



Wyre Forest District Water Cycle Strategy

Wyre Forest District Council

March 2010
Final Report
9T6121

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EXECUTIVE SUMMARY

Study Objectives

This Water Cycle Strategy (WCS) for Wyre Forest District Council (the Council) assesses the constraints and requirements that will arise from the scale of the proposed growth on the water infrastructure of the District. This project was commissioned prior to the release of the Environment Agency's Water Cycle Study guidance document and has therefore been written to the requirements of the Brief rather than this guidance. However, for cross reference the level of study commission is roughly equivalent to the 'Phase 2: Outline' Stage noted within the guidance document.

The Council is in the process of preparing its Local Development Framework (LDF), as required by the Planning and Compulsory Purchase Act 2004. The growth targets, as presented in the Draft Phase Two Revision of the West Midlands Regional Spatial Strategy (WMRSS) for the District currently stand as follows:

- An additional 3,400 new homes in Wyre Forest District by 2026 at a rate of 170 dwellings per year;
- Development of 33ha of employment land by 2026.

To assist the Council with the identification of the potential development sites most suitable for development, this WCS, through consultation with the Council, the Environment Agency, Severn Trent Water Limited (STWL), the Highways Agency and British Waterways has identifies the potential constraints to development within the District. It considers the following issues, addressing the constraints that they may pose to future development and discusses the improvements necessary to achieve the required level of development:

- Flood Risk;
- Water Resources;
- Water Supply;
- Wastewater Collection;
- Wastewater Treatment (including Water Quality); and
- Demand Management.

In addition, the WCS process also provides a benefit to the water company (STWL) by providing them with a more detailed indication of the potential development within the area. This will reduce the number of assumptions that are necessary in making decisions in relation to future planning of resource and infrastructure requirements.

Outputs

This report focuses upon the potential development sites, scenarios and options provided by the Council. It considers two trajectories of higher growth and assesses the flood risk, water supply, sewerage infrastructure, wastewater treatment and SUDS constraints for each proposed site, assigning a traffic-light colour code to indicate the ease of development in each case. In addition flood risk, water supply, waste water

treatment, river quality and demand management are discussed in more general terms. The report concludes with the presentation of a constraints table to assist the Council in their comparison of the viability and potential cost and time implications of the development of various sites.

Conclusions

Flood Risk

Analysis of flood risk has been primarily based upon the conclusions of the preceding Level 1 SFRA and draft Level 2 SFRA. This WCS has identified that flood risk is the biggest constraint for development within Wyre Forest and is mainly associated with the residual risk of flooding from the overtopping or breaching of flood defences within the towns of Kidderminster and Bewdley. Additional risk is posed by flash flooding risk related to capacity exceedance of the minor and ordinary watercourse, sewer networks and surface water drainage system. Development will therefore require consultation with the Environment Agency to ensure it meets the requirements of PPS25, maintenance and clearing of minor and ordinary watercourses and the implementation of SUDS in both new and existing developments. The suitability of SUDS techniques has been considered separately and concluded that, due to the number of Source Protection Zones located underneath the proposed potential development sites, many locations will require the implementation of non-infiltration SUDS techniques. Additional information and guidance regarding these restrictions has been provided in Section 8.3 and **Appendix D** of this report.

Water Resources

STWL are confident that water supply will not constrain development within Wyre Forest District due to the size of the Water Resource Zone in which the District is situated and their ability to transfer water in from neighbouring zones. However some watercourses are already experiencing low flows and abstraction restrictions to protect the water dependent SSSIs located within the District. Due to the predicted increase in development and the drought-related effects of climate change, water resources will become increasingly limited and water efficiency measures feature highly within STWL's dWRMP and Statement of Response. To assist STWL in delivering their water demand targets, it will be necessary for new development to support these aims through the implementation of efficiency measures wherever possible.

Water Supply

There is also little variation between potential development sites in terms of connection to the water supply infrastructure. STWL do not envisage any issues regarding the connection of new potential development sites within the existing urban areas to the network and, as such, most sites are highlighted in 'green' within the constraints table. However, variations do occur when for sites currently classified as Greenfield (i.e. have no existing connections present) and/or located in the more rural areas of the District, to which new water supply infrastructure will have to be installed. These sites have been highlighted within the constraints matrix as requiring a higher level of infrastructure investment and therefore higher time and cost implications.

Wastewater Infrastructure

The analysis of the wastewater infrastructure network has indicated a number of potential constraints and bottlenecks within the existing system, many of which have already experienced occurrences of flooding and these have been addressed within the constraints matrix accordingly. However, these are all being addressed by STWL and factored into their AMP5 submission as they are legally required to provide connection to new development.

Wastewater Treatment

The capacity of the main Wastewater Treatment Works (WwTWs) within the District have been identified as having the ability to accommodate the predicted increase in effluent, including the Kidderminster Oldington works, which is key to a majority of the development. However, there are a number of pumping stations and rural WwTWs that are already operating at capacity and will therefore require upgrade or improvement to accommodate the additional flows. It is also necessary to ensure that the environmental constraints are not exceeded as a result of new development, especially as some watercourses (such as Blakedown Brook) are already failing their RQOs and the District as a whole has been identified as suffering from nitrification issues.

Demand Management

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 to accommodate the increasing demands and effects of climate change.

Constraints Matrix

Although some potential development sites will require some degree of investment to make them feasible, no major “show stoppers” have been identified and no sites have been classified as ‘red’ in all three categories, and very few have been classified with more than two ‘reds’. Due to the close proximity of many of the sites within the District it will be possible to increase the feasibility of many sites with one infrastructure improvement. The traffic light colours used in the summary tables within this report relate to a high level cost estimation. The potential development sites shown in red will require a high degree of investment, whereas those highlighted in green will require a low level of investment. This matrix will not only guide the Council and developers to the sites most suitable for development at the present time but will also assist in streamlining the sites which may require further analysis, either individually or as part of a Phase 3: Detailed WCS.

Data Sources

The data used within this WCS (and preceding Level 1 and Level 2 Strategic Flood Risk Assessments, SFRAs) is documented within **Appendix B**. The results of the SFRAs have been used as the basis for the flood risk section of this report. Additional data has been obtained from the Environment Agency and Severn Trent Water Limited, including Severn Trent Water’s draft Water Resource Management Plan 2009 (dWRMP), Statement of Response, Final Business Plan (PR09) and Strategic Direction Statement, ‘Focus on Water’. As the Regional Spatial Strategy figures and dWRMP are currently in

draft form, it is recommended that this WCS be reviewed in light of any new findings released in these documents.

Co-operation

This WCS was carried out for the Council with the co-operation and support of the Environment Agency, Severn Trent Water Limited, Highways Agency and British Waterways.

GLOSSARY

Asset Management Plans	Asset Management Planning is the process by which the Office of Water Services (Ofwat) determined the programme of water infrastructure and environmental improvements that are to be funded over a five year period and the water bill price rises that have to be allowed to fund this.
Brownfield site	Any land or site that has been previously developed.
Catchment	The area contributing flow or <i>runoff</i> to a particular point on a watercourse.
Climate change	Long-term variations in global temperature and weather patterns both natural and as a result of human activity, primarily greenhouse gas emissions.
Culvert	Covered channel or pipe that forms a <i>watercourse</i> below ground level, or through a raised embankment.
Development	The carrying out of building, engineering, mining or other operations in, on, over or under land or the making of any material change in the use of any buildings or other land.
Enmained	Watercourse designated as a <i>Main River</i>
Environment Agency	Government Agency charged with the protection of the environment.
Exception Test	The final process of the PPS25 Sequential Test (TIERS 3 & 4). It is required for some developments (depending on their vulnerabilities as defined in Tables D.2 and D.3 of Planning Policy Statement (PPS) 25: Development and Flood Risk), when a development application is made for a site within Flood Zones 2 & 3 and no other site of lower flood risk is available.
Flood defence	Flood defence infrastructure, such as flood walls and embankments, intended to protect an area against flooding, to a specified <i>standard of protection</i> .
Flood Hazard	The potential risk to life and potential damage to property resulting from flooding.
Flood probability	The estimated likelihood of a flood of a given magnitude occurring or being exceeded in any specified time period.
Flood risk	An expression of the combination of the <i>flood probability</i> and the magnitude of the potential consequences of the <i>flood event</i> .

Flood risk assessment	A study to assess the risk of a site or area flooding, and to assess the impact that any changes or development in the site or area will have on <i>flood risk</i> .
Flood Zones	Flood Zones are defined in Table D.1 of Planning Policy Statement (PPS) 25: Development and Flood Risk. They indicate land at risk by referring to the probability of flooding from river and sea, ignoring the presence of defences.
Floodplain	Area of land that borders a watercourse, an estuary or the sea, over which water flows in time of flood, or would flow but for the presence of flood defences where they exist.
Functional floodplain	Land where water has to flow or be stored in times of flood. It includes the land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the Environment Agency, including water conveyance routes.
Greenfield	Previously undeveloped land.
Groundwater	Water in the ground, usually referring to water in the saturated zone below the <i>water table</i> .
Groundwater flooding	Flooding caused by <i>groundwater</i> escaping from the ground when the <i>water table</i> rises to or above ground level.
Growth Points	The New Growth Points initiative was designed to provide support to local communities who wish to pursue large scale and sustainable growth, including new housing, through partnership with the Government. 29 areas were named New Growth Points and will share £40m in 2007-8 for a first round of infrastructure projects and to support growth related studies, master planning and capacity-building.
Housing Land Availability Assessments	Independent assessments of land availability which considers the options for meeting the Regional Spatial Strategy housing targets.
Local Development Documents	Documents that set out the spatial strategy for local planning authorities which comprise development plan documents.
Local Development Framework	Framework which forms part of the statutory development plan and supplementary planning documents which expand policies in a development plan document or provide additional detail.
Local Planning Authority	Body responsible for planning and controlling development, through the planning system.

Main River	A watercourse designated on a statutory map of Main rivers, maintained by the Environment Agency.
Mitigation measure	A generic term used in this guide to refer to an element of <i>development</i> design which may be used to manage some <i>risk</i> to the <i>development</i> , or to avoid an increase in <i>risk</i> elsewhere.
Ofwat	The Water Services Regulation Authority, which is the economic regulator of the water and sewerage industry in England and Wales.
Ordinary watercourse	A watercourse which is not a private drain and is not designated a <i>Main river</i> .
Regional Spatial Strategy	A document produced as part of the national planning system with the main purpose to provide a long term land use and transport planning framework for the Region. It guides the preparation of local authority development plans and local transport plans.
Return period	A term sometimes used to express <i>flood probability</i> . It refers to the estimated average time gap between floods of a given magnitude, but as such floods are likely to occur very irregularly, an expression of the <i>annual flood probability</i> is preferred.
River Basin Management Plan (RBMP)	Plans that set out the environmental objectives for all groundwater and surface water bodies and Protected Areas within a River Basin District.
Runoff	Water flow over the ground surface to the drainage system.
Sequential Test	The Sequential Test refers to the application of this approach by Local Planning Authorities (LPAs) in determining land uses that are compatible with the level of flood risk at each allocated development site within a Local Authority area. Development should be directed to Flood Zone 1 wherever possible, and then sequentially to Flood Zones 2 and 3, and to the areas of least flood risk within Flood Zones 2 and 3, as identified by the Strategic Flood Risk Assessments (SFRA) (see Table D.1 and Table D.2 of PPS25).
Settlement of Significant Development	Towns identified for the focus of growth beyond the Major Urban Area. These are identified as being capable of balanced and sustainable growth, with development primarily aimed at meeting the economic and social needs of the area rather than attracting out-migration from the Major Urban Areas.

Standard of protection	The estimated probability of an event occurring which is more severe than those against which an area is protected by flood defences.
Strategic Centre	Urban areas identified within the Regional Spatial Strategy as key locations for development and/or regeneration to promote the region as a whole and support wider development aims.
Strategic Flood Risk Assessment (SFRA)	A study to examine flood risk issues on a sub-regional scale, typically for a river catchment or local authority area during the preparation of a development plan.
Source Protection Zone (SPZ)	Defined areas showing the risk of contamination to selected groundwater sources used for public drinking water supply, from any activities that might cause pollution in the area.
Sustainable Drainage Systems (SUDS)	A sequence of management practices and control structures, often referred to as SUDS, designed to drain surface water in a more sustainable manner. Typically, these techniques are used to attenuate rates of runoff from potential development sites.
Watercourse	Any natural or artificial channel that conveys surface water.
Water Cycle Strategy (WCS)	Provides a plan and programme of Water Services Infrastructure implementation. It is determined through an assessment of the environment and infrastructure capacity for: water supply; sewage disposal; flood risk management; and surface water drainage.

ABBREVIATIONS

AMP	Asset Management Plan
AMR	Annual Monitoring Report
BRE	Building Research Establishment
BREEAM	Building Research Establishment Environmental Assessment Method
CAMS	Catchment Abstraction Management Strategy
CDD	Cistern Displacement Devices
CDWF	Consented Dry Weather Flow
CIRIA	Construction Industry Research and Information Association
CSO	Combined Sewer Overflow
DAP	Drainage Action Plan
DCLG	Department of Communities and Local Government
DI	Deployable Output
DWF	Dry Weather Flow
DVA	Derwent Valley Aqueduct
dWMRSS	Draft West Midlands Regional Spatial Strategy
dWRMP	draft Water Resources Management Plan
FAS	Flood Alleviation Scheme
FRA	Flood Risk Assessment
fWRMP	final Water Resource Management Plan
GIS	Geographical Information System
GQA	General Quality Assessment
GWA	Ground Water Availability
GWMU	Ground Water Management Unit
HOF	Hands-Off Flow
ISIS	1d Modelling Software

LDF	Local Development Framework
LNR	Local Nature Reserve
LPA	Local Planning Authority
NFCDD	National Flood and Coastal Defence Database
NLP	Nathaniel Lichfield Partners
OS	Ordnance Survey
PPS25	Planning Policy Statement 25 – Development and Flood Risk
RBMP	River Basin Management Plan
RQO	River Quality Objective
RSA	Restoring Sustainable Abstraction
RSS	Regional Spatial Strategy
SAC	Special Areas of Conservation
SFRA	Strategic Flood Risk Assessment
SHLAA	Strategic Housing Land Availability Assessment
SPZ	Source Protection Zone
SSSI	Sites of Special Scientific Interest
SSW	South Staffordshire Water
STWL	Severn Trent Water Limited
SUDS	Sustainable Drainage Systems
SWS	Special Wildlife Site
TUFLOW	2d Modelling Software
UWWTD	Urban Wastewater Treatment Directive
WAFU	Water Available for Use
WCS	Water Cycle Strategy
WCSP	Worcestershire County Structure Plan
WFD	Water Framework Directive

WMRA	West Midlands Regional Assembly
WMRSS	West Midlands Regional Spatial Strategy
WRMU	Water Resource Management Unit
WRP	Water Resources Plan
WRZ	Water Resource Zone
WTW	Water Treatment Works
WwTW	Wastewater Treatment Works

1 INTRODUCTION

1.1 General Overview

In July 2008 Royal Haskoning was appointed by Wyre Forest District Council (hereafter “the Council”) to produce a Level 2 Strategic Flood Risk Assessment (SFRA) and Water Cycle Strategy (WCS). This report relates to the production of the WCS. This project was commissioned prior to the release of the Environment Agency’s Water Cycle Study guidance document and has therefore been written to the requirements of the Brief rather than this guidance. However, for cross reference the level of study commission is roughly equivalent to the ‘Phase 2: Outline’ Stage noted within the guidance document.

1.2 Scope

The Council is in the process of preparing its Local Development Framework (LDF), as required by the Planning and Compulsory Purchase Act 2004. The growth targets, as presented in the Draft Phase Two Revision of the West Midlands Regional Spatial Strategy (WMRSS) for the District currently stand as follows:

- An additional 3,400 new homes in Wyre Forest District by 2026 at a rate of 170 dwellings per year¹;
- Development of 33ha of employment land by 2026.

There are three main towns within the area - Kidderminster, Stourport on Severn and Bewdley. These towns are the focal points for growth in the District, primarily, both within their existing developed extents. Potential additional sites to accommodate the growth have been identified in the more rural areas of the District and, most notably, around some of the larger villages, including Chaddesley Corbett, Blakedown, Cookley, Fairfield and Shatterford. Although none of the settlements within Wyre Forest District have been identified as ‘New Growth Points’ or ‘Settlements of Significant Development’, the town of Kidderminster has been identified within the WMRSS as a ‘Local Regeneration Area’ and a ‘Strategic Centre’. As such there is an aim to improve long term economic prospects within the town and to promote development which will aid the growth and development of the region. The key developments to promote its use as a ‘Strategic Centre’ include major retail development, uses which attract large numbers of people (such as tourism) and large scale leisure and office development. Due to the concentrated growth within the three main towns, these long term goals for Kidderminster, and the rural nature of the area in general, locations identified for development have to be selected carefully with due consideration of all the elements of the water cycle.

The WCS is a technical study required in order to assess the constraints and requirements that will arise from the proposed growth on the water infrastructure of the District. In addition, it will assist in determining which locations within the Local Authority area are the most suitable to accommodate the required growth.

¹ Please note that since the main element of this work has been undertaken, the RSS Panel report has indicated that a total of 4,000 new dwellings could be required within Wyre Forest by 2026. This equates to 200 dwellings per year. However, it should be noted that this figure is in line with the sensitivity testing used within this report.

1.3 Objectives of the Water Cycle Strategy

The WCS considers the following issues, addressing the constraints that they may pose to future development and discusses the improvements necessary to achieve the required level of development:

- Flood Risk;
- Water Resources;
- Water Supply;
- Wastewater Collection;
- Wastewater Treatment (including Water Quality); and
- Demand Management.

The WCS process also provides a benefit to the water companies by providing them with a more detailed indication of the potential development within the area. This will reduce the number of assumptions that are necessary in making decisions in relation to future planning of resource and infrastructure requirements.

This WCS has been produced for Wyre Forest District Council in consultation with the Council, the Environment Agency, Severn Trent Water Limited (STWL), the Highways Agency and British Waterways.

2 DATA COLLECTION AND METHODOLOGY

2.1 Overview

A sequential approach was adopted within the production of this WCS and followed the high level model shown:



1. Firstly, the current status of the water management infrastructure was assessed in order to gain an insight into the current demands placed upon it as well as existing management strategies.
2. Secondly, using information available at the time of writing, the likely trends of future growth, environmental targets and possible external threats (e.g. climate change) were established.
3. Thirdly, the impact of the identified pressures on the existing water infrastructure and other environmental assets was assessed.
4. Finally, high level sustainable management strategies were proposed in order to manage the identified problems.

The information requested from each consultee was listed and requested at the inception meeting and subsequent meetings held jointly for the SFRA or solely for the WCS. The list of information received can be found in **Appendix B**. The limitations of this data are discussed further in Section 2.7.

2.2 Housing Growth and Trajectories

The Draft Phase Two WMRSS provides targets for housing and employment development for the period 2006 – 2026, as follows:

- An additional 3,400 new homes in Wyre Forest District at a rate of 170 dwellings per year; and
- 33ha of employment land.

The Council has provided GIS datasets of potential development locations, including both those evaluated within the Level 1 and Level 2 SFRA's and additional sites identified within the Council's ongoing Strategic Housing Land Availability Assessment (SHLAA). As the SHLAA has not yet been finalised, development of these sites is not certain and analysis of these locations is therefore for evaluation purposes only. All the sites provided were overlaid upon Ordnance Survey mapping for the District and used as a basis for the production of this WCS, including discussion with the Environment Agency and STWL.

In addition to the housing targets outlined above, this WCS has considered two scenarios of higher development for the purposes of sensitivity testing, based upon estimates provided by the Council. The first sensitivity test was carried out using a 15% increase in the WMRSS figures quoted above and the second using a 30% increase. The first of these sensitivity tests is approximately in line with the higher development

scenario for Wyre Forest District, outlined in the Nathaniel Lichfield Partners (NLP) 'Development Options' study² which was carried out for the Government Office for the West Midlands (GOWM) and published on the 7th October 2008. This is broadly in line with the RSS Panel Report of September 2009.

2.3 Flood Risk

This WCS has been prepared in parallel with a Level 2 Strategic Flood Risk Assessment³ (SFRA) for the District, which follows a Level 1 SFRA, completed in January 2008⁴. The findings in relation to flood risk are therefore based on the Level 1 and Level 2 SFRA reports. This WCS accounts for the 'Direct Flood Risk' from the Main Rivers and ordinary watercourses and the 'Additional Flood Risk' that a development will pose to existing development further downstream as a result of surface runoff or upstream from the effect of backing up of water.

2.4 Water Resources and Supply

Potable water within the whole of Wyre Forest District is provided by STWL. All information included within this report has been collected through consultation with STWL in addition to documentation from Ofwat and the Environment Agency. STWL published their Strategic Direction Statement in December 2007 and their draft Water Resource Management Plan 2009 (dWRMP), covering the period 2010 – 2035, in the first half of 2008. Their Statement of Response, which addresses queries raised during the consultation period of the draft report, was published in February 2009, with the final dWRMP due for release later in the year. All of these documents have been utilised in the production of this report, although it must be borne in mind that the dWRMP has not yet been finalised. As a result this report may require reviewing to account for any changes.

2.5 Wastewater

Wastewater collection and treatment services are provided by STWL for all of Wyre Forest District. Information regarding the standard, capacity and location of the infrastructure has been sought through consultation with STWL, the Environment Agency and the Council. In addition, information has also been obtained through consultation with STWL and their Final Business Plan (PR09). STWL have provided direct comment regarding the capacity of the wastewater network to accommodate the flow from a number of the proposed potential development sites, in addition to their FLOODS2 database and Drainage Action Plan (DAP) reports. At the time of writing the most recent models of the sewerage network had been commissioned as part of the DAP reporting process (with the most recent carried out in 2004/5).

Additional risk assessment information was collated regarding the capacity of the Wastewater Treatment Works (WwTWs) from STWL and the Environment Agency. This has consisted of STWL's Consented Dry Weather Flow (CDWF) and JR08 data and the Environment Agency publication, 'West Midlands Regional Spatial Strategy (RSS 11):

² Development Options for the West Midlands RSS in Response to the NHPAU Report, Government Office for the West Midlands, Nathaniel Lichfield and Partners, October 2008

³ Wyre Forest District SFRA – Draft Level 2 Report, Royal Haskoning, August 2009

⁴ Wyre Forest District SFRA – Level 1 Report, Royal Haskoning, January 2008

The Impact of Housing Growth on Water Quality and Waste Water Infrastructure’, published in June 2007.

2.6 Water Quality

The Environment Agency has provided the General Quality Assessment (GQA) grades and River Quality Objectives (RQO) for the main watercourses within Wyre Forest District, along with the Catchment Abstraction Management Strategies (CAMS) for the Worcestershire Middle Severn and the Severn Corridor. This data, alongside consultation with the Environment Agency and STWL, was used to provide an assessment of the water quality in the District.

Initial indications show that although river quality across Wyre Forest District is generally good, the downstream section of the Blakedown Brook has been identified as having a significant RQO failure. Levels of phosphates and nitrates in all the watercourses are very high. In the smaller streams and tributaries it is likely that this is because of the arable land uses within the area and upstream. For the main rivers (e.g. the River Stour and the River Severn) the inputs of treated sewage effluent is more likely to be a contributory factor.

2.7 Data Limitations

Although all stakeholders have been helpful with their provision of data and information provided, there are limitations to the analysis due to the level of detail available. For example, STWL were not able to provide direct comment on the SHLAA potential development sites or any of the WwTWs other than Kidderminster (Oldington). In addition it was not possible to update or rerun the existing sewer models presented in the DAP reports to reflect the development projections. This may be a consideration for the Council in a future review of this study or an update to a ‘Phase 3: Detailed WCS’.

In addition, it must be borne in mind that the WMRSS and dWRMP reports, which form the basis of this study, are both currently in Draft form. The conclusions may therefore require adjustment when the final reports are published.

3 WYRE FOREST WATER CYCLE CATCHMENT

3.1 Wyre Forest District

Wyre Forest District lies in the central area of North Worcestershire and is bounded by Malvern Hills District to the West, Wychavon District to the South and Bromsgrove District to the East. It lies to the southwest, and partially within the Green Belt, of the West Midlands conurbation.

The District covers an area of just over 195km² and, in 2001, the population was approximately 97,000. Of this figure, just over 55,000 were located in Kidderminster, 19,000 in Stourport upon Severn and 9,000 in Bewdley (the three towns within the District). The rest of the District is rural, containing a few larger villages and numerous smaller settlements and hamlets. The larger villages include Chaddesley Corbett, Blakedown, Cookley, Fairfield, Shatterford, Upper Arley and Rock. The largest concentration of settlements in the District is along the corridors of the River Severn and the River Stour.

Figure 1 shows the boundaries of Wyre Forest District and includes key features such as main towns, villages, watercourses, roads and railways.

3.2 Water Cycle Infrastructure

3.2.1 Water Supply

Potable water within the whole of Wyre Forest District is provided by Severn Trent Water Limited (STWL). Most of the District is therefore connected by a network of water supply mains. This is discussed in detail in Section 6 of this report.

The main water supply resource within the area is abstraction from the River Severn at Trimpley. However, the Sherwood Sandstone Aquifer, located under the central band of the District provides an additional groundwater supply. Both the River and the aquifer have, besides their primary water supply function, significant environmental value and are vulnerable to overabstraction and pollution. Consideration must therefore be given to the vulnerability of these sources when planning new development. It is important that new development does not cause detriment and should contribute to achieving the goals of the Water Framework Directive, RBMPs and CAMS studies and deliver betterment wherever possible.

3.2.2 Wastewater

Wastewater collection and treatment within the District is the responsibility of STWL. The wastewater produced is treated at a number of Wastewater Treatment Works (WwTW), located mainly within, but also outside the District. The main WwTWs are located in Kidderminster (Oldington), which receive flows from most of the urban areas of Kidderminster, Stourport on Severn and Bewdley. However, there are number of smaller WwTW and pumping stations serving the rest of the District.

The issues relating to wastewater collection and treatment are discussed in detail in Section 7 of this report.

3.2.3 Watercourses

The Main Rivers located within Wyre Forest District are shown on **Figure 1**.

The catchments of the two largest Rivers - the River Severn and the River Stour - roughly bisect the District from north to south with the River Severn and its tributaries draining the western side of the District and the River Stour and its tributaries draining the eastern side. The confluence of the two is located at Stourport on Severn close to the District's southern border. The other Main Rivers within the District are:

- the Dowles Brook;
- the Dick Brook;
- the Riddings Brook;
- the Blakedown Brook; and
- the Hoo Brook.

In addition, Wyre Forest is drained by a number of tributary streams and brooks (ordinary watercourses), also shown on **Figure 1**, including the upstream extents of the Dick Brook, the Blakedown Brook and the Hoo Brook. The additional ordinary watercourses include:

- the Drakelow Brook;
- the Hors Brook;
- the Hockley Brook;
- the Elmley Brook;
- the Hadley Brook;
- the Gladder Brook;
- the Snuffmill Brook;
- the Burnthorne Brook; and
- the Hartlebury Brook.

The District is also bisected from north to south by the Staffordshire and Worcestershire canal, which runs roughly parallel to the River Stour for its entire length from the District boundary, northeast of Cookley, to its confluence with the River Severn at Stourport on Severn.

Numerous pools, balancing ponds and storage areas are located within Wyre Forest District and these are also shown on **Figure 1**. The largest of these, Trimley Reservoir, is a major water supply lake, filled through abstraction from the River Severn and which feeds into both STWL and South Staffordshire Water's supply zones, including many of the settlements within the Wyre Forest District.

4 GROWTH AND DEVELOPMENT WITHIN WYRE FOREST DISTRICT

4.1 Introduction

In order to assess the capacity of the water cycle infrastructure to meet the likely requirements of future development, it is necessary to assume development projection scenarios. However, the inherent difficulty in determining the location of potential development should be recognised, as the precise location of sites will be dependent upon an overall assessment of the findings of numerous individual studies, such as this WCS and the SFRA.

A number of potential development sites (both Greenfield and Brownfield) have been put forward by the Council for consideration within this study. The sites put forward are from a combination of sources and their inclusion within this report does not necessarily mean that development will be forthcoming in these areas over the plan period. The sites are shown, along with the reference numbers referred to in the report, in **Figure 2**. They are shown in three groups – the first includes sites which were assessed within the Level 1 SFRA, the second indicates the additional sites considered in the Level 2 SFRA, whereas the third indicates the additional sites identified as part of the Council's ongoing SHLAA study.

The Council has stated that they expect approximately 60% of the new dwellings to be located in Kidderminster and 30% in Stourport-on-Severn. As the exact locations are not certain all the potential development sites identified will be included in the WCS analysis, although the effect of these two towns as the development epicentres upon water resources and supply and wastewater infrastructure will be considered.

4.2 Development Scenarios

4.2.1 Proposed Scenarios

The WCS has been produced based on development projections provided by the Council. These figures were based on the preferred option presented in the Draft Phase Two WMRSS, published in December 2007, and cover the period 2006 – 2026

Housing

- An additional 3,400 new homes in Wyre Forest District at an indicative rate of 170 dwellings per year

Employment

- 33ha of employment land within the District boundaries (The Council envisages almost all of this allocation to be located within or around the town of Kidderminster)

Other

- 35,000m² of retail floorspace and 40,000m² of new office development, to be located in the strategic centre of Kidderminster

4.2.2 Scenarios for Sensitivity Testing

The WMRSS has not yet been finalised and, as a result of the Baroness Andrews Intervention and resulting Nathaniel Lichfield and Partners⁵ study, it is thought that the housing figures quoted in the Draft Phase Two report will increase. The results of the Nathaniel Lichfield and Partners (NLP) study were published on 7th October 2008 and do indicate the potential for the housing requirement in Wyre Forest District to increase. The report presents three potential growth scenarios representing housing allocations between 51,500 and 80,000 units higher than the draft West Midlands Phase 2 Regional Spatial Strategy Revision. In all three cases, the proposed increase within Wyre Forest District is 400 dwellings. However, emphasis is placed upon the need for these dwellings to be located in rural areas. Prior to the publication of these figures the Council proposed two scenarios of higher development projections for the purposes of sensitivity testing within this WCS – one based on an increase of 500 houses (15%) and one based on an increase of 1000 houses (30%). The first of these sensitivity tests is therefore inline with the results of the NLP study. The second development projection has been retained as a high level sensitivity test. The employment figures have been calculated using the same percentage increase from the draft Phase Two WMRSS as the housing. The NLP study did not address the issue of additional employment requirement to meet the needs of the additional population.

Table 1 outlines these three sensitivity test scenarios:

Table 1: Housing and Employment Scenario figures for the Purposes of Sensitivity Testing

	Scenario 1 <i>(WMRSS Draft Phase 2 Preferred Option)</i>	Scenario 2 <i>(Preferred Option +15% ≈ NLP Study Results)</i>	Scenario 3 <i>(Preferred Option +30%)</i>
Housing	3,400 dwellings	3,900 dwellings	4,400 dwellings
Employment	33ha	38ha	43ha

A further WMRSS update – The WMRSS has moved on a step further whilst this report was being prepared. The Panel Report into the WMRSS was published in September 2009 and identified that for Wyre Forest the proposed development targets were 4,000 new dwellings and 44hectares of employment land, from 2006 - 2026. Although these figures differ from Scenario 1, they are broadly consistent with the sensitivity tested scenarios (2 & 3) and therefore are deemed suitable for being used as a basis for the report without the need for other alternatives to be considered.

⁵ *Commissioned by the Government Office for the West Midlands to look at options for higher housing growth across the Region to meet the Government's aspirations set out in the 2007 Housing Green Paper.*

5 FLOOD RISK

5.1 Introduction

PPS25 identifies flood risk as a material planning consideration, which should be addressed at all stages of the planning process. The issue of flood risk in respect to new development should be considered in terms of:

- Direct flood risk to the new development; and
- Increased flood risk to other areas as a result of an increase in surface water runoff rate.
- Increase in flood risk from development in the floodplain.

This section draws on the findings of the final Level 1 and draft Level 2 Strategic Flood Risk Assessments and considers the potential development sites in terms of the impact of flood risk.

5.2 Wyre Forest District Flood Risk Assessment

This WCS has been prepared in parallel with a Level 2 Strategic Flood Risk Assessment (SFRA) following on from a Level 1 SFRA prepared for the District, by Royal Haskoning, in 2007. The findings in relation to flood risk are therefore based on these two SFRA reports.

The Level 1 SFRA was produced in accordance with PPS25 guidelines (Communities and Local Government, 2006, Planning Policy Statement 25: Development and Flood Risk) and A Practice Guide Companion to PPS25 “Living Draft”, 2007. The Level 2 SFRA was produced in accordance with the PPS25 Guidelines and Development and Flood Risk a Practice Guide, 2008. *Please note this guidance was updated between the draft and finalisation of this report. If required by the Council this WCS should therefore be updated to reflect this update.*

The objectives of the SFRAs are to provide a robust assessment of the extent and nature of the risk of flooding and its implications for land use planning. In addition, the SFRAs set the criteria for the submission of planning applications in the future and for guiding subsequent development control decisions. The increased scope Level 2 SFRA as per paragraph E6 of PPS25 facilitates possible application of the Exception Test and addresses significant flood risk issues within the District, prior to the submission of emerging LDF documents. This more detailed SFRA considers the detailed nature of the flood hazard by building upon the findings of the Level 1 SFRA and takes into account the presence of flood management measures through further detailed hydraulic modeling.

5.2.1 Direct Flood Risk

The majority of proposed new development within the District is located within or around the towns of Kidderminster, Bewdley and Stourport on Severn. The rest of the potential development sites are scattered around the larger villages in the rural areas.

Kidderminster

Flood Risk within Kidderminster is mainly associated with the River Stour. However, the tributary watercourses of the Hoo Brook and the Blakedown Brook, draining from the east (both enmained in their downstream extents) also pose a fluvial flood risk to the potential development sites.

The Level 1 SFRA has also identified problems arising when the River Stour interacts with Staffordshire and Worcestershire Canal, which also bisects Kidderminster, running in very close proximity to the River Stour along its course through the District. In 2007 the River Stour overtopped its banks and, upstream of the Wyre Forest District boundary, the floodwaters interacted with the canal, filling all available freeboard and rapidly conveying floodwaters downstream, resulting in the flooding problems in Kidderminster. Although the threat of flooding from the canal can be alleviated through the control of sluices, it is a source that should be considered for all potential development sites located in proximity to the waterway.

As stated in the Level 2 SFRA there are no recorded instances of groundwater flooding within Kidderminster, but the Level 1 SFRA has detailed historic occurrences of sewer flooding within the town. This is discussed in greater detail within Section 6 through discussion of the capacity of the wastewater network. Pluvial flooding has been modelled and assessed as part of the Level 2 SFRA, indicating greater depths of flooding to the north of the town and lower depths to the south. The results however were not conclusive with regards to individual potential development sites, instead indicating the general routes and depths of flooding across the town as a whole. As such, the results from the pluvial modelling have not been included as part of this WCS assessment, although it is recommended that the Level 2 SFRA is referred to alongside the conclusions of this WCS.

Stourport on Severn

Flood risk within Stourport on Severn is mostly associated with the River Severn, although the River Stour (out-falling into the River Seven within the town) also poses a risk. The Level 2 SFRA also identifies two smaller ordinary watercourses which flow through the town (the Burnthorne Brook and the Hartlebury Brook), but these do not flow in proximity to any of the proposed potential development sites so will not be assessed in detail within this WCS.

As identified above, and within the Level 1 SFRA, the Staffordshire and Worcestershire Canal, which flows through Stourport on Severn and subsequently outfalls into the River Severn, also poses a flood risk due to potential upstream interactions with the River Stour during times of flooding. Although this threat has been successfully alleviated in the past through the operation of sluices releasing water into the River Severn, it is a source that should be considered for all potential development sites located in proximity to the waterway.

The Level 2 SFRA has also considered the threat from pluvial flooding within the town, the historical occurrence of which was noted within the Level 1 SFRA. Although this modelling indicates that pluvial flooding poses a hazard across Stourport on Severn, no particular areas of concern have been identified. It is therefore recommended that the Level 2 SFRA is referred to alongside the conclusions of this WCS, with additional assessment carried out for the drainage networks located in proximity to the proposed potential development sites. The Environment Agency recommend these assessments to be carried out as an input into the Sites Allocation DPD.

A number of historical occurrences of sewer flooding have also been noted within the Level 1 SFRA, most notably to the southern side of the River Severn. This is discussed in greater detail within Section 6 through discussion of the capacity of the wastewater network.

Bewdley

The River Severn bisects the town of Bewdley and is the main source of flood risk. This is currently mitigated through the use of demountable defences throughout the town, although the residual risk from breach or overtopping still remains and has been assessed as part of the Level 2 SFRA.

Additional risk is posed from a number of unnamed watercourses, including Snuffmill Brook, Dowles Brook and Riddings Brook. Of these, only the Riddings Brook poses a risk to the proposed development. Although discussed within the Level 2 SFRA, the Riddings Brook is currently being modelled to a higher standard using 2d TUFLOW modelling as part of a separate study being undertaken by Royal Haskoning for the Environment Agency. This study is due for completion in March 2010 and the results should be referred to before development takes place in this area.

The Level 1 SFRA has identified a couple of occurrences of sewer and storm water flooding within the area. The report also identified the lower end of the Riddings Brook catchment as being “marshy” due to high levels of the water table which may exacerbate any surface water flooding problems. This potentially affects development site SH36 and should be investigated further as part of a site specific FRA. To gain greater certainty on deliverability within a phased time scale, it is recommended that further investigation on storm and surface water is carried out for this site prior to a developer’s FRA.

Rural Wyre Forest District

In addition to the River Severn and River Stour, a number of ordinary watercourses cross the rural areas of Wyre Forest District. Of these it is the Dick Brook, Blakedown Brook, Drakelow Brook, Hors Brook and Hockley Brook which pose a risk to the proposed potential development sites. Although additional modelling has not been carried out for these watercourses, the flood risk has been assessed using the Environment Agency Flood Zones alongside any additional information gathered as part of the Level 1 or Level 2 SFRAs. The sites at risk of rural flooding have been discussed individually within the Level 2 SFRA, however additional analysis should be carried out as part of a site specific FRA.

The Level 1 SFRA identifies some occurrences of surface water and groundwater flooding within the rural areas. The occurrences of surface water flooding are mainly associated with the overwhelming of highway drains on the A456 and A449, of which sites D33, SH128 and SH110 are in proximity. The potential for groundwater flooding has been identified around the village of Wolverley where particular areas are known to be “marshy” due to high water table levels. This may affect sites SH13, SH115, SH121, SH116 and SH70. A site specific FRA should be undertaken for all these sites to investigate these issues further before development commences.

Environment Agency Flood Zones

In accordance with PPS25, the location of new development should initially be based on the Flood Zones defined in the Environment Agency's Flood Map, which refer to the probability of sea and river flooding, ignoring the presence of any defences. **Table 7** below shows the Flood Risk Vulnerability and Flood Zone Compatibility (from PPS25).

Table 7 – Flood Risk Vulnerability and Flood Zone “Compatibility” (from PPS25)

Flood Zone	Definition	Flood Risk Vulnerability Classification				
		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	<i>Low Probability:</i> less than 1:1000 probability of river or sea flooding in any year (<0.1%)	✓	✓	✓	✓	✓
Zone 2	<i>Medium Probability:</i> 1%-0.1% probability of river flooding or 0.5%-0.1% probability of sea flooding in any year	✓	✓	Exception Test Required	✓	✓
Zone 3a	<i>High Probability:</i> >1% probability of river flooding or >0.5% probability of sea flooding in any year	Exception Test Required	✓	✗	Exception Test Required	✓
Zone 3b	<i>Functional Floodplain:</i> annual probability of flooding of 1:20 years (5%) or greater, where flood water flows or is stored	Exception Test Required	✓	✗	✗	✗

The Sequential and Exception Tests

The Sequential Test aims to steer all development to areas at the lowest probability of flooding. When land is allocated for development, the sequential test should be applied to demonstrate that all other sites reasonably available for development in areas at a lower probability of flooding have been considered first.

Following the application of the Sequential Test, there may be valid reasons for considering a development type which is not entirely compatible with the level of flood risk of that site. The Exception Test provides a method of managing flood risk whilst allowing necessary development to occur. However, this does tend to be in exceptional circumstances.

PPS25 states “*The Exception Test is only appropriate for use when there are large areas in Flood Zones 2 and 3, where the Sequential Test alone cannot deliver acceptable sites, but where some continuing development is necessary for wider sustainable development reasons.*”

The Exception Test shows:

- if a proposed development provides wider sustainability benefits that outweigh the increased flood risk;
- that the development does not subsequently increase flood risk;
- that, where possible, the development will reduce flood risk; and
- most importantly that the development will be safe.

The development should also be on previously developed land.

Employment use, including shops, financial, professional and other services, restaurants and cafes, hot food takeaways, offices, general industry, storage and distribution, non residential institutions and assembly and leisure, are identified within PPS25 as being 'Less Vulnerable'. These are therefore permitted in Flood Zones 2 or 3a, following application of the Sequential Test. Residential use is generally classified as 'More Vulnerable', unless it consists of caravans, mobile homes or park homes intended for permanent use or includes basement dwellings, in which case it is classified as 'Highly Vulnerable'. Following application of the Sequential Test, application of the Exception Test is required for More Vulnerable use development in Flood Zone 3a and Highly Vulnerable development in Flood Zone 2.

Figure 7 shows the EA Flood Zones 2 (100 - 1000 year) and 3a (<100 year) for the main watercourses within the District. In addition, the extent of Flood Zone 3b (Functional Floodplain, 25 year), where available from existing modelling studies, is also shown. These indicate that a number of potential development sites within Wyre Forest District are at risk of flooding during these events. However, these Flood Zones do not take into account the presence of flood defence infrastructure and the protection they provide to the potential development sites.

As part of Kidderminster is protected by the relatively new Flood Alleviation Scheme (FAS) and dam and part of Bewdley is protected by the demountable flood defences, it was considered necessary, as part of the Level 2 SFRA, to undertake additional analysis to identify the "real" flood risk to these two towns.

