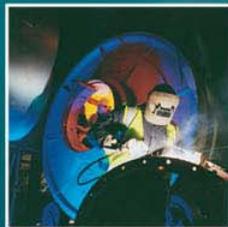
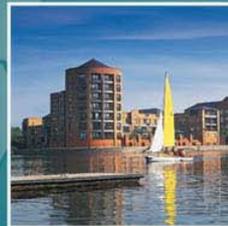
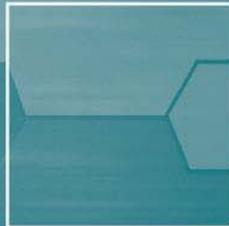
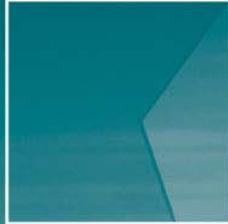


North West Leicestershire District Council

Water Cycle Study

Scoping and outline Report

19 March 2010



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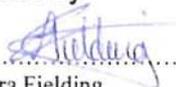
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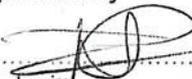
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North West Leicestershire District Council

Water Cycle Study

Scoping and Outline Report

19 March 2010

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Executive Summary

Purpose of this Report

This report has been produced for the purpose of providing an initial overview of the water cycle and its constraints to development in North West Leicestershire, providing strategic level advice on water infrastructure and environmental capacity to inform the Local Development Framework and strategic site allocation. The Council are exploring four growth options to meet the housing target set by the Regional Spatial Strategy and to contribute to the Leicestershire Housing Market Area, as part of the Three Cities and Three Counties Growth Point (of Derbyshire, Leicestershire and Nottinghamshire). This report forms the Scoping and Outline Phases of the Water Cycle Study in accordance with the Environment Agency Guidance, and has used the information gathered to make further recommendations for a Detailed Phase.

The aims and objectives of the North West Leicestershire Water Cycle Study can be outlined as follows:

- Take an integrated approach to management of the water environment;
- Meet EU framework targets on water quality, determining whether environmental resources can cope with providing water and receiving wastewater to/from further development;
- Determine whether the existing water and wastewater services infrastructure has sufficient capacity to support the planned development;
- Determine whether environmental resources can cope with providing water and receiving wastewater to/from further development;
- Ensure sustainable flood risk management over the long term are delivered through policies to protect future development from flooding;
- Aspire to water neutrality in all developments, by identifying mechanisms for achieving high standards of water efficiency, with the aim of reaching water neutrality through a stepped programme of measures and planning policy;
- Provide the evidence base for the Local Development Framework.

The study has involved working with the key stakeholders, the Water Companies, the Environment Agency and the Council to establish the key constraints within the water cycle and to identify integrated solutions in order to achieve sustainable development. Data for this study has been collated from Severn Trent Water (STW), the Environment Agency (EA), and North West Leicestershire District Council.

The study examines issues regarding water resources, wastewater treatment, water quality, sewerage and flood risk in general across the whole study area. Where constraints are identified these are explored further and recommendations made to either resolve these problems or to identify future work required.



Water Quality and Wastewater Treatment

The water quality of the Districts Rivers is generally Moderate status, with Bad Status present on the Lower Trent. Elevated nutrient levels contribute to the water quality issue in the area, with particular regard to phosphorous that can arise from agricultural sources and from sewage discharges. The River Mease Special Area of Conservation has reached capacity for the level of sewage it can receive, as a result of elevated ortho phosphate.

This study assesses the potential capacity at the works serving the six settlements where growth is forecast to occur. From these results it is recommended that Option 1 is the preferred option, which concentrates growth in the Coalville area. In this scenario nearly all the treatment works will have capacity for growth, with the exception of Snarrows serving Coalville. This option sees the minimum amount of growth in the Ashby and Measham area, which will relieve pressure on the water quality issue in the River Mease. It has been identified that Severn Trent will need to focus their investment at the Snarrows works to prevent capacity being exceeded in around 2014. Further assessment will be required in a Detailed Study to fully explore the impact of the concentrated growth and increased effluent at the Snarrows works and in relation to the quality of the receiving watercourse.

Large scale developments are also likely to have an impact on the sewerage network that conveys waste flow to the treatment works. Previous flooding incidents of sewers have been recorded in parts of Ashby, Coalville and Thringstone/Whitwick and capacity issues still exist, some of which may be expensive to resolve. Detailed hydraulic modelling will be required to determine the impacts and improvements needed in the sewers, however this will require more information from development's masterplans on layout and housing numbers. The Council should continue to liaise with Severn Trent with regard to infrastructure requirements for the preferred growth option.

Water Resources and Supply

As a result of the significant constraint in the region on water resources, it is recommended that all new homes are built to Code for Sustainable Homes Level 3/4 to reduce demand from new households. The capacity assessment in this study (Section 6.1) has shown that even with a 20% increase in the predicted growth rate, a saving of 2 ML/d could be achieved if all new homes were built to a consumption level of 105 l/h/d.

This report was prepared during the transition period between water company planning cycles. On a five yearly basis water companies set out their long term requirements for maintaining and enhancing their water supply and wastewater infrastructure in their Strategic Business Plans, supported by a Water Resource Management taing account of the economic, environmental and social implications of their Business Plans. The plans are submitted to OFWAT, the Environment Agency and Defra for approval, prior to issuing the final plans. During the preparation of this report, only the draft reports were available for review. Determination of the final plans took place during the final stages of this study, and therefore the consequences of the determination and final plans were not available for inclusion.



Severn Trent has forecast that there will be a surplus in supply over the growth period, **dependent** on a combination of demand management (achieving an efficient level of consumption per head) and increasing abstraction where available. To reduce the pressure on water resources in the region and to support the water company's management plans, it is key that the Council brings forward recommendations for all new homes to be water efficient in the Core Strategy.

The impact of the current economic climate on general housing development, combined with the emphasis of development in the growth point areas has the potential to create a step change in the way that resources, and particularly new infrastructure needs to be planned and delivered at a local level. It is recommended that the steering group continue to meet in order to monitor the growth rate and location over the growth period.

Flood Risk and Sustainable Drainage

New development in North West Leicestershire should be guided toward the lowest flood risk zones. Fluvial flood zones are most widespread in the northern parts of Castle Donington and Kegworth. Development options should favour sites in Flood Zone 1, of which there are numerous opportunities in the district.

Surface water flooding should also be a material planning consideration. New developments should apply sustainable drainage techniques to control flood risk, whilst also providing benefit in terms of water quality, amenity value and green infrastructure targets.



Recommended Policies and Actions

Recommendation Policy 1

It is recommended that Option 1 is the preferred growth option to be taken forward in the Core Strategy with regard to the water quality and wastewater treatment issues identified.

The main constraint to growth is the water quality of the River Mease. Option 1 is favoured in this report as it sees the least amount of growth in the Mease catchment and therefore the least impact on its water quality.

Option 1 sees the majority of growth in Coalville. Improvements will be required in the sewer network, conveying waste flow to the treatment works and also, post 2015, improvements will be required to the Snarrows Wastewater Treatment works.

Recommendation Policy 2

The Core Strategy should require developers of private homes to design new homes to meet the minimum water use standard in Level 3/4 of the Code for Sustainable Homes (105 l/p/d).

Recommendation Policy 3

It is recommended that the Core Strategy includes policies to support the water companies' water efficiency activities for existing households.

Recommendation Policy 4

The WCS recommends that the Core Strategy includes policies that require sustainable drainage techniques (SuDS) that mimic natural drainage, rather than using traditional piped systems in all new developments.



Recommendation Action 1

It is recommended that Severn Trent review the consent conditions and treatment capacity at Snarrows wastewater treatment works in advance of potentially significant growth in the Coalville area.

Recommendation Action 2

It is recommended that a Detailed Water Cycle Study is undertaken. This would:

Drive solutions to be investigated and implemented for sewage treatment at the Packington works;

Make use of the water quality model being developed for the area to determine impacts on increased sewage discharges on water quality, to support mitigation and design measures for meeting WFD standards;

Examine the infrastructure constraints for the provision of improved and/or new infrastructure;

Assess the impacts of concentrated development in Coalville on the Snarrows works and receiving water quality;

Explore the possibility of phasing development in line with Severn Trent's investment programme in the River Mease catchment;

Explore how windfall development within the River Mease catchment will be dealt with;

Review feasible options for achieving level 3/4 of the CSH (water consumption);

Assess locally specific interactions between suppressed household consumption, sewerage, and discharge effluent volumes;

Review the final Water Resource Management Plan and Ofwat determination for the planning period to 2015;

Undertake a cost/benefit analysis of development options; funding streams, including financial contributions from developers;

Assess the sustainability of preferred options with regard to carbon emissions;

Develop the water cycle strategy for the district; and

Continue the stakeholder engagement through regular steering group meetings and promote ongoing dialogue between the local authorities and the water companies for monitoring and assessing the impacts of growth on the water resources management in the study area.



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Glossary

AMP	Asset Management Period	Five year period in which water companies implement planned upgrades and improvements to their asset base. Activities are subject to funding review. The current AMP period, AMP5, runs from 2010 to 2015.
BAP	Biodiversity Action Plan	Each Local Biodiversity Action Plan works on the basis of partnership to identify local priorities and to determine the contribution they can make to the delivery of the national Species and Habitat Action Plan targets.
BOD	Biological Oxygen Demand	A widely used measure of polluting potential - a measure of oxygen use, or demand, by bacteria breaking down the biodegradable load in sewage treatment plants or environmental waters.
BREEAM	Building Research Establishment Environmental Assessment Method	A voluntary measurement rating for green buildings that was established in the UK by the Building Research Establishment.
CAMS	Catchment Abstraction Management Strategy	The assessment of how much water can be extracted to meet its many economic uses – agriculture, industry, and drinking water supply – while leaving sufficient water in the environment to meet ecological needs.
CLG	Communities and Local Government	Communities and Local Government sets policy on local government, housing, urban regeneration, planning and fire and rescue.
CFMP	Catchment Flood Management Plan	A strategic planning tool through which the Agency will seek to work with other key decision-makers within a river catchment to identify and agree policies for sustainable flood risk management.
CSH	Code for Sustainable Homes	Signals a new direction for building standards. Wherever practical DCLG intend to develop and introduce a system of sustainable building standards based on voluntary compliance.
CSO	Combined Sewer Overflow	A system for allowing a certain flow of combined sewerage and stormwater to be discharged into watercourses untreated during storm events to prevent the sewerage system backing up and flooding.
Defra	Department for Environment, Food and Rural Affairs	Department that brings together the interests of farmers and the countryside; the environment and the rural economy; the food we eat, the air we breathe and the water we drink.
DPD	Development Plan Document	Details the spatial representation of housing and employment land allocations in response to the regional spatial strategy.
DWF	Dry Weather Flow	The measure of the flow influx to a WwTW derived from human activity (both domestic and trade), but excluding any storm-induced flows.



EA	Environment Agency	A government body that aims to prevent or minimise the effects of pollution on the environment and issues permits to monitor and control activities that handle or produce waste. It also provides up-to-date information on waste management matters and deals with other matters such as water issues including flood protection advice.
EMDA	East Midlands Development Agency	The regional development agency for the East Midlands region, which provides the strategic driver for regional economical development.
GIS	Geographical Information System	A system for capturing, storing, analyzing and managing data and associated attributes which are spatially referenced to the earth.
GQA	General Quality Assessment	The Environment Agency's method for classifying the water quality of rivers and canals is known as the General Quality Assessment scheme (GQA). It is designed to provide an accurate and consistent assessment of the state of water quality and changes in this state over time.
LDF	Local Development Framework	A folder of local development documents that outlines how planning will be managed in the area.
l/h/d	Litres per head per day	A unit for measuring the amount of water consumed and waste flow from households.
LPA	Local Planning Authority	The local authority or council that is empowered by law to exercise planning functions. Often the local borough or district council. National parks and the Broads authority are also considered to be local planning authorities. County councils are the authority for waste and minerals matters.
OFWAT	The Water Services Regulation Authority	The Water Services Regulation Authority. Ofwat regulate how much money a water company can be required to spend over each five year planning period, and regulate the amount of money the water companies can charge from their customers.
pcc	Per capita consumption	A phrase referring to the amount of water consumed per head.
PPS25	Planning Policy Statement 25	Set out the Government's national policies on development and flood risk. The policies in these statements apply throughout England and focus on procedural policy and the process of preparing local development documents.
PR	Periodic Review (for water companies' investment plans)	One of Ofwat's main tasks is to set price limits for the water and sewerage companies in England and Wales. Ofwat do this in order to protect consumers from the monopoly providers of these services. However it is also their duty to enable efficient companies to finance their functions. They make sure that consumers receive reliable services and value for money and that each company is able to meet its environmental obligations now and in the future. Price limits are reviewed every five years. Prices were set at the price review in 2004 for the 2005 – 2010. This current price review (PR09) covers the five years from April 2010.



RBMP	River Basin Management Plan	The River Basin Management Plans describe the river basin district, and the pressures that the water environment faces. It shows what this means for the current state of the water environment in the river basin district, and what actions will be taken to address the pressures in line with the requirements of the Water Framework Directive. It sets out what improvements are possible by 2015.
RSS	Regional Spatial Strategy	A broad development strategy for a region for a 15 to 20 year period prepared by the Regional Planning Body.
SAC	Special Area of Conservation	A site designated under the European Community Habitats Directive, to protect internationally important natural habitats and species.
SFRA	Strategic Flood Risk Assessment	Document that informs the planning process of flood risk and provides information on future risk over a wide spatial area. It is also used as a planning tool to examine the sustainability of the proposed development allocations.
SPA	Special Protection Area	Sites classified under the European Community Directive on Wild Birds to protect internationally important bird species.
SSSI	Site of Special Scientific Interest	A site identified under the Wildlife and Countryside Act 1981 (as amended by the Countryside and Rights of Way Act 2000) as an area of special interest by reason of any of its flora, fauna, geological or physiographical features (basically, plants, animals, and natural features relating to the Earth's structure).
SSW	South Staffordshire Water Ltd	Water supply only company, that provide water supply to the South Staffordshire and a small minority area of North West Leicestershire District Council.
STW	Severn Trent Water Ltd	Water supply and sewerage company, that provide water supply to the majority of the study area, and sewerage services to the entire study area.
SuDS	Sustainable Drainage Systems	Sustainable drainage systems or sustainable (urban) drainage systems: a sequence of management practices and control structures designed to drain surface water in a more sustainable fashion than some conventional techniques (may also be referred to as SDS).
SWMP	Surface Water Management Plan	A framework through which key local partners with responsibility for surface water and drainage in their area work together to understand the causes of surface water flooding and agree the most cost effective way of managing surface water flood risk.
WCS	Water Cycle Study	A study aimed at ensuring that future development is sustainable in terms of flood risk management, water quality and water supply.
WFD	Water Framework Directive	A European Union directive which commits member states to making all water bodies (surface, estuarine and groundwater) of good qualitative and quantitative status by 2015.



WRMP	Water Resource Management Plan	Plan prepared by water supply undertakers every 5 years outlining how they aim to meet predicted demand for water over the next 25 years.
WRZ	Water Resource Zone	Defined by the water supply/demand balance in the region such that all customers within it receive the same level of service in terms of reliability of water supply.
WwTW	Wastewater Treatment Works	Separates solids from liquids by physical processes and purifies the liquid by biological processes. Discharge from Wastewater Treatment Works may contain a range of pollutants and need to be carefully monitored.
UKCIP	United Kingdom Climate Change Impacts Programme	Mainly funded by the Department for Environment, Food and Rural Affairs it helps co-ordinate scientific research into the impacts of climate change, and helps organisations adapt to those unavoidable impacts.
UKWIR	United Kingdom Water Industry Research	This organisation facilitates collaborative research for UK water operators.



1. Introduction

1.1 Background and Aims

A Water Cycle Study (WCS) is one of a number of strategic studies used by Local Planning Authorities as part of the evidence base for Local Development Frameworks. The Study will propose necessary infrastructure and policy requirements to achieve the planned growth without compromising, and where possible enhancing, the water environment. It also aims to identify the phasing of the water infrastructure requirements so that these do not constrain the timing of the proposed development. Where environmental constraints on housing growth exist that cannot be accommodated by infrastructure solutions these also need to be identified.

The key issues that should be addressed in a WCS include:

- Assessing the capacity of the current water infrastructure to accommodate growth without adversely affecting the environment by considering:
 - The availability of water resources;
 - The capacity of the drainage network;
 - The potential to increase flood risk;
 - The capacity of existing wastewater infrastructure;
 - The environmental capacity of receiving watercourses to receive wastewater;
- Determining the potential impact of the proposed development in the context of requirements of environmental legislation including the Water Framework Directive, Habitats Directive and any other relevant water cycle policy;
- Identifying the infrastructure necessary to achieve the proposed growth within the constraints of the environment and legislation; and
- Developing a strategy for a phased approach to development that allows key growth targets to be met whilst providing sufficient time for the identified infrastructure to be adopted.

The Study provides a mechanism to bring together the range of water related issues under a single framework and ensure that all stakeholders have their say. Most of the data and information used in a Water Cycle Study will already exist within stakeholder organisations and one of the key benefits of the partnership approach is unlocking and joining up this understanding and information and making it available.

It is important to understand the different scales at which the elements of the water cycle (water supply, sewerage and drainage) are managed, and the impacts this has on assessing constraints to growth. Water supply is managed



strategically, as there is a high level of connectivity in the water supply network and water can be moved great distances from the raw water sources (rivers, reservoirs, or groundwater) to the point of delivery. Generally, new developments can be connected to the main system relatively easily. In contrast, wastewater treatment works have much smaller defined catchment areas and so the location of development relative to the capacity of the nearest treatment works and receiving water can be critical. Although drainage issues are specific to individual developments, the integration of drainage development across sites offers significant potential for green space/habitat creation, in addition to reducing flood risk and potentially water demand.

1.2 National Guidance on Water Cycle Studies

The Environment Agency has issued a National Guidance document (<http://publications.environment-agency.gov.uk/pdf/GEHO0109BPPF-e-e.pdf>) to ensure that water cycle studies are carried out in a consistent way. This guidance outlines the required approach for the Scoping, Outline and Detailed phases of water cycle studies.

The National Guidance on Water Cycle Studies indicates that the assessment should be carried out in three phases:

- **Scoping:** The primary aim of the Scoping Phase is to collate and review existing information (e.g. previous studies and monitoring data) on the water environment within the study area, identify development plans and engage with key stakeholders, including the Environment Agency, water companies and drainage authorities, to identify key issues that require consideration in the following stages of the work;
- **Outline:** The primary aim of the Outline Phase is to identify potential environmental and water infrastructure constraints to development to provide an evidence base to support the Core Strategy and identification of preferred sites for development. The study should identify areas of uncertainty that may require further detailed studies;
- **Detailed:** The Detailed Phase aims to resolve areas of uncertainty identified in the Outline Phase through further more detailed studies. It identifies what water cycle management measures and infrastructure are needed, where and when they are needed, who is responsible for providing the systems, and by what deadline. This may involve an assessment of the costs and benefits of options. It also provides guidance to the local authorities to facilitate implementation and funding of the Strategy.

This report comprises a combination of the Scoping and Outline phases as set out in the National Guidance.

1.3 Structure of the Report

This report is structured with by the following chapters:

- **Chapter 2: Development and Growth**, provides an overview of the regional, national and local policies relevant to growth and the water environment in the District;
- **Chapter 3: The Water Cycle**, introduces the elements of the natural and urban water cycle and relevant legislation;



- **Chapter 4: Existing Water Environment**, presents the baseline scenario of water resources, water quality, wastewater treatment, sewerage and flood risk;
- **Chapter 5: Environmental Constraints**, reviews the baseline data to determine where constraints to growth exist in the District;
- **Chapter 6: Capacity for Growth**, assesses the capacity of the environment and water infrastructure to accommodate growth;
- **Chapter 7: Climate Change**, reviews the impacts that should be considered from climate change on the water cycle; and
- **Chapter 8: Future Recommendations**, summarises the findings and presents the policy recommendations.

Chapter 4 presents the tasks for the Scoping phase of the study, comprising the data and literature review. Chapters 5 and 6 present the core tasks of the Outline phases. At the end of Chapters 4 to 6 is a one page summary of the issues covered in these chapters.

The data and analyses presented in this combined Scoping and Outline Phase provide the evidence base for making planning decisions at a strategic level. This evidence should be used to consider which options will best support the LDF Core Strategy for each Council area and related policies. It highlights areas where further analysis is required. It does not provide an instant answer for determining planning applications.

Detailed information on the methods used to assess the environmental constraints, and on sustainable development features, such as demand management measures and sustainable drainage techniques, are included within a series of appendices.

1.4 The Study Area

The Study Area has been agreed by the Project Group at the Inception Meeting to include the whole of the District Council boundary for North West Leicestershire.

North West Leicestershire District is predominantly rural with parts of the National Forest covering much of the District. The main settlement in the District is Coalville, with Ashby de la Zouch the next biggest settlement, followed by the villages of Kegworth, Castle Donington, Ibstock and Measham. The landscape of the district is discussed further in Chapter 4.



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2. Development and Growth

2.1 Planning Context

National, regional, sub regional and local planning policy sets out guidance and requirements for delivering sustainable development and therefore addresses, amongst other things: housing and employment growth and its distribution; water management and protection; infrastructure provision; and flood risk management. The following sections outline the relevant planning policy in which these issues are framed and the current and emerging development plan for the North West Leicestershire District.

2.1.1 National Policy

Government guidance is provided through a series of Planning Policy Statements (PPSs), the most relevant of which are summarised below.

PPS1 – Delivering Sustainable Development, Supplement to PPS1: Planning & Climate Change

An important theme in national policy is to achieve sustainable development, including dealing with Climate Change. PPS1 and the 2006 supplements to it on: ‘Climate Change’, ‘Zero Carbon Development’ and the ‘Code for Sustainable Homes’ have now been incorporated in a Planning and Climate Change Bill. PPS1 requires regional planning bodies (RPBs) and local planning authorities (LPAs) to prepare development plans which are in line with the principles for sustainable development and promote outcomes in which environmental, economic and social objectives are achieved together over time. This should be achieved using a spatial planning approach.

Specifically, planning authorities should identify land suitable for meeting housing and other types of development taking into account the need to provide essential infrastructure and avoid flood risk. PPS1 advises that regional planning authorities and local authorities should promote amongst other things the sustainable use of water resources and the use of sustainable drainage systems in the management of runoff. The supplement advises local authorities to take into account the capacity of existing and potential infrastructure including water supply, sewage and sewerage, to service future development sites in ways consistent with successfully adapting to likely changes in the local climate.

PPS 3 – Housing

PPS3 underpins the delivery of the Government's strategic housing policy objectives where the goal is to ensure that everyone has the opportunity to live in a decent home, which they can afford, in a community where they want to live. Most future development within the district will be for housing. PPS3 requires that ‘new housing should



be built on previously developed land' (PDL) before greenfield land. PPS25 reiterates this requirement in its Exception Test.

PPS 12 – Creating Strong, Safe and Prosperous Communities through Local Spatial Planning

PPS 12 was published in June 2008. It outlines the nature of local spatial planning and the key components of local spatial plans and how they should be prepared. It should be taken into account by local planning authorities in preparing Local Development Frameworks (LDFs) which include development plan documents (DPDs) and other local development documents (LDDs).

With regard to infrastructure, PPS12 states Core Strategies should be supported by evidence of what physical, social and green infrastructure is needed to enable the amount of development proposed for the area, taking account of its type and distribution. This evidence should cover who will provide the infrastructure and when it will be provided. The Core Strategy should draw on and in parallel influence any strategies and investment plans of the local authority and other organisations.

The water cycle study forms part of the robust and credible evidence base which will underpin policies within the Authority's Core Strategy and other relevant LDDs.

PPS 25 – Development and Flood Risk

PPS25 sets out Government policy on development and flood risk. It aims to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas of highest risk. It also aims to ensure that new development does not increase the risk of flooding elsewhere. Where, in exceptional circumstances, new development is necessary in such areas then the aim is to make it safe without increasing flood risk elsewhere and, where possible, to reduce flood risk overall.

PPS25 stipulates that all planning applications for developments greater than 1 hectare must be accompanied by a Flood Risk Assessment detailing surface water management plans to demonstrate that runoff does not increase from the proposed development once it has been built and that runoff is not simply moved elsewhere.

This approach is supported in the Government's Pitt review of the summer 2007 flooding, in which the comments in PPS25 are reiterated. It makes it clear that developments within flood zone 2 and 3 should not be allowed to proceed unless there is clear proof that they are compatible developments for these zones, and that LPAs should become responsible for local flooding.



2.1.2 Regional Policy

The East Midlands Regional Plan is the Regional Spatial Strategy (RSS) relevant to North West Leicestershire District. The RSS was adopted in March 2009 and establishes the broad development strategy for the region. It provides a regional framework within which Local Planning Authorities can prepare their Local Development Frameworks (LDFs) for the period to 2026.

The District is situated within the Leicester and Leicestershire Housing Market Area (HMA) which is also part of the Three Cities Growth Point designated in December 2005 by Communities and Local Government to deliver large scale development, consistent with the principles of sustainable development, and to maximise the economic potential of the area. The RSS also sets out the Three Cities Sub Regional Strategy which supports the growth planned for the Leicestershire.

Policy 13a of the East Midlands Regional Plan sets a target for housing provision across the Leicester and Leicestershire HMA of 80,400 dwellings between 2006 and 2026, of which 10,200 dwellings are proposed to be developed in the North West Leicestershire District. Policy SRS3 states that for North West Leicestershire an average of 510 dwellings per year will need to be developed which should be located mainly at Coalville, identified as a Sub Regional Centre, and including sustainable urban extensions as necessary. It is understood that there are a number of dwellings which have already been completed and therefore the North West Leicestershire emerging Core Strategy Development Plan Document (DPD) will need to plan for a minimum of approximately 9,500 dwellings over the period 2009-2026.

The adopted RSS sets out policies relating to the regional approach to water management and protection; green infrastructure provision; and flood risk management which indicate how LPAs can deliver this as part of their LDFs.

Policy 32: A Regional Approach to Water Resources and Water Quality requires LPAs to work with key partners to ensure there is timely provision of appropriate additional infrastructure for both supply and waste water treatment and to ensure sustainable water extraction is achieved. Furthermore, the policy requires LPAs to promote the use of sustainable drainage and water efficiency techniques especially in new development.

Policy 35: A Regional Approach to Managing Flood Risk requires LDFs to incorporate policies which ensure inappropriate development is not located in flood risk areas.

2.1.3 Local Policy

NWLDC is currently preparing its Local Development Framework (LDF) including its Core Strategy Development Plan Document (DPD) and other Local Development Documents. In the latest consultation for the Core Strategy DPD, the Council identified four potential options for the distribution of new housing, which all focus the majority of development in Coalville. These were developed from four different scenarios and were presented in the North West Leicestershire Core Strategy Further Consultation (November 2008), as set out in Table 2.1 below.



Table 2.1 Four Development Options for North West Leicestershire to meet Regional Growth Targets between 2006 and 2026 (Core Strategy Further Consultation November 2008)

Settlement	Option 1 – Focus on Coalville	Option 2- Coalville focus with significant growth in rural towns	Option 3 – Coalville focus with significant growth in two rural towns	Option 4- Coalville focus with significant growth in two rural towns
Coalville	9800	8000	5400	7700
Ashby de la Zouch	500	2400	1800	500
Castle Donington	500	350	1200	1000
Ibstock	100	100	1000	1000
Kegworth	50	75	800	400
Measham	50	75	800	400

'Numbers refer to number of dwellings'.

Each option results in the same total number of housing of 11,000 by 2026, but each would see a different spatial distribution of the housing. In order to present an up to date assessment of the impacts of growth on the water cycle, the number of completions between April 2006 and March 2009 were deducted from the growth options to provide a trajectory of planned growth for the District, for use in this study. The data was provided to Entec by the Council, and is summarised in Table 2.2 below. The total number of houses in each option varies slightly as a result of mathematical rounding on the annual growth rate.

Table 2.2 Projected Growth 2010 - 2026 for Water Cycle Study, taking Account of Completions

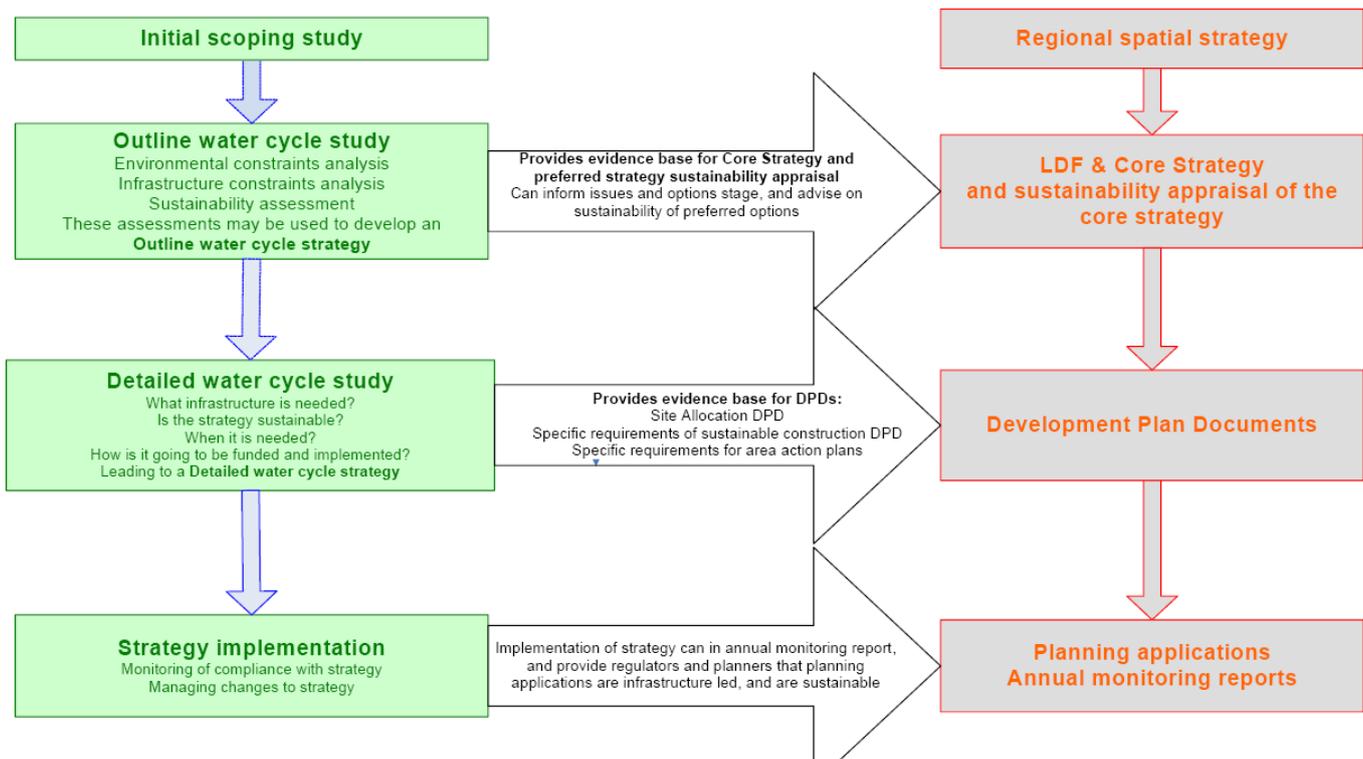
Settlement	Option 1		Option 2		Option 3		Option 4	
	Annual Rate	Total						
Coalville	552	9,384	446	7,582	293	4,981	429	7,293
Ashby	13	221	125	2,125	89	1,513	13	221
Castle Donnington	27	459	18	306	68	1,156	56	952
Ibstock	5	85	5	85	58	986	58	986
Kegworth	1.5	25	3	51	45	765	22	374
Measham	1	17	2	34	45	765	21	357
SUM	599	10,191	599	10,183	599	10,166	599	10,183



The Council has set out locations for three potential Strategic Distribution Centres in its Core Strategy consultation document which could provide Strategic Freight Rail Interchanges (SFRIs) as specified in the RSS to be provided in the region. With regards to employment land, the RSS does not contain any specific requirement in respect of future provision of employment land for the District. However, a study carried out by the Leicestershire Economic Partnership identifies a potential requirement for between 20-25ha of new employment land. It suggests that this can be accommodated as part of a potential Sustainable Urban Extension in the Coalville Area.

The Scoping and Outline WCS provides the evidence base on water cycle elements to support policy development for the submission document of the Core Strategy which is anticipated to be in 2010. The study will therefore assist the delivery of growth in a timely and structured manner and also ensure that an integrated approach to the management of the water environment is applied in the District.

Figure 2.1 Planning Context of Water Cycle Studies



2.2 Planning for Water Infrastructure

Water companies plan for investment in water infrastructure to supply new development through the Asset Management Plan (AMP) process which runs in 5 year cycles. This process is regulated by the Office of Water Services (OFWAT), which reviews the plans and determines charges for water services. This process is carried out in conjunction with the Environment Agency that assesses environmental requirements for investment, the



Drinking Water Inspectorate (DWI) that assesses the investment required to improve drinking water quality. The outcome is a Business Plan which is produced by each water company and outlines the requirements for investment over the following 5 year period which is submitted to OFWAT.

The water companies are currently in the process of submitting their Business Plan for the period 2010 to 2015 (known as the Periodic Review 2009 - PR09). Water companies are able to submit interim determinations within the 5 year planning cycle to seek additional funding for unforeseen requirements but most plans should be covered by the normal submission process. Water Cycle Strategy covers a longer planning period and can therefore inform longer term water company asset planning.

Water companies are also required to produce Water Resources Management Plans (WRMP) which report longer term planning related to the development of water resources over a period of 25 years. The Water Resource Management Plan identifies investment in water resources schemes to meet additional demand related to population growth and changes in per capita consumption of water. This report is based predominantly on the draft WRMPs, which were the most up to date plans available during the assessment. During the final stages of this study, the final WRMPs were issued, however the consequences of the final determination and planning are not yet available from Severn Trent for inclusion in this study.

[Appendix A](#) discusses the regulatory mechanisms of the water industry in more detail.



3. The Water Cycle

3.1 Introduction

The water cycle describes the pathways and processes through which the water we use moves through the natural and built environment, as well as through the above and below ground infrastructure on which the domestic population and industry depend. Figure 3.1 illustrates the traditional image of the water cycle showing how water enters a river catchment, how it runs through and over the land, before returning to the river system and ultimately returning to the sea.

