Exeter and East Devon New Growth Point Water Cycle Study Outline Study Report

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Exeter & East Devon New Growth Point

Sponsored by:




Exeter and East Devon New Growth Point Water Cycle Study

Outline Study Report

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Exeter and East Devon New Growth Point – Water Cycle Study

Outline study report

Revision schedule:

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05/10/09	WBEWCS/01	Working draft report issued to SWW for review in advance of workshop	K. Berry	A. McConkey	S. Burge
22/10/09	WBEWCS/02	First draft report issued to study partners for comment	K. Berry	A. McConkey	S. Burge
04/12/09	WBEWCS/03	Draft final issue, incorporating comments from study partners	K. Berry	A. McConkey	S. Burge
24/03/10	WBEWCS/04	Final report	R.Wootton P. Hargreaves	A. McConkey	S. Burge
22 /04/10	WBEWCS/04	Final report incorporating the final River Basin Management Plan changes	E Smith	A. McConkey	S. Burge

CONTENTS

Executive summary

Introduction

The Proposed Changes to the draft Regional Spatial Strategy for the South West propose delivery by 2026 of around 28,500 new homes within the Exeter and East Devon New Growth Point (NGP) and 5600 homes across the remainder of East Devon.

The NGP Steering Board appointed Halcrow Group Ltd to undertake this outline Water Cycle Study (WCS) to support the growth point status and provide an evidence base to inform the preparation of the Local Development Frameworks (LDF) and Core Strategy of Exeter City Council, East Devon District Council and an Area Action Plan for Teignbridge District Council.

The purpose of the Water Cycle Study is to ensure that the proposed growth targets can be met without adversely impacting on the water environment and that required water services infrastructure can be planned for and brought online alongside new development, in a timely and phased manner.

Background

The vision of the NGP Steering Board is to realise the full economic potential of Exeter as a major regional centre, providing a range of employment opportunities in conjunction with a self sufficient new community. Opportunities for growth within the Exeter city boundary are strongly constrained spatially and as a result key elements of housing and employment are to be allocated at East Devon and an urban extension within Teignbridge.

The NGP Steering Board aspires towards water neutrality, whilst meeting EU framework targets on water quality and ensuring sustainable flood management over the longer term through collaborative planning and joint working with developers and key partners. The large scale of new growth proportional to the existing population will present a significant challenge to meeting the NGP's aspiration towards water neutrality.

The effect of development on the water environment forms a key part of the Sustainability Appraisal (SA) and Strategic Environmental Assessment (SEA), required under the Local Development Framework (LDF) process. As part of the Core Strategy, a WCS gives planning authorities a robust evidence base to assess development impacts and to inform the debate over appropriate allocations, phasing of development and developer contributions.

The water cycle

More development means more potable water demand, increased flows to wastewater treatment works and a greater risk of flooding as rainwater runs off new houses driveways and roads. Human manipulation of the natural water cycle can result in negative impacts on the water-related environment, which can indirectly affect the ecology that is dependant on the natural features of a water cycle.

The study area features important riverine and estuarine habitats including the Exe Estuary (SSSI, SPA & Ramsar site), the Otter Estuary (SSSI) and the River Axe (SAC). The Exe estuary is considered to have elevated nutrient levels due to the inputs from WwTWs and diffuse agricultural sources within the catchment. Due to these elevated nutrient levels, the estuary may be vulnerable to biological instabilities in the future if a nutrient concentration 'tipping-point' is reached.

Under the Water Framework Directive (WFD) the objective is for all water bodies to meet good ecological status by 2015. Of those water bodies in the study area that receive discharges from WwTWs, the Rivers Otter, Axe and Clyst are currently rated as poor and the Exe Estuary, Axe Estuary and Lyme Bay West are rated as Moderate.

Study approach

This outline water cycle study has been undertaken following the Environment Agency guidance for Water Cycle Studies (http://www.environment-agency.gov.uk/research/planning/33368.aspx).

An initial scoping stage was undertaken to establish the group of study partners, gather existing sources of information, data and analyses and assess the key environmental and major infrastructure constraints.

The study has been undertaken in partnership with representatives of:

- The Environment Agency
- East Devon District Council
- Exeter City Council
- Teignbridge District Council
- South West Water Ltd
- Devon County Council

The following development figures have been used:

		Development Target to 2026 (No. of Houses)	
Sub-region	**Location**	**Secretary of State Proposed Changes**	**Total tested by Water Cycle Study**
Exeter City	Exeter City Council (including 500 dwellings SW of Exeter in Area of Search 4C)	15,000	15,000
Teignbridge	South west of Exeter (Area of Search 4C)	2,000	2,000
East Devon	Cranbrook	7,500	10,000
	East of Exeter (Area of Search 4B)	4,000	4,500
	Elsewhere in East Devon	5,600	5,600

The main body of the study report documents a review and assessment of flood risk, water quality, wastewater and water resources in the study area. Conclusions and recommendations – summarised below - are presented in full in Chapter 10, together with a constraints assessment matrix to provide a graphical summary of the study findings.

At this outline stage of water cycle study, no detailed modelling or analysis has been undertaken to support the findings. The capacity of water services infrastructure has been assessed by providing development growth scenarios to South West Water to enable the company to identify any critical capacity constraints and assess requirements for future detailed analysis.

Key messages

- This water cycle study has identified no absolute environmental constraints or critical infrastructure constraints to the proposed scale of growth in Exeter, East Devon and the area of Teignbridge within Area of Search 4C.
- There is sufficient strategic water resources availability to serve development.
- There is sufficient area within the study boundary that can be developed with or without mitigation without increasing flood risk. No critical constraints to implementing sustainable urban drainage have been identified.
- The Environment Agency believe that adequate environmental monitoring, along with scope for measures to reduce nutrient loads will provide sufficient safeguards to the Exe estuary.
- Partnership working between Exeter and East Devon New Growth Point, the Environment Agency, South West Water and other stakeholders in the growth process will facilitate the selection and implementation of suitable technical solutions and enable growth to proceed in a sustainable manner.
- Detailed analysis will be required in order to determine the most appropriate infrastructure solutions for new development, however South West Water are confident that provided that they are consulted during the site allocations DPD stage or at the outline planning application stage, the they will be able to provide or requisition infrastructure capacity within the normal planning timetable.
- South West Water's Asset Management Plan for 2010-2015 (AMP5) (due to be finalised in November 2009) includes funding allocations towards delivery of the New Growth Point development, including ring-fenced funding for the first phase of the Cranbrook New Community.
- To achieve the NGP's aspiration of water neutrality, all new homes built after 2009 will be required to achieve CSH Level 3 water efficiency and together with measures to reduce the Per Capita Consumption for existing metered properties by 1.5 l/h/d, each year from 2009 to the end of the planning period.
- The implementation of water efficiency measures will not only reduce water demand and demand on water resources but produce associated savings in energy, financial costs and carbon emissions. Reductions in water demand can also reduce the need for additional infrastructure, resulting in further savings.

1 Introduction

1.1 Introduction

1.1.1 The Exeter and East Devon New Growth Point (NGP) is programmed to deliver up to 28,500 new homes by 2026 and around 201,000m^2 of new business accommodation. The NGP Steering Board appointed Halcrow Group Ltd to undertake this outline Water Cycle Study (WCS) to support the growth point status. The study will provide an evidence base to inform the Local Development Frameworks (LDF) and Core Strategy of Exeter City Council, East Devon District Council and an Area Action Plan for Teignbridge District Council.

1.1.2 The purpose of the Water Cycle Study is to ensure that the proposed growth targets can be met without adversely impacting on the water environment and that required infrastructure can be planned for and brought online alongside new development, in a timely and phased manner. The overall aim of the water cycle study is to develop a water cycle strategy for the New Growth Point that:

- all partners can commit to
- shows how water infrastructure (both water supply and waste water) can be put in place along side development rather than afterwards
- sets out design standards for sustainable drainage
- integrates urban drainage
- builds on the strategic flood risk assessment work to preventing flooding
- works with green infrastructure plans

1.2 Background

1.2.1 There is a finite capacity within the environment, and it cannot simply provide more and more water to serve new development. Equally, there is a limit to the amount of waste water that can be safely returned to our rivers and the sea without having a detrimental impact on the environment. Furthermore, we know that extreme rainfall can overwhelm drains and overtop flood defences. Climate change is bringing fresh challenges as patterns of rainfall are predicted to change, with more intense rainfall events. We must also make sure that water infrastructure contributes to the shift to a low carbon economy that is essential if greenhouse gas emissions are to be reduced. Planning for water has to take into account these natural constraints, and factors such as the timing and location imposed by the development itself.

1.2.2 Water Cycle Studies (WCS) are required to ensure that proposed growth does not adversely impact on the existing water cycle environment and that new Water Services Infrastructure (WSI) can be planned for and provided alongside new development in a sustainable and cost effective manner.

1.2.3 The extent of the Exeter and East Devon New Growth Point study area is shown in Figure 1.1. Opportunities for growth within the Exeter city boundary are strongly constrained spatially and as a result key elements of housing and employment are to be allocated at East Devon and an urban extension within Teignbridge. The vision of the NGP Steering Board is to realise the full economic potential of Exeter as a major regional centre, providing a range of employment opportunities in conjunction with a self sufficient new community.

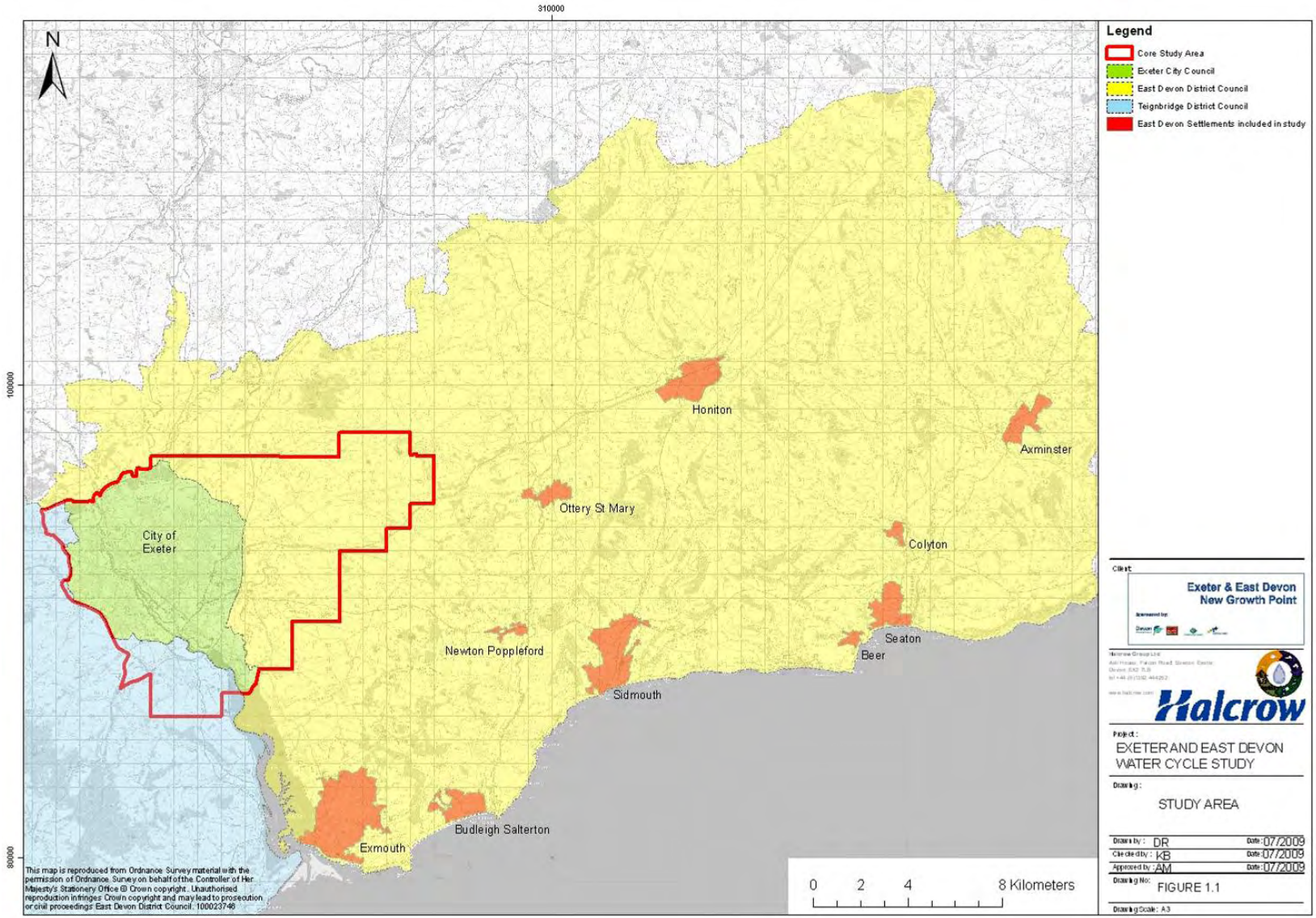


Figure 1.1 – The study area

1.2.4 The NGP Steering Board aspires towards water neutrality, whilst meeting EU framework targets on water quality and ensuring sustainable flood management over the longer term through collaborative planning and joint working with developers and key partners. This Outline Water Cycle Study has been undertaken in partnership with representatives of:

- The Environment Agency
- East Devon District Council
- Exeter City Council
- Teignbridge District Council
- South West Water Ltd
- Devon County Council

1.3 Water neutrality

1.3.1 'Water neutral' development means that the total demand for water within a given spatial area is the same after new development is built, as it was before. That is the new demand for water should be offset in the existing community by making existing homes and buildings in the area more water efficient.

1.3.2 The most recent estimate population of Exeter City is 122,400 (Mid-2007 Population Estimates. ONS, Crown Copyright) Assuming an average occupancy rate of 2.3 persons per dwelling, the Proposed Changes target of 15,000 additional dwellings over the RSS period equates to a population increase of 34,350 people or 28%. This level of growth at Exeter over the next 20 years is notably higher than the projected UK increase of approximately 14 per cent and faster than previous rates of growth in the city. The large scale of new growth proportional to the existing population will present a significant challenge to meeting the NGP's aspiration towards water neutrality.

1.4 Study scope

1.4.1 The water cycle study commenced with a scoping workshop held on 27th March 2009. The purpose of the workshop was to identify the key water cycle issues faced by the NGP and discuss the study scope and outputs for the respective Core Strategies. The workshop was attended by:

- Exeter & East Devon New Growth Point - Neil Blackmore
- Environment Agency - Cherry Herbert
- South West Water - Martyn Dunn & Jackie Turner
- East Devon District Council - John Maidment & Matt Dickens
- Teignbridge District Council - Martin Hutchings, Neil Baglow & Claire Body
- Exeter City Council - Jill Day & Peter Stewart
- Devon County Council - Gareth Bradford
- Halcrow Group Ltd - Andy McConkey, Kate Berry & Matt Tompsett

1.4.2 The study focuses on the development scenarios provided by the NGP delivery team (see Section 2.2) and seeks to identify:

- Environmental risks and constraints to housing development
- Infrastructure constraints to housing development and infrastructure capacity thresholds
- Whether existing water cycle capacity (environmental and infrastructure) can cope with the proposed development scenarios

- Whether major new infrastructure and/or development phasing is required to allow development
- Where possible, mitigation options to avoid potential negative impacts of proposed development upon the water cycle
- Opportunities for new development to utilise existing spare infrastructure capacity, aspire to water neutrality, maximise water sustainability and incorporate green infrastructure
- Implications of the draft Floods and Water Bill and Surface Water Management Guidance, which seek to place responsibility for the management of surface water and sustainable drainage systems with the Unitary or Upper Tier Authority
- A framework for water cycle sustainability objectives and assessment
- Requirements for further study and investigation

1.4.3 These issues have been assessed by gathering and assessing existing data and analysis that is already available in order to identify the key environmental and major infrastructure constraints and to decide where further detailed assessment is needed.

1.4.4 At this outline stage of assessment, no detailed modelling or analysis has been undertaken to support the findings. The capacity of water services infrastructure has been assessed by providing development growth scenarios to South West Water to enable the company to identify capacity constraints, planned improvements and the additional improvements that would be required to accommodate development.

1.4.5 Commercial or trade land uses are not generally included in this study, as it is expected that these developments will not exert significant demand on water services infrastructure. However, the following significant commercial developments are key ambitions of the New Growth Point and have therefore been included in the water cycle study scope:

- Exeter Science Park
- Business Park linked to Exeter Airport (Skypark)
- Inter-modal rail freight handling facility (Exeter Gateway)
- Airport expansion including new terminal

1.5 Evidence base

1.5.1 The following key studies have been used to inform the water cycle study:

- Strategic Flood Risk Assessments
- Catchment Abstraction Managements Stategies
- Catchment Flood Management Plans
- Habitat Regulations Assessments
- SWW Water Resources Plan 2010 – 2035
- River Basin Management Plan

1.5.2 These and the other reference documents that have been collated during the course of the study are listed fully in Section 12. Other data that has been obtained for use in the study is listed in Appendix A.

2 Growth and development

2.1 Planning policy

2.1.1 The South West Regional Spatial Strategy (RSS) will set the regional context for planning until 2026 and will replace Regional Planning Guidance for the South West (RPG10). Following a final phase of consultation and amendment, the adopted RSS is due to be published in late 2009/early 2010.

2.1.2 In preparing a Core Strategy to implement the RSS, each local planning authority must ensure that the document is:

- founded on a robust and credible evidence base;
- the most appropriate strategy in all the circumstances, having considered the reasonable alternatives;
- deliverable;
- flexible; and
- able to be monitored.[DCLG 2008:15,17].

2.1.3 The effect of development on the water environment forms a key part of the Sustainability Appraisal (SA) and Strategic Environmental Assessment (SEA), required under the Core Strategy process. As part of the Core Strategy, a WCS gives planning authorities a robust evidence base to assess development impacts and to set out appropriate allocations, phasing of development and developer contributions.

2.1.4 The status of Core Strategy preparation at the three Local Authorities involved in the New Growth Point is described below.

Exeter City Council (ECC)

2.1.5 The Preferred Options Report (based on the Draft RSS requirements to 2021) was consulted on in 2006. This has since been updated to accord with the requirements of the RSS Panel Report (for 12,000 dwellings to 2026). A further focused consultation is planned (Autumn 2009) in response to the revised PPS12 guidance on infrastructure planning and strategic allocations and in response to the housing requirement identified in the adopted RSS (proposed to increase from 11,000 (draft RSS) to 15,000 in the RSS Proposed Changes).

East Devon District Council (EDDC)

2.1.6 Core Strategy issues and options consultation was completed in February 2009 and EDDC are now awaiting publication of the final RSS allocations. The Preferred Option (based on consultation response and including RSS changes) is due in Spring 2010.

Teignbridge District Council (TDC)

2.1.7 The Third Revised Teignbridge Local Development Scheme (LDS) [TDC 2009] sets out the Teignbridge LDF programme and plan-making timetable. The LDS was brought into effect on 16th June 2009. The Draft Sustainability Appraisal Scoping Report for the Core Strategy (DPD), Southwest of Exeter Area Action Plan (DPD) and Newton Abbot Area Action Plan (DPD) was published at the end of May 2009. The Southwest of Exeter AAP is programmed for publication in May 2010 and submission in August 2010. The draft Core Strategy is programmed for publication in November 2010 and submission in March 2011. Teignbridge District Council is developing a Water Cycle Study to support the Teignbridge growth point status.

2.2 Development scenarios

2.2.1 The development scenarios that have been used for this study are presented in Table 2.1 below. At the time of undertaking this WCS, the Regional Spatial Strategy for the South West was yet to be adopted. Hence in agreement with the respective Local Authorities, the development scenarios have generally used the growth figures of the Proposed Changes to the RSS, published by the Secretary of State in July 2008.

Table 2.1 – Development scenarios

		Development Target to 2026 (No. of Houses)	
Sub-region	**Location**	**Secretary of State Proposed Changes**	**Total tested by Water Cycle Study**
Exeter City	Exeter City Council (including 500 dwellings SW of Exeter in Area of Search 4C)	15,000	15,000
Teignbridge	South west of Exeter (Area of Search 4C)	2,000	2,000
East Devon	Cranbrook	7,500	10,000
	East of Exeter (Area of Search 4B)	4,000	4,500
	Elsewhere in East Devon	5,600	5,600

2.2.2 The areas of growth that are currently being considered to deliver these RSS development targets are shown in Table 2.2 and Figure 2.1overleaf, and are described below.

Exeter City

2.2.3 Development growth areas are identified to the east of Exeter City at Newcourt (approx. 3700 dwellings, including 1200 dwellings with planning permission/subject to S106) and Monkerton/Hill Barton (approx 2300 dwellings) and to the south-west of Exeter at Alphington (approx. 600 dwellings). In addition significant growth (8400 dwellings including 2000 windfalls) will also be required within Exeter's existing urban area. These areas were identified as strategic areas for growth in the Preferred Options, but the revised housing numbers identified above will be consulted upon as part of the focused consultation in autumn 2009. This study will test the water cycle constraints, opportunities and capacities for these growth areas.

East Devon District

2.2.4 The RSS (Proposed Changes) Policy HMA4 identifies an area of strategic growth of 7500 dwellings at new community Cranbrook and 4000 dwellings to the east of Exeter city (Area of Search 4B).

2.2.5 An outline planning application for Cranbrook - currently at an advanced stage - is programmed to accommodate 2,900 dwellings (with supporting facilities and infrastructure), hence to meet the 7,500 RSS target an additional 4,600 dwellings are required. The East Devon LDF Issues and Options Report [EDDC 2008b] identifies eight options for the expansion of Cranbrook.

2.2.6 Although the Proposed Changes to the RSS identify a requirement for 4000 dwellings in Area of Search 4B in East Devon, there is no specific reference to this taking the form of a second new

community (except in the supporting documents) therefore as well as options for a second new community, EDDC have identified options for some of the 4000 dwellings to be accommodated in an urban extension to Exeter city.

2.2.7 The Proposed Changes to the RSS requires development of at least 5,600 dwellings in the rest of East Devon, where there are already significant existing commitments to development totalling 2,500 dwellings. That leaves a minimum need of 3,100 additional dwellings to meet the proposed RSS target. The East Devon LDF Issues and Options Report [EDDC 2008b] considers locations and directions for future development and growth at each of the District's seven main towns (Ottery St Mary, Honiton, Exmouth, Axminster, Sidmouth, Seaton, Budleigh Salterton). The Water Cycle Study tests the existing infrastructure capacity at these seven settlements and in addition at the villages of Beer, Colyton and Newton Poppleford.

2.2.8 The New Growth Point features significant commercial and employment land development proposals, focussed to the east of Exeter in the East Devon district. Hence in addition to the areas of housing growth, the following commercial developments are included in the scope of this Water Cycle Study:

- Science Park
  With links to the University of Exeter and the Met Office, Exeter Science Park is proposed as a predominantly knowledge based, mixed-use development covering a 25 hectare site. An outline planning application for 76,450m^2 of B1 land uses is currently under consideration by East Devon District Council.

- Intermodal Freight Terminal (IMFT)
  The freight terminal will provide storage and distribution for strategic rail transportation, including integration with air and road transport links. The IMFT was granted outline planning permission in December 2007 for a 65 hectare site, with 61,000m^2 of accommodation and 900 jobs proposed under Phase 1 of the development.

- Skypark
  Once completed, this 38 hectare development area is set to deliver 7,600 jobs and consist of 140,000m^2 of office and industrial floor space, together with a 150 bed hotel with leisure and conference facilities. The outline planning application for Skypark has a resolution to grant permission subject to the signing of a 106 agreement.

- Exeter Airport Expansion
  Exeter Airport published its final master plan in October 2009, featuring proposed growth in passenger traffic - currently 1.05 million per annum – to 1.9 million passengers by 2015 and 3.4 million by 2030. The master proposals include expansion of the terminal building and car parking area, together with a new internal road system, a new hotel and a Flybe Training Academy.

Teignbridge District

2.2.9 The RSS (Proposed Changes) Policy HMA4 identifies an area of strategic growth of at least 2500 dwellings located to the south-west of Exeter city (Area of Search 4C), at least 2,000 of which are to be located within the Teignbridge Plan area. TDC's preparation of the Southwest of Exeter AAP will be informed by a master plan for the whole of Area of Search 4C, and will be consulted upon as part of the plan preparation.

2.2.10 The masterplan study is being undertaken by LDA Design and has been jointly commissioned by Teignbridge District Council, Exeter City Council, Devon County Council and Exeter and East Devon New Growth Point. The masterplan will cover both the Teignbridge and Exeter growth for Area of Search 4C. The visioning workshops were held in October 2009 and the final report is due by the end of February 2010.

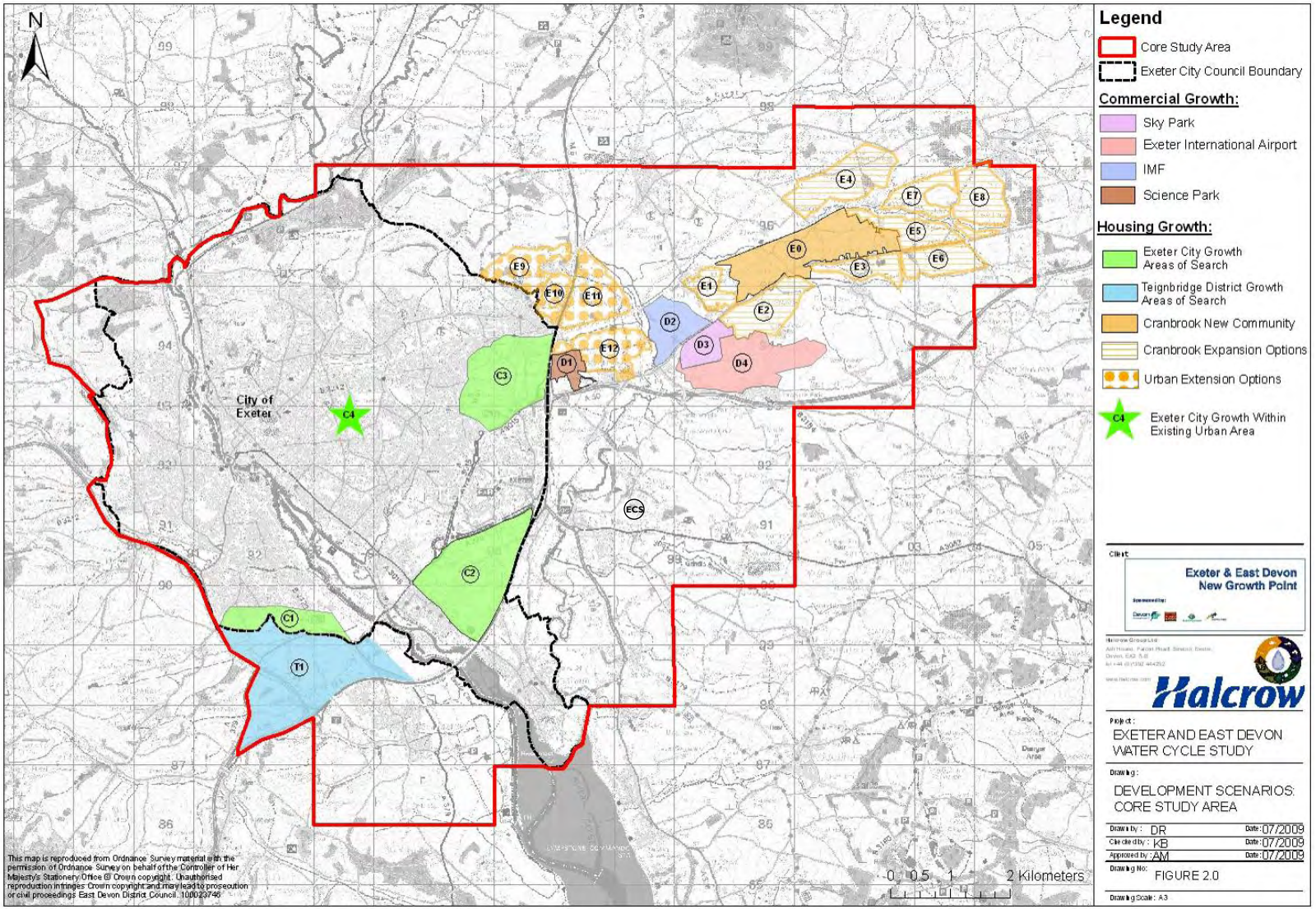


Figure 2.1 – Areas of growth in core study area

Table 2.2 – Areas of Growth

Sub-region	Growth Area	Development Target (No. of Houses)		Site Ref.	Description	Approximate scale of growth
		Secretary of State	Max to be tested in WCS			
Exeter City	ECC boundary, including RSS Area of Search 4c	15,000	15,000	C1	Alphington area	600 dwellings
				C2	Newcourt area	3700 dwellings
				C3	Monkerton/ Hill Barton	2300 dwellings
				C4	Exeter existing urban	6400 dwellings
Teignbridge	South west of Exeter (Area of Search 4c)	2,000	2,000	T1	Alphington area	2000 dwellings
East Devon	Cranbrook New Community	7500	10,000	E0	Allocated Phase 1	2900 dwellings
				E1 to E8	Extension options 1to 8	Combination of Options E1-E8 to accommodate 4600 to 7100 dwellings
	East of Exeter (RSS Area of search 4b)	4000	4500	E9	Pinhoe area	Combination of Options E9-ECS to accommodate up to 4500 dwellings
				E10	Pinn Court Farm area	
				E11	Mosshayne area	
				E12	Redhayes	
				ECS	Exeter county	
	Elsewhere in East Devon	5600	5600	E13	Axminster	Growth at every settlement, totalling 5600 dwellings in combination
				E14	Beer	
				E15	Budleigh Salterton	
				E16	Colyton	
				E17	Exmouth	
				E18	Honiton	
				E19	Newton Poppleford	
				E20	Ottery St Mary	
				E21	Seaton	
				E22	Sidmouth	
	Commercial development	-	-	D1	Airport Expansion	Increase terminal and car parking areas
				D2	IMFT	61,000sq.m of B8 landuse
				D3	Science Park	76,000 sq.m of B1 landuse
				D4	Skypark	140,000sq.m of B1 & B2 landuses

3 The water cycle catchment

3.1 Introduction

3.1.1 Figure 3.1 shows the natural and engineered elements that comprise the Water Cycle in the context of this study. Although the methods of dealing with the water cycle elements may change, the basic requirements never will. Rain will fall, clean water will be needed for life and sewage treatment will be needed for public health.

