

Central Bedfordshire Council Local Plan (2015-2035)

**Water Cycle Study
(July 2017)**

Central Bedfordshire Water Cycle Strategy (WCS) – Stage 1

1. Introduction

- 1.1 The NPPF requires Local Planning Authorities to take a proactive approach towards mitigating against climate change; and include strategic policies in the Local Plan to deliver infrastructure for water supply, waste water, water quality and flood risk management.
- 1.2 New developments require the provision of clean water, safe disposal of waste water and protection from flooding. It is possible that allocating homes at some locations may result in the capacity of existing infrastructure being exceeded. This could lead to service failures, adverse environmental impacts or high upgrade costs being passed onto residential and business customers. Climate change presents further challenges, such as higher frequency of intensive rainfall or drought, that can be expected to put greater pressure on infrastructure.
- 1.3 The Water Cycle Strategy (WCS) is a mechanism for assessing the demands that proposed growth will place on existing water services infrastructure, and establish its ability to cope. It will enable water resource and capacity issues to be resolved at the earliest possible stage in the planning process, allowing stakeholders to plan and implement infrastructure in a timely manner to meet the needs of new homes and businesses.
- 1.4 Central Bedfordshire's WCS is being prepared in two stages:
 - Stage 1 is a high level, baseline assessment of Central Bedfordshire identifying known capacity issues and available headroom within water and wastewater services. It documents how much growth is allowed for in existing water company plans; identifies the current capacity available to accept growth without infrastructure upgrades being required; and identifies any known constraints to upgrading existing assets, for example restricted land capacity for extending a waste water treatment works (WwTWs).
 - Stage 2 is a more detailed assessment taking into consideration the sites proposed for allocation in the Local Plan. It will assess the likely impact of potential development sites on existing water infrastructure and identify where and when future infrastructure upgrades are likely to be required. Stage 2 will inform the Pre Submission Local Plan (Regulation 19) document.
- 1.5 The WCS is being prepared in collaboration with the Environment Agency and water utilities companies that cover the area (Anglian Water, Affinity Water and Thames Water). Most of the data and information used within the WCS already exists within the organisations that have responsibility for operation, regulating and managing the water

environment. The WCS simply makes this information readily available for the Council to assist in decision making and discussions with landowners and developers.

- 1.6 The Stage 1 WCS has been prepared by specialist consultants JBA, who have also been commissioned to prepare Stage 2 later this year. The Stage 1 study has been completed using the best available information at the time of preparation.

2. Key Findings

- 2.1 The overall assessment has identified that no strategic scale water or waste water constraints on growth have been identified in Central Bedfordshire. This includes reservoirs or water reuse plants for example.
- 2.2 In all settlements there is either evidence that additional infrastructure is likely to be required to accommodate growth; or currently insufficient evidence at Stage 1 (in the absence of growth figures or identified sites) to prove that it will not.
- 2.3 In all but two locations, no major technical constraints have been identified at any of the water and waste water utilities that cannot be addressed given sufficient notice of development. The exceptions are:
- Caddington Waste Water Treatment Works – it is not currently known whether increasing a wastewater discharge to groundwater would be feasible;
 - Studham Waste Water Treatment Works – has the same issue as Caddington above, and in addition has space constraints on the existing treatment works site which may limit expansion.
- 2.4 These could both be significant constraints but potential solutions do exist if these WwTWs are selected to accommodate a significant scale of development.
- 2.5 The initial modelling work has also shown that for six WwTWs (Barton le Clay, Chalton, Dunstable, Markyate, Shillington and Tempsford) the receiving water course is already classified as 'Bad' under the Water Framework Directive and no further deterioration should be allowed. Any growth in these catchments would need to be sufficiently phased to enable time for upgrades to be implemented.
- 2.6 Table 10.1 in the Stage 1 WCS report summarises the overall findings by WwTWs catchment area and provides a guide as to how much growth could be accommodated within an area (based on the capacity of existing services) without the need for additional resources and investment.
- 2.7 The Stage 1 conclusions will be used in the initial site assessment process to identify where capacity is available or where infrastructure upgrades are likely to be required.

3. Summary of Implications

- 3.1 As Stage 1 only identifies the baseline position based on committed levels of growth, it is not possible to identify what solutions may be implemented to address capacity issues. The Stage 2 study is required to assess the impact of potential future development sites on water infrastructure and identify where and when infrastructure upgrades are likely to be required.
- 3.2 Whilst the water utilities companies have a statutory duty to supply water and deal with waste water regardless of the level of growth, the provision of upgrades or new infrastructure is likely to have implications on the phasing of new sites allocated in the Local Plan. The type of upgrade required will influence timescale for delivery of sites.
- 3.3 The timescale required to implement any specific infrastructure upgrade will depend on many site specific factors including but not limited to the scale of works, engineering complexity, planning and environmental constraints, land purchase and access, ground conditions and traffic conditions.
- 3.4 The following table, extracted from section 10 of the Stage 1 report and developed by JBA with advice from the water utility companies, provides indicative timescales for different types and sizes of upgrades:

Infrastructure type	Trigger for water company to assess requirements and develop plans	Indicative project timescales for infrastructure upgrades or other interventions	
		Minor	Major
Water resources	Publication of LPA Local plans and associated updates	Demand management measures, minor new resource e.g. borehole: 3-5 years	New strategic asset e.g. water reuse plant, reservoir: 5-20 years
Water supply	Pre-development enquiries Planning applications	Localised supply pipe upgrades: 1-2 years	New supply mains, boosters, service reservoirs, treatment works: 3-5 years
Wastewater treatment	Pre-development enquiries Planning applications	Minor upgrade of existing treatment works: 2-4 years	Major upgrade or new treatment works: 3-5 years
Sewerage	Pre-development enquiries Planning applications	Localised sewerage upgrades: 1-3 years	New collection sewers or other strategic assets: 3-5 years

- 3.5 There may also be limitations on the scale of growth that might be accommodated within a particular catchment, particularly for any sites within the Caddington and Studham catchment. This will need to be taken into consideration when shortlisting sites.

Appendix A

Central Bedfordshire Water Cycle Strategy

Stage 1



JBA
consulting

Central Bedfordshire Council Water Cycle Study

Stage I Study

April 2017

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Final v2.0.1 / 17 th January 2017	Modifications to water quality conclusions	Central Bedfordshire Council, Environment Agency, Affinity, Anglian Water, Thames Water
Final v2.0.2 / 22 nd March 2017	Further modifications following additional CBC review.	Central Bedfordshire Council, Environment Agency, Affinity, Anglian Water, Thames Water
Final v2.0.3 / 10 th April 2017	Final modifications following additional CBC review.	Central Bedfordshire Council, Environment Agency, Affinity, Anglian Water, Thames Water
Final v2.0.4 / 27 th April 2017	Final modifications following additional CBC review.	Central Bedfordshire Council, Environment Agency, Affinity, Anglian Water, Thames Water

Contract

This report describes work commissioned by Central Bedfordshire Council by an email dated 23/03/2016. Central Bedfordshire's representatives for the contract was Pru Khimasia-John. Paul Eccleston, Holly Hart and Rebecca Price of JBA Consulting carried out this work.

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Purpose

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Abbreviations

ALC	Agricultural Land Classification
ALS	Abstraction Licensing Strategy
AMP	Asset Management Plan
AMR	Annual Monitoring Report
AONB	Area of Outstanding Natural Beauty
AP	Assessment Point
ASNW	Ancient Semi-Natural Woodland
AW	Anglian Water
BOD	Biochemical Oxygen Demand
BREEAM	Building Research Establishment Environmental Assessment Methodology
CAMS	Catchment Abstraction Management Strategies
CAPEX	Capital Expenditure
CfSH	Code for Sustainable Homes
CSO	Combined Sewer Overflow
DCLG	Department of Communities and Local Government
DWI	Drinking Water Inspectorate
DYAA	Dry Year Annual Average
EA	Environment Agency
EFI	Ecological Flow Indicator
EP	Environmental Permit
FWMA	Flood and Water Management Act
FZ	Flood Zone
GES	Good Ecological Status
GIS	Geographic Information Systems
HOF	Hands-Off Flow
IDB	Internal Drainage Board
IDP	Infrastructure Delivery Plan
JBA	Jeremy Benn Associates
LDE	Level Dependent Environments
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
l/p/d	Litres per person per day
LWS	Local Wildlife Site

MI/d	Mega (million) litres per day
NNR	National Nature Reserve
NPPF	National Planning Policy Framework
OAN	Objectively Assessed Needs
OfWAT	Water Service Regulation Authority
ONS	Office of National Statistics
OPEX	Operational Expenditure
OS	Ordnance Survey
PCC	Per Capita Consumption
PE	Population Equivalent
p/h	Person per house
PPS	Planning Policy Statement
PR	Price Review
R/A/G	Red / Amber / Green assessment
RBD	River Basin District
RBMP	River Basin Management Plan
RMA	Rick Management Authority
RNAG	Reason for Not Achieving Good (Status)
RQP	River Quality Planning tool
RSS	Regional Spatial Strategy
RZ	Resource Zone
SA	Sustainability Appraisals
SAC	Special Area of Conservation
SDS	Strategic Direction Statements
SEA	Strategic Environmental Assessment
SEPA	Scottish Environmental Protection Agency
SFRA	Strategic Flood Risk Assessment
SHMA	Strategic Housing Market Assessment
SHLAA	Strategic Housing Land Availability Assessment
SINC	Site of Importance for Nature Conservation
SNCI	Site of Nature Conservation Interest
SPA	Special Protection Area
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
SU	Sewerage Undertaker
SuDS	Sustainable Drainage Systems
uFMfSW	Updated Flood Map for Surface Water
UWWTD	Urban Waste Water Treatment Directive
WaSC	Water and Sewerage Company
WCS	Water Cycle Study

WFD.....	Water Framework Directive
WRC	Water Recycling Centre
WRMP.....	Water Resource Management Plan
WRZ.....	Water Resource Zone
WQA	Water Quality Assessment
WSZ.....	Water Supply Zone
WTW	Water Treatment Works
WwTW	Wastewater Treatment Works

1 Introduction

1.1 Terms of Reference

JBA Consulting have been commissioned by Central Bedfordshire Council to prepare a detailed Strategic Flood Risk Assessment (SFRA) and Water Cycle Study (WCS). The purpose of these studies is to provide a comprehensive and robust evidence base to support the production of the Local Plan to 2035 and will replace the existing Water Cycle Studies for Luton and South Bedfordshire¹ and Bedford and Mid Bedfordshire² (published 2008 and 2009 respectively) and the Strategic Flood Risk Assessments for Mid- and South Bedfordshire (both published in 2008).

1.2 Aims

The WCS will consider the demands that the proposed level of growth will place on existing water services infrastructure and establish its ability to cope. It will also look at the availability of water resource and capacity issues with respect to accommodating growth, enabling these to be resolved at the earliest possible stage in the planning process. In doing so potential benefits of demand management techniques will be explored. This will allow stakeholders to plan and implement infrastructure in time to meet the needs of new housing and industry.

In summary, the key aims of the WCS are:

- Identify the demands of the proposed level of growth on existing water services infrastructure such as water resources and supply, sewage network and wastewater treatment, and establish its ability to deal with it.
- Consider the key areas of, and other relevant aspects such as demand management, flood risk management, ecology and guidance for developers.
- Identify capacity issues and potential blockers to growth, enabling these to be resolved at the earliest possible stage in the planning process.
- Consider climate change, new legislation (e.g. the Water Framework Directive) and provide details of best practice with regard to sustainable development.
- Allow stakeholders to plan and implement infrastructure in time to meet the needs of new housing and industry.
- Identify immediate funding requirements and possible funding sources and longer-term maintenance costs, enabling these to be factored into the planning process at an early stage.
- Provide a basis where possible for informing the decision-making process in relation to planning applications.

1.3 The Water Cycle

1.3.1 What is a Water Cycle Study (WCS)?

A water cycle study is³:

- *A method for ensuring that the most sustainable water infrastructure is provided where and when it is needed;*
- *A risk based approach ensuring that town and country planning makes best use of environmental capacity, adapts to environmental constraints and makes best use of environmental opportunities;*
- *A way of ensuring that all stakeholders have their say, preventing any unexpected infrastructure constraints that could delay or prevent development;*

1 Halcrow Group Limited (2008) Water Cycle Strategy Luton and South Bedfordshire. Phase 1 Outline Strategy Technical Report. Accessed online at http://www.centralbedfordshire.gov.uk/Images/water-strategy-luton-southbeds-phase-one-south_tcm3-6896.pdf on 23/06/2016

2 Halcrow Group Limited (2009) Bedford Borough and Mid Bedfordshire District Outline Water Cycle Strategy. Accessed online at http://www.bedford.gov.uk/environment_and_planning/planning_town_and_country/planning_policy__its_purpose/technical_reports.aspx on 23/06/2016.

3 Water Cycle Study Guidance by Environment Agency (July 2009) Accessed online at https://khub.net/c/document_library/get_file?uuid=2019d3e3-da60-405f-9a85-439db02e0fae&groupId=6084608 on 29/04/2016

- The process that brings all the available knowledge and information together to help make better, more integrated, risk based planning decisions; and
- A way of ensuring compliance with BERR4 "Regulator's Compliance Code" to ensure that risk assessment precedes and informs all aspects of their approaches to regulatory activity.

The Scoping Report was undertaken to identify the environmental and water services infrastructure opportunities and constraints in the study area based on the combined development across the Central Bedfordshire authorities.

Most of the data and information used in a Water Cycle Study will already exist within the organisations that have the responsibility for operating, regulating and managing the water environment. This highlights one of the key benefits of a partnership approach to a WCS which is unlocking this understanding and information and making it readily available.

Figure 1-1: The Water Cycle

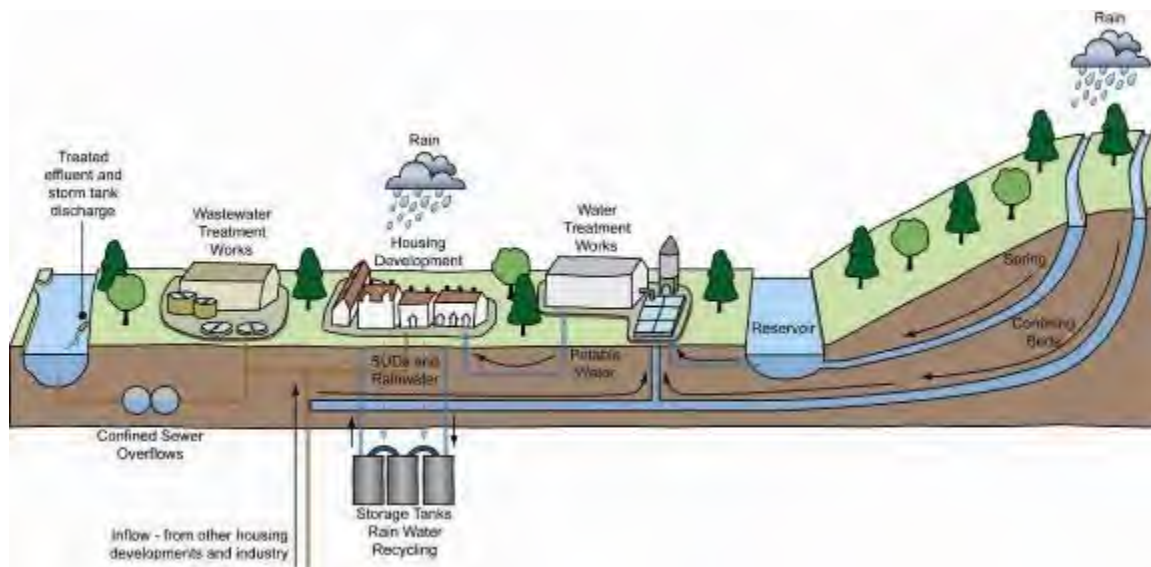


Figure 1-1 shows the main elements that comprise the Water Cycle and shows how the natural and man-made processes and systems interact to collect, store or transport water in the environment.

1.4 Our Impact on the Water Cycle

New homes require the provision of clean water, safe disposal of wastewater and protection from flooding. It is possible that allocating large numbers of new homes at some locations may result in the capacity of the existing available infrastructure being exceeded. This situation could potentially lead to service failures to water and wastewater customers, adverse impacts to the environment or high costs for the upgrade of water and wastewater assets being passed on to bill payers. Climate change presents further challenges such as increased intensive rainfall and a higher frequency of drought events that can be expected to put greater pressure on the existing infrastructure.

1.5 Study Area

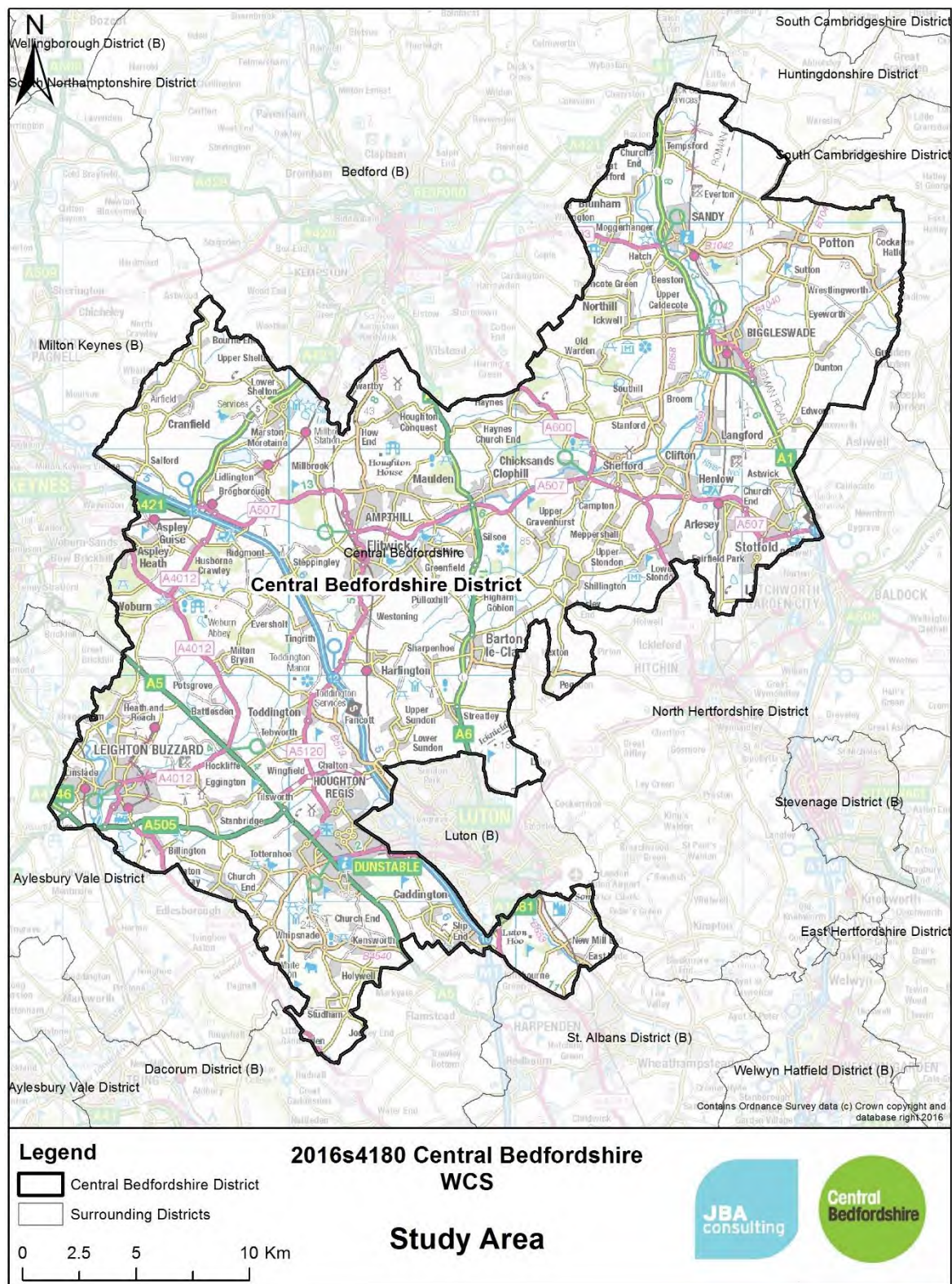
The WCS has been conducted for the Local Planning Authority area of Central Bedfordshire Council (CBC). Central Bedfordshire includes the towns of Leighton Buzzard, Biggleswade, Dunstable and Houghton Regis (see Figure 1-2 below). Anglian Water (AW) and Affinity Water are the water suppliers for Central Bedfordshire (see Figure 4-3 on page 35), whilst AW and Thames Water (TWUL) are the water and sewerage undertakers (see Figure 5-1 on page 46). The area is located within the Upper and Bedford Ouse⁵ Management Catchment and the Upper Lee Management Catchment (see Figure 4-1 on page 28). Parts of the study area are underlain by two principal

4 The Department for Business Enterprise and Regulatory Reform is now known as the Department for Business, Innovation and Skills. Accessed online at: <https://www.gov.uk/government/publications/regulators-code> on 29/04/2016

5 Environment Agency (2016) Catchment Data accessed at: <http://environment.data.gov.uk/catchment-planning/search?type=placename&k=BEDFORD&q=http://environment.data.gov.uk/catchment-planning/so/Town/bedford> on 03/05/2016

aquifers: The Upper Bedford Ouse and Woburn Sands and the Upper Bedford Ouse Chalk. They are both used for public water supplies and agricultural and industrial abstractions.

Figure 1-2: Study area



1.6 The staged approach

This WCS is being prepared in two stages. This report relates to stage 1, and will ultimately be supplemented by the stage 2 report:

1.6.1 Stage 1:

The stage 1 WCS is a high-level assessment of the whole of Central Bedfordshire, designed to inform CBC of known capacity issues and available headroom within the water and wastewater services. The key characteristics of this stage 1 report are:

- The report has been prepared prior to CBC having an agreed settlement hierarchy or agreed directions for growth. During preparation of the stage 1 report, CBC went to consultation on "Shaping Central Bedfordshire," the first, high-level consultation on the emerging local plan. Consequently, all settlements have been considered as potential locations for growth within this stage.
- The recommendations, by settlement, will guide CBC as to how much growth could be accommodated in an area (based on existing services capacity) without the need for additional resource/investment.
- The WCS Phase 1 report will not be used as a basis for excluding sites, but will help provide a risk assessment to the deliverability/suitability of the sites that have progressed through the site assessment process.
- The stage 1 report was required in time for CBC to use it to inform into the preparation of the Regulation 18 consultation.
- Anglian Water, Affinity Water and Thames Water, the providers of water and wastewater services within Central Bedfordshire, were engaged and invited to identify:
 - currently available capacity to accept growth without significant infrastructure upgrade,
 - any known significant constraints to upgrading assets, for example available land constraining extension of a treatment works, and
 - sites for strategic infrastructure development within Central Bedfordshire which they would seek to be safeguarded from future development in the Local Plan.
- Anglian Water, Affinity Water and Thames Water declined, at this stage, to provide a Red/Amber/Green (RAG) assessment of available capacity. For clarity of presentation, a RAG scoring has been applied by JBA using the following descriptions:

There is evidence of some capacity to accommodate moderate growth* using existing infrastructure, or a plan in place to accommodate anticipated levels of growth.

Significant infrastructure upgrade likely to be required or no evidence of capacity to accommodate moderate growth using existing infrastructure. No technical or timescale constraints to delivery identified.

Significant infrastructure upgrade likely to be required or no evidence of capacity to accommodate moderate growth using existing infrastructure. Technical or timescale constraints to delivery have been identified

* "Moderate growth" is used subjectively here to describe growth relative to the existing scale of a settlement. Typically, it would lead to an additional peak demand on water and wastewater services of 10% or lower.

1.6.2 Stage 2:

Stage 2 will constitute an assessment of sites under consideration for allocation.

CBC have set out their criteria for the assessment of housing sites⁶. Criteria 33 relates to water and wastewater services:

Criteria 32: Water Utilities: Is there the capacity to provide all required infrastructure for waste water and potable water?

The assessment will be made using a Red/Amber/Green (RAG) approach, with the following criteria:

⁶ Central Bedfordshire Council (2016) Housing site assessment criteria. Accessed online at <http://www.centralbedfordshire.gov.uk/planning/policy/local-plan/call-for-sites/assessment-criteria/consultation.aspx> on 02/08/2016.

No significant infrastructure upgrade is likely to be required

Significant infrastructure upgrade likely to be required but no technical or timescale constraints to delivery identified.

Significant infrastructure upgrade likely to be required and technical or timescale constraints to delivery have been identified

The stage 2 assessment will commence when CBC have prepared a list of sites under consideration for allocation, and will be required to feed into the Regulation 19 consultation.

2 Record of Engagement

2.1 Introduction

Preparation of a water cycle study requires significant engagement with stakeholders both within the Local Planning Authority, with water and wastewater utilities, with the Environment Agency and, where there may be cross-boundary issues, with neighbouring local authorities. This section forms a record of engagement for the WCS.

2.2 Stage 1 engagement

The preparation of stage 1 was supported by the following engagement:

Inception meeting, 07/04/2016

Engaged parties	CBC Lead Local Flood Authority function Affinity Water (unable to attend) Anglian Water Thames Water (unable to attend) Environment Agency
Details	Scope of works and data collection requirements reviewed.

Request for water quality and wastewater treatment data, 18/04/2016

Engaged parties	Environment Agency
Details	Covered Water Quality data

Local Plan Consultants Workshop, 25/07/2016

Engaged parties	Central Bedfordshire Council (various departments) All consultants working on the Local Plan and its evidence base
Details	Overview of WCS provided to workshop. Information provided to consultants on the development of the Local Plan.

Request for information from water and sewerage utilities, 09/09/2016

Engaged parties	Affinity Water Anglian Water Affinity Water
Details	<p>A letter was sent to each of the water and sewerage utilities, requesting the following information:</p> <p>Water resources</p> <p>A draft assessment of water resources in Central Bedfordshire is attached to this letter. This assessment concludes that, based on Department for Communities and Local Government (DCLG) 2015 projections, future growth in the Water Resource Zone could be higher than planned for in the Water Resource Management Plan.</p> <ul style="list-style-type: none"> • Please review and comment on the draft assessment. • Assuming that the DCLG projections are accurate, please comment on what impact this would likely have on water resources. • Please provide WRMP annual review reports for 2015 and 2016 (if available). <p>Water supply</p> <p>In the absence of growth projections for settlements within Central Bedfordshire, at this stage we request that you provide an assessment of:</p> <ul style="list-style-type: none"> • The available capacity for growth, (calculated as equivalent additional dwellings) within the water supply systems. This assessment can be provided at a scale convenient to your planning methods and models, for example supply zones, district metering areas (DMAs) or parishes. If the assessments are undertaken

	<p>based on supply zones or DMAs, please provide boundaries to enable us to relate these to settlements.</p> <ul style="list-style-type: none"> Identify any significant known constraints which could make provision of additional supply capacity technically difficult, more expensive and/or more time consuming to achieve in particular settlements or supply zones. <p>Wastewater Collection</p> <p>We appreciate that assessments of wastewater collection system capacity are highly site-specific. Therefore, at this stage, we request a high-level assessment of:</p> <ul style="list-style-type: none"> Current capacity and issues at the catchment-scale. Identify any significant known constraints which could make provision of additional sewerage capacity technically difficult, more expensive and/or more time consuming to achieve in particular settlements or catchments, for example the need to upgrade a sewer beneath a railway line. Please provide any Drainage Strategies which have been prepared for catchments in Central Bedfordshire. <p>Wastewater treatment</p> <p>The Environment Agency have prepared an initial assessment of the available treatment capacity, based on 2014 observed Dry Weather Flow.</p> <ul style="list-style-type: none"> Please comment on the EA assessment of flow capacity. Identify any significant known constraints which could make provision of additional treatment capacity technically difficult, more expensive and/or more time consuming at specific works, for example land constraints, odour issues due to encroachment of development etc. <p>Water quality</p> <p>No actions required at this stage.</p> <p>Safeguarding sites</p> <ul style="list-style-type: none"> Are there any significant sites for strategic infrastructure development within Central Bedfordshire which you require to be safeguarded from future development in the Local Plan? If so, please provide site outlines.
--	---

Review of draft Stage 1 Water Cycle Study, November / December 2016

Engaged parties	Affinity Water Anglian Water Thames Water Environment Agency
Details	Invited to review draft report. Comments have been addressed in the final stage 1 report.

2.3 Further stakeholder engagement at stage 2.

As the WCS moves into stage 2, further engagement with the Environment Agency and water and wastewater utilities will be required to refresh the assessments of available headroom. The format of this engagement will be determined by timescales and the preferred option proposed by CBC.

