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West Oxfordshire Water Cycle Study: Phase 1 scoping study

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GLOSSARY OF ACRONYMS AND ABBREVIATIONS	
Abbreviation	Description
ALS	Abstraction Licensing Strategy
AMP	Asset Management Plan
BAP	Biodiversity Action Plan
BGS	British Geological Society
BOD	Biochemical Oxygen Demand
BREEAM	Building Research Establishment Environmental Assessment Method
CAMS	Catchment Abstraction Management Strategy
CBA	Cost Benefit Analysis
CFMP	Catchment Flood Management Plan
CIL	Community Infrastructure Levy
CIRIA	Construction Industry Research and Information Association
CLG	Communities and Local Government
CRC	Carbon Reduction Commitment
CSH	Code for Sustainable Homes
DEFRA	Department for Environment, Food and Rural Affairs
DO	Dissolved Oxygen
DPD	Development Plan Document
DWF	Dry Weather Flow
DWI	Drinking Water Inspectorate
EA	Environment Agency
EIB	European Investment Bank
FMfSW	Flood Maps for Surface Water
GI	Green Infrastructure
GWR	Greywater Recycling
HA	Highways Agency
HMWB	Heavily Modified Water Body (under the Water Framework Directive)
l/h/d	Litres/head/day (a water consumption measurement)
LCT	Limits of Conventional Treatment

GLOSSARY OF ACRONYMS AND ABBREVIATIONS	
Abbreviation	Description
LDDs	Local Development Documents
LDF	Local Development Framework
LFE	Low Flow Enterprise (low flow model)
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
Ml	Mega Litre (a million litres)
NE	Natural England
NH4	Ammonium
NPPF	National Planning Policy Framework
OCC	Oxfordshire County Council
OFWAT	The Water Services Regulation Authority (formerly the Office of Water Services)
OR	Occupancy Rate
P	Phosphorous
PE	Population Equivalent
Q95	The river flow exceeded 95% of the time
RAG	Red/Amber/Green Assessment
RBMP	River Basin Management Plan
RoC	Review of Consents (under the Habitats Directive)
RQP	River Quality Planning (tool)
RWH	Rainwater Harvesting
SAC	Special Area for Conservation
SFRA	Strategic Flood Risk Assessment
SPA	Special Protection Area
SPD	Supplementary Planning Document
SPZ	Source Protection Zone
SS	Suspended Solids
SSSI	Site of Special Scientific Interest
STW	Severn Trent Water
SUDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan

GLOSSARY OF ACRONYMS AND ABBREVIATIONS	
Abbreviation	Description
TWUL	Thames Water
UKCIP02	United Kingdom Climate Impacts Programme 2002
UKCP09	United Kingdom Climate Projections 2009
UKTAG	United Kingdom Technical Advisory Group (to the WFD)
UKWIR	United Kingdom Water Industry Research group
UWWTD	Urban Wastewater Treatment Directive
WCS	Water Cycle Study
WFD	Water Framework Directive
WN	Water Neutrality
WODC	West Oxfordshire District Council
WRMP	Water Resource Management Plan
WRMU	Water Resource Management Unit (in relation to CAMS)
WRZ	Water Resource Zone (in relation to a water company's WRMP)
WSI	Water Services Infrastructure
WTW	Water Treatment Works
WwTW	Waste Water Treatment Works

Executive Summary

Background

West Oxfordshire District Council (WODC) is preparing a new Local Plan to 2031 and requires supporting evidence in relation to the water environment. In response to consultation on the draft Local Plan 2015, the Environment Agency has requested further investigation into foul water treatment capacity to ensure growth in the district does not impact on water quality. In addition, the District falls within an area of demonstrable 'water stress' and planned growth (in addition to other pressures) is forecast to lead to a supply demand deficit within the next ten years.

A Scoping Water Cycle Study (WCS) has been commissioned to form an evidence base for further decision-making on the water environment within the planning process and to ensure the Local Plan meets with the requirements of the National Planning Policy Framework (NPPF) with respect to the water environment and water infrastructure provision.

The West Oxfordshire Local Plan divides the district into 5 sub-areas around the main settlements; Witney, Carterton, Chipping Norton, Eynsham-Woodstock and Burford-Charlbury. Target growth numbers have been allocated to each of the five sub-areas to meet the district's housing and employment need in addition to new homes to help meet unmet need in the City of Oxford.

Water Environment Key Findings

- The majority of the district drains into the Rivers Cherwell, Windrush and Evenlode. The Evenlode in particular has a high conservation value with a number of SSSIs directly linked to the river environment.

- All surface water bodies in the district which are classified under the Water Framework Directive (WFD) have been reviewed to summarise their status related to physico-chemical indicators and any identified influencing factors of not achieving good status as required by the WFD. The majority of waterbodies in the district are not currently achieving good status with around a quarter at poor or bad status. Water industry activity is identified as a suspected influence of preventing Good status combined with agricultural runoff in the majority of cases, although it is rarely confirmed as a cause.

- The Chil and Limb Brooks watercourse has been identified in the Scoping WCS as having poor or bad status for ammonia, Disolved Oxygen (DO) and phosphate with sewerage discharge confirmed as the factor preventing ammonia achieving good status and probable it is preventing DO and phosphate achieving good status.

- West Oxfordshire has a number of Sites of Special Scientific Interest (SSSI) with water dependant species as identified in the Scoping WCS. A more detailed ecological assessment would be required to determine whether growth may have a detrimental impact on any of these sites.

- The main source of flooding in West Oxfordshire is from rivers and in some cases high water tables and springs. New development must maintain areas of functional flood plain storage currently providing protection to the larger settlements in the district and the City of Oxford.

- Significant expansion of urban areas into greenfield sites must consider the impact on surface water management; maximising the use of Sustainable Drainage Systems (SuDS) in new developments to help improve water quality, water reuse and relieve pressure on the sewerage network.

Water Resources and Supply Key Findings

- The majority of consumptive water abstraction for public water supply is abstracted from groundwater sources.

- Water resources within a catchment are assessed and monitored by the Environment Agency. Abstraction Licensing Strategies (ALS) set out how water abstraction will be managed at a local level. West Oxfordshire is covered by the Cotswold ALS, the Thames Catchment ALS and a small area of the Cherwell, Thame and Wye ALS. Whilst there is water available in the Cotswold and Cherwell, Thame and Wye ALSs, the catchments are protected from additional consumptive abstractions due to the downstream Thames not having water available. Any new abstractions in direct connectivity with a river are subject to strict conditions to ensure no deterioration of the watercourse.

- Thames Water (TWUL) supplies water to the district, which is covered by the Swindon and Oxfordshire (SWOX) Water Resource Zone (WRZ). TWUL's most recent Water Resource Management Plan (WRMP) (2014) forecasts a water supply deficit by 2024/25 in SWOX under dry year annual average conditions driven by a combination of population increase and climate change. Increased housing projections resulting from the Oxfordshire Strategic Housing Market Assessment (SHMA) after publication of the WRMP could potentially bring forward this deficit. Whilst TWUL has plans in place to secure supply, there is significant pressure on water resources in this area, which could benefit from initiatives to encourage reduced water consumption.

Recommendation

Due to demonstrable 'Water Stress' in the region, water efficiency in new developments should be maximised through the inclusion of a water efficiency policy in the Local Plan. It is recommended that this be in line with the Building Regulations optional standard of 110 l/h/d.

Wastewater Treatment and Water Quality Key Findings

- Wastewater treatment and collection in West Oxfordshire is provided by TWUL. The Environment Agency sets standards for effluent discharged into rivers, estuaries and the sea from water companies through the issue of a permit to discharge to each wastewater treatment works (WwTW). Each permit has a permitted Dry Weather Flow (DWF), which describes the volume that can be discharged from WwTWs under normal operating conditions.

- The current measured flow and consented DWF for each WwTW were provided by TWUL. The remaining volumetric capacity at each works has been calculated as the difference between these two figures based on the assumption that TWUL are able to discharge up to the maximum permitted DWF without causing any deterioration to the water environment. On this basis the WwTW serving areas of proposed growth in the Local Plan have adequate capacity to accommodate flows from new development with the exception of Cassington WwTW which serves Eynsham; Cassington WwTW would require upgrades to accommodate both local planned growth and allocation of unmet need of the City of Oxford.

- It is acknowledged that this approach does not take account of existing permits which have not been reviewed or altered to reflect WFD targets and as such there may be some WwTWs where utilisation of permitted headroom could cause deterioration of WFD status. This is not possible to determine at scoping stage but where the Environment Agency and/or TWUL consider there to be a risk, this will require further detailed study through a collaborative approach.

- In terms of wastewater infrastructure, TWUL has developed drainage strategies to help alleviate sewer flooding and address growth in areas identified with capacity issues. Future development must consider existing constraints and it should be considered how infrastructure upgrades can both alleviate and improve existing problems.

Recommendations

- Further work within an Outline Study be undertaken to determine the impact of a new permit at Cassington WwTW which serves Eynsham. This work could also review the usable permitted headroom within existing permits elsewhere to determine whether using this headroom will have WFD implications. In particular, discharge from Stanton Harcourt WwTW and the WFD status of the Chil and Limb Brooks needs to be considered as well as the water quality requirements of hydrologically linked downstream ecological designations. Collaborative work will be required with TWUL and the Environment Agency, particularly to define baseline usable headroom within the existing permitting regime.
- WODC should work with Oxfordshire County Council (OCC), as the Lead Local Flood Authority for Oxfordshire and statutory consultee on the use of Sustainable Drainage in new developments, to clarify minimum requirements for SuDS relevant to the district.
- As part of an Outline Study, further investigation could be carried out in collaboration with TWUL and OCC in relation to locations of known sewer flooding, particularly where surface water is entering the foul sewer network, to ensure new development does not exacerbate known problems and where possible alleviates existing risk.
- It is recommended that a focused local strategy led by TWUL, covering detailed assessment of wastewater network capacity and flood risk, is carried out once the details of the proposed development at Eynsham are better understood.

1 Introduction

1.1 Background

West Oxfordshire District Council (WODC) is preparing a new Local Plan to 2031 and the council requires the supporting evidence to be updated in relation to the water environment. In response to a number of concerns raised by the Environment Agency in relation to the draft Local Plan in 2015, further investigation is required into foul water treatment capacity to ensure proposed growth does not negatively impact on water quality. In addition, the District falls within an area of demonstrable 'water stress'[1] and planned growth (in addition to other pressures) is forecast to lead to a supply demand deficit within the next ten years[2]. This Scoping Water Cycle Study has been commissioned to form an evidence base for further decision-making on the water environment within the planning process and to ensure the Local Plan meets with the requirements of the National Planning Policy Framework (NPPF) with respect to the water environment and water infrastructure provision.

1.2 Objectives of the Water Cycle Study

The overall objective of the West Oxfordshire Water Cycle Study (WCS) is to identify any constraints on housing and employment growth planned for the district up to 2031 that may be imposed by the water cycle and how these can be resolved i.e. by ensuring that appropriate water infrastructure is provided to support the proposed development. Furthermore, it will provide a strategic approach to the management and use of water which ensures that the sustainability of the water environment in the District is not compromised.