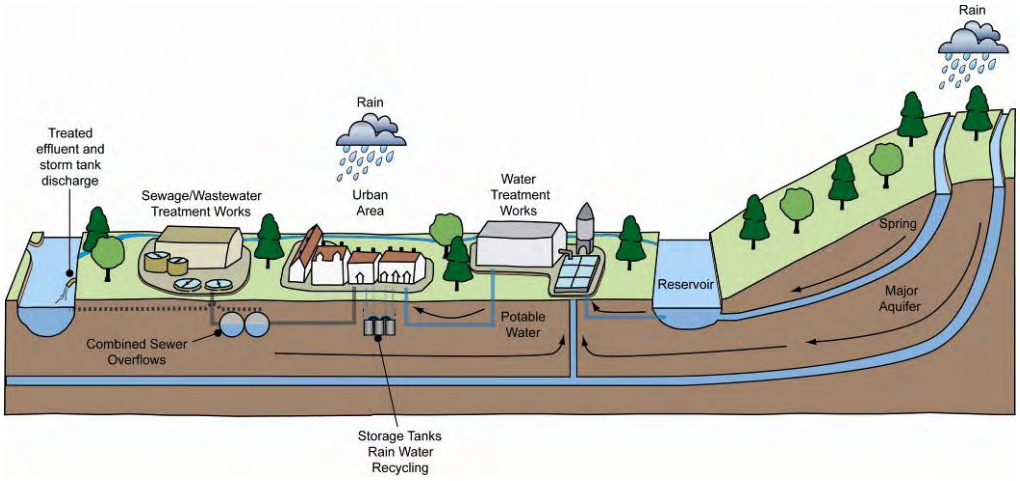


Figure 3.1 – The water cycle

3.1.2 Human manipulation of the natural water cycle can result in negative impacts on the water-related environment, which can indirectly affect the ecology that is dependant on the natural features of a water cycle. These features are potentially at risk from future development due to the associated increase in demand for clean water supply taken from natural sources; increased treatment of waste water that has to return to receiving waters; and the alteration of natural surface water flow paths.

3.1.3 There are two key uncertainties in the study of any water cycle: Climate change, which can be modelled crudely for some aspects of the water cycle, and the Water Framework Directive ((WFD) already transposed into UK law) which could mean that water quality standards improve significantly between now and 2016. What is acceptable now may not necessarily be so in the future.

3.2 River catchments and hydrology

3.2.1 The river catchments within the study area are shown in Figure 3.2 The main watercourses that drain the core study area are the River Exe and its tributary the River Clyst. Just upstream of the growth point area, the River Exe is joined by two major tributaries, the River Creedy from the west and the River Culm from the east. The wide floodplains of the River Exe and River Culm provide significant floodwater storage immediately upstream (north) of the core study area, attenuating and reducing peak flows. Downstream of Exeter, the River Exe flows in a south-easterly direction into the Exe estuary.

3.2.2 Elsewhere in East Devon, the other main river catchments are the River Otter in the west of the district (flowing through Newton Poppleford and to the coast at Budleigh Salterton), the River Sid

flowing to the coast at Sidmouth, and the River Axe in the east flowing through Axminster to the coast at Axmouth (just east of Seaton).

3.2.3 The Environment Agency's Catchment Flood Management Plans for the Exe and the East Devon catchments tabulate flows for a 1% annual probability flood event (having a 1 in 100 year chance of occurrence) in the Exe, Otter and Axe catchments, as shown in Table 3.1 below.

3.2.4 The rivers respond rapidly to rainfall, particularly in the East Devon settlements and floods are characterised by a very rapid rise and fall in water levels, with high flood peaks. Each sub-catchment contributes differently in terms of flow and timing in relation to the overall peak.

Table 3.1 – Estimated peak river flows for 1 in 100 year flood event (source: *The Exe CFMP and the East Devon CFMP*, both Environment Agency)

River	Peak flow (m^3/s)	Volume of water passing in flood event (m^3)
Exe (upper)	140	6 million
Exe total	750	60 million
Otter total	181	11 million
Axe total	152	10

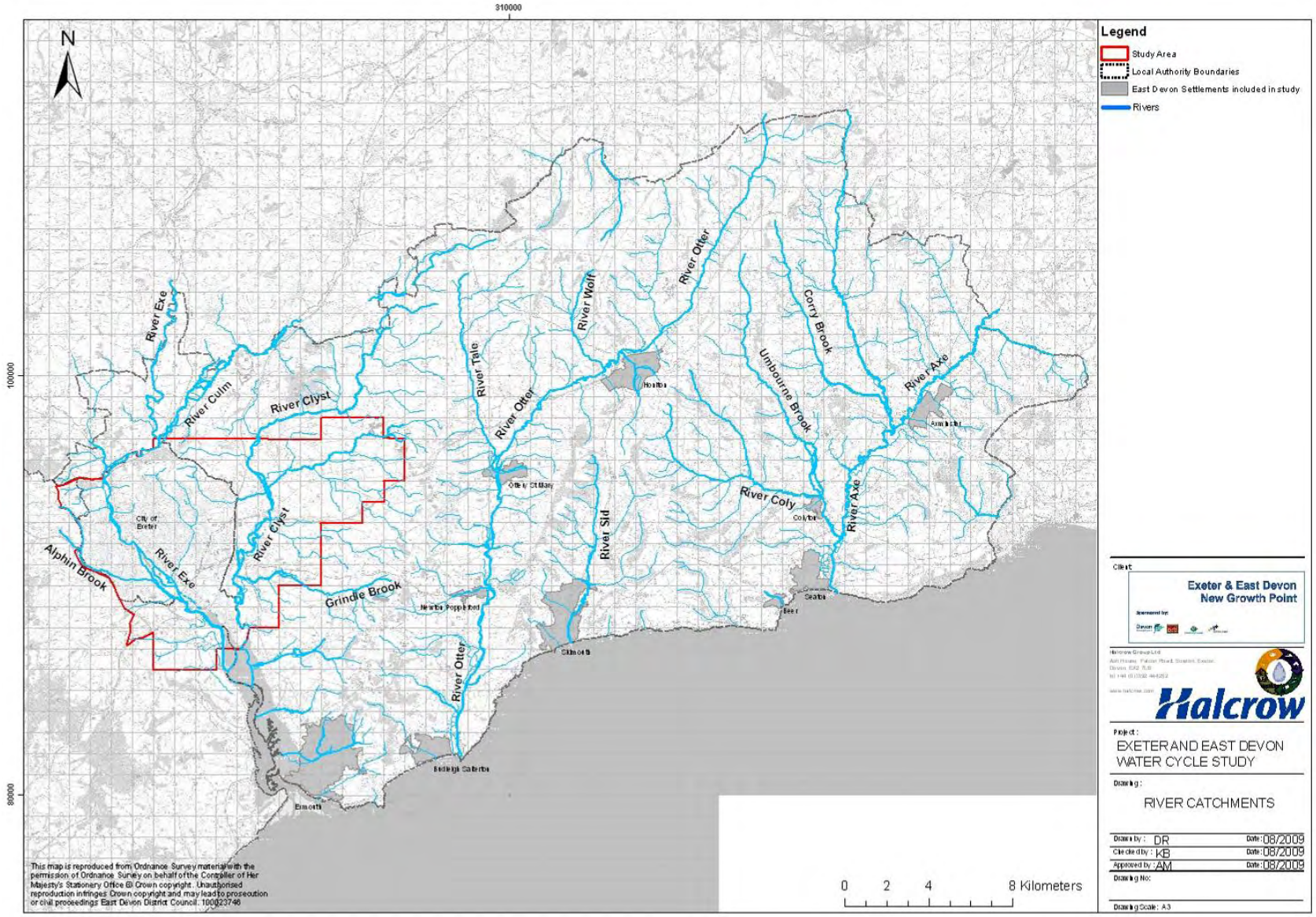


Figure 3.2 – River catchments in study area

3.3 Geology

3.3.1 The geology of the study area is summarised briefly in the paragraphs below, based upon a review of British Geological Society maps (Sheets 325, 326, and 339). The geology of the river catchments and the study area as a whole is already well-documented in the CFMP and CAMS documents produced by the Environment Agency and in the recently published Green Infrastructure Study for the New Growth Point [LDA Design 2009]. For the purposes of this Water Cycle Study the geological classification was determined for each of the identified growth areas – the results are recorded in the table in Appendix B.

3.3.2 The bedrock geology across Exeter and East Devon becomes progressively younger from west to east. In the west the relatively permeable Permian strata of the Exeter Group (sandy breccias and fine sandstones) lie along the east-side of the Exe Estuary. In the hills around and to the north and northeast of Exeter City these sediments give way to older and less permeable mudstones, siltstones and sandstones of the Carboniferous Holsworthy Group in the Clyst catchment.

3.3.3 Further to the east, beneath the Otter and Sid catchments, the presence of relatively impermeable Permo-Triassic mudstones of the Aylesbeare and Mercia Mudstone Groups lead to significant surface runoff. Beneath the Axe and Lim catchments in the east, younger and variably permeable Jurassic strata, comprising a sequence of interbedded mudstones and limestones, are capped by Cretaceous clays, and highly permeable sandstones and Chalk.

4 Flood risk management and urban drainage

4.1 Introduction

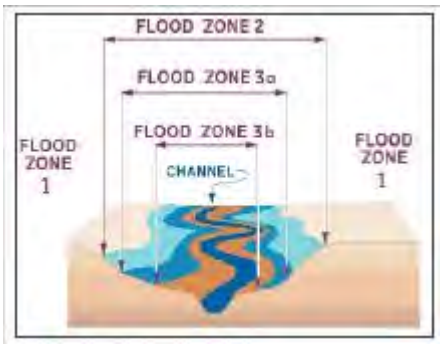
4.1.1 This chapter assesses the key flood risk and surface water management issues within the core study area and at the ten East Devon settlements identified as potential growth areas.

4.1.2 The assessment identifies existing critical water services infrastructure and areas of potential development located within existing flood risk areas and considers whether the development proposals could –without mitigation - result in increased flood risk as a consequence of:

- loss of existing floodplain due to encroaching development
- surface water run-off from new development
- additional flows from new homes into existing sewer networks, exceeding their capacity
- increased discharges from WWTW to watercourses

4.1.3 Planning Policy Statement 25 (PPS25) requires that there is no increase in flood risk due to development. Urban drainage is a key component of managing flood risk and this chapter provides a broad assessment of the potential for surface water management in the growth areas. The implications of existing legislation and the emerging Floods and Water Management Bill are also considered.

4.1.4 The Environment Agency produces mapping of flood risk zones to identify the statistical risk of flooding of land throughout England and Wales. The flood risk zones within the study area are reproduced in Figure 4.1. The EA flood maps currently only show fluvial (river) and tidal flooding; pluvial (rainfall) flooding is not covered at present although this is currently being prepared. These maps do not take in to account any existing flood defences or make any allowance for climate change impacts. The Environment Agency's flood risk mapping is regularly updated and it is recommended that reference is always made to the most up to date maps available.



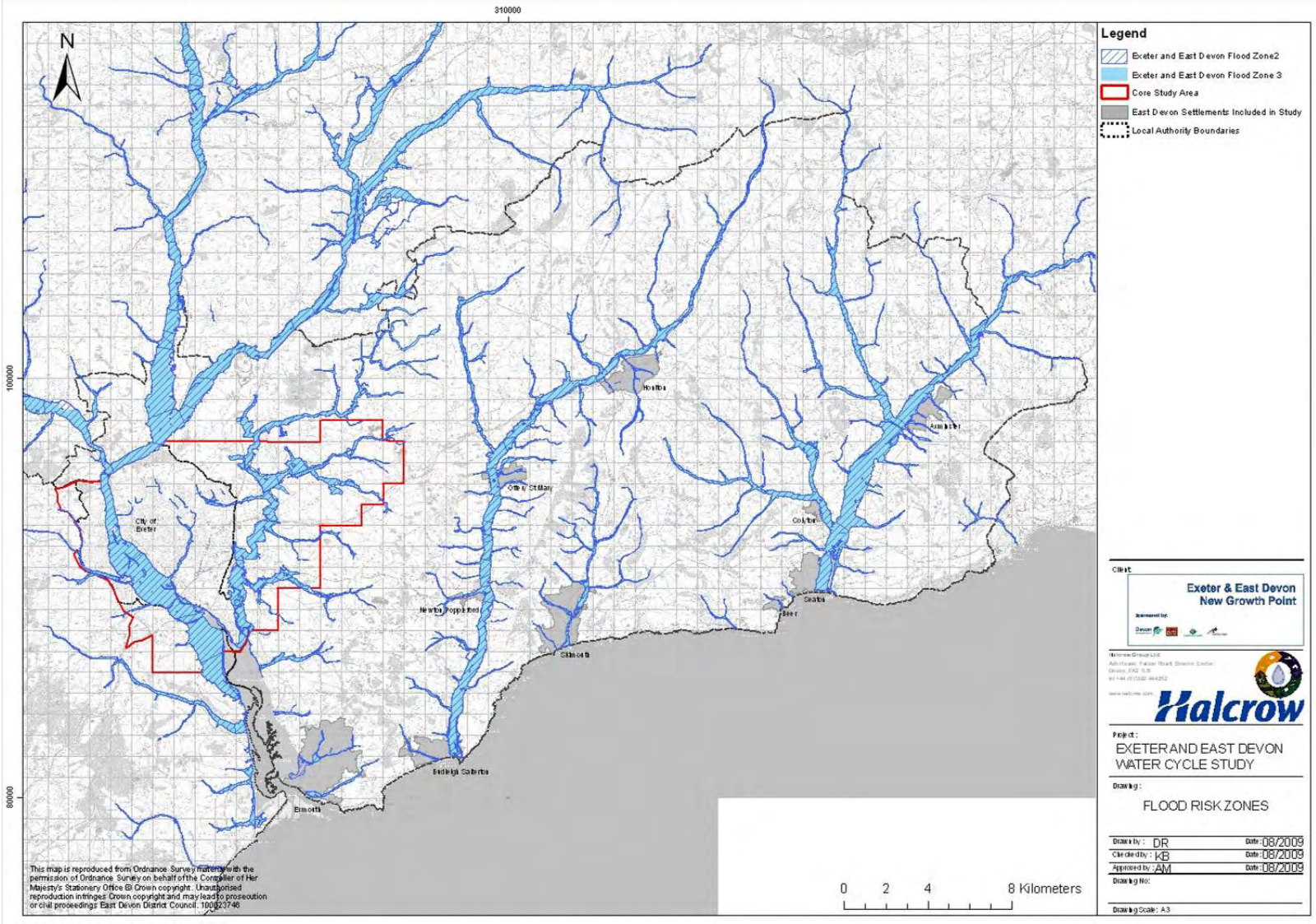


Figure 4.1 – Flood risk zones in study area

4.2 Flood risk assessments and management plans

4.2.1 All of the development areas and sites identified in this study are large enough to be classified as 'major development' under PPS25 and would each therefore require to be accompanied by a Flood Risk Assessment (FRA) to demonstrate how flood risk from all sources has been managed taking climate change into account. The proposed developments of Cranbrook New Community, Exeter Science Park, Skypark and the Intermodal Freight Terminal have all either already obtained outline planning consent or have applications currently under consideration.

4.2.2 The Environment Agency produces Catchment Flood Management Plans (CFMP) in order to understand the factors that contribute to flood risk within river catchments now and in the future. Each plan identifies the most sustainable policies and actions to manage the risks of flooding within the catchment over the next 50 to 100 years. The Exe (2008) and the East Devon (2008) Catchment Flood Management Plans (CFMP) are relevant to the study area.

4.2.3 Local Authorities undertake Strategic Flood Risk Assessments (SFRA) to provide on overview of flood risk within their boundary and to provide guidance on flood risk issues to planning officers and developers. The status of SFRA work within the study area is summarised below.

Exeter City

4.2.4 A Level 1 Strategic Flood Risk Assessments (SFRA) was completed for Exeter City Council (ECC) in 2008 and Level 2 SFRA mapping is currently being agreed with the Environment Agency. The Level 2 work has looked at areas of high flood risk where development is proposed in the ECC Core Strategy. A draft sequential test is underway for ECC, and will incorporate the results of the Level 2 SFRA work.

East Devon

4.2.5 A Level 1 Strategic Flood Risk Assessment (SFRA) was undertaken for East Devon District Council (EDDC) in 2008. A Level 2 SFRA will only be required if development allocations are not within Zone 1 (i.e. Level 2 is not required for the current allocations, including Cranbrook).

4.2.6 Subsequent to the publication of the East Devon CFMP and the Level 1 SFRA, flooding in late October 2008 affected over 350 properties in the East Devon area. In response to this event, the multi-agency East Devon Flood Recovery Partnership was established to examine the flooding issues and see what lessons could be learnt to reduce future flood risk. The Partnership - comprising of East Devon District Council, Devon County Council, the Environment Agency and Devon and Somerset Fire and Rescue Service – meets at regular intervals and publishes a 'Flood Recovery Update' to inform residents and interested parties of progress.

Teignbridge

4.2.7 A Level 1 Strategic Flood Risk Assessment (SFRA) was completed for Teignbridge District Council and Dartmoor National Park Authority in 2005 and was later updated in 2007 in light of more recent government guidance on development and flood risk. A Level 2 SFRA is currently under consideration and is due to be completed in February 2010. The Council has commissioned a Water Cycle Strategy for the District (excluding Area of Search 4C) – the outline study is due for completion in May 2010.

4.3 Development and existing flood risk

4.3.1 PPS25 seeks to direct new development towards areas of lowest flood risk (Zone 1). This study has reviewed the flood zone(s) associated with each of the identified development growth areas and noted existing critical infrastructure at risk of flooding in these areas. This assessment is based on the latest flood zones published issued by the Environment Agency in June 2009.

4.3.2 The main source of flood risk in the study area is from river (fluvial) flooding, particularly when prolonged periods of rainfall fall on a saturated catchment. Tidal and coastal flooding presents a risk in the south of the study area around the Exe estuary and East Devon coastline. There are also a limited number of cases of surface water flooding, sewer flooding, groundwater flooding identified within the CFMPs and SFRAs listed in Section 4.2.

4.3.3 Within the core study area, the Pynes Hill Water Treatment Works and the Countess Wear Wastewater Treatment Works are both at risk of flooding in the 1 in 100 year flood (1% Annual Exceedence Probability (AEP)). These strategic infrastructure assets serve Exeter and parts of East Devon and the impact of such a flooding event would affect water supplies and sewerage to thousands of people. Other critical strategic infrastructure at risk of flooding includes the M5 motorway, the A30 dual-carriageway and the London Paddington and London Waterloo main railway line. The Paddington to Penzance railway, Exe Estuary railway and Exeter to Barnstaple railway are also all at risk of flooding in the 1 in 100 year flood (1% AEP).

Centre and edge of Exeter

4.3.4 There have been no events resulting in flooding to more than 30 properties in any individual location in the Exe catchment since 2000. The most significant flood event in Exeter occurred in 1960, when the River Exe caused widespread flooding affecting more than 1000 properties with flows reaching 700 cumecs. This led to the development of the present flood alleviation scheme through the city.

4.3.5 It is envisaged that due to climate change this scheme will offer a much reduced standard of protection by 2100 and therefore the Exe CFMP proposed policy for Exeter (Policy Unit 1) is to 'Take further action to reduce flood risk (now and in the future)'. Proposed actions include improve flood risk management and warning systems, encourage more sustainable developments, reduce the number of people in Exeter and Stoke Canon living in areas of significant flood risk, lessen the impacts of flooding on railways and create/enable critical infrastructure to be more flood resilient.

4.3.6 Key areas of Exeter city at risk of flooding include Countess Wear, Alphington, Topsham, St Thomas, Marsh Barton, Monkerton, The Quay and lower parts of Exwick and St Davids. Critical assets in Exeter at risk of flooding from the River Exe include: two health centres, two schools/colleges, the A377 near Exe Bridges, St. Davids railway station, approximately 35 electric sub-stations and two emergency ambulance services.

4.3.7 In 2009 the Environment Agency completed improvement works to the existing flood defences at Station Road to address a low-point in the defences and improve the standard of protection provided to the Exwick area.

4.3.8 The New Court growth area is located entirely within the low flood risk zone (zone 1). The majority of the Monkerton area is also classified as low flood risk, however a small part of the area is affected by the flood zones 2 and 3 of the Pin Brook, a tributary of the River Clyst. The brook's

floodplain is narrow and restricted to immediately beside the brook, in part due to a flood alleviation scheme constructed in the 1980s.

4.3.9 Part of the Alphington growth area (Area of Search 4C) is affected by Flood Zones 2 and 3 of the stream that runs in parallel to the north edge of the A379. Other parts of the Alphington area are at risk of flooding from the Alphin Brook. A flood defence scheme in Marsh Barton industrial estate provides flood protection to the Alphington area in excess of the 1 in 200 year flood event. However the steep and rapid brook catchment makes flood warning challenging, making the area generally unsuitable for significant development. The Exeter SFRA notes that further development in the Alphington area may be possible, but impacts on downstream drainage capacity should be considered.

4.3.10 The key source of flood risk in the south of the core study area is the Exe Estuary, with flood zones 2 and 3 affecting the lower parts of Exminster.

4.3.11 The Exeter SFRA indicates that neither sewer flooding nor groundwater flooding are a major problem in the city.

East of Exeter

4.3.12 All of the growth areas located to the east of Exeter in East Devon are within The Exe CFMP Policy Unit 4, for which the proposed policy is to 'Take further action to sustain the current level of flood risk into the future'.

Commercial development sites

4.3.13 The Science Park, Airport expansion, IMFT and Skypark sites are generally all located in areas of low flood risk, but in proximity to higher risk zones. The exception is the part of the Intermodal Freight Terminal development that falls within the indicative 1 in 100 yr flood plain of the River Clyst.

4.3.14 Although the Science Park site is entirely within Flood Zone 1, it is located adjacent to areas at risk of fluvial flooding from the River Clyst and Pin Brook. An outline planning application is currently under consideration for Phase 1 of the development. The Great Moor stream running to the south of the site currently receives surface water runoff from the M5 Junction 29 and Sowton Industrial Estate, and although near critical capacity, it is not thought that it will receive any increased discharge generated from development of the Science Park.

Cranbrook New Community

4.3.15 Parts of the site allocated for the Cranbrook new community are located in the medium and high risk flood zones of the Cranny Brook and Rockbeare Stream. However, the only developments proposed in these areas are for the essential infrastructure of the new railway station and the crossing of the Rockbeare stream. Although the Cranbrook expansion options are generally limited in extent to Flood Zone 1 areas, the sites all border the zones of higher flood risk associated with these watercourses. The East Devon SFRA notes flood incidents having occurred in the vicinity of the west and south east expansion option areas.

East of Exeter

4.3.16 The growth areas identified by East Devon as options for a second new community or urban extension – Pinhoe, Pinn Court Farm, Mosshayne, Redhayes areas and the County Showground site - are generally located in areas of low flood risk (zone 1) but are again in close proximity to

higher flood risk zones of the River Clyst and its tributaries. The main source of flood risk is the Pin Brook watercourse, which flows south through Pinhoe and was subject to a flood alleviation scheme in the 1980s following flooding problems due in part to culverted channel sections and blockages.

East Devon settlements

4.3.17 Notable flooding problems elsewhere in East Devon are associated with the rivers Otter, Sid, Axe and their tributaries. The key sources of flooding and the CFMP policies are listed for each of the ten main settlements in Table 4.1 below.

Table 4.1 – Sources of flooding and CFMP policies for East Devon settlements

Settlement	Sources of flooding	CFMP Policy Unit	CFMP policy
Axminster	River Axe, Mill Brook and Gamber Lake watercourses	East Devon 9	Continue with existing or alternative actions
Beer	Beer Stream and overland flows	East Devon 11	Reduce existing flood risk management actions
Budleigh Salterton	River Otter and Budleigh Salterton Brook	East Devon 3	Take further action to reduce flood risk
Colyton	River Coly and Ridgeway Stream. Sewer incident also recorded in SFRA.	East Devon 11	Reduce existing flood risk management actions
Exmouth	English Channel, Exe Estuary, Withycombe Brook, Bapton Brook and Littleham Brook. Sewer flood incidents recorded.	Exe 5	Take further action to sustain the current level of flood risk into the future
Honiton	Gissage Stream, Glen Stream and River Otter	East Devon 6	Continue with existing or alternative actions
Newton Poppleford	River Otter and Back Brook	East Devon 11	Reduce existing flood risk management actions
Ottery St Mary	River Otter and Furze Brook	East Devon 5	Sustain the current scale of flood risk
Seaton	English Channel, Axe estuary and River Axe. Sewer flood incidents	East Devon 4	Take further action to reduce flood risk

Settlement	Sources of flooding	CFMP Policy Unit	CFMP policy
	recorded.		
Sidmouth	River Sid and Sidmouth tributary	East Devon 7	Sustain the current scale of flood risk into the future

4.3.18 The East Devon CFMP notes that many of the East Devon settlements flood regularly, but without significant risk to life or property. Flooding from rivers is a notable problem in Seaton and Honiton, whilst Sidmouth has one of the most significant flooding records amongst the East Devon settlements. Several steep watercourses enter the lower reaches of the River Otter, resulting in flood risk to Newton Poppleford and Ottery St Mary. The Gissage and Glen Streams are the main sources of flooding in Honiton and the River Coly – a main tributary of the River Axe - causes flood risk to Colyton. River flooding combines with tidal flooding in Sidmouth, Seaton and Budleigh Salterton.

4.3.19 Surface water flooding is also a problem in the catchment, often caused by runoff from agricultural land and exacerbated when the capacity of drainage systems is insufficient or when blockages occur. However the East Devon CFMP describes the problem as 'high frequency, but low impact'.

4.3.20 Flooding in late October 2008 affected over 350 properties in the East Devon area, including Feniton, Ottery St Mary, Tipton St John, Newton Poppleford, Otterton and Budleigh Salterton. The East Devon Flood Recovery Partnership reported in it's Autumn 2009 update that the vast majority of affected properties were flooded by small streams or surface water run-off, rather than by main rivers. Over the past year, the Partnership has been working to investigate the flooding issues and implement measures to reduce flood risk, including agricultural land management techniques and surface water drainage improvements. A report summarising the flood event, lessons learnt and improvements undertaken is due to be completed by the Partnership in early 2010.

4.3.21 Existing Sewage Treatment Works are at risk of flooding in the following East Devon settlements:

- Honiton (River Otter)
- Ottery St Mary (River Otter)
- Seaton (River Axe)

4.3.22 The Lime Kilns Terminal Sewage Pumping Station at Budleigh Salterton is also at risk of flooding from the adjacent River Otter.

4.4 Impact of development on flood risk

Loss of existing floodplain due to encroaching development

4.4.1 The majority of the indentified growth areas and directions are partially or wholly located in the low risk flood zone. However, most areas are also in close proximity to areas of greater flood risk and often border flood zones 2 and 3. In these circumstances development must avoid future encroachment into the floodplain by establishing a distinct and significant buffer zone between the edge of development and zones of higher risk. The scale and extent of buffers should be determined in consultation with the Environment Agency, relative to the topography and elevation of each site. Flood buffer zones present the opportunity for multi-functional Green Infrastructure that may be used for biodiversity enhancement and recreational uses.

Surface water run-off from new development

4.4.2 Future development in Flood Zone 1 should realise opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development. All new development must ensure that flood risk is not increased elsewhere by achieving greenfield runoff rates for surface water.

4.4.3 The proposed Cranbrook and Science Park developments already have drainage strategies in place that indicate that greenfield run-off rates can be achieved.

Additional flows from new development into existing sewer networks, exceeding their capacity

4.4.4 Provided that all new development is served by separated sewer systems[1] and that South West Water have adequate notice of development in order to design and implement new or improved foul sewers of adequate capacity, then the risk of foul sewer flooding from new development should be negligible. The risk of sewer flooding occurring is slightly greater within Exeter's existing urban area due to the in-combination affect of infil developments utilising existing combined sewer systems that have limited residual capacity. Local authorities should Supporting the South West Water 'Sewers for Sewage' initiative to reduce foul sewer flooding due to surcharging by surface water and blockage by grease, oils and waste.