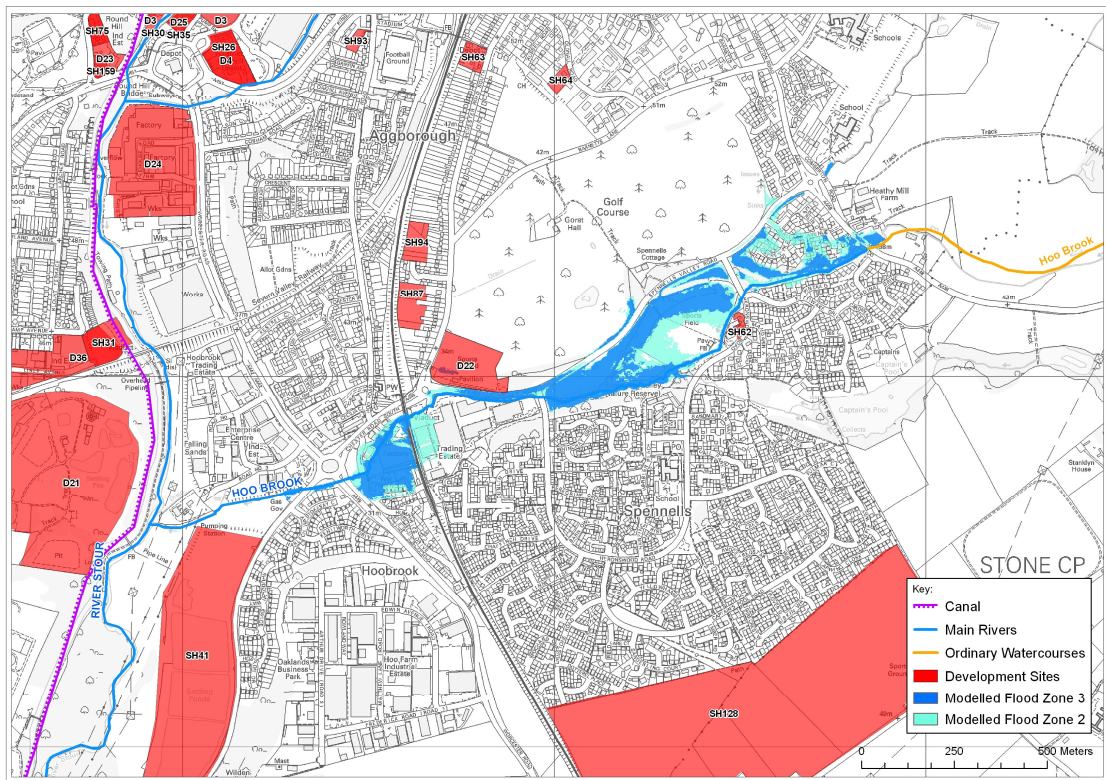
"Real" Flood Risk

The Level 2 SFRA has analysed the "real" flood risk through the construction of 2d TUFLOW models in Kidderminster and Bewdley, which has enabled the modelling of flow paths behind the flood defences. These models have been run for the 1% plus climate change, 0.1% and 0.1% plus climate change scenarios, enabling the identification of rapid inundation zones, flood hazard mapping and the simulation of breaching and overtopping of the defences. Within Kidderminster, breach and overtopping scenarios were also run for the flood storage dam located to the north of the town. The methodology behind this approach, in addition to outputs showing the climate change scenarios, please see Sections 3 and 5 of the Level 2 SFRA.

Figure 8 shows the worst case scenario mapping (both depth and flood hazard) within Kidderminster for the 0.1% plus climate change event. Due to the magnitude of the event both the flood storage dam and all defences in the FAS through the town are overwhelmed. **Figure 9** shows the worst case breaching scenario of the demountable defences in Bewdley for the 0.1% plus climate change event.

As part of the Level 2 SFRA, additional ISIS modelling was carried out for the Hoo Brook through Kidderminster in order to correct misalignments in the Flood Zones identified as part of the Level 1 SFRA. The new Flood Zone extents created as the result of this modelling, and how they compare to the two potential development sites located in proximity to this Brook (D22 and SH62) are shown in **Figure 10** below:

Figure 10 - Modelled Hoo Brook Flood Extents



Summary of Direct Flood Risk

Tables 8a – 8d below summarise the direct flood risk to each of the proposed potential development sites within the District. The Flood Risk is summarised using the Environment Agency Flood Zones, with the exception of sites D22 and SH62, which have been directly affected by the updated Flood Zones produced as part of the Hoo Brook model. However, where the site is located behind either the Kidderminster or Bewdley FAS, it is marked with an asterisk (*) to indicate the site is not at direct risk of flooding during that event due to the protection offered by the defences. Sites in Stourport-on-Severn which are protected by the Kidderminster dam upstream are marked by a cross (†). However, these sites are still at a residual risk of flooding and the Level 2 SFRA should be consulted to determine the risk posed to the site during an overtopping or breach event.

To determine the impact of breach and/or failure of the flood defences, Hazard Mapping was carried out in the Level 2 SFRA for Kidderminster and Bewdley. The results of this hazard mapping and the access/egress route analysis has also been included, where applicable, in the tables below (as shown in Tables 14, 15, 22 and 23 in the Level 2 SFRA). The Level 2 SFRA assessed defence breach, dam breach and dam overtopping scenarios, but only the most conservative and highest hazard ratings have been identified within this WCS. The methodology behind the allocation of hazard ratings and access/egress route constraints is discussed in detail within the Level 2 SFRA. It should be noted that the defences in Bewdley and Kidderminster are not designed to withstand a 100year plus climate change flood event. As such the Level 2 SFRA should be referred to for additional analysis of climate change.

These tables also take into account flood risk from any unmodelled 'ordinary watercourses' and historical surface and sewer flooding (identified and outlined within the Level 1 SFRA). Where a site is at direct risk of fluvial flooding it is highlighted in red. Where a site is at partial risk of fluvial flooding, considered at risk from flooding of an ordinary watercourse or located in an area known to have experienced sewer or surface water flooding in the past, it is highlighted in orange. Similarly, where a site is identified as having a significant or extreme Flood Hazard Rating and/or no access/egress routes it is highlighted in red. Where a site has been identified as having a moderate or low Flood Hazard Rating or having only 1 access/egress route, it is highlighted in orange.

As stated in the Level 2 SFRA, please note that additional modelling is currently be undertaken for the River Stour and, as such, the following results may require update once this data becomes available.

Table 8a – Kidderminster Direct Flood Risk

Unique ID	Location	Functional Floodplain	100 year	1000 year	Source of Flood Risk	Hazard Rating	Access/Egress
D1	Land to Rear of Crossley	No	Yes*	Yes	River Stour Possibly the canal	Extreme	No routes
D3/ SH14/ SH25	KTC.4	Marginal	Partially*	Partially	River Stour, sewers and historically	Extreme	No routes
D4	Council Depot Site	No	No*	Partially	River Stour	Significant	1 route
D5/ SH82	Churchfields Business Park	No	No	No	Possibly the canal	Outside Breach Extent	Outside Breach Extent
D7	Georgian Carpet Factories Site	No	No	No	Possibly the canal		
D8	Lime Kiln Bridge	No	No	No	Possibly the canal		
D9/ SH10	Park Lane Timber Yard	No	No	No	Historically Possibly the canal		
D10/ SH19	BT Site, Mill Street	Marginal	Partially*	Partially	River Stour and historically	Extreme	No routes
D11	Current Morrisons application Site	Partially	Partially*	Partially	River Stour and sewers	Extreme	2+ routes
D12/ SH76	Park Street	No	No	No	None	Outside Breach Extent	Outside Breach Extent
D21	British Sugar Site	No	No	No	None		
D22	Victoria Sports Ground	Not Defined	No	No	None (Originally Hoo Brook)		
D23/ SH75/ SH159	Park Lane	No	Partially	Partially	River Stour	Moderate	2+ routes
D24	Current Sealine Factory (Various Units)	Marginal	Partially*	Partially	River Stour	Extreme	1 route
D25/ SH35	Current Retail Area	Marginal	No*	Yes	River Stour	Significant	No routes
D26	New Road and Market Street	No	Yes*	Yes	River Stour	Significant	No routes
D27	Brintons Offices - Exchange Street	No	Yes*	Yes	River Stour	Low	No routes
D28	Current Morrisons Site & Other Shops	No	No*	Partially	River Stour	Moderate	1 route
D29/ SH60	Worcester St Enhancement Area	No	No	No	None	Outside Breach Extent	Outside Breach Extent
D30/ SH9	Church Street Car Park	Marginal	Partially*	Partially	River Stour and historically from canal	Low	2+ routes


Unique ID	Location	Functional Floodplain	100 year	1000 year	Source of Flood Risk	Hazard Rating	Access/Egress
D31	Puxton	<i>Marginal</i>	Yes*	Yes	River Stour	Extreme	No routes
D33	Lax Lane Craft Centre	No	No	No	Highways	<i>Outside Breach Extent</i>	<i>Outside Breach Extent</i>
D36	Lisle Avenue	No	No	No	None		
D38/SH40	Puxton Site	<i>Marginal</i>	Partially	Partially	River Stour	None	2+ routes
D40	Hoo-Brook Link Road	Partially	Partially	Partially	River Stour	None	2+ routes
D46	Cheshires Printers	No	No	No	None	<i>Outside Breach Extent</i>	<i>Outside Breach Extent</i>
D47/SH81	Kidderminster market auctions	No	No	No	None		
D48/SH71	Comberton Place	No	No	No	None		
D49/SH80	Comberton Hill	No	No	No	None		
D50/SH152	CMS Car Showrooms	No	No	No	None		
D52/SH61	Rock Works	No	No	No	None		
D53	Matalan	No	Partially*	Yes	River Stour Possibly the canal	Extreme	No routes
D54	Worcester Street	No	No	No	None		
SH4	78 MILL STREET	No	Partially*	Partially	River Stour and historically	Extreme	No routes
SH11	CASTLE ROAD / PARK LANE	No	Yes*	Yes	River Stour	Low	1 route
SH18	GEORGIAN CARPETS	No	No*	Partially	River Stour Possibly the canal	Moderate	2+ routes
SH20	PLAYING FIELD ADJ. ST. MARY'S	No	No*	Partially	River Stour Possibly the canal	Low	2+ routes
SH21	REAR PARADE BROADWATERS	Not Defined	Partially	Partially	Blakedown Brook	None	2+ routes
SH30	NEW ROAD CARTERS SITE	<i>Marginal</i>	Partially*	Yes	River Stour	Extreme	No routes
SH31	R&D Aggregates Site	No	No	<i>Marginal</i>	River Stour Possibly the canal	<i>Outside Breach Extent</i>	2+ routes
SH32	PARK LANE	No	Partially	Partially	River Stour	Low	2+ routes
SH38	BED CITY MCF COMPLEX	No	Partially*	Yes	River Stour and historically	Moderate	1 route


Unique ID	Location	Functional Floodplain	100 year	1000 year	Source of Flood Risk	Hazard Rating	Access/Egress
SH39	ELGAR HOUSE GREEN STREET	No	Partially*	Partially	River Stour and historically	Significant	No routes
SH41	FORMER BRITISH SUGAR PONDS		No*	Partially	River Stour	Outside Breach Extent	2+ routes
SH42	MILL BANK GARAGE	No	No*	Marginal	River Stour and historically	Extreme	1 route
SH43	PIANO BUILDING WEAVERSWHARF	No	Yes	Yes	River Stour	Extreme	2+ routes
SH44	ZANZIBARS CASTLE ROAD	No	No*	Yes	River Stour	Significant	2+ routes
SH47	26 WOOD STREET	No	No	No	None	Outside Breach Extent	Outside Breach Extent
SH53	TELEPHONE EX. BLACKWELL ST	No	No	No	None		
SH56	LEA STREET SCHOOL	No	No	No	None		
SH59	SUTTON RESERVOIR	No	No	No	None		
SH62	NURSING HOME, SPENNELLS	No	No	No	None		
SH63	CHESTER RD S. SERVICE STN	No	No	No	None		
SH64	OLDNALL ROAD	No	No	No	None		
SH65	PURAC BUILDING	No	No	No	Highways		
SH69	FRANCHE COMM.CENTRE	No	No	No	None		
SH72	RIFLE RANGE SHOPS	No	No	No	None		
SH73	HURCOTT MAISONETTES	No	No	No	None		
SH74	BROADWATERS COMM. CENTRE	No	No	No	Sewers		
SH78	207 BIRMINGHAM ROAD	No	No	No	Highways		
SH79	CHESTER ROAD BOWLING CLUB	No	No	No	None		
SH80	COMBERTON HILL	No	No	No	None		
SH83	FRANCHE ROAD TRIANGLE	No	No	No	None		
SH84	LAND OFF BROOMFIELD CL.	No	No	No	None		

Unique ID	Location	Functional Floodplain	100 year	1000 year	Source of Flood Risk	Hazard Rating	Access/Egress
SH85	YEW TREE PUB	No	No	No	None	<i>Outside Breach Extent</i>	<i>Outside Breach Extent</i>
SH86	HARRIERS TRADING ESTATE	No	No	No	None		
SH87	S. OF BERNIE CROSSLND WALK	No	No	No	None		
SH88	PLAYING FIELD SUTTON PK RISE	No	No	No	None		
SH91	QUEENS STREET (REDEVT.)	No	No	No	None		
SH93	273/4 HOO RD ST ANDREWS GRN	No	No	No	None		
SH94	N OF BERNIE CROSSLAND WLK	No	No	No	None		
SH95	BLAKEBROOK SCHOOL	No	No	No	None		
SH96	EAGLE'S NEST PH	No	No	No	None		
SH97	AYLMER LODGE SURGERY	No	No	No	None		
SH98	NORTHLND AV. SURGERY	No	No	No	None		
SH105	KING CHARLES 1 SCHOOL	No	No	No	None		
SH106	SUTTON ARMS PH	No	No	No	None		
SH109	HURCOTT ADR	No	No	No	None		
SH111	OFFMORE LANE ALLOTMENTS	No	No	No	None		
SH113	OASIS ARTS & CRAFTS	No	No	No	None		
SH114	REILLOC CHAIN	No	No	No	None		
SH122	THE BRIARS HOTEL	No	No	No	None		
SH125	LAND AT 108-109 BEWDLEY HILL	No	No	No	None		
SH128	STANKLYN LANE	No	No	No	Possibly highways		
SH133	WOLVERLEY TRAFFIC LIGHTS	No	No	No	None		
SH134	R/O 41 CLARENCE ST	No	No	No	None		

Unique ID	Location	Functional Floodplain	100 year	1000 year	Source of Flood Risk	Hazard Rating	Access/Egress
SH135	LAND AT THE LEA	No	No	No	None	<i>Outside Breach Extent</i>	<i>Outside Breach Extent</i>
SH137	ZORTECH AVENUE	No	No	No	Possibly sewers		
SH142	MUSKETEER PH RIFLE RANGE	No	No	No	None		
SH143	LOW HABBERLEY FARM	No	No	No	None		
SH150	CESHIRE SITE	No	No	No	None		
SH151	FRANCHE ROAD	No	No	No	None		
SH153	164-166 SUTTON PARK ROAD	No	No	No	None		
SH154	WINDSOR DRIVE	No	No	No	None		
SH155	WOLVERHAMPTON ROAD	No	No	No	Possibly sewers and highways		
SH156	FRANCHISE STREET	No	No	No	None		
SH157	LONGFELLOW GREEN	No	No	No	None		
SH163	OFF WOLVERLEY RD FRANCHE	No	No	No	None		

Notes

 Direct risk of flooding, 'Extreme' or 'Significant' Flood Hazard Rating and / or no access/egress routes identified in Level 1 and 2 SFRA's

 Partial risk of fluvial flooding, risk of flooding from Ordinary Watercourse, 'Moderate' or 'Low' Flood Hazard Rating and/or 1 access/egress route identified in Level 1 and 2 SFRA's

* Site protected by Kidderminster or Bewdley FAS

† Site protected by Kidderminster Dam FAS


Table 8b – Stourport on Severn Direct Flood Risk


Unique ID	Location	Functional Floodplain	100 year	1000 year	Source of Flood Risk	Hazard Rating	Access/Egress
D2/ SH17	Riverside Business Centre	Yes [†] (not defined)	Yes [†]	Yes	River Stour and groundwater	N/A	N/A
D13/ SH7	STC.2	Partially [†]	Partially [†]	Partially	River Severn and River Stour		
D14/ SH3	STC.3	Partially	Partially	Partially	River Severn and River Stour		

Unique ID	Location	Functional Floodplain	100 year	1000 year	Source of Flood Risk	Hazard Rating	Access/Egress
D15/ SH45	Lichfield Basin	No	No	Partially	River Severn, River Stour, highways and canal (historically)	N/A	N/A
D16	Shipleys Amusement Area	Yes	Yes	Yes	River Severn and historically		
D17	Thomas Vale - Affordable Housing	Not Defined	Partially [†]	Partially	River Stour		
D18	Parsons Chain	Not Defined	No [†]		River Stour		
D19	A.Harris and Sons	Not Defined	No [†]	No			
D34/ SH27/ 34/ 117	Baldwin Road	Not Defined	No [†]	No			
D35/ SH8	STC.4	No	No	Partially	River Severn		
D39	Stourport Relief Road	Partially	Partially	Partially	River Severn and River Stour		
D41/ SH33	ADR - Power Station Road	No	No	Yes	River Severn and River Stour		
D42/ SH28	Car Garages - Worcester Road	No	No*	Yes	River Severn and River Stour		
D43/ SH57	Stourport Civic Centre	No	No	No	None		
D44/ SH15	Lickhill Lodge First School	Marginal	Marginal	Partially	River Severn		
SH5	BALDWIN ROAD LOCAL PLAN SITE	Not Defined	No*	Marginal	River Stour		
SH16	PARSONS CHAIN	No	No*	Partially	River Severn		
SH37	LAND AT MOORHALL LANE	No	Partially	Partially	River Severn		
SH46	TONTINE BUILDINGS	No	No	Yes	River Severn and historically		
SH48	CHICHESTER CARAVANS	No	No	No	Possibly canal		
SH49	TAN LANE FIRST SCHOOL	No	No	No	None		
SH50	VALE ROAD GARAGE	No	No	No	Possibly canal		
SH51	A-Z WEDDING SERVICES	No	No	No	None		
SH52	ARELEY COMMON 1 ST SCH	No	No	No	None		

Unique ID	Location	Functional Floodplain	100 year	1000 year	Source of Flood Risk	Hazard Rating	Access/Egress
SH54	MARTLEY ROAD	No	No	No	None (possible from unmodelled watercourse)	N/A	N/A
SH55	BRIDGE STREET MALL	No	No	No	Possibly sewers		
SH67	QUEENS ROAD WALSHES	No	No	No	Possibly sewers		
SH68	WALSHEs COMM. CENTRE	No	No	No	Possibly sewers		
SH89	MORGAN MATROC	No	No	No	None		
SH92	Garage Block ADJ Areley Com. SCH	No	No	No	None		
SH99	TESCO&BEDLAND STORES	No	No	No	Possibly canal		
SH100	20 LORNE STREET	No	No	No	None		
SH101	MERRIHILL MITTON GARDNS	No	No	No	Possibly canal		
SH102	COUNTY BUILDINGS	No	No	No	Possibly canal		
SH103	THE MANOR PH	No	No	No	None		
SH104	MIDLAND IND. PLASTICS	No	No	No	None		
SH118	MANOR ROAD DEPOT	No	No	No	None		
SH124	MITTON STREET	No	No	No	None		
SH138	BOURNEWOOD NURSERIES	No	No	No	None		

Notes

 Direct risk of flooding, 'Extreme' or 'Significant' Flood Hazard Rating and / or no access/egress routes identified in Level 1 and 2 SFRA's

 Partial risk of fluvial flooding, risk of flooding from Ordinary Watercourse, 'Moderate' or 'Low' Flood Hazard Rating and/or 1 access/egress route identified in Level 1 and 2 SFRA's


* Site protected by Kidderminster or Bewdley FAS


† Site protected by Kidderminster Dam FAS

Table 8c – Bewdley Direct Flood Risk

Unique ID	Location	Functional Floodplain	100 year	1000 year	Source of Flood Risk	Hazard Rating	Access/Egress
D6 SH1	Load Street	No	Partially [*]	Yes	River Severn (historically)	Significant	2+ routes
D32	Lax Lane Craft Centre	No	Yes [*]	Yes	River Severn and Snuffmill Brook (historically)	Significant	1 route
		+ potentially Snuffmill Brook (unmodelled)					
D45/SH22	Butt Town Meadow Caravan Park	Marginally	Partially	Yes	River Severn and historically	Outside breach extent	Outside breach extent
SH2	TEXACO GARAGE BEWDLEY	No	No	Yes	River Severn		
SH36	STOURPORT ROAD BEWDLEY	No	No	Yes	River Severn and possibly Riddings Brook		
		+ potentially Riddings Brook (unmodelled)					
SH66	WRIBBENHALL FIRST SCHOOL	No	No	No	None		
SH77	LAND AT 71-73 KIDDRMNSTR RD	No	No	No	Sewers and potentially Riddings Brook		
		+ potentially Riddings Brook (unmodelled)					
SH136	WYRE HILL	No	No	No	None		
SH145	The Allotments Grey Green Farm	No	No	No	None		
SH146	Front Meadows, Grey Green FRM	No	No	No	Possibly Riddings Brook		
		+ potentially Riddings Brook (unmodelled)					
SH148	LAND SOUTH OF LODGE CLOSE	No	No	No	Possibly Riddings Brook		
		+ potentially Riddings Brook (unmodelled)					
SH149	REAR CATCHEMS END FISH BAR	No	No	No	Possibly Riddings Brook		
		+ potentially Riddings Brook (unmodelled)					

Notes

 Direct risk of flooding, 'Extreme' or 'Significant' Flood Hazard Rating and / or no access/egress routes identified in Level 1 and 2 SFRAs

 Partial risk of fluvial flooding, risk of flooding from Ordinary Watercourse, 'Moderate' or 'Low' Flood Hazard Rating and/or 1 access/egress route identified in Level 1 and 2 SFRAs

* Site protected by Kidderminster or Bewdley FAS


† Site protected by Kidderminster Dam FAS


Table 8d – Rural Wyre Forest Direct Flood Risk

Unique ID	Location	Functional Floodplain	100 year	1000 year	Source of Flood Risk	Hazard Rating	Access/Egress
D20	Wilden Lane	<i>Marginal</i>	Partially	Partially	River Stour	N/A	N/A
D37/ SH29	Titan Steel Wheels - Cookley	Not Defined	Partially	Partially	River Stour and historically	N/A	N/A
D51/ SH107	Lea Castle Hospital	No	No	No	None		
SH6	BLACKSTONE BARNs	No	No	Yes	River Severn		
SH12	ROCK TAVERN, CAUNsALL ROAD	Not Defined	No	Partially	River Stour		
SH13	MANOR HOUSE WOLVERLEY	Not Defined	Partially	Partially	River Stour, possibly Drakelow Brook		
SH23	ADJ CHADD. CORB. SURGERY	Not Defined	Partially	Partially	Hockley Brook		
SH58	LAND AT HEMMING WAY	No	No	No	None		
SH70	WOLVERLEY COURT	No	No	No	Possibly canal		
SH90	BUTTS LANE STONE	No	No	No	None		
SH108	KIMBERLEE AVENUE ADR	No	No	No	None		
SH110	BLAKEDOWN NURSERIES ADR	No	No	No	None		
SH112	ADJ. 29 CASTLE RD COOKLEY	No	No	No	None		
SH115	SEBRIGHT ROAD	No	No	No	None		
SH116	FAIRFIELD ADR	No	No	No	None		
SH119	WILDEN TOP ADR	No	No	No	None		
SH120	CHAD. CORBETT SCHOOL	No	No	No	None		
SH121	HAYES ROAD ADR	No	No	No	None		
SH123	OXBINE CALLOW HILL	No	No	No	None		
SH126	ORCHARD CL, BLISS GATE	No	No	No	None		
SH127	GARAGE THE GRN CHAD CORB	No	No	No	None		

Unique ID	Location	Functional Floodplain	100 year	1000 year	Source of Flood Risk	Hazard Rating	Access/Egress
SH129	LAND AT STONE HILL	No	No	No	None	N/A	N/A
SH130	LAND AT FOLD FARM	No	No	No	None		
SH131	LAWNSWOOD WESTHEAD RD	No	No	No	Possibly canal		
SH132	BROWN WESTHEAD PARK	No	No	No	None		
SH139	BINE LANE BLISS GATE	No	No	No	None		
SH140	LAND AT FAR FOREST	No	No	No	None		
SH141	LAND AT SHATTERFORD	No	No	No	None		
SH144	OPPOSITE EAST VIEW CLOWSTOP	No	No	No	None		
SH147	land rear of 92 Wilden Lane	No	No	No	None		
SH158	TERRACE CLOWS TOP	No	No	No	None		
SH160	LAND OFF BRIAR HILL	No	No	No	None		
SH161	HEMMING WAY CHAD. CORBETT	No	No	No	None		
SH162	GLEBE LAND WOLVERLEY RD	No	No	<i>Marginal</i>	Drakelow Brook		

Notes

 Direct risk of flooding, 'Extreme' or 'Significant' Flood Hazard Rating and / or no access/egress routes identified in Level 1 and 2 SFRAs

 Partial risk of fluvial flooding, risk of flooding from Ordinary Watercourse, 'Moderate' or 'Low' Flood Hazard Rating and/or 1 access/egress route identified in Level 1 and 2 SFRAs

* Site protected by Kidderminster or Bewdley FAS

† Site protected by Kidderminster Dam FAS

5.2.2 Additional Flood Risk

In addition to the risk from direct flooding, the increase in flood risk to the rest of the District, resulting from runoff attributed to the development of sites, must be considered. In line with the requirements of PPS25, the use of SUDS and, in particular, source control measures should be optimised in new developments to minimise the impact of additional run-off. Most sites should be able to accommodate some form of SUDS depending on their characteristics (see Section 8.3 and **Appendix D** for more details). However, some sites will pose a much greater risk to other development than others and will require prioritisation when considering the implementation of SUDS.

Although the suitability of SUDS (with regards to underlying Source Protection Zones and the Brownfield/Greenfield nature for each of the potential development sites) is considered separately in Section 8 and **Figure 24**, this Section highlights the potential development sites which drain into potentially problematic watercourses and are therefore key locations for consideration of the potential implementation of SUDS practices.

Certain watercourses have been identified in the Level 1 and Level 2 SFRA and the Wyre Forest Watercourse Management Advisory Study⁶ as being prone to flooding due to their capacity, the capacity of culverts along their length or tendency to block (i.e. Riddings Brook and Dick Brook). These watercourses will therefore be sensitive to the influx of additional runoff, especially in times of heavy rainfall, potentially increasing the flood risk downstream. The potential development sites which are located in proximity to and from which drainage would naturally feed into these watercourses are highlighted in red in **Tables 9a - 9d** below. A number of other watercourses exist, which, although no particular capacity problems have been identified, drain through urban areas and are therefore constrained in their capacity, (i.e. Blakedown Brook, Hoo Brook, Hors Brook, Snuffmill Brook, Riddings Brook and Hartlebury Brook). The potential development sites which are located in proximity to, and would naturally drain into, these watercourses are highlighted in orange. The watercourses which drain into the River Severn and the River Stour have not been highlighted within this analysis. Although it is still important to minimise surface runoff from these sites and utilise SUDS as far as possible, these Rivers are significantly large in size for the runoff not to cause an immediate noticeable difference from individual potential development sites, although the cumulative effect would be more significant. It is therefore of paramount importance that the runoff from these sites does not go unchecked and SUDS techniques should be applied which are compatible with the site specific ground conditions (see Section 8.3). A Surface Water Management Plan (SWMP) would assist with this analysis.

⁶ Wyre Forest District Watercourse Management Advisors, Royal Haskoning, March 2008

Table 9a – Kidderminster Additional Flood Risk

Unique ID	Location	Greenfield/ Brownfield	Watercourse	Watercourse identified as having limited capacity	Watercourse drains through urban area
D1	Land to Rear of Crossley	Brownfield			
D3/ SH14/ SH25	KTC.4	Brownfield			
D4	Council Depot Site	Brownfield			
D5/ SH82	Churchfields Business Park	Brownfield			
D7	Georgian Carpet Factories Site	Brownfield			
D8	Lime Kiln Bridge	Brownfield			
D9/ SH10	Park Lane Timber Yard	Brownfield			
D10/ SH19	BT Site, Mill Street	Brownfield			
D11	Current Morrisons application Site	Brownfield			
D12/ SH76	Park Street	Brownfield			
D21	British Sugar Site	Brownfield			
D22	Victoria Sports Ground	Greenfield	Hoo Brook		
D23/ SH75/ SH159	Park Lane	Brownfield			
D24	Current Sealine Factory (Various Units)	Brownfield			
D25/ SH35	Current Retail Area	Brownfield			
D26	New Road and Market Street	Brownfield			
D27	Brintons Offices - Exchange Street	Brownfield			
D28	Current Morrisons Site & Other Shops	Brownfield			
D29/ SH60	Worcester St Enhancement Area	Brownfield			
D30/ SH9	Church Street Car Park	Brownfield			

Unique ID	Location	Greenfield/ Brownfield	Watercourse	Watercourse identified as having limited capacity	Watercourse drains through urban area
D31	Puxton	Greenfield			
D33	Lax Lane Craft Centre	Brownfield			
D36	Lisle Avenue	Brownfield			
D38/ SH40	Puxton Site	Greenfield			
D40	Hoo-Brook Link Road	N/A			
D46	Cheshires Printers	Brownfield			
D47/ SH81	Kidderminster market auctions	Brownfield			
D48/ SH71	Comberton Place	Brownfield			
D49/ SH80	Comberton Hill	Brownfield			
D50/ SH152	CMS Car Showrooms	Brownfield			
D52/ SH61	Rock Works	Brownfield			
D53	Matalan	Brownfield			
D54	Worcester Street	Brownfield			
SH4	78 MILL STREET	Brownfield			
SH11	CASTLE ROAD / PARK LANE	Brownfield			
SH18	GEORGIAN CARPETS	Brownfield			
SH20	PLAYING FIELD ADJ. ST. MARY'S	Greenfield			
SH21	REAR PARADE BROADWATERS	Greenfield	Blakedown Brook		
SH30	NEW ROAD CARTERS SITE	Brownfield			
SH31	R&D Aggregates Site	Brownfield			
SH32	PARK LANE	Brownfield			

Unique ID	Location	Greenfield/ Brownfield	Watercourse	Watercourse identified as having limited capacity	Watercourse drains through urban area
SH38	BED CITY MCF COMPLEX	Brownfield			
SH39	ELGAR HOUSE GREEN STREET	Brownfield			
SH41	FORMER BRITISH SUGAR PONDS	Greenfield			
SH42	MILL BANK GARAGE	Brownfield			
SH43	PIANO BUILDING WEAVERSWHARF	Brownfield			
SH44	ZANZIBARS CASTLE ROAD	Brownfield			
SH47	26 WOOD STREET	Brownfield			
SH53	TELEPHONE EX. BLACKWELL ST	Brownfield			
SH56	LEA STREET SCHOOL	Brownfield			
SH59	SUTTON RESERVOIR	Brownfield			
SH62	NURSING HOME, SPENNELLS	Brownfield	Hoo Brook		
SH63	CHESTER RD S. SERVICE STN	Brownfield			
SH64	OLDNALL ROAD	Brownfield			
SH65	PURAC BUILDING	Brownfield			
SH69	FRANCHE COMM.CENTRE	Brownfield			
SH72	RIFLE RANGE SHOPS	Brownfield			
SH73	HURCOTT MAISONETTES	Brownfield			
SH74	BROADWATERS COMM. CENTRE	Brownfield	Blakedown Brook		
SH78	207 BIRMINGHAM ROAD	Brownfield			
SH79	CHESTER ROAD BOWLING CLUB	Greenfield			
SH83	FRANCHE ROAD TRIANGLE	Greenfield			

Unique ID	Location	Greenfield/ Brownfield	Watercourse	Watercourse identified as having limited capacity	Watercourse drains through urban area
SH84	LAND OFF BROOMFIELD CL.	Brownfield			
SH85	YEW TREE PUB	Brownfield	Blakedown Brook		
SH86	HARRIERS TRADING ESTATE	Brownfield			
SH87	S. OF BERNIE CROSSLND WALK	Greenfield	Hoo Brook		
SH88	PLAYING FIELD SUTTON PK RISE	Greenfield			
SH91	QUEENS STREET (REDEVT.)	Brownfield			
SH93	273/4 HOO RD ST ANDREWS GRN	Brownfield			
SH94	N OF BERNIE CROSSLAND WLK	Brownfield	Hoo Brook		
SH95	BLAKEBROOK SCHOOL	Brownfield			
SH96	EAGLE'S NEST PH	Brownfield			
SH97	AYLMER LODGE SURGERY	Brownfield			
SH98	NORTHLND AV. SURGERY	Brownfield			
SH105	KING CHARLES 1 SCHOOL	Brownfield			
SH106	SUTTON ARMS PH	Brownfield			
SH109	HURCOTT ADR	Greenfield	Blakedown Brook		
SH111	OFFMORE LANE ALLOTMENTS	Greenfield			
SH113	OASIS ARTS & CRAFTS	Brownfield			
SH114	REILLOC CHAIN	Brownfield			
SH122	THE BRIARS HOTEL	Brownfield			
SH125	LAND AT 108-109 BEWDLEY HILL	Brownfield			
SH128	STANKLYN LANE	Greenfield			

Unique ID	Location	Greenfield/ Brownfield	Watercourse	Watercourse identified as having limited capacity	Watercourse drains through urban area
SH133	WOLVERLEY TRAFFIC LIGHTS	Greenfield	Blakedown Brook		
SH134	R/O 41 CLARENCE ST	Brownfield			
SH135	LAND AT THE LEA	Greenfield			
SH137	ZORTECH AVENUE	Brownfield			
SH142	MUSKETEER PH RIFLE RANGE	Brownfield			
SH143	LOW HABBERLEY FARM	Greenfield			
SH150	CHESHIRE SITE	Brownfield			
SH151	FRANCHE ROAD	Brownfield			
SH153	164-166 SUTTON PARK ROAD	Brownfield			
SH154	WINDSOR DRIVE	Brownfield			
SH155	WOLVERHAMPTON ROAD	Brownfield	Blakedown Brook		
SH156	FRANCHISE STREET	Brownfield			
SH157	LONGFELLOW GREEN	Brownfield			
SH163	OFF WOLVERLEY RD FRANCHE	Greenfield			

Table 9b – Stourport on Severn – Additional Flood Risk

Unique ID	Location	Greenfield/ Brownfield	Watercourse	Additional runoff poses an issue to existing development	Major upgrade to existing drainage system required
D2/ SH17	Riverside Business Centre	Brownfield			
D13/ SH7	STC.2	Brownfield			
D14/ SH3	STC.3	Brownfield			
D15/ SH45	Lichfield Basin	Brownfield			
D16	Shipleys Amusement Area	Brownfield			
D17	Thomas Vale - Affordable Housing	Brownfield			
D18	Parsons Chain	Brownfield			
D19	A.Harris and Sons	Brownfield			
D34/ SH27/ 34/ 117	Baldwin Road	Brownfield			
D35/ SH8	STC.4	Brownfield			
D39	Stourport Relief Road				
D41/ SH33	ADR - Power Station Road	Brownfield	Hartlebury Brook		
D42/ SH28	Car Garages - Worcester Road	Brownfield			
D43/ SH57	Stourport Civic Centre	Brownfield			
D44/ SH15	Lickhill Lodge First School	Brownfield			
SH5	BALDWIN ROAD LOCAL PLAN SITE	Brownfield			
SH16	PARSONS CHAIN	Brownfield			
SH37	LAND AT MOORHALL LANE	Greenfield			
SH46	TONTINE BUILDINGS	Brownfield			
SH48	CHICHESTER CARAVANS	Brownfield			

Unique ID	Location	Greenfield/ Brownfield	Watercourse	Additional runoff poses an issue to existing development	Major upgrade to existing drainage system required
SH49	TAN LANE FIRST SCHOOL	Brownfield			
SH50	VALE ROAD GARAGE	Brownfield			
SH51	A-Z WEDDING SERVICES	Brownfield			
SH52	ARELEY COMMON 1 ST SCH	Brownfield			
SH54	MARTLEY ROAD	Brownfield			
SH55	BRIDGE STREET MALL	Brownfield			
SH67	QUEENS ROAD WALSHES	Brownfield			
SH68	WALSHES COMM. CENTRE	Brownfield			
SH89	MORGAN MATROC	Brownfield			
SH92	Garage Block ADJ Areley Com. SCH	Brownfield			
SH99	TESCO&BEDLAND STORES	Brownfield			
SH100	20 LORNE STREET	Brownfield			
SH101	MERRIHILL MITTON GARDNS	Brownfield			
SH102	COUNTY BUILDINGS	Brownfield			
SH103	THE MANOR PH	Brownfield			
SH104	MIDLAND IND. PLASTICS	Brownfield			
SH118	MANOR ROAD DEPOT	Brownfield			
SH124	MITTON STREET	Brownfield			
SH138	BOURNEWOOD NURSERIES	Brownfield			

Table 9c – Bewdley – Additional Flood Risk

Unique ID	Location	Greenfield/ Brownfield	Watercourse	Additional runoff poses an issue to existing development	Major upgrade to existing drainage system required
D6/ SH1	Load Street	Brownfield			
D32	Lax Lane Craft Centre	Brownfield			
D45/ SH22	Butt Town Meadow Caravan Park	Brownfield			
SH2	TEXACO GARAGE BEWDLEY	Brownfield			
SH36	STOURPORT ROAD BEWDLEY	Greenfield	Riddings Brook		
SH66	WRIBBENHALL FIRST SCHOOL	Brownfield	Riddings Brook		
SH77	LAND AT 71-73 KIDDRMNSTR RD	Brownfield	Riddings Brook		
SH136	WYRE HILL	Brownfield			
SH145	The Allotments Grey Green Farm	Greenfield	Riddings Brook		
SH146	Front Meadows, Grey Green FRM	Greenfield	Riddings Brook		
SH148	LAND SOUTH OF LODGE CLOSE	Greenfield	Riddings Brook		
SH149	REAR CATCHEMS END FISH BAR	Greenfield	Riddings Brook		

Table 9d – Rural Wyre Forest – Additional Flood Risk

Unique ID	Location	Greenfield/ Brownfield	Watercourse	Additional runoff poses an issue to existing development	Major upgrade to existing drainage system required
D20	Wilden Lane	Mixed			
D37/ SH29	Titan Steel Wheels - Cookley	Brownfield			
D51/ SH107	Lea Castle Hospital	Brownfield			
SH6	BLACKSTONE BARNs	Greenfield			
SH12	ROCK TAVERN, CAUNSALL ROAD	Brownfield			
SH13	MANOR HOUSE WOLVERLEY	Brownfield			
SH23	ADJ CHADD. CORB. SURGERY	Greenfield			
SH58	LAND AT HEMMING WAY	Greenfield			
SH70	WOLVERLEY COURT	Brownfield			
SH90	BUTTS LANE STONE	Brownfield			
SH108	KIMBERLEE AVENUE ADR	Greenfield			
SH110	BLAKEDOWN NURSERIES ADR	Brownfield	Blakedown Brook		
SH112	ADJ. 29 CASTLE RD COOKLEY	Greenfield			
SH115	SEBRIGHT ROAD	Greenfield			
SH116	FAIRFIELD ADR	Greenfield			
SH119	WILDEN TOP ADR	Greenfield			
SH120	CHAD. CORBETT SCHOOL	Brownfield			
SH121	HAYES ROAD ADR	Greenfield			
SH123	OXBINE CALLOW HILL	Brownfield			
SH126	ORCHARD CL, BLISS GATE	Brownfield			
SH127	GARAGE THE GRN CHAD CORB	Brownfield			

Unique ID	Location	Greenfield/ Brownfield	Watercourse	Additional runoff poses an issue to existing development	Major upgrade to existing drainage system required
SH129	LAND AT STONE HILL	Greenfield	Hoo Brook		
SH130	LAND AT FOLD FARM	Greenfield			
SH131	LAWNSWOOD WESTHEAD RD	Greenfield			
SH132	BROWN WESTHEAD PARK	Greenfield			
SH139	BINE LANE BLISS GATE	Greenfield			
SH140	LAND AT FAR FOREST	Brownfield			
SH141	LAND AT SHATTERFORD	Brownfield			
SH144	OPPOSITE EAST VIEW CLOWSTOP	Greenfield	Dick Brook		
SH147	land rear of 92 Wilden Lane	Greenfield			
SH158	TERRACE CLOWS TOP	Brownfield	Dick Brook		
SH160	LAND OFF BRIAR HILL	Greenfield			
SH161	HEMMING WAY CHAD. CORBETT	Greenfield			
SH162	GLEBE LAND WOLVERLEY RD	Greenfield			

5.2.3 Overall Flood Risk

By combining the results from the analysis of direct flood risk and additional flood risk mentioned in Sections 5.2.1 and 5.2.2 above, a traffic light colour code system of overall flood risk has been constructed for all the potential development sites.



- **Low Flood Risk**

⇒ No Direct Flood Risk:

- not identified within Flood Zones;
- 2+ access/egress routes; and
- no hazard identified/outside breach extent

*(not highlighted orange or red in **Tables 8a - 8d**)*

and

⇒ No Additional Flood Risk - fits with existing drainage system
*(Not highlighted in orange or red in **Tables 9a - 9d**)*

NOTE: although these sites are identified as fitting within the existing drainage system, the Environment Agency would wish to see all Greenfield sites drain at the same rate post development as they did prior to development to minimise the impact and risk of flooding



- **Medium Flood Risk**

⇒ Some Direct Flood Risk:

- partial Main River source or from ordinary watercourse or non fluvial; and/or
- low or moderate hazard identified; and/or
- 1 access/egress route identified

*(highlighted in orange in **Tables 8a - 8d**)*

and/or

⇒ Some Additional Flood Risk - additional runoff poses an issue to existing development

*(highlighted in orange in **Tables 9a - 9d**)*



- **Significant Flood Risk**

⇒ Direct Flood Risk:

- within Flood Zones 2 or 3; and/or
- no access/egress routes, and/or
- significant or extreme hazard

*(highlighted in red in **Tables 8a - 8d**)*

and/or

⇒ Additional Flood Risk - major upgrade required to additional drainage system *(highlighted in red in **Tables 9a - 9d**)*

Tables 10a – 10d show the traffic light colour with regard to flood risk assigned to each of the potential development sites within the District. The flood risk is summarised in **Figure 11**.