Figure 3.1 Traditional View of the Water Cycle without Artificial Influence

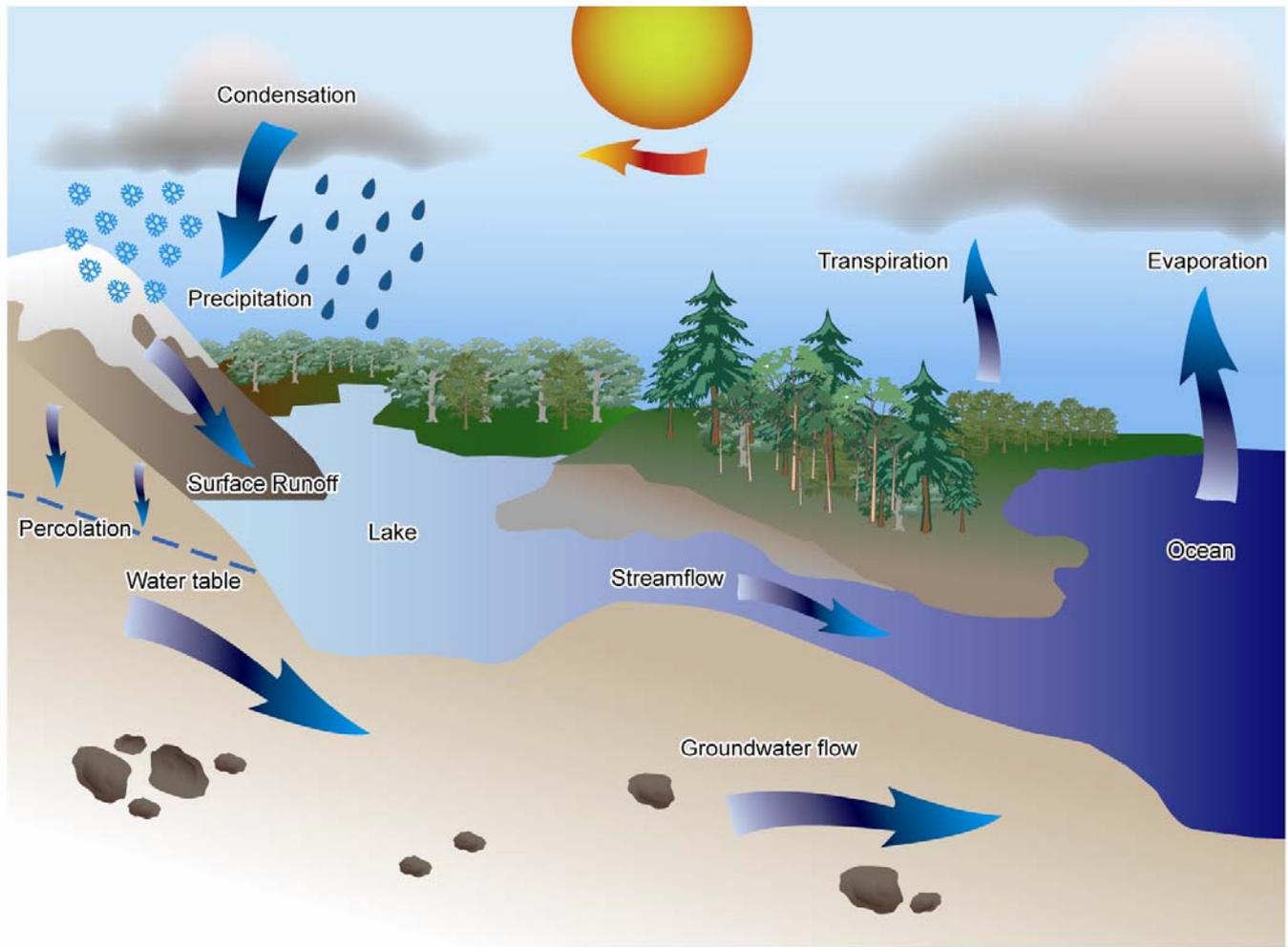
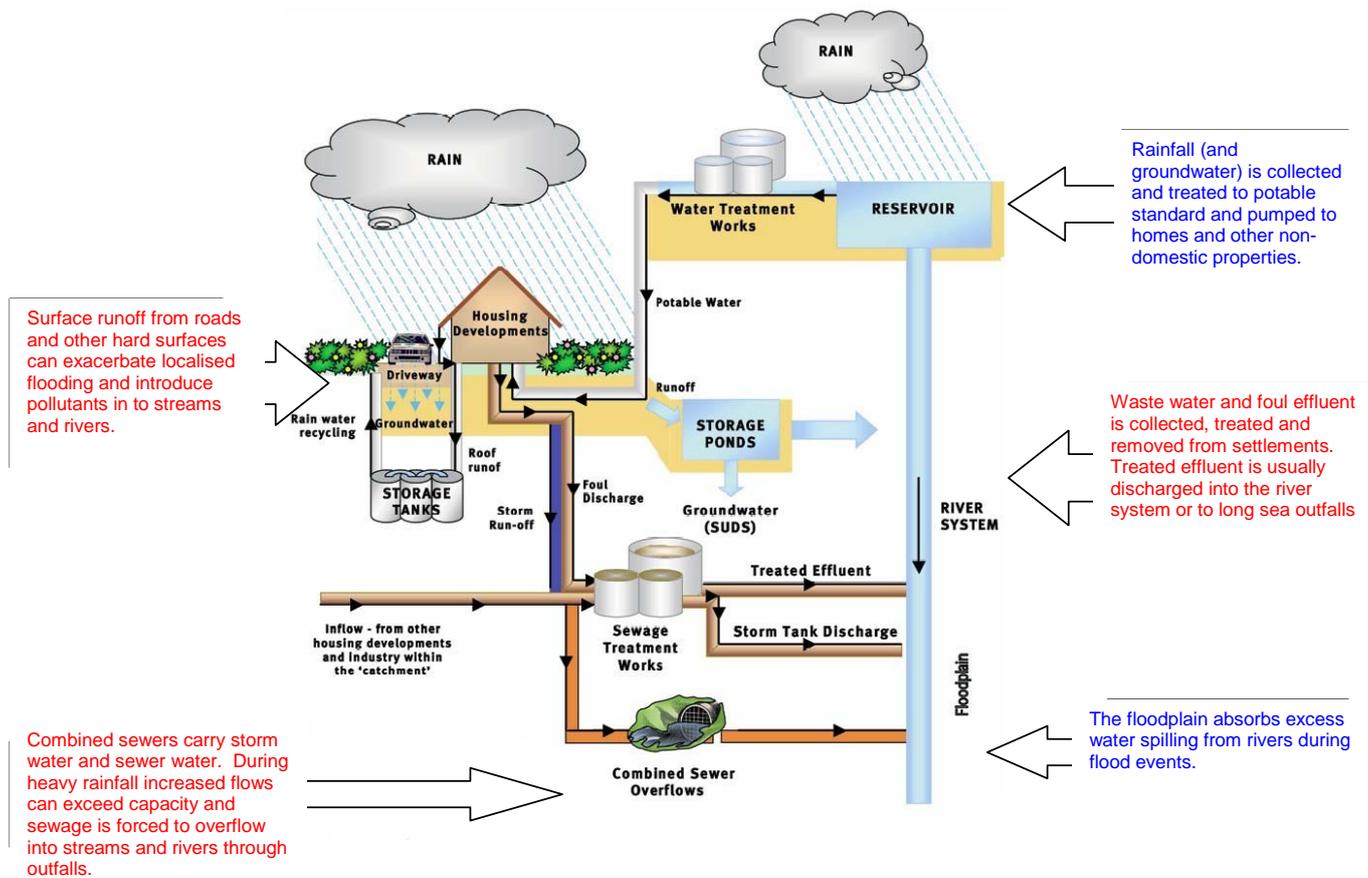


Figure 3.2 illustrates the added complexities within the urban water cycle (in schematic form) as a result of housing development and the infrastructure required to support it. The main differences between the natural and the urbanized water cycle relate to the rate of surface runoff (and percolation in to the ground), and the streamflow. In the urbanized cycle water is captured and stored for use, and this water only re-enters the river network once it has been used and then treated at wastewater treatment works. Hence, the timing and quality of water entering the river network can be significantly different in the urban version of the cycle.

Figure 3.2 Schematic of the Urban Water Cycle Based on Current Practice



The capacity of the water infrastructure needs to be sized appropriately to ensure the sufficient supply of clean water to homes and industry and to receive foul drainage, whilst preventing the discharge of polluted runoff and untreated foul drainage to protect the quality of the receiving water and any dependant habitats, whilst also reducing the risk of flooding.



3.2 Legislation and Guidance

Legislation, guidance and supporting evidence for water related issues, such as water quality, flood risk management and urban drainage, have a significant impact on the water cycle and are often the cause of changes in water infrastructure, as much as development pressures. Any adaptations to the water cycle must be compliant with such legislation and some are undertaken within the regulatory framework.

There is currently an unprecedented level of change in the legislation and guidance for water related issues. Some of these changes are driven by European directives; others are in response to national pressures, from the 2007 summer floods for instance. These changes are either currently being implemented, soon to be applied or likely to change in next five to ten years. Given that the timetable for the Water Framework Directive spans the next 18 years in three six-year cycles, the water companies expect to use the first period to carry out the majority of investigations to establish the necessary investment. This will provide an opportunity to assess the improvements delivered through other quality investments. The WFD is discussed in more detail in Section 3.3.

The primary pieces of legislation which set the context relating to the water cycle are summarised in Table 3.1 below.

Table 3.1 Primary Water Related Legislation

Legislation	Description
Water Framework Directive	The Water Framework Directive sets out a requirement to achieve good ecological status in rivers, estuaries and coastal waters, together with good status of groundwater by at least 2027. It presents a unique opportunity for holistic environmental management for all users of the water environment. A cross body Technical Advisory Group (UKTAG) has recently published a set of environmental standards. Whilst there is no certainty that these standards will become statutory in the current form, they form the best current knowledge of how the standards may change. It is considered likely they will be finalised later this year.
Habitats Directive	As people make increasing demands on the environment our wildlife habitats are coming under more and more pressure. The Habitats Directive recognises this and aims to protect the wild plants, animals and habitats that make up our diverse natural environment. The European Directives created a network of protected areas of national and international importance. These are called 'Natura 2000' sites and include Habitats Directive Special Areas of Conservation (SACs). The Habitats Directive has been transposed into English law as the Conservation (Natural Habitats &c) Regulations 1994, now known as the Habitats Regulations. Existing and future water management has the potential to affect a number of these designations and the Environment Agency Review of Consents process has identified a series of amendments that will be required to existing abstraction licences and discharge consents if adverse effects on the European Sites are to be avoided.



Table 3.1 (continued) Primary Water Related Legislation

Legislation	Description
Urban Wastewater Treatment Directive	<p>The Urban Wastewater Treatment Directive (UWWTD) regulates the collection and treatment of wastewater from residential properties and industry. Under this Directive receiving waters can be designated as 'Sensitive' where additional levels of treatment are required at significant contributing discharges. These can either be direct discharges or those upstream of the designated reach / water body that serve a population equivalent in excess of 10,000. One type of sensitive area is the "Sensitive Area [Eutrophic]", where elevated nutrient concentrations, mainly nitrogen or phosphorus, present a risk to the ecological status of the receiving water. In these areas, larger sewage discharges must be treated to reduce nutrient loads.</p>
Nitrates Directive	<p>Adopted by the European Union in 1991, this directive aims to reduce water pollution caused by nitrogen from agricultural sources and to prevent such pollution occurring in the future. The directive requires Defra and the Welsh Assembly Government to identify surface or groundwaters that are, or could be high in nitrate from agricultural sources. Nitrogen is one of the nutrients that can effect plant growth. Surface waters also have to be identified if too much nitrogen has caused a change in plant growth which affects existing plants and animals and the use of the water.</p> <p>Once a water has been identified, all land draining to that water is designated as a Nitrate Vulnerable Zone. Within these zones, farmers must observe an action programme of measures which include restricting the timing and application of fertilisers and manure, and keeping accurate records.</p>
Freshwater Fish Directive	<p>The EC Directive on Freshwater Fish is designed to protect and improve the quality of rivers and lakes to encourage healthy fish populations. It sets water quality standards and monitoring requirements for areas of water which are chosen, or 'designated' by Defra. These 'designated' areas of water are selected because they are significant bodies of water which are capable of supporting fish populations.</p>
Floods Directive and Flood Risk Regulations 2009	<p>The Floods Directive is designed to help Member States prevent and limit floods and their damaging effects on human health, the environment, infrastructure and property. The Floods Directive came into force on 26 November, 2007. The Directive requires Member States to first carry out a preliminary assessment by 2011 to identify the river basins and associated coastal areas at risk of flooding. For such zones they would then need to draw up flood risk maps by 2013 and establish flood risk management plans focused on prevention, protection and preparedness by 2015. The Directive applies to inland waters as well as all coastal waters across the whole territory of the EU. The Flood Risk Regulations 2009 was published in December 2009 to transpose the directive into UK law</p>
Floods and Water Management Bill	<p>The Flood and Water Management Bill was published in November 2009. It is designed to improve how the UK prepares for and responds to flood emergencies and better protect water quality and water supplies during drought.</p>



3.3 Integrated Catchment Management

The capacity of the receiving water environment and thus development in the study area is constrained by environmental quality objectives enforced by UK and European legislation. The Water Framework Directive (WFD) is European legislation that aims to consolidate existing legislation. It came into force in December 2000, and was transposed into UK law in 2003. It introduces some new environmental standards that will help to improve the ecological health of inland waters to achieve 'good status'.

The main aims of the WFD are to prevent deterioration and enhance the status of the water environment, including groundwater. This will be achieved within a framework of River Basin Planning by:

- Reducing pollution;
- Promoting sustainable water use; and
- Contributing to mitigating the effects of floods and droughts.

Sustainable drainage systems (SuDS) is the name given to drainage techniques that aim to mimic natural processes, rather than using traditional piped urban systems. Traditionally piped drainage was designed to convey rainfall away from developments as quickly as possible; however this can lead to water entering rivers more quickly in urban areas compared to rural catchments and can result in flooding. Sustainable drainage systems use grassed ditches and ponds, for example, instead of pipes to control rainfall. These allow some rainfall to soak back into the ground, and this slows down the movement of rainfall runoff in the catchment. Vegetation in these systems can also reduce the amount of urban pollutants entering watercourses and groundwater sources.

In the UK, all water that is supplied to properties and business is treated to a standard suitable for drinking. Installing devices that use the least amount of water possible will also reduce the amount of wastewater that is discharged from buildings into the sewer network. These water efficient measures will also help to reduce the amount of water abstracted from rivers and groundwater sources, reducing the pressure on natural ecosystems and increasing the volume of water available for diluting both point source and diffuse pollution.

The urban water cycle is complex and highly integrated with many feedback mechanisms. Advanced planning and appropriate management helps to ensure that the water cycle contributes to a safe, clean and healthy environment, rather than being a source of long term problems.



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4. Existing Water Environment

In order to advise on the most sustainable approach to water management, an understanding of the existing natural environment and drainage infrastructure is required. The landscape, hydrology and river basin characteristics, water resources, water quality, wastewater treatment, sewerage and drainage of the study area have been summarised using information from various sources, including the Environment Agency and consultations with the water companies (Severn Trent Water and South Staffordshire Water) and the Council. These provide a baseline context for the district and for the water cycle study. This chapter provides a general background, followed by sections discussing the existing water quality, water supply and wastewater and sewerage arrangements.

4.1 General Background

4.1.1 Landscape

A large proportion of the district is covered by rural landscape being located in the centre of the midlands and the National Forest. The National Forest was created in 1990 with the aim of creating a large scale forest in lowland Britain, bringing together commercial forestry with ecological, landscape and public benefit. The woodland coverage is now at 18% (2009 coverage from <http://www.nationalforest.org/>), with planting continuing to reach 33% coverage of land between the ancient forests of Needwood and Charnwood by 2014. The remaining rural areas are used for agricultural land.

The main settlement in the district is Coalville, followed in size by Ashby de la Zouch. Parts of the ancient Charnwood Forest extend into the district to the east of Coalville. The remainder of the district is served by larger villages of Castle Donington, Kegworth, Ibstock and Measham with a number of smaller villages in the rural areas.

The Coalville settlement comprises of a number of different settlements including Coalville, Whitwick, Thringstone, Greenhill and Hugglescote. Within this urban framework are two large areas of undeveloped land north of the A511 between the northern part of Coalville and Whitwick that comprise part of the Green Wedge together with larger area of land west of Whitwick and Thringstone and east of Swannington. The Green Wedge was designated in the adopted North West Leicestershire Local Plan and covers an area of around 445 hectares. Its future is currently under consideration as part of the Core Strategy.

The geology of the study area is dominated by impermeable clays and marls with limited areas of permeable rocks. More widespread through the river corridors of the catchment are alluvial sand and gravel deposits.



4.1.2 River Basin Context

For the Water Framework Directive (WFD), the Environment Agency has divided England and Wales into nine river basin districts in order to manage targets on both surface water and groundwater quality. The study area is located within the Humber River Basin District, one of the largest river basin districts, which includes the Rivers Trent and Humber.

For each River Basin District, the Environment Agency has produced a draft River Basin Management Plan for protecting and improving the water environment in line with WFD requirements. The Humber River Basin District is divided into various catchments of which the Tame, Anker and Mease catchment and the River Soar catchment are located in North West Leicestershire. The rivers in these two catchments ultimately flow into the River Trent. Water quality of these rivers is discussed in Section 4.3 below.

The main watercourses in the study area are the River Sence, the River Mease and the River Soar, tributaries of the River Trent (Figure 4.1). In the southern half of the District, watercourses drain toward the River Mease and the River Sence, tributaries of the Upper Trent. Toward the northern half, watercourses drain toward the River Soar, a tributary of the Lower Trent.

The average annual rainfall received within the study area is 641mm, as monitored at Kegworth (standard period 1961 to 1990 average). This is less than the average of 897mm for England and Wales.



Figure 4.1 Hydrological Context of Study Area



4.1.3 Flooding

The main sources of flooding in the study area arise from the District's rivers. A Strategic Flood Risk Assessment was completed in May 2008 by Atkins Ltd on behalf of the Council, which addressed all forms of flooding present (including groundwater flooding, surface water and infrastructure related flooding as well as fluvial). The flood zones associated with the District's rivers are relatively confined to the watercourses and their immediate channels. This is as a result of the District being located predominantly in the headwaters of the rivers and therefore not subject to flows from a larger upstream area. A summary of the main areas in the District affected by the various flood sources is presented in Table 4.1 below.

Watercourses for which detailed hydraulic modelling has been undertaken include the River Trent, Grace Dieu Brook, Black Brook, River Mease, Gilwiskaw Brook and Hooborough Brook. The River Soar has also been modelled as part of a recent strategic study; however flood outlines are not available. The complete SFRA report can be found on the Council's website at

http://www.nwleics.gov.uk/development_planning/DisplayArticle.asp?ID=4881.

Table 4.1 Summary of Flooding Sources (SFRA Final Report, Atkins, May 2008)

Source	Location
Fluvial	<ul style="list-style-type: none"> • Castle Donington from the River Trent and Castle Donington Brook; • Hemington from the River Trent and Hemington Brook; • Lockington from the River Trent and Lockington Brook; • Kegworth from the River Soar; • Diseworth from Long Whatton Brook; • Osgathorpe from Westmeadow Brook; • Belton from Westmeadow Brook; • Thringstone from Grace Dieu Brook; • Whitwick from Grace Dieu Brook; • Ashby de la Zouch from Gilwiskaw Brook; • Packington from Gilwiskaw Brook; • Measham from the River Mease.
Groundwater	Parts of North West Leicestershire are susceptible to rising groundwater due to the large-scale closure of the coal mines within the Leicestershire and South Derbyshire coalfield.
Surface Water Flooding	No specific problem areas have been identified as suffering from severe interruption and damage through surface water flooding within North West Leicestershire, and as such this source of flooding is not considered a high priority in terms of the relative scale of potential flood damages compared to other types of flooding in the District.



Table 4.1 (continued) Summary of Flooding Sources (SFRA Final Report, Atkins, May 2008)

Source	Location
Canals	Minor canal risk of flooding.
Sewers	Appendix A of the SFRA shows the location of foul and surface water sewer incidents. Within the context of strategic planning, identification of these hotspots will inform North West Leicestershire District Council of areas where increased levels of investment may be required by developers to improve the hydraulic capacity of the existing sewer system.

Surface water run-off can present a risk of flooding. In urban areas, impermeable surfaces replace the natural ground surface resulting in increased conveyance of rainfall runoff into drains, rather than naturally infiltrating into the ground. The rate and volume of rainfall runoff from these areas can increase and exacerbate flooding by reaching river systems quicker than in a natural environment, and through exceeding the capacity of conventional piped drainage systems. In many areas, drains are designed for both surface water and foul water, and should these reach capacity ahead of heavy rainstorms, the risk of sewage flooding can be high.

Most of the District is generally rural. In the north and east of the District the underlying geology comprises mudstones that are of low permeability such that runoff rates will naturally be high and infiltration of rainfall will be low. In the south and west of the District sandstones are present, which permit high rates of infiltration and subsequently lower run-off rates. The overlying soils and gradients are also important in determining run-off and infiltration. Within urban areas and where drift and soils are made of clay material, runoff rates will potentially be higher with a risk of surface water flooding.

4.2 Water Quality

Water quality of rivers, lakes and groundwater is a good indicator of the general health of the water bodies in terms of their ecology, biodiversity and amenity. The WFD is the principal legislative driver dictating the targets for surface and groundwater quality and under which actions to achieve compliance are implemented and monitored. Other EC Directives, such as the Habitats Directive and the Urban Wastewater Treatment Directive also set objectives for specific designated waters, which contribute to the overall target of achieving good water body status and WFD compliance by 2015.

4.2.1 Overall Water Quality

The Environment Agency has been monitoring the health of all receiving waters (watercourses receiving effluent discharges) for a number of years through the previous General Quality Assessment (GQA) scheme based on chemistry, biology and nutrients. In 2007, the monitoring programme changed to align with WFD requirements.



Previous results from the GQA scheme are not directly comparable with the current regime yet it is the WFD standards that drive future improvements to water quality.

Under the new WFD programme, water quality targets are set in the River Basin Management Plans (RBMP), with the aim of reaching 'Good Ecological Status' in all waterbodies. The ecological status forms part of an overall status, the components of which are shown in Figure 4.2 below, as taken from the Humber River Basin Management Plan (December 2009).

The Humber RBMP covers the District, which is located in the Tame, Anker and Mease and the Soar catchments. Physical modifications due to urbanisation and for water storage and supply and barriers to fish movement also play a key role in determining the status of rivers and lakes in these two catchments.

Currently only 3% of surface water bodies in the Tame, Anker and Mease catchment are achieving either good status or potential in line with WFD standards. Point source discharges from water industry sewage works and diffuse run-off from urban areas also play a key role in determining the status of rivers and lakes in this catchment.

Some key actions for this catchment from the River Basin Management Plan (December 2009) are to:

- Improve sewage treatment works at a number of locations to reduce the levels of phosphate, for the River Trent designation;
- Target pollution prevention campaigns around industrial areas in the urban areas; and
- Improve sewage treatment works at a number of locations in the River Mease catchment to reduce the levels of phosphate in the SAC site.

In the Soar catchment, 9% of surface water bodies in the overall catchment are currently achieving either good or potentially good status. Diffuse pollution from agriculture is the key reason for failures in the Soar catchment.

Some key actions for the Soar catchment are to:-

- Work with British Waterways, Leicestershire County Council, Angling clubs and Inlands Waterways Association to remove floating Pennywort from the River Soar;
- Improve sewage works at locations throughout the catchment to reduce the input of nutrients and improve water quality; and
- Work with Severn Trent Water Ltd to reduce the number of misconnections within the catchment.

The majority of rivers in the District are designated Moderate Status, with the River Trent downstream of the district designated Bad Ecological Status.



Figure 4.2 The Components of Overall Status for the Water Framework Directive

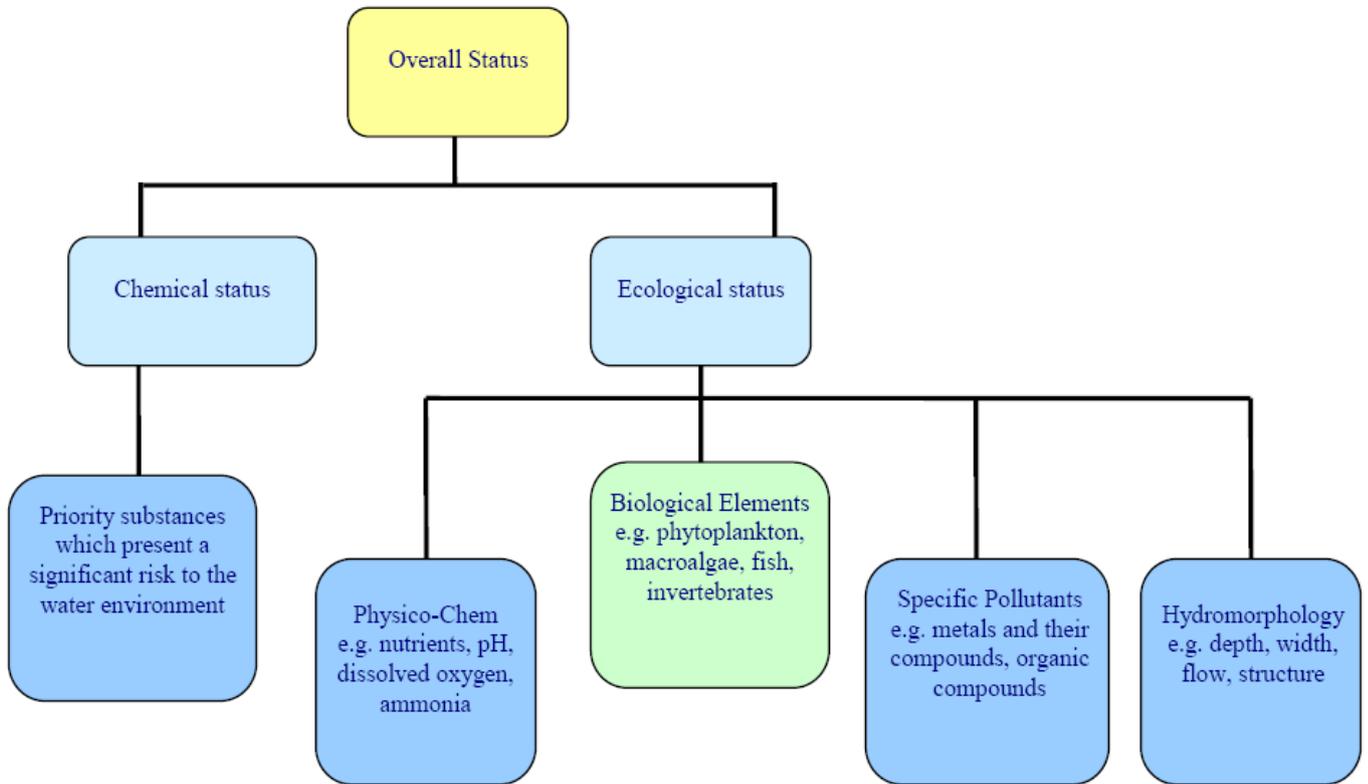


Table 4.2 presents the main statistics for the two catchments from the River Basin Management Plan for the River Humber District.

Table 4.2 Overall Water Framework Directive Statistics for Catchments in Study Area

River and Lake Waterbodies	Tame Anker and Mease		Soar	
	Now	2015	Now	2015
% at good status overall (chemical and ecological)	3	3	9	9
% improving for one or more elements in rivers		38		2



4.2.2 Receiving Waters

The Environment Agency has provided to Entec the WFD status for the watercourses receiving sewage discharges in the District. The data is presented in Table 4.3 below. The results indicate that the majority of watercourses have a Poor or Moderate overall Status, and that most are at risk of not achieving the WFD targets for Ecology in 2015. The River Mease and its tributary Ibstock Brook are currently classified as having a Bad overall status. Most rivers also have a Poor status for phosphate. Phosphorous is clearly an issue and potentially attributable to both agricultural sources and wastewater treatment works. Nutrients are essential for aquatic life; however elevated concentrations can have a significant impact on the aquatic ecology through stimulating the growth of benthic and microscopic plants. This is known as eutrophication and can result in oxygen depletion, a reduction in water clarity and even fish kills. The water quality of the River Mease is discussed in Section 4.2.4 below: Designated Sites.

Table 4.3 Assumed Compliance with WFD Targets, Based on GQA Measurements

Wastewater Treatment Works	Receiving Water	Overall WFD Status	Phosphate	Current Ecological Status	2015 Predicted Ecological Quality	Risk of failing 2015 target
Packington	Gilwiskaw Brook	Poor	Moderate	Poor	Moderate	At Risk
Measham	River Mease	Bad	Bad	Moderate	Moderate	At Risk
Ravenstone	River Sence	Bad	Poor	Bad	Bad	At Risk
Snarestone	Tributary of River Mease	Poor	Poor	Poor	Moderate	At Risk
Snarrows (Coalville)	Grace Dieu Brook	Moderate	Bad	Moderate	Moderate	At Risk
Ibstock	Ibstock Brook	Bad	Moderate	Bad	Poor	At Risk
Worthington	Ramsley Brook	Poor	Poor	Moderate	Moderate	At Risk
Long Whatton	Long Whatton Brook	Moderate	Moderate	Moderate	Moderate	At Risk
Breedon	Ramsley Brook	Poor	Poor	Moderate	Moderate	At Risk
Donisthorpe	Hooborough Brook	Moderate	Poor	Moderate	Moderate	At Risk



Table 4.3 (continued) Assumed Compliance with WFD Targets, Based on GQA Measurements

Wastewater Treatment Works	Receiving Water	Overall WFD Status	Phosphate	Current Ecological Status	2015 Predicted Ecological Quality	Risk of failing 2015 target
Kegworth	River Soar	Moderate	Moderate	Moderate Potential	Moderate Potential	Probably At Risk
Wilson	Ramsley Brook	Poor	Poor	Moderate	Moderate	At Risk
Annwell Place	Gilwiskaw Brook	Poor	Moderate	Poor	Moderate	At Risk
Chilcote	Chilcote Brook (River Mease)	Moderate	Poor	Moderate	Moderate	At Risk
Castle Donington	Tributary of River Trent	Good	Poor	Moderate	Moderate	At Risk
WFD Status:		High	Good	Moderate	Poor	Bad

The table illustrates that all river reaches are at risk of exceeding WFD standards for 2015, with failures for phosphorus being the most likely for all rivers. The issue of nutrients is a well established water quality problem in the wider East Midlands region and a complex one to resolve as there is a variety of contributors, some of which are located in the upper catchments. Neighbouring authorities are also facing similar water quality problems with regard to nutrients.

The EA has completed a review of the assessment of pressures water bodies face, and their risk of failing to achieve the objectives of the Water Framework Directive in 2015, as part of the further river basin characterisation exercise. The assessments do not reflect the current quality or status of a water body, rather the risk that they may fail objectives as result of pressures acting on them. The results from 2008 have been provided to Entec for this study for the North West Leicestershire District, and are presented in Figure 4.3 in a traffic light symbology to indicate which stretches of river are most at risk of failing to meet targets.

The figure clearly shows again the issue of phosphorous which is a component at risk of failing to meet WFD standards in nearly all watercourses in the District. This issue has also been highlighted in the neighbouring studies for the Derby and Greater Nottingham Housing Market Areas, where phosphorous levels are also failing to meet environmental standards. It should be noted that the standards for this element are even tighter in the River Mease SAC to meet the requirements of the Habitats Directive. This issue is already impacting on development in areas of North West Leicestershire and South Derbyshire Districts where effluent is discharged into the River Mease or its tributaries. Section 4.2.4 discusses this issue in more detail. Phosphorous is potentially attributable to both agricultural sources and wastewater treatment works, and to improve the water quality a combination of rural land management and wastewater treatment will be required.



Figure 4.3 Environment Agency WFD Risk Assessment (2008)



4.2.3 Groundwater

In the context of the Water Framework Directive, the water environment includes rivers, lakes, estuaries, groundwater and coastal waters out to one nautical mile. For the purposes of river basin management, these waters are divided into units called water bodies. The quality of water in groundwater bodies is defined by both quantitative and chemical status in the River Basin Management Plans. The groundwater bodies in the study area are generally designated as having a good quantitative status, but in the Tame Anker and Mease catchment area the chemical status is generally poor.

Aquifers that are used for public water supply have designated protection zones around the abstraction source to prevent pollution of the underlying groundwater. Within North West Leicestershire, source protection zones are located in Coalville, Whitwick and Measham and its surrounding area, covering the villages of Chilcote, Appleby Magna and Stretton en le Field.

4.2.4 Designated Sites

The legislative drivers for the water quality are presented in Table 3.1, which includes European legislation to protect receiving waters and their dependant habitats that are considered particularly sensitive. The sites present in the study area are presented in Figure 4.5, with tables of their designations in [Appendix D](#).