Increased discharge from WwTW

4.4.5 Increased discharges from WwTW due to development may adversely affect flood risk downstream of the works. PPS25 requires that there is no increase in flood risk due to development. Mitigation measures may be required where either (a) there is a quantifiable increase in the frequency of spill from storm storage tanks due to additional foul flows, or (b) the receiving watercourse and associated flood risk area is particularly sensitive to changes in flows.

4.4.6 Consultation with South West Water has not identified any locations within the study area where there is a known problem associated with discharge from a WwTW increasing flood risk in the receiving waters. Typically, the discharge consent determination process assesses downstream flood risk as part of the determination process. We have assumed that the existing discharge

[1] A separate system comprises a foul system which conveys wastewater or foul drainage only to the wastewater treatment works, and a separate surface water system that collects roof and highway runoff and discharges the clean runoff into rivers and coastal waters.

consent granted for each WwTW included an assessment of flood risk impact and that the outcome was considered to be acceptable. Some of the older consents may not have been assessed for Flood Risk Impact at the time of issue but will have been considered as part of the more recent Catchment Flood Management Plans (CFMP).

4.4.7 In granting any future consents, the Environment Agency will review the flood risk impact to ensure that there is no adverse affect. Applications for future flow increases at WwTW are assessed for potential impact upon flood risk, and where there is considered to be a potential problem, compensatory measures will be introduced.

4.4.8 South West Water should consult with the Environment Agency to identify an appropriate policy for identifying locations where mitigation measures would be required and agree suitable methods for mitigation where required. For example, one option for mitigating the increase in flows could be to provide additional storage volume in the floodplain or in any flood attenuation facilities in the vicinity of the WwTW to compensate for the increase in flows.

4.5 Development and surface water management

Introduction

4.5.1 Successful management of the surface water environment is critical for any new development or re-development of land. Failure to adequately consider surface water management during the planning and design process can result in flooding and hazard to members of the public, the environment or critical infrastructure after construction.

4.5.2 Sustainable Drainage Systems (SuDS) - recognised as the first step in the management of surface water in new developments – seek to mimic natural drainage processes as closely as possible to reduce flood risk on-site as well as downstream of the development. The SuDS 'treatment train' sets out this approach, starting at the top of the hierarchy with prevention techniques and then cascading through the source control, site control and regional control, as described in Table 4.2 below.

4.5.3 SuDS should not be considered in isolation as having a single (drainage) function but should – wherever possible - seek to perform an essential green infrastructure role with multiple functions. This can be achieved if SuDS are designed sensitively, in the right locations and with long-term management plans in place.

Table 4.2 – SuDS treatment train (Source: *SuDS Manual C697*, CIRIA 2007.)

SuDS technique	Description
Prevention	The use of good site design and site housekeeping measures to prevent runoff and pollution (e.g. sweeping to remove surface dust and detritus from car parks), and rainwater harvesting. Prevention policies should generally be included within the site management plan.
Source control	Control of runoff at or very near its source (e.g. soakaways, other infiltration methods, green roofs, pervious pavements).
Site control	Management of water in a local area or site (e.g. routing water from building roofs and car parks to a large soakaway, infiltration or detention basin).
Regional control	Management of runoff from a site or several sites, typically in balancing ponds or wetland.

4.5.4 SuDS are not a panacea to flood prevention; there will be occasions during extreme rainfall events when the system capacity will be exceeded and overland flows will be generated. It is important from an early stage to recognise this risk and ensure that developers determine the route that overland flows would take and implement mitigation measures to prevent putting people or critical infrastructure at risk. It is recommended that the best practice guidance 'Designing for exceedance' [CIRIA 2006] is followed.

Legislation and guidance

4.5.5 SuDS are currently designed and implemented under the existing legislative requirements of the Land Drainage Act 1991 (amended 1994) and the Town and Country Planning Act 1990 and generally in accordance with existing best practice guidance (e.g. The SuDS Manual [CIRIA 2007], the Model Agreements for Adoption [National SuDS Working Group 2004] and the Rainfall runoff management for developments [Defra/EA 2005]). However the implementation of successful SuDS is currently far from straight forward; the primary difficulty is in answering the question 'who will adopt the SuDS once constructed?' The answer to this question will determine the design approach and standards taken by the developer.

4.5.6 The draft Floods and Water Management Bill seeks to place the responsibility for adoption and maintenance of SuDS (serving more than one property) on Upper Tier or Unitary Authorities and sets out the responsibilities for all the stakeholders, including a duty for Local Authorities to co-operate with the Upper Tier and Unitary Authorities on flood risk management matters.

4.5.7 In anticipation of this new legislation and the associated national standards, it is recommended that Local Authorities make a positive step toward adopting SuDS on proposed developments using current best practice and then passing these systems over to the Upper Tier or Unitary authority under the 'designation' part of the draft Bill. Examples of where this approach is being applied can currently be seen in Cornwall, Oxfordshire, Northampton and Cambridge, where the City and County Councils have worked in partnership with others to develop design and adoption guidance for developers.

4.5.8 South West Water have recently been engaged in Defra's national SuDS pilot projects in both Camborne and Torbay, working with the Environment Agency, Local Authorities and others to develop integrated sustainable drainage solutions.

Assessment of surface water management potential

4.5.9 The following key criteria will affect the potential of successful surface water management options and must be considered in the detailed design and planning of SuDS:

- Permeability of the underlying geology
- Soil properties
- Catchment topography
- Ground water levels (water table)
- Contaminated ground conditions
- Flood risk
- Presence of aquifers
- Drinking water source protection zones (SPZ)
- Extent of existing and proposed urbanised area
- Availability of point of outfall (e.g. watercourse, sea, soak-away)
- Existing landuses that may affect SuDS techniques – e.g. flight path of airport

4.5.10 At this outline phase of Water Cycle Study, only a broad assessment of surface water management potential has been undertaken for each of the development growth areas, using the criteria defined in Table 4.3 below.

4.5.11 The assessment was based upon a desk-study of readily available data and analysis and has used a simple traffic light approach to assess the potential for SuDS, with green indicating a positive outcome, yellow indicating a notable outcome, and red indicating a critical outcome. This assessment provides an indication of the constraints to and opportunities for sustainable surface water management in the areas of future growth. Detailed intrusive investigations will be needed by developers to support their proposals as they come forward.

4.5.12 The assessment results are presented in Table 4.4 and Table 4.5 overleaf, followed by a discussion of the criteria and the key issues identified.

Table 4.3 – Surface water management potential - assessment criteria

Key criteria	Impact on SuDS potential - Definition		
	Critical	Notable	Positive
Permeability of underlying geology (determined from British Geological Survey plans)	Poor potential for drainage by infiltration due to low permeability.	Moderate potential for drainage by infiltration due to moderate permeability.	Good potential for drainage by infiltration due to high permeability.
Ground water source protection zones (SPZ)	Development located within Inner SPZ or combination of Inner, Outer, & Total catchment SPZs.	Development located within Outer or Total catchment SPZ.	Development located outside of Total catchment SPZ.
Outfall availability	Outfall is >500m from site boundary.	Outfall is 0-500m from site boundary.	Outfall available on-site.
Urbanised area	76-100% of the surrounding area is urbanised.	26-75% of the surrounding area is urbanised area.	0-25% of the surrounding area is urbanised area,
Overall assessment	More than one criteria assessed as 'critical'.	Up to one critical criteria, the remainder notable or positive	No critical criteria and two or more criteria 'positive'.

Table 4.4 – Surface water management potential – assessment results for East Devon settlements

Settlement	Underlying geology	Source protection zones (SPZ)	Outfall availability	Urbanised area	Overall assessment
Exmouth	🔴	🟢	🟡	🟢	🟡
Budleigh Salterton	🟢	🟡	🟡	🟢	🟢
Newton Poppleford	🟢	🔴	🟡	🟢	🟡
Ottery St Mary	🟡	🔴	🟡	🟢	🟡
Sidmouth	🔴	🟢	🟡	🟢	🟡
Honiton	🔴	🟢	🟡	🟢	🟡
Beer	🔴*	🟡	🟡	🟢	🟡
Seaton	🔴	🟢	🟡	🟢	🟡
Colyton	🔴	🟢	🟡	🟢	🟡
Axminster	🔴	🟢	🟡	🟢	🟡

* = Underlying geology highly permeable but prone to dissolution.

Table 5.5 – Surface water management potential – assessment results for the core study area (to be read in conjunction with Figure 2.1)

Site Ref.	Underlying geology	Source protection zones (SPZ)	Outfall availability	Urbanised area	Overall assessment
Teignbridge					
T1	🟡	🟢	🟡	🟢	🟢
Exeter City					
C1	🟡	🟢	🟢	🟢	🟢
C2	🟡	🟢	🟡	🟡	🟡
C3	🟡	🟢	🟡	🟡	🟡
C4	🟡	🟢	🟡	🔴	🟡
East Devon					
D1	🟢	🟢	🔴	🟢	🟡
D2	🔴	🟢	🟢	🟢	🟡
D3	🟡	🟢	🟢	🟢	🟢
D4	🟡	🟢	🟢	🟡	🟢
E0	🟡	🟢	🟢	🟢	🟢
E1	🟡	🟢	🟢	🟢	🟢
E2	🔴	🟢	🟢	🟢	🟡
E3	🟡	🟢	🟢	🟢	🟢
E4	🟡	🟢	🟢	🟢	🟢

Site Ref.	Underlying geology	Source protection zones (SPZ)	Outfall availability	Urbanised area	Overall assessment
E5	🟡	🟢	🟢	🟢	🟢
E6	🟡	🟢	🟢	🟢	🟢
E7	🟡	🟢	🟢	🟢	🟢
E8	🟡	🟢	🟢	🟢	🟢
E9	🔴	🟢	🟢	🟢	🟡
E10	🟢	🟢	🟢	🟢	🟢
E11	🟡	🟢	🟢	🟢	🟢
E12	🟡	🟢	🟢	🟢	🟢

Discussion of assessment criteria and results

Permeablility of underlying geology

4.5.13 The underlying geology is of great importance to the management of surface water because it determines the viability of infiltration techniques, which are viewed as the primary means of surface water disposal (source control). The presence of underlying geology of low permeability will not rule out the use of SuDS techniques, but will reduce the options for disposal at source. It is also important to note that some types of highly permeable underlying geology, such as chalk, may be at risk of dissolving if surface water is encouraged to soak away through the rock. It is recommended that a thorough ground investigation is commissioned by the developer to determine the viability of any proposed SuDS schemes.

4.5.14 The geology underlying each of the identified development areas was determined from British Geological Society maps (Sheets 325, 326, and 339). The geological classification assigned to each site is recorded in the table in Appendix B.

4.5.15 The majority of the development areas were assessed as notable, because the large size of the sites results in variation in the underlying geology - and therefore the permeability - across a single site.

4.5.16 The development areas that were assessed as critical (i.e. poor potential for drainage by infiltration) were those which overly geology that primarily consists of materials that are either impermeable or have such slow rates of infiltration that they are considered practically impermeable.

4.5.17 In locations where underlying chalk is located (notably Seaton, Axminster and Beer) caution must be exercised when considering infiltration techniques, as introducing concentrated volumes of surface water into chalk formations can result in dissolution (dissolving of the rock) and destabilisation of ground conditions.

Groundwater source protection zones (SPZ)

4.5.18 The Environment Agency has established Source Protection Zones (SPZ) to protect drinking water abstraction boreholes. The zones are described in Table 4.6 (extracted from the

Environment Agency web site) together with an explanation as to the constraints posed by each zone on developments;

4.5.19 Surface water drainage by infiltration to ground could potentially contaminate the groundwater and therefore a thorough understanding of the underlying hydrogeology would need to be demonstrated by a developer proposing infiltration techniques to confirm that their proposals would not lead to contamination of ground water.

4.5.20 Ottery St Mary and Newton Poppleford are both located within source protection zones and as a result any discharge of surface water to ground will need to be discussed with the Environment Agency at an early stage of development. Both Budleigh Salterton and Beer have all three zones present but on a much smaller scale affecting less of the area that may be developed in the future. Sidmouth and Honiton are shown as not being affected by SPZ's although it is possible that extensive development could extend into SPZ3.

Table 4.6 – Key impacts of source protection zones on surface water management

Groundwater source protection zone description	Key impacts on surface water management
Zone 1 (Inner protection zone) Any pollution that can travel to the borehole within 50 days from any point within the zone is classified as being inside zone 1. This applies at and below the water table. This zone also has a minimum 50 metre protection radius around the borehole. These criteria are designed to protect against the transmission of toxic chemicals and water-borne disease.	The EA will object to: • any new trade effluent, storm sewage or other significantly contaminated discharges to ground. • the use of deep soakaways (including boreholes or other structures that bypass the soil layers) for surface water disposal unless the developer can show that there is no viable alternative, that there is no direct discharge of pollutants to groundwater, that risk assessment demonstrates an acceptable risk to groundwater and that pollution control measures are in place. The discharge of clean roof water to ground is acceptable provided that all roof water down-pipes are sealed against pollutants entering the system from surface run-off, effluent disposal or other forms of discharge.
Zone 2 (Outer protection zone) The outer zone covers pollution that takes up to 400 days to travel to the borehole, or 25% of the total catchment area – whichever area is the biggest. This travel time is the minimum amount of time that the EA thinks pollutants need to be diluted, reduced in strength or delayed by the time they reach the borehole.	The discharge of clean roof water to ground is acceptable provided that all roof water down-pipes are sealed against pollutants entering the system from surface run-off, effluent disposal or other forms of discharge. This must not create new pathways for pollutants to groundwater. The EA will object to the use of deep soakaways (including boreholes or other structures that bypass the soil layers) for surface water disposal unless the developer can show: • there is no viable alternative, and • that there is no direct discharge of pollutants to groundwater, and • that risk assessment demonstrates an acceptable risk to groundwater and • that pollution control measures are in place.
Zone 3 (Total catchment) The total catchment is the total area needed to support removal of water from the borehole, and to support any discharge from the borehole.	

Outfall availability

4.5.21 If discharge to ground is not feasible for surface water management, there will be a need to identify a suitable point of discharge to either a watercourse or a South West Water adopted sewer. South West Water have stated that the connection of a surface water discharge to a public foul sewer will not be permitted under any circumstances, in line with the company's initiative 'Sewers for Sewage' which seeks to combat sewer flooding through reducing surcharging by surface water and blockage by debris.

4.5.22 This assessment has identified the nearest available points of discharge. Whether or not there is available capacity within the watercourse or sewer has not been assessed.

4.5.23 All of the identified growth areas have access to a sewer or watercourse within their site extents or less than 500m from their site boundary except for the Science Park site. Any new outfall for surface water from this development could potentially connect into the highways drainage if necessary along the old A30, but this would need to consider that that sewer is only likely to be designed to accommodate up to the 5yr return period storm.

Urbanised areas

4.5.24 In highly urbanised areas the potential for surface SuDS – such as ponds and swales - is constrained by the lack of undeveloped land available. Furthermore the high percentage of existing impermeable surfaces in urbanised areas increases the risk of overland flows both towards and from new developments.

4.5.25 The majority of the identified development areas in the study area are located on undeveloped land on the periphery of existing urban areas. The only development area significantly affected by this criteria is C4 (Exeter City) due to the existing urban nature of the City restricting the potential for surface SuDS solutions such as ponds and swales. In urbanised areas such as this the focus on controlling surface water runoff should be at the prevention and source control level with green roofs, green walls, and rainwater harvesting, as well as more engineered solutions such as cellular storage tanks.

Recommendations

4.5.26 The following actions are recommended in order to ensure that the surface water management of new developments is planned and implemented appropriately and in line with the draft Floods and Water Management Bill:

- Adopt a policy of 'No surface water connection to foul sewer'.
- Prepare a SuDS policy and adoption guide to assist planners and developers. This should become a Supplementary Planning Document (SPD) and be closely linked to the Green Infrastructure Study recommendations and the emerging Green Infrastructure strategy.
- When determining land allocations within the Local Development Framework, the land take required for SuDS should be estimated prior to applying the development densities to the land parcels. This will ensure sufficient land is set-aside to implement successful SuDS solutions, which will also perform as multi-functional green infrastructure.
- Prepare Surface Water Management Plans for areas of widespread development i.e. Science Park, Skypark, Intermodal Freight Terminal, and Cranbrook to ensure a coherent approach is taken to surface water management and ensure delivery of strategic SuDS as opposed to multiple developments generating their own isolated approach to SuDS.
- Work collaboratively with key stakeholders and the County Council to reflect their proposed new responsibilities for local flood risk management when generating policy documents for surface water management to ensure that the links necessary for partnership working are already established.
- Ensure through the planning consent process that SuDS solutions are technically feasible - developers should demonstrate a thorough understanding of site conditions and provide evidence to substantiate that sustainable urban drainage solutions are deliverable.

- Ensure through the planning consent process that SuDS solutions are protected against incapacity due to future infill development. For example, South West Water have found that where existing developments have been constructed with only a foul sewer network and SuDS (i.e. no surface water sewer network) the subsequent extension of a property in that development has built over the existing SuDS (such as a soakaway), potentially leading to surface water flooding. In such situations and under the current provisions of Section 106 of the Water Act, the developer has a right to connect domestic sewage (including roof water) to the public sewer and so given that there is no surface water sewer in existence, the Water Company has to allow a connection of surface water into the foul sewer network. This additional input has not been designed for and therefore can lead to sewer flooding.
- Seek an amendment of Section 106 of the Water Act to exclude roof water from the definition of 'domestic sewage'. Such an amendment would remove the right to connect roof water to existing public sewers and would support South West Water to reduce foul sewer flooding (due to surface water surcharge) and improve wastewater treatment capacity and efficiency (preventing increases in wastewater volume due to surface water).

5 Environmental context

5.1 Environmental assets

5.1.1 The core study area features important riverine and estuarine habitats within the River Exe and River Clyst valleys, which together are identified within the South West Nature Map as a floodplain grazing marsh Strategic Natural Area (SNA).

5.1.2 The Exe Estuary is designated as a wetland of international importance under the Ramsar convention on wetlands. It is also a Special Protection Area (SPA) under the EC Birds Directive and its wet meadow and mud flat habitats support overwintering and migrating birds. It is also of recreational value, used for walking, windsurfing and jet skiing.

5.1.3 The East Devon Pebblebed Heaths area is located to the south east of Exeter, predominantly within the River Otter catchment. This designated site is the largest area of lowland heath in Devon and includes both dry and wet heath habitat.

5.1.4 Habitats Regulations Assessments (HRA) have been undertaken for the Regional Spatial Strategy and for Exeter City Council Core Strategy in order to assess the impacts of population growth on European designated sites. Within and bordering the WCS area these include the following Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs) and Special Areas of Conservation (SACs):

- Exe Estuary SSSI, SPA and Ramsar site
- Otter Estuary SSSI
- River Axe SSSI, SAC
- Dawlish Warren SAC and SSSI
- Sidmouth to West Bay SAC (including Axmouth Lyme Regis SSSI and Sidmouth to Beer Coast SSSI)
- East Devon Pebblebed Heaths SSSI, SAC and SPA (East Devon Heaths)

5.1.5 In addition to these designated sites, there is a County Wildlife Site (CWS) in the Clyst floodplain (between Clyst St Mary and Topsham) and both the Exeter Ship Canal and the Exminster Marshes are regarded as locally important habitats. These designated and protected sites are documented comprehensively in the recently published Green Infrastructure Study for the New Growth Point [LDA Design 2009].

5.1.6 The Exeter City HRA indicated the potential for a significant 'in-combination' impact on the Exe Estuary of the development proposals in EDDC, ECC and TDC.

5.1.7 The RSS HRA concluded that: "*We remain uncertain that water pollution in relation to increased pressure on sewage treatment works to serve new development will not result in adverse effects on the integrity of the Exe Estuary SPA and Ramsar site and the River Axe SAC due to the higher levels of housing in the Proposed Changes compared to the Panel recommendations*."

5.1.8 The Environment Agency's response to the RSS HRA consultation stated:

"Assuming sufficient investment is forthcoming over the planning period and there is some further innovation in sewage treatment technologies we conclude that, as far as possible, there will be no effect on the integrity of the sites listed.

However, due to the long time frame over which the RSS applies, and the locational flexibility offered in lower tier plans there remains a small risk that the capacity of the environment to assimilate sewage flows may be exceeded at particular places as growth proceeds. Although it is difficult to pin point where this issue may arise in the future we nevertheless have confidence that our monitoring, combined with the normal plan making and development control processes in cluding Habitat Regulation Assessments, will enable us to anticipate this risk and secure the safeguards that are required at particular works as development progresses through the planning process. Draft RSS provides some policy safeguards to ensure that this happens (e.g. policy RE6) and we note that the Panel advice is to strengthen these in the final plan."

5.1.9 Natural Englands's response to the RSS HRA consultation included:

"We have no reason to think that 'end of pipe' solutions (through investment in infrastructure) would definitely not be adequate, though further assessment would be required to show that they would be adequate. However the wider sustainability issues of additional 'end of pipe' treatment needs to be carefully considered (e.g. increased carbon emissions). Natural England now advocates a move away from 'end of pipe' solutions wherever possible because of these wider sustainability issues."

5.2 Green Infrastructure (GI)

5.2.1 'Green Infrastructure' is the network of green spaces and other natural elements such as rivers and lakes that intersperse and connect villages, towns and cities. Green Infrastructure assets have the potential to deliver a wide range of social, environmental and economic benefits. This potential is optimised when the natural environment is planned and managed as an integrated whole – a concept of connectivity and multi-functionality which underpins the 'Green Infrastructure Approach'.

5.2.2 The vision of the Landscape Institute is one where green infrastructure approaches to land use planning are afforded the same priority as conventional infrastructure, such as transport and power supply.

5.2.3 Within the study area the River Exe valley is a major green space running through the heart of Exeter and the Clyst valley provides a green buffer zone along the eastern fringe of the Exeter urban area.

5.2.4 A Green Infrastructure (GI) Study was completed in April 2009 for Exeter Area and East Devon New Growth Point. The aim of the GI study is to ensure a proactive approach to environmental planning, protection and enhancement whilst embracing economic regeneration and ensuring sustainable management of land and water resources. The GI study should be used to inform new strategic water management initiatives to take advantage of multifunctional solutions.

5.2.5 A key opportunity for multifunctional green infrastructure solutions is through flood risk management and surface water management functions, to be implemented in combination with habitat enhancement. These opportunities should be incorporated into the detailed design of developments and green infrastructure projects may present the opportunity to 'retro-fit' sustainable surface water management practices into areas of existing development. New and currently planned developments should be future-proofed and have built-in capacity without compromise to the quality of the space and multi-functionality.

5.2.6 The recommendations of the GI study support the Water Cycle Study aim for water services infrastructure to be planned and implemented alongside new development in order to ensure no

negative impact on biodiversity and where possible enhancement is achieved through improvements in reducing water demand and improving water quality.

5.2.7 Further to this, the GI study recommends that:

- WFD water quality standards are adopted by WwTW as soon as practicable so that anticipated benefits to water and wetland features can be realised.
- The Environment Agency should take a lead role to involve and collaborate fully with partners to ensure the implementation of habitat creation opportunities with improved accessibility in relation to flood mitigation plans.

5.3 River Quality Objectives (RQOs)

5.3.1 Contaminated urban drainage, storm water discharges and treated wastewater discharges all have an impact on the water quality in the receiving waters. The Environment Agency is responsible for setting water quality targets and monitoring water quality for rivers in England and Wales. The EA are also responsible for formally permitting potentially polluting discharges by issuing consents to discharge under the Water Resources Act.

5.3.2 The River Quality Objectives (RQOs) were agreed by Government as targets for all rivers in England and Wales when the water industry was privatised in 1989. The targets specified, at the time, the water quality needed in rivers if we are to be able to rely on them for water supplies, recreation and conservation.

5.3.3 The RQOs are expressed in terms of the River Ecosystem (RE) class, with an RQO of RE1 signifying a high chemical quality objective, and RE5 signifying a low or poor objective. The compliance with the RQO is assessed by the Environment Agency based on their river quality sampling and monitoring programme (General Quality Assessment or GQA programme).

5.3.4 The Environment Agency has provided annual GQA river quality sampling data for use in the WCS, covering the period from 1997 up to 2006, which was the last year of GQA monitoring.

5.3.5 The Exe Catchment Abstraction Management Strategy published in 2004 reported that approximately 10% of the river reaches in the Exe catchment were failing their RQO. Within the WCS area, failures were located in the River Culm and tributaries of the River Clyst. Agricultural runoff was believed to be the primary cause of poor water quality in the Exe CAMS area, however improvements to discharges from sewage treatment works were also being undertaken through the Water Company's Asset Management Plan 3 (AMP3).

5.3.6 The EA GQA data shows that, in 2006, all river reaches within the Exeter City Council area were compliant with the RQOs. This was the first year in the record period that this occurred, with the previous two years having a compliance rate of approximately 83%. The Exe CFMP records that chemical water quality in the designated rivers of the Exe catchment ranges from very good to fairly good; with the exception of the Exeter ship canal which is graded fair. Biological water quality in the designated rivers also ranges from very good to fairly good (no data recorded for the Exeter ship canal), with the Exe,and Clyst being graded as very good.

5.3.7 The CAMS for the East Devon catchments – published in 2005 - records that the Sid, Lim and the lower and middle Otter reaches all passed their RQOs in 2002, but that there were significant failures in the River Axe and the upper part of the Otter catchment. A major improvement project was launched to improve water quality in the Axe by seeking improvements in agricultural

management practices. The EA GQA data shows that in East Devon District in 2006, 55% of river reaches were compliant with the RQOs and 16% were recorded as significant failures.

5.3.8 The RQO does not monitor or assess compliance for all substances that may exert an impact on ecological water quality, for example nutrients such as phosphorus and nitrates, and hazardous or priority list substances.

5.3.9 The Exe CFMP action plan identifies as a high priority the need for South West Water and the Environment Agency to look in further detail at the risk of pollution from flooding of Countess Wear Waste Water Treatment Works (action PU1.3).

5.4 The Water Framework Directive

5.4.1 The Water Framework Directive (WFD) came into force in December 2000, and was transposed into UK law in December 2003. It is the most substantial piece of European Commission water legislation to date and is designed to improve and integrate the way water bodies are managed throughout Europe. Under the WFD all Member States must:

- prevent deterioration in the classification status of aquatic ecosystems, protect them and improve the ecological condition of waters;
- aim to achieve at least good status for all waters by 2015. Where this is not possible, good status should be achieved by 2021 or 2027;
- promote sustainable use of water as a natural resource;
- conserve habitats and species that depend directly on water;
- progressively reduce or phase out releases of individual pollutants or groups of pollutants that present a significant threat to the aquatic environment;
- progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants, and;
- contribute to mitigating the effects of floods and droughts.

No deterioration

5.4.2 The first principle of the WFD is to prevent deterioration in aquatic ecosystems. No deterioration must be met in all but very exceptional circumstances. Exceptional circumstances apply when the deterioration is caused by physical modifications or the result of sustainable new human development activities. Even in such cases it is necessary to demonstrate that there was no better way to achieve the desired development. No deterioration requires that a water body does not deteriorate from its current ecological or chemical classification, and applies to individual pollutants within a water body. For example, if dissolved oxygen was currently classified as moderate status, then the first principle of the WFD would be to ensure no deterioration from moderate class.

Good status

5.4.3 Under the WFD the objective is for all water bodies to meet good ecological status by 2015. For surface waters (rivers, lakes, transitional waters), good ecological status can be defined as:

- good chemical status for the relevant substances (there are also a series of daughter directives);
- good physico-chemical status on the scale of high, good, moderate, poor and bad;
- good biological class, and;
- good hydro-morphological class.

5.4.4 The River Basin Management Plans (see Section 5.4 below) contain maps showing the regional physico-chemical and biological classifications. Discharges from sewage treatment works will typically impact primarily on the physico-chemical classification, which includes parameters such as ammonia and phosphate, and the biological classification of a river, which includes measures such as fisheries and river invertebrates.

5.4.5 The status of a water body is measured through a series of specific standards and targets that have been developed by the UK administrations, supported by the WFD UK Technical Advisory Group (www.wfduk.org).

5.4.6 The manner in which overall status is assessed is by using a 'one out, all out' approach. That is, the status is determined by the lowest common denominator. The following diagram shows how this works in practice.