Future large-scale developments within and outside Central Bedfordshire can have the potential to affect existing sewer networks, infrastructure and water supply and demand. Central Bedfordshire Council has boundaries with the following Local Authorities:

- Huntingdonshire District Council
- South Cambridgeshire District Council
- Aylesbury Vale District Council
- Dacorum District Council
- St. Albans District Council
- North Hertfordshire District Council
- Luton Borough Council

- Milton Keynes Council
- Bedford Borough Council

The neighbouring authorities will, where relevant, be contacted, and where possible, their Local Plans and WCSs will be reviewed to assess whether there are any proposed large-scale developments that may affected the resources in Central Bedfordshire.

In addition, there are also cross-boundary issues relating to the WCS. The quality of water that is released from sewer treatment works and the impact it may have on the water quality on any receiving bodies needs to be considered. This may result in cross boundary issues where growth from two or more LPAs contribute to deterioration of a water body.

3 Development Scenarios and Key Developments

3.1 Introduction

Central Bedfordshire Council embarked on the preparation of a new Local Plan in early 2016. This followed the withdrawal of its Development Strategy in November 2015, as a consequence of increasing growth projections and housing targets and significant changes to planning guidance. The withdrawn Development Strategy identified a housing needs figure of 31,000 new homes for the period 2011 to 2031. 25,600 of these homes were required to meet demand within Central Bedfordshire, and a further 5,400 homes were proposed to meet part of Luton Borough Council's unmet housing need. This Stage 1 WCS has been prepared at an early stage in the development of the Local Plan. The revised housing need figure for Central Bedfordshire is currently being defined and any unmet need arising from neighbouring local authorities has yet to be agreed through the plan making process. This Stage 1 report has therefore not been informed by future growth requirements in Central Bedfordshire. Stage 2 of the WCS will be prepared in parallel with the new Local Plan and this next stage will consider the scale of growth being proposed in Central Bedfordshire and the sites selected to deliver this growth.

3.2 Growth scenarios

At the time of commencement of the WCS, CBC were not in a position to advise on growth scenarios, either at authority area, settlement or site scale. However, initial assessments were required in order that the provision of water and wastewater services could be taken into account in developing the council's preferred options strategy and Regulation 18 consultation. Consequently, the WCS development was divided into two stages:

3.2.1 Stage 1

The stage 1 assessment reported herein focusses on:

- Documenting what growth is already allowed for in water company plans, for example in Water Resource Management Plans.
- Identifying currently available capacity to accept growth without significant infrastructure upgrade.
- Identifying any known significant constraints to upgrading assets, for example available land constraining extension of a treatment works.

3.2.2 Stage 2

The stage 2 assessment will be based on draft allocation sites, enabling site and settlement-specific assessment of requirements for future infrastructure upgrades.

CBC require the stage 2 assessment to inform the Council's Regulation 19 consultation document.

3.3 Duty to co-operate and unmet need from neighbouring councils

The duty to cooperate was created in the Localism Act 2011, and places a legal duty on local planning authorities, county councils in England and public bodies to "engage constructively, actively and on an ongoing basis to maximise the effectiveness of Local and Marine Plan preparation"⁷.

Local planning authorities must demonstrate how they have complied with the duty at the independent examination of their Local Plans. One key aspect of the duty is for a council to consider whether it can accommodate a neighbouring planning authority's "unmet" need for housing or other development. Typically, this might be a need for additional housing to serve a growing city population, which due to multiple planning constraints cannot be met within that city's boundary.

It is anticipated that CBC may need to consider unmet need from neighbouring local authorities. The level of unmet need that needs to be accommodated within Central Bedfordshire is currently being determined through engagement with neighbouring local authorities as part of the plan

⁷ Department of Communities and Local Government (2016) Planning Policy Guidance: Duty to co-operate. Accessed online at <http://planningguidance.communities.gov.uk/blog/guidance/duty-to-cooperate/what-is-the-duty-to-cooperate-and-what-does-it-require/> on 22/09/2016.

making process. This information will feed into the Stage 2 WCS, alongside growth proposals outside of Central Bedfordshire which may impact on water infrastructure with the area.

3.4 Shaping Central Bedfordshire consultation

During preparation of this stage 1 WCS, CBC went to consultation on their early indications of the approach to the new Local Plan⁸. Key messages relevant to this WCS were:

- Central Bedfordshire is a complex area in planning terms, as it spans the employment and housing market areas of neighbouring Milton Keynes, Luton, Bedford and Stevenage.
- An initial estimate of 20,000 new homes is required over the period of 2015-2035. Some of this growth will come from already allocated sites, including large-scale allocations around Dunstable. Leighton Buzzard and Wixams, crossing into Bedford Borough (see plan in appendix C).
- CBC are considering some rolling-back of Green Belt status around Dunstable/Houghton Regis and Luton, and may also consider designating Green Belt in other areas where it might be required.
- The quality of the local environment is considered to be a key reason why people want to live and work in Central Bedfordshire. CBC has identified potential for environmental improvements, and developer funding may help to fund such projects.
- New settlements of 3,000 plus homes, or smaller new settlements of 1,500 plus adjacent to existing settlements will be considered as part of the approaches to meeting the areas housing needs.

The consultation considers the potential for growth in four broad areas, as shown in Figure 2-1:

- Area A - South and West/ M1 Corridor: Potential for all levels of growth including strategic scale growth adjoining urban areas, where Green Belt release can be justified.
- Area B - East/A1 Corridor: Potential for all levels of growth, including new settlements, if appropriate supporting infrastructure is provided.
- Area C - East/West Corridor: Limited potential small scale growth for existing settlements. Potential for medium up to strategic scale growth including new settlements subject to investment in infrastructure and viability of sites at this scale.
- Area D - Central Section: Potential for limited small to medium scale growth.

3.5 Commitments

When reviewing growth plans at the settlements or site scale, it is useful for water companies to be able to differentiate clearly between committed growth (of which they should already be aware through their reviews of Local Plans (and the predecessors)), planning applications and developer enquiries.

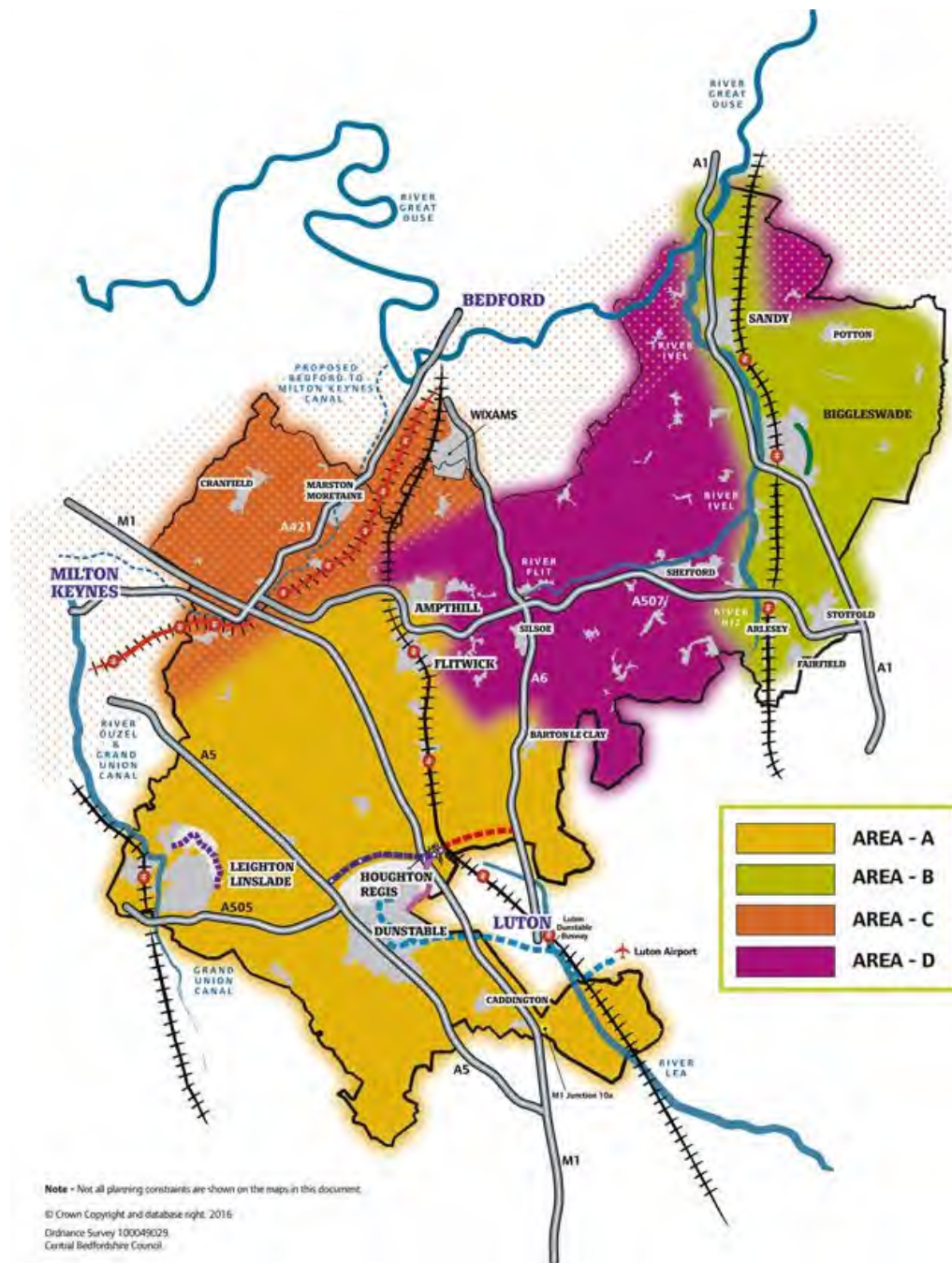
A plan of recent completions and commitments is included in Appendix C. This should be considered when assessing sites at Stage 2.

3.6 Conclusions

This Stage 1 WCS has been prepared at an early stage in the development of the Local Plan. The revised housing need figure for Central Bedfordshire is currently being defined and any unmet need arising from neighbouring local authorities has yet to be agreed through the plan making process. This Stage 1 report has therefore not been informed by future growth requirements in Central Bedfordshire. Stage 2 of the WCS will be prepared in parallel with the new Local Plan and this next stage will consider the scale of growth being proposed in Central Bedfordshire and the sites selected to deliver this growth.

⁸ Central Bedfordshire Council (2016) Shaping Central Bedfordshire. Accessed online at <http://www.centralbedfordshire.gov.uk/planning/policy/local-plan/shaping-central-beds-consultation.aspx> on 14/10/2016.

Figure 3-1: Approaches to growth, Shaping Central Bedfordshire consultation



4 Legislative and Policy Framework

The following sections introduce a number of national, regional and local policies that must be considered by the LPAs, water companies and developers. Key extracts from these policies relating to water consumption targets and mitigating the impacts on the water environment from the new developments, are summarised below.

4.1 National policy

4.1.1 National Planning Policy Framework (NPPF) and Practice Guidance

The National Planning Policy Framework (NPPF)⁹ was published on 27th March 2012, as part of reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth. The main NPPF provides guidance to planning authorities to take account of flood risk and water and wastewater infrastructure delivery in their Local Plans:

- Paragraph 94 of the NPPF states “Local planning authorities should adopt proactive strategies to mitigate and adapt to climate change, taking full account of flood risk, coastal change and water supply and demand considerations”.
- Paragraph 99 of the NPPF states: “Local Plans should take account of climate change over the longer term, including factors such as flood risk, coastal change, water supply and changes to biodiversity and landscape. New development should be planned to avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure.
- Paragraph 156 of the NPPF states: “Local planning authorities should set out the strategic priorities for the area in the Local Plan. This should include strategic policies to deliver...the provision of infrastructure for transport, telecommunications, waste management, water supply, wastewater, flood risk and coastal changes management, and the provision of minerals and energy”.

In March 2014, the Planning Practice Guidance was issued by Department for Communities and Local Government, with the intention of providing guidance on the application of the National Planning Policy Framework (NPPF) in England. Of relevance to this study;

- Flood Risk and Coastal Change¹⁰ - see the CBC Strategic Flood Risk Assessment (SFRA) for details of this guidance.
- Water Supply, Wastewater and Water Quality¹¹.

4.1.2 Planning Practice Guidance: Water Supply, Wastewater and Water Quality

Specific planning practice guidance on planning for water supply, wastewater and water quality issues was issued by DCLG in 2014.

- The Planning Practice Guidance sets out a framework of linked guidance and documents:
- Local Planning Authorities (LPAs) must have regard for Water Framework Directive as implemented in the Environment Agency’s River Basin Management Plans¹².
- The National Policy Statement for Waste Water. This sets out Government policy for the provision of major waste water infrastructure to construct a new wastewater treatment plant or increase the capacity of an existing plant to a population equivalent of more than 500,000.
- Water Cycles Studies (WCS). These are identified as voluntary studies that assist the EA, LPAs and Water and Sewerage Companies (WaSCs) to work together.
- Planners should consider the contribution that the catchment-based approach can make, for example by improving farming and land management practices to improve water quality,

⁹ Department for Communities and Local Government (2012) National Planning Policy Framework

¹⁰ Department for Communities and Local Government (2014) Planning Practice Guidance: Flood Risk and Coastal Change (2014). Accessed online at <http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/> on 05/05/2016.

¹¹ Department for Communities and Local Government (2014) Planning Practice Guidance: Water supply, wastewater and water quality. Accessed online at <http://planningguidance.planningportal.gov.uk/blog/guidance/> on 05/05/2016

¹² Environment Agency (Dec 2009) River Basin Management Plan for the Anglian River Basin District. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/309814/River_Basin_Management_Plan.pdf

offsetting the need to implement more advanced water or water recycling centres. The Defra catchment-based approach guidance is referenced¹³.







- The Environment Agency and OfWAT Drainage Strategy Framework¹⁴ guidance is referenced. It is expected that public facing drainage strategies will become an integral part of Water and Sewer Companies (WaSC) business plans.
- LPAs are advised to discuss growth plans at an early stage with WaSCs, to enable growth to be allowed for in the company's five-yearly business plans. Wastewater treatment works are classified as waste developments, so co-operation with the council's waste function will be required.
- Local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond. This can be achieved, for instance, through the layout and form of development, including green infrastructure and the appropriate application of sustainable drainage systems.

Specific guidance on how infrastructure, water supply, wastewater and water quality considerations should be accounted for in both plan-making and planning applications is summarised below.

13 Department for Environment, Food and Rural Affairs (2013) Catchment Based Approach: Improving the quality of our water environment. <https://www.gov.uk/government/publications/catchment-based-approach-improving-the-quality-of-our-water-environment>

14 Environment Agency / OfWAT (2013) Drainage Strategy Framework. http://webarchive.nationalarchives.gov.uk/20150624091829/https://www.ofwat.gov.uk/future/sustainable/drainage/rpt_com201305draimagestrategy.pdf

Table 4-1: Planning practice guidance: Water supply, wastewater and water quality considerations for plan making and planning applications

	Plan-making		Planning applications
Infrastructure	Identification of suitable sites for new or enhanced infrastructure. Consider whether new development is appropriate near to water and wastewater infrastructure. Phasing new development so that water and wastewater infrastructure will be in place when needed.	 	Wastewater considerations include: first presumption is to provide a system of foul drainage discharging into a public sewer. Phasing of development and infrastructure. Circumstances where package sewage treatment plants or septic tanks are applicable.
Water supply	Water efficiency guidance is set out in Planning Practice Guidance: Housing - Optional Technical Standards - see section 3.1.3.		Planning for the necessary water supply would normally be addressed through the Local Plan ... exceptions might include: large developments not identified in Local Plans; where a Local Plan requires enhanced water efficiency in new developments.
Water quality	How to help protect and enhance local surface water and groundwater in ways that allow new development to proceed and avoids costly assessment at the planning application stage. The type or location of new development where an assessment of the potential impacts on water bodies may be required. Expectations relating to sustainable drainage systems.		Water quality is only likely to be a significant planning concern when a proposal would: involve physical modifications to a water body; or indirectly affect water bodies, for example as a result of the redevelopment of land that may be affected by contamination etc. or through a lack of adequate infrastructure to deal with wastewater.
Wastewater	The sufficiency and capacity of wastewater infrastructure. The circumstances where wastewater from new development would not be expected to drain to a public sewer.		If there are concerns arising from a planning application about the capacity of wastewater infrastructure, applicants will be asked to provide information about how the proposed development will be drained and wastewater dealt with.
Cross-boundary concerns	Water supply and water quality concerns often cross local authority boundaries and can be best considered on a catchment basis. Recommends liaison from the outset.		No specific guidance (relevant to some developments).
SEA and Sustainability Appraisal	Water supply and quality are considerations in Sustainability Appraisals and Strategic Environmental Assessment. Appraisal objectives could include preventing deterioration of water quality, taking climate change into account and seeking opportunities to improve water bodies.		No specific guidance (should be considered in applications).

4.1.3 Planning Practice Guidance: Housing - Optional Technical Standards

This guidance, updated in March 2015, advises planning authorities on how to gather evidence to set optional requirements, including for water efficiency. It states that “all new homes already have to meet the mandatory national standard set out in the Building Regulations (of 125 litres/person/day). Where there is a clear local need, local planning authorities can set out Local Plan policies requiring new dwellings to meet the tighter Building Regulations optional requirement of 110 litres/person/day.” Planning authorities are advised to consult with the EA and water

companies to determine where there is a clear local need, and also to consider the impact of setting this optional standard on housing viability. A 2014 study¹⁵ into the cost of implementing sustainability measures in housing found that meeting a standard of 110 litres per person per day would cost only £9 for a four-bedroom house, based on use of flow restricting devices to reduce water use by taps and showers.

4.1.4 Building Regulations and Code for Sustainable Homes

The Building Regulations (2010) Part G¹⁶ were amended in early 2015 to require that all new dwellings must ensure that the potential water consumption must not exceed 125l/person/day, or 110 l/person/day where required under Local Plan policy. The regulations include advice on how to calculate this.

The Code for Sustainable Homes (CfSH) was, from 2007 to March 2015, the Government's optional national standard for new housing. It became effective in England in April 2007 and a Code rating for new homes became mandatory in May 2008. The Code included six levels of water efficiency for new homes. Seeking to simplify the various building codes that house builders have to adhere to, the Government withdrew CfSH in March 2015, with the exception of legacy cases: *"where residential developments are legally contracted to apply a code policy (e.g. affordable housing funded through the national Affordable Housing Programme 2015 to 2018, or earlier programme), or where planning permission has been granted subject to a condition stipulating discharge of a code level, and developers are not appealing the condition or seeking to have it removed or varied"*.

4.1.5 Sustainable Drainage Systems (SuDS)

From April 2015, Local Planning Authorities (LPA) have been given the responsibility for ensuring through the planning system that sustainable drainage is implemented on developments of 10 or more homes or other forms of major development. Under the new arrangements, the key policy and standards relating to the application of SuDS to new developments are:

- National Planning Policy Framework which requires that development in areas already at risk of flooding should give priority to sustainable drainage systems.
- The House of Commons written statement¹⁷ setting out the governments intentions that LPAs should "ensure that sustainable drainage systems for the management of run-off are put in place, unless demonstrated to be inappropriate" and "clear arrangements in place for ongoing maintenance over the lifetime of the development." In practice this has been implemented by making Lead Local Flood Authorities (LLFAs) statutory consultees on the drainage arrangements of major developments.
- The Defra Non-statutory technical standards for sustainable drainage systems¹⁸. These set out the government's high level requirements for managing peak flows and runoff volumes, flood risk from drainage systems and the structural integrity and construction of SuDS. This very short document is not a design manual and makes no reference to the other benefits of SuDS, for example water quality, habitat and amenity. Neither does it address adoption and maintenance.
- Central Bedfordshire Council (CBC) is the LLFA covering this region and under this arrangement CBC are now a statutory consultee on planning applications for major developments with surface water drainage. The Central Bedfordshire Sustainable Drainage Guidance¹⁹ provides specific guidance on the Council's expectations for SuDS design to meet multiple objectives, and outlines the process for approval of SuDS designs by CBC as the Local Planning Authority and Lead Local Flood Authority. Some SuDS features may be adopted by CBC in its role as Highways Authority and/or where located within public open spaces. Within those areas of Central Bedfordshire served by the Bedford Group of Internal Drainage Boards (BGIDBs), SuDS may also be adopted by the IDB. The broad

15 Department for Communities and Local Government (2014) Housing Standards Review: Cost Impacts. Accessed online at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/353387/021c_Cost_Report_11th_Sept_2014_FINAL.pdf on 15/11/2016.

16 HM Government (2015) The Building Regulations (2010) Part G - Sanitation, hot water safety and water efficiency. 2015 edition. Accessed online at http://www.planningportal.gov.uk/uploads/br/BR_PDF_AD_G_2015.pdf on 10/05/2016.

17 Sustainable drainage systems: Written statement - HCWS161. Accessed online at <http://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2014-12-18/HCWS161/> on 05/05/2016.

18 Defra (2015) Sustainable Drainage Systems: Non-statutory technical standards for sustainable drainage systems

19 AECOM (2015) Central Bedfordshire Sustainable Drainage Guidance Adopted April 2014, Updated May 2015. Accessed online at http://www.centralbedfordshire.gov.uk/Images/suds-guidance_tcm3-10532.pdf on 21/06/2016

principles of this are set out in the Marston Vale Surface Water Plan, however at present the IDB does not have a published policy on SuDS adoption.

- CBC have also published an additional guidance notes for developers submitting surface water drainage proposals as part of a planning application²⁰. SuDS are also encouraged on minor applications, and CBC expect to see suitable consideration of surface water drainage within minor planning applications.
- An updated version of the CIRIA SuDS Manual²¹ was published in 2015. The guidance covers the planning, design, construction and maintenance of SuDS for effective implementation within both new and existing developments. The guidance is relevant for a range of roles, including but not limited to drainage engineers, planners, drainage approval boards, highways authorities, developers and environmental regulators, with the level of technical detail increasing throughout the manual.
- Anglian Water have produced a SuDS adoption manual²² on the design, construction and adoption of SuDS. SuDS located within a private property boundaries are the responsibility of the property owner. Anglian Water will consider the adoption and maintenance of SuDS features in public open space that can be shown to receive treated surface water runoff from a development. Anglian Water will not adopt any SuDS within the intermediate area unless they are satisfied that all this part of the management train is maintained effectively.
- Thames Water do not at present have a SuDS adoption manual. In their Addendum to Sewers for Adoption 7th Edition Nov 2012²³ TWUL states that they "will not adopt geocellular structures, balancing ponds or swales of any type. Where such features are incorporated as part of a drainage design for a site, the developer should arrange for the Local Authority, the SUDS Adopting body or a properly constituted management company to maintain them."
- The Environment Agency support the use of infiltration SuDS where they do not present a risk to the water environment, but point out that infiltration SuDS may not be applicable in areas where the groundwater level is close to the ground surface.
- SuDS features not adopted by CBC, Anglian Water or BGIDBs need to be maintained by householders (in the case of SuDS on private land) and by management companies for other SuDS on public open spaces and highways.

4.1.6 BREEAM

BREEAM (Building Research Establishment Environmental Assessment Methodology) is an internationally recognised method of assessing, rating and certifying the sustainability of buildings.

BREEAM can be used to assess the environmental performance of any type of building: new and existing. Standard BREEAM schemes exist for assessment of common domestic and non-domestic building types and less common building types can be assessed by developing bespoke criteria.

Using independent, licensed assessors, BREEAM assesses criteria covering a range of issues in categories that evaluate energy and water use, health and wellbeing, pollution, transport, materials, waste, ecology and management processes. This promotes both climate change mitigation (energy efficiency) and adaptation (water efficiency). Buildings are rated and certified on a scale of 'Pass', 'Good', 'Very Good', 'Excellent' and 'Outstanding'.

BREEAM has expanded from its original focus on individual new buildings at the construction stage to encompass the whole life cycle of buildings from planning to in-use and refurbishment. The standard is regularly revised to improve sustainability, respond to industry feedback and support sustainability strategies and commitments. BREEAM standard can be applied to virtually any building and location, with versions for new buildings, existing buildings, refurbishment projects and large developments.

²⁰ Central Bedfordshire Council (2015) Advice for the provision of surface water drainage systems for new developments. Accessed online at http://www.centralbedfordshire.gov.uk/Images/surface-water-advice-note_tcm3-10546.pdf on 21/06/2016

²¹ CIRIA (2015) The SuDS Manual (C753)

²² Towards Sustainable Water Stewardship. Sustainable drainage systems (SUDS) adoption manual. Accessed online at http://www.anglianwater.co.uk/_assets/media/AW_SUDS_manual_AW_FP_WEB.pdf on 05/05/2016.

²³ <https://www.thameswater.co.uk/tw/common/downloads/your-business-developer-services/tw-addendum-to-sewers-for-adoption-7th-edition.pdf>

4.2 Regional policy

4.2.1 Catchment Flood Management Plans

Catchment Flood Management Plans (CFMP) are high level policy documents covering large river basin catchments. They aim to set policies for sustainable flood risk management for the whole catchment covering the next 50 to 100 years. Central Bedfordshire is part of the Great Ouse CFMP²⁴ with the exception of the south west of the area (including Dunstable and Houghton Regis) which is in the Thames CFMP²⁵. CBC lies over various sub areas which have different policies and actions. These set out ways of reducing the flood risk across the catchment, for example, flood warning services or flood water storage.

4.2.2 Surface Water Management Plans (SWMPs)

SWMPs outline the preferred surface water management strategy in a given location and establish a long-term action plan to manage surface water. Central Bedfordshire Council currently do not have a SWMP, and is not covered by a high-level regional SWMP.

The Upper River Great Ouse had a Preliminary Flood Risk Assessment covering Bedford Borough Council, Central Bedfordshire Council and Milton Keynes Council, which was completed in June 2011. This desk based study identified that there was extensive information regarding historic flooding and there was some fluvial flooding in Central Bedfordshire. No references were given as to where these flood events occurred.

4.3 Local policy

4.3.1 Localism Act

The Localism Act outlined plans to shift and re-distribute the balance of decision making from central government back to councils, communities and individuals. The Localism Act was given Royal Assent on 15 November 2011.

In relation to the planning of sustainable development, provision 110 of the Act places a duty to cooperate on Local Authorities. This duty requires Local Authorities to *“engage constructively, actively and on an ongoing basis in any process by means of which development plan documents are prepared so far as relating to a strategic matter”*²⁶.

The Localism Act also provides new rights to allow local communities to come together and shape new developments by preparing Neighbourhood Plans. This means that local people can decide not only where new homes and businesses should go and but also what they should look like. As neighbourhoods draw up their proposals, Local Planning Authorities will be required to provide technical advice and support.

4.3.2 Local Plan and Local Strategy

The Central Bedfordshire Council Local Plan will set out the Council's vision on how the area will develop in the future, ensuring growth happens in a structured way. It will outline the principles that will guide future development. The updated WCS will inform the Local Plan.

Adopted policy is set out in the Adopted Core Strategy for the former Mid Bedfordshire area and the adopted Local Plan for the former South Bedfordshire area. Central Bedfordshire Council are in the process of preparing a new Local Plan to replace these adopted documents which will contain up to date policies in it, reflecting current guidance. It is anticipated that new policies relating to sustainable water management will draw upon the recommendations of this WCS.

4.3.3 Water Cycle Studies

Central Bedfordshire is covered by two existing WCSs: the Bedford Borough and Mid-Beds District WCS in the north and the Luton and South Bedfordshire WCS in the south. An outline and a detailed WCS have been prepared for both areas.

- Bedford Borough and Mid-Bed District WCS: an outline was produced in 2009 and a detailed study was produced in 2012. The outline WCS highlighted that a few Water

²⁴ Environment Agency (December 2009) Great Ouse Catchment Flood Management Plan Summary report <https://www.gov.uk/government/publications/great-ouse-catchment-flood-management-plan>

²⁵ Environment Agency (December 2009) Thames Catchment Flood Management Plan Summary report <https://www.gov.uk/government/publications/thames-catchment-flood-management-plan>

²⁶ Localism Act 2011: Section 110. <http://www.legislation.gov.uk/ukpga/2011/20/section/110>

Recycling Centres (WRCs) would need to be upgraded for future developments with additional network improvements. It was also found that the water efficiency measures will not be sufficient to achieve "water neutrality" across the area. The detailed WCS identified further Water Recycling Centres which would need to be improved, such as Marston Vale and Arlesey, presumably referring to Marston Moretaine WwTW and Poppy Hill WwTW). It also highlighted the lack of water availability in the region.