River Mease SAC

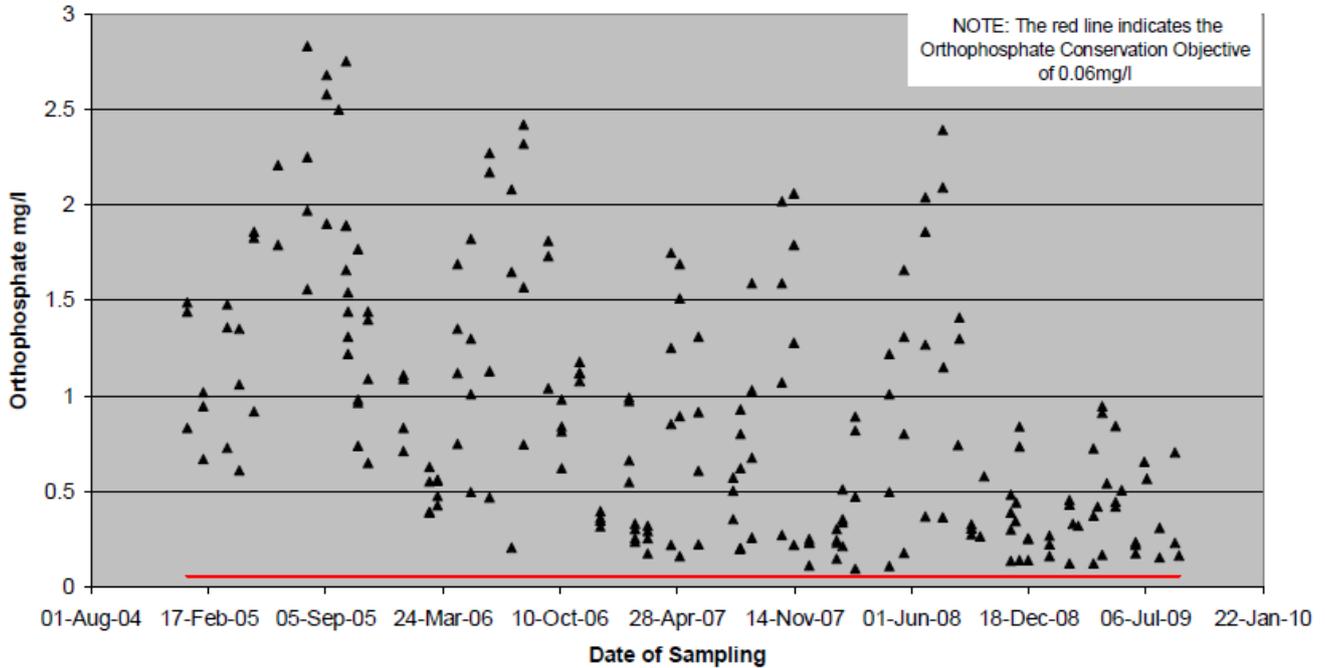
The River Mease is a small lowland river designated Special Area of Conservation (SAC) and a Site of Specific Scientific Interest (SSSI) on account of its vegetation and freshwater fish communities. The current condition of the SAC is unfavourable. The unfavourable status is primarily related to elevated nutrients, in particular ortho phosphate. Phosphorous in rivers can be sourced from agricultural sources and from sewerage.

The outcome of a planning appeal for development within the catchment of the Packington wastewater treatment works is currently awaited. The issue of water quality in the River Mease was a major issue considered at the inquiry, with the Environment Agency and Natural England providing evidence on the water quality issue of ortho phosphates in the river (see Section 5.1.1 for more detail). The results of the monitoring of this element are presented in Figure 4.4 below, taken from the Agency's proof of evidence at the public inquiry.

The red line in Figure 4.4 represents the target quality of ortho-phosphates of 0.06 mg/l as set by the Habitat's Directive. The black triangles represented actual concentrations of ortho phosphate as measured by the Environment Agency's routine sampling and monitoring programme. The graph clearly demonstrates that the ortho phosphate levels are elevated significantly above the desired target value between February 2005 and July 2009.



Figure 4.4 Environment Agency's Routine Sample Data from Sites at Snarestone, Measham, Stretton Bridge and Croxall



Source: Proof of evidence of Dr Philip Hulme BEng(Hons) PhD MCIWEM CEng (Environment Agency) regarding an appeal under the section 78 of the Town & Country Planning Act 1990 by Hallam Land Management at Lower Packington Road and Measham Road Ashby-De-La-Zouch

The overall objective for the SAC is to protect and improve the water or water-dependent environment to the extent necessary to achieve favourable conservation status. Actions to protect the water objectives for the site from the River Basin Management Plan and projects that the Environment Agency and Natural England are currently working on along the river are presented in [Appendix E](#).

The Habitats Regulation Assessment for the North West Leicestershire Core Strategy (Further Consultation, June 2009) identified that the proposed sites in Measham and Ashby would have a negative impact on the River Mease SAC. Water quality related mitigation was also found to be required for the River Mease. Recommendations included the use of sustainable drainage techniques wherever practical to help mitigate diffuse pollution and support groundwater recharge. If improvements are necessary they should be delivered before the delivery of housing so that the quality of effluent discharged is not compromised; this can be addressed in a Detailed WCS.

The Tame, Anker and Mease CAMS states that a Habitats Directive review is under way which will assess the effect of abstraction (and other regulated activities including WwTW discharges) and determine management options by 2010 for the River Mease. The Water Cycle Study has confirmed that the South Staffordshire Water public water supply abstractions on the River Mease have been subject to sustainability reductions (reduced abstraction to resolve low flow issues). (See Section 4.3.3 below).



Figure 4.5 Designated Sites in the Study Area



Ashby Canal SSSI

Ashby Canal is designated as a Site of Special Scientific Interest (SSSI) in its uppermost reaches, between Snarestone in the North West Leicestershire district and Carlton in Hinkley and Bosworth. It is a SSSI on account of its aquatic and emergent plants and the diversity of plants and invertebrates. In December 2009 the condition summary indicated that 83% of the canal was considered unfavourable declining, with the remainder considered unfavourable no change (http://www.sssi.naturalengland.org.uk/special/sssi/sssi_details.cfm?sssi_id=1001311).

Unfavourable declining means that the special interest of the SSSI unit is not being conserved and will not reach favourable condition unless there are changes to site management or external pressures. The site condition is becoming progressively worse. Unfavourable no change means the special interest of the SSSI unit is not being conserved and will not reach favourable condition unless there are changes to the site management or external pressures.

The unfavourable state is a result of public access/disturbance, due to too many boats and not enough dredging leading to turbid water conditions. Within the District the canal does not receive inflow from other watercourses, or receive effluent from sewage discharges and is therefore not considered to be impacted by the proposed growth in the District. However an overflow from the canal into a tributary of the Mease is present at Snarestone. This will be used to control flows in the canal and will not form a constraint for development in the District.

The Ashby Canal Trust promotes the restoration of the canal and brings together interested parties. Leicestershire County Council is leading a project to restore the Ashby Canal, and has successfully applied for a Transport and Works Act order giving Government Authority to restore the canal from Snarestone to Measham. British Waterways is the current operator of the canal.

Other Designations

The District is located within a Nitrate Vulnerable Zone designated under the Nitrates Directive, which requires all known areas of land which drain into polluted waters (nitrate concentrations greater than 50 mg/l) to be designated. The designation leads to monitoring and implementation of measures where possible to reduce nitrate pollution from agricultural land within the designated zone. Housing growth is unlikely to affect the targets for this designation.

A number of Freshwater Fish Directive sites are located on the boundary and within 1km of the study area, predominantly in the Soar catchment and watercourses drainage north into the Lower Trent. The names and locations of these sites are shown on Figure 4.5. Watercourses designated under this directive are selected because they are significant bodies of water which are capable of supporting fish populations, and gives them protection from chemicals that are harmful to fish, such as ammonia. Water quality must be maintained at a good standard for fish populations to grow. The directive affects any discharges to designated waters including industry and sewage treatment plants. It will be the responsibility of Severn Trent Water to ensure that the sewage treatment plants continue to meet the quality targets throughout the growth period.



The River Trent and the River Soar (the entire length of both rivers) are Designated Sensitive Areas (Eutrophic) under the Urban Wastewater Treatment Directive. The aim of this directive is to ensure that all wastewater in the EU is treated to an appropriate standard, and this is dependent on the size of the wastewater treatment works and the sensitivity of the receiving watercourse. Under this directive, areas designated as 'eutrophic sensitive' must have phosphorus-stripping equipment installed at sewage treatment works that serve populations of 10 000 or more, to a standard of 2 mg/l of phosphorous. For population equivalents over 100 000, a tighter standard of 1 mg/l is required. Hence the scale of growth is an important consideration for wastewater treatment works that discharge into the River Soar and River Trent with reference to this directive. With reference to North West Leicestershire, only the Kegworth Wastewater Treatment Works discharges directly into the River Soar and the population equivalent is not forecast to exceed 10 000 over the growth period to 2026.

4.3 Water Supply

In North West Leicestershire, Severn Trent Water is the water supply undertaker with a statutory duty for public water supply. The Environment Agency is responsible for managing the resources in the form of granting (or refusing) abstraction licences to abstract water for various purposes.

Information on public water supply in this area has been taken from Severn Trent Water's draft Water Resource Management Plan (dWRMPs), and from subsequent changes and supplementary information that have been made available following the statutory consultation process, as detailed in the Company's Statement of Response. Additional data has also been made available specifically for the purpose of this study. Water supply infrastructure information was provided by Severn Trent, including general comments on the capacity of the strategic supply network.

4.3.1 Regional Water Resources

Public water supply is managed at a strategic rather than a local level based on water resource zones. North West Leicestershire is supplied with water from the East Midlands water resource zone, which covers a large geographical area, operated by Severn Trent Water. Only a small area, around the village of Chilcote is supplied by South Staffordshire Water, rather than Severn Trent Water. Figure 4.6 shows how the study area fits in to the context of the supply zone, and illustrates the general areas where water is abstracted for public water supply. As strategic growth is not planned for this small part of the district, the assessments have not included a review of South Staffordshire Water's resource management plans.



Figure 4.6 Water Resource Zones and Principal Source Locations



There are significant water resources in the resource zone, from both groundwater and surface water sources. The Derbyshire Derwent catchment is an important long-standing public water supply for the East Midlands and South Yorkshire. The East Midlands water resource zone is underlain by principal aquifers, and a significant proportion of public water supply (620 megalitres per day, Ml/d) is sourced from the major reservoirs in the Derwent and Dove valleys plus several river abstractions. Public water supplies in the zone are also augmented by a transfer from Rutland Reservoir (Anglian Water).

In managing resources at a strategic / zonal level a demand centre may be supplied with water from sources across the whole water resource zone, through an integrated zonal distribution network. An increase in demand from new development or from existing customers increases pressure on all the water resources in the zone, not specific local sources.

The average annual rainfall across the water resource zone ranges from 1394mm per year in the Derwent Valley, to 634mm per year along the River Wreak (Centre for Ecology and Hydrology website). Demand for supply from this rainfall is high and the Environment Agency has assessed that this area is under moderate water stress.

4.3.2 Catchment Abstraction Management Strategies

The Environment Agency manages water resources within the environment, principally through the water resource abstraction licensing system. As part of this, the Environment Agency assesses water resource availability at a regional and local (catchment) level. The Catchment Abstraction Management Strategies (CAMS) set out how much water is available for additional abstraction taking into account the needs of the environment, and abstraction for public water supply and other uses. The results are used to inform future water abstraction licensing strategies and so provide a useful context in which to understand the environmental constraints affecting the water supply options available to Severn Trent Water. Section 5.1.2 sets out the implications of these strategies for water resource development relevant to the study area.

The CAMS relevant to the East Midlands supply zone show that the vast majority of resource units have either no water available, are over licensed, or are even over abstracted. In these cases the Environment Agency's licensing strategy is to close the catchments to further abstraction at low flows, or seek to reduce licence volumes in over abstracted catchments. A summary of the assessment for each CAMS is provided in the table below, with more detail provided in [Appendix B](#).

The implications of this are discussed further in Chapter 5. With many of the CAMS units showing that there are little resources left for abstraction in the supply zone serving North West Leicestershire, the importance of conserving water and water efficiency will be fundamental to manage the demand from both new and existing homes to prevent impacts on the environmental resources for public supply.



Table 4.4 Summary of CAMS Resource Assessments in the East Midlands Zone

CAMS	Low Flow Resources Availability Assessment
Catchments providing a large amount of public water supply:	
Derbyshire Derwent	The sub unit containing the reservoirs = over licensed under all flow conditions. The remaining sub units are over licensed or have No Water Available.
Tame, Goyt, and Etherow	The catchments upstream of the reservoirs have not been assessed . These reservoirs are operated by United Utilities.
Dove	This catchment is over abstracted .
Idle and Torne	This catchment is over abstracted . >50% of the water abstracted is used for Public Water Supply (PWS). Anglian Water and Yorkshire Water also abstract from this catchment.
Lower Trent and Erewash	Most of this catchment is over abstracted, over licensed or has no water available. There is some water available in the fluvial Trent. The EA intends to maintain the status as 'Water Available' and so would grant further abstraction licences subject to appropriate flow conditions. All new licences will have a time limit of 31 March 2015. New applications for groundwater will be subject to normal determination criteria. Where a proposed abstraction could impact on a Habitat Directive SPA and/or SAC site, the impact of each licence on that site will be assessed under the Habitats Regulations process. Approximately a quarter of the study area is within this catchment.
Catchments providing a small amount of public water supply:	
Soar	Most of this catchment has water available at low flows. The EA strategy is to move to No Water Available to enable continued development of water resources without compromising the ecological flow requirements within the catchment. Approximately a quarter of the study area is within this catchment.
Tame, Anker and Mease	There is no water available in the River Mease (including the Measham groundwater unit). There is some water available in the wider area from the rivers Tame, Anker, Cole, Rea, Bourne and the River Trent from the Tame to the Dove. However, much of this is outside of the East Midlands zone. Approximately a quarter of the study area is within this catchment.
Catchments with no significant public water supply abstractions by Severn Trent Water	
Staffordshire Trent Valley	Abstractions within this catchment are predominantly for industrial and agricultural use. The catchment is a net importer of water from the Elan Valley for PWS and is discharge dominated and impacted greatly by the large sewage treatment works at Minworth (approx 16km west of the study area). Six miles of the River Sence are managed as a trout fishery. Approximately a quarter of the study area is within this catchment.



Table 4.4 (continued) Summary of CAMS Resource Assessments in the East Midlands Zone

CAMS	Low Flow Resources Availability Assessment
Don and Rother	Some water available in upper and lower Rother catchments. Abstraction in this area accounts for only a small amount of the total licensed volume in the catchment and most of this is for industrial use.
Welland	The sub catchments lying within the East Midlands resource zone are over abstracted .
Warwickshire Avon	Rugby, Upper Avon and River Swift catchment = over abstracted . The strategy for this unit is to move to over-licensed by encouraging reduction in licensed quantities for public water supply licences that are not fully used.

Note – this is the Resource Availability Status at low flows – water may be available for abstraction at higher flows subject to abstraction constraints.

4.3.3 Restoring Sustainable Abstractions

Where water company abstractions are suspected to be contributing to pressure on habitats protected under the Habitats Directive, the abstractions and their impact on river flows and /or groundwater levels are investigated, and if determined necessary, a reduction in the volume that can be abstracted is sought by the Environment Agency. This type of reduction in abstraction quantities is called a Sustainability Reduction. The reduction of any Public Water Supply abstraction licences would require provision of alternative water resources.

South Staffordshire Water has included reductions in abstraction from groundwater sources in the vicinity of the River Mease SAC, which together with other areas in the South Staffordshire resource zone total 2 megalitres per day (Ml/d). Furthermore, the Environment Agency CAMS for the Mease confirms that this catchment is a net importer of public water supply, which means water is supplied from elsewhere but discharged as river flow within the catchment from the wastewater treatment works. Therefore, any reductions in household demand for water would reduce pressure on external sources, but might reduce the volume of flow being discharged into the Mease.

In September 2008 the Environment Agency provided Severn Trent Water with indicative reductions to be included in the final WRMP. However, Severn Trent Water has not included any sustainability reductions in its draft WRMP as the sites are still under investigation and any reductions are still uncertain. No additional information is available from the Environment Agency to confirm the presence and volumes of any potential reductions in abstraction in order to comply with the Habitats Directive Review of Consents.

Should further sustainability reductions be indentified, this will add further pressure on water resources, which are already very limited in the supply zone serving North West Leicestershire, and provides further need for water efficiency measures to be implemented in the district, as well as across the East Midlands supply zone in general.



4.3.4 Severn Trent Water's Draft Water Resource Management Plan (WRMP)

Severn Trent Water prepared and submitted its draft WRMP to the Environment Agency and Defra for consultation in May 2008, as required for long term planning related to the development of water resources over a period of 25 years (see Section 2.2). Since submission of the draft plan, the water company has produced a Statement of Response to the representations that were made on its plan during the consultation period. This document sets out how they will address comments and amend their final plan.

As part of the Statement of Response Severn Trent Water issued its 'Latest Assessment of the Supply-Demand Balance' and this data is used in this water cycle study. The Final WRMPs were being prepared during the delivery of this project. Following the issue of the draft WCS report, Ofwat's determination on the water company plans was given in November 2009. The Ofwat determination indicated a reduction in funding below that required to deliver the full scope of Severn Trent Water's submitted plan. The implications of this reduction has not been made available in time for this study, but a general comment provided by Severn Trent Water has been given to state that they will continue to meet their obligations to support the future growth in the District. More detailed information describing the water resource planning process, including the Ofwat periodic review of pricing is available in Section 6.1 and [Appendix A](#).

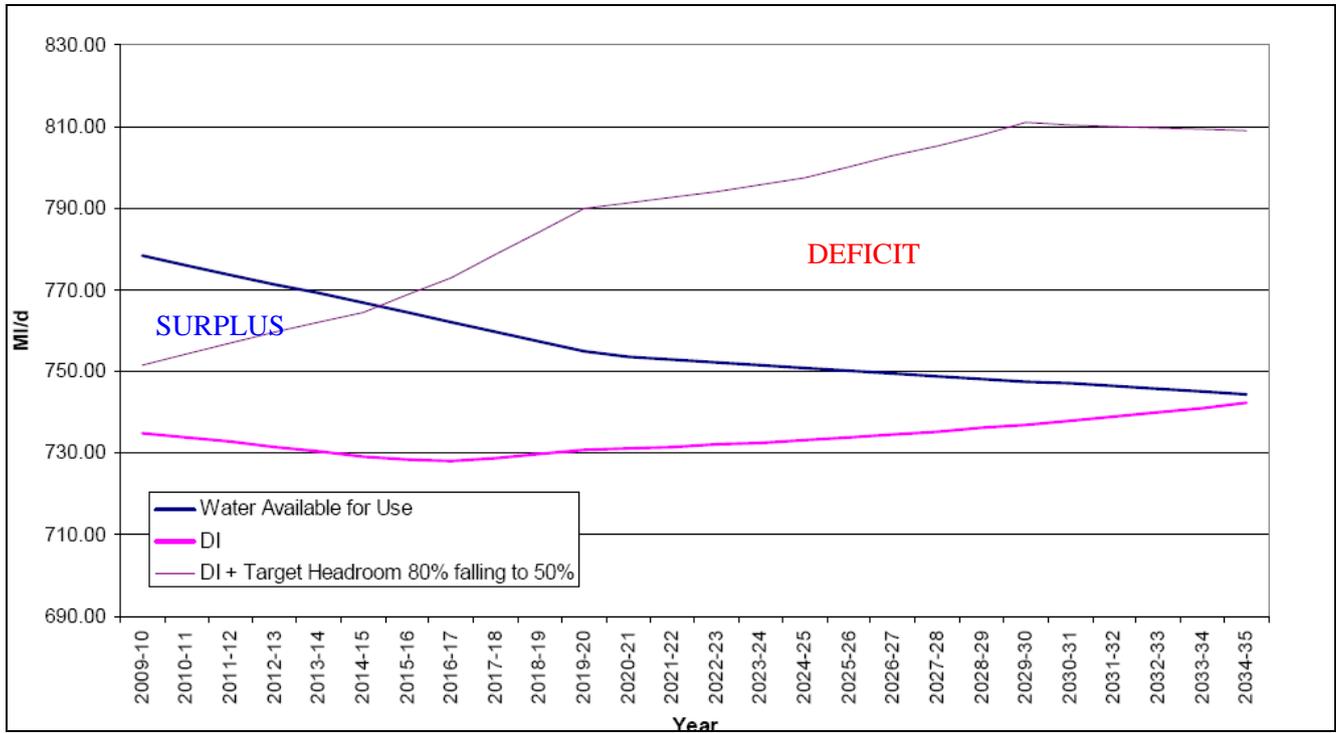
The information presented in Severn Trent Water's draft WRMP and Statement of Response includes forecasts of how the balance between supply and demand will change in the East Midlands water resource zone over the 25 years from 2010 to 2035. These forecasts are based upon theoretical planning scenarios that all water companies use in their WRMPs which effectively consider the dry year situation (this is not the same as a drought situation). The Company has derived a 'baseline forecast' that shows how supply and demand is expected to change under a 'business as usual' scenario, i.e. no additional policy changes, or new schemes beyond what are already planned and funded. Growth projections set out by the Regional Spatial Strategy are used in the demand calculations.

Severn Trent's latest baseline forecast indicates a deficit in supply, starting in 2015/16. This means that in the East Midlands supply zone demand is forecast to start exceeding supply in 2015/16 and water available for use (supply) would be 60 megalitres per day (Ml/d) less than demand in 2034/35. This is driven by diminishing supplies coinciding with increased demand.

In response to the potential deficit the company proposes a number of measures to limit increases in demand and to provide more supplies of water, so that in its final planning scenario, the Company forecasts a continual surplus in the East Midlands water resource zone for all of the next 25 years to 2034/35. Figures 4.6 and 4.7 illustrate the differences between Severn Trent's supply and demand forecast in the baseline and final planning scenarios.



Figure 4.7 Baseline Supply Demand Balance

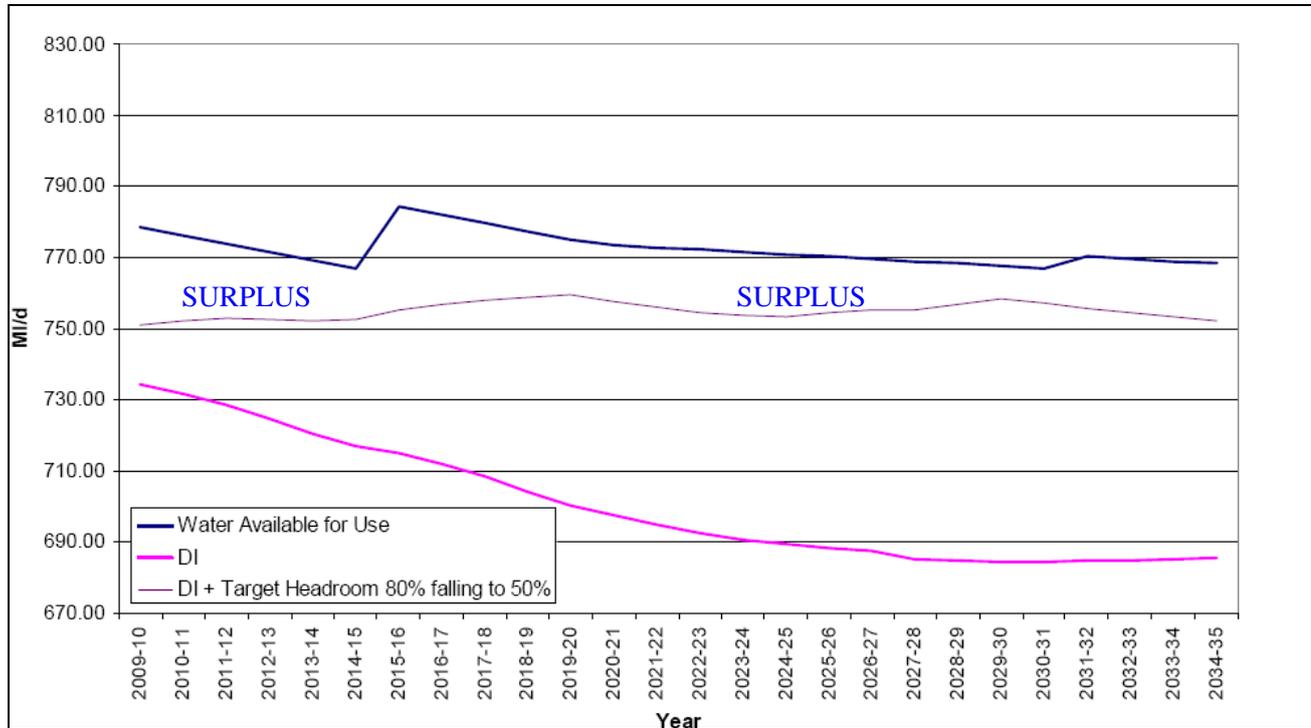


Source: Severn Trent Water Statement of Response (2009)

Key: DI Distribution Input (demand), WAFU Water Available For Use (supply)



Figure 4.8 Final Planning Solution Supply Demand Balance



Source: Severn Trent Water Statement of Response (2009)

Severn Trent Water recognises the drive from national Government to significantly increase the supply of new housing. Towns and cities across the East Midlands have been identified as growth points. Under current economic situation and the housing market it is not certain how much of this will take place. The Company will continue to monitor trends and develop its flexible plan in response to changes over time.

Severn Trent Water states that where there is reasonable certainty over the future growth plans of local government it will develop infrastructure ahead of planned development to ensure that water from new resources may be deployed to the right place at the right time. In its Final Business Plan, Severn Trent Water has identified strategic reinforcements in areas where there is sufficient detail in the Local Development Framework housing growth numbers to enable the hydraulic impact to be assessed.

The key supply and demand facts and figures taken from the water company's draft WRMP and updates from the Statement of Response are summarised below.



Severn Trent Water - East Midlands Water Resource Zone Key Facts

Total dry year supply (annual average deployable output) 2010 = 845MI/d, 2014 = 865MI/d.

Range of sources from across the zone:

Surface water sources = 75% of public water supply (major reservoirs in the Derwent and Dove valleys).

Groundwater sources = 25% of public water supply (majority of groundwater abstracted from the Mansfield, Nottingham, and Worksop areas).

Population forecast to increase by 335,000 between 2006/07 and 2030/31*

Environmental pressures forecast to reduce supply: 39MI/d lost due to climate change by 2030/31 (surface water). The draft WRMP included no sustainability reductions for this zone, and this is confirmed in the Statement of Response.

A baseline surplus of approximately 30MI/d in 2007/08*

A baseline deficit of approximately 60MI/d by 2030/31*

No deficit in final planning scenario* Takes account of measures to secure supply and manage demand.

*based on STW latest assessment of supply demand balance and reported in the Statement of Response.

Chapter 5 summarises the company's preferred options to secure supplies over the next 25 years, examining the constraints affecting the range of supply and demand options.

4.4 Wastewater and Sewerage

The information presented on wastewater treatment and sewerage is based on data provided by Severn Trent Water (STW) for the purposes of this study. Severn Trent Water is the sole provider of public wastewater services in the study area, while the Environment Agency regulates the quality of effluent discharges to help protect water quality, the environment and human health. This is done through issuing discharge consents which set the flow rates and water quality standards that must be achieved at the point of effluent discharge. Within the more rural areas there are likely to be some smaller private sewerage treatment systems that are not included in this report, as they are unlikely to be impacted by the proposed large scale growth focussed on the larger towns in the study area.

4.4.1 Wastewater Treatment Works

There are fifteen wastewater treatment works (WwTW) in North West Leicestershire that serve the urban areas. The catchment areas for the treatment works is governed by the sewage infrastructure and network. A plan showing the WwTW catchments is presented in Figure 4.9, which also shows three abandoned works (Charley Hall, Charnwood Lodge and Oaks).



Figure 4.9 Wastewater Treatment Works and their Indicative Catchments



A fundamental factor describing the hydraulic, or flow, capacity is the ‘Dry Weather Flow’ (DWF), which is a measure of the incoming flow to the works derived from human activity (both domestic and trade), but excluding any storm-induced flows. The Environment Agency issue a maximum DWF rate as part of the individual works consents in order to protect the receiving watercourse from high flow rates.

All wastewater treatment works also monitor the actual effluent flows at the point of discharge. The difference between measured wastewater flows and consented DWFs provides an estimate of the available capacity at a works to receive additional inflows from growth.

Measured and consented flow data were provided by Severn Trent Water for most treatment works in the study area. The comparison between the two for those that data were provided is presented in Table 4.5 where the measured DWF is a calculated average of DWF between 2005 and 2007, because 2008 was classified as an unusually wet year. Data for the full year for 2009 was not available for this study, which was prepared within 2009. It can be seen that a number of the works are already operating over their consented discharge, so will have no capacity to accommodate any additional housing growth (in red text), unless additional investment is planned and implemented in time for new developments to come online. The assessment presented in [Appendix H](#) by Severn Trent on the six main wastewater treatment works to be affected by growth, have used observed DWF as an average from 2005 to 2009 where this information is available from their internal databases. As shown in the Table 4.5 notes, 2009 DWF data was not available for Entec for this study which was drafted during the 2009 calendar year.

The largest deficit in flow of these is shown at Snarestone WwTW. Snarrows WwTW serves the town of Coalville and is the largest works in the study area. It has the largest amount of spare flow capacity, so is likely to be able to accommodate larger housing growth numbers. However, it is important to remember that in planning for flow to works, sewerage companies include a ‘headroom’ allowance for seasonal variation, which is not included here.

Table 4.5 Comparison between Consented and Measured Effluent Flows

Wastewater Treatment Works Site	Consented DWF	Measured DWF*	Difference between consented and measured DWF
PACKINGTON	4,729	4482	247
MEASHAM	1,464	988	476
RAVENSTONE	420	356	64
SNARESTONE	335	395	-60
SNARROWS	9,447	8160	1,287
IBSTOCK	1,927	1538	389



Table 4.5 (continued) Comparison between Consented and Measured Effluent Flows

Wastewater Treatment Works Site	Consented DWF	Measured DWF*	Difference between consented and measured DWF
WORTHINGTON	515	398	117
LONG WHATTON	455	464	-9
BREEDON	210	211	-1
DONISTHORPE	600	641	-41
KEGWORTH	1,589	1230	359
CASTLE DONINGTON	2,480	2112	368

The measured DWF value is calculated by Entec using the average measured DWF for the years 2005, 2006 and 2007 provided by Severn Trent Water in the spreadsheet Greater Nottingham Flow Data – DWF_(1).xls. The 2008 DWF is considered to be misrepresented as the year was unseasonably wet. The 2009 data was not available for the assessment which was completed in November 2009. The assessment in Appendix H has been provided by Severn Trent and uses slightly different values of DWF data. This is because Severn Trent has used data from 2009 which was not available to Entec at the time of preparing this assessment. Appendix H only assesses capacity at six of the main works in the District.

The quality of the effluent from treatment works is also governed by consents issued by the Environment Agency. The ability of the works to treat incoming effluent to the required standard should also be considered when planning for growth in the catchment of the works. The consent for quality will be driven by the needs of the receiving watercourse or water body.

Sewerage companies monitor the flow quality leaving the works to ensure that it is within the consent limit. Information was requested on the compliance of works in the study area against the consent limits and was provided by Severn Trent Water in general comments for the six main works that are likely to be affected by the proposed growth. Severn Trent Water's assessment is based on desktop assessments using readily available information and has not been subjected to detailed hydraulic analysis. A summary of the issues at these six works is presented in Table 4.6. The full comment provided by Severn Trent is in [Appendix H](#).

Table 4.6 Capacity of Works Based on Current Quality Performance

Works	Receiving Watercourse	River Catchment	Estimated headroom based on current quality performance
Packington	Gilwiskaw Brook	River Mease	Minimal
Snarrows (serving Coalville)	Grace Dieu Brook	River Soar	Limited



Table 4.6 (continued) Capacity of Works Based on Current Quality Performance

Works	Receiving Watercourse	River Catchment	Estimated headroom based on current quality performance
Castle Donington	River Trent	River Trent	Limited
Ibstock	Ibstock Brook	River Sence	Significant
Kegworth	River Soar	River Soar	Significant
Measham	River Mease	River Mease	Limited

The treatment capacity of the works and the capacity of the receiving watercourse is a complex issue that requires detailed modelling. The Environment Agency and Severn Trent Water combined are funding a water quality model for the East Midlands area which will not be available in time for this study. The model is due to be completed by April 2010 and is being constructed in order to review impacts of wastewater discharges on the receiving watercourses. The modelling of growth impacts on water quality could be addressed if required in a Detailed Water Cycle Study, making use of the model being developed when it becomes available in 2010.

4.4.2 Sewerage Network

The term sewerage is used in this report to describe the underground sewers and pipes that are used for the removal of wastewater from buildings to the treatment works. Severn Trent were asked to provide high level comments on potential capacity issues in the sewerage piped network at the main settlements where growth might occur, for the purpose of this report. Their assessment was prepared using readily available information and was not subject to detailed hydraulic modelling. A summary of the main issues is presented below.

Within Ashby, there are known capacity issues in the area south of the town, with previously known external flooding incidents from sewers. The Thringstone/Whitwick area has also experienced known flooding incidents. Development upstream of this location would require significant improvements to accommodate additional sewerage flow. Severn Trent Water is currently undertaking project feasibility to address the flooding problem but as the solution is likely to be expensive it is likely to be deferred. In light of potential development in Whitwick (Thornborough Road) upstream of the flooding incidents, it may warrant the provision of a new outfall sewer. Discussions between Severn Trent and the Local Authority on the funding of any new infrastructure would be required.

Ibstock has recently been investigated for flood alleviation following sewer flooding incidents. The high cost of the preferred solution has resulted in the deferment of further alleviation. The area affected is considered to have no capacity in the sewerage network for further development without additional improvements along Melbourne Road. This refers specifically to the potential development of sites north of Ashby Road.



4.4.3 Sludge Management

Wastewater sludge is produced in the treatment of wastewater and also requires treatment and disposal in a sustainable manner. The planned growth in the North West Leicestershire will lead to increased sludge production and potentially affect future sludge management practices in the region. In the Final Business Plan for Severn Trent Water published on their website ([http://www.stwater.co.uk/upload/pdf/SVT - PR09 - FBP - A.pdf](http://www.stwater.co.uk/upload/pdf/SVT_-_PR09_-_FBP_-_A.pdf)) they anticipate by the end of AMP5 having an additional '22,000 tonnes of dried solids per year to deal with at our sludge treatment facilities, as a result of higher treatment standards and growth in demand'.

Severn Trent Water's sludge strategy seeks to mitigate risks associated with the sludge to land route, which is currently seen as environmentally the best route. Whilst there is currently a high level of demand for sludge from agriculture, the company recognises future trends and pressures may change the demand, therefore investigations into the sludge to energy capability are ongoing. Through increasing the electricity generation from sludge the company will look to reduce their carbon footprint also.

In their Final Business Plan, Severn Trent Water has a comprehensive sludge management strategy in place that is not expected to hinder growth plans.