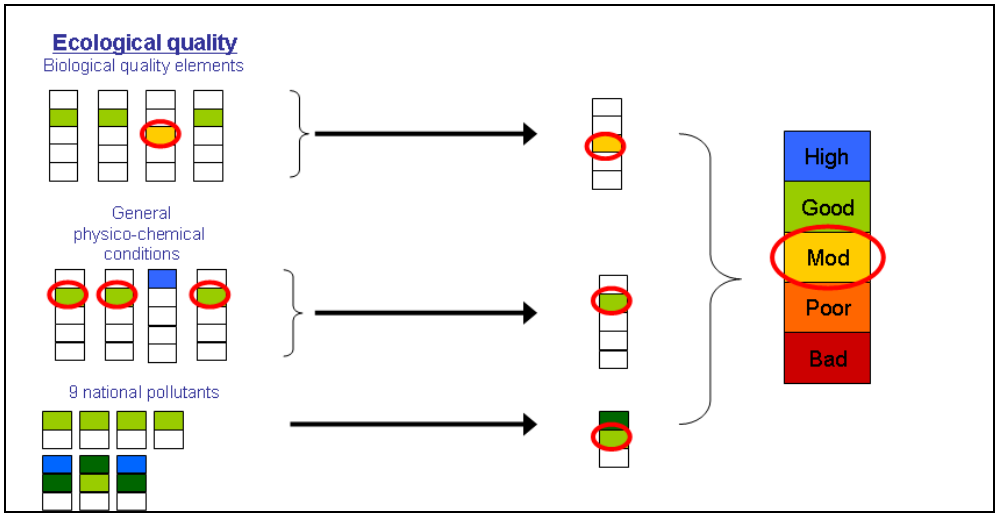


Figure 5.1 – Determining water body status

Alternative objectives

5.4.7 Although the WFD specifies that good status should be met by 2015 there are circumstances where it is possible to delay meeting good status until 2021 or 2017, or where a lesser objective will be required. These circumstances include technical feasibility, disproportional costs, or natural conditions (recovery times). In most instances it is likely that these circumstances will lead to an

extended deadline (i.e. 2021 or 2027) to meet good status, rather than setting a less stringent objective.

5.4.8 Under Article 4 (3) of the WFD it is possible to designate water bodies as artificial or heavily modified water bodies. The WFD recognises that that some water bodies have been modified to provide valuable social or economic benefits, and it is recognised these water bodies are not able to achieve natural conditions, and hence should not be required to achieve good ecological status. Artificial or heavily modified water bodies therefore have an alternative objective of meeting "good ecological potential" and these are identified in the draft River Basin Management Plans.

5.5 River Basin Management Plans

5.5.1 In England and Wales, the Environment Agency is the lead authority in ensuring delivery of the WFD. The Environment Agency prepared draft River Basin Management Plans (dRBMP), published for consultation in December 2008, which set out:

- the current status for each water body (including confidence limits);
- the objectives and targets for each water body;
- the main pressures for each water body;
- an action plan outlining what will be required, by whom, and when to meet good ecological status, and;
- justification for setting an alternative objective by 2015.

5.5.2 In June 2009 the Environment Agency concluded the consultation period for the draft River Basin Management Plan for the South West River Basin [EA 2009d]. The draft plan recorded the current state of the water environment in the south west river basin, with classification of water bodies undertaken in accordance with the new methodology of the Water Framework Directive.

5.5.3 The first RBMP were finalised and adopted in December 2009. RBMPs will now be reviewed and updated every six years (i.e. 2021, 2027). The Environment Agency expects spatial planning to take the RBMP's into account through Sustainability Appraisals by incorporating evidence from the RBMP studies into the assessment

5.5.4 The WCS study area is located within the East Devon River Basin District Catchment, as shown in Figure 5.2 below.

Figure 5.2 – Map of the South West River Basin

A summary of the classification of the waterbodies within the South West RBMP are shown in Figure 5.3 below, with a summary of the targets for 2015.

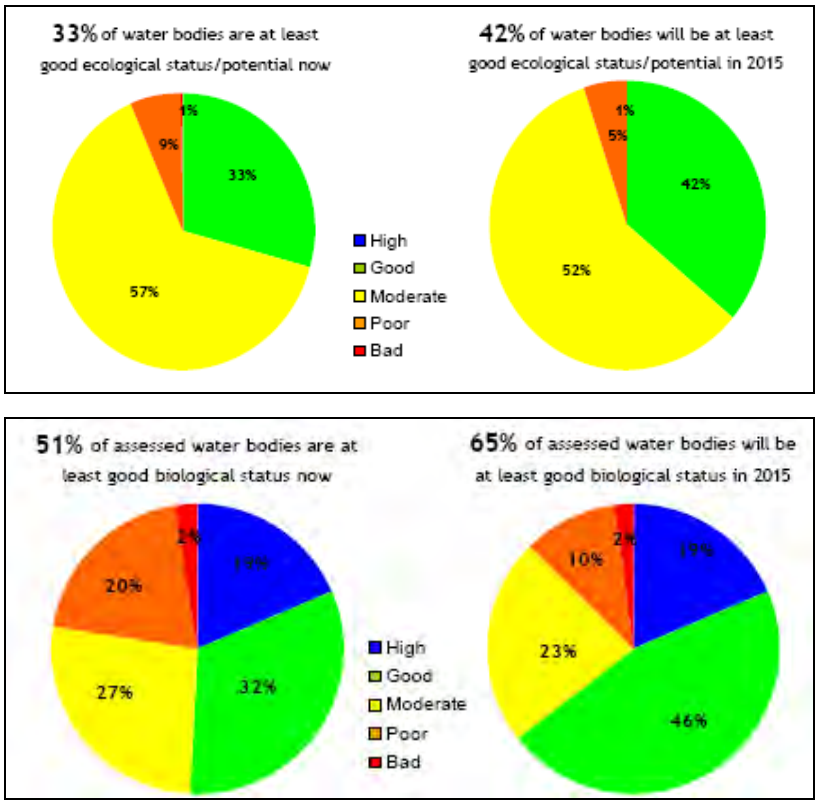


Figure 5.3 – Current and 2015 target status for the South West River Basin

5.5.5 The majority of surface water bodies in the catchment are currently classified as either good or moderate ecological status. Figure 5.4 shows the proportion of assessed river water bodies in each status class, by element. The main contributors to less than good status are identified as being phosphate, diatoms and fish.

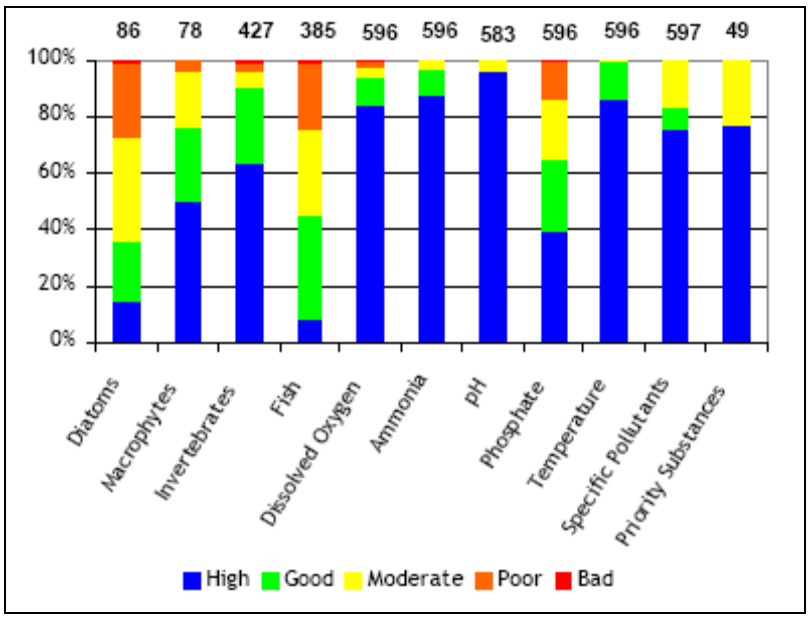


Figure 5.4 – Proportion of assessed river water bodies in each status class, by element (numbers above bars indicate total number of water bodies assessed for each element)

Surface Water Bodies - Ecological status

5.5.6 It can be seen from the RBMP classification table (Table 5.1) that the majority of the East Devon catchment within and surrounding the study area is not currently compliant with good ecological status. By 2015, 35 per cent of surface waters in this catchment will improve for at least one element of good status and seventeen river water bodies will improve to good ecological status. The main reasons for less than good status are; impacted fish communities, high levels of phosphate, impacted diatom communities and physical modification.

Surface Water Bodies – Chemical Status

5.5.7 Seven waterbodies have been assessed in the East Devon catchment for Chemical Status. All of these meet good chemical status.

Groundwater Bodies

5.5.8 For groundwater bodies, currently 84 per cent are at good quantitative status in the South West River Basin. 64 per cent are at good chemical status. The three main ground water bodies that underlie the core study area (Otter Valley/Central Devon & Exe/Permian Aquifers Central Devon) all achieve a poor chemical status. Figure 5.5 shows the predicted quantitative status for groundwater in 2015, and Figure 5.6 shows the predicted chemical status for groundwater in 2015.

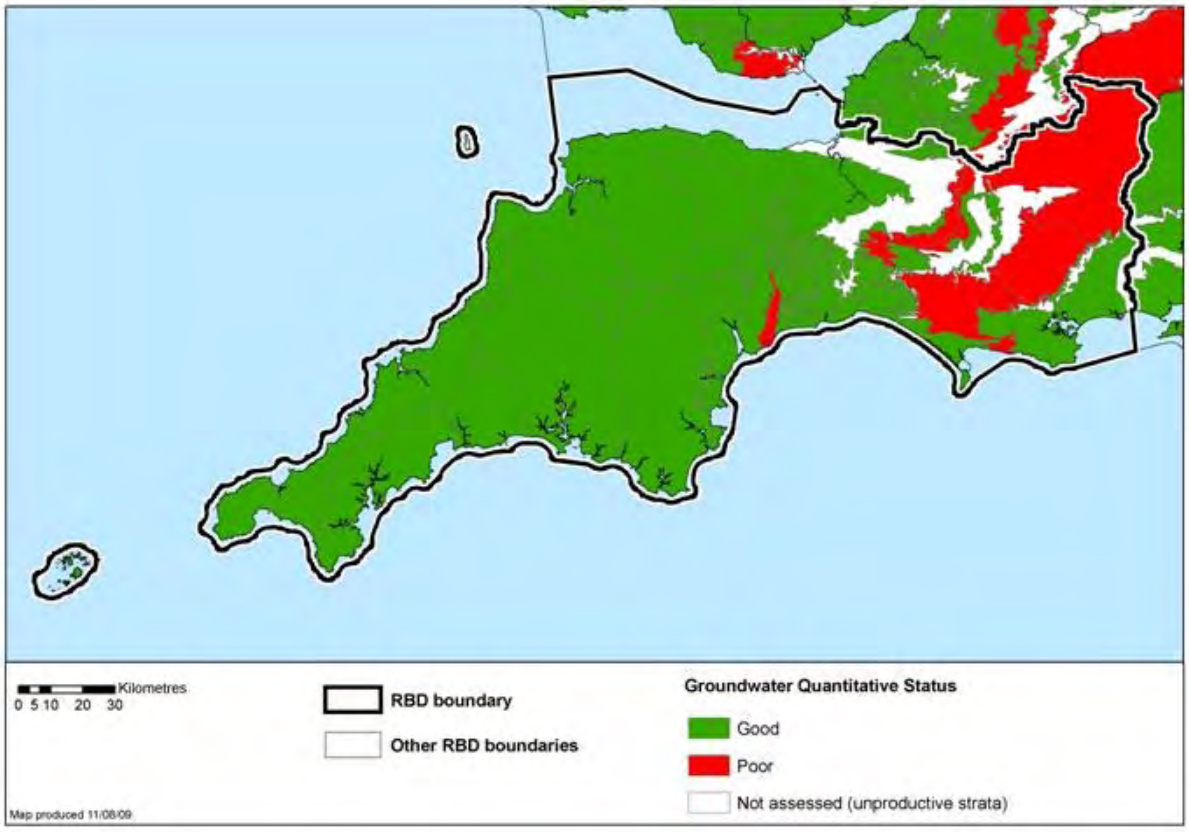


Figure 5.5 – Predicted quantitative status for groundwater in 2015 © Environment Agency copyright and / or database right 2009. All rights reserved. This map includes data supplied under licence from: © Crown Copyright and database right 2009. All rights reserved. Ordnance Survey licence number 100026380 and BGS © NERC 2009.

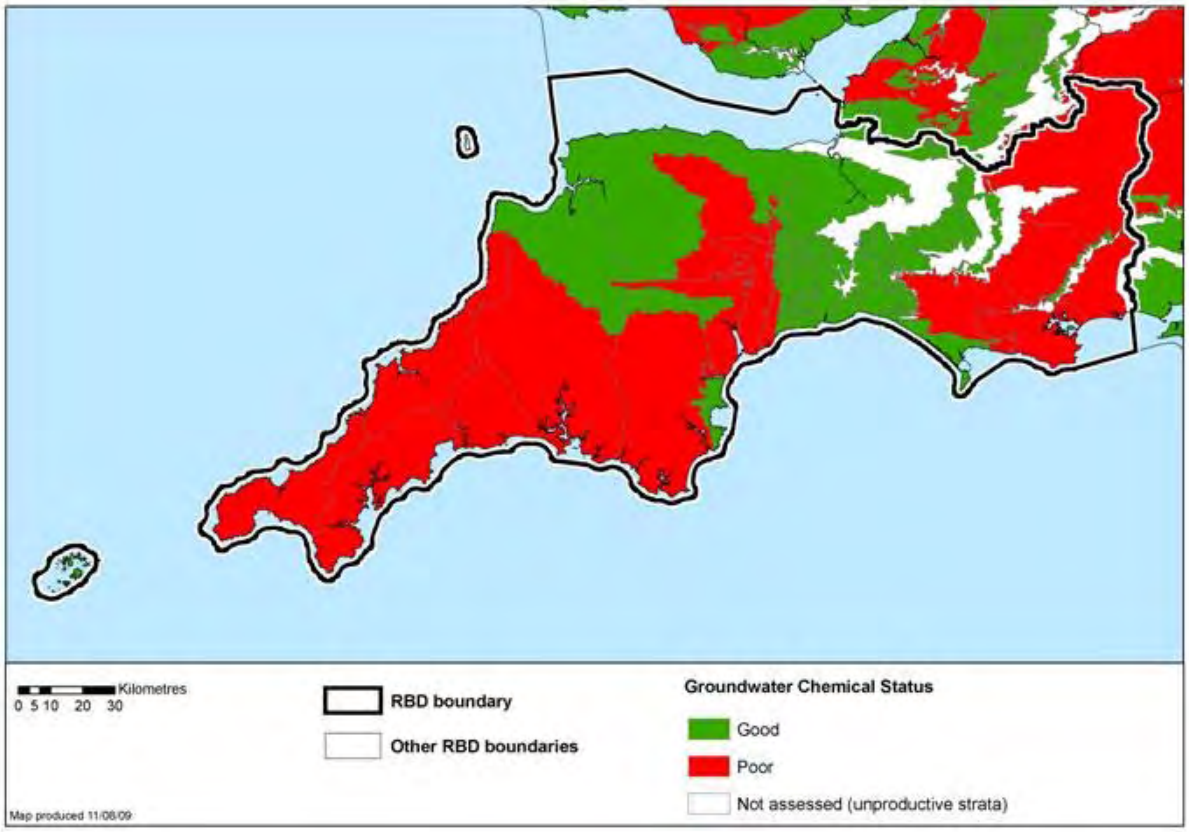


Figure 5.6 – Predicted Chemical status for groundwater in 2015 © Environment Agency copyright and / or database right 2009. All rights reserved. This map includes data supplied under licence from: © Crown Copyright and database right 2009. All rights reserved. Ordnance Survey licence number 100026380 and BGS © NERC 2009.

Estuarine Water Bodies

5.5.9 The ecological potential of the Exe Estuary is currently moderate with the aim to meet good status by 2027, the current chemical quality is assessed as good status.

Classification status of WwTW receiving waters

5.5.10 The Water Framework Directive classification status of each of the water bodies that receive discharges from wastewater treatment works affected by the development scenarios are listed in Table 5.1 below, and shown in Figure 5.7.

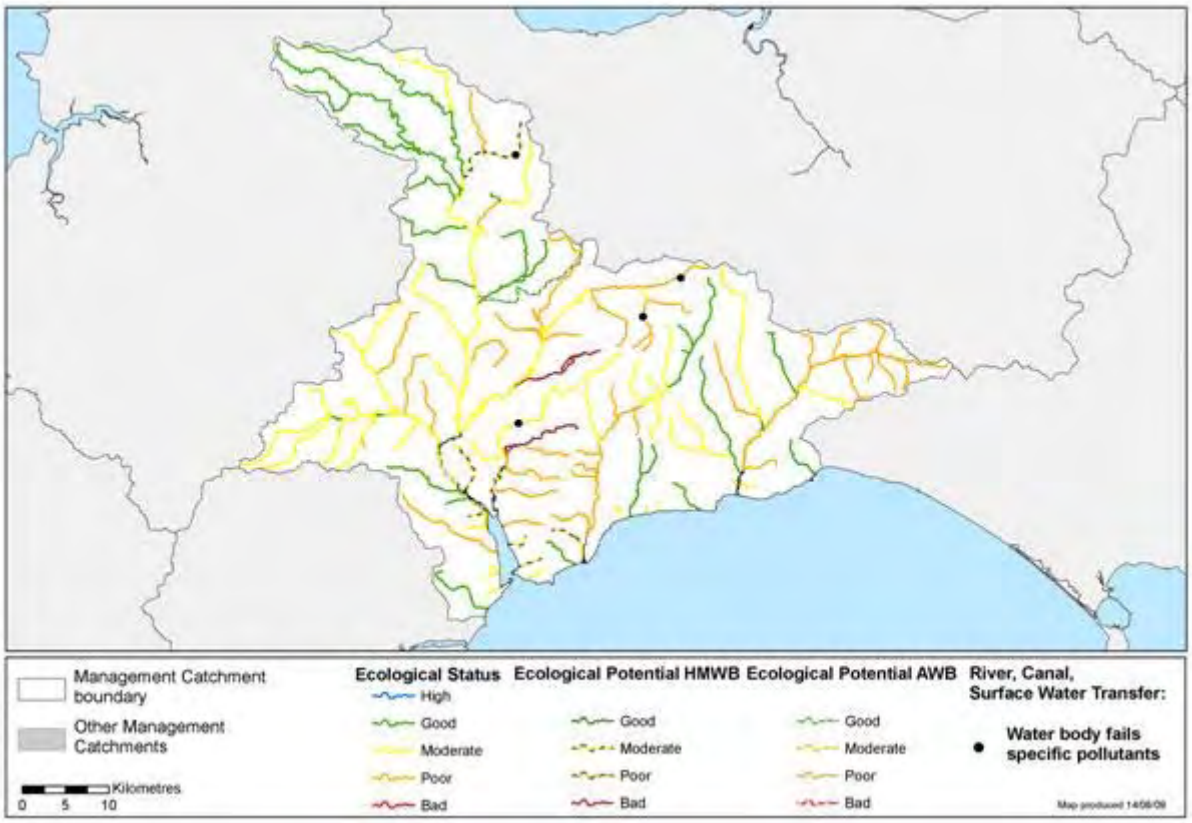


Figure 5.7 – Predicted quantitative and chemical status for groundwater in 2015. © Environment Agency copyright and / or database right 2009. All rights reserved. This map includes data supplied under licence from: © Crown Copyright and database right 2009. All rights reserved. Ordnance Survey licence number 100026380. Some river features of this map are based on digital spatial data licensed from the Centre for Ecology and Hydrology, © CEH. Licence number 198 version 2

Table 5.1 WFD classification status of water body, categorised by WwTWs[2]

Name of Waste water treatment works (WwTW) that would be affected by growth	Growth areas that would drain to WwTW[3]	Water Body Name	Water Body Designation	Water Body ID	Overall physicochemical Status (EcoGen)	Overall Biological status (EcoBio)	Overall HM status (EcoHM)	Overall ecological status (EcoClass)	Ecological status objective (EcoObj)
Countess Wear	Exter City (C1 – C4) Teignbridge (T1) East Devon (E9 – E12, D1, D3 & D4, D2, E0 – E8,	Exe Estuary	Estuarine	GB510804505600	○	●	●	○	●
Cranbrook (Proposed)		River Clyst	Freshwater	GB108040508760	○	●	●	●	●
Axminster (Kilmington)	E13	River Axe	Freshwater	GB108045008870	○	●	●	●	●
Seaton South	E14, E21	Axe Estuary	Estuarine	GB510804505400	○	○	●	○	●
Exmouth Maer Lane	E15 & E17	Lyme Bay West	Coastal	GB650806420000	●	●	○	○	●
Colyton	E16	River Axe	Freshwater	GB108045008870	○	●	●	●	●
Honiton	E18	River Otter	Freshwater	GB108045009180	●	○	●	○	●
Otterton	E19	Lyme Bay West	Coastal	GB650806420000	●	●	○	○	●
Ottery St Mary	E20	River Otter	Freshwater	GB108045009170	○	●	●	●	●
Sidmouth	E22	Lyme Bay West	Coastal	GB650806420000	●	●	○	○	●

Symbol	Status
●	High
●	Not High
●	Good
●	Moderate
●	Poor
●	Bad
○	Not yet assessed
●	Other

[2] This is the waterbody either that the WwTW falls into or the immediate downstream waterbody where the discharge is on the boundary.

[3] Refer to Table 2.2 in Section 2 for a reference list of growth areas.

6 Wastewater collection, treatment, disposal and environmental quality

6.1 Introduction

6.1.1 The wastewater assets in the Exeter and East Devon Growth Point area are owned, operated and maintained by South West Water (SWW), including responsibility for the operation and maintenance of the existing public sewer network. It is also responsible for the surface water drainage from roofs, driveways and hard standings relating to properties, if they are connected directly to the public sewer system or if the surface water system has been adopted by SWW. It is not responsible for soakaways, land drainage, highway drainage, Sustainable Urban Drainage (SUDS) or private water systems.

6.1.2 Wastewater assets comprise the sewerage and drainage assets that convey wastewater to wastewater treatment works and the wastewater treatment works itself. This includes pumping stations where wastewater cannot drain to the wastewater treatment works under gravity.

6.2 Wastewater collection and sewerage

6.2.1 The wastewater that we produce from our homes and our businesses is collected by the drainage system below ground from where it is transported by gravity or via pumping to wastewater treatment works. This drainage system is known as the sewerage system, and can be either a separate or combined sewerage system.

6.2.2 A separate system comprised a foul system which conveys wastewater or foul drainage only to the wastewater treatment works, and a surface water system that collects roof and highway runoff and discharges the clean runoff into rivers and coastal waters. Combined systems collect both rainfall runoff and foul water, and in times of very heavy rainfall can be at risk of being overwhelmed and causing dilute sewage to flood above ground.

6.2.3 A Combined Sewage Overflow (CSO) is a discharge of combined foul and storm sewage, to a watercourse. A CSO acts as a relief valve during times of very heavy rainfall and allows dilute storm sewage to be discharged into river and coastal waters. The design of such overflows ensures that discharges only occur during times of very heavy rainfall when there is sufficient dilution in the receiving water to ensure the discharge does not cause pollution or environmental damage.

6.2.4 New residential developments and new employment areas that connect to the existing sewerage system can cause an increase in foul flooding and surface water flooding, and an increase in discharges from combined sewer overflows in combined sewerage systems, therefore it is important to understand the nature and capacity of the downstream sewerage system when allocating land for development.

6.2.5 Incapacity in the sewerage system is unlikely to be an absolute showstopper to development; where there is incapacity, upgrades to the existing sewerage system or new strategic sewer mains can provide additional capacity, subject to funding being provided. However, the time required to plan, finance and deliver sewerage upgrades depends on the length of upgrade required, and the land use below which the existing or new system would drain. Major upgrades through the existing urban area can cause significant disruption within the existing urban area and hence take

longer to plan and deliver than new strategic systems through greenfield land. However, new strategic solutions can be significantly more costly.

6.3 Wastewater treatment works

6.3.1 The Wastewater Treatment Works (WwTWs) that have been identified by the study as having potential to receive significant additional sewage associated with housing growth (above typical windfall development rates) are listed in Table 5.1 in Section 5, alongside the current Water Framework Directive classification status for each water body that receives discharges from those WwTWs.

6.3.2 The main wastewater treatment works (WwTW) serving the study area is Exeter Countess Wear WwTW which serves the Exeter urban extent. Many of the smaller settlements in East Devon have their own smaller WwTW. A new WwTW is already planned by SWW to serve the proposed new community of Cranbrook. SWW have obtained planning permission for the Cranbrook WwTW and have applied for approval for ring-fenced funding for its provision in their Asset Management Plan for 2010 – 2015 (AMP5).

6.3.3 The future expansion potential of a wastewater treatment works with respect to water quality is determined by assessing the discharge consent, set by the Environment Agency. This consent is designed to protect the water quality objectives of the receiving watercourse and specifies a flow and quality that the WwTW has to achieve to protect those objectives.

6.3.4 As the population connected to a sewage treatment works increases, the amount of treated wastewater (or effluent) being discharged to the receiving water generally increases in proportion to the population increase. If the population increase is forecasted to cause the treatment works to exceed the consented discharge volume allowed by the EA consent, improvements are likely to be required to improve the standard of treatment and to ensure river quality does not deteriorate.

6.3.5 The quantity of treated effluent discharged from each treatment works and its quality is specified by the legal discharge consent, issued by the Environment Agency under the Water Resources Act 1992.

6.3.6 The consent is normally based upon the dry weather flow (DWF) of the treated effluent, and stipulates limits for the concentration of biochemical oxygen demand (BOD), total suspended solids (TSS) and ammoniacal nitrogen (NH3). Compliance is determined by means of statistical analysis of effluent quality data. Those works which discharge to sensitive watercourses also have limits relating to phosphorus and total nitrogen, consented under the Urban Waste Water Treatment Directive (UWWTD) or the Habitats Directive. Compliance with these standards is measured on an annual average basis. In addition discharges to or close to designated bathing waters are required to treat to a higher standard to prevent bacterial and viral matter causing a failure of bathing water standards.

6.3.7 In the foreseeable future, consent limits will be set with a view to meeting the requirements of the Water Framework Directive (WFD) whose aim is to ensure that good river quality standards are met throughout each waterbody. The current consent practice derives consent limits that are based upon the volume and quality of the receiving watercourse, along with the effluent quality and volume, at the point of discharge

6.4 Consented capacity at WwTWs

6.4.1 New development increases the amount of sewage needing to be treated by the wastewater treatment works. Most wastewater treatment works have a certain amount of headroom between the current population connected to the works, and the population at which the discharge consent will be breached. If forecast future flows will exceed the consented capacity of the WwTW a variation of the consent will be needed from the Environment Agency, normally resulting in a tightening of the consented quality parameters to ensure river quality does not deteriorate.

6.4.2 This assessment has not been able to look at the actual hydraulic or process capacity at the sewage treatment works because of a lack of available data. It is the responsibility of the water company to effectually drain developments, and to provide sewage treatment capacity under the Water Industry Act 1991. As long as there is environmental capacity available and a new consent can be granted, additional sewage treatment capacity can always be provided, and should not be seen as a showstopper to development. When there is greater certainty surrounding the timing and location of development, South West Water will carry out more detailed assessments of infrastructure capacity to ensure any additional sewage treatment or conveyance infrastructure is provided where and when it is needed.

6.4.3 Having identified which WwTWs within the study area will be affected by development and which development growth areas these WwTWs would be likely to drain (see Table 5.1), this study has assessed the maximum number of additional dwellings that could be connected to the WwTW without causing a breach of discharge consent. Table 6.1 shows the results of this analysis, which have been colour coded, with red showing those sites that have no current capacity, amber showing where the level of growth tested will cause the wastewater treatment works to breach its consent, and green where the planned level growth is within consented capacity.

6.4.4 Table 6.2 shows the water company planning period in which our assessment forecasts consented capacity will be exceeded based on a linear projection of forecast housing completions.

Table 6.1 Assessment of consented capacity at wastewater treatment works (based upon Environment Agency Discharge Consent data)

Sub Region	Growth Area	Possible Allocation Location	Relevant WwTW	Receiving Water	Tidal or Freshwater Discharge	Maximum Dwelling Forecast to Test (to 2026)	Consented available capacity (dwellings)[4]
Exeter City	ECC Boundary	Exeter Sites (C1,C2,C3,C4)	Exeter - Countess Wear	Exe Estuary	Estuarine	15,000	30,000
Teignbridge	South West of Exeter	Alphington Area (T1)				2,000	
East Devon	East of Exeter	Urban Extension (E9,E10,E11,E12)				4,500	
	Commercial	Exeter Airpot/Science Park/Skypark (D1,D3,D4)				N/A	
	Commercial	IMFT (D2)	Cranbrook	River Clyst	Freshwater	N/A	7,500
	Cranbrook New Community	(E0,E1,E2,E3,E4,E5,E6,E7,E8)				10,000	
	Elsewhere in East Devon – Growth at existing settlements	Axminster (E13)	Axminster (Kilmington)	River Axe	Freshwater	1,000	2,500
		Beer (E14)	Seaton South	Pumped to Seaton	N/A	1,000	500
		Seaton (E21)	Seaton South	Axe Estuary	Estuarine	1,000	
		Budleigh Salterton (E15)	Exmouth Maer Lane	Pumped to Exmouth	N/A	1,000	-2,500
		Exmouth (E17)	Exmouth Maer Lane	Lyme Bay	Coastal	1,000	
		Colyton & Colyford (E16)	Colyton	Axe Estuary	At tidal limit	1,000	600
		Honiton (E18)	Honiton	River Otter	Freshwater	1,000	1,800
		Newton Poppleford (E19)	Otterton	Lyme Bay	Coastal	1,000	2,000
		Ottery St Mary (E20)	Ottery Town	River Otter	Freshwater	1,000	2,000
		Sidmouth (E22)	Sidmouth	Lyme Bay	Coastal	1,000	5,000

[4] The dry weather flow has been calculated using the following assumptions. Per capita consumption has been assumed to be 120 litres per head per day for new properties, occupancy rate has been assumed to be an average of 2.2, and an infiltration rate of 40% of dry weather flows has been assumed.

