England's environment fund (England)

The Highways England's environment fund will in part be invested in addressing pollution from highway runoff (pollution from towns, cities and transport), but also physical modifications (to improve habitat). The measures from the programme are identified as contributing to securing additional outcomes for the environment. However, specific measures, or programmes for the Severn river basin district are not identified at this stage, therefore there are no measures identified for contributing to water body element improvements.

Highway runoff is detritus that collects on roads made up of silt and grits mixed with contaminants such as metals and oils, which can wash off the road and reach water bodies and harm the ecology of the water environment. Measures to address this are likely to comprise Sustainable Drainage Systems (SuDS), measures that can trap pollutants from highway outfalls through a swale (shallow grassy ditch) to large balancing ponds that regulate flow quantity as well as allowing pollutants to settle out. These measures are therefore anticipated to be primarily beneficial for European sites, reducing sediment, nutrient and chemical loadings, metal concentrations and improved dissolved oxygen levels, particularly for downstream water-dependent sites and features within areas of influence of the discharges. Potential hazards may arise from the construction of these measures, such as disturbance, physical damage and habitat loss, depending on their size / scale and proximity to European sites.

Measures to address physical modification pressures will be implemented, such as fish and eel passes installed to allow fish migration, and will therefore be of potential benefit for site features, particularly anadromous fish. The main potential hazards from these measures, similar to flood risk management (see section 4.4.2.4) relate to the physical works required to achieve the improvements primarily during their construction, and as such are likely to be short term in nature.

Project level HRA would be required where a European site or sites were identified as potentially being affected by these measures, which would be triggered by the consenting process, such as planning permission or flood defence consent where in proximity to main rivers. Highways schemes can be afforded permitted development powers; however, where such schemes potentially affect European sites, planning permission is required unless supporting assessment can demonstrate no likely significant effect on European sites.

Mitigation for these measures would be similar to that of flood risk management, focused on construction related mitigation, such as avoidance of sensitive habitats; use of screening / segregation; sensitive timing of construction works and appropriate sensitive construction working methods. Such mitigation can be tailored at the project level, informed by project-level HRA, to the habitat types, affected species and their sensitivities, in order to build mitigation in to the design of the scheme and the methods of working.

4.4.2.4 Flood risk management investment programme (England)

The RBMP measures from the flood risk management investment programme all relate to securing additional outcomes for the environment. The measures all target improving modified habitats, through the removal or modification of engineering structures; removal or easement of barriers to fish migration; and improvement to condition of the riparian zone and/or wetland habitats. In total there are 10 such measures proposed for those areas of the Severn RBD within the English catchment, with over half focused on improving the condition of riparian zone and/or wetland habitats. The programme of measures comprises 3 measures associated with delivering outcomes for WFD protected areas; 1 measure for delivering WFD outcomes for SSSIs; 2 measures delivering WFD outcomes related to consent of flood works; and 4 measures related to removal of eel barriers.

The main potential risks from this programme to European sites and features relate to the physical works and interventions required to achieve and implement the improvements. The nature, scale and precise details of these interventions are not included in the plan. However, the hazards generated from the measures are likely to arise principally during their construction, and as such are likely to be short term in nature. The risks during operation are considered likely to be minimal, since the measures are proposed to improve habitat and supporting physical processes in order to achieve improvements in water body status, and with respect to protected areas, to secure their favourable conservation status.

Many of the European site qualifying species are considered susceptible to these types of physical modification measures. These include fish, mammals of river habitats and amphibia and to a slightly lesser extent vascular plants of aquatic habitats and vascular plants, lower plants and invertebrates of wet habitats. Bird population groups, such as birds of lowland freshwaters and their margins, birds of coastal and estuarine habitats and, to a slightly lesser extent, birds of lowland wet grassland are also considered to be vulnerable to these types of measures. Within the RBD habitats that are considered particularly susceptible to measures for physical modifications are riverine habitats, fens, bogs and wet habitats (not acidification sensitive), standing waters (not acidification sensitive) and estuarine and inter-tidal habitats and to a slightly lesser extent coastal and submerged marine habitats, bogs and wet habitats (acidification sensitive) and standing waters (acidification sensitive).

Project level HRA would be required where a European site or sites were identified as potentially being affected by these measures, triggered by the consenting process. This would include planning permission where significant schemes were involved, and/or flood defence consent from the Environment Agency for any physical works / modifications on or near a main river¹¹. Some work can be undertaken under permitted development rights and should the measures be found to have likely significant effect on a European site then the application for consent is made to the local planning authority. For any marine works, i.e. where inter-tidal habitat creation or improvement is proposed, any measures involving works below the mean high water spring (MHWS) tidal limit would require a marine licence, which would also trigger the requirement for project level HRA where European sites were

¹¹ For works on or near ordinary watercourses, the equivalent ordinary watercourse consent from the Lead Local Flood Authority (LLFA) or Internal Drainage Board (IDB) would be required, which would also trigger the need for HRA where European site/a were potentially affected.

potentially affected. Where measures or associated schemes affect SSSIs (which underpin European site designations) the prior assent from Natural England would be required (and NRW where cross-border sites are potentially affected), which may also trigger the need for scheme-level HRA.

With respect to the 3 measures associated with delivering outcomes for WFD protected areas, early liaison and engagement with Natural England (and NRW for cross-border sites) would be particularly important given the likelihood of any works being within or in close proximity to those sites. Early and ongoing liaison would help to ensure that the measures are focused on all relevant qualifying features, other potential benefits can be realised where possible and potential unintended impacts of implementing the measures are appropriately mitigated.

The main mitigation for these types of physical modification measures relate generally to the avoidance of working on, or in proximity to sensitive habitats; the use of fencing and screening to minimise visual and noise disturbance to sensitive species where appropriate, and also segregation / prevention of construction activity on or near sensitive habitats. Appropriate timing of works would reduce potential risks by avoiding ecologically sensitive periods, such as breeding or migratory passage periods for birds, fish and other species. Such mitigation can be tailored at the project level, informed by project-level HRA, to the habitat types, affected species and their sensitivities, in order to build mitigation in to the design of the scheme and the methods of working.

4.4.2.5 Catchment level grant in aid funded improvements (England)

The RBMP measures for catchment level grant in aid funded improvements all relate to securing additional outcomes for the environment. In total there are 17 measures (5 national and 12 RBD specific). Of these, 5 measures relate to improving modified physical habitats; 6 measures relate to managing pollution from modified habitats; 3 measures refer to managing pollution from towns, cities and transport; and 1 measure relates to removing high risk non native invasive species. In addition 2 measures refer in general terms to funding a post (jointly with Natural England) to lead the delivery of SSSI river restoration projects in England.

Measures to manage pollution from towns, cities and transport, control non-native invasive species and manage pollution from rural areas / reduce diffuse pollution at source are considered to generally be relatively low risk, with the outcomes of these interventions likely to be primarily positive for European sites.

The measures to improve modified physical habitats potentially generate a wider range of hazards and therefore considered to be of higher potential risk, depending on their proximity to European sites and sensitive features. The hazards generated from the measures are likely to arise principally during their construction, and as such are likely to be short term in nature. The risks during operation are considered likely to be minimal, since the measures are proposed to improve habitat and supporting physical processes in order to achieve improvements in water body status. Susceptible habitats and species to such physical modifications are as for those identified under flood risk management (see section 4.4.2.4 above).

Project level HRA would be required where a European site or sites were identified as potentially being affected by these measures, triggered by the consenting process. This would include planning permission where significant schemes were involved; flood defence consent from the Environment Agency for any physical works / modifications on or near a main river; and marine licence for any works below MHWS.

Mitigation for these measures would consider the avoidance of working on / in proximity to sensitive habitats; use screening to minimise disturbance to sensitive species where appropriate; and also segregation / prevention of construction activity on or near sensitive habitats. Timing of construction works would also reduce potential risks by avoiding ecologically sensitive (breeding or migratory) periods. Such mitigation can be tailored at the project level, informed by project-level HRA, to the habitat types, affected species and their sensitivities, in order to build mitigation in to the design of the scheme and the methods of working.

4.4.2.6 Abandoned metal and coal mine programmes (England)

Across the whole of the Severn RBD pollution from mine waters is not identified as a SWMI, however, in places it is an important local issue. For the Severn RBD in England there is one measure for securing additional outcomes for the environment in relation to the abandoned metal and coal mines programme. The measure relates to reducing point source pollution at source and specifically to mine water treatment and diffuse metal measures at Minsterley.

Overall, this type of measure is considered to generally present a relatively low risk to European sites and features, with potential hazards such as disturbance, physical damage / habitat loss likely to be associated with the physical works to construct any treatment / remediation scheme, if in proximity to a European site. These hazards and potential risks, where in proximity to European sites, would be short term in nature and manageable through construction mitigation. The risks during operation are considered likely to be minimal, since the measures are proposed to improve downstream water quality status, and therefore also benefit water-dependent European sites / protected areas. There may be rare exceptions where the flora of European sites is adapted to the water quality from mine water discharges, and water quality improvements may therefore lead to adverse effects, but this is considered to be an exception, and is best addressed at the site / project level. The Stiperstones & The Hollies (SAC) is in the wider area of this general location; early liaison with Natural England would be important to determine any potential site specific risks to the site's designated qualifying features. Project level HRA would be required if a European site was identified as potentially being affected by this measure, triggered by the consenting process (flood defence consent, planning permission). If Permitted Development powers covered implementing the measure, but European sites were potentially affected, no likely significant effect would have been demonstrated under the Habitats Regulations.

Any mitigation required is likely to be primarily construction-related, considering the need for avoidance of working on or in proximity to sensitive habitats; the use of screening and sensitive working methods to minimise visual / noise disturbance and also provide segregation / prevention of construction activity on or near sensitive habitats. Appropriate timing of works would reduce potential risks by avoiding ecologically sensitive periods, such as breeding or migratory periods. Mitigation for any potential operational effects is expected

only to be necessary in exceptional circumstances where improved water quality may adversely affect the flora of European sites in proximity / downstream from mine water discharges. Such site-specific mitigation is best addressed at the project level in liaison with Natural England.