Table 10a – Kidderminster – Overall Flood Risk

Unique ID	Area	Brownfield/ Greenfield	Location	Overall Flood Risk
D1	1.1	Brownfield	Land to Rear of Crossley	R
D3/SH14/25	8.8	Brownfield	KTC.4	R
D4	1.2	Brownfield	Council Depot Site	R
D5/SH82	7.1	Brownfield	Churchfields Business Park	Y
D7	4.5	Brownfield	Georgian Carpet Factories Site	Y
D8	0.5	Brownfield	Lime Kiln Bridge	Y
D9/SH10	1.0	Brownfield	Park Lane Timber Yard	Y
D10/SH19	0.6	Brownfield	BT Site, Mill Street	R
D11	3.6	Brownfield	Current Morrisons application Site	R
D12/SH76	1.7	Brownfield	Park Street	G
D21	23.9	Brownfield	British Sugar Site	G
D22	2.2	Greenfield	Victoria Sports Ground	Y
D23/SH75/ SH159	0.9	Brownfield	Park Lane	Y
D24	6.5	Brownfield	Current Sealine Factory (Various Units)	R
D25/SH35	0.6	Brownfield	Current Retail Area	R
D26	0.5	Brownfield	New Road and Market Street	R
D27	0.2	Brownfield	Brintons Offices - Exchange Street	R
D28	1.2	Brownfield	Current Morrisons Site and Other Shops	Y
D29/SH60	0.6	Brownfield	KTC.3 - Worcester Street Enhancement Area	G
D30/SH9	0.1	Brownfield	Church Street Car Park	Y
D31	7.3	Greenfield	Puxton	R
D33	0.3	Brownfield	Lax Lane Craft Centre/WVRS/British Red Cross	Y
D36	5.3	Brownfield	Lisle Avenue	G
D38/SH40	1.7	Greenfield	Puxton Site	Y
D40	<i>1124m (Road)</i>		Hoo-Brook Link Road	Y
D46	0.3	Brownfield	Cheshires Printers	G
D47/SH81	0.4	Brownfield	Kidderminster market auctions	G
D48/SH71	0.1	Brownfield	Comberton Place	G
D49/SH80	0.1	Brownfield	Comberton Hill	G
D50/SH152	0.9	Brownfield	CMS Car Showrooms	G
D52/SH61	0.3	Brownfield	Rock Works	G
D53	0.7	Brownfield	Matalan	R
D54	1.5	Brownfield	Worcester Street	G
SH4	0.3	Brownfield	78 MILL STREET	R
SH11	0.1	Brownfield	CASTLE ROAD / PARK LANE	R
SH18	5.4	Brownfield	GEORGIAN CARPETS	G
SH20	1.0	Greenfield	PLAYING FIELD ADJACENT ST. MARY'S SCHOOL	G
SH21	0.3	Greenfield	REAR OF THE PARADE BROADWATERS	Y
SH30	0.8	Brownfield	NEW ROAD CARTERS SITE	R
SH31	1.0	Brownfield	R&D Aggregates Site	Y
SH32	0.1	Brownfield	PARK LANE	Y

Unique ID	Area	Brownfield/ Greenfield	Location	Overall Flood Risk
SH38	0.8	Brownfield	BED CITY MCF COMPLEX	R
SH39	0.5	Brownfield	ELGAR HOUSE GREEN STREET	R
SH41	15.3	Greenfield	FORMER BRITISH SUGAR SETTLING PONDS	Y
SH42	0.1	Brownfield	MILL BANK GARAGE	R
SH43	0.1	Brownfield	PIANO BUILDING WEAVERS WHARF	R
SH44	0.3	Brownfield	ZANZIBARS CASTLE ROAD KIDDERMINSTER	R
SH47	0.1	Brownfield	26 WOOD STREET	G
SH53	0.2	Brownfield	TELEPHONE EXCHANGE BLACKWELL STREET	G
SH56	0.5	Brownfield	LEA STREET SCHOOL	G
SH59	1.7	Brownfield	SUTTON RESERVOIR	G
SH62	0.1	Brownfield	HERONS NURSING HOME, SPENNELLS	Y
SH63	0.4	Brownfield	CHESTER ROAD SOUTH SERVICE STATION	G
SH64	0.2	Brownfield	OLDNALL ROAD	G
SH65	0.3	Brownfield	PURAC BUILDING	Y
SH69	0.8	Brownfield	FRANCHE COMMUNITY CENTRE	G
SH72	0.3	Brownfield	RIFLE RANGE SHOPS	G
SH73	1.1	Brownfield	HURCOTT MAISONNETTES	G
SH74	0.5	Brownfield	BROADWATERS COMMUNITY CENTRE	Y
SH78	0.2	Brownfield	207 BIRMINGHAM ROAD KIDDERMINSTER	Y
SH79	0.4	Greenfield	CHESTER ROAD BOWLING CLUB	G
SH83	1.1	Greenfield	FRANCHE ROAD TRIANGLE	G
SH84	0.8	Brownfield	LAND OFF BROOMFIELD CLOSE	G
SH85	0.3	Brownfield	YEW TREE PUB	Y
SH86	0.5	Brownfield	HARRIERS TRADING ESTATE	G
SH87	0.8	Greenfield	SOUTH OF BERNIE CROSSLND WALK	Y
SH88	1.6	Greenfield	PLAYING FIELD OFF SUTTON PARK RISE	G
SH91	0.3	Brownfield	QUEENS STREET (REDEVELOPMENT)	G
SH93	0.2	Brownfield	273/4 HOO ROAD (ADJ. ST.ANDREWS GREEN	G
SH94	0.6	Brownfield	NORTH OF BERNIE CROSSLAND WALK	Y
SH95	1.3	Brownfield	BLAKEBROOK SCHOOL / COUNTY BUILDINGS	G
SH96	0.3	Brownfield	EAGLE'S NEST PH	G
SH97	0.2	Brownfield	AYLMER LODGE SURGERY	G
SH98	0.1	Brownfield	NORTHUMBERLAND AVENUE SURGERY	G
SH105	5.8	Brownfield	KING CHARLES 1 SCHOOL	G
SH106	0.4	Brownfield	SUTTON ARMS PH	G
SH109	14.0	Greenfield	HURCOTT ADR	A
SH111	3.6	Greenfield	OFFMORE LANE ALLOTMENTS	G
SH113	1.8	Brownfield	OASIS ARTS & CRAFTS	G
SH114	0.9	Brownfield	REILLOC CHAIN	G
SH122	0.5	Brownfield	THE BRIARS HOTEL	G
SH125	0.6	Brownfield	LAND AT 108-109 BEWDLEY HILL	G
SH128	39.5	Greenfield	STANKLYN LANE	Y
SH133	18.1	Greenfield	LAND AT WOLVERLEY TRAFFIC LIGHTS	Y
SH134	0.0	Brownfield	R/O 41 CLARENCE STREET	G

Unique ID	Area	Brownfield/ Greenfield	Location	Overall Flood Risk
SH135	1.6	Greenfield	LAND AT THE LEA	G
SH137	3.2	Brownfield	ZORTECH AVENUE	Y
SH142	0.2	Brownfield	MUSKETEER PH RIFLE RANGE	G
SH143	95.2	Greenfield	LOW HABBERLEY FARM	G
SH150	0.3	Brownfield	CHESHIRE SITE	G
SH151	0.2	Brownfield	FRANCHE ROAD	G
SH153	0.9	Brownfield	164-166 SUTTON PARK ROAD	G
SH154	0.8	Brownfield	WINDSOR DRIVE KIDDERMINSTER	G
SH155	0.2	Brownfield	WOLVERHAMPTON ROAD KIDDERMINSTER	Y
SH156	0.9	Brownfield	FRANCHISE STREET KIDDERMINSTER	G
SH157	0.8	Brownfield	LONGFELLOW GREEN KIDDERMINSTER	G
SH163	2.7	Greenfield	LAND OFF WOLVERLEY ROAD FRANCHE	G

Table 10b – Stourport on Severn – Overall Flood Risk

Unique ID	Area	Brownfield/ Greenfield	Location	Overall Flood Risk
D2/SH17	3.09	Brownfield	Riverside Business Centre	R
D13/SH7	6.06	Brownfield	STC.2	Y
D14/SH3	2.20	Brownfield	STC.3	Y
D15/SH45	2.03	Brownfield	Lichfield Basin	Y
D16	0.95	Brownfield	Shipleys Amusement Area	R
D17	0.77	Brownfield	Thomas Vale - Affordable Housing Site	Y
D18	3.71	Brownfield	Parsons Chain	G
D19	0.22	Brownfield	A.Harris and Sons	G
D34/SH27/ SH34/SH117	1.60	Brownfield	Baldwin Road	G
D35/SH8	0.38	Brownfield	STC.4	Y
D39	<i>2958m (Road)</i>		Stourport Relief Road	Y
D41/SH33	3.14	Brownfield	ADR - Power Station Road	R
D42/SH28	0.83	Brownfield	Car Garages - Worcester Road	R
D43/SH57	0.59	Brownfield	Stourport Civic Centre	G
D44/SH15	1.37	Brownfield	Lickhill Lodge First School	Y
SH5	0.36	Brownfield	BALDWIN ROAD LOCAL PLAN SITE	Y
SH16	6.26	Brownfield	PARSONS CHAIN	Y
SH37	1.97	Greenfield	LAND AT MOORHALL LANE	Y
SH46	0.17	Brownfield	TONTINE BUILDINGS	R
SH48	0.38	Brownfield	CHICHESTER CARAVANS / ROGERS RESCUE	Y
SH49	0.68	Brownfield	TAN LANE FIRST SCHOOL	G
SH50	0.23	Brownfield	VALE ROAD GARAGE	Y
SH51	0.15	Brownfield	A-Z WEDDING SERVICES	G
SH52	0.55	Brownfield	ARELEY COMMON FIRST SCHOOL	G
SH54	0.59	Brownfield	MARTLEY ROAD	Y
SH55	0.20	Brownfield	BRIDGE STREET MALL	Y

Unique ID	Area	Brownfield/ Greenfield	Location	Overall Flood Risk
SH67	0.36	Brownfield	QUEENS ROAD WALSHES	Y
SH68	0.17	Brownfield	WALSHES COMMUNITY CENTRE	Y
SH89	3.50	Brownfield	MORGAN MATROC	G
SH92	0.08	Brownfield	garage block adjacent Areley common school	G
SH99	0.25	Brownfield	TESCO AND BEDLAND STORES	Y
SH100	0.21	Brownfield	20 LORNE STREET	G
SH101	0.29	Brownfield	MERRIHILL MITTON GARDENS	Y
SH102	0.67	Brownfield	COUNTY BUILDINGS	Y
SH103	0.36	Brownfield	THE MANOR PH	G
SH104	3.16	Brownfield	MIDLAND INDUSTRIAL PLASTICS	G
SH118	0.19	Brownfield	MANOR ROAD DEPOT	G
SH124	0.14	Brownfield	MITTON STREET	G
SH138	1.71	Brownfield	BOURNEWOOD NURSERIES	G

Table 10c – Bewdley – Overall Flood Risk

Unique ID	Area	Brownfield/ Greenfield	Location	Overall Flood Risk
D6/SH1	0.66	Brownfield	Load Street	R
D32	0.26	Brownfield	Lax Lane Craft Centre/WVRS/British Red Cross	R
D45/SH22	2.09	Brownfield	Butt Town Meadow Caravan Park	R
SH2	0.12	Brownfield	TEXACO GARAGE BEWDLEY	R
SH36	3.18	Greenfield	STOURPORT ROAD BEWDLEY	R
SH66	1.00	Brownfield	WRIBBENHALL FIRST SCHOOL	R
SH77	0.26	Brownfield	LAND AT 71-73 KIDDERMINSTER ROAD BEWDLEY	R
SH136	0.49	Brownfield	WYRE HILL	G
SH145	3.88	Greenfield	The Allotments Grey Green Farm	R
SH146	7.20	Greenfield	The Front Meadows, Grey Green Farm, Bewdley	R
SH148	2.55	Greenfield	LAND SOUTH OF LODGE CLOSE	R
SH149	3.06	Greenfield	LAND REAR OF CATCHEM'S END FISH BAR	R

Table 10d – Rural Wyre Forest – Overall Flood Risk

Unique ID	Area	Brownfield/ Greenfield	Location	Overall Flood Risk
D20	2.10	Mixed	Wilden Lane	Y
D37/SH29	5.71	Brownfield	Titan Steel Wheels - Cookley	Y
D51/SH107	23.07	Brownfield	Lea Castle Hospital	G
SH6	0.27	Greenfield	BLACKSTONE BARNES	R
SH12	0.06	Brownfield	ROCK TAVERN, CAUNSALL ROAD	Y
SH13	1.01	Brownfield	THE MANOR HOUSE WOLVERLEY	Y
SH23	2.28	Greenfield	ADJACENT CHADDESLEY CORBETT SURGERY	Y
SH58	0.45	Greenfield	LAND AT HEMMING WAY	G
SH70	0.04	Brownfield	WOLVERLEY COURT	G
SH90	7.09	Brownfield	BUTTS LANE STONE	G

Unique ID	Area	Brownfield/ Greenfield	Location	Overall Flood Risk
SH108	1.20	Greenfield	KIMBERLEE AVENUE ADR	G
SH110	1.36	Brownfield	BLAKEDOWN NURSERIES ADR	Y
SH112	0.15	Greenfield	LAND ADJACENT 29 CASTLE ROAD COOKLEY	G
SH115	0.62	Greenfield	SEBRIGHT ROAD	G
SH116	3.11	Greenfield	FAIRFIELD ADR	G
SH119	2.72	Greenfield	WILDEN TOP ADR	G
SH120	0.49	Brownfield	CHADDESLEY CORBETT SCHOOL	G
SH121	1.16	Greenfield	HAYES ROAD ADR	G
SH123	0.27	Brownfield	OXBINE CALLOW HILL	G
SH126	0.26	Brownfield	LAND OFF ORCHARD CLOSE, BLISS GATE	G
SH127	0.07	Brownfield	GARAGE SITE THE GREEN CHADDESLEY CORB.	G
SH129	3.94	Greenfield	LAND AT STONE HILL	Y
SH130	0.31	Greenfield	LAND AT FOLD FARM	G
SH131	6.38	Greenfield	LAND AT LAWNSWOOD WESTHEAD ROAD	G
SH132	1.76	Greenfield	BROWN WESTHEAD PARK	G
SH139	5.16	Greenfield	BINE LANE BLISS GATE	G
SH140	0.64	Brownfield	LAND AT FAR FOREST	G
SH141	1.07	Brownfield	LAND AT SHATTERFORD	G
SH144	1.73	Greenfield	LAND OPPOSITE EAST VIEW CLOWS TOP	R
SH147	0.43	Greenfield	land rear of 92 Wilden Lane	G
SH158	0.34	Brownfield	LAND AT THE TERRACE CLOWS TOP	R
SH160	1.90	Greenfield	LAND OFF BRIAR HILL	G
SH161	2.38	Greenfield	LAND OFF HEMMING WAY CHADDESLEY CORB.	G
SH162	0.17	Greenfield	GLEBE LAND OFF WOLVERLEY RD WOLVERLEY	G

5.2.4 Flood Risk Management Options

There are a number of options available for consideration in order to manage the risk of flooding. The most effective approach will be to avoid the risk by zoning as much new development as possible away from Flood Zones 2 and 3, or alternatively, high risk flood zones. It is recognised however that the overall sustainability of the growth in terms of existing communities and other targets requiring priority use of Brownfield sites will make complete avoidance impractical. However, opportunities should be taken where possible as this will provide the best long term solution in terms of flood risk and the vulnerability of the proposed land must be compatible with the Flood Zones as stated in PPS25.

Flood Defences are historically a conventional way of managing flood risk, although their implementation and upkeep can be costly. As compared with avoidance measures, flood defences only increase the standard of protection and measures still need to be in place to forecast and manage extreme events above this standard, including safe evacuation when necessary. Where defences are already in place it must be noted that they were built to protect existing development and were not designed of the purpose of enabling new development. It must be recognised that breaching and overtopping of flood defences in certain circumstances may pose significant problems and greater risk sequentially than undefended Flood Zone 3 sites.

Reducing the amount of surface water running off potential development sites can also reduce and hence manage the risk of flooding. Flood storage reservoirs, or SUDS drainage systems would be suitable methods. The monitoring of flows, along with better flood warning and forecasting methods could be employed on land already developed and identified as being at risk of flooding. Improvements to flood warning and forecasting is, however, dependent upon funding available to the Environment Agency.

Ground raising is also proposed as a possible flood risk mitigation option for some of the sites. However, ground raising can potentially increase flood risk elsewhere and therefore may not in fact be an appropriate mitigation measure. As such, as a general principle, ground raising is not recommended in the flood plain. This will need further careful consideration on a site by site basis.

5.3 Conclusions

Flood Risk is a significant concern within Wyre Forest District, both in terms of fluvial, surface water and canal flooding, as outlined in the Level 1 and Level 2 SFRA. This flood risk has been assessed within this WCS in terms of 'Direct' flood risk to the proposed potential development sites and 'Additional' flood risk (the effect the development will have on other sites further downstream), as stated within the SFRA. Due to their location close to the watercourses and in urban areas, where the watercourse flow is constricted, the potential development sites at the highest risk, or most significant risk of adversely impacting other potential development sites, tend to be located in the middle of the urban areas of Kidderminster, Stourport and Bewdley. In particular, the potential development sites in Bewdley are most adversely affected by flood risk due to the drainage issues in the town associated with the Riddings Brook and the risk posed by the overtopping or breaching of the demountable defences located on the River Severn. However, it must be understood that most of the Direct Flood Risk within the towns of Kidderminster and Bewdley relate to the residual flood risk behind the flood defences. Appropriate development within these areas must therefore be decided through review of the Level 2 SFRA and discussion with the Environment Agency. All these sites, shown as Red in **Tables 10a - 10d** and **Figure 11**, will require further analysis as part of site specific FRAs. In general the more rural sites have the lowest constraints for development. However, the Environment Agency will require the runoff rates to remain unchanged for sites currently classified as Greenfield and betterment must be provided for those sites currently classified as Brownfield. As a flood risk management option the Environment Agency also suggest reductions of surface water inputs into the foul sewer (which links to the requirement to reduce foul capacity flood issues, discussed further in Section 8.3). Further analysis of SUDS requirements are analysed in Section 8.

6 WATER RESOURCES AND WATER SUPPLY

6.1 Introduction

Severn Trent Water Limited (STWL) is responsible for providing potable water to the whole of the Wyre Forest District. The assessment of water resources and water supply included in this WCS has therefore been primarily based on consultation with, and data provided by, STWL together with documentation produced by Ofwat and the Environment Agency.

STWL is one of the largest water companies in England and supplies a population of over 8 million people with around 1,900 million litres of potable water. STWL serves an area of 21,000 square kilometers in the Midlands and central Wales, stretching from the Bristol Channel to the Humber and from mid-Wales to the East Midlands.

6.2 Water Resources Plans

Water companies have a duty to maintain the security of their supplies. In order to help achieve this, water companies produce Water Resource Management Plans (WRMPs). These set out forecasts of supply and demand over a twenty-five year horizon and address how they intend to provide sufficient water to meet the needs of the customer whilst protecting the environment.

STWL produced their latest draft Water Resource Management Plan (dWRMP) in May 2008, which is currently under review following public consultation. However, their Statement of Response to the queries raised has been published and therefore indicates the most significant changes likely to the dWRMP during finalisation. The dWRMP has been produced using the water resources planning guidelines that the EA published in 2007. It covers the period 2010 – 2035, although it must be appreciated that the WRMP is updated on a five year cycle, with this version being produced in line with STWL's 2010-2035 Strategic Direction Statement, 'Focus on Water' provided for Ofwat in December 2007.

STWL have stated that the Phase Two Revision RSS development figures were not complete when this dWRMP was finalised and, as such, the development projections may not match the current RSS figures. Conversely the Environment Agency do believe that the Scenario 1 figure of 3,400 dwellings for Wyre Forest was used within the dWRMP and, as a result the conclusions should be accurate for the base-level scale of development considered within this WCS. In February 2009 STWL released their 'Statement of Response' to concerns raised by stakeholders regarding the dWRMP. This document states that the most recent RSS figures will be analysed within their final WRMP and are included within updated supply/demand figures published with the Statement of Response. As the NLP figures have been released prior to the review of the final WRMPs, STWL believes that they will be incorporated into the finalised reports although this is dependent upon whether the West Midlands Regional Assembly (WMRA) incorporates the findings into the final WMRSS figures.

Within this report it will be assumed that the dWRMP and Statement of Response figures account for the Phase 2 Revision RSS figures, as stated by the EA, but not the NLP suggested increase. As a result of this uncertainty, if required by the Council, this WCS should be reviewed in light of the most recent development figures analysed within the final WRMP, once it is published.

In addition to Water Resource Management Plans, water companies produce Asset Management Plans (AMPs) covering five year periods. These plans identify what the company intends to deliver over that period and what impact this will have on their customers' bills. Currently water companies are operating under AMP4, which covers the period 2005-2010. AMP5 will cover 2010-2015, AMP6 2015-2020 etc.

6.3 Water Resources

6.3.1 Water Resource Zone

A Water Resource Zone (WRZ) is the largest possible zone in which all resources, including external transfers, can be shared and hence the zone in which all customers experience the same risk of supply failure from a resource failure⁷.

STWL's supply area consists of six WRZs, originally derived for use in their 2004 Water Resources Plan (WRP04). Wyre Forest District is located within the largest of STWL's WRZ, WRS3, entitled 'Severn'. This WRZ covers most of the southern half of STWL's supply area, including Warwickshire, Worcestershire, parts of Gloucestershire, Wolverhampton, parts of Shropshire and Powys, with a total population of 2.3 million. However, following Environment Agency concerns regarding whether the Severn WRZ complies with the definition of a WRZ (e.g. that all customers within the zone share the same risk of supply failure), STWL are currently in the process of setting up a network of 40 to 50 'water accountability' zones which will provide leakage and water production management information at a sub WRZ level. The dWRMP stated that STWL planned to have these accountability zones set up and metered by March 2009. However, within the Statement of Response, STWL claim they intend to leave the WRZ definitions as they stand at present within the final WRMP, although they admit they do require a review⁸.

Figure 12 shows the area supplied by STWL divided into the six WRZs with Severn highlighted in orange. The white area shown in the centre of STWL's supply area is supplied by a separate water company, South Staffordshire Water (SSW). Their supply area is located north of Wyre Forest District, terminating just south of the village of Kinver on the Wyre Forest District's northern border. As a result of their proximity, SSW share the water supplied from the Hampton Loade Reservoir with STWL (the reservoir is owned and operated by SSW).

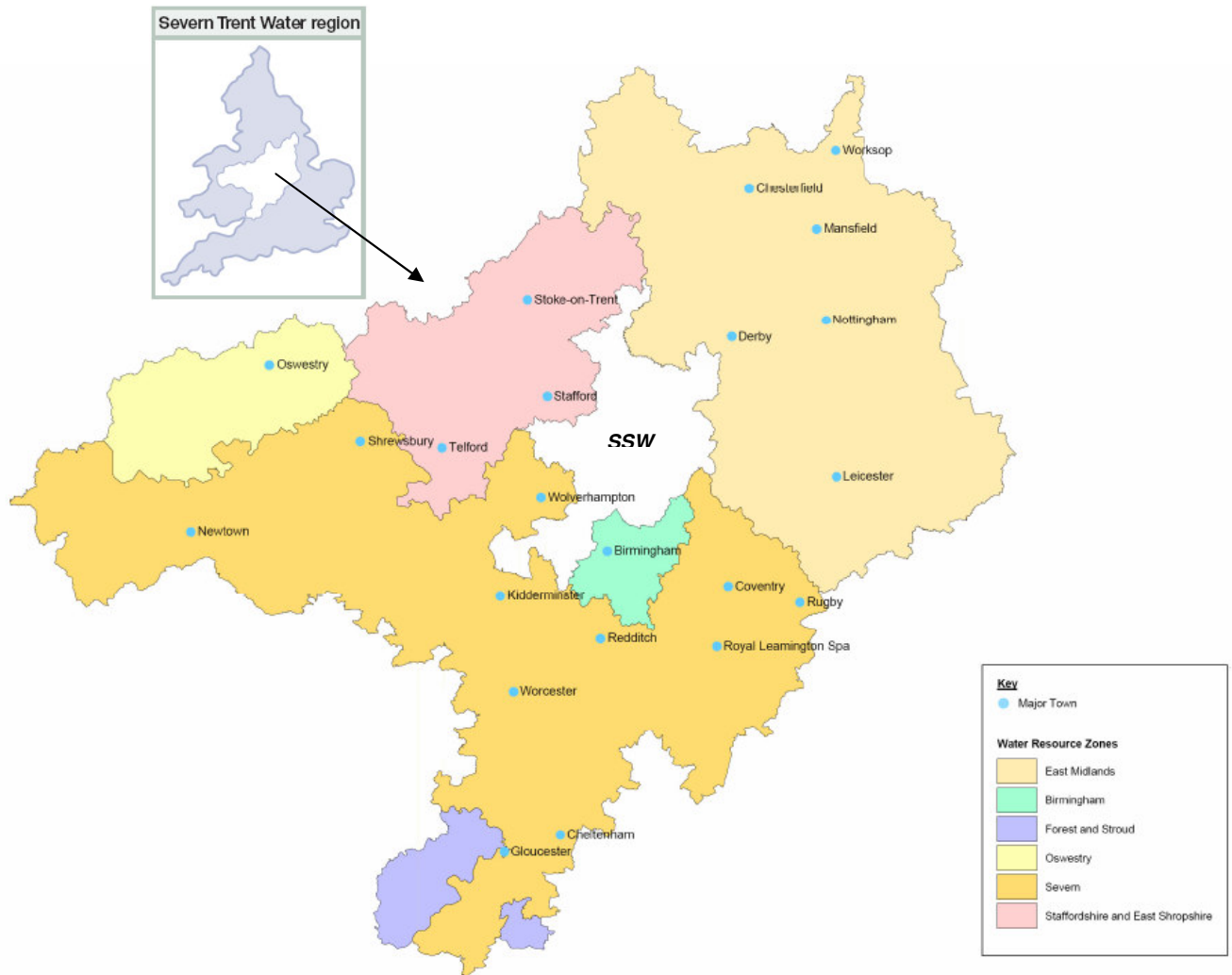
Due to the size of these zones it is difficult to obtain detailed information at the District scale. However it does imply that, within these zones, the precise location of development is not important in terms of water resources. If, following revision, it is decided to divide the current WRZs further, a more detailed analysis of water resource availability at the District scale may be possible.

The information used in this Section has been obtained from consultation with STWL, their dWRMP and Statement of Response and the Environment Agency.

⁷ West Midlands Regional Spatial Strategy (RSS 11) – The Impact of Housing Growth on Public Water Supplies, Environment Agency, June 2007

⁸ Statement of Response, Severn Trent Water, February 2009

Figure 12 – Water Resource Zones of Severn Trent Water



(Adapted from STW publications – *Focus on Water, 2007* and *dWRMP SEA, Technical Summary, 2008*)

6.3.2 Water Sources

Over its entire supply area STWL obtains 40% of its water from river abstraction. The other 60% is split equally between groundwater and reservoirs. In total STWL operates 17 major surface water abstraction and raw water treatment works, around 180 groundwater abstraction sources and 15 reservoirs, most of which are naturally filled by gravity. The groundwater sources draw mainly from the Triassic Sandstone Aquifers in the English Midlands (which underlay much of this study area) but also smaller aquifers in Nottinghamshire and the Cotswolds. Triassic sandstone has large water storage capacity within the structure of the strata and it does not tend to react rapidly to periods of low rainfall. Therefore, it gives a relatively reliable and constant supply of water.

In addition to the indigenous supplies, STWL imports water from neighbouring water undertakers, principally SSW and Dwr Cymru (Welsh Water). The Welsh transfer is supplied via the Elan Aqueduct under gravity from Powys to Frankley, located to the East of Wyre Forest on the outskirts of Birmingham. This is stored in the Bartley Reservoir and in normal operation supplements the Birmingham city's supply. It constitutes approximately 14% of STW's total water supply. A small quantity of this water is transferred from the Birmingham Zone into the Severn Zone.

Within the Severn Zone, 53% of Worcestershire is supplied by groundwater from the Triassic Sandstone aquifer, underlying much of the central swathe of Wyre Forest District, including the three towns of Kidderminster, Bewdley and Stourport on Severn. However, this groundwater supply only provides water to small local areas within the District itself, such as Chaddesley Corbett, Deansford Lane in Blakedown and Green Street in Kidderminster. This groundwater supply is also susceptible to nitrate enrichment, which has resulted in ongoing treatment. The majority of the water supply for the rest of the District originates from Main River abstractions, most notably at Hampton Loade Water Treatment Works from the River Severn, which is owned and operated by SSW. As such it also supplies SSW's supply area beyond the District boundary. The regulation of the River Severn is controlled and operated by the Environment Agency who monitor and report on the situation regularly.

The dWRMP also states that Worcestershire, Warwickshire, Gloucestershire and South Shropshire make up the largest supply system within the Severn Zone. Within this area there are some limitations on the capacity of linkages, although the system can be supported by imports from the Birmingham WRZ and the East Midlands WRZ.

6.3.3 Current and Future Water Availability

Table 11 is taken from STWL's dWRMP and outlines the supply demand balance within each of their Water Resource Zones. However, it must be noted that these are baseline figures and do not include any mitigation measures proposed by STWL. The Severn WRZ is outlined in red:

Table 11 - STWL Supply Demand Balance

Zone	Year when supply demand balance becomes negative	Baseline supply-demand balance position at the end of successive AMP periods				
		Supply-demand balance In 2014/15 (MI/d)	Supply-demand balance In 2019/20 (MI/d)	Supply-demand balance In 2024/25 (MI/d)	Supply-demand balance In 2029/30 (MI/d)	Supply-demand balance In 2034/35 (MI/d)
East Midlands	2011/12	-29.30	-76.86	-88.73	-104.92	-112.43
Staffs and East Shropshire	2006/07	-16.63	-22.85	-32.29	-39.10	-43.55
Severn	2006/07	-56.03	-71.67	-80.85	-86.79	-96.61
Forest and Stroud	2006/07	-0.10	0.96	1.88	2.53	2.59
Birmingham	2018/19	5.41	-1.90	-2.01	2.66	2.71
Oswestry	N/A	1.93	1.15	1.00	0.84	0.50

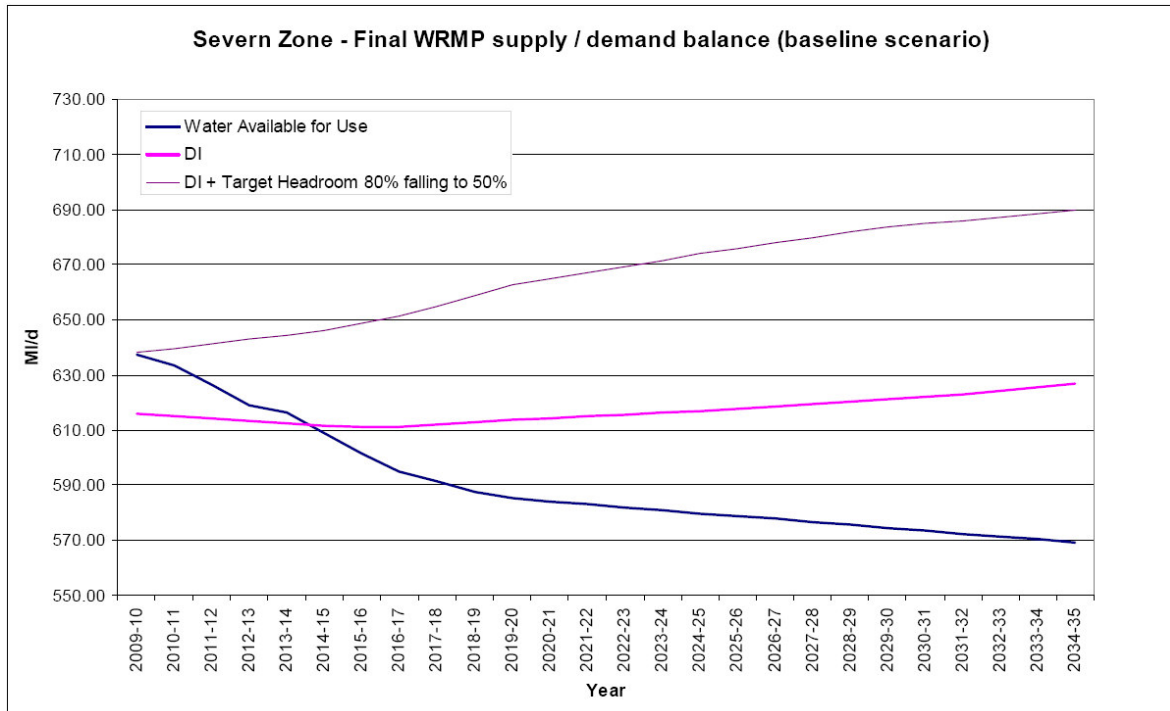
Note: A negative value indicates a risk of shortfall (deficit) of resources to meet demand. A positive value indicates surplus of resources over demand. All values refer to the balance of supply and demand averaged over the year as a whole, under the "baseline" planning condition of the continuation of present policies and the inclusion of climate change impacts, but without any further measures ("interventions") to bring supply and demand into balance.

Table 11 shows that the Severn WRZ has a negative supply demand balance from 2006/7 and this balance remains negative throughout the planning period of this WCS and beyond, becoming increasingly negative over time. Close to the end of the planning period covered by this WCS, 2024/5, the shortfall in this WRZ is over 80MI/d. It should also be noted that these deficits are the final planning scenarios (with mitigation measures included) and that housing/population growth is just one of the contributing factors (for example, Climate Change is another big factor which requires consideration).

However, since the publication of their dWRMP, STWL have, following comments and concerns raised by stakeholders, re-assessed their supply demand balance analysis. **Figure 13** shows their latest assessment of the baseline scenario supply/demand balance for the Severn WRZ, as compared to the assessment included in the dWRMP (**Figure 14**). This compares the Distribution Input (DI), which indicates total demand, with the Water Available for Use (WAFU). Although the recalculation has produced a lower demand forecast, it has also predicted a lower WAFU over much of the planning

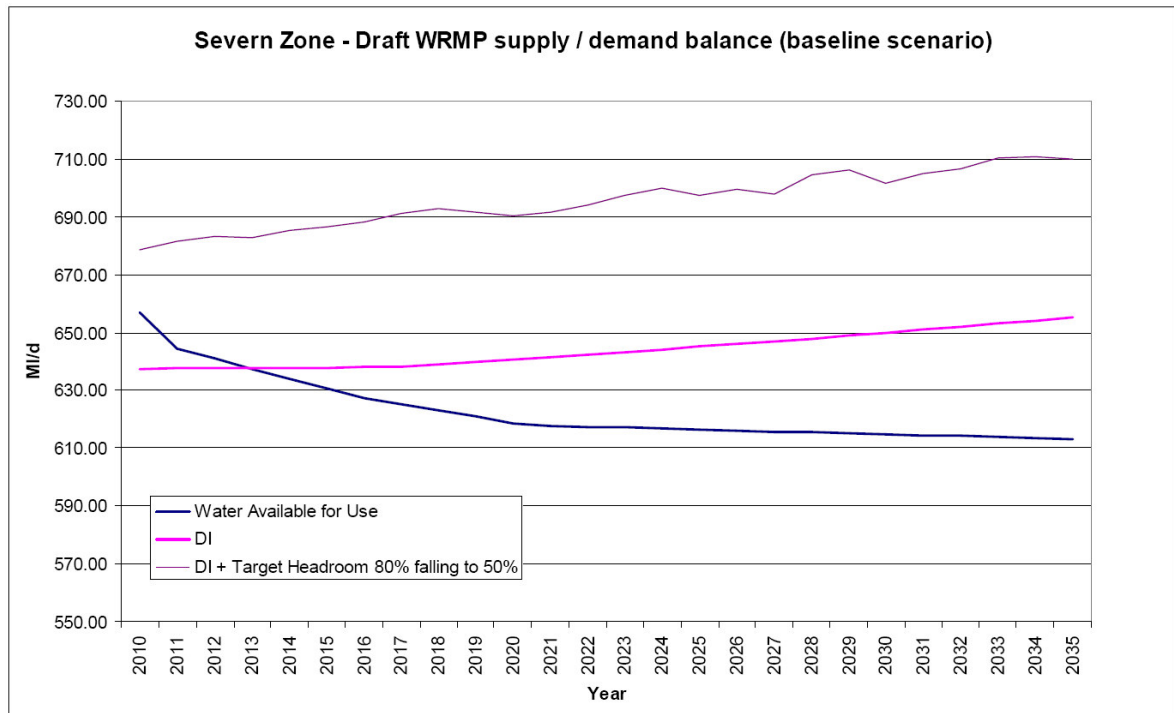
period, mainly due to inclusion of a more realistic representation of climate change. This new projection indicates that there is enough WAFU in the system to meet the DI until 2013-14, although beyond this date the supply/demand balance becomes increasingly negative, reaching a projected supply/demand shortfall of around 120MI/d by 2035. However, in agreement with **Table 11** above, the recalculated figures do indicate that the WAFU is lower than the DI plus target headroom throughout the planning period, although this gap is much smaller than shown in the dWRMP over the first few years.

Figure 13: Adjusted Severn Zone Baseline Scenario Supply/Demand Balance (Statement of Response)



(Draft Water Resource Management Plan – Statement of Response, STWL, Feb 2009)

Figure 14: Severn Zone Baseline Scenario Supply/Demand Balance, dWRMP



(Draft Water Resource Management Plan – Statement of Response, STWL, Feb 2009)

The dWRMP also states that it is the Worcestershire, Warwickshire, Gloucestershire and South Shropshire area of this WRZ which has a predicted supply-demand balance deficit based on dry year demand and supply, therefore including Wyre Forest District. This shortfall was identified in WRP04 and solutions were funded in this AMP period. The main scheme included a new river intake and water treatment works at Ombersley, which would have supplied an additional 30 million liters of water a day to support the Severn WRZ through the strategic water grid. The aim of this strategy was to achieve a supply/demand balance at the 80% confidence level by 2010. However, due to problems gaining the appropriate planning permissions and justification of the additional abstraction license, this has been delayed, resulting in the continued shortfall of water supply for this area of the WRZ.

To overcome these shortfalls, STWL outlined a number of measures (“interventions”) in their dWRMP. Following the comments raised by the stakeholders, the proposed measures have been reviewed and updated within the latest Statement of Response, as shown in **Table 12** below and graphically in **Figure 15**. Although the operational area of STW includes other RSS areas in addition to the West Midlands, such as the East Midlands and South West, correspondence with STWL referred solely to the effect of the WMRSS on the water supply.

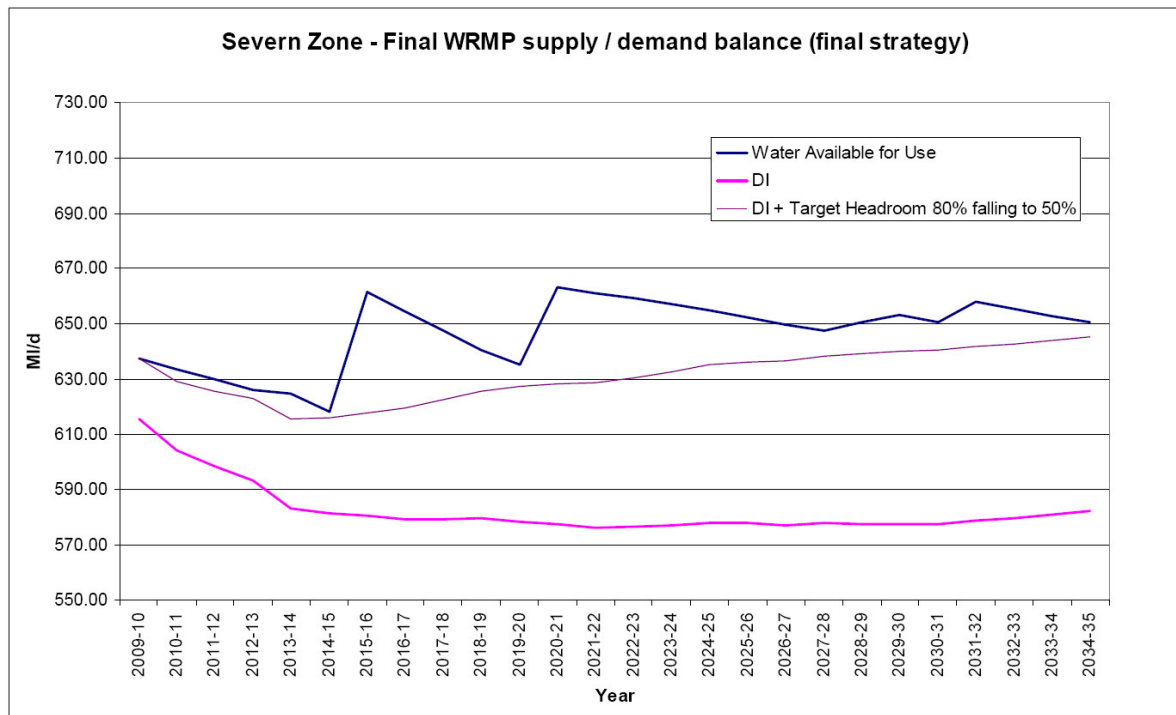
Table 12: Proposed Intervention Strategy to Maintain Supply/Demand Balance, Severn WRZ

AMP Period	Proposed Intervention
AMP 5 2010 - 2015	<ul style="list-style-type: none"> • Additional household metering; • Household and non-household water efficiency programme; • Leakage control through a combination of active leakage control, mains replacement and pressure control; • Derwent Valley Aqueduct (DVA) duplication from Kings Corner to Hallgates.
AMP 6 2015 – 2020	<ul style="list-style-type: none"> • New Birmingham groundwater source; • Minworth aquifer storage and recovery; • Highters Heath aquifer storage and recovery; • Household and non-household water efficiency programme; • Leakage control through combination of active leakage control, mains replacement and pressure control.
AMP 7 2020 – 2025	<ul style="list-style-type: none"> • Household and non-household water efficiency programme; • Leakage control through combination of active leakage control, mains replacement and pressure control.
AMP 8 2025 – 2030	<ul style="list-style-type: none"> • Norton aquifer storage and recovery; • River Leam flow compensation change; • Household and non-household water efficiency programme; • Leakage control through combination of active leakage control, mains replacement and pressure control.
AMP 9 2030 - 2035	<ul style="list-style-type: none"> • Whitacre aquifer storage and recovery; • Household and non-household water efficiency programme; • Leakage control through combination of active leakage control, mains replacement and pressure control.

