

# Planning for **Water** in Worcestershire

TECHNICAL RESEARCH PAPER



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It is a subject of great importance to planners.

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## Update

December 2011

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This paper has been prepared in partnership with





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## 1. Introduction

Water is a vital resource. Its management is fundamental to sustainable development. It is a subject area of great importance to planners. The way in which water is managed can determine whether new development, land management water usage, mineral working and waste management have a positive or negative impact on people and the environment. These impacts can manifest in the form of water shortages, flooding, poor water quality, habitat and species loss and insufficient infrastructure capacity. More positively, good planning of water issues can provide us with not only clean and reliable water supplies, but also areas for recreation, habitats for wildlife and flood mitigation. It is essential to identify the water related issues and how they interrelate, so that they may be appropriately considered as an integral part of any objective seeking to deliver sustainable development.

Whether it is directly via its appearance as rivers in the landscape or indirectly such as supplies to irrigate its fertile valleys, defining habitats and land use, or influencing development patterns, water is a key component of the character of the County. The sustainable management of water is an essential issue to be addressed in Worcestershire. Indeed the events of June/July 2007 brought the issue of flooding to national attention, costing the County Council an estimated £9million of which £6 million was estimated for the repairs carried out by the Highways department (Lammas and Alston, 2007). The 'Local climate impact profile for Worcestershire' by Lammas and Alston (2007) reports in more detail on the social, economic and environmental impacts that extreme weather events have had on the County, in particular the June/July floods of 2007.

This paper seeks to bring to the attention of plan makers and decision makers the water issues facing the County over the next 20 years and provide examples of best practice for how we might manage/plan our water resource in the future. This is undertaken via an assessment of the following topic areas:

1. Water quality;
2. Water resources and infrastructure; and
3. Flood risk.

For each issue, the paper will pay particular attention to the effect climate change will potentially have within Worcestershire, as we begin to experience the predicted warmer and drier summers, warmer wetter winters and more extreme weather events.

### Purpose

The purpose of this Technical Research Paper is to provide a consistent, strategic approach to the management of water by, identifying the key issues and implications surrounding the management of water in the County so that water related issues can be properly and strategically planned for at an early stage in the plan making process. To this end the paper will help inform all forms of plan making and community based plans in Worcestershire including:

- Sustainability Appraisals
- Local Development Documents (LDD's)
- Community Strategies
- Revisions to Strategic Flood Risk Assessments and Water Cycle Strategies
- Surface Water Management Plans
- Water Resources Management Plans
- Infrastructure Delivery Plans



## Scope

Water bodies are defined as covering groundwaters, all surface water bodies, including lakes, streams, rivers and artificial waters, such as canals, all of which are within the scope of this paper.

## Status

This Technical Research paper forms part of a wider approach to Natural Resource Planning and Management in Worcestershire being led by the County Council. Where linkages to other natural resource matters are identified they are highlighted. This paper has been prepared in close collaboration with the Environment Agency, Severn Trent Water and Natural England, taking into account best practice and policy development from across the UK. As described above, the paper is intended to act as a background technical report to help inform policy and strategy preparation but does not itself represent County Council, Environment Agency, Severn Trent Water or Natural England policy. In many areas it is a distillation of Environment Agency, Severn Trent Water and Natural England advice from the national level to the Worcestershire scale. In particular it seeks to echo the Environment Agency's Water Resources Strategy 'Developing our Water Resource Strategy for England and Wales' (2009a) within a Worcestershire context. However the paper is not comprehensive in its consideration of water related issues and thus does not negate the need to read other relevant Environment Agency, Severn Trent Water, Natural England or Government advice, references to which are provided in Appendix 1 of this paper.

## Audience

This paper is directed at everyone involved in plan making in Worcestershire as well as adjoining authorities that share cross boundary water issues and resources. Its primary focus is with regard to flooding; water quality; economic and built development such as new and existing industrial land and housing stock; waste and minerals operations and sustainable use and management of the water environment including enhancement of water and wetland. While it will have relevance to land management practices such as agriculture and forestry due to their specific water related issues, much of this is beyond any direct influence of the planning system, and they are therefore not a primary consideration of this paper. The Technical Research Paper is structured as follows:

- **Chapter 2** provides the policy context and evidence
- **Chapter 3** describes the key water related issues and challenges we face in Worcestershire within the ambit of spatial and water planning
- **Chapter 4** responds to the challenges by setting out options for how they might be addressed in policy documents
- **Chapter 5** sets out monitoring requirements and further work that should be undertaken.





## Roles and responsibilities of key players

Responsibility for water related matters, in Worcestershire is divided between a number of different bodies, for example Local Authorities, the Environment Agency, Severn Trent Water etc. Many other agencies and indeed individual landowners also have responsibilities with regards to water. Some of the key players/stakeholders in relation to water quality, water resources and infrastructure and flood risk are described in Appendix 2.

## Update

This paper forms a first update to the previous technical paper, published in December 2008, as recommended within. Updates have been made where newer versions of documents have since been released, or entirely new documentation produced. These include;

- Flood and Water Management Act 2010
- River Basin Management Plans
- Catchment Flood Management Plans
- Water Resource Strategy for England and Wales
- Water Resource Strategy Midland Regional Action Plan
- Water Resource Management Plans
- Water Cycle Strategies
- Strategic Flood Risk Assessments.

The best practice examples have been updated, with new ones added and similar ones merged together, resulting in a list of 40. The newly added best practice examples are;

5. Discourage the connection of surface water drains into foul sewers in all new developments. Instead encourage the use of SUDS, green infrastructure and/or grey water measures.
18. In areas prone to surface water flooding encourage the removal of surface water drains feeding into foul sewers. Instead encourage the retro fitting of SUDS, green infrastructure and/or grey water measures.
21. Encourage the rehabilitation of river morphology (restoration of meanders and connectivity to floodplain can help to slow and store flood waters), especially in areas upstream of settlements prone to fluvial flooding.
33. Maintain and improve the connection between habitats to enable species migration. This can be achieved using green infrastructure and SUDS.
37. Adopt National Indicator 189: Flood and coastal erosion risk management.
40. Promote awareness of misconnections and their contribution to the pollution of the local water environment through use of [www.connectright.org.uk](http://www.connectright.org.uk)



## 2. Context

### a. Policy

#### National

The two main national policy drivers in relation to water and spatial planning are **PPS 25 Development and Flood risk** and the **Water Framework Directive (WFD)**.

The main aims of **PPS 25** are: 'Ensuring that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Where new development is, exceptionally, necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall' (CLG, 2010, March). Flood Risk Assessments are the main mechanism to address these aims. An assessment is made of the risk to an area or site from flooding, now and in the future, taking account of climate change and the impact that any changes or development will have on flood risk in the area or elsewhere. At local level it may also be used to identify how to manage these changes and ensure that flood risk is not increased (CLG, 2010). Strategic Flood Risk Assessments (SFRA) are undertaken at Local Authority level and should be informed (where available) by Regional Flood Risk Assessments (RFRA) undertaken by the Regional Planning Bodies. SFRA in turn will inform Site Specific Flood Risk Assessment (FRA) of those submitting a planning application to the Local Authority.

RFRA and SFRA are free standing assessments and the findings should be incorporated or reflected in the Sustainability Appraisal of Local Development Documents. This will ensure that planning strategies will

support the Government's objectives for development and flood risk as set out in PPS 25. SFRA is made up of level 1 and level 2 assessments; the level 1 assessment should be detailed enough to allow application of the Sequential Test on the basis of Table D1 of PPS25, inform the Sustainability Appraisal and subsequent plan policies and identify whether application of the Exception Test is likely to be necessary. The principal purpose of a Level 2 SFRA is to facilitate application of the Exception Test (CLG, 2010).

Consultation has finished on amendments to PPS25. The revised PPS was released in March 2010, It includes amendments to the "definition" of Flood Zone 3b, The Functional Floodplain, in Table D.1 in Annex D, and to some of the Flood Risk Vulnerability Classifications in Table D.2, Annex D.

Local Authorities need to use the Sequential Test when allocating land for development, to steer development to areas with the lowest probability of flooding (Flood Zone 1). The sequential test should demonstrate that proposed development is being allocated in the lowest flood risk category (as described below) and that there exist no suitable areas of lower probability of flooding in which to locate the proposed development. The flood zones refer to the probability of river flooding only (however, an SFRA should consider all sources of flooding as well as taking the impact of climate change into account). Flood zones 2 and 3 are shown on the Environment Agency's Flood Maps. Zone 1 is all the land that falls outside these two zones. The zones are defined as follows;





- **Zone 1** has a low probability of flooding and comprises of land assessed as having a less than 1 in 1000 annual probability of river flooding in any year (<0.1%).
- **Zone 2** has a medium probability of flooding and is defined as comprising of land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%).
- **Zone 3a** has a high probability of flooding. Land in this zone has a 1 in 100 or greater annual probability of river flooding (>1%) in any year.
- **Zone 3b** Functional floodplain comprises of land where water has to flow or be stored in times of flood.

Where it has not been possible to locate development in zones with a lower probability of flooding, through the Sequential Test, as a result of large areas of land covered by flood zone 2 and 3, the Exception Test should be applied. The Exception Test provides a method for managing flood risk whilst allowing necessary development to occur.

The Exception Test must demonstrate that the development provides wider sustainability objectives that outweigh the flood risk. When allocating land in spatial plans, determining broad locations for development and infrastructure, or considering applications for development, decision-makers should take into account the vulnerability to flood risk of certain land uses. The Exception Test should not be used to justify vulnerable developments in flood Zones 3a and 3b and should only be applied after the Sequential Test has been applied.

There are three parts to the Exception Test all three sections have to be passed. Further details on flood zones, appropriate uses, vulnerable and essential development, the sequential test, the exception test and determining planning applications can be found in Appendix D of PPS25. It is worth noting that many of the floods in Worcestershire in 2007 took place in areas outside of designated flood plains, as a result of surface water rather than fluvial flooding and this is why it is important that SFRA consider all types of flooding.

The Environment Agency is the lead organisation responsible for implementing the **Water Framework Directive (WFD)** and will do so through the production of **River Basin Management Plans (RBMP's)**, one for each of the River Basin Districts in England and Wales. The WFD (2000/60/EC) which came into force in December 2000 and was put into UK law (transposed) in 2003 is the most substantial piece of EC legislation to date and is designed to improve the ecological health and prevent further deterioration of the whole water environment (surface and ground water), promote the sustainable use of water, reduce water pollution and ensure a progressive reduction in groundwater pollution. It is based on the strategic catchment level approach of River Basins Districts, across England and Wales. River Basin Management Plans will be produced for each river basin district every six years.





Local Authorities are likely to have a principal role in delivery of the WFD through their own activities and by working in partnership with others. Failure to comply with WFD requirements may lead to the European Commission bringing legal proceedings against the UK. Local Authorities have a general responsibility not to compromise the achievement of UK compliance with EC Directives and will have a responsibility to ensure the targets set out in the WFD are met. The European Water Framework Directive (WFD) will require that over 30 measures are looked at, grouped into ecological status (this includes biology as well as 'supporting elements' like phosphorus, temperature and pH) and chemical status ('priority substances'). When assessing the quality of water bodies the WFD will use a principle of 'one out, all out' which means the poorest individual result drives the overall classification. WFD monitoring is risk-based, focussing where there is likely to be a problem.

Worcestershire is part of the Severn River Basin District (see map in Appendix 4), which, is the third largest in England and Wales. Through the production of the Severn RBMP the significant water issues facing that catchment are identified in order that they can be considered and addressed as a whole rather than in isolation. This is due to pollution operating across large scales with hard to identify sources, such as the transportation of agricultural pollutants across entire catchments. The majority of point source pollution problems, such as sewage works, have been identified and addressed by the EA and relevant water utility companies (pers. comm. EA 2010). As such no specific actions to address the failings highlighted exist for a particular watercourse or waterbody.

RBMPs are produced to integrate and streamline those plans and processes related to water and its management by establishing a clear and transparent process of analysis and decision-making (Environment Agency, 2009c). This is done through the setting of objectives and developing programmes of measures to meet those objectives. The WFD has set a target that all surface and ground waters should aim to reach 'good status' by 2015. Any surface water body which has had substantial changes to its physical character as a result of physical alterations caused by human use, otherwise known as 'heavily modified' water courses, need to reach 'good ecological potential' by 2015. All water bodies must reach 'good' or 'high' status by 2027 (heavily modified need to reach it maximum potential, known as 'good potential' by this timeframe).

The current status of all assessed waterbodies are shown for each district in Appendix 5. Each map has an accompanying table highlighting the areas which require improvement based on the ecological status grouping only, as these are the most common factors determining the ratings given. Full details on the status of all criteria for each waterbody, along with any further monitoring actions the EA are taking, are contained within Appendix B of the Severn RBMP.



The first completed RBMPs were released in December 2009, with ours, the Severn RBMP focussing on the protection, improvement and sustainable use of water across the Severn catchment. As a regional application of the WFD, the plan focuses on ecological conservation and improvement, and the reduced use and release of pollutants. The Severn RBMP outlines the current state of the water environment and details actions to improve it by the next plan completion in 2015, including the following relating to water quality, resources and infrastructure and flooding;

- **Comply with regulations** such as Environmental Permitting, Environmental Damage and Groundwater, to limit environmental damage and help prevent land contamination, pollution and deterioration of waters. (industry, manufacturing and other business)
- Run **pollution prevention advice and campaigns** to provide targeted advice and enforcement (Environment Agency) to reduce contaminants being released to groundwater from industrial estates, petrol stations and other sources. (industry, manufacturing and other business)
- Promote **reduction in water use** for specific sectors, including water efficiency plans that incorporate water reuse, recycling, rainwater harvesting and clean and dirty water separation. (industry, manufacturing and other business)
- Implementation of **sustainable drainage** Code of Practice. Comply with published advice for operators of sustainable drainage systems. (industry, manufacturing and other business)
- Include **strong water efficiency policies** in Spatial Strategies and Local Development Plans/Frameworks (Local Authorities, Regional Assemblies, Welsh Assembly Government)
- Ensure that **planning policies and spatial planning documents** take into account the objectives of the Severn River Basin Management Plan, including Local Development Documents and Sustainable Community Strategies (Local Authorities).
- Implement **surface water management plans**, increasing resilience to surface water flooding and ensuring water quality is considered on a catchment basis (Environment Agency, Local Authorities).
- Promote the use of **sustainable drainage** in new urban and rural development where appropriate, and retrofit in priority areas including highways where possible (Environment Agency).
- Ensure the need for appropriate **Water Cycle Studies** are included in regional and local plans particularly in growth or high risk areas (Local authorities)
- Reduce diffuse pollution by developing examples and promoting **best practice use** of sustainable drainage (Local Authorities)
- Implement the **Environment Agency and Highways Agency Memorandum of Understanding** and associated initiatives to minimise the risk of pollution (Highways Agency, Environment Agency)
- Reduction in demand for water through **promotion of free household meters** (water companies)





To implement these actions the Severn RBD is divided into its 10 constituent catchments. Worcestershire primarily covers four of these; the Worcestershire Middle Severn, Severn Vale, Teme and Warwickshire Avon. Each catchment details statistics and a map of current water status, with more specific key ecological actions relating to pollution reduction, abstraction and sewerage management. The key actions for these catchments are detailed below, along with the districts to which they mostly relate. A detailed map showing which RBMP catchments cover which districts is shown in Appendix 6. Sections of the Wyre and the Tame, Anker and Mease catchments also cover Worcestershire but these are not summarised below due to their small areas of cover relative to the other four.

#### **Worcestershire Middle Severn; (Wyre Forest, Worcester City, Bromsgrove and Wychavon)**

- Improvement to discharges at a number of sewage treatment works
- Investigations to assess the impacts of abstraction on the environment under the Restoring Sustainable Abstraction programme
- Projects on Wildlife Trust owned reserves to improve wetland and riparian habitat
- Wildlife Trust's 'Access to Nature' community involvement programme to improve habitat and raise awareness of Black Country rivers
- Green Futures initiative to provide co-ordinated advice to farmers on complying with agricultural and environmental regulations across the West Midlands

#### **Severn Vale; (Malvern Hills)**

- Investigating the sources of metals and other pollutants and various actions to improve the management of water resources
- Improvement to discharges at a number of sewage treatment works and investigations to assess the impacts of abstraction on the environment under the Restoring Sustainable Abstraction programme
- Provision of advice to farmers under the England Catchment Sensitive Farming Delivery Initiative
- Salmon in Schools project to raise local awareness of the salmon lifecycle and habitat
- Pollution reduction campaigns on a local industrial estates
- Actions to reduce the impact from pesticides including metaldehyde (slug pellets)

#### **Teme; (Malvern Hills)**

- Improvements to discharges at several sewage treatment works
- Provision of advice to farmers under the England Catchment Sensitive Farming Delivery Initiative
- Investigations to assess the impacts of abstraction on the environment under the Restoring Sustainable Abstraction programme
- Actions to reduce the impact from pesticides including metaldehyde (slug pellets)





### Warwickshire Avon; (Wychavon, Redditch and Bromsgrove)

- Improvement to discharges at a number of sewage treatment works
- Investigations to assess the impacts of abstraction on the environment under the Restoring Sustainable Abstraction programme
- Guidance and training in irrigation best practice, including benchmarking and Scheduling
- Pollution reduction campaigns on local industrial estates
- Encourage farmers and industry to build storage reservoirs to support or replace summer irrigation
- Voluntary Initiative educational and advice programme to reduce the impact of agricultural chemical use including metaldehyde (slug pellets) in the River Leam catchment
- Wildlife Trust projects to improve the ecological value of the rivers Avon, Stour and Sowe through partnerships with landowners, schools and the local community

Both PPS 25 and the WFD highlight the issue of taking account of the impacts arising from climate change upon water quality and water availability. A consideration of climate change within Worcestershire can be found within the **County Climate Change Strategy** and within the **Planning for Climate Change in Worcestershire Technical Research Paper (November 2008)**.

The Government's **Water Strategy for England, Future Water** was produced in February 2008 and provides a clear direction for England setting out the long term vision of where Government want the water sector to be by 2030 and some

of the steps that will need to be taken to ensure that good clean water is available for people, businesses and nature. The Strategy looks at the water cycle as a whole, from rainfall, drainage through to discharge, treatment and every aspect of water use. In summary they have a vision for sustainable delivery of secure water supplies and an improved and protected water environment.

**Catchment Flood Management Plans (CFMPs)** have been produced by the Environment Agency (December 2009) with the 'aim of working in partnership with key decision-makers within a river catchment to explore and define long term sustainable policies for flood risk management' (Environment Agency 2008a). These set out a preferred plan of action for sustainable flood risk management over the next 50 to 100 years.

The objectives contained within the Severn CFMP aim to reduce the risk of flooding, not through detailed solutions, but through the use of generic actions. These include;

- Increased attenuation
- Rural land use change
- Increased conveyance
- Localised protection
- Influence and informing (through combining with other policies, SUDS and better warnings)

Flood risks vary within different parts of a single river catchment and as a result different approaches are needed for different locations. Catchment Flood Management Plans divide the river catchment into a series of policy units (as can be seen in Appendix 7).



Worcestershire falls under the following policy units: the Teme, Middle Severn, Kidderminster and Bromsgrove, Redditch, Lower Severn Corridor, and the Middle Avon. In order to meet the objectives in the Severn CFMP, one of six policy choices is selected for each policy unit and details the broad types of action that will be taken towards reducing flood risk. These are selected according to the extent, nature and scale of current and future flood risk within different parts of the catchment.

The performance and implemented actions of the CFMP by Worcester County Council and all District Councils are monitored by the EA under National Indicator 189: flood and coastal erosion risk management. All relevant county and district actions were compiled and sent to the EA for scrutiny in summer 2010. The outcomes of this were due to be conveyed at the end of September 2010, but have been delayed. No new date has been set up for reporting as of October 2010.

Under the 2006 **Natural Environment and Rural Communities Act (NERC)** local authorities, the Environment Agency and water companies now have a legal duty to have regard to biodiversity in carrying out all of their functions.

Additionally **PPS1 Delivering Sustainable Development** and **PPS 23 Planning and Pollution Control** all refer to the issues surrounding the sustainable use of water resources. **PPS12 Local Spatial Planning** highlights the need for Local Planning Authorities in their Core Strategies to address new infrastructure requirements, including who will provide it and when, for the proposed new developments.

The Environment Agency has produced a **Water Resource Strategy for England and Wales** (Mar 2009) which sets out actions towards water resources based on the twin track approach of demand management and resource development. Multiple general recommendations are made for the entire country surrounding the use of SUDS, inter-organisational planning and increased water efficiency. Relevant county-wide recommendations include;

- Encourage planning authorities to use planning conditions and/or legal agreements to secure the implementation of SUDS, especially in areas where pressure on water resources is high.
- Less connection of surface water with combined sewers. We see this happening by reviewing the automatic right to connect to sewers and using SUDS more widely.
- Developers should work in partnership with water companies and others to explore the feasibility of achieving water neutrality when new housing developments are proposed, within the context of a water cycle strategy.
- Increase mandatory standards for fixtures, fittings and appliances to improve the water efficiency of homes and businesses.
- Adopt water efficiency standards in planning conditions that are tighter than the default standard identified in building regulations.
- In areas where water resources are under pressure, include measures that support water neutrality where new development is planned and require developers to produce water cycle studies where housing developments are proposed.





Since the release of this document these broad-ranging recommendations have been translated into more locally specific and detailed actions, as contained in the **Water Resource Strategy Regional Action Plan for the Midlands** (please see page 13).