4.4.2.7 Water resources sustainability measures (England)

The RBMP water resources sustainability measures all relate to securing additional outcomes for the environment, with all the measures nationally based; there are no specific water resources sustainability measures for the Severn RBD. The national measures are not specifically defined, and therefore their locations at this stage are unknown. The measures refer in general terms to the following regulatory and partnership based activities involving:

- Reviewing abstraction licences, including groundwater abstraction licences, and only renewing on a sustainable basis.
- Regulating a number of currently exempt abstraction activities, including groundwater.
- Using the Catchment Based Approach and collaborative working with external stakeholders to deliver WFD catchment objectives.

In general, these measures are likely to benefit European sites and their management within the Severn RBD. The regulatory measures, for example, will serve to help delivery priority actions in any associated Site Improvement Plan where the Environment Agency is identified as a lead delivery body or partner.

Measures required to control the pattern or timing of abstraction are considered to present a relatively low risk to designated European sites and their features. Some European site features are considered more sensitive to these measures, with water-dependent features more susceptible to water levels and changes in flow regimes than non water-dependent features. Due to the nature of the measures, risks are more likely to occur during operation, with little or no construction works likely to be required to implement abstraction regime changes. However, the risks during operation are considered likely to be minimal, particularly since the primary purpose of the measures is to improve water body status. Where the water body includes a water-dependent European site, this is also a WFD protected area, and the measure is therefore expected to target flow / water levels to protect and improve the status of these protected areas as part of the water body objective.

Project level HRA would be required where a European site or sites were identified as potentially being affected by these measures, which would be triggered by the abstraction licence consenting process for any abstraction licence variation.

The main mitigation for these measures relates to the consideration of operational changes in water levels, flows / velocities and physical regime, due to changed abstraction timings / patterns. This would be mitigated through consideration of flow / water level requirements for European site features as part of any appraisal of any abstraction licence variations. For example, depending on complexity of the proposed changes to the abstraction regime on river flow patterns, modelling may be required to assess changes to the flow and physical regime, potential secondary effects on channel morphology, and how this in turn may

influence dependent European habitats and species. Such appraisal would be undertaken as part of project-level HRA, where required, to support an abstraction licence variation.

4.4.2.8 Local Measures from catchment partnerships and groups

The RBMP includes a wide range of local measures that seek to secure additional outcomes for the environment through addressing urban and rural diffuse pollution, invasive non native species and physical modifications to improve habitat, as well as supporting community and sector engagement and education. The measures are represented in each of the 8 management catchments within England, including their cross-border areas in Wales, although the majority do not identify specific locations. In the majority of cases the measures are likely to deliver multiple benefits relating to improvements to water quality, improving riverine and riparian habitats and species, including fish migration, and working with natural processes in support of flood risk management.

The measures to address urban and rural diffuse pollution are generally considered to present low risk to European sites, with physical modification more likely to generate a wider range of hazards and potential risk to European sites. The hazards and risks from physical modifications are anticipated to be similar to those identified for flood risk management (see section 4.4.2.4, as are the consenting regimes that would trigger the need for project level HRA, where potential effects on European sites are identified.

Mitigation related to this programme at the project level would also reflect that identified for flood risk management and catchment level grant in aid (see sections 4.4.2.4 and 4.4.2.5) in addition to relevant consent/assent requirements from Natural England / NRW. As programmes and measures are developed and refined, early consultation with Natural England and/or NRW would enable the tailoring of measures to avoid potential risk and conflicts with European site objectives, but also to maximise potential benefits for European site features.

4.4.2.9 NRW Programme of Measures

This section assesses the available programme of measures funded by NRW and or specific to the areas of the Severn RBD within Wales. The programme encompasses measures likely to directly contribute to predicted improvements in water body element status by 2021 as well as measures securing additional outcomes for the environment.

NRW Funded Improvements – predicted improvements in water body status

A programme of measures is identified for 30 priority waterbodies in the Usk and South East management catchments and the cross-border areas in Wales of the Wye and Severn Upland management catchments. Across these priority waterbodies the following measure types are represented:

- Measures for physical modifications to improve habitat through the removal or easement of barriers to fish migration (19 waterbodies); improvement to the condition of channel/bed and/or banks/shoreline (3 waterbodies); improving modified habitat (1 waterbody).

- Measures for managing waste water pollution through reducing point source pollution at source (12 waterbodies) and through mitigating/remediating point source impacts on receptors (9 waterbodies)
- Measures for managing rural pollution through reducing rural diffuse pollution at source (21 waterbodies) and through reducing diffuse pollution pathways (1 waterbody).
- Measures involving changes to the natural flow and levels of water through the appropriate management of releases and impoundments (2 waterbodies) and through managing abstraction (1 waterbody).

NRW Funded Improvements – additional environmental outcomes

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 include the following:

- Improvements to the status of fish in the Wye and South East Valleys as a result of measures, for example, habitat improvements, fish passage schemes and spawning gravel cleaning that will be put in place as an alternative to salmon stocking.
- In the Wye, Usk and South East Valleys catchments improvements to habitat, morphology, water quality and a reduction in invasive species are anticipated as a result of partnership action supported by NRW under the Joint Working Partnership and Competitive Funding schemes.
- Following the State of Nature report a 'Nature Fund' was created in Wales to respond to the challenges for wildlife and habitats. Three of the seven Nature Action Zones eligible for the fund (Brecon Beacons, Cambrian Mountains and South Wales Valleys) fall within the Severn RBD. With a priority being improving river catchments, a range of improvements are expected during the life of this plan.
- Investment in 'Glastir'¹², contributing towards reductions in sediment, nutrients, pesticides and bacterial pollution; measures are likely to have a particular focus on addressing diffuse pollution from rural areas, the sustainable management / restoration / creation of forested and wooded land, and may also comprise physical modifications, such re-naturalising rivers and coastal defences; the uptake of measures is voluntary and the exact location of measures and their outcomes are not known.

Available information on the programme of measures for delivering additional environmental outcomes for priority waterbodies¹³ indicates the following range of measure types:

- Managing pollution from waste water with 1 measure for reducing point source pollution at source.
- Managing pollution from rural areas comprising 5 measures for reducing diffuse pollution at source and 1 measure to mitigate/remediate diffuse pollution impacts on receptors.

¹² The sustainable land management scheme for Wales, funded by the Welsh Government Rural Communities - Rural Development Programme 2014-20.

¹³ Priority waterbodies located in the Usk and South East management catchments and parts of the Wye and Severn Uplands management catchments in Wales

- Physical modifications (to improve habitat) including 7 measures for the removal or easement of barriers to fish migration and 3 measures for the improvement to the condition of channel/bed and/or banks/shoreline.

Potential risks from these programmes to European sites and features vary depending on the nature of the measures. As outlined in previous sections, measures required to reduce point source pollution at source, reduce diffuse pollution at source, reduce diffuse pollution pathways, mitigate / remediate point source impacts on receptors and controlling the pattern/timing of abstraction are considered to present a relatively low risk to European sites and features.

The measures to remove or provide easement of barriers to fish migration and to improve the condition of channel/bed and/or banks/shoreline are considered to present a potentially higher risk, with water-dependent European site features likely to be more susceptible to the potential hazards. The nature, scale and location of these measures are not known at this stage, although the potential hazards, such as disturbance, habitat loss, physical damage and siltation / turbidity, are likely to arise principally during their construction, and therefore likely to be short term in nature. The risks during operation may result in changes in flow patterns / velocities, water levels / water table and physical regime, to which site features in proximity (upstream or downstream) to the measures may be sensitive. Another potential risk is increased competition from non-native invasive species.

Upstream / downstream water-dependent habitats are considered susceptible to these types of higher risk measures, in particular the riverine, fens, bogs and wet habitats and standing waters, and also potentially coastal, estuarine and inter-tidal habitats where measures are to be implemented in coastal / estuarine locations. Water-dependent species considered particularly vulnerable to these measures are mammals of river habitats and amphibia and to a slightly lesser extent vascular plants of aquatic habitats and vascular plants, lower plants and invertebrates of wet habitats. Bird species groups, such as birds of lowland freshwaters and their margins, birds of coastal and estuarine habitats, and to a slightly lesser extent, birds of lowland wet grassland, are also considered to be particularly susceptible to such measures. Whilst fish species groups are also considered particularly vulnerable to these measures, this would be mainly associated with the construction phase and once completed fish species are likely to benefit since the main aim of the measure is to improve habitat / connectivity and supporting physical processes. Similarly, the sensitivities in relation to birds, mammals and amphibia are more likely to relate to hazards arising from construction activities, and therefore of a short term nature, but less likely once the works for removing/easing a barrier or improvements to channel/bed and/or banks/shoreline have been completed.

Project level HRA would be required where a European site or sites were identified as potentially being affected by these measures, triggered by the consenting process. For measures addressing point source pollution, this is likely to be the discharge consent from NRW under the Environmental Permitting Regulations. For measures involving any physical works / modifications on or near a main river¹⁴, flood defence consent from NRW and / or planning permission from the local planning authority would trigger the requirement for

¹⁴ For works on or near ordinary watercourses, the equivalent ordinary watercourse consent from the Lead Local Flood Authority (LLFA) would be required or NRW, which would also trigger the need for HRA where European site/s were potentially affected.

project level HRA where European sites were potentially affected. Additionally, improvement measures to channel/bed and/or banks/shoreline in marine or estuarine areas that may involve works below the mean high water spring (MHWS) tidal limit would require a marine licence from NRW, which would also trigger the requirement for project level HRA where European sites were potentially affected.