4.5 Summary of Existing Environment

- The district contains a high percentage of rural land and parts of the National Forest. The underlying geology mainly comprises impermeable clays and marls with limited areas of permeable rocks. Alluvial sand and gravel deposits are present in the river corridors;
- North West Leicestershire is located in the Tame, Anker and Mease Catchment, and the River Soar Catchment of the Humber River Basin District. The main watercourses in the district are the River Sence, the River Mease and the River Soar, tributaries of the River Trent;
- Fluvial flood zones generally indicate narrow floodplains for most watercourses, with the exception of the Lower Trent and River Soar near Castle Donington and Kegworth, where the flood zones extend further away from the watercourses;
- The status of watercourses in the study area is generally 'Moderate' status, according to the Humber River Basin Management Plan (December 2009). Many of the watercourses in the area are failing to meet the required standards for nutrients. Phosphorous is a particular problem and an issue of concern in the River Mease;
- A number of designated sites are present. The entire area is classified as a Nitrate Vulnerable Zone. The River Mease is designated as a Special Area of Conservation. Sites in the watercourses downstream of the district are designated under the Freshwater Fish Directive;
- Water is supplied to the district from Severn Trent's East Midlands Water Resource Zone (a small area of the district at Chilcote is supplied by South Staffordshire Water). As strategic growth is not



planned for this small part of the district, the assessments have not included a review of South Staffordshire Water's resource management plans;

- The Environment Agency's Catchment Abstraction Management Strategies consider the resource units in the zone to have no water availability, be over licensed or over abstracted. The area is considered to be under **moderate water stress**;
- In Severn Trent's draft Water Resource Management Plan, taking account of growth over the resource zone and without further schemes than currently available, water supply is forecast to be in deficit compared to demand;
- In response to the potential deficit Severn Trent Water has proposed a number of measures to limit increases in demand and to provide more supplies of water, so that there will be a surplus in the final planning scenario during the next 25 years;
- Fifteen public wastewater treatment works operated by Severn Trent serve the area. Of these, Snarestone, Donisthorpe, Long Whatton and Breedon works are already at capacity, based on measured DWF provided by Severn Trent Water;
- The sewerage network has previously experienced capacity issues and flooding incidents at Ashby, Thringstone and Ibstock and these issues are ongoing. Additional investment may be required in these areas prior to further development.





5. Potential Constraints to Development

This section presents the potential constraints to development based on the state of the existing environment and water infrastructure, as assessed in Chapter 4 from data provided by third parties. The constraints for development are presented below in a traffic light context, for each topic area. The key for the traffic light system is as follows:

	Development ok, no constraints identified.
	Development may be ok, minor constraints identified, minor mitigation required to meet planned trajectory.
	Constraints identified, development may be ok with major mitigation to meet growth targets against Core Strategy timescale.
	Development should not proceed due to major constraint.

A series of annotated maps (Figures 5.1 to 5.3) are also provided at the end of the chapter, to direct the reader to the main constraints to development.

The assessment of water cycle constraints is focussed on the six main settlements of Ashby de la Zouch, Coalville, Measham, Ibstock, Kegworth and Castle Donington, as these areas will be the main growth centres of the district and therefore most likely to potentially impact on either the environment or infrastructure.

5.1 Environmental Constraints

5.1.1 Water Quality

The water quality records of the rivers and watercourses in the study area indicate that many rivers are failing to meet WFD targets, with particular reference to nutrient levels. Due to the sparse nature of summary data examined and the sampling frequency of the monitoring on which this summary data is derived, it is not clear whether this is caused primarily by WwTW discharges.

The excessively high levels of phosphates and nitrates illustrate the limited environmental capacity of most receiving waters to receive any additional pollution load. As treatment capacity of the WwTWs has not been assessed in this study because of the need for more detailed modelling, the impact of growth on discharge quality cannot be determined. However, the Environment Agency will continue to monitor and set the discharge limits from WwTWs with regard to quality, to ensure that water quality does not deteriorate further. The potential impact of stricter discharge consents would be on the timing of improvements and on the amount of investment required by STW to update treatment works, if required. The impacts of growth on water quality are mainly discussed below with regard to the River Mease. Investigating the impacts and potential mitigation measures would fall under the remit of a Detailed Water Cycle Study.



The River Mease SAC presents a big constraint in the study area, which is considered to be at saturation point for receiving effluent flows and failing to meet its WFD status, with particular regard to ortho phosphates. The EA's position statement on River Mease is to object to all discharges to the River Mease 'unless it can be demonstrated by the applicant when submitting a planning application that the additional effluent from the proposed development will not cause deterioration of the quality of the receiving water course and/or a breach of the sewage works discharge consent.' Furthermore, Natural England has adopted a position that ensures no increase in discharge occurs to the River Mease driven by the SAC designation, and the 0.06mg/l Phosphate target. If a new development does not meet this discharge then they will advise the relevant local authority that the development is not Habitats Regulation compliant, and object to the development. This position leads to Natural England objecting to single dwellings, change of use, discharge of drainage conditions and large development.

These position statements will impact growth or new developments in the southern area of North West Leicestershire District: Packington WwTW discharges into a tributary of the River Mease, whilst the Measham, Snarestone, Chilcote and Donisthorpe WwTW discharge directly into the River Mease. These catchments are shown in Figure 5.4 to represent potential constraints to development in those catchments.

The full position statement of the EA is presented in [Appendix E](#), with a plan showing the extent of the Mease catchment provided by the Environment Agency. The Agency has indicated that they would be highly unlikely to consent any increase in the DWF. Their position is that the current DWF should be viewed as a baseline from which to reduce orthophosphate loadings into the River Mease.

Natural England has also objected to development in the River Mease catchment on the grounds of significant impacts on the water quality. At the time of publication of this study, Natural England and the EA's position are being tested at appeal but the outcome will not be available in time for this study. Discussions between Natural England, the EA and the District Council are ongoing to resolve where possible how to deal with any growth in the Mease catchment and how best to resolve the water quality issue. This study recommends that a Detailed WCS is undertaken to assist and provide the evidence for future decisions on protecting the water quality. The Council's website sets out the current requirements for development in the Mease catchment (http://www.nwleics.gov.uk/development_control/DisplayArticle.asp?ID=10991).

This section highlights that there are environmental constraints present in the study area due to elevated nutrient concentrations and failing WFD targets in the study area's watercourses. Treatment of diffuse pollution from agricultural sources lies outside the remit of this study but it is advised that the EA and land owners work together to complete the actions set out in the RBMP to reduce diffuse pollution. [Appendix E](#) lists the ongoing projects in the Mease catchment to control other sources of pollution.

Effective measures are required to improve ensure that the quality of the watercourses does not deteriorate, which are likely to include improvements to WwTWs to deliver reductions in point source pollution. These improvements would be needed prior to growth being delivered. Continued communication between the local authority and Severn Trent Water is required to ensure that appropriate improvements can be made in wastewater infrastructure to improve the quality of discharged effluent/CSO discharges within the required timescales that is



often in advance of new housing connecting to the sewer network) and that these enhancements can be planned, funded and implemented within the AMP programmes operated by STW.

Table 5.1 Water Quality Constraints

Location	Surface Water WFD Status	Groundwater WFD Status	Freshwater Fish Waters	Designations	Overall Score
Coalville	Poor Status with high pollutants in River Sence	The chemical status of groundwater units around Coalville is classified as poor	Designation Downstream on the River Sence	No water dependent SAC or SSSI downstream	Minor constraint identified by the poor status and freshwater fish directive site on the River Sence
Ashby de la Zouch	Gilwiskaw Brook is Poor status with high pollutants	The chemical status of groundwater units around Ashby is classified as poor	No Designations in the Area	River Mease SAC	River Mease presents a major constraint to development in the area, that requires mitigation for development
Measham	Moderate status on the River Mease due to pollutants	The chemical status of groundwater units around Measham is classified as poor	No Designations in the Area	River Mease SAC	River Mease presents a major constraint to development in the area, that requires mitigation for development
Castle Donington	Bad status with high pollutants on the River Trent. Poor status on Hemington Brook, due to pollutants	The chemical status of groundwater units around Castle Donington is classified as Poor, with a Good unit in the south	Designation downstream on the River Trent & Trent and Mersey Canal	No water dependent SAC or SSSI downstream	Poor status on Hemington Brook and Bad Status on River Trent presents minor constraint to development



Table 5.1 (continued) Water Quality Constraints

Location	Surface Water WFD Status	Groundwater WFD Status	Freshwater Fish Waters	Designations	Overall Score
Kegworth	Moderate status on the River Soar	The chemical status of groundwater units around Kegworth is classified as Good, with a Poor unit in the south	Designation downstream on the River Trent & Trent and Mersey Canal	No water dependent SAC or SSSI downstream	No major constraints identified in terms of water quality
lstock	Bad status on lstock Brook, with high pollutants. Poor status on River Sence	The chemical status of groundwater units around lstock is classified as poor	Designation Downstream on the River Sence	No water dependent SAC or SSSI downstream	Poor status on lstock Brook and River Sence presents minor constraint to development

5.1.2 Water Resources

The resource situation in the East Midlands is significantly constrained. The CAMS documents that cover the East Midlands resource zone are summarised in Chapter 4 and show that the resources are said to have no further availability, be over licensed or over abstracted at low flows. Figure 5.1 summarises the resource availability assessment by the Environment Agency’s CAMS.

Additional abstraction in the wider area is unlikely to be an option to meet the water demand of the future population expected within the study area. The Environment Agency has stated that in order to accommodate sustainable growth more efficient use of water resources is needed including Restoration of Sustainable Abstraction (RSA) as discussed in [Appendix B](#).

Severn Trent Water has assessed the impact of climate change and predicts a loss of 38.8MI/d by 2034/35 compared to present day water availability. This is equivalent to 4.4% of the existing supply volume (deployable output). Chapter 7 discusses the impact of climate change on the water cycle in more detail.

There is little opportunity to develop new water resource schemes; current licensed abstractions may be curtailed in order to protect the environment, and climate change is expected to reduce resource availability further. This situation reinforces the importance of managing demand in this area.



Figure 5.1 Water Resource Constraints in the East Midlands Zone



Severn Trent Water has stated explicitly that its surplus in the final strategy supply-demand balance is dependent on successfully managing the demand of new and existing customers, and the Company considers that the Local Authorities to have a key role in supporting its demand management strategy.

Table 5.2 Water Supply Constraints

Location	Severn Trent Water Resource Zone, supplying all areas of the District
Ashby, Coalville, Measham, Ibstock, Kegworth, Castle Donington	<p>STW has included plans to resolve the potential deficit in supply, mainly through increasing the capacity of the existing sources and through demand management and metering in existing homes.</p> <p>It will be important that the Council encourages water efficiency in new homes to support STWs resource management plans over the growth period.</p>

5.1.3 Flooding

Where zones of high flood probability are defined by the Environment Agency's Flood Zone 3, development categorised as being highly vulnerable should be prohibited in accordance with PPS25. When considering the suitability of sites for development, the flood zones defined in the SFRA should be referred to, to steer development into the lowest flood risk zones through application of the Sequential Test.

Residential development is classified as More Vulnerable therefore to comply with the Sequential Test this type of development should not be permitted in Flood Zone 3, unless it can pass the Exception Test. To pass the Exception Test, developments should demonstrate that:

- The development provides a wider sustainability benefit to the community that outweighs flood risk;
- The development is on previously developed, or developable land; **and**
- The development will be safe from flooding without increasing flood risk elsewhere.

Fluvial flood zone 3 is present along the route of the watercourses, and does not generally extend into wide floodplains in the study area. The main settlements affected by zone 3 are Castle Donington and Kegworth, which are located nearer to the Rivers Trent and Soar, and in Ashby where the centre of the town has limited areas of flood zone 3. For more information on flooding, the reader should refer to the Strategic Flood Risk Assessment for the district.

The risk of flooding from surface water run-off, sewers and culverted watercourses can be relatively high in urban areas. New developments can increase the percentage of impermeable surfaces through new roads and roofs,



which has the potential to increase flooding from surface-water run-off. The flood risk can also be increased to areas downstream of new developments. The Environment Agency has recently prepared maps showing a high level assessment of areas that may be susceptible to surface water flooding. These are only available for local authorities to view, but have been provided to Entec by the Council for comment. Within the District, the areas most at risk from fluvial flooding correspond with areas of fairly extensive areas of intermediate or high levels of susceptibility to surface water flooding (Ashby, Castle Donington and Kegworth).

Development on existing Greenfield sites, as with all development, will require compliance with PPS25 to prevent increases in run-off. Larger sites on Greenfield land may require particular consideration of the land take required to meet PPS25 requirements of limiting run-off to Greenfield rates. Sufficient attenuation and sustainable drainage should be allowed for as well as consideration of strategic SuDS solutions for drainage control.

Table 5.3 Flooding Constraints

Location	Fluvial Flooding	Surface Water Flooding	Overall Score
Ashby	Flood risk in town centre (Flood Zone 3 of Gilwiskaw Brook) upstream (north) of railway line. Development should avoid these areas.	'Intermediate' to 'More' susceptibility to flooding from surface water run-off along river paths, as defined by Environment Agency's high level national assessment of rainfall run-off	Minor constraints from fluvial flood risk and surface water flooding.
Coalville	Minimal flood risk from rivers. Parts of Whitwick area and Thringstone lie in Flood Zone 3 of Grace Dieu Brook	'Intermediate' to 'More' susceptibility to flooding from surface water run-off along river paths, as defined by Environment Agency's high level national assessment of rainfall run-off.	Minor constraints from fluvial flood risk and surface water flooding.
Measham	Flood risk present to properties nearest the River Mease. If growth in this area avoids development near the river, fluvial flooding will not be a constraint to development.	'Intermediate' to 'More' susceptibility to flooding from surface water run-off along river paths, as defined by Environment Agency's high level national assessment of rainfall run-off	Minor constraints from fluvial flood risk and surface water flooding.
Ibstock	Minimal flood risk from River Sence	'Intermediate' to 'More' susceptibility to flooding from surface water run-off along river paths, as defined by Environment Agency's high level national assessment of rainfall run-off	Minor constraints from fluvial flood risk and surface water flooding.



Table 5.3 (continued) Flooding Constraints

Location	Fluvial Flooding	Surface Water Flooding	Overall Score
Kegworth	Parts of town to north and east in Flood Zone 2 and 3 of River Soar	'Intermediate' to 'More' susceptibility to flooding from surface water run-off along river paths and within wider floodplain, as defined by Environment Agency's high level national assessment of rainfall run-off	Major constraints from fluvial flood risk and surface water flooding in parts of the town. New development should be located in Flood Zone 1, which covers half of the town
Castle Donington	Parts of town to the north in Flood Zone 3, although may afford some protection from flood defences	'Intermediate' to 'More' susceptibility to flooding from surface water run-off along river paths and within wider floodplain, as defined by Environment Agency's high level national assessment of rainfall run-off	Major constraints from fluvial flood risk and surface water flooding in parts of the town. New development should be located in Flood Zone 1, which covers half of the town

5.2 Infrastructure Constraints

5.2.1 Water Supply

Severn Trent Water provided GIS shapefiles showing the spatial extent of its water supply network within the study area. This information is confidential and cannot be reproduced in this report, however if developers wish to view the network for a specific site the data can be requested directly from Severn Trent. The distribution network extends to all existing developed sites, such that additional, infill, development should not require extensive new mains in order to connect to the network. However, additional mains enhancements may be required in areas close to hydraulic capacity.

In summary, North West Leicestershire is principally supplied via the Severn Trent strategic main, referred to as the Derwent Valley Aqueduct, which is due to be enhanced during AMP5 (see Section 6.1.2). Severn Trent Water has confirmed that there are currently no known constraints at the water supply treatment works or in the strategic level network serving the District.



5.2.2 Wastewater Treatment

A high level comparison of the consented and measured DWF for the main WwTWs in the study area (Table 4.5) indicates that the following works are already over capacity in terms of hydraulic/flow capacity: Snarestone; Long Whatton; Breedon and Donisthorpe. Very little growth is planned in these catchments and therefore this does not necessarily present a constraint to growth. Nevertheless, it is recommended that Severn Trent review the consented discharge and consider applying for an increase, so that the consent limit is no longer breached.

The remaining works, particularly the six works serving the six settlements being considered for growth (Coalville, Ashby, Castle Donington, Kegworth, Ibstock and Measham) are considered to have capacity for flows based on the comparison on consented DWF and the average measured DWF from 2005 to 2007. Severn Trent Water has also provided their comments on the estimated capacity in terms of flow and quality for the six main works in the District. These are presented in Table 5.4 below.

Table 5.4 Assessment of Constraints and Main Wastewater Treatment Works

Wastewater Treatment Works	Receiving Watercourse	Flow Constraint	Quality Constraint
Packington	Gilwiskaw Brook	Capacity issues	Receiving watercourse unable to receive additional flow
Snarrows	Grace Dieu Brook	Little capacity available	Large growth expected, may be potential issue
Castle Donington	River Trent	Little capacity available	No issues foreseen
Ibstock	River Sence	Capacity available, minimal growth expected	No issues foreseen
Kegworth	River Soar	Capacity available, minimal growth expected	No issues foreseen
Measham	River Mease	Little capacity available	Receiving watercourse unable to receive additional flow

Table 5.4 is based on assessment provided by Severn Trent Water, from desktop information and not from hydraulic modelling. **General comment regarding treatment capacity from Severn Trent Water:** Whilst sewage treatment works may not have sufficient spare capacity to accept the levels of development being proposed in its catchment area this does not necessarily mean that development cannot take place. Under Section 94 of the Water Industry Act 1991 sewerage undertakers have an obligation to provide additional treatment capacity as and when required. Where necessary we will discuss any discharge consent implications with the Environment Agency. If there are specific issues which may prevent or delay the provision on additional capacity these have been highlighted below.

Based on the comments provided by Severn Trent Water (summarised in Table 5.4 above) there are some capacity issues at the wastewater treatment works at Snarrows (serving Coalville), Castle Donington and Measham. These



works may require variation in flow consent to accommodate further growth. Packington works is heavily constrained by capacity and water quality issues may prevent any increase in flow consent.

The main constraint facing the area from wastewater treatment works is the water quality issue in the River Mease. As the river is designated a Special Area of Conservation, it is important that the water quality levels are maintained and improved from the existing situation, where the standard for ortho-phosphate is being exceeded. If water quality stays the same or decreases, there is a risk to the habitats in the watercourses. The pollution is likely to come from a number of sources including agricultural land use and sewerage. The areas where growth will be affected by the water quality issue are the catchments of Packington, Measham, Snarestone, Donsithorpe and Chilcote wastewater treatment works (see Figure 5.2).

The wastewater treatment works catchments are based on the existing sewerage network that conveys waste flows from property to the works. Some of the rural parts of the district are served by private works and hence are not shown (data has been provided by Severn Trent on their assets only). Where new development is proposed outside of the sewerage catchments, new infrastructure will be required to connect developments to the network, and the catchment areas will change to reflect this.

With regard to the potential housing and other development in the study area, most potential sites are already within sewerage catchments, with the exception of the proposed Money Hill site in Ashby, and the proposed Strategic Distribution Sites (all three of the Strategic Distribution site locations are shown to be outside of sewerage catchments). Significant infrastructure may therefore be needed to serve these sites. Sewerage and drainage constraints are discussed in Section 5.2.3.

The Environment Agency and Natural England have the responsibility to deliver actions for controlling agricultural run-off under the Humber River Basin Management Plan. It is the responsibility of the Environment Agency and Severn Trent Water to review discharge consents and implement AMP schemes to improved sewerage discharges. Actions relevant to the study area from the Humber RBMP are presented in [Appendix D](#).

Chapter 6 reviews the capacity of the works over the growth period to 2026.



Figure 5.2 Wastewater Treatment Works Constraints



5.2.3 Sewerage and Drainage

Sewerage

The existing sewerage serving parts of the district is already at capacity and has previously experienced sewer flooding. These capacity issues still exist. In the locations where there is little capacity, this presents a potential constraint to further development, as the sewerage network will not be able to receive additional flows in the underground sewer pipes. The constraint can lead to impacts on phasing of development, as the sewerage undertaker will need to plan time for improvements as well as determine if improvements are economically viable.

Severn Trent has made a high level assessment for the purpose of this study, on which sites may potentially be impacted by existing capacity issues in the sewer network. The assessments use the most up to date information available but are not based on detailed hydraulic modelling. The sites that have been highlighted as potential or definitely constrained by the sewerage network are presented in Table 5.5 below and displayed in Figure 5.3. The remaining sites and settlements are not listed as they have not been highlighted as constrained by the sewerage network.

Table 5.5 Severn Trent Water's Assessment of Sewerage Capacity for Potential Strategic Sites

Settlement	Site	Wastewater Treatment Works	Potential Impact on sewerage infrastructure
Ashby	Money Hill	Packington	Medium - Due to the size and location of this site detailed modelling is required.
	Holywell Spring Farm	Packington	Medium - Minor downstream flooding needs to be addressed.
	South of Ashby (Packington Nook)	Packington	This site will require infrastructure improvements due to known capacity issues. Detailed hydraulic modelling required to confirm extent of improvements.
	Lounge	Packington	Medium - Location of the site will require pumping across A42/railway.
Coalville	Thornborough Rd, Whitwick, Coalville	Snarrows	This site will require significant infrastructure improvements.
	Green Lane, Whitwick	Snarrows	This site will require significant infrastructure improvements.
	SW Coalville	Snarrows	Medium - The size of this development would need detailed hydraulic modelling and to check capacity availability of Kelham Bridge SPS.



Table 5.5 (continued) Severn Trent Water's Assessment of Sewerage Capacity for Potential Strategic Sites

Settlement	Site	Wastewater Treatment Works	Potential Impact on sewerage infrastructure
	SE Coalville	Snarrows	Medium - The size of this development would need detailed hydraulic modelling and to check capacity availability of Kelham Bridge SPS.
	Greenhill Farm, Coalville	Snarrows	
	Leicester Rd / Ravenstone Rd	Snarrows	
Ibstock	North of Ashby Road	Ibstock	There are known flooding problems which are expensive to resolve.
	South of Ashby Rd	Ibstock	Low - but may need pumping station upsizing/replacement.
	Station Rd	Ibstock	Low - but may need pumping station upsizing/replacement.
Measham	Land between Burton Rd & New St, NE Atherstone Rd	Measham	Low (subject to pumping capacity checks).
	North East Atherstone Rd	Measham	Low (subject to pumping capacity checks).

These are desktop assessments using readily available information and have not been subjected to detailed hydraulic modelling

Surface Water Drainage

The Government's Water Strategies *Making Space for Water* (2005) and *Future Water* (2008) and the requirements of the Water Framework Directive require a more sustainable approach to drainage than the conventional piped networks that have historically been used to convey rainfall away from developments as quickly as possible. In these documents Defra highlights the benefits of sustainable drainage systems as an alternative approach to traditional piped systems. Defra is promoting SuDS as a natural drainage process with the characteristics of storage, slow conveyance and some volume reduction.

PPS25 states that all developments greater than one hectare must provide a Flood Risk Assessment which considered surface water management for the development to prevent increased flood risk from surface drainage. Developments on brownfield, or developed sites, that have conventional drainage infrastructure, are permitted to



discharge to the existing drainage system provided flows do not increase. It is likely that development will increase runoff and therefore the additional runoff would need to be managed on site before being discharged into existing drains.

The surface water runoff rate after development on greenfield, or undeveloped sites, must not be greater than the runoff rate from the undeveloped site. With reference to the potential development of the Green Wedge in Coalville, significant attenuation is likely to be required to prevent run-off being greater than the existing Greenfield run-off rate (see Table 5.3).

The preferred method of SuDS is infiltration that is best suited to areas overlain by permeable soils and geology. In most parts of the study area, the soils and geology are of low permeability and may be unsuitable for infiltration techniques. Due to the variability of soils and geology however, site specific infiltration tests should be carried out to confirm the feasibility of infiltration drainage.

Furthermore, where infiltration is into an aquifer the risk of contamination should be assessed and minimised, particularly where the groundwater is a source of public water supply. Additional measures, such as oil interceptors, may be required. Source Protection Zones (SPZs) are used to protect groundwater resources from pollutants. In areas designated as SPZs, the location and type of discharges into the water environment are closely controlled. The level of control is most stringent close to the point of abstraction. This will require consideration during the site specific design for drainage where SPZs are present in parts of Coalville and Measham.

The SuDS approach is not wholly dependent on infiltration, but also includes attenuation techniques such as ponds, wetlands, green roofs and water recycling schemes which hold back run-off volumes and rates and allow water re-use. Developers should be encouraged to consider the land take required for SuDS at the earliest opportunity, as typically SuDS need a greater footprint than traditional piped drainage systems. On sites where space is limited this may form a minor constraint to development.



Figure 5.3 Sewerage Constraints



Summary of Constraints

- The resource situation in the East Midlands is significantly constrained. Environment Agency CAMS suggest that there is little water available for further abstraction;
- Severn Trent has planned to prevent a deficit in supply through a combination of demand management and increased abstraction in the small areas where licence variation may be allowed by the Environment Agency. Through water company planning therefore, mitigation plans to overcome the supply constraint are already being investigated;
- Ofwat, the water regulator, released their decision on water companies funding plans toward the end of this study, and the consequences of their decisions have not yet been made available from Severn Trent. However, Severn Trent has advised that the reduction in funding as a result of the Ofwat determination will not detract from their obligation to provide water supply and treatment capacity for future growth;
- The main constraint to development within study area is the inability of the River Mease to accept additional effluent. The river is already exceeding its targets for water quality. Additional effluent from new development has the potential to reduce water quality in the river even further;
- There are some areas that are constrained in the short term by the sewerage network – the underground piping carrying effluent from homes to the wastewater treatment works. Where potential development sites comprise large urban extension areas (potential sites in Ashby and Coalville) detailed modelling is required to determine the impact on the sewerage system;
- Sewer flooding has previously occurred in some areas of Ashby, Coalville and Thringstone and capacity issues in the sewer network still exist in these areas (comment from Severn Trent Water, December 2009). This may form a constraint to new development;
- Flooding from the River Trent and its tributaries will constrain development locations. The areas most at risk from fluvial flooding are in Castle Donington, Kegworth and adjacent to the Rivers Trent and Soar. Future development should comply with PPS25 and locate development in the lowest flood zone where possible;
- Sustainable drainage measures should be applied in all new developments. The study has identified that there may be constraints to infiltration drainage measures in the district.



6. Opportunities and Capacity for New Development

This section assesses the future capacity of the water cycle to accommodate growth. The demands of the proposed level of growth on the existing water environment and water services infrastructure are reviewed and demand management scenarios are discussed. A sensitivity analysis is included on the four growth options to account for uncertainty in the planned housing trajectory.

6.1 Water Supply

Forecast demand is a critical component of the water resource management plan. Severn Trent Water plans to secure supplies based on projections of population growth and per capita consumption (pcc) and states that the demand forecast uses the growth projections set out by the Regional Spatial Strategy.

The per capita consumption forecast is based on the assumption that water efficiency policies and activities will successfully reduce individuals' demand for water. The per capita consumption forecasts (measured and unmeasured customers and per capita consumption in new homes) are available in [Appendix A](#).

A sensitivity analysis has been undertaken to test the implications of alternative growth scenarios and per capita consumption levels on household demand in the study area. The Council has supplied its projected growth rates (per Ward) and these have been totalled to produce a preferred growth rate for the study area. By agreement with the Council an upper and lower projection was calculated (20% above and below the preferred growth rate respectively).

To each of these growth rates, ten alternative demand scenarios were applied (ranging from business as usual, to very water efficient) based on the expected amount of water used per person. The demand (in litres per head per day) is based on an assumed percentage of the new homes meeting various levels of water efficiency per person through implementation of water efficient devices. Some new homes, such as socially funded homes for example, will all now be built so that the average consumption rate is 105 litres per head per day in line with Level 3 of the Code for Sustainable Homes.

A suite of 33 results were produced covering a demand spectrum deviating from Severn Trent Water's forecast, as presented in Table 6.1 below. The sensitivity analysis uses the forecast occupancy rates within Severn Trent Water's WRMP. This may lead to an overestimate of demand as it assumes that population grows linearly with housing growth, which is unlikely in reality.



Table 6.1 Summary of Water Efficiency Scenarios Used in Sensitivity Analysis

BUSINESS AS USUAL pcc in existing households is as per the water company baseline forecast* pcc in forecast households is as per existing measured customers baseline forecast*			
HIGHLY WATER EFFICIENT pcc in existing households is 10% below the water company final planning forecast* Forecast households:			
Scenario 1a.	35% at 80 l/h/d	65% at 105 l/h/d	The most water efficient scenario. All new homes reach CSH level 4 as a minimum
Scenario 1b.	35% at 105 l/h/d	65% at 120 l/h/d	A third of new homes reach CSH level 4
Scenario 1c.	35% at 125 l/h/d	65% at 130 l/h/d	Demand in new homes misses CSH levels but demand is in line with Defra pcc target.
MODERATELY WATER EFFICIENT pcc in existing households is as per the water company final planning forecast* Forecast households:			
Scenario 2a.	25% at 80 l/h/d	75% at 105 l/h/d	All new homes reach CSH level 4 as a minimum
Scenario 2b.	25% at 105 l/h/d	75% at 120 l/h/d	A quarter of new homes reach CSH level 4
Scenario 2c.	25% at 125 l/h/d Represents STW and Defra policy forecasts	75% at 130 l/h/d	Demand in new homes misses CSH levels but demand is in line with Defra pcc target.
LEAST WATER EFFICIENT pcc in existing households is 10% above the water company final planning forecast* Forecast households:			
Scenario 3a.	45% at 105 l/h/d	55% at 120 l/h/d	Over half of new homes reach CSH level 1
Scenario 3b.	3b. 45% at 120 l/h/d	55% at 125 l/h/d	Less than half of new homes reach CSH level 1
Scenario 3c.	3c. 45% at 130 l/h/d	55% at 150 l/h/d	pcc in new homes is significantly higher than CSH levels, and Defra target
*See Appendix A l/h/d = litres per household per day			

Figure 6.1 illustrates a summary of the results. By applying the Company pcc forecasts and occupancy rates to the existing housing stock, and Council preferred growth (10,183 new houses by 2026/27 taking account of completions to 2009), demand in the study area is expected to increase from 12.2Ml/d to approximately 13.9Ml/d. (This is derived by multiplying how much water is forecast to be used per person, by the average number of people

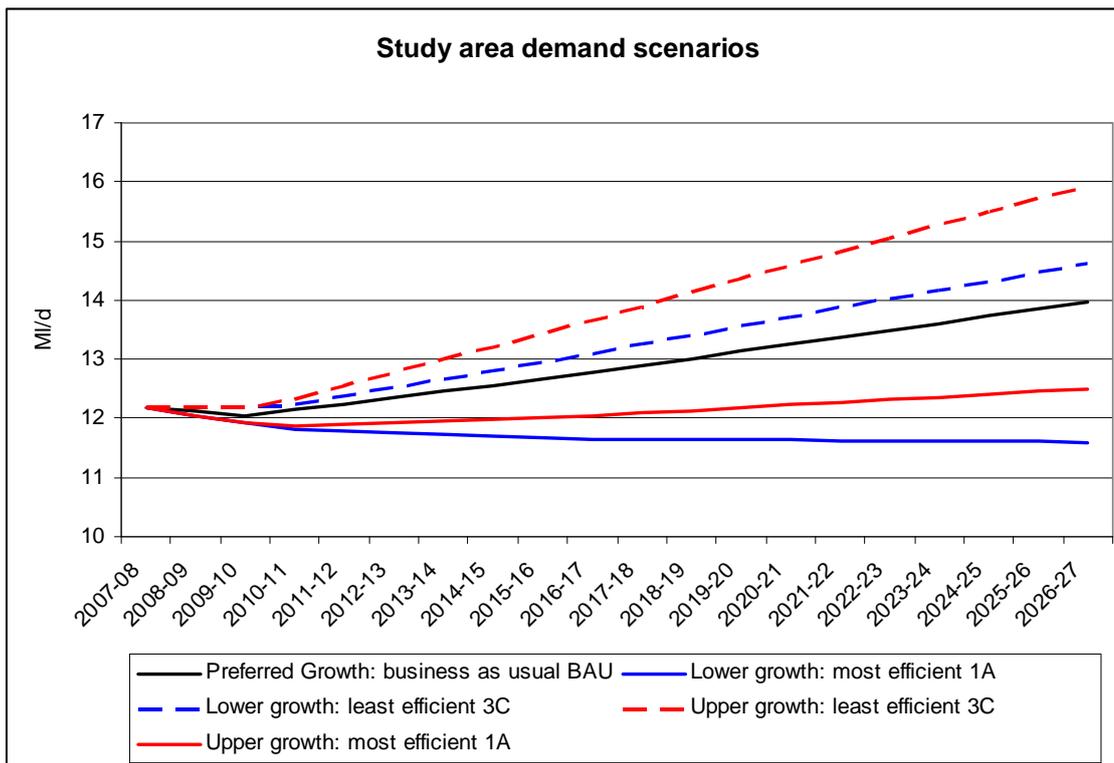


per household based on the average annual growth rate of 599 from Table 2.2). This calculation has been performed by Entec, specific to the District, and does not include forecast demand calculated by Severn Trent Water.

Higher growth (20% higher annual housing growth than Council’s projected growth rate) combined with increasing pcc (i.e. unsuccessful demand management strategies) could increase this to 15.9MI/d, although this inherently assumes an increase in population. This calculation assumes that the average annual growth rate is 20% higher than that forecast by the Council, i.e. 20% higher than 599 houses per year).

In contrast, lower growth (20% less houses built per year than the Council’s projected housing growth of 599 houses per year) combined with very effective demand management (that is pcc 10% less than forecast, and new homes reaching Code For Sustainable Homes level 3/4 and 5/6 for water consumption) could lead to household demand in 2025/26 of 11.6MI/d. This is less than the current demand in the study area. It shows how even under a lower growth scenario, demand would be higher than the business as usual projection if demand is not managed effectively.

Figure 6.1 Summary of Alternative Growth Rate and Demand Scenario Forecasts



This shows that demand in the study area could fluctuate by ± 2 MI/d from the water company estimate. Severn Trent Water includes a headroom element in its demand forecast, to allow for uncertainties in future housing



growth, population, and per capita consumption (and supply uncertainties). The Company has a provision for approximately 40Ml/d to cover all uncertainties across the zone. Theoretically, this means that there should be sufficient resource in the plan to allow for unexpected higher demands, without further impacting on the environmental status of the CAMS resource units. However, there are 32 local authority areas within the East Midlands zone (see [Appendix C](#)) and the headroom provision is unlikely to allow for unexpected higher demands in all areas, as well as allowing for the supply uncertainties.