(Adapted from dWRMP, Statement of Response, STWL, Feb 2009)

The dramatic increases in the WAFU shown in **Figure 15** relate to the processes shown in **Table 12** above that result in significant water resource increase, such as the DVA duplication at the end of AMP5 and the introduction of a new Birmingham groundwater source in AMP6. If all the strategies listed in **Table 12** are implemented then this figure implies that the WAFU will remain above the DI plus target headroom throughout the planning period. However, the margin is such that if one or more cannot be implemented for any reason, the resulting WAFU may drop below the DI plus target headroom level.

Figure 15 - Adjusted Severn Zone Baseline Scenario Final Strategy Supply/Demand Balance



The Ombersley treatment works appears to no longer be included within the proposed interventions to meet the supply/demand balance within the Severn WRZ.

In addition, due to concerns that some abstraction of water could be contributing to environmental damage of rivers and wetlands, the EA have constructed a programme called 'Restoring Sustainable Abstraction' (RSA), which may result in abstraction reductions being identified. This area of the Severn Zone has been impacted by such reductions (including the Blakedown Brook and the Hoo Brook⁹), which will be reviewed and updated before the final WRMP 2009.

However, the scenario post 2010 is dependent upon the investment STWL are able to make during AMP5 and AMP6. Essentially there is no additional water available for abstraction from either groundwater or river sources within Wyre Forest and, as such, any additional water supply required within the District must be brought in from outside. This has been highlighted in consultation with both the Environment Agency and STWL and within the dWRMP and CAMS studies.

Consultation with STWL has identified that although the dWRMP accounted for development figures in line with the Draft Phase Two WMRSS and therefore Scenario 1, there is flexibility with the water supply headroom figures, which should be sufficient to account for the higher development Scenarios 2 and 3. However, without mitigation, this will be in deficit within the next five years. It is therefore essential that mitigation measures are implemented. As many of the measures outlined above are reliant upon support via the Ofwat Business Plan process, the promotion of water efficiency measures, such as rainwater harvesting, greywater recycling and the implementation of water meters are therefore critical installations in new developments. STWL are currently promoting water resource efficient development with an aim for 'sustainable homes'. Guidance regarding rainwater harvesting has been provided by the Environment Agency and can be downloaded from [http://publications.environment-](http://publications.environment-agency.gov.uk/)

⁹ The Worcestershire Middle Severn Catchment Abstraction Management Strategy, Dec 2006, Environment Agency

agency.gov.uk/pdf/GEHO0108BNPN-E-E.pdf. Although this technique is generally not very effective on an individual scale, the Environment Agency states that it has been proven to be effective on a larger scale.

To ensure that the efficient use of water is being promoted by water companies, such as STWL, to their consumers, Ofwat requested in August 2007 that all water companies set voluntary water efficiency targets for 2008-9 and 2009-10. Following this voluntary trial Ofwat intends to propose more refined targets as part of their final determination of price limits in 2009 (PR09). In June 2008 Ofwat released a consultation paper which details their proposals for setting annual water efficiency targets for each water company for AMP5 (2010-11 to 2014-15). Within this paper Ofwat proposes that each company has a minimum equivalent base service target of saving 1L of water per billed property per day through approved water efficiency activity. For STWL this relates to 3.3Ml/d. On top of this base target they request a sustainable economic level of water efficiency, which is to be proposed by the water companies, and that would form part of a sustainable economic approach to balancing supply and demand.

At a regional level, larger than the WRZs, STWL believe there is sufficient water supply to meet the predicted demands, although this too is reliant upon the implementation of mitigation measures. However, they recognise that the local delivery scale is potentially the largest problem as the dWRMP does not assess the situation at an asset specific level. This will be reviewed within STWL's next Business Plan and is therefore reliant upon the provision of as much information regarding the size, location and profile of the proposed development from the Councils as far in advance as possible.

6.3.4 Canal Network

One option for boosting water supply to a WRZ experiencing a supply demand deficit is to bulk import additional water from other areas which are experiencing a surplus. One of the methods for achieving this is to utilise the existing canal network as a transfer resource. This is briefly discussed by STWL as a water resource option in their dWRMP but is not included as a viable option within their plans for the study area in the near future. The source of the water pumped into this system may be a reservoir, river or groundwater, but the scheme would require the transfer of water of a suitable quality and to a suitable location, where a new treatment works would be required to process the water before it entered the supply network. However, this is a system that the Environment Agency is promoting and may become a more prominent consideration in the future, although there are currently no active projects being considered within the West Midlands.

6.3.5 Environmental Considerations

The Council have asked for comment regarding the influence that increasing demands on water resources may have on sites of national and international importance.

Figure 16 shows the Conservation Areas, Local Nature Reserves, Sites of Special Scientific Interest (SSSIs) and Special Wildlife Sites located within Wyre Forest District. These were all provided as shapefiles from the Council. A number of these sites are reliant upon water availability and are protected under a range of environmental legislation and designations. Protection of these sites is dependent upon a number of stakeholders, most notably the water companies and the Environment Agency:

Severn Trent Water Limited

Within their dWRMP, STWL identify SSSIs, water related SSSIs and Special Areas of Conservation (SACs) across their supply area. For the Severn WRZ they state that there are 13 Natura 2000 sites (land designated by the UK and EU governments as having the most seriously threatened habitats and species across Europe) and 171 water dependent SSSIs. None of the Natura 2000 sites are located within Wyre Forest District. However, a number of SSSIs are located within the District and are dependent upon receiving water from the Triassic Sandstone aquifer or the watercourses. Where these water supplies are under pressure, from over abstraction or low flows, special care must be taken not to let the natural water supply fall below critical thresholds. This may become especially problematic with the extra demands on water supply from increased development.

Environment Agency

The Environment Agency have produced a number of Catchment Abstraction Management Strategies (CAMS) which have been produced in consultation with a range of key stakeholders and explain how they will manage the water resources. There are two CAMS studies relevant to the area covered by Wyre Forest District:

- The Worcestershire Middle Severn CAMS, which covers most of the Main Rivers in Wyre Forest District, with the exception of the River Severn, and the Triassic Sandstone aquifer;
- The Severn Corridor CAMS, focuses on the regulated reaches of the River Severn through the District

These studies outline where water is available for abstraction, where there is a need to reduce current rates of abstraction, outline their policy on time-limited licences and renewal of licences and provide an indication of the reliability of a potential abstraction licence. In addition they highlight the water management units within each area and the water related SSSIs, Special Areas of Conservation (SAC) and Special Protection Areas (SPA). There are no SACs or SPAs present within Wyre Forest District.

Wyre Forest is located within four Water Resource Management Units (WRMUs) covering the following areas:

- The River Severn from its confluence with the River Worfe, upstream of the Wyre Forest District boundary, to its confluence with the River Stour;
- The River Severn from its confluence with the River Stour to its confluence with the River Teme, downstream of the Wyre Forest District boundary;
- The Dowles Brook catchment; and
- The eastern side of the District, including the River Stour and the Blakedown Brook.

The Environment Agency use a four tier system to categorise water resource availability as follows:

Table 13 – Environment Agency Water Resource Availability Status Categories

Indicative Resource Availability Status	Licence Availability
Water Available	Water is likely to be available at all flows including low flows. Restrictions may apply.
No Water Available	No water is available for further licensing at low flows. Water may be available at higher flows with appropriate restrictions.
Over-licensed	Current actual abstraction is such that no water is available at low flows. If existing licences were used to their full allocation they could cause unacceptable environmental damage at low flows. Water may be available at high flows, with appropriate restrictions.
Over-abstracted	Existing abstraction is causing unacceptable damage to the environment at low flows. Water may still be available at high flows, with appropriate restrictions.

(Adapted from the Worcestershire Middle Severn CAMS, EA, 2006: pp17)

The first three of the WRMUs listed above have been classified as having ‘No Water Available’ within the CAMS studies.

At present the Dowles Brook catchment actually has a status of ‘Water Available’, but due to the restrictions on the River Severn, this status has been overwritten and has a target to remain as ‘No Water Available’ until 2018. This status means that a ‘hands-off flow’ (HOF) restriction will be in place stating that abstraction must cease when the flow on the Dowles Brook falls to 1.9Ml/d. Due to the lack of permanent flow measuring stations, the Dick Brook will experience similar restrictions to the Dowles Brook in times of low flow. All existing licences on the Dowles Brook will be subject to the same conditions as new licences.

The WRMU located in the Eastern side of the District is suffering from even tighter water restrictions, with a current and target status of ‘Over-abstracted’. This is mainly due to loss of base flow from the underlying groundwater. No abstraction will be granted for abstraction on watercourses within this WRMU, including the River Stour, the Blakedown Brook and the Hoo Brook and a HOF will be granted for abstraction in times of low flow. In addition winter storage reservoirs and other water efficient measures will be encouraged and any licences granted or varied within this unit will be subject to a restrictive daily pumping capacity to protect flow variability.

A number of the SSSIs shown in **Figure 16**, especially those located on marshland are dependent upon water availability. These comprise Stourvale Marsh, Hurcott and Podmore Pools, Puxton Marshes, Hartlebury Common, Wilden Marshes and Meadows and River Stour Flood Plain, which are also identified individually in **Figure 16**. No water dependent SSSIs are located along the River Severn corridor within the Wyre Forest District.

The eastern side of the District is located above a Groundwater Management Unit (GWMU) comprising the Triassic Sandstone Aquifer, which also supports a number of the SSSIs mentioned above. This GWMU has also been identified within the Worcester Middle Severn CAMS as being ‘Over-abstracted’ and has a target to remain at this level until 2018. The Environment Agency has noted that the groundwater in Kidderminster, in particular, has supported supply abstraction for more than 100 years, becoming

unsustainable in recent years. It was subsequently 'closed' for further abstraction in the 1980s. The CAMS study states that the current strategy is to prevent the current situation from worsening and regain as much licensed water as possible, although, especially around the towns, it can never be returned to its natural state as the rise in groundwater levels would result in flooding problems to basement dwellings. It is unlikely that the natural state will ever re-occur, however, due to the high demand on water in the present day. There is therefore no further water available for abstraction and licences due for renewal will be reduced as far as possible. Reductions in groundwater levels will impact any of the water dependent sites of national and international importance located above and, potentially, any of the sites located downstream on watercourses fed from a groundwater source. STWL also notes within its dWRMP that the Triassic Sandstone Aquifer is under pressure.

These studies indicate that the whole of Wyre Forest District is under pressure with regards to water availability. Due to its location close to the headwaters of catchments, the presence of the River Severn, and the location of a large proportion of the sandstone aquifer within its borders, problems with water availability within Wyre Forest District extend far beyond its borders and can have negative impacts on sites much further downstream. It is therefore essential that appropriate measures are taken not to over abstract the sources groundwater and surface water sources within its administrative area.

This brief analysis shows that there are many SSSIs, some of which are identified as being of national importance located both within and outside Wyre Forest District which are highly dependent upon water resources which are already highly stressed. Development within the region must therefore take account of the requirements of these sites and not further exacerbate the problems with increased water abstraction. The Environment Agency and water companies are already working together to help solve these problems. The large WRZs used by the water companies will assist in this as water does not need to be sourced locally. Some methods to help partially resolve these problems are discussed in Section 8, of this report, 'Demand Management', however further investigation of sites located in proximity or upstream of SSSIs may require further site-specific analysis before development.

In addition to water availability, many of these sites are also sensitive to the quality of the water they receive in terms of chemical input, eutrophication, acidification, sediment inputs and urban debris. These water quality issues will be discussed in Section 7.4 of this WCS.

6.3.6 Agricultural Impact

Agricultural practices have a high demand for water supply and can have a major impact on water resources, mainly to fulfil irrigation requirements, but also due to the potential impacts from the use of fertilisers and general land management. This supply is often gained from river or groundwater abstractions which therefore require a licence from the Environment Agency. As outlined in the CAMS above, this may become very restricted within the District and increasingly pressurised due to development and climate change. The following tables summarise the future strategy for water abstraction licences within Wyre Forest District: Although it must be appreciated that the CAMS status is at low flows only, the sandstone aquifer underneath Wyre Forest District has a high storage and lag time response to recharge, having the impact of 'smoothing out' the impact of

groundwater abstraction on surface flow regimes over the entire hydrological year. As such, the assessment within the CAMS actually applies to any flow regime.

Table 14 – Impact of Water Availability on Abstraction Licences in Wyre Forest District¹⁰

Water Source	Status	New Licences	Existing Licences
River Stour (including Blakedown Brook)	Over-abstracted	All subject to HOF* No low flow licences Encouragement of winter storage reservoirs and water efficient measures Restrictive daily pumping capacity	No increase in low flow quantity HOF* Reductions on volumes Daily pumping capacity of 0.5MI/d Reservoirs and efficiency measures
Triassic Sandstone Aquifer	Over-abstracted	No further water available	No additional water Renewal licences only approved through stringent testing Reduction to maximum usage of all licences due for renewal
Dowles Brook	No Water Available at low flows 2014: No Water Available	HOF below 1.9MI/d Restrictions will also apply to Dick Brook	Same conditions as new licences

*HOF refers to Hands Off Flow – water can only be abstracted at times of higher flow

For most of the District, there will be increasing restrictions on the abstraction licences. The reduction in water abstraction from the Triassic Sandstone Aquifer will undoubtedly affect agricultural practices in the region. More water is currently available in the south west of the District. However, the restrictions will increase towards the end of the planning period as the Dowles Brook WRMU moves towards a full status of No Water Available.

As development and climate change predictions are set to increase the pressure on water availability, it is essential that measures, such as winter storage of water for agricultural use and the provision of storage lakes are adopted sooner rather than later.

6.3.7 Non Residential Water Use

Some non-residential water use has a much higher demand for water supply than typical housing or employment development, for example the food processing or brewing industries. If these are proposed for development within a region then it is vital to inform the water company as they will need to structure this into their forecasts within their asset management and business plans. For WRZ such as Severn, where the supply-demand balance is already in deficit, this could be a major concern. The Council has stated that, at present, no such industry has been identified for development within Wyre Forest District, so this is not a requirement for consideration. However, the Council also emphasised that this is not a final decision and, as such, the situation would need to be reviewed if a new site is proposed. As the water supply has already been identified as under pressure Wyre Forest District, the introduction of a high water use industry may

¹⁰ This information is valid at the time of publication of the Draft report (December 2009)

create significant problems for development within the area, especially in the short term before the improvements suggested by STWL are in operation.

Conversely, typical office based employment development has a much lower water supply requirement per land area than residential use and therefore will have less impact in areas such as Severn, with a negative supply-demand balance.

STWL have mentioned non-resident water demand within their dWRMP and Statement of Response. They have noted that the recent economic downturn has had a significant effect on the quantity of water used by their commercial customers over the last year and they expect this trend to continue through 2009/10 with the effects felt throughout AMP5. STWL have also revised their water efficiency strategy to target certain types of commercial customers with significant savings within their water consumption predictions.

Water Resources Summary

Consultation with STWL identifies that, as long as mitigation can be put in place, such as the improvements to water supply listed in Section 6.3.3, water supply is not envisaged to be a problem in Wyre Forest District at the current level of growth (i.e. 3,400 dwellings by 2026) as water can be transferred between WRZs. However, STWL did state that the timing of the development was very important as the dWRMP is based upon the pro rata growth of 170 dwellings per year.

As the whole of Wyre Forest District is located within one WRZ, across which water can be exported and imported depending upon demand and regardless of location within the zone, there is no variation between potential development sites. **Table 15** presents a traffic light colour code to represent the supply/demand balance within Wyre Forest District as presented within STWL's Statement of Response, 2009.

Table 15 - Predicted Supply/Demand Balance within Wyre Forest District (Severn WRZ)

		AMP5 2010-15	AMP6 2015-20	AMP7 2020-25	AMP8 2025-30
Baseline Scenario	Supply/demand (DRAFT WRMP)	Amber	Red	Red	Red
	Supply/demand (FINAL WRMP)	Amber	Red	Red	Red
Final Strategy	Supply/demand (DRAFT WRMP)	Amber	Amber	Amber	Green
	Supply/demand (FINAL WRMP)	Green	Green	Green	Green

Red - WAFU is less than DI

Amber - WAFU is less than DI plus target headroom, but greater than DI

Green - WAFU is greater than DI plus target headroom

However, it must also be noted that the movement of water within a WRZ is reliant upon existing infrastructure, such as pump capacities and pipe size, which may act as a limiting factor. In addition, it must be borne in mind that water resources are a problem within Wyre Forest District and will potentially become more problematic in the future

due to development, increasing restrictions on abstractions, agricultural impact and non residential water use. As these limiting factors are common across the entire District it has not been possible to carry out site specific classifications.

Should the pro rata growth therefore increase, as a result of an accelerated rate of development or an increased development projection, the water supply may not be sufficient and additional measures to transfer water into the area from outside the WRZ will need to be budgeted for and installed to prevent shortfalls in the water supply. For STWL to plan for such an occurrence and gain the appropriate funding, there would be an obvious delay in the availability of an increase in water supply. It is therefore essential that should the development projections differ from the current Phase Two WMRSS, STWL is made aware of, and starts planning for, the changes as soon as possible.

6.4 Water Supply Infrastructure and Impact of Development

The capacity of the infrastructure used to pipe water to existing and new development, both residential and commercial, could potentially have a significant impact on the timing of development. For example, in order to serve a significant increase in population it may be necessary to undertake significant improvements to the existing infrastructure. This is especially true for large development in primarily rural areas which may not have sufficient, or even any, infrastructure present. Similarly, the type of employment land intended for development is also an important consideration as the water supply requirements for a brewery or food processing plant are much greater than for an office block, which again may result in a requirement for significant improvements to be made to the existing infrastructure. The lead in time necessary to make these improvements would of course impact on the delivery of the new development.

For the purposes of the WCS, STWL provided information about the current water supply infrastructure in the form of printed schematics and verbal consultation in addition to the information provided within the dWRMP. However, they do state that all the information provided is for indicative purposes only as it is not feasible at this stage to undertake detailed analysis in order to determine more accurately the infrastructure requirements and associated capital costs, especially due to the long term phasing of developments and uncertainty at this time.

Appendix C contains schematic diagrams of STWL's strategic water grid, as shown in their dWRMP and a more detailed version provided by STWL for use in this study. For clarification purposes the information has been simplified so as to only show the significant features of the network.

STWL was consulted and plans of the development scenarios were explained. The Council provided them with GIS shapefiles of the proposed SHLAA potential development sites, as they stand at present, for comment on issues relating to water supply and the potential need for improvements to the existing infrastructure. STWL state that although they will always try and accommodate development, they cannot provide a guarantee as financial constraints and the practicalities of time scale must always be a consideration.

The rest of this section discusses the water resources, environmental considerations, agricultural impacts, impact of non residential water use and water supply infrastructure.

STWL were provided with figures and locations for growth based upon the current Phase Two Preferred Option (Scenario 1) in addition to the estimated Scenarios 2 and 3 as well as the current potential development site locations from the ongoing SHLAA. They stated that the condition of the network is not a fundamental factor within Wyre Forest, but, due to increased security restrictions, were not able to comment upon the capacity of the current infrastructure.

However, as extension to the water supply network will be required for the development of Greenfield sites and adjustments to the network for Brownfield sites, the exact locations, timing and size of development would need to be submitted to the water companies as soon as possible to allow them to factor any costs into their next AMP submissions to Ofwat. The calculations of cost and design for individual sites are generally not undertaken by the water companies until they are approached by a developer, who would be required to pay an infrastructure charge. In addition, if the higher development Scenarios, most notably Scenario 3, were implemented instead of Scenario 1 then there is a higher probability that the capacity of the current infrastructure will be exceeded and upgrades to the system required.

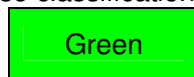
Although unable to provide detailed schematics, STWL did provide general schematics of the water supply infrastructure within the District, in addition to the larger scale diagrams provided within their dWRMP. As far as possible these have been accumulated onto one map. **Figure 17** shows the existing supply system and the proposed developments across Wyre Forest District. STWL also stated that within the town centres, they do not envisage any problems with connection of new developments to the existing infrastructure. Locations of water supply infrastructure are for indicative purposes only and are not accurate.

Tables 16a – 16d summarise the capacity of the water supply network solely in terms of:

- proximity to the major supply mains, as shown in **Figure 17**;
- type of site (Brownfield or Greenfield); and
- remoteness of the site

However, it must also be noted that the movement of water within a WRZ is reliant upon existing infrastructure, such as pump capacities and pipe size, which may act as a limiting factor.

These classifications are shown graphically in **Figure 18**.



- Little or no infrastructure upgrade required
- ⇒ Located in proximity to major supply main
- ⇒ Brownfield site so some existing infrastructure should be present
- ⇒ Easily accommodated within the existing system as located within, or on the edge of, a developed area



- Minor infrastructure upgrade required
- ⇒ Satisfies one or two of the three criteria required for 'green' classification



- Major infrastructure upgrade required
- ⇒ Satisfies none of the criteria required for 'green' classification

Table 16a – Kidderminster – Overall Water Supply Constraints

Unique ID	Area	Brownfield/ Greenfield	Location	Water Supply
D1	1.1	Brownfield	Land to Rear of Crossley	Y
D3/SH14/25	8.8	Brownfield	KTC.4	G
D4	1.2	Brownfield	Council Depot Site	G
D5/SH82	7.1	Brownfield	Churchfields Business Park	G
D7	4.5	Brownfield	Georgian Carpet Factories Site	G
D8	0.5	Brownfield	Lime Kiln Bridge	G
D9/SH10	1.0	Brownfield	Park Lane Timber Yard	G
D10/SH19	0.6	Brownfield	BT Site, Mill Street	G
D11	3.6	Brownfield	Current Morrisons application Site	G
D12/SH76	1.7	Brownfield	Park Street	G
D21	23.9	Brownfield	British Sugar Site	G
D22	2.2	Greenfield	Victoria Sports Ground	Y
D23/SH75/ SH159	0.9	Brownfield	Park Lane	G
D24	6.5	Brownfield	Current Sealine Factory (Various Units)	G
D25/SH35	0.6	Brownfield	Current Retail Area	G
D26	0.5	Brownfield	New Road and Market Street	G
D27	0.2	Brownfield	Brintons Offices - Exchange Street	G
D28	1.2	Brownfield	Current Morrisons Site and Other Shops	G
D29/SH60	0.6	Brownfield	KTC.3 - Worcester Street Enhancement Area	G
D30/SH9	0.1	Brownfield	Church Street Car Park	G
D31	7.3	Greenfield	Puxton	Y
D33	0.3	Brownfield	Lax Lane Craft Centre/WVRS/British Red Cross	Y
D36	5.3	Brownfield	Lisle Avenue	G
D38/SH40	1.7	Greenfield	Puxton Site	Y

Unique ID	Area	Brownfield/ Greenfield	Location	Water Supply
D40	1124m (Road)		Hoo-Brook Link Road	N/A
D46	0.3	Brownfield	Cheshires Printers	G
D47/SH81	0.4	Brownfield	Kidderminster market auctions	G
D48/SH71	0.1	Brownfield	Comberton Place	G
D49/SH80	0.1	Brownfield	Comberton Hill	G
D50/SH152	0.9	Brownfield	CMS Car Showrooms	G
D52/SH61	0.3	Brownfield	Rock Works	G
D53	0.7	Brownfield	Matalan	G
D54	1.5	Brownfield	Worcester Street	G
SH4	0.3	Brownfield	78 MILL STREET	G
SH11	0.1	Brownfield	CASTLE ROAD / PARK LANE	G
SH18	5.4	Brownfield	GEORGIAN CARPETS	G
SH20	1.0	Greenfield	PLAYING FIELD ADJACENT ST. MARY'S SCHOOL	Y
SH21	0.3	Greenfield	REAR OF THE PARADE BROADWATERS	Y
SH30	0.8	Brownfield	NEW ROAD CARTERS SITE	G
SH31	1.0	Brownfield	R&D Aggregates Site	G
SH32	0.1	Brownfield	PARK LANE	G
SH38	0.8	Brownfield	BED CITY MCF COMPLEX	G
SH39	0.5	Brownfield	ELGAR HOUSE GREEN STREET	G
SH41	15.3	Greenfield	FORMER BRITISH SUGAR SETTLING PONDS	Y
SH42	0.1	Brownfield	MILL BANK GARAGE	G
SH43	0.1	Brownfield	PIANO BUILDING WEAVERS WHARF	G
SH44	0.3	Brownfield	ZANZIBARS CASTLE ROAD KIDDERMINSTER	G
SH47	0.1	Brownfield	26 WOOD STREET	G
SH53	0.2	Brownfield	TELEPHONE EXCHANGE BLACKWELL STREET	G
SH56	0.5	Brownfield	LEA STREET SCHOOL	G
SH59	1.7	Brownfield	SUTTON RESERVOIR	G
SH62	0.1	Brownfield	HERONS NURSING HOME, SPENNELLS	G
SH63	0.4	Brownfield	CHESTER ROAD SOUTH SERVICE STATION	G
SH64	0.2	Brownfield	OLDNALL ROAD	G
SH65	0.3	Brownfield	PURAC BUILDING	G
SH69	0.8	Brownfield	FRANCHE COMMUNITY CENTRE	G
SH72	0.3	Brownfield	RIFLE RANGE SHOPS	G
SH73	1.1	Brownfield	HURCOTT MAISONNETTES	G
SH74	0.5	Brownfield	BROADWATERS COMMUNITY CENTRE	Y
SH78	0.2	Brownfield	207 BIRMINGHAM ROAD KIDDERMINSTER	G
SH79	0.4	Greenfield	CHESTER ROAD BOWLING CLUB	G
SH83	1.1	Greenfield	FRANCHE ROAD TRIANGLE	Y
SH84	0.8	Brownfield	LAND OFF BROOMFIELD CLOSE	Y
SH85	0.3	Brownfield	YEW TREE PUB	G
SH86	0.5	Brownfield	HARRIERS TRADING ESTATE	G
SH87	0.8	Greenfield	SOUTH OF BERNIE CROSSLND WALK	G
SH88	1.6	Greenfield	PLAYING FIELD OFF SUTTON PARK RISE	G
SH91	0.3	Brownfield	QUEENS STREET (REDEVELOPMENT)	G

Unique ID	Area	Brownfield/ Greenfield	Location	Water Supply
SH93	0.2	Brownfield	273/4 HOO ROAD (ADJ. ST.ANDREWS GREEN	G
SH94	0.6	Brownfield	NORTH OF BERNIE CROSSLAND WALK	G
SH95	1.3	Brownfield	BLAKEBROOK SCHOOL / COUNTY BUILDINGS	G
SH96	0.3	Brownfield	EAGLE'S NEST PH	Y
SH97	0.2	Brownfield	AYLMER LODGE SURGERY	G
SH98	0.1	Brownfield	NORTHUMBERLAND AVENUE SURGERY	G
SH105	5.8	Brownfield	KING CHARLES 1 SCHOOL	G
SH106	0.4	Brownfield	SUTTON ARMS PH	G
SH109	14.0	Greenfield	HURCOTT ADR	Y
SH111	3.6	Greenfield	OFFMORE LANE ALLOTMENTS	Y
SH113	1.8	Brownfield	OASIS ARTS & CRAFTS	G
SH114	0.9	Brownfield	REILLOC CHAIN	G
SH122	0.5	Brownfield	THE BRIARS HOTEL	G
SH125	0.6	Brownfield	LAND AT 108-109 BEWDLEY HILL	G
SH128	39.5	Greenfield	STANKLYN LANE	G
SH133	18.1	Greenfield	LAND AT WOLVERLEY TRAFFIC LIGHTS	Y
SH134	0.0	Brownfield	R/O 41 CLARENCE STREET	G
SH135	1.6	Greenfield	LAND AT THE LEA	G
SH137	3.2	Brownfield	ZORTECH AVENUE	G
SH142	0.2	Brownfield	MUSKETEER PH RIFLE RANGE	G
SH143	95.2	Greenfield	LOW HABBERLEY FARM	G
SH150	0.3	Brownfield	CHESHIRE SITE	G
SH151	0.2	Brownfield	FRANCHE ROAD	G
SH153	0.9	Brownfield	164-166 SUTTON PARK ROAD	G
SH154	0.8	Brownfield	WINDSOR DRIVE KIDDERMINSTER	G
SH155	0.2	Brownfield	WOLVERHAMPTON ROAD KIDDERMINSTER	G
SH156	0.9	Brownfield	FRANCHISE STREET KIDDERMINSTER	G
SH157	0.8	Brownfield	LONGFELLOW GREEN KIDDERMINSTER	G
SH163	2.7	Greenfield	LAND OFF WOLVERLEY ROAD FRANCHE	Y

Table 16b – Stourport on Severn – Overall Water Supply Constraints

Unique ID	Area	Brownfield/ Greenfield	Location	Water Supply
D2/SH17	3.09	Brownfield	Riverside Business Centre	G
D13/SH7	6.06	Brownfield	STC.2	G
D14/SH3	2.20	Brownfield	STC.3	G
D15/SH45	2.03	Brownfield	Lichfield Basin	G
D16	0.95	Brownfield	Shipleys Amusement Area	G
D17	0.77	Brownfield	Thomas Vale - Affordable Housing Site	G
D18	3.71	Brownfield	Parsons Chain	G
D19	0.22	Brownfield	A.Harris and Sons	G
D34/SH27/ SH34/SH117	1.60	Brownfield	Baldwin Road	G

Unique ID	Area	Brownfield/ Greenfield	Location	Water Supply
D35/SH8	0.38	Brownfield	STC.4	G
D39	2958m (Road)		Stourport Relief Road	N/A
D41/SH33	3.14	Brownfield	ADR - Power Station Road	G
D42/SH28	0.83	Brownfield	Car Garages - Worcester Road	G
D43/SH57	0.59	Brownfield	Stourport Civic Centre	G
D44/SH15	1.37	Brownfield	Lickhill Lodge First School	Y
SH5	0.36	Brownfield	BALDWIN ROAD LOCAL PLAN SITE	G
SH16	6.26	Brownfield	PARSONS CHAIN	G
SH37	1.97	Greenfield	LAND AT MOORHALL LANE	Y
SH46	0.17	Brownfield	TONTINE BUILDINGS	G
SH48	0.38	Brownfield	CHICHESTER CARAVANS / ROGERS RESCUE	G
SH49	0.68	Brownfield	TAN LANE FIRST SCHOOL	G
SH50	0.23	Brownfield	VALE ROAD GARAGE	G
SH51	0.15	Brownfield	A-Z WEDDING SERVICES	G
SH52	0.55	Brownfield	ARELEY COMMON FIRST SCHOOL	G
SH54	0.59	Brownfield	MARTLEY ROAD	G
SH55	0.20	Brownfield	BRIDGE STREET MALL	G
SH67	0.36	Brownfield	QUEENS ROAD WALSHES	G
SH68	0.17	Brownfield	WALSHES COMMUNITY CENTRE	G
SH89	3.50	Brownfield	MORGAN MATROC	G
SH92	0.08	Brownfield	garage block adjacent Areley common school	G
SH99	0.25	Brownfield	TESCO AND BEDLAND STORES	G
SH100	0.21	Brownfield	20 LORNE STREET	G
SH101	0.29	Brownfield	MERRIHILL MITTON GARDENS	G
SH102	0.67	Brownfield	COUNTY BUILDINGS	G
SH103	0.36	Brownfield	THE MANOR PH	G
SH104	3.16	Brownfield	MIDLAND INDUSTRIAL PLASTICS	G
SH118	0.19	Brownfield	MANOR ROAD DEPOT	G
SH124	0.14	Brownfield	MITTON STREET	G
SH138	1.71	Brownfield	BOURNEWOOD NURSERIES	G

Table 16c – Bewdley – Overall Water Supply Constraints

Unique ID	Area	Brownfield/ Greenfield	Location	Water Supply
D6/SH1	0.66	Brownfield	Load Street	G
D32	0.26	Brownfield	Lax Lane Craft Centre/WVRS/British Red Cross	G
D45/SH22	2.09	Brownfield	Butt Town Meadow Caravan Park	G
SH2	0.12	Brownfield	TEXACO GARAGE BEWDLEY	G
SH36	3.18	Greenfield	STOURPORT ROAD BEWDLEY	Y
SH66	1.00	Brownfield	WRIBBENHALL FIRST SCHOOL	G
SH77	0.26	Brownfield	LAND AT 71-73 KIDDERMINSTER ROAD BEWDLEY	G
SH136	0.49	Brownfield	WYRE HILL	G
SH145	3.88	Greenfield	The Allotments Grey Green Farm	Y

Unique ID	Area	Brownfield/ Greenfield	Location	Water Supply
SH146	7.20	Greenfield	The Front Meadows, Grey Green Farm, Bewdley	Y
SH148	2.55	Greenfield	LAND SOUTH OF LODGE CLOSE	Y
SH149	3.06	Greenfield	LAND REAR OF CATCHEM'S END FISH BAR	Y

Table 16d – Rural Wyre Forest – Overall Water Supply Constraints

Unique ID	Area	Brownfield/ Greenfield	Location	Water Supply
D20	2.10	Mixed	Wilden Lane	Y
D37/SH29	5.71	Brownfield	Titan Steel Wheels - Cookley	Y
D51/SH107	23.07	Brownfield	Lea Castle Hospital	Y
SH6	0.27	Greenfield	BLACKSTONE BARNES	R
SH12	0.06	Brownfield	ROCK TAVERN, CAUNSALL ROAD	Y
SH13	1.01	Brownfield	THE MANOR HOUSE WOLVERLEY	Y
SH23	2.28	Greenfield	ADJACENT CHADDESLEY CORBETT SURGERY	Y
SH58	0.45	Greenfield	LAND AT HEMMING WAY	Y
SH70	0.04	Brownfield	WOLVERLEY COURT	R
SH90	7.09	Brownfield	BUTTS LANE STONE	Y
SH108	1.20	Greenfield	KIMBERLEE AVENUE ADR	Y
SH110	1.36	Brownfield	BLAKEDOWN NURSERIES ADR	Y
SH112	0.15	Greenfield	LAND ADJACENT 29 CASTLE ROAD COOKLEY	Y
SH115	0.62	Greenfield	SEBRIGHT ROAD	Y
SH116	3.11	Greenfield	FAIRFIELD ADR	Y
SH119	2.72	Greenfield	WILDEN TOP ADR	Y
SH120	0.49	Brownfield	CHADDESLEY CORBETT SCHOOL	R
SH121	1.16	Greenfield	HAYES ROAD ADR	Y
SH123	0.27	Brownfield	OXBINE CALLOW HILL	Y
SH126	0.26	Brownfield	LAND OFF ORCHARD CLOSE, BLISS GATE	Y
SH127	0.07	Brownfield	GARAGE SITE THE GREEN CHADDESLEY CORB.	Y
SH129	3.94	Greenfield	LAND AT STONE HILL	Y
SH130	0.31	Greenfield	LAND AT FOLD FARM	Y
SH131	6.38	Greenfield	LAND AT LAWNSWOOD WESTHEAD ROAD	Y
SH132	1.76	Greenfield	BROWN WESTHEAD PARK	Y
SH139	5.16	Greenfield	BINE LANE BLISS GATE	Y
SH140	0.64	Brownfield	LAND AT FAR FOREST	Y
SH141	1.07	Brownfield	LAND AT SHATTERFORD	Y
SH144	1.73	Greenfield	LAND OPPOSITE EAST VIEW CLOWS TOP	Y
SH147	0.43	Greenfield	land rear of 92 Wilden Lane	Y
SH158	0.34	Brownfield	LAND AT THE TERRACE CLOWS TOP	R
SH160	1.90	Greenfield	LAND OFF BRIAR HILL	Y
SH161	2.38	Greenfield	LAND OFF HEMMING WAY CHADDESLEY CORB.	Y
SH162	0.17	Greenfield	GLEBE LAND OFF WOLVERLEY RD WOLVERLEY	Y

6.5 Conclusions

The assessment of water resources and water supply is limited by the availability and detail of information provided by STWL and has been based upon the dWRMP report, the Statement of Response and consultation with STWL. When released the final WRMP may supersede some of the conclusions of this report, although it is unlikely that any changes will be major.

Overall water supply is limited within the District, but it not envisaged by STWL to be a constraint to development, due to the improvement plans highlighted in their dWRMP and Statement of Response and the ability to transfer water between WRZs. However, there are a number of water dependent SSSIs and abstraction restrictions which must be appreciated and considered when supplying water to a new development. Due to this constraints and the future predictions of population growth and climate change it is still paramount for demand management techniques to be implemented into all new developments and retro fitted, as far as possible, into existing development.

The condition of the network is not seen by STWL as a problem and they do not envisage any connection issues within the town centres. A high level analysis has therefore been carried out on the potential development sites based upon the type and location of site with regards to the existing water supply network. As can be expected this indicates that the more rural Greenfield sites will require a higher level of infrastructure upgrade than the Brownfield sites located within the existing urban areas. However, information was not available regarding the capacity of the water supply network. It must therefore be borne in mind that even if there is an unlimited supply of water available “bottle-necks” in the water supply infrastructure could limit growth. Large scale developments on the margins of the existing supply network would require significant investment in infrastructure upgrade. Given the lead in time associated with the design and construction of infrastructure improvements it is essential that the timing of infrastructure upgrade be factored into the planning of new development allocations. For example, it may not be feasible to plan for immediate development in the more marginal Greenfield sites where significant upgrade would be necessary.

It must also be appreciated that any development application will require a formal submission to the water companies outlining the water usage requirements in order that the application can be assessed in detail to identify the potential impact upon the water distribution system and any upgrades that may be required. The Environment Agency would recommend investigation into conjunctive water use (creating a balance between surface and groundwater abstraction) to improve sustainability to both sources. As mentioned in Section 6.4 above, the water requirements are extremely sensitive to the type of employment land intended for development, details of which have not been provided or reviewed within this WCS.

7 WASTE WATER COLLECTION, TREATMENT AND RIVER WATER QUALITY

7.1 Introduction

Wastewater collection and treatment within the whole of Wyre Forest District is undertaken and managed by Severn Trent Water Limited (STWL). The assessment of the wastewater infrastructure, as presented in this WCS, has been based on consultation with STWL, together with information produced by Ofwat and the Environment Agency.

This section will address the capacity of the existing wastewater infrastructure to deal with the increase in flow as a result of the proposed increase in population, both in terms of pipe network and in the capacity of the sewage treatment works. This section also addresses the environmental quality of the receiving watercourses and the potential limiting impact of this due to legislation relating to water quality.

7.2 Wastewater Collection

The main network of sewers between developed areas and sewage treatment works are considered 'public' sewers and are the responsibility of STWL. However, for houses built after 1 October 1937 all pipework serving more than one property will be a 'private' sewer until they join the public sewer, normally under the road. Maintenance of private sewers is the responsibility of all the house owners using it. It is the capacity and location of the main public sewers that will be discussed within this report.

However, there are two types of public sewer: foul and surface. The foul sewers remove dirty wastewater that cannot be discharged into the environment and carry it to sewage treatment works. Surface water sewers transmit runoff from housing (i.e. roofs, driveways etc.) and discharge it into ditches and rivers. Although new developments generally connect road gullies to housing estate mains, highway drainage is usually owned and operated by highways authorities, especially on main routes and water companies have no legal requirement to take highway drainage. However, there will also be locations within the study area where there is only one combined sewer, which is a much older system and transmits both foul and surface water. Although the proportion of 'dirty' water containing sewage is much less in these systems, the inclusion of foul water results in the need to treat all the discharge from these sewers at the sewage treatment works.

The main wastewater treatment infrastructure within the District is shown in **Figure 19**. Wastewater is collected within 'catchments', under the power of gravity or artificially pumped. At the 'downstream' end of the catchments the wastewater is then either treated at a Wastewater Treatment Works (WwTW) and the treated effluent released into a watercourse or it is pumped to another catchment which does contain a WwTW. Outside of the catchments, in the more rural areas of the District, wastewater is collected in septic tanks.

Additional features shown on the schematic are Combined Sewer Overflows (CSOs), although these have unfortunately not been separated from the pumping stations in the GIS shapefile supplied by STWL. CSOs are located on the older combined sewer systems, mentioned above. As the combined sewers transmit both foul sewage and surface water they rapidly reach capacity and are at risk flooding during rainstorm events. Therefore at times of high flow CSOs operate at overflows to discharge some of

the sewage out of the sewer system and into a nearby watercourse. However, this discharge contains surface water and foul effluent and thus poses health and ecological risks as well as aesthetic pollution.