As previously highlighted a key issue for the mitigation of measures involving the removal or easement of barriers to fish migration or improvements to channel/bed and/or banks/shoreline relates to the consideration of operational changes in water levels, flows / velocities and physical regime. This would be mitigated through consideration of flow / water level requirements for European site features as part of any appraisal to support the consent applications. For example, depending on complexity of the proposed changes to the flow regime on river flow patterns, modelling may be required to assess changes to the flow and physical regime, potential secondary effects on channel morphology, and how this in turn may influence dependent European habitats and species.

General construction-related mitigation for these higher risk measures would consider the avoidance of working on or in proximity to sensitive habitats; the use of screening and sensitive working methods to minimise visual and noise disturbance to sensitive species, and also provide segregation / prevention of construction activity on or near sensitive habitats. Appropriate timing of works would reduce potential risks by avoiding ecologically sensitive periods, such as breeding or migratory passage periods for birds, fish and other species. Specific investigations may also be needed, such as confirming whether there is a risk that removing an existing structure/barrier could serve to mobilise sediments that might be historically contaminated and be of risk to bird and fish species directly as well as indirectly via their food sources. At the project level relevant mitigation measures would include appropriate measures for trapping sediment and avoiding its introduction to the water environment, undertaking works during periods of low flow to minimise sediment transfer as well as ensuring designs address any potential changes in physical processes that could potentially harm existing in-channel, marginal and bankside habitats.

4.4.3 Measures to achieve outcomes for 2027 or beyond

Where the programmes of measures expected to deliver outcomes by 2021 (section 4.4.2 above) are unable to include the further measures required to achieve all long-term WFD objectives in the RBD (and that have been assessed as worthwhile), then these have been carried forward as future investments and programmes for 2027 and beyond. The plan summarises this required investment in future measures under government and key sectors, and is at a level of detail that does not relate to SWMI required measures. The HRA is thus unable to consider any more specific risks related to these future programmes.

4.4.4 Additional measures for protected areas

The updated RBMP sets out the range of plans and programmes that are in place nationally to achieve the objectives of different protected areas – see Table 6 below. These are separate plans and programmes that will contribute to the RBMP objectives related to protected areas and have a range of lead organisations and authorities responsible for them. These plans and programmes will have had to consider HRA requirements as part of their development where required. Measures / projects taken forward that involve physical works will be subject to relevant consenting processes that will consider HRA requirements at a

project level. The subsequent planning and consenting processes would be expected to address any potential effects on European sites at the level of detail of measures arising from these separate plans and programmes.

Table 6 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.
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 come 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)	Nitrate vulnerable zones have been designated in areas where water quality is affected by nitrates from agricultural sources. Measures to reduce nitrate concentrations within nitrate vulnerable zones include establishing a voluntary code of good agricultural practice and developing action programmes to reduce agricultural nitrate losses.
Natura 2000: Water dependent Special Areas of Conservation (SACs) and Special Protection Areas for Wild Birds (SPAs)	In England 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. In Wales Natural Resource Wales are developing Prioritised Improvement Plans (PIPs) for all Natura 200 sites that are not currently in favourable status. These PIPs together with thematic plans will address key strategic issues, contributing to achieving objectives under the Water Framework Directive. On cross border sites a single plan will be produced. Natural Resources Wales is currently reviewing its Core Management Plans for Natura 2000 sites to ensure that the targets are accurate and reflect the latest knowledge.

4.5 Consideration of results and conclusion

The assessment of likely significant effects has been carried out for required measures related to each SWMI from the consulted on updated RBMP, and for the programmes of measures drawn from government or key sector investment plans where further details could

be considered by the HRA. The level of detail on the measures does not allow the assessment to consider effects on specific European sites. The HRA has considered potential hazards associated with the types of measures that are related to each SWMI in the RBMP, and indicates the potential levels of risk to the range of features of the European sites in the RBD.

The measures that may pose potentially higher risks to European Sites have been identified in this HRA, and the range of mitigation options available have been explored, so that future project level assessment can consider these when the details of the nature and location of measures are known. For the Severn RBD, these measures are:

- Removal or easement of barriers to fish migration
- Removal or modification of engineering structure
- Improvement to condition of riparian zone and/or wetland habitats
- Improvement to condition of channel/bed and/or banks/shoreline.

The programmes of measures in the Severn RBMP that are more focussed on improving physical modifications in water bodies, and are more likely to include these potentially higher risk measures are:

- Flood risk management investment programme
- Catchment level grant in aid funded improvements
- Local measures from catchment partnerships
- NRW funded improvements.

The HRA has considered the range of controls and mitigation that would be expected to address these potential risks, focused particularly on the potential higher risk measures and their effects. In terms of controls, before any measures in the plan are implemented they must be subject to the requirements of the Habitats Regulations; any plans or projects required to implement the measures must undergo an 'appropriate assessment' if they are determined to be likely to result in a significant effect in a European sites or sites. While the assessment has identified where there are likely to be higher risks, this requirement applies to any lower tier plan or project where there is the possibility of a likely significant effect on a European site.

As part of the various consenting mechanisms, where likely significant effects cannot be ruled out at the project level, the competent authority will undertake an appropriate assessment and the measures cannot receive approval to proceed until it has been demonstrated that they will not result in adverse effects on integrity of any affected European sites. Or, where an adverse effect cannot be ruled out, and there are no alternative solutions to meeting the objectives of the project, a case for Imperative Reasons of Overriding Public Interest (IROPI), which includes the identification of compensatory measures, may be prepared, and must be approved by the Secretary of State or the Welsh Government. Appendix 2 provides additional detail on the consenting processes and the consideration of the Habitats Regulations as they relate to RBMP and SWMI required measures.

The updated RBMP does not constrain the nature, scale and/or location of the measures proposed in the plan, so they can be developed in a way that will avoid the likelihood of any

significant effects on European sites, or if supported by an appropriate assessment and legal means of securing any mitigation required, can prevent an adverse effect on site integrity.

At this strategic plan level, this assessment has concluded, for the plan itself that there are no likely significant effects, and at this stage there is no requirement to consider further stages of the HRA on the RBMP programme of measures. This is a plan level conclusion and does not give weight to any future conclusion of HRAs at the lower tier/project level. Each must be assessed on their individual merits and the inclusion of any measures in this plan does not influence the conclusions being drawn for future HRAs, and does not give any weight where imperative reasons may be pursued. Any possible in-combination effects of the RBMP with other plans are considered in section 5 below.

5 In combination effects with other plans and projects

Given the geographical scale of the RBMP, and the high level assessment being undertaken, it is not possible to undertake a comprehensive assessment of potential impacts in combination with other plans or projects. In-combination assessment requires the consideration of impacts that are not significant alone to be checked for the possibility of such impacts becoming significant when combined with the effects of other plans or projects. As this high level assessment has not been undertaken at a level of detail that allows for quantification of impacts, it is therefore not possible to judge whether potential effects will be significant alone, and whether they can be fully avoided or mitigated for, or that residual impacts may remain. In-combination assessment at this plan level therefore serves to highlight where such assessment may be relevant to future HRAs, and focuses on plans with a similar geographic scale to the river basin (plans and projects of any scale should be considered at later stages when more detail on the project itself is available). The plans considered as part of the assessment of in-combination effects are taken from those reviewed as part of the Strategic Environmental Assessment (SEA). The SEA review generally found that the draft RBMP aligns very well with the objectives of other plans and programmes in the Severn region, particularly those aimed at promoting sustainability and nature conservation.

Table 7 below considers where such plans may potentially contribute to effects on European sites in combination with the Severn RBMP.

The risk of significant in-combination effects on European sites with other plans is considered to be low, because the objectives and actions within the RBMP are aimed at improving the status of water bodies, and achieving favourable conservation status for water dependent European sites. Interactions with other strategic plans may potentially constrain the implementation of RBMP objectives. However, the plans may also provide opportunities to co-deliver actions identified within the Site Improvement Plans (SIPs) or Prioritised Improvement Plans (PIPs) for the Severn RBD to achieve favourable conservation status for water dependent European site features.

Habitats Regulations Assessments of measures or actions undertaken at later plan or project stages will still however require consideration of potential in combination effects, at an appropriate level of detail, i.e. in combination with plans or other relevant projects.

Table 7 Other Strategic Plans and potential in-combination effects with the Severn RBMP