- Luton and South Bedfordshire WCS: an outline was issued in 2008 and a detailed WCS was published in 2010. The outline WCS highlighted that there was capacity for growth in Dunstable whilst Leighton Buzzard had negative impacts on the local SSSIs. The detailed WCS indicated that Dunstable would need to be upgraded by 2015 for extra capacity for growth. The report also revealed that meeting the WFD targets would be a major challenge for the region.
- Luton WCS, 2015.²⁷ This recent study assessed the impact of three growth scenarios for the Luton Local Plan period 2011 to 2031, ranging from 5,993 to 6,659 dwellings within the borough. In all three scenarios, additional allocations within neighbouring local authorities totalling 10,988 dwellings were assessed. Of these, North Luton (3,200) and North of Houghton Regis (4,826) are within Central Bedfordshire, totalling 8,026 dwellings. Employment growth will also be substantial, with an estimated 22,250 within Luton and 5,775 in neighbouring council areas, the majority in Central Bedfordshire. A further 5,50 new jobs are expected as part of the expansion of London Luton Airport. Consequently this study provides useful information for neighbouring local authorities, and is referenced throughout this study.

This WCS draws upon but supersedes the earlier studies regarding provision of water and wastewater provision within Central Bedfordshire.

4.3.4 Infrastructure Delivery Plan

The Central Bedfordshire Infrastructure Delivery Plan²⁸ has been produced to provide supporting evidence for the Community Infrastructure Levy (CIL) Draft Charging Schedule. It sets out all of the infrastructure that is either required or sought by providers in order to support the level of growth planned for in the Development Strategy submitted in October 2014. The study provides a schedule for the infrastructures to be provided and their cost. The former should be reviewed at least annually to reflect the latest information whilst the latter has to be refined as appropriate when the projects are developed. The Plan will be updated for the purposes of supporting the Local Plan and any emerging CIL.

The infrastructures have been categorised in ten categories: Broadband, Community & Culture, Economic Development, Education & Early Years, Green Infrastructure, Health & Social Care, Leisure, Transport, Utilities and Waste. Each of them has been classified as:

- Critical: Critical infrastructure is that which has been identified as infrastructure development that must take place to enable physical development.
- Essential: Essential infrastructure is infrastructure that is required if development is to be achieved in a timely and sustainable manner.
- Desirable: Desirable infrastructure is infrastructure that is required for sustainable development but is unlikely to prevent development in the short to medium term.

4.3.5 Local Climate Change Risk Assessment

The Local Climate Change Risk Assessment (LCCRA) for Central Bedfordshire²⁹, completed in 2012, looks at the effects of climate change on the area. The key risks likely to impact the CBC area are:

- Flooding
- Water resource deficits and drought
- Overheating
- Subsidence

²⁷ Luton Borough Council (2015) Luton Water Cycle Strategy. Accessed online at <https://www.luton.gov.uk/Environment/Lists/LutonDocuments/PDF/Local%20Plan/Climate%20change/CC%20005.pdf> on 15/07/2016

²⁸ Central Bedfordshire Council (2015) Infrastructure Delivery Plan. Accessed online at http://www.centralbedfordshire.gov.uk/Images/dcs-8_tcm3-2049.pdf on 23/06/2016

²⁹ LDA Design (2012) Central Bedfordshire Climate Change Adaptation Evidence Base. Accessed online at <http://www.centralbedfordshire.gov.uk/environment/natural/sustainability.aspx> on 23/06/2016

- Damage to the natural environment
- One of the most relevant assessment of the LCCRA for the WCS is the water resources one. Below a summary from the report is reported: *"Water resources are already under pressure across the East of England. Parts of Bedfordshire have been officially in drought since April 2011. Groundwater levels are reported to be 'exceptionally low'. The Environment Agency has identified Central Bedfordshire as an area at 'high risk' of continued drought through 2012. Long term projections of water availability project a reduction in deployable output of 30% by the 2080s leading to a deficit in water supplies. While new infrastructure can help increase supplies, these projections do not take changes in population or changes in personal water consumption into account which are likely to exacerbate the issue. The implications for the economy should not be ignored."*

The study quotes the Environment Agency and National Climate Change Risk Assessment which indicated that the Anglian region would be in supply/demand deficit by the 2020s in the "mid" and "dry" water resource scenarios, and by the 2050s in the "wet" scenario.

4.4 Environmental Policy

4.4.1 Urban Wastewater Treatment Directive (UWWTD)

The UWWTD is an EU Directive that concerns the collection, treatment and discharge of urban wastewater and the treatment and discharge of waste water from certain industrial sectors. The objective of the Directive is to protect the environment from the adverse effects of the abovementioned wastewater discharges. More specifically Annex II.A(a) sets out the requirements for discharges from urban wastewater treatment plants to sensitive areas which are subject to eutrophication. One or both parameters may be applied depending on the local situation. The values for concentration or for the percentage reduction shall apply. For specific information regarding concentration limits please refer to the UWWTD³⁰. The Directive has been transposed into UK legislation through enactment of the Urban Waste Water Treatment (England and Wales) Regulations 1994 and 'The Urban Waste Water Treatment (England and Wales) (Amendments) Regulations 2003'.

Wastewater treatment works within Central Bedfordshire are mapped in Figure 5-1.

4.4.2 Habitats Directive

The EU Habitats Directive aims to protect the wild plants, animals and habitats that make up our diverse natural environment. The directive created a network of protected areas around the European Union of national and international importance called Natura 2000 sites.

These sites include:

- Special Areas of Conservation (SACs) - these support rare, endangered or vulnerable natural habitats, plants and animals (other than birds).
- Special Protection Areas (SPAs) - support significant numbers of wild birds and their habitats.

Special Protection Areas and Special Areas of Conservation are established under the EC Birds Directive and Habitats Directive respectively. All in all the directive protects over 1,000 animals and plant species and over 200 so called "habitat types" (e.g. special types of forests, meadows, wetlands, etc.), which are of European importance.

There are no SPAs or SACs located within Central Bedfordshire.

4.4.3 The Water Framework Directive

The Water Framework Directive (WFD) was first published in December 2000 and transposed into English and Welsh law in December 2003. It introduced a more rigorous concept of what "good status" should mean than the previous environmental quality measures. The WFD estimated that 95% of water bodies were at risk of failing to meet "good status".

River Basin Management Plans (RBMP) are required under the WFD and are strategies that should influence development plans and be influenced by them. The Central Bedfordshire Council area predominately falls within the Anglian³¹ River Basin District (RBD) with a small section in the south

³⁰ UWWTD. Accessed online at <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:31991L0271> on 03/05/2016.

³¹ Environment Agency (2015) Anglian river basin district river basin management plan accessed online at

falling within the Thames³² RBD. The RBMPs were revised in 2015, and set out plans to protect and enhance water bodies over the second-cycle period 2015 to 2021. The current status is mapped in Figure 6-4.

One WFD objective is to have "no deterioration", therefore all water bodies must meet the class limits for its status class declared in the Final Anglian and Thames River Basin Management Plans. A second objective requires all water bodies to achieve good ecological status. Future development needs to be planned carefully so that it helps towards achieving the WFD and does not result in further pressure on the water environment and compromise WFD objectives. The WFD objectives as outlined in the updated RBMPs are summarised below:

- *"To prevent deterioration of the status of surface waters and groundwater*
- *To achieve objectives and standards for protected areas*
- *To aim to achieve good status for all water bodies or, for heavily modified water bodies and artificial water bodies, good ecological potential and good surface water chemical status*
- *To reverse any significant and sustained upward trends in pollutant concentrations in groundwater*
- *The cessation of discharges, emissions and losses of priority hazardous substances into surface waters*
- *Progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants."*

Protected Area Objectives

The WFD specifies that areas requiring special protection under other EC Directives, and waters used for the abstraction of drinking water, are identified as protected areas. These areas have their own objectives and standards.

Article 4 of the WFD required Member States to achieve compliance with the standards and objectives set for each protected area by 22 December 2015, unless otherwise specified in the Community legislation under which the protected area was established. Some areas may require special protection under more than one EC Directive or may have additional (surface water and/or groundwater) objectives. In these cases, all the objectives and standards must be met.

The types of protected areas are:

- areas designated for the abstraction of water for human consumption (Drinking Water Protected Areas);
- areas designated for the protection of economically significant aquatic species (Freshwater Fish and Shellfish);
- bodies of water designated as recreational waters, including areas designated as Bathing Waters;
- nutrient-sensitive areas, including areas identified as Nitrate Vulnerable Zones under the Nitrates Directive or areas designated as sensitive under Urban Waste Water Treatment Directive (UWWTD); and
- areas designated for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection including relevant Natura 2000 sites.

Many WFD protected areas coincide with water bodies; these areas will need to achieve the water body status objectives in addition to the protected area objectives. Where water body boundaries overlap with protected areas the most stringent objective applies; that is the requirements of one EC Directive should not undermine the requirements of another.

The objectives for Protected Areas relevant to this study are as follows:

Drinking Water Protected Areas

- Ensure that, under the water treatment regime applied, the drinking water produced meets the requirements of the Drinking Water Directive plus any UK requirements to make sure that drinking water is safe to drink; and

<https://www.gov.uk/government/collections/river-basin-management-plans-2015> on 25/04/2016.

³² Environment Agency (2015) Thames river basin district river basin management plan accessed online at <https://www.gov.uk/government/collections/river-basin-management-plans-2015> on 25/04/2016.

- Ensure the necessary protection to prevent deterioration in the water quality in the protected area in order to reduce the level of purification treatment required.

Economically Significant Species (Freshwater Fish Waters)

- To protect or improve the quality of running or standing freshwater to enable them to support fish belonging to:
- Indigenous species offering a natural diversity; or
- species the presence of which is judged desirable for water management purposes by the competent authorities of the Member States.

Nutrient Sensitive Areas (Nitrate Vulnerable Zones)

- Reduce water pollution caused or induced by nitrates from agricultural sources; and
- prevent further such pollution.

Nutrient Sensitive Areas (Urban Waste Water Treatment Directive)

- To protect the environment from the adverse effects of urban waste water discharges and waste water discharges from certain industrial sectors.

Natura 2000 Protected Areas (water dependent SACs and SPAs)

The objective for Natura 2000 Protected Areas identified in relation to relevant areas designated under the Habitats Directive or Birds Directive is to:

- Protect and, where necessary, improve the status of the water environment to the extent necessary to achieve the conservation objectives that have been established for the protection or improvement of the site's natural habitat types and species of Community importance in order to ensure the site contributes to the maintenance of, or restoration to, favourable conservation status.

Groundwater Source Protection Zones

The Environment Agency has a Groundwater Protection Policy to help prevent groundwater pollution. In conjunction with this the Environment Agency have defined groundwater Source Protection Zones (SPZs) to help identify high risk areas and implement pollution prevention measures. The SPZs show the risk of contamination from activities that may cause pollution in the area, the closer the activity, the greater the risk. There are three main zones (inner, outer and total catchment) and a fourth zone of special interest which is occasionally applied.

Zone 1 (Inner protection zone)

This zone is designed to protect against the transmission of toxic chemicals and water-borne disease. It indicates the area in which pollution can travel to the borehole within 50 days from any point within the zone and applies at and below the water table. There is also a minimum 50 metre protection radius around the borehole.

Zone 2 (Outer protection zone)

This zone indicates the area in which pollution takes up to 400 days to travel to the borehole, or 25% of the total catchment area, whichever area is the biggest. This is the minimum length of time the Environment Agency think pollutants need to become diluted or reduce in strength by the time they reach the borehole.

Zone 3 (Total catchment)

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

Zone of special interest

This is defined on occasions, usually where local conditions mean that industrial sites and other polluters could affect the groundwater source even though they are outside the normal catchment area.

The Environment Agency's Groundwater protection: Principles and practice (GP3)³³ sets out a series of position statements that detail how the Environment Agency delivers government policy on groundwater and protects the resources from contamination. The position statements that are

³³ Environment Agency (2013) Groundwater protection: Principles and practice (GP3). Accessed online at <https://www.gov.uk/government/publications/groundwater-protection-principles-and-practice-gp3> on 25/04/2016

relevant to this study with regard to discharges to groundwaters, including surface water drainage and the use of SuDS, discharges from contaminated surfaces (e.g. lorry parks) and from treated sewage effluent.

Source Protection Zones within Central Bedfordshire are mapped in Figure 8-2.

4.5 Water Industry Policy

4.5.1 The Water industry in England

Water and sewerage services in England and Wales are provided by 10 Water and Sewerage Companies (WaSCs) and 12 'water only' companies. The central legislation relating to the industry is the Water Industry Act 1991³⁴. The companies essentially operate as regulated monopolies within their supply regions, although very large water users and developments are able to obtain water and/or wastewater services from alternative suppliers - these are known as inset agreements.

The Water Act 2014 aims to reform the water industry to make it more innovative and to increase resilience to drought and floods. Key measures which could influence the future provision of water and wastewater services include:

- All non-domestic customers will be able to switch their water supplier and/or sewerage undertaker
- New businesses will be able to enter the market to supply these services
- Measures to promote a national water supply network.
- Enabling developers to make connections to water and sewerage systems, including increased use of inset arrangements, whereby new settlements or large developments have their water and/or wastewater provided by an inset company rather than the local incumbent supplier.
- In March 2017, the retail market for non-household customers will be deregulated to allow customers to switch water suppliers.
- OfWAT are considering deregulation of the retail market for domestic customers.

4.5.2 Regulation of the water industry

The water industry is primarily regulated by three regulatory bodies;

- The Water Service Regulation Authority (OfWAT) - economic and customer service regulation
- Environmental Agency - environmental regulation
- Drinking Water Inspectorate (DWI) - drinking water quality

Every five years the industry submits a Business Plan to OfWAT for a Price Review (PR). These plans set out the company's operational expenditure (OPEX) and capital expenditure (CAPEX) required to maintain service standards, enhance service (for example where sewer flooding occurs), to accommodate demand growth and to meet environmental objectives defined by the Environment Agency. OfWAT assesses and compares the plans with the objective of ensuring what are effectively supply monopolies are operating efficiently. The industry is currently at the beginning of the Asset Management Plan 6 (AMP6) which runs from 2015 to 2020.

When considering investment requirements to accommodate growing demand, water companies are required to ensure a high degree of certainty that additional assets will be required before funding them. Longer term growth is, however, considered by the companies in their internal asset planning processes and reported on in their 25-year Strategic Direction Statements (SDS) and Water Resource Management Plans (WRMPs).

4.5.3 Water Resource Management Plans

Water companies are required to prepare the 25-year forward looking WRMPs, with updates prepared every five years, and these are reviewed annually. WRMPs are required to assess:

- Future demand (due to population and economic growth)
- Demand management measures e.g. water efficiency and leakage reduction
- How the company will address changes to abstraction licenses

³⁴ Water Industry Act 1991. Accessed online at <http://www.legislation.gov.uk/ukpga/1991/56/contents> on 25/04/2016.

- How the impact of climate change will be mitigated
- Where necessary, set out the requirements for developing additional water resources to meet growing demand.

Central Bedfordshire is covered by the Anglian Water and Affinity Water WRMPs. In these statutory plans, water suppliers set out their plans for the management of water resources over the next 25 years (2015-2040). These include maintaining the balance between the supply and demand for water as well as dealing with climate change, population increase and environmental needs.

- Anglian Water³⁵ - Ruthamford South. This resource zone is supplied by a combination of surface water and groundwater. There is currently a deficit due to a historic growth of the area and the resource zone cannot share resources to the north. However, it is predicted that there will be a water surplus over the next 25 years but this excludes the effects from exporting water to Affinity Water. There will also be a 2% demand increase with future climate change. Future schemes have been put into place to reduce the demand for water including the transfer of water from the Ruthamford North to Ruthamford South, increasing the capacity of a local reservoir or reusing water from Huntingdon.
- Affinity Water³⁶ - Water Resource Zone 1 covers the rest of Central Bedfordshire. This has estimated the population to grow by 12% by the end of the planning period. The area will be in deficit by the middle of the planning period but there are schemes to improve the water efficiency by reducing leakage and implementing metering in properties.

The projections used by Anglian Water and Affinity Water to assess population growth and water demand over the plan period are fully reviewed in Section 4.

4.5.4 Developer contributions

Developments with planning permission have a right to connect to the public sewerage systems. Water suppliers have a duty to make a connection to a new or existing premises where requested by the developer or occupier. Developers may either requisition a water supply connection or sewerage system, or self-build the assets and offer these for adoption by the water company or sewerage undertaker. Self-build and adoption are usually practiced for assets within the site boundary, whereas requisitions are normally used where an extension or upgrading of the infrastructure requires construction on third party land.

The costs of requisitions are shared between the water company and developer as defined in the Water Industry Act 1991.

Where a water company is concerned that a new development may impact upon their service to customers or the environment (for example by causing foul sewer flooding or pollution) they may request the LPA to impose a Grampian condition, whereby the planning permission cannot be implemented until a third-party action, for example the water company upgrading a sewer, is complete.

The Town and County Planning Act Section 106 agreement and Community Infrastructure Levy agreements may not be used to obtain funding for water or wastewater infrastructure.

³⁵ Anglian Water (2015) Water Resources Management Plan 2015. Accessed online at <http://www.anglianwater.co.uk/environment/our-commitment/our-plans/water-resource-management.aspx> on 23/06/2016

³⁶ Affinity Water (2014) Final Water Resources Management Plan, 2015-2020. Accessed online at <https://stakeholder.affinitywater.co.uk/water-resources.aspx> <http://www.anglianwater.co.uk/environment/our-commitment/our-plans/water-resource-management.aspx> on 23/06/2016

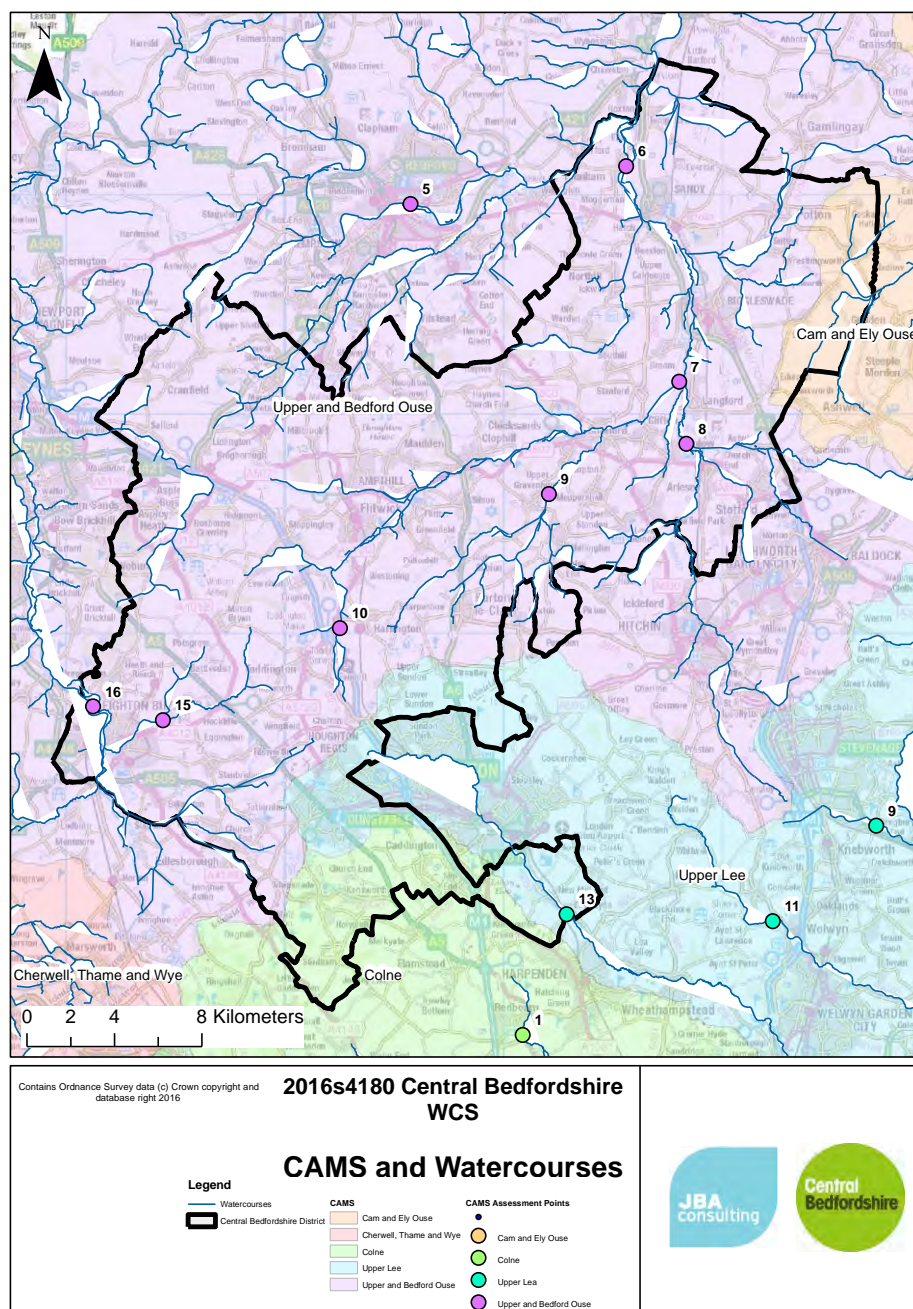
5 Water Resources and Water Supply

5.1 Introduction

5.1.1 Surface waters

The majority of Central Bedfordshire is drained by the rivers Flit and Hit, known as the River Ivel from their confluence in Shefford. The Ivel then flows north and is itself a tributary of the Great Ouse. The north west corner of Central Bedfordshire is within the upper catchment of the Bedford Ouse, with the western boundary draining westwards to the River Ouzel. The south western area, around Luton, sits on a chalk bedrock and therefore has a less dense network of surface waters, the exception being the River Lee, the source of which is just inside Central Bedfordshire at Houghton Regis.

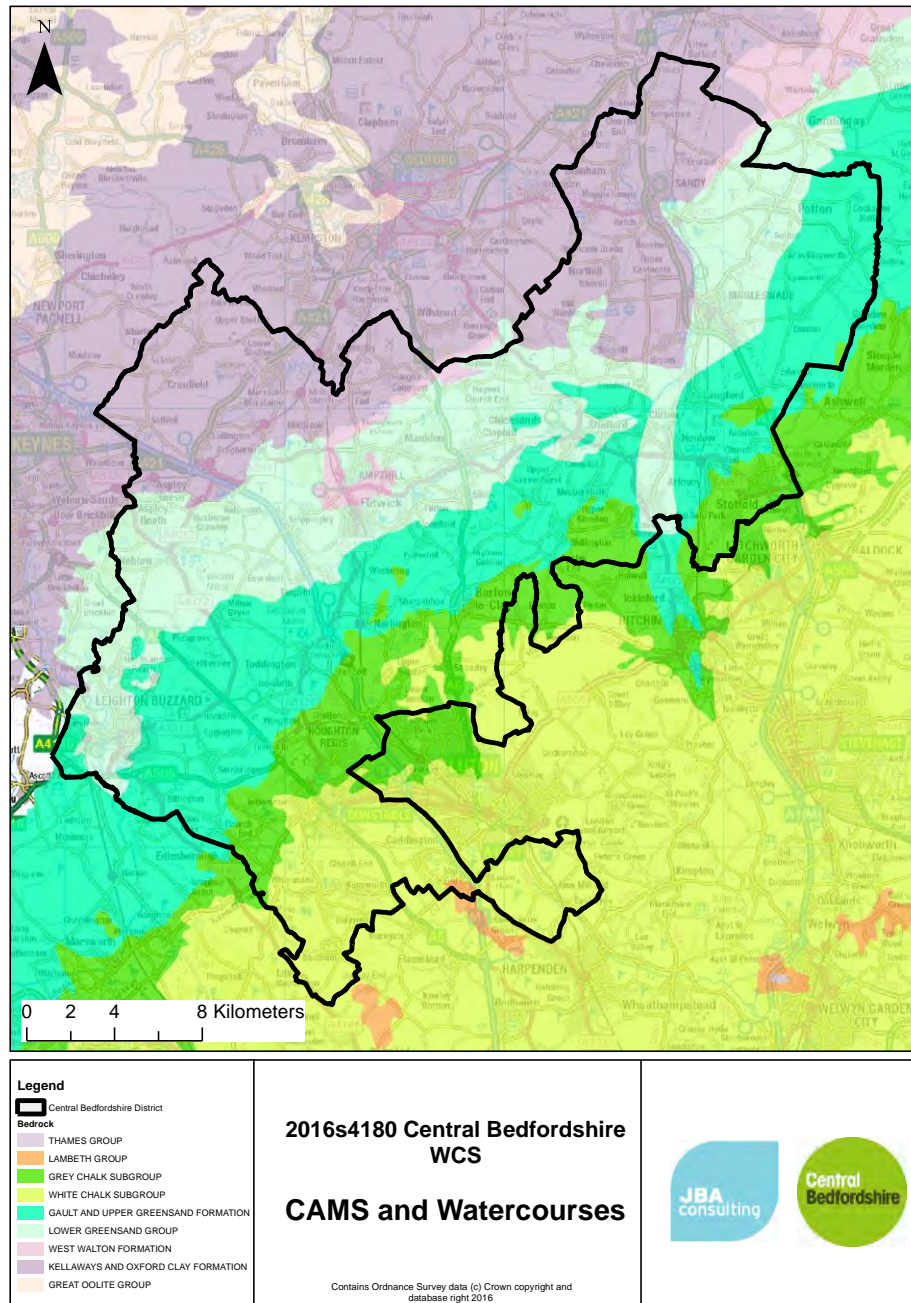
Figure 5-1: Surface Waters and Catchment Abstraction Management Strategy areas



5.1.2 Geology and groundwater

The geology in the region varies throughout the catchment. There is a range of various chalks in the south edges of the catchment, characterising this part of catchment as permeable. The middle and north ranges of the catchment become less permeable with a geology made up of mudstones, sandstones and clays.

Figure 5-2: Geology of Central Bedfordshire



5.2 Availability of water resources

The Catchment Abstraction Management Strategies (CAMS) are prepared by the Environment Agency to manage abstractions in a particular area. The CAMS provides information on the resources available and what conditions might apply to new licenses. The licences require abstractions to stop or reduce when a flow or water level falls below a specific point as a restriction to protect the environment and manage the balance between supply and demand for water users. The CAMS are published in a series of documents known as Abstraction License Strategies (ALSs), but for clarity here the term CAMS is used to refer to these.

New and varied licenses are normally time limited, which allows time for a periodic review of the area as circumstances may have changed since the licenses were granted. These are generally

given for a twelve-year duration, but shorter or longer duration licenses can be accepted. This is dependent on local factors such as the lifetime of the infrastructure, the availability of resources and future plans or changes. The licences can be replaced or renewed near to the expiry date.

The CAMS is important in terms of the WRMP as this helps determine the current and future pressures on water resources and how the supply and demand will be managed by water companies³⁷. Central Bedfordshire is covered by The Upper Ouse and Bedford Ouse CAMS, the Colne CAMS and the Upper Lee CAMS (see Figure 4-1). Each CAMS has been reviewed in the sections below.

5.2.1 Resource Availability Assessment

In order to abstract surface water, it is important to understand what water resources are available within a catchment and where abstraction for consumptive purposes is allowed. The Environment Agency has developed a classification system which shows:

- The relative balance between the environmental requirements for water and how much has been licensed for abstraction;
- Whether there is more water available for abstraction in the area;
- Areas where abstraction may need to be reduced.

The availability of water for abstraction is determined by the relationship between the fully licensed (all abstraction licences being used to full capacity) and recent actual flows (amount of water abstracted in the last 6 years) in relation to the Environmental Flow Indicator (EFI). Results are displayed using different water resource availability colours, further explained in Table 4-1. In some cases, water may be scarce at low flows, but available for abstraction at higher flows. Where local resource availability is expressed as Q30, this means that local resource is available for 70% of the time (i.e. when flows are at or above the 30-percentile flow). Where resource availability is expressed as Q95, local resource is only available for 5% of the time. Licences can be granted that protect low flows, this usually takes the form of a "Hands off Flow" (HOF) condition on a licence. Groundwater availability as a water resource is based on the corresponding surface water availability unless better information on principle aquifers is available or if there are local issues that need to be taken into account.

Table 5-1: Implications of Surface Water Resource Availability Colours.