In response to the draft local plan (2015), in a 'Joint Statement of Common Ground' [3] on foul water treatment capacity and water supply between Thames Water (TWUL) and the Environment Agency, in relation to foul water treatment capacity, the Environment Agency has requested to see either:

- Evidence to demonstrate that there is sufficient headroom/flow capacity within the existing sewage treatment works to accommodate planned growth; or
- Evidence to demonstrate whether the additional flows required to accommodate the proposed growth would meet the following aspects of the relevant Environmental Permit: biological oxygen demand, phosphate and ammonia.

In terms of water supply, the Environment Agency considers that the West Oxfordshire Local Plan should include a policy requirement for new homes to meet the Building regulations optional requirement of 110 litres/person/day because the District is located in an area of demonstrable 'water stress'.

In light of the stakeholder requirements, the first stage of this study, the Scoping Report, has undertaken a review of the water cycle position and provided an overview of the following specific items:

- Capacity issues with regards to water treatment works, clean water network and water resources in West Oxfordshire;
- Capacity issues with regards to wastewater treatment capacity in West Oxfordshire;
- Potential impacts of future water abstraction and wastewater discharge near water dependent European Sites; and
- Baseline water quality issues with respect to the discharge of wastewater and surface water.

The outputs of the study aim to meet the requirements of the Environment Agency in terms of informing the Local Plan and help WODC to select and develop in the most sustainable locations, minimising the impact on the environment, water quality, and water resources. Further details of the progression of the Phase 1 Scoping report are included within Section 2.3: Stages of a Water Cycle Study.

The impacts of flood risk within the District are being assessed concurrently within the update to the West Oxfordshire Strategic Flood Risk Assessment (SFRA). The outputs from this study have informed this Scoping WCS.

[1] Environment Agency (2013) Water Stressed areas – final classification. July 2013
[2] Thames Water Utiltities Ltd (2014) Final Water Resource Management Plan 2015-2010
[3] West Oxfordshire Local Plan 2031 Examination: Joint Statement of Common Ground, Foul water treatment capacity and water supply. 23 October 2015

Stakeholders and consultation

The study has been undertaken following discussions with, and using data provided by, the following key stakeholders:

- WODC;
- Oxfordshire County Council (OCC);
- Environment Agency; and
- TWUL.

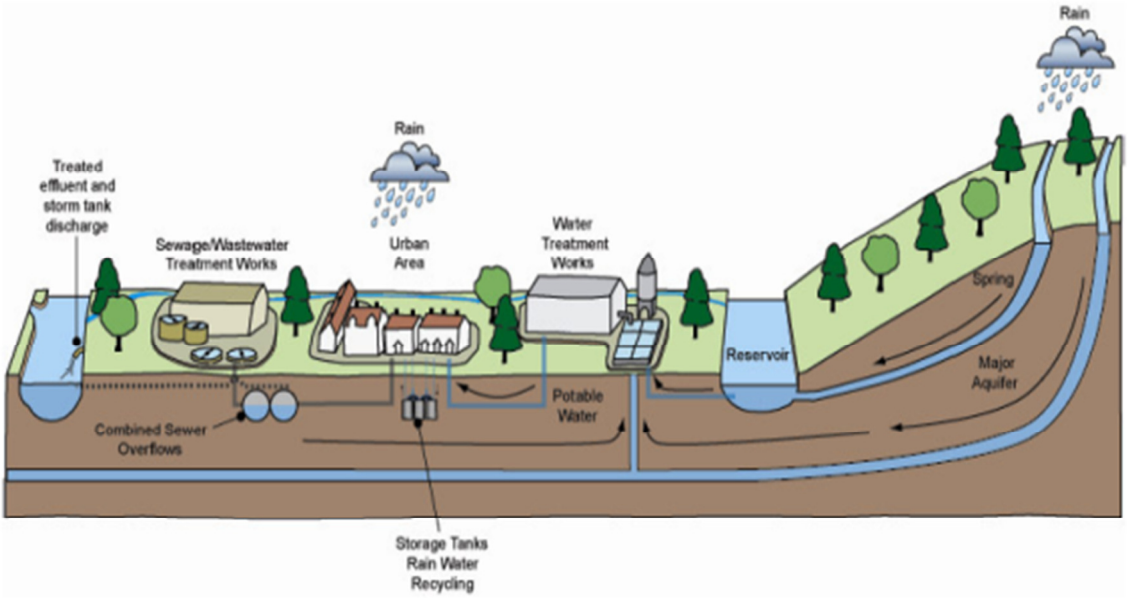
2 West Oxfordshire Water Cycle Study

2.1 The Water Cycle

In its simplest form, the Water Cycle can be defined as 'the process by which water is continually recycling between the earth's surface and the atmosphere'. Without considering human influences, it is simply the process by which rain falls, and either flows over the earth's surface or is stored (as groundwater, ice or lakes) and is then returned to the atmosphere (via evaporation from the sea, the soil, surface water or animal and plant life) ready for the whole process to repeat again.

In the context of this study, the 'water cycle' has a broader definition than the simple water or 'hydrological' cycle. The human influence on the water cycle introduces many new factors into the cycle through the need to abstract water from the natural environment, use it for numerous purposes and then return to the natural system (Figure 2-1). The development and introduction of technology such as pipes, pumps, drains, and chemical treatment processes has meant that human development has been able to manipulate the natural water cycle to suit its needs and to facilitate growth and development. 'Water Cycle' in this context is therefore defined as both the natural water related environment (such as rivers, wetland ecosystems, aquifers etc.), and the water infrastructure (hard engineering focused elements such as: water treatment works, supply pipelines and pumping stations) which are used by human activity to manipulate the cycle.

Figure 2-1 The Water Cycle Study (Source: Environment Agency[4])



2.2 Implications for Development

In directly manipulating elements of the water cycle, man affects many changes to the natural water cycle which can often be negative. To facilitate growth and development, there is a requirement for clean water supply which is taken from natural sources (often depleting groundwater stores or surface systems); the treatment of waste water which has to be returned to the system (affecting the quality of receiving waters); and the alteration and management of natural surface water flow paths which has implications for flood risk. These impacts can indirectly affect ecology which can be dependent on the natural features of a water cycle for example wading birds and wetland habitat, or brown trout breeding in a Chalk stream which derives much of its flow from groundwater sources.

In many parts of the UK, some elements of the natural water cycle are considered to be at, or close to their limit in terms of how much more they can be manipulated. Further development will lead to an increase in demand for water supply and a commensurate increase in the requirement for waste water treatment; in addition, flood risk may increase if development is not planned for in a strategic manner. The sustainability of the natural elements of the water cycle is therefore at risk.

A WCS is an ideal solution to address this problem. It will ensure that the sustainability of new development is considered with respect to the water cycle, and that new water infrastructure introduced to facilitate growth is planned for in a strategic

[4] Water Cycle Study Guidance, Environment Agency http://webarchive.nationalarchives.gov.uk/20140328084622/http://cdn.environment-agency.gov.uk/geho0109bpff-e-e.pdf)

manner; in so doing, the WCS can ensure that provision of water infrastructure is sufficient such that it maintains a sustainable level of manipulation of the natural water cycle.

2.3 Stages of a Water Cycle Study

Online Environment Agency guidance on Water Cycle Studies (WCS)[5] and more recent guidance for the West Thames area[6] suggests that they should generally be undertaken in three stages; scoping, outline and detailed, however in many cases not all stages will be necessary. The scoping study will identify whether an outline study is needed and the outline would identify whether a detailed study is needed.

It is down to the Local Authority to decide whether they have sufficient evidence to address the following points as to whether they progress with a WCS:

1. Urban development only occurs within environmental constraints
2. Urban development occurs in the most sustainable location;
3. Water cycle infrastructure is in place before development, and;
4. Opportunities for more sustainable infrastructure options have been realised.

Further to concerns raised by the Environment Agency about the potential impact of growth identified in the submission Local Plan on the existing sewage treatment works and thus potential detrimental impact on water quality, WODC have acknowledged additional work should be undertaken in the form of this scoping WCS to help address their concerns.

2.3.1 Scoping Water Cycle Study

The scoping study determines the key 'water-cycle' areas where development is likely to either impact on the water environment, or is likely to require significant investment in water infrastructure (i.e. pipes, or treatment) to service new development.

Its key purpose is to define whether there are significant constraints that would need further assessment to determine whether they affect either the locations of allocation options, or the amount of development that can be provided within an allocation site.

It is a high level assessment that looks at town-wide or area-wide issues. The level of assessment covers whether:

- There is a potential for an area-wide negative supply and demand balance for potable water i.e. demand is likely to be greater than supply for the growth area;
- There are any ecologically sensitive sites that have a hydrological link to development i.e. an SAC wetland site located on a river downstream of discharges from a wastewater treatment works;
- A town has a history of sewer flooding and hence potential restrictions on new connections from development; and
- Local watercourses have water quality concerns which will be made worse if further discharge of wastewater from new development occurs.

A scoping study therefore defines the study area, defines the key stakeholders required to input to the study and concludes what issues require further investigation and therefore, what the scope of the Outline Water Cycle Study should be.

In line with Environment Agency Guidance[6], the scoping study should look to answer the following questions or identify where there are knowledge gaps which would justify further work to determine if growth can be supported:

Water Resources

- Is there enough water?
- Does the water company's approach to water resources make sure there is enough water available to serve the projected growth levels?
- Is there enough capacity in the existing abstraction licences for the proposed development?
- Will existing licences remain valid?
- Can abstraction be reduced with better management practices?
- If new major infrastructure is needed, can it be provided and funded in time?
- Is it sustainable?

[5] Draft Water Cycle Study Manual – Guidance on how to carry out a water cycle study, Environment Agency (http://www.halcrow.com/wcs_guidance/pdf/WCSguidance_v2.pdf)
[6] Environment Agency (2015) Water Cycle Study Guidance and Requirements – West Thames Area. November 2015

Water Quality

- Will the proposed housing growth have a detrimental impact on water quality?
- Is there sufficient environmental capacity within the receiving water environment to accommodate the resulting increase flow and pollutant loads from the Sewage Treatment Works as the result of the planned housing growth?
- If not, are there alternative discharge locations that will not cause a failure of water quality targets or causing deterioration in water quality?
- Is there an increased risk of discharges from storm water overflows causing an adverse water quality impact?
- Will the sewerage undertaker need to apply to increase the level of treated sewage effluent that is allowed to be discharged under the existing environmental permits at allow future growth?
- Will the quality standard on the Environmental Permit need to be tightened to meet existing or future water quality standards as a result of the proposed growth (e.g. WFD)?
- Can the existing sewerage and wastewater treatment networks cope with the increased wastewater the proposed growth will generate?
- If new major infrastructure is required (wastewater treatment works, major pumping mains or sewer mains) can they be provided and funded in time?

2.3.2 Outline and Detailed Water Cycle Studies

Outline Study

The Outline Study considers all of the ways in which new development will impact on the water environment or water infrastructure specific to where growth is most likely to be targeted. It is usually undertaken during consideration of allocation sites such that it can inform the decision process in terms of where development will be targeted for each authority. Where there is likely to be an impact on the water environment, a key aim of the Outline study is to provide Local Planning Authorities (LPAs) with the evidence base which ensures that water issues have been taken into account when deciding the location and intensity of development within an authority's planning area as part of the development of the Local Plan. It also aids in setting core policies related to water as part of any Supplementary Planning Documents (SPD). Finally, it gives the water company an evidence base to its business plans which determine how much they can charge customers to invest in upgrades and the provision new infrastructure required to service proposed development.