Name of Plan	Potential in-combination effects with the RBMP on European sites
Flood Risk Management Plan (FRMP) for the Severn RBD	Where measures in the RBMP propose physical modifications, and to a lesser extent other SWMI required measures, there is potential for interaction with measures proposed within the FRMP that comprise physical intervention/s, where these are in proximity to European sites. Given RBMP actions are focused on water dependent European sites and FRMP measures are focused on the water environment, these sites are likely to be more susceptible to in-combination effects. Such in-combination effects could include construction impacts such as noise and visual disturbance, where the timing of implementation of measures co-incided, or impacts arising from operation such as changes to flows / water levels or the physical regime. In certain catchments, such as the South East Valleys, the draft FRMP includes a comparatively high number of proposed measures that could lead to future flood alleviation schemes/works. Depending on the location, type, scale and design of the future actions this could potentially conflict with the objectives of the RBMP in this area and potentially impact European Sites as, for example, by hindering objectives for improving fish passage. In the further development of scheme options in this catchment in particular, it will be important that early consideration is given to identifying solutions that address the objectives of the RBMP and the FRMP, and development of mitigation as part of the flood alleviation schemes if / where appropriate.
Severn Trent Water, Welsh Water, Bristol Water, Wessex Water, Anglian Water, South Staffordshire Water Resource Management Plans	The RBMP and Water Resource Management plans contain similar objectives around the protection, improvement, sustainable management and use of the water environment in terms of quantity and quality. Interactions between the plans, particularly for water dependent European sites are likely; however, particularly given that water resource plans are identified within the RBMPs as plans to work alongside the RBMP to address pressures on water body status and meet specific protection designation objectives, water resource plans or actions arising from them should act as mechanisms to deliver RBMP objectives for water dependent European sites. The HRAs of the Water Resource Management Plans concluded that they will have no significant effects on European sites within the Severn RBD alone or in combination with other known plans and projects. An exception is the plan for South Staffordshire Water, where it appears no HRA was undertaken. However, a Strategic Environmental Assessment was deemed not to be required on the basis that there is no deficit in supply over the planning period and therefore options for increased supply were not under consideration.
Local Authority Local Development Plans	Promotion of growth within local development plans, depending on location, may place pressure on both water dependent and non-water dependent European sites. Development activities arising from local development plans could result in impacts on European Sites through disturbance during construction, adverse effects from encroachment on habitats or species displacement, or indirect effects such as alterations to drainage, increased surface water run-off and diffuse / point source pollution. Significant interactions with the Severn RBMP are considered unlikely, given that RBMP actions are focused on water body and water dependent European site improvements. However, development activities arising from local development plans may inhibit the ability of the RBMP to achieve objectives relating to European site protected areas. In the Severn RBD, for example, particular consideration would need to be given to areas subject to increased levels of housing and economic growth and resource development (e.g. minerals, waste and renewable energy), such as in the South East Valleys and Usk management catchments and the strategic industrial area of Avonmouth (near Bristol), and the potential for in-combination effects for designated sites including the Severn Estuary and Rivers Wye and Usk.
Marine Strategy Framework Directive, UK Marine Strategy, Welsh National	The South West (inshore) and Welsh National Marine Plans are not yet publicly available and in preparation. However the principles that will be applied to the marine plans are set out in the Marine Strategy Framework Directive (MSFD) and the UK Marine Policy Statement. The geographical scope of the MSFD is focused on marine / coastal waters; therefore any interactions with the RBMP are only likely to affect the European sites in the coastal / estuarine locations in the RBD and in particular the Severn Estuary. The MSFD has complementary objectives to the RBMP, with an overall objective to achieve 'Good Environmental Status' in marine waters by 2020, including the same objectives for good ecological and chemical status. However, the MSFD also covers broader environmental aspects, such as noise, litter, and aspects of biodiversity, therefore is likely to complement objectives in

Marine Plan, South West (inshore) Marine Plan	the RBMP aimed at achieving favourable conservation status for European site protected areas. The UK Marine Policy Statement is the framework for marine planning and taking decisions about the marine environment, such as informing marine licensing decisions. Marine Plans, as part of their objective of sustainable development, will help to implement measures for GES and therefore serve to complement the RBMP. Their objective for living within environmental limits is also considered to be compatible with the RBMP's objectives for European sites and improving their conservation status. Potential conflicts could arise, however, in connection with development, resource extraction (e.g. marine aggregates) and infrastructure activities enabled by the policy framework set out in the emerging plans.
Shoreline Management Plans (SMP2): Anchor Head to Lavernock Point (Severn Estuary) Hartland Point to Anchor Head Severn Estuary Flood Risk Management Strategy	<p>The Shoreline management Plans (SMPs) set out a strategic view of how coastal flood risk should be managed in the future. Policy options typically applied include: no active intervention, hold the line, advance the existing line and management realignment. Impacts that could potentially arise as a result of the implementation of SMPs include:</p> <ul style="list-style-type: none"> • changes in the physical regime, flow or velocity regime and resulting in coastal or estuarine erosion or deposition and altered flooding regimes; • changes to water chemistry resulting from alternations in salinity or an increased risk of pollution from, for example, the flooding of landfill sites or other contaminated land; • habitat severance; • disturbance during construction or maintenance; and • habitat loss/physical damage as a result of coastal squeeze, sea level rise, the creation of new defences or conversely the retreat of the defence line. <p>There is potential for conflict with river basin management planning, for example, where no active intervention and managed realignment affects water bodies behind a defence or where hold the line increases coastal squeeze and increases tide locking in and hence prolonged, increased water depths for adjacent freshwater bodies. The HRAs of the SMPs determined that it was not possible to conclude there will be no adverse effects to protected sites and a joint Imperative Reasons of Overriding Public Interest (IROPI) Statement of Case and compensatory habitat proposals for the SMPs has been prepared due to the overlap of the two SMPs with European sites. The Statement of Case is being considered by Defra and the Welsh Government. Some potential effects have been deferred to strategy level for consideration – in this case the Severn Estuary Flood Risk Management Strategy (FRMS). The emerging Severn Estuary FRMS has been developed as part of a strategic approach to the management of flood and coastal erosion. The Strategy is needed because climate change is expected to increase risk of tidal flooding. It responds to and further develops the broad policy options set out in the SMPs and is intended to provide a framework for the implementation of individual projects and schemes to manage coastal flooding and erosion risks over a period of 100 years. The HRA for the Strategy concluded that the following significant adverse effects on European sites cannot be ruled out:</p> <ol style="list-style-type: none"> 1. Habitat loss / damage to the Severn Estuary SAC / SPA / Ramsar, resulting from coastal squeeze and footprint of defences 2. Loss of supporting habitat to the Severn Estuary SAC / SPA / Ramsar and Somerset Levels and Moors SPA / Ramsar, resulting from coastal squeeze and footprint of defences. 3. Loss of estuary form or function, affecting the Severn Estuary SAC / SPA / Ramsar and Somerset Levels and Moors SPA / Ramsar, resulting from loss of habitat / supporting habitat. <p>Consequently the preferred policy options are being progressed through a Statement of Case for IROPI and compensatory habitat requirements (these based on the assumption that sea level rises continue at the predicted rate). Priority habitat compensation schemes (to meet the first epoch of 0-20 years) have already been delivered near Stroath and the Steart Peninsula (South West RBD).</p>
National Park and Area of Outstanding	The purpose of National Park and AONB Management Plans is primarily to secure the conservation and enhancement of natural beauty, wildlife and cultural heritage, promote public enjoyment and understanding, whilst also supporting the social and economic wellbeing of their communities. Designated landscapes in the RBD encompass many different European sites, including water dependent sites, which contribute to the areas'

Natural Beauty Management Plans	conservation interest, natural beauty and recreational value. In relation to the RBMP, National Park and AONB management plans typically incorporate compatible objectives for promoting sustainable development, conserving and enhancing biodiversity and natural resources (including the water environment), managing development and tackling climate change. River basin planning can serve to support the objectives and implementation of management plans by helping to identify where improvements can be made to its water bodies. Similarly, the implementation of the management plans may offer opportunities to deliver RBMP objectives for water dependent European sites and support Site Improvement Plans and Prioritised Improvement Plans.
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6 Conclusion and future HRAs

This HRA has been carried out at the level of published detail in the 2015 updated Severn RBMP. At this strategic plan stage of the RBMP the details of where and how the measures will be implemented are not included within the plan. This assessment has identified potential hazards to European sites associated with implementation of the SWMI required measures in the RBMP, and the potential risks to European site qualifying features. The assessment has considered how these risks relate to the proposed programmes of measures with a focus on the programmes to deliver WFD outcomes by 2021.

The RBMP does not constrain exactly where or how those measures should be implemented, which will be determined at either a lower-tier plan or project level. The range of mitigation options that will be available have been considered as part of this assessment, and given the options available, there is confidence at this plan level that the measures can be implemented whilst harm to European sites is prevented. The RBMP also makes it clear that before any measures in the plan are implemented they must be subject to the requirements of the Habitats Regulations. A conclusion of no likely significant effect at the plan level does not infer any similar conclusion at the lower tier plan or project level 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. Any mitigation measures required to ensure the project does not result in an adverse effect on the integrity of a site must be implemented. The Environment Agency will help and advise other parties on mitigation proposals as well as ensuring that they are incorporated into schemes it is responsible for.

The HRA has further considered the in combination effects of the updated RBMP with other plans at a strategic scale and determined that the risks are unlikely to be significant to European sites (see section 5). It is however acknowledged that it is not possible to do a comprehensive in-combination assessment at this strategic level, because the lack of detail available makes it impossible to adequately quantify any potential impacts. More robust in-combination assessment should be undertaken at the lower tier/project level.

It is concluded that for the updated RBMP the proposed measures are not likely to have any significant effects on any European sites, alone or in-combination with other plans or projects. This is a strategic plan level conclusion and relates to the plan only. Given this conclusion, there is no requirement to progress to the next stage of the Habitats Regulations assessment (an 'appropriate assessment' to examine the question of adverse effect on the integrity of European sites). This conclusion does not preclude the need for lower tier plan/project level appropriate assessment, nor does it give any weight to the conclusions that may be drawn at that level.

This HRA has been prepared in a way that should assist HRA at a subsequent level, i.e. lower tier strategies, plans or projects that implement measures. As local actions are developed at a project level and the details of their scope and scale are known, this may identify additional effects on European sites that have not been assessed here, or were not appropriate to consider at this spatial scale of plan.