Water Resource Availability Colour	Implications for Licensing
High hydrological regime	There is more water than required to meet the needs of the environment. Due to the need to maintain the near pristine nature of the water body, further abstraction is severely restricted.
Water available for licensing	There is more water than required to meet the needs of the environment. Licences can be considered depending on local/downstream impacts.
Restricted water available for licensing	Fully Licensed flows fall below the Environmental Flow Indicator (EFI). If all licensed water is abstracted there will not be enough water left for the needs of the environment. No new consumptive licences would be granted. It may also be appropriate to investigate the possibilities for reducing fully licensed risks. Water may be available via licence trading.
Water not available for licensing	Recent Actual flows are below the Environmental Flow Indicator (EFI). This scenario highlights water bodies where flows are below the indicative flow requirement to help support Good Ecological Status. No further licences will be granted. Water may be available via licence trading.
HMWBs (and /or discharge rich water bodies)	These water bodies have a modified flow that is influenced by reservoir compensation releases or they have flows that are augmented. There may be water available for abstraction in discharge rich catchments.

5.2.2 Upper Ouse and Bedford Ouse CAMS

The Upper Ouse and Bedford Ouse CAMS covers an area of around 3043km². The majority of the CAMS is rural with development concentrated in highly developed cities and towns. The main

³⁷ Environment Agency (2013) Managing Water Abstraction. Accessed online at <https://www.gov.uk/government/collections/water-abstraction-licensing-strategies-cams-process> on 27/04/2016

pressure on water resources is the abstraction of water for public supply. Three water companies, Affinity Water, Cambridge Water and Anglian Water operate in this CAMS³⁸.

The principle aquifers in the CAMS area are the Great Oolite in the east of the area and the Chalk and Woburn Sands in the South. The most heavily utilised groundwater resource is the Greensand and Chalk aquifer to the south and west of the catchment.

Note that all abstractions upstream of Offord (near Huntingdon) are subject to protected rights known as the Offord Clause. Abstraction at Offord is controlled by a licence that permits a variable rate of abstraction that is dependent on the measured flows in the river. The Offord licence was granted in 1968 to follow the provisions of the Great Ouse Water Act 1961. Since 1992 all licences have contained a clause that is linked to the Offord licence, which prevents the derogation of the Offord licence and safeguards public water supply.

Table 4-2 shows the resource availability in the Upper Ouse and Bedford Ouse at various assessment points. Across the catchment, the Hands-Off Flow (HOF) restrictions in place mean that abstraction for consumption is only available for up to 32% of the time. It is common practice within a CAMS area for new licenses to be time-limited and tied to a common end date (CED). 25% of licenses in the Upper Ouse and Bedford Ouse CAMS are time limited, with the next CED falling in March 2028.

Table 5-2: Resource Availability for the Upper Ouse and Bedford Ouse CAMS

AP	Name	Local resource availability	HOF Q (1)	HOF (Ml/d) (2)	Days p.a. (3)	Gauging station at AP?	Additional restrictions
5	Roxton	Q30	Q32	863.9	116	Roxton	Offord Clause Local flow conditions based at Meagre Farm gauging station
		Q50					
		Q70					
		Q95					
6	Ivel	Q30	Q32	217	116	Blunham	Offord Clause Local flow condition based at Roxton and Blunham gauging station
		Q50					
		Q70					
		Q95					
7	Flit and Campton	Q30	Q32	94.3	116	n/a	Offord Clause
		Q50					
		Q70					
		Q95					
8	Hiz	Q30	Q32	55	116	Arlesey	Offord Clause
		Q50					
		Q70					
		Q95					
9	Campton Brook	Q30	Q32	22.5	116	n/a	Offord Clause
		Q50					
		Q70					
		Q95					
10	Flit	Q30	Q32	17	116	Shefford	Offord Cause
		Q50					
		Q70					
		Q95					
15	Clipstone	Q30	Q32	16.3	116	Clipstone	Offord

38 Environment Agency (March 2013) The Upper Ouse and Bedford Ouse Abstractions Licensing Strategy. Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/289835/LIT7708_df73f8.pdf on 01/08/2016

AP	Name	Local resource availability	HOF Q (1)	HOF (MI/d) (2)	Days p.a. (3)	Gauging station at AP?	Additional restrictions
		Q50					Clause
		Q70					
		Q95					
16	Leighton Buzzard	Q30	Q32	64.9	116	Leighton Buzzard	Offord Clause
		Q50					
		Q70					
		Q95					

(1) Hands off Flow restriction (Q value)

(2) Hands off Flow restriction (MI/D value)

(3) Number of days per annum abstraction may be available

(4) Approximate volume available at restriction (MI/D)

5.2.3 Colne CAMS

The Colne CAMS is approximately 1018 km² and covers a small area in the south of Central Bedfordshire. The CAMS area receives an average annual rainfall of 716mm and has a population of around 830,000. Population increase and urban growth increases water demand in this CAMS leading to significant pressures.

There are no surface or groundwater resources available for abstraction and therefore no consumptive licences can be obtained as low flows in the catchment are below the requirement to meet a Good Ecological Status and water has been over abstracted. Water resources in this region are available less than 30% of the time, demonstrating a large pressure on the water companies and a lack of resources available.

5.2.4 Upper Lee CAMS

The Upper Lea CAMS is approximately 1,033 km² and covers a small portion in the south of Central Bedfordshire. There are a large number of abstraction licences within this CAMS area mostly for groundwater resources. This abstracted water is mostly utilised for supporting the public water supply and agricultural uses. The main pressure on water resources is the requirement to provide good quality water for residential and business requirements.

There is no surface water available for licensing across the Upper Lee CAMS at any flow level as the recent flows are below the requirement to meet a Good Ecological Status. The Upper Lee CAMS is located on unconfined chalk geology, no new consumptive licences for groundwater will be granted in the CAMS. The water resources in this area for both surface and groundwater abstraction is available less than 30% of the time, demonstrating a large pressure on the catchment for resources.

5.2.5 Cam and Ely Ouse

There are over 800 current abstraction licenses in the Cam and Ely Ouse CAMS, 35.5% is for public water supply and 25.5% is for water transfers. There is also extensive recreational use of watercourses in the catchment. This CAMS contains the natural Ely Ouse system but also the South Level Fenland which is a Level Dependant Environment (LDE). This LDE is actively drained and managed by drains and dykes and has been divided into three Level Dependant Management Units (LDMUs). 66% of abstraction licences are time limited in this CAMS, the next common end date is the 31 March 2027³⁹.

At AP2, 3, 4 and 5, and their associated LDMU's, all upstream of Cambridge, there is no water available at low or medium flows and HOF conditions apply.

5.2.6 Recommendations in CAMS for better management practices

Due to abstraction, several water bodies in Central Bedfordshire have fallen below the Ecological Flow Indicator (EFI) which may lead the EA to change or revoke some abstraction licences. This underlines the need to reduce abstraction by using more efficient management practices. This would increase the sustainability of abstraction and reduce the impacts to the environment.

39 Environment Agency (2013) Cam and Ely Ouse Abstraction Licensing Strategy. Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/289824/LIT7706_89dabb.pdf on 24/06/2016

The water supply companies, Anglian Water and Affinity Water, are required to take these limitations in available supply into account in preparation of their Water Resource Management Plans, to balance these with future changes in demand (including planned growth), and, where demand is predicted to exceed supply, to develop plans to address this. However, it is recognised that the planning system also plays a role in sustainable water resource management. The CAMS place an emphasis on adopting water efficiency and demand management techniques. Method include:

- Testing the level of water efficiency before granting an abstraction licence
- Promoting efficient use of water
- Taking actions to limit the demand
- Reducing leakage
- Embedding policies for low-water consumption design in new buildings into spatial plans.

This would ultimately cut the growth in abstraction and limit the impacts on flow and the ecology.

5.2.7 Water stress

Water stress is a measure of the level of demand for water (from domestic, business and agricultural users) compared to the available freshwater resources, whether surface or groundwater. Water stress causes deterioration of the water environment in both the quality and quantity of water, and consequently restricts the ability of a waterbody from achieving a "Good Status" under the WFD.

The Environment Agency has undertaken an assessment of water stress across the UK. This defines a water stressed area as where:

- "The current household demand for water is a high proportion of the current effective rainfall which is available to meet that demand; or
- The future household demand for water is likely to be a high proportion of the effective rainfall available to meet that demand.

The assessment⁴⁰ has classified both the Anglian Water and Affinity Water supply regions as areas of "serious" water stress. This has two key consequences:

- Under water industry regulation, water companies in areas classified as seriously water stressed need to evaluate compulsory metering alongside other options when preparing water resource management plans (WRMPs).
- Under the "Planning Practice Guidance: Housing - Optional Technical Standards" (see section 3.1.3), Local Planning Authorities are permitted, where there is a "clear local need" to opt for the lower per-capita consumption figure of 110litres/person/day in new housing. The designation of the area as being at "serious" water stress provides the evidence base for this local need.

5.3 Water Resource Management Plans

5.3.1 Methodology

When new houses are planned it is important to ensure that there are enough water resources in the area to cover the increase in demand without the risk of shortage in the future or in periods of high demand. Anglian Water are responsible for supplying water for most of Central Bedfordshire, with the exception of:

- a ring of settlements surrounding Luton, including Dunstable and Houghton Regis, which are supplied by Affinity Water, and,
- a very small area to the north east of Sandy, theoretically within the Cambridge Water supply area, but in fact containing no existing settlements. For this reason, the Cambridge Water WRMP has not been reviewed.

The water company supply zone boundaries are shown in Figure 4-3.

The Anglian Water and Affinity Water WRMPs were reviewed. Attention was focussed upon:

- The available water resources and future pressures which may impact the supply element of the supply/demand balance.

⁴⁰ Environment Agency and Natural Resources Wales (July 2013) Water stressed areas - final classification. Accessed at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/244333/water-stressed-classification-2013.pdf on 25/04/2016.

- The allowance within those plans for housing and population growth and its impact upon the demand side of the supply/demand balance.
- The planned water consumption for new homes.
- The need for any strategic water resource infrastructure schemes within the study area which may require safeguarding in the Local Plan.

In addition a draft of this assessment of water resources in Central Bedfordshire was provided to Affinity Water and Anglian Water, who were asked to review and comment, and to provide WRMP annual review reports for 2015 and 2016 (if available).

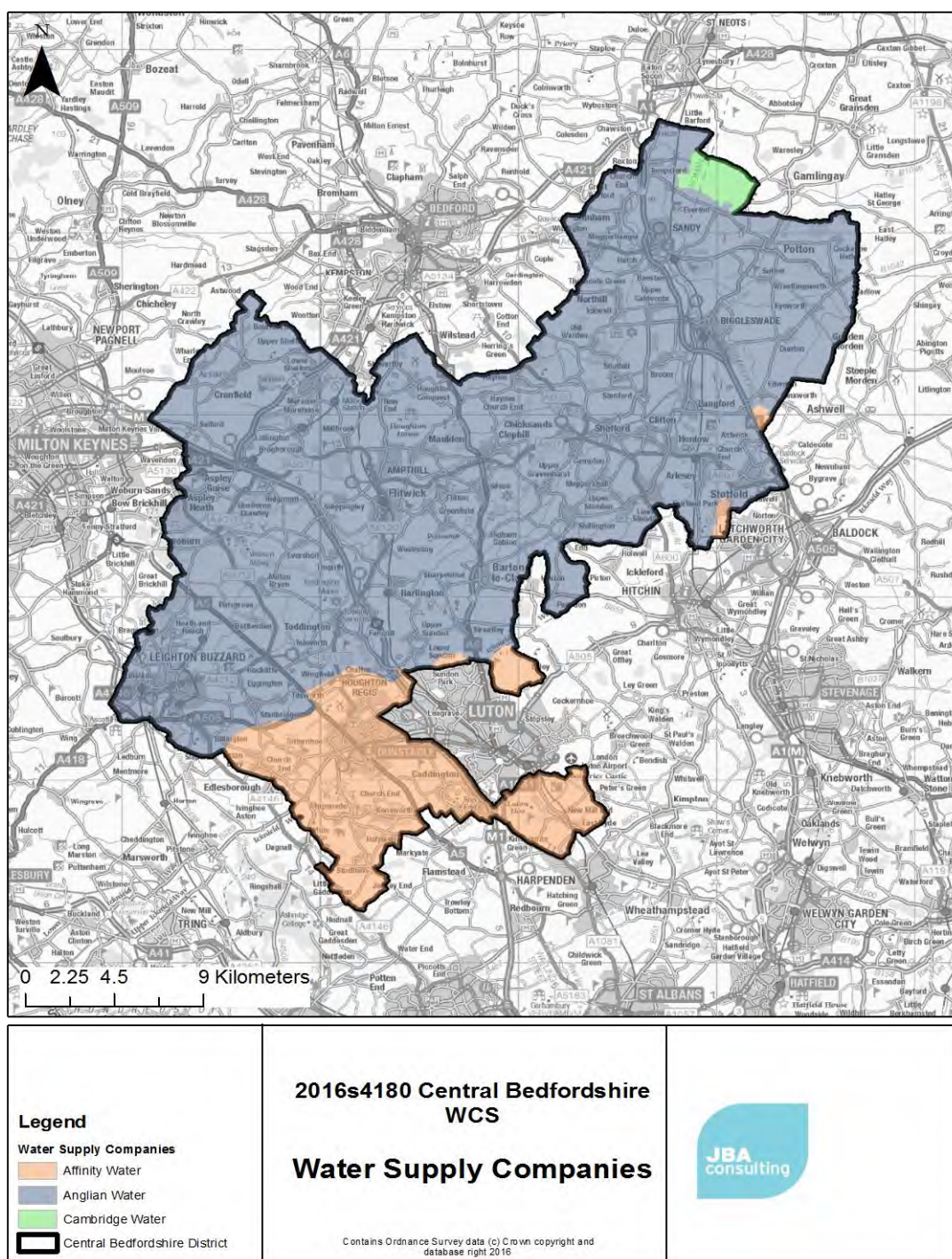
Note that water resource management plans are divided into plans for specific water resource zones (WRZs). These may cover several local authorities, so it is important that assessments of water resources account for planned growth in all of the local authorities with which Central Bedfordshire shares a WRZ.

5.3.2 Data collection

The datasets used to assess the water resource capacity were:

- Sites location in GIS format (provided by the CBC)
- Number of planned houses for each year for each site (provided by CBC)
- Company and water resource zone boundaries (Anglian Water and Affinity Water).
- Water Resource Management Plans (Anglian Water and Affinity Water)

Figure 5-3: Water Supply Company Boundaries



5.3.3 Results

Anglian Water

The majority of Central Bedfordshire is supplied by Anglian Water's Ruthamford South Water Resource Zone (WRZ), the extents of which are illustrated in Figure 4-4:

Figure 5-4: Ruthamford South WRZ



Source: Anglian Water WRMP

Supply-demand balance: The WRZ is predicted to enter supply-demand deficit under dry-year annual average conditions by 2026/27, reaching a deficit of 28.5MI/d (megalitres per day) by 2039/40. This is as a result of growth in the zone and a reduced yield from Grafham Reservoir. Other potential sources of supply uncertainty include climate change (up to 50MI/d by 2039/40, levels of service (essentially the frequency of hosepipe bans) and further reductions as a result of improved flow monitoring and sustainability reductions.

Population and household growth: Across the Anglian Water region, growth scenarios of up to one million extra residents have been considered in the plan. Population increase accounts for 80MI/d of the predicted rise in demand of 144MI/d by 2040. The WRMP used a combination of applying Office of National Statistics (ONS) population and property projections, regional projections based on the EA's Water Resource Planning guidelines, and a final check against Local Authority projections and Annual Monitoring Reports (AMRs). The household growth estimates used in the WRMP for Ruthamford South WRZ are shown in Table 4-4.

Table 5-3: Anglian Water WRMP household growth estimates for Ruthamford South

Household growth estimates	2015-20	2020-25	2025-30	2030-35	2035-40	Total 2015-2040
Local Authority trend estimates (from WRMP)	25,000	20,000	20,000	20,000	20,000	105,000
WRMP trend estimates	18,500	20,000	20,000	21,000	21,000	100,500

To provide a comparison using the latest available household projections, the Department for Communities and Local Government's (DCLG's) February 2015 estimates of household growth⁴¹ were collated for the six local authorities which form the Ruthamford South WRZ. An estimate of the percentage of the current population of each local authority within the WRZ was applied. The assessment has used DCLG figures for Central Bedfordshire because they are available for all LPAs within the water resource zone, and over a consistent timescale. As the DCLG figures run to 2037, the 2037 household growth was assumed also to apply to 2038 to 2040, in order to provide an estimate for the full period of the WRMP. Results indicated that the latest DCLG household growth estimates of around 112,000 in the WRZ are greater than those estimates used by Anglian Water (Table 4-5).

Table 5-4: DCLG 2015 Household Projections in Ruthamford South WRZ

Local Planning Authority	Est. % pop. within WRZ		2015-2019	2020-2024	2025-2029	2030-2034	2035-2039	Total
Aylesbury Vale	50%	Total	4,650	5,146	4,856	4,487	3,217	22,356
		WRZ	2,325	2,573	2,428	2,244	1,609	11,178
Bedford UA	90%	Total	4,141	4,931	4,920	4,688	3,677	22,357
		WRZ	3,727	4,438	4,428	4,219	3,309	20,121
Central Bedfordshire UA	90%	Total	7,866	8,854	8,221	7,781	5,810	38,532
		WRZ	7,079	7,969	7,399	7,003	5,229	34,679
Huntingdonshire	50%	Total	3,466	3,849	3,478	3,109	2,171	16,073
		WRZ	1,733	1,925	1,739	1,555	1,086	8,037
Milton Keynes UA	100%	Total	6,414	7,233	6,994	6,382	4,454	31,477
		WRZ	6,414	7,233	6,994	6,382	4,454	31,477
South Northampton	80%	Total	1,543	1,857	1,805	1,655	1,234	8,094
		WRZ	1,234	1,486	1,444	1,324	987	6,475
TOTAL		Total	28,080	31,870	30,274	28,102	20,563	138,889
		WRZ	22,513	25,623	24,432	22,726	16,674	111,967

Per-capita consumption: Within the Ruthamford South WRZ, Anglian Water have predicted a future reduction in household per capita consumption (PCC), by 2040, from 180litres/person/day to 129l/p/d in unmeasured households and from 126l/p/d to 112l/p/d in measured households. Consumption in new homes compared to existing homes is not separately reported. The option to require new homes to be designed to limit average PCC to 110l/p/d would therefore contribute to meeting these targeted reductions in household water consumption.

The preferred plan: Anglian Water have presented the following preferred plan for maintaining the supply-demand balance in Ruthamford South WRZ:

- AMP6 (2015-20). Anglian Water's focus for 2015-2020 is on demand management. Within Ruthamford South this will include leakage reduction, 30,000 water efficiency audits, and a

⁴¹ Department for Communities and Local Government (2016) 2014-Based Household Projections, 2012 - 2039. Accessed online at <https://www.gov.uk/government/statistical-data-sets/live-tables-on-household-projections> on 08/08/2016

programme of enhanced metering to encourage customers to take up water meters, with an estimated 20,000 installations within the WRZ. Compulsory metering is not proposed. Following this approach, as part of an extensive programme of customer engagement, Anglian Water identify two key benefits: mitigation of drought risk, by reducing consumption and increasing customer awareness of the link between consumption and the environment, and giving customers and opportunity to reduce bills.

- AMP8 (2025-30). Ruthamford North RZ transfer 1 (24MI/d) - This option provides for transfer of water from the Ruthamford North RZ to Ruthamford South via a 900mm diameter, 21km long new pipeline from Hannington Reservoir to Salcey Reservoir (in South Northamptonshire).
- AMP10 (2035-40). Recommission Ruthamford South RZ Reservoir. This potential scheme involves the construction of a new 12 MI/d water treatment works (WTW) at the existing Foxcote reservoir site to the north east of Buckingham (Aylesbury Vale). The new WTW would treat water obtained from utilising the existing abstraction licences from the reservoir and the River Ouse. This WTW at Foxcote would supply treated water to 10 MI/d average demand and up to 12MI/d during peak demand periods.
- There are no major water resource infrastructure developments planned within Central Bedfordshire, and therefore no requirements for safeguarding of sites have been identified.

The WRMP states that the preferred plan is sensitive to transfer requirements from other resource zones, including from other water companies. This could therefore be sensitive to sudden changes in household projections or to sustainability reductions in abstraction licenses. This will be addressed through the five-yearly WRMP process, and the annual update reports. CBC and other authorities across the Anglian Water region should therefore continue to liaise with Anglian Water to ensure that their growth forecasts are as accurate as possible.

Additional comments from Anglian Water

The following additional comments have been received from Anglian Water in response to this review of the WRMP:

- "Anglian Water is required to prepare a WRMP which sets out how we will manage the demand and supply balance for water supplies within the Anglian Water region. Where we have identified a deficit predicted in a specific water resource zone it identifies how this would be overcome by supply and demand measures. It is important to note that we have commenced the preparation of the next WRMP following the publication of the approved WRMP published in 2015. Local Plan growth targets and the timing of sites will be a key source of information to inform both plans. At the appropriate stage we will also be consulting on this document..."
- "...Central Bedfordshire forms part of a water resource zone where a deficit is forecast as part of our current WRMP which was published in 2015. However the WRMP outlines we will maintain the supply/demand balance for those areas within this WRZ over the plan period. We are currently preparing the next WRMP where we will consider how the supply/demand balance will be maintained in the Central Beds administrative area. As part of which we will consider local plan growth targets within the Anglian Water region including Central Beds..."
- "...There are no significant changes contained within the Annual Monitoring Reports since the publication of the WRMP in 2015."

Affinity Water

A ring of Central Bedfordshire settlements around Luton, including Dunstable, are supplied by Affinity Water's Lee Water Resource Zone (WRZ 3), one of six WRZs which form Affinity's Central area, the extents of which are illustrated in Figure 4-4:

Figure 5-5: Affinity Water WRZs



Source: Affinity Water WRMP

Affinity Water published their WRMP in 2014, and published an Annual Review report in 2015⁴². Where available, figures quoted below are from the Annual Review report.

Supply-demand balance: WRZ3 (Lee) is currently in surplus, however the other five of Affinity's central area WRZs are in deficit when headroom targets are taken into account. The Lee WRZ is predicted to move into deficit by 2020, with this deficit increasing to approximately 180MI/d across the Central area by 2040. This equivalent to approximately 15% of the present target headroom.

Population and household growth: The WRMP commissioned a study by Experian, which used a combination of trend-based projections by ONS and DCLG, local authority plan-based projections, and a "most-likely" projection which followed the plan-based projections, but with lower levels of house building. Affinity Water project a population growth of 21% in WRZ3 (Lee) to 2040, and a 25% increase in the number of households in the same period. Household growth estimates used in the WRMP for WRZ 3 (Lee) are shown in Table 4-6.

Table 5-5: Affinity Water WRMP household growth estimates for WRZ 3 (Lee)

Metric	2012/13 - 2020	2020 - 2040	Total 2012/13 -2040
Household growth during period	15,046	51,041	66,087
Additional per year	2,149	2,552	2,448 (average)

To provide a comparison using the latest available household projections, the Department for Communities and Local Government's (DCLG's) February 2015 estimates of household growth⁴³ were collated for the six local authorities which form the WRZ 3 (Lee). An estimate of the percentage of the current population of each local authority within the WRZ was applied. The assessment has used DCLG figures for Central Bedfordshire because they are available for all LPAs within the water resource zone, and over a consistent timescale. As the DCLG figures run to 2037, the 2037 household growth was assumed also to apply to 2038 to 2040, in order to provide an estimate for the full period of the WRMP. Results indicated that the latest DCLG household growth estimates of around 80,000 in the WRZ are significantly higher than those estimates used by Affinity Water

⁴² Affinity Water (2015) Water Resource Management Plan 2010 - 2035 Final Annual Review June 2015. Accessed online at <https://stakeholder.affinitywater.co.uk/water-resources.aspx> on 11/07/2016.

⁴³ Department for Communities and Local Government (2015) 2012-based Household Projections: England, 2012-2037. Accessed online at <https://www.gov.uk/government/statistics/2012-based-household-projections-in-england-2012-to-2037> on 11/07/2016

(Table 4-7). There is significant uncertainty in the percentage of development future development within each local authority which will fall within this WRZ, however the difference is significant enough to warrant further investigation.

Table 5-6: DCLG 2015 Household Projections in WRZ3 (Lee)

Local Planning Authority	Est. % pop. within WRZ		2013-2020	2021-2040	Total
Central Bedfordshire	10%	Total	11,676	28,427	40,103
		WRZ	1,168	2,843	4,010
East Hertfordshire	50%	Total	5,806	14,715	20,521
		WRZ	2,903	7,358	10,261
Luton	100%	Total	7,963	20,859	28,822
		WRZ	7,963	20,859	28,822
North Hertfordshire	90%	Total	4,949	13,675	18,624
		WRZ	4,454	12,308	16,762
St Albans	30%	Total	4,600	12,954	17,554
		WRZ	1,380	3,886	5,266
Welwyn Hatfield	100%	Total	3,739	11,489	15,228
		WRZ	3,739	11,489	15,228
TOTAL		Total	38,733	102,119	140,852
		WRZ	21,607	58,742	80,349

Per-capita consumption: Within the WRZ 3 (Lee), Affinity Water have predicted a future reduction in household per capita consumption (PCC), by 2040, from 152litres/person/day to 138l/p/d as an average across measured and in unmeasured households. Consumption in new homes compared to existing homes is not separately reported. The option to require new homes to be designed to limit average PCC to 110l/p/d would therefore contribute to meeting these targeted reductions in household water consumption.

The preferred plan: Affinity Water have presented the following preferred plan for maintaining the supply-demand balance in WRZ 3 (Lee):

- AMP 6 (2015-20) Affinity are moving to universal metering in their central area by 2024. They aim to achieve this in WRZ 3 (Lee) by the end of 2018. This will be supported by a parallel programme of commercial water efficiency.
- Leakage reduction will also target reduced losses of 3Ml/d during this AMP period, and further leakage reduction programmes are planned for AMPs 9(2030-35) and 10 (2035-40).
- A peak license scheme for managing abstractions at Hertford has been delayed until AMP10 to allow for further monitoring.
- In response to increases in forecast population growth between their draft and final plans, Affinity have introduced some additional supply measures including a replacement borehole in Hertford and source optimisation in south east Royston.

Environment Agency Water Resources Comments

The Environment Agency provided the following standard comments on water resources:

“The interaction of development planning and water resource management is a key issue for this region, and there are three key elements to consider. (These feature in Section 7.8 of the Regional Water Resources Strategy published in 2001). Our comments are made under these key aspects.

Development should not be committed ahead of secure water supplies:

The development lies within the area traditionally supplied by Anglian Water Services Ltd and Affinity Water Ltd. It is assumed that water will be supplied using existing sources and under existing abstraction licence permissions. The planners should seek advice from the water company to find out whether this is the case, or whether a new source needs to be developed or a new abstraction licence is sought. The Agency may not be able to recommend a new or increased abstraction licence where water resources are fully committed to existing abstraction and the environment.

The location of development should take into consideration the relative availability of existing developed water resources:

The timing and cost of infrastructure improvements will be a consideration. This issue should be discussed with the water company.

Every opportunity should be taken to build water efficiency into new developments, and innovative approaches should be encouraged:

The Environment Agency supports all initiatives aimed at reducing water use. The extent of water efficiency measures adopted will affect the demand for water for the development and this will be expected to be taken into consideration. It is assumed that new houses will be constructed with water meters fitted. Other water saving measures that we wish to see incorporated include low flush toilets, low flow showerheads, water butts for gardens etc. The Environment Agency also supports the idea of greywater recycling as it has the potential to reduce water consumption in the average household by up to 35%. This must, however, be achieved in a safe and hygienic manner.

It is the responsibility of the applicant to ensure that no local water features (including streams, ponds, lakes, ditches or drains) are detrimentally affected, this includes both licensed and unlicensed abstractions.”

5.3.4 Conclusions

The two WRMPs demonstrate the pressures on water resources in southern and eastern England, with increasing demand due to population growth, uncertainty of yield and drought conditions due to climate change and the need to reduce some abstractions in order to reduce impacts on the water environment.

The DCLG growth forecasts within CBC and its neighbouring councils in the Anglian Water Ruthamford South zone are greater than what has been planned for in the Anglian Water WRMP. Likewise, initial analysis of DCLG household growth forecasts in Affinity Water's WRZ 3 (Lee) indicate current growth forecasts may be significantly higher than those allowed for in the WRMP. Up to date housing need projections for Central Bedfordshire have the opportunity to feed into WRMP's moving forwards, alongside future locations for growth and up to date information on housing completions and commitments.