It could be that the Outline Study identifies that water cycle issues are not significant, and that new development can be implemented without significant new investment. If this is the case, a detailed study may not be required. However, if new infrastructure is required, or an impact on the water environment cannot be ruled out as significant, a detailed water cycle study will need to be undertaken for a specific solution or site specific allocations.

Detailed Study

A detailed study can vary significantly in its scope and remit. However, its key purpose is to define what specific infrastructure and mitigation is required to facilitate development where significant infrastructure solutions are required. Usually, it can only be undertaken once decisions have been made on the location of allocations and the likely intensity and type of development within them. Dependent on the findings of the Outline Study, there could be the potential requirement to undertake detailed and complex studies in order to define exactly what infrastructure or mitigation is required.

The Detailed study can be undertaken in conjunction with the development of DPDs such as Area Action Plans and should provide the evidence base to site specific policies in SPDs.

2.4 Integration with the Planning System

As part of the Local Plan making process, LPAs are required to produce evidence based studies which support the selection processes used in deciding on final growth targets and areas to be promoted for growth. The WCS is one such example of an evidence-based study which specifically addresses the impact of proposed growth on the 'water cycle'.

As part of WODC's overall strategy to meet future growth targets in a sustainable way, the WCS will make up one of a number of strategic studies which will form part of the evidence base supporting the production of West Oxfordshire District Council's LDF.

2.5 National, Regional and Local Drivers and Policies

The growth within West Oxfordshire will need to comply with EU Directives, UK legislation and guidance on water, as shown in Table 2-1 below.

Table 2-1 EU Directives & UK Legislation & Guidance on Water

Directive/Legislation/Guidance	Description
Birds Directive 2009/147/EC	Provides for the designation of Special Protection Areas.
Eel Regulations 2009	Provides protection to the European eel during certain periods to prevent fishing and other detrimental impacts.
Environmental Protection Act 1990	Integrated Pollution Control (IPC) system for emissions to air, land and water.
Flood & Water Management Act 2010	The Flood and Water Management Act 2010 is the outcome of a thorough review of the responsibilities of regulators, local authorities, water companies and other stakeholders in the management of flood risk and the water industry in the UK. The Pitt Review of the 2007 flood was a major driver in the forming of the legislation. Its key features relevant to this WCS are: • To give the Environment Agency an overview of all flood and coastal erosion risk management and unitary and county councils the lead in managing the risk of all local floods. • To encourage the uptake of sustainable drainage systems by removing the automatic right to connect to sewers. • To widen the list of uses of water that water companies can control during periods of water shortage, and enable Government to add to and remove uses from the list. • To enable water and sewerage companies to operate concessionary schemes for community groups on surface water drainage charges. • To make it easier for water and sewerage companies to develop and implement social tariffs where companies consider there is a good cause to do so, and in light of guidance issued by the Secretary of State.
Future Water, February 2008	Sets the Government's vision for water in England to 2030. The strategy sets out an integrated approach to the sustainable management of all aspects of the water cycle, from rainfall and drainage, through to treatment and discharge, focusing on practical ways to achieve the vision to ensure sustainable use of water. The aim is to ensure sustainable delivery of water supplies, and help improve the water environment for future generations.
Groundwater Directive 80/68/EEC	To protect groundwater against pollution by 'List 1 and 2' Dangerous Substances.
Habitats Directive 92/44/EEC and Conservation of Habitats & Species Regulations 2010	To conserve the natural habitats and to conserve wild fauna and flora with the main aim to promote the maintenance of biodiversity taking account of social, economic, cultural and regional requirements. In relation to abstractions and discharges, can require changes to these through the Review of Consents (RoC) process if they are impacting on designated European Sites. Also the legislation that provides for the designation of Special Areas of Conservation provides special protection to certain non-avian species and sets out the requirement for Appropriate Assessment of projects and plans likely to have a significant effect on an internationally designated wildlife site.
Land Drainage Act 1991	Sets out the statutory roles and responsibilities of key organisations such as Internal Drainage Boards, local authorities, the Environment Agency and Riparian owners with jurisdiction over watercourses and land drainage infrastructure.
Making Space for Water, 2004	Outlines the Government's strategy for the next 20 years to implement a more holistic approach to managing flood and coastal erosion risks in England. The policy aims to reduce the threat of flooding to people and property, and to deliver the greatest environmental, social and economic benefit.
National Planning Policy Framework	Planning policy in the UK is set by the National Planning Policy Framework (NPPF). Supported by the online Planning Practise Guidance (PPG) NPPF advises local authorities and others on planning policy and operation of the planning system. A WCS helps to balance the requirements of various planning policy documents, and ensure that land-use planning and water cycle infrastructure provision is sustainable.
Pollution Prevention and Control Act (PPCA) 1999	Implements the IPPC Directive. Replaces IPC with a Pollution Prevention and Control (PPC) system, which is similar but applies to a wider range of installations.
Ramsar Convention	Provides for the designation of wetlands of international importance

Directive/Legislation/Guidance	Description
Urban Waste Water Treatment Directive (UWWTD) 91/271/EEC	This Directive concerns the collection, treatment and discharge of urban waste water and the treatment and discharge of waste water from certain industrial sectors. Its aim is to protect the environment from any adverse effects caused by the discharge of such waters.
Water Act 2003	Implements changes to the water abstraction management system and to regulatory arrangements to make water use more sustainable.
Water Framework Directive (WFD) 2000/60/EC	The WFD is the most significant piece of water legislation since the creation of the EU. The overall requirement of the directive is that all waterbodies in the UK must achieve "Good Status". The current review cycle has established this target for 2027. The definition of a waterbody's 'status' is a complex assessment that combines standards for water quality with standards for hydromorphology (i.e. habitat and flow quality) with ecological requirements. The Environment Agency is the body responsible for the implementation of the WFD in the UK. The Environment Agency have been supported by UKTAG[7], an advisory body which has proposed water quality, ecology, water abstraction and river flow standards to be adopted in order to ensure that water bodies in the UK (including groundwater) meet the required status[8]. The two key aspects of the WFD relevant to the wastewater assessment in this WCS are the policy requirements that: – development must not cause a deterioration in status of a waterbody[9]; and – development must not prevent future attainment of 'good status', hence it is not acceptable to allow an impact to occur just because other impacts are causing the status of a water body to already be less than good.
Natural Environment & Rural Communities Act 2006	Covering Duties of public bodies – recognises that biodiversity is core to sustainable communities and that Public bodies have a statutory duty that states that "every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity
Water Resources Act 1991	Protection of the quantity and quality of water resources and aquatic habitats. Parts have been amended by the Water Act 2003. Also sets out flood defence responsibilities of the Environment Agency for main rivers
Wildlife & Countryside Act 1981 (as amended)	Legislation that provides for the protection and designation of SSSIs and specific protection for certain species of animal and plant among other provisions.

2.5.1 Local Drivers and Policies

Local Development Framework

WODC are in the process of updating the current adopted Local Plan (2006) through a number of documents which form the Local Development Framework (LDF).

The new Local Plan will cover the period up to 2031. The Draft Plan was submitted for independent examination in July 2015. Following publication of the Inspector's preliminary findings in December 2015, the examination has been suspended until December 2016 so the council can undertake additional work including updating the evidence base which this Scoping WCS will contribute to.

It is essential that the Local Plan proposed development is informed using the findings and advice from a sound evidence base that examines economic, social and environmental needs and constraints. This must include the comprehensive planning, phasing, delivery and management of water, sewerage, flooding and drainage infrastructure, whilst not adversely affecting environmental capacity. A critical element is therefore to consider in greater detail, the risks associated from all forms of flooding and the existing state, limitations and future requirements of the West Oxfordshire water cycle system in the context of future growth. The West Oxfordshire Strategic Flood Risk Assessment (SFRA) is being updated alongside this scoping WCS. This report will therefore summarise findings of the SFRA which should be referred to for further detail on flood risk in the district.

2.5.2 Water Company Planning

It is important to consider the planning timelines, both in terms of the Local Plan and for TWUL in terms of the funding mechanisms for new water supply and water treatment infrastructure.

[7] The UKTAG (UK Technical Advisory Group) is a working group of experts drawn from environment and conservation agencies. It was formed to provide technical advice to the UK's government administrations and its own member agencies. The UKTAG also includes representatives from the Republic of Ireland.
[8] UK Environmental Standards and Conditions (Phase I) Final Report, April 2008, UK Technical Advisory Group on the Water Framework Directive.
[9] i.e. a reduction High Status to Good Status as a result of a discharge would not be acceptable, even though the overall target of good status as required under the WFD is still maintained

There are two elements of Water Company planning that are pertinent to the West Oxfordshire WCS and specifically, with regard to integration with Spatial Planning timelines for Local Planning Authorities.

Financial and Asset Planning

Water Company planning for Asset Management and funding is governed by the Asset Management Plan (AMP) process which runs in 5 year cycles. The Office of Water Services (OFWAT) is the economic regulator of the water and sewerage industry in England and Wales, and regulates this overall process.

In order to undertake maintenance of its existing assets and to enable the building of new assets (asset investment), water companies seek funding by charging customers according to the level of investment they need to make. The process of determining how much asset investment required is undertaken in conjunction with:

- the Environment Agency as the regulator determining investment required to improve the environment;
- the Drinking Water Inspectorate (DWI) who determine where investment is required to improve quality of drinking water; and,
- OFWAT who along with the Environment Agency require Water Companies to plan sufficiently to ensure security of supply (of potable water) to customers during dry and normal years.

The outcome is a Business Plan which is produced by each water company setting out the required asset investment over the next 5 year period, the justification for it and the price increases required to fund it.

Overall, the determination of how much a Water Company can charge its customers is undertaken by OFWAT. OFWAT will consider the views of the Water Company, the other regulators (Environment Agency, DWI) and consumer groups such as the Consumer Council for Water when determining the price limits it will allow a water Company to set in order to enable future asset investment. This process is known as the Price Review (PR) and is undertaken in 5 year cycles. When OFWAT make a determination on a Water Company's business plan, the price limits are set for the following five years allowing the water company to raise the funds required to undertake the necessary investment within the AMP round.

Water Resource Planning

Water companies are required to produce Water Resource Management Plans (WRMP) on a statutory basis covering 25 year planning horizons. WRMPs set out how a water company plans to provide and invest in existing and new water resource schemes (e.g. reservoirs, desalination) to meet increases in demand for potable supply, as a result of new development, population growth and climate change over the next 25 year period. The WRMPs must be updated in 5 yearly cycles to coincide with the Price Review and AMP process. TWUL published its most recent plan in 2014 covering the period 2015 to 2040 (WRMP14).

The WCS will help provide an evidence base both for WODC's statutory LDF process and justification for TWUL Strategic Business Plans for any investment required in AMP7 (2020-2025) and beyond.