Table 6.2 Forecast WwTW flows for development scenarios

Relevant WwTW	Current BOD 95%ile consent	Current Amm 95%ile consent	Consented DWF	Forecast calculated dry weather flow[5]			
				2011 DWF (m^3/day)	2016 DWF (m^3/day)	2021 DWF (m^3/day)	2026 DWF (m^3/day)
Exeter - Countess Wear	20	10	40,486	31,392	33,378	35,365	37,351
Cranbrook	14	2	2,810	924	1,848	2,772	3,696
Axminster (Kilmington)	25	N/A	2,229	1,317	1,410	1,502	1,595
Exmouth Maer Lane	250 (max)	N/A	9,186	10,297	10,482	10,666	10,851
Colyton	20	N/A	1,045	892	985	1,077	1,170
Honiton	N/A	N/A	3,115	2,542	2,635	2,727	2,820
Ottery Town	30	N/A	1,063	461	646	830	1,015
Otterton	40	N/A	1,643	948	1,041	1,133	1,226
Seaton South	20	N/A	2,300	2,285	2,470	2,654	2,839
Sidmouth	250 (max)	N/A	6,331	4,427	4,520	4,612	4,705

Notes:

The flows from Budleigh Salterton are pumped to Exmouth, Maer Lane and are included in the figures for Exmouth, Maer Lane provided in the table above. Flows from Newton Poppleford pass to Otterton WwTW.

The flows from Beer are pumped to Seaton South WwTW and are included in the figures for Seaton South provided in the table above.

[5] The dry weather flow has been calculated by using the following assumptions. Per capita consumption has been assumed to be 120 litres per head per day for new properties, occupancy rate has been assumed to be an average of 2.2, and an infiltration rate of 40% of dry weather flows has been assumed.

Exeter Countess Wear

6.4.5 Exeter Countess Wear WwTW has the consented capacity for the total development scenario of 21,500 new homes up to 2026. This scenario does not breach the current flow consent. The Environment Agency have stated that they have concerns regarding the discharges from Countess Wear as the WwTW discharges to the Exe Estuary which contains a SPA and Ramsar site. The Exe estuary is considered to have elevated nutrient levels due to the inputs from WwTWs and diffuse agricultural sources within the catchment. Due to these elevated nutrient levels, the estuary may be vulnerable to biological instabilities in the future if a nutrient concentration 'tipping-point' is reached.

6.4.6 The EA state in their response to the Draft RSS Panel Report that; "*with monitoring in place to detect early signs of stress in the estuary ecosystem, and scope for action on nutrient loads in the Exe into the future from both point and diffuse sources across the catchment, we consider that this provides sufficient safeguards for development to move forward at Exeter.*" [EA 2006]

6.4.7 We therefore do not consider water environmental capacity to be a constraint to growth in Exeter. However, we recommend that Exeter City, the Environment Agency and South West Water work in partnership to develop a monitoring and development intervention programme to manage the risk of deterioration in the Exe.

Cranbrook

6.4.8 Once operational, the proposed Cranbrook WwTW will discharge to the River Clyst. Cranbrook WwTW has planned consented capacity for growth up to 2021 (7500 dwellings) but for growth beyond this level the flow consent will be breached. The River Clyst is currently at moderate physiochemical status and poor biological and ecological status. The consent for the new works will have taken the Water Framework Directive standards into account, therefore the poor status should not be considered as a constraint to growth.

6.4.9 In order to meet WFD good status the BOD and ammonia consents may require tightening as part of the River Basin Management Plan activities. As the ammonia consent is currently at 2, this may require a tightening which is beyond best available technology (currently considered to be at 1mg/l), although this is not considered likely.

Axminster (Kilmington)

6.4.10 Axminster (Kilmington) WwTW discharges to the River Axe. There is consented capacity at the WwTW for the 1000 additional dwellings up to 2026. However, the River Axe is currently at moderate physiochemical status and is at poor biological and ecological status. Therefore the BOD and ammonia consents may require tightening to meet WFD good status.

6.4.11 The EA state in their response to the Draft RSS Panel Report [EA 2006] that although they have concerns regarding the River Axe already failing its phosphate standard, due to recent nutrient stripping initiatives, they consider that there is capacity for the levels of development proposed in this catchment.

Exmouth Maer Lane

6.4.12 There is no consented capacity for growth at Exmouth Maer Lane WwTW as the flow consent is breached by the 2011 (500 dwellings) growth projections. In terms of water quality consents, as this is a tidal discharge with UV, the water quality consents are unlikely to require changing.

6.4.13 The Environment Agency is currently in advanced discussions to determine a new consent application for Exmouth Maer Lane WwTW, which will increase the consented dry weather flow to a value in excess of the flow forecasted for 2026 by this study (Table 6.2). The Environment Agency has made the necessary assessments (based on a design horizon of 2016-2021) and awaits formal submission of the consent application.

6.4.14 Any further spatial allocation at either Exmouth or Budleigh Salterton will require that this variation of the existing consent at Exmouth Maer Lane WwTW is granted by the Environment Agency, and that South West Water plan for the implementation of any associated infrastructure capacity improvements in advance of, or in phase with development.

Colyton

6.4.15 Colyton WwTW has consented capacity for growth up to 2016 (500 dwellings) however our calculations forecast that the flow consent will be breached by 2021. Colyton WwTW discharges to the River Axe (approximately 75m upstream of Axe Bridge on the A3052), via a long outfall line. The River Axe is currently at moderate physiochemical status and is at poor biological and ecological status. Therefore the BOD consent may require tightening to meet WFD good status. There is no ammonia consent currently set at this WwTW .

6.4.16 The EA state in their response to the Draft RSS Panel Report [EA 2006] that although they have concerns regarding the River Axe already failing its phosphate standard, due to recent nutrient stripping initiatives, they consider that there is capacity for the levels of development proposed in the catchment.

Honiton

6.4.17 Honiton WwTW has the consented capacity for all projected growth up to 2026. Honiton WwTW discharges to the River Otter which meets WFD good status in terms of physiochemical status, however it is classified as poor for both biological and ecological status. It is not considered that the WwTW discharge is the cause of the poor ecological status. However, should further assessment determine that the WwTW does contribute to the poor status, a quality consent might be needed. This should not be considered a barrier to growth at the scale planned, and any improvements will be identified through the RBMP process.

Ottery Town

6.4.18 Ottery Town WwTW has the consented capacity for all projected growth up to 2026. Currently there is a BOD consent of 30 mg/l and no ammonia consent has been set. Ottery Town WwTW discharges to the River Otter which is moderate in terms of physiochemical status and classified as poor for both biological and ecological status. To meet WFD good status WwTW improvements may be needed and a tighter quality

consent required, however these improvements will be driven by the RBMP process and should not be considered a constraint to growth.

Otterton

6.4.19 Otterton WwTW has the consented capacity for all projected growth up to 2026. Currently there is a BOD consent of 40 mg/l and no ammonia consent has been set. Otterton WwTW has a coastal discharge to Lyme Bay West, which is high in terms of physiochemical status and classified as good for biological status and moderate for ecological status. To meet WFD good status WwTW improvements may be needed and a tighter quality consent required, however these improvements will be driven by the RBMP process and should not be considered a constraint to growth.

Seaton South

6.4.20 Seaton South WwTW has consented capacity for growth up to 2011 (500 dwellings) however the flow consent is breached by 2016. Seaton South discharges to the Axe Estuary.

6.4.21 The Environment Agency is currently in advanced discussions to determine a new consent application for Seaton South WwTW, which will increase the consented dry weather flow to a value in excess of the flow forecasted for 2026 by this study (Table 6.2). The Environment Agency has made the necessary assessments (based on a design horizon of 2016-2021) and awaits formal submission of the consent application.

Sidmouth

6.4.22 Sidmouth WwTW has consented capacity for all growth up to 2026 (1000 dwellings). The WwTW has a coastal discharge to Lyme Bay West. which is high in terms of physiochemical status and classified as good for biological status and moderate for ecological status. To meet WFD good status WwTW improvements may be needed and a tighter quality consent required, however these improvements will be driven by the RBMP process and should not be considered a constraint to growth.

6.5 Wastewater network capacity

6.5.1 South West Water have carried out a high level assessment of the implications of the development scenarios being tested by this study on the wastewater network. The results are shown in Table 6.2 and summarised below. South West Water have generally not identified any areas of network capacity concern at this outline stage and on this basis consider there to be a reasonable prospect of delivery of all of the development scenarios within the normal planning process timeframe. It is recommended that SWW are consulted as soon as a site is identified for development; SWW recommend that once precise locations, numbers and timescales are known then it is at that stage that SWW will be able to undertake a detailed assessment of what impacts the development will have on the network and what, if any, infrastructure is specifically required.

Exeter urban area (Sites C1-C4 and T1)

6.5.2 South West Water have not identified any of the Exeter City or Alphington urban extension growth areas as being of particular concern at this outline stage. Any

development on previously developed land, on urban infill or windfall development has the potential to cause foul flooding or an increase in CSO discharge downstream of the development location.

6.5.3 SWW should be consulted on any proposed development within the urban area as soon as a site is identified for development. Provided that SWW are consulted during the site allocations DPD (should urban infill be allocated during this stage) or at the outline planning application stage, SWW are confident that they are able to provide or requisition sewerage network capacity during the normal planning timetable.

Cranbrook new community (Sites E0 – E8)

6.5.4 The Cranbrook new community will require a new sewerage drainage network in association with the provision of the new Cranbrook WwTW. SWW have allocated funding in their AMP5 plan (2010-2015) for the provision of wastewater infrastructure to serve the first phase of the new community development (2900 dwellings).

6.5.5 South West Water have not identified any material differences – in terms of wastewater network provision - between the options for expansion of Cranbrook being tested in this study. The proposed Cranbrook WwTW will be of a modular construction to allow incremental expansion of the WwTW in phase with the development of the new community.

East of Exeter urban extension (Sites E9 – E12 & ECS)

6.5.6 SWW have not identified any differences between any of the urban extension options with respect to sewerage capacity and no specific areas have been highlighted as causing concern at this outline stage. It is recommended that SWW should be consulted on any proposed development as soon as a site is identified for development. Provided that SWW are consulted during the site allocations DPD or at the outline planning application stage, SWW are confident that they are able to provide or requisition sewerage network capacity during the normal planning timetable.

Other East Devon settlements (Sites E13 – E22)

6.5.7 SWW have not identified any differences between any of the East Devon settlements with respect to sewerage capacity and no specific areas have been highlighted as causing concern at this outline stage. It is recommended that SWW should be consulted on any proposed development as soon as a site is identified for development. If SWW are consulted during the site allocations DPD or at the outline planning application stage, SWW are confident that they are able to provide or requisition sewerage network capacity during the normal planning timetable.

Commercial development (Sites D1 – D4)

6.5.8 Wastewater from the Science Park and Skypark developments will need to drain to Countess Wear WwTW, via existing wastewater networks. Exeter International Airport currently operates a private sewage treatment plant, however the masterplan for the Airport Expansion includes proposals to direct sewage from the site to the new Cranbrook WwTW and de-commission the existing private plant.

6.5.9 SWW have not identified any significant network capacity concerns at this outline stage, but it is recommended that SWW should be consulted as the proposals and planning

applications for each development progress, to enable SWW to undertake a detailed assessment of network capacity at the appropriate level of development certainty.

6.5.10 SWW expect that the Intermodal Freight Terminal will drain to the new Cranbrook WwTW, via the existing wastewater network. SWW have not identified any significant network capacity concerns at this outline stage and anticipate that this development is unlikely to require significant new sewerage infrastructure to be requisitioned.

Table 6.2 Wastewater network assessment

		Sites and options to meet Growth Target:				B1	B2	B3	B4	B6
Sub-region	Growth Area	Site Ref.	Location	Description	Approx. Number of dwellings proposed (if known)	Do SWW consider that this site will require new sewerage infrastructure to be requisitioned?	Will this site drain direct to a STW, or will it drain through the existing drainage network?	If through the existing network, is it likely to lead to an increase in foul flooding or CSO spill?	If through the existing network, would this site drain through existing pumping stations?	Are there any other considerations WCS should take into account rega the suitability of this site from a sev perspective
Exeter City	ECC boundary, including Area of Search 4c	C1	Alphington Area	Area of Search	600	Improvements needed	Existing	Investigations needed	Yes	No
		C2	Newcourt Area	Area of Search	3700 (including 1200 dwellings with planning permission/ subject to S106)	Improvements needed	Existing	Investigations needed	No	No
		C3	Monkerton/ Hill Barton Area	Area of Search	2300	Improvements needed	Existing	Investigations needed	Yes	No
		C4	Exeter Existing Urban Area	Development within Existing Urban Area	6400	Improvements needed	Existing	Likely - investigations req'd	Yes	No
Teignbridge	South west of Exeter (Area of search 4C)	T1	Alphington Area	Area of Search	2000	Improvements needed	Existing	Likely - investigations req'd	Yes	No
East Devon	Cranbrook New community	E0	Cranbrook New Community (CNC)		Combination of options E1-E8 to accommodate up to 4600 dwellings			N/A	N/A	
	East of Exeter (RSS Area of Search 4B) Urban extension/2nd new community	E9	Pinhoe area	Area of Search	Combination of options E9-E12 to accommodate up to 4500 dwellings		Existing	Likely - investigations req'd	Yes	No
		E10	Pinn Court Farm area	Area of Search			Existing	Likely - investigations req'd	Yes	No
		E11	Mosshayne area	Area of Search			Existing	Likely - investigations req'd	Yes	No
		E12	Redhayes	Area of Search			Existing	Likely - investigations req'd	Yes	
		ECS	County Showground	Area of Search			Existing	Likely - investigations req'd	Yes	No
	Elsewhere in East Devon Existing settlements identified for potential growth above 100 dwellings	E13	Axminster	Expansion of existing settlement	Growth at every settlement, totalling 5600 in combination	Depends on site selection	Existing	Depends upon location	Yes	No
		E14	Beer	Expansion of existing settlement		Depends on site selection	Existing	Depends upon location	Yes	No
		E15	Budleigh Salterton	Expansion of existing settlement		Depends on site selection	Existing	Depends upon location	Yes	No
		E16	Colyton	Expansion of existing settlement		Depends on site selection	Existing	Depends upon location	No	No
		E17	Exmouth	Expansion of existing settlement		Depends on site selection	Existing	Depends upon location	Yes	No
		E18	Honiton	Expansion of existing settlement		Depends on site selection	Existing	Depends upon location	Yes	No
		E19	Newton Poppleford	Expansion of existing settlement		Depends on site selection	Existing	Depends upon location	Yes	No
		E20	Ottery St Mary	Expansion of existing settlement		Depends on site selection	Existing	Depends upon location	Yes	No
		E21	Seaton	Expansion of existing settlement		Depends on site selection	Existing	Depends upon location	Depends upon location	No
		E22	Sidmouth	Expansion of existing settlement		Depends on site selection	Existing	Depends upon location	Yes	No
	Significant Commercial Development	D1	Exeter Airport Expansion	Expansion of existing facilities	N/A	Improvements needed	Existing	Likely - investions req'd	Yes	No
		D2	Intermodal Freight Facility (Exeter Gateway)	Granted outline planning permission	N/A	Unlikely	Existing	Not if drained to new Sewage Treatment Works		No
		D3	Science Park	Outline planning application under consideration	N/A	Improvements needed	Existing	Likely - investions req'd	Yes	No
		D4	Skypark	Local Plan Allocation. Outline planning application consented.	N/A	Improvements needed	Existing	Likely - investions req'd	Yes	No

6.6 Wastewater summary

6.6.1 This study has identified that there are no critical constraints to growth at the scale planned with respect to wastewater collection and treatment.

6.6.2 The assessment of the consented capacity at each of the WwTWs shows that there is consented capacity for all growth up to 2026 at Exeter Countess Wear, Axminster (Kilmington), Honiton, Ottery Town, Otterton and Sidmouth WwTWs without the need for a change to the existing flow consent.

6.6.3 Cranbrook (proposed), Colyton and Seaton South WwTWs currently have some consented capacity for growth but these will require a change to the flow consent for growth up to 2026. Exmouth Maer Lane WwTW has no current capacity for any further growth. However the Environment Agency is currently in advanced discussions to determine new consent applications for both Seaton South and Exmouth Maer Lane WwTWs, which will both be in excess of the dry weather flow that has been forecast by this study for 2026. The Environment Agency has made the necessary assessments for these new consents (using a design horizon of 2016-2021) and currently awaits formal submission of the consent applications.

6.6.4 To meet WFD good status, the Cranbrook, Honiton and Ottery Town WwTWs are likely to require a tightening of quality consents. However, these improvements will be driven by the RBMP process and should not be considered a constraint to growth.

6.6.5 This study has not been able to assess the actual hydraulic or process capacity at the sewage treatment works because of a lack of available data. However it is the responsibility of the water company to effectually drain developments, and to provide sewage treatment capacity under the Water Industry Act 1991. As long as there is environmental capacity available and a new consent can be granted, additional sewage treatment capacity can be provided, and should not be seen as a showstopper to development.

6.6.6 South West Water have not identified any areas of significant network capacity concern at this outline stage and on this basis consider there to be a reasonable prospect of delivery of all of the development scenarios within the normal planning process timeframe. When there is greater certainty surrounding the timing and location of development, South West Water can carry out more detailed assessments of infrastructure capacity to ensure any additional sewage treatment or conveyance infrastructure is provided where and when it is needed.

7 Water resources and water supply

7.1 Introduction

7.1.1 This chapter reviews the current status of water resources and supply in the study area and assesses whether the capacity of water supply infrastructure is adequate to meet demand from future development.

7.1.2 The study area falls entirely into the area of supply of South West Water Ltd (SWW). The company provides both water and wastewater services across Devon and Cornwall and small parts of Somerset and Dorset, serving approximately 1.65 million residents and around 8 million visitors per year.

7.1.3 This study assumes that SWW will remain responsible for the provision of water resources for the entire study area. It is however possible for other companies to supply the water to the development sites via inset appointments[6].

7.2 Water resource management

7.2.1 The Environment Agency is responsible for managing the abstraction of water resources to ensure that there is enough water for abstraction while protecting the needs of the natural environment. The EA reported on the current state of water resources in England and Wales in December 2008 [EA2008c] and subsequently launched its Water Resources Strategy for England and Wales on 30 March 2009 [EA2009]. The Environment Agency is the competent authority responsible for the implementation of the Water Framework Directive (WFD), which is being undertaken through River Basin Management Plans (see Section 5.5). The WFD requires the EA to manage the impacts of water abstraction pressures in a more integrated way and may lead towards changes in abstraction licences where abstraction is having an adverse effect.

7.2.2 Figure 7.1 shows the Environment Agency's assessment of relative water stress throughout England, which is based upon the level of household demand for water as a proportion of the available freshwater resources. Areas where demand is a high proportion have the greatest need for water efficiency measures. The assessment findings have been used by Defra to consider the need for higher rates of household metering.

7.2.3 Water resources in the Exeter and East Devon area are classified as under moderate water stress. The effects of climate change are likely to further reduce supply and could also actually increase demand.

[6] The inset appointment process is the route by which one company replaces the incumbent as the appointed water and/or Sewerage Company for a specified area. The replacement appointed Water Company will have all of the same duties and responsibilities as the previous statutory water company for the specified area. (www.ofwat.gov.uk)

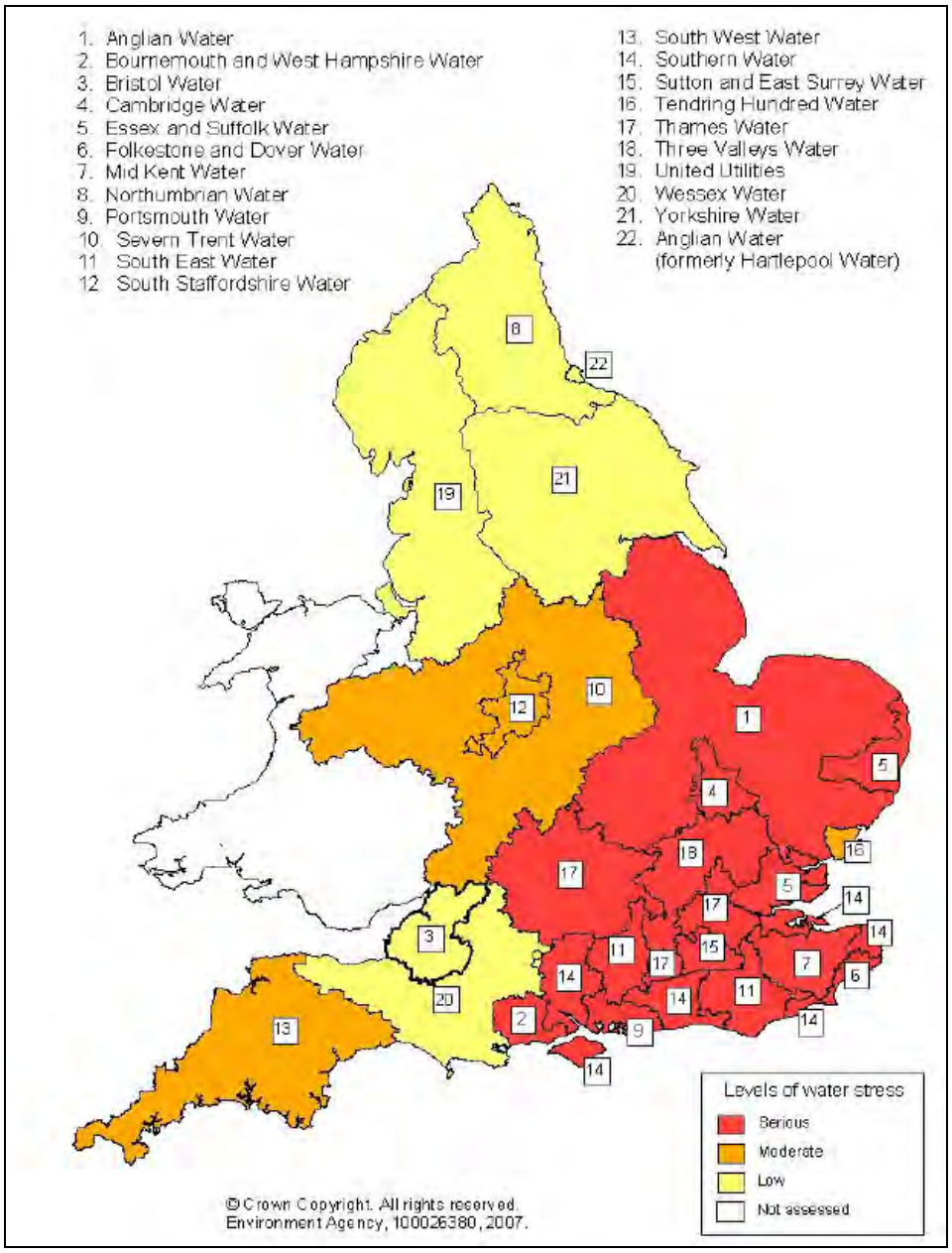


Figure 7.1 - Map of Areas of Relative Water Stress (source: Water resources in England and Wales – Current state and future pressures; Environment Agency)

7.3 Catchment Abstraction Management

7.3.1 The Environment Agency manages water resources at a local level through Catchment Abstraction Management Strategies (CAMS), which are prepared on a 6 yearly cycle. Each CAMS area is sub-divided into Water Resource Management Units (WRMU).

7.3.2 All of the information contained in this study is taken from the results of the first CAMS cycle. The second cycle is now underway, having commenced in 2008. As part of the second cycle the Environment Agency will review and update all of the CAMS as part of a live rolling process, which will be completed by June 2011 and may alter the water availability status in some areas.

7.3.3 Within the CAMS, the Environment Agency's assessment of the availability of water resources is based on a classification system which states the perceived resource availability status, indicating:

- The relative balance between the environmental requirements for water and how much is licensed for abstraction;
- Whether water is available for further abstraction;
- Areas where abstraction needs to be reduced.

7.3.4 The categories of resource availability status are shown in Table 7.1 below. The classification is based on an assessment of a river system's ecological sensitivity to abstraction-related flow reduction.

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

Table 7.1 – CAMS resource availability status categories

7.3.5 This classification can be used to help assess the potential for additional water resource abstraction opportunities. The Exeter and East Devon New Growth Point is located entirely within the Exe CAMS area. The remainder of East Devon is located in the Otter, Sid, Axe and Lim CAMS area, which supports groundwater abstraction for public water supply, particularly from the Otter Valley. The Environment Agency has most recently assessed the resource availability status of these CAMS areas as follows:

Exe Catchment CAMS

7.3.6 At the time of the first CAMS publication in 2004, of the seven WRMUs within the Exe CAMS area, only the Clyst catchment was assessed as 'water available'. The Exe, Culm and Creedy catchments were all assessed as 'no water available' and the two groundwater WRMUs (Crediton East and Duckaller) were both assessed as 'over-licensed'. This meant that over the majority of the Exe CAMS area, no water was available for further abstraction at low flows.

7.3.7 The resource assessments had generally found there to be water available in the lower reach of the Exe and in the Rivers Culm and Creedy. However the status of each was overridden to 'no water available' due to the obstruction to fish passage experienced during low flows at St James Weir, located at the downstream end of the CAMS area, at the tidal limit of the Exe. Construction

works have since been undertaken at the weir to improve fish passage and consequently the CAMS update in 2007 recorded a change in status to 'water available' for the lower Exe, the Creedy and the Culm catchments. The status of all other WRMUs in the CAMS area remained unchanged.

7.3.8 The availability of water in the Upper and Middle Exe unit is dictated by the operation of Wimbleball strategic reservoir in the headwaters of the Exe. The abstraction licences for public water supply and the regulation of the River Exe flows using the reservoir have been defined through a public inquiry, which was satisfied that no environmental damage would result from their operation.

7.3.9 Unusually, the status of the Crediton East aquifer has not affected the status of the Exe catchment WRMUs that it underlies. This is because a reduction in the contribution of water from this aquifer to the overlying CAMS rivers is unlikely to be critical to the rivers, due to their significant upstream catchments. The largest existing groundwater abstraction licences within the Crediton East aquifer are for public water supply under drought conditions or if a pollution incident occurs on the River Exe. However these licences have not been used for almost 20 years and only a small proportion of the total licensed abstraction is regularly utilised.

7.3.10 The Environment Agency have advised that the Exe CAMS is one of the first in the South West Region to be reviewed and updated as part of the second CAMS cycle. The updated CAMS is currently being audited in preparation for publication.

Otter, Sid, Axe and Lim CAMS

7.3.11 There are over 12,000 abstraction licences in place within the CAMS. Public Water Supply is the primary consumptive abstractor accounting for 80% of consumptive licences, with three quarters obtained from groundwater sources.

7.3.12 Of the eight WRMUs within this CAMS area, three were assessed as 'water available', four were assessed as 'no water available' and one was assessed as 'over licensed' in February 2005. The CAMS update published in October 2007 did not record any change in the status of the WRMUs.

7.3.13 The rivers Sid and Otter are underlain by regionally important major aquifers (the Sherwood Sandstone Group) that are extensively exploited for water supply. The Otter Sandstone groundwater WRMU has a status of over-licensed and the Environment Agency operates the 'Groundwater Management Strategy for the Otter Valley Triassic Aquifer' [EA 1999]. The strategy seeks to protect the public water supply boreholes and the SPA sites at the East Devon Pebblebed Heaths and at the River Otter. Future abstraction licence applications may require a supporting Environmental Impact Assessment, including consultation with Natural England

7.3.14 The Environment Agency have advised that the Otter, Sid, Axe and Lim CAMS is due for review and updating in 2010/2011 as part of the second CAMS cycle.

7.4 Water company resource planning

7.4.1 All water companies have a duty to produce water resources plans covering the next 25 years. The Water Resources Plan (WRP) sets out how the company intends to provide sufficient quantity and quality of water to meet the needs of its existing and future customers, whilst also minimising the impacts on the environment. Population growth as well as changing demands within the existing customer base must therefore be comprehensively planned for. Whilst strategic

plans for meeting future demand over a 25 year period are set out in the WRP, detailed design of schemes is not undertaken until works have been granted funding by Ofwat.

7.4.2 Although not previously compulsory, companies have prepared 25 year water resource management plans on a voluntary basis, and shared these with the Government and regulators, since 1999. On 1st April 2007 these plans became compulsory under changes to the Water Industry Act 1991, and this year for the first time they are also subject to public consultation before they are finalised.

7.4.3 SWW's Water Resources Plan is currently being finalised following consultation responses, including from the EA and Defra. This study has used the second draft of the WRP, which is the most comprehensive and up-to-date available. The information remains subject to change pending the publication of the final plan in November 2009, however SWW have commented that the final plan will not feature any significant changes from the 2nd Draft.

7.5 Strategic water supply

7.5.1 The study area is located within SWW's Wimbleball Strategic Supply Area (SSA), which stretches from Tiverton in the north to Exmouth in the south and from Crediton in the west to Axminster in the east. Drinking water supply is sourced predominantly from abstractions on the River Exe at Allers Water Treatment Works (WTW) near Tiverton and Pynes WTW at Exeter. Abstraction of natural flow from the River Exe is supported by augmentation releases from Wimbleball reservoir located in Somerset. Wessex Water Ltd (the adjacent water supply company to the east) uses Wimbleball reservoir for direct water supplies. There are no major storage reservoirs located within the core study area.