6.1.1 Water Neutrality

The demand scenarios illustrate the impact that consumption in new homes can have on the overall demand in an area. Severn Trent Water has made it clear that effective demand management will be needed in order to maintain the balance between supply and demand in the future. This section examines the feasibility of aspiring to water neutrality in new developments across the study area.

Water neutrality is defined as:

The net demand for water in an area of significant development being the same after development is completed as it was before.

Water neutrality may be achieved by making new homes and other buildings water efficient, retrofitting water efficient devices into existing homes and buildings and increasing rates of metering. The relevance of water neutrality in any particular area is highly dependent on the water resource situation in the area; for example if water resources are seriously stressed and there are limited opportunities for further resource development. The feasibility of achieving water neutrality is dependent on a number of factors, including the number of new homes to be built relative to the numbers of existing homes in an area, the existing levels of per capita consumption in the area and whether the reduction required is realistically possible.

Table 6.2 summarises how much demand would be generated over time by people in new households across the study area. Severn Trent Water's forecast of occupancy rate and per capita consumption in new households has been applied to the annual growth rate of 599 new homes per year (see Section 2.1.3). By 2026/27 an additional 3Ml/d will be generated from the new homes that have been built. Therefore, in order for this to be water neutral 3Ml/d would need to be saved by existing customers. However, in order for this to be truly 'neutral' this reduction would have to be in addition to the decrease in demand from existing customers that is already forecast due to metering and other water efficiency measures. It is because of the forecast reduction in demand from existing customers that the overall increase in demand for both existing and new homes is forecast to increase by approximately 2Ml/d rather than 3Ml/d.

Information provided by the Council shows that there are approximately 38,468 existing homes in the study area, assuming an average occupancy rate of 2.4, there is an existing population of 92,323 people. A reduction of 3Ml/d



equates to approximately 32 litres per person. Average per capita consumption is currently 139 litres. Therefore, in order to achieve neutrality, average pcc of all existing customers would need to fall to 107 litres.

Table 6.2 Demand from New Development

Parameter	Unit	2010/11	2015/16	2020/21	2026/27
District's annual growth rate	Number	599	599	599	599
STW new properties occupancy rate	Head per property	2.32	2.28	2.24	2.21
Population growth (per annum)	Number	1390	1364	1344	1323
New properties demand (pcc)	Litres per head per day	131.67	130.39	129.82	129.28
New properties demand	Litres per day	182964	177850	174495	170995
New properties demand	Megalitres per day	0.18	0.18	0.17	0.17
Cumulative demand	Megalitres per day	0.18	1.08	1.96	3.00

Severn Trent Water has an ambitious programme of activities to reduce total demand (including from non households). Through the following actions the Company plans to save 16MI/d across the East Midlands zone by 2015:-

- Actively promoting and distributing 'Save-a-Flush' devices. Currently only 1 in 6 homes has such a device installed. These devices will be targeted at householders with older, larger cisterns;
- Encouraging all customers to undertake self audits of their water use and making information available to all consumers on how they can be more water efficient;
- Partnering with a range of product manufacturers and suppliers to increase customers' access to water efficiency products and services, and to promote changes in behaviour;
- Reducing consumption in its own offices and buildings; and
- Water audits and product retrofits in commercial properties and retrofit.

The total household population across the East Midlands water resource zone is approximately 2,840,000. Assuming the demand savings were shared evenly between the household population Severn Trent's aim of saving 16MI/d by 2015 equates to 5.7litres per person. Therefore, an additional range of measures would be required to reduce pcc in North West Leicestershire by a further 26l/h/d. The cost and social implications of additional demand management as required to achieve neutrality may not therefore be justifiable in this area. The Mease



catchment is a net importer of water (i.e. water abstracted elsewhere is ultimately released into the River Mease) and water neutrality could create an unusual problem in this area. A reduction in the volume of water being released per household to the waste water treatment works that discharge into the River Mease may increase the concentration of effluent to be treated, and may potentially reduce the overall volume of water being discharged. The level of impact would depend on the number of new houses to be built and the number of existing homes targeted to achieve neutrality.

Nevertheless, water efficiency measures should be promoted through planning policy and awareness campaigns led by the Councils in the resource zone, in order to support Severn Trent's forecast household consumption rates.

6.1.2 Supply Infrastructure

Ofwat expects that water and waste undertakers' growth assumptions are in-line with the regional and local planning process established under the 2004 Compulsory Purchase Act. In addition, under the Water Industry Act 1991, the water company has a duty to connect a property to the mains system if the property requires supply for domestic purposes. Whilst Ofwat can make provision for water companies to invest in growth driven investment via their Final Determinations, they will also require, where appropriate, that contributions are sought from developers to help fund new infrastructure requirements resulting from new development.

Severn Trent Water has made provision within its Final Business Plan to improve the resilience of the supply network and to ensure security of supply to its customers both now and into the future. Although STW's strategic grid allows water to be moved around its supply area, the Company has highlighted the need to ensure protection of supplies over the next Business Plan period.

Ofwat's final determination was released in November 2009 and early indications from Severn Trent Water are that Ofwat will fund significantly less investment on assets or services required to meet demand from growth compared to that set out by the Company in its Final Business Plan. The reduction in funding from Ofwat means that Severn Trent Water will not be able to fund network enhancements to its preferred level. The scale of this impact will be dependent on the nature of the infrastructure enhancements identified by the Company, and decisions on which particular enhancements may need to be postponed. Severn Trent are not able to detail the consequences on the investment programme at the time of publication, but have advised that the reduction in funding will not detract from their obligation to provide water supply and treatment capacity for future growth.

Severn Trent Water has a major AMP5 scheme to duplicate the Derwent Valley Aqueduct (DVA) from Kings Corner to the Hallgates Distribution Service Reservoir complex. This is a pipeline connecting existing parts of the distribution system. It will increase supply and resilience in areas supplied by the DVA, i.e. Kegworth. No strategic water resource constraints have been identified for the East Midlands zone. However, pressure to reduce abstraction may increase if the outcomes of two RSA [Restoring Sustainable Abstraction] investigations conclude that reductions are required (at Melbourne's abstraction at Eggington intake and in the Derwent Valley) (Bamford). Conclusions are not expected until 2015. Water supply infrastructure constraints are more likely to be local in nature (i.e. localised bottlenecks). These constraints will be discovered when models are run based on individual



development sites when masterplans become available. This could potentially be included in a Detailed Water Cycle Study. Severn Trent Water has confirmed that there are currently no known constraints at the water supply treatment works serving the study area.

It is important that the Council maintains dialogue with Severn Trent Water to discuss the likely development sites as the Local Development Framework plans are completed. In order to plan and prioritise its network enhancements the water company will need to examine its existing infrastructure, known issues, and areas of proposed development.

6.2 Wastewater Treatment Works and Water Quality

6.2.1 Treatment Capacity and Water Quality

The compliance of wastewater treatment works against the quality consent has not been provided for the purposes of the study. The information was requested from Severn Trent but it was not available for use in the study. Nevertheless the issue of the limited capacity of the River Mease to receive additional effluent has been highlighted by the Environment Agency, and has been the focus of a recent planning inquiry for a development in the catchment of Packington Wastewater Treatment Works.

Water quality in the River Mease is the driving issue for improvement required on the outflow from wastewater treatment works that discharge into the Mease catchment, in particular the phosphorous (P) level in the outflow. The Environment Agency informed the steering group of the consent limits for P at the works in the Mease catchment. It is proposed to tighten the consent limits at these works, in order to reduce the level of ortho phosphates in the River Mease. It is proposed to reduce the phosphorous limit at Packington works to 1 mg/l by 2014 (Severn Trent Water, data provided to Entec for this study).

The diversion of the existing wastewater discharges out of the catchment is not considered to be a solution to the water quality issue in the River Mease. This is partly because the wastewater discharges are not the sole source of phosphorous. Modelling of the water quality by the Environment Agency has shown that even without the wastewater discharges, the ortho phosphates in the river are still too high (as advised during the steering group meeting, September, 2009). This indicates that agricultural sources are also contributing to the elevated nutrients. [Appendix E](#) lists the current schemes in the Mease catchment that are targeting agricultural run-off.

Furthermore, the flow volume from the wastewater treatment works in the Mease catchment actually supports the baseflow of the river (as advised during the steering group meeting, September, 2009). There would be concern over a reduction in flow in the river and the impacts on the river habitats if flow volumes were to be reduced by diverting existing wastewater discharges to other rivers.

One option potentially being considered is to divert **additional** effluent flow from new developments out of the River Mease catchment. This issue in relation to treatment works capacities is discussed below in Section 6.2.3.



6.2.2 Flow Capacity in the Study Area

Using the planned increase in housing numbers from 2010 to 2026 for the preferred four options, as provided to Entec by North West Leicestershire District Council (Section 2.1.3, Table 2.2), an assessment of the future flows arriving at the six works serving the six growth areas has been undertaken. A wastewater consumption rate of 135 l/day per person, and a fixed infiltration rate of 25% have been assumed.

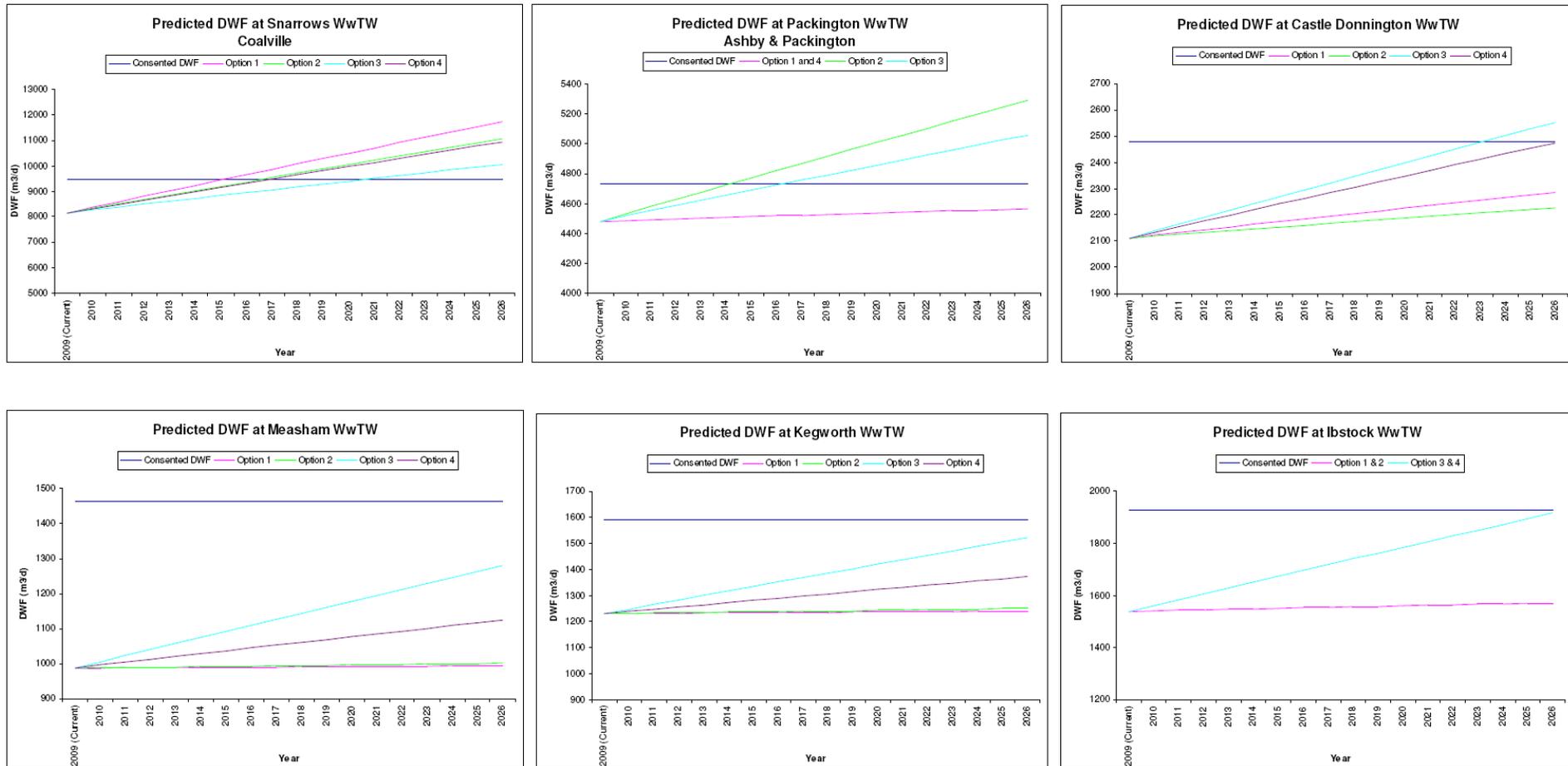
Occupancy rates for the district were provided by the Council from the 2001 census data as being 2.4. Occupancy is also forecast for the growth period by Severn Trent Water for the purposes of their water resource calculations, and shows a decrease in occupancy throughout the growth period. This is a reflection of the expected pattern of dispersing the number of people per property as a result of the increase in property from development.

Headroom allowance has not been included, which sewerage companies add onto the predicted DWF to allow for seasonal variations. It must be remembered that a headroom must be added to the predicted DWF to allow for seasonal variation, therefore the works may reach capacity slightly earlier than suggested in these graphs, once headroom is added.

The assessments are presented in Figure 6.2, and a summary of the findings is listed below the figure.



Figure 6.2 Predicted Dry Weather Flow over Growth Period (to 2026) at the Six Growth Areas (not including headroom)



Under all four options, the works at Measham, Kegworth and Ibstock may be able to accommodate the proposed level of growth and do not appear to constrain growth. However toward the end of the growth period in 2026, Kegworth and Ibstock are close to reaching capacity in terms of flow volume.

The works serving Coalville (Snarrows WwTW) will potentially present a constraint to growth in its capacity to receive additional effluent, under all four growth options. The works will reach capacity at different times between the growth options. It will reach capacity first under option 1 at around the year 2015, in around 2017 under options 2 and 4 the works will reach capacity, and under option 3 the works will reach capacity by approximately 2021.

Packington works will reach capacity under option 2 at around the year 2014 and at around 2017 under option 3. Options 1 and 4 do not have such a high growth figure planned for the Ashby area, and therefore the works under these options will be under less pressure.

Under growth Option 2, the works serving Castle Donington will reach capacity toward the end of the growth period around the year 2024. Option 4 growth will see the works at capacity by 2026.

6.2.3 Flow Capacity outside the Study Area

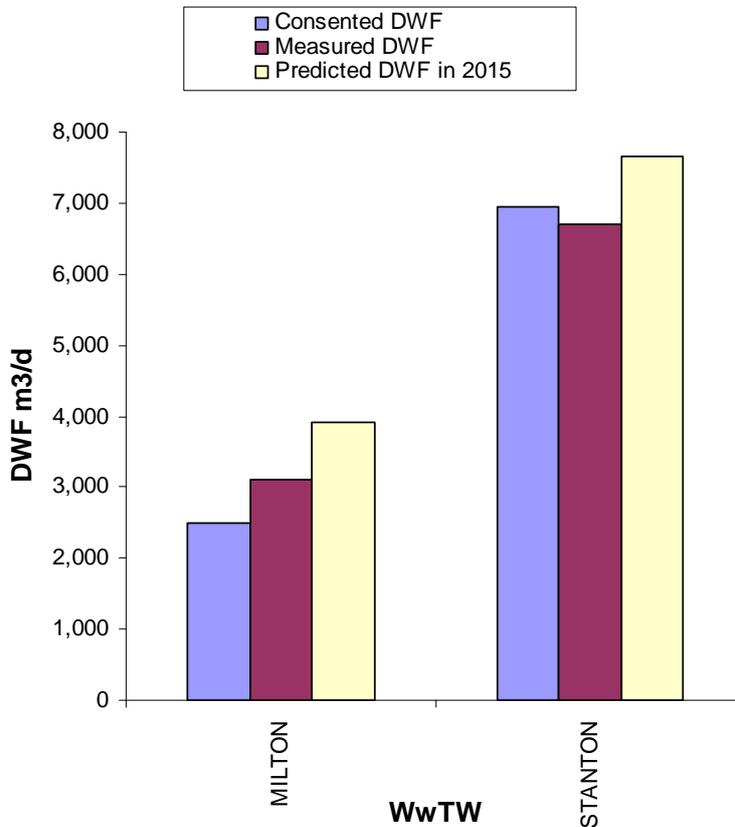
The main constraint facing development in the study area is the limited capacity of the River Mease to receive additional effluent. This will potentially affect new development in the areas of Ashby de la Zouch, Measham and the villages in between. As discussed in Section 6.2.1 above, the diversion of effluent from new development outside of the catchment may be one solution that should be considered in more detail by Severn Trent Water, the Environment Agency and the District Council.

Data has been provided to Entec from Severn Trent Water on the consented and measured effluent flow (Dry Weather Flow) for some of the works in the neighbouring district of South Derbyshire. Wastewater treatment works that are closest to North West Leicestershire that might be considered for accommodation of effluent from new development in Ashby are the Milton works and the Stanton works, both serving Swadlincote and its surrounding area. These works have been considered in terms of flow capacity. The assessment of the ability of these works to receive the predicted flow from Ashby and Measham is purely on the flow capacity and is not a detailed assessment: the sewerage network and gradients for example have not been assessed.

Effluent flow has been calculated based on the planned growth in Swadlincote, plus the maximum combined growth that is forecast in the Ashby and Measham area (see Table 2.1 and 2.2, Option 3). Figure 6.2 below indicates the impact on future DWF at Milton and Stanton wastewater treatment works that would arise if: a) all of the growth is diverted to Milton; and b) all of the growth is diverted to Stanton. The forecast DWF also includes the future wastewater flow that will arise from the predicted growth in Swadlincote, as used in the Derby Water Cycle Study (Entec 2009).



Figure 6.3 Forecast Wastewater Flows for South Derbyshire Works, if Effluent from new Homes in Ashby and Measham are Diverted (2010 to 2015)



The assessment indicates that the works at Milton and Stanton do not have capacity in their flow consent to accommodate additional flow from new development from 2010 to 2015 in Ashby and / or Measham. Should Severn Trent wish to explore this option further, they would need to allow timing to request a variation in the flow consent, assess the impacts on the quality consent and the receiving watercourses, and review the investment required in the sewerage network and treatment works.

6.3 Sustainable Flood Risk Management

In order to minimise flooding resulting from heavy rainfall and drainage constraints, development plans must consider the potential runoff and discharge rates from potential development sites, as well as consulting with the sewerage undertaker to determine existing capacity of the drainage network. PPS25 states that all developments greater than one hectare must provide a Flood Risk Assessment which considers surface water management for the development to prevent increased flood risk from surface drainage. PPS25 advocates consideration of flood risk and sustainable drainage throughout all stages of the planning process.



Regional planning statements and the Environment Agency promote the use of Sustainable Drainage Systems (SuDS). SuDS are designed to reduce the potential impact of new and existing developments with respect to surface water drainage discharges by making more use of natural processes to convey surface water away from development. They aim to:

- Control runoff at source;
- Improve water quality by treating runoff and removing pollutants prior to discharge off site;
- Enhance the amenity value of a development;
- Encourage groundwater recharge; and
- Integrate with the environmental surroundings.

By implementing SuDS measures, multiple benefits can be achieved that include improved water quality and amenity value, contributing to Green Infrastructure targets and creation of important habitats, as well as flood risk mitigation.

SuDS are the name given to a drainage approach, rather than any particular drainage type, and are often described in terms of a “management train”, a series of progressively larger scale practices to manage runoff and control water quality. The management train is:

- **Prevention**, Application at individual sites, e.g. use of rainwater harvesting, management to prevent accumulation of pollutants;
- **Source Control**, Control of runoff at or very near to its source e.g. through permeable pavements, green roofs etc;
- **Site Control**, Management of water in a local area or site e.g. by routing water from building roofs and car parks to large soakaways or infiltration/detention basins;
- **Regional Control**, Management of runoff from a site or number of sites, typically in a balancing pond or wetland.

Examples of SuDS that should be considered are presented in Table 6.3 below. Chapter 7 of the SFRA (Atkins, May 2008) also presents a high level assessment of SuDS suitability for the District.



Table 6.3 Examples of SuDS Techniques

SuDS technique	Description	Attenuation / Infiltration
Soakaways	Grassed trenches that store and dispose of water through infiltration.	Infiltration
Permeable Paving	Paving that will permit rainwater to infiltrate into the soil or constructed layers beneath the surface.	Both
Infiltration Basins	Depressions that store and dispose of water through infiltration when required during heavy rainfall events. During dry periods the basins remain dry.	Both
Infiltration Trench	Vegetated strips of gently sloping ground that allow infiltration through the base and sides, as well as filtering out silt and pollutants.	Both
Filter Strips	Vegetated strips of gently sloping ground to drain water from impermeable surfaces and filter out pollutants, silt and suspended sediments.	Both
Swales	Shallow vegetated channels that conduct and/or retain water, and allow filtering of particulates through the vegetation. If unlined these features allow infiltration into the underlying ground.	Attenuation
Ponds	Permanently wet basins designed to store water and attenuate peak flows, with permanent bankside and emergent vegetation.	Attenuation
Detention Basin	Dry basins designed to attenuate peak flows and store water for specific retention times.	Attenuation
Wetlands	Shallow pond systems with aquatic vegetation that allow water to be stored and passed through vegetation for filtration of pollutants.	Attenuation
Green Roofs	Vegetated roofs that reduce runoff volumes and rates.	Attenuation

A drainage strategy flow diagram is presented in Chapter 8. This refers to surface water drainage, which should be kept separate from foul drainage to reduce pressures on the sewerage capacity in the District.



Summary of Future Capacity and Opportunities

- Without additional measures, Severn Trent's draft WRMP forecasts a deficit in supply of water throughout the growth period. To rectify the deficit, the Company has developed a strategy based on a combination of demand management and increases in existing abstraction, where water is deemed available. This strategy will remove the deficit, generating a surplus of between 10-20MI/d until 2034/35, based on a reduction in household water consumption in new homes;
- A sensitivity analysis has tested the implications of alternative growth scenarios and consumption levels per head on household demand, which indicates the importance of implementing water efficiency measures: demand in the study area could fluctuate by ± 2 MI/d from the water company estimate;
- As Severn Trent are predicting a surplus based on a range of strategic measures, water neutrality is unlikely to be an appropriate goal for the development area, as the concept needs to be applied at a resource zone scale and be driven by predicted deficits;
- Nevertheless, water efficiency measures should be promoted through planning policy and awareness campaigns led by the Councils in the resource zone, in order to support Severn Trent's forecast household consumption rates;
- Severn Trent Water has made provision within its Final Business Plan to improve the resilience of the supply network and to ensure security of supply to its customers both now and into the future. It is important that the Council maintains dialogue with Severn Trent Water to plan and prioritise network enhancements;
- The River Mease currently has no additional capacity to receive additional effluent from wastewater treatment works in terms of the quality of the watercourse. This affects the sewerage catchments feeding to: Packington, Measham, Chilcote and Donisthorpe wastewater treatment works (see Figure 5.2);
- A high level assessment of flow capacity of the wastewater treatment works indicates that under growth Option 3, Snarrows (Coalville), Packington and Castle Donington works would reach capacity during the growth period. Under growth Option 2 Packington and Snarrows works reach capacity, and under Option 1 Snarrows works reaches capacity, based on the existing DWF consent. Variation to the flow consent would be required prior to development under these options to prevent these works reaching capacity;
- To prevent increased discharges from wastewater treatments works in the Mease catchment, one option might be to consider diverting effluent from new homes in Ashby and Measham to nearby works in South Derbyshire. The works that serve Swadlincote however would not have capacity to serve the additional homes under Option 2 based on the current DWF and forecast growth in the Swadlincote area.;
- In terms of wastewater treatment works capacity and water quality, the favoured option for growth would be Option 1 The Coalville Focus. However, with regard to the sewerage network, the increased growth in Coalville is likely to put additional pressure on the existing network which is already at capacity in the Thringstone and Whitwick areas;



- There are opportunities to prevent increases in flood risk from new development through the development of SuDS and green infrastructure in the new developments, which will have the benefit of reducing run-off rates and providing amenity and water quality mitigation in new developments.



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7. Climate Change

7.1 Background

Climate change is likely to have major direct impacts on the water cycle as a result of changes in rainfall patterns and temperature/evaporation. Furthermore, climate change will affect patterns of water usage and have wider impacts on land use. Current climate change modelling broadly indicates that there will be wetter warmer winters and drier hotter summers and that some of these impacts will become evident within the timescale of the revised Regional Spatial Strategy up to 2026. Climate change has also been identified as a key issue in the East Midlands Plan and the National Water Cycle Study guidance.

In particular, climate change may have the following impacts:

- Reduction of water resources availability due to reduced annual rainfall and increased temperature - increased evapo-transpiration may reduce aquifer recharge;
- Increased intensity and frequency of storms. This is likely to increase the intensity and frequency of fluvial flooding and urban drainage related flood events;
- Changes to water usage particularly in relation to irrigation of gardens and parkland using potable water. The benefits of rainwater harvesting and storage will also be affected. Demand for summer irrigation water for agriculture is also likely to increase;
- Changes in water table levels may also affect infiltration and leakage of water from the sewerage system;
- Reduced summer rainfall will result in lower river flows which would reduce dilution of wastewater discharges. Compliance with environmental quality standards is, in some cases, based on 90 percentile values which tend to occur during the summer period; reduced river flows may have a magnified impact on compliance;
- Stress on wetlands. Consequently, these systems are likely to become less resilient to other perturbations such as impacts of abstractions and discharges.

The potential impacts outlined above change the context in which impacts of housing growth on the water cycle occur and should therefore be considered as part of the Water Cycle Study process.

7.2 Climate Change Modelling and UKCP09

Assessment of climate change impacts is based on global climate models which include a representation of land, air, ocean, ice, hydrological cycle and the carbon cycle. Detailed scenarios for the UK are generated using a regional climate model. This is a high resolution model which is part of the full global climate model. This model



produces the output that forms the basis of the climate change predictions produced by the UK Climate Programme (UKCP). The climate range models have been run for a range of scenarios to account for uncertainty regarding future carbon emissions.

The first set of scenarios was produced in 1998 and is known as UKCIP98. These were superseded in 2002 by UKCIP02, which are still used in some guidance documents, such as PPS25 and in some water company plans. Recently in June 2009 new output has been released, known as UKCP09. The latest output uses the same climate change models but in contrast to previous output, probabilistic output has also been produced based on a range of model set ups and referencing output from other climate change models. The output is also at a higher resolution than previous UK scenarios, with data being available at a 25km resolution. This provides much greater spatial detail but also means that topographic features, such as air flow over hills and descriptions of catchments, should be more accurate.

For the first time, daily and sub daily data will be available thanks to the use of a weather generator. This is a tool which provides information on future climate which is statistically consistent with the probabilistic climate projections.

7.3 Climate Change and the Study Area

Figure 7.1 to 7.3 show predicted changes in average annual temperature, summer precipitation and winter precipitation for the Medium Emissions scenario as shown on the UKCP09 website.

The key findings for the East Midlands in the 2050s under the medium emissions scenario are listed below and are taken from the UKCP website (<http://ukclimateprojections.defra.gov.uk/content/view/2166/528>):

- The central estimate of increase in **winter mean temperature** is 2.2°C; it is very unlikely to be less than 1.1°C and is very unlikely to be more than 3.4°C;
- The central estimate of increase in **summer mean temperature** is 2.5°C; it is very unlikely to be less than 1.2°C and is very unlikely to be more than 4.2°C;
- The central estimate of change in **winter mean precipitation** is 14%; it is very unlikely to be less than 2% and is very unlikely to be more than 29%; and
- The central estimate of change in **summer mean precipitation** is –16%; it is very unlikely to be less than –36% and is very unlikely to be more than 6%.



Figure 7.1 Change in Annual Average Daily Temperature for the 2050's under the Medium Emissions Scenario (UKCP09)

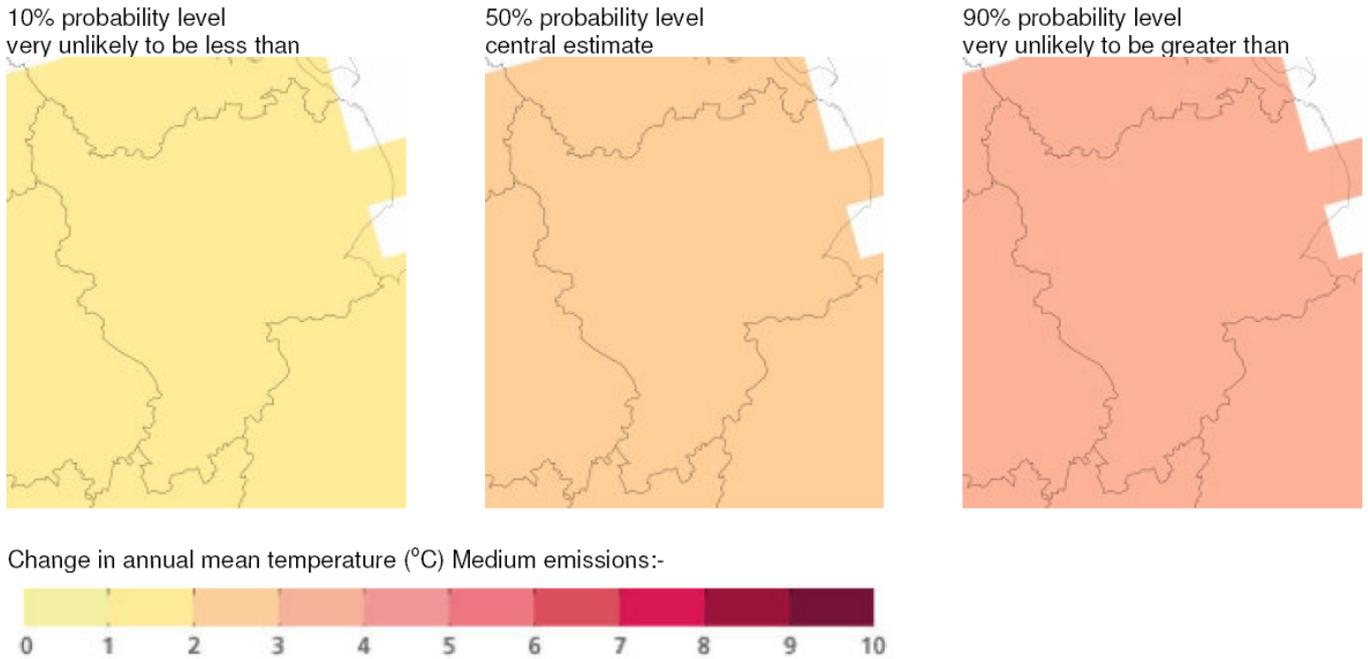


Figure 7.2 Change in Summer Mean Precipitation for the 2050's under the Medium Emissions Scenario (UKCP09)

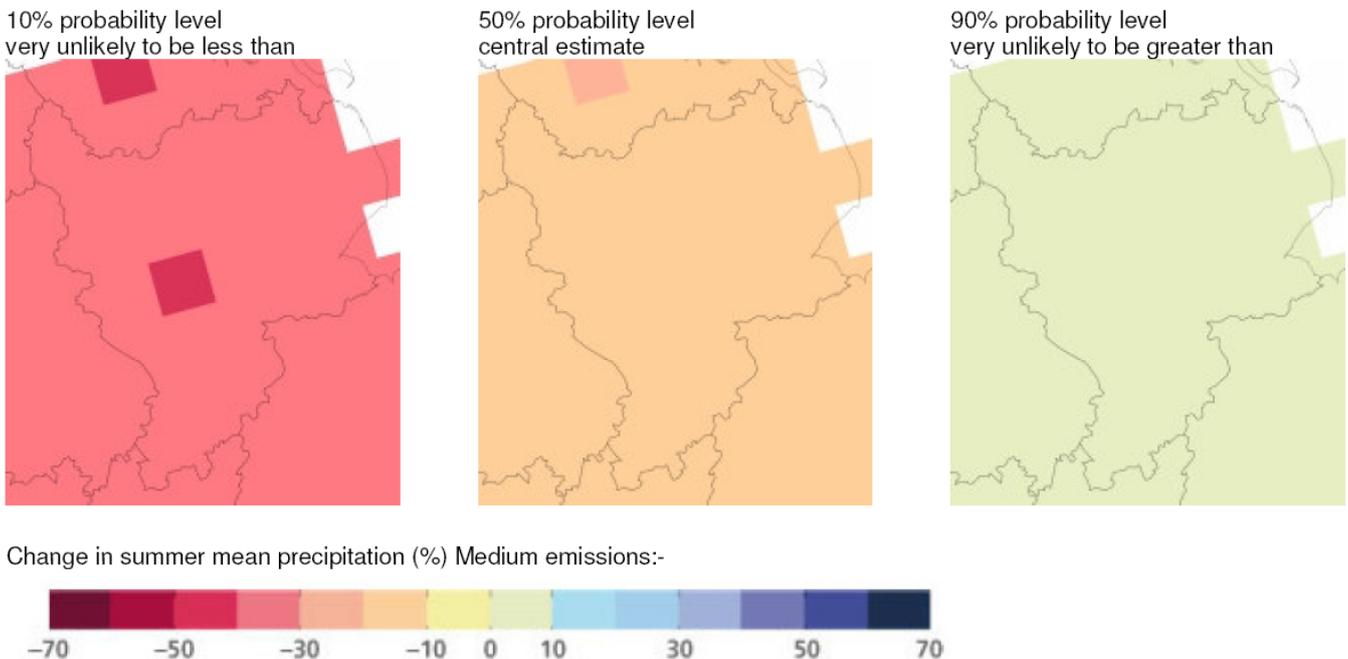
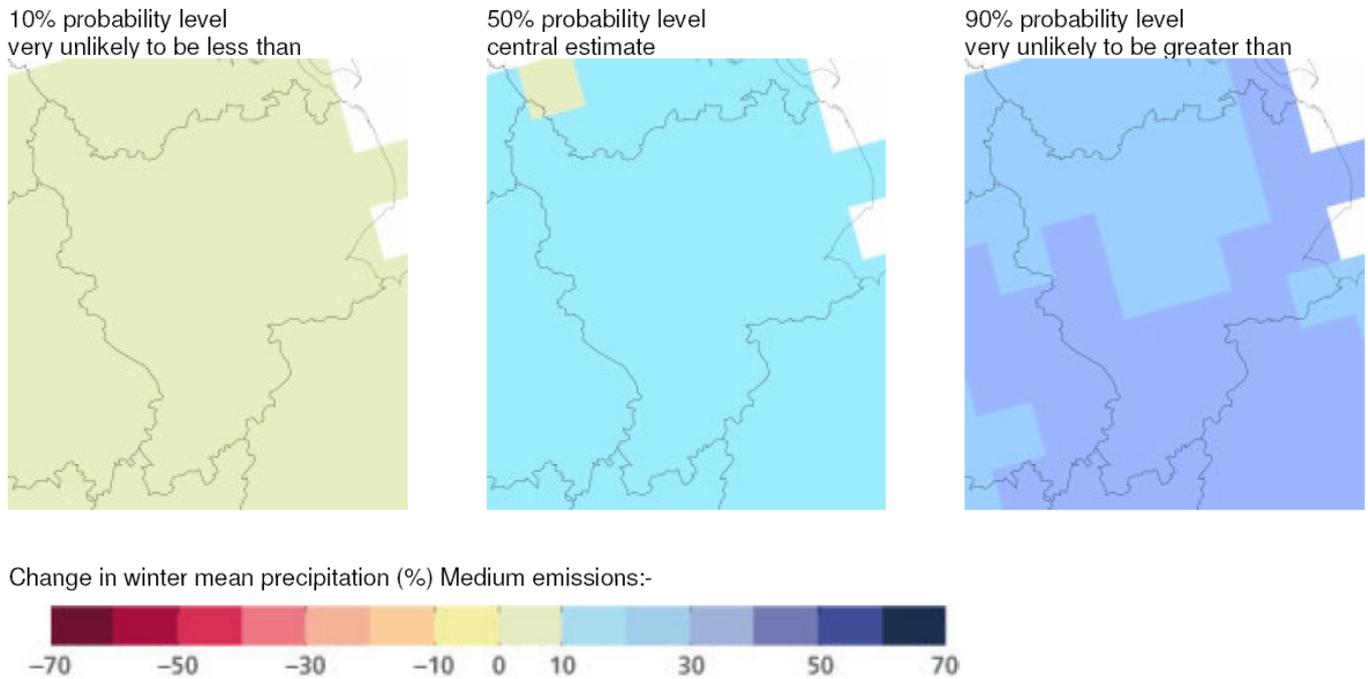


Figure 7.3 Change in Winter Mean Precipitation for the 2050's under the Medium Emissions Scenario (UKCP09)



The rainfall patterns in the study area and high percentage of surface water resources are likely to be particularly vulnerable to climate change impacts in the immediate term. By 2050 the central estimate for changes in annual daily temperature is for an increase of 2 to 3 degrees. Coupled with a decrease in summer precipitation of 10 to 20 percent is likely to put further pressures on water resource availability. Section 4.3.4 (Box Summary) states that Severn Trent has estimated a loss in available water of 39MI/d by 2030 / 2031 in the East Midlands Zone as a result of these climate change impacts, reinforcing the importance of managing demand in this area. Furthermore, agricultural demand for water will be increased as temperature rises in addition to reduced summer rainfall; this is likely to affect some rural parts of the study area, particularly where restrictions to the supply of water exist to protect low flows such as in the catchment of the River Mease. Increased winter rainfall and more intense summer storms will increase flood risk. The climate change flood zones presented in the SFRA (Figures 1 to 4, Atkins, 2008) should be considered to take account of future risks.