Since May 2008 all newly built homes are required to get a rating (from zero to six) under the **Code for Sustainable Homes**. This may be assessed rating from one to six, or a zero rating, if no assessment has been undertaken. However all social housing developments funded by the Housing Corporation programme 2008 - 2011, other publicly funded housing developments and homes built on Government land have to obtain a Code for Sustainable Homes rating of at least level three. The code assesses the sustainability of new homes against six levels of sustainable design and construction standards, level 6 being the most sustainable. It is the government's aim that by 2016 all new homes will be zero carbon i.e. zero net emissions of carbon dioxide from all energy use in the home. Appendix 3 provides extracts from level 6 of the Code as it relates to water and surface water runoff.

**The Flood and Water Management Act**, was granted Royal Assent on 8th of April 2010, thereby making the bill an Act of Parliament and details roles and responsibilities of flood risk management activities and implements several recommendations of the Pitt Review. The most relevant outcomes of the Act, in relation to this paper are;

- New statutory responsibilities for managing flood risk: There will be national strategies and guidance on managing flood risk in England and Wales. Unitary and county councils will bring together the relevant bodies, who will have a duty to cooperate, to develop sustainable strategies for managing local flood risk.

- Protection of assets which help manage flood risk: The Environment Agency, local authorities and internal drainage boards will be able to ensure that private assets which help manage the risks of floods cannot be altered without consent.
- Sustainable drainage: Drainage systems for all new developments will need to be in line with new National Standards to help manage and reduce the flow of surface water into the sewerage system.
- The Lead Local Authority will have to approve then adopt SUDS in new developments consisting of more than one property.
- Proposed plans to bring in a programme of retrofitting SUDS in to existing developments.
- New sewer standards: All sewers will be built to agreed standards in future so that they are adopted and maintained by the relevant sewerage company.

Other areas cover the provision and cost of water and changes to reservoir safety measures providing encompassing legislation dealing with all facets of water. However, as yet no timetable for the implication of these actions has been laid out, nor has any further guidance or strategies surrounding Flood Risk Management (FRM) actions been released. Implementation and legal guidance is included for SUDS in schedule 3 of the Act, but no national standards have yet been produced. As such, until the legislation is enacted fully, regular checks should be made into the availability of guidance and the current responsibilities of relevant parties to ensure compliance.





## Regional Policy and Practice

It was the intention that under the new coalition Government that **Regional Spatial Strategies (RSS)** would be rapidly abolished. A letter to this effect from the Rt Hon Eric Pickles MP, Secretary of State for Communities and Local Government was sent to all Local Authorities on 27 May 2010. In the letter it stated its intention to rapidly abolish the RSS returning decisions on housing and planning to local councils and that the letter could be treated as a material consideration for decisions a Local Authority or Planning Inspector was making.

In July 2010 all England's RSSs, (except the one for the London Plan), were formally revoked through Section 79 (6) of The 2009 Local Democracy, Economic Development and Construction Act by the Communities Secretary, Eric Pickles and they will no longer form part of the development plan for the purposes of s38(6) of the Planning and Compulsory Purchase Act 2004. The legal basis for the regional strategies and their housing targets were abolished through the Localism Bill released 13 December 2010.

The government has stated that its intention to revoke the Regional Strategies through the Localism Bill should be considered as a material consideration in planning decisions, although the Court of Appeal decision on 27 May 2011 clarified that the proposed abolition of the strategies is not a material consideration in plan-making and that significant weight could only be attached to the intention in exceptional cases with very clear reasons for doing so.

Therefore, the evidence base used to inform the RSS is still a credible form of information. The findings contained in the RFRA and other documents with regards to the RSS are still an accurate form of information with regards to the implications of increased housing on flooding and water resources for the figures given. Appendix 8 contains information that was produced to inform the RSS that is relevant to this paper.

Under the Water Act 2003 Severn Trent Water and other water companies are legally required to prepare **Water Resources Management Plans (WRMP)**. These plans show how the water company intends to meet projected demands for water over the next 25 years. These now statutory documents have to be produced every five years covering a 25-year period from 2010. The Severn Trent Water Resources Plan was published in June 2010. The Strategy aims to address, as part of its long term supply capabilities to meet future demand, the following challenges: future housing growth, climate change impacts, water quality, restoring sustainable abstraction and the impacts of the Water Framework Directive. The Severn Trent supply area for the purpose of water resources planning is split up into six water resource zones, Worcestershire falls into the Severn (WRZ 3) Water Resource Zone. To accompany the WRMP Severn Trent Water have completed a Strategic Environmental Assessment (SEA) and are completing a Habitats Regulations Assessment (HRA).

To accompany the WRMP Severn Trent Water have completed a Strategic Environmental Assessment (SEA) and a Habitats Regulations Assessment (HRA).



The strategy for this Zone is based on maximizing use of existing sources through extending the capacity of its strategic grid, increasing water efficiency activities and reducing leakage. In the longer term, a need for more water resources and treatment capacity to maintain the supply / demand balance has been identified. Within the Severn Zone the Plan has identified Water resource issues affecting groundwater and surface water. It also found that Aquifers are under pressure in many areas including Kidderminster and Bromsgrove. The River Severn is a major source of water with within this Zone with five key water supply abstractions having the potential to impact on the Severn Estuary. The Severn (WRZ3) Water Resource Zone has special importance for the stressed and damaged/lost groundwater dependent wetlands of Worcestershire, which post/current abstraction has severely compromised. Efficiency savings and demand management in the round are necessary to correct this ecological problem, as well as targeted site recovery plans to raise lowered water tables (Pers comms Natural England 2010).

The **West Midlands Checklist** is an online tool, developed by a steering group comprising representatives from local authorities, developers, consultants, regional bodies, the voluntary sector and statutory bodies. Developers, Local Authorities and funding bodies can all make use of the checklist. With regards to water the checklist addresses the need for developments to both incorporate flood resilience and to reduce the contribution made to flash flooding. To maximise the availability of harvested rain and grey water (water recycled from domestic waste, such as washing machines) for appropriate use on

developments, to reduce the demand for fresh water, as well as addressing the wider energy efficiency agenda. Further details on the West Midlands Checklist can be found at

<http://www.checklistwestmidlands.co.uk/>

The **Water Resource Strategy Regional Action Plan for the Midlands** (Dec 2009) has been produced by the Environment Agency to implement locally the general actions contained within the Water Resource Strategy for England and Wales. This specific plan covers the Midlands region as defined by the EA and consists of the Severn and Humber River Basin Districts. The document contains an overarching action plan, focussing on current and future water resources, and as such has close links to RBMPs, CFMPs, CAMs and water company strategies. It lists 36 detailed actions for the entire Midlands area, along with those responsible for completing them, and the timescales involved.

One of the six key priorities identified for the midlands, Mid32, states:

*'We want everyone to make informed decisions when using water resources to ensure that they are using water efficiently... We expect local authorities to provide a political commitment to upgrade and retrofit properties on change of occupier.'*





## Local Policy and Practice

Currently in place at a local level are **Worcestershire County Structure Plan** saved policies CTC 8 Flood Risk and Surface Water Drainage and CTC 9 Impact on Watercourses and Aquifers, these are saved until further notice.

The **Waste Core Strategy** is currently being prepared, but the County Council does have saved **Minerals Local Plan** policies in place. When produced water issues will be addressed in the Waste Core Strategy and Minerals Core Strategy, both generically e.g. avoiding flood risk areas and in detail e.g. addressing leachate from decomposing waste, potential flood attenuation benefits of mineral restoration. The assessment of possible impacts upon surface and groundwater flows, water levels and quality will be particularly important in the preparation of the Minerals Core Strategy.

**Local Development Framework** - Wyre Forest District Council have completed their Core Strategy which was adopted in December 2010 and has water management and sustainable development as two of its core policies. The remaining District Councils' Core Strategies have yet to be adopted and as a result the District Councils have saved local plan policies until replaced by Core Strategies. Whilst preparing their Core Strategies Local Authorities will need to take account of the issues in this paper and Water Cycle Strategies, Strategic Flood Risk Assessment (SFRA) and consider the need for Surface Water Management Plan (SWMP). A floodplain management strategy has been produced by Worcester City Council which was incorporated in to its 2004 Local Plan. It was held up as an example of good practice and as a result examples of it have been included in PPS 25 Development and Flood Risk, practice guide.

### The four categories of resource availability are defined as follows:

Water Available	Water likely to be available at all flows including low flows. Restrictions may apply.
No Water Available	'No Water Available' for further licensing at low flows although water may be available at higher flows with appropriate restrictions.
Over-licensed	Current actual abstraction is resulting in 'No Water Available' at low flows. If existing licences were used to their full allocation they would have the potential to cause unacceptable environmental impact at low flows. Water may be available at high flows with appropriate restrictions.
Over-abstracted	Over-abstracted Existing abstraction is causing unacceptable environmental impact at low flows. Water may still be available at high flows with appropriate restrictions.

*Source: Environment Agency, 2008b*





**Catchment Abstraction Management Strategies (CAMS)** are produced by the Environment Agency. The first round of CAMS covers a six-year period and identifies through 'resource availability status' locations where water is available; no water is available, is over licensed and/or over abstracted. 'The resource availability status indicates the relative balance between committed and available resources, showing whether licences are likely to be available and highlighting areas where abstraction needs to be reduced' (Environment Agency, 2005).

There are five Catchment Abstraction Management Strategies that cover the Worcestershire area. They are the Worcestershire Middle Severn CAMS, Severn Vale CAMS, Teme CAMS, Warwickshire Avon CAMS and the Severn Corridor CAMS which as its name suggests encompasses the River Severn Corridor. Appendix 9 shows the coverage of the CAMS. CAMS describe where water is available for further abstraction and where it needs to be reduced in order to conserve aquatic habitats and prevent damage to the environment.

The vision for the Second Edition of the **Sustainable Community Strategy for Worcestershire** is of 'a county with safe, cohesive, healthy and inclusive communities, a strong and diverse economy and a valued and cherished environment'. The Community Strategy is prepared by the Local Strategic Partnership (LSP) with the aim to improve the quality of life of people who visit, work or live in the county. The Sustainable Community Strategy has been broken down into 6 themes and under the better environment for today and tomorrow

theme, the following priority outcome has been devised 'To address issues of water quality, supply, and consumption and land drainage in Worcestershire'.

**Strategic Flood Risk Assessments (SFRAs)**, as detailed fully in the PPS 25, planning authorities are required to make informed planning decisions through the designation of flood zones based on risk, and the application of the sequential and exception tests. A Level 1 assessment involves general, large-scale investigations into the sources and pathways of flooding, calculated through historic records and modelling, and includes an application of the sequential test. A Level 2 assessment is applied to medium or high risk areas, giving more site-specific details of flooding from all sources and includes an application of the exception test. The detail on the progress and findings of district SFRA can be found in Appendix 10.

The findings of the RFRA and district produced SFRAs are being collated and reviewed by the County Council in order to produce the **Flood Risk Assessments in Worcestershire** background paper to Inform the Waste Core Strategy. Upon completion this will provide a detailed overview of the RFRA and all available Level 1 and 2 SFRAs across Worcestershire.



**Water Cycle Strategies (WCS)** are being encouraged by the Environment Agency to accompany Development Plan Documents. The Water Cycle Strategy will provide a plan and programme for implementation of water services infrastructure. The Water Cycle Strategy will include an assessment of the environment and infrastructure capacity for water supply, sewage disposal, flood risk management and surface water drainage. It will highlight sewerage areas where there exists a constraint to future development either because the solution costs are unreasonably expensive or if there are physical constraints which make provision of additional capacity impractical, and where the provision of additional capacity may take a while to provide and thus needs to be taken in to account with regard to phasing of development. The plan will also provide an overall estimated cost for the identified solution and of the identified infrastructure improvements required.

Due to the limited availability of water across the Worcestershire area, relevant Water Cycle Strategies build upon the findings and actions contained within SFRAs, CAMS and WRMPs to outline measures for promoting and increasing sustainable water usage across the county. South Worcestershire, Bromsgrove and Redditch (combined) and Wyre Forest have all produced Water Cycle Strategies, details of which can be found in Appendix 10. Redditch and Bromsgrove are currently working on an update to their current WCS.

The development of **Surface Water Management Plans (SWMP)**, are set out by the Flood and Water Management Act 2010 as the process in which local authorities will manage all flood risk. PPS 25 good practice guide (2008) also states that they have an important role in developing a coordinated strategic approach to managing surface water

drainage and reducing flood risk. They could also provide the mechanism with which to integrate the requirements of River Basin Management Plans (RBMP) into planning policies (CLG 2007 and Environment Agency, ND).

Recommendation 18 from the Pitt Review (2008) recommended that local SWMP's should provide the basis for managing all local flood risk. The plans should focus on managing flood risk, making efficient use of Sustainable Drainage Systems (SUDS) and safeguarding existing features of the water environment. Further information on SWMP can be found in Water Strategy - Future Water (2008), PPS25 Development and Flood Risk, Practice Guide (2009) and Environment Agency Policy Brief Environmental Infrastructure (ND).

Worcestershire County Council is currently undertaking the process of producing SWMPs for each of the six districts within the county. These will detail the location and extent of pluvial and groundwater flooding, and the areas where this interacts with other sources, such as fluvial and sewer flooding. These locations will be mapped and contain holistic information regarding event frequency, magnitude and thresholds. SWMPs will utilise the flooding information contained within SFRAs and Multi-Agency Flood Plans (MAFPs), and will in turn inform these documents when newer versions are produced. Upon completion the plans will outline priority areas and the actions to be taken, as well as informing all future planning decisions in terms of surface water occurrence, movement and inter-connectivity. Recently a grant was received from DEFRA to undertake the production of these, however no timetable for the completion of the final documents has been decided.





The use of strategically planned and managed Green Infrastructure in Worcestershire is outlined in the **Planning for Landscape, Biodiversity and the Historic Environment in the development of Green Infrastructure Strategies in Worcestershire** (Worcestershire County Council, 2008b). This paper has been produced to introduce and explain the concepts of green and grey infrastructure, and how they can be beneficial. It is also designed to inform other policies, documents and strategies and gives details on the sources of evidence required for planning green infrastructure.

The evidence base outlined in version 1 has been drawn together to produce an Environmental Character Area map for Worcestershire. This map identifies areas of strategic intervention (Character Areas) based on the quality or vulnerability to change of existing green infrastructure assets and this includes blue infrastructure. An approach (i.e. Protect and Enhance) and series of objectives have been developed for each character area and in terms of blue infrastructure this has been informed by the CFMP/SFRA for this area.

Members of the steering group have also been involved in developing concept plans for strategic development sites within the county. The concept plans provide a framework for the development of master plans for areas of strategic growth and includes a statement of aims and objectives for green infrastructure that the partners to the paper would expect to see addressed in the master planning of development. The concept plans are based on primary baseline data and the multifunctional characteristics of the site in doing so they identify the green infrastructure assets, and spatial patterns that give rise to opportunities for a connected and multifunctional green infrastructure network including the use of SUDS.

The **Biodiversity Action Plan (BAP)** process is the Government's response to the ratification of the Rio Convention in 1992, and commitment to nature conservation in the UK. The first Worcestershire BAP was produced in 1999. It was revised and re-launched in 2008 with new targets and actions valid to 2017. The Worcestershire BAP consists of 19 Habitat Action Plans (HAP) and 25 Species Action Plans (SAP) setting targets for the conservation of that habitat or species and the actions taken to achieve them. Local Planning Authorities have a key role to play in the delivery of the BAP, through Development Control, land management and their ability to influence and educate residents of the County. Worcestershire Biodiversity Action Plans of direct relevance to this Technical Research Paper are:

- Rivers and Streams HAP
- Fen and Marsh HAP
- Reedbeds HAP
- Lowland Wet Grassland HAP
- Wet Woodland HAP
- Ponds and Lakes HAP
- Canals HAP
- Great Crested Newt
- Otter SAP
- Water Vole SAP
- White-clawed Crayfish SAP
- Twaite and Allis Shad SAP
- Common Club-tail dragonfly SAP
- Black Poplar SAP

This list is not exclusive. Many habitats and species of local and national BAP significance can be found within the wider floodplain environment. Those listed above are mostly associated with the river corridor landscape. There will be an interim review of many of the wetland related plans in 2009, informed by the draft Severn RBMP





## b. Evidence base

Below is a summary of the key evidence base that was used to inform this paper that is not contained within the documents outlined previously. Information used to inform this section can be found in the appendices; in particular Appendix 11 'Water related facts and figures'.

### Climate change

- Summer rainfall is predicted to decrease and winter rainfall increase (UKCP09, 2009). The likelihood of extreme weather events are expected to increase as witnessed during the summer floods of 2007 when the likes of Tenbury, Evesham and Pershore were flooded and many roads made impassable. Approximately 10% of the land area of Worcestershire is at risk of flooding (about 167 km<sup>2</sup>) (Pers Comm, Environment Agency, 2008). A decrease in summer rainfall levels as a result of climate change may lead to an increase in the occurrences of drought episodes with demand for water often peaking during drought periods.
- In the Midlands, October 2010 to October 2011 overall rainfall totals were between 60 percent and 70 per cent of the long term average making this the driest 13 months on record. Worcestershire was between seven the driest counties in the region (Environment Agency, 2011b, p.1).

### Development

- Worcestershire is currently a moderate area for water stress (Environment Agency, 2007b). Development of new water resources, treatment and distribution infrastructure will be required in future to serve the projected housing growth rates (Mott MacDonald, 2007). The CAMS resource availability maps,(Appendix 9) for Worcestershire demonstrate that

most of the County has no water availability status meaning that no water is available for further licensing at low flows. Areas that are over abstracted, meaning existing abstraction is causing unacceptable environmental impacts at low flows, can be found in the north of the County running down to the centre. A small area on the southern boundary of the County is over licensed, which means the current actual abstraction is resulting in 'No Water Available' at low flows and if all licences were used to their full allocation they could cause unacceptable damage to the environment during low flow periods. For all of the three scenarios water may still be available for abstraction at high flows with appropriate restrictions. A very small area in the north east of the county has water available although restrictions may still apply. (Environment Agency, 2008b).

### Domestic

- People who live in Worcestershire use on average between 130-149 litres of water a day (EA, 2007b). With higher standards of living as customers invest more of their income in their homes and gardens, they increasingly expect to have an uninterrupted water supply that meets all of their needs, regardless of whether those needs might be viewed as "non-essential" by water resource planners.
- Seven (58%) of the large Sewage Treatments Works in the County are either at high or medium risk of putting pressure on sewage treatment infrastructure, if new development occurs (Environment Agency, 2007d). However, Severn Trent are using the Water Cycle Strategy process to advise planners as to where sewage treatment works have limited capacity, but this does not mean that additional capacity cannot be provided as and when needed (Pers Comm Severn Trent, 2009).



- In Worcestershire during 2006-2007 just over half the County's water supply (53%) was abstracted from ground water supplies (Pers Comm Severn Trent Water, 2007).

### Agriculture/Forestry

- Compared to the amount of water abstracted for public water supply, the amount abstracted for agriculture is low. However, much of the diffuse pollution within water bodies in rural areas is as a result of agriculture and forestry practices (Environment Agency 2007a).

### Water Biodiversity

- Rivers, streams and canals can be rich in biodiversity and act as wildlife corridors linking habitats. How we manage watercourses will affect the biodiversity as will climate change in the form of drought, changes in water temperature and extreme weather events such as flooding. Abstraction of water for public water supplies is already having detrimental impacts on biodiversity, lowland wet meadows are already under serious threat. The unsustainable abstraction of groundwater has caused many problems in the North Worcestershire area and as a result a number of these water bodies are supported by compensatory water drawn from groundwater. Without this, some stream reaches would cease to flow and some pools would disappear in periods of low flow. Important wetland habitats in Redditch and Kidderminster have already been lost to development. Damage to habitats can occur as a result physical modification to a watercourse such as canalisation. Fragmentation of habitats can occur when flood control measures are installed resulting in negative biodiversity impact.

### Historic Environment

- The relationship between people and water is intrinsically linked, therefore

all water courses and sources of water have been the focus of past and present human activity. Some of our most important archaeological sites are associated with current and former water courses, and often provide environments for exceptional preservation. Extraction can cause the dewatering of previously stable waterlogged deposits, while flood compensation measures can often have a detrimental impact on above and below ground heritage assets. Conversely some enhancement projects can have a positive effect on the Historic Environment such as the restoration of historic water management features.

### Risk based assessment of water bodies

- In Worcestershire, 600km of rivers and streams were assessed to establish if they were at risk of not meeting the WFD objectives in 2015. The biggest risk of not meeting the WFD objectives is from diffuse pollution from Phosphates and Nitrates and overall the majority of watercourses in Worcestershire are at a medium to high risk of not meeting the WFD objectives. (Environment Agency 2009c). Maps in Appendix 5 for each District show the current status of the water bodies surface and ground water.
- As reported in our 22 December brief, winter abstraction restrictions continue to decrease. Furthermore, river flows reflected the rainfall patterns across Midlands with mean November flows 'exceptionally low' for all monitoring sites in the Trent basin. Flows were more variable in the Severn catchment. Both Stareton and Evesham in the Avon catchment were 'notably low', as was Tenbury on the Teme. Redbrook on the Wye, in contrast, was 'below normal' (Environment Agency, 2011a, p.1).





## 3. Water related challenges and issues

Water issues which need to be addressed by the planning system in Worcestershire:

- Adapting to the challenges of climate change
- Preventing and managing surface ground and fluvial flooding
- Ensuring sufficient water supply
- Ensuring sufficient sewerage capacity (infrastructure)
- Biodiversity enhancement and the role of green infrastructure (wetlands, woodlands etc) in flood management and water cycle
- Improving water efficiency in developments
- Improving water quality in the natural environment.
- Achieving sustainable abstraction without detriment to the natural environment.

Having identified the key planning related water issues in Worcestershire this next section addresses the challenges associated with planning for water in the future. Each district produces and adopts their own water management planning focussed documents which outlines key actions relating to the following issues, and is used to inform core strategies. Wychavon have produced a water management supplementary planning document, which was adopted in 2009.