7.5.2 The Wimbleball SSA is also dependent upon the significant groundwater resources of East Devon. The Triassic Sandstone Group of the southern part of the Otter valley is the most significant in terms of public water supply, with groups of boreholes being the typical method of abstraction. SWW renewed abstraction licenses for a number of the key Otter Valley boreholes in 2000 and the company's WRP assumes that these licences will be renewed again in 2010.

7.5.3 SWW's strategy for the Wimbleball SSA is to optimise East Devon groundwater abstractions to serve the eastern fringes of the catchment in order to minimise the need to pump treated water long distances from the Exe abstraction points. The Environment Agency has noted in it's representation on SWW's 1st Draft WRP that the water company had not considered the non-renewal of time limited abstraction licences in the Otter catchment, which could result in loss of baseline deployable output in the Wimbleball SSA. The EA notes that SWW will need to take further action to better understand the environmental impacts of their abstractions in order to support the licence renewal process. Although the EA's guidelines for water resources planning state that time limited licences should not pose a risk to security of supply, it is important to note that the Otter surface water body is identified as being "probably at risk' from abstraction by the Environment Agency's Water Resources Strategy [EA 2009] and as currently having poor ecological status in the draft River Basin Management Plan for the South West [EA 2008d].

7.6 Water demand forecasts

7.6.1 South West Water's 2nd draft Water Resources Plan (WRP) predicts an overall fall in demand until about 2017/2018, after which demand is expected to rise. SWW's Total Demand forecast for the

SWW region is reproduced in Figure 7.2 below. The initial fall in demand is a result of a forecasted decline in non-household demand during economic recession, combined with a forecasted decline in household demand due to increasing levels of metering and increased water efficiency. Demand then begins to rise in the latter period of the plan as a consequence of population growth.

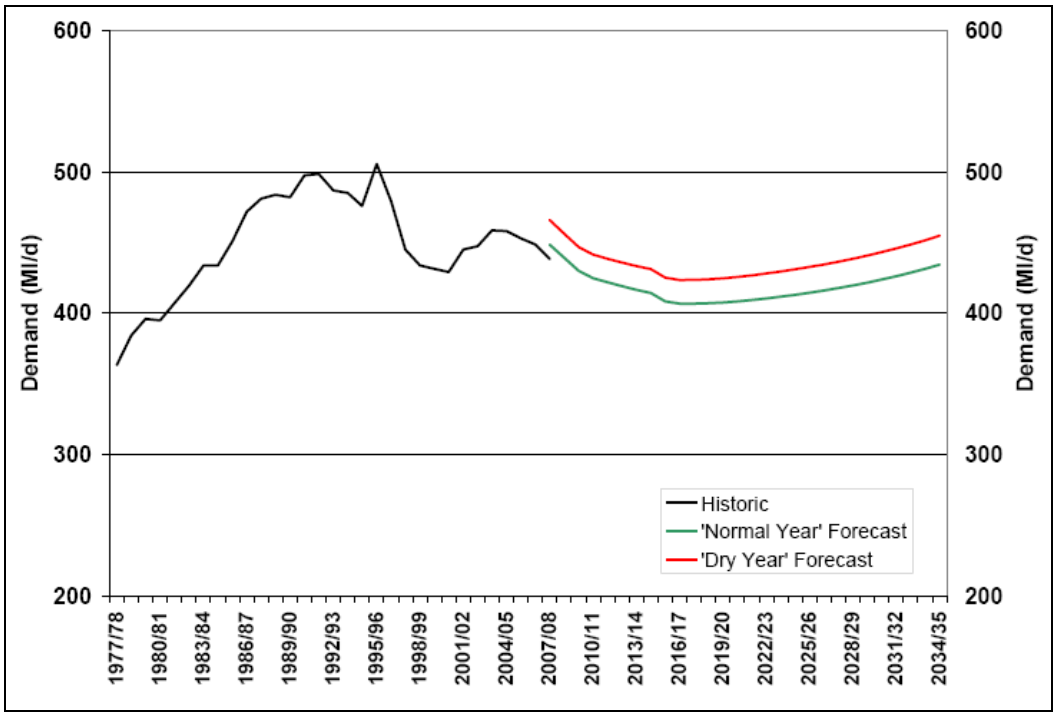


Figure 7.2 –Total South West Water demand forecast (Source: *2nd Draft Water Resources Plan 2010 - 2035*, South West Water Ltd)

7.6.2 Within the 2nd draft WRP, SWW make a number of assumptions for their baseline data and for calculation of their baseline demand forecast. These include the following:

- Demand scenarios are compatible with the mandatory requirements of the Code for Sustainable Homes (CSH).
- Forecasts include allowance for the latest OFWAT water efficiency target of 0.75Ml/d per year, published in November 2008.
- A general trend of reduced occupancy is applied.
- Impacts of climate change are included in the calculation of deployable output and forecast demand (leading to upward pressure on PCC).
- Leakage is planned to be maintained at the current target level of 84Ml/day throughout the planning period.

Population and property growth

7.6.3 Significant growth is anticipated within the Exeter and East Devon New Growth Point, which is located entirely within SWW's Wimbleball Resource Zone. An increase in population will lead to an increase in the amount of water which SWW will need to supply. Table 7.2 shows SWW's

forecast for growth in population over the plan period. Table 7.3 shows SWW's forecasted growth in dwellings.

Table 7.2 – South West Water's forecast growth in the resident population of the Wimbleball Strategic Supply Area (Source: *2nd Draft Water Resources Plan 2010 - 2035*, South West Water Ltd)

Year:	2007	2026	2036
Population (000s)	332.6	358.3	374.1
% increase against 2007	-	7.7%	12.5%

Table 7.3 – South West Water's assumed future housing development (000s of new properties) (Source: *2nd Draft Water Resources Plan 2010 - 2035*, South West Water Ltd)

Period:	2007-11	2011-16	2016-21	2021-26	2026-31	2031-2036
Wimbleball Resource Zone	2.7	5.2	7.7	8.3	8.3	8.3
Cumulative total	2.7	7.9	15.6	23.9	32.2	40.5

7.6.4 The SWW estimates reproduced in Table 7.3 forecast a total of 23,900 new properties constructed between 2007 and 2026 in the Wimbleball Resource Zone. In contrast the Proposed Changes to the RSS propose a total of 28,500 dwellings for the New Growth Point over the same period. South West Water's Water Strategy Group have provided a comparison of the maximum growth targets assumed for this study against the growth figures that SWW have used in their latest water resource planning. The results are shown in Table 7.4.

Table 7.4 – Comparison of New Growth Point and South West Water growth figures

Growth area	WCS Max. Growth Target	SWW WRP (2010 to 2035)
Exeter city	15,000	17,700
Teignbridge	2000	240
East Devon	10,100	12,500
Cranbrook	10,000	8,380
Total	**37,100**	**38,820**

7.6.5 SWW have commented that '*there is very little difference between the two totals, although there are some differences in the geographical location of development. These differences are not significant in terms of the water resource situation and fit comfortably with the Water Resources Plan*'.

Household demand - Per Capita Consumption (PCC)

7.6.6 SWW forecasts future household demand by estimating the Per Capita Consumption of the growing population. Historic consumption rates and the estimated PCC for 2007/08 are shown in Figure 7.3 below.

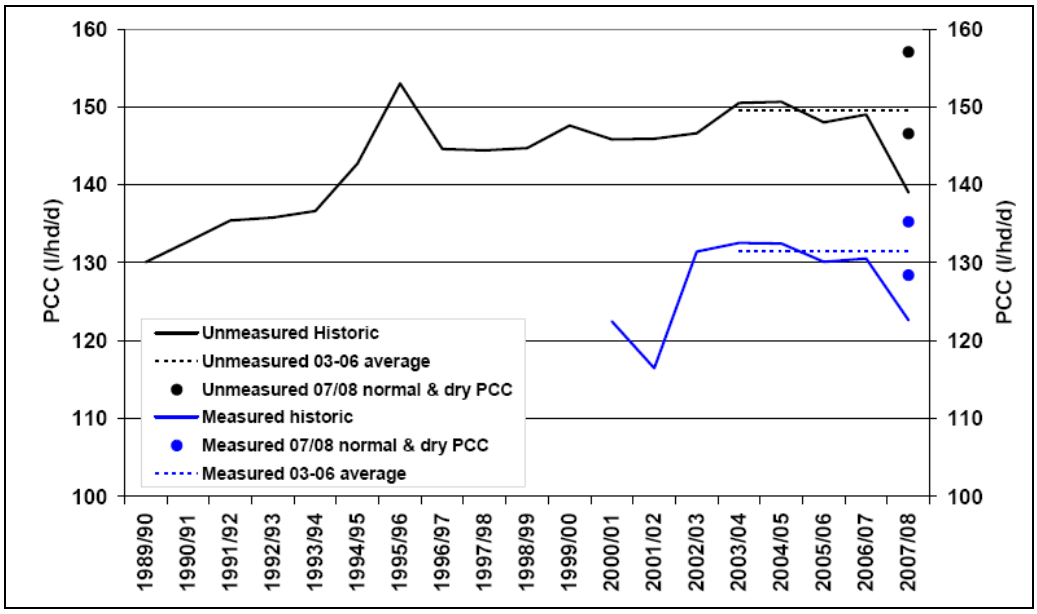


Figure 7.3 – South West Water historic Per Capita Consumption (PCC) and estimates of normal and dry base year PCC (Source: *2nd Draft Water Resources Plan 2010 - 2035*, South West Water Ltd)

7.6.7 SWW's average forecast for PCC is reproduced in Figure 7.4 below, which shows a decline in PCC over the first decade, followed by a gradual increase over the remainder of the WRP period.

7.6.8 The forecasts show that by year 2030, the normal year PCC will at best be approximately 135 litres per person per day, which is 5 litres above Defra's aspiration for average per capita consumption of 130 litres.

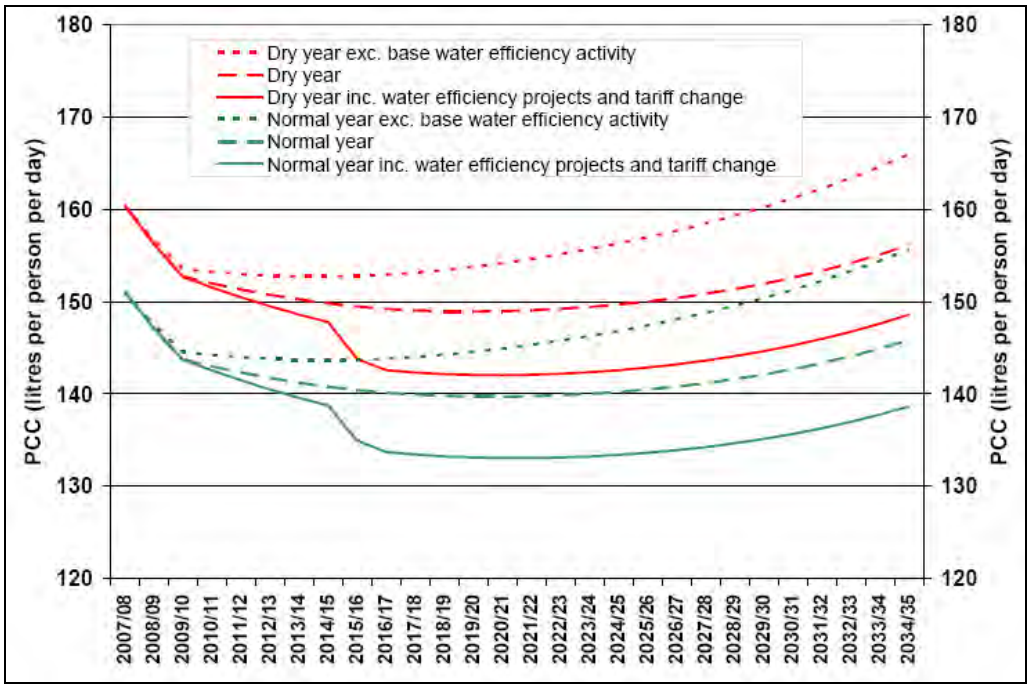


Figure 7.4 – South West Water average forecast Per Capita Consumption (PCC) (Source: 2nd *Draft Water Resources Plan 2010 - 2035*, South West Water Ltd)

Non-household demand

7.6.9 SWW's average forecast for non-household demand is reproduced in Figure 7.5 below, which shows a decline in demand over the WRP period. SWW's demand estimation includes the current period of economic recession, reflected in the sharp decline in non-household demand over the initial period of the WRP.

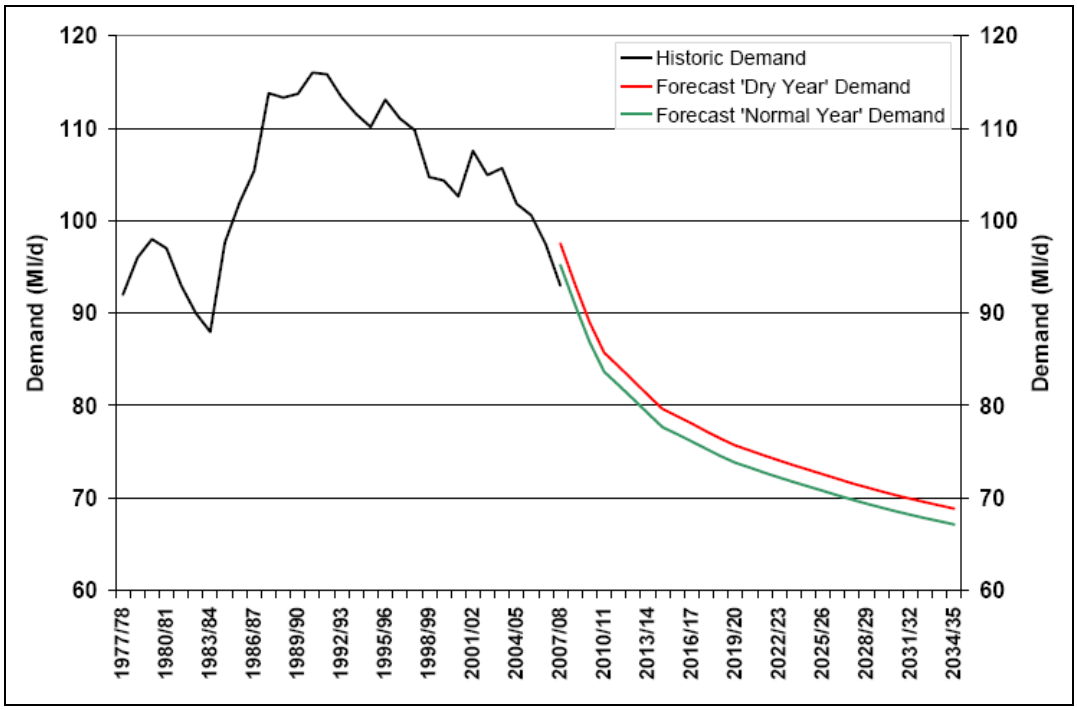


Figure 7.5 – South West Water forecast for non-household demand (Source: 2nd *Draft Water Resources Plan 2010 - 2035*, South West Water Ltd)

7.7 Water demand management

National policy - *Future Water*

7.7.1 The Government's new water strategy for England, *Future Water* was published in February 2008. *Future Water* outlines a strategic and integrated approach to the sustainable management of our water resources to 2030, for the public water supply as well as for the provision of healthy ecosystems and the services they provide.

7.7.2 The Vision by 2030 includes the following measures:

- Reduced per capita consumption of water through cost effective measures, to an average of 130 litres per person per day (l/p/d) by 2030 or possibly even 120 litres per person per day depending on new technological developments and innovation
- Amend the Building Regulations to include a requirement for a minimum standard of water efficiency in new homes. The requirement will be in the form of a calculated whole building performance standard set at 125 litres per day (l/p/d).
- In areas of serious water stress it is believed that near universal metering will be needed by 2030.

7.7.3 In response to the Strategy, the Environment Agency have stated that in water stressed areas the introduction of universal metering needs to be undertaken earlier. The Environment Agency would like to see the majority of households in areas where water is scarce to be metered by 2015 with the remainder in water scarce areas being metered by 2020. The Environment Agency also wish to promote the metering of all new properties, including flats.

7.7.4 Reductions in PCC of the order aspired to in *Future Water* will require more widespread changes to underlying cultural attitudes to water use. Such changes are not directly within the control of water companies. Until there is evidence of this change, planning future water supplies on the basis of such an assumption would be a high risk strategy.

Code for Sustainable Homes (CSH)

7.7.5 The Code for Sustainable Homes introduces a step-change in sustainable development and forms a basis for future developments to the Building Regulations. As of May, 2008 the Government has made it mandatory that all new homes have a rating against the Code for Sustainable Homes. The Code measures the sustainability of a new home against nine categories of sustainable design, rating the 'whole home' as a complete package. The Code uses a 1 to 6 star rating system to communicate the overall sustainability performance of a new home. The Code sets minimum standards for energy and water use at each level.

7.7.6 The relevant sections in relation to the Water Cycle Strategy are:

- Water Efficiency;
- Surface Water Run-off; and
- Energy / CO_2 (relating to heating water).

7.7.7 A minimum requirement for each of the nine categories is necessary to achieve the base rating of Level 1. Beyond this, threshold values must be attained for both 'Water' and 'Energy' to achieve higher code levels. Hence to achieve for example Code Level 3, the requirements for both carbon and water efficiency must be achieved in addition to the minimum points system requirement.

Points may be awarded in the other sustainability categories for initiatives and measures implemented beyond the base level requirement for Code Level 1.

7.7.8 Table 7.5 below defines the Carbon and Water Efficiency requirements for each Code Level rating. This assumes the basic entry requirements are met for the other six categories.

7.7.9 All new social housing already has to be built to CSH level 3, and the Water Act 2003 places a requirement on LPAs to take steps wherever practicable to encourage the conservation of water. It should be noted that to attain Code Level 3, a home must satisfy the criteria for carbon AND water efficiency. The reduction in use of heated water can therefore contribute towards achieving higher targets for both carbon and water efficiency.

7.7.10 The Environment Agency recommends that measures are adopted to allow the efficient use of water in all new homes with water efficiency set at 105 litres pre head per day (i.e. level 3/4 for water within Code for Sustainable Homes) or better.

Achieving a sustainability rating

	Minimum Standards				
	Energy		Water		
Code Level	Standard (Percentage better than Part L[1] 2006)	Points Awarded	Standard (litres per person per day)	Points Awarded	Other Points[4] Required
1(★)	10	1.2	120	1.5	33.3
2(★★)	18	3.5	120	1.5	43.0
3(★★★)	25	5.8	105	4.5	46.7
4(★★★★)	44	9.4	105	4.5	54.1
5(★★★★★)	100[2]	16.4	80	7.5	60.1
6(★★★★★★)	A zero carbon home[3]	17.6	80	7.5	64.9

Notes
1. Building Regulations: Approved Document L (2006) – 'Conservation of Fuel and Power.'
2. Zero emissions in relation to Building Regulations issues (i.e. zero emissions from heating, hot water, ventilation and lighting).
3. A completely zero carbon home (i.e. zero net emissions of carbon dioxide (CO_2) from all energy use in the home).
4. All points in this document are rounded to one decimal place.

Table 7.5 – Code Level requirements for energy and water efficiency (Source: *Code for Sustainable Homes – A Step Change in Sustainable Home Building Practice*. Crown Copyright, 2006.)

Environment Agency Policy

7.7.11 In March 2009 the Environment Agency launched their Water Resources Strategy for England & Wales. The strategy sets out how the Environment Agency believe water resources should be managed within the frameworks set out by Defra in its water strategy for England '*Future Water*'.

7.7.12 The strategy includes a series of actions that the Environment Agency believes need to be taken to deliver a secure water supply and safeguard the environment. The strategy looks to 2050 and beyond and is supported by a number of specific studies. The Environment Agency's vision for water resources is for there to be enough water for people and the environment, meeting legitimate needs. To support this vision, aims and objectives have been established which the Water Resources strategy has been designed to achieve. One aim of the strategy is that "Good water management contributes to sustainable development by supporting people and the economy in an improved environment. The objectives of this include;

- Adoption of the twin track approach of resource development alongside demand management in all sectors of water use.
- In England, the average amount of water used per person in the home is reduced to 130 litres each day by 2030.
- The Environment Agency targets and adapts its approach to reflect the location and timing of pressures on water resources.
- In England, water companies implement near-universal metering of households, starting in areas of serious water stress (the majority of homes in water-stressed areas to be metered by 2015).
- Leakage from mains and supply pipes is reduced (support targets based upon sustainable economic level of leakage).
- New and existing homes and buildings are more water efficient.
- Water resources are allocated efficiently and are shared within regions where there are areas of surplus.

7.7.13 The strategy also aims to ensure "People value water and enjoy their water environment and understand how it contributes to their quality of life". This will be achieved through the following objectives:

- Water pricing for the abstraction and use of water acts as an incentive for the sustainable use of water resources.
- Abstractors and users make informed choices to use water more efficiently.
- Innovative tariffs are adopted by water companies to maximise savings and minimise issues of affordability.
- The needs of wildlife, fisheries, navigation and recreation, as well as the environment and abstractors, are fully taken into account when allocating water resources.
- Innovative technology is developed to improve water efficiency by all water users.
- The Environment Agency is also proposing to publish regional action plans in autumn 2009.

Regional Policy

7.7.14 Under the Water Act 2003, (part 3 sections 81 & 83), relevant authorities must, where appropriate, take steps to encourage the conservation of water'. The New Growth Point study area is covered by the South West Regional Spatial Strategy (RSS) which will guide policy until 2026. The draft published in 2006 is currently undergoing a review and public consultation. It is proposed that following government amendments the policy relating to water resources will state the following:

7.7.15 Policy RE 6: Water resources:

'The region's network of ground, surface and coastal waters and associated ecosystems will be protected and enhanced, taking account of the Environment Agency's 'Regional Water Resources Strategy', catchment abstraction management strategies, groundwater vulnerability maps, groundwater source protection zone maps and river basin management plans. Surface and groundwater pollution risks must be minimised so that environmental quality standards are achieved and where possible exceeded. Local planning authorities, through their LDDs, must ensure that rates of planned development do not exceed the capacity of existing water supply and wastewater treatment systems and do not proceed ahead of essential planned improvements to these systems.'

7.7.16 It also goes on to acknowledge that where the Draft RSS identifies development levels likely to result in significant increased demand for water, sustainable provision of supply will be required. It states that these sensitivities may necessitate more stringent or innovative water conservation measures dependent upon the identification of sites and specific locations for new development in local development plan documents in order to ensure that there is no adverse effect of the integrity of such sites. It also acknowledges that where the abstraction sources for new development sites and locations are hydrologically connected to N2K sites there will be more likelihood of adverse effects occurring. The Government has also committed to bringing forward an amendment to Building Regulations to include a requirement for a minimum standard of water efficiency in new homes as well as a review of the Water Supply (Water Fittings) Regulations 1999 later in 2008.

7.7.17 Whilst proposed policy RE6 recognises the additional demand that new development - such as that proposed in Exeter and East Devon - puts on water resources and the potential impact up on sensitive conservation sites, it does not go as far as to suggest targets for limiting PCC of water or recommend how government proposes to play it's part at a regional level. Instead it refers to other bodies such as the Environment Agency and passes the implementation of more stringent measures down to Local Authorities and their Local Development Plans.

Water company measures

7.7.18 The SWW draft WRP forecasts that the Wimbleball Strategic Supply Area will maintain a surplus of supply over demand plus headroom through until 2035, as a result of SWW's current and proposed demand management policies and investment in water supply infrastructure – see Figure 7.6. The draft WRP does not include any proposals for new abstraction licences, nor does it identify any sustainability reductions within the Wimbleball SSA.

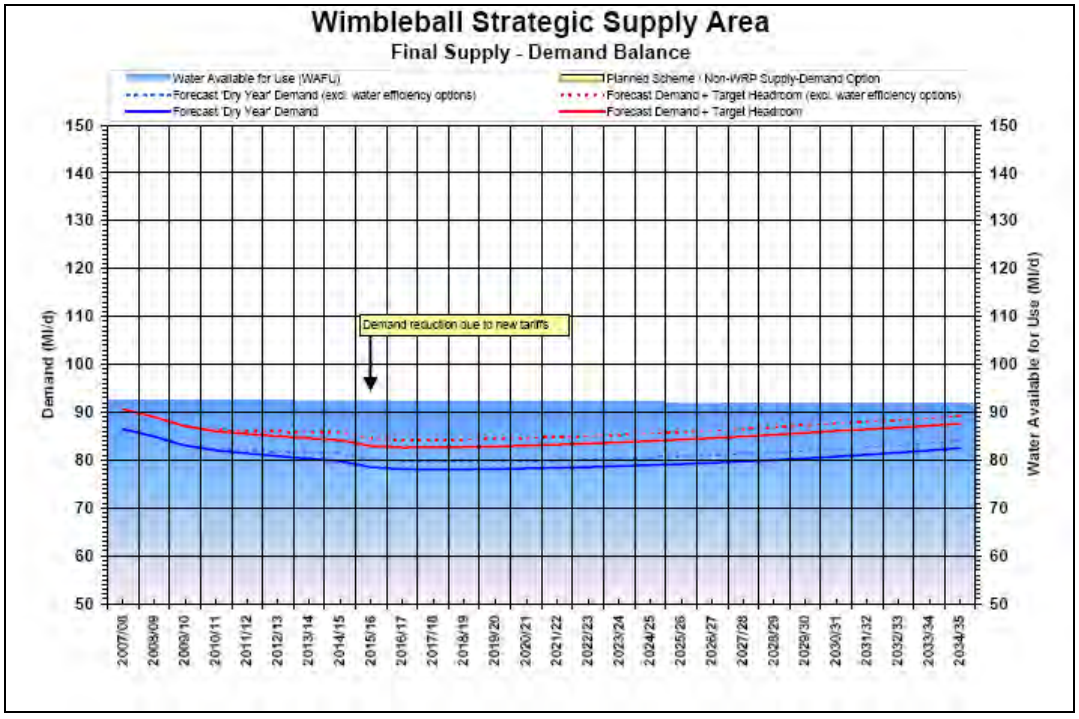


Figure 7.6 – South West Water forecast supply-demand balance for Wimbleball SSA (Source: 2nd *Draft Water Resources Plan 2010 - 2035*, South West Water Ltd)

7.7.19 The following demand management measures are proposed by SWW in their draft WRP:

Metered (measured) supply

7.7.20 SWW first introduced the option of free meter installation in 2000 and currently have 60% of households metered, which is almost double the current average for England and Wales. SWW expect metering to reach 80% by 2014/15 and 90% by 2029/30. The estimated impact on demand is that meter optant PCC will fall by 10% in the first year after opting and fall by 14% in the second year and thereafter.

Water efficiency projects

7.7.21 In 2010/2011 SWW plan to implement three specific water efficiency projects: 'Domestic Water Efficiency', 'Small and Medium Enterprise Project' and 'Water Efficiency at WWTW'.

New tariff structure

7.7.22 SWW plan to implement new tariff structures in 2015/16 and estimate this will result in a total measured PCC reduction of 5%, spread over 2 years following implementation. SWW are

currently trialling differential tariffs to assess the most effective and equitable methods for managing water demand i.e. tariffs that offer money savings for water conservation. This can be particularly effective on reducing industrial and business sector demands, where there is a commercial incentive.

7.8 Achieving water neutrality - future demand scenario testing

7.8.1 All the analysis within the SWW draft WRP undergoes a rigorous testing and review process with Defra, Ofwat and the Environment Agency, as well as public consultation. The assumptions made by SWW have been stated above and the baseline case provided by SWW has been accepted for use within the future demand scenario testing undertaken for the WCS.

7.8.2 The Office of National Statistics (ONS) publishes mid-year population estimates for local authority areas on an annual basis. The most recent data is for June 2006 and was published in August 2007. These have been used to estimate the current SSA and study area populations. The study area lies wholly within the Wimbleball SSA.

7.8.3 The forecast populations used by SWW are based on the latest housing growth scenario from the South West Regional Assembly as of October 2008, by parish to 2016 and by district thereafter. The 2006 population of Wimbleball SSA is identified by SWW as 316,471. Data from the Office of National Statistics (ONS) records the population of Wimbleball SSA as 327,581. There is less than 5% difference between these figures and therefore the population figures provided from SWW are considered to be correct and have been used in the demand scenario testing. The population of the water cycle study area within SWW Wimbleball SSA has been calculated from the ONS data to be 259,599 in 2007.

7.8.4 The water company has a statutory requirement to supply water to a specific level of service. The way that it is regulated means that it cannot rely on promises by developers or local authorities to manage demand. Hence, the per capita consumption (PCC) scenarios used by SWW in its demand assessment does not look at more aspirational demand management scenarios that can only be achieved with strong planning policies. This study has therefore considered demand management scenarios that go beyond SWWs plans.

7.8.5 The demand management scenarios considered below use the most recent figures from the June Return figures for a 'Dry Year' as a baseline for assessment of more ambitious consumption reduction scenarios.