Additional Information

In addition to the legislation and guidance set out above, the following studies and reports are relevant to and, where available, have been used within the West Oxfordshire Scoping WCS:

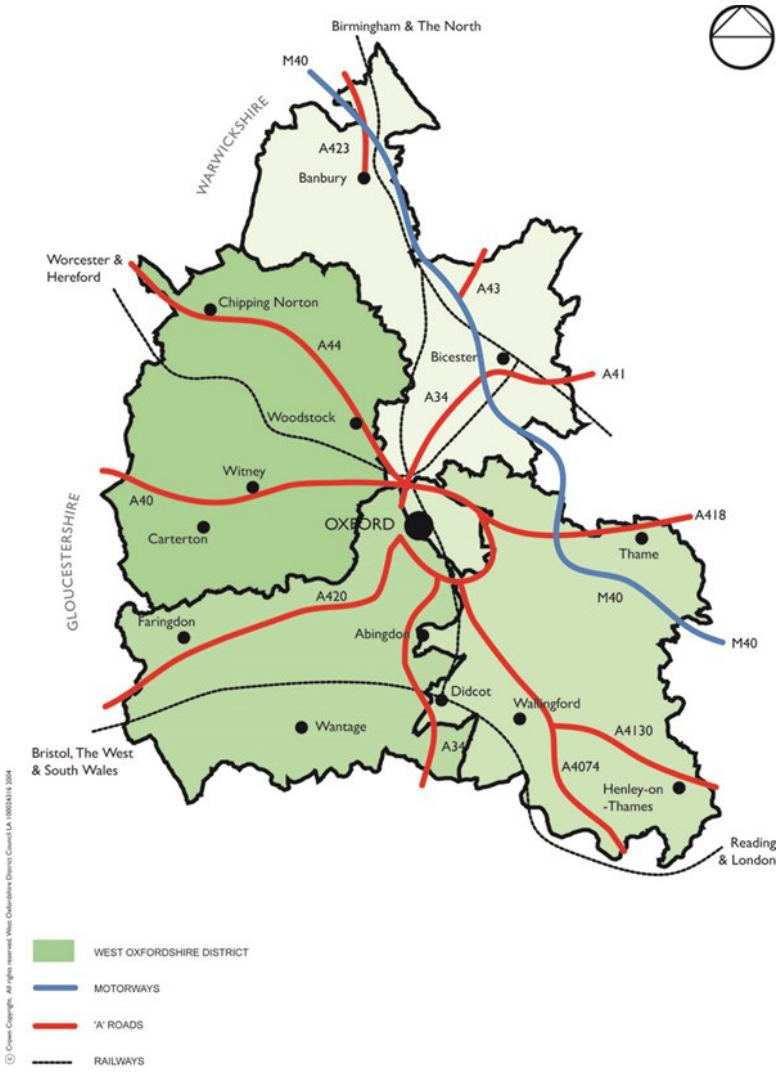
- Environment Agency Cotswolds Catchment Abstraction Licensing Strategy (December 2012);
- Thames Water Drainage Strategies for Witney (Brize Norton), Carteron & Standlake (2015);
- West Oxfordshire Sustainability Appraisal Scoping Report (December 2009);
- West Oxfordshire Infrastructure Delivery Plan Update (February 2015);
- Oxfordshire wildlife and landscape study;
- West Oxfordshire Strategic Housing and Land Availability Assessment (SHLAA) (2014);
- Site allocation information provided by WODC; and
- West Oxfordshire Strategic Flood Risk Assessment (SFRA) (2016) – the required update for this is being undertaken alongside this Scoping WCS and preliminary findings have been reviewed.

3 Development in West Oxfordshire

3.1 West Oxfordshire

The West Oxfordshire District lies to the west of the City of Oxford and includes three main settlement areas: Witney, Carterton and Chipping Norton (Figure 3-1). The area is bordered to the south by the River Thames and the administrative area of Vale of White Horse District Council; to the east by Cherwell District Council; to the north by Stratford-on-Avon District Council; and to the west by Cotswold District Council.

Figure 3-1 West Oxfordshire location in relation to the City of Oxford, taken from http://www.westoxon.gov.uk[10]



The District is predominantly a rural area, with unspoilt countryside, historic parkland, low-lying farmland and remnants of ancient forests. It covers an area of approximately 714 km^2; of which approximately 34% is within the Cotswolds Area of Outstanding Natural Beauty (AONB). The settlements vary in size depending on the natural constraints in the area. The majority of new development occurs in the larger towns and villages where there is already a wide range of facilities available.

It is estimated that a 104,800 people are living within the West Oxfordshire District[11] with around 47% of people living in Witney, Carterton and Chipping Norton[12].

[10] http://www.westoxon.gov.uk/visitors/welcome-to-west-oxfordshire/ [accessed September 2016]

3.2 West Oxfordshire sub areas

The West Oxfordshire Local Plan 2031 divides the District into 5 sub-areas focussed around the main settlements as outlined in Figure 3-2.

Figure 3-2 Sub-areas in West Oxfordshire

3.2.1 Housing growth

Table 3-1 outlines the planned distribution of growth by sub-area having regard to the proposed changes to the Local Plan which will be subject to consultation in November 2016. Whilst these figures are subject to potential change through the local plan development process, they give an indication of WODC's position on overall housing numbers and the proposed distribution of growth by sub-area. In terms of phasing, it is estimated that around 4,500 new homes are likely to be delivered in the next 5 years (2016 – 2021).

In addition to the growth projected for the district, a further 2,750 homes are proposed at Eynsham to help contribute towards Oxford's unmet housing need[13].

[11] Census 2011 Summary for West Oxfordshire Including Carterton, Chipping Norton and Witney available from https://www.westoxon.gov.uk/media/101468/west-oxfordshire-2011-census-leaflet.pdf
[12] http://www.oxford.gov.uk/districtdata/homepage/8/district_data_-_west_oxfordshire
[13] OCC 'A Countywide Approach to Meeting the Unmet Housing Need of Oxford' https://www.oxfordshire.gov.uk/cms/sites/default/files/folders/documents/communityandliving/partnerships/GrowthBoard/PostSHMAStrategicWorkProgramme.pdf

Table 3-1 Draft Planning figures for residential development in West Oxfordshire sub-areas to 2031

	Witney Sub-Area	Carterton Sub-Area	Chipping Norton Sub-Area	Eynsham Woodstock Sub-Area	Burford Charlbury Sub-Area	Totals
Proposed number of new homes (inc. completions 2011-2016)	4,400	2,600	2,400	2,800	1,000	13,200
Percentage contribution to overall requirement	33%	20%	18%	21%	8%	100%
Proposed number of homes to meet Oxford's housing needs	0	0	0	2,750	0	2,750

3.2.2 Employment Growth

In addition to housing growth, WODC are also planning for future business land provision. Reflecting the proposed Local Plan changes the following planned areas in Table 3-2 have been included in the demand and supply analysis within the scoping WCS. A high level assessment of job numbers and approximate water use has been made based on a number of assumptions in line with other WODC planning documents as follows:

- 1 job per 20m^2 office floorspace;
- 1 job per 30m^2 industrial floorspace (or where use class not specified);
- 1 job per 40m^2 storage and warehousing;
- Average plot density has been assumed at 0.41 thus a 1 hectare site would yield 4,100m2 of floorspace; and,
- Average employment consumption is 16 l/h/d[14].

Table 3-2 Indicative employment floorspace figures and assumed water requirements

	West Witney	Carterton	Chipping Norton	Eynsham
Approximate area	20 ha	10ha	9 ha	40ha
Approximate water use requirement (m^3/day)	44	22	20	87

[14] CIRIA (2006) Water Key Performance Indicators and benchmarks for offices and hotels. CIRIA C657. London 2006

4 Water Cycle Environment and Infrastructure baseline

4.1 Introduction

This section describes the environmental and infrastructure baseline within West Oxfordshire with regards to the various components of the water cycle. It is important to establish the baseline and hence spare capacity of the water environment and associated water/wastewater infrastructure because a basic assumption of the WCS is that it is preferential to maximise the use of existing facilities without causing negative effects upon the existing water environment. This is to reduce cost, reduce the impact to existing communities and to allow early phasing of some new development, negating the need to rely on longer lead in times associated with securing funding for new infrastructure through the statutory water company planning process.

Initial assessments of the potential impacts from the proposed level of growth in West Oxfordshire and recommendations for further investigation are provided in Section 5.

4.2 Water Environment

4.2.1 Climate

West Oxfordshire falls within the far south of the Midland climate region as identified by the Met Office[15]; a region of transitional climate between north and south England in terms of temperature, and between Wales and eastern England in terms of rainfall. The annual temperature range for this region is more pronounced than in most parts of the UK due to its distance from the sea, whereby temperature extremes of both winter and summer are a key characteristic of the Midlands climate.

In terms of rainfall, the more sheltered areas of the south Midlands are the driest with less than 700 mm per year (compared with annual totals around 500 mm in the drier parts of eastern England and over 4000 mm in the western Scottish Highlands). Rainfall distribution in the south Midlands has an even distribution throughout the year, with summer amounts associated with showery, convective rainfall.

4.2.2 Geology & Groundwater

Three distinct regions of bedrock underlie the District including:

- the Kellaways and Oxford Clay Formation in the south and south east,
- the Great Oolite Group (Sandstone and Limestone) underlying the centre of the district including Burford, Witney, Charlbury and Chipping Norton, and
- the Lias Group (Mudstone, Siltstone, Limestone and Sandstone) in the extreme north and west of the District underlying the Cotswolds.

The Great Oolite Group and Lias Group are designated as Principal and Secondary aquifers respectively by the Environment Agency, and largely fall within the Cotwolds Catchment Abstraction Management Strategy (CAMS) area, with a portion of the Thames Corridor CAMS area located in the south west of the District.

The Thames River Basin Management Plan (RBMP) defines four Water Framework Directive (WFD) groundwater bodies within the District:

- Kemble Forest Marble groundwater body;
- Burford Jurassic groundwater body;
- Chipping Norton Jurassic groundwater body; and
- Upper Thames Gravels groundwater body.