### The challenges of climate change (drought and flooding)

The issues associated with Climate Change remain one of the main reasons to tackle the management of water. There is clear reference to climate change and its impact on flooding in PPS 25 and how it should be addressed. The supplement to PPS1 explains how flood risk and ensuring sufficient water capacity of existing and potential infrastructure

needs to be taken into account by plan makers (CLG, 2006d).

All new development needs to take account of design exceedance to ensure that overland flood routes are kept clear. Because one of the key issues which need to be considered in relation to climate change is that an increase in rainfall intensities will result in greater pressure on existing sewerage systems. All underground drainage systems have a finite design capacity and every year there is a chance that their design capacity will be exceeded. Where this occurs flooding of properties can occur.

The higher climate change resilience/drought tolerance of semi-natural agricultural land (e.g. traditionally managed semi-natural 'old grasslands' as compared to sown agricultural leys) requires further investigation.

The flood amelioration benefits of semi-natural habitats and wild places have been largely overlooked and undervalued in the past. Land that previously absorbed and slowly released rain and floodwater has been replaced with less permeable intensive agricultural land-use and impermeable urban surfaces. As a consequence rain and flood water tends to be quickly diverted into artificial channels and highly modified and constrained watercourses, which have limited capacity to cope with severe rainfall and flood events (Holtan, HN and Kirkpatrick, MH, 1950 and Claxton, M, 2008).

Planning for climate change mitigation and adaptation is difficult due to both the short time horizon for many plans compared to the long term impacts of climate change and the uncertainty surrounding the nature and degree of those impacts.



The Environment Agency produces National and Regional Drought Management briefings. This provides a useful source of information on the current status of water resources and drought. They also recently released the "Drought Prospects Report for Winter Spring 2011/2012". The links to the above documents can be found in Appendix 1.

### Surface, Ground and Fluvial flooding

The Stern Review recognised that the planning system has a vital role to play in managing long term flood risk. The planning system should be used to reduce and avoid flood risk and thus reduce the social, economic and environmental impacts that are caused.

Over the years floods have occurred as a result of rivers such as the Severn, Avon and Teme bursting their banks and through surface water flooding as a result of intense rainfall. In Worcestershire, there are 11% of domestic and commercial addresses at risk of both surface water and/or fluvial flooding. This includes approximately 10% of the land area and approximately 11,100 (4.3%) of addresses at risk of fluvial flooding. Furthermore, approximately 20,000 (7.8%) of addresses in Worcestershire are at risk of surface water flooding. Worcestershire County Council as Lead Local Flood Authority will be preparing Surface Water Management plans. The figure for the addresses at risk of surface water flooding may change once the plans are completed and more detail is available (Pers Comm, Environment Agency, 2011).

Parts of Worcestershire are particularly prone to river flooding. Many of our towns and villages for example Stourport, Kidderminster, Tenbury, Worcester, Bewdley, Upton, Pershore, Evesham are built on the banks of large rivers with a long history of flooding. Climate change is likely to result in greater frequency of extreme events such as those

experienced during 2007 and 2008 becoming more frequent.

PPS 25 highlights that the impact of flooding depends greatly on land use, the higher the population and density of buildings, the greater the potential impact. Essentially flooding from rivers occurs in two situations:

1. A steep catchment and local intense rainfall can lead to a flash flooding event (land use can exacerbate or ameliorate floodwater runoff rates and peaks)
2. In those areas with a large and flat catchment, flood levels will rise slowly with the natural floodplain remaining flooded for several days therefore acting at a natural regulator of the water flow (CLG 2010).

Where water has not been able to soak into the ground as a result of a period of intense rainfall, flooding from the land occurs. Topography and built development will have strong influence on the impact of this form of flooding. Groundwater flooding occurs when the water levels in the ground rise above surface elevations. This is most likely to occur in low lying areas underlain by permeable rock- aquifers. However this is generally unlikely to occur in this County except in very localised areas. Groundwater floods can take weeks to months to disappear (CLG 2010).

Flooding from sewers occurs when heavy rainfall amounts cannot be accommodated by the sewer, as a result of it being of insufficient capacity or blocked by debris. Combined sewers take both surface and wastewater, should flooding occur, floodwater would be contaminated by sewage, which has health impacts. Potential measures to combat and address this problem are detailed under Sewerage Capacity in Section 4: Opportunities for a way forward.





Flooding can arise from non-natural or artificial sources (such as canal, reservoirs) as a result of the facility being overwhelmed or dam failure (CLG 2010). The physical modification of watercourses such as canalisation can increase the risks of floods occurring at that location and further downstream.

### Water Supply

As a result of climate change as well as the warm wetter winters we should expect hotter drier summers. This means that during the summer months the possibility of water shortages increases. Over half of public water supply in Worcestershire is provided by groundwater. Increases in housing building and the predicted increase in water usage per person per day, will put further pressure on the amount of water that is available for public water supply and other uses in the County, placing challenges on water providers to provide a clean ready and sustainable supply of water.

The Environment Agency Report (2007c) states that achieving Level 3 for the code for sustainable homes for all new homes could achieve approximately 25% water efficiency targets reducing/delaying the need for new resource developments. Getting existing homes retrofitted and new homes fitted with water efficient measures will be a key factor in reducing the demand on water supply. Individuals' behaviour needs to change to improve water efficiency in the home and house builders and planners need to ensure that design features are incorporated into new homes. The perceived cost of installing water efficiency measures into homes may limit the uptake.

If new reservoirs are needed to meet a short fall in available water supply then they need to be planned well in advance as they can take 25-30 years to plan and build.

The long-term solution to remove the harm to the environment from unsustainable abstraction is to review the actual abstractions, allow the natural groundwater level to rise and so restore flows to streams and groundwater dependant habitats. By reducing these abstractions, alternative supplies have to be found which can be expensive. A short-term option would be discharging compensation water to streams when flows are low. This has happened on the Battlefield Brook and Bow Brook to name but two. The Restoring Sustainable Abstraction Programme (RSA) was set up by the Environment Agency in 1999 with the aim of restoring abstraction licensing assumptions. Table 1.2 in Appendix 11 contains details of the Areas of Restoring Sustainable Abstraction in Worcestershire.

The annual performance report published by Ofwat (OFWAT, 2010) found that Severn Trent had marginal deficits in two of its water resource zones under dry year annual average conditions. These will be removed by deficits by 2010-11. Over this period STW water met their leakage target of 500 MI/day. An efficiency target of 3.72 MI/day was set for the region in 2008. 2009-10 efficiency activities were reported on a trial basis so no information is included in the report. 33% of premises in the STW region have water meters needs.

### Sewage capacity (infrastructure)

Along with housing, associated infrastructure will need to be provided, for adequate wastewater treatment. There is an ageing infrastructure, which will be costly to replace or upgrade if it is not found to be sufficient to cope with the increase in housing numbers as predicted in the WMRSS. In providing infrastructure the Water Framework Directive (WFD) states that this must not cause the water environment to deteriorate.



Seven Sewage Treatment Works in Worcestershire were found to be at medium to high risk of not having sufficient capacity to meet the needs of new housing developments. They were recorded as follows: Alvechurch, Blackminster, Bromsgrove/Fringe Green, Droitwich/Ladywood, Pershore (Tiddesley Wood), Redditch Priest Bridge, and Worcester (Environment Agency 2007d). The challenge is to ensure that adequate sewage treatment works are in place to cope with the houses that are built.

Phasing the necessary infrastructure ahead of house building is a challenge to be overcome and developers need to demonstrate that adequate capacity exists both on and off site to serve the development and that it will not lead to, or exacerbate existing problems elsewhere.

To ensure potential capacity constraints can be identified at an early stage it is recommended that developers contact Severn Trent Water as early as possible in order that capacity improvements can be programmed in line with development phasing.

### **Biodiversity enhancement, historic environmental consultation and the role of green infrastructure (wetlands, woodlands etc) in flood management and the water cycle**

Ensuring people have a sustainable water supply without causing a detrimental impact on the environment is a challenge to be tackled. In the past abstraction licences had little regard to the impact on the environment. Battlefield Brook in Bromsgrove is an example of human activity impacting on a watercourse, with water being removed since 1884. Abstraction of water resulted in lowering of the water table, which led to periods of low flow (although this is not the sole cause of low flow problems). Water vole populations in this area have been impacted by abstraction of water and installing concrete channels in the stream

in Sanders Park which prevented the population moving up stream.

Abstraction resulting in periods of low flow can also have significant impacts on the historic environment, particularly on palaeo-environmental deposits. An example of this is The Bog on Hartlebury Common, which has peat deposits that have developed over 10,000 years that have suffered desiccation as a result of the lowering of the water-table as a result of abstraction.

Local Planning Authorities, Environment Agency and water providers will need to ensure that the targets in the WFD are met, and that full consultation is carried out with English Heritage and the County Council Historic Environment and Archaeology Service to ensure that historic environment sensitivities are addressed using PPS5: Planning and the Historic Environment.

It will be necessary to ensure that river corridors are in good ecological health to aid the movement of species and that BAP targets and actions are not compromised, through the role Local Planning Authorities take in their development control and land management work. Local Planning Authorities need to influence and educate residents of the county to ensure the BAP targets are met and actions undertaken.

### **Water efficiency in developments**

Level six of the Code for Sustainable Homes requires reducing the usage of water to 80 litres per day per person. To achieve this level, the water usage in Worcestershire will need to be reduced by approximately 46% from the current 130-149 litres. This may be achieved by the introduction of water metering, water recycling, rainwater harvesting and the installation of devices that use less water.

‘Greywater recycling’ is re-using the water from baths, showers and wash hand basins, for use in toilets, washing





machines and outside taps. However, it may not be sustainable to fit 'greywater' recycling systems into individual homes on a large scale.

"Rainwater harvesting" has a role in the management of water resource, surface water and run-off. The most common technique of rainwater harvesting is the use of rainwater-butts, which collect the run-off from roofs. When it rains, the water-butt fills with water which afterwards can be re-used during dry periods in gardens or even toilets and washing machines. This system can be utilised on a small scale in individual households or on a large-scale in commercial and residential developments.

One of the issues for the application of rainwater harvesting systems is that of expense with the perception that the cost of the installation of these systems outweighs the potential benefits, despite the fact that the saving of water can bring economic savings to households and businesses.

SUDS can be used for groundwater recharge via storage and infiltration to the ground helping to recharge groundwater aquifers in areas of low availability. They can be designed to counter increased discharge from developed sites and to minimise the volume of water discharged from the site and good site design will maximise natural drainage to be used in areas such as gardens and parklands. The reduction in size, or even elimination, of off-site surface water sewers may be a useful cost saving measure (Environment Agency, nd, p. 12).

### Water quality

Point source pollution is closely controlled but diffuse pollution is an increasing problem (Environment Agency 2007d). Diffuse pollution unlike point source pollution, is harder to trace and therefore harder to control. Pollution of river courses can have environmental, social

and economic impacts. Pollution incidents can be very costly to treat, have huge environmental impacts and can prevent the public from using the water body whilst it is polluted.

Pollution to aquifers, which supply the majority of public water supplies, can be extremely costly or impossible to clean up and as a result are very vulnerable to pollution. Diffuse pollution from Phosphates and Nitrates are causing the most problems in Worcestershire's watercourses, with Worcestershire having the highest levels of these pollutants in the West Midlands.

Climate change will lead to hotter drier summers, which will lead to a drop in water levels in watercourses and should a pollution incident occur it will be magnified as a result of lower flow levels ability to dilute and remove the pollutant. This will create challenges for those responsible for managing water pollution incidents. Flooding can draw pollutants from urban areas and agricultural land and scour riverbanks contributing to pollution and an increase in sediment in rivers (Environment Agency 2007d) creating further challenges for those managing watercourses.

Agri-chemicals associated with arable land-usage could be removed, if this land was not farmed in this way in areas where it was causing a problem - further reducing diffuse pollution, sedimentation of watercourses and soil erosion.

However, chemical usage reduced by nearly 40% between 1996 and 2006 and farmers are constantly working with DEFRA and the NFU to further reduce the quantities of pesticides and fertiliser used (pers. comm. NFU, 2011). A potential benefit of changing land use is that permanent grassland cut for hay or grazed can provide habitats for wildlife, retain ground water, silt/nutrient retention and storage of flood water.



## 4. Opportunities for a way forward

Future water resource use, supply and sewerage and flood risk management are key issues that need to be addressed in the County with regards to the location of existing and future development. It is now largely recognised that as a result of climate change we are to expect milder wetter winters, and hotter drier summers, which in turn is likely to lead to an increase of flooding episodes and water shortages in the County.

Agriculture and its impact on the water environment will be an important issue for the WFD to address through its RBMPs, however it largely falls out of the scope of this paper, due to the limited impact that this paper could be expected to achieve. This is as a result of agricultural practices not needing to apply for planning permissions in many cases, due to Permitted Development rights. However the County Council will encourage sustainable agricultural development. For example the innovative use of water to reduce the impact on the environment.

Water should be used efficiently and where appropriate the use of SUDs, rainwater harvesting and recycling is encouraged. Reservoirs can provide a reliable source of water for irrigation (planning permission may be required dependent on the size of the of the reservoir proposed). Water can be abstracted during high flows for storage and use during the drier growing season. Where an agricultural development does not fall under permitted development rights and planning permission is required the council would encourage schemes that have added environmental, social and economic benefits.

The County Council will encourage through the work of the Land Drainage Partnership, riparian landowners, whilst also enabling BAP targets, to accept their responsibilities with maintaining watercourses on their land and seeking appropriate consent before they carry out work which might have an effect on the watercourse.

### Water related issues within Worcestershire

This section will look at how issues can be addressed when preparing or responding to documents (Core Strategy, SFRA, SEA, SPD, and Community Strategy) by suggesting best practice examples. Table 1.0 (on pages 32) identifies which best practice examples relate to each of the issues detailed subsequently. Appendix 12 (on pages 71, 72 and 73) states which documents these are most applicable for. These currently comprise of suggestions and recommendations made in relevant documentation, but some, such as the use of SUDS, will become duties and legal responsibilities in future legislation.

### Location of development

As detailed in the supplement to PPS1, flood risk and ensuring sufficient water capacity of existing and potential infrastructure needs to be taken into account by plan makers (CLG, 2006d).





### Sewerage Capacity

When planning for new development it is important that sufficient capacity exists within existing and potential new sewerage systems to accommodate new growth. However, the lack of capacity should not always be seen as a deterrent to development as it is often financially worthwhile to provide additional capacity at the same time as resolving existing flooding problems (Pers Comm, Severn Trent 2009). Also the removal of surface water drains from entering foul sewers to entering SUDS systems can free up additional sewerage capacity. Both of these should be taken into account when planning new development, with possible measures and outcomes discussed with Severn Trent.

This may make it necessary in some circumstances for developers to carry out appropriate studies to ascertain whether the proposed development will lead to overloading of existing water and sewerage infrastructure. Developers will need to liaise with the Sewerage Undertakers where a capacity problem exists and no improvements are programmed by the water company to agree what improvements are required and how they are to be funded. Appendix 13 contains examples of policy wordings that local planning authorities might want to consider including in their Core Strategies on this subject.

Rather than building new wastewater treatment facilities it is more likely that that water companies will extend existing facilities. Sustainable water management schemes such as grey water recycling, reedbed systems rainwater harvesting and reducing water consumption can lessen the impacts on sewage treatment works.

### Surface, ground and fluvial flooding

'Floodplains may remain flooded for several days, acting as the natural regulator of the flow. This is a function that the planning system should promote and enhance' (CLG, 2010).

Water storage should be incorporated into spatial plans and drainage 'pinch points' or barriers should be avoided. Holding water in the upper parts of catchments can reduce downstream flooding (Shaw et al, 2007).

The most effective way to manage flood risk is to reduce exposure to it through climate proofing developments by assessing the risk over the lifetime of the development and locating and designing development accordingly. Local Planning Authorities will need to consider flooding from all sources and use the Sequential test to steer all developments to areas with the lowest probability of flooding, particularly for vulnerable uses. The Exception Test will be applied by Local Planning Authorities in those areas where it is not possible to locate development in zones with a lower probability of flooding through the Sequential Test (CLG, 2010 and Shaw et al, 2007).

Reversion of flood plains to a more natural condition will enable huge improvements to floodwater mitigation, biodiversity enhancement/restoration, recreation value, green tourism opportunities, historic landscape character etc within the county.



Sir Michael Pitt was asked by government ministers to conduct an independent review into the 2007 June, July floods. The final report, *The Pitt Review: Lessons learned from the 2007 floods*, was published in June 2008. Over 90 recommendations were made. In December 2008 the Government issued a response to these recommendations and has subsequently released progress reports, the latest of which was published in December 2009. Worcestershire also produced an update on implementation in October 2009. All progress and actions contained within these documents are detailed with the relevant recommendation in Appendix 14.

### Water supply/infrastructure

Infrastructure planning is a requirement of the Core Strategy production process. Plans should demonstrate that they are deliverable and demonstrate that the necessary social, physical and green infrastructure is provided to support the proposed development. It includes planning for water supply, sewage and flooding.

LPAs work with the water companies to identify capacity and constraints in the water infrastructure delivery. Worcestershire County Council is preparing the Infrastructure Report in order to support the work done by LPAs. The report sets out details of existing strategic infrastructure assets and their capacities. Where possible information on deficits and future need is included and this will act as a baseline until it is possible to calculate more accurate deficits in infrastructure that will arise as a result of updated development targets and in discussion with infrastructure and service providers.

Local Planning Authorities need to recognise that improvements to water distribution infrastructure will be required to provide water supplies to new housing. Demands on the water supply and wastewater infrastructure have to be reduced. Appendix 13 contains examples of policy wordings that local planning authorities might want to consider including in their Core Strategies on this subject.

### Biodiversity enhancement, historic environment conservation and provision of green infrastructure

Local Planning Authorities and developers should look wherever possible to engineer biodiversity gain into development and water management infrastructure retaining features of biodiversity importance, heritage assets and habitats and protect them during construction.

Compensation should be provided through the creation of replacement habitats, archaeological mitigation or other appropriate measures provided when loss to existing habitats/heritage assets is unavoidable.

There is huge potential for habitat creation, particularly in floodplains where new or enhanced habitat could also offer flood mitigation / storm-water storage potential and watercourse water quality improvements etc. S106 agreements and biodiversity banking for developments that do not have any direct opportunities for biodiversity gain are ways in which to fund these improvements.





The north-south river corridors are key routes for migratory birds and other species' movement and need to be in good ecological health to facilitate this. Also, all river corridors, wetlands and water bodies potentially contain well preserved historic environment deposits and features.

There are potential opportunities for the creation of new lakes and ponds, including those for recreation, stock watering and crop irrigation, through conservation of water stocks, interception of rainfall and decreased reliance on piped/mains water. New development should fully appraise and enable this potential. New ponds should be sited as close to existing ponds as possible to enable typical species to transfer from one to the other. New development should incorporate permeable ground surfaces in to proposals and regulate surface water from impermeable surfaces.

Green infrastructure is the network of land and water that is made up of green spaces and natural elements, connecting cities, towns and villages. The provision of green infrastructure can have many social, economic, historic and environmental benefits. The latter include; protecting, restoring and reconnecting defragmented habitats, supporting species that are threatened by climate change, agricultural intensification and urban sprawl, conservation of locally distinctive historic landscapes.

Well planned Green Infrastructure can have significant multi functional benefits from a water point of view when it is properly appraised and incorporated into the design and subsequent management of developments. It can help improve water quality by reducing sediment runoff /sediment capture, agri-chemical capture, improve water resources by enabling groundwater recharge and improve flood prevention, by minimising direct surface runoff/improved rainwater capture into watercourses and sewerage systems and

acting as a flood storage area (Mitchell, R.J., et al, 2007).

The GI work in Worcestershire arose in response to a growing number of national and regional drivers which recognise the pivotal role that environmental initiatives play in the planning and delivery of multiple public benefits i.e. PPS 12 (2008).

This work will be represented in the GI Framework Paper comprising of 4 separate versions:

- 1st.** Introduced key GI concepts, policy context and relevant datasets relating to the natural and historic environment (completed).
- 2nd.** Identifies a series of strategic GI Environmental Character Areas for Worcestershire as areas of strategic intervention to which specific GI guidelines/targets have been attached and will shortly be published in the second GI framework paper.
- 3rd.** Will develop a methodology for the assessment of multifunctional role of green infrastructure; identify countywide and local GI corridors and assets; and identify a portfolio of potential projects by district.
- 4th.** Will draw together more socio-economic research in order to map the public benefits of GI and how we can further draw out its multifunctionality.

Alongside this work at a county and district level, the GI Partnership has also been working at a different spatial scale to produce a number of concept plans for strategic housing sites around the county. Concept plans provide a framework for the development of areas of strategic growth, setting out aims and objectives for GI that should be addressed in site masterplanning. So far plans have been produced for sites near Malvern, Pershore, Worcester, Redditch and Bromsgrove.



The Worcestershire County Council holds the Worcestershire Historic Environment Record (HER) which is a database of over 22,000 archaeological sites, historic buildings, monuments and landscape features in Worcestershire. This is linked to a GIS (geographical information system) and is searchable with a wide range of other datasets including, for example, flood mapping. This information and advice can be provided on request ([archaeology@worcestershire.gov.uk](mailto:archaeology@worcestershire.gov.uk)).

### Water Quality

Water quality issues need to be tackled to ensure that the targets in the Water Framework Directive are met. Therefore plan makers have to do what they can to improve water quality in order to meet WFD objectives.

### Water efficiency in developments

Communities and Local Government and Defra in 2009 introduced amendments to Building Regulations to set a whole building performance standard for new homes. New developments will be expected to comply with building regulations which require all new homes to be built so that water usage does not exceed 125 litres per person per day (CLG and Defra, 2009). This will be the equivalent to level one of the Code for Sustainable Homes.