Whilst neither water company has relied on new homes being more water-efficient than existing metered homes, the opportunity, through the planning system, to ensure that new homes do meet the higher standard of 110l/person/day, at nominal additional cost to the developer, would be in line with general principals of sustainable development, and reducing energy consumed in the treatment and supply of water. Achieving this level of water efficiency in new homes has been identified as being affordable, at an estimated £9 per property (see section 4.1.3). This level of consumption is achievable using simple measures such as tap inserts and low-use shower heads.

There is potential for innovative approaches, such as rainwater harvesting and grey-water reuse, to achieve significantly lower water consumption, and the Environment Agency encourage the adoption of innovative water efficiency measures in water-stressed areas. Such measures however, could add significant costs at the construction stage, and the council should consider whether, under current planning guidance and building regulations, it is defensible to require or request higher standards of water efficiency.

Case study: Rainwater Harvesting in North West Cambridge

Issues

Rising rental prices and housing supply shortages are a longstanding issue within the city of Cambridge. As such, when looking for a space to provide affordable housing and research facilities for its growing numbers of staff and students, Cambridge University looked two miles outside the city centre.

However, concerns were raised over whether existing water scarcity and flood risk issues on the 150 hectare site could withstand the additional pressures of the new development.

The North West Cambridge Development

The North West Cambridge Development proposal put forward an innovative scheme to address both the water consumption and flood risk issues facing the site.

The finished site will contain the largest water recycling system in the country, which aims to reduce average water consumption to almost half of the UK average. This will be achieved through rainwater harvesting and water re-use. Rainwater from all building roofs will be collected, filtered and then stored in underground tanks onsite, for non-drinking uses, such as in toilets. The development aims to be drought resistant, through using native plant species, and watering open spaces using rainwater collected in water butts.

The issue of surface water flood risk was addressed through designing a suite of Sustainable Drainage Systems (SuDS). A system of swales, green corridors and a balancing pond will be installed to mimic the natural drainage of the area, by storing and slowly releasing water through the site, and to intercept pollutants from water running off the paved areas. This will minimise the risk of surface water flooding to the site itself and to downstream communities.

Results

The North West Cambridge Development proposal passed through the planning process with unanimous approval, and is on track for completion, with the first student accommodation due to open in Winter 2016/2017.

Collaborative working was key to the success of the development at planning stages. Cambridge University remained in close consultation with the committee of local planning authorities and also with neighbouring communities, including the North West Community Forum.

It is hoped that the North West Cambridge Development will inspire similarly innovative solutions for the management of water resources within future development across the UK.



Photo: Cambridge University

5.3.5 Recommendations

Action	Responsibility	Timescale
Review population and housing growth forecasts within the Affinity Water WRZ 3 (Lee)	Affinity Water, CBC	ASAP
Continue to regularly review forecast and actual household growth across the supply region through WRMP Annual Update reports, and where significant change is predicted, engage with Local Planning Authorities.	Anglian Water, Affinity Water	Ongoing
Provide yearly profiles of projected housing growth to water companies to inform the WRMP update.	CBC and other LPAs in the Ruthamford South (Anglian) and WRZ 3 Lee (Affinity) zones	Ongoing
Use planning policy to require the 110l/person/day water consumption target permitted by National Planning Policy Guidance in water-stressed areas. This applies across Central Bedfordshire as the whole authority area is classed as an area of "serious" water stress.	CBC	In draft Local Plan
Consider whether planning policy can be used to require or encourage the adoption of even lower water consumption, for example by use of rainwater harvesting or grey-water reuse.	CBC	In draft Local Plan
Water companies should advise CBC of any strategic water resource infrastructure developments within Central Bedfordshire, where these may require safeguarding of land to prevent other type of development occurring. However, at present, no major potential schemes have been identified within the CBC boundary.	Anglian Water, Affinity Water, CBC	In draft Local Plan

5.4 Water supply infrastructure assessment

Increase in water demand adds pressure to the existing supply infrastructure. An assessment is required to identify whether the existing infrastructure is adequate or whether upgrading will be required. The time required to plan, obtain funding and construct major pipeline works can be considerable and therefore water companies and planners need to work closely together to ensure that the infrastructure is able to meet growing demand.

Water supply companies make a distinction between supply infrastructure, the major pipelines, reservoirs and pumps that transfer water around a WRZ, and distribution infrastructure, smaller scale assets which convey water around settlements to customers. This assessment is focused on the supply infrastructure. It is expected that developers should fund assessments and the modelling of the distribution systems to assess requirements for load capacity upgrades.

5.4.1 Methodology

The water suppliers were requested to provide the following information for each settlement or parish in Central Bedfordshire:

- The available capacity for growth (calculated as equivalent additional dwellings) within the water supply systems.
- Identify any significant known constraints which could make provision of additional supply capacity technically difficult, more expensive and/or more time consuming to achieve in particular settlements or supply zones.

5.4.2 Results

Anglian Water

The following comments were received from Anglian Water:

- "We are of the view that it is difficult to generalise about the available capacity within existing water supply networks at a settlement/parish level in the absence of specific figures or sites being identified by Central Bedfordshire Council. We will be able to comment further once the scale of growth has been identified as part of the Phase 2 Study...
- ...The water supply infrastructure varies significantly across a parish. Within all the parishes there will be some capacity for development but also within all parishes there will be areas where there is no capacity. It depends on the location and size of the growth within the parish. The spreadsheet provided asks that we provide comments at a parish level based upon the no. of existing properties in the area. It is considered that an assessment at this geographic level is not appropriate in that it wouldn't provide a meaningful assessment of capacity. Therefore it is recommended that this issue should be examined further as part of the Phase 2 Study when the scale and location of growth will be identified.
- See also section 4.3.3 for comments received from Anglian Water relating to water resources.
- The following capital schemes are planned for AMP6 (2015-2020)
 - Milton Bryan to Health and Reach trunk main: A 400mm reinforcement main required to support the proposed growth in Leighton Linlade (~7500 prop's). Completed.
 - Steppingley to Milton Bryan trunk main: A 400mm reinforcement main required to support the proposed growth in Leighton Linlade. Proposed for late AMP6 early AMP7.
 - Wing Strategic main Wing to Beanfield section and Beanfield to Hannington section: The Wing Strategic main which was laid in 2009 is outside this geographical area as it was laid between Rutland Water and Northampton. However, this scheme is designed to bring more water to supply growth until 2025 in the area south from Rutland water reservoir to several areas including Central Bedfordshire.

Affinity Water

The following response was received from Affinity Water:

"There is no strategic limitation on growth as we have a statutory duty to supply water regardless of the level of growth. Inevitably, there will always be an impact on infrastructure capacity when new households and customers are connected to our network. From our perspective, the real concern is the precise location of growth and whether this is wholly captured in our planning as we rely on information from developers and local plans to plan for infrastructure upgrading. That is the reason why we need to ensure that engagement is in place to share information between Local Authorities and us in a timely manner. Impacts may be in relation to local network or there may be larger scale upgrades of main pipelines, should the level of growth exceed current network capacity.

Infrastructure upgrading is also inherently linked to our long term water supply strategy that is reviewed every five years through the publication of our Water Resources Management Plan. Affinity Water is currently preparing its plan for the next Asset Management Period (AMP7) which will be published in 2019 after being approved by the Secretary of State. This plan will be informed by technical work undertaken to assess the current supply-demand balance and, should a deficit be foreseen, identify feasible options available to reduce the water deficit in its supply area. Customer views will be taken into account through a public consultation. Our view is that the Water Cycle Study will allow Affinity Water to engage more widely with relevant stakeholders and therefore be in a better position to consider future infrastructure need for the next Asset Management Period (AMP7).

Note that Affinity Water supply water to Luton. The capacity of water mains to supply planned development in and around Luton was not considered within the 2015 Luton Water Cycle Strategy.

5.4.3 Conclusions

Further engagement with Anglian Water and Affinity Water will be required at Stage 2 to determine the available capacity of water supply infrastructure and any significant constraints to supplying potential allocation site identified by CBC.

5.4.4 Recommendations

Table 5-7: Water supply capacity actions

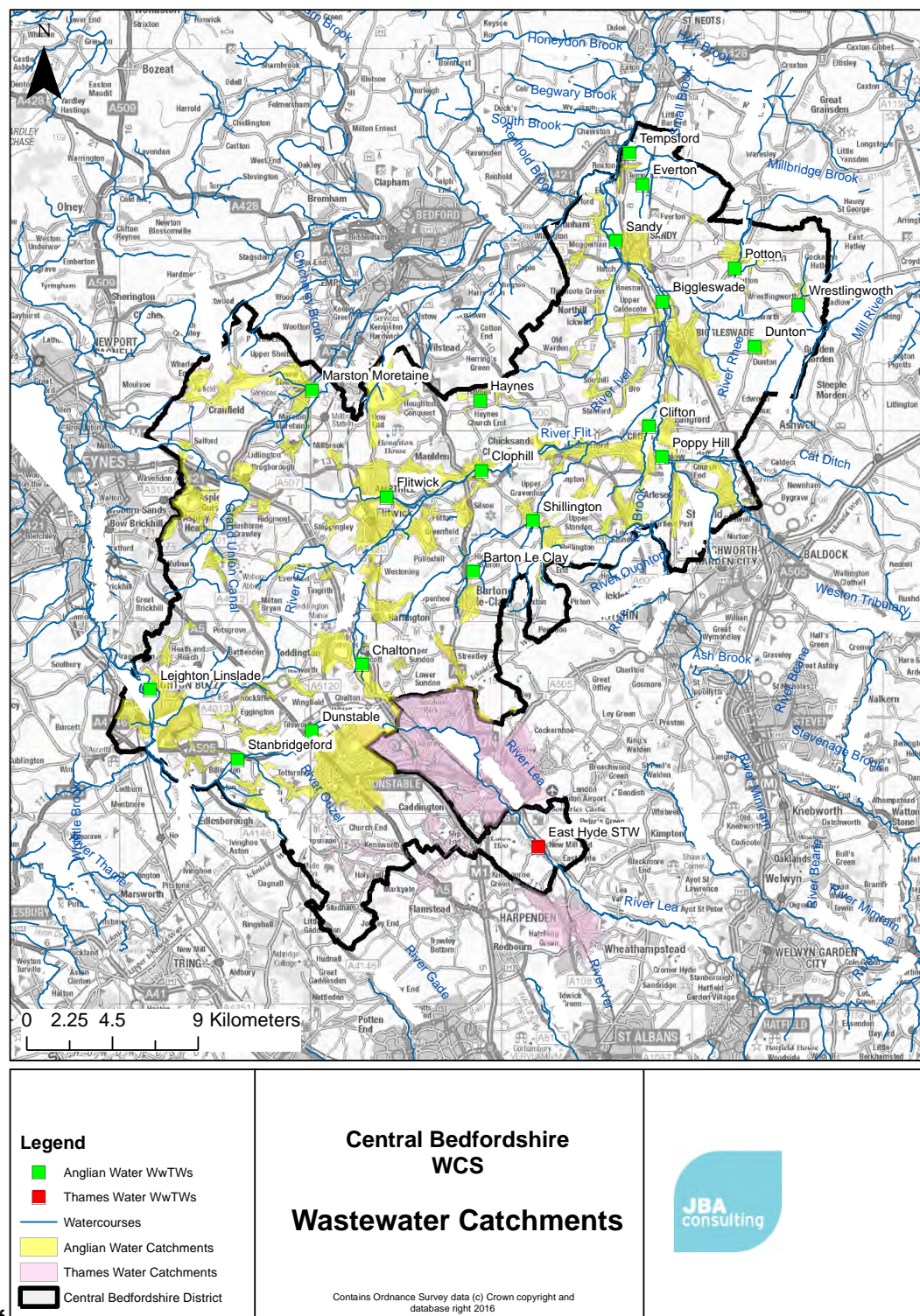
Action	Responsibility	Timescale
Assess the capacity of water supply networks to serve draft allocation sites identified by CBC in the stage 2 WCS.	CBC Anglian Water Affinity Water	Early 2017
Take into account water supply infrastructure constraints in phasing development in partnership with Anglian Water and Affinity Water	CBC Anglian Water Affinity Water	Ongoing
Anglian Water and Affinity Water to continue to assess growth demands as part of their water asset planning activities and feedback to CBC where concerns arise.	Anglian Water Affinity Water	Ongoing
Anglian Water, Affinity Water and developers will be expected to work closely and early-on in the planning promotion process to determine water supply requirements to proposed developments	Anglian Water, Affinity Water and Developers	Ongoing

6 Wastewater Collection and Treatment

6.1 Introduction

Wastewater services in the majority of Central Bedfordshire are provided by Anglian Water, except in the south west where services are provided by Thames Water. Anglian Water operate 19 treatment works in the area. Only one Thames Water treatment works is located in Central Bedfordshire, and this works, East Hyde, primarily services Luton (see Figure 5-1). Other settlements in Central Bedfordshire are served by Thames Water treatment works within neighbouring Hertfordshire.

Figure 6-1: Wastewater collection and treatment catchments



Note that Anglian Water now uses the terminology Water Recycling Centres (WRCs) to underline the role of treatment works in recycling water to the natural environment. The term wastewater and wastewater treatment is used generically in this report and applies to both Thames Water and Anglian Water assets.

6.2 Drainage Strategies

6.2.1 Introduction

Sewerage undertakers have been required to undertake long-term planning for management of their sewerage systems. Normally called Drainage Area Plans (DAPs) but also called Sewerage Management Plans (SMPs). These have traditionally been internal documents, not shared with other Risk Management Authorities (RMAs), and have mainly (though not exclusively), focussed on foul and combined sewerage systems.

In 2013, OfWAT and the Environment Agency issued joint guidance⁴⁴ on how water companies should prepare public-facing Drainage Strategies, at a catchment scale, to demonstrate how they will deliver their AMP6 outcomes (for example reduced sewer flooding, reduced pollution incidents, capacity for growth) within each catchment. Drainage strategies should focus on the water company's foul, combined and surface water sewers, but also work with other RMAs to play their part in addressing wider drainage issues including flooding and water pollution. The guidance describes the six guiding principles of a drainage strategy as:

- Partnership - to be optimal, strategies must be developed in partnership with customers, developers, LLFAs, planners and the EA.
- Uncertainty - Strategies should acknowledge uncertainty, for example in data and the impacts of climate change, and set out how these uncertainties will be addressed (for example adaptive approaches to climate change).
- Risk-based - Plans should consider the probability and consequence of inadequate drainage, and prioritise operations and investment where the risk is greatest.
- Whole-life costs and benefits - strategies should promote interventions which deliver outcomes to customers and the environment at the lowest cost to customers and the community. Wider benefits (for example ecosystem services) should also be valued when selection interventions.
- Live process - strategies should be adaptable and reviewed periodically.
- Innovative and sustainable - Strategies should evaluate alternatives to traditional engineering schemes, considering innovative approaches such as active system control, surface water disconnection, customer engagement and incentivisation.

6.2.2 Anglian Water Drainage Strategies

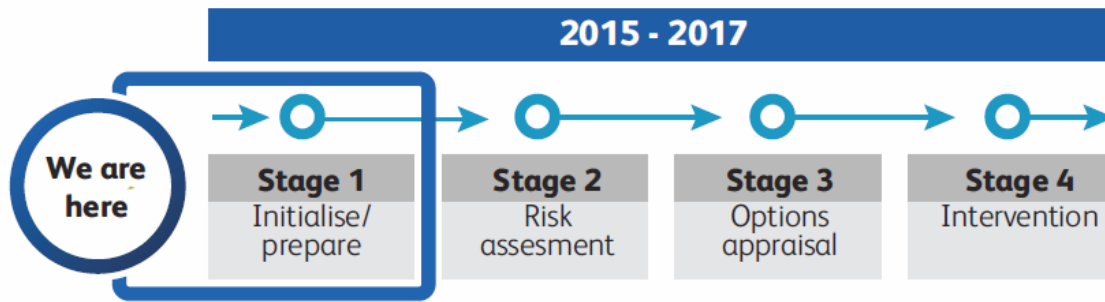
Anglian Water have confirmed that there are currently no published drainage strategies for the Central Bedfordshire area.

6.2.3 Thames Water Drainage Strategies

Thames Water have focussed their first batch of Drainage Strategies on catchments where they will be addressing sewer flooding and growth issues during AMP6 (2015-2020). Water companies are also required by the Environment Agency⁴⁵ to prepare Infiltration Reduction Plans (IRPs) in catchments where groundwater infiltration may lead to prolonged overflows (either at permitted CSOs or at temporary overflow points) to watercourses in order to prevent sewer flooding. Many of the catchments for which TWUL has prepared strategies fall into this category, and the drainage strategies contain sections on managing infiltration.

⁴⁴ OfWAT and the Environment Agency (2013) Drainage Strategy Framework for water and sewerage companies to prepare Drainage Strategies. Accessed online at http://www.ofwat.gov.uk/wp-content/uploads/2015/12/rpt_com201305drainagestrategy1.pdf on 27/07/2016

⁴⁵ Environment Agency (2012) Regulatory position statement: discharges made from groundwater surcharged sewers



Thames Water have published 31 drainage strategies, however none of them cover wastewater catchments serving Central Bedfordshire.

6.3 Sewerage system capacity assessment

New residential developments add pressure to the existing sewerage system. An assessment is required to identify the available capacity within the existing systems, and the potential to upgrade overloaded systems to accommodate future growth. The scale and cost of upgrading works may vary significantly depend upon the location of the development in relation to the network itself and the receiving WwTW.

It may be the case that an existing sewerage system is already working at its full capacity and further investigations have to be carried out to define which solution is necessary to implement to increase its capacity. New infrastructure may be required if, for example, a site is not served by an existing system.

Sewerage Undertakers must consider the growth in demand for wastewater services when preparing their five-yearly Strategic Business Plans (SBPs) which set out investment for the next Asset Management Plan (AMP) period. Typically, investment is committed to provide new or upgraded sewerage capacity to support allocated growth with a high certainty of being delivered. Additional sewerage capacity to service windfall sites, smaller infill development or to connect a site to the sewerage network across third party land are normally funded via developer contributions.

6.3.1 Methodology

In this stage 1 assessment, the focus was on identifying existing headroom capacity. A true assessment of sewerage system capacity requires an understanding of the likely scale and locations of growth, and therefore this aspect of the WCS will be revisited at stage 2.

6.3.2 Data collection

The sewerage undertakers were requested to provide the following:

- Current capacity and issues at the catchment scale;
- Identify any significant known constraints which could make provision of additional sewerage capacity technically difficult, more expensive and/or more time consuming to achieve in particular settlements or catchments, for example the need to upgrade a sewer beneath a railway line;
- Drainage strategies which have been prepared for catchments in Central Bedfordshire.

6.3.3 Results

Anglian Water

The following comments were received from Anglian Water.

- *"We are currently seeing growth enquiries for instance in the vicinity of Leighton Linlade, Dunstable, Marston Moretaine and in the main there is a requirement for sizeable off-site reinforcement, conveyancing costs and consideration of upgrading WRCs. None of this seems to have impacted the developer's desire to build in these areas. It could be reasoned therefore that other factors rather than the lack of wastewater infrastructure are determining the location of these sites.*
- *If the location is in a remote area then the developer will need to consider conveyancing costs to the network. Conversely if the site is near an established larger settlement, any sizeable development is likely to require reinforcement of the existing network regardless of the existing performance of the sewer.*

- *The wastewater collection infrastructure varies significantly across a parish. Within all the parishes there will be some capacity for development but also within all parishes there will be areas where there is no capacity. It depends on the location and size of the growth within the parish. The spreadsheet provided asks that we provide comments at a parish level based upon the no. of existing properties in the area. It is considered that an assessment at this geographic level is not appropriate in that it wouldn't provide a meaningful assessment of capacity. Therefore it is recommended that this issue should be examined further as part of the Phase 2 Study when the scale and location of growth will be identified.*
- *We have been asked to provide drainage strategies for Central Beds area. I can confirm that currently there are no published drainage strategies within the area served by Anglian Water.*
- *There are no strategic capital schemes for the current AMP period relating to increasing or providing further capacity within the existing foul sewerage network within Anglian Water's area of responsibility."*

The Luton Water Cycle Strategy identified that the majority of the Houghton Regis North site (approximately 3,542 homes) will drain to Dunstable WwTW. The remaining homes (approximately 780), plus North of Luton (3,200 homes) would drain to Chalton WwTW. Regarding the latter, the Luton WCS states that *"The optimum solution cannot be established until a full survey of the local system has been undertaken and the layout of the development has been established. Upgrading of the existing outfall trunk sewer may be necessary towards the end of the development to accommodate the increased flow. This could prove costly and would require a long lead in time as approvals would be required from the National Rail and Highways authorities. There should be a requirement that this is undertaken at the master planning stage."* Houghton Regis North is a committed development. Land North of Luton was a proposed allocation within the withdrawn Central Bedfordshire Development Strategy. This site is to be reconsidered as an option for growth through the new Local Plan.

Thames Water

The following results have been received from Thames Water.

Settlement	Flooding	Pollution	Sewer capacity
Caddington	There is limited external only sewer flooding reported to 7 properties. The events are mainly pre 2000 and therefore have very poor data quality.	None	Capacity is limited
Houghton Regis	There is no reported sewer flooding in this area	Historic pollutions have been reported in this area	The foul sewer system is less than 1 km in length. Sewer capacity is unknown but can be assumed to be limited.
Hyde	Two properties have reported sewer flooding in this area, one is internal and the other external flooding. Both occur between 1 in 10 and 10 in 20 year events.	None	Sewer capacity appears adequate.
Kensworth	Seven properties have reported sewer flooding in this area. Three are internal and foul external flooding locations. Most of the flooding was reported pre 2000 and therefore has poor data quality.	Historic pollution events have been reported in this area.	Sewer capacity appears adequate
Slip End	Seven properties have reported sewer flooding in this area, all external flooding only. All reports are prior to 2003 and in events between 1 in 10 and 1 in 20 years	Historic Pollution events have been reported in this area.	Sewer capacity appears adequate
Streatley	No reported flooding	None	No data of sewer capacity is available
Studham	No reported flooding	None	No data of sewer capacity is available

Settlement	Flooding	Pollution	Sewer capacity
Whipsnade	No reported flooding	None	Sewer capacity appears adequate

The Luton WCS assumed that all allocations within Luton will be served but the East Hyde WwTW sewerage system. It concluded that " *Detailed network modelling may be required by AW or TW, but it is likely that the relatively small number of allocations within Luton can be accommodated by the existing sewer infrastructure.*"

6.3.4 Conclusions

Limited information is available at this stage to confirm available sewerage capacity. More analysis will be provided at Stage 2 once the amount and locations for potential growth are known.

6.3.5 Recommendations

Table 6-1: Sewerage capacity actions

Action	Responsibility	Timescale
Take into account sewerage infrastructure constraints in phasing development in partnership with Anglian Water and Thames Water	CBC	Ongoing
Anglian Water and Thames Water to continue to assess growth demands as part of their wastewater asset planning activities and feedback to CBC where concerns arise.	AW and TW	Ongoing
Anglian Water, Thames Water and developers will be expected to work closely and early-on in the planning promotion process to develop an outline Drainage Strategy for the site. The Outline Drainage strategy should set out sufficient detail to determine the likely timescales for the delivery of the infrastructure and the likely costs of the infrastructure. The Outline Drainage Strategy should be submitted as part of the planning application submission, and where required, used as a basis for a drainage planning condition to be set.	AW, TW and Developers	Ongoing
Developers will be expected to show that surface water from a site will be disposed using a sustainable drainage system (SuDS) with connection to sewer seen as the last option.	Developers, CBC (as LLFA)	Ongoing

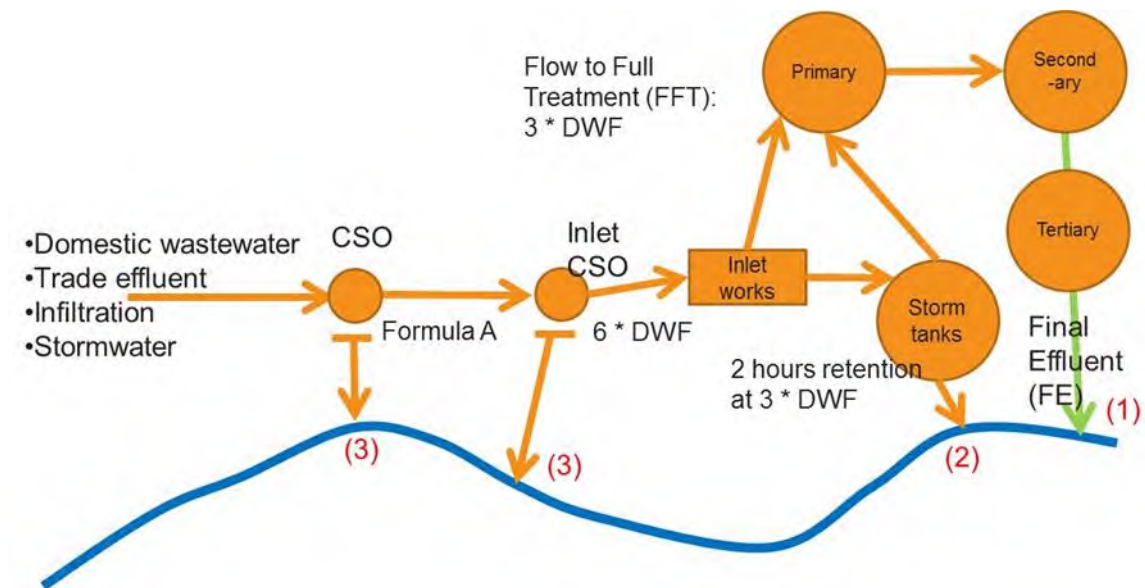
6.4 Wastewater treatment works flow consent assessment

6.4.1 Introduction

The EA is responsible for regulating sewage discharge releases via a system of Environmental Permits (EPs). Monitoring for compliance with these permits is the responsibility of both the EA and plant operators. Figure 5-2 summarises the different types of wastewater releases that might take place, although precise details vary from works to works depending on the design.

During dry weather, the final effluent from the Wastewater Treatment Works (WwTW) should be the only discharge (1). With rainfall, the storm tanks fill and eventually start discharging to the watercourse (2) and Combined Sewer Overflows (CSOs) upstream of the storm tanks start to operate (3). The discharge of storm sewage from treatment works is allowed only under conditions of heavy rain and snow melt, and therefore the flow capacity of treatment systems is required to be sufficient to treat all flows arising in dry weather and the increased flow from smaller rainfall events. After rainfall, storm tanks should be emptied back to full treatment, freeing their capacity for the next rainfall event.

Figure 6-2: Overview of typical combined sewerage system and Wastewater Discharges



Environmental permits are used alongside water quality limits as a means of controlling the pollutants load discharged from a Wastewater Treatment Works to a receiving watercourse. Sewage flows rates must be monitored for all WwTWs where the permitted discharge rate is greater than 50m³/day in dry weather.

Permitted discharges are based on a statistic known as the Dry Weather Flow (DWF). As well as being used in the setting and enforcement of effluent discharge permits, the DWF is used for Waste Water Treatment design, as a means of estimating the 'base flow' in sewerage modelling and for determining the flow at which discharges to storm tanks will be permitted by the permit (Flow to Full Treatment FFT). Compliance against the permitted DWF is assessed by calculating the 90th percentile (Q90) of daily flows recorded at each WwTW (in other words the flow which is exceeded for 90% of the time).

WwTW Environmental Permits also consent for maximum concentrations of pollutants, in most cases Suspended Solids (SS), Biochemical Oxygen Demand (BOD) and Ammonia (NH₄), with the nutrient Phosphorous (P) also permitted at larger treatment works. These are determined by the Environment Agency with the objective of ensuring that the receiving watercourse is not prevented from meeting its environmental objectives, in particular that Chemical Status element of the Water Framework Directive (WFD) classification.

Increased domestic population and/or employment activity can lead to increased wastewater flows arriving at a WwTW. Where there is insufficient headroom at the works to treat these flows, this could lead to failures of flow consents

6.4.2 Methodology

The approach to assess wastewater treatment capacity was to use wastewater permitted Dry Weather Flows and observed flow records, provide by the Environment Agency. In parallel, the sewerage undertakers were asked to identify any significant known constraints which could make provision of additional treatment capacity technically difficult, more expensive and/or more time consuming at specific works, for example land constraints or odour issues due to encroachment of development.

6.4.3 Data collection

For treatment works within the Environment Agency's East Anglian area, an assessment of existing headroom capacity was provided. Within the EA's Hertfordshire and North London area, only monthly mean wastewater flow was provided. It was not possible to calculate DWF from this data, and therefore the assessment in this area is based on Thames Water's comments and a similar headroom assessment published in the Luton WCS.