7.8.6 The demand management scenarios below shows how various demand management strategies can affect the requirement for additional water resources in the study area, and what would need to be done to achieve this in the existing urban area and the new development sites. The following approach and assumptions have been applied:

- We have calculated the current total potable water demand for the WCS area by factoring the current total domestic population in the strategic supply area to the domestic population in the WCS area. This factor was used to apportion all demand values, including non use (e.g. leakage) and non household demand.
- We have assumed that leakage is constant during the plan period. SWW also assume in their draft WRMP09 that total leakage is constant at 84 ML/d, whilst total leakage in l/pr/d in

Wimbleball SSA as a whole will decrease over the planning period due to an increasing number of properties.

- We have assumed that baseline water consumption for existing metered and unmetered properties remains constant during the plan period. This differs from SWW assumption in the draft WRMP09 that PCC for metered properties decreases and then increases during the planning period and for unmetered properties increases due to increasing demand related to gardens and showering, which is a factor of climate change.
- We have assumed that non-household demand remains the same during the planning period. SWW have assumed that both measured and unmeasured non-household consumption decreases over the planning period.
- We have used SWW baseline and forecast occupancy rates for new properties provided in their draft WRMP09. We have assumed the occupancy rate in the existing housing remains constant throughout the planning period at the average baseline rate of 2.28. The SWW draft WRMP09 assumes that the occupancy rate for measured and unmeasured households increases and then decreases during the planning period.
- We have used forecast dwelling numbers provided in the RSS up to 2026. These may differ from the values in the draft WRMP09. As mentioned earlier, the draft WRMP undergoes a rigorous testing and review process with Defra, Ofwat and the Environment Agency, as well as public consultation. One of the key areas for scrutiny in this process is the forecast dwelling and population assumptions; therefore we are not undertaking any additional review of the accuracy of SWW forecast population or dwelling numbers.

7.8.7 The list of scenarios below provides detail of the components of each scenario tested. These are summarised in Table 7.6. The outcomes of these demand management scenarios are shown in Figure 7.7 below.

Scenario 1: Business as usual

7.8.8 This scenario looks at how potable demand would increase should the SWW draft WRMP09 forecast PCC rates be realised in the new development areas, assuming that all new properties are metered. The PCC for existing homes (metered and unmetered) is assumed to remain constant throughout the planning period at 140.24 l/h/d for existing metered homes and 166.94 l/h/d for existing unmetered homes. The meter penetration ratio of metered to unmetered homes is assumed to be in agreement with the SWW draft WRMP09 forecast. This scenario has been used as the basis against which all other scenarios have been derived.

Scenario 2: New homes built to Code for Sustainable Homes Level 5, at 80 l/h/d.

7.8.9 This scenario looks at a hard lined approach to the implementation of CSH water efficiency targets for new developments to reduce demand, whereby all new homes built after 2009 will be required to achieve CSH level 5 (80 l/h/d). We have assumed that all other variables are as detailed in Scenario 1.

Scenario 3: New homes built to Code for Sustainable Homes Level 3 and existing metered PCC reduced by 1 l/h/d/y

7.8.10 This scenario looks at how the implementation of CSH water efficiency targets to CHS level 3 and a decrease in existing metered PCC reduces the overall increase in demand. All new homes built after 2009 will be required to achieve CSH level 3 (105 l/h/d) and plans implemented to reduce the PCC for existing metered properties by 1 l/h/d, each year from 2009 to the end of the planning period.

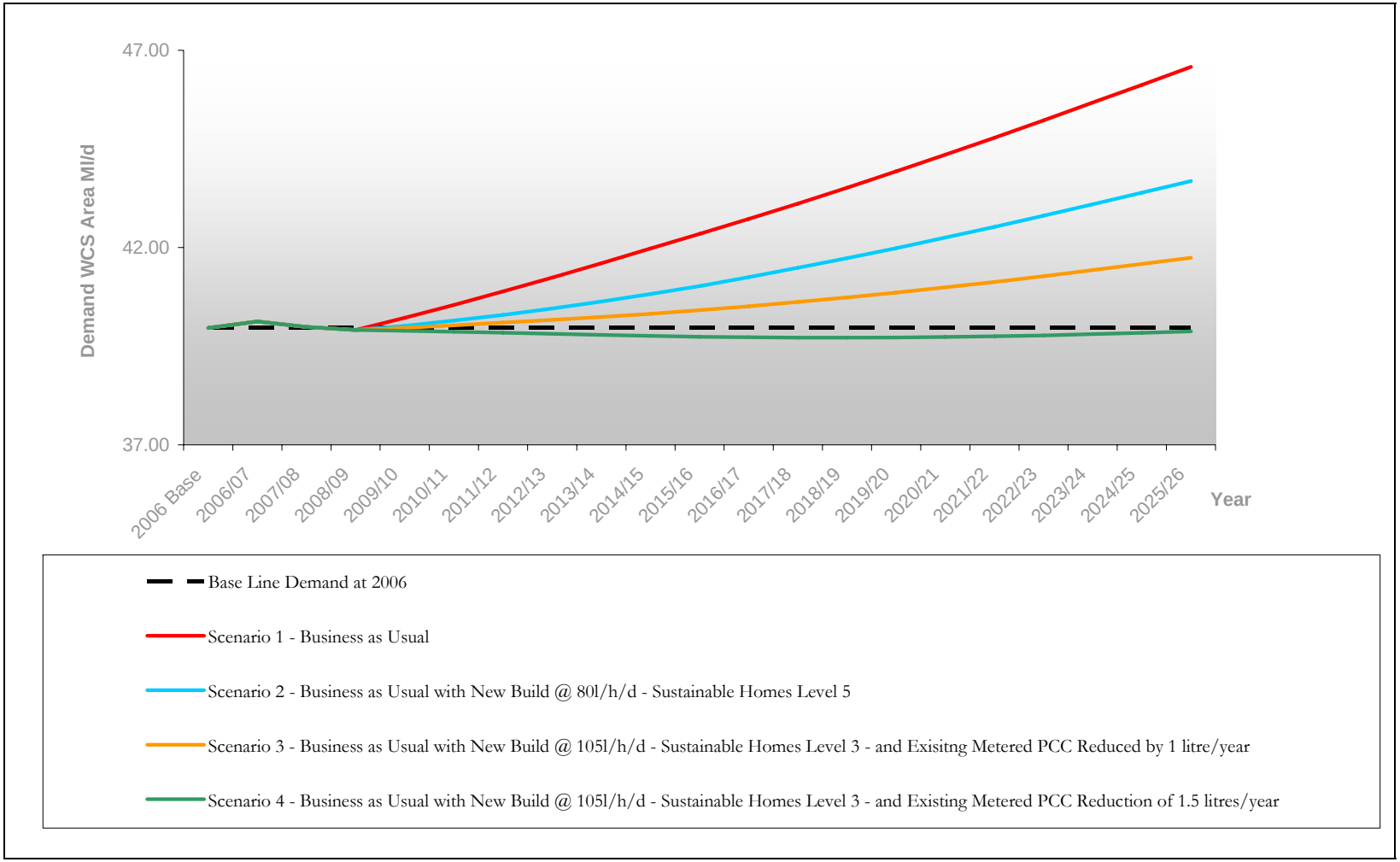
Scenario 4: Water Neutrality within WCS study area - New homes built to Code for Sustainable Homes Level 3 and existing metered PCC reduced by 1.5 l/h/d/y

7.8.11 This scenario looks at how the implementation of CSH water efficiency targets to CHS level 3 and a decrease in existing metered PCC reduces the overall increase in demand to baseline levels, and maintains a water neutral position. All new homes built after 2009 will be required to achieve CSH level 3 (105 l/h/d) and plans implemented to reduce the PCC for existing metered properties by 1.5 l/h/d, each year from 2009 to the end of the planning period.

Scenario	SWW Planned Metered Supply Ratio	Other metering	CSH3	CSH5	Reduction in existing PCC	Other measures
1	Yes	All new properties metered.	No	No	No	No
2	Yes	All new properties metered.	No	Yes	No	No
3	Yes	All new properties metered.	Yes new properties from 2009	No	Yes 1 l/h/d/y	No
4	Yes	All new properties metered	Yes new properties from 2009	No	Yes 1.5 l/h/d/y	No

Table 7.6 - Description of water resources scenarios assessed

Figure 7.7 – Potable water demand based on scenario analysis



7.8.12 Current potable water demand in the WCS in 2006/07 was 39.96Ml/d. The business as usual case (scenario 1) based upon constant existing PCC rates and varying new pcc rates shows that if no demand management measures were implemented other than the increased meter penetration proposed by SWW, an additional 6.62Ml/d of potable water will be required in the study area by 2026. This is approximately equivalent to almost two and a half Olympic size swimming pools on a daily basis, or an increase in household demand of 16.6% between now and 2026. This is the worst-case scenario and it should be highlighted that South West Water's own proposals for meter penetration are to meet 80% metering by 2014/2015 which is close to the Environment Agency's proposals on 95% meter penetration of the existing population by 2016.

7.8.13 The implementation of the various levels of the CSH has been tested alongside SWW's proposals on metering (scenarios 2, 3, and 4). By comparing the difference between scenario 1 and 2 it is possible to see that the introduction of the CSH level 5 for new homes built from 2009 onwards reduces the additional demand by an additional 2.9ML/d by 2026. With less stringent implementation of the CSH as shown in Scenarios 3 and 4 but with the addition of sequentially reduced PCC demand from existing metered properties, the total demand by 2025/2026 can be reduced by a further 3.8 ML/d compared to that in scenario 2. This creates a water neutral position to the end of the planning period.

7.8.14 The analysis also shows that the greatest reduction in water demand can be achieved by reducing demand in the existing population. This is because the existing population account for a larger proportion of the total population than the population from new development. Therefore though measures such as CSH, targeted at new developments have a positive impact upon total demand they should be used in conjunction with proposals for the existing population in order to achieve maximum reductions in total demand. Comparing the scenarios it can be seen that the increase in demand is not as steep over the planning period with the use of CSH measures and reduces further with the reduction in PCC of existing population which can have a dramatic affect. Scenario 4 details a reduction in PCC each year for existing metered houses of 1.5 l/h/d which lowers the existing metered housing PCC to 114.74 by 2026, below that required by CSH level 3. However it must be accepted that a reduction in 1.5 l/h/d per year cannot be sustained over the long-term and will be constrained by technology at some point.

7.8.15 Water neutrality (scenario 4) can be achieved from 2009 to 2026 by implementing a variety of measures. This includes SWW proposals for 80% penetration by 2014/2015, though aims should be for the Environment Agency's proposals on compulsory metering of 95% of existing properties by 2016; the implementation of the CSH (as described above) and a reduction in the existing PCC of the existing population. This would need to be achieved through the implementation of water efficiency measures such as retrofitting, education and encouraging water efficient devices.

7.9 Future implementation of demand management measures

Metering

7.9.1 The measures included in the scenarios in the section above, in some cases, will not be practical to implement. The implementation of Environment Agency metering of 95% of existing properties by 2016 is an ambitious target and requires around 6,000 properties a year to be connected to a meter at a cost of up to £500 each. Currently 60% of customers in the South West Water area are connected to a meter which is almost double the national average. Since October 2007, water companies within seriously water stressed areas have been given extended powers to increase

compulsory metering. South West Water have set themselves a targeted progressive metering programme, which will result in a company metering penetration level of 80% by 2015 and 90% of individual households by 2030, this has been aided by the free meter installation option introduced by SWW in 2000.

Water Consumption in new properties

7.9.2 A range of water consumption targets have been identified for new properties. The government's strategy has a requirement for a standard of 125 litres per day (l/p/d) for new properties, which it anticipates will be achieved by ensuring that all new homes have fittings with a good standard of water efficiency. New requirements on water efficiency will be introduced into the Building Regulations through the proposed New Approved Document G titled 'Sanitation, Hot Water Safety and Water Efficiency', due to come into force in April 2010.

7.9.3 It is recommended that the Code for Sustainable Homes is supported as much as practicably possible depending upon each individual development. The code should be specifically targeted through local planning regime at the largest developments where the benefits from development wide collection systems would be greatest. Developments that are built later within the planning period are more likely to occur at a time when the CSH has become statutory and adequate technology is in place to make the more stringent levels of the code more cost-efficient and feasible.

Water efficient devices and education

7.9.4 The government expects the demand for water efficient products from new housing to help drive the market and improve the efficiency of everyday water using products over time. To further facilitate these improved levels of efficiency, the Water Supply (Water Fittings) Regulations 1999 will be reviewed. These cover for example the maximum water use of toilets, urinals, washing machines etc. The review will also consider enforcement issues, advances in technical standards and water conservation, and the case for setting new performance standards for key water fittings. This will also support the CSH.

7.9.5 Most water companies offer water efficient devices either free of charge or at a reduced price. This can include cistern displacement devices (such as hippos, save-a-flush), water butts, trigger hose attachments, water audits and supply pipe replacement or repairs. Water efficiency campaigns can be very successful in reducing water consumption and are continuously undertaken by water companies. As part of the government's water strategy it has published a list of top water saving tips.

7.9.6 The promotion of water efficient devices and awareness of water saving measures should continue to be encouraged, such as those to be implemented by SWW in 2010/2011. Whether this can achieve a reduction in water consumption used in the scenarios above and whether this reduction per year can be maintained is uncertain. It's likely that initially with efficiency devices and education a reduction in water consumption is feasible in the initial stages of the planning period. However to continue the decrease in water consumption beyond a certain level will be difficult as campaigns saturate the customer base and existing technologies are utilised. By this point it may be that consumption can be reduced to a level whereby measures, such as additional water resources or licences to support the increase in supply will not be required.

Water efficiency and energy

7.9.7 Approximately 24% of domestic energy consumption in the UK goes to heating water (DTI 2002). This excludes space heating. Showering alone accounts for approximately 1% of total UK carbon emissions (MTP 2008). In addition, the treatment and distribution of water by water companies accounts for large amounts of energy consumption – e.g. Anglian Water is the largest single energy user in the East of England region, and recent estimates suggest that water companies consume more than 1% of the energy produced in the UK.

7.9.8 Energy prices are currently high and rising. In situations where more efficient hot water using fixtures and fittings, such as showers, baths and hot water taps are installed a major cost savings gained by the user will be through savings on the energy bill as well as the water bill.

7.9.9 The implementation of water efficiency measures not only reduce water demand and demand on water resources but produce associated savings in energy, financial costs and carbon emissions. Reductions in water demand can also reduce the need for additional infrastructure, resulting in further savings.

The cost of water efficiency

7.9.10 A specification for indoor water use of 120 litres per person per day, as per Part G of the Building Regulations and Levels 1/2 of the Code can be achieved through installing a combination of standard and efficient fittings and fixtures. CLG estimate that this will not add any cost to a new home (CLG 2008).

7.9.11 Code Level 3/4 can be achieved by installation of efficient water using fixtures and fittings. CLG has estimated that under current supply-demand scenarios, achieving Code Level 3 specification for water consumption of 105 litres per person per day, will add £125 to the cost of a new home (CLG 2008). Developers Countryside Properties and Taylor Wimpey have estimated £400 and £280 respectively. The variation arises from different scales of business or assumptions on scales of business, dwelling type or assumptions on dwelling type and therefore style or desirability of fittings.

7.9.12 To achieve a specification of 80 litres per person per day required for Code Level 5/6, it is generally accepted that some form of water recycling is required. Inclusion of a rainwater or greywater recycling system is relatively costly. CLG estimate that achieving Code Level 5/6 would add £2650 to a new standard home. However, this is likely to be less per dwelling if communal water recycling systems are installed, and CLG (2008) estimate £800 for apartments.

7.9.13 The cost of meeting the Code will fall as demand increases. Bathroom manufacturer Grohe have estimated that, assuming bulk supply of the fittings and fixtures, the cost of meeting Code Level 3 /4 would drop to as little as £12.50 (Grohe 2008). The Governments stated intention is to kickstart the market transformation process by requiring the public housing sector to build to medium level Code specification. However, this means that the relatively higher costs of meeting the Code during the early stages of market transformation are borne by housing associations. The National Housing Federation is lobbying for private developers to be subject to the same Code implementation timetable. At least at this stage, achieving Code Level 3/4 specification for water consumption is one of the cheapest aspects of Code implementation.

7.9.14 The average unit price for a metered water customer in 2008 is approximately 0.3 pence per litre including waste water charges. Average per capita consumption is about 150 litres per person per

day. Assuming that actual water use in the home meets the target specification, savings on water bills can be estimated as shown in Table 7.7.

Average PCC	Target Specification	Savings (litres per day)	Unit cost of water (pence per litre)	Savings (pounds per person per year)	Savings per household per year (assuming 2.4 people)
150	120	30	0.3	£32.85	£98.55
150	105	45	0.3	£49.27	£147.82
150	80	70	0.3	£76.75	£229.95

Table 7.7 - Savings on water bills calculated from average UK metered water price and assuming specification targets are met in practice.

7.9.15 For water bills, the payback time for specifications meeting Part G and Code Levels 1 through 4 ranges from immediately to a few years. If water recycling systems are added, the payback time is significantly longer – in the order of 10 years for systems supplying single homes. Savings on energy bills also need to be considered and in general these will at least match, and often exceed, the savings on metered water bills. Dwellings with water recycling systems will also save energy if efficient fittings are installed, but recycling systems will use energy for pumping and water treatment.

7.9.16 In conclusion, payback times for specifications involving efficient fittings and fixtures are reassuringly quick – a few years at most. Payback times for specifications that include recycling systems are significantly longer. Defra's water efficiency hierarchy illustrates this (Figure 7.8).

Figure 7.8 - Indicative illustration of cost-benefit of water efficiency strategies (Defra)

7.10 Water resources summary

7.10.1 It is anticipated that with the twin-track approach to supply-demand management that South West Water propose in their draft WRMP09, that there will be sufficient water resources to support the predicted growth in the Wimbleball Strategic Supply Area through until the end of the current planning period (2026).

7.10.2 The Environment Agency commenced the second cycle of Catchment Abstraction Management Strategies in 2008. Once updated and published, the results of the Exe CAMS and the Otter, Sid, Axe and Lim CAMS should be reviewed and

7.10.3 The scenarios tested above have attempted to predict future demand with various demand reduction measures in place. Scenario 4 shows that water neutrality can be considered realistic only with a change in tariff structures and with a targeted programme of retrofit within existing housing.

7.10.4 The demand analysis shows that a reduction in the PCC of existing properties and population is likely to have a greater impact than targeting new developments alone. It also demonstrates how increasing the proportion of the metered population can help reduce water demand. It is recommended that continued support is given to South West Water's current and proposed demand management policies and that new measures and technologies are supported at a national and local level.

7.11 Water supply infrastructure

7.11.1 This section assesses the water supply infrastructure in the study area and identifies high level capacity constraints in the supply network. This assessment has been undertaken primarily by South West Water itself, based upon the development scenarios provided by Halcrow.

7.11.2 SWW have identified that there are no real significant issues with providing water supply infrastructure where it is needed. Table 7.8 below shows SWW assessment of the sites we have tested.

7.11.3 SWW's Strategic Business Plan submission includes a proposal – subject to funding - for a new borehole in the Ottery area, however the borehole proposal is not included in SWW's Water Resources Plan because it is not required for supply-demand reasons (based on the forecasted surplus of supply over demand through to 2035). The borehole proposal is backed by the Drinking Water Inspectorate as a water quality enhancement measure.

7.11.4 SWW have confirmed that the development scenarios being tested in this study are consistent with the population increase assessed as part of the water resources management plan. For the urban extensions and new settlements being tested, SWW consider that new water supply infrastructure to serve the developments is likely to be required, although they have no concerns that the infrastructure can be delivered within normal planning timescales.

7.11.5 The extent to which new infrastructure would be required to serve development in the East Devon settlements being assessed will depend on the exact location of development with respect to the existing urban area, therefore this cannot be assessed until more detailed information regarding likely location of development is available. However, SWW have expressed no concerns

with respect to the provision of water supply infrastructure should allocations at the scale being tested be made at the smaller urban settlements

7.11.6 It is recommended that Water Supply infrastructure is not considered a material consideration with respect to strategic spatial planning. It is also recommended that the detailed planning of infrastructure is carried out as part of a detailed water cycle study once exact development locations are confirmed through the Core Strategies and Site Allocation DPDs.

Table 7.8 – Water supply infrastructure constraints

Sub-region	Growth Area	Does this growth target fit within the growth figures used in SWW's Water Resource Plan?	Do SWW consider that this site will require new water supply infrastructure to be requisitioned?	If so, what strategic and major infrastructure might be required?	Date at which SWW believe existing capacity will be exceeded, or when SWW believe new infrastructure will be required	Are there any planned improvements at this site to cope with growth? If so, what is the planned design capacity and when will improvements be delivered	Are there any other considerations the WCS should take into account regarding the suitability of this site from a water supply perspective
Exeter City	ECC boundary, including Area of Search 4c	Yes	Yes	Requires investigation	Sufficient raw water is available until at least 2035 (i.e. end of current Water Resources Plan). Infrastructure surveys would be carried out only when a site was likely to be developed and improvements would be made if required.		No
		Yes					
		Yes					
		Yes					
Teignbridge	South west of Exeter (Area of search 4C)	Yes	Yes	Requires investigation			No
East Devon	Cranbrook New community	Yes	Yes	New trunk main			No
	East of Exeter (RSS Area of Search 4B) Urban extension/2nd new community	Yes	Yes	New trunk main			No
	Elsewhere in East Devon Existing settlements identified for potential growth above 100 dwellings	Yes	Depends on location	None likely			No

8 Water services infrastructure funding and planning

8.1.1 Any improvements to the water services infrastructure to meet growth or future consent standards needs to be programmed into a water company's capital programme, which runs in five year Asset Management Plan (AMP) cycles.

8.1.2 The money that South West Water have available in each AMP period to spend on infrastructure is determined by OFWAT in consultation with government, the Environment Agency and consumer organisations. The consultation process is known as the Periodic Review.

8.1.3 We are currently approaching the end of the AMP4 period (2005-2010) and water companies are in the process of finalising the next Periodic Review (PR09), to determine the allowable capital expenditure for AMP5 (2010-2015). Figure 8.1 below illustrates the AMP planning cycle and Figure 8.2 illustrates the forthcoming AMP5 planning horizon (2010 to 2015) in greater detail.

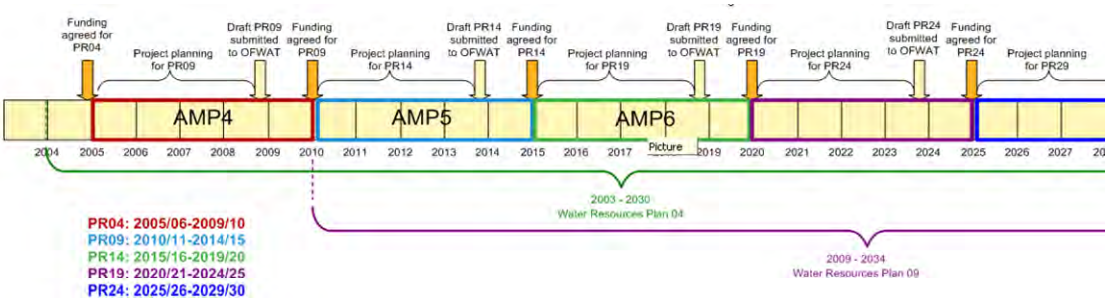


Figure 8.1 – Water company AMP funding cycles

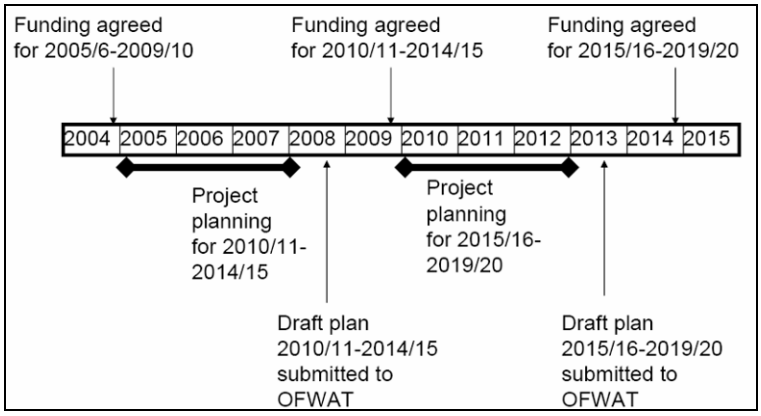


Figure 8.2 – Water company capital funding cycle for AMP5 (2010-2015)

8.1.4 This funding cycle and its associated constraints can have implications for the phasing of development, and it is important that water companies are involved in the planning process to ensure that infrastructure can be provided in time.

8.1.5 South West Water will begin planning for the period 2015/16 – 2019/20 next year in 2010 towards submitting a draft plan to OFWAT in 2013. Once funding has been obtained for new or upgraded infrastructure, there can be a significant lead-in time for planning and construction before the infrastructure can be used. Furthermore, there is limited scope for adjustment or re-allocation of funding once allocated, therefore it can be difficult for the Water Company to accommodate requirements for significant infrastructure if not already included in the plan for that AMP period.

8.1.6 It is therefore important that planning authorities are aware of the submission dates for each AMP cycle and that they regularly provide South West Water with up-to-date information on the scale, timing and certainty of proposed development. For instance, South West Water will require detailed information on likely housing developments for 2016-2020 in advance of 2013 if they are to plan and provide the infrastructure required to meet those levels of growth.

8.1.7 In the context of the three AMP cycles between 2010 and 2026, South West Water are confident that they will be able to provide or requisition adequate infrastructure capacity within the normal planning timetable, provided that they are consulted during the site allocations DPD stage or at the outline planning application stage.

8.1.8 In response to this study consultation, South West Water have suggested the following approximate timescales as a guideline for the duration required for planning by the water company to deliver water services infrastructure to new development:

- Major development (New community/settlement) ⇨ 2 AMP cycles
- Significant development (1000 – 3000 dwellings) ⇨ 1 AMP cycle
- Minor development (<1000 dwellings) ⇨ 1 AMP cycle (may be accommodated within current AMP period utilising existing funding)

8.1.9 South West Water's Asset Management Plan for 2010-2015 (AMP5) is due to be finalised in November 2009 and includes funding allocations towards delivery of the New Growth Point development, including ring-fenced funding for the first phase of the Cranbrook New Community.

8.1.10 South West Water have recently stated in response to Exeter City Council's Autumn 2009 consultation on the Core Strategy:

"In view of the scale of development under consideration determination of the final numbers is not a particular matter and we are happy to await the outcome of the RSS.

We will however be able to factor in the development proposals to our forthcoming business plans to meet the growth to the period 2026 in terms of providing sufficient potable water to the general area and adequate sewage treatment capacity.

The means by which the individual areas are provided with water supplies and drainage facilities will need to be considered in detail as and when sites are promoted."

9 Water cycle sustainability objectives

9.1.1 An aim of this outline water cycle study is to identify a framework for water cycle sustainability objectives against which future development proposals may be assessed by the planning authority.

9.1.2 Water cycle sustainability objectives are proposed in Table 9.1 below. These have been based upon a review of the following existing publications:

- Exeter City Council: Core Strategy Sustainability Appraisal Report
- East Devon District Council: Vision and Objectives for East Devon Core Strategy
- South West Water Strategic Environmental Assessment of Water Resources Plan

9.1.3 It is recommended that these proposed objectives are further developed by the planning authorities and where appropriate are incorporated into the Sustainability Appraisal (SA) and Strategic Environmental Assessment (SEA) of the Core Strategy process.

Table 9.1 – Proposed Water Cycle Sustainability Objectives

Objectives	Key Indicators
Water resource and water supply Objective: To ensure that water consumption and supply is as efficient as possible.	
• Reduce the consumption of water, both domestic and industrial (i.e. introduction of water metres, tariffs and other demand management measures). • Make best use of past investments and assets including existing buildings and infrastructure. • Promote sustainable water use based on long-term protection of available water sources. • Contribute to mitigating the effects of drought. • Increase public awareness	• CAMS status – how many CAMS in deficit. • Water consumption rates – per capita consumption • SWW energy consumption / carbon footprint. • Compliance with code for sustainable homes.
Water quality and environment Objective: To reduce pollution and maintain a high quality of water environment.	
• Ensure the progressive reduction of pollution of groundwater and prevent further pollution. • Achieve good ecological and chemical status in all inland and coastal waters by 2015. • Conserve and enhance SPAs, NNRs and SSSIs. • Ensure that coastal floodplain habitats are not prevented from naturally responding from sea level rise. • Employ green infrastructure principles (e.g. rain water harvesting, green roofs, attenuation ponds.)	• Number of planning permissions granted contrary to the advice of the Environment Agency on water quality grounds. • General assessment of river/coastal water quality. • General assessment of drinking water quality. • Biodiversity (i.e. decrease in population of indicator species).
Wastewater drainage and treatment Objective: Effective management of waste water: reduce the amount of waste water produced, better use of waste water.	
• Minimise waste water by better demand management and separation of storm water from foul sewers. • Make best use of past investments and assets including spare capacity in existing infrastructure. • Encourage recycling of waste water and reduction in energy use by residences and businesses. • Promote low carbon wastewater infrastructure solutions (e.g. gravity drainage rather than pumped). • Develop new markets for waste water.	• Water consumption. • Quantity of waste water generated and recycled. • SWW energy consumption / carbon footprint. • Percentage of existing wastewater networks that are separate
Flood risk and surface water management Objective: To ensure that there in no increase in flood risk.	
• Guide development away from areas liable to flooding by the use of a sequential test approach to land use planning. • Further reduce existing flood risk. • Employ sustainable flood risk solutions. • Contribute to mitigating the effects of floods – promote flood resilience. • Increase public awareness	• Number of planning permissions granted contrary to the advice of the Environment Agency on flood risk grounds. • Number of planning permissions granted in Flood Zones 2 and 3. • Actual implementation of flood defences. • Compliance with code for sustainable homes.