Local authorities and community strategies should promote the use of the Code for Sustainable homes. Water efficiency measures incorporated into new builds as with the code for sustainable homes can help reduce water consumption (CLG, 2008b, December). The products that we put in our home can also help to reduce water usage, by selecting those that use less water. These can be both fitted into new properties and retro-fitted in existing ones.

However retro-fitting in existing properties is largely beyond the scope of this paper. The Severn Trent Water's Your guide to saving water, provides ideas on how homeowners can make water efficiency saving in their homes.

New developments should incorporate water efficiency measures. These can be in the form of grey water recycling, rainwater harvesting systems and installing household items that take less water. Economic savings may be made by the use of water metering, water recycling, rainwater harvesting and installing household items that use less water. Environmental benefits and social benefits through a 'feel good' factor will be achieved, by reducing carbon footprints.

Given that Worcestershire has been categorised under the Catchment Abstraction Management Strategies at low flows as having water resources which are over licensed, over abstracted and where no water is available, and the forecasted increase in water usage per person will put even more pressure on water supplies in certain areas. Encouraging water efficiency in new developments will aid this situation, dependant on the amount that is achieved (as demonstrated in water supply above).

### Adapting to climate change

The use of SUDS and in particular green roofs and porous paving are ways of adapting to the effects of climate change through alleviating storm run-off. The benefits of street trees, parks and other urban greenspace need to be secured through appropriate anticipatory management. For example, mature trees may suffer water stress unless a larger area of unpaved or permeable surface is provided around them so more rainwater reaches their roots.





There needs to be long term integrated planning for urban flood management. A strategic body needs to lead this planning. Local authority led Surface Water Management Plans (SWMPs) should be developed (EA, 2007f).

**Full List of Best Practice Examples:**

1. Take note of CAMS strategy and sustainable abstraction.
2. Prepare Infrastructure Delivery Plans for large developments (e.g. 3,000 to 5,000 homes) to co-ordinate and identify infrastructure needs, planning and delivery (EA, nd).
3. Identify new sources of water supply for major developments. For significant growth ensure sufficient water resource capacity exists avoiding areas that already experience, or are predicted to experience, shortfalls in water supply through over abstraction, drought and climate change.
4. SUDS: Contribution of SUDS to good sustainable water management through their inclusion in development. Use green infrastructure to regulate the water cycle and as part of flood management. Planting of vegetation can reduce surface runoff.
5. Discourage the connection of surface water drains into foul sewers. Instead encourage the use of SUDS, green infrastructure and/or grey water measures.
6. SUDS: Mitigate the effects of storms through rainwater capture.
7. SUDS: Discourage the paving over of drive ways and encourage the provision of soakaways, porous paving and green roofs, particularly in large developments having considerable amounts of roof and hard standing areas. Avoid development or impose special measures to prevent groundwater pollution from development sited within groundwater protection zones.
8. Locate development in areas with little or no risk from flooding and will not add to the risk of flooding elsewhere.
9. Consider floodplain realignment for existing critical services in flood risk areas.
10. Evacuation routes planned for those developments located in flood risk areas.
11. Restore minerals sites to areas for flood storage.
12. Where development or redevelopment has to take place in floodplains it should have conditions imposed to maximise flood resistance and resilience features. It should be low density and have a higher requirement for greenspace areas
13. As part of SFRAs, develop jointly with neighbouring LPA a local standard for design of developments in flood zones areas, with regard to climate change scenarios.
14. Withdraw Permitted Development rights in areas of high risk of flooding e.g. paving over front gardens or conversions of ground floors to living accommodation.
15. Promote the use of 'Checklist West Midlands' to developers.
16. Floodplains should not be developed on, allowing them to flood and act as a natural regulator of flow.
17. New development in existing areas should improve waste Management and drainage of the area.
18. In areas prone to surface water flooding encourage the removal of surface water drains feeding into foul sewers. Instead encourage the retrofitting of SUDS, green infrastructure and/or grey water measures.
19. Local Authorities to produce Surface Water Management Plans (SWMP) to help reduce the impacts of flooding through new developments.



20. Diversion of flood flows away from affected or vulnerable areas, possibly through the construction of a second flow channel.
21. Encourage the rehabilitation of river morphology (restoration of meanders and connectivity to floodplain can help to slow and store flood waters), especially in areas upstream of settlements prone to fluvial flooding.
22. Flood attenuation and temporary water storage, including use of greenspace and sacrificial areas (e.g. sport fields and car parks).
23. Widening drains to increase capacity, fitting one way valves in drains to prevent backflows, managing flood pathways and removing pinch points so that heavy rainfall can drain away.
24. Retrofit existing properties that are at risk of flooding, or have flooded, so as they are able to cope with further flooding events. This could include using flood resilient materials or raising floor levels and electrical fittings.
25. Where flooding is a particular problem the LPA should set out its specific approach.
26. Flood amelioration benefits can be gained through retaining and appropriately managing land cover. Incorporate long established habitats, such as old grasslands, into new development schemes where possible.
27. Wherever possible engineer biodiversity gain into development and water management infrastructure. S106 and biodiversity banking for developments that do not have any direct opportunities for biodiversity gain. Compensation through the creation of replacement habitats or other appropriate measures provided when loss to existing habitats is unavoidable.
28. Creation of biodiversity rich wetlands and restoration of natural wetland function, especially in areas of high risk of surface water flooding.
29. Creation of wet woodlands and the removal of field drains upstream of settlements prone to flooding.
30. Consider the cumulative impacts of development. Not be detrimental to quality, quantity or natural flow of waters systems, or its associated biodiversity.
31. All water issues to be considered as part of SA objective/process.
32. Reduce water consumption through xeriscaping - creating landscapes that do not require irrigation.
33. Maintain and improve the connection between habitats to enable species migration. This can be achieved using green infrastructure and SUDS.
34. Targeted promotion of water metering within areas of over abstraction.
35. All new homes to be built to at least level 4 for water of the Code for Sustainable Homes, seeking water neutral development in areas of water stress.
36. Reduce water consumption by installation, or retrofitting of existing properties, with grey water recycling and rainwater harvesting systems, or white goods and household facilities that use less water. Code for Sustainable Homes.
37. Adopt National Indicator 189: Flood and coastal erosion risk management or equivalent local target.
38. Effects of climate change considered for the design life of buildings/ development (climate proofing developments for flood risk and water supplies).
39. Adopt National Indicator 188: Adapting to climate change or equivalent local target.
40. Promote awareness of misconnections and their contribution to the pollution of the local water environment through use of [www.connectright.org.uk](http://www.connectright.org.uk)





**4. OPPORTUNITIES FOR A WAY FORWARD** • Planning for Water in Worcestershire

The table below indicates which best practice examples relate to which category of water related issues, as detailed previously in this section.

**Table 1.0 Best Practice examples and Water Related Issues**

Best Practice Examples	Water related issues within Worcestershire							
	Location of development	Sewerage Capacity	Surface, ground and fluvial flooding	Water supply/ infrastructure	Biodiversity enhancement and provision of	Water Quality	Water efficiency in developments	Adapting to climate change
1.	★			★				
2.				★			★	
3.	★	★		★				
4.	★	★	★		★	★	★	★
5.	★	★	★	★	★		★	★
6.		★	★		★	★	★	★
7.		★	★			★		★
8.	★		★					
9.			★		★			
10.	★		★					
11.			★					
12.	★		★		★			
13.			★					★
14.			★					
15.		★	★	★			★	★
16.	★		★					
17.	★		★					
18.		★	★	★			★	
19.	★		★					
20.	★		★					
21.			★		★			
22.			★		★			
23.			★					
24.			★					
25.			★					
26.			★		★			★
27.					★			
28.			★		★			
29.			★		★			
30.	★				★	★		
31.	★	★	★	★	★	★	★	★
32.				★				
33.					★			
34.	★						★	
35.	★						★	★
36.				★			★	★
37.			★					
38.			★	★			★	★
39.			★					★
40.		★		★	★	★		



## 5. Monitoring and Further Work

### Monitoring

As chapter 4 illustrates the implementation of the suggested actions in this paper will principally be via various planning policy documents. These will each in turn be monitored by Local Planning Authorities who will report on progress through their Annual Monitoring Reports (AMR). For each of the water related policies included in the planning documents there will need to be an associated indicator. This may require the development of additional indicators but existing indicators, which AMR's may use, are already being collated in the County via the Worcestershire Partnership Environment Group's State of the Environment Report ([www.worcestershirepartnership.org.uk/wpeg/soe](http://www.worcestershirepartnership.org.uk/wpeg/soe)) and includes data for Worcestershire on:

- River water quality (chemical).
- River water quality (biological).
- Number of properties at risk of flooding

Information reporting, again via the Local Planning Authority AMR, on the significant sustainability effects forecast in the Sustainability Appraisal but also Strategic Environment Assessments of other plans, will provide data on the water quality and quantity and flooding.

Other existing sources of indicators at a UK and regional scale include Defra's Sustainable Development Indicators in your Pocket 2007; and Environment Agency's annual State of the Environment in the West Midlands. These include additional indicators although at a national scale only on:

- Total abstractions from non-tidal surface and ground water, leakage losses and Gross Domestic Product
- Domestic water consumption, litres per person per day
- Water Stress - assessments of water availability

Severn Trent Water produces a monitoring report for OFWAT, their economic regulator, on their work programme, which includes baseline information on water supply and investment programme as well as an annual report and sustainability report.

The Local Area Agreement from 2008 until it is replaced by new policies will also seek to include indicators relating to the water environment and these will be reported on an annual basis.

As work on the Water Framework Directive progresses there will be developed a detailed monitoring programme to assess progress towards achieving targets.

### Further work

As the topic of water planning is a relatively new policy arena for the planning system it is proposed that this paper be reviewed and updated on a regular basis. This will enable suggested actions in the paper to be revised the evidence base improved and the legislative requirements, in particular with regard to implementation of the Water Framework Directive within Worcestershire updated and reported on.





A significant but essential challenge will be to refine the data in the monitoring reports to a Worcestershire and district scale so as to help establish the future evidence base. Future drafts of this paper will attempt to be more location specific.

Examples of areas of work that could be progressed further by Local Planning Authorities and others:

- Review the contents of this paper in 2011 to take account of the Localism Bill and any newly published water related plans that are produced as a result.
- Continue to respond to consultations on water related issues.
- Continued working with Severn Trent Water and the Environment Agency on infrastructure needs in the County through the development of an Infrastructure Delivery Plan.
- Use this paper to input into the work on Green Infrastructure by providing blue infrastructure related information to inform this area of work.
- Work towards ensuring that the best practice examples within this paper are actioned through the Worcestershire Partnership Environment Group and its Water Resources Sub Group, (Worcestershire County Council, Environment Agency, Severn Trent Water and Worcestershire Wildlife Trust) the Worcestershire Water Group.
- Prepare a ' State of the Worcestershire Water and Wetlands Environment', to assemble an authoritative evidence baseline for guiding priorities and assessing future change in the status of environmental assets.

### Emerging Policy

The end of 2010 saw introduction of the Localism Bill, which is now awaiting formal consent. In July 2011, the National Planning Policy Framework was published for comments. The emerging policy will significantly change the planning system as well as the way we plan and protect water.

The Flood and Water Act (2010) is pending ministerial order before it comes into effect. Enactment of the Flood and Water Act (2010) including the development of SUDS guidance and accompanying regulations will add clarification to the roles and responsibilities of various stakeholders. It will place direct requirement for SUDS to have multifunctional benefits to, for example, biodiversity and recreation. It will also endorse a statutory duty for Flood Risk Authorities to co-operate on cross boundary issues. In addition, the Act will provide leading local flood authorities and the Environment Agency with the power to request information required in connection to their flood risk management functions.

This paper has been developed prior to those changes and their implications to the water management in Worcestershire will be taken into account when reviewing the Water Research Paper in the future.



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## Appendix 2. Roles and Responsibilities of key players

Organisation	Role and Responsibility	Document
Environment Agency	<p>The Environment Agency has a large number of duties and powers to regulate and manage the water environment. The main duties are as follows:</p> <ul style="list-style-type: none"> <li>• To maintain or improve any watercourses which are designed as Main Rivers;</li> <li>• To maintain or improve any sea or tidal defences;</li> <li>• To install and operate flood warning equipment;</li> <li>• To control actions by riparian owners and occupiers which might interfere with the free flow of watercourses; and</li> <li>• To supervise internal drainage boards.</li> </ul> <p>Environment Agency has statutory responsibility for flood management and defence and manage flood risk to existing properties and assets. They are also responsible for producing River Basin Management Plans under the Water Framework Directive. The Environment Agency can also provide baseline data to inform SFRA.</p>	<p>River Basin Management Plans under the Water Framework Directive. Also provide baseline data to inform SFRA.</p> <p>Catchment Flood Management Plans</p> <p>Catchment Abstraction Management Strategies</p> <p>Water Level Management Plans</p>
Local Authorities and West Midlands Regional Assembly	<p><b>Planning</b></p> <p>Regional and local planning authorities are responsible for assessing flood risk as they prepare regional and local development plans, and local planning authorities are responsible for ensuring developers assess flood risk for their development proposals.</p> <p>At the Local Authority level the keys areas include Spatial Planning and Emergency Planning. They have statutory powers to manage flood risk to existing properties and assets. Local Authorities produce Core Strategies and Area Action Plans and Supplementary Planning Documents to make up the Local Development Framework. As part of this Local Authorities are required to carry out Strategic Flood Risk Assessments as documented in PPS25, these can inform and be informed by Sustainability Appraisals. The River Basin Management Plan, produced as required by the WFD, will not be completed until 2009. However Local Authorities need to take account of it now and ensure that achievement of the UK compliance with EC Directives is not comprised. It is expected that this is achieved by Local Authorities engaging in the RBMP process, identifying the relevant water issues, helping to achieve the WFD objectives and including the priorities in the plans they produce.</p> <p><b>Emergency Planning</b></p> <p>Produce the County Flood Plan which was developed to facilitate a multi agency response framework which was designed to mitigate the impact of flooding episodes in the future.</p>	<p>LDD</p> <p>WMRSS</p>
<p>Worcester Land Drainage Partnership</p> <p>Members: <i>Worcestershire County Council, Bromsgrove District Council, Malvern Hills District Council, Redditch Borough Council, Worcester City Council, Wychavon District Council, Wyre Forest District Council, the National Farmers' Union, the Country Landowners' Association, the Environment Agency, Malvern Hills Conservators, Severn Trent Water (invited)</i></p>	<p>Following floods in 2007, the lead organisations with responsibility for ensuring the maintenance of water-courses such as streams, ditches, culverts and associated structures have agreed to:</p> <ul style="list-style-type: none"> <li>• Work together to reduce the likelihood of flooding by promoting and, where appropriate implementing, robust maintenance regimes.</li> <li>• Share and disseminate best practice between responsible bodies.</li> <li>• Make domestic riparian landowners more aware of their rights and responsibilities.</li> <li>• Maintain and improve communication channels between responsible bodies.</li> <li>• Work together to monitor the success of joint working.</li> </ul>	



Organisation	Role and Responsibility	Document
Severn Trent Water	STW have statutory duty to provide potable water as well as treating and disposing of it.	Water Resource Management Plans (WRMP)
South Staffordshire Water	South Staffordshire Water has statutory duty to provide potable water and treating.	Water Resource Management Plans (WRMP)
Welsh Water	Welsh Water have statutory duty to provide potable water as well as treating and disposing of it.	Water Resource Management Plans (WRMP)
Internal Drainage Boards (IDBs)	<p>Internal Drainage Boards (IDBs) are independent bodies, created under various statutes to manage land drainage in areas of special drainage need. These areas include not only agricultural land but also large urban areas.</p> <p>Each Board operates within a defined area in which they have permissive powers under the Land Drainage Act 1991 to undertake flood defence works, other than on watercourses that have been designated as 'Main'.</p>	
British Waterways	British Waterways is a public corporation managing and more than 2,200 miles (3,540 km) of canals and rivers in England, Scotland and Wales. They are responsible for several reservoirs and many miles of pounds in Worcestershire. They sit on water managements groups and advise on water abstraction	
Natural England	Natural England works for people, places and nature, to enhance biodiversity, landscapes and wildlife in rural, urban, coastal and marine areas; promote access, recreation and public well-being; and contribute to the way natural resources are managed so that they can be enjoyed now and in the future.	<p><b>National Character Area descriptions and objectives</b></p> <p><b>National and WM State of the Environment report</b></p>
Local Strategic Partnership	<p>The Worcestershire Partnership is the Local Strategic Partnership for the county of Worcestershire. A cross-sectoral, multi agency partnership that provides a strategic lead on a wide range of issues that effect the quality of life of Worcestershire residents. There are also Local Strategic Partnerships operating in each District. Their tasks include:</p> <ul style="list-style-type: none"> <li>● Coordinating Worcestershire's Local Area Agreement Supporting the Worcestershire Partnership Board and Task Groups.</li> <li>● Providing a co-ordinating function between the different elements of the Partnership.</li> <li>● Supporting specific Partnership projects and project managing work commissioned by the Partnership</li> <li>● Preparing, monitoring and implementing the County wide Community Strategy</li> <li>● Producing the Annual Update to the Community Strategy</li> <li>● Promoting the Worcestershire Partnership at events across the County</li> </ul>	LAA/Community Strategy





## Appendix 3. Code 6 of the Code for Sustainable Homes for water

To meet level 6, homes will have to be designed to use no more than about 80 litres of water per person per day. This could be achieved by fitting such items as:

- 6/4 Dual Flush WC;
- Flow Reducing/Aerating taps throughout;
- 6-9 litres per minute shower (note that an average electric shower is about 6/7 liters per minute);
- a smaller, shaped bath - still long enough to lie down in, but less water required to fill it to a level consistent with personal comfort;
- 18 litres maximum volume dishwasher;
- 60 litres maximum volume washing machine.

To achieve the standard would also mean that about 30% of the water requirement of the home is provided from non-potable sources such as rainwater harvesting system or grey water recycling systems.

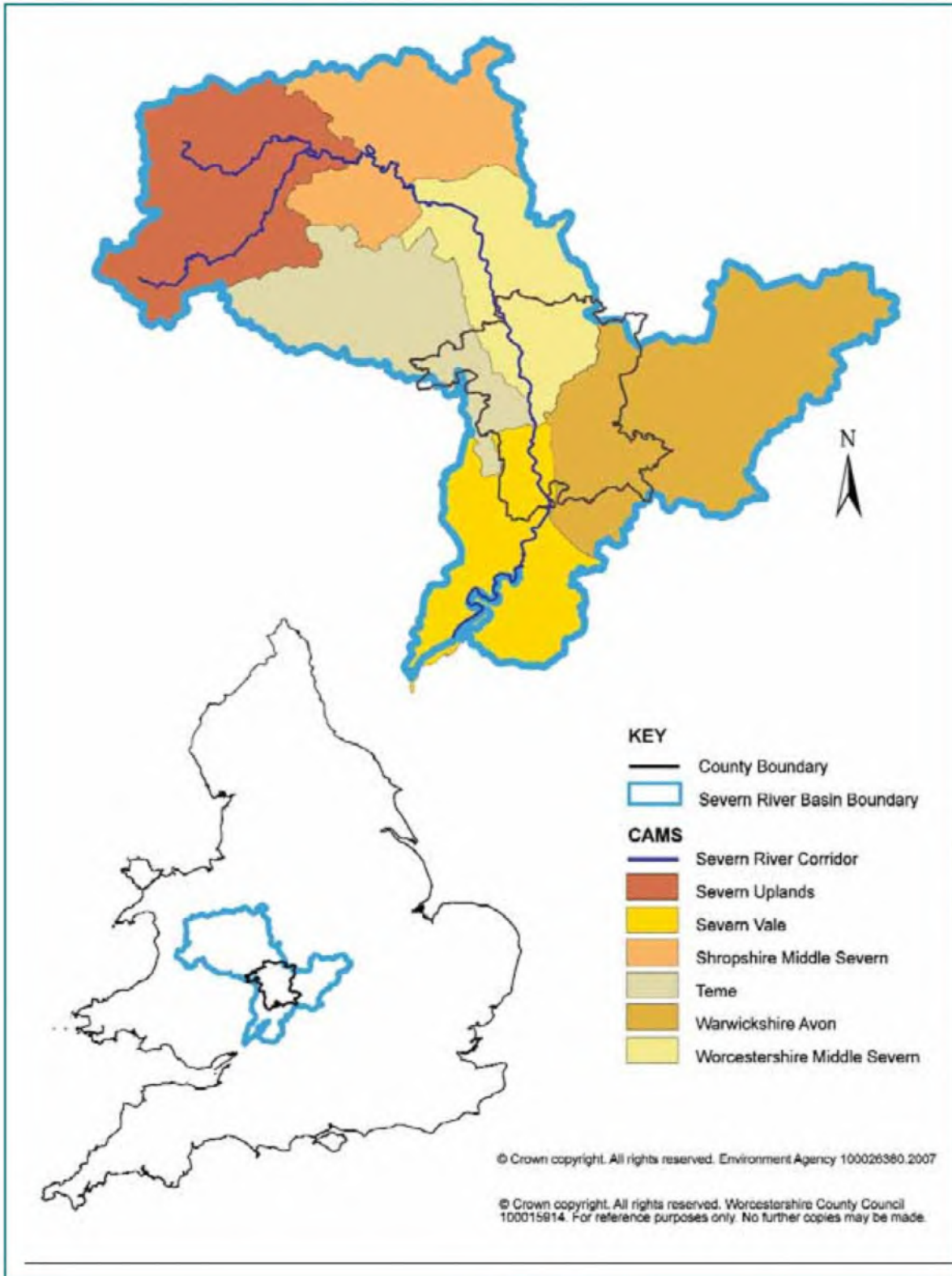
Other minimum requirements are required for:

- Surface water management - this may mean the provision of soak aways and areas of porous paving;

*Source: Code for Sustainable Homes, 2006a, CLG*



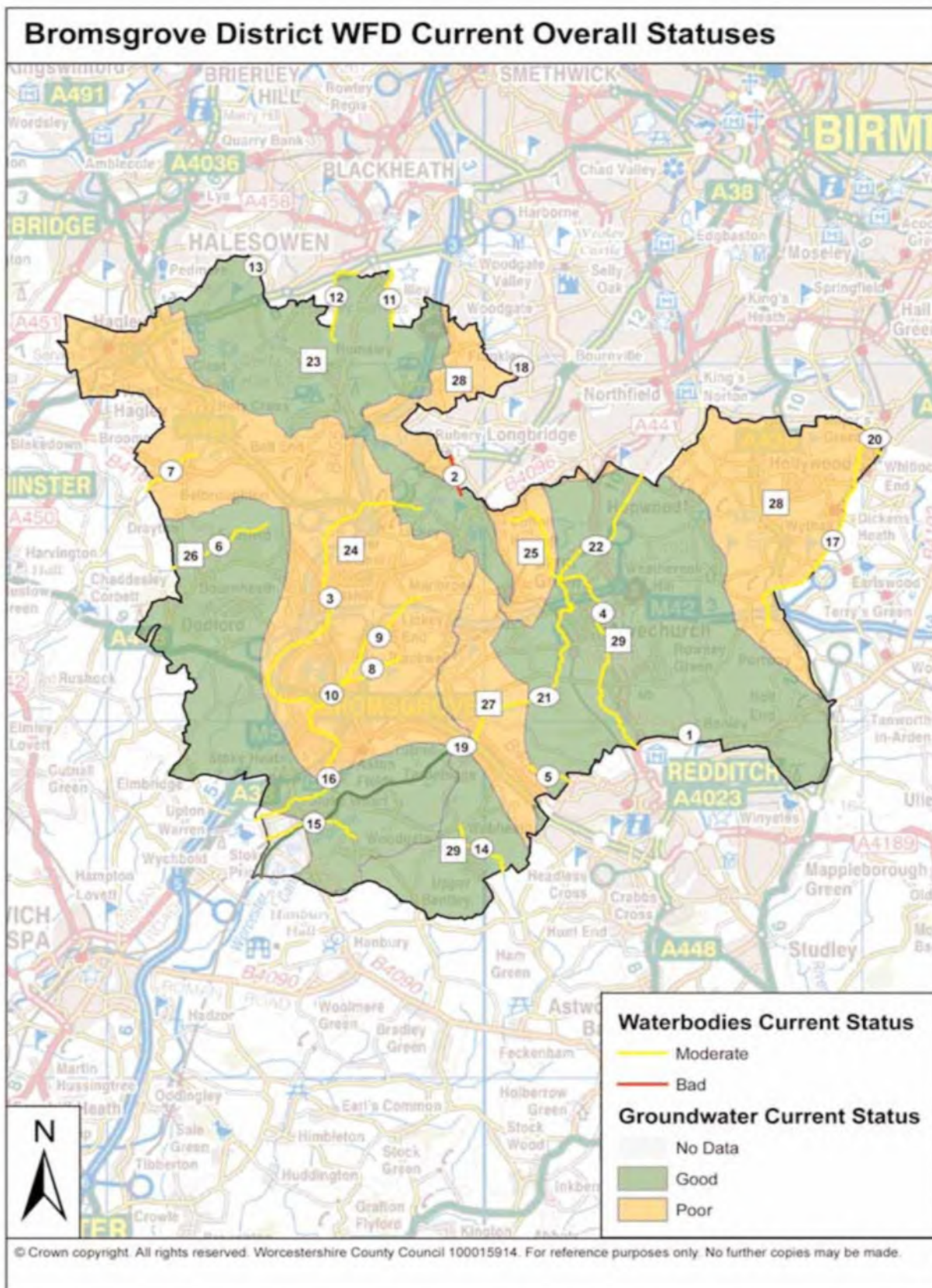
## Appendix 4. Coverage of Catchment Abstraction Management Strategy within the Severn River Basin District







## Appendix 5. Current statuses of all assessed water bodies under the WFD in Worcestershire by District

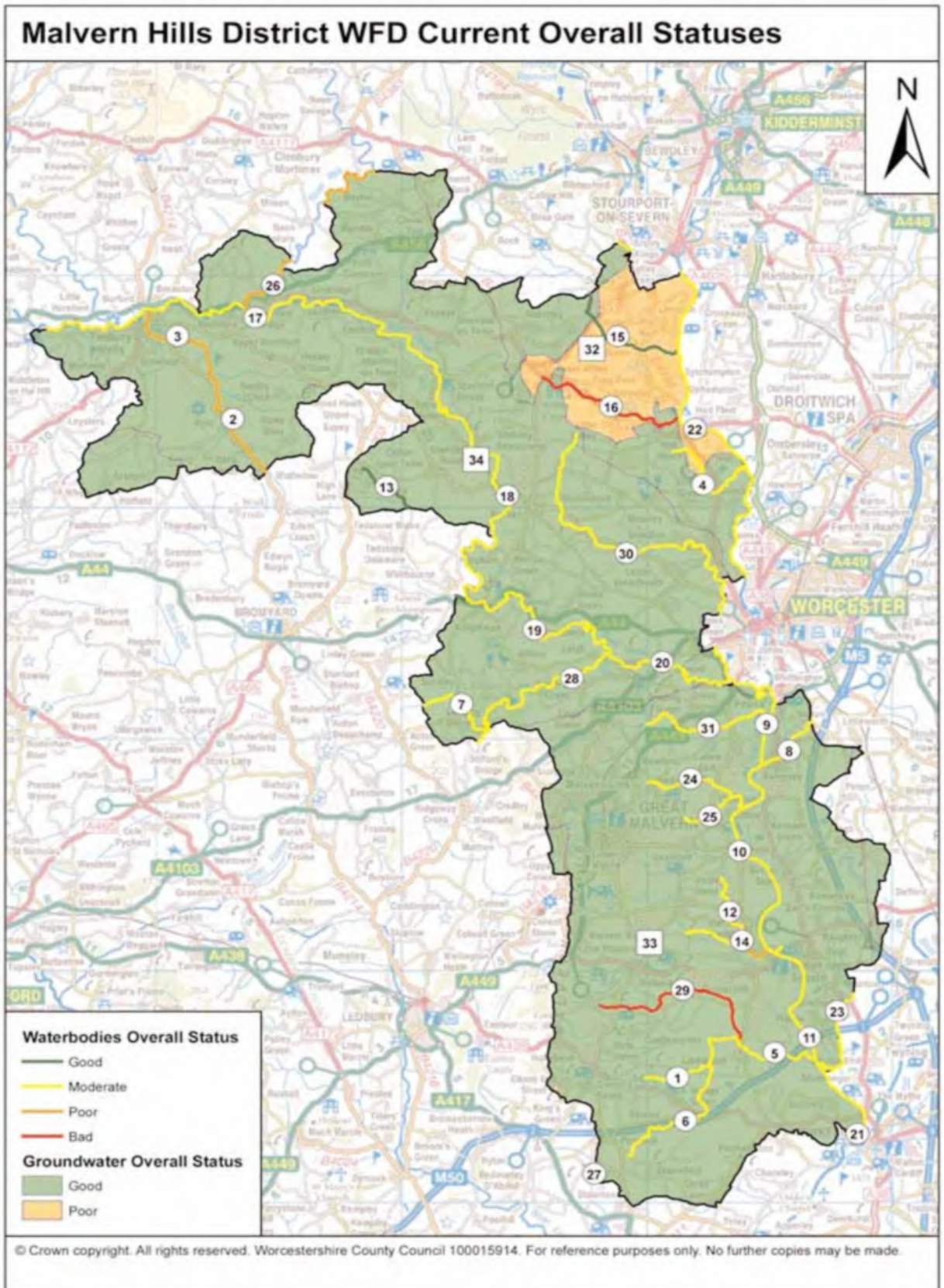






Bromsgrove District		
Number	Current Status	Areas Failing
<b>WATERCOURSES</b> (circles)		
1, 14	Moderate	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Phosphate Levels: Poor
2	Bad	High, pH and Temperature. Moderate Ammonia, Dissolved O2, Phosphate Levels and Specific Pollutants. Invertebrate Levels: Bad
3, 7	Moderate	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Phosphate Levels: Moderate
4	Moderate	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Phosphate Levels: Poor. Invertebrate Levels: Moderate
5, 6	Moderate	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Phosphate Levels: Poor.
8, 9, 10	Moderate	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Invertebrate Levels: Moderate
11, 12, 13	Moderate	High Dissolved O2, pH and Temperature. Invertebrate Levels: Poor
15, 16	Moderate	High Dissolved O2, pH and Temperature. Phosphate Levels: Bad. Phytobenthos Levels: Moderate
17	Moderate	High pH, Moderate Dissolved O2 and Phosphate Levels
18	Moderate	High pH and Temperature, Moderate Ammonia, Dissolved O2 and Specific Pollutants and Phosphate Levels. Invertebrate Levels: Poor
<b>CANALS</b> (ovals)		
19	Good	High Ammonia, Dissolved O2, pH, Temperature, Specific Pollutants and Phosphate Levels
20	Moderate	High pH, and Temperature
21, 22	Moderate	High Ammonia, pH, Temperature, Specific Pollutants
<b>GROUNDWATER ZONES</b> (squares)		
23, 26, 29	Good	No issues
24	Poor	Poor Chemical Test results. Poor Impact on Water Levels, Surface Water and Wetlands
25, 27	Poor	Poor Chemical Test results. Poor Impact on Surface Water and Wetlands
28	Poor	Chemical Status: Fail



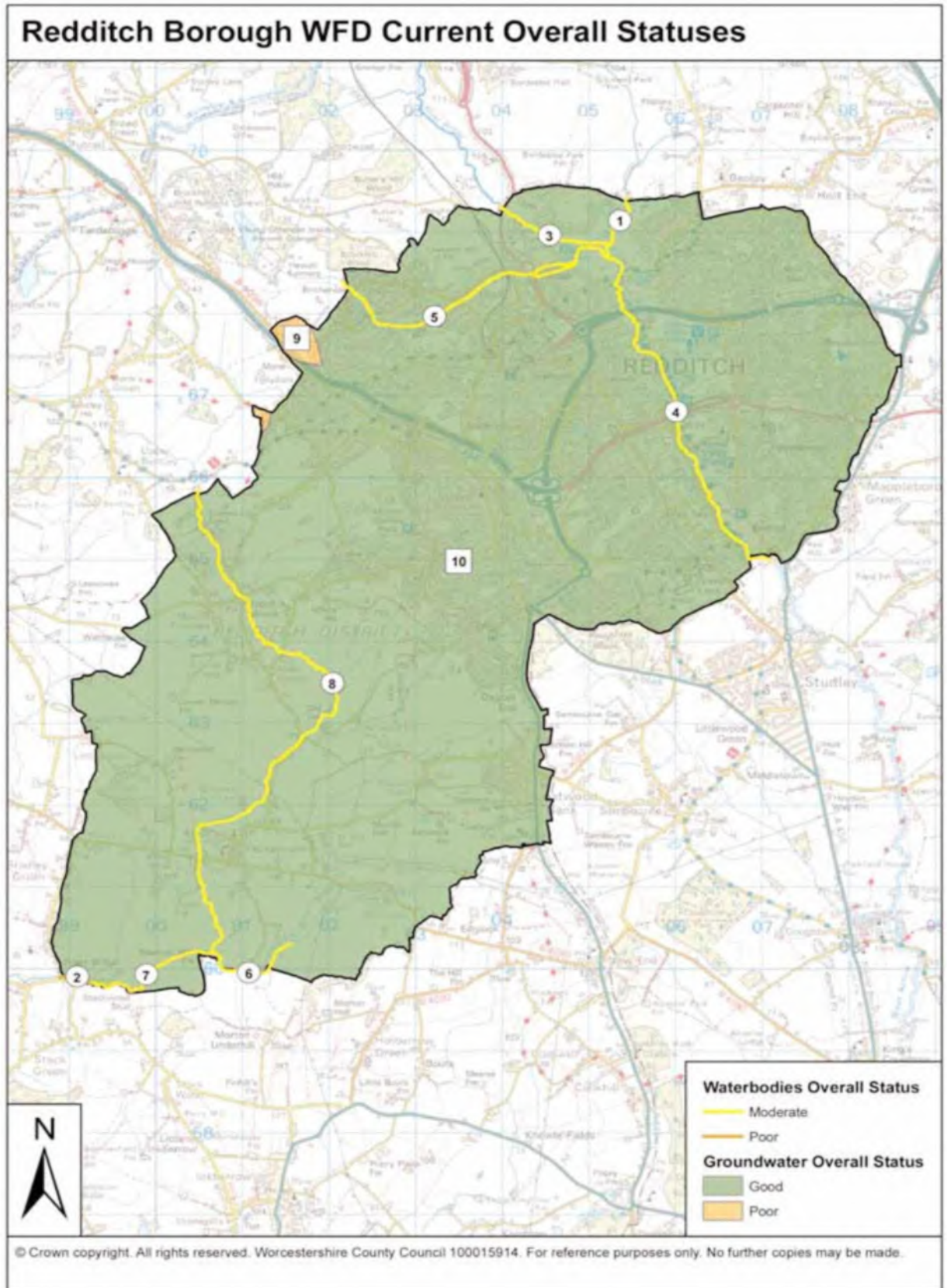






Malvern Hills District		
Number	Current Status	Areas Failing
<b>WATERCOURSES</b> (circles)		
1, 6	Moderate	High, Ammonia, pH, Temperature and Specific Pollutants. Moderate Dissolved O2. Poor Phosphate Levels
2, 3	Poor	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Poor Fish Levels
4, 27, 30	Moderate	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Poor Phosphate Levels
5	Moderate	High, Ammonia, pH, Temperature and Specific Pollutants. Moderate Dissolved O2 and Fish Levels. Poor Phosphate Levels
7, 24, 25, 28, 31	Moderate	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Moderate Phosphate Levels
8, 9, 10, 11, 21	Moderate	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Poor Phosphate and Invertebrate Levels
12	Moderate	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Moderate Invertebrate and Poor Phosphate Levels
13, 15	Good	No issues
14	Moderate / Poor	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Poor Phosphate Levels. Moderate and Poor Invertebrate Levels
16	Bad	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Poor Phosphate Levels. Bad Invertebrate Levels
17, 18, 19, 20	Moderate	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants
22	Moderate	High, Dissolved O2, pH and Temperature. Moderate Fish and Invertebrate Levels. Poor Phosphate Levels.
23	Moderate	High, Ammonia, pH, Temperature and Specific Pollutants. Moderate Phosphate Levels
26	Poor	High, Ammonia, pH, Temperature and Specific Pollutants. Moderate Dissolved O2. Poor Fish Levels
29	Bad	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Poor Phosphate Levels. Bad Photobenthos Levels
<b>GROUNDWATER ZONES</b> (squares)		
32	Poor	Poor Water Balance and Chemical Test results. Poor Water Level, Surface Water and Wetlands Impact
33, 34	Good	No issues

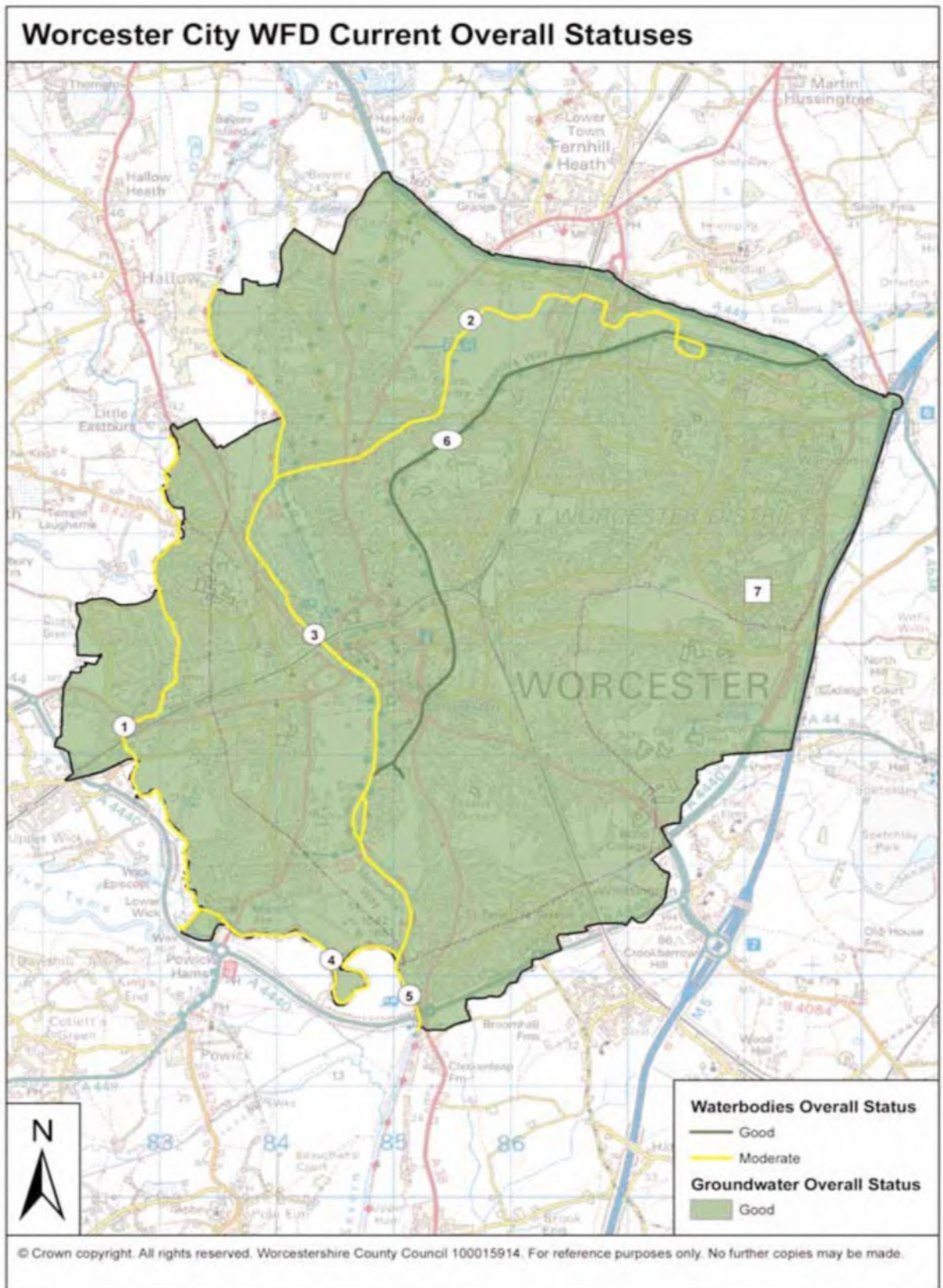






Redditch Borough		
Number	Current Status	Areas Failing
<b>WATERCOURSES</b> (circles)		
1, 5, 6, 7, 8	Moderate	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Poor Phosphate Levels
2	Poor	High, Ammonia, Dissolved O2, pH and Specific Pollutants. Moderate Fish and Poor Phosphate Levels.
3, 4	Moderate	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Moderate Invertebrate and Poor Phosphate Levels
<b>GROUNDWATER ZONES</b> (squares)		
9	Poor	Poor Water Balance and Surface Water Impact
10	Good	No issues