Appendix 1 Table A1a - Potential Impacts of Measures on qualifying features of European Sites in the Severn RBD (8 management catchments in England and cross-border areas)

		SEVERN [8 Management Catchments in England with cross border areas]		RBMP MEASURES for RBD	Physical modifications (to improve habitats)							Managing pollution from waste water				Manage pollution from towns, cities and transport				Changes to natural flow and levels of water				Managing invasive non-native species				Manage pollution from rural areas			Manage pollution from mines	
		No of impacts (hazards) from measures on qualifying features	water dependent features Y/N	no. of occurrences of the feature within RBD	Measure type	Removal or easement of barriers to fish migration	Removal or modification of engineering structure	Improvement to condition of channel/bed and/or banks/shoreline	Improvement to condition of riparian zone and/or wetland habitats	Change to operations and maintenance	Vegetation management	Reduce diffuse source pollution at source	Reduce point source pathways (i.e. control entry to water environment)	Mitigate/Remediate point source impacts on receptor	Reduce point source pollution at source	Reduce diffuse pollution at source	Reduce diffuse pollution pathways (i.e. control entry to water environment)	Mitigate/Remediate diffuse pollution impacts on receptor	Use alternative source/relocate abstraction or discharge	Water Demand Management	Control pattern/timing of abstraction	Improvement to condition of channel/bed and/or banks/shoreline	Prevent introduction	Early detection, monitoring and rapid response (to reduce the risk of)	Mitigation, control and eradication (to reduce extent)	Building awareness and understanding (to slow the spread)	Reduce diffuse pollution at source	Reduce diffuse pollution pathways (i.e. control entry to water environment)	Mitigate/Remediate diffuse pollution impacts on receptor	Mitigate/Remediate point source impacts on receptor		
No.of EUROPEAN SITES in RBD (33)						26	25	34	30	14	16	18	12	34	10	9	23	14	7	6	14	5	0	5	6	4	43	21	30	4	No of Ops Cthmt (total 61)	
						43%	41%	56%	49%	23%	26%	30%	20%	56%	16%	15%	38%	23%	11%	10%	23%	8%	0%	8%	10%	7%	70%	34%	49%	7%	% of all Ops Cthmt	
		Qualifying features																														
SAC (34)	Ramsar (4)	1.1 Fens and wet habitats not acidification sensitive*	Y	6	9	9	8	8	5	2	3	3	3		3	3	4	5	2	2	8		2	2		3	3	4	3			
		1.2 Bogs and wet habitats, acidification sensitive*	Y	11	6	6	6	6	5	2	3	3	3		3	3	3	5	2	2	6		2	2		3	3	3	3			
		1.3 Riverine habitats	Y	5	10	10	9	9	6	2	3	3	3		3	3	4	5	2	2	9		2	2		3	3	4	3			
		1.4 Standing Waters acidification sensitive*	Y	5	7	7	7	7	4	1	2	2	2		2	1	3	4	2	2	7		1	1		2	1	3	2			
		1.5 Standing waters not acidification sensitive*	Y	6	9	9	8	8	5	1	2	2	2		2	1	3	4	2	2	8		1	1		2	1	3	2			
		1.6 Dry woodlands*	N	14	3	3	2	2	2	1	2	2	2		2	2	2	2	0	0	2		1	1		2	2	2	2			
		1.7 Dry Grassland*	N	12	3	3	2	2	2	1	2	2	2		2	1	2	2	0	0	2		1	1		2	1	2	2			
		1.8 Dry heathland habitats*	N	10	2	2	2	2	2	1	2	2	2		2	1	2	2	0	0	2		1	1		2	1	2	2			
		1.9 Upland*	N	2	4	4	4	4	4	2	3	3	3		3	3	3	4	1	1	4		2	2		3	3	3	3			
		1.10 Coastal habitats*	N	7	6	6	5	5	4	2	3	3	3		3	2	3	3	0	0	5		2	2		3	2	3	3			
		1.11 Coastal habitats sensitive to abstraction*	Y	4	6	6	6	6	3	1	2	2	2		2	2	3	3	1	1	6		1	1		2	2	3	2			
		1.12 Estuarine and intertidal habitats	Y	5	8	8	8	8	5	2	3	3	3		3	2	4	5	2	2	8		2	2		3	2	4	3			
		1.13 Submerged marine habitats	Y	5	5	5	5	5	2	1	1	1	1		1	1	2	2	1	1	5		1	1		1	1	2	1			
	SPA (6)		2.1 Vascular plants of aquatic habitats	Y	7	7	7	7	4	1	2	2	2		2	1	3	4	2	2	7		1	1		2	1	3	2			
			2.2 Vascular plants, lower plants and invertebrates, wet hal	Y	5	7	7	6	6	4	1	2	2	2		2	2	3	4	2	2	6		1	1		2	2	3	2		
			2.3 Vascular plants, grassland	N	0	3	3	3	3	2	1	2	2	2		2	1	2	2	0	0	3		1	1		2	1	2	2		
			2.4 * Liverworts – Western rustwort	Y	5	3	3	3	3	3	1	2	2	2		2	1	2	3	1	1	3		1	1		2	1	2	2		
			2.5 Anadromous fish	Y	6	10	10	10	10	6	2	3	3	3		3	2	4	5	2	2	10		2	2		3	2	4	3		
			2.6 Non-migratory fish and invertebrates of rivers	Y	6	9	9	10	10	6	2	3	3	3		3	2	4	5	2	2	10		2	2		3	2	4	3		
			2.7 Invertebrates of wooded habitats	N	2	2	2	2	2	2	1	2	2	2		2	1	2	2	0	0	2		1	1		2	1	2	2		
			2.8 Mammals wooded habitats	N	7	3	3	3	3	3	2	3	3	3		3	2	3	3	0	0	3		2	2		3	2	3	3		
			2.9 Mammals of riverine habitats	Y	5	9	9	10	10	6	2	3	3	3		3	3	4	5	2	2	10		2	2		3	3	4	3		
2.10 Amphibia			Y	7	8	8	8	8	5	2	3	3	3		3	3	4	5	2	2	8		2	2		3	3	4	3			
2.11 Coastal plants	N	0	5	5	5	5	4	1	2	2	2		2	2	2	4	2	2	5		1	1		2	2	2	2					
2.12 Marine mammals	Y	4	4	4	5	5	2	2	2	2	2		2	2	2	2	0	0	5		2	2		2	2	3	2					
SPA (6)		3.1 Birds of uplands	N	4	5	5	5	5	4	2	3	3	3		3	3	3	4	1	1	5		2	2		3	3	3	3			
		3.2 Birds of woodland & scrub	N	3	3	3	3	3	3	2	3	3	3		3	2	3	3	0	0	3		2	2		3	2	3	3			
		3.3 Birds of lowland heaths & brecks	N	3	3	3	3	3	3	2	3	3	3		3	2	3	3	0	0	3		2	2		3	2	3	3			
		3.4 Birds of lowland wet grassland	Y	7	7	7	7	7	6	2	3	3	3		3	3	3	5	2	2	7		2	2		3	3	3	3			
		3.5 Birds of lowland dry grassland	N	1	3	3	3	3	3	2	3	3	3		3	2	3	3	0	0	3		2	2		3	2	3	3			
		3.6 Birds of lowland freshwaters & their margins	Y	8	9	9	10	10	6	2	3	3	3		3	3	4	5	2	2	10		2	2		3	3	4	3			
		3.7 Farmland Birds	N	7	4	4	4	4	4	2	3	3	3		3	3	3	4	1	1	4		2	2		3	3	3	3			
		3.8 Birds of coastal habitats	Y	8	9	9	10	10	6	2	3	3	3		3	3	4	5	2	2	10		2	2		3	3	4	3			
		3.9 Birds of estuarine habitats	Y	7	9	9	10	10	6	2	3	3	3		3	3	4	5	2	2	10		2	2		3	3	4	3			
		3.10 Birds of open sea and offshore rocks	Y	2	3	3	4	4	3	2	3	3	3		3	2	3	3	0	0	4		2	2		3	2	3	3			

Colour coding used to indicate risk, assuming higher risk is associated with a higher number of hazards.

1 = 1 hazard / qualifying feature sensitivity

10 = 10 hazard / qualifying feature sensitivities

Appendix 1 Table A1b - Potential Impacts of Measures on qualifying features of European Sites in the Usk and South East Valleys management catchments (Wales)

SEVERN [Usk and SE Valleys Catchments in Wales]		water dependent features Y/N	no. of occurrences of the feature within RBD	RBMP MEASURES for RBD	Physical modifications (to improve habitats)		Managing pollution from waste water		Manage pollution from towns, cities and transport		Changes to natural flow and levels of water		Managing invasive non-native species		Manage pollution from rural areas		Manage pollution from mines		No. of Ops Ctchmt (total 2) % of all Ops Ctchmt	
No of impacts (hazards) from measures on qualifying features					Measure type	Wales Measures: Improve fish passage and habitat Mitigate impacts of flood and coastal defences Mitigate impacts of water resource impoundments Reduce impacts of other physical modifications	Equivalent Measure type and hazard rating = Engineering works	Wales Measures: reduce pollution from sewage discharges reduce pollution from other waste water discharges	Equivalent Measure type and hazard rating = reduce point source pollution	Wales Measures: Sustainable access and recreation management tackle misconnections and urban diffuse pollution Waste management Other sustainable and marine management practices	Equivalent Measure type and hazard rating = mitigate diffuse pollution	Wales Measures: Drainage and water level management Improve flows and water levels	Equivalent Measure type and hazard rating = improve channel/bank/shoreline	Wales Measures: Manage invasive non-native species	Equivalent Measure type and hazard rating = eradicate/mitigate species	Wales Measures: Sustainable agricultural practices Sustainable woodland and forestry management	Equivalent Measure type and hazard rating = reduce diffuse pollution	Wales Measures: Mine water and contaminated land remediation		Equivalent Measure type and hazard rating = mitigate point source
No. of EUROPEAN SITES in RBD (33)					2	100%	2	100%	2	100%	2	100%	2	100%	2	100%	2	100%		
Qualifying features																				
SAC (12)	Ramsar (1)	1.1 Fens and wet habitats not acidification sensitive*	Y	4		9		3		4		8		2		4		3		
		1.2 Bogs and wet habitats, acidification sensitive*	Y	2		6		3		3		6		2		3		3		
		1.3 Riverine habitats	Y	2		10		4		4		9		2		4		3		
		1.4 Standing Waters acidification sensitive*	Y	1		7		2		3		7		1		3		2		
		1.5 Standing waters not acidification sensitive*	Y	1		9		2		3		8		1		3		2		
		1.6 Dry woodlands*	N	5		3		2		2		2		1		2		2		
		1.7 Dry Grassland*	N	1		3		2		2		2		1		2		2		
		1.8 Dry heathland habitats*	N	3		2		2		2		2		1		2		2		
		1.9 Upland*	N	2		4		3		3		4		2		3		3		
		1.10 Coastal habitats*	N	2		6		3		3		5		2		3		3		
		1.11 Coastal habitats sensitive to abstraction*	Y	1		6		2		3		6		1		3		2		
		1.12 Estuarine and intertidal habitats	Y	2		8		3		4		8		2		4		3		
1.13 Submerged marine habitats	Y	2		5		1		2		5		1		2		1				
2.1 Vascular plants of aquatic habitats	Y	1		7		2		3		7		1		3		2				
2.2 Vascular plants, lower plants and invertebrates, wet hal	Y	3		7		2		3		6		1		3		2				
2.3 Vascular plants, grassland	N	0		3		2		2		3		1		2		2				
2.4 * Liverworts – Western rustwort	Y	2		3		2		2		3		1		2		2				
2.5 Anadromous fish	Y	3		10		3		4		10		2		4		3				
2.6 Non-migratory fish and invertebrates of rivers	Y	2		9		3		4		10		2		4		3				
2.7 Invertebrates of wooded habitats	N	0		2		2		2		2		1		2		2				
2.8 Mammals wooded habitats	N	1		3		3		3		3		2		3		3				
2.9 Mammals of riverine habitats	Y	2		9		3		4		10		2		4		3				
2.10 Amphibia	Y	1		8		3		4		8		2		4		3				
2.11 Coastal plants	N	0		5		2		2		5		1		2		2				
2.12 Marine mammals	Y	1		4		2		3		5		2		3		2				
SPA (1)		3.1 Birds of uplands	N	1		5		3		5		2		3		3		3		
		3.2 Birds of woodland & scrub	N	0		3		3		3		3		2		3		3		
		3.3 Birds of lowland heaths & brecks	N	1		3		3		3		3		2		3		3		
		3.4 Birds of lowland wet grassland	Y	2		7		3		3		7		2		3		3		
		3.5 Birds of lowland dry grassland	N	0		3		3		3		3		2		3		3		
		3.6 Birds of lowland freshwaters & their margins	Y	2		9		3		4		10		2		4		3		
		3.7 Farmland Birds	N	2		4		3		3		4		2		3		3		
		3.8 Birds of coastal habitats	Y	2		9		3		4		10		2		4		3		
		3.9 Birds of estuarine habitats	Y	2		9		3		4		10		2		4		3		
		3.10 Birds of open sea and offshore rocks	Y	1		3		3		3		4		2		3		3		