6.4.4 Results

Anglian Water

Table 6-2: Assessment of DWF volumetric consent headroom

WwTW	2014 p.e.	Permitted DWF (m3/day)	Measured Q90 2014	2014 Q90 flow as a % of Permitted DWF	Estimated capacity (dwellings)	Does WwTW currently also serve other LPAs?
Barton Le Clay	4897	1143	1094	96%	187	No
Biggleswade	19368	4100	3241	79%	3272	No
Chalton	70883	15000	13516	90%	5653	Yes - small area of Luton
Clifton	16295	2931	2841	97%	343	No
Clophill	6141	1800	1159	64%	2442	No
Cotton Valley	No data provided					Yes - Milton Keynes
Dunstable	49566	17000	11701	69%	20187	Yes - small area of Luton
Dunton	537	140	98	70%	160	No
Everton	419	110	46	42%	244	No
Flitwick	27986	8300	3971	48%	16491	No
Haynes	955	275	164	60%	423	No
Leighton Lincolns	37247	7600	5059	67%	9680	No
Marston Moretaine	9533	2300	1520	66%	2971	No
Millbrook	No data provided					No
Milton Bryan	No data provided					No
Poppy Hill	18923	4700	4339	92%	1375	No
Potton	6113	1200	676	56%	1996	No
Sandy	11734	2200	1961	89%	910	No
Shillington	6086	1204	681	57%	1992	Yes - possibly from North Herts
Stanbridgeford	13812	2482	2871	116%	-1482	Yes - Aylesbury Vale
Tempsford	2104	700	468	67%	884	Yes - possibly from Bedford
Upper Sundon	No data provided					No
Wrestlingworth	638	180	126	70%	206	No

Note that the assessment above is based on 2014 data, which was the latest available at the time that the data was requested. Available headroom is subject to erosion as a result of completions and commitments, and therefore the stated available capacity should be treated with caution. The measured Q90 Dry Weather Flow (DWF) was calculated by the Environment Agency as the flow which is exceeded for 90% of the time, based on observed flows for the year 2014. It is worth noting that this was a year of exceptionally high rainfall. Across the Thames region, CEH⁴⁶ estimate that the annual rainfall had a 1 in 30-50 year return period, and 1 in 10-15 across the Anglian region. Consequently, river levels in the Lee were 165% of the long-term average, 139% for the Great Ouse. In these conditions, many wastewater collection systems would be expected to exhibit higher

46 Centre for Ecology and Hydrology (2015) Hydrological Summary for December 2014. Accessed online at http://nora.nerc.ac.uk/509404/1/HS_201412.pdf on 15/07/2016

than average infiltration flows. The EA has commissioned research (currently unpublished) into identifying periods of "unusual" rainfall which should be excluded from the calculation of actual DWF. This method has not been applied to the calculation of actual DWF in Table 5-2. It is therefore possible that the Q90 flows were atypical during 2014, and if so this would lead to an under-estimation of headroom at these WwTWs.

The following additional comments were received from Anglian Water:

- *"Where there are existing water recycling centres ... we would expect these sites to continue to be used for this purpose. It is unclear whether it is necessary to safeguard sites specifically as part of the Local Plan."*
- *"There is a growth scheme for Leighton Linlade WRC as part of the current AMP period."*

Thames Water

Thames Water provided the following comments on their treatment works serving Central Bedfordshire:

Figure 6-3: Thames Water assessment of WwTW capacity

Settlement	Receiving WwTW	Comment on WwTW Capacity Assessment	Does WwTW currently also serve other LPAs?
Caddington, Aley Green, Slip End, Woodside	Caddington	Limited spare treatment capacity. Site has a groundwater discharge rather than an outfall direct to the river. Fairly small site. With current operation / asset arrangement, cannot accommodate a significant increase in flow and load.	Yes - small area of Dacorum
Hyde	East Hyde	Currently undergoing a growth upgrade to accommodate growth that was known of at the point of design. Significant increases in proposed levels of growth may necessitate further upgrade requirements. Site is fairly constrained, with limited options for process expansion on a large scale.	Yes - Predominantly serves Luton
Kensworth, Flamstead, Markyate	Markyate	Recently underwent an upgrade to replace the tertiary treatment on the site. Final effluent discharge is to the watercourse usually runs dry and the STW provides flow. There is limited spare land within our ownership to enable process expansion, however the STW is not landlocked. Topography and flood risk may however make expansion a challenge.	Yes - Markyate and Flamstead within Dacorum
Studham, Holywell, Oldhill Wood, Whipsnade	Studham	Very limited capacity. Growth would be likely to require an upgrade. Upgrades may require land purchase as there is very little spare land on site for additional process units.	No

The 2015 Luton Water Cycle Study⁴⁷ undertook an assessment of the volumetric headroom and water quality impacts of growth at three wastewater treatment works around Luton, all of which are located within Central Bedfordshire:

- East Hyde WwTW, operated by Thames Water, is located within Central Bedfordshire, however, with the exception of the hamlets of East Hyde and Newmill End, it serves southern and central Luton.
- Chalton WwTW, operated by Anglian Water, serves Toddington and Chalton within Central Bedfordshire, as well as northern Luton (note that sewerage within Luton Borough which discharges to Chalton WwTW is managed by Thames Water).
- Dunstable WwTW, operated by Anglian Water, does not serve areas within Luton but does serve strategic allocations within Central Bedfordshire which are associated with the growth of a "greater Luton."

Results for these three WwTWs are therefore taken from the Luton WCS. Future growth in the catchments was based on existing housing allocations and additional allocation scenarios:

47 Luton Borough Council (2015) Luton Water Cycle Strategy. Accessed online at <https://www.luton.gov.uk/Environment/Lists/LutonDocuments/PDF/Local%20Plan/Climate%20change/CC%20005.pdf> on 15/07/2016

Table 6-3: Luton WCS headroom assessment for Chalton, Dunstable and East Hyde WwTWs.

	Allocations						Current permitted DWF (m3/d)	Future 2031 DWF after Growth (m3/d)	Headroom assessment	
	Housing			Employment (jobs)					2031 Headroom Capacity (m3/d)	Approximate residual housing capacity after growth (2031)
WwTW	Luton	C Beds.	Total	Luton	C Beds.	Total				
Chalton	566	3,704	4,270	-	5,150	5,150	15,000	413	413	1,416
Dunstable	-	4,322	4,322	-	625	625	17,000	13,895	3,105	8,808
East Hyde (Scenario C)	6,093	2,962	9,055	22,248	-	22,248	44,418	37,345	7,073	22,531

Note that the assessment above is believed to have been based on 2014 or earlier data. Available headroom is subject to erosion as a result of completions and commitments, and therefore the stated available capacity should be treated with caution. These results indicate that, for the growth scenarios in and around Luton under consideration in 2015, there was some capacity, with existing WwTW flow consents, for additional growth beyond that which was considered up to 2031. The East Hyde results are presented for the highest growth considered (scenario C). Note that the WCS does not record how DWF was derived from housing and employment numbers.

For Markyate STW it was not possible to calculate current DWF with the data provided and therefore it has not been possible to assess available flow headroom.

6.4.5 Conclusions

Available wastewater treatment headroom, expressed as an equivalent number of dwellings, has been calculated for WwTWs serving Central Bedfordshire. These values are based on 2014 data (the latest available at the time of request), and may be subject to erosion of capacity as a result of completions and commitments. They should, therefore, be treated as indicative of the current flow capacity of the WwTW, and it is recommended that they are revisited (in catchments where significant growth may be allocated) at stage 2. Values are stated as equivalent dwellings to provide an easily understandable metric for planners. Actual capacity for growth will depend upon the mix of residential, commercial and industrial development being proposed.

The availability of potential headroom capacity varies significantly by settlement, ranging from no available headroom at Stanbridgeford to capacity for the equivalent of over 20,000 dwellings at both Dunstable and East Hyde, although the latter primarily services Luton. In addition, Leighton Linlade has volumetric capacity for over 9,000 equivalent dwellings.

It is important to emphasise that this is not an absolute constraint to growth in that environmental and physical capacity can be made available in a number of different ways which are not limited to upgrades of sites.

A summary of all of the stage 1 WCS results, by WwTW catchment, is provided in Table 10-1.

6.4.6 Recommendations

Table 6-4: WwTW headroom actions

Action	Responsibility	Timescale
Central Bedfordshire Council should consider the available headroom at each settlement when assigning draft site allocations.	CBC	Local Plan preparation
Further analysis will be undertaken in the Stage 2 Assessment when development numbers are provided from Central Bedfordshire Council.	CBC, AW, TW	Local Plan preparation

6.5 Wastewater treatment works odour assessment

Where new development encroaches upon existing wastewater treatment works, odour from that works may become a cause for nuisance and complaints from residents. Managing odour at WwTWs can add considerable capital and operational costs, particularly when retro-fit onto existing WwTWs.

National Planning Policy Guidance recommends that plan-makers considering whether new development is appropriate near to sites used (or proposed) for water and wastewater infrastructure, in particular due to the risk of odour impacting on residents and requiring additional investment to address.

6.5.1 Methodology

- Thames Water's policy is that a new development may need an odour assessment if the site is less than 800m from a WwTW and is encroaching closer to the WwTW than existing urbanised areas.
- Anglian Water recommend a 400m zone for screening odour assessments
- For the purpose of this assessment the "screening zone" appropriate to the water company responsible for each WwTW was applied.

An ArcGIS exercise will be carried out to identify sites that are less than 800m from a Thames Water WwTW or 400m from an Anglian Water WwTW and encroaching closer to the WwTW than existing urbanised areas. If there are not existing houses it is more likely that an odour assessment will be needed. Another important aspect is the location of the site in respect to the WwTW. Historic wind direction records for Luton airport indicate that the prevailing winds in Central Bedfordshire blow from the west south west⁴⁸.

6.5.2 Data collection

The following datasets will be used to assess the WwTW odour risk:

- Sites location in GIS format (provided by the CBC)
- WwTWs location in GIS format (provided by sewerage undertakers)
- OS maps

6.5.3 Results

Odour risk screening zones are shown on Map 7.

This assessment is site-specific and will be prepared at Stage 2.

The following additional comments were received from Anglian Water regarding odour:

"The potential for residents/occupiers to be adversely affected by their proximity to water recycling centres and pumping station should also be fully considered as part of the site selection process."

6.5.4 Conclusions

The screening assessment for potential odour nuisance requires sites under consideration for allocation, as it is based on the distance of sites from potential sources of odour at wastewater treatment works. This assessment will be carried out at stage 2. The assessment will make recommendations for which sites should carry out an odour impact assessment. It is usually considered the responsibility of the developer to commission odour impact assessments. The Institute of Air Quality Management has prepared guidance on the assessment of odour for planning.⁴⁹

6.6 Water quality impact assessment

The increased discharge of effluent due to an increase of the population served by a WwTW may impact on the quality of the receiving water body. The Water Framework Directive (WFD) does not allow a water body to deteriorate from its current class.

It is Environment Agency policy to model the impact of increasing effluent volumes on the receiving watercourse. Where the scale of development is such that deterioration is predicted, a new permit

48 Ren SMART website <http://www.rensmart.com/Weather/WindArchive#monthlyLayer> accessed on 26/09/2016

49 IAQM (2014) Guidance on the assessment of odour for planning. Accessed online at <http://www.iaqm.co.uk/text/guidance/odour-guidance-2014.pdf> on 21/03/2017

may be required for the WwTW to improve the quality of the final effluent, so that the extra pollution load will not result in deterioration in the water quality of the watercourse. This is known as “no deterioration” or “load standstill”.

EA guidance states that a 10% deterioration in the receiving water can be allowed in some circumstances as long as this does not cause a class deterioration to occur. Where a water-body is currently at "Poor" status, not further deterioration is permissible.

If a watercourse fails the ‘good status’ target, further investigations are needed in order to define the ‘reasons for a fail’ and which actions could be implemented to reach such status.

Many of the WwTWs in Central Bedfordshire outfall to headwaters, in other words they discharge to relatively short rivers with small upstream catchments and relatively low flows. This means that the potential dilution of pollutant loads from wastewater effluents may be limited, particularly during periods of low river flows.

During the preparation of the Water Cycle Study the EA advised that it would be necessary to undertake an assessment of the water quality impact of developments in the WwTW catchments which will receive significant additional wastewater flows.

The full water quality assessment is included in Appendix A. This section provides a summary of the methodology, results and conclusions.

Figure 5-3 indicates that the majority of Central Bedfordshire's watercourses are not currently meeting a "Good" classification. There can be many reasons why a watercourse may not be classified as good, including where its flow regime is impacted by over-abstraction or physical barriers such as weirs, and where it is impacted by pollutants from urban or rural sources. The Environment Agency publish a summary of Reasons for Not Achieving Good Status (RNAGs) for each water body⁵⁰. The results for watercourses in Central Bedfordshire have been summarised in Table 5-6. These results indicate that "pollution from waste water" is the most common RNAG within the area, impacting 22 of the 32 watercourses, followed by "physical modifications" and "pollution from rural areas". This emphasises that discharges from wastewater treatment works are a significant contributor to water bodies not meeting Good status, and therefore that development should not be allowed to make this situation worse.

50 Environment Agency (2015) RBMP2 Reasons for Not Achieving Good Status. Accessed online at <https://data.gov.uk/dataset/wfd-rbmp2-reasons-for-not-achieving-good-status> on 26/09/2016

Figure 6-4: Water Framework Directive 2015 Overall Class

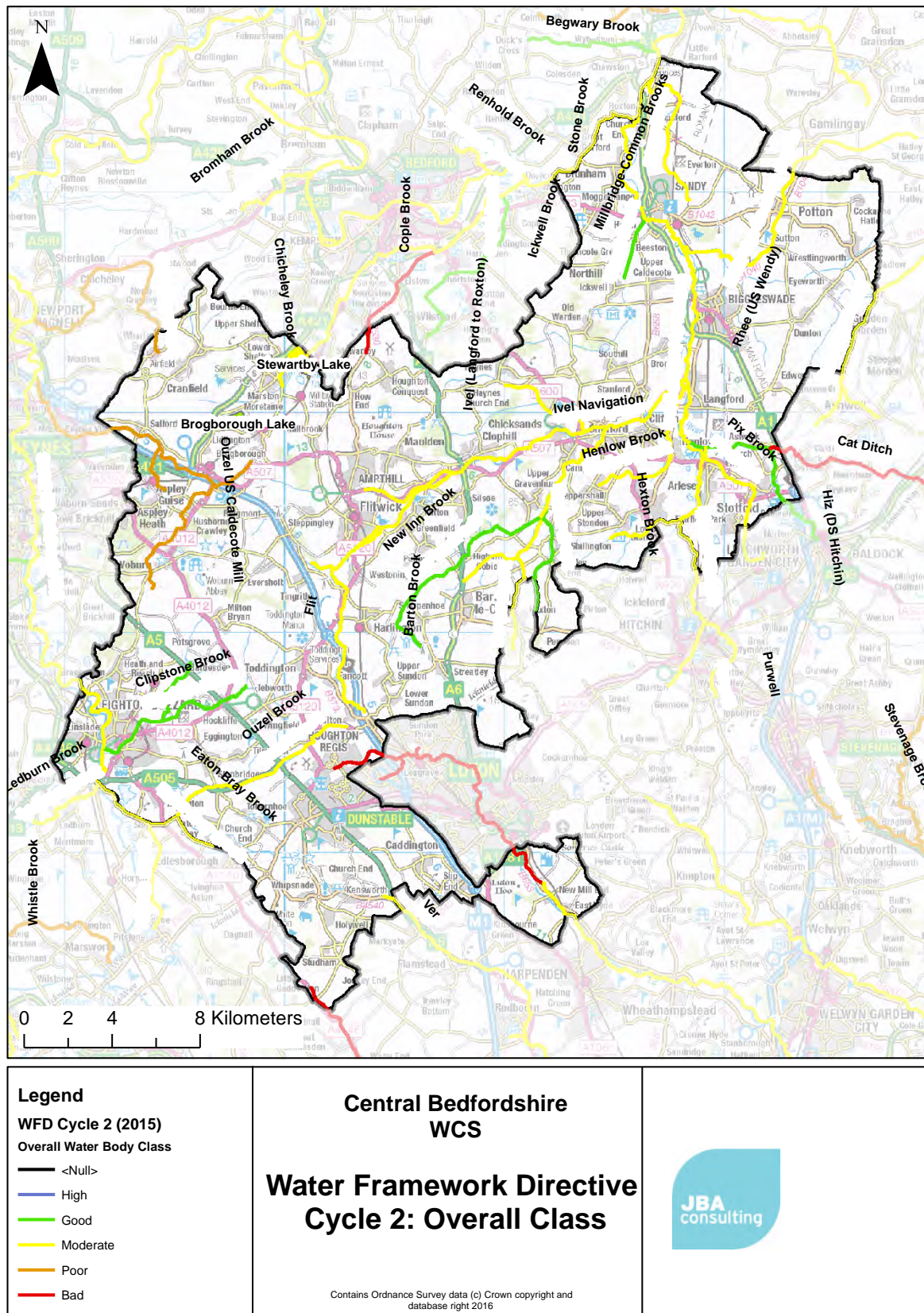


Table 6-5: RNAGs: count of National Significant Water Management Issues

Water Body Name	Changes to the natural flow and levels of water	Natural conditions	Non-native invasive species	Physical modifications	Pollution from rural areas	Pollution from towns, cities and transport	Pollution from waste water	Unknown (pending investigation)	Grand Total
Barton Brook							1		1
Broughton Brook					2		1	1	4
Campton Brook (Hit)			1	1			1		3
Cat Ditch								1	1
Chicheley Brook					4		6		10
Chicksands Brook					2		2	1	5
Clipstone Brook Tributary								1	1
Eaton Bray Brook								1	1
Elstow Brook (US Shortstown)								1	1
Flit			1	2			2		5
Flit and Ivel Navigation d/s of Shefford							1		1
Flit tributary		1							1
Gade (Upper stretch Great Gaddesden to confluence with Bulbourne / GUC)	5			2		1			8
Harrowden Brook					2				2
Henlow Brook	1	1					2		4
Hiz (DS Hitchin)			1	2		1			4
Ivel (DS Langford to Roxton)				2			1		3
Lee (from Luton Hoo Lakes to Hertford)							2		2
Lee (from Luton to Luton Hoo Lakes)	1			4		1	1		7
Millbridge and Potton Brooks				2			4		6
Ouse (Newport Pagnell to Roxton)				3	2		1		6
Ouse (Roxton to Earith)				2	2		1		5
Ouzel (US Clipstone Brook)			1	1			1		3
Ouzel Brook							1		1
Ouzel US Caldecote Mill				3	1		1		5
Pix Brook						1	3	1	5
Rhee (US Wendy)				1			1		2

Water Body Name	Changes to the natural flow and levels of water	Natural conditions	Non-native invasive species	Physical modifications	Pollution from rural areas	Pollution from towns, cities and transport	Pollution from waste water	Unknown (pending investigation)	Grand Total
Running Waters-Steppingley							4		4
Stondon Brook		1							1
Stone Brook		1		1	1		4		7
Ver	2			6					8
Whistle Brook			1	1	1		1		4
TOTAL	9	4	5	33	17	4	42	7	121

6.6.1 Methodology

The contaminants assessed were Biochemical Oxygen Demand (BOD), Ammonia (NH₄) and Phosphorus (P).

The selected approach was to use the EA River Quality Planning (RQP) tool in conjunction with their recommended EA guidance for assessing environmental permit conditions. RQP uses a steady state Monte Carlo Mass Balance approach where flows and water quality are sampled from modelled distributions based (where available) on observed flow and quality in the upstream watercourse and the WwTW discharge.

In the absence of growth projections at the catchment scale, modelling was limited to assessing what additional wastewater flow, and therefore how many additional homes, could be accommodated without causing a class deterioration or deterioration in any determinant of 10% or greater. Where the present-day class is Bad, no further deterioration is normally permissible.

6.6.2 Data collection

Within their East Anglia area, the Environment Agency provided model input values for Monte Carlo modelling at each WwTW, including upstream river flows and quality, treated effluent flows and quality and permit limits. For WwTWs within the EA's Hertfordshire and North London area, WwTW historic flow and quality records were provided, along with river flow estimates. The data required to run the RQP software were:

Upstream river data:

- Mean flow
- 95% exceedance flow
- Mean for each contaminant
- Standard deviation for each contaminant

River quality target data:

- No deterioration target
- 'Good status' target

Discharge data:

- Mean flow
- Standard deviation for the flow
- Mean for each contaminant
- Standard deviation for each contaminant
- Per capita consumption, average occupancy and percentage return to sewer for calculation of water quality headroom.

The above data inputs were based on observations where available. If observed river flows were not available these were obtained from an existing model or a low-flows estimation software.

If observed water quality data were not available these were obtained from an existing model or a neighbouring catchment with similar characteristics, or the mid-point of the WFD class.

6.6.3 Results

General chemical and physicochemical quality elements

Table 5-7 summarises the modelling results of the maximum potential dwellings that could be placed in each STW catchment. The "equivalent number of new dwellings" is the number of dwellings that could be accommodated in a catchment before a water quality deterioration triggers a revision of the treatment works permit (and possibly an upgrade to the treatment works). This should be considered alongside the available flow headroom (presented in Table 5-2 and Table 5-3). The final summary in Table 10.1 includes both the flow headroom and water quality "no-deterioration" assessment, and notes on how to combine the different assessments. Values are stated as equivalent dwellings to provide an easily understandable metric for planners. Actual capacity for growth will depend upon the mix of residential, commercial and industrial development being proposed.

At six treatment works (Barton Le Clay, Chalton, Dunstable, Markyate, Shillington, and Tempsford), the modelling of the present-day downstream water quality indicated that the river would be classed a "Bad" for one or more determinands. Therefore, at these works, this initial assessment indicates that there is no environmental capacity to accommodate growth without improvements to the treatment works.

It is important to emphasise that this is not an absolute constraint to growth, merely an assessment of how much growth is possible before the risk of significant deterioration is likely to require a tightening of the environmental permit.

Table 6-6: Equivalent housing numbers which could be accommodated before permit tightening likely to be required to prevent deterioration

WwTW	Maximum additional daily mean effluent discharge (ML/d) permissible without causing a class or 10% deterioration.	Equivalent number of new dwellings
Barton Le Clay	0.0	0
Biggleswade	7.0	620
Chalton	0.0	0
Clifton	8.2	1,500
Clophill	2.7	150
Dunstable	0.0	0
Flitwick	14.0	1,200
Leighton Linlade	11.8	760
Poppy Hill	6.6	240
Potton	1.8	80
Sandy	3.8	340
Shillington	0.0	0
Stanbridgeford	4.4	430
Tempsford	0.0	0
Markyate	0.0	0

Priority substances and other EU-level dangerous substances

As well as the general chemical and physicochemical water quality elements (BOD, NH₄, P etc.) addressed above, a watercourse can fail to meet GES due to exceeding permissible concentrations of hazardous substances. Currently 33 substances are defined as hazardous or priority hazardous substances, with others under review. Such substances may pose risks both to humans (when contained in drinking water) and to aquatic life and animals feeding in aquatic life. These substances are managed by a range of different approaches, including EU and international bans on manufacturing and use, targeted bans, selection of safer alternatives and end-of-pipe treatment

solutions. There is considerable concern within the UK water industry that regulation of these substances by setting permit values which require their removal at wastewater treatment works will place a huge cost burden upon the industry and its customers, and that this approach would be out of keeping with the "polluter pays principle".

Within this WCS we consider how the planning system might be used to manage priority substances:

- Industrial sources – whilst the stage 2 WCS will cover employment sites, it won't consider the type of industry and therefore likely sources of priority substances are unknown. It is recommended that developers should discuss potential uses which may be sources of priority substances from planned industrial facilities at an early stage with the EA and, where they are seeking a trade effluent consent, with the sewerage undertaker.
- Agricultural sources - There is limited scope for the planning system to change or regulate agricultural practices.
- Surface water runoff sources - some priority substances e.g. heavy metals, are present in urban surface water runoff. It is recommended that future developments would manage these sources by using SuDS, designed following the CIRIA SuDS Manual.
- Domestic wastewater sources - some priority substances are found in domestic wastewater as a result of domestic cleaning chemicals, detergents, or materials used within the home. Whilst an increase in the population due to housing growth could increase the total volumes of such substances being discharged to the environment, it would seem more appropriate to be managing these substances through regulation at source, rather than through restricting housing growth through the planning system.

No further analysis of priority substances will be undertaken as part of this study.

Wastewater treatment works discharging to groundwater

Two wastewater treatment works at Caddington and Studham (both Thames Water) in Central Bedfordshire discharge to groundwater. If the proposed growth in either of these two catchments is anticipated to lead to an exceedance of the existing volumetric discharge permits, it would be necessary to undertake a groundwater risk assessment to demonstrate that the potential environmental impacts of the discharge are acceptable can be adequately mitigated. The Environment Agency provide guidance on how to undertake such an assessment⁵¹.

Preparing such an assessment was beyond the scope of this stage 1 study. If significant development draining to either Studham or Caddington WwTW is proposed, it is recommended that the stage 2 study includes a groundwater impact assessment.

6.6.4 Conclusions

The following conclusions are drawn from this stage 1 water quality impact assessment:

- Barton Le Clay, Chalton, Dunstable, Markyate, Shillington, and Tempsford WwTWs need to be upgraded to accommodate housing growth without causing deterioration of the "Bad" WFD class. It is therefore anticipated that all growth in these catchments would need to be phased to enable time for upgrades to be implemented.
- All of the remaining WwTWs have some capacity within their existing quality permits to accommodate future development without causing a class of 10% deterioration.
- In some settlements, the available capacity is quite small, reflecting the limited dilution potential available in the receiving watercourse.
- In other settlements, the WwTW allows for a large future effluent discharge which does not affect the water quality downstream due to large volumes of discharge. However, if large scale developments are proposed at these locations additional SIMCAT modelling should be considered to test for deterioration downstream as a result of growth at several treatment works discharging to the same river system.
- Where development in excess of the equivalent number of dwellings indicated is allocated, it is probable that a WwTW upgrade would be required in order to meet a tighter permit condition set to ensure that load-standstill is met.

⁵¹ Environment Agency (2016) Groundwater risk assessment for your environmental permit. Accessed online at <https://www.gov.uk/guidance/groundwater-risk-assessment-for-your-environmental-permit> on 12/12/2016.

- This stage 1 assessment has not considered the potential for growth to prevent watercourses from meeting WFD Good Ecological Status. This will be addressed at stage 2.
- The assessment is provided to indicate what environmental headroom for growth is available without the need to upgrade treatment works or make other interventions. It is not intended as an absolute constraint to growth.

6.6.5 Recommendations

Table 6-7: Water quality actions

Action	Responsibility	Timescale
Central Bedfordshire Council should consider the available environmental capacity at each settlement when assigning draft site allocations.	CBC	Local Plan preparation
Further analysis will be undertaken in the Stage 2 Assessment when development numbers are provided from Central Bedfordshire Council. This should include groundwater impact assessments if significant development is proposed at Caddington, Slip End, Studham or Whipsnade.	CBC	Local Plan preparation

Case study: Catchment-scale discharge permits in the Bristol Avon

Issues

With a strong farming heritage in the upper catchment and a growing urban population in the lower catchment, the Bristol Avon receives high concentrations of phosphate pollution. The dominance of this nutrient has caused excessive growth of plants in the river, or 'eutrophication', which starves other aquatic organisms of oxygen.

Despite progress since 2000 in reducing levels of phosphorous in the River Avon, the catchment continues to fall short of the European Union Water Framework Directive water quality requirements.

One of the key sources of the pollutant is water leaving sewer treatment works, which has led to the requirement of higher phosphorous removal for all 24 Wessex Water sewage works within the Bristol Avon catchment.

Traditionally, each of the sewage works would require a separate discharge permit from the Environment Agency, as well as significant upfront capital investment. Delivering this scale of development and capital cost was unfeasible for Wessex Water, and would have resulted in a significant rise in customer bill prices, as well as a greater risk of the Bristol Avon catchment failing to meet its water quality targets.

Partnership initiative on a catchment scale

In order to find a more sustainable solution for the Bristol Avon, Wessex Water collaborated with the Environment Agency to develop a catchment-level discharge permit. The new permit provides the water company with a higher chance of meeting tight discharge standards, and ensuring that water quality targets in the catchment are met. It also requires less upfront investment, which maintains the affordability of customer bills.

This joined-up approach to achieving multiple benefits continues throughout the catchment, with the Bristol Avon Catchment Partnership working actively since 2012 to manage the river environment and water resources alongside stakeholder interests.

Next Steps

The catchment permit initiative is a first for the water industry. It will be trialled over a period of four years, starting in January 2017. Based on its success, similar schemes may be adopted elsewhere in the UK.