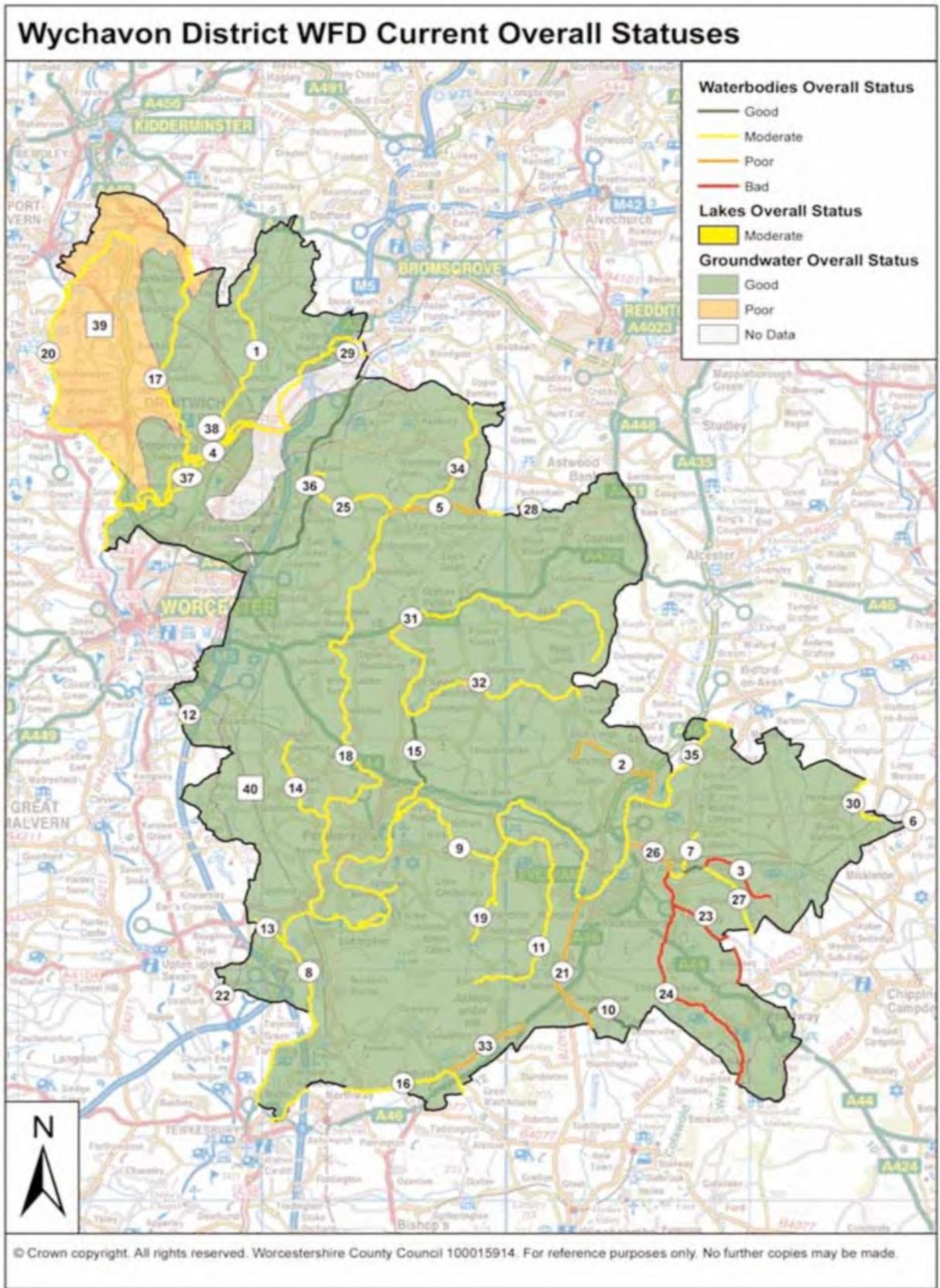






Worcester City District		
Number	Current Status	Areas Failing
<b>WATERCOURSES</b> (circles)		
1	Moderate	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Poor Phosphate Levels
2, 3	Moderate	High Dissolved O2, pH and Temperature. Moderate Fish and Invertebrate Levels. Poor Phosphate Levels.
4	Moderate	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants
5	Moderate	High Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Poor Invertebrate and Phosphate Levels.
<b>CANALS</b> (ovals)		
6	Good	High Ammonia, pH, Temperature, Specific Pollutants and Phosphate Levels
<b>GROUNDWATER ZONES</b> (squares)		
7	Good	No issues



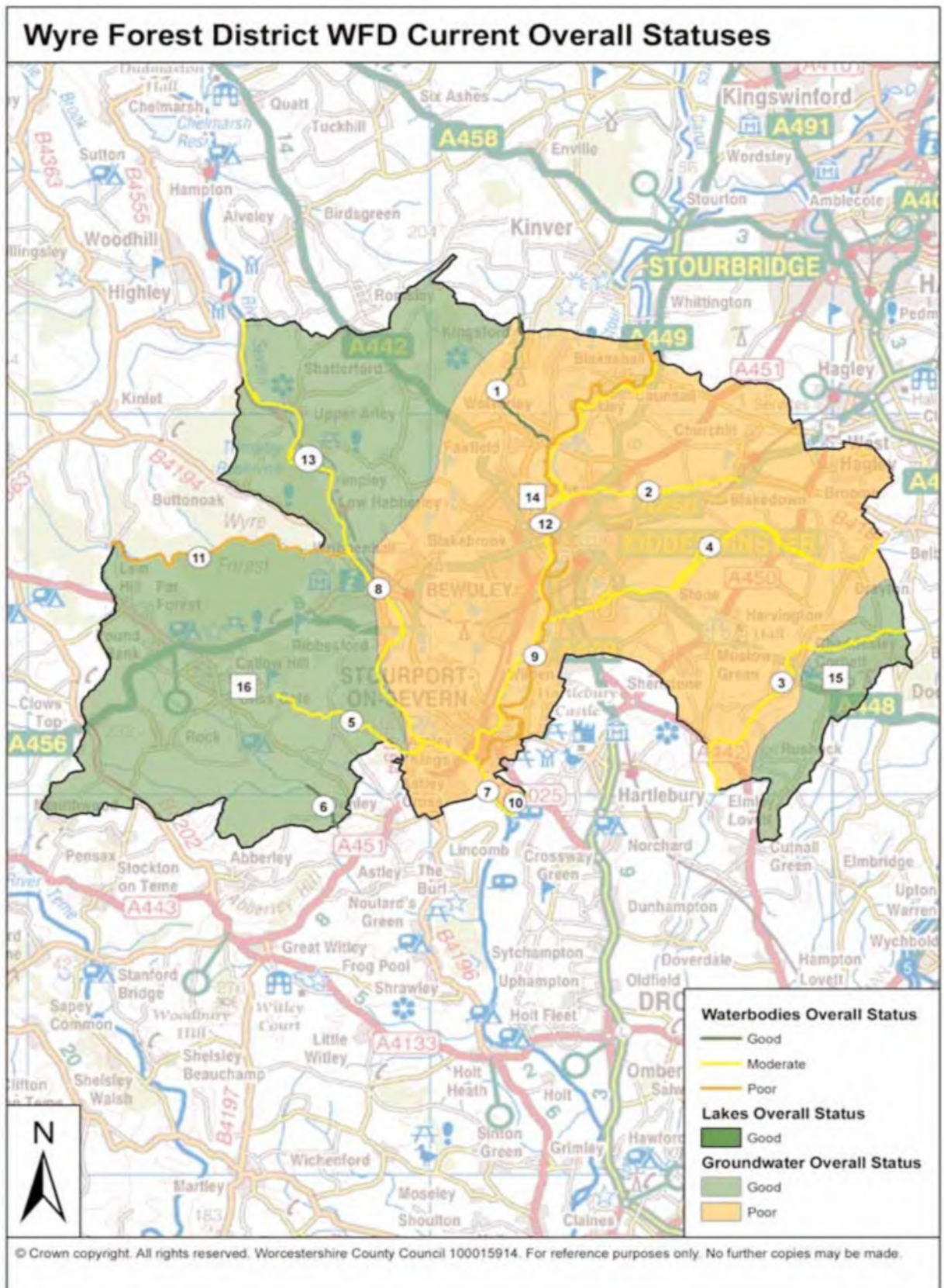






Wychavon District		
Number	Current Status	Areas Failing
<b>WATERCOURSES</b> (circles)		
1	Moderate	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Moderate Invertebrate and Phosphate Levels
2, 14	Poor	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Moderate Phosphate and Poor Invertebrate Levels
3	Bad	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Poor Phosphate and Bad Invertebrate Levels
4	Moderate	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Bad Phosphate Levels
5	Moderate	High, Ammonia, Dissolved O2, pH and Specific Pollutants. Poor Phosphate and Phytobenthos Levels
6	Moderate	High Dissolved O2, pH and Temperature. Moderate Phosphate and Invertebrate Levels
7, 8, 9, 11, 16, 17, 28, 31, 35	Moderate	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Poor Phosphate Levels
10, 27 (lower)	Good	No issues
12	Moderate	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Poor Invertebrate and Phosphate Levels
13, 27 (upper)	Moderate	No details given
15	Good / Moderate	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. High to Poor Phosphate Levels
16	Moderate	High, Ammonia, Dissolved O2, pH and Specific Pollutants. Moderate Fish and Poor Phosphate Levels
19	Moderate	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Moderate Invertebrate Levels
20	Moderate	High Dissolved O2, pH and Temperature. Moderate Fish and Invertebrate Levels. Poor Phosphate Levels
21	Poor	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Moderate Phosphate and Poor Fish Levels
22	Moderate	High, Ammonia, pH, Temperature and Specific Pollutants. Moderate Phosphate Levels
23, 24	Bad	High Ammonia, Dissolved O2, pH and Specific Pollutants. Moderate Fish and Invertebrate, Poor Phosphate and Bad Photobenthos Levels
25, 34	Moderate	High Ammonia, Dissolved O2, pH and Specific Pollutants. Poor Phosphate Levels
26	Poor	High Ammonia, pH, Temperature and Specific Pollutants. Moderate Fish and Invertebrate, Poor Phosphate and Photobenthos Levels
29	Moderate	High Dissolved O2, pH and Temperature. Bad Phosphate Levels
30	Moderate	High pH and Temperature. Moderate Invertebrate and Phosphate Levels
32	Moderate	High Ammonia, Dissolved O2, pH and Specific Pollutants. Moderate Invertebrate and Poor Phosphate Levels
33	Poor	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Poor Invertebrate and Phosphate Levels
<b>CANALS</b> (ovals)		
36	Good	High Ammonia, pH, Temperature, Specific Pollutants and Phosphate Levels
37	Moderate	No details given
<b>LAKES</b> (big circles)		
38	Moderate	No details Given
<b>GROUNDWATER ZONES</b> (squares)		
39	Poor	Poor Water Balance and Chemical Test results. Poor Water Level, Surface Water and Wetlands Impact
40	Good	No issues







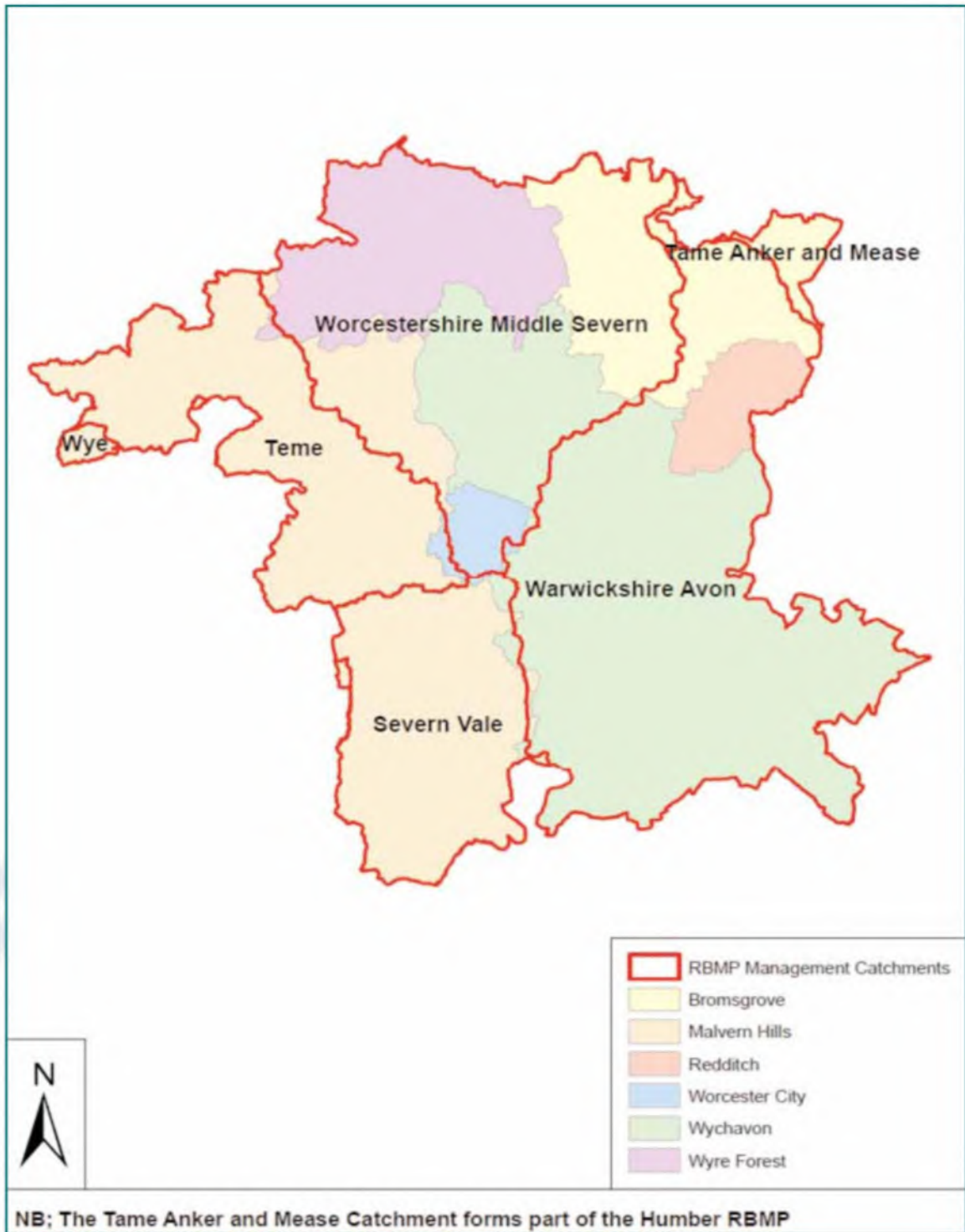


Wyre Forest District		
Number	Current Status	Areas Failing
<b>WATERCOURSES</b> (circles)		
1	Good	Moderate Invertebrate and Levels
2	Moderate	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Moderate Invertebrate and Bad Phosphate Levels
3	Moderate	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Poor Phosphate Levels
4, 10	Moderate	High, Ammonia, Dissolved O2, pH, Temperature and Specific Pollutants. Moderate Phosphate Levels
5	Moderate	No details given
6	Good	No issues
7, 8	Moderate	High Dissolved O2, pH and Temperature. Moderate Fish and Invertebrate Levels. Poor Phosphate Levels
9	Poor	High Dissolved O2, pH and Temperature. Moderate Fish, Poor Invertebrate Levels and Bad Phosphate Levels
11	Poor	High, Ammonia, Dissolved O2, pH, Temperature, Specific Pollutants and Phosphate Levels. Moderate Macrophyte and Poor Invertebrate Levels
<b>CANALS</b> (ovals)		
12	Good	High Ammonia, pH, Temperature and Specific Pollutants. Poor Phosphate Levels
<b>LAKES</b> (big circles)		
13	Moderate	No details given
<b>GROUNDWATER ZONES</b> (squares)		
14	Poor	Poor Water Balance and Chemical Test results. Poor Water Level, Surface Water and Wetlands Impact
15, 16	Good	No issues



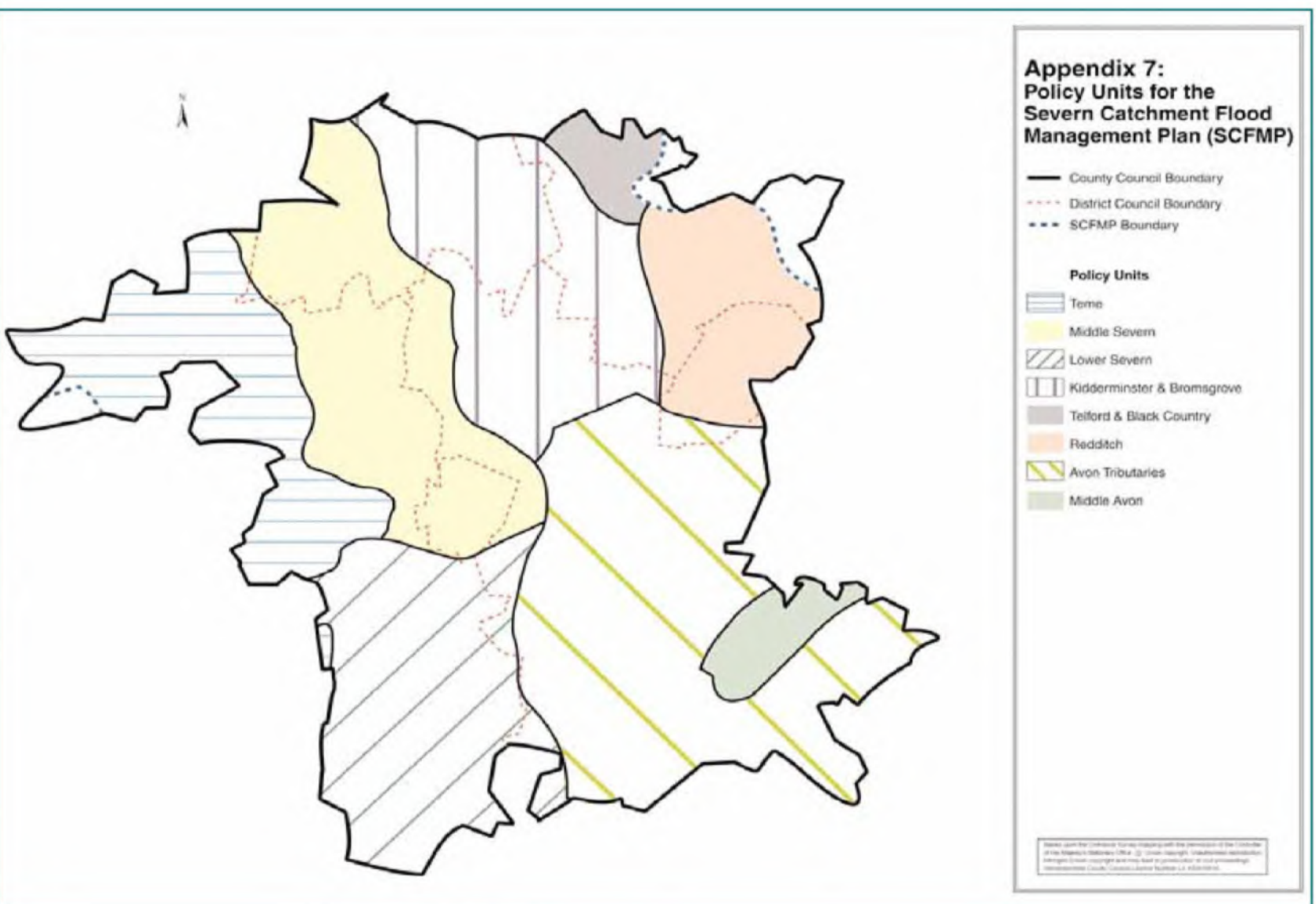


## Appendix 6. Worcestershire Districts and Severn RBMP Management Catchments





## Appendix 7. Policy units for the Severn Catchment Flood Management Plan







## Appendix 8. Evidence from the West Midlands Regional Spatial Strategy (WMRSS)

It was the intention that the West Midlands Regional Spatial Strategy (WMRSS) would provide the overarching planning policy framework for the region, guiding Local Authorities in the preparation of their Local Development Documents (LDD's). In July 2010 all England's RSSs, (except the one for the London Plan), were formally revoked through Section 79 (6) of The 2009 Local Democracy, Economic Development and Construction Act and they will no longer form part of the development plan for the purposes of s38(6) of the Planning and Compulsory Purchase Act 2004.

The legal basis for the regional strategies and their housing targets will be abolished through the Localism Bill that will be released Autumn 2010. However, the evidence base used to inform the RSS is still a credible form of information. Therefore, the findings contained in the RFRA and other documents with regards to the RSS is still an accurate form of information with regards to the implications of increased housing on flooding and water resources for the figures given. The WMRSS when revoked was in the process of undergoing a partial revision.

The WMRSS Phase Two Revision Preferred Option (December 2007) stated that the level of new house building set out in the phase two document was likely to create pressure on water resources supplying the Region. It went on to say new development would impose pressure on existing waste water infrastructure and that significant investment in waste water infrastructure, such as sewers and sewage treatment works would likely be needed to ensure the water environment is protected. Reducing the volume of waste water from both new and existing buildings by water efficiency measures,

would help to reduce demand on existing infrastructure. The use of sustainable drainage systems will be essential to reduce any adverse effects from development on the water environment, Chapter 2 of the draft preferred option for the WMRSS revision stated that the new level of housing growth (36,600 dwellings in Worcestershire) was likely to create pressure on water resources supplying the Region, particularly in the Severn, Birmingham and South Staffordshire zones. Worcestershire falls into the Severn Zone.

The Environment Agency report (2007c) West Midlands Regional Spatial Strategy (RSS11- The Impact of Housing Growth on Public Water Supplies) examined the effects the three housing options in the WMRSS Phase 2 revision on public water supplies and for the Severn zone found the following. The housing figure in the draft-preferred option relate to a figure between options 2 and 3 of the issues and option stage of the WMRSS revision. The WMRSS - Phase Two revision, spatial options, for regional housing growth 2001 - 2026 were:

- Option 1** 381,000
- Option 2** 491,200
- Option 3** 575,000.

- **Option 1:** the zone goes into small short-lived deficit.
- **Option 2:** the zone goes into a significant deficit for 6 years in two time periods (2011-2016 and 2019-2024).
- **Option 3:** the zone to go into a significant deficit for 10 years in two time periods.
- 8% water efficiency in all new homes only has a small impact on the size and duration of the deficit for all options.



- 25% water efficiency in all new homes has a significant impact on the size and duration of the deficit for all options.
- At the start of the plan period the zone is already in significant deficit. Consequently the zone requires new water resource development to keep the zone in surplus.

What follows is an assessment made by the Local Planning Authorities (LPA) in Worcestershire for the West Midlands Regional Flood Risk Appraisal Update (2009), to inform the WMRSS as to the perceived risk to flood.

- It is perceived by Wychavon LPA that flood risk is seen as a significant factor for strategic planning in the district, with no developments anticipated in Flood Zone 3 in the next 20 years. Wychavon LPA consider that the following areas are not defended to a satisfactory standard:- Badsey; Beckford; Cleeve Prior; Evesham (Hazel Ave.) Harvington; Honeybourne; Little Comberton; North Littleton; Pinvin; Rous Lench; Stock and Bradley.
- In Redditch flood risk is not seen as a significant factor for strategic planning in the district. No development is anticipated in Flood Zone 3 in the next 20 years. Redditch LPA considered that the following areas are not defended to a satisfactory standard: - Beech Tree Close/Salters Lane, Batchley; Windsor Works; Enfield; Loxley Close & Brooklands Lane, Church Hill; Furze Lane and Winyates Green
- In Bromsgrove the risk from pluvial flooding and canal overtopping is seen as a significant factor for strategic planning in the district. Possibility of some development on some small sites in Flood Zone 3 in the next 20 years.