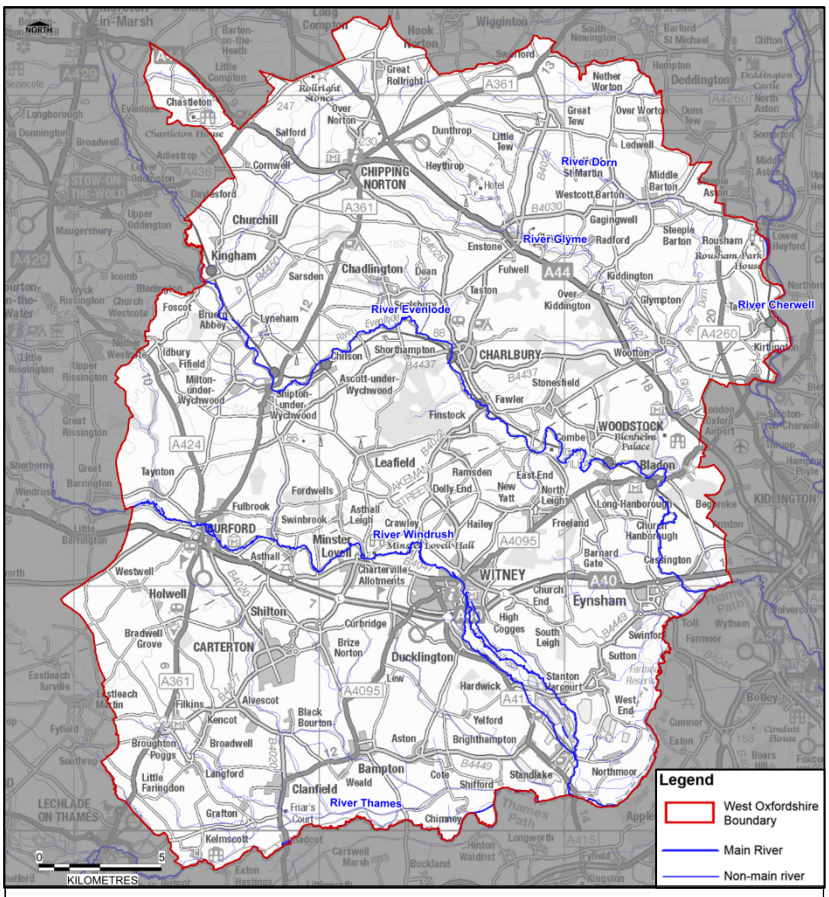
Under the WFD, the Kemble Forest Marble groundwater body has been classified as being at Good Chemical status and Quantitative status. The remaining WFD groundwater bodies have also been classified at Good Quantitative status, but Poor Chemical status.

[15] http://www.metoffice.gov.uk/climate/uk/regional-climates/mi Accessed 17th August 2016

4.2.3 Rivers

The three main rivers in West Oxfordshire are the Cherwell, Windrush and Evenlode (see Fig. 4-1). These watercourses drain almost all of the land area across the West Oxfordshire District, eventually flowing into the River Thames. West Oxfordshire falls predominantly within the Thames River Basin District (RBD), with a small area of land in the far north contained within the Severn RBD draining to the north towards the River Stour (outside of West Oxfordshire). The Thames RBD consists of 17 management catchments, of which West Oxfordshire covers two, the Cotswolds management catchment and the Cherwell and Ray management catchment. The Cotswolds management catchment is further made up of two operational catchments, the Windrush and Evenlode operational catchments. **Figure 4-1** shows the location of the watercourses in the district.

Figure 4-1 Watercourse of West Oxfordshire



River Windrush (Cotswolds)

The River Windrush flows from west to south east from its source located in the Cotswolds where it is fed by groundwater springs rising from the Great Oolite limestone aquifer bedrock, to its confluence with the River Thames at Newbridge. The river drains a predominantly agricultural landscape, flowing through the urban area of Witney and in the lower reaches of the catchment through extensive gravel pit workings. The Windrush is known to flood after heavy rain[16], despite the pervious nature of the limestone aquifers which feed the river.

The Windrush catchment within West Oxfordshire is 321km^2 with a river length of approximately 27km.The catchment also contains the River Thames (33km in length) from its confluence with the Leach at Lechlade-on-Thames to its confluence with the Evenlode at Cassington. Nine Sites of Special Scientific Interest (SSSI) exist within the catchment, although a more detailed analysis is required to determine their dependence on the water environment, which could be carried out if the WCS is progressed to Outline stage.

River Evenlode (Cotswolds)

The north of the District primarily drains to the Evenlode catchment, a mainly agricultural catchment with scattered smaller settlements, the landscape is predominantly rural forming part of the Cotswolds AONB. The River Evenlode rises from the limestone underlying the Cotswolds, flowing south east towards its confluence with the River Thames at Eynsham for

[16] http://www.cotswoldsriverstrust.org/2.html

approximately 40km. The catchment within West Oxfordshire is 338km^2 containing the major tributaries of the River Glyme, River Dorn and Cornwell Brook.

The Evenlode catchment has a high conservation value, with 24 SSSI's including Wychwood, Blenheim Park and Glyme Valley, which are directly linked to the rivers Evenlode and Glyme, as well as remnant populations of nationally endangered native crayfish, water voles and rare plant species.

The catchment has been impacted over the years through a combination of channel modification and pollution, with phosphate pollution a concern on the Rivers Evenlode and Glyme.

River Cherwell (Cherwell and Ray)
Two tributaries of the River Cherwell, the Deddington Brook and River Swere, drain small areas of agricultural land in the far north of the District. The River Cherwell forms part of the eastern boundary for approximately 10km, flowing north to south between the settlements of Heyford and Enslow.

4.2.4 WFD Status

It is important to ensure any increased sewage discharges from proposed developments will not lead to deterioration of existing surface water and groundwater quality. This should be approached through effective design of wastewater and surface drainage infrastructure and in combination with other measures, assist in the achievement of Good Ecological status or potential for waterbodies under the WFD by 2021 or 2027. The WFD classifications for surface water bodies in West Oxfordshire, as taken from the Thames RBMP, are given in Table 4-1 below.

Legend to Table 4-1: Hierarchy of WFD status

Status	Definition
High	Near natural conditions. No restriction on the beneficial uses of the water body. No impacts on amenity, wildlife or fisheries.
Good	Slight change from natural conditions as a result of human activity. No restriction on the beneficial uses of the waterbody. No impact on amenity or fisheries. Protects all but the most sensitive wildlife.
Moderate	Moderate change from natural conditions as a result of human activity. Some restriction on the beneficial uses of the water body. No impact on amenity. Some impact on wildlife and fisheries.
Poor	Major change from natural conditions as a result of human activity. Some restrictions on the beneficial uses of the water body. Some impact on amenity. Moderate impact on wildlife and fisheries.
Bad	Severe change from natural conditions as a result of human activity. Significant restriction on the beneficial uses of the water body. Major impact on amenity. Major impact on wildlife and fisheries with many species not present.

Table 4-1 WFD classifications of surface water bodies in West Oxfordshire

Waterbody name	Current status	2021 predicted status/potential	2027 target status/potential	Physico-chemical status				Reasons for not achieving Good (relating to phosphate unless stated)	
				Overall Phys-chem status	Ammonia	DO	Phosphate	Activity	Certainty
Westcote Brook (source to Evenlode at Bledington) (GB106039029950)	Good	Good	Good	Good	High	High	Good		
Evenlode (Bledington to Glyme confluence) (GB106039029960)	Moderate	Moderate	Moderate	Moderate	High	High	Poor	Agriculture and rural land management (Diffuse source)	Suspected and probable
								Water Industry (Point source)	Suspected and probable
Coldron and Taston Brooks (GB106039029970)	Poor	Poor	Good	Good	High	High	Good		
Sars Brook (source to Evenlode downstream Bledington) (GB106039029980)	Moderate	Good	Good	Good	High	Good	High		
Radcot Cut (GB106039030231)	Moderate	Moderate	Moderate	Moderate	High	Good	Moderate	Water Industry (Point source)	Probable
Broadwell Brook (GB106039030232)	Moderate	Moderate	Good	Good	High	Good	High		
Highmoor Brook at Brize Norton (GB106039030260)	Moderate	Moderate	Good	Moderate	Moderate	Good	Good	Water Industry (Point source-*amm)*	Suspected
Evenlode (Glyme to Thames) (GB106039029880)	Bad	Bad	Moderate	Moderate	High	High	Poor	Agriculture and rural land management (Diffuse source)	Suspected and probable
								Water Industry (Point source)	Suspected and probable
Littlestock Stream to tributary of Evenlode at Shipton (GB106039029910)	Moderate	Moderate	Moderate	Moderate	High	High	Poor	Agriculture and rural land management (Diffuse source)	Suspected and probable
								Water Industry (Point source)	Suspected and probable
Glyme (Dorn confluence to Evenlode (GB106039029940)	Poor	Poor	Good	Moderate	High	High	Moderate	Water industry (Point source)	Probable
Windrush and tributaries (Little Rissington to Thames) (GB106039030440)	Moderate	Moderate	Moderate	Good	High	High	Good		

Waterbody name	Current status	2021 predicted status/potential	2027 target status/potential	Physico-chemical status				Reasons for not achieving Good (relating to phosphate unless stated)	
				Overall Phys-chem status	Ammonia	DO	Phosphate	Activity	Certainty
Hazelford and Coombe Brook (GB106039030450)	Poor	Poor	Poor	Moderate	High	High	Moderate	Water industry (Point source)	Probable
Deddington Brook (Source to Cherwell) (GB106039037190)	Moderate	Moderate	Good	Good	High	Good	High		
Upper Swere (Source to Wigginton) (GB106039037200)	Moderate	Moderate	Good	Good	High	Good	High		
Shill Brook and Tributaries (GB106039030280)	Moderate	Moderate	Good	Moderate	High	High	Moderate	Water industry (Point source)	Probable
Chil and Limb Brooks (source to B4044) (GB106039030310)	Poor	Poor	Moderate	Moderate	Poor	Bad	Bad	Agriculture and rural land management (Diffuse source)	Suspected and probable
								Water Industry (Point source) – P,DO	Suspected and probable
								Water Industry (Point source) Amm	Suspected and confirmed
Thames (Leach to Evenlode) (GB106039030333)	Poor	Poor	Moderate	Moderate	High	High	Moderate	Agriculture and rural land management (Diffuse source)	Probable
								Water Industry (Point source)	Probable
Thames (Evenlode to Thame) (GB106039030334)	Moderate	Moderate	Moderate	Moderate	High	High	Moderate	Agriculture and rural land management (Diffuse source)	Suspected
								Water Industry (Point source)	Suspected
Cherwell (Nell Bridge to Bletchingdon) (GB106039037431)	Moderate	Moderate	Moderate	Moderate	High	Good	Poor	Agriculture and rural land management (Diffuse source)	Suspected
								Water Industry (Point source)	Suspected
Dorn (Source to Glyme) (GB106039037380)	Poor	Poor	Moderate	Moderate	High	High	Moderate	Water Industry (Point source)	Suspected

Waterbody name	Current status	2021 predicted status/potential	2027 target status/potential	Physico-chemical status				Reasons for not achieving Good (relating to phosphate unless stated)	
				Overall Phys-chem status	Ammonia	DO	Phosphate	Activity	Certainty
Little Compton Brook and tributaries (Source to Evenlode) (GB106039037390)	Moderate	Moderate	Good	Moderate	High	Moderate	Moderate	Agriculture and rural land management (Diffuse source)	Suspected
								Water Industry (Point Source)	Suspected
Cornwell Brook and tributaries (Source to Evenlode) (GB106039037400)	Moderate	Moderate	Moderate	Moderate	High	High	Poor	Agriculture and rural land management (diffuse source)	Suspected and probable
								Water Industry (Point source)	Suspected and probable
Evenlode (Compton Bk to Bledington Bk) and 4 Shires (GB106039037410)	Poor	Poor	Moderate	Moderate	Moderate	Bad	Poor	Agriculture and rural land management (Diffuse source)	Suspected and probable
								Water Industry (Point Source)	Suspected and probable
Glyme (Enstone to Dorn) (GB106039030010)	Moderate	Moderate	Good	High	High	High	High		
Glyme (Source to Enstone) (GB106039030020)	Moderate	Moderate	Good	Moderate	High	High	Moderate	Agriculture and rural land management (Diffuse source)	Suspected
								Urban and transport	Suspected
Heythorpe Stream and tributaries (GB106039030030)	Moderate	Moderate	Good	High	High	High	High		

4.2.5 Cotswolds Catchment

Within the Cotswolds catchment, there are 34 rivers, canals and surface water transfers and three lakes. According to the Thames RBMP, 3 waterbodies currently achieve Good or better ecological status/potential, 21 waterbodies at Moderate ecological status/potential, and 13 at Poor or less ecological status/potential. Agricultural land uses dominate the Cotswold catchment, with groundwater and surface water abstraction for public water supply and industrial/agricultural uses also having impacts on the water environment. A number of SSSI's and groundwater dependent ecosystems are linked to water quality. Key issues affecting both groundwater and surface water in the catchment include diffuse pollution from agricultural run-off, point source pollution and poor habitat. Table 4-1 (above), identifies where physico-chemical indicators are achieving less than good. Bad to moderate phosphate levels are mostly attributed to a combination of agricultural land uses and waste water discharges with a probable or suspected level of confidence.