7 Flood Risk Management

7.1 Assessing additional flood risk from increased WwTW discharges

The growth in population of a settlement leads to increased volumes of treated effluent being discharged to the receiving watercourse. In situations where a large treatment works is discharging to a small watercourse, this has the potential to significantly increase peak river flows and thereby to increase downstream flood risk. An assessment has been carried out in order to identify locations where the increase in peak river flow may be significant.

7.1.1 Methodology

The following process has been used to assess the potential increased risk of flooding due to additional flow reaching each specific WwTW:

- Identify all WwTWs across Central Bedfordshire that may receive additional flows as a result of development in that area of the study site;
- Identify the points of discharge for all WwTW;
- At each outfall point, use the FEH CD-ROM v3.0 to extract the catchment descriptors for each WwTWs;
- Use the ReFH⁵² method to calculate the peak 1 in 30 (Q30) and 1 in 100 (Q100) year fluvial flows at the WwTW outfalls
- Calculate quantify a 5% increase in either the Q30 or Q100 flow as an equivalent number of additional homes having their wastewater treated and discharged via that WwTW.

7.1.2 Data collection

Datasets used to assess the risk of flooding:

- Locations of each WwTW and their associated outfalls
- Catchment Descriptors for each WwTW from FEH CD-ROM v3.0⁵³

7.1.3 Results

The assessment results indicate that the increased risk of flooding due to increased treated effluent entering rivers is unlikely to be a limiting factor on growth, with significant growth permissible within the threshold of a 5% increase on the 1 in 30 year flood flows.

Table 7-1 summarises these results.

Table 7-1: Assessing additional flood risk from increased WwTW discharges

WwTW	Existing 1 in 30 year peak river flow (m3/s)	Additional dwellings causing a 5% increase in 1 in 30 year river flow	Existing 1 in 100 year peak river flow (m3/s)	Additional dwellings causing a 5% increase in 1 in 100 year river flow
Barton Le Clay	6.0	74,400	7.9	99,800
Biggleswade	4.4	764,700	5.9	1,008,300
Chalton	45.2	3,400	59.6	5,100
Clifton	0.2	69,400	0.3	91,400
Clophill	4.1	135,300	5.4	179,300
Dunstable	8.0	5,100	10.6	8,500
Dunton	0.3	6,800	0.5	8,500
East Hyde	0.4	111,200	0.5	177,100
Everton	8.1	25,400	12.9	33,800
Flitwick	1.5	74,400	2.0	99,800

⁵² Note: ReFH2 was released in February 2015. This implements improvements which are mainly relevant to permeable and urbanised catchments. As the study catchments are not permeable or highly urbanised, and that the ReFH method is not being used to generate hydrographs in this case, ReFH1 has been used. The ReFH boundary unit in ISIS Free v3.7.0.233 was used.

⁵³ FEH CD-ROM v3.0 © NERC (CEH). © Crown copyright. © AA. 2009. All rights reserved.

WwTW	Existing 1 in 30 year peak river flow (m3/s)	Additional dwellings causing a 5% increase in 1 in 30 year river flow	Existing 1 in 100 year peak river flow (m3/s)	Additional dwellings causing a 5% increase in 1 in 100 year river flow
Haynes	4.4	255,500	5.9	362,000
Leighton Linlade	15.1	849,200	21.4	1,096,200
Marston Moretaine	50.2	179,300	64.8	238,500
Poppy Hill	10.6	255,500	14.1	362,000
Potton	15.1	94,700	21.4	123,500
Sandy	5.6	16,900	7.3	23,700
Shillington	1.0	204,700	1.4	269,000
Stanbridgeford	12.1	93,000	15.9	125,200
Tempsford	5.5	162,400	7.4	211,500
Wrestlingworth	9.6	101,500	12.5	133,600
Markyate	1.3	20,300	1.6	27,100

7.2 Assess surface water drainage

The assessment of surface water drainage capacity is a site-specific exercise which should be carried out at stage 2 of the Water Cycle Study, once sites under consideration for allocation have been established. Surface water drainage of development sites should follow the SuDS hierarchy, with preference given to on-site reuse, then discharge preferred to ground or, where this is not feasible, to surface waters. Discharge to surface water sewers and combined sewers should only be used as a last resort where no other disposal route is feasible.

7.3 Recommendations

Table 7-2: Flood risk actions

Action	Responsibility	Timescale
The increased effluent flow is not expected to cause a significant additional flood risk to any of the receiving waters therefore this aspect is not considered to be a constraint on growth. The Stage 2 WCS should check potential quantum of allocations against calculated capacity for each WwTW.	JBA / CBC	As required

8 Environmental Constraints and Opportunities

8.1 Introduction

This stage 1 analysis has focussed on identification of water-related environmental constraints and designations within Central Bedfordshire. Once potential site allocation boundaries are available at stage 2, interactive maps will be created for Central Bedfordshire, allowing these layers to be displayed 'on' or 'off' with the aim of being able to quickly identify the presence of environmental features within or close to the proposed sites. The maps should be used in conjunction with Sustainability Appraisals (SA) and/or Strategic Environmental Assessments (SEAs) when these are available.

The maps can be used to identify environmental features in close proximity to a site of proposed development and the distance between the features. The distance at which the feature becomes significant to the development of the site depends on the type, nature and potential sensitivity of different environmental designations and features. The potential adverse impacts associated with development of the sites were then considered in relation to these features, and potential environmental opportunities, such as habitat creation or recreational opportunities were also identified.

The presence of an environmental designation or feature may present a constraint to the development of the site or may require the implementation of mitigation measures to enable the development to proceed in a manner that does not have a significant adverse effect on the environment.

8.2 Data collection

Information for Central Bedfordshire was collected on a range of key environmental designations and features. This information was provided by the Environment Agency, Central Bedfordshire Council or sources from OS OpenData. Those designations and features relating to the water environment are listed in Table 8-1 below.

Table 8-1: Environmental Designations and Features

Feature	Description	Features within Central Bedfordshire
Watercourse	A river, stream or other riparian feature i.e., ditch, as shown on OS mapping.	Central Bedfordshire has several main river catchments and associated watercourses, these being, the River Ivel, River Lee (upper), and the River Ouzel.
Water Framework Directive (WFD) classification	The Water Framework Directive (WFD) requires that all 'water bodies' (rivers, lakes, estuaries, coastal waters and groundwater) achieve good ecological potential by 2015. Under the WFD, all waterbodies are classified by their current and future predicted water quality, and specifically their ecological and chemical status.	The majority of watercourses are designated as moderate, with some designated as poor e.g. Broughton Brook. Several have also been classified as good, such as New Inn Brook and Clipstone Brook.
Aquifer - Bedrock / Superficial Deposits	Underground layers of water-bearing permeable rock or drift deposits from which groundwater can be extracted. These are split into: Superficial (Drift) - permeable unconsolidated (loose) deposits. For example, sands and gravels. Bedrock - solid permeable formations e.g. sandstone, chalk and limestone. These classifications are further split into the following designations: Principle Aquifers are layers of rock or drift deposits that have high intergranular and/or fracture permeability. Secondary Aquifers include a wide range of rock layers or drift deposits with an equally wide range of water permeability and storage.	Data unavailable

Feature	Description	Features within Central Bedfordshire
Groundwater Source Protection Zones	Source Protection Zones (SPZs) are defined around large and public potable groundwater abstraction sites. The purpose of SPZs is to provide additional protection to safeguard drinking water quality through constraining the proximity of an activity that may impact upon a drinking water abstraction.	The largest groundwater source protection zones that cover Central Bedfordshire are in Zone 3. A sizeable proportion of Central Bedfordshire is also covered by Zone 2.

8.3 Results

8.3.1 Surface Water

Central Bedfordshire has 3 significant watercourses and associated catchments, the River Ivel in the north of Central Bedfordshire, the River Ouzel in the south west and the River Lee (upper) in the south. Figure 8-1 shows the Water Framework Directive overall classification of the main watercourses. The majority of the watercourses in Central Bedfordshire are moderate, with some being identified as good, and a few being identified as poor. The River Lee has been classified as poor, whilst the River Ouzel and River Ivel have been classified as moderate. Pressures on water quality include phosphorus and nitrate contamination through diffuse pollution from agricultural areas and phosphorous, ammonia and poor dissolved oxygen due to wastewater treatment processes.

Potential adverse impacts on the environment from the development of the draft allocation sites and associated water supply/sewerage infrastructure improvements include:

- Increased surface runoff and sediment loading leading to increased turbidity in receiving watercourses;
- Pollutants in chemicals and sewage effluent affecting water quality in surface waters and groundwater; and
- Increased pressure on water resources due to over-abstraction.

River corridors form natural wildlife corridors and are an important feature of the landscape in Central Bedfordshire, requiring adequate buffer zones free of development. An assessment should be made of the impact of site development on the WFD status of each waterbody that site water will drain into. The assessment should consider both water quality and quantity. Measures may need to be provided to avoid any impact on water quality or channel morphology in these waterbodies.

The Council should aim to set back development a minimum of 6m from watercourses (wider buffers of 7-8m are set by the EA regions for Main Rivers), providing buffer strip to 'make space for water' and allow additional capacity to accommodate climate change. Developments should look at opportunities for river restoration, de-culverting and river enhancement as part of the development. Such measures could provide an important contribution to the WFD objectives for the watercourse.

The following management options outline how the proposed site allocations can minimise their impact on the neighbouring watercourses by reducing both diffuse and point sources of pollution. New developments are required to attenuate surface water runoff and SuDS are the recommended approach as stated in NPPF, paragraph 51 of the Planning Practice Guidance and Building Regulations H. The implementation of SuDS schemes can:

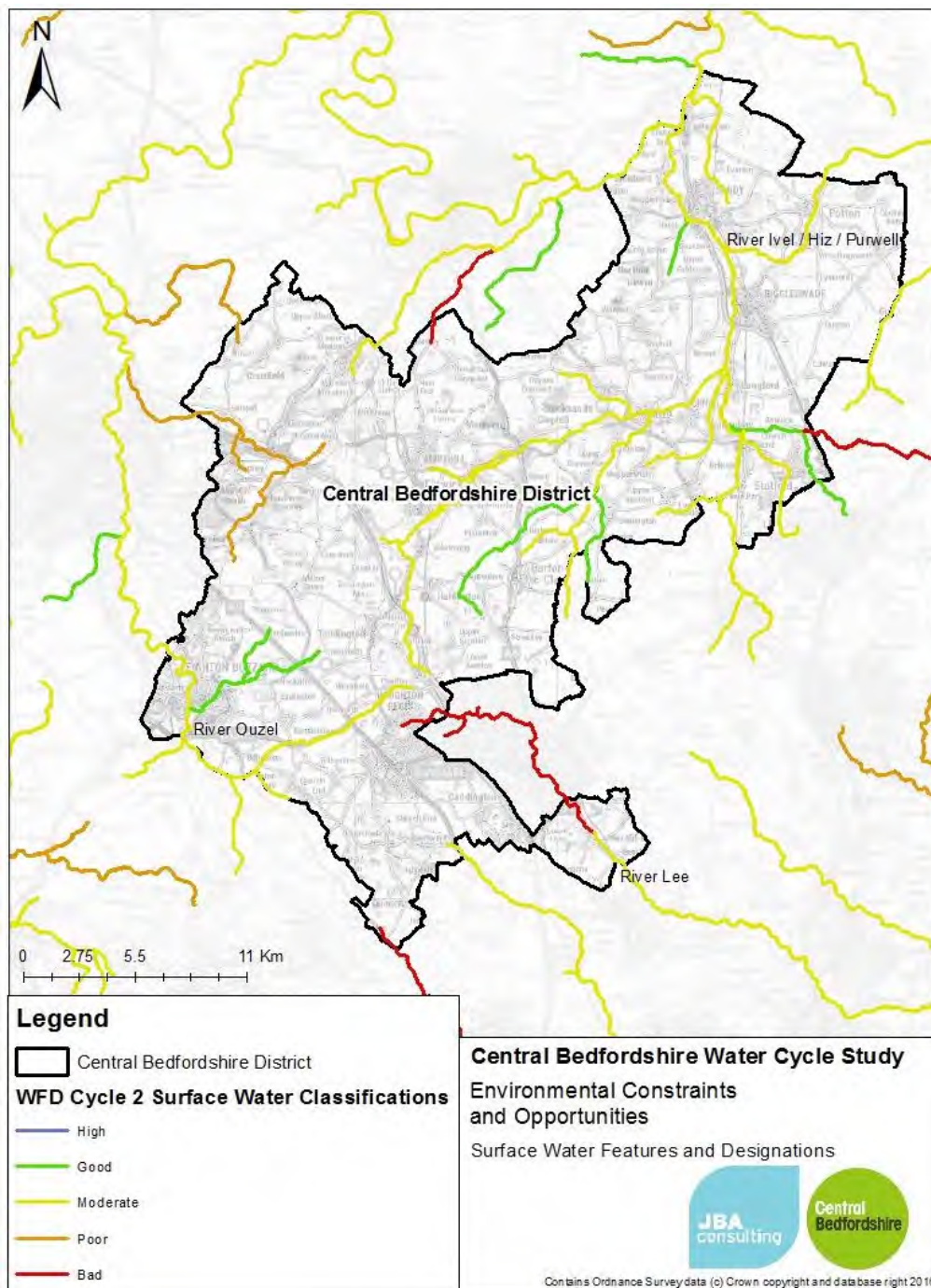
- Mitigate the impact on receiving waters by holding and treating urban surface water run-off at or near to the source;
- Slow down surface runoff during heavy rain, reducing flooding problems;
- Provide new still water (i.e., ponds and ditches) and wetland habitat to benefit biodiversity;
- Offer recreational and amenity opportunities to local residents; and
- Enhance the local landscape character.

HR Wallingford's study, 'Maximising the Ecological Benefits of Sustainable Drainage Schemes' (2003), advises that the maximum ecological benefits derived from SuDS may come from improvements to the still water aquatic environment and that the best that can often be achieved for the receiving waters is to prevent further deterioration. However, research indicates that whilst ponds and ditches may support quite rich wildlife communities, most SuDS schemes do not fulfil

their ecological potential. This is due to inappropriate design features or a lack of maintenance of the structures leading to poor water quality and domination by common plant species. The design of a SuDS scheme would need to be specific to the development site and would need to meet the topographic and hydrological characteristics present there.

Riparian buffer strips can also be provided adjacent to watercourses within the development site or along its periphery. Buffer strips provide an intermediate protection zone between developed land and areas of conservation value, restricting the flow of pollutants and preventing them from being washed from the site into the watercourse. The width of the buffer strips will depend on the size of the water body. Natural England guidance in relation to buffer strips adjacent to agricultural land states that 'Generally speaking, the wider the buffer the better the protection for the water body'.

Figure 8-1: Central Bedfordshire Surface Water Designations



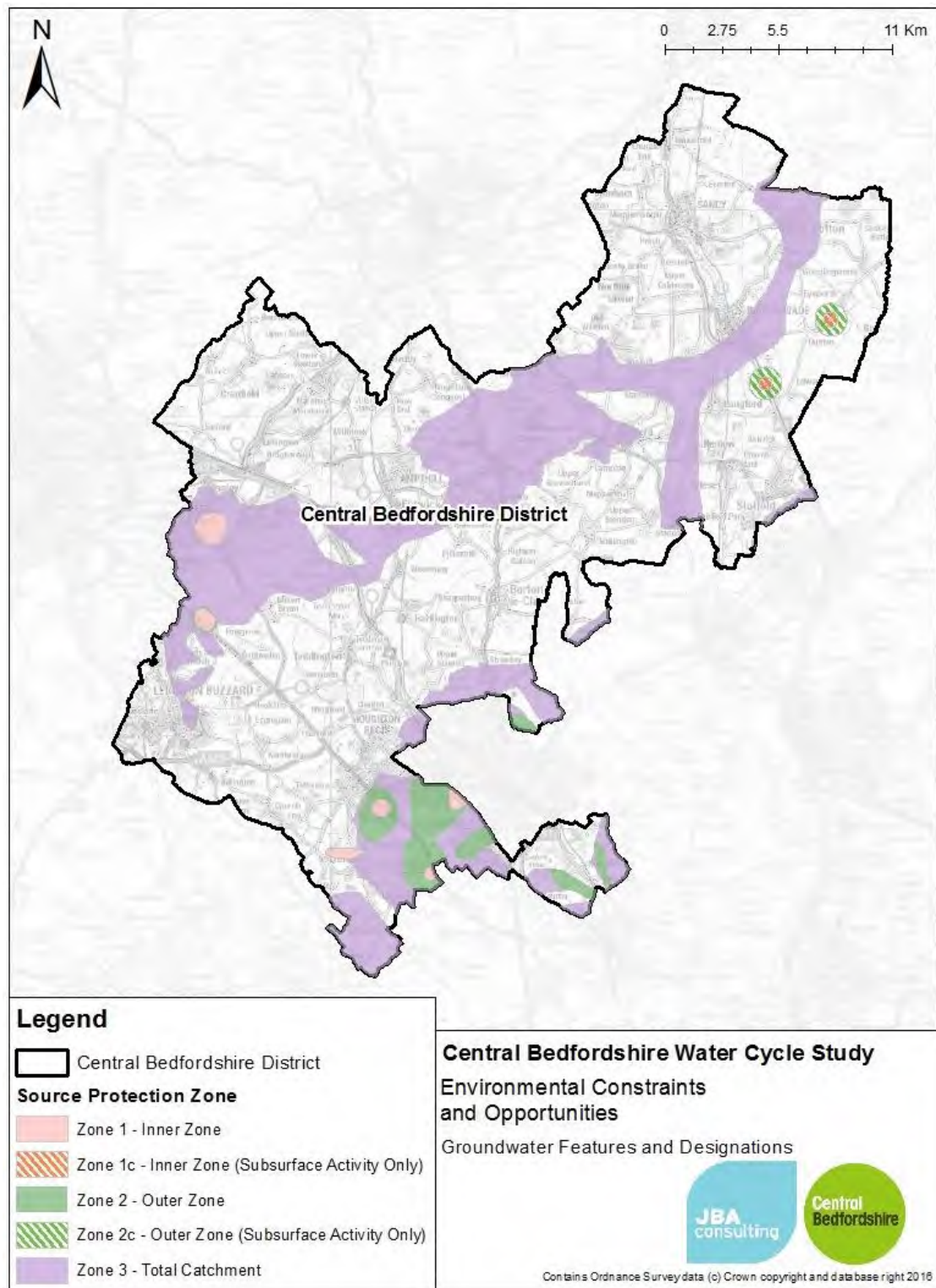
8.3.2 Groundwater

Source Protection Zones (SPZ) are distributed across 2 main bands of Central Bedfordshire. Zone 3 SPZ stretches across a band from the north-east border to the south west, where there are small areas that are covered by Zone 1c (inner zone subsurface activity only) and Zone 2c (outer zone subsurface activity only) around Wrestlingworth and Dunton in the north east. There are also 2 areas in this band of SPZ that are covered by Zone 1, located near the western border of Central Bedfordshire. The south east has also been identified as having areas covered by SPZs, particularly near the boundary of the area. These areas are predominately in Zone 3, with areas of Dunstable, Caddington and Kenworth covering SPZs in inner Zone 1 and outer Zone 2. Figure 8-2 locates the SPZs across Central Bedfordshire.

Development within a source protection zone must assess, design out or mitigate the potential impacts of human activity on groundwater. The Environment Agency's guidance⁵⁴ recommends as precautionary approach, because contamination to groundwater can have "serious or irreversible" impacts. When considering development plans, this has different implications according to the type of development. For housing and low-risk commercial development, this principally impacts where surface water is proposed to be discharged to groundwater. CBC's "Advice for the provision of surface water drainage systems for new developments" requires Source Protection Zones to be considered in a Surface Water Drainage Strategy. Further guidance on how to undertake groundwater risk assessments for SuDS is included in the CIRIA SuDS Manual.

The EA guidance sets out specific position statements for other higher-risk activities including but not limited to transport infrastructure, pipelines, oil industry facilities, petrol stations, industries handling hazardous substances and large-scale agricultural developments.

Figure 8-2: Central Bedfordshire Groundwater Designations



8.4 Opportunities

There are a number of environmental opportunities that could be used when development is being considered. Implementation of these opportunities would have the potential to help mitigate the environmental impacts of development of each site and deliver environmental benefits, particularly in relation to biodiversity and water quality. The nature and scale of any environmental benefits achieved would depend upon the site characteristics and sensitivity of the surrounding environment. These environmental opportunities are summarised in table 7-3.

Table 7-3: Environmental Opportunities and Benefits

Environmental opportunity	Potential environmental benefits
Allocation of green space for the provision of SuDS	<ul style="list-style-type: none"> • Potential to provide flood risk benefits through interception of surface runoff. • Reduced sediment loading in receiving watercourses and improved water quality. • Amenity value.
Retention and enhancement of existing water features on the site i.e., ponds, ditches and streams through creation of vegetated buffer strips.	<ul style="list-style-type: none"> • Increased biodiversity value, particularly for amphibians, invertebrates and small mammals. • Potential to provide flood risk benefits through interception of surface runoff. • Increased amenity value.
Creation of new water features on site i.e., ponds, ditches and streams.	<ul style="list-style-type: none"> • Increased biodiversity value, particularly for amphibians, invertebrates and small mammals. • Potential to provide flood risk benefits through interception of surface runoff. • Provision of amenity resource.
Terrestrial and marginal vegetation planting along river corridors to increase vegetation cover and improve water quality.	<ul style="list-style-type: none"> • Reduced river bank erosion. • Reduced water temperatures. • Increased biodiversity value, particularly for birds, invertebrates and fish. • Reduced sediment loading in receiving watercourses and improved water quality.
Planting of native broadleaved trees and retention of existing mature trees.	<ul style="list-style-type: none"> • Increased rainfall interception and reduced surface runoff. • Reduced sediment loading in receiving watercourses and improved water quality. • Increased local biodiversity, particularly in relation to birds, invertebrates and small mammals. • Increased shading and reduced heat-island effect. • Improved local air quality. • Increased amenity value.
Habitat creation and provision of amenity areas in location at risk of flooding.	<ul style="list-style-type: none"> • Maintain floodplain connectivity. • Increased biodiversity value of floodplain, particularly for birds, invertebrates and small mammals. • Reduced flood risk to people and properties. • Reduced sediment loading in receiving watercourses and improved water quality. • Increased amenity value.

8.5 Conclusions

When development is being considered for this area it is important that the potential to cause a range of adverse impacts are considered. More detailed environmental surveys and assessments may need to be required when development sites are being considered, to determine the acceptability of their development and to inform the requirement for mitigation measures. When considering areas for development, it should not be assumed that areas with few environmental features in close proximity are suitable for development. Likewise, sites with a greater amount of environmental features in close proximity should not be assumed to be unsuitable for development, as constraints could be appropriately assessed.

The potential for adverse impacts on the water environment is closely related to the presence and sensitivity of water features on, or in close proximity to development sites. Where such features exist, adequate protection measures should be implemented in the design of the development to ensure effective protection during both construction and operational phases. Such measures would include the provision of wide vegetated buffer zones adjacent to watercourses, to reduce the risk of contaminated runoff affecting river water quality and to promote aquatic biodiversity. The use of SuDS systems would promote infiltration of surface runoff and contribute to groundwater recharge, whilst also offering potential biodiversity, flood risk and amenity benefits.

Development of sites may also result in other environmental risks not specifically related to the water environment. Such effects could include the loss of, or damage to, important archaeological and heritage features, adverse impacts on terrestrial biodiversity, impacts on the setting of landscape or historic environment features, and the loss of high quality agricultural land. Development proposals for these sites would need to consider the sites wider context and planning policy.

There are also a range of potential environmental opportunities that could be delivered through any development proposals. Opportunities include enhancement of existing ecological features, such as watercourses, field margins and trees, the provision of new biodiversity habitats, and the creation of new recreational and amenity areas.

8.6 Recommendations

This study has provided a high-level appraisal of the potential environmental risks and opportunities associated with new development, the water cycle and the water environment. More detailed assessment of the environmental issues associated with the development of sites should be undertaken prior to the approval for development to commence. This should include a thorough desk study and site surveys as required to fully identify sensitive environmental features present on each site.

The following recommendations are proposed in relation to development in Central Bedfordshire:

- Consultation with Central Bedfordshire Council's ecologists and heritage officers should be undertaken in relation to the development of each site to further identify potential environmental risks and opportunities, and to determine specific requirements for mitigation measures.
- Developers should seek to maximise the water quality and amenity/ecological benefits when installing SuDS for surface water flood management. The design of SuDS schemes should be specific to each allocation site to maximise the environmental benefits derived. Careful planning of SuDS schemes in areas identified as groundwater aquifers or sensitive to groundwater contamination would be required to ensure no adverse impact on groundwater quality. However, provision of SuDS has the potential to maintain or improve groundwater recharge.
- Watercourses should be protected through the inclusion of riparian buffer strips. These zones will increase infiltration of surface runoff with potential benefits in terms of flood risks and water quality in the receiving watercourse.
- Existing water features i.e., ponds, ditches and streams should be retained as a high priority and incorporated into SuDS schemes where appropriate to maintain the aquatic biodiversity value of the sites and to provide a local source of flora and fauna that may naturally colonise new habitats.
- The removal or modification of existing river culverts should be considered where practicable in line with Environment Agency guidance. Modification of culverts has the potential to reduce flood risk due to blockages, create a more natural river bed profile and hydromorphological process, and also benefit a range of aquatic wildlife through new habitat creation or improving access to valuable habitat. Implementation of these measures could contribute towards delivery of the requirements of the Water Framework Directive.
- Good design principles should be applied to all developments, particularly those located in sensitive or protected landscapes so as to minimise the impact on landscape character and visual amenity. Design advice provided by CBC should be applied and consultation with the Council's landscape officer should be undertaken to inform the design of the development of a site.

Case study: Nutrient off-setting in the River Mease, Leicestershire

Issues

An Environment Agency review of the River Mease Special Area of Conservation (SAC) in 2009 identified a significant issue of poor water quality, due to high levels of phosphorous pollution. Phosphates were entering the river from sewage treatment works, roads and fields, causing the unsustainable growth of algae in the river and fish populations to decline. As a result, the River Mease was failing to meet the requirements of the Habitats and Water Framework Directives.



The River Mease SAC Water Quality Management Plan

To reduce the levels of phosphorous within the River Mease SAC, meet the required environmental status of the SAC, and accommodate the planned levels of housing growth, a Water Quality (Phosphate) Management Plan (WQMP) was produced.

The interests and expertise of stakeholders across the catchment were taken into account, with the plan produced in partnership with the Environment Agency, Natural England, Severn Trent Water, North West Leicestershire District Council, South Derbyshire District Council and Lichfield District Council.

Way forward

The Water Quality Management Plan aims to limit levels of phosphorous in the River Mease to 0.06mg/l, and Local Planning Authorities are reluctant to accept any further increase in wastewater entering the public sewer system. To meet these targets, developers are now required to pay into the River Mease Developer Contribution Scheme for additional wastewater produced by any new development, which in turn funds phosphorous mitigation solutions.

The Environment Agency are enforcing stricter phosphorous limits on their discharge consents for water treatment works within the SAC, and are working with Severn Trent Limited to find alternative medium to long-term solutions to managing wastewater in the River Mease catchment. These may involve higher standards of treatment or even transporting the wastewater to be treated outside the catchment.

Phosphorous levels will also be managed by mitigation measures identified in the supporting River Mease Restoration Plan, which include filtering pollutants through a strip of grassland alongside the river.

The River Mease SAC Water Quality Management Plan remains as a living document, and will be updated regularly by the key partners.

9 Climate Change Impact Assessment

9.1 Introduction and Methodology

The National Planning Policy Framework and its associated guidance⁵⁵ identifies planning as having a key role in reducing greenhouse gas emissions and in building resilience to the impacts of climate change. It requires local planning authorities to adopt proactive strategies to mitigate and adapt to climate change. Central Bedfordshire Council's climate change strategy includes a target to support the efficient use of all natural resources, including energy and water.⁵⁶ Therefore the evidence base of the Local Plan, including the Water Cycle Study, should take into consideration both the mitigation of and adaption to climate change.

A qualitative assessment has been undertaken to assess the potential impacts of climate change on the assessments made in this water cycle study. This has been done using a matrix which considered both the potential impacts of climate change on the assessment in question, and also the degree to which climate change has been considered in the information used to make the assessments contained within the WCS (see Table 9-1).

The impacts have been assessed on a whole authority area basis; the available climate models are generally insufficiently refined to draw different conclusions for different parts of Central Bedfordshire, or doing so would require a degree of detail beyond the scope of this study.