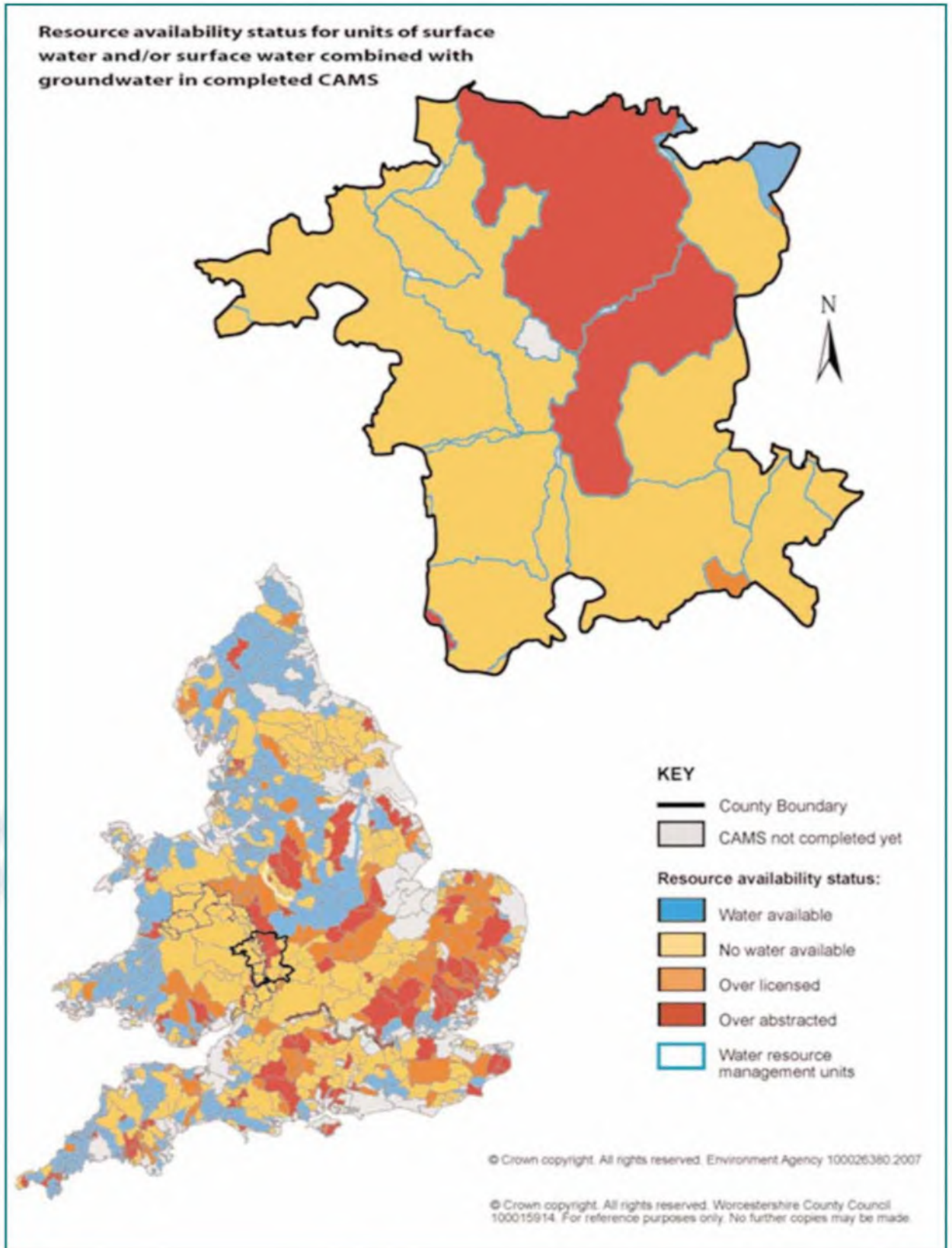
- Wyre Forest LPA sees flood risk as a significant factor in Strategic planning for the District. Wyre Forest LPA considers that neither Kidderminster nor Bewdley are defended against flood to a satisfactory standard. It is anticipated that there will be some development in Flood 3 zone in the next 20 years, but this is less than 1% of the total Zone 3 land in the district.
- Flood risk is considered to be a significant factor in strategic planning in Worcester City. No significant development is anticipated in Flood Zone 3 in the next 20 years, although there could be some limited development. Worcester City LPA consider that the following locations are not defended against flooding to a satisfactory standard:- along the River Severn and Teme; along Duck Brook; Laugherne Brook; Barbourne Brook; and Astwood Brook flash flooding from rainstorms at other location.
- In Malvern Hills flood risk is seen as a significant factor for strategic planning in the district. It is anticipated that there will be no development in Flood Zone 3 in the next 20 years. Malvern Hills LPA consider that the following locations are not defend against flooding to a satisfactory standard:- Upton-upon-Severn and the area west of Worcester.

*(source: adapted from Faber Maunsell, 2007)*





## Appendix 9. CAMS resource availability





## Appendix 10. Details of District SFRA and WCS

### Strategic Flood Risk Assessments

In Worcestershire some districts have worked together to produce joint SFRAs. These being Bromsgrove and Redditch Districts (combined) and South Worcestershire (Malvern Hills District, Worcester City and Wychavon District combined). Due to the close links, in most parts the completion of these SFRAs has been undertaken at the same time as the production of Water Cycle Studies (as discussed further in the following subsection).

South Worcestershire have produced a combined Level 1 and Level 2 report, published November 2009. The Level 1 portion consists of a broad-scale, area wide investigation into flooding from all rivers, surface water, groundwater and canals and reservoirs. As well as producing a zonal map of fluvial river flooding, as required by PPS 25, maps have been produced outlining those areas at risk of flooding from surface water and other sources.

The Level 2 section builds upon these findings, but rather than applying the exception test it undertakes a more thorough investigation into flooding at those sites previously identified for strategic development by the South Worcestershire Joint Core Strategy, based on targets contained with the WMRSS. These include 16 potential sites across a number of urban areas;

- Worcester (5 sites)
- Droitwich Spa (3)
- Great Malvern (4)
- Pershore (1)
- Evesham (3)
- Tenbury Wells (1) - windfall site
- Upton Upon Severn (1) - windfall site

As such, risks and sources of flooding vary throughout, though these are outlined for fluvial, groundwater surface water flooding for each site based on historical events, maps and models. Also, potential surface water flooding caused by the development is explored, along with measures for the potential mitigation of flooding to the sites from all sources. For the entire study area, the storage ability of various SUDS measures are given in detail, with indicative costs, including their planning and maintenance. Broad-scale sewerage models are included for those potential development sites in Worcester and Droitwich.

#### **The conclusions and recommendations of the South Worcestershire SFRA are;**

- Surface water flooding is a high risk in many areas, especially Droitwich and Worcester it is recommended that Surface Water Management Plans are produced for Droitwich, Pershore Malvern and Worcester City
- For large developments, a strategic approach to SUDS for runoff attenuation and water quality improvement linking to the green infrastructure plan is required
- Site specific Flood Risk Assessments will be required prior to development to ensure flood risk is fully addressed, including the effects of climate change
- Mitigation measures should be seen as a last resort to address flood risk, and only once risk has been minimised by planning sequentially across a site





- Developments should be safe up to a 1 in 1000 year event, with safe access and egress routes. The emergency services should be satisfied with evacuation and rescue capabilities if required
- North Worcestershire tends to have a "sponge" effect due to sandy soils however South Worcester is more 'flashy' in terms of flooding.

**The conclusions and recommendations of the Bromsgrove and Redditch SFRA are;**

Bromsgrove and Redditch completed a joint level 1 SFRA in January 2009. It gives an overview of the watercourses and catchments across the districts as well as investigating historical flooding from fluvial sources, sewers, highway drainage and surface water, groundwater, canals and reservoirs to detail the flood risk zones. Detailed lists of possible development locations are given, all with the respective flood zones in which they are located. The report also includes specific guidance and examples for the use of SUDS across the area. A locally relevant issue relating to planning and sustainable water usage involves groundwater and zones where this is under protection due to human consumption. These are shown on an EA produced map and are a critically important factor to consider when planning development within Bromsgrove DC.

A joint Level 2 report is currently being commenced and is expected for publication in January 2011.

The conclusions and recommendations of the Bromsgrove and Redditch Level 1 SFRA are;

- Limited main river flooding occurs in the area with surface water and sewer flooding being the most common
- A sequential test must be applied to all proposed sites and a site specific flood risk assessment produced where flood zones are undefined or other sources of flooding are considered an issue
- Management of surface water runoff should use a combination of site specific and strategic SUDS measures, encouraging 'source control' where possible
- Developments within the floodplain, but outside the functional floodplain must remain safe without increasing flood risk elsewhere and ideally reducing risk elsewhere
- Where appropriate the LDF should allocate green corridors along the lines of watercourses
- Paving of gardens or other areas should be controlled and SUDS would be required to drain these wherever practicable
- Appropriate SUDS techniques should be considered for all new developments to ensure that flood risk is not increased elsewhere. For Greenfield sites, this will require a calculation of Greenfield runoff rates
- Any new development on a site should give full consideration to improving existing culverts by either opening them up, or if this is not practicable, then the existing culvert should be improved in capacity
- New developments that have watercourses running through them should have a comprehensive plan for managing and maintaining the watercourse
- Where practicable flood risk should be reduced by increasing flood storage, improving flood flow routes and/or removing existing obstructions to flow



### The conclusions and recommendations of the Wyre Forest SFRA are;

Wyre Forest District Council has produced a Level 1 SFRA for their area which was published in January 2008. This includes details of the possible sources of flooding, including reservoirs which are prevalent in the area, and the extents of historic flooding. Tabulated information is given outlining the size and locations of possible development sites with the flood zone in which they are located. The locations of existing flood defences and coverage of warning systems is given for each.

The Level 2 SFRA report for the district was published in February 2010 and builds upon the results of the Level 1 study. Higher detail models are used to redefine the flood zones and identify areas of rapid inundation. The location, condition and responsibility of all flood defence structures are incorporated to conduct breach and overtopping analyses. Updated risk ratings are given to those sites identified in the Level 1 report with detailed mapping and modelling of those within Flood Zone 3.

- Flooding occurs mostly from the Severn and Stour, however minor watercourse and surface water flooding also pose a large problem
- Management of surface water runoff should use a combination of site specific and strategic SUDS measures, encouraging 'source control' where possible
- The continued maintenance and upgrade of existing flood defences is key to flood risk mitigation in the area
- The risk from defence overtopping and breaching must be mitigated for when planning new developments

- Sites in Flood Zone 1 should reduce the overall level of flood risk in the area and beyond through the layout and form of the development and the appropriate application of SUDS
- Sites in Flood Zone 2 should be safe and reduce flooding where possible through the use of SUDS
- Sites in Flood Zone 3a and 3b should be safe with no net loss of flood storage and should reduce flood risk in the surrounding area. Existing developments should be attempted to be relocated
- All new developments must produce a site specific Flood Risk Assessment

### Water Cycle Strategies

**South Worcestershire** produced a draft Water Cycle Strategy at the same time as their Level 1 and 2 combined SFRA report. As such, this investigation links closely with the SFRA Level 2, as the potential development areas studied are the same, with the WCS including issues surrounding the provision of water services for the sites.

The report finds that the following are the most important factors relating to the adequate provision of water within current and future developments across the county, all of which are at differing stages of being addressed;

- Water supply and wastewater infrastructure
- Water quality and the environment
- Flood risk
- Climate change



It is also recommended that this report be updated regularly, and reviewed upon the release of further relevant reports and studies surrounding water infrastructure, abstraction, and ecological issues. Many of these ongoing studies have been completed since the production of the draft WCS, so changes to the final document are likely.

**The conclusions and recommendations of the draft South Worcestershire WCS are;**

- The strategic allocations outlined are able to be accommodated by the current water infrastructure, though upgrades and improvement will be needed for some. Any other developments must investigate current infrastructure capacity and accommodation measures with the relevant water utility company
- There is currently significant pressure on water resources in the area, with Severn Trent predicting this to increase. Retrofitting and water efficiency measures in new developments are essential to ease this pressure
- The proposed development sites are all located near watercourses that are failing WFD quality targets. SUDS should be used to manage water quality as well as flood risk. The proximity of SSSIs, wetlands and other ecological areas must be taken into account during SUDS design
- Pluvial and Fluvial flooding form the predominant flood risk in the area. Surface water should be addressed via SUDS infiltration techniques, where appropriate, or attenuation areas.

- Climate change must be taken into account when looking at site design, water infrastructure and supply, pluvial and fluvial flood risk and SUDS design

**Bromsgrove and Redditch** produced a WCS at the same time their Level 1 SFRA report, and was published in September 2008. This contains more detail on future development quotas than the South Worcestershire WCS, with 133 small-scale potential housing and employment sites identified across the two districts. Each is investigated separately and given a colour-coded rating based on the infrastructure requirements surrounding current flood risk, water supply and waste water status, required for development. These results show that flood risk is the biggest problem across the area, with the implementation of SUDS being an important area of investigation prior to development. It is also found that waste water capacity problems exist around currently developed areas, though this is being addressed by Severn Trent. Potential new developments in these locations will first require consultation to discuss infrastructure capacity.

Similarly to the South Worcestershire WCS, the report requires regular updates and suggests reviews upon the release of other relevant documentation. An addendum was produced in January 2009 giving WCS relevant details for three extra development sites surrounding Redditch, which were identified after the completion of the initial report (they have recently commissioned consultants to update their WCS at the same time as producing their SFRA level 2 and this is scheduled for completion in spring 2011).



**The conclusions and recommendations of the Bromsgrove and Redditch WCS are;**

- In the area water is over-abstracted and demand outweighs supply. Water treatment works are generally at, or approaching, capacity and in many places flooding from lack of sewer capacity occurs
- Flood risk is the biggest problem to development in the area due to limited capacity of watercourses and substrata to hold addition surface water. However this can be mostly addressed through the use of SUDS
- Limitations in water resources may pose a problem depending on the type and density of development, especially for high water use industries. This highlights the need for the storage of water for agricultural use
- Wastewater treatment problems are located in or around the currently developed areas. This highlights restrictions within the existing sewage systems, most notably due to the infiltration of storm water into the foul sewers. Improvements to the surface water drainage system would decrease the restrictions to development associated with flood risk and wastewater removal.
- Some sewage treatment works pose capacity problems, mostly due to the quality of the river water into which they discharge. Many measures are already being undertaken by STW, who must be consulted when deciding the location and size of new developments

- For all sites a high level of implementation of water demand management techniques will be a necessity, including SUDS, water metering, rain water harvesting and grey water recycling to accommodate the increasing demands and effects of climate change.

**Wyre Forest** produced a WCS at the same time as their Level 2 SFRA report, and was published in March 2010. This builds upon the SFRA findings and incorporates investigations into the water and sewerage infrastructure for the proposed development sites. Each is rated on a traffic light system based on current conditions, with sewerage capacity issues identified as the main limiting factor to development in the area. To address this it is suggested that surface water drains are removed from combined sewers with attenuation systems and other SUDS methods used to store water.

**The conclusions and recommendations of the Wyre Forest WCS are;**

- Flood risk is the biggest problem to development in the area, with the most significant risk form the breach or overtopping of defences in Kidderminster and Bewdley. Many other areas suffer from flash flooding caused by the capacity exceedence of watercourses, sewer networks and surface water drainage infrastructure
- Water resource and supply infrastructure is not a problem identified by STW, though in areas where watercourses are experiencing low flows abstraction restrictions may be implemented by the EA depending on the size and type of development





- Due to the high number of water dependant ecological sites, such as SSSI's, the preservation of high quality water supplies are essential
- Wastewater infrastructure has been identified as a constraint to development by STW in some areas, with some already experiencing flooding due to limited capacity. These are being addressed by STW, though new developments must consult on this
- Some rural wastewater pumping stations, most notably Blakedown, Roundhill, Upper Arley and Chaddersley Corbett are currently operating at capacity and will require upgrading or improvement should new development take place
- Decreasing the input of surface water into combined foul sewers through the use of SUDS would increase the capacity for further development, though STW must be consulted
- For all sites a high level of implementation of demand management techniques will be a necessity, including SUDS, water metering, rain water harvesting and grey water recycling etc to accommodate the increasing demands and effects of climate change



## Appendix 11 Water related facts and figures

### Climate change

- Predicted that by 2020 summer rainfall will have decreased by 12% (Met Office, 2009)
- Annual mean precipitation is expected to decrease by less than 13%. (Met Office, 2009)
- Extreme weather events such as intense rainfall can collect more pollution from urban areas and agricultural land and scour riverbanks contributing to pollution and an increase in sediment in rivers (Environment Agency 2009d).
- Approximately 10% of the land area of Worcestershire is at risk of flooding (about 167km<sup>2</sup>). After Herefordshire, Worcestershire has the second highest percentage of total land at risk from flooding in the West Midlands. There are over 9,146 properties at risk of flooding - approx. 4% of the total number of properties. 38% of the 9,146 properties are at significant risk; 30% are at moderate risk; 32% are at low risk. Worcestershire has the 3rd highest number of properties at 'high' risk in the West Midlands (Pers Comm: Environment Agency 2008).
- 3 planning applications were approved contrary to Environment Agency advice on flood risk grounds in Worcestershire in 2005/06; all were minor developments.
  - o Worcestershire County Council: a minor educational development
  - o Wychavon District Council: a minor residential development
  - o Malvern Hills District Council: a minor agricultural development
- The June/ July floods of 2007 affected all districts in the County, albeit to different degrees. This was largely as a result of intense rainfall falling in the County over short periods of time, leading to flash floods and fluvial flooding. Badly hit were the towns of Tenbury, Pershore and Evesham (Lammas and Alston, 2007). Chapter 3 contains a description of flood types that occur in Worcestershire.
- Closure of roads as a result of flooding impacts on the emergency services and has an economic impact when people and products are unable to or are delayed in reaching their destination. Also diversions generally cause increased journey miles and therefore vehicular emissions, plus increase traffic loading along otherwise little-used roads and through settlements.
- Warmer drier summers may reduce flow to rivers, which can create conditions that are favourable for invasive species (Environment Agency, 2007d).
- Predicted that climate change will lead to an increase in the occurrences of heat waves and drought events (Lammas and Alston, 2007)
- As summer months become drier, agriculture in the south of the county will begin to suffer more from the effects of drought (Lammas and Alston, 2007) with demand for water often peaking in drought periods.
- Both drought and flooding can lead to the subsidence of buildings and roads (Lammas and Alston, 2007). The summer floods also revealed the potential for slumping of saturated hillside soils (e.g. The Vineyards, nr. Knightwick and the hillside nr. Hamm Castle, Shelsley Beauchamp) and Severn Valley Railway.





- The table 1.1 below shows a correlation between soil disturbance and permeability; demonstrating that the longer soils are left uncultivated the greater will be their infiltration rate. Many semi-natural habitat types, for example woodland, heathland, wetland and species-rich grassland are frequently recognised and offered varying degrees of protection for their biodiversity importance, however Worcestershire also retains a considerable semi-natural 'old grassland' resource that is likely to provide significant protection from flooding (Holtan, HN and Kirkpatrick, MH, 1950 and Claxton, M, 2008).

**Table 1.1 Infiltration rates and Land-use type**

Land-use type	Infiltration Rate (mm per hr)
Old permanent pasture	60
4-8 year old pasture	36
3-4 year old pasture, lightly grazed	30
Permanent pasture, moderately grazed	24
Hay meadow	17
Permanent pasture, heavily grazed	15
Strip cropped, mixed cover	11
Arable	10
Bare soil, cultivated	95
Bare soil, crusted	60

Source: Holtan, HN and Kirkpatrick, MH, 1950 and Claxton, M, 2008

**Development**

- 2006 -2007 Worcestershire water supply was 94ML from Groundwater, 73 ML from Surface water (51 ML Strensham, 21ML Trimpley, 2ML Mythe) with an additional ML from Frankly Reservoir 11 (Pers Comm Severn Trent Water)

- Taking account of actual and forecasted demand for water, the existing and forecast water availability and population growth, Worcestershire is a moderate area for water stress (Environment Agency, 2009b)
- Limited headroom for sustainable supply of water from the River Severn and aquifers in the north west of the County (Environment Agency 2007c).
- Worcestershire resource availability for surface water and/or surface water combined with groundwater is demonstrated in the CAMS diagrams in Appendix 9. It demonstrates that the County faces areas with no water availability, areas that are over licensed and areas that are over abstracted.
- Transferring large amounts of water from areas of surplus to those in deficit is possible, however it can be extremely expensive to do Severn Trent Water operates a Strategic Water Grid that links approximately 2/3 of its area, by linking up water treatment works on the River Severn to Coventry where water from the East Midlands meets. The Environment Agency's 2007 consultation paper, 'Developing our Water Resources Strategy for England and Wales' states that water resources should be shared locally between companies and sectors. STW and South Staffordshire Water have the ability to share some water resources (Pers Comm Severn Trent, 2009).
- It can take between 20-25 years to plan and build for a reservoir, approximately 10 years for a new river abstraction, 2 to 3 years for a new ground water abstraction site and over 5 years for large waste water infrastructure (Environment Agency, 2007c, Pers Comm Severn Trent).



- Sewerage infrastructure was inundated due to the large volume of water during the floods of June/July 2007.
- Development of new water resources, treatment and distribution infrastructure will be required in future to serve the projected housing growth rates (Mott MacDonald, 2007) (Wyre Forest District Council, 2010).
- The Restoring Sustainable Abstraction Programme identifies sites where unsustainable abstraction could be having an impact on the environment. The programme investigates the sites and then identifies potential options that are appraised to implement a solution to remove the risk of potential future damage to the environment (Environment Agency, 2007b) **Table 1.2** contains details of the Restoring Sustainable Abstraction Programme in Worcestershire.