Figure 19 shows the main public sewers located within Wyre Forest District, as provided by STWL. STWL have also provided information regarding occurrences of flooding from the sewer network (extracted from the FLOODS2 database), capacity issues (from their Drainage Action Plans - DAP Reports - and WwTW flow data) and comments (provided by their Strategies team) regarding the potential impact of some of the potential development sites upon the sewerage network. Unfortunately, due to security restrictions, we are unable to provide most of this information in its raw form, although all information will be drawn upon, where appropriate, throughout this analysis. They were also unable to provide any information regarding planned upgrades to or expansions of existing WwTWs. This is therefore an area that will require additional consultation and review with STWL ahead of the initiation of any development, perhaps for inclusion within an Implementation Plan.

7.2.1 Catchments

As shown in **Figure 19**, most of the proposed potential development sites are located within the catchment areas depicted by STWL. Approximately fifteen of the sites fall partially outside these catchment areas, but as the outlines of these areas are not accurate, it is assumed that these will be able to connect to the existing network, although, depending upon the topography, some parts of the sites may require pumps to connect to the gravity network. Five of the sites are located completely outside the catchment areas: two around Stone (both southeast of Kidderminster); one in Blackstone (south of Bewdley); and two in the village of Clows Top, (west of Rock). Further investigation regarding these sites will be required with STWL to establish whether they can be connected into the existing sewer network or whether new infrastructure will need to be installed.

7.2.2 Models

Models have been constructed for most areas of Wyre Forest District to enable STWL to make an assessment of the likely constraints and weaknesses within the system. These models have not been updated or rerun for the purposes of this WCS and, as such, they base the predicted development scenarios and locations within the District upon the Wyre Forest District Local Plan. If they are updated and rerun within the planning period, as recommended by the Environment Agency, the results should be assessed alongside the finding of this WCS. The results of the existing models are discussed further in Section 7.2.3.

7.2.3 DAP Reports

Four Drainage Action Plan reports exist for Wyre Forest District, as illustrated in **Figure 20**, covering Kidderminster¹¹, Bewdley¹², Stourport on Severn¹³ and the Rural Areas¹⁴. These reports utilise the results of the network models mentioned above to assess

¹¹ DAP Report L-879-01

¹² DAP Report L-879-02

¹³ DAP Report L-879-03

¹⁴ DAP Report L-879-04 (RAMPS), split into sub-areas A-J

where there are potential capacity restrictions within the network and whether any areas require improvement or upgrade. These findings have been used to influence the development site classifications and are discussed further in a site-by-site description within **Tables 17a - 17d**.

7.2.4 FLOODS2 Database

This database shows the recording historical occurrences of sewer flooding, both from surface and foul sewers between 1991 and 2008. Due to the potential implications of property blight resulting from the illustration of exact locations of such flooding, we have presented this information as broad areas within **Figure 20**. This has been used to assist in the assessment of likely capacity restrictions within the existing sewer network. If, for example, a section of infrastructure has previously experienced occurrences of flooding, this indicates the sewer pipes are already suffering from capacity restrictions and are therefore likely to be negatively impacted by an increase in development upstream.

7.2.5 STWL Comments

STWL have provided comments outlining their view of potential impacts of development upon the wastewater network. These are the most accurate assessment of the potential impact of the potential development sites, but unfortunately these have only been provided for the potential development sites included within the SFRA and not the additional SHLAA sites.

7.2.6 Wastewater Infrastructure Conclusions

The capacity of the wastewater infrastructure has been assessed based firstly upon the comments provided by the STWL strategies team. Where this information has not been available the analysis has been based upon the available data, including an assessment of the locations of historical flooding (FLOODS2 database), the proximity of the additional sites to those commented on by STWL and the network restrictions noted in the DAP reports. A traffic light colour code has been drawn up using the following classifications and the reasons for the classification of each site are summarised in the right hand column. The comments shaded in blue are those provided by STWL. It must also be noted that the sites marked as Greenfield will require investment to connect them to the sewer network, whereas there is a possibility that Brownfield sites may already have a connection in place and therefore require less investment.

Green

- Little or no infrastructure upgrade required
- ⇒ As stated by STWL; or
- ⇒ No identified capacity issues (i.e. no FLOODS2 records in the vicinity of the development site and no issues identified in the DAP report)

Yellow

- Minor infrastructure upgrade required
- ⇒ As stated by STWL; or
- ⇒ Capacity restriction or upgrades identified in the DAP report; and/or
- ⇒ Upstream of historical FLOOD2 surface water flooding or downstream of FLOODS2 foul water flooding and/or
- ⇒ Within an area of FLOODS2 foul water flooding but network is identified by STWL has being scheduled for an upgrade within AIMS database.

Red

- Major infrastructure upgrade required
- ⇒ Within proximity or immediately upstream of an area of network with historical FLOOD2 foul water flooding.

Table 17a – Kidderminster – Capacity of Sewerage Infrastructure

Unique ID	Area	Brownfield/ Greenfield	Sewerage Infrastructure	Reason
D1	1.1	Brownfield	G	There are no known flooding problems downstream of this site and subject to hydraulic modelling there should be no capacity issues. There is a 300mm diameter foul sewer and a 750mm diameter surface water sewer crossing the site and may need to be diverted.
D3/SH14/25	8.8	Brownfield	G	The redevelopment of these site offer the potential to improve the current performance of the sewerage system in Kidderminster. Nearly all of the roof water is currently connected to the foul sewer and so as part of redevelopment we would expect surface water to be separated. This would release capacity in the foul sewer to accept additional foul flows from new development. Whilst there are no known flooding problems in the town centre there are several localised areas where the sewerage system is currently stressed and so surface water separation would be beneficial. The green designation of this site is subject to the separation of surface water currently connected to the foul sewers.
D4	1.2	Brownfield	G	As above.
D5/SH82	7.1	Brownfield	G	The redevelopment of these site offer the potential to improve the current performance of the sewerage system in Kidderminster. Nearly all of the roof water is currently connected to the foul sewer and so as part of redevelopment we would expect surface water to be separated. This would release capacity in the foul sewer to accept additional foul

Unique ID	Area	Brownfield/ Greenfield	Sewerage Infrastructure	Reason
				flows from new development. Whilst there are no known flooding problems downstream there are several localised areas where the sewerage system is currently stressed and so surface water separation would be beneficial. The green designation of this site is subject to the separation of surface water currently connected to the foul sewers.
D7	4.5	Brownfield	G	As above.
D8	0.5	Brownfield	G	As above.
D9/SH10	1.0	Brownfield	G	The roof water from the existing building currently connects to the foul sewer and so separation of surface water as part of redevelopment will release capacity for additional foul flows. There are no known flooding problems downstream of this development and the current hydraulic performance is reasonably good and so subject to surface water separation there should be no capacity issues relating to these redevelopments.
D10/SH19	0.6	Brownfield	G	There are no known flooding problems downstream of this site and subject to hydraulic modelling there should be no capacity issues. is a 300mm diameter foul sewer and a 750mm diameter surface water sewer crossing the site and may need to be diverted.
D11	3.6	Brownfield	G	The redevelopment of this site offers the potential to improve the current performance of the sewerage system in Kidderminster. Nearly all of the roof water is currently connected to the foul sewer and so as part of redevelopment we would expect surface water to be separated. This would release capacity in the foul sewer to accept additional foul flows from new development. Whilst there are no known flooding problems in the town centre there are several localised areas where the sewerage system is currently stressed and so surface water separation would be beneficial. The green designation of this site is subject to the separation of surface water currently connected to the foul sewers.
D12/SH76	1.7	Brownfield	G	The roof water from the existing building currently connects to the foul sewer and so separation of surface water as part of redevelopment will release capacity for additional foul flows. There are no known flooding problems downstream of this development and the current hydraulic performance is reasonably good and so subject to surface water separation there should be no capacity issues relating to these redevelopments.
D21	23.9	Brownfield	G	This site is located immediately upstream of Kidderminster STW. There are no known flooding problems downstream of the site and so subject to hydraulic modelling there should be no capacity issues associated with this development
D22	2.2	Greenfield	Y	Whilst this is only a small development there are known hydraulic restrictions in the immediate vicinity and a known low severity flooding problem downstream. Subject to hydraulic modelling the additional foul flow from this site are not expected to significantly impact on the existing flooding problem but localised upsizing may be required. Minor flooding problems downstream.

Unique ID	Area	Brownfield/ Greenfield	Sewerage Infrastructure	Reason
D23/SH75/ SH159	0.9	Brownfield	G	This is only a small site but currently roof water is thought to connect to the foul sewer. Consequently subject to separation of surface water there are no expected to be any capacity issues relating to this site.
D24	6.5	Brownfield	G	There are existing foul and surface water sewers servicing this site. There are no known flooding problems downstream and the current hydraulic performance is reasonable. Parts of the roof drainage are thought to drain to the foul sewer and we would expect this to be separated as part of any redevelopment. Subject to hydraulic modelling this site is not expected to cause a capacity issue.
D25/SH35	0.6	Brownfield	G	The redevelopment of these site offer the potential to improve the current performance of the sewerage system in Kidderminster. Nearly all of the roof water is currently connected to the foul sewer and so as part of redevelopment we would expect surface water to be separated. This would release capacity in the foul sewer to accept additional foul flows from new development. Whilst there are no known flooding problems in the town centre there are several localised areas where the sewerage system is currently stressed and so surface water separation would be beneficial. The green designation of this site is subject to the separation of surface water currently connected to the foul sewers.
D26	0.5	Brownfield	G	As above.
D27	0.2	Brownfield	G	As above.
D28	1.2	Brownfield	G	As above.
D29/SH60	0.6	Brownfield	G	As above.
D30/SH9	0.1	Brownfield	G	This is only a small site and no capacity issues are envisages. There is however a 675mm diameter surface water crossing the site which may have to be diverted.
D31	7.3	Greenfield	G	There are no known flooding problems downstream of this site and subject to hydraulic modelling there should be no capacity issues. There is a 225mm diameter foul sewer running along the northern boundary of the site.
D33	0.3	Brownfield	Y	Part of this site is already connected to the public sewers. Due to topography the site is expected to drain either west to Hillary Road sewage pumping station or east to Mare & Colt SPS. Whilst these are only small pumping stations there is potential to free up capacity in the foul sewer as some roof water is through to connect to the foul sewer. Subject to surface water separation and hydraulic analysis this development would not be expected to have any capacity issues which cannot be addressed by localised upsizing/pump replacement. Potential impacts on small pumping stations.
D36	5.3	Brownfield	G	There are known flooding problems immediately adjacent to this redevelopment site. A solution is currently being appraised as part of our sewer flooding capital investment programme. However our records indicate that roof water from the existing buildings currently connects to the foul sewer and so separation of surface water flows will improve hydraulic performance. Subject to hydraulic modelling the redevelopment of this site should improve the hydraulic performance.

Unique ID	Area	Brownfield/ Greenfield	Sewerage Infrastructure	Reason
D38/SH40	1.7	Greenfield	G	Only a small site located adjacent to existing recent development. Provided surface water is not connected to the foul sewerage system there are no issues with this site.
D40	11124m (Road)		N/A	
D46	0.3	Brownfield	G	The redevelopment of this site offers the potential to improve the current performance of the sewerage system in Kidderminster. Nearly all of the roof water is currently connected to the foul sewer and so as part of redevelopment we would expect surface water to be separated. This would release capacity in the foul sewer to accept additional foul flows from new development. Whilst there are no known flooding problems in the town centre there are several localised areas where the sewerage system is currently stressed and so surface water separation would be beneficial. The green designation of this site is subject to the separation of surface water currently connected to the foul sewers.
D47/SH81	0.4	Brownfield	G	As above.
D48/SH71	0.1	Brownfield	G	As above.
D49/SH80	0.1	Brownfield	G	As above.
D50/SH152	0.9	Brownfield	G	The redevelopment of these site offer the potential to improve the current performance of the sewerage system in Kidderminster. Nearly all of the roof water is currently connected to the foul sewer and so as part of redevelopment we would expect surface water to be separated. This would release capacity in the foul sewer to accept additional foul flows from new development. Whilst there are no known flooding problems downstream there are several localised areas where the sewerage system is currently stressed and so surface water separation would be beneficial. The green designation of this site is subject to the separation of surface water currently connected to the foul sewers.
D52/SH61	0.3	Brownfield	G	The roof water from the existing building currently connects to the foul sewer and so separation of surface water as part of redevelopment will release capacity for additional foul flows. There are no known flooding problems downstream of this development and the current hydraulic performance is reasonably good and so subject to surface water separation there should be no capacity issues relating to these redevelopments.
D53	0.7	Brownfield	G	As above.
D54	1.5	Brownfield	G	The redevelopment of this site offers the potential to improve the current performance of the sewerage system in Kidderminster. Nearly all of the roof water is currently connected to the foul sewer and so as part of redevelopment we would expect surface water to be separated. This would release capacity in the foul sewer to accept additional foul flows from new development. Whilst there are no known flooding problems in the town centre there are several localised areas where the sewerage system is currently stressed and so surface water separation would be beneficial. The green designation of this site is subject to the separation of surface water currently connected to the foul sewers.

Unique ID	Area	Brownfield/ Greenfield	Sewerage Infrastructure	Reason
SH4	0.3	Brownfield	G	Located between or close to the sites identified by STWL within Kidderminster as having a low potential impact on the sewerage infrastructure.
SH11	0.1	Brownfield	G	As above.
SH18	5.4	Brownfield	G	As above.
SH20	1.0	Greenfield	R	Located in an area of foul sewer flooding and upstream of any area identified in the DAP report as having capacity restrictions.
SH21	0.3	Greenfield	R	Located in an area of foul sewer flooding.
SH30	0.8	Brownfield	G	Located between or close to the sites identified by STWL within Kidderminster as having a low potential impact on the sewerage infrastructure.
SH31	1.0	Brownfield	G	As above.
SH32	0.1	Brownfield	G	As above.
SH38	0.8	Brownfield	G	As above.
SH39	0.5	Brownfield	G	As above.
SH41	15.3	Greenfield	Y	Upstream of an area identified in the DAP report as having potential capacity restrictions when Local Plan development is considered.
SH42	0.1	Brownfield	G	Located between or close to the sites identified by STWL within Kidderminster as having a low potential impact on the sewerage infrastructure.
SH43	0.1	Brownfield	G	As above.
SH44	0.3	Brownfield	G	As above.
SH47	0.1	Brownfield	G	As above.
SH53	0.2	Brownfield	G	As above.
SH56	0.5	Brownfield	G	As above.
SH59	1.7	Brownfield	Y	Close to an area identified in the DAP report as having potential capacity restrictions when Local Plan development is considered.
SH62	0.1	Brownfield	G	Located between or close to the sites identified by STWL within Kidderminster as having a low potential impact on the sewerage infrastructure.
SH63	0.4	Brownfield	Y	Within an area identified in the DAP report as having potential capacity restrictions when Local Plan development is considered..
SH64	0.2	Brownfield	Y	Within an area identified in the DAP report as having potential capacity restrictions with regards to foul water capacity.
SH65	0.3	Brownfield	Y	Within an area identified in the DAP report as having potential capacity restrictions when Local Plan development is considered.
SH69	0.8	Brownfield	R	Located in an area of foul sewer flooding.
SH72	0.3	Brownfield	R	Located in an area of foul sewer flooding and upstream of any area identified in the DAP report as having capacity restrictions.
SH73	1.1	Brownfield	Y	Located within an area of foul flooding but next to potential development sites identified by STWL as having a low potential impact on the sewerage infrastructure. Also upstream of pumping stations identified in the DAP report as requiring capacity upgrade.
SH74	0.5	Brownfield	Y	Identified as being in an area of historical surface water flooding.
SH78	0.2	Brownfield	Y	Identified as being close to an area of foul flooding and within an area identified in the DAP report as having potential capacity restrictions when Local Plan development is considered.

Unique ID	Area	Brownfield/ Greenfield	Sewerage Infrastructure	Reason
SH79	0.4	Greenfield	Y	Within an area identified in the DAP report as having potential capacity restrictions when Local Plan development is considered.
SH83	1.1	Greenfield	G	Close to an area identified by STW as having a low potential impact on the sewerage infrastructure and not upstream of any areas of historical sewer flooding.
SH84	0.8	Brownfield	Y	This site is located close to an area affected by foul flooding, however this area has been identified by STWL as having a planned upgrade to the infrastructure (AIMS database).
SH85	0.3	Brownfield	Y	Identified as being close to an area of foul flooding.
SH86	0.5	Brownfield	G	Located between or close to the sites identified by STWL within Kidderminster as having a low potential impact on the sewerage infrastructure.
SH87	0.8	Greenfield	Y	Within an area identified in the DAP report as having potential capacity restrictions with regards to current capacity for foul water flow and upstream of an area of identified foul flooding.
SH88	1.6	Greenfield	Y	Located upstream of an area of foul flooding and within an area identified by STWL as having current surface water capacity problems.
SH91	0.3	Brownfield	Y	Located close to an area of foul flooding and within an area identified within the DAP report as having surface water capacity issues.
SH93	0.2	Brownfield	G	Located between or close to the sites identified by STWL within Kidderminster as having a low potential impact on the sewerage infrastructure.
SH94	0.6	Brownfield	Y	Within an area identified in the DAP report as having potential capacity restrictions and upstream of an area of identified foul flooding.
SH95	1.3	Brownfield	Y	Close to an area identified in the DAP report as having current foul water capacity restrictions.
SH96	0.3	Brownfield	Y	Upstream of areas of foul and surface water flooding.
SH97	0.2	Brownfield	G	Located between or close to the sites identified by STWL within Kidderminster as having a low potential impact on the sewerage infrastructure.
SH98	0.1	Brownfield	G	As above.
SH105	5.8	Brownfield	Y	Within an area identified in the DAP report as having current foul water capacity restrictions.
SH106	0.4	Brownfield	R	Located in an area of foul sewer flooding.
SH109	14.0	Greenfield	Y	Located upstream of areas of foul and surface water flooding.
SH111	3.6	Greenfield	Y	Upstream of an area identified in the DAP report as having potential capacity restrictions when Local Plan development is considered.
SH113	1.8	Brownfield	Y	This site is within an area affected by foul flooding, however this area has been identified by STWL as having a planned upgrade to the infrastructure (AIMS database).
SH114	0.9	Brownfield	Y	As above.
SH122	0.5	Brownfield	Y	Located in an area of surface water flooding and upstream of an area of foul flooding.
SH125	0.6	Brownfield	Y	Within an area identified in the DAP report as having potential capacity restrictions when Local Plan development is considered.
SH128	39.5	Greenfield	Y	Large Greenfield site with potential to introduce a high volume of effluent to the system and without any existing connections to the sewerage system.

Unique ID	Area	Brownfield/ Greenfield	Sewerage Infrastructure	Reason
SH133	18.1	Greenfield	Y	Located upstream of areas of foul and surface water flooding.
SH134	0.0	Brownfield	G	This site is within an area affected by foul flooding, however this area has been identified by STWL as having a planned upgrade to the infrastructure (AIMS database).
SH135	1.6	Greenfield	Y	Located upstream of an area identified in the DAP report as having capacity restrictions when Local Plan development is considered.
SH137	3.2	Brownfield	Y	Located in an area of foul sewer flooding and upstream of any area identified in the DAP report as having capacity restrictions, especially regarding a need to upgrade the pumping station.
SH142	0.2	Brownfield	R	Located in an area of foul sewer flooding and upstream of any area identified in the DAP report as having capacity restrictions.
SH143	95.2	Greenfield	Y	Large Greenfield site with potential to introduce a high volume of effluent to the system and without any existing connections to the sewerage system. Also located upstream of areas of surface and foul flooding.
SH150	0.3	Brownfield	G	This site is within an area affected by foul flooding, however this area has been identified by STWL as having a planned upgrade to the infrastructure (AIMS database).
SH151	0.2	Brownfield	G	As above.
SH153	0.9	Brownfield	Y	Located upstream of an area of foul flooding.
SH154	0.8	Brownfield	R	Located in an area of foul sewer flooding and upstream of any area identified in the DAP report as having capacity restrictions.
SH155	0.2	Brownfield	Y	Identified as being close to an area of foul flooding and within an area of surface flooding.
SH156	0.9	Brownfield	R	Located in an area of foul sewer flooding.
SH157	0.8	Brownfield	Y	Located upstream of an area identified in the DAP report as having capacity restrictions when Local Plan development is considered and current surface water capacity restrictions.
SH163	2.7	Greenfield	G	This site is within an area affected by foul flooding, however this area has been identified by STWL as having a planned upgrade to the infrastructure (AIMS database).

Table 17b – Stourport on Severn – Capacity of Sewerage Infrastructure

Unique ID	Area	Brownfield/ Greenfield	Sewerage Infrastructure	Reason
D2/SH17	3.09	Brownfield	G	These two sites are opposite Worcester Road SPS which pumps all flows from Stourport to the Kidderminster catchment. There are no known flooding problems downstream of the potential development sites. Some of the buildings on site D2 currently have surface water connected to the foul sewer as so as part of the redevelopment we would expect these to be separated. This will release capacity in the foul sewer for this and other developments proposed in Stourport.
D13/SH7	6.06	Brownfield	G	There are no known flooding problems downstream of these redevelopment sites. There are several public sewers crossing the sites and there is a combined sewer overflow within the site boundary of site D13 (Off Severn Road near to junction with Lichfield Street). Current hydraulic performance indicates that redevelopment of this site should not have any capacity issues but will need to be confirmed by detailed hydraulic modelling.
D14/SH3	2.20	Brownfield	G	As above.
D15/SH45	2.03	Brownfield	G	As above.
D16	0.95	Brownfield	G	Small redevelopment site and so do not expect any capacity issues provided surface water is not connected to the foul sewers.
D17	0.77	Brownfield	G	Small redevelopment site and so do not expect any capacity issues provided surface water is not connected to the foul sewers. There is a 225mm diameter foul sewer crossing the site which may need to be diverted depending on the proposed development layout.
D18	3.71	Brownfield	G	This site is opposite Worcester Road SPS which pumps all flows from Stourport to the Kidderminster catchment. There are no known flooding problems downstream of the potential development sites. One of the twin 375/450mm diameter rising mains from Worcester Road SPS cross the northern boundary of this site.
D19	0.22	Brownfield	G	Small site and so do not expect any capacity issues provided surface water is not connected to the foul sewers.
D34/SH27/ SH34/SH117	1.60	Brownfield	G	These two sites are opposite Worcester Road SPS which pumps all flows from Stourport to the Kidderminster catchment. There are no known flooding problems downstream of the potential development sites. Some of the buildings on site D2 currently have surface water connected to the foul sewer as so as part of the redevelopment we would expect these to be separated. This will release capacity in the foul sewer for this and other developments proposed in Stourport.
D35/SH8	0.38	Brownfield	G	Small redevelopment site and so do not expect any capacity issues provided surface water is not connected to the foul sewers.
D39	2958m (Road)		N/A	
D41/SH33	3.14	Brownfield	G	Site is located immediately upstream of Power Station Road SPS which then pumps flows via a 470m 150mm diameter rising main. Subject to hydraulic performance checks at the pumping station we would not expect this site to result in any capacity issues.
D42/SH28	0.83	Brownfield	G	Small redevelopment site and so do not expect any capacity issues provided surface water is not connected to the foul sewers.
D43/SH57	0.59	Brownfield	G	As above.

Unique ID	Area	Brownfield/ Greenfield	Sewerage Infrastructure	Reason
D44/SH15	1.37	Brownfield	G	Small redevelopment site and so do not expect any capacity issues provided surface water is not connected to the foul sewers. A 600mm diameter surface water sewer crosses the western boundary of the site.
SH5	0.36	Brownfield	G	Located between or close to the sites identified by STWL within Stourport as having a low potential impact on the sewerage infrastructure.
SH16	6.26	Brownfield	G	As above.
SH37	1.97	Greenfield	G	As above.
SH46	0.17	Brownfield	G	As above.
SH48	0.38	Brownfield	G	As above.
SH49	0.68	Brownfield	G	As above.
SH50	0.23	Brownfield	G	As above.
SH51	0.15	Brownfield	G	As above.
SH52	0.55	Brownfield	G	No problems identified in DAP reports and small site which should produce little effluent to impact the system.
SH54	0.59	Brownfield	Y	Located close to an area of foul flooding.
SH55	0.20	Brownfield	G	Located between or close to the sites identified by STWL within Stourport as having a low potential impact on the sewerage infrastructure.
SH67	0.36	Brownfield	Y	Located in an area of surface water flooding.
SH68	0.17	Brownfield	Y	As above.
SH89	3.50	Brownfield	R	Located within an area of foul flooding.
SH92	0.08	Brownfield	G	No problems identified in DAP reports and small site which should produce little effluent to impact the system.
SH99	0.25	Brownfield	G	Located between or close to the sites identified by STWL within Stourport as having a low potential impact on the sewerage infrastructure.
SH100	0.21	Brownfield	G	As above.
SH101	0.29	Brownfield	G	As above.
SH102	0.67	Brownfield	G	As above.
SH103	0.36	Brownfield	G	As above.
SH104	3.16	Brownfield	R	Located within an area of foul flooding.
SH118	0.19	Brownfield	G	Located between or close to the sites identified by STWL within Stourport as having a low potential impact on the sewerage infrastructure.
SH124	0.14	Brownfield	G	As above.
SH138	1.71	Brownfield	Y	Located upstream of an area of foul flooding.

Table 17c – Bewdley – Capacity of Sewerage Infrastructure

Unique ID	Area	Brownfield/ Greenfield	Sewerage Infrastructure	Reason
D6/SH1	0.66	Brownfield	G	Several public foul and surface water sewers cross this site and so may need to be diverted depending on development layout. Additional foul flows from this redevelopment is not expected to have any capacity issues provided surface water is not connected to the foul sewer
D32	0.26	Brownfield	G	600mm diameter public surface water sewers cross this site and so may need to be diverted depending on development layout. Additional foul flows from this redevelopment is not expected to have any capacity issues provided surface water is not connected to the foul sewer
D45/SH22	2.09	Brownfield	G	225mm diameter foul sewer currently crosses site. Catchment drains to Beales Corner SPS but additional foul flows not expected to have any capacity issues on downstream sewers provided surface water is not connected to the foul sewers
SH2	0.12	Brownfield	G	Located between or close to the sites identified by STWL within Bewdley as having a low potential impact on the sewerage infrastructure.
SH36	3.18	Greenfield	G	Located between or close to the sites identified by STWL within Bewdley as having a low potential impact on the sewerage infrastructure.
SH66	1.00	Brownfield	R	Located within an area of known surface and foul water flooding and capacity restrictions.
SH77	0.26	Brownfield	R	As above.
SH136	0.49	Brownfield	R	Located within an area of foul flooding.
SH145	3.88	Greenfield	R	Located within an area of known surface and foul water flooding and capacity restrictions.
SH146	7.20	Greenfield	R	As above.
SH148	2.55	Greenfield	R	As above.
SH149	3.06	Greenfield	R	As above.

Table 17d – Rural Wyre Forest – Capacity of Sewerage Infrastructure

Unique ID	Area	Brownfield/ Greenfield	Sewerage Infrastructure	Reason
D20	2.10	Mixed	G	Small redevelopment site is upstream of Kidderminster STW and so do not expect any capacity issues provided surface water is not connected to the foul sewers. There is a 450mm diameter foul sewer crossing the north eastern site boundary which may need to be diverted depending on the proposed development layout.
D37/SH29	5.71	Brownfield	G	The redevelopment of this site gives the potential to remove surface water currently connected to the foul sewer. Whilst there are no known flooding problems in the vicinity the current hydraulic performance indicates hydraulic stress, therefore removal of surface water will free up capacity for additional foul flows from the proposed developments in Cookley. All flows in Cookley are pumped via Caunsall Road SPS to Kidderminster catchment. Surface water separation will benefit system performance.
D51/SH107	23.07	Brownfield	Y	There are no public sewers in the vicinity and is not currently connected to the sewerage network. Whilst there are no known flooding problems downstream of a potential connection point the current hydraulic model is predicting localised capacity issues. Further detailed modelling would be required to confirm if any localised upsizing is required.
SH6	0.27	Greenfield	Y	Located in an area with no identified flooding or capacity problems. However, no existing link to the sewerage system identified so infrastructure will be required.
SH12	0.06	Brownfield	G	Located in an area with no identified flooding or capacity problems.
SH13	1.01	Brownfield	Y	Located in an area of foul flooding but also in an area identified as being within the upgrade plans of STWL (AIMS).
SH23	2.28	Greenfield	Y	Located upstream of area identified in the DAP report as having capacity restrictions, regarding replacement of the storm pipe under Kidderminster Road.
SH58	0.45	Greenfield	Y	As above.
SH70	0.04	Brownfield	G	Located in an area with no identified flooding or capacity problems.
SH90	7.09	Brownfield	Y	Located upstream of a pumping station identified in the DAP report as requiring refurbishment.
SH108	1.20	Greenfield	G	Located close to sites identified by STWL as having a low potential impact on the sewerage infrastructure.
SH110	1.36	Brownfield	Y	Located upstream of an area of foul flooding.
SH112	0.15	Greenfield	G	Located close to sites identified by STWL as having a low potential impact on the sewerage infrastructure.
SH115	0.62	Greenfield	G	Located in an area with no identified flooding or capacity problems.
SH116	3.11	Greenfield	G	As above.
SH119	2.72	Greenfield	Y	Located upstream of area identified in the DAP report as having capacity restrictions when development in the Local Plan is considered.
SH120	0.49	Brownfield	Y	Located upstream of area identified in the DAP report as having capacity restrictions, regarding replacement of the storm pipe under Kidderminster Road.
SH121	1.16	Greenfield	G	No identified occurrences of flooding or capacity restrictions and located in proximity to sewerage infrastructure.

Unique ID	Area	Brownfield/ Greenfield	Sewerage Infrastructure	Reason
SH123	0.27	Brownfield	Y	Located upstream of area identified in the DAP report as having septicity problems and infiltration issues at the pumping station.
SH126	0.26	Brownfield	Y	As above.
SH127	0.07	Brownfield	Y	Located upstream of area identified in the DAP report as having capacity restrictions, regarding replacement of the storm pipe under Kidderminster Road.
SH129	3.94	Greenfield	Y	Located upstream of a pumping station identified in the DAP report as requiring refurbishment.
SH130	0.31	Greenfield	Y	Located upstream of area identified in the DAP report as having capacity restrictions, regarding replacement of the storm pipe under Kidderminster Road.
SH131	6.38	Greenfield	G	No identified occurrences of flooding or capacity restrictions and located in proximity to sewerage infrastructure.
SH132	1.76	Greenfield	G	As above.
SH139	5.16	Greenfield	Y	Located upstream of area identified in the DAP report as having septicity problems and infiltration issues at the pumping station.
SH140	0.64	Brownfield	Y	Located upstream of a pumping station identified in the DAP report as requiring upgrade.
SH141	1.07	Brownfield	G	No identified occurrences of flooding or capacity restrictions and located in proximity to sewerage infrastructure.
SH144	1.73	Greenfield	R	No existing infrastructure in proximity to site.
SH147	0.43	Greenfield	Y	Located upstream of area identified in the DAP report as having capacity restrictions when development in the Local Plan is considered.
SH158	0.34	Brownfield	R	No existing infrastructure in proximity to site.
SH160	1.90	Greenfield	Y	Located upstream of area identified in the DAP report as having capacity restrictions, regarding replacement of the storm pipe under Kidderminster Road.
SH161	2.38	Greenfield	Y	As above.
SH162	0.17	Greenfield	Y	Located in an area of foul flooding but also in an area identified as being within the upgrade plans of STWL (AIMS).

7.3 Wastewater Treatment

All wastewater transmitted in the combined or foul sewer networks, either by gravity systems or pumps, is taken to a WwTW to be cleansed and subsequently released back into the river network. The number of WwTWs is decreasing due to a preference for the utilisation of fewer larger works, although the Environment Agency is now trying to reduce the trend in amalgamating smaller works as it is not always the most viable option environmentally.

Kidderminster (Oldington) is the main WwTW within Wyre Forest District, serving the towns of Kidderminster, Stourport and Bewdley, although numerous smaller works are also present within and just outside the District boundaries, as shown in **Figure 19**. These include:

- Rectory Lane, Rock;
- Fox Lane, Chaddesley Corbett;
- Blakedown;
- Upper Arley;
- Belbroughton (just outside the western boundary of the District);
- Horton Lane, Great Horton (south of the District); and
- Roundhill (north of the District boundary).

The capacity of these systems is an important consideration when planning new development. This is judged in terms of the ability of the WwTW to receive more flow and the quality of the watercourse into which it discharges. For a WwTW to increase its capacity, it has the potential to require an increase in Consented Dry Weather Flow (CDWF). If the quality of the river in question is already marginal or poor, it may prove to be a barrier to the increase in CDWF due to the enhanced influence an increase in treated effluent will have upon the aquatic ecosystem. However, should consent be granted, the conditions will undoubtedly be stringent and require additional capital investment by STWL in order to meet the higher effluent standard, particularly with regards to the level of phosphates discharged¹⁵. The Urban Wastewater Treatment Directive (UWWTD) is designed to make sure all wastewater in the EU is treated to the appropriate standard. An essential element of the Directive is that quality standards for effluent fall into categories depending on the size of the treatment works and the sensitivity of the receiving watercourse. As populations grow, some WwTW may exceed the UWWTD threshold that requires nutrient removal¹⁵. In locations where households cannot be connected to existing sewers, particularly of concern in the rural areas of the District, this may result in additional septic tank discharges to water bodies in which levels of phosphates and nitrates are already very high. Under the Water Resources Act a 'consent to discharge' must be obtained from the Environment Agency before any polluting material is legally discharged into a watercourse. The consents are based upon the quality and volume of the waste water and the quality and capacity of the receiving watercourse. If a WwTW needs to expand due to new development with it may be necessary for a new consent for increased flow to be applied for. The RSS states that although the Environment Agency may grant this it is likely to set tighter limits on the pollutant concentrations to ensure overall loading is unaltered. When the initial RSS targets were released, the Environment Agency carried out a study to assess the impact of housing growth on water quality and wastewater infrastructure¹⁵. However,

¹⁵ West Midlands Regional Spatial Strategy (RSS 11) The Impact of Housing -Growth on Water Quality and Waste Water Infrastructure, 2007

SUDS can be implemented as part of new developments with the resulting effect of improving water quality and reducing additional rate and volume of surface water run off.

STWL have provided the CDWF values for each of the WwTWs for use in this WCS. Due to its importance as a recipient of additional effluent from development within or around the three main urban areas, STWL have also provided comment regarding the future capacity of the Kidderminster Oldington works, taking account of the proposed development. This WwTW has a current CDWF of 19,400m³/d and STWL estimate that this WwTW has sufficient spare capacity to accommodate an additional 7,780 properties (at a population density of 2.4 people per dwelling), which is more than sufficient for all three scenarios of proposed development within the District. STWL have also stated that for this WwTW they do not envisage any future problems regarding expansion of the works or a negative effect upon water quality from an increase in treated effluent.

For all the other WwTWs, Royal Haskoning have used a simple discharge estimation tool to calculate the effect of the proposed development upon the discharge and CDWF. This tool utilises the housing trajectories provided by the Council and Annual Monitoring Reports (AMRs) for each of the WwTW catchments and calculates the additional effluent which can be expected to be produced for treatment by the development. As such it predicts when and if the WwTWs will exceed their CDWF. This takes a conservative worst-case scenario and assumes that none of the WwTW will be consented an increased in DWF within the planning period. The calculations also assume a residential development design flow of 136 litres/capita/day (an average reading between the current 148litres/capita/day and the predicted 133 litres/capita/day in 2035¹⁶), an infiltration rate of 34 litres/capita/day (based on 25% of the Per Capita Consumption) and an average dwelling occupancy of 2.4 people. The results of this analysis and the CDWF for each of the WwTWs are shown in **Table 18** below. As all of the proposed employment development is predicted to be located in or around Kidderminster, no allowance has been built into these calculations for trade effluent.

Table 18 - Predicted effect of development upon WwTW capacity

WwTW	CDWF (m ³ /d)	Proposed Population Increase*	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2020/22	2020/23	2020/24	2020/25	2020/26
Upper Arley	65	169	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Chaddesley Corbett	116	99	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Blakedown	433	5	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
Belbroughton	500	0	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Rock	-	0	No CDWF data available																			
Roundhill	59,836	0	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Horton Lane	-	0	No CDWF data available																			
Kidderminster Oldington	19,400	4,128	Provided by STWL																			

* includes an allowance for non-residential population

G	Discharge is less than CDWF
Y	Discharge is within 20% of CDWF
R	Discharge exceeds CDWF

¹⁶ Severn Trent Water WRMP Statement of Response, 2009

This analysis indicates that, for the more rural areas of Upper Arley and Chaddesley Corbett the WwTWs are already operating under pressure and, as a result, will require either an increase in CDWF or an improvement in their operating capacity to accommodate any potential new development in these areas. However, given the rural location of these areas, it is not anticipated that a large amount of development will occur over the plan period within these locations, which should help to limit the improvements that might be required on the existing WwTWs. Following the publication of this WCS these WwTWs may be identified within STWs PR09 programme of works for improvement. Further consultation with STW will therefore be required,

In addition to the consented limits, the ammonia and phosphate levels in the receiving watercourses must be considered in a review of consent limits, as will the requirements of the WFD and the findings of the RBMP.

When reviewing discharge consents the Environment Agency have two over-arching policies which they adhere to:

1. Growth - they will not allow any breach of a statutory standard due to growth and will minimise any deterioration due to growth;
2. No deterioration - they will minimise the deterioration to water quality.

Where they are not satisfied that control measures are in place to prevent deterioration of the watercourse in the current class (as stated in the RBMPs), they may object to proposals for growth.

Table 19 summarises the results of the Environment Agency risk assessment and water quality analysis for each of the WwTWs, in addition to the comments provided by STWL. River quality is assessed in greater detail in Section 7.4).

Table 19 – Wastewater Treatment Works Serving Wyre Forest District

Wastewater Treatment Works	Watercourse	STW Opinion - future problems	EA Risk Assessment (Overall Risk)	River Quality Objective
Kidderminster Oldington	River Stour	None	Low	Compliant
Rectory Lane, Rock	Dick Brook	Not given	-	Compliant (downstream)
Fox Lane, Chaddesley Corbett	Hockley Brook	Not given	-	-
Blakedown	Blakedown Brook	Not given	-	Compliant (but Significant Failure downstream)
Upper Arley	River Severn	Not given	-	Compliant
Horton Lane, Great Horton	Tributary of Hadley Brook	Not given	-	-
'Belbroughton'	Hoo Brook	Not given	-	Compliant
Roundhill, Stourbridge	River Stour	Improvement plans to upgrade ¹⁷	High	Compliant

¹⁷ 'Bills to fund wave of investment', Severn Trent Water, 19th February 2007

STWL have already identified the need for improvement works at Roundhill WwTW within their AMP4 submission, which was identified as High Risk within the Environment Agency risk assessment report, based upon water quality and flow risk. If additional improvements are required based upon the updated dWMRSS figures, they will incorporate this need into their AMP5, PR09 submission this year. However, as this WwTW only receives wastewater from a small area of Wyre Forest District and none of the potential development sites are located within this catchment, this is not an important concern within this WCS.

This analysis indicates that the main WwTW within Wyre Forest District and the one which will serve a large proportion of the potential development within the District is Kidderminster (Oldington). As mentioned above, STWL have not identified any restriction to the proposed development for this WwTW. **Table 19** indicates that the Environment Agency has also assessed this WwTW as being at low environmental risk, both in terms of flow and quality. The watercourse which receives its outflow, the River Stour, has also been assessed by the Environment Agency as being compliant with its River Quality Objectives (RQO). The importance of the water quality is discussed later in this Section.

Unfortunately none of the smaller WwTWs have been included within the Environment Agency's Risk Assessment study, although most of the watercourses into which they discharge have been assessed as being 'compliant' with their RQOs. The only WwTW of slight concern is the Blakedown works. Although Blakedown Brook has been assessed as being compliant with its RQO in the region of the WwTW, it has been assessed as significantly failing its RQO downstream from the Hurcott Road bridge, through Kidderminster to its confluence with the River Stour. This WwTW may therefore require additional review for any potential development sites within its catchment.

7.3.1 Wastewater Treatment Conclusions

Overall the results of this analysis indicate that the wastewater treatment works of concern within the planning period are:

- Blakedown (for a failure in RQO downstream of the works);
- Roundhill (high overall risk in the Environment Agency's assessment and risk of CDWF exceedence);
- Upper Arley (due to risk of CDWF exceedence); and
- Chaddesley Corbett (due to risk of CDWF exceedence)

It is highly likely that these issues will be overcome through consultation with STWL and the Environment Agency through an improvement in the treatment process, increase in CDWF and/or extension of the works. These results are therefore not a showstopper to development but merely indicate a potential time or cost implication when developing within these areas.

The results of this analysis upon the potential development sites is summarised in **Tables 20a - 20d** below and shown graphically in **Figure 21**:



Green

- Little or no infrastructure upgrade required
- ⇒ Located in catchment of WwTW not identified as having capacity restrictions or water quality issues*



Yellow

- Minor infrastructure upgrade required
- ⇒ Located in catchment of WwTW identified as having downstream water quality issues*, no available CDWF data or located outside a WwTW catchment but close to a network joined to a WwTW catchment.



Red

- Major infrastructure upgrade required
- ⇒ Located in catchment of a WwTW identified as having capacity issues*

*(discussed further in Section 7.4).