Table 9-1: Climate Change Pressure Scoring Matrix

		Impact of pressure		
		Low	Medium	High
Have climate change pressures been considered in the assessment?	Yes - quantitative consideration			
	Some consideration but qualitative only			
	Not considered			

⁵⁵ Department of Communities and Local Government (2014) Planning Practice Guidance: Climate Change. Accessed online at <https://www.gov.uk/guidance/climate-change> on 23/03/2017.

⁵⁶ Central Bedfordshire Council (2010) Climate Change Strategy. Accessed online at http://www.centralbedfordshire.gov.uk/Images/climate-strategy_tcm3-12980.pdf on 23/03/2017.

9.2 Results

Table 9-2: Scoring of Climate Change Consequences for the Water Cycle Study

Assessment	Impact of Pressure (source of information)	Have climate change pressures been considered in the assessment?	Climate Change Score
Water resources	High (1 and 2) - decrease in available supply, increase in uncertainty.	Yes - qualitative within WRMP and RMBP	
Water supply infrastructure	Medium - some increased demand in hot weather could have implications for pipe capacity and low pressure	No - not assessed	
Wastewater Collection	High - Intense summer rainfall and higher winter rainfall increases flood risk	No - not considered	
Wastewater treatment	Medium - Increased winter flows and more extreme weather events reduces flow headroom	No - not considered	
WwTW odour	Low	No - not considered	
Water quality	Nutrients: High (1) Sanitary determinands: Medium (1)	No - not considered	
Flooding from increased WwTW discharge	Low	No - not considered	

Sources:

(1) River Basin Management Plans for the Thames and Anglian regions.

(2) Anglian Water and Affinity Water Final Water Resource Management Plans, 2014

9.3 Recommendations

Table 9-3: Climate Change Actions

Action	Responsibility	Timescale
When undertaking detailed assessments of environmental or asset capacity, consider how the latest climate change guidance can be included.	EA, TW, AW, Affinity Water, CBC	As required
Take "no regrets" decisions in the design of developments which will contribute to mitigation and adaptation to climate change impacts. For example, consider surface water exceedance pathways when designing the layout of developments.	CBC, Developers	As required

10 Summary and Recommendations

10.1 Water Cycle Study summary

The Water Cycle Study has been carried out in cooperation with the Environment Agency, Affinity Water, Anglian Water and Thames Water. The overall assessment is that no strategic-scale water or wastewater constraints on growth have been identified within Central Bedfordshire. In all settlements, there is either evidence that additional infrastructure is likely to be required to accommodate growth, or insufficient evidence to prove that it will not. However, with two exceptions, (wastewater treatment at Caddington and Studham), the water and wastewater utilities have not identified any major technical constraints which could not be addressed given sufficient notice of development. In the case of Caddington, it is not known whether increasing a wastewater discharge to groundwater would be feasible. Studham has a similar issue, as well as space constraints on the existing treatment works site. These may be significant constraints at these locations, however potential solutions do exist if these are selected for significant development, for example wastewater could be pumped to a neighbouring treatment works.

Modelling for six treatment works (Barton Le Clay, Chalton, Dunstable, Markyate, Shillington, and Tempsford) indicate that the receiving watercourse is already classed as “Bad” and therefore no further deterioration should be allowed. It is therefore anticipated that all growth in these catchments would need to be phased to enable time for upgrades to be implemented.

Table 10-1 summarises the findings to date. The results are also presented in plan format in Maps 1 to 6.

How to use this table:

- Results have been summarised by WwTW catchment area, as these have quantified capacity assessments associated with them. The settlements served within each catchment are identified. For, for example, in the case of Biggleswade WwTW, the analysis indicates that the WwTW has a capacity for 620 homes before deterioration to the watercourse would be expected to occur and an upgrade of the WwTW may be required. This would be 620 homes in Biggleswade or in any of the other settlements served by that WwTW (Upper Caldecote, Ickwell Green, Northhill, Thorncote Green).
- There are three measures of available capacity at each WwTW: flow, water quality and flood risk. Development exceeding the lowest of the three measures would be expected to require improvements to the treatment works to increase its capacity and/or set a tighter quality consent to prevent water quality deterioration in the river. This does not mean that development should be avoided in that settlement, only that it will likely require an upgrade to wastewater treatment, and sufficient time should be allowed in the profiling of development to enable upgrades to be completed before capacity limits are exceeded.
- Capacity at WwTWs is expressed as a number of equivalent dwellings. Where only housing development is proposed, this would be the number of dwellings. Where employment growth is also planned, allowance should also be made for the increase in wastewater from employment sites, the quantity of which can vary significantly depending upon the type of development.
- Anglian Water, Affinity Water and Thames Water declined, at this stage, to provide a Red/Amber/Green (RAG) assessment of available capacity. For clarity of presentation, a RAG scoring has been applied by JBA in Table 10-1 using the following descriptions:

There is evidence of some capacity to accommodate moderate* growth using existing infrastructure, or a plan in place to accommodate anticipated levels of growth.	Significant infrastructure upgrade likely to be required or no evidence of capacity to accommodate moderate growth using existing infrastructure. No technical or timescale constraints to delivery identified.	Significant infrastructure upgrade likely to be required or no evidence of capacity to accommodate moderate growth using existing infrastructure. Technical or timescale constraints to delivery have been identified
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* “Moderate growth” is used subjectively here to describe growth relative to the existing scale of a settlement. Typically, it would lead to an additional peak demand on water and wastewater services of 10% or lower.

A “red” assessment for a catchment does not imply that growth could not be accommodated within that area, but points out that constraints have been identified which are expected to make the

provision of infrastructure more technically challenging, more costly or to take longer than in other locations.

Table 10-1: Summary of stage 1 capacity assessments

WwTW catchment	Settlements served in CBC	Local Plan area (see Figure 3-1)	Does WwTW serve other LPAs?	Water Utility	Water resource capacity comments	Water supply capacity comments	Waste water Utility	Sewerage capacity comments	WwTW capacity (equivalent dwellings)			Overall conclusion
									Flow capacity headroom in current WwTW	Capacity in watercourse without causing a deterioration in water quality	Capacity in watercourse without significant increase in flood risk.	
Barton Le Clay	Barton Le Clay Church End	A	No	Anglian Water	DCLG growth forecasts are greater than what has been planned for in the Anglian and Affinity Water WRMPs. However, the WRMP planning process is able to identify and address these changes in proposed demand.	No information available at this stage	Anglian Water	No information available at this stage	187	0	74,400	Existing WwTW is close to capacity. No major constraints to providing new assets identified.
Bedford	Duck End Houghton Conquest How End	C	Yes - Bedford	Anglian Water	As above.	No information available at this stage	Anglian Water	No information available at this stage	Not assessed	Not assessed	Not assessed	Would require a joint assessment with Bedford BC if significant growth planned. No major constraints to providing new assets identified.
Biggleswade	Biggleswade Ickwell Green	B	No	Anglian Water	As above.	No information available at this stage	Anglian Water	No information available at this stage	3272	620	764,700	Capacity for growth within

WwTW catchment	Settlements served in CBC	Local Plan area (see Figure 3-1)	Does WwTW serve other LPAs?	Water Utility	Water resource capacity comments	Water supply capacity comments	Waste water Utility	Sewerage capacity comments	WwTW capacity (equivalent dwellings)			Overall conclusion
									Flow capacity headroom in current WwTW	Capacity in watercourse without causing a deterioration in water quality	Capacity in watercourse without significant increase in flood risk.	
	Lower Caldecote Northhill Thorncote Green Upper Caldecote					stage		stage				existing wastewater treatment works. No major constraints to providing new assets identified.
Caddington	Caddington Aley Green Pepperstock Slip End Woodside	A	Yes - small area of Dacorum	Affinity Water	As above.	No information available at this stage	Thames Water	Capacity is limited in Caddington, appears adequate in Slip End.	Not assessed	Not assessed as WwTW discharges to groundwater. Site-specific assessment required to assess the feasibility of expanding treatment at this works.	Not assessed	Requires a site-specific assessment or consider transfer of wastewater to another catchment.
Chalton	Chalton Fancott Streatley Toddington	A	Yes – small area of Luton	Affinity Water	As above.	No information available at this stage	Thames Water	No data of sewer capacity is available in Streatley. Luton WCS assessed approx. 4,000 homes in Houghton Regis North and North of Luton connecting to Chalton. No assessment of sewerage capacity	1416	0	3,400	Water quality assessment indicates upgrade to wastewater treatment is likely to be required to prevent deterioration to the watercourse No major constraints to

WwTW catchment	Settlements served in CBC	Local Plan area (see Figure 3-1)	Does WwTW serve other LPAs?	Water Utility	Water resource capacity comments	Water supply capacity comments	Waste water Utility	Sewerage capacity comments	WwTW capacity (equivalent dwellings)			Overall conclusion
									Flow capacity headroom in current WwTW	Capacity in watercourse without causing a deterioration in water quality	Capacity in watercourse without significant increase in flood risk.	
								has been made available.				providing new assets identified.
Clifton	Broom Campton Chicksands Clifton Henlow, Old Warden Shefford Southill Stanford	D	No	Affinity Water	As above.	No information available at this stage	Anglian Water	No information available at this stage	343	1,500	69,400	Existing WwTW has limited capacity. No major constraints to providing new assets identified.
Clophill	Clophill Maulden Silsoe	D	No	Anglian Water	As above.	No information available at this stage	Anglian Water	No information available at this stage	2442	150	135,300	Existing WwTW has limited capacity. No major constraints to providing new assets identified.
Cotton Valley	Aspley Guise Aspley Heath Brogborough Husband Crawley Ridgemont Woburn	C	Yes – Milton Keynes	Anglian Water	As above.	No information available at this stage	Anglian Water	No information available at this stage	Not assessed	Not assessed	Not assessed	Would require a joint assessment with MKBC if significant growth planned. No major constraints to providing new assets identified.

WwTW catchment	Settlements served in CBC	Local Plan area (see Figure 3-1)	Does WwTW serve other LPAs?	Water Utility	Water resource capacity comments	Water supply capacity comments	Waste water Utility	Sewerage capacity comments	WwTW capacity (equivalent dwellings)			Overall conclusion
									Flow capacity headroom in current WwTW	Capacity in watercourse without causing a deterioration in water quality	Capacity in watercourse without significant increase in flood risk.	
Dunstable	Dunstable Houghton Regis	A	Yes – small area of Luton	Affinity Water		No information available at this stage	Anglian Water	Luton WCS assessed approx. 3,542 homes in Houghton Regis North connecting to Dunstable. No information available from AW at this stage. TW report limited capacity	8808	0	5,100	Water quality assessment indicates upgrade to wastewater treatment is required to prevent deterioration to the watercourse. No major constraints to providing new assets identified.
Dunton	Dunton	B	No	Anglian Water	As above.	No information available at this stage	Anglian Water	No information available at this stage	160	Not assessed	6,800	Existing WwTW has limited capacity. No major constraints to providing new assets identified.
East Hyde	Hyde	A	Yes - Predominantly serves Luton	Affinity Water	As above.	No information available at this stage	Thames Water	Sewer capacity in Hyde village appears adequate. Luton WCS foresees planned growth being accommodated	22,531	Not assessed	111,200	Capacity for growth within existing wastewater treatment works. No major constraints to providing new assets

WwTW catchment	Settlements served in CBC	Local Plan area (see Figure 3-1)	Does WwTW serve other LPAs?	Water Utility	Water resource capacity comments	Water supply capacity comments	Waste water Utility	Sewerage capacity comments	WwTW capacity (equivalent dwellings)			Overall conclusion
									Flow capacity headroom in current WwTW	Capacity in watercourse without causing a deterioration in water quality	Capacity in watercourse without significant increase in flood risk.	
												identified.
Everton	Everton	D	No	Anglian Water	As above.	No information available at this stage	Anglian Water	No information available at this stage	244	Not assessed	25,400	Existing WwTW has limited capacity. No major constraints to providing new assets identified.
Flitwick	Ampthill Eversholt Fliton Flitwick Greenfield Harlington Pulloxhill Steppingley Tingrith Wardhedges Westoning	C	No	Anglian Water	As above.	No information available at this stage	Anglian Water	No information available at this stage	16491	1,200	74,400	Capacity for growth within existing wastewater treatment works. No major constraints to providing new assets identified.
Haynes	Haynes	D	No	Anglian Water	As above.	No information available at this stage	Anglian Water	No information available at this stage	423	Not assessed	255,500	Existing WwTW has limited capacity. No major constraints to providing new assets identified.

WwTW catchment	Settlements served in CBC	Local Plan area (see Figure 3-1)	Does WwTW serve other LPAs?	Water Utility	Water resource capacity comments	Water supply capacity comments	Waste water Utility	Sewerage capacity comments	WwTW capacity (equivalent dwellings)			Overall conclusion
									Flow capacity headroom in current WwTW	Capacity in watercourse without causing a deterioration in water quality	Capacity in watercourse without significant increase in flood risk.	
Letchworth	Fairfield Park	B	Yes – predominantly serves North Herts	Affinity Water	As above.	No information available at this stage	Anglian Water	No information available at this stage	Not assessed	Not assessed	Not assessed	Would require a joint assessment with North Herts Council if significant growth planned. No major constraints to providing new assets identified.
Leighton Linlade	Linslade Leighton Buzzard Heath and Reach Leedon	A	No	Anglian Water	As above.	AW have identified completed or planned upgrades to accommodate growth plans	Anglian Water	No information available at this stage	9680	760	849,200	Capacity for growth within existing wastewater treatment works. No major constraints to providing new assets identified.
Markyate	Kensworth	A	Yes - Markyate and Flamstead within Dacorum	Affinity Water	As above.	No information available at this stage	Anglian Water	Sewer capacity in Kensworth appears adequate	Not assessed	0	Not assessed	Would require a joint assessment with Dacorum Council if significant growth planned. No major constraints to providing new

WwTW catchment	Settlements served in CBC	Local Plan area (see Figure 3-1)	Does WwTW serve other LPAs?	Water Utility	Water resource capacity comments	Water supply capacity comments	Waste water Utility	Sewerage capacity comments	WwTW capacity (equivalent dwellings)			Overall conclusion
									Flow capacity headroom in current WwTW	Capacity in watercourse without causing a deterioration in water quality	Capacity in watercourse without significant increase in flood risk.	
												assets identified.
Marston Moretaine	Cranfield Lidlington Marston Moretaine Shelton Upper and Lower	C	No	Anglian Water	As above.	No information available at this stage	Anglian Water	No information available at this stage	2,971	Not assessed	179,300	Capacity for growth within existing wastewater treatment works. No major constraints to providing new assets identified.
Millbrook	Millbrook	C	No	Anglian Water	As above.	No information available at this stage	Anglian Water	No information available at this stage	Not assessed	Not assessed	Not assessed	Limited information available for this small catchment. No major constraints to providing new assets identified.
Milton Bryan	Milton Bryan	A	No	Anglian Water	As above.	No information available at this stage	Anglian Water	No information available at this stage	Not assessed	Not assessed	Not assessed	Limited information available for this small catchment. No major constraints to providing new assets identified.

WwTW catchment	Settlements served in CBC	Local Plan area (see Figure 3-1)	Does WwTW serve other LPAs?	Water Utility	Water resource capacity comments	Water supply capacity comments	Waste water Utility	Sewerage capacity comments	WwTW capacity (equivalent dwellings)			Overall conclusion
									Flow capacity headroom in current WwTW	Capacity in watercourse without causing a deterioration in water quality	Capacity in watercourse without significant increase in flood risk.	
Poppy Hill	Arlesey Langford Stotfold	B	No	Anglian Water	As above.	No information available at this stage	Anglian Water	No information available at this stage	1,375	240	255,500	Water quality assessment indicates upgrade to wastewater treatment is likely to be required to prevent deterioration to the watercourse. No major constraints to providing new assets identified.
Potton	Potton Sutton	B	No	Anglian Water	As above.	No information available at this stage	Anglian Water	No information available at this stage	1,996	80	94,700	Water quality assessment indicates upgrade to wastewater treatment is likely to be required to prevent deterioration to the watercourse. No major constraints to providing new assets identified.

WwTW catchment	Settlements served in CBC	Local Plan area (see Figure 3-1)	Does WwTW serve other LPAs?	Water Utility	Water resource capacity comments	Water supply capacity comments	Waste water Utility	Sewerage capacity comments	WwTW capacity (equivalent dwellings)			Overall conclusion
									Flow capacity headroom in current WwTW	Capacity in watercourse without causing a deterioration in water quality	Capacity in watercourse without significant increase in flood risk.	
Sandy	Beeston Sandy	B	No	Anglian Water	As above.	No information available at this stage	Anglian Water	No information available at this stage	910	340	16,900	Capacity for growth within existing wastewater treatment works. No major constraints to providing new assets identified.
Shillington	Apsley End Lower Stondon Meppershall Shillington Upper Gravenhurst	D	Yes - possibly from North Herts	Anglian Water	As above.	No information available at this stage	Anglian Water	No information available at this stage	1992	0	204,700	Water quality assessment indicates upgrade to wastewater treatment is likely to be required to prevent deterioration to the watercourse. No major constraints to providing new assets identified.
Stanbridgeford	Billington Eaton Bray Eggington Hockliffe Lower End Standbridge Stanbridgeford	A	Yes - Aylesbury Vale	Anglian Water (Affinity Water in Church End and Tottern-	As above.	No information available at this stage	Anglian Water	No information available at this stage	-1482	430	93,000	Existing WwTW is at capacity. No major constraints to providing new assets

WwTW capacity (equivalent dwellings)												
WwTW catchment	Settlements served in CBC	Local Plan area (see Figure 3-1)	Does WwTW serve other LPAs?	Water Utility	Water resource capacity comments	Water supply capacity comments	Waste water Utility	Sewerage capacity comments	Flow capacity headroom in current WwTW	Capacity in watercourse without causing a deterioration in water quality	Capacity in watercourse without significant increase in flood risk.	Overall conclusion
	Tilsworth Tobworth Totterhoe			hoe)								identified.
Studham	Studham Whipsnade	A	No	Affinity Water	As above.	No information available at this stage	Thames Water	No data of sewer capacity is available in Studham. Sewer capacity appears adequate in Whipsnade	Very limited capacity. Growth would be likely to require an upgrade. Upgrades may require land purchase as there is very little spare land on site for additional process units. Alternatively, transfer of wastewater to another treatment works may be considered.	Not assessed as WwTW discharges to groundwater. Site-specific assessment required to assess the feasibility of expanding treatment at this works.	Not assessed	Requires a site-specific assessment or, given the limits of space on the existing treatment works, consider transfer of wastewater to another catchment.
Tempsford	Blunham Moggerhanger Tempsford	B	Yes - possibly from Bedford	Anglian Water	As above.	No information available at this stage	Anglian Water	No information available at this stage	884	0	162,400	Water quality assessment indicates upgrade to wastewater treatment is likely to be required to prevent deterioration to the watercourse No major constraints to

WwTW catchment	Settlements served in CBC	Local Plan area (see Figure 3-1)	Does WwTW serve other LPAs?	Water Utility	Water resource capacity comments	Water supply capacity comments	Waste water Utility	Sewerage capacity comments	WwTW capacity (equivalent dwellings)			Overall conclusion
									Flow capacity headroom in current WwTW	Capacity in watercourse without causing a deterioration in water quality	Capacity in watercourse without significant increase in flood risk.	
												providing new assets identified.
Upper Sundon	Upper Sundon	A	No	Anglian Water	As above.	No information available at this stage	Anglian Water (most sewers Thames Water)	No information available at this stage	Not assessed	Not assessed	Not assessed	Limited information available for this small catchment. No major constraints to providing new assets identified.
Wrestlingworth	Wrestlingworth	B	No	Anglian Water	As above.	No information available at this stage	Anglian Water	No information available at this stage	206	Not assessed	101,500	Existing WwTW is close to capacity. No major constraints to providing new assets identified.

10.2 Timescales for implementing water and wastewater infrastructure upgrades

At this stage 1, where the extent to which potential growth may exceed the existing capacity of the water and wastewater systems, it is not possible to identify what solutions may be implemented to address this. The timescale required to implement any specific infrastructure upgrade will depend on many site-specific factors, including but not limited to the scale of works, engineering complexity, planning and environmental constraints, negotiation of land purchase, access and wayleave, ground conditions and traffic conditions.

It is beyond the scope of this water cycle study to assess the timescales required to make individual infrastructure upgrades, however, Table 10-2, developed with advice from water companies, provides indicative timescales for different types and sizes of upgrade:

Table 10-2: Indicative timescales for implementing water infrastructure upgrades

Infrastructure type	Trigger for water company to assess requirements and develop plans	Indicative project timescales for infrastructure upgrades or other interventions	
		Minor	Major
Water resources	Publication of LPA Local Plans and associated updates	Demand management measures, minor new resource e.g. borehole: 3-5 years	New strategic asset e.g. water reuse plant, reservoir: 5-20 years
Water supply	Pre-development enquiries Planning applications	Localised supply pipe upgrades: 1-2 years	New supply mains, boosters, service reservoirs, treatment works 3-5 years
Wastewater treatment	Pre-development enquiries Planning applications	Minor upgrade of existing treatment works: 2-4 years	Major upgrade or new treatment works 3-5 years
Sewerage	Pre-development enquiries Planning applications	Localised sewerage upgrades: 1-3 years	New collector sewers or other strategic assets: 3-5 years

As is emphasised throughout this study, early developer engagement with water companies is essential to ensure that water and wastewater providers have adequate time to provide infrastructure upgrades required to accommodate growth.

10.3 Safeguarding of sites

The three water and wastewater utilities, Affinity Water, Anglian Water and Thames Water were asked whether there are any sites within Central Bedfordshire which they would seek to have safeguarded from further development in the Local Plan, in order to protect the site for potential future strategic water and wastewater assets. No sites have been identified as requiring safeguarding at this stage.

10.4 Recommendations

Aspect	Action	Responsibility	Timescale
Water resources	Review population and housing growth forecasts within the Affinity Water WRZ 3 (Lee)	Affinity Water, CBC	ASAP
	Continue to regularly review forecast and actual household growth across the supply region through WRMP Annual Update reports, and where significant change is predicted, engage with Local Planning Authorities.	Anglian Water, Affinity Water	Ongoing
	Provide yearly profiles of projected housing growth to water companies to inform the WRMP update.	CBC and other LPAs in the Ruthamford South (Anglian) and WRZ 3 Lee (Affinity) zones	Ongoing
	Use planning policy to require the 110l/person/day water consumption target permitted by National Planning Policy Guidance in water-stressed areas. This applies across	CBC	In draft Local Plan

Aspect	Action	Responsibility	Timescale
	Central Bedfordshire as the whole authority area is classed as an area of "serious" water stress.		
	Consider whether planning policy can be used to require or encourage the adoption of even lower water consumption, for example by use of rainwater harvesting or grey-water reuse.	CBC	In draft Local Plan
	Water companies should advise CBC of any strategic water resource infrastructure developments within Central Bedfordshire, where these may require safeguarding of land to prevent other type of development occurring. However, at present, no major potential schemes have been identified within the CBC boundary.	Anglian Water, Affinity Water, CBC	In draft Local Plan
Water supply	Assess the capacity of water supply networks to serve draft allocation sites identified by CBC in the stage 2 WCS.	CBC Anglian Water Affinity Water	Early 2017
	Take into account water supply infrastructure constraints in phasing development in partnership with Anglian Water and Affinity Water	CBC Anglian Water Affinity Water	Ongoing
	Anglian Water and Affinity Water to continue to assess growth demands as part of their water asset planning activities and feedback to CBC where concerns arise.	Anglian Water Affinity Water	Ongoing
	Anglian Water, Affinity Water and developers will be expected to work closely and early-on in the planning promotion process to determine water supply requirements to proposed developments	Anglian Water, Affinity Water and Developers	Ongoing
Sewerage	Take into account sewerage infrastructure constraints in phasing development in partnership with Anglian Water and Thames Water	CBC	Ongoing
	Anglian Water and Thames Water to continue to assess growth demands as part of their wastewater asset planning activities and feedback to CBC where concerns arise.	AW and TW	Ongoing
	Anglian Water, Thames Water and developers will be expected to work closely and early-on in the planning promotion process to develop an outline Drainage Strategy for the site. The Outline Drainage Strategy should set out sufficient detail to determine the likely timescales for the delivery of the infrastructure and the likely costs of the infrastructure. The Outline Drainage Strategy should be submitted as part of the planning application submission, and where required, used as a basis for a drainage planning condition to be set.	AW, TW and Developers	Ongoing
	Developers will be expected to show that surface water from a site will be disposed using a sustainable drainage system (SuDS) with connection to sewer seen as the last option.	Developers, CBC (as LLFA)	Ongoing
Wastewater treatment	Central Bedfordshire Council should consider the available headroom at each settlement when assigning draft site allocations.	CBC	Local Plan preparation

Aspect	Action	Responsibility	Timescale
	Further analysis will be undertaken in the Stage 2 Assessment when development numbers are provided from Central Bedfordshire Council.	CBC, AW, TW	Local Plan preparation
Water quality	Central Bedfordshire Council should consider the available environmental capacity at each settlement when assigning draft site allocations.	CBC	Local Plan preparation
	Further analysis will be undertaken in the Stage 2 Assessment when development numbers are provided from Central Bedfordshire Council. This should include groundwater impact assessments if significant development is proposed at Caddington, Slip End, Studham or Whipsnade.	CBC	Local Plan preparation
Environmental impacts and opportunities	Consultation with Central Bedfordshire ecologists and heritage officers should be undertaken in relation to the development of each site to further identify potential environmental risks and opportunities, and to determine specific requirements for mitigation measures.	Developers	Early in the site master-planning
	Developers should seek to maximise the water quality and amenity/ecological benefits when installing SuDS for surface water flood management. The design of SuDS schemes should be specific to each allocation site to maximise the environmental benefits derived. Careful planning of SuDS schemes in areas identified as groundwater aquifers or sensitive to groundwater contamination would be required to ensure no adverse impact on groundwater quality. However, provision of SuDS has the potential to maintain or improve groundwater recharge.	Developers	Early in the site master-planning
	Watercourses should be protected through the inclusion of riparian buffer strips. These zones will increase infiltration of surface runoff with potential benefits in terms of flood risks and water quality in the receiving watercourse.	Developers	Early in the site master-planning
	Existing water features i.e., ponds, ditches and streams should be retained as a high priority and incorporated into SuDS schemes where appropriate to maintain the aquatic biodiversity value of the sites and to provide a local source of flora and fauna that may naturally colonise new habitats.	Developers	Early in the site master-planning
	The removal or modification of existing river culverts should be considered where practicable in line with Environment Agency guidance. Modification of culverts has the potential to reduce flood risk due to blockages, create a more natural river bed profile and hydromorphological process, and also benefit a range of aquatic wildlife through new habitat creation or improving access to valuable habitat. Implementation of these measures could contribute towards delivery of the requirements of the Water Framework Directive.	Developers	Early in the site master-planning
	Good design principles should be applied to all developments, particularly those located in sensitive or protected landscapes so as to minimise the impact on landscape character and visual amenity. Design advice provided by CBC	Developers	Early in the site master-planning

Aspect	Action	Responsibility	Timescale
	should be applied and consultation with the Council's landscape officer should be undertaken to inform the design of the development of a site.		
Climate change	When undertaking detailed assessments of environmental or asset capacity, consider how the latest climate change guidance can be included.	EA, TW, AW, Affinity Water, CBC	As required
	Take "no regrets" decisions in the design of developments which will contribute to mitigation and adaptation to climate change impacts. For example, consider surface water exceedance pathways when designing the layout of developments.	CBC, Developers	As required

10.5 Conclusion

This Stage 1 WCS has been prepared at an early stage in the development of the Local Plan. The revised housing need figure for Central Bedfordshire is currently being defined and any unmet need arising from neighbouring local authorities has yet to be agreed through the plan making process. This Stage 1 report has therefore not been informed by future growth requirements in Central Bedfordshire. Stage 2 of the WCS will be prepared in parallel with the new Local Plan and this next stage will consider the scale of growth being proposed in Central Bedfordshire and the sites selected to deliver this growth.

The key activities at Stage 2 will include:

- Further engagement with the Environment Agency, Anglian Water, Affinity Water and Thames Water.
- Quantification of potential growth at the settlement and wastewater treatment scale, along with sensitivity scenarios.
- A review of the forecast quantum of growth against the stage 1 water resources assessment.
- Assessment of the impacts of the potential allocation sites on water supply, wastewater collection systems, wastewater treatment and on the water quality impact in receiving waters.
- Where major constraints are identified, outline potential solutions to deliver infrastructure, and the timescales required.