**Table 1.2 List of RSA sites in Worcestershire**

RSA Sites	AMP 4 Investigation Sites	SSSI Investigation	Habitats Directive Sites	New sites
Bow Brook	Hoo Brook	Ashmoor Common	Severn Estuary	Kingsford Brook, Wolverley
Hewell Park Lake		Bittell Reservoirs	Severn Estuary (Upper)	
Battlefield Brook		Ipsley Alders Marsh		
Blakedown Valley (incl. Hurcott and Podmore)		Hartlebury Common and Ditch		
		Puxton and Stourvale Marsh		
		Shrawley Wood		

Source: Environment Agency

### Domestic

- We have much less water per person in England and Wales than most Mediterranean countries, due to population densities and the increasing demand for water. Average water usage per person in England and Wales is 151 litres of water a day. People who live in Worcestershire used on average between 130-149 litre of water a day (EA, 2007b).
- In 2002 the majority of water abstracted in the Severn Catchment area was for public water supplies at just over 72%. Industry abstracted 12% of the total volume of water abstracted in that year. In Worcestershire during 2006-2007 53% of the County's water supply (94MI) was abstracted from ground water supplies (Severn Trent water, pc).
- There are 138 sewage works in the county. The biggest are Worcester and Kidderminster which serve the population equivalent of just over 100,000 people. 7 Sewage Treatments Works (Alvechurch, Blackminster, Bromsgrove/Fringe Green, Droitwich/Ladywood, Pershore (Tiddesley Wood), Redditch Priest Bridge, and Worcester (serving over 10,000 people) are either at high or medium risk of putting pressure on sewage treatment infrastructure, if new development occurs (Environment Agency, 2007d) without an expansion in capacity, though this will be provided by Severn Trent Water in such an event (Pers Comm Severn Trent, 2009).





- Within Severn Trent Water's Severn Zone there will be a deficit in the baseline supply/demand balance by 2010/11. The strategy outlined within the 2010 Water Resources Management Plan will ensure that this deficit is addressed. 25% water efficiency measures, as could be achieved by all new housing meeting Level 3 of the Code for Sustainable Homes, would reduce the size and duration of those deficits and possibly delaying and reducing the requirements for additional water resource developments (Environment Agency, 2007c).
- New development can lead to the creation of large impermeable surfaces that drain into piped draining systems. Natural infiltration into the ground is therefore inhibited, with the corresponding reduction in ground water and surface water recharge (Faber Maunsell (2007).

### Agriculture/Forestry

- Soil moisture will decrease annually by between 12% and 23%, up until 2080 when it is expected to decrease by between 22% and 42%. Dryer soil will call for higher levels of irrigation (Caven, 2004) or a switch to less 'thirsty' crop/forage types.
- The amount of water abstracted for agriculture purposes is low, when compared to the amounts abstracted for public water supply. However abstraction levels for agriculture are often at the highest during the summer months when water levels are naturally (or generally) lower (Environment Agency, 2007b).

- Agriculture and forestry practises are responsible for much of the diffuse pollution in rural areas. This pollution can be made worse where compaction and capping of the soil occurs leading to increase runoff from fields and increasing the possibility of flooding (Environment Agency, 2009d).
- Insensitive felling techniques - particularly large machine-clear felling, exposes large expanses of un-vegetated soil to erosion/soil run-off, often for several years - a problem that is particularly acute on steep slopes (Environment Agency, 2009d)
- The production of biofuels as a fuel source to combat the effects of climate change is an issue that is addressed through the County Councils Draft technical research paper on Planning for renewable energy, as part of its overall approach to Natural Resource Planning and Management in Worcestershire. A requirement of this energy type is a substantial amount of water. This could put pressure on those areas already under water stress and the abstraction of water could have environmental impacts. This issue will need to be addressed through the above paper.

### Water Biodiversity

- Otter, water vole, white-clawed crayfish, Twait and Allis Shad, common club-tail, black poplar and Ribbon-Leaved Water Plantain are protected species within Worcestershire.
- Many of Worcestershire's open water bodies have ornithological importance.
- The Severn and Avon rivers are important to the Club tailed Dragonfly (a BAP priority species) and of many streams and ponds to dragonflies in general.



- The watercourses around Bromsgrove provide important habitats for water voles.
- An increase in the abstraction from surface and/or groundwater could lead to a permanent reduction in the height of water table and the drying out of wetlands (Faber Maunsell (2007).
- Surface water run-off from new developments/roads, could lead to the pollution and eutrophication of water bodies (Environment Agency, 2009d).
- The increase in flooding will result in a loss of protected habitats (Faber Maunsell (2007).
- Increased housing development pressure is leading to the loss of semi-natural as well as man-made wildlife habitats, particularly around expanding urban areas i.e. brownfield sites, wetland areas (Faber Maunsell (2007). This is the case in Kidderminster and Redditch, where important wetlands have been built on, and are under threat from further development (Pers Comm County Council, 2008).
- Groundwater Resource depletion due to public water abstraction over a long time scale has contributed to unfavourable condition of designated SSSIs and Wildlife Sites in the Kidderminster area.
- Retaining existing water bodies within new developments has become more accepted in recent years; however the importance of retaining sufficient surrounding terrestrial habitat or an undeveloped buffer zone is frequently overlooked. However, there is also an increased pressure to create pools in wet areas for boating and fishing lakes, with the subsequent loss of semi-natural fen and marsh habitat (Faber Maunsell 2007 and Pers Comm County Council, 2008).
- New development can lead to the decline and drying out of wetland habitats such as fen and marsh, reedbeds and open water habitat, as a result of the increased abstraction for public water supplies (Environment Agency, 2009b)
- Lowland wet meadows are already under serious threat from drainage and their condition is likely to deteriorate further with increased water evapo-transpiration and abstraction during warmer, drier summers or unseasonal floods in the spring and summer months. Low water tables are detrimental to important bird populations, which are already in serious decline in these habitats (Mitchell, R.J. et al, 2007).
- Fragmentation of habitats can occur as a result of the installation artificial structures such as impoundments and flood control measure, to regulate water flow (Mitchell, R.J. et al, 2007).

### Historic Environment

- There are around 300 moated sites in Worcestershire, many of which are still water-filled, along with hundreds of mill complexes and numerous other archaeological sites associated with water-management.
- Many of Worcestershire's open water bodies have historic environment importance as designed landscape features, but also they are of high potential as stores of palaeo-environmental deposits that are sealed within anaerobic silt deposits.
- An increase in the abstraction from surface and/or groundwater could lead to a permanent reduction in the height of the water table leading to the drying out of palaeo-environmental deposits and dessication of organic artefacts preserved in waterlogged deposits.



- An increase in flooding will result in erosion to earthworks and other heritage assets including: damage to below ground archaeological sites exposed by flood water run-off; rapid erosion of archaeological features contained within river and stream banks and damage to historic structures such as bridges, sluices and other historic water management features.
- An increase in flooding may result in more damage to historic buildings already within areas flooded and an increase in the number of buildings affected as the flood waters spread further.
- Historic flood meadows and water-meadows are already under serious threat from drainage and their condition is likely to deteriorate further with increased water evapo-transpiration and abstraction during warmer, drier summers.

**Risk based assessment of water bodies**

- In Worcestershire, 600km of rivers and streams were assessed to establish if they were at risk of not meeting the WFD objectives in 2015. The Table 1.3 below demonstrates the percentage of Worcestershire's watercourses, which have a medium to high risk of not reaching the WFD for each water management issue effecting Worcestershire. The table demonstrates that the biggest risk of not meeting the WFD objectives is from diffuse pollution from Phosphates and Nitrates. Overall the majority of watercourses in Worcestershire are at a medium to high risk of not meeting the WFD objectives (Environment Agency 2007a).

**Table 1.3 Percentage of Worcestershire' rivers in each risk category for different pressures**

Pressure	% of water bodies 'at risk' (High risk) or 'probably at risk' (Moderate risk)
Diffuse Phosphates (P)	89.3%
Diffuse Nitrates (N)	84%
Diffuse pesticides and sheep dip	68.8%
Physical or morphological alteration	67.8%
Sediment delivery	66.2%
Point source nutrients	56.0%
Alien species	48.2%
Diffuse source urban discharges	41.2%
Point source sanitary determinands	35.9%

Source: Environment Agency (WFD Characterisation data)

- The pollution of watercourses from both urban and rural sources is particularly problematic along the Severn River Basin District. (Environment Agency, 2009c)
- Areas of the River Severn have problems with pollution from sheep dip. And the Teme from nutrients.
- Unsustainable groundwater abstraction has created problems at Battlefield Brook in Bromsgrove. This has resulted in low flow rates which have impacted on wildlife including water voles. Battlefield Brook is one of a number of RSA programme across the County. A full list can be found in Table 1.3.
- Physical modification to the Severn RBD could mean that over 48% of its river length and 72% of its lakes will fail the WFD objectives. Some of these will be designated as either 'artificial' or 'heavily' modified, which will mean that they have less stringent requirements to meet (Environment Agency, 2009b).



## Appendix 12 Best Practice Examples

Water related issues within Worcestershire	WM RSS	Sustainable Community Strategy & Local Area Agreement	Sustainability Appraisal	Local Development Framework											
				Waste Core Strategy	Minerals Core Strategy	Core Strategy				Area Action Plans	Site Specific Allocations				
						SWJC	WF	Red	Brom						
Location of development		1	8	1	1	1	1	1	1	1	1	1	1	1	1
		4	31	4	3	3	3	3	3	3	3	3	3	3	3
		5		30	4	4	4	4	4	4	4	4	4	4	4
		34			5	5	5	5	5	5	5	5	5	5	5
		35			8	8	8	8	8	8	8	8	8	8	8
					10	10	10	10	10	10	10	10	10	10	10
					16	16	16	16	16	16	16	16	16	16	16
					17	17	17	17	17	17	17	17	17	17	17
					19	19	19	19	19	19	19	19	19	19	19
					26	26	26	26	26	26	26	26	26	26	26
Sewerage capacity		5	31												
		7													
		15													
Surface, ground and fluvial flooding		4	31	4	4	4	4	4	4	4	4	4	4	4	4
		5		6	5	5	5	5	5	5	5	5	5	5	5
		6		8	6	6	6	6	6	6	6	6	6	6	6
		7		12	7	7	7	7	7	7	7	7	7	7	7
		9		16	8	8	8	8	8	8	8	8	8	8	8
		23		17	9	9	9	9	9	9	9	9	9	9	9
		24		20	10	10	10	10	10	10	10	10	10	10	10
		37		33	12	12	12	12	12	12	12	12	12	12	12

**KEY:** **SWJCS** - South Worcestershire Joint Core Strategy (Worcester City, Malvern Hills, Wychavon) **WF** - Wyre Forest District Council  
**Red** - Redditch Borough Council **Brom** - Bromsgrove Borough Council





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Water related issues within Worcestershire	WM RSS	Sustainable Community Strategy & Local Area Agreement	Sustainability Appraisal	Waste Core Strategy	Minerals Core Strategy	Local Development Framework								Area Action Plans	Site Specific Allocations
						Core Strategy				Core Strategy					
						SWJC	WF	Red	Brom	SWJC	WF	Red	Brom		
Surface, ground and fluvial flooding		38			33	13	13	13	13	13	13	13			
		39				14	14	14	14	14	14	14			
						15	15	15	15	15	15	15			
						16	16	16	16	16	16	16			
						17	17	17	17	17	17	17			
						18	18	18	18	18	18	18			
						19	19	19	19	19	19	19			
						20	20	20	20	20	20	20			
						21	21	21	21	21	21	21			
						22	22	22	22	22	22	22			
Water supply/ infrastructure		5	31			1	1	1	1	1	1	1	1	1	
		32				2	2	2	2	2	2	2	2	2	
		36				3	3	3	3	3	3	3	3	3	
		38				5	5	5	5	5	5	5	5	5	
						15	15	15	15	15	15	15	15	15	
						18	18	18	18	18	18	18	18	18	
						40	40	40	40	40	40	40	40	40	
						4	4	4	4	4	4	4	4	4	
						6	6	6	6	6	6	6	6	6	
						12	12	12	12	12	12	12	12	12	
Biodiversity enhancement and the provision of green infrastructure		9				7	7	7	7	7	7	7	7	7	
		27				9	9	9	9	9	9	9	9	9	
		28	30			11	11	11	11	11	11	11	11	11	
		29				12	12	12	12	12	12	12	12	12	
		33				16	16	16	16	16	16	16	16	16	
						21	21	21	21	21	21	21	21	21	
						22	22	22	22	22	22	22	22	22	
						26	26	26	26	26	26	26	26	26	
						27	27	27	27	27	27	27	27	27	
						28	28	28	28	28	28	28	28	28	
					29	29	29	29	29	29	29	29	29		

**KEY:** **SWJCS** - South Worcestershire Joint Core Strategy (Worcester City, Malvern Hills, Wychavon)  
**WF** - Wyre Forest District Council **Red** - Redditch Borough Council **Brom** - Bromsgrove Borough Council

Water related issues within Worcestershire	WM RSS	Sustainable Community Strategy & Local Area Agreement	Sustainability Appraisal	Local Development Framework									
				Waste Core Strategy	Minerals Core Strategy	Core Strategy				Area Action Plans	Site Specific Allocations		
						SWJJC	WF	Red	Brom				
Biodiversity enhancement and the provision of green infrastructure						30	30	30	30				
Water Quality	30	4	31	4	4	4	4	4	4	4	4	4	4
	31	6		6	6	6	6	6	6	6	6	6	6
		7		30	7	7	7	7	7	7	7	7	7
					30	30	30	30	30	30	30	30	30
Water efficiency in developments	31	5	31			40	40	40	40				
	35	6	33			2	2	2	2	2	2	2	2
		34				4	4	4	4	4	4	4	4
		35				5	5	5	5	5	5	5	5
Adapting to Climate Change		36				6	6	6	6	6	6	6	6
		38				13	13	13	13	13	13	13	13
		37				26	26	26	26	26	26	26	26
		39				35	35	35	35	35	35	35	35
						38	38	38	38				

**KEY:** **SWJCS** - South Worcestershire Joint Core Strategy (Worcester City, Malvern Hills, Wydhavon)  
**WF** - Wyre Forest District Council **Red** - Redditch Borough Council **Brom** - Bromsgrove Borough Council

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## Appendix 13. Suggested Policy Wording

Please see below, examples of policy wordings that could be adapted and included in Local Planning Authorities' Core Strategies, regarding the provision water and sewerage infrastructure capacity and development.

Planning permission will only be granted for developments which increase the demand for off-site water and sewerage infrastructure where:

1. it has been demonstrated that sufficient capacity already exists; or
2. it has been agreed in advance of the submission of any planning application that extra capacity can be provided in time to serve the development which will ensure that the environment and the amenities of local residents are not adversely affected.

The development or expansion of water supply or waste water facilities will normally be permitted, either where needed to serve existing or proposed development in accordance with the provisions of the LDF, or in the interests of long term water supply and waste water management.



## Appendix 14 Council update on the progress on achieving the recommendations in the Pitt Review

### Recommendation 7:

There should be a presumption against building in high flood risk areas, in accordance with PPS25, including giving consideration to all sources of flood risk, and ensuring that developers make a full contribution to the costs both of building and maintaining any necessary defences.

Strategic Flood Risk Assessments are now carried out to locate new development in areas of minimal flood risk, or investigate and mitigate risks from flooding when this cannot be achieved. An updated version of PPS25 was published in March 2010

### Recommendation 8:

The operation and effectiveness of PPS25 and the Environment Agency's powers to challenge development should be kept under review and strengthened if and when necessary.

Periodic reviews of this are ongoing

### Recommendation 9:

Householders should no longer be able to lay impermeable surfaces as of right on front gardens and the Government should consult on extending this to back gardens and business premises.

This was included into an amendment of the Town and Country Planning Act (1995), released in 2008, for front gardens only. Consultation is ongoing as to extending this to back gardens and business premises.

### Recommendation 10:

The automatic right to connect surface water drainage of new developments to the sewerage system should be removed.

This has been mentioned in the Flood and Water Management Act (2010), however the ability still remains. This is seen as a significant failing of the Act so further updates or legislation will most likely address this.

### Recommendation 11:

Building Regulations should be revised to ensure that all new or refurbished buildings in high flood-risk areas are flood-resistant or resilient.

This is underway with the amended regulations expected in Autumn 2010

### Recommendation 12:

All local authorities should extend eligibility for home improvement grants and loans to include flood resistance and resilience products for properties in high flood-risk areas.

Both Wychavon and Wyre Forest have informed residents in flood prone areas as to the home protection schemes and government grants available

### Recommendation 13:

Local authorities, in discharging their responsibilities under the Civil Contingencies Act 2004 to promote business continuity, should encourage the take-up of property flood resistance and resilience by businesses.

This is ongoing and being undertaken by district councils and monitored by Worcestershire County Council. Seminars have been undertaken for businesses in areas that have suffered from flooding. Communities are being encouraged to form 'flood groups' to develop local resilience.



**Recommendation 14:**

Local authorities should lead on the management of local flood risk, with the support of the relevant organisations.

This has been confirmed by the Flood and Water Management Act (2010). Adoption timescales and details are currently being finalised but this hand-over process will most likely take over a year. In Worcestershire a Strategic Flood Risk Co-ordinating Group has been established bringing together county and district officers and elected members with reps from the EA, Severn Trent, landowners, the Local Resilience Forum.

**Recommendation 15:**

Local authorities should positively tackle local problems of flooding by working with all relevant parties, establishing ownership and legal responsibility.

This will be addressed through the production of Surface Water Management Plans, as detailed within the Flood and Water Management Act (2010). The above group and strong land drainage partnership in the county will aid this.

**Recommendation 16:**

Local authorities should collate and map the main flood risk management and drainage assets (over and underground), including a record of their ownership and condition.

This will be addressed through the production of Surface Water Management Plans. An online mapping system is currently being developed to standardise, store and access countywide flooding information.

**Recommendation 17:**

All relevant organisations should have a duty to share information and cooperate with local authorities and the Environment Agency to facilitate the management of flood risk.

This has been set out in the Flood and Water Management Act (2010). The above working groups will aid this.

Worcestershire County Council data is currently being audited to make it more consistent and readily available.

**Recommendation 18:**

Local Surface Water Management Plans, as set out under PPS25 and coordinated by local authorities, should provide the basis for managing all local flood risk.

This has been set out in the Flood and Water Management Act (2010). A successful funding bid was entered to DEFRA for the production of these in Worcestershire. Mapping information is currently being collated.

**Recommendation 19:**

Local authorities should assess and, if appropriate, enhance their technical capabilities to deliver a wide range of responsibilities in relation to local flood risk management.

This has been set out in the Flood and Water Management Act (2010). A Worcestershire County Council flood risk management officer has been appointed along with the creation of various other county and district positions

**Recommendation 27:**

Defra, the Environment Agency and Natural England should work with partners to establish a programme through Catchment Flood Management Plans and Shoreline Management Plans to achieve greater working with natural processes.

A Catchment Flood Management Plan was completed for the Severn Catchment in December 2009. This will combine will other regional and national documentation to inform planning and flood mitigation decisions.

**Recommendation 86:**

The Government should publish an action plan to implement the recommendations of this Review, with a Director in Defra overseeing the programme of delivery and issuing regular progress updates. These are ongoing with the latest update report released in December 2009



## Appendix 15. Glossary of terms

<b>AAP</b>	Area Action Plans
<b>AMP</b>	Asset Management Plans
<b>BAP</b>	Biodiversity Action Plan
<b>Brom</b>	Bromsgrove
<b>CAMS</b>	Catchment Abstraction Management Strategies
<b>CFMP</b>	Catchment Flood Management Plan
<b>CLG</b>	Communities and Local Government
<b>EA</b>	Environment Agency
<b>FRA</b>	Flood Risk Assessment
<b>FRM</b>	Flood Risk Management
<b>HAP</b>	Habitat Action Plan
<b>IDBs</b>	Internal Drainage Boards
<b>LA</b>	Local Authority
<b>LAA</b>	Local Area Agreement
<b>LDD</b>	Local Development Document
<b>LPA</b>	Local Planning Authority
<b>LSP</b>	Local Strategic Partnership
<b>MAFP</b>	Multi-Agency Flood Plan
<b>NERC</b>	Natural Environment and Rural Communities Act
<b>ODPM</b>	Office of the Deputy Prime Minister
<b>Ofwat</b>	Water Services Regulation Authority
<b>PPS</b>	Planning Policy Statement
<b>RBMP</b>	River Basin Management Plan
<b>Redd</b>	Redditch
<b>RFRA</b>	Regional Flood Risk Appraisal
<b>RSS</b>	Regional Spatial Strategy
<b>SA</b>	Sustainability Appraisal
<b>SCS</b>	Sustainable Communities Strategies
<b>SAC</b>	Special Area for Conservation
<b>SAP</b>	Species Action Plan
<b>SEA</b>	Strategic Environmental Assessment
<b>SFRA</b>	Strategic Flood Risk Assessment
<b>SPD</b>	Supplementary Planning Document
<b>SSSI</b>	Site of Special Scientific Interest
<b>SUDS</b>	Sustainable Drainage Systems
<b>SWJC</b>	South Worcestershire Joint Core Strategy (Worcester City, Wychavon, Malvern Hills)





<b>SWMP</b> .....	Surface Water Management Plan
<b>WCS</b> .....	Water Cycle Strategy
<b>WF</b> .....	Wyre Forest
<b>WFD</b> .....	Water Framework Directive
<b>WMRA</b> .....	West Midlands Regional Assembly
<b>WMRSS</b> .....	West Midlands Regional Spatial Strategy
<b>WPA</b> .....	Waste Planning Authority
<b>WRMP</b> .....	Water Resources Management Plan

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