4.2.5.1 River Windrush

The River Windrush has been damaged over the years as a result of the combination of dredging, abstraction and agricultural pollution. The river supports a range of wildlife including some rarer species of fish and insects. A major problem in the area is the increasing quantity of sediment being washed into the river as a result of grazing cattle. This is increasing the levels of phosphate in the river. Pollution as a result of run off from local farms is also affecting the quality of the water in the river. These issues are preventing some parts of the river from meeting WFD standards.

4.2.5.2 River Evenlode

The river habitat and fish populations in the Evenlode catchment are degraded through a combination of historical channel modification and pollution (sediment and phosphate) from waste water and rural areas. In many places it has been over-deepened, widened and straightened, resulting in uniform channel morphology, a river divorced from its floodplain and extensive in-channel siltation. Additionally there are numerous weirs, (35 on the Glyme), impounding the flow and creating barriers to fish movement.

4.2.6 Abstractions

The dominant use of abstracted water in the study area is for agriculture, with domestic and private water supply also using abstracted water in the area.

Water is predominantly used for non-consumptive purposes such as fish farming and mineral workings, whereby the water is returned locally after use. The majority of consumptive abstraction, about 90% of its total, is used for public water supply and is abstracted from groundwater sources[17].

4.2.7 Sewerage Discharges

It should be noted that sewage discharge is identified within the Thames RBMP as potentially impacting WFD standards in both the Windrush and the Evenlode catchments, particularly in terms of phosphate and ammonia concentrations. As identified in Table 4-1 above, continuous point source discharge is often identified in combination with diffuse discharge from agricultural and land use practices as contributing to less than good phosphate status in a number of waterbodies, although confidence is only suspected or probable.

The Chil and Limb Brooks (GB106039030310) however are identified as failing on a number of physico-chemical indicators; ammonia, dissolved oxygen (DO) and phosphate are all 'poor' or 'bad' attributed to point source sewage discharge. It is confirmed that these discharges are preventing ammonia achieving good and probable that they are affecting DO and phosphate. This water body receives flow from Stanton Harcourt, where a relatively small amount of development is proposed and there is still significant permitted headroom in terms of volumetric discharge. The Chil and Limb Brooks ultimately connect to the Thames downstream which would be receiving significant extra flow from proposed development at Eynsham.

Recommendation:
Further work in an Outline Study, involving input from Thames Water and the Environment Agency should review current water quality issues in the Chil and Limb Brooks to confirm whether the existing permit needs to be changed and/or an upgrade to the wastewater treatment process at Stanton Harcourt WwTW is required.

At present there are no proposed measures within the RBMP linked to improving the status of waterbodies by 2021 in the Cotswold Catchment[18]. However, bearing in mind the suspected influence of wastewater discharges on water quality, it should remain a consideration of TWUL that the Environment Agency may choose to review and update permitted

[17] Environment Agency (2012) Cotswold Abstraction licensing Strategy.
[18] http://environment.data.gov.uk/catchment-planning/ManagementCatchment/3021/Summary [accessed 10/09/16]

discharges through their ongoing review process. This may in turn have implications for processing capacity and upgrade requirements.

4.3 Ecology and Biodiversity

The WFD imposes the duty to ensure that provision of water supply is sustainable and does not adversely impact the natural ecology of our rivers, by reducing the flow to levels below those required to sustain the ecology. Equally, the impact of discharges should not lead to a deterioration in status or prevent a waterbody reaching good status.

The West Oxfordshire District contains a number of sites of scientific and ecological importance. The area includes 29 Sites of Special Scientific Interest including Wychwood, Blenheim Park, which the River Glyme flows through and a number of other sites located in river valleys in the district supporting water dependant flora and fauna (see Table 4-2). The rich variety of habitats in these sites supports an extensive range of protected species and has specialist geological importance. There is only one Special Area of Conservation that is partly within West Oxfordshire; Cassington Meadows, which is an internationally important SAC and is part of the Oxford Meadows SAC linked to water quality of the River Thames. The area is one of only two known sites in the UK in which Creeping Marshwort is growing.

A number of additional sites are located within 20km of the district that could be directly or indirectly affected if development was to take place in West Oxfordshire. These sites include Oxford Meadows, Cothill Fen, Hackpen Hill, Little Wittenham, River Lambourn and North Meadow.

A number of sites within West Oxfordshire retain local wetland flora species that require the specialist conditions at each site to grow. A high-level review has identified some of these sites and associated species of specialist flora and fauna which are summarised in **Table 4-2**. It should be noted that a more detailed ecological assessment could lead to additional species being identified and a further expansion of this list.

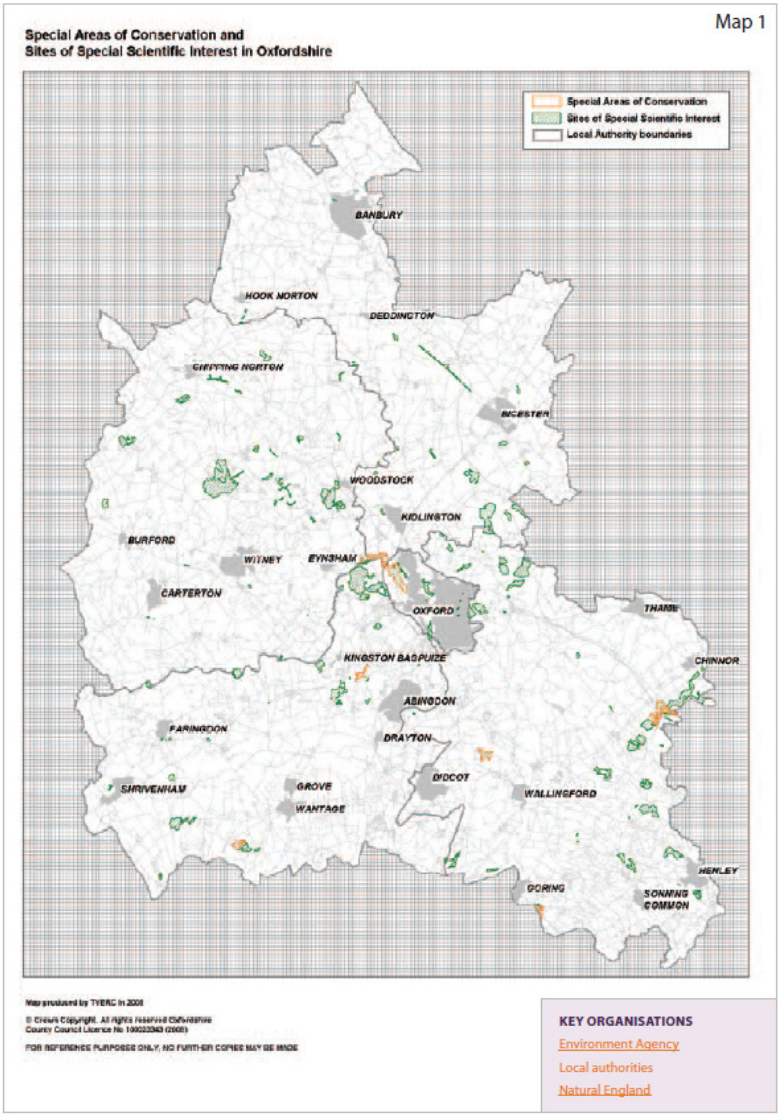
Recommendation
As part of an Outline study, a more detailed ecological assessment should be carried out to identify water-dependant species which may be impacted by increased development in the catchment.

Table 4-2 Sites in West Oxfordshire with identified wetland flora species

SSSI name	Main hydrological link	Main habitat	Specialist flora	Specialist fauna
Alvescot Meadows	Shill Brook	Neutral grassland - lowland	marsh marigold *Caltha palustri*, ragged-robin *Lychnis flos-cuculi* *Triglochin palustris*	*Chrysogaster maquarti* *Cheilosia intonsa*, Small Copper and orange-tip butterflies
Blenheim Park	River Glyme	Broadleaved, mixed and yew woodland - lowland	common reed *Phragmites australis* water violet *Hottonia palustris*	Pochard Tufted Duck
Bould Wood	River Evenlode	Fen, marsh and swamp - lowland	great burnet *Sanguisorba officinalis* devil's-bit scabious *Succisa pratensis* betony *Stachys officinali* lesser spearwort *Ranunculus flammula* sweet grass *Glyceria fluitans*	
Cassington Meadows	River Thames	Neutral grassland - lowland	*Sanguisorba officinalis* Pepper saxifrage *Silaum silaus* Meadowsweet *Filipendula ulmaria*	
Glyme Valley	River Glyme	Calcareous grassland - lowland	Rushes *Juncus* spp Greater Pond Sedge *Carex riparia* Greatwillowherb *Epilobium hirsutum*,	Corn Bunting Linnet
Langley's Lane Meadow	River Thames	Neutral grassland - lowland	*Alopecurus pratensis-Sanguisorba officinalis*	

SSSI name	Main hydrological link	Main habitat	Specialist flora	Specialist fauna
Middle Barton Fen	Cockley Brook / River Glyme	Neutral grassland - lowland	blunt-flowered rush *Juncus subnodulosus* hard rush *J. inflexus*, lesser pond sedge *Carex acutiformis*, reed sweet-grass *Glyceria maxima*	marsh flies *Tetanocera punctifrons* and *Pasacadina verbekei*
Wychwood	River Evenlode	Broadleaved, mixed and yew woodland - lowland	*Shining Pondweed Potomogeton lucens* *Mare's tail Hippuris vulgaris* *Stoneworts Chara spp*	Freshwater Crayfish *Austropotamobius pallipes* local water bugs *Corixa panzeri* and *Micronecta scholtzi*

Figure 4-2: Map of Special Areas of Conservation (SAC) and Sites of Special Scientific Interest (SSSI) in Oxfordshire taken from 'Biodiversity and Planning in Oxfordshire'[19]



4.4 Flood Risk

It is important for the WCS to include an assessment of the constraints of flood risk, and the infrastructure required to mitigate it as a result of proposed growth. Both flood risk to, and flood risk from development needs to be considered.