Colour coding used to indicate risk, assuming higher risk is associated with a higher number of hazards.

1 = 1 hazard / qualifying feature sensitivity

10 = 10 hazard / qualifying feature sensitivities

Table A2 - Potential Hazards arising from Measures proposed within the Severn RBMP

	Type of Hazard																						
	Acidification	Change in water levels or table	Changed water chemistry	Changes in flow or velocity regime	Changes in physical regime	Competition from non-native species	Disturbance (noise or visual)	Entrapment	Habitat loss	Killing/injury or removal of fish or other animals	Nutrient enrichment	PH	Physical damage	Predation	Reduced dilution capacity	Salinity	Siltation	Smothering	Surface water flooding changes	Thermal regime changes	Toxic Contamination	Turbidity	
RBMP Measure																							
Managing pollution from waste water																							
Reduce diffuse pollution at source									✓				✓										
Reduce point source pathways (i.e. control entry to water environment)									✓				✓										
Mitigate/Remediate point source impacts on receptor									✓				✓										
Reduce point source pollution at source																							
Manage pollution from towns, cities and transport																							
Reduce diffuse pollution at source									✓				✓										
Reduce diffuse pollution pathways (i.e. control entry to water environment)									✓				✓							✓			
Mitigate/Remediate diffuse pollution impacts on receptor									✓				✓										✓
Manage pollution from rural areas																							
Reduce diffuse pollution at source									✓				✓										
Reduce diffuse pollution pathways (i.e. control entry to water environment)									✓				✓							✓			
Mitigate/Remediate diffuse pollution impacts on receptor									✓				✓										✓
Manage pollution from mines																							
Mitigate/Remediate point source impacts on receptor									✓				✓										
Improve the natural flow and level of water																							
Use alternative source/relocate abstraction or discharge		✓		✓					✓				✓										
Water Demand Management		✓		✓																			
Control pattern/timing of abstraction		✓		✓																			
Improvement to condition of channel/bed and/or banks/shoreline		✓		✓	✓				✓	✓			✓				✓	✓					✓
To improve modified habitat																							
Removal or easement of barriers to fish migration		✓		✓	✓	✓	✓		✓				✓				✓	✓					✓
Removal or modification of engineering structure		✓		✓	✓	✓	✓		✓				✓				✓	✓					✓
Improvement to condition of channel/bed and/or banks/shoreline		✓		✓	✓				✓	✓			✓				✓	✓					✓
Improvement to condition of riparian zone and/or wetland habitats		✓		✓	✓				✓	✓			✓				✓	✓					✓
Change to operations and maintenance		✓		✓	✓				✓	✓			✓										
Vegetation management																							
To control or manage non native invasive/alien species																							
Prevent introduction																							
Early detection, monitoring and rapid response (to reduce the risk of establishment)													✓										
Mitigation, control and eradication (to reduce extent)													✓										
Building awareness and understanding (to slow the spread)																							
SCOPED OUT MEASURE OR HAZARD																							

Table A3 – European site features against Hazards for the Severn RBD

European site features (grouped) in the Severn West RBD	Hazard Types																						
	Acidification	Change in water levels or table	Changed water chemistry	Changes in flow or velocity regime	Changes in physical regime	Competition from non-native species	Disturbance (noise or visual)	Entrapment	Habitat loss	Killing/injury or removal of fish or other animals	Nutrient enrichment	PH	Physical damage	Predation	Reduced dilution capacity	Salinity	Siltation	Smothering	Surface water flooding changes	Thermal regime changes	Toxic contamination	Turbidity	
1.1 Fens and wet habitats not acidification sensitive																							
1.2 Bogs and wet habitats, acidification sensitive																							
1.3 Riverine habitats																							
1.4 Standing Waters acidification sensitive																							
1.5 Standing waters not acidification sensitive																							
1.6 Dry woodlands																							
1.7 Dry Grassland																							
1.8 Dry heathland habitats																							
1.9 Upland																							
1.10 Coastal habitats																							
1.11 Coastal habitats sensitive to abstraction																							
1.12 Estuarine and intertidal habitats																							
1.13 Submerged marine habitats																							
2.1 Vascular plants of aquatic habitats																							
2.2 Vascular plants, lower plants and invertebrates, wet habitats																							
2.3 Vascular plants, grassland																							
2.4 Mosses and Liverworts																							
2.5 Anadromous fish																							
2.6 Non-migratory fish and invertebrates of rivers																							
2.7 Invertebrates of wooded habitats																							
2.8 Mammals of wooded habitats																							
2.9 Mammals of riverine habitats																							
2.10 Amphibia																							
2.12 Marine mammals																							
3.1 Birds of uplands																							
3.2 Birds of woodland & scrub																							
3.3 Birds of lowland heaths & brecks																							
3.4 Birds of lowland wet grassland																							
3.5 Birds of lowland dry grassland																							
3.6 Birds of lowland freshwaters & their margins																							
3.7 Farmland Birds																							
3.8 Birds of coastal habitats																							
3.9 Birds of estuarine habitats																							
3.10 Birds of open sea and offshore rocks																							

The top row in the table represents hazard types; the table relates these to habitats or species in a group that may be significantly affected, with shaded squares in the table indicating that one or more of the habitats or species in a group may be affected by that hazard.

Table A4 Indicative Alignment of Local Measures for Usk and South East Valleys Management Catchment Summaries and SWMI Required (Tier 1) Measures for 8 Management Catchments in England (including cross-border areas) [Usk (✓); South East Valleys (#)]

NRW Measure	SWMI / TIER 1						
	Physical Modifications (to improve habitat)	Managing Pollution from Waste Water	Manage Pollution from Towns, Cities and Transport	Changes to Natural Flow and Levels of Water	Managing Invasive Non-native Species	Manage Pollution from Rural Areas	Manage Pollution from Mines
Address air pollution							
Complete first cycle investigation	Screened Out						
Drainage and water level management				✓#			
Improve fish passage and habitat	✓#						
Improve flows and water levels				✓#			
Manage invasive non-native species					✓#		
Mine water and contaminated land remediation							✓#
Mitigate impacts of flood and coastal defences	✓#						
Mitigate impacts of water resource impoundments	✓#						
New investigations	Screened Out						
Other sustainable land and marine management practices			#				
Reduce impacts of other physical modifications	✓#						
Reduce pollution from sewage discharges		#					
Reduce pollution from other waste water discharges		✓					
Sustainable access and recreation management			✓# (and other activities)				

	SWMI / TIER 1						
NRW Measure	Physical Modifications (to improve habitat)	Managing Pollution from Waste Water	Manage Pollution from Towns, Cities and Transport	Changes to Natural Flow and Levels of Water	Managing Invasive Non-native Species	Manage Pollution from Rural Areas	Manage Pollution from Mines
Sustainable agricultural practices						✓#	
Sustainable woodland and forestry management						✓#	
Tackle misconnections and urban diffuse pollution			✓#				
Waste management			✓#				