Table 20a – Kidderminster – Wastewater Treatment Constraints

Unique ID	Area	Brownfield/ Greenfield	Location	Wastewater Treatment
D1	1.1	Brownfield	Land to Rear of Crossley	G
D3/SH14/25	8.8	Brownfield	KTC.4	G
D4	1.2	Brownfield	Council Depot Site	G
D5/SH82	7.1	Brownfield	Churchfields Business Park	G
D7	4.5	Brownfield	Georgian Carpet Factories Site	G
D8	0.5	Brownfield	Lime Kiln Bridge	G
D9/SH10	1.0	Brownfield	Park Lane Timber Yard	G
D10/SH19	0.6	Brownfield	BT Site, Mill Street	G
D11	3.6	Brownfield	Current Morrisons application Site	G
D12/SH76	1.7	Brownfield	Park Street	G
D21	23.9	Brownfield	British Sugar Site	G
D22	2.2	Greenfield	Victoria Sports Ground	G
D23/SH75/ SH159	0.9	Brownfield	Park Lane	G
D24	6.5	Brownfield	Current Sealine Factory (Various Units)	G
D25/SH35	0.6	Brownfield	Current Retail Area	G
D26	0.5	Brownfield	New Road and Market Street	G
D27	0.2	Brownfield	Brintons Offices - Exchange Street	G
D28	1.2	Brownfield	Current Morrisons Site and Other Shops	G
D29/SH60	0.6	Brownfield	KTC.3 - Worcester Street Enhancement Area	G
D30/SH9	0.1	Brownfield	Church Street Car Park	G
D31	7.3	Greenfield	Puxton	G
D33	0.3	Brownfield	Lax Lane Craft Centre/WVRS/British Red Cross	G
D36	5.3	Brownfield	Lisle Avenue	G
D38/SH40	1.7	Greenfield	Puxton Site	G

Unique ID	Area	Brownfield/ Greenfield	Location	Wastewater Treatment
D40	1124m (Road)		Hoo-Brook Link Road	N/A
D46	0.3	Brownfield	Cheshires Printers	G
D47/SH81	0.4	Brownfield	Kidderminster market auctions	G
D48/SH71	0.1	Brownfield	Comberton Place	G
D49/SH80	0.1	Brownfield	Comberton Hill	G
D50/SH152	0.9	Brownfield	CMS Car Showrooms	G
D52/SH61	0.3	Brownfield	Rock Works	G
D53	0.7	Brownfield	Matalan	G
D54	1.5	Brownfield	Worcester Street	G
SH4	0.3	Brownfield	78 MILL STREET	G
SH11	0.1	Brownfield	CASTLE ROAD / PARK LANE	G
SH18	5.4	Brownfield	GEORGIAN CARPETS	G
SH20	1.0	Greenfield	PLAYING FIELD ADJACENT ST. MARY'S SCHOOL	G
SH21	0.3	Greenfield	REAR OF THE PARADE BROADWATERS	G
SH30	0.8	Brownfield	NEW ROAD CARTERS SITE	G
SH31	1.0	Brownfield	R&D Aggregates Site	G
SH32	0.1	Brownfield	PARK LANE	G
SH38	0.8	Brownfield	BED CITY MCF COMPLEX	G
SH39	0.5	Brownfield	ELGAR HOUSE GREEN STREET	G
SH41	15.3	Greenfield	FORMER BRITISH SUGAR SETTLING PONDS	G
SH42	0.1	Brownfield	MILL BANK GARAGE	G
SH43	0.1	Brownfield	PIANO BUILDING WEAVERS WHARF	G
SH44	0.3	Brownfield	ZANZIBARS CASTLE ROAD KIDDERMINSTER	G
SH47	0.1	Brownfield	26 WOOD STREET	G
SH53	0.2	Brownfield	TELEPHONE EXCHANGE BLACKWELL STREET	G
SH56	0.5	Brownfield	LEA STREET SCHOOL	G
SH59	1.7	Brownfield	SUTTON RESERVOIR	G
SH62	0.1	Brownfield	HERONS NURSING HOME, SPENNELLS	G
SH63	0.4	Brownfield	CHESTER ROAD SOUTH SERVICE STATION	G
SH64	0.2	Brownfield	OLDNALL ROAD	G
SH65	0.3	Brownfield	PURAC BUILDING	G
SH69	0.8	Brownfield	FRANCHE COMMUNITY CENTRE	G
SH72	0.3	Brownfield	RIFLE RANGE SHOPS	G
SH73	1.1	Brownfield	HURCOTT MAISONNETTES	G
SH74	0.5	Brownfield	BROADWATERS COMMUNITY CENTRE	G
SH78	0.2	Brownfield	207 BIRMINGHAM ROAD KIDDERMINSTER	G
SH79	0.4	Greenfield	CHESTER ROAD BOWLING CLUB	G
SH83	1.1	Greenfield	FRANCHE ROAD TRIANGLE	G
SH84	0.8	Brownfield	LAND OFF BROOMFIELD CLOSE	G
SH85	0.3	Brownfield	YEW TREE PUB	G
SH86	0.5	Brownfield	HARRIERS TRADING ESTATE	G
SH87	0.8	Greenfield	SOUTH OF BERNIE CROSSLND WALK	G
SH88	1.6	Greenfield	PLAYING FIELD OFF SUTTON PARK RISE	G
SH91	0.3	Brownfield	QUEENS STREET (REDEVELOPMENT)	G

Unique ID	Area	Brownfield/ Greenfield	Location	Wastewater Treatment
SH93	0.2	Brownfield	273/4 HOO ROAD (ADJ. ST.ANDREWS GREEN	G
SH94	0.6	Brownfield	NORTH OF BERNIE CROSSLAND WALK	G
SH95	1.3	Brownfield	BLAKEBROOK SCHOOL / COUNTY BUILDINGS	G
SH96	0.3	Brownfield	EAGLE'S NEST PH	G
SH97	0.2	Brownfield	AYLMER LODGE SURGERY	G
SH98	0.1	Brownfield	NORTHUMBERLAND AVENUE SURGERY	G
SH105	5.8	Brownfield	KING CHARLES 1 SCHOOL	G
SH106	0.4	Brownfield	SUTTON ARMS PH	G
SH109	14.0	Greenfield	HURCOTT ADR	G
SH111	3.6	Greenfield	OFFMORE LANE ALLOTMENTS	G
SH113	1.8	Brownfield	OASIS ARTS & CRAFTS	G
SH114	0.9	Brownfield	REILLOC CHAIN	G
SH122	0.5	Brownfield	THE BRIARS HOTEL	G
SH125	0.6	Brownfield	LAND AT 108-109 BEWDLEY HILL	G
SH128	39.5	Greenfield	STANKLYN LANE	G
SH133	18.1	Greenfield	LAND AT WOLVERLEY TRAFFIC LIGHTS	G
SH134	0.0	Brownfield	R/O 41 CLARENCE STREET	G
SH135	1.6	Greenfield	LAND AT THE LEA	G
SH137	3.2	Brownfield	ZORTECH AVENUE	G
SH142	0.2	Brownfield	MUSKETEER PH RIFLE RANGE	G
SH143	95.2	Greenfield	LOW HABBERLEY FARM	G
SH150	0.3	Brownfield	CHESHIRE SITE	G
SH151	0.2	Brownfield	FRANCHE ROAD	G
SH153	0.9	Brownfield	164-166 SUTTON PARK ROAD	G
SH154	0.8	Brownfield	WINDSOR DRIVE KIDDERMINSTER	G
SH155	0.2	Brownfield	WOLVERHAMPTON ROAD KIDDERMINSTER	G
SH156	0.9	Brownfield	FRANCHISE STREET KIDDERMINSTER	G
SH157	0.8	Brownfield	LONGFELLOW GREEN KIDDERMINSTER	G
SH163	2.7	Greenfield	LAND OFF WOLVERLEY ROAD FRANCHE	G

Table 20b – Stourport on Severn – Wastewater Treatment Constraints

Unique ID	Area	Brownfield/ Greenfield	Location	Wastewater Treatment
D2/SH17	3.09	Brownfield	Riverside Business Centre	G
D13/SH7	6.06	Brownfield	STC.2	G
D14/SH3	2.20	Brownfield	STC.3	G
D15/SH45	2.03	Brownfield	Lichfield Basin	G
D16	0.95	Brownfield	Shipleys Amusement Area	G
D17	0.77	Brownfield	Thomas Vale - Affordable Housing Site	G
D18	3.71	Brownfield	Parsons Chain	G
D19	0.22	Brownfield	A.Harris and Sons	G
D34/SH27/ SH34/SH117	1.60	Brownfield	Baldwin Road	G

Unique ID	Area	Brownfield/ Greenfield	Location	Wastewater Treatment
D35/SH8	0.38	Brownfield	STC.4	G
D39	2958m (Road)		Stourport Relief Road	N/A
D41/SH33	3.14	Brownfield	ADR - Power Station Road	G
D42/SH28	0.83	Brownfield	Car Garages - Worcester Road	G
D43/SH57	0.59	Brownfield	Stourport Civic Centre	G
D44/SH15	1.37	Brownfield	Lickhill Lodge First School	G
SH5	0.36	Brownfield	BALDWIN ROAD LOCAL PLAN SITE	G
SH16	6.26	Brownfield	PARSONS CHAIN	G
SH37	1.97	Greenfield	LAND AT MOORHALL LANE	G
SH46	0.17	Brownfield	TONTINE BUILDINGS	G
SH48	0.38	Brownfield	CHICHESTER CARAVANS / ROGERS RESCUE	G
SH49	0.68	Brownfield	TAN LANE FIRST SCHOOL	G
SH50	0.23	Brownfield	VALE ROAD GARAGE	G
SH51	0.15	Brownfield	A-Z WEDDING SERVICES	G
SH52	0.55	Brownfield	ARELEY COMMON FIRST SCHOOL	G
SH54	0.59	Brownfield	MARTLEY ROAD	G
SH55	0.20	Brownfield	BRIDGE STREET MALL	G
SH67	0.36	Brownfield	QUEENS ROAD WALSHES	G
SH68	0.17	Brownfield	WALSHES COMMUNITY CENTRE	G
SH89	3.50	Brownfield	MORGAN MATROC	G
SH92	0.08	Brownfield	garage block adjacent Areley common school	G
SH99	0.25	Brownfield	TESCO AND BEDLAND STORES	G
SH100	0.21	Brownfield	20 LORNE STREET	G
SH101	0.29	Brownfield	MERRIHILL MITTON GARDENS	G
SH102	0.67	Brownfield	COUNTY BUILDINGS	G
SH103	0.36	Brownfield	THE MANOR PH	G
SH104	3.16	Brownfield	MIDLAND INDUSTRIAL PLASTICS	G
SH118	0.19	Brownfield	MANOR ROAD DEPOT	G
SH124	0.14	Brownfield	MITTON STREET	G
SH138	1.71	Brownfield	BOURNEWOOD NURSERIES	G

Table 20c – Bewdley – Wastewater Treatment Constraints

Unique ID	Area	Brownfield/ Greenfield	Location	Wastewater Treatment
D6/SH1	0.66	Brownfield	Load Street	G
D32	0.26	Brownfield	Lax Lane Craft Centre/WVRS/British Red Cross	G
D45/SH22	2.09	Brownfield	Butt Town Meadow Caravan Park	G
SH2	0.12	Brownfield	TEXACO GARAGE BEWDLEY	G
SH36	3.18	Greenfield	STOURPORT ROAD BEWDLEY	G
SH66	1.00	Brownfield	WRIBBENHALL FIRST SCHOOL	G
SH77	0.26	Brownfield	LAND AT 71-73 KIDDERMINSTER ROAD BEWDLEY	G
SH136	0.49	Brownfield	WYRE HILL	G
SH145	3.88	Greenfield	The Allotments Grey Green Farm	G

Unique ID	Area	Brownfield/ Greenfield	Location	Wastewater Treatment
SH146	7.20	Greenfield	The Front Meadows, Grey Green Farm, Bewdley	G
SH148	2.55	Greenfield	LAND SOUTH OF LODGE CLOSE	G
SH149	3.06	Greenfield	LAND REAR OF CATCHEM'S END FISH BAR	G

Table 20d – Rural Wyre Forest – Wastewater Treatment Constraints

Unique ID	Area	Brownfield/ Greenfield	Location	Wastewater Treatment
D20	2.10	Mixed	Wilden Lane	G
D37/SH29	5.71	Brownfield	Titan Steel Wheels - Cookley	G
D51/SH107	23.07	Brownfield	Lea Castle Hospital	G
SH6	0.27	Greenfield	BLACKSTONE BARNES	Y
SH12	0.06	Brownfield	ROCK TAVERN, CAUNSALL ROAD	G
SH13	1.01	Brownfield	THE MANOR HOUSE WOLVERLEY	G
SH23	2.28	Greenfield	ADJACENT CHADDESLEY CORBETT SURGERY	R
SH58	0.45	Greenfield	LAND AT HEMMING WAY	R
SH70	0.04	Brownfield	WOLVERLEY COURT	G
SH90	7.09	Brownfield	BUTTS LANE STONE	Y
SH108	1.20	Greenfield	KIMBERLEE AVENUE ADR	G
SH110	1.36	Brownfield	BLAKEDOWN NURSERIES ADR	Y
SH112	0.15	Greenfield	LAND ADJACENT 29 CASTLE ROAD COOKLEY	G
SH115	0.62	Greenfield	SEBRIGHT ROAD	G
SH116	3.11	Greenfield	FAIRFIELD ADR	G
SH119	2.72	Greenfield	WILDEN TOP ADR	G
SH120	0.49	Brownfield	CHADDESLEY CORBETT SCHOOL	R
SH121	1.16	Greenfield	HAYES ROAD ADR	G
SH123	0.27	Brownfield	OXBINE CALLOW HILL	G
SH126	0.26	Brownfield	LAND OFF ORCHARD CLOSE, BLISS GATE	G
SH127	0.07	Brownfield	GARAGE SITE THE GREEN CHADDESLEY CORB.	R
SH129	3.94	Greenfield	LAND AT STONE HILL	Y
SH130	0.31	Greenfield	LAND AT FOLD FARM	R
SH131	6.38	Greenfield	LAND AT LAWNSWOOD WESTHEAD ROAD	G
SH132	1.76	Greenfield	BROWN WESTHEAD PARK	G
SH139	5.16	Greenfield	BINE LANE BLISS GATE	G
SH140	0.64	Brownfield	LAND AT FAR FOREST	G
SH141	1.07	Brownfield	LAND AT SHATTERFORD	R
SH144	1.73	Greenfield	LAND OPPOSITE EAST VIEW CLOWS TOP	R
SH147	0.43	Greenfield	land rear of 92 Wilden Lane	G
SH158	0.34	Brownfield	LAND AT THE TERRACE CLOWS TOP	R
SH160	1.90	Greenfield	LAND OFF BRIAR HILL	R
SH161	2.38	Greenfield	LAND OFF HEMMING WAY CHADDESLEY CORB.	R
SH162	0.17	Greenfield	GLEBE LAND OFF WOLVERLEY RD WOLVERLEY	G

7.4 River Water Quality

7.4.1 Current River Water Quality

As outlined in Section 7.3, river quality is highly dependent upon the quality of the discharge from the WwTW. This section analyses the quality of the main watercourses within Wyre Forest District and discusses the effect on wastewater treatment within the area. It must be noted that diffuse pollution also impacts on river water quality and the WFD objectives, as mentioned in the following paragraphs of this report, although this is more difficult to monitor.

The Environment Agency has provided the 2006 General Quality Assessment (GQA) grades and River Quality Objectives (RQO) for a number of watercourses within the District, along with the Catchment Abstraction Management Strategy's (CAMS) for the Worcestershire Middle Severn and River Severn Corridor. This data was used to provide an assessment of the water quality in the District.

RQOs are targets which were agreed by the Government for 40,000km of river length in England and Wales when the water industry was privatised in 1989. The targets specify the water quality needed in rivers if we are to be able to rely on them for water supplies, recreation and conservation and centre on ensuring the rivers support fish. They are based on chemical quality, and the Government believes that they represent the best available reference point to establish progress in maintaining and improving river quality. The targets, as shown on the Environment Agency website, are given in **Table 21**.

Table 21 - RQO Targets

RE1	very good quality (suitable for all fish species)
RE2	good quality (suitable for all fish species)
RE3	fairly good quality (suitable for high-class coarse fisheries)
RE4	fair quality (suitable for course fisheries)
RE5	poor quality (likely to limit fish populations)

Compliance with an RQO is assessed on the basis of data gathered by the EA over a complete calendar year. It is this data which is displayed in **Figure 22**. If a stretch of river fails to meet the standards the Environment Agency takes action to remedy the situation, firstly discovering the cause of the failure.

As they are based on chemical quality, the RQO does not monitor or assess compliance for all substances that may exert an impact on ecological water quality, such as phosphates, nitrates or biological quality. This data is provided by the EA in the GQA database. Chemical quality is an indicator of organic pollution in general, Biological quality is an indicator of the overall 'health' of rivers and Nitrate and Phosphate levels indicate diffuse pollution, most notably from agricultural practices. Elevated levels of these nutrients are of concern because they can cause eutrophication, which harms the

water environment. In addition, excess nitrate has to be removed before water can be supplied to consumers, increasing supply costs.

These four main quality indicators are assessed by the Environment Agency on a common six point scale, shown in **Table 22**:

Table 22 – GQA assessment scale

Grade	Standard	Explanation
A	Very Good	The quality is similar to (or better than) that expected for an average, unpolluted river of this size, type and location.
B	Good	The quality shows minor differences from Grade 'a' and falls a little short of that expected for an unpolluted river of this size, type and location.
C	Fairly Good	The quality is worse than that expected for an unpolluted river of this size, type and location.
D	Fair	The quality shows considerable differences from that expected for an unpolluted river of this size, type and location
E	Poor	The quality is much worse than expected for an unpolluted river of this size.
F	Bad	The quality is so bad that, in terms of biology, there may be little or no life present in the river

A summary of the GQA and RQO compliance data is presented graphically for each available stretch of river in **Figure 22**.

7.4.2 Effect of Agricultural Practices on Water Quality

As mentioned previously in this section, agriculture is a major source of diffuse pollution. Diffuse pollution cannot be attributed to a precise point or incident, but is the cumulative effect of day to day activities over a large area, including agriculture, forestry, mining, construction and urban life. The main agricultural sources of diffuse pollution include silt from soil erosion, nutrients from the application of fertiliser or spreading of manure and pesticides from the handling and application of the chemicals. In addition to this pollution entering surface water sources, it can be carried within infiltrating rain water and pollute groundwater sources. On their website, Defra states the following statistics¹⁸:

- around 60% of nitrate and 25% of phosphates in English waters originate from agricultural land;
- Agricultural practices contribute between 25-50% of pathogen loadings which affect England's bathing waters;
- Up to 75% of the sediment input into rivers can be attributed to agriculture, reducing water clarity and causing serious problems for fish, plants and insects; and
- Pesticides are contaminating drinking water sources, requiring expensive treatment at water works.

¹⁸ <http://www.defra.gov.uk/Environment/water/quality/nitrate/intro.htm>

Defra considers that the improved control of the application of manures and fertilisers to land is essential to improve the diffuse water pollution from agriculture. Studies to achieve this are ongoing, but the three currently recommended methods are:

- Promoting the Codes of Good Agricultural Practice
- Encouraging Catchment Sensitive Farming
- Implementing the EC Nitrates Directive

Codes of Good Agricultural Practice

These codes, until recently, consisted of Water, Air and Soil codes, which were introduced in the early 1990s and outline practical steps for preventing environmental pollution from farming activities. However, these have recently been reviewed and now consolidated into one document entitled 'Protecting our Water, Soil and Air: A Code of Good Agricultural Practice for farmers, land growers and land managers'. The consultation phase for this document ran from August 2007 until November 2007.

One of the aims of the code is to help farmers achieve the standards which will be required by the integrated approach to managing water quality and quantity across whole river catchments by 2015 as part of the Water Framework Directive. It does this by explaining the environmental impacts of farming practices and suggests methods of minimising these impacts with regards to management plans, use of farm buildings and structures, field work, specialised horticulture, wastes and water supplies to the farm. The full document can be found at on the Defra website at the following address:

<http://www.defra.gov.uk/foodfarm/landmanage/cogap/index.htm>

Catchment Sensitive Farming

Catchment Sensitive Farming is land management that keeps diffuse emissions of pollutants to levels consistent with the ecological sensitivity and uses of rivers, groundwaters and other aquatic habitats, both in the immediate catchment and further downstream. It includes managing appropriately the use of fertilisers, manures and pesticides; promoting good soil structure and rain infiltration to avoid run-off and erosion; protecting watercourses from faecal contamination, sedimentation and pesticides; reducing stocking density; managing stock on farms to avoid compaction and poaching of land; and separating clean and dirty water on farms.

At present the advice element of the programme is being delivered through the England Catchment Sensitive Farming Delivery Initiative (ECSFDI) across 50 Priority Catchments in England alongside some limited capital grants. The ECSFDI was rolled out across 40 catchments in England in 2006 with another 10 catchments added, along with 7 extensions in October 2008. These were jointly identified by Natural England and the Environment Agency from data gathered for the Water Framework Directive (WFD) and cover approximately 40% of the agricultural area of England. A number of the catchments included within this initiative are located to the west of Wyre Forest District and one (the River Teme) incorporates the far southwestern corner of the District, with the boundary running along the B4202. Further information regarding this scheme can be found on the Defra website at the following address:

<http://www.defra.gov.uk/farm/environment/water/csf/>

EC Nitrates Directive

This is an environmental measure designed to reduce water pollution by nitrate from agricultural sources to prevent such pollution from occurring in the future. The Directive requires Member States to:

- designate as Nitrate Vulnerable Zones (NVZs) all land draining to waters that are affected by nitrate pollution;
- establish a voluntary code of good agricultural practice to be followed by all farmers throughout the country (outlined above);
- establish an Action Programme of measures for the purposes of tackling nitrate loss from agriculture. The Action Programme should be applied either within NVZs or throughout the whole country; and
- review the extent of their NVZs and the effectiveness of their Action Programmes at least every four years and to make amendments if necessary.

66 Nitrate Vulnerable Zones (NVZs), 8% England, were designated in 1996 to protect drinking waters from nitrate pollution. A further 47% of England was designated as an NVZ in October 2002 to include all surface and groundwaters. On 1st January 2009 the NVZs were expanded again to cover 70% of England. Most of Wyre Forest District is classified as a NVZ, with just the southwestern area, around Far Forest and Callow Hill excluded. The boundary can be viewed in more detail by following this link:

http://web.adas.co.uk/defra/Parts/PDFs/Part20_PDF/Part20_Map14.pdf

Further information on this Directive can be found at:

<http://www.defra.gov.uk/environment/quality/water/waterquality/diffuse/nitrate/index.htm>

Within these areas farmers will have to comply with a number of rules to promote best practice in the use and storage of fertiliser and manure (building upon the Code for Agricultural Practice for the Protection of Water), , for example by following restrictions on the time of year that fertiliser can be spread on land and through storing excess manure. The detailed requirements are listed on the Defra website:

<http://www.defra.gov.uk/environment/quality/water/waterquality/diffuse/nitrate/action-nvz.htm>

Improvements to the nitrate and phosphate levels from agricultural sources within Wyre Forest District can therefore be made through:

- ⇒ promotion of the Codes of Good Agricultural Practice, especially now the updated version has been released;
- ⇒ Participation in the Catchment Sensitive Farming Initiative, if the study area is included within the Priority Catchments list in the future; and
- ⇒ Recognition of their location within a NVZ and application of the updated EC Nitrates Directive Action Programme.

7.4.3 Effect of Sewage Treatment Works on Water Quality

Untreated sewage discharges can have a significant impact on the environment. The inappropriate collection and treatment of sewage, and disposal of the sewage sludge (generated as a by-product of sewage treatment), have detrimental effects on river quality, mainly due to overloading of phosphates and nitrates resulting in eutrophication. Defra has identified nitrate and eutrophic sensitive areas in the UK which are being adversely affected by sewage discharges. The River Stour through Wyre Forest District is included on their list of eutrophic sensitive areas. However, for the worst affected watercourses the WwTW have been identified as Eutrophic Tertiary Treatment Works which have to provide a final treatment stage to raise the effluent quality before its release into the stream. None of the WwTW within the District have, at present, been assigned this status.

There are several European Union Directives that influence sewage treatment levels, including the Urban Waste Water Treatment Directive (UWWTD)¹⁹, Water Framework Directive and Freshwater Fish Directive. Development which requires the utilisation of works identified in the UWWTD may be restricted by the environmental constraints on the discharge. Within the study area the River Stour is designated a Sensitive Area (Eutrophic) and environmental restrictions may therefore be emplaced upon the Kidderminster Oldington WwTWs.

The Water Framework Directive (WFD) has an objective of 'no deterioration'. As such all water bodies must meet the class limits for the status class declared in the final RBMPs with the aim to achieve good ecological status (please see Section 10).

The aim of the Freshwater Fish Directive is to protect and improve the quality of rivers and lakes to encourage healthy fish populations. Water quality standards are set for 'designated' areas which are significant bodies of water capable of supporting fish populations. Within Wyre Forest District the Freshwater Fish designations of interest are:

- The River Stour (designated as cyprinid from Tack Farm to the confluence with the River Severn);
- Hadley Brook (designated as salmonid from Bradford Bridge, A442, to the River Salwarpe); and
- The River Severn (designated as cyprinid from the confluence with Vyrnwy to the confluence with the River Salwarpe)

In 2013 the waters currently designated as Fish Directive waters will become protected areas under the Water Framework Directive. This Directive affects any discharges to designated waters, including industry and sewage treatment plants, and the standards set within it are taken into account when the Environment Agency sets discharge consent limits. It is therefore highly important that no development takes place within the catchments of WwTWs that are currently exceeding their discharge consents.

¹⁹ See the Defra web page <http://www.defra.gov.uk/environment/quality/water/waterquality/sewage/uwwtd/index.htm>

7.5 Conclusions

The treatment of wastewater is dependent upon three main criteria – infrastructure location and capacity, sewage treatment work capacity and the ability of the watercourse to cope with the discharge from the works in terms of quality and flow. Using the data available within this WCS, these criteria have been assessed under two headings: the ability of the infrastructure to cope with the proposed development and the ability of the WwTW to cope with the proposed development. These criteria have been assessed using the traffic light colour scale for each of the potential development sites in **Tables 17a - 17d** and **20a - 20d** above and **Figures 20** and **21**.

Generally the areas of the District identified for new development are well served by the existing sewer network, falling within STWL's existing catchments. However some areas of the network have been identified as suffering from existing capacity issues, whereas others are predicted to suffer capacity constraints in the future. For combined sewer systems one option to provide additional capacity may be sought through the reduction in infiltration of storm water flow through attenuation in both existing and proposed potential development sites.

Most of the WwTWs within Wyre Forest District have not been identified within the Environment Agency's study as being of particularly high environmental risk, with the exception of Roundhill WwTW in Stourbridge. However, as this WwTW receives minimal flow from the Wyre Forest District it is not of significant concern when considering development within this area. Of greater concern are the Blakedown and Kidderminster WwTWs. The Blakedown Brook is identified as having a significant RQO failure downstream of the WwTW, which is likely to limit the additional flow this WwTW can receive without significant upgrade and improvement to its discharge. The Kidderminster WwTW discharges into the River Stour and, although this watercourse is currently compliant with its RQO, it has been identified as being eutrophic. Although STW do not envisage any capacity restrictions for this WwTW as the proposed development will not exceed its CDWF, this WwTW may experience harsher discharge restrictions in the future when accepting additional wastewater flow as the result of new development. It is possible this will result from the Environment Agency's next review of discharge consents and resulting impact on phosphate levels which may impact on the ability of the WwTWs to accommodate potential growth increases.

8 DEMAND MANAGEMENT

8.1 General

National government policy for sustainable development includes efficient resource use and PPS11 and PPS12 emphasise the need for water efficiency as part of sustainable development. In addition the Department of Communities and Local Government (DCLG) requirements for the sustainable communities' plan include higher standards of water efficiency and 25% savings. Government has stated a greater need for higher regional standards of water efficiency in response to the regional water resources position and the Water Act 2003 requirements place a duty on undertakers to achieve further water conservation and on public authorities to take into account the desirability of conserving water supplied to premises²⁰.

Development will increase the water requirement within the Wyre Forest District, but through managed water usage, wastage can be reduced and the developments made more sustainable in the long term to meet the Government requirements outlined above.

8.2 Water Usage

The three main methods used to promote sustainable water usage are metering (to encourage conservative usage in the home) leakage control (to reduce loss through the pipelines) and sustainable housing (to increase the efficiency of water usage). All three of these methods have been referred to in detail within STWL's dWRMP and Statement of Response. These are discussed below.

8.2.1 Metering

As stated in the RSS report¹², in general water users who are not metered use more water on average than metered customers. Metering helps to give users a signal and incentive to manage their own demand for water and, on average, water savings are reported within a range of 5-15% compared to unmetered use. All new properties are metered and further savings can be expected as more existing customers are metered and, in the long run, through the introduction of smart meters and changes to tariffs. Such changes can be promoted by both water companies and Councils, but will have to be made alongside protection of vulnerable customers.

The following outlines the comments and targets made by STWL within their dWRMP and Statement of Response:

By 2006-7 28% of households within STWL's region were metered, which was slightly ahead of the meter penetration they had projected in WRP04. Their dWRMP assumes that as a minimum, the current levels of uptake of free water meters will continue through the planning period and that the minimum level of meter penetration reached by 2035 will be 66% of the total housing stock. Due to a high uptake of free meters in 2007/8 this prediction has been increase to 72%. STWL do not operate any policies that compulsorily meter existing households (and cannot as the Environment Agency

²⁰ West Midlands Regional Spatial Strategy (RSS 11) The Impact of Housing Growth on Public Water Supplies, 2007

classifies this area of the West Midlands as an areas of only ‘Moderate Water Stress’, rather than high). However, they are proposing to implement a policy of metering households on change of occupier in their Staffordshire and East Shropshire WRZs for the 2010 – 2015 period and, within their Statement of Response, propose to increase this trial area beyond this WRZ, although they have not yet ascertained where. This may therefore affect Wyre Forest District, if it is extended to include the Severn WRZ. They can also encourage existing customers to have a meter installed through improvement of education/information and use of more favourable pricing and reward structures.

8.2.2 Leakage Control

Water companies have to meet leakage targets set by Ofwat to ensure they are related to economic levels. The Environment Agency expectation is that companies will continue to strive for higher standards and use new technology to drive leakage down further in future, especially where water resources are scarce. Government states that it does not expect water companies to allow leakage to rise. As stated in the RSS report¹², it is the view of the water companies that higher capital investment will be needed to achieve significant further reductions in leakage. Given that about 25% of all water supply is lost to leakage across the UK, more effort at a strategic scale by the water companies at property level scale through education would be of benefit.

At present an estimated 27% of treated water within STWLs supply zone is currently unaccounted for and therefore classed as leakage. Within their dWRMP they state that:

“Our AMP4 strategy has been to drive leakage down by 17Ml/d through a combination of measures, including:

- *Improving our processes of proactive and reactive leakage control;*
- *Implementing our Accountability Zones (AZs) programme to enable improved leakage reporting and targeting in trunk mains outside of DMAs;*
- *Replacing around 300km of water mains per annum;*
- *Installing continuous pressure monitoring at around 4000 critical pressure points within our network;*
- *Offering a free or subsidised customer owned supply pipe repair and replacement service;*
- *Working with contractors and academics to improve leak detecting technology “*

Their policy is to continue to achieve and maintain the economic level of leakage during AMP5 and over the longer term. Their assessment of the preferred long term strategy considers leakage reduction options alongside water resource investment options and demand management options, and seeks to achieve the *“overall least whole life cost mix of the different types of investment”*. The Statement of Response now also states that their leakage strategy due to outlined in their final WRMP (fWRMP), is based around the principle of never allowing leakage to rise over the forecast period. As part of this they intend to locate the household water meters at the point where the customer supply pipe meets the STWL supply pipe, thus enabling rapid identification of leaks within the customer’s pipes rather than their own.

8.2.3 Sustainable Housing

It was recommended within the West Midlands RSS¹² that a revision should be made to the RSS to include a policy on water efficiency. This would require that all new houses are to meet Level 3 of the Code of Sustainable Homes, requiring good water efficiency to be achieved. In terms of water usage Level 3 requires that:

The home will have to be designed to use no more than about 105 liters of water per person per day. This could be achieved by fitting a number of items such as:

- 6/4 Dual Flush WC;
- Flow Reducing/Aerating taps throughout;
- 6-9 liters 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;
- 18ltr maximum volume dishwasher;
- 60ltr maximum volume washing machine.

Other minimum requirements are required for:

- Surface water management – this may mean the provision of soakaways and areas of porous paving;

(Code for Sustainable Homes: A step-change in sustainable home building practice, 2006)

This code was published by the Department for Communities and Local Government (DCLG) in December 2006. Initially it was compulsory for all homes receiving government funding, and restricts water use to 105 litres per capita per day. Since April 2007 a developer of any new home can be assessed against this code. From May 1st 2008 this assessment became mandatory, although it is recommended that more stringent targets should be set (for example Level 4). The Council may benefit from a review of the Level 4 requirements against how the present housing stock compares (for example using OFWAT data). The code uses a points system to identify the most efficient homes, with higher points being awarded for the most efficient. Points are awarded for internal potable water consumption, (i.e. reduced toilet cistern sizes) external potable water consumption (i.e. water butts, grey water recycling and rainwater harvesting discussed below), surface water run off (specifically the use of SUDS) and flood risk, which is generally based on development location. There are similar measures against which commercial development can be assessed, dependent upon its intended use. These are set by the Building Research Establishment (BRE) and are known as BREEAM standards (BRE Environmental Assessment Method), upon which there is increasing pressure for commercial buildings to adhere. These can be viewed in detail on the BREEAM website: <http://www.breeam.org>.

In November 2008 Ofwat set a STWL a new water efficiency target for 2010 to 2015 of a reduction in customer consumption by an average of 1 litre/property/day over the next five years, equating to 3.27Ml/d annually or 16.35 Ml/d by 2015. They propose to do this through focus upon domestic water audits and limited household measures, including:

- Provision of Cistern Displacement Devices (CDD), such as the 'Save-a-Flush' device;
- Partner Activity with product manufactures and suppliers;
- Encouraging customers to carry out Self Audits of water use and wastage reduction opportunities;
- Demonstration of 'best in class' water use within new or refurbished STWL offices, including rainwater harvesting and greywater reuse (discussed in more detail below);
- Institutional and commercial audit and retrofit through the delivery of water efficient devices, audits and advice to institutional and commercial properties (such as schools);
- Household audit and retrofit in the Social Housing sector; and
- Product subsidies, education and product promotion to provide access to water efficient products.

All of these initiatives should be advertised to the local community and embraced within all new developments to provide both water availability and environmental benefits. More information and guidance regarding water efficiency techniques can be found in the following document: '*Water Efficient Solutions: The Practical Guide for Industry, Commerce and the Public Sector, 2008*'

Greywater Recycling

There are two types of greywater recycling systems. A water diversion system diverts greywater directly to the subsoil in the garden and a water recycling system with purification for the reuse of water in the home. The water for the water recycling system is collected from bath, shower and sink waste. The system then consists of a cleaning tank to remove any solids and then 'treat' the water, with the addition of disinfection tablets. This water is then collected in a tank ready for use, but provision must be made to discharge the water if it is stored for too long, as it may become hazardous. The water can then be reused for toilet flushing. More information and guidance regarding greywater recycling can be found in the Environment Agency's document 'Greywater: an Information Guide, 2008'. However, although this technique works well at the community scale, it is not always appropriate for individual properties or small scale developments.

Rainwater Harvesting

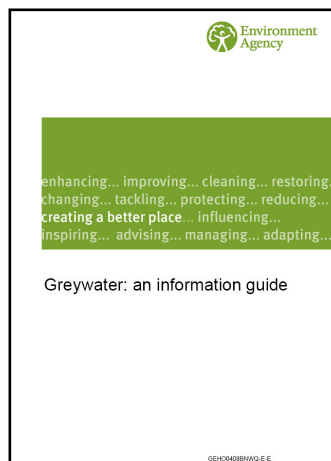
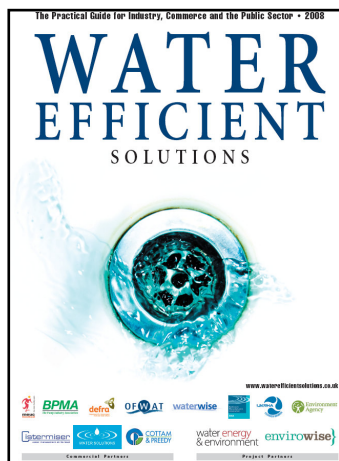
Rainwater harvesting is also a growing sector of water recycling. This is where rainwater from the roof area of the property is collected, and then reused to flush toilets, supply washing machines and outside tap use. Systems that combine the collection of rainwater and the reuse of greywater are also in use. However, it is now understood that this method works well at the community level but not at the individual property level due to cost and reliability issues. It is therefore most effective when implemented as part of a large-scale development.

STWL's main areas of activity during AMP4 were:

- Distribution of Save-a-flush cistern displacement devices to organisations and businesses who are installing them to customer and business premises;
- Discounted water butts and the opportunities for customers to purchase a discounted rain saver kit;

- Extension of their domestic product promotion to include additional product such as water efficient shower heads, shower timers and internal leak alarms since February 2008;
- Setting up of a partnership with Envirowise to target their top 250 water users with the aim to raise awareness of the importance of water efficiency and to give advice on the implementation of water efficiency measures;
- To undertake trials to investigate the use of retrofit water efficient devices in domestic properties and schools;
- Education programmes through education centres, provision of educational material and their 'Be Smart' initiative; and
- Development of options for their future water efficiency strategy developed through 2007, using their involvement with Waterwise and other industry trials.

More information regarding rainwater harvesting can be found in the Environment Agency's document 'Harvesting *Rainwater for Domestic Uses: An information guide, 2008*'.



8.3 Sustainable Drainage Systems

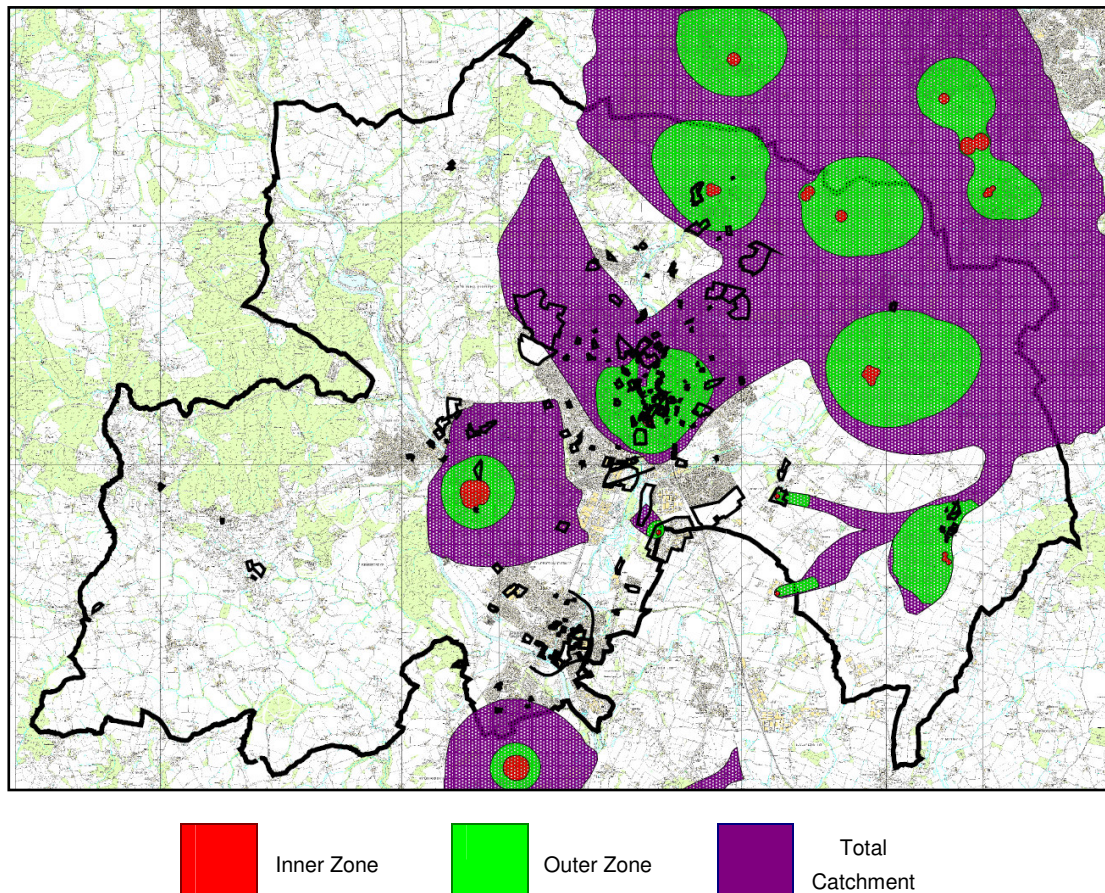
Within new developments, the incorporation of a suitably designed drainage system will be necessary in order to mitigate the risk of surface water and overland flooding as well as the risk posed by the overloading of local sewers and watercourses. It is therefore essential that Sustainable Drainage policies are included in the Council's LDF documents. Such a system should ideally be based upon Sustainable Drainage principles aimed at simulating natural processes and mitigating the impact of polluted surface water runoff upon the environment. Within the design of these systems, appropriate consideration of safe exceedence flows must be made, for example, to account for the predicted impact of climate change and possible blockages. Moreover, full advantage should be made of the opportunities for environmental enhancement posed by the utilisation of these systems. Proposed SUDS schemes should also consider operation and maintenance issues. The system should be robust in design in order to prevent blockages, allow ease of maintenance and reduce long term maintenance costs. Moreover, a suitable maintenance scheme should be proposed although the operation of the system should not be overly reliant upon maintenance being carried out.

It is essential to consider source control within the surface water drainage proposals; techniques which aim to manage the surface water at or close to the receiving surface should be utilised as widely as possible. For example, paved surfaces (e.g. car parks and access roads) should be of permeable construction allowing water to be stored prior to discharge. Other areas should ideally be drained using a network of grassed swales which will serve to improve the quality of the surface water and reduce the flow rate, whilst directing it to the attenuation area or discharge point. Furthermore, it is recommended that rainwater re-use schemes be utilised, such as, rainwater harvesting for domestic use, such as toilet flushing, as well as the encouragement of the use of water butts and rainwater storage tanks. Further source control techniques would include the installation of green roofs where practical. Incorporation of such measures would serve to greatly reduce the volume of surface water requiring discharge, reduce water demand, and would also further satisfy the Code for Sustainable Homes.