[19] Biodiversity and Planning in Oxfordshire. Published by BBOWT, Oxfordshire County Council and TVERC 2014 https://www.westoxon.gov.uk/media/896990/Biodiversity-and-Planning-in-Oxfordshire-BBOWT-and-OCC-full-document.pdf

The SFRA is currently being updated alongside this Scoping WCS, in accordance with the NPPF and the corresponding Planning Practice Guidance (PPG) to provide a strategic overview of flood risk within the district on the flood risk from fluvial, surface, ground and artificial water sources. The revised SFRA will incorporate policy changes and updated flooding information and modelling, which has become available since the Cherwell and West Oxfordshire Strategic Flood Risk Assessment SFRA was previously published in 2009.

The development of the SFRA will aid WODC in their application of the Sequential Test for potential site allocations and inform the Sustainability Appraisal and subsequent planning policies. If it is required, this information will be incorporated into the next stage of the WCS, and assessed in relation to the proposed development site allocations to ensure that:

- The risk of flooding to the potential development areas is quantified and the development is steered away from high risk areas (Flood Zones 2 and 3);
- Any flood mitigation measures are planned in a strategic manner; and
- There is no deterioration to existing communities' standard of protection.

Flooding from rivers

The main source of flood risk in West Oxfordshire is fluvial, predominantly associated with River Thames in the south of the District, but also the smaller catchments of the River Windrush and Evenlode. There are also locations within the District that are affected by high water tables and are susceptible to spring fed activity, primarily along the River Thames and Windrush catchments. A review of modelled fluvial risk identifies a number of areas at medium to high risk of flooding from rivers;

- The floodplain of the Upper Thames affects the southern and south eastern fringe of the district including Kelmscott, Bampton, Chimney, and Northmoor.
- The River Evenlode and the River Windrush flow south eastwards through the district and the floodplains associated with these watercourses affect the settlements of Minster Lovell, Crawley, Witney, Kingham, Ascott-under-Wychwood and Eynsham.

There are also areas along the rivers that act as a functional flood plain for storage space in times of a flood, which are essential to consider as part of the site allocation process.

- **River Thames -** The majority of the functional floodplain for the River Thames is used as farming land with minimal impact upon settlement areas and villages. The largest area affected by flooding is at the confluence of the River Windrush and River Thames, namely the village of Standlake, where parts of the village located within the functional floodplain. The use of farming land as functional floodplain provides significant capacity to protect the downstream settlements, including Oxford.
- **River Evenlode -** The Evenlode passes the rural service centre of Charlbury as well as several other villages prior to it meeting the River Thames 5km north west of Oxford. There are minimal settlement areas where development has occurred within the functional floodplain of the Evenlode with the main area affected being the Wychwoods.
- **River Windrush** - There is a large capacity within the floodplain upstream of Witney in areas of smaller development such as Crawley and Minster Lovell which acts as a natural defence protecting Witney. The Bridge Street crossing in the centre of Witney and buildings downstream heavily restrict the River Windrush at Witney.

Surface Water Management

Surface Water Management is a key consideration when assessing development within large areas. The urbanisation of large areas of land alters the way in which rainfall can drain away and has the potential to increase the rate and amount of water that enters watercourses causing an increase in flood risk. In many cases, the management of surface water is achieved via a requirement to restrict runoff from developed sites to that which occurs from the pre-development site usage and this is achieved by incorporating a range of Sustainable Drainage Systems (SUDS) which aim to maximise the amount of rainwater which is returned to the ground (infiltration) and then to hold back (attenuate) excess surface water.

Suitable surface water management measures should be incorporated into new development designs in order to reduce and manage surface water flood risk to, and posed by a proposed development. The implementation of SuDS is now a material planning consideration for all major developments. OCC as Lead Local Flood Authority (LLFA) are the statutory consultee regarding the implementation of SuDS in new major developments in the District. Informed inclusion of SuDS in development presents an opportunity to alleviate known issues with sewer flooding in parts of West Oxfordshire's urban centres, where connections of surface water into the foul sewer have compounded capacity problems (discussed further below in Section 4.6.1).

4.5 Water Resources and Supply

4.5.1 Water Resource Management

Water resources within a catchment are assessed and monitored by the Environment Agency. The river catchment is split up into a number of individual units whose status is assessed through an Abstraction Licensing Strategy (ALS) as part of the Catchment Abstraction Management Strategy (CAMS) process. ALS are strategies for the management of water resources at a local level and set out how water abstraction will be managed. They outline where water is available, and also, if relevant, where current rates of abstraction need to be reduced to allow the balance between the needs of abstractors, other water users and the aquatic environment to be protected. The study area is covered by the Cotwolds ALS published in December 2012 and the Thames Catchment ALS published in May 2014 as well as a very small area of the Cherwell, Thame & Wye ALS (December 2012) in the north. The CAMS areas are displayed in Figure 4-3.

Figure 4-3 The Cotswolds and Thames CAMS area

The Cotswolds ALS states that there is currently water available at low flows in all four (Middle Windrush, Lower Windrush, Evenlode and Glyme and unconfined Oolites) waterbodies in the Cotswolds CAMS area within West Oxfordshire. However, the downstream lower River Thames is classed as not having water available, and consequently low flows within the Cotswolds CAMS waterbodies (tributaries of the Thames) are protected from consumptive abstraction to account for the flow requirements of the River Thames.

The Thames ALS states that there is no water available at low flows in the Thames Corridor waterbody. This is also as a result of the flow requirements of the lower Thames downstream. A bespoke strategy for new consumptive abstractions has been produced by the Environment Agency to ensure these requirements are met[20] ,whereby any new surface water abstractions or groundwater abstractions in direct hydraulic continuity with a river are subject to conditions when abstraction can take place and a WFD assessment must be provided for new abstractions 2Ml/d or above to show it will not cause deterioration under the WFD or prevent the waterbody achieving Good ecological status/potential.

[20] Environment Agency (2014) Thames Catchment abstraction licensing strategy

The Cherwell, Thame & Wye ALS states that the middle Cherwell area, which partly overlaps West Oxfordshire has water available for licensing at low flows. However, this status is overridden by the requirements of the River Thames which changes the status to 'water not available for licensing' at low flows. Water would only be available during periods of high flow and no new consumptive licenses will be granted at low flows to protect the requirements of the River Thames. Consumptive groundwater licenses which do not have direct impact on river flows may be permitted with restrictions.

4.5.2 Water Supply

TWUL supplies water to the District, which is covered by the Swindon and Oxfordshire (SWOX) Water Resource Zone (WRZ).The primary water resources in the Thames Valley are largely groundwater (70%), with some surface water abstractions (30%)[21]. Two TWUL reservoirs are located just outside of the District, Farmoor Reservoir on the south east boundary fed by the River Thames and Grimsbury Reservoir to the north east in Banbury which is fed by the River Cherwell.

TWUL's 2014 WRMP states that under dry year annual average conditions, a water supply deficit is forecast from 2024/25 growing to a deficit of 15 Ml/d by 2040. This deficit is driven largely by a combination of population growth and the impact of climate change as well as sustainability reductions in the 2015-2020 period. These sustainability reductions are reductions in the licenced volume of water which Thames Water can abstract to feed into public supply for reasons of environmental impact and reduce overall supply. There is also a deficit forecast under peak conditions from 2019/20 to the end of the planning period growing to a deficit of 32 Ml/d by 2040. As the earlier forecast deficit, the peak condition scenario is the main investment driver for planning. The proposed solution to resolve the supply-demand deficit is using demand management including leakage reduction and rollout of metering across the WRZ.

Since local authority data was collected to prepare WRMP14, population and housing growth forecast by a number of authorities have been updated in line with the Oxfordshire Strategic Housing Market Assessment (SHMA) increasing the forecast number of properties across the SWOX WRZ between 2011 and 2029/30. TWUL considers the updated growth projections over the next 5 years can be accommodated in the WRZ[22]. There is however a high level of uncertainty associated with growth and TWUL have agreed with the EA to monitor growth data annually, recognising the significant pressure on water resources in this area.

4.5.3 Water supply infrastructure

The TWUL WRMP14 identifies a number of constraints within the SWOX WRZ *"where existing infrastructure is not capable of distributing or treating all of the raw water that can be produced on site"* however a number of projects were already underway at the time of producing the WRMP to remove identified network constraints with a significant reduction in the identified constraints within SWOX anticipated. It is likely that this issue will need to be revisited in the development of the next WRMP to ensure that revised housing projections are factored into the review of infrastructure capacity.

4.6 Wastewater Treatment and Collection

Wastewater treatment and collection infrastructure within the District is owned and operated by TWUL. The Environment Agency sets standards for effluent discharged into rivers, estuaries and the sea from water companies and industry, through the issue of a permit to discharge issued under the 1991 Water Resources Act. These discharge permit standards are set individually for each wastewater treatment works (WwTW) taking into account what is required to protect water quality and ecology, including legislative standards such as those imposed by the WFD.

The District is served by 27 different WwTWs, the majority of which serve the numerous small settlements located within the rural areas of the District. Witney WwTW is the largest which serves a population equivalent of approximately 28,000[23] and discharges to the River Windrush.

The permitted dry weather flow (DWF) limits are shown below in Table 4-3 for each of the WwTWs serving the District. DWF is a unit of measure, used by the Environment Agency in a discharge permit to describe the volume that can be discharged from WwTWs under normal operating conditions. Essentially it is supposed to represent the proportion of flow treated by a WwTW that is made up of foul (or waste) water and not surface water which is generated from rainfall events and is derived from measured flow statistics for each WwTW. A UKWIR project WW21/D developed a measure of DWF which concluded that the measure of DWF that would be the most appropriate was the 20th percentile (Q80)[24].

[21] TWUL (2014) Final Water Resource Management Plan, Section 4. Available at http://www.thameswater.co.uk/tw/common/downloads/wrmp/WRMP14_Section_4.pdf. Accessed 18/08/16
[22] Assessment of revised housing growth projections in Oxfordshire in the context of Water Resources: Thames Water and Environment Agency Position Statement. August 2015
[23] West Oxfordshire District Council. West Oxfordshire Council Plan 2012-2015. 2013-14 update
[24] An Improved Definition of Sewage Treatment Works Dry Weather Flow, Manuel Starr, 2006

Table 4-3 WwTW Permitted DWF limits

STW	Permitted DWF (m3/day)
Witney	11883
Cassington	4000
Carterton	3884
Chipping Norton	3725
Woodstock	1808
Church Hanborough	1455
Middle Barton	1188
Milton-under-Wychwood	1165
Bloxham	1000
Bampton	853
Stanton Harcourt	760
Standlake	737
Charlbury	727
Finstock	635
Burford	467
Clanfield	463
Enstone	450
Bledington	249
Tackley	209
Chadlington	180
Combe	175
Great Rollright	128
Little Compton	90
South Leigh	82
Spelsbury	50
Sandford St Martin	36
Foscot	14

The purpose of this Scoping WCS is to establish the baseline capacity at the WwTWs within the District to treat wastewater flows from proposed growth within the conditions of the current permit. Where there is insufficient capacity within existing permits, the study aims to review likely water quality risks from additional discharge and to set the scope for more detailed modelling as part of an Outline stage study.