7.4 Assessment of Environmental Capacity and Water Infrastructure Provision

Assessment of climate change issues by the Environment Agency and water infrastructure operators is mostly based on a national guidance produced by the regulators (Ofwat, Defra, and the Environment Agency) and water industry (e.g. UKWIR). This ensures that a consistent approach is followed to the complex issue of climate change. This section presents information on national guidance and the assessments carried out in the study area.



7.4.1 Water Resources

Severn Trent Water's PR09 Business Plan (April 2009) outlines the company's strategy toward climate change. Assessment of options and proposals for the period 2010-2015 has been carried out using Defra's 'social cost of carbon'. The key elements of STW's plan to reduce their carbon footprint are:

- Measures to achieve significant efficiencies in energy use;
- Taking into account carbon impacts in assessing the case for further quality and environmental improvements;
- Additional electricity generation projects, in particular using sewage sludge as a renewable energy source.

The document outlines STW's approach of small, incremental adaptation measures which are generally viewed as preferable to large one-off changes, due to the uncertainty relating to climate change effects. In addition, changes which contribute to climate change mitigation are likely to be preferred to those which add to the water company's carbon impact. STW state that they will continue to review solutions in the light of the latest climate change research, such as the UKCP09.

Severn Trent Water has forecast the impacts on its sources and customers' consumption using the UKCIP02 climate change data based on methodologies developed by the Environment Agency, as this was the latest data available during the assessments.

The impact of climate change on water resources will vary depending on the nature of the sources in a particular zone. It is generally considered that surface water sources will be more vulnerable than groundwater sources to changes in rainfall patterns in the shorter term. Surface water dominated resource systems may need to be changed to respond to more extreme weather events (heavy downpours, prolonged dry periods). Severn Trent Water has reassessed the impact of climate change and now predicts a loss of just under 40MI/d. In its Strategic Direction Statement, Severn Trent Water states that climate change is one of the most significant uncertainties facing the Company over the next 25 years.

Table 7.1 Impact of Climate Change on Deployable Output

Water Resource Zone	Deployable Output (MI/d) (2007/08)	Reduction due to climate change (2034/35)	Reduction as percentage of 07/08 DO
East Midlands zone	892 MI/d	38.8 MI/d	4.4%



7.4.2 Flood Risk

Guidance on assessment of climate change impacts on flood risk form part of Planning Policy Statement 25 (Annex B of PPS25, 2006). This provides guidance on how to make allowances for climate change impacts in the application of the recommended methodologies to assess flood risk.

With regard to fluvial flooding the guidance recommends an allowance of a 10% increase in peak flow for the period 1990 to 2025 and an allowance of 20% beyond this. The guidance recommends that it is important that the analysis is incorporated into Strategic Flood Risk assessments. A recent review of the UKCIP09 climate change impacts has been undertaken by the Environment Agency, and they have recommended that the climate change allowances within PPS25 should still be used.

Consideration of the effects of climate change was undertaken in SFRA (Atkins 2009) with regard to the River Soar, the River Mease, the Grace Dieu Brook and the Gilwiskaw Brook. Mapping of the climate change impacts is presented in the SFRA, but have not been provided to Entec for this study. They are however available to view through request to the Council and should be used when determining flood risks to any new development.

Ofwat Letter PR09/12 provides an instruction to water companies of their planning requirements for assessment of resilience of their assets to flood hazards. Guidance is provided in a supporting document that takes into account assessment of climate change impacts. Severn Trent Water has followed this guidance in assessing flood resilience of their assets.

7.4.3 Wastewater and Receiving Waters

Severn Trent Water carries out climate change analysis in their design of the hydraulic capacity of wastewater infrastructure by applying additional rainfall allowances in their sewer network modelling. Additional flows are also factored into analysis of the frequency and magnitude of their assessments of combined sewer overflows. Ofwat recommend that sewerage flooding should not occur more frequently than 1 in 20 years and that no net increase in sewerage flooding should occur. Sewerage systems for new development should not occur with a return period of less than 1 in 30 years in accordance with the requirements for Sewers for Adoption (Atkins 2008).

Investment should be based on a risk assessment approach based on the frequency of flooding and the sensitivity of the properties affected. It is recommended by Ofwat that climate change sensitivity analysis should be prepared, and that in the absence of more accurate guidance each sewerage company should take account of increasing rainfall intensity in line with DEFRA's guidance on climate change in planning and designing sewerage systems. The assessment should take into account the entire asset life (e.g. over the next 100 years).

Climate change will also affect the capacity of waters to receive wastewater flows particularly during low flow periods which are expected to increase. Impacts from combined sewer overflows' first flush of sewer sediments, due to intense rainfall following a long antecedent dry weather flow, may also become more pronounced as low river flows may be unable to provide sufficient dilution. Moreover, the strength of raw wastewater arriving at



treatment works in dry weather may increase due to less surface water entering combined sewers; this may in turn affect the operation of certain wastewater treatment processes.

At present these impacts are not considered in the setting of wastewater quality and flow consents or in future asset planning. Analysis of these impacts could be carried out by sensitivity analysis using existing water quality models (e.g. reducing Q95¹ flows by 20%) or by using hydrological models to simulate changes in river flow based on output from UKCP09. Such analysis would be undertaken by (or on behalf of) the Environment Agency and carried out at the river catchment scale rather than the Water Cycle Study area.

7.5 Implications of Climate Change and Mitigation

Sustainability and carbon accounting should form part of the options appraisal and cost benefit analysis that is likely to form part of the Detailed Phase Water Cycle Study. Carbon accounting for direct carbon emissions and embedded carbon have developed greatly in recent years and Ofwat has required water companies to report on green house gas emissions as part of their PR09 submissions (Part C8 of company guidance information requirements). UKWIR have also recently produced guidance documents for operational carbon production (UKWIR 2005) and embedded carbon (UKWIR 2008). Severn Trent Water has followed this guidance and monitors its carbon emissions and carries carbon accounting as part of the options appraisal and cost benefit analysis related to the provision of water infrastructure. Guidance on carbon accounting and mitigation are also available from the Carbon Research Centre and Carbon Trust.

Approaches to carbon budgeting will vary greatly between stakeholders and it will be important to develop a consistent approach particularly in relation to indirect emissions which may rely on information along supply chains. Adaptation of the water industry approach to other sectors such as drainage would provide the most straight forward way to achieve this.

For North West Leicestershire as for other areas with limited water resource availability, the main impacts from climate change on housing growth are likely to be from pressures on water resource availability and also from flood risk and dilution potential of wastewater flows. As summers become warmer and drier and winters become milder and wetter, water companies will face the challenges of winter storage to ensure demand can be met throughout the year. To reduce pressures on water abstraction, North West Leicestershire Council should encourage water efficiency measures as far as possible in both new and existing homes as well as in businesses. Changing rainfall patterns are likely to affect the existing areas at risk of flooding. Modelling and planning applications should take account of predicted changes in rainfall and river flows as set out in PPS25 to mitigate these impacts.

Nutrients in watercourses are a particular issue in the East Midlands Region, and should river flows decrease in the summers as a result of climate change, the dilution potential will also decrease. Sewerage providers in the region

¹ The flow that is exceeded 95% of the time, representing the most common flow rate



are focussing on improving the treatment and removal of nutrients where feasible at wastewater treatment works and take account of predicted climate change in their assessments. Measures to mitigate these issues must also consider their carbon footprint in order to prevent where possible increased emissions and further impacts on climate change. With reference to North West Leicestershire this will include the carbon accounting of the preferred solutions to treat wastewater in the River Mease catchment in a detailed Water Cycle Study.



8. Future Recommendations and Guidance

The combined Scoping and Outline Water Cycle Study has reviewed the existing environment with regard to the natural and urban water cycle. This 'baseline' data has informed where there are likely to be constraints to development from both the water environment and water services infrastructure. Potential phasing and capacity issues have been identified in the study, using the predicted growth for the four options under consideration in the Core Strategy. This section provides recommendations for the Council's Core Strategy and some technical areas that require further assessment. Box 1 summarises the recommended policies and actions.

8.1 Water Quality and Wastewater Treatment

The water quality of the Districts Rivers is generally Moderate status, with Bad Status present on the Lower Trent. It is the aim of the Water Framework Directive for all waterbodies to achieve Good Status. The River Basin Management Plan for the Humber District indicates that by 2015, there should be a 38% increase in water quality levels in the Tame Anker and Mease catchment for one or more elements that are used to define good status. The target for increase in the Soar catchment is 2%.

Elevated nutrient levels contribute to the water quality issue in the area, with particular regard to phosphorous that can arise from agricultural sources and from sewage discharges. The predicted growth in the District is likely to impact the volume of sewage discharges into the receiving waters, which is of concern for controlling this source of phosphorous and other nutrients. The River Mease has reached capacity for the level of sewage it can receive, as a result of elevated ortho phosphate. The largest wastewater treatment works discharging into the Mease in the district is at Packington, which is also close to capacity in terms of volume and treatment capacity for further development.

The Council are exploring four growth options to meet the housing target set by the Regional Spatial Strategy and to contribute to the Leicestershire Housing Market Area, as part of the Three Cities and Three Counties Growth Point (of Derbyshire, Leicestershire and Nottinghamshire). It is recommended that options with the minimum growth in the Ashby and Measham area are favoured as a result of the water quality constraint in the River Mease. Continued dialogue between the Council and Severn Trent will be required in order to accommodate any wind fall developments that may occur in these areas, in terms of sewage treatment.

It is recommended that Option 1 is the preferred option, which concentrates growth in the Coalville area. Section 6.2.2 assesses the potential capacity at the works serving the six settlements where growth is forecast to occur. From these results (Figure 6.2), it can be seen that all the works with the exception of Snarrows works which serves Coalville, will have capacity for the forecast growth. Severn Trent will need to focus their investment at this works to prevent capacity being exceeded in around 2014. Under all other growth scenarios, investment will be needed at more than one treatment works. Growth Option 4 is the second best option to consider, which sees also investment required at Castle Donington works toward the end of the growth period (2026).



Severn Trent has advised that there are no known physical constraints that would prevent additional capacity being provided at Snarrows treatment works, however the significant levels of development proposed in this catchment may result in consent tightening requirements. Further assessment will be required on the treatment capacity and water quality in the receiving water.

Large scale developments are also likely to have an impact on the sewerage network that conveys waste flow to the treatment works. Previous flooding incidents of sewers have been recorded in parts of Ashby, Coalville and Thringstone/Whitwick, some of which may be expensive to resolve. Detailed hydraulic modelling will be required to determine the impacts and improvements needed in the sewers, however this will require more information from development's masterplans on layout and housing numbers. The Council should continue to liaise with Severn Trent with regard to infrastructure requirements for the preferred growth option.

8.2 Water Resources and Supply

As a result of the significant constraint in the region on water resources, it is recommended that all new homes are built to Code for Sustainable Homes Level 3/4 to reduce demand from new households. The capacity assessment in this study (Section 6.1) has shown that even with a 20% increase in the predicted growth rate, a saving of 2 MI/d could be achieved if all new homes were built to a consumption level of 105 l/h/d.

Severn Trent has forecast that there will be a surplus in supply over the growth period, **dependent** on a combination of demand management (achieving an efficient level of consumption per head) and increasing abstraction where available. To reduce the pressure on water resources in the region and to support the water company's management plans, it is key that the Council brings forward recommendations for all new homes to be water efficient in the Core Strategy.

A recent study completed by Entec UK Ltd for the London Development Agency has demonstrated that basic water efficiency measures (6/4 litre dual flush toilets, standard rather than power showers, restrained flow bathroom taps etcetera) are feasible in terms of performance and customer satisfaction, and are sufficient to enable all types of new households to reach Level 3/4 of the Code for Sustainable Homes.

Local Authorities have an important role supporting the efforts of the water companies to raise awareness of the need to use water wisely, and for helping to distribute information to customers explaining how they can use water more efficiently and what the benefits are to them. The Environment Agency has highlighted that the planning authorities have a key role in managing water resources via spatial plans that contain policies promoting the efficient use of water resources.

It is recommended that alongside the policy for new homes to be Level 3/4, the Council includes policies to support the water company's water efficiency activities to help reduce demand from existing development, alongside the water companies metering strategies and other water efficiency activities. There is limited potential to further reduce per capita consumption below that already forecast by the water companies.



Ongoing communication with the water companies will be essential to ensure that the Local Development Plan, the WRMP and operational plans are aligned. Housing growth figures are subject to regular change as development plans and applications are received and processed. The water companies are obliged to develop their forecasts in line with the best available information. Currently these plans are based on the target figures presented in the Regional Spatial Strategy. By providing regular development plan updates the Local Authorities can significantly help the water companies to refine and implement their plans more effectively.

A significant issue that Severn Trent Water is keen to address is the impact that the growth point status will have compared to historical growth patterns. The water company manages its supplies, and its infrastructure development policies based on assumptions that are equally applicable across the whole water resource zone. The impact of the current economic climate on general housing development, combined with the emphasis of development in the growth point areas has the potential to create a step change in the way that resources, and particularly new infrastructure needs to be planned and delivered at a local level.

8.3 Flooding and Drainage

Flood risk to people and property can arise from various different sources, including fluvial (from rivers), tidal, surface water run-off (or pluvial), sewers & drains, culverted watercourses, groundwater, as well as through breaching/overtopping of flood defences and from artificial sources such as canals and reservoirs. The risk of flooding can never be totally removed, however through good planning, management and use of sustainable flood mitigation and drainage approaches, the risk and consequences of flooding in many areas can be reduced.

All sources of flood risk are considered to be a material planning consideration. PPS25 is the overarching planning guidance for taking account of flood risk in development. It promotes 'positive planning at all levels to deliver appropriate sustainable development in the right places, taking full account of flood risk'. The key message is to avoid inappropriate development and to locate development away from flood risk through the Sequential Test. The policies within PPS25 should inform both Regional Spatial Strategies and local authorities' local development documents, so that flood risk is taken into account at all stages throughout the planning process.

New development in North West Leicestershire should be guided toward the lowest flood risk zones. Fluvial flood zones are most widespread in the northern parts of Castle Donington and Kegworth. Development options should favour sites in Flood Zone 1, of which there are numerous opportunities in the district.

Surface water flooding should also be a material planning consideration. New developments should apply sustainable drainage techniques to control flood risk, whilst also providing benefit in terms of water quality, amenity value and green infrastructure targets.



Box 1 Summary of Recommendations

Recommendation Policy 1

It is recommended that Option 1 is the preferred growth option to be taken forward in the Core Strategy with regard to the water quality and wastewater treatment issues identified.

The main constraint to growth is the water quality of the River Mease. Option 1 is favoured in this report as it sees the least amount of growth in the Mease catchment and therefore the least impact on its water quality.

Option 1 sees the majority of growth in Coalville. Improvements will be required in the sewer network, conveying waste flow to the treatment works, and also post 2015 improvements will be required to the Snarrows Wastewater Treatment works.

Recommendation Policy 2

The Core Strategy should require developers of private homes to design new homes to meet the minimum water use standard in Level 3/4 of the Code for Sustainable Homes (105 l/p/d)

Recommendation Policy 3

It is recommended that the Core Strategy includes policies to support the water companies' water efficiency activities for existing households.

Recommendation Policy 4

The WCS recommends that the Core Strategy includes policies that promote sustainable drainage techniques (SuDS) that mimic natural drainage, rather than using traditional piped systems in all new developments.



Recommendation Action 1

It is recommended that Severn Trent review the consent conditions and treatment capacity at Snarrows wastewater treatment works in advance of potentially significant growth in the Coalville area.

Recommendation Action 2

It is recommended that a Detailed Water Cycle Study is undertaken. This would:

Drive solutions to be investigated and implemented for sewage treatment at the Packington works;

make use of the water quality model being developed for the area to determine impacts on increased sewage discharges on water quality, to support mitigation and design measures for meeting WFD standards;

examine the infrastructure constraints for the provision of improved and/or new infrastructure;

review feasible options for achieving level 3/4 of the CSH (water consumption);

assess locally specific interactions between suppressed household consumption, sewerage, and discharge effluent volumes;

review the final Water Resource Management Plan and Ofwat price determination for the planning period to 2015;

undertake a cost/benefit analysis of development options; funding streams, including financial contributions from developers;

assess the sustainability of preferred options with regard to carbon emissions;

develop the water cycle strategy for the district; and

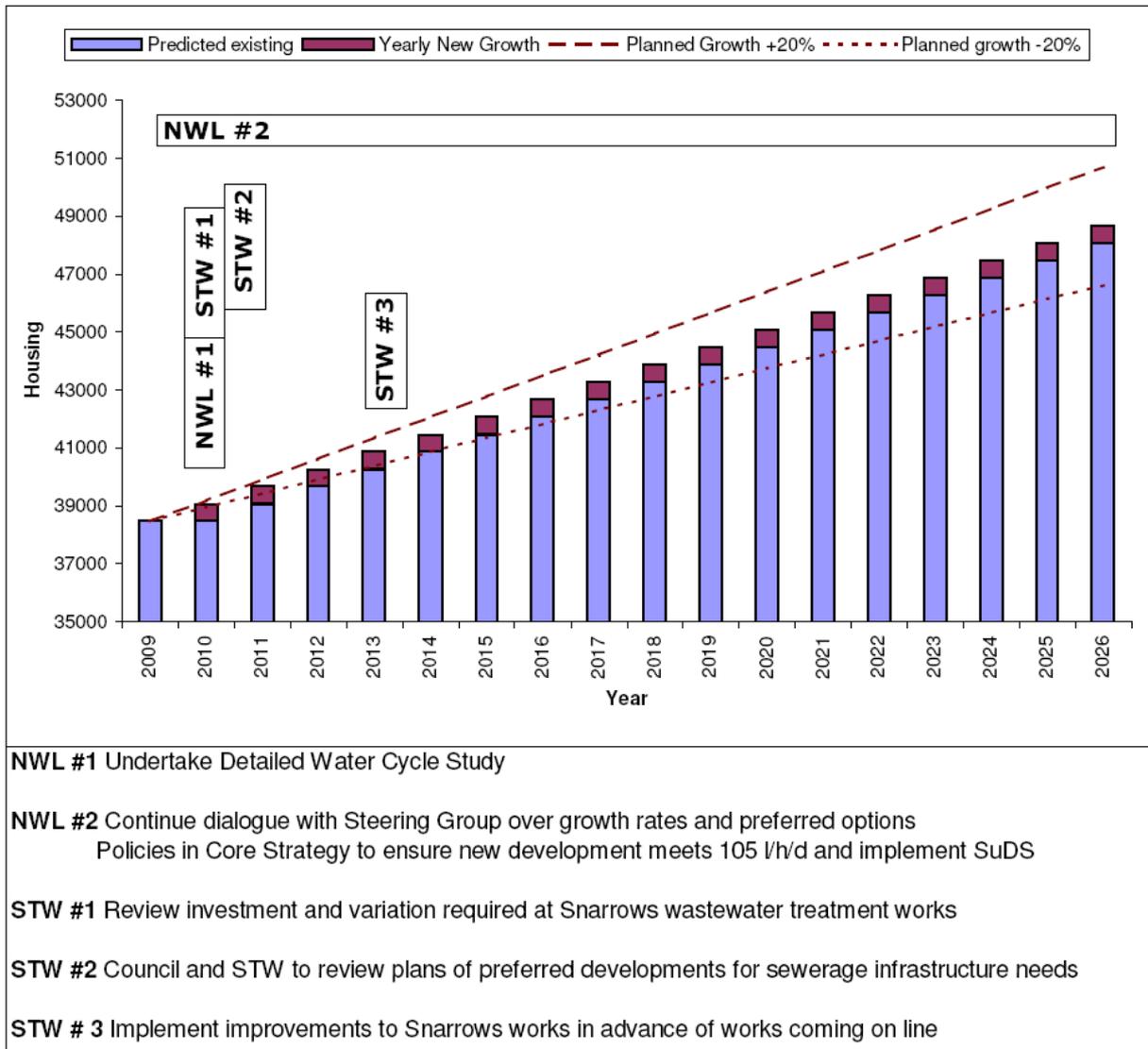
continue the stakeholder engagement through regular steering group meetings and promote ongoing dialogue between the local authorities and the water companies for monitoring and assessing the impacts of growth on the water resources management in the study area

8.4 Infrastructure and Policy Strategy

To incorporate the future recommendations, the development strategy presented in Figure 8.1 below has been developed. This includes the recommendations for policy and actions described above, and should be used to develop the detailed water cycle strategy for the District over the growth period.



Figure 8.1 Proposed Strategy for Infrastructure and Policy



NWL = Council responsibility, STW = Severn Trent responsibility



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Appendix A Water Resources



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Water Resources Management

In order to identify the potential constraints of water supply and the water environment it is necessary to understand how water resources are managed. Severn Trent Water is responsible for providing water supplies in this area. The following section introduces and summarises the planning process undertaken by water companies. It describes how water resources are managed at a strategic rather than local scale, which explains why sources and environmental pressures that may be a considerable distance from the study area are relevant.

Water Company Water Resource Management Plans

On a five yearly basis the water companies in England and Wales set out their long term requirements for maintaining and enhancing their water supply and wastewater infrastructure in their Strategic Business Plans. These plans are submitted to the financial regulator, the Water Service Regulation Authority (Ofwat). In addition to the Strategic Business Plans, the water companies must also submit a Water Resources Management Plan (WRMP) to Environmental regulator, the Environment Agency. These plans set out in detail how the water companies plan to balance supply and demand for water in their supply area over a 25 year period and take into account the economic, environmental and social implications of these plans. These plans, previously known as Water Resources Plans (WRPs) are reviewed and updated on a five yearly basis and submitted to the Environment Agency and Defra for approval. The last WRP was produced in April 2004. Since that time the plans have become a Statutory requirement under the Water Act 2003. The next WRMP is due to be completed later in 2009, although the water companies prepared and published their draft WRMPs for consultation in May 2008.

The Strategic Business Plans form part of the Periodic Review (PR) process whereby Ofwat, in consultation with other organisations including Defra, the Environment Agency, Natural England and consumer organisations, determines the expenditure that the water companies can make to maintain and enhance their infrastructure. The outcome of this determination is an Asset Management Plan (AMP) for the following five-year period.

The current (fourth) AMP period finishes in 2009 and the water companies are currently in the process of preparing their Strategic Business Plans covering the next AMP Period (AMP5), setting out their funding requirements for the period 2010 to 2015.

Levels of Service, Water Resource Zones and Water Company Planning

When planning future water resources the water companies aim to achieve 'levels of service' for customers, which are agreed with the water regulator, Ofwat. Each company has its own level of service, which states how frequently it expects to impose water use restrictions during periods of water shortage. Levels of service are important as they determine the investment required to maintain secure supplies of water and prevent more frequent restrictions than the companies' stated levels of service.

In the WRMPs, the water companies set out their plans for water resource provision at the sub-company level, in areas called water resource zones (WRZs). A WRZ is defined as "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 shortfall” (Environment Agency, 2008, section 5.5).

It is important to be aware that the water company plans are based on theoretical circumstances. For each water resource zone the water companies produce plans under a “dry year” scenario, ensuring that demand for water can be met for the agreed levels of service during a dry or drought period. All water companies produce plans to ensure that the annual average demand for water can be met during a dry year. The water companies use records of actual demand data and carry out a statistical process to ‘normalise’ this data and then they apply uplift factors to create a theoretical dry year annual average (in which the same demand is planned for every day of the year). Where water companies identify that the ability to meet short-term peaks in demand in a dry year is a driver for additional water supply investment, companies may also submit plans for a WRZ under peak or “critical period” conditions.

The forecast situation, constrained by existing policies and supply sources, is known as the ‘baseline’. Where a shortfall in supply capability is identified in the baseline, the water company identifies schemes to resolve the situation. These schemes are generally a combination of demand management and resource development, in line with the ‘twin-track’ approach to water management. It should be noted that, to ensure secure water supply, the water companies take uncertainties into account in their Water Resource Management Plans. These uncertainties include, for example, how climate change may affect demand and resource availability in the future.

Water Resource Zone Forecast Supply-Demand Balance

The water companies’ draft WRMPs set out how the companies intend to balance supply and demand over the next 25 years. The plan is based on forecasts of demand and supply. The demand forecast takes account of expected levels of per capita consumption and forecast population at a zonal level.

The baseline supply forecast takes account of the existing available sources, expected losses due to climate change and environmental pressures, and future additional sources which were approved in the previous WRP. Therefore, before exploring the potential environmental constraints within which future growth needs to be accommodated, it is necessary to identify the baseline situation (i.e. to identify any deficits in the forecast supply-demand balance) in each water resource zone.

The draft plan included a significant deficit in the East Midlands zone (up to 100MI/d by 2030/31 in the baseline). However, in its Statement of Response Severn Trent Water says that in the Final WRMP (yet to be published) the Company has removed the headroom deficit by the end of AMP 5 (2014/15) and beyond that target headroom will be maintained until the end of the planning period (2034/35). Since publishing its draft WRMP STW has recalculated deployable output and it has reduced from 892MI/d to 889MI/d in the East Midlands zone. This is forecast to remain constant at 892MI/d across the planning period. In its Business Plan the Company says there will be small changes to modelled baseline deployable output in the final plan. During the consultation on the draft WRMP, Natural England pointed out that the uncertainties in resource availability due to Restoring Sustainable Abstraction, the WFD, time limited licences, and CAMS are potentially huge. Severn Trent Water has said that it



has removed the deficit in the Final Plan, and that the revised deployable output does not include yield from sites that are affected by RSA.

Severn Trent Water reports that pressure from population and demand is increasing as the population continues to grow, households become smaller (water use in smaller households is less efficient than in larger family based households), and population demographics change. The Company has experienced a significant reduction in industrial demand and has attributed this as the result of the recession. Future demand for water is affected by the depth and duration of the economic recession and long term projections forecast a greater reduction in commercial consumption than in the draft plan (which forecast approximately 20MI/d reduction over the planning period). The Company reports that the recent decline has been extreme and this is projected to continue in 2009/10, and to be felt through AMP5. In its Statement of Response STW forecasts commercial consumption will be approx 25MI/d less in 2010 than originally forecast in the draft WRMP. By 2025/26 commercial use could be up to 60MI/d less than in the draft WRMP.

Per Capita Consumption Forecasts – Draft WRMP

Dry year per capita consumption.

*Severn Trent Water has reassessed its pcc forecast (shown in the table below in litres per head per day) for issue in the Final WRMP.

PCC Category	Baseline Measured	Final Strategy Measured	Baseline Unmeasured	Final Strategy Unmeasured	Baseline Average PCC	Final Strategy Average PCC
2006-07	123.15	123.15	145.43	145.43	139.36	139.36
2007-08	124.24	124.24	144.89	144.89	138.98	138.98
2008-09	125.33	125.33	144.36	144.36	138.66	138.66
2009-10	126.34	126.34	143.79	143.79	138.34	138.34
2010-11	127.24	127.81	143.23	141.69	138.03	137.14
2011-12	128.16	128.87	142.63	140.82	137.74	136.73
2012-13	128.96	129.77	142.02	139.91	137.44	136.29
2013-14	129.71	130.56	141.40	138.96	137.16	135.84
2014-15	130.40	131.30	140.74	137.99	136.86	135.41
2015-16	131.04	131.93	140.06	136.96	136.57	134.95
2016-17	131.63	132.49	139.36	135.91	136.28	134.49
2017-18	132.39	133.21	138.87	135.03	136.21	134.26



PCC Category	Baseline Measured	Final Strategy Measured	Baseline Unmeasured	Final Strategy Unmeasured	Baseline Average PCC	Final Strategy Average PCC
2018-19	133.12	133.87	138.36	134.13	136.15	134.02
2019-20	133.81	134.47	137.84	133.18	136.10	133.77
2020-21	134.47	135.03	137.30	132.20	136.04	133.52
2021-22	135.10	135.56	136.75	131.20	136.00	133.29
2022-23	135.70	136.02	136.17	130.13	135.95	133.03
2023-24	136.28	136.46	135.59	129.04	135.92	132.79
2024-25	136.83	136.85	134.98	127.89	135.88	132.53
2025-26	137.37	137.22	134.37	126.71	135.86	132.29
2026-27	137.91	137.59	133.76	125.51	135.86	132.07
2027-28	138.46	137.98	133.16	124.31	135.90	131.90
2028-29	139.00	138.34	132.56	123.05	135.96	131.73
2029-30	139.54	138.71	131.94	121.76	136.03	131.58
2030-31	140.02	138.99	131.27	120.35	136.05	131.38
2031-32	140.47	139.24	130.56	118.86	136.07	131.16
2032-33	140.89	139.46	129.89	117.50	136.12	131.02
2033-34	141.29	139.65	129.05	115.61	136.10	130.70
2034-35	141.67	139.82	128.24	113.84	136.10	130.44



Appendix B Catchment Abstraction Management Strategies



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Summary of CAMS for the East Midlands Resource Zone

The table below provides a more detailed version of Table 4.4 and compares the CAMS with investigations under the Restoring Sustainable Abstraction process (RSA).