Interactive soils maps are available to view on the National Soils Research Institute website: www.landis.org.uk/soilscapes/, which provides information regarding the soil type, drainage, fertility, texture, landcover and habitats. These indicate that the majority of the area possess a variable to negligible permeability. The permeability of the subsoil beneath a proposed development site influences the range of applicable techniques; permeable soils lend themselves to the application of infiltration based SUDS whilst the application of a SUDS system to a site with a soil of low permeability will necessitate the presence of a watercourse in which to discharge attenuated flows. However, in the absence of a watercourse, an agreement could be possible with the surface water regulating authority to discharge attenuated flows into a nearby surface water drain. Within an assessment of the feasibility of SUDS for a development site, it is recommended that an infiltration test be conducted.

Depending upon the proposed catchment and estimated surface water runoff pollutant load, the application of SUDS, especially those based upon infiltration, must be done so with care within areas designated by the EA as Source Protection Zones (SPZ). These define the locations of groundwater sources, such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk. **Figure 23**, below, shows the SPZs located beneath Wyre Forest District. SUDS schemes serving these catchments must fully integrate the management train concept and be lined in the upper stages (i.e. where the pollutant load is likely to be at its highest) in order to minimise the potential for pollutant laden surface water to infiltrate the ground. However, in addition to consideration of the actual pollutant loading of the surface water to be attenuated, attention must also be given to the ground which the surface water soaks through (i.e. the contaminated status of the site). The Environment Agency will object to enhanced infiltration through contaminated land where not accompanied by an appropriate risk assessment, leachate test, and/or associated soil remedial plan to show it would not cause increased pollution of groundwater. Due to the high concentration of regeneration in the District, issues surrounding contaminated land will be very important to note and may require further site specific surveys.

Figure 23 – Source Protection Zones within Wyre Forest District



The shape and size of the zones depends upon the condition of the ground, how the groundwater is removed and other environmental factors. The three zones are defined as below:

Zone 1 (Inner protection zone)

Any pollution that can travel to the borehole within 50 days from any point within the zone is classified as being inside zone 1. This applies at and below the water table. This zone also has a minimum 50 metre protection radius around the borehole. These criteria are designed to protect against the transmission of toxic chemicals and water-borne disease.

Zone 2 (Outer protection zone)

The outer zone covers pollution that takes up to 400 days to travel to the borehole, or 25% of the total catchment area – whichever area is the biggest. This travel time is the minimum amount of time that we think pollutants need to be diluted, reduced in strength or delayed by the time they reach the borehole.

Zone 3 (Total catchment)

The total catchment is the total area needed to support removal of water from the borehole, and to support any discharge from the borehole.

(Environment Agency website)

N.B. Although the location of these SPZs are valid as of December 2009, the Environment Agency periodically reviews and updates the maps. The location of these zones may therefore change in the future.

Depending upon the proposed catchment and estimated surface water runoff pollutant load, the application of SUDS, especially those based upon infiltration, must be done so with care within areas designated as Source Protection Zones (SPZ). SUDS schemes serving these catchments must fully integrate the management train concept and be lined in the upper stages (i.e. where the pollutant load is likely to be at its highest) in order to minimise the potential for pollutant laden surface water to infiltrate the ground.

Additional information on the planning, design, construction and operation of SUDS can be found in the CIRIA publication C697, *The SUDS Manual*, and the associated site handbook C698, both of which can be downloaded from the CIRIA website: www.ciria.org.uk/suds/publications.htm

The Adoption of SUDS

The maintenance of SUDS systems has been subject to a great deal of discussion over the last few years. At present there is no precedent for the adoption of SUDS – that is no authority or statutory undertaker take ownership of them as a matter of course. This often means that SUDS systems are not maintained by an appropriate authority. Without proper maintenance, their effectiveness diminishes.

There are already a number of good practice case examples where relevant organisations including local authorities, developers and water companies have developed acceptable adoption solutions for developments or development areas. Defra is currently working with its partners to develop an agreed national adoption system for SUDS. Some options for these are already being tested within the ongoing Defra Integrated Urban drainage pilots. The Floods and Water Bill currently being developed for England is expected to include clearer policy and responsibilities for adoption of SUDS. In the meantime it is good practice for the relevant key stakeholders including developers, water companies, Local Councils and County Council (Highways) to develop agreed bespoke adoption agreements for development areas to enable whole life management of SUDS. The Construction Industry Research and Information Association (CIRIA) has already published guidance that enable maintenance and adoption agreements to be set-up²¹.

Section 106 of the Town and Country Planning Act 1990 allows Planning Authorities to enter into legally binding agreements with the local unitary authority in order to offset the cost of the development. This may be the form of a fee, say as a contribution to a new school, or it could be an agreement, such as a section of the development site is developed as an amenity area and handed to the Local Authority.

The use of the Section 106 agreement has been considered as a method of collecting a financial contribution from developers in order to fund the future maintenance of SUDS schemes. An alternative method of collection could be through the Water Authorities infrastructure Charge, which is paid in relation to all new properties.

²¹ Interim Code of Practice for Sustainable Drainage Systems, July 2004 (<http://www.ciria.org/suds/icop.htm>)

However, before the collection of this money is considered, the following points would need determining:

- Who will 'adopt' the SUDS schemes?
- What will happen to developments that are not suitable for SUDS?
- How will the level of fees be set?
- If SUDS are not constructed on a suitable development should the developer be penalised?

These items will require further consideration as SUDS become more commonplace.

A summary guidance sheet outlining the SUDS and the different types of SUDS measures available is provided in **Appendix D**.

Potential Restrictions on the use of SUDS

As stated within their Groundwater Protection Policy²², the Environment Agency will support the use of sustainable drainage systems for new discharges to ground of surface run-off from roads, vehicle parking and public/amenity areas outside of Source Protection Zone 1 (Inner Zone), provided that an appropriate level of risk assessment demonstrates the groundwater conditions to be suitable. There should also be adequate protective measures for groundwater and arrangements for effective management and maintenance of the system. This policy therefore poses a constraint on the use of SUDS for new developments, where they are located within the Inner Zone of a SPZ, although infiltration may be permitted providing an impermeable membrane is present below the gravels to prevent any infiltration into the ground. It should be noted that for effective operational reasons SUDS are most effective outside Flood Zone 3, taking account of climate change (please see the Level 2 SFRA for more detail regarding the definition of this zone).

In addition, the use of SUDS on Brownfield sites will also be dependent on, and affect, the level of remediation required. Where contaminated land is present, the drainage of surface or roof water could mobilise the contaminants and therefore pose a risk to 'Controlled Waters' receptors. Therefore, proposals for the drainage of surface or roof water into the ground will need to take into account the outcome of a site investigation and any subsequent risk assessments and remedial options appraisals required for the site. Conversely, the requirement for surface or roof water drainage into the ground will need to be accounted for by any risk assessment or remedial options appraisal.

The potential development sites which for which the use of SUDS may be restricted by one or both of these are shown on **Figure 24**. The affected sites are also indicated in **Tables 21a - 21d** below.

Another consideration is the permeability of the underlying strata, which will determine the type of SUDS suitable for the site. For example, sites located on soils with limited permeability will require the implementation of SUDS schemes which utilise storage rather than infiltration. These have been classified based upon the soil maps shown on the National Soils Research Institute website (referred to above). However, as proven by the SUDS schemes implemented by Royal Haskoning in Cambourne,

²² The Environment Agency's Groundwater Protection Policy is available on the Environment Agency's website:
<http://www.environment-agency.gov.uk/research/library/publications/40741.aspx>

Cambridgeshire, also located on clay, alternative SUDS schemes can be implemented soils with low or bad permeability through detention/retention techniques, although these will be restricted where groundwater or source protection zones exist. These issues are discussed later within this report. Therefore, although indicated as potentially problematic for the implementation of SUDS techniques, the sites highlighted in red within the following tables should not be immediately dismissed with regards to SUDS. More information can be found within the Environment Agency's Groundwater Policy and Protection (GP3) document.

Tables 21a - 21d below summarise these three key considerations - SPZ location, nature of the site and permeability of the underlying strata.

Green

- Little or no restrictions identified for the use of SUDS.
- ⇒ Site not located above the Inner Zone of an SPZ
- ⇒ Greenfield site so remediation of contaminated land is not required.
- ⇒ Site located over a permeable sub strata.

Yellow

- Some restrictions identified for the use of SUDS.
- ⇒ Satisfies two of the criteria required for 'green' classification.

Red

- Major infrastructure upgrade required
- ⇒ Satisfies one or none of the criteria required for 'green' classification.

Table 21a – Kidderminster – SUDS Suitability

Unique ID	Area	Brownfield/ Greenfield	Location	Inner Zone of SPZ	Brownfield Site	Area of Low Permeability	Overall
D1	1.1	Brownfield	Land to Rear of Crossley		Yes	Yes	R
D3/SH14/25	8.8	Brownfield	KTC.4	Yes	Yes	Yes	R
D4	1.2	Brownfield	Council Depot Site	Yes	Yes	Yes	R
D5/SH82	7.1	Brownfield	Churchfields Business Park		Yes		Y
D7	4.5	Brownfield	Georgian Carpet Factories Site		Yes	Yes	R
D8	0.5	Brownfield	Lime Kiln Bridge		Yes		Y
D9/SH10	1.0	Brownfield	Park Lane Timber Yard		Yes	Yes	R
D10/SH19	0.6	Brownfield	BT Site, Mill Street		Yes	Yes	R
D11	3.6	Brownfield	Current Morrisons application Site		Yes		Y
D12/SH76	1.7	Brownfield	Park Street		Yes	Yes	R
D21	23.9	Brownfield	British Sugar Site		Yes	Yes	R
D22	2.2	Greenfield	Victoria Sports Ground				G
D23/SH75/ SH159	0.9	Brownfield	Park Lane		Yes	Yes	R



Unique ID	Area	Brownfield/ Greenfield	Location	Inner Zone of SPZ	Brownfield Site	Area of Low Permeability	Overall
D24	6.5	Brownfield	Current Sealine Factory (Various Units)		Yes	Yes	R
D25/SH35	0.6	Brownfield	Current Retail Area	Yes	Yes	Yes	R
D26	0.5	Brownfield	New Road and Market Street		Yes	Yes	R
D27	0.2	Brownfield	Brintons Offices - Exchange Street		Yes	Yes	R
D28	1.2	Brownfield	Current Morrisons Site and Other Shops		Yes		Y
D29/SH60	0.6	Brownfield	KTC.3 - Worcester Street Enhancement Area		Yes		Y
D30/SH9	0.1	Brownfield	Church Street Car Park		Yes		Y
D31	7.3	Greenfield	Puxton			Yes	Y
D33	0.3	Brownfield	Lax Lane Craft Centre/WVRS/British Red Cross	Yes	Yes		R
D36	5.3	Brownfield	Lisle Avenue		Yes	Yes	R
D38/SH40	1.7	Greenfield	Puxton Site			Yes	Y
D40	1124m (Road)		Hoo-Brook Link Road		N/A	Yes	Y
D46	0.3	Brownfield	Cheshires Printers		Yes		Y
D47/SH81	0.4	Brownfield	Kidderminster market auctions		Yes		Y
D48/SH71	0.1	Brownfield	Comberton Place		Yes		Y
D49/SH80	0.1	Brownfield	Comberton Hill		Yes		Y
D50/SH152	0.9	Brownfield	CMS Car Showrooms		Yes		Y
D52/SH61	0.3	Brownfield	Rock Works		Yes	Yes	R
D53	0.7	Brownfield	Matalan		Yes	Yes	R
D54	1.5	Brownfield	Worcester Street		Yes		Y
SH4	0.3	Brownfield	78 MILL STREET		Yes	Yes	R
SH11	0.1	Brownfield	CASTLE ROAD / PARK LANE		Yes	Yes	R
SH18	5.4	Brownfield	GEORGIAN CARPETS		Yes	Yes	R
SH20	1.0	Greenfield	PLAYING FIELD ADJACENT ST. MARY'S SCHOOL				G
SH21	0.3	Greenfield	REAR OF THE PARADE BROADWATERS				G
SH30	0.8	Brownfield	NEW ROAD CARTERS SITE		Yes		Y
SH31	1.0	Brownfield	R&D Aggregates Site		Yes	Yes	R
SH32	0.1	Brownfield	PARK LANE		Yes	Yes	R
SH38	0.8	Brownfield	BED CITY MCF COMPLEX		Yes	Yes	R
SH39	0.5	Brownfield	ELGAR HOUSE GREEN STREET		Yes		Y
SH41	15.3	Greenfield	FORMER BRITISH SUGAR SETTLING PONDS				G
SH42	0.1	Brownfield	MILL BANK GARAGE		Yes	Yes	R
SH43	0.1	Brownfield	PIANO BUILDING WEAVERS WHARF		Yes	Yes	R
SH44	0.3	Brownfield	ZANZIBARS CASTLE ROAD KIDDERMINSTER		Yes	Yes	R
SH47	0.1	Brownfield	26 WOOD STREET		Yes		Y
SH53	0.2	Brownfield	TELEPHONE EXCHANGE BLACKWELL STREET		Yes		Y
SH56	0.5	Brownfield	LEA STREET SCHOOL		Yes		Y
SH59	1.7	Brownfield	SUTTON RESERVOIR		Yes		Y
SH62	0.1	Brownfield	HERONS NURSING HOME, SPENNELLS		Yes		Y
SH63	0.4	Brownfield	CHESTER ROAD SOUTH SERVICE STATION		Yes		Y
SH64	0.2	Brownfield	OLDNALL ROAD		Yes		Y



Unique ID	Area	Brownfield/ Greenfield	Location	Inner Zone of SPZ	Brownfield Site	Area of Low Permeability	Overall
SH65	0.3	Brownfield	PURAC BUILDING		Yes		Y
SH69	0.8	Brownfield	FRANCHE COMMUNITY CENTRE		Yes		Y
SH72	0.3	Brownfield	RIFLE RANGE SHOPS		Yes		Y
SH73	1.1	Brownfield	HURCOTT MAISONETTES		Yes		Y
SH74	0.5	Brownfield	BROADWATERS COMMUNITY CENTRE		Yes		Y
SH78	0.2	Brownfield	207 BIRMINGHAM ROAD KIDDERMINSTER		Yes		Y
SH79	0.4	Greenfield	CHESTER ROAD BOWLING CLUB				G
SH83	1.1	Greenfield	FRANCHE ROAD TRIANGLE				G
SH84	0.8	Brownfield	LAND OFF BROOMFIELD CLOSE		Yes		Y
SH85	0.3	Brownfield	YEW TREE PUB		Yes		Y
SH86	0.5	Brownfield	HARRIERS TRADING ESTATE		Yes		Y
SH87	0.8	Greenfield	SOUTH OF BERNIE CROSSLND WALK				G
SH88	1.6	Greenfield	PLAYING FIELD OFF SUTTON PARK RISE				G
SH91	0.3	Brownfield	QUEENS STREET (REDEVELOPMENT)		Yes		Y
SH93	0.2	Brownfield	273/4 HOO ROAD (ADJ. ST.ANDREWS GREEN		Yes		Y
SH94	0.6	Brownfield	NORTH OF BERNIE CROSSLAND WALK		Yes		Y
SH95	1.3	Brownfield	BLAKEBROOK SCHOOL / COUNTY BUILDINGS		Yes		Y
SH96	0.3	Brownfield	EAGLE'S NEST PH		Yes		Y
SH97	0.2	Brownfield	AYLMER LODGE SURGERY		Yes		Y
SH98	0.1	Brownfield	NORTHUMBERLAND AVENUE SURGERY		Yes		Y
SH105	5.8	Brownfield	KING CHARLES 1 SCHOOL		Yes		Y
SH106	0.4	Brownfield	SUTTON ARMS PH		Yes		Y
SH109	14.0	Greenfield	HURCOTT ADR				G
SH111	3.6	Greenfield	OFFMORE LANE ALLOTMENTS				G
SH113	1.8	Brownfield	OASIS ARTS & CRAFTS		Yes		Y
SH114	0.9	Brownfield	REILLOC CHAIN		Yes		Y
SH122	0.5	Brownfield	THE BRIARS HOTEL		Yes		Y
SH125	0.6	Brownfield	LAND AT 108-109 BEWDLEY HILL		Yes		Y
SH128	39.5	Greenfield	STANKLYN LANE				G
SH133	18.1	Greenfield	LAND AT WOLVERLEY TRAFFIC LIGHTS				G
SH134	0.0	Brownfield	R/O 41 CLARENCE STREET		Yes		Y
SH135	1.6	Greenfield	LAND AT THE LEA				G
SH137	3.2	Brownfield	ZORTECH AVENUE		Yes		Y
SH142	0.2	Brownfield	MUSKETEER PH RIFLE RANGE		Yes		Y
SH143	95.2	Greenfield	LOW HABBERLEY FARM			Yes	Y
SH150	0.3	Brownfield	CHESHIRE SITE		Yes		Y
SH151	0.2	Brownfield	FRANCHE ROAD		Yes		Y
SH153	0.9	Brownfield	164-166 SUTTON PARK ROAD		Yes		Y
SH154	0.8	Brownfield	WINDSOR DRIVE KIDDERMINSTER		Yes		Y
SH155	0.2	Brownfield	WOLVERHAMPTON ROAD KIDDERMINSTER		Yes		Y
SH156	0.9	Brownfield	FRANCHISE STREET KIDDERMINSTER		Yes		Y

Unique ID	Area	Brownfield/ Greenfield	Location	Inner Zone of SPZ	Brownfield Site	Area of Low Permeability	Overall
SH157	0.8	Brownfield	LONGFELLOW GREEN KIDDERMINSTER		Yes		Y
SH163	2.7	Greenfield	LAND OFF WOLVERLEY ROAD FRANCHE				G

Table 21b – Stourport on Severn – SUDS Suitability

Unique ID	Area	Brownfield/ Greenfield	Location	Inner Zone of SPZ	Brownfield Site	Area of Low Permeability	Overall
D2/SH17	3.09	Brownfield	Riverside Business Centre		Yes		Y
D13/SH7	6.06	Brownfield	STC.2		Yes		Y
D14/SH3	2.20	Brownfield	STC.3		Yes		Y
D15/SH45	2.03	Brownfield	Lichfield Basin		Yes		Y
D16	0.95	Brownfield	Shipleys Amusement Area		Yes		Y
D17	0.77	Brownfield	Thomas Vale - Affordable Housing Site		Yes		Y
D18	3.71	Brownfield	Parsons Chain		Yes		Y
D19	0.22	Brownfield	A.Harris and Sons		Yes		Y
D34/SH27/ SH34/SH117	1.60	Brownfield	Baldwin Road		Yes		Y
D35/SH8	0.38	Brownfield	STC.4		Yes		Y
D39	2958m (Road)		Stourport Relief Road		N/A		G
D41/SH33	3.14	Brownfield	ADR - Power Station Road		Yes		Y
D42/SH28	0.83	Brownfield	Car Garages - Worcester Road		Yes		Y
D43/SH57	0.59	Brownfield	Stourport Civic Centre		Yes		Y
D44/SH15	1.37	Brownfield	Lickhill Lodge First School		Yes		Y
SH5	0.36	Brownfield	BALDWIN ROAD LOCAL PLAN SITE		Yes		Y
SH16	6.26	Brownfield	PARSONS CHAIN		Yes		Y
SH37	1.97	Greenfield	LAND AT MOORHALL LANE				G
SH46	0.17	Brownfield	TONTINE BUILDINGS		Yes		Y
SH48	0.38	Brownfield	CHICHESTER CARAVANS / ROGERS RESCUE		Yes		Y
SH49	0.68	Brownfield	TAN LANE FIRST SCHOOL		Yes		Y
SH50	0.23	Brownfield	VALE ROAD GARAGE		Yes		Y
SH51	0.15	Brownfield	A-Z WEDDING SERVICES		Yes		Y
SH52	0.55	Brownfield	ARELEY COMMON FIRST SCHOOL		Yes		Y
SH54	0.59	Brownfield	MARTLEY ROAD		Yes		Y
SH55	0.20	Brownfield	BRIDGE STREET MALL		Yes		Y
SH67	0.36	Brownfield	QUEENS ROAD WALSHES		Yes		Y
SH68	0.17	Brownfield	WALSHES COMMUNITY CENTRE		Yes		Y
SH89	3.50	Brownfield	MORGAN MATROC		Yes		Y
SH92	0.08	Brownfield	garage block adjacent Areley common school		Yes		Y
SH99	0.25	Brownfield	TESCO AND BEDLAND STORES		Yes		Y

Unique ID	Area	Brownfield/ Greenfield	Location	Inner Zone of SPZ	Brownfield Site	Area of Low Permeability	Overall
SH100	0.21	Brownfield	20 LORNE STREET		Yes		Y
SH101	0.29	Brownfield	MERRIHILL MITTON GARDENS		Yes		Y
SH102	0.67	Brownfield	COUNTY BUILDINGS		Yes		Y
SH103	0.36	Brownfield	THE MANOR PH		Yes		Y
SH104	3.16	Brownfield	MIDLAND INDUSTRIAL PLASTICS		Yes		Y
SH118	0.19	Brownfield	MANOR ROAD DEPOT		Yes		Y
SH124	0.14	Brownfield	MITTON STREET		Yes		Y
SH138	1.71	Brownfield	BOURNEWOOD NURSERIES		Yes		Y

Table 21c – Bewdley – SUDS Suitability

Unique ID	Area	Brownfield/ Greenfield	Location	Inner Zone of SPZ	Brownfield Site	Area of Low Permeability	Overall
D6/SH1	0.66	Brownfield	Load Street		Yes		Y
D32	0.26	Brownfield	Lax Lane Craft Centre/WVRS/British Red Cross		Yes		Y
D45/SH22	2.09	Brownfield	Butt Town Meadow Caravan Park		Yes		Y
SH2	0.12	Brownfield	TEXACO GARAGE BEWDLEY		Yes		Y
SH36	3.18	Greenfield	STOURPORT ROAD BEWDLEY				G
SH66	1.00	Brownfield	WRIBBENHALL FIRST SCHOOL		Yes		Y
SH77	0.26	Brownfield	LAND AT 71-73 KIDDERMINSTER ROAD BEWDLEY		Yes		Y
SH136	0.49	Brownfield	WYRE HILL		Yes		Y
SH145	3.88	Greenfield	The Allotments Grey Green Farm				G
SH146	7.20	Greenfield	The Front Meadows, Grey Green Farm, Bewdley				G
SH148	2.55	Greenfield	LAND SOUTH OF LODGE CLOSE				G
SH149	3.06	Greenfield	LAND REAR OF CATCHEM'S END FISH BAR				G

Table 21d – Rural Wyre Forest – SUDS Suitability

Unique ID	Area	Brownfield/ Greenfield	Location	Inner Zone of SPZ	Brownfield Site	Area of Low Permeability	Overall
D20	2.10	Mixed	Wilden Lane		Yes		Y
D37/SH29	5.71	Brownfield	Titan Steel Wheels - Cookley		Yes	Yes	R
D51/SH107	23.07	Brownfield	Lea Castle Hospital		Yes		Y
SH6	0.27	Greenfield	BLACKSTONE BARNES	Yes			Y
SH12	0.06	Brownfield	ROCK TAVERN, CAUNSALL ROAD		Yes	Yes	R
SH13	1.01	Brownfield	THE MANOR HOUSE WOLVERLEY		Yes		Y
SH23	2.28	Greenfield	ADJACENT CHADDESLEY CORBETT SURGERY			Yes	Y
SH58	0.45	Greenfield	LAND AT HEMMING WAY			Yes	Y

Unique ID	Area	Brownfield/ Greenfield	Location	Inner Zone of SPZ	Brownfield Site	Area of Low Permeability	Overall
SH70	0.04	Brownfield	WOLVERLEY COURT		Yes	Yes	R
SH90	7.09	Brownfield	BUTTS LANE STONE	Yes	Yes		R
SH108	1.20	Greenfield	KIMBERLEE AVENUE ADR				G
SH110	1.36	Brownfield	BLAKEDOWN NURSERIES ADR		Yes		Y
SH112	0.15	Greenfield	LAND ADJACENT 29 CASTLE ROAD COOKLEY				G
SH115	0.62	Greenfield	SEBRIGHT ROAD				G
SH116	3.11	Greenfield	FAIRFIELD ADR				G
SH119	2.72	Greenfield	WILDEN TOP ADR				G
SH120	0.49	Brownfield	CHADDESLEY CORBETT SCHOOL		Yes	Yes	R
SH121	1.16	Greenfield	HAYES ROAD ADR				G
SH123	0.27	Brownfield	OXBINE CALLOW HILL		Yes		Y
SH126	0.26	Brownfield	LAND OFF ORCHARD CLOSE, BLISS GATE		Yes	Yes	R
SH127	0.07	Brownfield	GARAGE SITE THE GREEN CHADDESLEY CORB.		Yes	Yes	R
SH129	3.94	Greenfield	LAND AT STONE HILL				G
SH130	0.31	Greenfield	LAND AT FOLD FARM			Yes	Y
SH131	6.38	Greenfield	LAND AT LAWNSWOOD WESTHEAD ROAD				G
SH132	1.76	Greenfield	BROWN WESTHEAD PARK				G
SH139	5.16	Greenfield	BINE LANE BLISS GATE			Yes	Y
SH140	0.64	Brownfield	LAND AT FAR FOREST		Yes		Y
SH141	1.07	Brownfield	LAND AT SHATTERFORD		Yes	Yes	R
SH144	1.73	Greenfield	LAND OPPOSITE EAST VIEW CLOWS TOP			Yes	Y
SH147	0.43	Greenfield	land rear of 92 Wilden Lane				G
SH158	0.34	Brownfield	LAND AT THE TERRACE CLOWS TOP		Yes	Yes	R
SH160	1.90	Greenfield	LAND OFF BRIAR HILL			Yes	Y
SH161	2.38	Greenfield	LAND OFF HEMMING WAY CHADDESLEY CORB.			Yes	Y
SH162	0.17	Greenfield	GLEBE LAND OFF WOLVERLEY RD WOLVERLEY			Yes	Y

8.4 Summary

A tap left running for just 15 minutes, the time it takes to brush your teeth 7 times, could use the same amount of water an efficient house uses in a day. By educating water users, a significant reduction in water demand could easily be made.

Demand management could be seen as an alternative to the sourcing of new water supplies. By reducing the current demand by 25% on 1000 dwellings, 250 new dwellings could be supplied without increasing the quantity of water required. Therefore the impact of the management of existing demand should not be underestimated as a method for accommodating future growth.

9 CONCLUSIONS

9.1 Introduction

This report has summarised the potential restrictions for the location of new development based upon the information available for the following five areas:

- Flood Risk;
- Water Supply;
- Sewerage Infrastructure;
- Wastewater Treatment; and
- SUDS

These have been classified using a traffic light colour code, summarised in Section 9.2 below and illustrated in more detail within this report. **Tables 22a - 22d** compare the findings for each development site to provide a constraints matrix. The aim of this matrix is to provide the Council with a quick comparative illustration from which they can weigh up the pros and cons of developing each of the potential development sites provided for analysis. As the colour code indicates the level of infrastructure improvement or implementation to enable development at each location, it provides a high level cost and time comparison for delivery. Although detailed cost and time implications cannot be provided for such a large scale analysis (which requires detailed discussion with the relevant service providers on a site by site basis), generally the sites highlighted in yellow will require higher cost and time investment than those highlighted in green, and similarly for the red compared to the yellow. If required by the Council, targeted sites can be taken forward to a 'Phase 3: Detailed' WCS which will provide more accurate time and cost scales.

9.2 Constraints Matrix

Tables 22a - 22d below summarise the constraints found for all the specified potential development sites within Wyre Forest District.



Green

- Clear to develop
 - ⇒ Low time and cost implications



Yellow

- Will require minor infrastructure improvement
 - ⇒ Medium time and cost implications



Red

- Will require major infrastructure improvement
 - ⇒ High time and cost implications

Table 22a – Kidderminster – Overall Constraints for Development

Unique ID	Area	Brownfield/ Greenfield	Location	Flood Risk	Water Supply	Sewerage Infrastructure	Wastewater Treatment	SUDS
D1	1.1	Brownfield	Land to Rear of Crossley	R	Y	G	G	R
D3/SH14/25	8.8	Brownfield	KTC.4	R	G	G	G	R
D4	1.2	Brownfield	Council Depot Site	R	G	G	G	R
D5/SH82	7.1	Brownfield	Churchfields Business Park	Y	G	G	G	Y
D7	4.5	Brownfield	Georgian Carpet Factories Site	Y	G	G	G	R
D8	0.5	Brownfield	Lime Kiln Bridge	Y	G	G	G	Y
D9/SH10	1.0	Brownfield	Park Lane Timber Yard	Y	G	G	G	R
D10/SH19	0.6	Brownfield	BT Site, Mill Street	R	G	G	G	R
D11	3.6	Brownfield	Current Morrisons application Site	R	G	G	G	Y
D12/SH76	1.7	Brownfield	Park Street	G	G	G	G	R
D21	23.9	Brownfield	British Sugar Site	G	G	G	G	R
D22	2.2	Greenfield	Victoria Sports Ground	Y	Y	Y	G	G
D23/SH75/ SH159	0.9	Brownfield	Park Lane	Y	G	G	G	R
D24	6.5	Brownfield	Current Sealine Factory (Various Units)	R	G	G	G	R
D25/SH35	0.6	Brownfield	Current Retail Area	R	G	G	G	R
D26	0.5	Brownfield	New Road and Market Street	R	G	G	G	R
D27	0.2	Brownfield	Brintons Offices - Exchange Street	R	G	G	G	R
D28	1.2	Brownfield	Current Morrisons Site and Other Shops	Y	G	G	G	Y
D29/SH60	0.6	Brownfield	KTC.3 - Worcester Street Enhancement Area	G	G	G	G	Y
D30/SH9	0.1	Brownfield	Church Street Car Park	Y	G	G	G	Y
D31	7.3	Greenfield	Puxton	R	Y	G	G	Y
D33	0.3	Brownfield	Lax Lane Craft Centre/WVRS/British Red Cross	Y	Y	Y	G	R
D36	5.3	Brownfield	Lisle Avenue	G	G	G	G	R
D38/SH40	1.7	Greenfield	Puxton Site	Y	Y	G	G	Y
D40	1124m (Road)		Hoo-Brook Link Road	Y	N/A	N/A	N/A	Y
D46	0.3	Brownfield	Cheshires Printers	G	G	G	G	Y
D47/SH81	0.4	Brownfield	Kidderminster market auctions	G	G	G	G	Y
D48/SH71	0.1	Brownfield	Comberton Place	G	G	G	G	Y
D49/SH80	0.1	Brownfield	Comberton Hill	G	G	G	G	Y
D50/SH152	0.9	Brownfield	CMS Car Showrooms	G	G	G	G	Y
D52/SH61	0.3	Brownfield	Rock Works	G	G	G	G	R
D53	0.7	Brownfield	Matalan	R	G	G	G	R
D54	1.5	Brownfield	Worcester Street	G	G	G	G	Y
SH4	0.3	Brownfield	78 MILL STREET	R	G	G	G	R
SH11	0.1	Brownfield	CASTLE ROAD / PARK LANE	R	G	G	G	R
SH18	5.4	Brownfield	GEORGIAN CARPETS	G	G	G	G	R
SH20	1.0	Greenfield	PLAYING FIELD ADJ. ST. MARY'S SCHOOL	G	Y	R	G	G
SH21	0.3	Greenfield	REAR OF THE PARADE BROADWATERS	Y	Y	R	G	G

Unique ID	Area	Brownfield/ Greenfield	Location	Flood Risk	Water Supply	Sewerage Infrastructure	Wastewater Treatment	SUDS
SH30	0.8	Brownfield	NEW ROAD CARTERS SITE	R	G	G	G	Y
SH31	1.0	Brownfield	R&D Aggregates Site	Y	G	G	G	R
SH32	0.1	Brownfield	PARK LANE	Y	G	G	G	R
SH38	0.8	Brownfield	BED CITY MCF COMPLEX	R	G	G	G	R
SH39	0.5	Brownfield	ELGAR HOUSE GREEN STREET	R	G	G	G	Y
SH41	15.3	Greenfield	FORMER BRITISH SUGAR SETTLING PONDS	Y	Y	Y	G	G
SH42	0.1	Brownfield	MILL BANK GARAGE	R	G	G	G	R
SH43	0.1	Brownfield	PIANO BUILDING WEAVERS WHARF	R	G	G	G	R
SH44	0.3	Brownfield	ZANZIBARS CASTLE ROAD KIDDERMINSTER	R	G	G	G	R
SH47	0.1	Brownfield	26 WOOD STREET	G	G	G	G	Y
SH53	0.2	Brownfield	TELEPHONE EXCHANGE BLACKWELL STREET	G	G	G	G	Y
SH56	0.5	Brownfield	LEA STREET SCHOOL	G	G	G	G	Y
SH59	1.7	Brownfield	SUTTON RESERVOIR	G	G	Y	G	Y
SH62	0.1	Brownfield	HERONS NURSING HOME, SPENNELLS	Y	G	G	G	Y
SH63	0.4	Brownfield	CHESTER ROAD SOUTH SERVICE STATION	G	G	Y	G	Y
SH64	0.2	Brownfield	OLDNALL ROAD	G	G	Y	G	Y
SH65	0.3	Brownfield	PURAC BUILDING	Y	G	Y	G	Y
SH69	0.8	Brownfield	FRANCHE COMMUNITY CENTRE	G	G	R	G	Y
SH72	0.3	Brownfield	RIFLE RANGE SHOPS	G	G	R	G	Y
SH73	1.1	Brownfield	HURCOTT MAISONETTES	G	G	Y	G	Y
SH74	0.5	Brownfield	BROADWATERS COMMUNITY CENTRE	Y	Y	Y	G	Y
SH78	0.2	Brownfield	207 BIRMINGHAM ROAD KIDDERMINSTER	Y	G	Y	G	Y
SH79	0.4	Greenfield	CHESTER ROAD BOWLING CLUB	G	G	Y	G	G
SH83	1.1	Greenfield	FRANCHE ROAD TRIANGLE	G	Y	G	G	G
SH84	0.8	Brownfield	LAND OFF BROOMFIELD CLOSE	G	Y	Y	G	Y
SH85	0.3	Brownfield	YEW TREE PUB	Y	G	Y	G	Y
SH86	0.5	Brownfield	HARRIERS TRADING ESTATE	G	G	G	G	Y
SH87	0.8	Greenfield	SOUTH OF BERNIE CROSSLND WALK	Y	G	Y	G	G
SH88	1.6	Greenfield	PLAYING FIELD OFF SUTTON PARK RISE	G	G	Y	G	G
SH91	0.3	Brownfield	QUEENS STREET (REDEVELOPMENT)	G	G	Y	G	Y
SH93	0.2	Brownfield	273/4 HOO ROAD (ADJ. ST.ANDREWS GREEN	G	G	G	G	Y
SH94	0.6	Brownfield	NORTH OF BERNIE CROSSLAND WALK	Y	G	Y	G	Y
SH95	1.3	Brownfield	BLAKEBROOK SCHOOL / COUNTY BUILDINGS	G	G	Y	G	Y
SH96	0.3	Brownfield	EAGLE'S NEST PH	G	Y	Y	G	Y
SH97	0.2	Brownfield	AYLMER LODGE SURGERY	G	G	G	G	Y
SH98	0.1	Brownfield	NORTHUMBERLAND AVENUE SURGERY	G	G	G	G	Y
SH105	5.8	Brownfield	KING CHARLES 1 SCHOOL	G	G	Y	G	Y

Unique ID	Area	Brownfield/ Greenfield	Location	Flood Risk	Water Supply	Sewerage Infrastructure	Wastewater Treatment	SUDS
SH106	0.4	Brownfield	SUTTON ARMS PH	G	G	R	G	Y
SH109	14.0	Greenfield	HURCOTT ADR	A	Y	Y	G	G
SH111	3.6	Greenfield	OFFMORE LANE ALLOTMENTS	G	Y	Y	G	G
SH113	1.8	Brownfield	OASIS ARTS & CRAFTS	G	G	Y	G	Y
SH114	0.9	Brownfield	REILLOC CHAIN	G	G	Y	G	Y
SH122	0.5	Brownfield	THE BRIARS HOTEL	G	G	Y	G	Y
SH125	0.6	Brownfield	LAND AT 108-109 BEWDLEY HILL	G	G	Y	G	Y
SH128	39.5	Greenfield	STANKLYN LANE	Y	G	Y	G	G
SH133	18.1	Greenfield	LAND AT WOLVERLEY TRAFFIC LIGHTS	Y	Y	Y	G	G
SH134	0.0	Brownfield	R/O 41 CLARENCE STREET	G	G	G	G	Y
SH135	1.6	Greenfield	LAND AT THE LEA	G	G	Y	G	G
SH137	3.2	Brownfield	ZORTECH AVENUE	Y	G	Y	G	Y
SH142	0.2	Brownfield	MUSKETEER PH RIFLE RANGE	G	G	R	G	Y
SH143	95.2	Greenfield	LOW HABBERLEY FARM	G	G	Y	G	Y
SH150	0.3	Brownfield	CHESHIRE SITE	G	G	G	G	Y
SH151	0.2	Brownfield	FRANCHE ROAD	G	G	G	G	Y
SH153	0.9	Brownfield	164-166 SUTTON PARK ROAD	G	G	Y	G	Y
SH154	0.8	Brownfield	WINDSOR DRIVE KIDDERMINSTER	G	G	R	G	Y
SH155	0.2	Brownfield	WOLVERHAMPTON ROAD KIDDERMINSTER	Y	G	Y	G	Y
SH156	0.9	Brownfield	FRANCHISE STREET KIDDERMINSTER	G	G	R	G	Y
SH157	0.8	Brownfield	LONGFELLOW GREEN KIDDERMINSTER	G	G	Y	G	Y
SH163	2.7	Greenfield	LAND OFF WOLVERLEY ROAD FRANCHE	G	Y	G	G	G

Table 22b – Stourport on Severn – Overall Constraints for Development

Unique ID	Area	Brownfield/ Greenfield	Location	Flood Risk	Water Supply	Sewerage Infrastructure	Wastewater Treatment	SUDS
D2/SH17	3.09	Brownfield	Riverside Business Centre	R	G	G	G	Y
D13/SH7	6.06	Brownfield	STC.2	Y	G	G	G	Y
D14/SH3	2.20	Brownfield	STC.3	Y	G	G	G	Y
D15/SH45	2.03	Brownfield	Lichfield Basin	Y	G	G	G	Y
D16	0.95	Brownfield	Shipleys Amusement Area	R	G	G	G	Y
D17	0.77	Brownfield	Thomas Vale - Affordable Housing Site	Y	G	G	G	Y
D18	3.71	Brownfield	Parsons Chain	G	G	G	G	Y
D19	0.22	Brownfield	A.Harris and Sons	G	G	G	G	Y
D34/SH27/ SH34/SH117	1.60	Brownfield	Baldwin Road	G	G	G	G	Y
D35/SH8	0.38	Brownfield	STC.4	Y	G	G	G	Y
D39	2958m (Road)		Stourport Relief Road	Y	N/A	N/A	N/A	G

Unique ID	Area	Brownfield/ Greenfield	Location	Flood Risk	Water Supply	Sewerage Infrastructure	Wastewater Treatment	SUDS
D41/SH33	3.14	Brownfield	ADR - Power Station Road	R	G	G	G	Y
D42/SH28	0.83	Brownfield	Car Garages - Worcester Road	R	G	G	G	Y
D43/SH57	0.59	Brownfield	Stourport Civic Centre	G	G	G	G	Y
D44/SH15	1.37	Brownfield	Lickhill Lodge First School	Y	Y	G	G	Y
SH5	0.36	Brownfield	BALDWIN ROAD LOCAL PLAN SITE	Y	G	G	G	Y
SH16	6.26	Brownfield	PARSONS CHAIN	Y	G	G	G	Y
SH37	1.97	Greenfield	LAND AT MOORHALL LANE	Y	Y	G	G	G
SH46	0.17	Brownfield	TONTINE BUILDINGS	R	G	G	G	Y
SH48	0.38	Brownfield	CHICHESTER CARAVANS / ROGERS RESCUE	Y	G	G	G	Y
SH49	0.68	Brownfield	TAN LANE FIRST SCHOOL	G	G	G	G	Y
SH50	0.23	Brownfield	VALE ROAD GARAGE	Y	G	G	G	Y
SH51	0.15	Brownfield	A-Z WEDDING SERVICES	G	G	G	G	Y
SH52	0.55	Brownfield	ARELEY COMMON FIRST SCHOOL	G	G	G	G	Y
SH54	0.59	Brownfield	MARTLEY ROAD	Y	G	Y	G	Y
SH55	0.20	Brownfield	BRIDGE STREET MALL	Y	G	G	G	Y
SH67	0.36	Brownfield	QUEENS ROAD WALSHES	Y	G	Y	G	Y
SH68	0.17	Brownfield	WALSHES COMMUNITY CENTRE	Y	G	Y	G	Y
SH89	3.50	Brownfield	MORGAN MATROC	G	G	R	G	Y
SH92	0.08	Brownfield	garage block adjacent Areley common school	G	G	G	G	Y
SH99	0.25	Brownfield	TESCO AND BEDLAND STORES	Y	G	G	G	Y
SH100	0.21	Brownfield	20 LORNE STREET	G	G	G	G	Y
SH101	0.29	Brownfield	MERRIHILL MITTON GARDENS	Y	G	G	G	Y
SH102	0.67	Brownfield	COUNTY BUILDINGS	Y	G	G	G	Y
SH103	0.36	Brownfield	THE MANOR PH	G	G	G	G	Y
SH104	3.16	Brownfield	MIDLAND INDUSTRIAL PLASTICS	G	G	R	G	Y
SH118	0.19	Brownfield	MANOR ROAD DEPOT	G	G	G	G	Y
SH124	0.14	Brownfield	MITTON STREET	G	G	G	G	Y
SH138	1.71	Brownfield	BOURNEWOOD NURSERIES	G	G	Y	G	Y

Table 22c – Bewdley – Overall Constraints for Development

Unique ID	Area	Brownfield/ Greenfield	Location	Flood Risk	Water Supply	Sewerage Infrastructure	Wastewater Treatment	SUDS
D6/SH1	0.66	Brownfield	Load Street	R	G	G	G	Y
D32	0.26	Brownfield	Lax Lane Craft Centre/WVRS/British Red Cross	R	G	G	G	Y
D45/SH22	2.09	Brownfield	Butt Town Meadow Caravan Park	R	G	G	G	Y
SH2	0.12	Brownfield	TEXACO GARAGE BEWDLEY	R	G	G	G	Y
SH36	3.18	Greenfield	STOURPORT ROAD BEWDLEY	R	Y	G	G	G
SH66	1.00	Brownfield	WRIBBENHALL FIRST SCHOOL	R	G	R	G	Y
SH77	0.26	Brownfield	LAND 71-73 KIDDERMINSTER ROAD BEWDLEY	R	G	R	G	Y
SH136	0.49	Brownfield	WYRE HILL	G	G	R	G	Y
SH145	3.88	Greenfield	The Allotments Grey Green Farm	R	Y	R	G	G
SH146	7.20	Greenfield	The Front Meadows, Grey Green Farm, Bewdley	R	Y	R	G	G
SH148	2.55	Greenfield	LAND SOUTH OF LODGE CLOSE	R	Y	R	G	G
SH149	3.06	Greenfield	LAND REAR OF CATCHEM'S END FISH BAR	R	Y	R	G	G

Table 22d – Rural Wyre Forest – Overall Constraints for Development

Unique ID	Area	Brownfield/ Greenfield	Location	Flood Risk	Water Supply	Sewerage Infrastructure	Wastewater Treatment	SUDS
D20	2.10	Mixed	Wilden Lane	Y	Y	G	G	Y
D37/SH29	5.71	Brownfield	Titan Steel Wheels - Cookley	Y	Y	G	G	R
D51/SH107	23.07	Brownfield	Lea Castle Hospital	G	Y	Y	G	Y
SH6	0.27	Greenfield	BLACKSTONE BARNS	R	R	Y	Y	Y
SH12	0.06	Brownfield	ROCK TAVERN, CAUNSALL ROAD	Y	Y	G	G	R
SH13	1.01	Brownfield	THE MANOR HOUSE WOLVERLEY	Y	Y	Y	G	Y
SH23	2.28	Greenfield	ADJACENT CHADDESLEY CORBETT SURGERY	Y	Y	Y	R	Y
SH58	0.45	Greenfield	LAND AT HEMMING WAY	G	Y	Y	R	Y
SH70	0.04	Brownfield	WOLVERLEY COURT	G	R	G	G	R
SH90	7.09	Brownfield	BUTTS LANE STONE	G	Y	Y	Y	R
SH108	1.20	Greenfield	KIMBERLEE AVENUE ADR	G	Y	G	G	G
SH110	1.36	Brownfield	BLAKEDOWN NURSERIES ADR	Y	Y	Y	Y	Y
SH112	0.15	Greenfield	LAND ADJACENT 29 CASTLE ROAD COOKLEY	G	Y	G	G	G
SH115	0.62	Greenfield	SEBRIGHT ROAD	G	Y	G	G	G
SH116	3.11	Greenfield	FAIRFIELD ADR	G	Y	G	G	G
SH119	2.72	Greenfield	WILDEN TOP ADR	G	Y	Y	G	G
SH120	0.49	Brownfield	CHADDESLEY CORBETT SCHOOL	G	R	Y	R	R

Unique ID	Area	Brownfield/ Greenfield	Location	Flood Risk	Water Supply	Sewerage Infrastructure	Wastewater Treatment	SUDS
SH121	1.16	Greenfield	HAYES ROAD ADR	G	Y	G	G	G
SH123	0.27	Brownfield	OXBINE CALLOW HILL	G	Y	Y	G	Y
SH126	0.26	Brownfield	LAND OFF ORCHARD CLOSE, BLISS GATE	G	Y	Y	G	R
SH127	0.07	Brownfield	GARAGE SITE THE GREEN CHADDESLEY CORB.	G	Y	Y	R	R
SH129	3.94	Greenfield	LAND AT STONE HILL	Y	Y	Y	Y	G
SH130	0.31	Greenfield	LAND AT FOLD FARM	G	Y	Y	R	Y
SH131	6.38	Greenfield	LAND AT LAWNSWOOD WESTHEAD ROAD	G	Y	G	G	G
SH132	1.76	Greenfield	BROWN WESTHEAD PARK	G	Y	G	G	G
SH139	5.16	Greenfield	BINE LANE BLISS GATE	G	Y	Y	G	Y
SH140	0.64	Brownfield	LAND AT FAR FOREST	G	Y	Y	G	Y
SH141	1.07	Brownfield	LAND AT SHATTERFORD	G	Y	G	R	R
SH144	1.73	Greenfield	LAND OPPOSITE EAST VIEW CLOWS TOP	R	Y	R	R	Y
SH147	0.43	Greenfield	land rear of 92 Wilden Lane	G	Y	Y	G	G
SH158	0.34	Brownfield	LAND AT THE TERRACE CLOWS TOP	R	R	R	R	R
SH160	1.90	Greenfield	LAND OFF BRIAR HILL	G	Y	Y	R	Y
SH161	2.38	Greenfield	LAND OFF HEMMING WAY CHADDESLEY CORB.	G	Y	Y	R	Y
SH162	0.17	Greenfield	GLEBE LAND OFF WOLVERLEY RD WOLVERLEY	G	Y	Y	G	Y

This WCS has shown that there are a number of potential restrictions and for most of the potential development sites for all elements of the water cycle.