Appendix 2 – Project level control and mitigation for SWMI required measures

Measure Type	Potential hazards*	Legal / consenting processes	Specific mitigation / mitigation approaches for implementation of measures
Physical modifications (to improve habitats)	<ul style="list-style-type: none"> • Change in water levels or table • Changes in flow or velocity regime • Changes in physical regime • Competition from non-native species • Disturbance (noise or visual) • Habitat loss • Killing/injury or removal of fish or other animals • Physical damage • Salinity • Siltation • Turbidity. 	<ul style="list-style-type: none"> • Planning permission from local planning authority under the Town & Country Planning Act. • The Town and Country Planning (General Permitted Development) Order 1995 (as amended). • Flood Defence Consent from the Environment Agency for work on or near a main river, flood or sea defences (Water Resources Act 1991, Flood and Water Management Act 2010). • Environmental Impact Assessment (Land Drainage Improvement Works) Regulations 1999. • Ordinary Watercourse Consent from either lead local flood authority or Internal Drainage Board (IDB) or NRW for work on or near all other watercourses that aren't main rivers. • Marine Licence from the Marine Management Organisation (MMO) or NRW in Wales for works below the mean high water spring tidal limit. • For each of the above consenting processes, there is a requirement for HRA where designated European sites are potentially affected. 	<ul style="list-style-type: none"> • Consideration of existing habitats and use, and appropriate survey as necessary. Appraisal of projects for potential impacts on European sites, supported by appropriate levels of survey, investigation and impact assessment. • Avoidance of working on, or in proximity to sensitive habitats, wherever possible. • Use of screening to minimise visual and noise disturbance to sensitive species from construction plant, workers and activities. • Timing of works to avoid ecologically sensitive periods, such as breeding or migratory passage periods (may vary depending on the European sites and qualifying features affected). • Seek early advice and approval from Natural England or NRW where works in proximity to designated European sites, including scope of HRA / appraisal required, any supporting survey if necessary, building of mitigation in to the design, sensitive timings and construction methods of working. • Consider location and extent of activity, sensitive timing and methods of construction to minimise effects on designated habitats and species. • Seek assent from Natural England or NRW in advance of works within or affecting SSSIs (which underpin European sites). • Consider potential functioning role of habitat improvements in relation to relevant qualifying features of European sites in proximity / potentially affected, to avoid conflict and, where appropriate, incorporate habitat improvements complementary to site conservation objectives. • Appropriate methods of working including pollution prevention and control measures. • Review the relevant Site Improvement Plan/s or Prioritised Improvement Plans (PIPs) for European Site/s potentially affected to establish priority issues, pressures and threats and site features affected, particularly those related to physical modification; consider whether any proposed actions or methods of working may exacerbate these issues, and whether the project / activity may help co-deliver any of the remedial measures / actions identified in the SIP/s or PIPs. •

Measure Type	Potential hazards*	Legal / consenting processes	Specific mitigation / mitigation approaches for implementation of measures
Managing pollution from waste water	<ul style="list-style-type: none"> • Disturbance (noise or visual) • Habitat loss • Physical damage. 	<ul style="list-style-type: none"> • Planning permission from local planning authority under the Town & Country Planning Act. • The Town and Country Planning (General Permitted Development) Order 1995 (as amended). • Water Resources Act 1991. • Environmental Permit under the Environmental Permitting Regulations (England and Wales) 2010. 	<ul style="list-style-type: none"> • Consider appropriate methods of working including pollution prevention and control measures. • Avoidance of working on, or in proximity to sensitive habitats, wherever possible. • Timing of works to avoid ecologically sensitive periods, such as breeding or migratory passage periods (may vary depending on the European sites and qualifying features affected). • Use of screening to minimise visual and noise disturbance to sensitive species from construction plant, workers and activities. • Seek early advice and approval from Natural England or NRW (assent from Natural England/NRW in advance of works within or affecting SSSIs) where works in proximity to designated European sites, including scope of HRA / appraisal required, any supporting survey if necessary, building of mitigation in to the design, sensitive timings and construction methods of working. • Review the relevant Site Improvement Plan/s or Prioritised Improvement Plans for European Site/s potentially affected; consider whether any proposed actions or methods of working may exacerbate these issues, and whether the project / activity may help co-deliver any of the water quality related remedial measures / actions identified in the SIP/PIP.
Manage pollution from towns, cities and transport	<ul style="list-style-type: none"> • Disturbance (noise or visual) • Habitat loss • Physical damage • Surface water flooding changes • Turbidity. 	<ul style="list-style-type: none"> • Planning permission from local planning authority under the Town & Country Planning Act. • The Town and Country Planning (General Permitted Development) Order 1995 (as amended). • Environmental Permit under the Environmental Permitting Regulations (England and Wales) 2010. 	<ul style="list-style-type: none"> • Guidance within 'Port development and dredging in Natura 2000 estuaries and coastal zones' (European Commission guidance). • Guidance within 'Design Manual for Roads and Bridges', volume 11 environmental assessment, section 4. • Consider appropriate methods of working including pollution prevention and control measures. • Avoidance of working on, or in proximity to sensitive habitats, wherever possible. • Timing of works to avoid ecologically sensitive periods, such as breeding or migratory passage periods (may vary depending on the European sites and qualifying features affected). • Review the relevant Site Improvement Plan/s or Prioritised Improvement Plans for European Site/s potentially affected to establish priority issues, pressures & threats related to water quality, and site features affected; consider whether any proposed actions or methods of working may exacerbate these issues, and whether the project / activity may help co-deliver any of the water quality related measures / actions proposed in the SIP/PIP to remedy these issues.

Measure Type	Potential hazards*	Legal / consenting processes	Specific mitigation / mitigation approaches for implementation of measures
Changes to natural flow and levels of water	<ul style="list-style-type: none"> • Change in water levels or table • Changes in flow or velocity regime • Changes in physical regime • Disturbance (noise or visual) • Habitat loss • Killing/injury or removal of fish or other animals • Physical damage • Salinity • Siltation • Turbidity. 	<ul style="list-style-type: none"> • Flood Defence Consent from the Environment Agency for work on or near a main river, flood or sea defences. • Ordinary Watercourse Consent from either lead local flood authority or Internal Drainage Board (IDB) or NRW for work on or near all other watercourses that aren't main rivers. • Marine Licence from the Marine Management Organisation (MMO) or NRW in Wales, for works below the mean high water spring tidal limit. • Environmental Impact Assessment (Land Drainage Improvement Works) Regulations 1999. • Abstraction licence from the Environment Agency (Water Resources Act 1991 (as amended by Water Act 2003), Environment Act 1995, Water Resources (Abstraction and Impounding) Regulations 2006).. • Impoundment licence from the Environment Agency/NRW (as for abstraction licence). • Drought Permits and Orders (Water Resources Act 1991, Environment Act 1995). • Environmental Permit under the Environmental Permitting Regulations (England and Wales) 2010. 	<ul style="list-style-type: none"> • Consideration of existing site qualifying features - habitats and species potentially affected, and their sensitivity to changes in water levels or water table, changes in flow or velocity regime and subsequent potential changes in geomorphology / physical regime. • Consider use of screening to minimise visual and noise disturbance to sensitive species from construction plant, workers and activities. • Consider appropriate methods of working including pollution prevention and control measures. • Timing of works to avoid ecologically sensitive periods, such as breeding or migratory passage periods (may vary depending on the European sites and qualifying features affected). • Timing of abstractions / flow changes to avoid ecologically sensitive periods for water dependent European sites and features; optimise proposed changes to target relevant qualifying features, particularly those identified in SIPs/PIPs where water levels / flows identified as the priority pressures / threats. • Consider potential secondary water quality effects to changes to flow / water levels, such as potential WQ changes, increased / decreased siltation / turbidity, and sensitivity of features to changes, to inform appraisal of projects and influence their design, if appropriate. • Review the relevant Site Improvement Plan/s or Prioritised Improvement Plans for European Site/s potentially affected to establish priority issues, pressures and threats related to water quality / quantity, physical regime and site features affected; consider whether any proposed actions or methods of working may exacerbate these issues, and whether the project / activity may help co-deliver any of the measures / actions proposed in the SIP/PIP to remedy these issues.
Managing invasive non-native species	<ul style="list-style-type: none"> • Disturbance (noise or visual) • Physical damage. 	<ul style="list-style-type: none"> • Operations affecting SSSI's require assent from Natural England / NRW (Wildlife and Countryside Act 1981). • Environmental Impact Assessment (Land Drainage Improvement Works) Regulations 1999. • The Wildlife and Countryside Act 1981. • Environmental Protection Act 1990. • The Salmon and Freshwater Fisheries Act 1975. 	<ul style="list-style-type: none"> • Timing of management activity to avoid sensitive periods, such as breeding or migratory passage periods (may vary depending on the European sites and qualifying features affected). • Appropriate methods and monitoring to reduce risk of unintentional spread of invasive non-native species, during management / control activities. • Seek early advice / approval from Natural England/NRW (assent in advance of works within / affecting SSSIs) where management activities planned in proximity to designated European sites, including sensitive timings and methods of management.

Measure Type	Potential hazards*	Legal / consenting processes	Specific mitigation / mitigation approaches for implementation of measures
			<ul style="list-style-type: none"> • Consider location and extent of management activity, sensitive timing and methods of management to minimise effects on designated habitats and species. • Review the relevant Site Improvement Plan/s or Prioritised Improvement Plans (PIPs) for European Site/s potentially affected to establish priority issues, particularly any related to invasive non-native species; consider whether any proposed actions or methods of working may exacerbate these issues, and whether the management activity can help co-deliver any of the measures / actions proposed in the SIP/PIP to remedy these issues.
Manage pollution from rural areas	<ul style="list-style-type: none"> • Disturbance (noise or visual) • Habitat loss • Physical damage • Surface water flooding changes • Turbidity. 	<ul style="list-style-type: none"> • Operations affecting SSSI's require assent from Natural England/NRW (Wildlife and Countryside Act 1981). • Environmental Impact Assessment (Land Drainage Improvement Works) Regulations 1999. 	<ul style="list-style-type: none"> • Consider guidance contained within 'Farming for Natura 2000' - Guidance on how to support Natura 2000 farming systems to achieve conservation objectives (European Commission 2014). • Consider timing of management activity to avoid sensitive periods, such as breeding or migratory passage periods (may vary depending on the European sites and qualifying features affected). • Any changes to land management practices to address diffuse pollution in rural areas within or affecting SSSIs (which underpin European Site designations) should involve consultation with Natural England or NRW to ensure no potential for adverse effects, checked against the list of operations likely to damage the SSSI and inform changes to SSSI management agreements, where appropriate. • Review the relevant Site Improvement Plan/s or Prioritised Improvement Plans for European Site/s potentially affected to establish priority issues, particularly any related to water quality / diffuse pollution; consider whether any proposed actions or methods of working may exacerbate these issues, or whether the management activity can help co-deliver any of the measures / actions proposed in the SIP/PIP to remedy these issues.
Manage pollution from mines	<ul style="list-style-type: none"> • Disturbance (noise or visual) • Habitat loss • Physical damage. 	<ul style="list-style-type: none"> • The Coal Industry Act 1994. • The Energy Act 2011. • Planning permission from local planning authority / minerals planning authority under the Town & Country Planning Act. • Environmental permit under the Environmental Permitting Regulations (England and Wales) 2010. • The Town and Country Planning (General Permitted Development) Order 1995 (as 	<ul style="list-style-type: none"> • Seek assent from Natural England/NRW in advance of works within or affecting SSSIs (which underpin European sites). • Consider whether any specific European site features are adapted to unique water quality determinants, for which mine remediation may result in changes to. • Adhere to the Mine Water Treatment Schemes Code of Practice (Coal Authority and Planning Officers Society, 2012). • Consideration the intervention / scheme in relation to the need for EIA +/- HRA, through consultation with the local planning authority / mineral planning authority and Natural England/NRW, and obtain an