Table B1 Summary of CAMS Assessments

CAMS	Assessment	RSA investigations (2010-2015)*
Catchments providing a large amount of public water supply:		
Derbyshire Derwent	>1,000MI authorised to be abstracted per day for PWS. The sub unit containing the reservoirs = over licensed under all flow conditions. The remaining sub units are over licensed or have No Water Available.	Derwent Valley River Noe River Ashop
Tame, Goyt, and Etherow	The catchments upstream of the reservoirs have not been assessed . These reservoirs are operated by Severn Trent Water. 81% of all licensed abstraction volumes are for PWS.	
Dove	This catchment is over abstracted . Carsington water is a major reservoir used by Severn Trent Water to supply the East Midlands zone (Tittesworth reservoir is outside of the zone). Egginton is a large surface water source, licensed to abstract 236MI/d, approximately 15% of the total licensed quantity for the zone. Deployable output of this source is less than the full licensed quantity. Consequently, the impact of a reduction in this licence on the Company's ability to secure public water supply would depend on the size of the reduction, particularly if this is large enough to reduce its deployable output.	Egginton on River Dove Carsington reservoir Henmore Brook
Idle and Torne	This catchment is over abstracted . >50% of the water abstracted is used for PWS. Anglian Water and Yorkshire Water also abstract from this catchment. The efficient use of water by direct abstractors and public water supply customers will be extremely important to achieve improvements with significant reductions in usage.	Rainworth Water EA will seek to regain as much licensed water as possible for the environment in this area.
Lower Trent and Erewash	Most of this catchment is over abstracted, over licensed or has no water available . There is some water available in the fluvial Trent. The EA intends to maintain the status as 'Water Available' and so would grant further abstraction licences subject to appropriate flow conditions. All new licences will have a time limit of 31 March 2015. New applications for groundwater will be subject to normal determination criteria. Where a proposed abstraction could impact on a Habitat Directive SPA and/or SAC site, the impact of each licence on that site will be assessed under the Habitats Regulations process. Approximately a quarter of the study area is within this catchment.	River Greet Dover Beck



Table B1 (continued) Summary of CAMS Assessments

CAMS	Assessment	RSA investigations (2010-2015)*
Catchments providing a small amount of public water supply:		
Soar	<p>Most of this catchment has “water available’ at low flows. However, the EA strategy is to move to No Water Available to enable continued development of water resources without compromising the ecological flow requirements within the catchment.</p> <p>The Sherwood Sandstone and Charnwood aquifers are classified as major aquifers but with limited outcrops they are not considered to be strategic groundwater resources in a regional context, although they are locally significant.</p> <p>Approximately a quarter of the study area is within this catchment.</p>	Charnwood reservoir
Tame and Anker	<p>There is ‘no water available’ in the River Mease (including the Measham groundwater unit). There is some water available in the wider area from the rivers Tame, Anker, Cole, Rea, Bourne and the River Trent from the Tame to the Dove (and the Birmingham, Sutton, Nuneaton, Coleorton and Warton groundwater units). However, much of this is outside of the East Midlands zone.</p> <p>Approximately a quarter of the study area is within this catchment.</p>	River Blythe (outside of East Midlands zone)
Catchments with no significant public water supply abstractions by Severn Trent Water		
Staffordshire Trent Valley and Mease	<p>Abstractions within this catchment are predominantly for industrial and agricultural use. The catchment is a net importer of water from the Elan Valley for PWS and is discharge dominated and impacted greatly by the large sewage treatment works at Minworth (approx 16km west of the study area).</p> <p>Six miles of the River Sence are managed as a trout fishery.</p> <p>Approximately a quarter of the study area is within this catchment.</p>	
Don and Rother	<p>Some water available in upper and lower Rother catchments. Abstraction in this area accounts for only a small amount of the total licensed volume in the catchment and most of this is for industrial use.</p>	
Welland	<p>The sub catchments lying within the East Midlands resource zone are over abstracted.</p> <p>Import from Rutland Water which is the dominant PWS feature in the Welland catchment. Any new consumptive licence for abstraction during low flows, upstream of this abstraction, would derogate AWS’s PWS licence.</p>	



Table B1 (continued) Summary of CAMS Assessments

CAMS	Assessment	RSA investigations (2010-2015)*
Warwickshire Avon	<p>Rugby, Upper Avon and R. Swift catchment = over abstracted. The strategy for this WRMU is to move to over-licensed by encouraging reduction in licensed quantities for public water supply licences that are not fully used. The influence of the reservoirs and public water supply licences are the main factors impacting on the licensing strategy in this unit. A more detailed modelling study of the reservoirs is required before it would be justified to pursue more drastic measures in terms of taking back resources.</p> <p>Public water supply and industrial use account for 88% of the water abstracted in the whole catchment (outside of East Midlands zone).</p>	





Appendix C Planned Growth in Adjacent Areas



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Planned Growth in East Midlands Resource Zone

Other major towns and cities in the East Midlands zone, sharing the resources that are available include Chesterfield, Worskop, Mansfield, Newark on Trent, Nottingham, Derby, Loughborough, and Leicester. Figure C1 shows the other local authority areas which are supplied by the East Midlands water resource, with the annual growth rate taken from the East Midlands Plan (March 2009). Table C2 presents this in comparison with the growth figures taken from Severn Trent Water's draft WRMP.

The figures in Table C1 suggest a shortfall in the East Midlands zone housing forecast. Severn Trent Water calculated its forecast using the data that was available in early 2008. It should also be considered that the relationship between housing numbers and demand is not linear. The increase in the number of houses is not expected to translate into an equal increase in the number of people living in the area. Severn Trent Water forecast its population based on population data from the Office of National Statistics. The impact of changing household projections is expected to affect occupancy rate rather than population (although occupancy rate has an impact on per capita consumption).

The water company monitors housing numbers and population annually and reviews its demand and supply forecast every five years. In the longer term uncertainty around new housing numbers and resultant water consumption has been included in the headroom assessment.



Figure C1 Local Authority Areas in the East Midlands Resource Zone

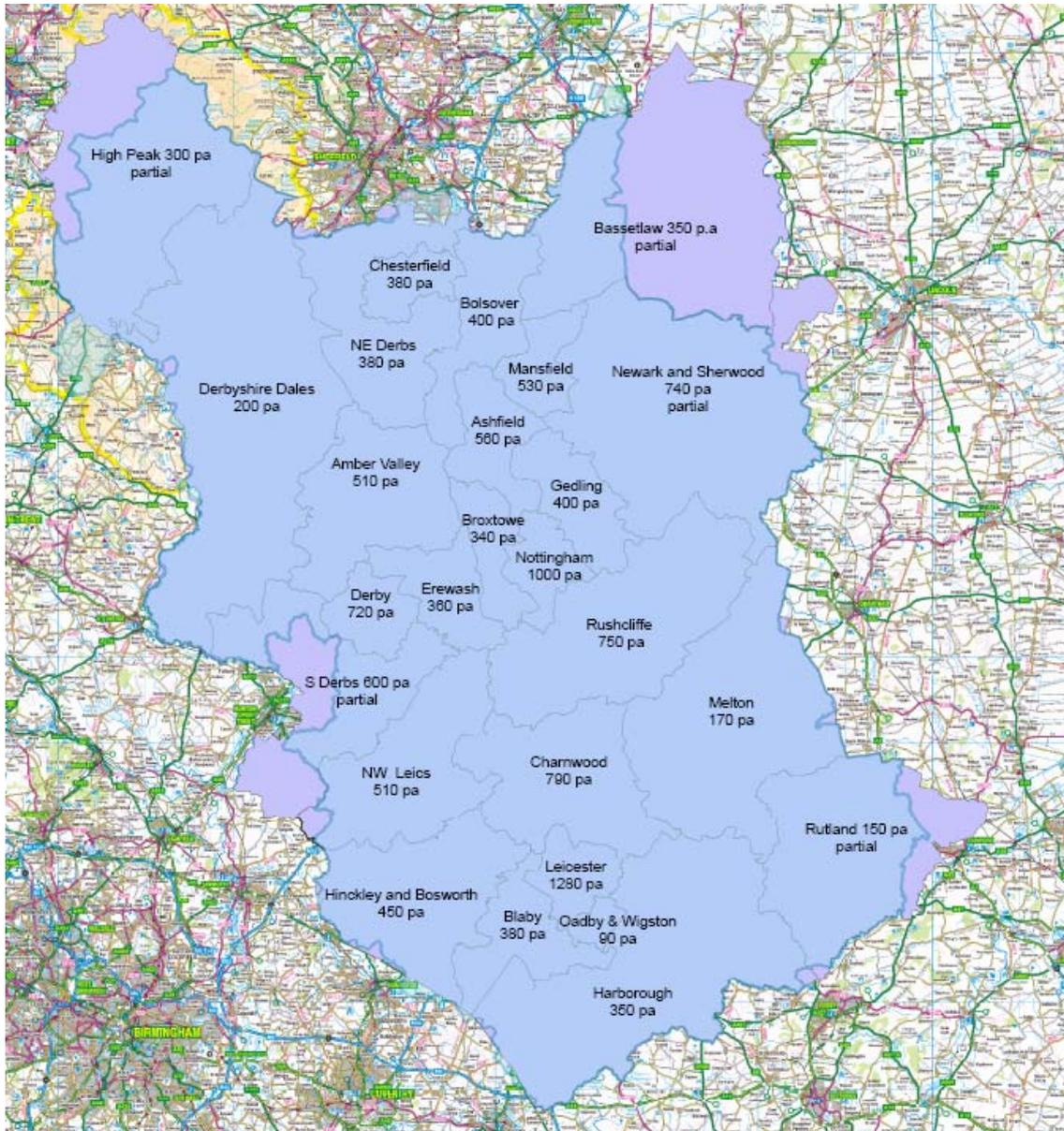


Table C1 New Homes Planned in East Midlands Resource Zone

Local Authority	Annual growth rate*	Growth between 2006-2016	Growth between 2006-2026
Rutland	150	1500	3000
Nottingham Outer HMA	1830	18300	36600
Ashfield (inc Hucknall)	560	5600	11200
Mansfield	530	5300	10600
Newark & Sherwood	740	7400	14800
Northern HMA	1510	15100	30200
Bolsover	400	4000	8000
Chesterfield	380	3800	7600
NE Derbyshire	380	3800	7600
Bassetlaw	350	3500	7000
Peak, Dales & Park HMA	500	5000	10000
Derbyshire Dales	200	2000	4000
High Peak	300	3000	6000
Derby HMA	1830	18300	36600
Derby	720	7200	14400
Amber Valley	510	5100	10200
South Derbyshire	600	6000	12000
Leicester & Leicestershire HMA	4020	40200	80400
Leicester	1280	12800	25600
Blaby	380	3800	7600
Charnwood	790	7900	15800
Harborough	350	3500	7000
Hinckley & Bosworth	450	4500	9000
Melton	170	1700	3400
NW Leicestershire	510	5100	10200
Oadby & Wigston	90	900	1800
Nottingham Core HMA	2850	28500	57000
Erewash	360	3600	7200



Table C1 (continued) New Homes Planned in East Midlands Resource Zone

Local Authority	Annual growth rate*	Growth between 2006-2016	Growth between 2006-2026
Nottingham (city)	1000	10000	20000
Broxtowe	340	3400	6800
Gedling	400	4000	8000
Rushcliffe	750	7500	15000
Sum:	12,690	126,900	253,800
STW East Mids zone	Approx 11,400	102,610	216,301

* East Midlands Regional Plan, March 2009



Appendix D Detail of Designated Sites



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Designations

The table below presents a list of the designated sites in the study area with the reason for their designation.

Table D1 Designated Sites within the Study Area

Type of designation	Name	Reason for designation
Special Area of Conservation (SAC)	River Mease	<p>The Mease is an example of bullhead <i>Cottus gobio</i> populations in the rivers of central England. Bed sediments are generally not as coarse as other sites selected for the species, reflecting the nature of many rivers in this geographical area, but are suitable in patches due to the river's retained sinuosity. The patchy cover from submerged macrophytes is also important for the species.</p> <p>The River Mease is a good example of a riverine population of spined loach <i>Cobitis taenia</i>. It is a small tributary of the River Trent and has retained a reasonable degree of channel diversity compared to other similar rivers containing spined loach populations. It has extensive beds of submerged plants along much of its length which, together with its relatively sandy sediments (as opposed to cohesive mud) provides good habitat opportunities for the species.</p>
Site of Special Scientific Interest (SSSI)	Lockington Marshes	The site has one of the largest remaining areas of willow woodland in Leicestershire and a diverse complex of wetland habitat supporting an important invertebrate fauna with many nationally scarce species.
	Blackbrook Reservoir	<p>Blackbrook Reservoir lying on the northern fringe of Charnwood Forest, supports an unusual marginal plant community unique to the English Midlands.</p> <p>The water is mesotrophic, derived from the mix of acid base-poor Precambrian rocks and the more fertile base-rich Triassic and glacial deposits.</p> <p>The reservoir has locally important flocks of wintering wildfowl and supports breeding great crested grebe and little grebe.</p>
	One Barrow Plantation	Part of the site falls within the existing biological Site of Special Scientific Interest known as Blackbrook Reservoir, see above.
	Charnwood Lodge	<p>Charnwood Lodge contains the best and most extensive examples of moorland habitats in the East Midlands. It is dominated by a series of rocky outcrops and ridges of considerable geological importance.</p> <p>The wet heath habitat is well represented at Charnwood Lodge. Large areas are dominated by purple moor-grass, with heather and cross-leaved heath locally abundant. Associated species can be found at the site that are rare in Leicestershire.</p>



Table D1 (continued) Designated Sites within the Study Area

Type of designation	Name	Reason for designation
	Newton Burgoland Marshes	The site includes some of the best remaining examples of neutral alluvial grassland and marsh in Leicestershire and is representative of such habitats in Central and Eastern England.
	River Mease	See above
	Ashby Canal	The Ashby Canal supports communities of aquatic and emergent plants that are representative eutrophic standing water bodies in the English lowlands. The diversity of aquatic plants and invertebrates makes this one of the most important water bodies of its type in the East Midlands.



Appendix E River Mease Additional Information



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Environment Agency's Position Statement (August 2009)

Development in the River Mease Catchment

Our Role

The Environment Agency is a consultee to the planning process and makes comment on a wide range of planning applications including residential developments. Our role here is simply to protect and improve the environment. We will carry out this role by ensuring that the potential for a development to cause environmental deterioration is assessed and mitigated.

It is a requirement of the Water Framework Directive that waste water and sewage effluent produced by new developments is dealt with to ensure that there is no deterioration in the quality of the water courses receiving this extra volume of treated effluent. Furthermore part of the Environment Agency's remit here is to seek long term improvements in water quality both in terms of its chemical and biological quality.

The River Mease Catchment

Ashby de la Zouch is situated in the River Mease catchment and this is one of the most sensitive river catchments in terms of water quality within the midlands region.

Part of the River Mease and the Gilwiskaw Brook is designated a Special Area of Conservation under the EU Habitats Directive, this highlights the sensitivity of the river to pollution and the need to prevent any future deterioration of the quality of the river water in this area.

The river is at saturation point in terms of the amount of treated effluent it already receives and the River is currently failing its water quality targets for phosphate. As such the Environment Agency is seeking ways to improve the water quality in this river to ensure that it is compliant with the Water Framework Directive and Habitats Directive.

It is therefore unlikely that the River Mease would be able to deal with any increase in the amount of effluent it receives without a serious drop in the quality of its water, which would in turn threaten the wildlife that is dependant on the river for its habitat.

Applications for Planning Permission

We are advising the Planning Authority that any applicant must ensure that the sewerage treatment facility and sewage disposal systems have sufficient capacity to accommodate and adequately treat the additional sewage generated by any new development.



We will object to all discharges to the River Mease catchment unless it can be demonstrated by the applicant when submitting a planning application that the additional effluent from the proposed development will not cause deterioration of the quality of the receiving water course and/or a breach of the sewage works discharge consent.

It may be an option to expand or upgrade sewage treatment in the area, however if this is not possible we would advise that alternative arrangements are examined for the disposal of sewage in the River Mease Catchment to ensure the sustainable improvement in the quality of the water courses in this area.

Current Projects in the Mease Catchment (2009)

The Environment Agency is currently working on the following projects along the River Mease:-

- A programme of pollution prevention visits to farms within the catchment;
- As part of the Upper Trent Catchment Sensitive Farming Initiative (also included Tame and Anker, Blyth) – 2006-2008 - a number of events were carried out including one to one farm visits, on-farm demonstrations and resource management workshops;
- Targeting data collection and sampling within the catchment and tie in with WFD pollution investigations; and
- Developing a water quality management plan (WQMP) for the River Mease SAC catchment. This will also highlight the fact that in order to tackle diffuse pollution it will not be solely the remit of the EA. Other competent authorities (e.g. National Farming Union, Farming and Wildlife Advisory Group, Natural England, Local Authorities, Local Interest Groups etc) will also need to play their part in order to reduce diffuse pollution as this will fall under WFD and not Habitats Directive Review of Consents.

Furthermore, Natural England (NE) is working on the following projects to tackle diffuse pollution from agriculture in the River Mease catchment:-

- Actively targeting Environmental Stewardship through the Higher Level Stewardship (HLS) agreements to better address agricultural runoff. NE have set up a River Mease action group, which is chaired by the River Mease SAC Lead Adviser. This action group draws together Higher Level Stewardship advisers from Leicestershire, Derbyshire and Staffordshire to ensure a joined up approach to ensure pro-active targeting across counties and Natural England regions. Advisers are currently targeting landowners within the River Mease Catchment who are not addressing diffused pollution. Incentives such as Higher Level Stewardship are being offered around to address resource protection. This adviser has also been trying to identify any missed connections that are discharging to the Mease;
- A River Mease Catchment Adviser has been employed by NE since October 2009. This is to identify and locate areas of agricultural run-off/ diffused pollution across the entire catchment area. This information will be invaluable to ensure we have an effective targeted approach, and will be fed to HLS advisor and other NE and partner organisations when completed in March 2010;



- They are planning to hold an ELS/HLS promotional workshop for Derbyshire landowners who currently have ELS across their holding but whose options do not address resource protection;
- NE are working very closely with the Environment Agency who has already identified areas which are within the flood plain could be re-wetted. Landowners of these areas are being targeted;
- They are also looking into run-off from the A42 and plan to meet and discuss with the Highways Agency shortly; and
- The SSSI Lead Adviser for the River Mease SAC and the regional Adviser are also actively targeting landowners who farm directly along the river bank to secure appropriate management.

Through the planning system NE have adopted a position that ensures no increase in discharge occurs to the River Mease driven by the SAC designation, and the 0.06mg/l Phosphate target, if a new development does not meet this discharge then we advise the relevant local authority that the development is not Habitats Regulation compliant, and object. NE also requires that new development and any mitigation proposed is WFD compliant. This position leads NE objecting to single dwellings, change of use, discharge of drainage conditions and large development.

NE is engaging with developers regarding the possibility of wetland creation along the Mease as mitigation to strip out Phosphorous, although this is fairly difficult to get the capital funding for.

Humber RBMP Action for River Mease (2009)



N2K Protected Area in Humber River Basin District (River Mease SAC)

Protected Area name River Mease SAC	Protected Area designation Habitats Directive (Council Directive 92/43/EEC): http://www.jncc.gov.uk/page-1374 Detailed site information: http://www.natureonthemap.org.uk/	Is the Protected Area meeting its environmental objectives as required by Article 4 (1c)?	N
		If not, date for achieving environmental objectives	2015
If extended, justification provided at end of this table			

Overall objective for Protected Area:

Favourable Conservation Status (to protect and, where necessary, improve the water or water-dependent environment to the extent necessary to maintain at or improve to Favourable Conservation Status the water-dependent habitats and species for which the Protected Area is designated)

Water-dependent habitats or species for which the Protected Area was designated (interest features):

Bullhead (S1163); Otter (S1355); Rivers with floating vegetation often dominated by water-crowfoot (H3260); Spined loach (S1149); White clawed crayfish (S1092)

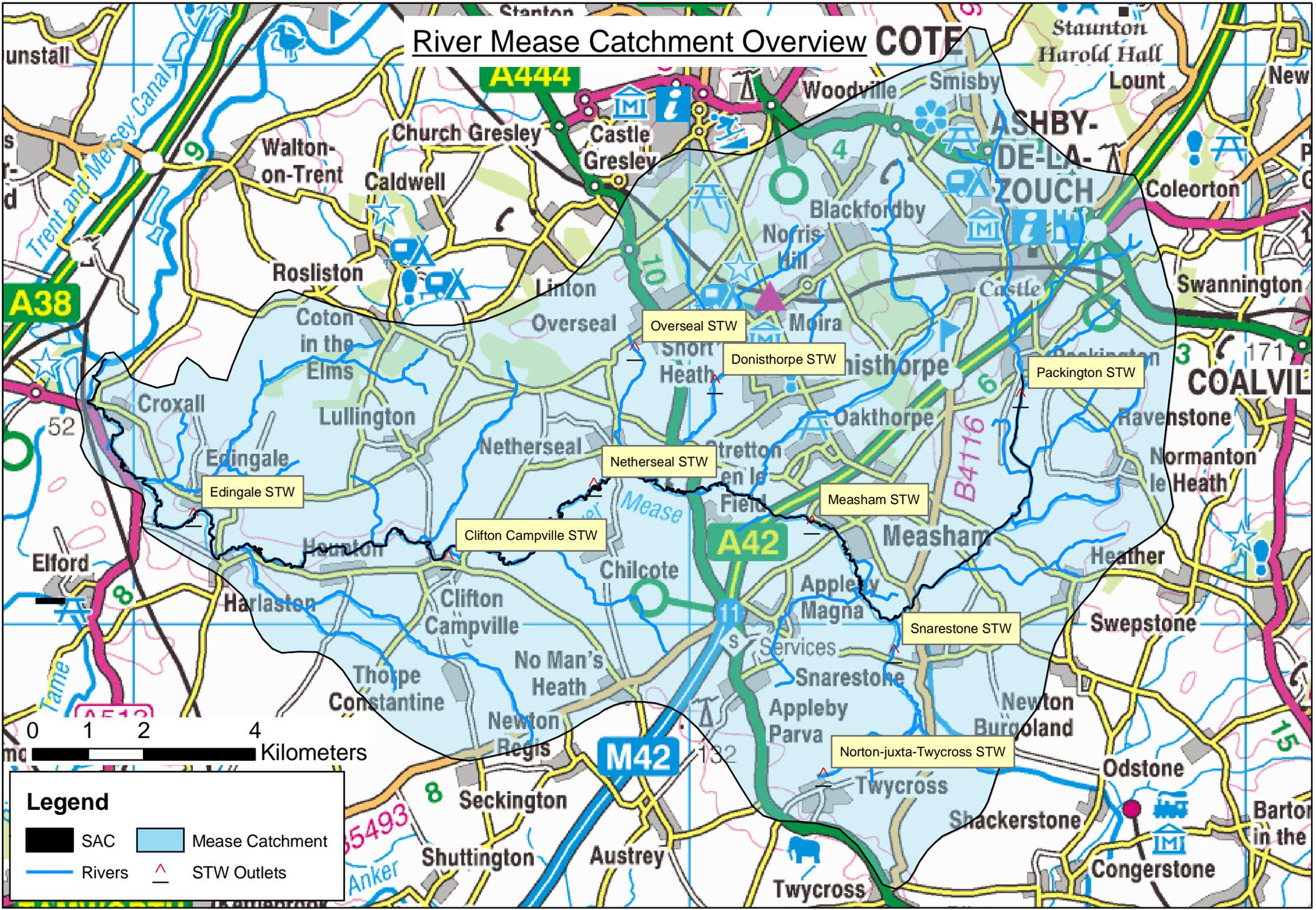
Waterbody ID:

GB104028046560; GB104028046570; GB104028046590

Reason for feature/s not meeting objective		Measures proposed to maintain at, or improve to, Favourable Conservation Status		Measure to be made operational no later than
Attribute	Reason	Measure	Organisation responsible	
Hydrology	- Drainage	Undertake specific management works	Highways Agency	2012
Hydrology	- Water abstraction	Abstraction licence - revoke or amend	Environment Agency	2012
Invasive Species	- Invasive freshwater species	Invasive Species Control Programme for Protected Areas	Natural England	2012
Morphology	- Inland flood defence works	Flood management programme	Environment Agency	2012
Water Quality	- Water pollution - agriculture/run off	Develop pollution action plan (evaluate impacts and apply appropriate solution, eg CSF, WPZ or control of discharges)	Natural England	2012
Water Quality	- Water pollution - agriculture/run off	Develop pollution action plan (evaluate impacts and apply appropriate solution, eg CSF, WPZ or control of discharges)	Environment Agency	2012
Water Quality	- Water pollution - discharge	Discharge consent - revoke or amend	Environment Agency	2012
Water Quality	- Water pollution - discharge	Implement AMP scheme	Severn Trent Water Ltd	2012



River Mease Catchment Overview



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Appendix F Humber River Basin Management Plan Actions



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The Humber River Basin District is one of the most diverse regions in England ranging from the upland areas of the White and Dark Peak in Derbyshire, the Southern Pennines, Yorkshire and North York Moors to the Yorkshire Wolds and the lowlands to the east.

Agriculture dominates the landscape of the Humber River Basin District, accounting for over 70% of land use. The rural areas range from small, settlements with a continuing reliance on hill farming, forestry and quarrying, through small settlements which are also important as service and employment centres, to the urban fringe areas and communities which mining, extraction and heavy industries once supported. The lowlands in the east and river valleys such as the Trent, Ouse and Humberhead Levels support a wide range of productive arable and livestock farming.

Agriculture, forestry and moorland management all have the potential to impact on the water environment. Although overall the number of direct pollution incidents from agriculture and forestry has decreased in recent years, in some areas there is the need to reduce the impact of diffuse pollution on rivers and ground waters from manures, sediment, fertilisers and pesticides. Much can be achieved by improved soil management and adoption of best practice. Good land management not only cares for the places we value, but it can also reduce the impact on the water environment and provide cost savings for farmers as well as benefits for the wider rural economy.

The actions from the draft RBMP relevant to the study area are presented below.



Pressure	Description of the Action				Means of Delivery	Lead Organisation/ Partners	Driver for Action
	What will happen	Where it will happen	Catchment	When it will happen			
Scenario A - What is already happening and what will happen (M1, M2 and M3a measures and No deterioration actions)							
Abstraction	Availability of grants for construction of irrigation and industrial supply reservoirs	East Midlands Development Agency are offering RDPE funding for Water Resource Management projects such as irrigation reservoirs during the period 2007-	Targeted Catchments across the RBD	2008	Cooperative agreements or financial incentives	Regional Development Agencies	WFD - basic measure (Art 11.3 c)



		2013.					
Abstraction	Encourage farmers and Industry to build storage to support summer irrigation	The Midlands region in partnership with Anglian region and other external organisations has produced a booklet on irrigation reservoirs. This will be promoted at farm events and to relevant organisations eg planners, bankers etc in conjunction with water efficiency messages.	Targeted Catchments across the RBD	2008	Cooperative agreements or financial incentives	Environment Agency, Industry	WFD - basic measure (Art 11.3 c)



Chemicals	Suspension (temporary) on use as sheep-dip	National	Targeted Catchments across the RBD	Dependent on decision on future of cypermethrin sheep dip	UK Marketing and Use Legislation	VMD	
Hazardous substances and other pollutants (GW prevent and limit)	Agri-environment schemes/ Environmental Stewardship payments for best practice to control agri-chemicals (England only)	National	Targeted Catchments across the RBD	Ongoing	Environmental Stewardship Scheme	All land managers	Groundwater Directive
Hazardous substances and other pollutants (GW prevent and limit)	Apply for permits for disposal of sheep dip and pesticides	National	Targeted Catchments across the RBD	Ongoing	Groundwater Regulations Reg 18	All land managers making relevant disposals	Groundwater Directive
Hazardous substances and other pollutants (GW prevent)	Proactive targeted farmer education on control of agri-chemicals	England Catchment Sensitive Farming Delivery Initiative – current	Yorkshire Derwent, Hull and East Riding, Louth Grimsby and Ancholme,	Ongoing	Voluntary action and education	All land managers in designated catchments	Government Policy



and limit)		catchments	Swale Ure Nidd and Ouse, Derbyshire Derwent, Esk and Coast				
Hazardous substances and other pollutants (GW prevent and limit)	Enforcement of Groundwater Regs to control agri-chemicals through cross compliance	National	Targeted Catchments across the RBD	Ongoing	Rural Payments Agency Single Payment Scheme	Rural Payments Agency	Nitrates Directive, CAP Cross-Compliance and Single Farm payment
Hazardous substances and other pollutants (GW prevent and limit)	Comply with General Binding Rules, new regulatory approach from implementation of GWDD	National	GW Targeted Catchments across RBD	2012	New Groundwater Regulations 2008	All land managers making relevant disposals	Groundwater Directive
Hazardous substances and other pollutants (GW prevent and limit)	Comply with new EC Sustainable Use of Pesticides Directive to control use of Plant Protection Products	Applies across the whole of the EU	GW Targeted Catchments across RBD	EU timetable	EC	All land managers	Groundwater Directive



Hazardous substances and other pollutants (GW prevent and limit)	Follow Pesticides Statutory Code of Practice Published advice for operators	National	GW Targeted Catchments across the RBD	Ongoing	Voluntary action and education	All land managers	Groundwater Directive
Hazardous substances and other pollutants (GW prevent and limit)	Follow Sheep Dip Statutory Code of Practice Published advice for operators	National	GW Targeted Catchments across the RBD	Ongoing	Voluntary action and education	All land managers	Groundwater Directive
Hazardous substances and other pollutants (GW prevent and limit)	Follow Statutory Code of Good Agricultural Practice. Published advice for operators on control of agri-chemicals	National	GW Targeted Catchments across the RBD	Ongoing	Voluntary action and education	All land managers	Groundwater Directive
Hazardous substances and other pollutants (GW prevent and limit)	Groundwater Protection: Policy & Practice - external education on GW pollution prevention	National	GW Targeted Catchments across the RBD	Ongoing	Voluntary action and education	All land managers	Groundwater Directive
Hazardous substances and other pollutants (GW prevent and limit)	Local agricultural partnerships e.g. LEAF, NGOs such as Rivers Trusts, Landcare, Farming & Wildlife Advisory Group – advice on use of agri-chemicals	National	GW Targeted Catchments across the RBD	Ongoing	Voluntary action and education	All land managers	Groundwater Directive
Hazardous substances and other pollutants (GW prevent and limit)	Registrations New regulatory approach from implementation of GWDD	National	GW Targeted Catchments across the RBD	2012	New Groundwater Regulations 2008	All land managers making relevant disposals	Groundwater Directive



Hazardous substances and other pollutants (GW prevent and limit)	Voluntary Initiative Educational and advice programme to minimise the environmental impact of pesticides	National	GW Targeted Catchments across the RBD	Ongoing	Voluntary action and education	All land managers	0
Nutrients	Enforcement of 2008 NVZ Action Plan	GWB	NVZ areas - Targeted Catchments across RBD	Ongoing	Inspection programme	Environment Agency	Nitrates Directive
Nutrients - Nitrate	Agri-environment Schemes/ Environmental Stewardship - payments for best practice to limit nitrate input (England only)	National	Targeted Catchments across the RBD	Ongoing	Environmental Stewardship Scheme	Natural England	0
Nutrients - Nitrate	Proactive targeted farmer education on nitrate control	England Catchment Sensitive Farming Delivery Initiative – current catchments	Yorkshire Derwent, Hull and East Riding, Louth Grimsby and Ancholme, Swale Ure Nidd and Ouse, Derbyshire Derwent, Esk and Coast	Ongoing	Voluntary action and education	All land managers in designated catchments	Government Policy
Nutrients - Nitrate	Enforcement of nitrate input restrictions in NVZ action plan through cross compliance	2008 Nitrate Vulnerable Zones	NVZ areas - Targeted Catchments across RBD	Ongoing	Rural Payments Agency Single Payment Scheme	Rural Payments Agency	Nitrates Directive, CAP Cross-Compliance and Single Farm payment
Nutrients - Nitrate	Enforcement of Sludge Regs through cross compliance	National	Targeted Catchments across the RBD	Ongoing	Rural Payments Agency Single Payment Scheme	Rural Payments Agency	CAP Cross-Compliance and Single Farm payment



Nutrients - Nitrate	Enforcement of nitrate input restrictions in NVZ action plan through cross compliance	2008 Nitrate Vulnerable Zones	NVZ areas - Targeted Catchments across RBD	Ongoing	Rural Payments Agency Single Payment Scheme	Rural Payments Agency	Nitrates Directive, CAP Cross-Compliance and Single Farm payment
Nutrients - Nitrate	Enforcement of Sludge Regs through cross compliance	National	Targeted Catchments across the RBD	Ongoing	Rural Payments Agency Single Payment Scheme	Rural Payments Agency	CAP Cross-Compliance and Single Farm payment



Nutrients - Nitrate	Comply with enhanced restriction on nitrogen loading to land	2008 Nitrate Vulnerable Zones	NVZ areas - Targeted Catchments across RBD	2010	Action Programme for Nitrate Vulnerable Zone (England & Wales) Regulations 2008	All land managers in NVZ	Nitrates Directive, CAP Cross-Compliance and Single Farm payment
Nutrients - Nitrate	Comply with General Binding Rules - new regulatory approach from implementation of GWDD	National	GW Targeted Catchments across RBD	2012	New Groundwater Regulations 2008	All land managers making relevant disposals	Groundwater Directive
Nutrients - nitrate	Establish and enforce Nitrate Vulnerable Zones in river catchments at a high risk from nitrate pollution, requiring farmers to follow a programme of measures to reduce nitrate entering the water from farmland.	Established by 2008 regs. Inspections will be targeted based on risk and evidence base.	Targeted Catchments across the RBD	2011	Nitrate Vulnerable Zone Regulations 1988	Environment Agency	Bathing Waters Directive, Shellfish Waters Directive
Nutrients - Nitrate	Comply with restriction on nitrogen loading to land	2002 Nitrate Vulnerable Zones	New 2008 designated zones	2005	Action Programme for Nitrate Vulnerable Zone (England & Wales) Regulations 1998	All land managers in NVZ	Nitrates Directive, CAP Cross-Compliance and Single Farm payment
Nutrients - Nitrate	Follow advice on nitrate control	2002 Nitrate Vulnerable Zones	New 2008 designated zones	Ongoing	Action Programme for Nitrate Vulnerable Zone (England & Wales) Regulations 1998	All land managers in NVZ	Nitrates Directive, CAP Cross-Compliance and Single Farm payment
Nutrients - Nitrate	Follow advice to farmers on nitrate control	2008 Nitrate Vulnerable Zones	Targeted Catchments across the RBD	Ongoing	Action Programme for Nitrate Vulnerable Zone (England & Wales) Regulations 2008	All land managers in NVZ	Nitrates Directive, CAP Cross-Compliance and Single Farm payment
Nutrients - Nitrate	Follow Statutory Code of Good Agricultural Practice. Published advice for operators on nitrate	National	GW Targeted Catchments	Ongoing	Voluntary action and education	All land managers	Water Resources Act



	control		across the RBD				
Nutrients - Nitrate	Groundwater Protection: Policy & Practice - external education on GW pollution prevention	National	GW Targeted Catchments across the RBD	Ongoing	Voluntary action and education	All land managers	Groundwater Directive
Nutrients - Nitrate	Local agricultural partnerships e.g. LEAF, NGOs such as Rivers Trusts, Landcare, Farming & Wildlife Advisory Group - Advice to farmers on nitrate control	National	Targeted Catchments across the RBD	Ongoing	Voluntary action and education	All land managers	Groundwater Directive
Nutrients - Nitrate	Registrations - New regulatory approach from implementation of GWDD	National	GW Targeted Catchments across the RBD	2012	New Groundwater Regulations 2008	All land managers making relevant disposals	Groundwater Directive
Organic pollutants, Nutrients, pesticides, sediment, faecal indicator organisms	Establish and maintain a nationally funded advised partnership under the Catchment Sensitive Farming Programme to reduce diffuse water pollution from agriculture in at risk catchments.		Yorkshire Derwent, Hull and East Riding, Louth Grimsby and Ancholme, Swale Ure Nidd and Ouse, Derbyshire Derwent, Esk & Coast	2009	Education and Advisory Programme through CSF	Environment Agency and Natural England	Bathing Waters Directive, Shellfish Waters Directive
Organic pollutants, Nutrients, Sediments, Habitat manipulation	Maintain the Entry Level Stewardship (ELS) Scheme offering farmers an incentive to achieve environmental benefits on agricultural land.	National	Targeted Catchments across the RBD	2009		Defra	Habitats Directive
Organic pollutants, Nutrients, Sediments, Habitat manipulation	Maintain the Higher Level Stewardship Scheme offering farmers an incentive to achieve environmental benefits over and above those required under the Entry Level Stewardship Scheme.	National	Targeted Catchments across the RBD	2009		Defra	Habitats Directive



Appendix G Tables D.2 and D.3 from PPS25 Annex D



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Table D.2: Flood Risk Vulnerability Classification

Essential Infrastructure	<ul style="list-style-type: none"> • Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk, and strategic utility infrastructure, including electricity generating power stations and grid and primary substations.
Highly Vulnerable	<ul style="list-style-type: none"> • Police stations, Ambulance stations and Fire stations and Command Centres and telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent.¹⁹
More Vulnerable	<ul style="list-style-type: none"> • Hospitals. • Residential institutions such as residential care homes, children’s homes, social services homes, prisons and hostels. • Buildings used for: dwelling houses; student halls of residence; drinking establishments; nightclubs; and hotels. • Non-residential uses for health services, nurseries and educational establishments. • Landfill and sites used for waste management facilities for hazardous waste.²⁰ • Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less Vulnerable	<ul style="list-style-type: none"> • Buildings used for: shops; financial, professional and other services; restaurants and cafes; hot food takeaways; offices; general industry; storage and distribution; non-residential institutions not included in ‘more vulnerable’; and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment plants. • Sewage treatment plants (if adequate pollution control measures are in place).