These summary tables indicate that flood risk is the biggest problem for development within Wyre Forest District, mainly due to the location of many sites in the flood plain. The most significant restrictions are related to the residual risk of flooding from the overtopping or breaching of flood defences within the towns of Kidderminster and Bewdley. This will require consideration and addressing, alongside consultation with the Environment Agency, to weigh up the flood risk source and return period to decide the most appropriate land use for each development site in line with PPS25. In addition, many areas of the District suffer from flash flooding risk related to capacity exceedance of the minor and ordinary watercourse, sewer networks and surface water drainage. Continued maintenance and clearing of these watercourses and the implementation of SUDS systems in both old and new developments will be paramount to reducing this risk. The selection of appropriate SUDS systems will require consideration of the constraints highlighted above and the guidance provided within **Appendix D** of this report. For many sites within Wyre Forest District, especially those located above the Inner Zone of an SPZ, will be limited to non-infiltration techniques.

There is little differentiation between the potential development sites in terms of connection to the water supply network. Due to the predicted increase in development and the drought-related effects of climate change, water resources will become increasingly limited. STWL have not identified the provision of water as a potential constraint through the planning period, due to the ability to transfer water between the

WRZs. However, some of the watercourses are already experiencing low flows, as illustrated by the abstraction restrictions emplaced by the Environment Agency. Limitations in water resources may pose a problem dependent upon the type of development and the density of development, especially with regards to Scenario 3 or high water use industries. This may result in a delay to the timing in which industry can be developed if mains water cannot be provided or is too expensive. These problems with water resources and overabstraction issues within the District highlight the necessity for storage of water for agricultural use, especially during the winter months. Due to the high number of water dependent SSSIs within the District, the preservation of local water supply is, and will continue to be, an important issue for consideration and it is vital that the implementation of new development does not further affect this situation. A number of water efficiency and demand reduction measures are being proposed by STWL and it will be necessary for new development to support these aims through the implementation of efficiency measures wherever possible. This will be aided further through the retrofitting of existing properties. STWL also do not see the connection of development to the water supply network as a constraint to development, although, as illustrated in **Tables 22a - 22d** above, the more rural and Greenfield sites will require higher levels of investment than the Brownfield sites already located within the water supply network system.

The analysis of the wastewater infrastructure network has indicated a number of potential constraints and bottlenecks within the existing system, many of which have already experienced occurrences of flooding. However, these are all being addressed by STWL and factored into their AMP5 submission as they are legally required to provide connection to new development. Despite this, STWL have requested that, should the level of development increase dramatically, they are provided with notification to enable the requirement for additional improvements and extensions to the works to be factored into their following AMP submissions. It is also be advisable to ensure that all future sewerage systems are separate and to work towards a programme of separation of combined sewers, in particular in the critical areas to reduce the stress on the sewage treatment works, although this will require detailed discussion with STW. Where Brownfield sites currently discharge to these combined sewers and there is an aspiration to discharge surface water to the watercourse the runoff rates of new development must be less than the current Brownfield rate, regardless of the current capacity of the watercourse.

The capacity of the main WwTWs within the District have been identified as having the ability to accommodate the predicted increase in effluent, including the Kidderminster Oldington works, which is key to a majority of the development. However, there are a number of pumping stations and rural WwTWs that are already operating at capacity and will therefore require upgrade or improvement to accommodate the additional flows. Most notable are the Blakedown, Roundhill, Upper Arley and Chaddesley Corbett works. It is also necessary to ensure that the environmental constraints are not exceeded as a result of new development, especially as some watercourses (Blakedown Brook) are already failing their RQOs and the District as a whole has been identified as suffering from nitrification issues.

Although some potential development sites will require some degree of investment to make them feasible, no major show stoppers have been identified and no sites have been classified as 'red' in all three categories, and very few have been classified with more than two 'reds'. Due to the close proximity of many of the sites within the District it will be possible to increase the feasibility of many sites with one infrastructure

improvement. For example, decreasing the infiltration of surface water into the foul water mains within the combined sewers, through the implementation of SUDS techniques or construction of additional balancing ponds and lakes, will decrease the pressure on the foul water main and potentially increase the capacity for additional foul sewage, although such techniques will require further discussion with STW and the Council Drainage Engineers.

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.

Reference to the development trajectories must be considered when reviewing the results in **Tables 22a – 22d** above, as this may limit the level of choice available between the proposed potential development sites. For example, should the WMRSS development requirements increase towards Scenarios 2 or 3, the area of land available to develop becomes increasingly restricted and less site choice is available. In this situation site selection will have to be increasingly strategic to minimise the potential time and cost implications. In this situation the findings of this report can be used to provide general guidance regarding the most feasible locations in terms of flood risk, water supply and wastewater treatment.

It must be noted that there are limitations to all the results which are discussed throughout the body of this report. Improvements, such as increased modelling of the ordinary watercourses and sewer and water supply networks may provide an increased level of detail.

9.3 High Level Cost Estimation

Detailed costings of the required improvements cannot be provided within this report as the water companies will not provide cost estimates until they are approached by a developer and are aware of the situation at that time. However, as mentioned in Section 9.1, the traffic light colours used in the summary tables within this report relate to a high level cost estimation. The potential development sites shown in red will require a high degree of investment, whereas those highlighted in green will require a very low level of investment. The potential costs to be considered are:

- Implementation of new flood risk reduction measures (such as new defences, flood warning schemes or land raising);
- Maintenance of existing flood defences and upgrading;
- Improvement/maintenance of the conveyance and capacity of the smaller and ordinary watercourses, including replacing damaged or insufficient culverts;
- Implementation of new water supply pipe lines to connect the new potential development sites to the existing trunk mains.
- Upgrading or installation of booster stations necessary for transmitting the water to rural potential development sites located outside the current water supply network;
- Installation of new WTWs or upgrading the capacity of current WTWs;
- Transferring additional water supply from neighbouring WRZs;
- Increasing capacity of the WwTWs;
- Improving the water quality of the treated effluent to comply with water quality standards;
- Increasing capacity and connections of the surface water sewage networks;

- Implementation of SUDS schemes, including the provision of land for above-ground attenuation;
- Water resource demand management measures; and
- Upgrading and increased maintenance of the watercourse channels, including replacing damaged or insufficient culverts.

The Environment Agency recommends that funding sources are identified within an Implementation Plan. This will highlight who is essential to the delivery (for example STWL, the Environment Agency, riparian owners, developers etc).

10 RECOMMENDATIONS

It is recommended that this study is reviewed once the final WRMPs and WMRSS figures are published and if any other strategic studies are carried out (for example a Surface Water Management Plan or final River Basin Management Plans²³). In addition, a review should be carried out once the Water Framework Directive Programme of Measures has been published as they may require a reduction in abstraction, resulting in a higher demand for mains water. If possible, it is also recommended that additional models of the ordinary watercourses, sewer networks and water supply systems are carried out to increase the accuracy of the results, perhaps through commission of a Phase 3 Detailed WCS. This will allow finalisation of the constraints matrix and inclusion of accurate high level costings, which may create greater divides between the potential development sites than could be presented here. For many of the sites, however, this will still provide a 'broad-scale' analysis and viability of development may not be concluded upon within detailed site-specific FRAs and infrastructure upgrade analyses.

10.1 LDF Policies and Development Control Policies

This WCS provides information regarding all elements of the Water Cycle to support appropriate land use allocations within the District. The site allocations within the Local Development Framework should reflect the Council's strategic planning policies and should address all the issues and limitations regarding water supply, wastewater treatment and flood risk identified within this report.

Suggested local policies for the LDF and Development Control policies relating to the finding of this WCS are as follows (all recommendations relating to flood risk presume that reference is made to the Level 1 and Level 2 SFRA's and PPS25 and the Exception and Sequential Tests are followed):

- Location and phasing of development should ensure that infrastructure is provided in the right place and at the right time;
- The location of potential development sites should be allocated according to the capacity of the wastewater network, water supply network and the guidance set out in PPS25, as identified in this WCS and the associated Level 1 and Level 2 SFRA's;
- When reviewing the results of flood risk this WCS should be reviewed alongside the Level 2 SFRA.
- It should be assured that the development of any new site does not detrimentally impact any existing development in terms of wastewater disposal, water supply or flood risk;
- Ample lead times must be provided for the new and updated infrastructure required by new development. As such, continued close two way communication with Severn Trent Water is necessary to ensure the delivery of infrastructure to facilitate the new development without causing environmental deterioration;

²³ The River Severn RBMP was finalised between submission of the draft of this WCS and finalisation. This information can now be found on the Environment Agency's website by following this link -

<http://wfdconsultation.environment-agency.gov.uk/wfdcms/en/severn/Intro.aspx>

For reference a summary table of the watercourses included within the study area of this project is included in **Appendix E**.

- The Environment Agency would expect an Implementation Plan to demonstrate the Councils' development strategy for the District;
- Policies should be included that ensure all new homes are built to the appropriate water efficient standard and the Council should ensure the Water Company keeps them updated on progress with their water efficiency measures and programmed schedule of works;
- More stringent targets for demand management than Level 3 of the Code for Sustainable Homes should be investigated;
- Where feasible, investigation into conjunctive water use between groundwater and surface water abstraction;
- As far as possible Brownfield land should be chosen for development above Greenfield land, where it is appropriate and practical in terms of water supply, wastewater treatment and flood risk;
- All new development should adopt appropriate SUDS, grey water recycling and/or rainwater harvesting methods as appropriate to deal with the surface water runoff produced on that site;
- The suggested recommendations and policies in the SFRA, with regards to flood risk, should be noted;
- Appropriate consideration must be given to the guidance provided in PPS25, and the Sequential and Exception Tests followed, for any development identified as being either wholly or partially located in Flood Zones 2 or 3. Further information and policies regarding flood risk are provided in the Level 1 and Level 2 SFRAs;
- FRAs should be undertaken where identified as necessary within this WCS or the Level 1 SFRA;
- Due to the nature of the District every new development will require the inclusion of SUDS and some will require the collected surface water to be disposed of on site, using a non-infiltration method;
- No new development should be connected to the surface water sewer network where the sewer network is at capacity;
- On site attenuation must be applied to all sites currently draining to combined sewers or where there are plans to separate out to surface water drainage.
- Where Brownfield sites currently discharge to combined sewers and there is an aspiration to discharge surface water to the watercourse the runoff rates of new development must be less than the current Brownfield rate, regardless of the current capacity of the watercourse.
- The development of any new site should not have a negative impact on water quality, either directly through pollution of surface or ground water or indirectly through overloading of sewage treatment works;
- Until upgrade or improvement works are carried out no development should take place in areas served by sewage treatment works or sewer networks that have been identified as currently operating at, or above, current capacity;
- All necessary measures should be adopted to reduce water supply demand and through efficiency measures, both in new developments and through retrofitting of old development;
- Formal submission to the appropriate water company will be required for any new development, outlining the water usage requirements for the site;
- Ensure the policies of the Core Strategy and associated LDF Documents are designed to achieve the recommended high level of implementation of demand management techniques in a manner which allows this to be achievable and enforceable;

- In line with the objectives of the WFD, development must not result in any water body failing to meet the class limits for the status class declared in the final River Severn RBMP (Please see Appendix E for reference of the water body classifications and objectives. These should now be reviewed alongside the sewage treatment work discharge consents);
- In line with the objectives of the WFD, no development should take place within the catchments of WwTWs that are currently exceeding their discharge consents until the discharge issues are resolved.
- As stated in the Level 2 SFRA, a SWMP is recommended for Wyre Forest District;
- Further site specific analysis of those development site located in proximity or upstream of SSSIs may be required before development commences;
- The investigation of some cost estimations would be useful for the Core Strategy and Site Allocations DPD;
- As STW is key in the provision of infrastructure the certainty of delivery times of any STW schemes must be monitored to ensure that it is in parallel with development;

11 REFERENCES

1. Wyre Forest District Level 1 SFRA, final, Royal Haskoning, 2008
2. Wyre Forest District Level 2 SFRA, draft, Royal Haskoning, 2009
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4. West Midlands Regional Spatial Strategy (WMRSS) Phase Two Revision Draft: West Midlands Regional Assembly, 2008
5. Focus on Water, Strategic Direction Statement 2010 – 2035, Severn Trent Water, 2007
6. Draft Business Plan 2010-15, Severn Trent Water, 2008
7. Final Business Plan 2010-15, Severn Trent Water, 2009
8. Draft Water Resources Management Plan, Severn Trent Water, 2009
9. The Worcestershire Middle Severn Catchment Abstraction Management Strategy, Environment Agency, 2006
10. Severn Corridor Catchment Abstraction Management Strategy, Environment Agency
11. The Worcestershire Middle Severn Catchment Abstraction Management Strategy, Environment Agency, 2006
12. Census 2001, <http://www.statistics.gov.uk/census2001/census2001.asp>
13. Wyre Forest District Local Plan, Wyre Forest District Council, 2004
14. Local Development Framework Core Strategy Issues and Options, Revised, Wyre Forest District Council, 2008
15. Local Development Framework Core Strategy Issues and Options Paper, Wyre Forest District Council, 2008
16. Borough of Redditch Local Development Framework, Local Plan No. 3, Redditch Borough Council, 2007
17. Worcestershire County Structure Plan 1996 – 2011, 2001
18. West Midlands Regional Spatial Strategy (RSS 11): The Impact of Housing Growth on Public Water Supplies, Environment Agency, 2007
19. West Midlands Regional Spatial Strategy (RSS 11): The Impact of Housing Growth on Water Quality and Waste Water Infrastructure, Environment Agency, 2007

20. River Severn Catchment Flood Management Plan, draft, Environment Agency, 2008
21. Planning for Water in Worcestershire, Technical Research Paper, draft, Worcestershire County Council, 2008
22. Development Options for the West Midlands RSS in Response to the NHPAU Report, Nathaniel Lichfield and Partners, 2008
23. Greywater: an Information Guide, Environment Agency, 2008
24. Harvesting Rainwater for Domestic Uses: An information guide, Environment Agency, 2008
25. Water Efficient Solutions: The Practical Guide for Industry, Commerce and the Public Sector, 2008
26. Drought Plan for Midlands Region, Upper Severn Area, Environment Agency

APPENDICES

Appendix A Figures

Appendix B Data Register

Appendix B – Data Register

Document ID	Title	Format	Provided by
9T6121_001	Planning for Water in Worcestershire – Draft (February 2008)	Report – digital	WFDC
9T6121_002	Flood Watch Areas	Shapefiles – digital	EA (Paul Flynn)
9T6121_003	Mastermap Tiles	CD x 1	WFDC
9T6121_004	Pictometry	CD x 4	WFDC
9T6121_005	LiDAR	CD x 1	EA (Mike Plant)
9T6121_006	Stour & Severn Models	CD x 1	EA (Pete Restorick)
9T6121_007	Source Protection Zones	PDF	EA (Paul Flynn)
9T6121_008	Groundwater Protection Zones	PDF	EA (Paul Flynn)
9T6121_009	Sewer Network Schematic	Printed Screen Dump	STW (Matt Foster)
9T6121_010	Wastewater Treatment Infrastructure	Printed Screen Dump	STW (Matt Foster)
9T6121_011	Water Supply Network Schematic	Printed Screen Dump	STW (Matt Foster)
9T6121_012	Water Supply Infrastructure	Printed Screen Dump	STW (Matt Foster)
9T6121_013	Ordnance Survey Mapping (10K, 25K and 50K)	TIFF tiles	WFDC (Jon Elmer)
9T6121_014	Wyre Forest District Adopted Local Plan, January 2004	Report	WFDC
9T6121_015	Wyre Forest District Local Development Framework, Core Strategy Issues and Options Paper, January 2008	PDF	WFDC (Website)
9T6121_016	Potential Development Sites	Shapefiles	WFDC
9T6121_017	Updates to Development Sites	Shapefiles	WFDC
9T6121_018	NFCDD data	Shapefiles	EA
9T6121_019	River Quality Data (GQA)	Excel Spreadsheet	EA (Website)
9T6121_020	River Quality Data (RQO)	Scanned table	EA (Dawn Karle)
9T6121_021	River Severn CFMP	PDF	EA (Website)

Document ID	Title	Format	Provided by
9T6121_022	Employment Land Availability Assessment, April 2008	PDF	WFDC (Website)
9T6121_023	Residential Land Availability Assessment, April 2008	PDF	WFDC (Website)
9T6121_024	Severn Trent Water, Draft Water Resource Management Plan and Non-Technical Summary	PDF and Report	STW (Website and Andrew Marsh)
9T6121_025	Severn Trent Water, Strategic Direction Statement – Focus on Water	PDF Report	STW (Website)
9T6121_026	The Potential Impacts of Climate Change in the West Midlands	PDF	Internet
9T6121_027	The Worcestershire Middle Severn Catchment Abstraction Management Strategy, December 2006	PDF	EA (Website)
9T6121_028	Severn Corridor Catchment Abstraction Management Strategy (CAMS)	PDF	EA (Website)
9T6121_029	A Sustainable Future for the West Midlands – A Regional Sustainable Development Framework, Version Two, July 2006	PDF	Internet
9T6121_030	Wilden Marsh and Meadows SSSI Restoration – <i>Environment Agency Scoping Report, February 2007</i>	Report	EA via WFDC
9T6121_031	Drought Plan for the Midlands Region Upper Severn Area	PDF	EA (Website)
9T6121_032	West Midlands Regional Flood Risk Appraisal, Final Report, October 2007	PDF	WMRA (Website)
9T6121_033	West Midlands Regional Spatial Strategy Phase Two Revision – Draft, Preferred Option, December 2007	PDF	WMRA (Website)
9T6121_034	Wilden Marshes and Meadows SSSI Restoration: Environmental Scoping Report, February 2007	Report	EA (Website)
9T6121_035	Worcestershire County Plan, 2005	Report	Internet
9T6121_036	Worcestershire County Emergency Flood Plan, 2005	PDF	Internet
9T6121_037	Regional Spatial Strategy for the West Midlands, January 2008	PDF	WMRA (Website)
9T6121_038	Environment Agency High Level Target 3: Emergency Exercises and Emergency Plans' Report to DEFRA April 2005	PDF	Internet
9T6121_039	SHLAA Sites	Shapefiles	WFDC (Jon Elmer)
9T6121_040	Greywater: an information guide	PDF	EA (Website)
9T6121_041	Harvesting rainwater for domestic uses: an information guide	PDF	EA (Website)
9T6121_042	Water Efficient Solutions: The Practical Guide for Industry, Commerce and the Public Sector, 2008	PDF	Waterwise (Website)

Document ID	Title	Format	Provided by
9T6121_043	Source Protection Zones	GIS Shapefiles	EA (Liane Auliffe)
9T6121_044	NFCDD Defence Data with Condition	Excel Spreadsheets x3	EA (Yolande Jones)
9T6121_045	GQO assessment locations	Excel Spreadsheet	EA (Dawn Karle)
9T6121_046	Greenfield/Brownfield classifications for SFRA sites	Excel Spreadsheet	WFDC (Jon Elmer)
9T6121_047	Regionally Important Geological Sites (RIGS)	Shapefile and Excel Spreadsheet	WFDC (Jon Elmer)
9T6121_048	Sites of Special Scientific Interest (SSSIs)	Shapefile	WFDC (Jon Elmer)
9T6121_049	Landscape Protection Areas (LPAs) - no longer in use by Final publication of report.	Shapefile	WFDC (Jon Elmer)
9T6121_050	Areas of Great Landscape Value	Shapefile	WFDC (Jon Elmer)
9T6121_051	National Nature Reserves (NNR)	Shapefile	WFDC (Jon Elmer)
9T6121_052	Local Nature Reserves (LNR)	Shapefile	WFDC (Jon Elmer)
9T6121_053	Special Wildlife Sites (SWS)	Shapefile	WFDC (Jon Elmer)
9T6121_054	Flood Watch Area 103	Shapefile	EA (Paul Flynn)
9T6121_055	ISIS files for Severn	.DAT files	EA (Dan Trewin)
9T6121_056	Node locations - Kidderminster	MapInfo Files (Some)	EA (Pete Restorick)
9T6121_057	Node Locations - Kidderminster	Map Info files (Some)	EA (Rhys McCarthy)
9T6121_058	Node Locations - Kidderminster	Map Info files (Some)	EA (Pete Restorick)
9T6121_059	Wolverley FRA	PDF	EA (Sally Avard)
9T6121_060	Node Locations and water levels through Kidderminster (old model with incorrect embankment heights)	.csv .shp	EA (Pete Restorick)
9T6121_061	ISIS files for Wolverley Project	.dat and .ief files	EA (Pete Restorick)
9T6121_062	Data on river flows, sewage works and dilution – summary table	Email	EA (Dawn Karle)
9T6121_063	STW Waterlines	Shapefile	STW (Dawn Williams)
9T6121_064	STW Sewerlines	Shapefile	STW (Dawn Williams)

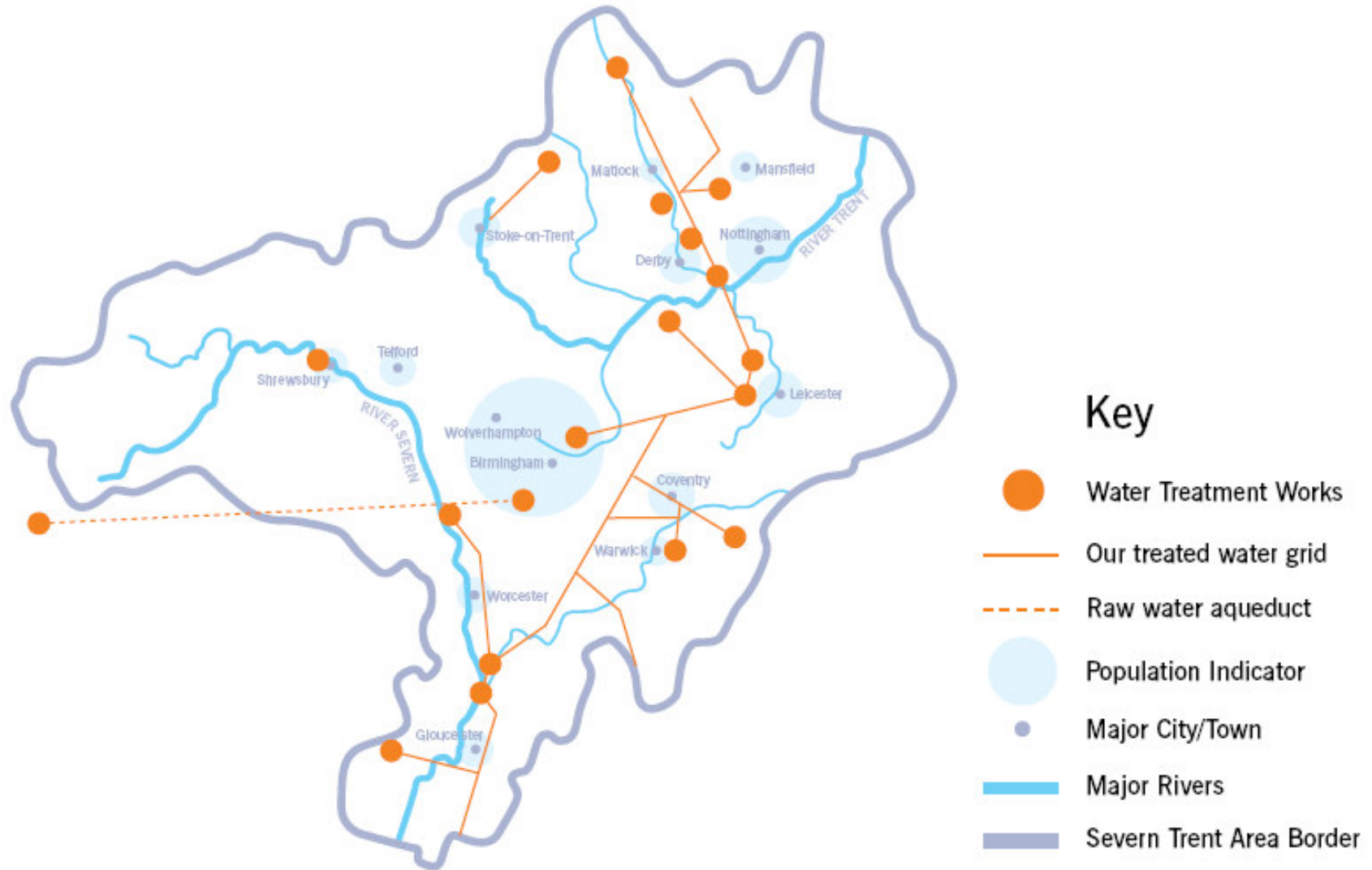
Document ID	Title	Format	Provided by
9T6121_065	DWF Flow Data	Excel	STW (Dawn Williams)
9T6121_066	Epop JR08 Data	Excel	STW (Dawn Williams)
9T6121_067	Additional Epop and DWF Data	Excel	STW (Dawn Williams)
9T6121_068	AIMS Postcodes (capital schemes)	MapInfo	STW (Tim Smith)
9T6121_069	STW DAP Areas	MapInfo	STW (Tim Smith)
9T6121_070	STW DAP Model Availability	Excel	STW (Tim Smith)
9T6121_071	FLOODS2 Database	Excel	STW (Tim Smith)
9T6121_072	AIMS Postcodes (capital schemes) - updated	MapInfo	STW (Tim Smith)
9T6121_073	Capital Schemes Process Map	PDF	STW (Tim Smith)
9T6121_074	DAP report notes	Word	RH (Rachel Ranger)
9T6121_075	STW Wastewater Comments	Excel	STW (Tim Smith)

Appendix C

Water Supply Schematics

Severn Trent Water - Strategic Treated Water Grid

Providing safe, clean drinking water to 7.4 million customers





ROYAL HASKONING

Appendix D Guidance

GUIDANCE NOTE: DEALING WITH SURFACE WATER

1. Requirements of PPS25 regarding surface water management

Urban developments can have a big effect on the quantity and speed of surface water runoff. By replacing vegetated ground with buildings and paved areas the amount of water being absorbed into the ground is severely reduced, therefore increasing the amount of surface water present. This additional surface water increases the demand on drainage systems in built up areas. Traditional drainage systems are designed to get rid of the water as quickly as possible to prevent flooding in the built up area. This can cause problems, particularly downstream, by altering the natural flow patterns of the catchment. In addition, water quality can be affected due to pollutants from the built up areas being washed into the watercourse due to the lack of treatment of the water. One technique which can reduce this problem is the use of Sustainable Drainage Systems (SUDS).

2. What are SUDS?

Sustainable Drainage Systems (SUDS) are techniques designed to control surface water runoff before it enters the watercourse. They are designed to mimic natural drainage processes, along with treating the water to reduce the amount of pollutants getting into the watercourse. They can be located as close as possible to where the rainwater falls and provide varying degrees of treatment for the surface water, using the natural processes of sedimentation, filtration, adsorption and biological degradation.

3. The Purpose of SUDS

SUDS are more sustainable than traditional methods because they can:

- Manage the speed of the runoff
- Protect or enhance the water quality
- Reduce the environmental impact of developments
- Provide a habitat for wildlife
- Encourage natural groundwater recharge.

In addition, they can be used to create more imaginative and attractive developments and are designed so that less damage is done, than conventional systems, if their capacity is exceeded.

4. Where are SUDS appropriate?

Surface water management using SUDS can be implemented at all scales and in most urban settings, ranging from hard-surfaced areas to soft landscaped features, even if there is limited space. Most techniques use infiltration but even if the area has little or no infiltration SUDS can still be used in the form of green roofs, permeable surfaces, swales and ponds.

5. The different types of measures

SUDS are made up of one or more structures built to manage surface water runoff, and used in conjunction with good site management. There are five general methods, listed below. These are shown in hierarchical order in terms of the 'management train', described in the CIRIA SUDS Manual, 2007 (Prevention → Source Control → Site Control → Regional Control). The techniques that are higher in the hierarchy are preferred to those further down so that prevention and control of water at source should always be considered before site or regional controls, such as balancing ponds and wetlands.

- i. **Prevention** – this can involve minimizing paved areas, replacing tarmac with gravel, rainwater recycling, cleaning and sweeping, careful disposal of pollutants, and general maintenance.
- ii. **Filter strips and swales** – these are vegetated surface features that drain water evenly off impermeable areas. Swales (figure 1) are long shallow channels whilst filter strips (figure 2) are gently sloping areas of ground. Both of these mimic natural drainage by allowing rainwater to run in sheets through vegetation, slowing and filtering the flow.

Figure 1 - Cross-section of a Swale

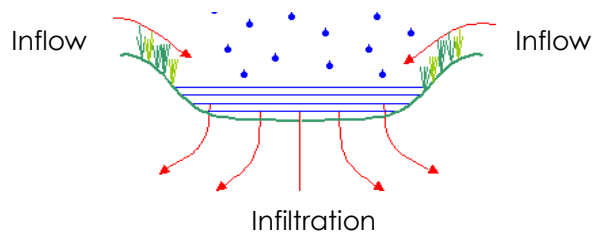
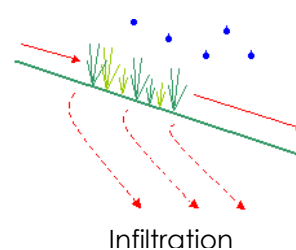


Figure 2 - Cross-section of a Filter Strip



- iii. **Permeable surfaces and filter drains** – these are devices that have a volume of permeable material below ground to store surface water. Runoff flows to this storage area via a permeable surface.
- iv. **Infiltration devices** – these enhance the natural capacity of the ground to store and drain water. They include soakaways, infiltration trenches and infiltration basins. See figure 3.
- v. **Basins and ponds** – these are areas for storage of surface runoff e.g. floodplains, wetlands, and flood storage reservoirs. They can be designed to control flows by storing water then releasing it slowly once the risk of flooding has passed. See fig 4.

Figure 3 Cross-section through an Infiltration Basin

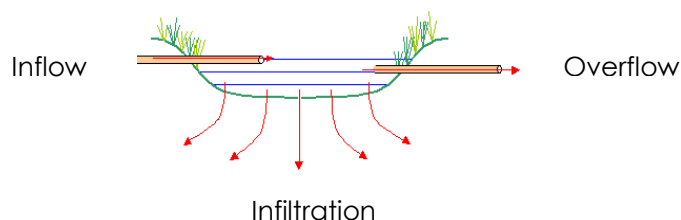
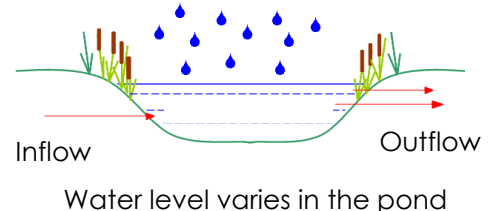


Figure 4 - Cross-section of a Pond



6. References

Information taken from:

- *Planning Policy Statement 25 – Development and Flood Risk*, December 2006
- www.ciria.org/suds
- *The SUDS Manual, 2007 (CIRIA C697)*

Appendix E Additional Data

River Severn final RBMP summary

Waterbody Name	Current Overall Potential	Overall Status Objective	Protected Area Designation	Catchment (RBMP Map Code)
RIVERS				
River Severn (confluence of River Worfe to confluence of River Stour)	Moderate	Good by 2027	Drinking Water Protected Area, Freshwater Fish Directive, Nitrates Directive	Worcestershire Middle Severn (R4)
River Stour (confluence of Smestow Brook to confluence River Severn)	Poor	Good by 2027	Freshwater Fish Directive, Nitrates Directive, Urban Waste Water Treatment Directive	Worcestershire Middle Severn (R25)
Drakelow Brook (source to confluence with River Stour)	Good	Good by 2015	Nitrates Directive	Worcestershire Middle Severn (R43)
Blakedown Brook (source to confluence with River Stour)	Moderate	Good by 2027	Freshwater Fish Directive, Nitrates Directive	Worcestershire Middle Severn (R45)
Hartlebury Brook (source to confluence with River Severn)	Moderate	Good by 2027	Nitrates Directive	Worcestershire Middle Severn (R19)
Hoo Brook (source to confluence with River Stour)	Moderate	Good by 2027	Nitrates Directive	Worcestershire Middle Severn (R20)
Dowles Brook (source to confluence with River Severn)	Poor	Good by 2027	Freshwater Fish Directive, Nitrates Directive	Worcestershire Middle Severn (R21)
CANALS				
Staffordshire & Worcester Canal, Stourbridge Canal to River Severn	Moderate	Good by 2027	Nitrates Directive	Staffordshire & Worcester Canal, Stourbridge Canal to River Severn (Ca5)
GROUNDWATER				
<p>Please refer to Appendix B of the final River Severn RBMP (http://wfdconsultation.environment-agency.gov.uk/wfdcms/en/severn/Intro.aspx)</p>				

Adapted from Appendix B of the final River Severn RBMP, December 2009

Appendix F

EA Sign Off Letter

Mr Jonathan Elmer
Wyre Forest District Council
Planning Policy
Duke House
Clensmore Street
Kidderminster
DY10 2JX

Our ref: SV/2010/103971/OR-
01/PO1-L03
Your ref:
Date: 15 March 2010

Dear Sir

Water Cycle Strategy - Final Report March 2010

We are of the view that the Water Cycle Strategy (WCS) as revised and amended in March 2010, provides a useful part of the evidence base relating to water infrastructure. It highlights the constraints and opportunities that arise from the proposed scale and broad location of growth within the District and provides a basis for progressing the formation of policies and guidance constituting the Local Development Framework (LDF).

The Core Strategy (CS), which will provide the local planning authority's (LPA) overarching strategy, should have regard to these recommendations and include policies or references (hooks) to ensure the timely provision of the necessary water related infrastructure. Policies must therefore be carefully designed and worded to ensure that they achieve this, while being deliverable and enforceable.

We understand that due to recent build and extant permissions, water related infrastructure capacity is not anticipated to be an issue of concern for at least the first 5 years of the LDF. This should be made explicit within the CS as part of the justification for deliverability of the CS.

We note that overall, water resources and water supply are not envisaged by STWL to be a constraint to development. However, due to the fact that the Report states that water resources are generally under pressure, it is essential that the LPA carefully monitors the situation to ensure that STWL mitigation measures are effective. To help facilitate such effectiveness, policies including challenging targets for water efficiency could be included in the LDF documents and adopted as soon as possible to ensure that implementation of the CS is not compromised.

Close communication with STWL is essential for the delivery of infrastructure to accommodate growth at the appropriate time without adverse impact on the environment, amenity, and the implementation of the Council's vision for the district.

Environment Agency
Hafren House, Welshpool Road, Shelton, Shrewsbury, Shropshire, SY3 8BB.
Customer services line: 08708 506 506
Email: enquiries@environment-agency.gov.uk
www.environment-agency.gov.uk

Cont/d..

The issue of the current lack of capacity and associated environmental risk at the rural WwTW's (eg Upper Arley, Chaddesley Corbett, Blakedown and Roundhill) needs to be addressed by the LPA in the CS and subsequent LDF documents, to ensure adequate lead-in times for infrastructure and development.

Likewise, sites affected by foul sewer flooding will need to be addressed in an implementation strategy to ensure that infrastructure is available prior to new development being constructed and occupied. The CS should recognise that such sites are unlikely to be available in the first 5 years of the CS.

In the three main urban areas generally proposed for growth, the performance of the Oldington WwTW at Kidderminster is critical. We note that STWL has identified that it has sufficient capacity for the predicted housing growth for the plan period with current consent standards. A point to note as part of further work on implementation is that changes in legislation and policy may affect the consents to discharge and thus impact on available capacity.

Phasing of sites in relation to available infrastructure capacity therefore needs to be addressed within the LDF process, including the imminent CS, so that development and the environment are not adversely affected.

We support the recommendation "Until upgrade or improvement works are carried out, no development should take place in areas served by sewage treatment works or sewer networks that have been identified as currently operating at, or above, current capacity." The LPA should ensure that this is taken into account in subsequent LDF documents on infrastructure implementation, including the Site Allocations Document and is addressed via appropriate policies.

We support the Recommendation that high level costings should be carried out, as this will contribute to ensuring that the CS, Sites Allocation and Development Control policies can be effectively implemented at the appropriate time without compromising environmental requirements and quality.

We appreciate the difficulties encountered in trying to get detailed information from infrastructure suppliers, however in the absence of such detailed costings, a criteria based policy on infrastructure provision may be an effective tool to aid appropriate delivery. An indication of the policies to address infrastructure constraints as identified in the WCS should also be included in the CS prior to other DPD's being produced.

Yours faithfully

Mrs Hilary Berry
Senior Planning Officer

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