Measure Type	Potential hazards*	Legal / consenting processes	Specific mitigation / mitigation approaches for implementation of measures
		amended). <ul style="list-style-type: none"> • Water Resources Act 1991. 	EIA screening opinion as required. <ul style="list-style-type: none"> • The LPA / MPA may need to conduct an appropriate assessment if it is possible that a minewater treatment scheme / intervention / remediation measures is likely to have a significant effect on a European site either individually or in combination with other plans or projects. • Review the relevant Site Improvement Plan/s or Prioritised Improvement Plans for European Site/s potentially affected to establish priority issues, particularly any related to water quality; consider whether any proposed actions or methods of working may exacerbate these issues, or whether the scheme / intervention / management activity can help co-deliver any of the actions proposed in the SIP/PIP to remedy these issues.

* Hazards are based on those used in Environment Agency's Habitats Directive Handbook; further detailed description is provided in Appendix 3.

Appendix 3 - Descriptions of Hazards used within the HRA*

<p>Acidification Could the action lead to activities that result in releases of sulphur dioxide, oxides of nitrogen and ammonia that cause acidification?</p>
<p>Change in water levels or table Could the action lead to changes in the water levels or water table?</p>
<p>Changed water chemistry Could the action lead to significant changes in water chemistry (BOD, COD, organic and inorganic pollutants) in the short and long term?</p>
<p>Changes in flow or velocity regime Could the action lead to changes in the flow or velocity regime of a water body? Could the action lead to greater river or tidal flows under normal or extreme events?</p>
<p>Changes in physical regime Could the action alter physical processes that will alter the present characteristics of a site – e.g. coastal processes, fluvial and geomorphologic processes, erosion processes? This includes the pattern of sediment movement, erosion and deposition, bathymetry and hydrodynamic processes, which can result in direct loss of habitat and indirect effects on dependent species and habitats. Such changes can be caused by dredging activities or from construction activities.</p>
<p>Competition from non-native species Could the action result in increased competition from non-native species? The introduction of non-native animals and plants may have a range of effects, from undetectable to changes in a community composition to the complete loss of native communities. The effects are highly unpredictable, but can be very serious.</p>
<p>Disturbance (noise or visual) Could the action lead to increased noise or visual disturbance at the European site from direct or indirect, continuous or intermittent effects? Disturbance from construction, operational activities, recreation, land management activities etc may cause sensitive birds and mammals to deviate from their normal, preferred behaviour. It is difficult to make generalisations about the likely effects of disturbance because a wide range of factors are involved and different species react differently. It is likely that the effects will depend on the type and timing of disturbance and the proximity of the sources to the sensitive populations.</p>
<p>Entrapment Could the action lead to impingement or entrapment of fish or other species.</p>
<p>Habitat loss Could the action lead to new structures whose footprint will impinge on the European site? Could the action lead to land use change that will impinge on the European site? Could the action lead to ongoing processes which will exacerbate habitat loss (e.g. coastal squeeze)?</p>
<p>Killing/injury or removal of fish or other animals Could the action cause the killing/injury or removal of fish or other animals?</p>
<p>Nutrient enrichment Could the action lead to nutrient enrichment? An addition of nutrients can lead to changes in vegetation, directly affecting protected habitats and species of flora, or protected species dependent upon the vegetation.</p>

pH
Could the action lead to changes in pH of a water body?
Physical damage
Could the action lead to temporary works of such a nature that will cause long-term damage to the existing habitat? Could the action lead to recurring operations and maintenance that will lead to disturbance?
Predation
Could the action encourage predators?
Reduced dilution capacity
Could the action lead to reduced dilution capacity of a water body?
Salinity
Could the action lead to a change in the salinity of a water body or other habitat? Changes in salinity of the water may affect the toxicity of other substances. It may also have a direct effect on the distribution of species across the site and the composition of biological communities. Change is of concern in coastal or estuarine waters where the zone of transition from freshwater to brackish or saltwater may be critical to the interest feature.
Siltation
Could the action lead to increased physical damage caused by the deposit of suspended solids from water? Siltation can cover food for birds and kill macro-invertebrates or render them inaccessible. It may also affect the feeding behaviour of birds and other animals that detect prey by sight. An increase in suspended sediment can affect filter-feeding organisms, through clogging and damage to feeding and breathing equipment. Young fish can also be damaged if sediment becomes trapped in the gills. Fine sediments can smother the gravel beds used by salmon for spawning.
Smothering
Could the action lead to physical damage caused by the deposit of solid material from the air?
Surface water flooding changes
Could the plan lead to a significant reduction or increase in the frequency of surface water flooding (fluvial, pluvial and tidal)? Consideration should be given to the potential to flood throughout the year, to greater depths, reduced frequency may lead to drying out or changes to sediment supply etc; and supply of water to seasonally ephemeral water bodies.
Thermal regime changes
Could the plan lead to a mean temperature change of more than 0.2°C in a water body?
Toxic contamination
Could the action lead to releases of substances that could be harmful to flora and fauna?
Turbidity
Could the plan lead to an increase in suspended sediments? Increased turbidity associated with suspended solids results in reduced light penetration, which may affect photosynthesis. This may affect invertebrates directly and species higher up the food chain indirectly e.g. birds. Turbidity can be a direct effect of activities such as agitation dredging or over-pumping, or an indirect effect e.g. through the removal of vegetation protecting a bed or bank.

* The hazards and their descriptions that have been used in the HRA are based on those used in Environment Agency's Habitats Directive Handbook.

Appendix 4 – European Sites within the Severn RBD

Site ID	Name of Site	SPA, SAC, Ramsar	Area (ha)*
UK0030071	Aberbargoed Grassland #	SAC	40
UK0012734	Avon Gorge Woodlands	SAC	152
UK0012584	Bath and Bradford-on-Avon Bats	SAC	107
UK9013111	Berwyn #	SPA	24188
UK0012926	Berwyn and South Clwyd Mountains #	SAC	27221
UK0030092	Blaen Cynon #	SAC	67
UK0030096	Brecon Beacons #	SAC	270
UK0012587	Bredon Hill	SAC	360
UK0030100	Brown Moss #	SAC	32
UK0030109	Cardiff Beech Woods #	SAC	116
UK9010041	Chew Valley Lake #	SPA	576
UK0012766	Coed Y Cerrig #	SAC	9
UK0030119	Coedydd Llawr-y-glyn #	SAC	101
UK0030145	Elan Valley Woodlands #	SAC	440
UK0013658	Cotswolds Beechwoods	SAC	586
UK0013585	Cwm Cadlan #	SAC	84
UK0030127	Cwm Clydach Woodlands	SAC	29
UK0030135	Dixton Wood	SAC	13
UK0012735	Downton Gorge	SAC	69
UK0012878	Drostre Bank #	SAC	13
UK9014111	Elenydd – Mallaen #	SPA	30022
UK0012928	Elenydd #	SAC	8609
UK0012912	Fenn`s, Whixall, Bettisfield, Wem and Cadney Mosses #	SAC	949
UK0030150	Fens Pools #	SAC	20
UK0030158	Granllyn #	SAC	21
UK0012985	Llangorse Lake #	SAC	216
UK0030198	Lyppard Grange Ponds #	SAC	1
UK0012658	Mells Valley	SAC	28
UK0030048	Mendip Woodlands	SAC	254
UK0030213	Montgomery Canal #	SAC	56
UK0030221	Mynydd Epynt #	SAC	40
UK0030052	North Somerset and Mendip Bats	SAC	561
UK0014792	Rhos Goch #	SAC	68

Site ID	Name of Site	SPA, SAC, Ramsar	Area (ha)*
UK0030250	River Clun #	SAC	15
UK0013007	River Usk/ Afon Wysg #	SAC	1008
UK0012642	River Wye/ Afon Gwy #	SAC	2235
UK0012826	Rodborough Common	SAC	104
UK0012683	Salisbury Plain	SAC	21438
UK9011102	Salisbury Plain	SPA	19689
UK0013030	Severn Estuary #	SAC	73715
UK9015022	Severn Estuary #	SPA	24663
UK0030072	Sugar Loaf Woodlands #	SAC	174
UK0014783	Tanat and Vyrnwy Bat Sites	SAC	12
UK0012810	The Stiperstones & The Hollies	SAC	601
UK0014784	Usk Bat Sites #	SAC	1686
UK9007051	Walmore Common #	SPA	53
UK0013595	West Midlands Mosses #	SAC	184
UK0014794	Wye Valley and Forest of Dean Bat Sites #	SAC	143
UK0012727	Wye Valley Woodlands #	SAC	916
UK11081	Severn Estuary	Ramsar	24663
UK11076	Walmore Common	Ramsar	53
UK11043	Midland Meres & Mosses - Phase 1	Ramsar	511
UK11080	Midland Meres & Mosses - Phase 2	Ramsar	1588

Denotes if the site is a WFD: Natura 2000 protected area site.

* Area denoted is for the entire designated area rather than the area within the RBD boundary.

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