¹⁹ DETR Circular 04/00 – para. 18: *Planning controls for hazardous substances.*
www.communities.gov.uk/index.asp?id=1144377

²⁰ See *Planning for Sustainable Waste Management: Companion Guide to Planning Policy Statement 10* for definition.
www.communities.gov.uk/index.asp?id=1500757



Table D.2: contd.

Water-compatible Development	<ul style="list-style-type: none"> • Flood control infrastructure. • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel workings. • Docks, marinas and wharves. • Navigation facilities. • MOD defence installations. • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. • Water-based recreation (excluding sleeping accommodation). • Lifeguard and coastguard stations. • Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. • Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.
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Notes:

- 1) This classification is based partly on Defra/Environment Agency research on Flood Risks to People (FD2321/TR2)²¹ and also on the need of some uses to keep functioning during flooding.
- 2) Buildings that combine a mixture of uses should be placed into the higher of the relevant classes of flood risk sensitivity. Developments that allow uses to be distributed over the site may fall within several classes of flood risk sensitivity.
- 3) The impact of a flood on the particular uses identified within this flood risk vulnerability classification will vary within each vulnerability class. Therefore, the flood risk management infrastructure and other risk mitigation measures needed to ensure the development is safe may differ between uses within a particular vulnerability classification.

It should be noted that the Department for Communities and Local Government have proposed changes to Table D.2 of PPS25, that would result in sewage treatment plants and water treatment plants being classified as ‘essential infrastructure’ and would therefore only be suitable if the Exception Test can be passed. Sewage transmission infrastructure and pumping stations would be classified as ‘water compatible’.



Table D.3²²: Flood Risk Vulnerability and Flood Zone ‘Compatibility’

Flood Risk Vulnerability classification (see Table D2)		Essential Infrastructure	Water compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone (see Table D.1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	✗	Exception Test required	✓
	Zone 3b ‘Functional Floodplain’	Exception Test required	✓	✗	✗	✗

Key:

- ✓ Development is appropriate
- ✗ Development should not be permitted





Appendix H Severn Trent Water's Assessment of Sewerage and Wastewater Treatment



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North West Leicestershire Water Cycle Study

Potential impact of proposed developments on sewage treatment works

18th November 2009

Note: These are desktop assessments using readily available information and have not been subjected to detailed hydraulic analysis

General comment regarding treatment capacity:

Whilst sewage treatment works may not have sufficient spare capacity to accept the levels of development being proposed in its catchment area this does not necessarily mean that development cannot take place. Under Section 94 of the Water Industry Act 1991 sewerage undertakers have an obligation to provide additional treatment capacity as and when required. Where necessary we will discuss any discharge consent implications with the Environment Agency. If there are specific issues which may prevent or delay the provision on additional capacity these have been highlighted below.

Sewage Treatment Works Name	OS Grid Ref		Current PE	Current / observed dry weather flow (m3/d)	Estimated spare hydraulic capacity		Estimate headroom based on current quality performance (RAG)	Future quality issues (RAG)	Physical constraints regarding provision of additional treatment capacity (RAG)	Any other comments	Receiving Watercourse	River Catchment	Current Consent Information							
	Eastings	Northings			PE	Dwellings (@ 2.4hd/dwelling)							Consent Reference	FT	DWF (m3/d)	Amn (Summer)	Amn (Winter)	BOD (mg/l)	SS (mg/l)	p
Packington	435500	314100	33160	4334	2466	1030	Minimal	Probable issue	No land or other constraints preventing expansion	Whilst there are no known physical constraints that would prevent additional capacity being provided at this treatment works we are aware that the Environment Agency have specific concerns about river water quality in the River Mease. As part of the EA's National Environment Programme we are expecting to meet a 1 mg/l P by Sept 2014 plus a 2mg/l Ammonia by 2012. Consequently where additional growth in the catchment requires us to seek an increase in consented DWF we expect their to be further consent tightening issues at this works.	Gilwiskaw Brook	River Mease	T/23/36076/R	13,617	4729	5 see comment	5 see comment	15	35	n/a see comment
Snarrows	443100	318500	42766	8190	7854	3270	Limited	Marginal concern subject to size of development	No land or other constraints preventing expansion	There are no known physical constraints that would prevent additional capacity being provided at this treatment works. However the significant levels of development proposed in this catchment may result in consent tightening requirements	Grace Dieu Brook	River Soar	T/57/46075/R	21,341	9447	5	5	10	20	2
Castle Donington	444500	328200	7153	1973	1762	730	Limited	Not expected to be an issue	Limited potential to provide additional capacity	The are site constraints restricting expansion at this treatment work. A project is currently underway assessing what improvements are required to meet future development	River Trent	River Trent	T/36/45984/R	6,048	2480	15	15	40	60	n/a
Ibstock	440000	309100	7678	1572	2220	930	Significant	Not expected to be an issue	No land or other constraints preventing expansion	There are no known physical constraints that would prevent additional capacity being provided at this treatment works.	Ibstock Brook	River Sence	T/20/36246/R	5,124	1927	10	10	15	25	2
Kegworth	448600	327400	3525	1252	2108	880	Significant	Not expected to be an issue	No land or other constraints preventing expansion	There are no known physical constraints that would prevent additional capacity being provided at this treatment works.	River Soar	River Soar	T/59/45410/R	4,493	1589	15	15	25	45	n/a
Measham	431635	312446	5962	1030	2714	1130	Limited	Probable issue	No land or other constraints preventing expansion	Whilst there are no known physical constraints that would prevent additional capacity being provided at this treatment works we are aware that the Environment Agency have specific concerns about river water quality in the River Mease. Where additional growth in the catchment requires us to seek an increase in consented DWF we expect their to be concent tightening issues at this works.	River Mease	River Mease	T/23/35286/R		1464	10	10	25	45	n/a

North West Leicestershire Water Cycle Study

Potential impact of proposed developments on sewerage infrastructure assets

18th November 2009

Note: These are desktop assessments using readily available information and have not been subjected to detailed hydraulic modelling

Site Ref	Site Name	Size	Units	Sewage Treatment Works Catchment	Sewerage Comment	Potential impact on sewerage infrastructure
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Ashby

A1	Money Hill	1500	dwelling	Packington	This is a significant extension to the Ashby sewerage catchment but as flows will need to drain across the centre of Ashby is unlikely there will be sufficient capacity to accept additional flow flows without reinforcement works. Further detailed modelling would be required to confirm the level of improvements. Due to the potential issues with additional discharges to the River Mease there is an option to pump this development to an alternative sewerage works	Medium - Due to the size and location of this site detailed modelling is required
A2	Holywell Spring Farm	145	dwelling	Packington	This site is located upstream of known external flooding problems and so hydraulic modelling will be required to identify the extent of any reinforcement works	Medium - Minor downstream flooding needs to be addressed
A4	East of Leicester Road	347	dwelling	Packington	There are no known flooding problems immediately downstream of this development and it is crossed by a 450mm dia foul sewer to the south east. Subject to hydraulic modelling this site should not cause any problems which cannot be addressed by localised reinforcement work.	Low
A5	South of Ashby	1100	dwelling	Packington	This is a significant extension to the Ashby sewerage catchment but is crossed by several sewers draining Ashby. There is unlikely there will be sufficient capacity to accept additional flow flows without reinforcement works. There is also a pumping station downstream which may need upsizing. Further detailed modelling would be required to confirm the level of improvements. There are known issues relating to this site due to issues raised by the Environment Agency in relation to additional discharges to the River Mease.	These site will require infrastructure improvements due to known capacity issues. Detailed hydraulic modelling required to confirm extent of improvements
14	Ashby Holywell Spring Farm	500	dwelling	Packington	This site is located upstream of known external flooding problems and so hydraulic modelling will be required to identify the extent of any reinforcement works. A 375mm dia foul sewer currently crosses this site	Medium - Location of the site will require pumping across A42/railway
S3	Lounge		dwelling	Packington	There are no public sewers in the immediate vicinity of this site but it is likely that flows will need to be pumped. The site will also need to cross the A42 and the railway to the south of the site. Subject to hydraulic assessment of a suitable discharge point there should not be any adverse capacity issues	Medium - Location of the site will require pumping across A42/railway

Coalville/Whitwick/Thringstone

C2	Thornborough Road, Whitwick	651	dwelling	Snarrows	The two sites are upstream on known flooding problems on the downstream sewerage system in Thringstone. These 750mm dia sewers currently follow a convoluted route through rear gardens and so it would be difficult to provide additional capacity. We are currently undertaking project feasibility to address the flooding problem but as the solution is likely to be expensive it is likely to be deferred. In light of the proposed development upstream it may warrant the provision of a new outfall sewer but we would need to discuss the funding of this with the Local Authority	These site will require significant infrastructure improvements
C3	Land at Green Lane, Coalville	2000	dwelling			

Site Ref	Site Name	Size	Units	Sewage Treatment Works Catchment	Sewerage Comment	Potential impact on sewerage infrastructure
C4	South West Coalville	692	dwellings	Snarrows	This development is to the north of Kelham Bridge SPS and would gravitate south towards this pumping station.. There are no known flooding problems between the site and the pumping station but the sewer running along Melbourne Road is only 225mm dia and so may have limited spare capacity to accept a further c700 dwellings. This development would have the same capacity concerns as site C6	Medium - The size of this development would need detailed hydraulic modelling and to check capacity availability of Kelham Bridge SPS
C5	Greenhill Farm, Coalville	254	dwellings	Snarrows	This site is 5.2km upstream of the known flooding problems in Thringstone but the foul flows from this site are not expected to have a significant impact of this flooding problem. However there is other known flooding problems downstream of the development which may be slightly affected. Project appraisal is currently being undertaken on this problems. In addition there are also two combined sewer overflows downstream of the site. In summary this development may require some localised reinforcement work but detailed hydraulic modelling would be required to confirm the extent of this work	Medium
C6	South East Coalville	5000	dwellings	Snarrows	This topography for this development site indicates that the onsite drainage would flow towards the east/south east with Grange Road splitting the site in two from a drainage aspect. Subject to local drainage with regards to how the site would connect to the existing public sewerage system this part of Coalville drains west along a 500mm dia trunk sewer running parallel to the River Sence. This sewer is protected by a combined sewer overflow in Donington le Heath and eventually outfalls to a sewage pumping station at Kelham Bridge (which also has an overflow). Flows are then pumped north via a 7.6km 400mm dia rising directly to Snarrows STW. This rising main passes through sites C4 and the development to the north of Thringstone. The only known flooding problem downstream of this large development is an external flooding problem in Donington le Heath but generally the current performance of the sewerage system is reasonable. However due to the size of this development detailed hydraulic modelling will be required to determine if any reinforcement works are required to prevent new flooding in the catchment or result in adverse problems at the downstream combined sewer overflows.	Medium - The size of this development would need detailed hydraulic modelling and to check capacity availability of Kelham Bridge SPS
54	Chapel Street, Donisthorpe	71	dwellings	Snarrows	This development is upstream of the 500mm dia trunk sewer which drains to Kelham Bridge SPS. However the additional foul flows generated by 71 dwellings is not expected to be an issue	Low
104	North of Hensons Lane, Thringstone	465	dwellings	Snarrows	Located 0.6km upstream of Snarrows STW, this site is crossed by two 750mm dia foul sewers, a 225mm dia foul sewer and a 400mm dia foul rising main before they combine on the northern boundary of the site before flowing north to the treatment works by 600/750mm dia sewers. Due to the topography the eastern part of the site may need to drain to a connect to a 150mm dia foul sewer draining to Grace Dieu - Loughborough Rd SPS which then pumps flows back up the to 750mm dia sewer downstream of the site. There are known flooding problems upstream of this site but subject to detailed hydraulic modelling this development is not expected to be an issue due to its proximity to Snarrows STW	Low

Castle Donington

CD1	Rear of Upton Close	1220	dwellings	Castle Donington	The GIS shape file for this site is only small and so assume the 1220 dwellings for this site is wrong. The site will need to be pumped to the existing gravity sewers but as there are no known flooding problems downstream then subject to hydraulic modelling this site is not expected to result in any capacity issues	Low
CD2	North of Park Lane	275	dwellings	Castle Donington	Site is located to the west of an existing catchment with a separate drainage system which then drains by gravity to the treatment works. There are no known flooding problems downstream then subject to hydraulic modelling this site is not expected to result in any capacity issues	Low

Site Ref	Site Name	Size	Units	Sewage Treatment Works Catchment	Sewerage Comment	Potential impact on sewerage infrastructure
CD3	South of Park Lane	700	dwelling	Castle Donington	Site is located to the south of an existing catchment with a separate drainage system which then drains by gravity to the treatment works. There are a few isolated known external flooding problems downstream but subject to hydraulic modelling and any localised reinforcement works this site is not expected to result in any capacity issues	Low
S2	West of Junction 24 M1			Castle Donington and/or Kegworth	The site could drain north towards Lockington which is currently pumped to the gravity sewers upstream of Donington STW. Under this option the existing pumping station at Lockington and the 2.4km 150mm dia rising main would need replacing. The alternative would be to pump the site directly to either Castle Donington STW 2.5km to the north west. Alternatively there is a 300mm gravity sewer which crosses the A42/M1 draining in to the Kegworth catchment. This sewer is pumped via a pumping station on Derby Road by a 250mm dia rising main directly to kegworth STW. As there are various options available to drain this site there are not envisaged to be any significant capacity issues.	Low

Sawley Crossroads

S1	Sawley Crossroads			Castle Donington	This site will need to be pumped to Castle Donington STW approx 2.2km to the south west. As this will be pumped via dedicated infrastructure there are no capacity implications for the existing infrastructure	Low
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Ibstock

I1	Leicester Road / Ravenstone Road	131	dwelling	Snarrows	There are 225mm dia foul and surface water sewer crossing this site which drain north towards Kelham Bridge SPS. Draining this site to Kelham Bridge SPS is not expected to be a problem but there may be capacity issues with the pumping station due to the significant development proposed to the south of Coalville	Medium due to association with Coalville developments and potential capacity issues with Kelham Bridge SPS
I2	Off Leicester Road	220	dwelling	Ibstock	A 300mm dia foul sewer runs within the western boundary of this site. There are no known flooding problems downstream and subject to hydraulic modelling only localised reinforcement would be expected to cater for this development	Low
I3	North of Ashby Road	235	dwelling	Ibstock	This site is located upstream on known flooding problems which have recently been assessed as part of our flood alleviation programme. Due to the high cost of this solution the project has been deferred and so there is no capacity available for this development site without significant improvements along Melbourne Road	There are known flooding problems which are expensive to resolve.
I4	South of Ashby Road	290	dwelling	Ibstock	This site is located to the west of a catchment which drains to a small sewage pumping station on Station Road which lifts flows up to the nearby foul sewer before gravitating down to Ibstock STW. There are no known flooding problems downstream of this site and subject to hydraulic analysis this site should not have any significant capacity issues but may need the pumping station to be upsized	Low - but may need pumping station upsizing/replacement
I5	Land south of Pretoria Road	160	dwelling	Ibstock	This site is located to the east on Ibstock on a remote sewer catchment served by a 225mm dia sewer. There are no known flooding problems immediately downstream of the site nor any combined sewer overflows and so subject to hydraulic modelling only localised reinforcement work may be required	Low
I6	Station Road	180	dwelling	Ibstock	This site is located to the west of a small sewage pumping station on Station Road which lifts flows up to the nearby foul sewer before gravitating down to Ibstock STW. There are no known flooding problems downstream of this site and subject to hydraulic analysis this site should not have any significant capacity issues but may need the pumping station to be upsized	Low - but may need pumping station upsizing/replacement

Kegworth

K1	Adjoining Cott Factory	404	dwelling	Kegworth	This site is located to the west of Kegworth STW and so should not have any capacity issues. There is a 375mm dia foul sewer crossing part of the site plus a 250mm dia rising main	Low
K2	Adjacent Computer Centre	542	dwelling	Kegworth	These three sites are upstream of Derby Road SPS which pumps directly to Kegworth STW. There is an	Low

Site Ref	Site Name	Size	Units	Sewage Treatment Works Catchment	Sewerage Comment	Potential impact on sewerage infrastructure
K3	Computer Centre	272	dwelling		existing 300mm dia foul sewer crossing the site. Subject to capacity checks at Derby Road SPS there are not expected to be any capacity issues	
K4	North of Ashby Road	250	dwelling			
K5	Station Road / Long Lane	324	dwelling	Kegworth	This site is located directly opposite Kegworth STW and so should not have any capacity issues	Low

Measham

M1	South of Burton Road	168	dwelling	Measham	All foul flows from Measham are pumped to Measham STW via a 1.2km rising main from Westminster Industrial Estate sewage pumping station. Hydraulic capacity would need to be checked to ensure there is sufficient capacity to accept additional development flows in Measham. Whilst this site is located close to Westminster Industrial Estate sewage pumping station, flows from the site would need to pass under the A42 through twin 225mm dia foul pipes and an 800mm dia surface water sewer (which cross the eastern corner of this site). There are no known sewer flooding problems downstream of this site and so subject to hydraulic modelling no capacity issues are anticipated.	Low (subject to pumping capacity checks)
M2	Land between Burton Road and New Street	400	dwelling	Measham	All foul flows from Measham are pumped to Measham STW via a 1.2km rising main from Westminster Industrial Estate sewage pumping station. Hydraulic capacity would need to be checked to ensure there is sufficient capacity to accept additional development flows in Measham. This site is close to Westminster Industrial Estate sewage pumping station and there are no known sewer flooding problems downstream of this site. There is a 225mm dia foul water sewer crossing this site and is protected by a combined sewer overflow immediately upstream of the development. Due to the size of the development it is unlikely that sufficient spare capacity would be available in a 225mm dia sewer to accept additional foul flows and to ensure there is no adverse impact on the CSO performance. Whilst detailed hydraulic modelling would be required to confirm the extent of the reinforcement work the worst case would be that approx 650m of sewer would need to be upsized.	Low (subject to pumping capacity checks)
M3	North east of Atherstone Road	410	dwelling	Measham	There is an existing 225mm dia foul sewer to the west of the development site which passes through rear gardens before draining through a combined sewer overflow on Tamworth Road and then on to Westminster Industrial Estate sewage pumping station. Whilst there are no known flooding problems on downstream of the site detailed hydraulic modelling would be required to confirm that there is adequate spare capacity. Whilst acceptance of foul flows in to this sewer is not expected to be an issue any downstream upsizing would be difficult as the route of the sewer passes through rear gardens	Low (subject to downstream capacity checks)

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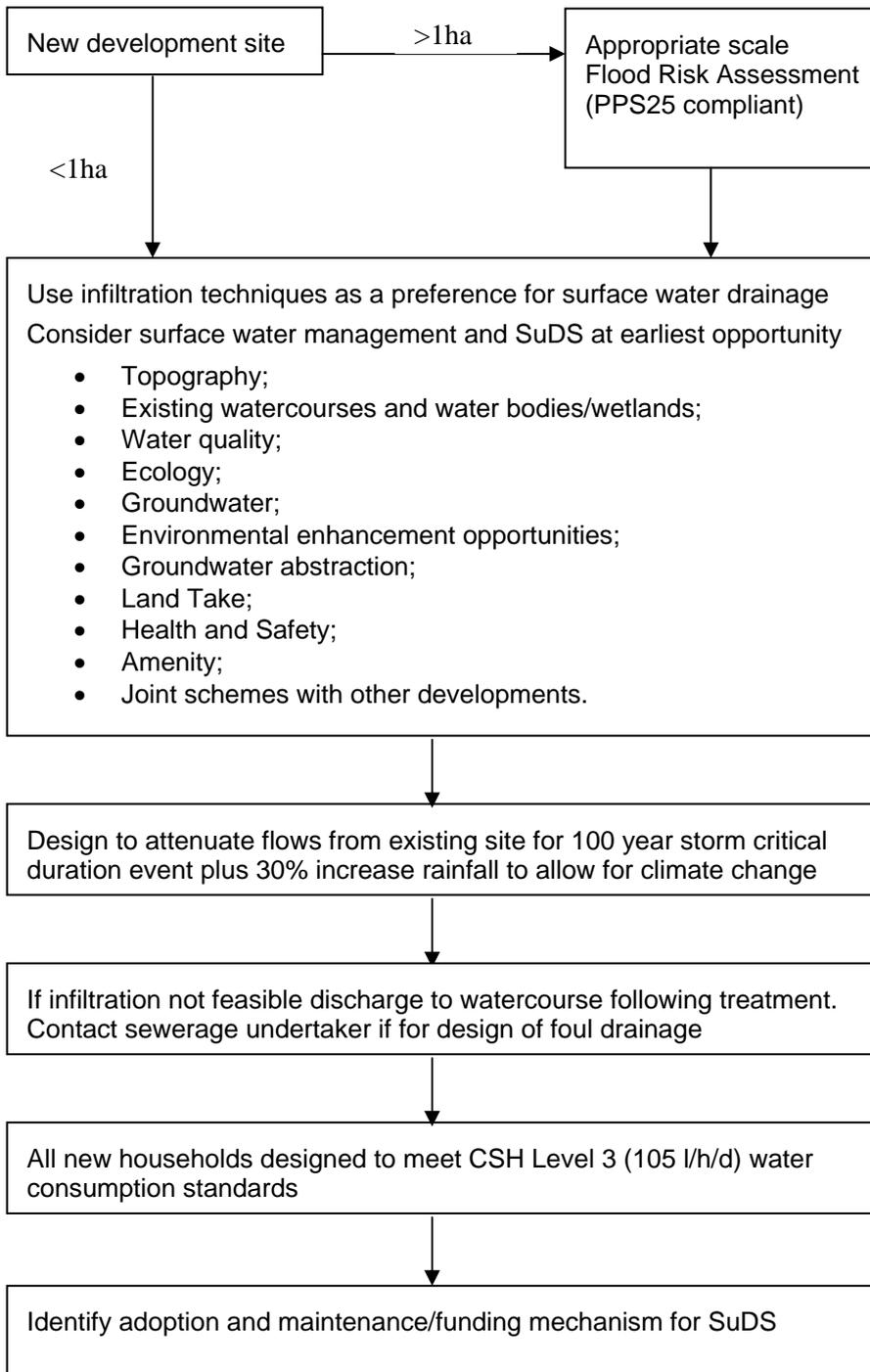
Appendix I Developer Guidance Checklist



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Appendix J Climate Change



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Research and Development of Guidance

Research into climate change impacts and the development of guidance is an ongoing process and release of UKCP09 output is likely to result in changes in the requirement for climate change assessment in relation to the water cycle. Table J1 summarises current developments in this area which may affect future Water Cycle Study work.

Table J1 Key Developments in Climate Change Assessment

Topic area	Developments
Water Resources	Improved guidance on water resources and development of improved climate change factors. Initial UKWIR project scheduled to release information in September 2009, but further work on incorporating the latest UKCP projections into the water resource planning process is likely to continue for 2-3 years.
Water Resources	UKWIR study on climate change impacts on groundwater levels. Ongoing work building on previous study; Effects of Climate Change on River Flows and Groundwater Recharge: A practical Methodology - Synthesis Report. UKWIR 2006.
Flooding	Joint CEH/JBA guidance currently being developed.

Climate Change Impacts and the WCS Process

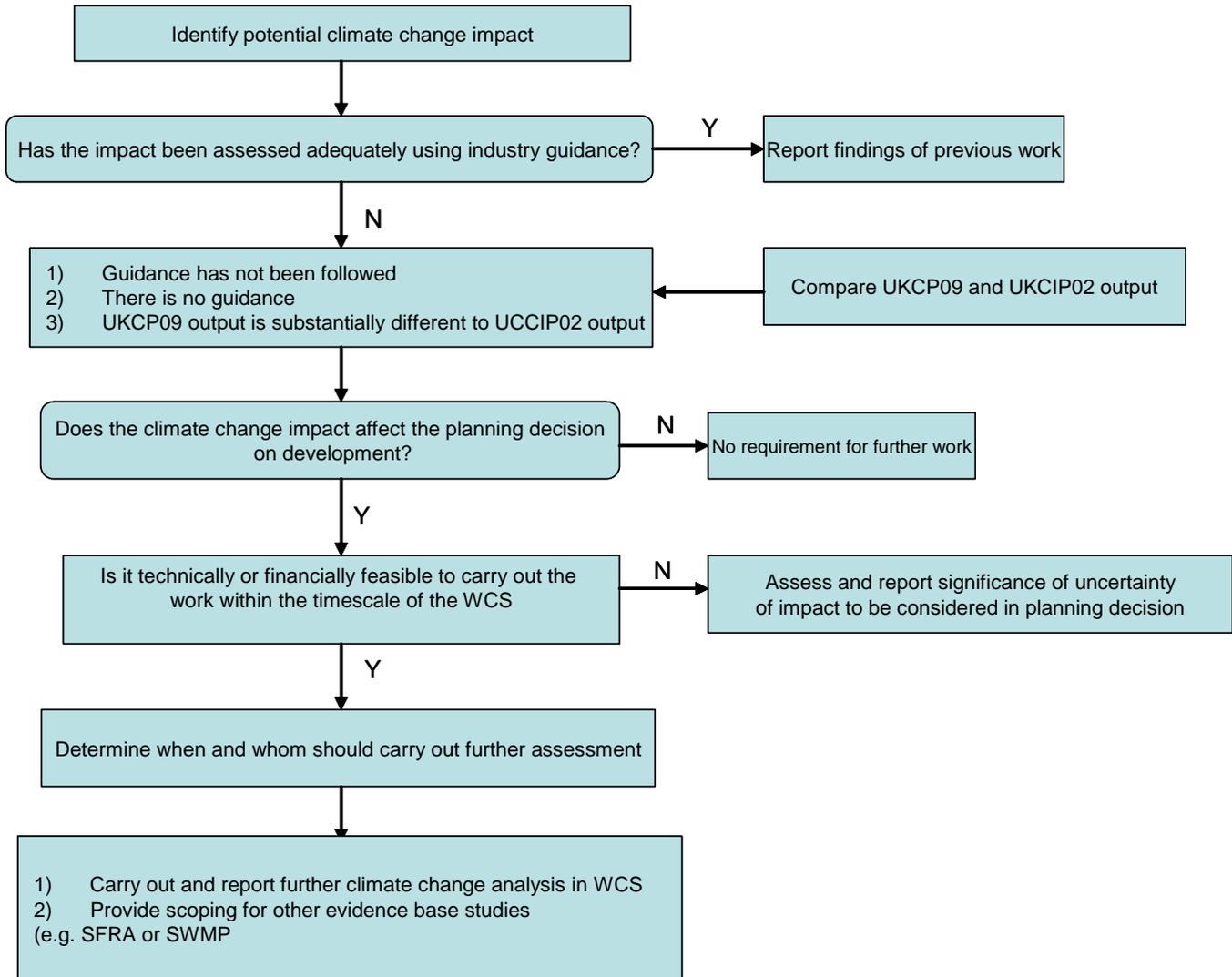
Water Cycle Studies should aim to identify any weakness in existing water infrastructure and environmental capacity assessments with regard to climate change and address these weaknesses if these are relevant to planning decisions on development. It should also aim to ensure that climate change is taken into account in further work related to the assessment of environmental capacity and the design of water infrastructures. Key factors in this process are listed below which are also illustrated in the flow diagram.

- Review of existing assessments of climate change with regard to national guidance and best practise;
- Updating of the assessments to take into account UKCP09 output. Recent asset management planning and, in particular, STW's asset management plans submitted for PR09 are based on UKCIP02 output. The implications of the more recent and improved information needs to be taken into account in future planning;
- Guidance related to climate change impacts does not cover all parts of the water cycle.

Bearing in mind the wide ranging requirements to assess climate change impacts on the water cycle and ongoing work by the Environment Agency, it is important to be clear about when climate change work should be carried out as part of a Water Cycle Study. Assessment of climate change should focus on climate change impacts on



environmental constraints on housing growth and on the timing of delivery of water infrastructure if existing or ongoing work does not adequately address these issues. This detailed assessment tends to be carried out in the Detailed Phase of a Water Cycle Study. The table below identifies key areas where climate change should be incorporated into the various phases of a Water Cycle Study.



Topic area	Key Issue	Action	Justification for further work	Comments	By when and by whom
Water Resources	Has current guidance from the Environment Agency been followed in developing the water resource plan for the study area?	Review differences between the existing methodology and guidance to identify any deficiencies related to housing growth (e.g. impacts on water resource availability and demand). Carry out further work following the guidance.	This additional work should only be carried out where the further work is required to inform planning decisions within required timescales.	May not be feasible in project timescale if involves major reworking of WMRP analysis.	Detailed phase. By consultants in collaboration with Severn Trent Water.
	Is assessment of the key water resources issues identified WRMP and WCS Scoping Phase likely to be significantly affected by differences between the UKCP02 and UKCP09 output?	Carry out comparison between UKCIP02 and UKCP09 output. If differences significant in relation to housing growth carry out additional work using UKCP09 output.	This additional work should only be carried out where the further work is required to inform planning decisions within required timescales.	May not be feasible in project timescale if involves major reworking of WMRP analysis.	Detailed phase. By consultants in collaboration with Severn Trent Water.



Topic area	Key Issue	Action	Justification for further work	Comments	By when and by whom
	Are there key habitats in the study area that are affected by abstractions (e.g. identified in Site Action Plans). Are abstractions affected by housing growth? Are the findings of previous investigations likely to be affected by climate change?	Where previous work has indicated abstraction impacts of the habitat are significant and where housing growth may affect abstraction rate – re-run previous assessment using output from UKCP09 output.	This additional work should only be carried out where uncertainty in relation to the impacts on wetlands may affect planning decisions.	Would be expensive and time consuming if it involves running hydrological and groundwater models.	Collaboration between Severn Trent, Environment Agency and consultants.
	Has or will climate change be assessed in relation to flood resilience of water supply assets?	Review previous work to determine whether OFWAT guidance has been followed. Carry out further work following guidance.	This additional work should only be carried out where the further work is required to inform planning decisions within required timescales.		Detailed phase. By consultants in collaboration with Severn Trent.



Topic area	Key Issue	Action	Justification for further work	Comments	By when and by whom
Flood Risk	Has climate change been assessed in the design of water demand management systems (e.g. grey water recycling, rain water harvesting).	Provide guidance to developers regarding incorporation of climate change allowances in their design.	Provide guidance if developers have not considered already.		Detailed phase. Consultants and developers.
	Has PPS25 guidance been followed in the existing Flood Risk Assessments?	Provide scoping for addition Flood Risk Assessment Work.	Statutory requirement.		Separate study to be commissioned by local authority; ideally to coincide with Detailed Phase.
	Ensure that climate change assessment is incorporated into the design of SuDs and drainage systems?	Provide guidance to developers regarding incorporation of climate change allowances in their design.	Provide guidance if developers have not considered already.		Detailed phase. Consultants and developers.



Topic area	Key Issue	Action	Justification for further work	Comments	By when and by whom
	Has resilience to flooding been considered in the design of drainage assets (e.g. Internal Drainage Board).	Provide scoping for further work to be incorporated into Surface Water Management Plans.	Ensure drainage systems are designed adequately within developments and downstream.		Separate study to be commissioned by local authority; ideally to coincide with Detailed Phase.
Wastewater	Has or will sensitivity assessment in relation to climate change been taken into account in planning of wastewater infrastructure following OFWAT guidance (wastewater treatment and sewerage)?	Carry out analysis using climate change allowances to inform design of wastewater systems (e.g. INFOWORKS modelling).	Ensure systems designed adequately.		Detailed phase. By consultants in collaboration with Severn Trent Water.



Topic area	Key Issue	Action	Justification for further work	Comments	By when and by whom
	Has climate change been taken into account in the assessment of environmental capacity of environmental waters to receive additional wastewater flows in relation to the development.	Carry out further modelling work to assess changes in flow in receiving waters that result from climate change using UKCP09 output and assess impact using water quality models.	Compliance with Environment Quality Standards under current conditions may not indicate future compliance.	Would require setting up a rainfall run-off model and using time series output from UKCP09 weather generator (EARWIG).	Detailed phase. By consultants in collaboration with Environment Agency and Severn Trent Water.
	Has resilience to flooding been considered in the design of wastewater assets	Review previous work to determine whether OFWAT guidance has been followed. Carry out further work following guidance.	This additional work should only be carried out where the further work is required to inform planning decisions within required timescales.		Detailed phase. By consultants in collaboration with Severn Trent Water.