10 Conclusion

10.1 Summary

10.1.1 This water cycle study has identified no absolute environmental constraints to the proposed scale of growth in Exeter and East Devon and the area of Teignbridge within Area of Search 4C. Detailed analysis will be required in order to determine the most appropriate infrastructure solutions for new development, however South West Water are confident that provided that they are consulted during the site allocations DPD stage or at the outline planning application stage, they will be able to provide or requisition infrastructure capacity within the normal planning timetable.

10.1.2 South West Water's Asset Management Plan for 2010-2015 (AMP5) is due to be finalised in November 2009 and includes funding allocations towards delivery of the New Growth Point development, including ring-fenced funding for the first phase of the Cranbrook New Community.

10.1.3 Partnership working between Exeter and East Devon New Growth Point, the Environment Agency, South West Water and other stakeholders in the growth process will facilitate the selection and implementation of suitable technical solutions and enable growth to proceed in a sustainable manner.

10.2 Flood risk management

10.2.1 There is sufficient area within the study boundary that can be developed with or without mitigation without increasing flood risk. The identified development sites and growth areas are predominantly located in the low risk Flood Zone 1.

10.2.2 Future development in Flood Zone 1 should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development. Where growth areas are located in close proximity to Flood Zones 2 and 3 there should be a distinct and significant buffer zone established between the edge of development and the zones of higher flood risk in order to ensure no future encroachment onto floodplain and to accommodate potential increases in flood extents due to climate change.

10.2.3 All new development must ensure that flood risk is not increased elsewhere by achieving greenfield runoff rates for surface water. Developers should demonstrate a thorough understanding of site conditions and provide evidence to substantiate that sustainable urban drainage solutions are deliverable. The study has not identified any growth areas that have absolute constraints to implementing sustainable urban drainage.

10.2.4 All flood risk management and surface water management proposals should recognise the opportunity for multi-functional green infrastructure that may be used for biodiversity enhancement and recreational uses.

10.3 Water quality and environment

10.3.1 The study area features important riverine and estuarine habitats including the Exe Estuary (SSSI, SPA & Ramsar site), the Otter Estuary (SSSI) and the River Axe (SAC).

10.3.2 The Exe estuary is considered to have elevated nutrient levels due to the inputs from WwTWs and diffuse agricultural sources within the catchment. Due to these elevated nutrient levels, the

estuary may be vulnerable to biological instabilities in the future if a nutrient concentration 'tipping-point' is reached. The Environment Agency believe that adequate environmental monitoring, along with scope for measures to reduce nutrient loads will provide sufficient safeguards to the Exe estuary. We therefore do not consider water environmental capacity to be a constraint to growth in Exeter.

10.3.3 We recommend that Exeter City, the Environment Agency and South West Water work in partnership to develop a monitoring and development intervention programme to manage the risk of environmental deterioration in the Exe.

10.3.4 Under the Water Framework Directive (WFD) the objective is for all water bodies to meet good ecological status by 2015. Of those water bodies in the study area that receive discharges from WwTWs, the Rivers Otter, Axe and Clyst are currently rated as poor, and the Exe Estuary, Axe Estuary and Lyme Bay West are rated as moderate.

10.3.5 In order to meet WFD requirements for good status, Cranbrook, Honiton and Ottery Town WwTWs are likely to require a tightening of quality consents. However, these improvements will be driven by the RBMP process and should not be considered a constraint to growth.

10.4 Wastewater

10.4.1 This study has identified that there are no critical constraints to growth at the scale planned with respect to wastewater collection and treatment.

10.4.2 Development within and to the immediate southwest and east of Exeter city will be served by the existing Countess Wear wastewater treatment works. A new WwTW is already planned by SWW to serve the proposed new community of Cranbrook. SWW have obtained planning permission for the Cranbrook WwTW and have applied for approval for ring-fenced funding for its provision in their Asset Management Plan for 2010 – 2015 (AMP5). Most of the smaller settlements in East Devon have their own smaller WwTW.

10.4.3 South West Water have not identified any critical wastewater infrastructure capacity constraints at this stage and are confident that they will be able to provide or requisition adequate wastewater capacity within the normal planning timetable, provided that they are consulted during the site allocations DPD stage or at the outline planning application stage.

10.4.4 The assessment of the consented capacity at each of the WwTWs shows that there is consented capacity for all growth up to 2026 at Exeter Countess Wear, Axminster (Kilmington), Honiton, Ottery Town, Otterton and Sidmouth WwTWs without the need for a change to the existing flow consent.

10.4.5 Cranbrook, Colyton and Seaton South WwTWs will require a change to the flow consent to allow growth up to the maximum scenario tested to 2026. Exmouth Maer Lane WwTW has no current capacity for any further growth.

10.4.6 The Environment Agency is currently in advanced discussions to determine new consent applications for both Seaton South and Exmouth Maer Lane WwTWs. The Environment Agency has made the necessary assessments for these new consents (using a design horizon of 2016-2021) and currently awaits formal submission of the consent applications. If granted, these WwTWs are expected to have consented capacity for growth up to 2026 (based on the analysis undertaken by this study and presented in Section 6.4).

10.4.7 This study has not been able to assess the actual hydraulic or process capacity at the sewage treatment works because of a lack of available data. However it is the responsibility of the water company to effectually drain developments, and to provide sewage treatment capacity under the Water Industry Act 1991. As long as there is environmental capacity available and a new consent can be granted, additional sewage treatment capacity can be provided, and should not be seen as a showstopper to development.

10.5 Water resources and supply

10.5.1 South West Water has forecasted that through the implementation of proposed demand management programmes, there will be a surplus of water supply over demand throughout the RSS plan period and up to 2035, without the need for strategic infrastructure investment. Therefore water resources availability will not be a constraint to the development proposed in Exeter and East Devon.

10.5.2 South West Water have not identified any critical water supply infrastructure constraints at this stage and are confident that they will be able to provide or requisition adequate water supply capacity within the normal planning timetable, provided that they are consulted during the site allocations DPD stage or at the outline planning application stage.

10.6 Water efficiency

10.6.1 The implementation of water efficiency measures will not only reduce water demand and demand on water resources but produce associated savings in energy, financial costs and carbon emissions. Reductions in water demand can also reduce the need for additional infrastructure, resulting in further savings.

10.6.2 A reduction in the water consumption of existing properties and population is likely to have a greater overall impact on water demand than by targeting water efficiency in new developments alone. Increasing the proportion of the metered population will also help to reduce total water demand.

10.6.3 The assessment of options to manage water demand has shown that the New Growth Point's aspiration of achieving water neutrality can only be considered realistic with a change in tariff structures and with a targeted programme of retrofit within existing housing. To achieve water neutrality, all new homes built after 2009 will be required to achieve CSH level 3 (105 l/h/d) and plans implemented to reduce the Per Capita Consumption for existing metered properties by 1.5 l/h/d, each year from 2009 to the end of the planning period.

10.7 Constraints assessment summary

10.7.1 The constraints assessment of each of the water cycle elements is summarised in Table 10.2 below, based upon the traffic light system of colour coding defined in Table 10.1.

10.7.2 The constraints assessment summary provides an overview of the study findings for each development site and growth area and gives an in indication of where there are critical or significant constraints to development.

10.7.3 In the locations where options for growth areas are currently under consideration (Cranbrook expansion, East of Exeter urban extension/2nd new community, East Devon settlements) this study has not identified critical water cycle constraints to any of the growth options. Further to this, South West Water's high level assessment has not identified any significant material differences between options in terms of water services infrastructure.

Table 10.1A – Definition of constraint assessment categories

Definition of constraint assessment outcome		
Critical	**Notable**	**Minor**
Critical constraint to development. Major investment required and/or unlikely to be implemented in time to meet development targets.	Development feasible within plan period but requires significant investment, management and mitigation to be planned in phase with development.	Development feasible with only small scale investment, management and mitigation required.

Table 9.1 – Summary of outline water cycle constraints assessment

Growth Area	Site Ref.	Description	Flood risk	SuDS potential	Environment and water quality	Wastewater	Water resources	Water supply network
ECC boundary, including RSS Area of Search 4c	C1	Alphington area						
	C2	Newcourt area						
	C3	Monkerton/ Hill Barton area						
	C4	Exeter existing urban area						
South west of Exeter (Area of Search 4c)	T1	Alphington area						
Cranbrook New Community	E0	Allocated Phase 1						
	E1	Extension option 1						
	E2	Extension option 2						
	E3	Extension option 3						
	E4	Extension option 4						
	E5	Extension option 5						
	E6	Extension option 6						
	E7	Extension option 7						
	E8	Extension option 8						

Table 9.1 – Summary of outline water cycle constraints assessment

Growth Area	Site Ref.	Description	Flood risk	SuDS potential	Environment and water quality	Wastewater	Water resources	Water supply network
East of Exeter (RSS Area of search 4b)	E9	Pinhoe area						
	E10	Pinn Court Farm area						
	E11	Mosshayne area						
	E12	Redhayes						
	ECS	County Showground						
Elsewhere in East Devon	E13	Axminster						
	E14	Beer						
	E15	Budleigh Salterton						
	E16	Colyton						
	E17	Exmouth						
	E18	Honiton						
	E19	Newton Poppleford						
	E20	Ottery St Mary						
	E21	Seaton						
	E22	Sidmouth						
Commercial development	D1	Airport Expansion						
	D2	IMFT						
	D3	Science Park						
	D4	Skypark						

10.8 Outline water cycle strategy

10.8.1 The following actions are required to ensure that the proposed growth in Exeter and East Devon can be met without adversely impacting on the water environment and that required water infrastructure can be planned for and brought online alongside new development, in a timely and phased manner:

- Planning authorities shall maintain awareness of the regulated funding cycles under which Water Companies operate and ensure that South West Water is updated on the status of development proposals on a regular basis and in particular during the preparation stage of each AMP period.
- Planning authorities shall consult South West Water as soon as precise locations, numbers and timescales for development are known and if required, SWW can then be appointed to undertake a detailed assessment of the water services infrastructure requirements.
- Exeter and East Devon New Growth Point shall investigate and co-ordinate opportunities to use funding such as the Community Infrastructure Fund as a mechanism to fund detailed analysis of water services infrastructure where there is a need to identify sustainable technical solutions at an early stage (I.e. in advance of developer-led investigations).
- Exeter City, the Environment Agency and South West Water shall work in partnership to develop a monitoring and development intervention programme to manage the risk of deterioration in the Exe Estuary.
- Planning authorities shall promote sustainable surface water management and flood risk reduction by:
    - Adopting a policy of 'No surface water connection to foul sewer'.
    - Supporting the South West Water 'Sewers for Sewage' initiative to reduce foul sewer flooding due to surcharging by surface water and blockage by grease, oils and waste.
    - Preparing a SuDS policy and adoption guide to assist planners and developers. This should become a Supplementary Planning Document (SPD) and be closely linked to the Green Infrastructure Study recommendations and the emerging Green Infrastructure strategy.
    - Working collaboratively with key stakeholders and the County Council to reflect their proposed new responsibilities for local flood risk management when generating policy documents for surface water management to ensure that the links necessary for partnership working are established.
    - Estimating the land-take required for SuDS solutions prior to applying the development densities to determine land allocations within the Local Development Framework. This will ensure sufficient land is set-aside to implement successful SuDS solutions that will also perform as multi-functional green infrastructure.
    - Preparing Surface Water Management Plans for areas of widespread (adjoining) development to ensure a coherent approach is taken to surface water management and ensure delivery of strategic SuDS as opposed to multiple developments generating their own isolated approach to SuDS.
    - Ensuring through the planning consent process that SuDS solutions are technically feasible and are protected against incapacity due to future infill development. It is important to ensure that future infill development does not negatively impact on existing surface water

management systems – e.g. extension of a property that would prevent the existing soakaway from functioning, potentially leading to flooding.

- Seek an amendment of Section 106 of the Water Act to exclude roof water from the definition of 'domestic sewage'. Such an amendment would remove the right to connect roof water to existing public sewers and would support South West Water to reduce foul sewer flooding (due to surface water surcharge) and improve wastewater treatment capacity and efficiency (preventing increases in wastewater volume due to surface water).

- When published, the Planning Authorities shall compare the adopted RSS development targets against the development scenarios used in this study and assess the implications of any differences between the two.
- South West Water shall consult with the Environment Agency to assess the need for measures to mitigate existing flood risk at critical water supply and wastewater treatment assets, to mitigate future flood risk in receiving waters due to increased discharges from WwTWs and to mitigate pollution risk from flooding of WwTWs.

10.8.2 In addition, the following actions are recommended to enhance the sustainability of future development in Exeter and East Devon:

- Development of the proposed water cycle sustainability objectives and where appropriate, application to the Sustainability Appraisal of the Core Strategy.
- When published by the Environment Agency, review the updated Catchment Abstraction Management Strategies (CAMS) for the Exe catchment and for the Otter, Sid, Axe and Lim catchment and incorporate the findings into the Sustainability Appraisal.
- Investment in the most sustainable water services infrastructure solutions available.
- Redefinition of 'domestic sewage' within Section 106 of the Water Act to exclude roof water and prevent the right to connect roof water to foul sewer.
- Reduce water consumption of the existing population through implementation of water efficiency measures such as retrofitting, education and encouraging development of water efficient devices.
- Maximise implementation of water metering at existing properties to support South West Water's target of 80% coverage by 2015 and the Environment Agency's aspiration of 95% of existing properties by 2016.
- Implementation through planning conditions of the Code for Sustainable Homes (CSH) to a level of 3 and above for water efficiency, targeted at the larger developments where the benefits from strategic water conservation systems would be greatest.

11 Glossary

AAP	Area Action Plan
AEP	Annual Exceedence Probability
CAMS	Catchment Abstraction Management Strategy
CFMP	Catchment Flood Management Plan
DCC	Devon County Council
DPD	Development Plan Documents
EA	Environment Agency
ECC	Exeter City Council
EDDC	East Devon District Council
E&EDNGP	Exeter and East Devon New Growth Point
HMA	Housing Market Area
LDF	Local Development Framework
PPS	Planning Policy Statement
RBMP	River Basin Management Plan
RE1	River Ecosystem 1
RQO	River Quality Objectives
RSS	Regional Spatial Strategy
SAC	Special Area of Conservation
SFRA	Strategic Flood Risk Assessment
SPA	Special Protection Area
STW	Sewage Treatment Works
SuDS	Sustainable Drainage Systems
SWW	South West Water
TDC	Teignbridge District Council
WCS	Water Cycle Study
WwTW	Wastewater Treatment Works

12 References

CIRIA 2006 *C635 Designing for exceedance*

CIRIA 2007 *C697 SUDS Manual*

Cooper Partnership 2006 *Cranbrook Landscape, Biodiversity and Drainage Strategy*

DCLG 2004 *Planning Policy Statement 23: Planning and pollution control*

DCLG 2005 *Planning Policy Statement 1: Delivering Sustainable Development*

DCLG 2005a *Planning Policy Statement 9: Biodiversity and Geological Conservation*

DCLG 2006 *Planning Policy Statement 3: Housing*

DCLG 2006a *Planning Policy Statement 25: Development and Flood Risk*

DCLG 2006b *New Growth Points, Partnership for Growth with Government – Exeter and East Devon*

DCLG 2008 *South West Regional Spatial Strategy Proposed Changes Sustainability Appraisal Final Report*

DCLG 2008a *South West Regional Spatial Strategy Proposed Changes Habitat Regulations Assessment Final Report*

DCLG 2008b *Planning Policy Statement 12: Local Spatial Planning*

Defra 2005 *Making Space for Water – First Government response to Autumn 2004 consultation*

Defra 2008 *Future Water – The Government's Water Strategy for England*

Defra/EA 2005 *Technical Report W5-074/A Preliminary rainfall runoff management for developments*

EA 1999 *Groundwater Management Strategy for the Otter Valley Triassic Aquifer*

EA 2003 *Exe CAMS Technical Document*

EA 2004 *The Exe Catchment Abstraction Management Strategy*

EA 2004a *The Otter, Sid, Axe and Lim CAMS Technical Document*

EA 2005 *The Otter, Sid, Axe and Lim Catchment Abstraction Management Strategy*

EA 2006 *The Environment Agency response to the RSS Panel Report Consultation on Wastewater Treatment and disposal*

EA 2007a *The Otter, Sid, Axe and Lim CAMS Annual Update*

EA 2007b *The Teign, Torbay and South Hams Catchment Abstraction Management Strategy*

EA 2007c *Exe CAMS Annual Update*

EA 2007d *The state of groundwater in England and Wales*

EA 2007e *Position Statement: Sustainable Communities*

EA 2007f *Hidden Infrastructure: The pressures on environmental infrastructure*

EA 2007f *Fact Sheet: Water Neutrality*

EA 2008 *Exe Catchment Flood Management Plan*

EA 2008a *East Devon Catchment Flood Management Plan*

EA 2008b *The Environment Agency's representation on South West Water's draft water resources management plan*

EA 2008c *Water resources in England and Wales – current state and future pressures*

EA 2008d *Water for life and livelihoods: A consultation on the draft River Basin Management Plan for the South West River Basin District*

EA 2008e *Strategic Environmental Assessment of the draft River Basin Management Plan for the South West River Basin District*

EA 2009 *Water for people and the environment - Water Resources Strategy for England and Wales*

ECC 2005 *Core Strategy Issues and Options*

ECC 2006 *Core Strategy Draft Preferred Options Paper*

ECC 2006a *Core Strategy Sustainability Appraisal Report*

ECC 2007 *Exeter Fringes Landscape Sensitivity and Capacity Study*

ECC 2008 *Exeter City Council Strategic Flood Risk Assessment Final Report*

ECC 2008a *Exeter Core Strategy Habitats Regulations Assessment*

EDDC 2007 *Cranbrook:: A new community for East Devon*

EDDC 2008 *East Devon Local Development Framework Sustainability Appraisal Generic scoping report for core strategy and other LDF documents*

EDDC 2008a *East Devon District Council Strategic Flood Risk Assessment Main Report*

EDDC 2008b *East Devon Local Development Framework Issues and Options Consultation Report*

East Devon Flood Recovery Partnership 2009 *Flood recovery update, Issue 3, Autumn 2009*

Exeter International Airport 2009 *Exeter International Airport Masterplan*

GOSW 2008 *Further consultation on vital south west development vision*

ICE 2009 *Can green infrastructure promote urban sustainability?*

LDA Design 2009 *Green Infrastructure Study for Exeter Area and East Devon New Growth Point*

Landscape Institute 2008 *Green Infrastructure Position Statement*

National SuDS Working Group 2004 *Model Agreements for Adoption*

SWRA 2006 *The Draft Regional Spatial Strategy for the South West 2006 - 2026*

SWRA 2008 *Regional Spatial Strategy for the South West: Examination in Public April – July 2007: Report of the Panel Section 1: Main Report*

SWRA 2008a *The draft revised regional spatial strategy for the south west incorporating the secretary of state's proposed changes – for public consultation*

SWW 2007 *Strategic Direction Statement*

SWW 2009 *2nd Draft Water Resources Plan 2010 – 2035, incorporating the Consultation Response Statement*

SWW 2009a *Strategic Environmental Assessment of 2nd Draft Water Resources Plan 2009 – Environmental Report*

SWW 2009b *Final Business Plan*

SWW 2009c Email response to Exeter City Council's consultation on the LDF Core Strategy

TDC 2007 *Teignbridge Strategic Flood Risk Assessment*

TDC 2008 *Teignbridge Plan Area – Strategic Housing Land Availability Assessment*

TDC 2009 *Third Revised Teignbridge Local Development Scheme*

For further guidance on Water Cycle Studies, reference should be made to the guidance document available on the Environment Agency's website:

http://www.environment-agency.gov.uk/research/planning/33368.aspx

Appendix A – Study Data

Ref. No	Subject & Type of data	Source	Date received
WBEWCS001	Data licence for OS maps – Word Document	Adrian Marsden – EDDC	11/03/2009
WBEWCS002	DVD containing 10k and 50k maps	Adrian Marsden – EDDC	19/03/2009
WBEWCS003	EDDC Local Plan GIS information	Adrian Marsden – EDDC	19/03/2009
WBEWCS004	EDDC GIS boundary	Adrian Marsden – EDDC	19/03/2009
WBEWCS005	ECC Local Plan GIS information	Ian Dawson – ECC	23/06/2009
WBEWCS006	ECC GIS boundary	Ian Dawson – ECC	23/06/2009
WBEWCS007	Exeter and East Devon New Growth Point GIS boundary	John Maidment – EDDC	23/06/2009
WBEWCS008	East Devon Strategic Growth Areas GIS boundaries	John Maidment – EDDC	18/06/2009
WBEWCS009	Data Licence for EA data, Ref: 8983	EA External Relations Team	30/06/2009
WBEWCS010	Fluvial flood zone maps GIS – East Devon, Exeter & South Devon	EA External Relations Team	30/06/2009
WBEWCS011	RQO/GQO data up to 2006 – Excel document	EA External Relations Team	30/06/2009
WBEWCS012	South west SIMCAT data file (using dry weather flows)	EA External Relations Team	30/06/2009
WBEWCS013	STW Consent conditions – Excel document	EA External Relations Team	30/06/2009
WBEWCS014	Sample sites – ArcMap GIS	EA External Relations Team	30/06/2009
WBEWCS015	Latest Exe and East Devon CFMPs – electronic documents	EA External Relations Team	30/06/2009
WBEWCS016	Latest CAMS status – ArcMap GIS	EA External Relations Team	30/06/2009
WBEWCS017	CAMS documents and technical CDs	EA External Relations Team	30/06/2009
WBEWCS018	Water Framework Directive classification maps – ArcMap GIS	EA External Relations Team	30/06/2009
WBEWCS019	ArcMap GIS data previously used for East Devon SFRA: Hydrometric areas Flood incident data Flood Warning and Watch Areas Major Incident Plan Areas River catchment boundaries Main river and ordinary watercourses Flood mapping and Flood defence data	EA External Relations Team	24/04/2008

Appendix B – Geology characteristics							
Geology			Geological and Hydrogeological Properties1	Aquifer Class (Infiltration Drainage Potential)2	Distribution within Study Area 3	Groundwater Flooding Potential4	WCS Sites affected
Age	Group/ Formation	Unit					
Quaternary (Pleistocene and Recent)		Peat	Silt and fibrous plant material. Highly porous but poorly permeable	**Non - Aquifer** *(Poor)*	Restricted to river valleys and generally only of local occurrence	Unlikely	
		Alluvium	Silt and clay, often overlying or containing lenses of sand and gravel. Variably porous and permeable (generally poor, although sands and gravels may be significant locally)	**Non - Aquifer** *(Poor)*	Widespread in river valleys, particularly in the Exe and Axe	Possible - though likely related to fluvial/tidal events	D2, E12, EXM, OSM, COLY,
		River Terrace Gravels	Coarse sands and gravels in river valleys. Typically present above current river levels at multiple elevations. Generally moderately to highly porous and permeable	**Minor aquifer** *(Moderate)*	Relatively minor restricted to Exe valley	Possible – though likely related to fluvial/tidal events	D2, D3, E0, E1, E2, E3, E4, E5, E6, E7, E8, E11, E12, ECS, EXM, BUD, NEWT, OSM, AXM,
		Plateau Gravels and Clay-with-Flints	Coarse sands and gravels chiefly of flint and/or chert, set in clay in the case of Clay-with-Flints. Poorly to moderately porous and permeable	**Non - Aquifer** *(Poor)*	On high plateaux of East Devon between Rivers Otter and Lim	Unlikely	COLY, BEER
		Head deposits	Heterogeneous mix of clay, silt, sand and gravel of periglacial origin. May be layered depending on local provenance. Poorly to moderately porous and permeable	**Non - Aquifer** *(Poor)*	At toe of valley slopes in all areas of study area	Unlikely	D3, E1, E2, E3, E4, E5, E6, E7, E8, E9, E11, E12, NEWT, OSM, SID, HON
Upper Cretaceous	Chalk Super group		Extremely pure white limestones with random and bedded flint. Generally highly porous (primary and secondary) and permeable	**Major** *(Good)*	Caps high ground between Rivers Axe and Lim and as outlier at Beer	Unlikely	AXM, BEER
Lower Cretaceous	Greensand Group		Silty, fine-grained, glauconitic and variably shelly sand and sandstone. Moderately permeable, highly porous.	**Major** *(Good)*	Forms high ground between Rivers Axe and Lim	Possible but localised	SEAT, COLY

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	Gault Formation		Clays and sandy clays. Low porosity and impermeable.	**Non - Aquifer** *(Poor)*	Restricted outcrop below Greensand in valley sides	Unlikely	
Unconformity							
Jurassic	Lias Group	Blue Lias Formation	Thin, jointed limestone interbedded with mudstones. Generally poorly permeable but fractures (secondary porosity) allows minor yields in some areas	**Minor aquifer** *(Moderate)*	Between Charton Bay and eastern boundary of study area and in upper reaches of Axe catchment	Possible but localised	AXM
Triassic	Penarth Group		Mudstones and siltstones with limestones near top. Low porosity, poorly permeable	**Non Aquifer** *(Poor)*	Between River Axe and eastern boundary of study area. Restricted surface outcrop (capped by Chalk)	Unlikely	AXM
	Mercia Mudstone Group		Mudstones with thin siltstones and rare sandstones. Low porosity, poorly permeable	**Non Aquifer** *(Poor)*	Between Rivers Sid and Axe through to northwest limit of study area	Possible but localised	OSM, SID, HON, SEAT, COLY, AXM
	Sherwood Sandstone Group	Otter Sandstone Formation	Fine silty sandstones with local bands of mudstone, siltstone and gravel. Highly porous, moderately to highly permeable	**Minor aquifer** *(Moderate)*	Between Rivers Otter and Sid through to north of study area	Unlikely	BUD, NEWT, OSM, SID
		Budleigh Salterton Pebble Beds	Coarse sandy silty gravels with cobbles and lenses of sandstone, mudstone and siltstone. Highly porous, moderately to highly permeable	**Major aquifer** *(Good)*	Budleigh Salterton northward towards Wellington	Unlikely	
Triassic/ Permian	Aylesbeare Mudstone Group	Littleham Mudstone Formation	Mudstones and siltstones with rare channelised sandstones and gravels. Low porosity, generally poorly permeable	**Non Aquifer** *(Poor)*	Littleham to Budleigh Salterton through to north of study area	Possible but localised	D4, EXM

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Age	Group/ Formation	Unit					
Permian		Exmouth Mudstone and Sandstone Formation	Mudstones and siltstones with channelised and massive sandstones. Variably porous, poorly to moderately permeable	**Minor aquifer** *(Moderate)*	Exmouth north along east bank of the Exe Estuary to north of study area	Possible but localised	, D4, E0, E2, E3, E4, E5, E6, E7, E8, ECS, EXM
	Exeter Group	Alphington and Whipton Formations etc.	Sandy breccias with lenses of mudstone. Variably porous, moderately permeable	**Minor aquifer** *(Moderate)*	Exeter City and west-side of River Clyst	Unlikely	T1, C1, C2, D1
		Dawlish Sandstone Formation	Fine sandstones with infrequent bands of impermeable mudstone. Highly porous, moderately to highly permeable	**Major aquifer** *(Good)*	Eastern-side of Exe Estuary and of River Clyst	Unlikely	C2, C3, C4, , D1, D4, E1, E9, E10, E11, E12, ECS
Carboniferous	Holsworthy Group	Crackington Formation	Mudstones, siltstones and sandstones. Variably porous, poorly to moderately permeable. Minor yields from fractures	**Non Aquifer** *(Poor)*		Possible but localised	C4, E9, E10, E11

Notes to Table:

1. Generalised descriptions only. Major impermeable units (e.g. Fullers Earth, Lower Lias Shales and mudstones) may have very localised more permeable units but these are unlikely to be significant in extent. Groundwater flooding may occur in small bodies outside main aquifer units
2. Aquifer classification based on Aquifer Properties Manuals (BGS 1997; 2000). The infiltration drainage potential is based primarily on indicative geological/lithological/hydrogeological properties only – soils, groundwater levels, unit thickness and topographic setting will further constrain potential and must be investigated locally.
3. Distribution from 1:50,000 geological mapping. Locations approximate.
4. Groundwater flooding potential – indicative only (possible/unlikely) related to potential for more extensive flooding (unless stated), refer “FRIS” Mapping for occurrence of groundwater flooding to date. Localised flooding may from small groundwater bodies in all formations.

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Triassic	Penarth Group		Mudstones and siltstones with limestones near top. Low porosity, poorly permeable	**Non Aquifer** *(Poor)*	Between River Axe and eastern boundary of study area. Restricted surface outcrop (capped by Chalk)	Unlikely	AXM
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