The volume element of the discharge permit determines the maximum number of properties that can be connected to a WwTW catchment. When discharge permits are issued, they are generally set with a volume 'freeboard', which acknowledges that allowance needs to be made for additional connections. This allowance is termed 'permitted headroom'. The quality conditions applied to the discharge permit are derived to ensure that the water quality of the receiving waterbody is not adversely affected, even when the maximum amount of flow is discharged. For the purposes of this scoping review, a simplified assumption is applied that the permitted headroom is usable and would not affect attainment of downstream water quality targets. This headroom therefore determines how many properties can be connected to the WwTW before a new discharge permit would need to be issued (and hence how many properties can connect without significant changes to the treatment infrastructure).

It is acknowledged that this simplified approach does not take account of existing permits, which have not been reviewed or altered to reflect WFD targets, and as such, there may be some WwTWs where utilisation of the permitted headroom could cause deterioration of WFD targets. It is not possible to determine how much of the calculated permitted headroom is usable at scoping stage. It is recommended that if the Environment Agency or Thames Water consider that there is a risk of WFD non-compliance as a result of the existing permitting regime, that this is considered through further study via a collaborative approach between the Council, the Environment Agency and Thames Water.

In order to carry out the assessment of capacity within the works' discharge permits, the current consented DWF and the measured flow from each WwTW were obtained from TWUL. The volumetric capacity at the remaining works can be calculated as the difference between the measured flow and the consented DWF, as shown below in **Table 4-4.**

For comparison, the proposed housing numbers to drain to each works currently being considered in the Local Plan process (including a proportional distribution of anticipated Windfall sites and sites under 10 dwellings) are also included in the Table.

Table 4-4 DWF consent capacity at WwTWs in West Oxfordshire serving areas of proposed new developments

WWTW	Settlements served	Receiving watercourse	Current DWF capacity (m^3/d)	Proposed new homes to be served by WwTW	Additional flow generated by proposed new homes (m^3/d)	Additional flow form proposed employment requirement* (m^3/d)[25]	Total additional flow (m3/d)	Residual flow capacity (m3/d	Approximate residual housing capacity
Witney	Witney, Minster Lovell, Ducklington, Curbridge	Colwell Brook, leading to **River Windrush**	1,843	4,386	1,151	44	1,195	648	2,468
Carterton	Carterton	Shill Brook leading to **River Thames**	1,001	2,245	589	22	611	491	1,952
Bampton	Bampton, Aston	Shill Brook leading to **River Thames**	88	307	81		81	7	28
Cassington	Eynsham	Evenlode to **River Thames**	913	Local Plan: 1254	329	87	417	496	1891
				+ 2750 (provision for Oxford unmet need)	722		722	-225.52	-859
				Total: 4004	1051	87	1,139		
Woodstock	Woodstock	River Glyme leading to **River Evenlode**	662	873	229		229	433	1,649
Church Hanborough	Long Hanborough, Bladon, Freeland, North Leigh	**River Evenlode**	167	487	128		128	39	149
Tackley	Tackley	**River Cherwell**	60	32	8		8	52	197
Standlake	Northmoor	**River Windrush**	88	17	4		4	84	318
Stanton Harcourt	Stanton Harcourt	Chil Brook to **River Thames**	275	61	16		16	2259	987
Chipping Norton	Chipping Norton, Kingham	Cornwell Brook to **River Evenlode**	2,087	2,389	627	20	647	1,440	5,847
Burford	Burford	**River Windrush**	105	235	62		62	43	164
Charlbury	Charlbury	**River Evenlode**	351	216	57		57	294	1,121
Finstock	Stonesfield	**River Evenlode**	191	248	65		65	126	480
Milton-under-wychwood	Milton-under-wychwood, Shipton-under-Wychwood	Littlestock Brook to **River Evenlode**	136	263	69		69	259	987

[25] High level assessment based on the assumption of 1 job per 20m^2 office floorspace,1 job per 30m^2 industrial floorspace (or where class use not specified) and 1 job per 40m^2 of storage and warehousing

The Initial analysis of current headroom of WwTWs in the District indicates that current projections for development over the plan period can be accommodated within existing permits at all WwTWs with the exception of Cassington when considering inclusion of all of the identified Oxford unmet need. The level of growth proposed at Eynsham will require further assessment of the water quality implications of a revised discharge permit in addition to detailed infrastructure planning by TWUL in relation to the sewer network.

Recommendations

- Further assessment work in an Outline Study will be required to determine the necessary permit conditions and any associated upgrade works to sewerage infrastructure to accommodate the projected growth in Eynsham and to ensure there is no deterioration to the water environment.
- Where the Environment Agency or Thames Water consider that there is a risk of WFD non-compliance as a result of the existing permitting regime, this should be considered through further study via a collaborative approach between the Council, the Environment Agency and Thames Water.

4.6.1 Wastewater Treatment infrastructure

Recent periods of significant flooding in West Oxfordshire, particularly 2007 and 2014, have highlighted constraints in parts of the existing sewer system where residential properties have suffered from sewer flooding including the settlements of Carterton, Standlake, Brize Norton, North Leigh, Bampton, Clanfield, Eynsham and Finstock. Causes of sewer flooding are complex and can be related to a combination of groundwater or other flood water incursion, and surface water connections rather than solely a foul capacity issue. However it is important that where constraints on capacity are known that future development does not exacerbate the risk and remediation schemes are developed with an understanding of future growth targets.

TWUL has developed specific drainage strategies for Brize Norton, Carterton and Standlake. These are presently at Stage 1 'initialise and prepare' of the 4-stage Drainage Strategy Framework developed by the Environment Agency and Ofwat[26]. It is intended that these strategies will develop to define how TWUL will "*alleviate sewer flooding and address growth related issues in each area sustainably and economically over the next few years*". The outputs of these strategies are informing TWUL's business planning with a commitment to improving assets, protecting properties from sewer flooding and ensuring river quality meets both customer expectations and regulatory requirements.

[26] Halcrow (2013) Drainage Strategy Framework: For Water and sewerage companies to prepare Drainage strategies. Good practice guidance commissioned by the Environment Agency and Ofwat. May 2013

5 Findings, Constraints and Recommendations

5.1 Water Resources

This scoping study has addressed whether there is sufficient evidence to answer six key questions relating to the provision of water resources. Responses to these questions are provided below, and where required, what the recommendation is either for further work, or the implementation of an action for the study stakeholders.

Is there enough water?

Within the Cotswolds CAMS area, all four waterbodies in West Oxfordshire (Middle Windrush, Lower Windrush, Evenlode and Glyme and unconfined Oolites) currently have 'water available' at low flows. However, the downstream lower River Thames is classed as 'not having water available' and consequently low flows within the Cotswolds CAMS waterbodies (tributaries of the Thames) are protected from consumptive abstraction to account for the flow requirements of the River Thames.

West Oxfordshire is supplied with water by Thames Water (TWUL) and sits almost entirely within the Swindon and West Oxfordshire (SWOX) WRZ, which has a forecast water supply deficit from 2024/25 under dry year annual average conditions.

Does the water company's approach to water resources make sure there is enough water available to serve the projected growth levels?

In order to address the supply and demand balance in SWOX WRZ over the planning period, the WRMP14 proposes to focus on leakage reduction and the rollout of progressive metering to households from 2020 supported by a comprehensive water efficiency programme and a transfer from Slough, Wycombe & Aylesbury (SWA) WRZ at the end of the planning period.

Forecasts for water supply availability in WRMP14 were based on housing projections provided prior to the publication of the Oxfordshire Strategic Housing Market Assessment (SHMA). The SHMA along with a number of other reports has led several local authorities within the SWOX WRZ, including WODC, to increase their projected housing growth forecasts. Based on current supply /demand forecasts, and assessment of surplus resource over the next 5 years, TWUL estimate they could accommodate an additional 19,200 properties (just under a third of the total additional housing under SHMA) in the SWOX WRZ over the next 5 years and bring forward planned medium term measures in the WRMP, if required. However, it is recognised that there is significant pressure on water resources in this area and the wider Thames supply area and TWUL will be reviewing population and housing growth in the context of water resources on an annual basis to ensure security of supply. TWUL are planning for their next WRMP which will account for the increased housing projection now planned for the West Oxfordshire District.

Is there enough capacity in the existing abstraction licences for the proposed development?

TWUL's WRMP14 and subsequent assessment of revised housing growth projections confirm this to be the case.

Will existing licences remain valid?

There is no current indication that existing licenses will not remain valid.

If new major infrastructure is needed, can it be provided and funded in time?

TWUL's WRMP14 and subsequent assessment of revised housing growth projections sets out the plan for meeting water demand to 2040, which at present does not require any new major infrastructure.

Can abstraction be reduced with better management practices? Is it sustainable?

TWUL are working with the Environment Agency to identify where abstractions may be environmentally harmful and proposing solutions to address any required reductions in abstraction or implement river restoration work. Of sites identified for action, none are currently located within West Oxfordshire[27].

5.1.1 Summary

TWUL has confirmed through their WRMP that a supply demand deficit is currently forecast within the next 10 years and have consequently developed a suite of options to manage water provision over the short to medium term to 2040. Since the publication of the WRMP14, increased housing need projections have prompted a review of water supply in the short term whereby TWUL has identified that they could accommodate additional projected growth in the SWOX WRZ over the

[27] http://www.thameswater.co.uk/cr/Preciousresource/Ensuringwehavesufficientwaterresources/Abstractionslowflows/index.html

next 5 years without implementing additional measures. As there are significant uncertainties associated with growth projections, occupancy and per capita consumption, growth and water usage will be monitored annually to identify any required additional measures as needed.

Whilst abstraction licensing planning identifies constraints on future new consumptive licenses in the Cotswolds CAMS area due to the impact on the downstream Thames, it is not currently considered by TWUL that new licenses are required to meet the water supply need to 2040. Potential enhancements to existing groundwater schemes outside of West Oxfordshire have been identified within existing license conditions that could be introduced if required in the short term. It is also identified that planned for programmes of demand management from 2020 could be brought forward to achieve additional resource benefit.

Whilst TWUL has demonstrated that they have sufficient plans in place to meet water demand for the plan period, there remains significant uncertainty around how population growth and climate change may impact on water supplies, which will require regular monitoring. In terms of sustainable management of the water environment and future supply, supporting a reduction in water use is a more reliable and sustainable approach than seeking out new options for abstractions or water transfer routes in the future. Considering the demonstrated water stress in this region, it is strongly encouraged that the Local Plan includes a policy to encourage reduced water use in all new developments so that current resources can be used with maximum efficiency.

Recommendation

Due to demonstrable 'Water Stress' in the region, water efficiency in new developments should be maximised through the inclusion of a water efficiency policy in the Local Plan. It is recommended that this be in line with the Building Regulations optional standard of 110 l/h/d.

5.2 Water Quality

This scoping study has addressed whether there is sufficient evidence to answer eight key questions relating to growth and potential effects on water quality. Three questions, as outlined below have been covered in the initial response, with answers to the five remaining questions provided in subsequent paragraphs.

- **Will the proposed housing growth have a detrimental impact on water quality?**
- **Is there sufficient environmental capacity within the receiving water environment to accommodate the resulting increase flow and pollutant loads from the Sewage Treatment Works as the result of the planned housing growth?**
- **Will the sewerage undertaker need to apply to increase the level of treated sewage effluent that is allowed to be discharged under the existing environmental permits to allow future growth?**

Most of the WFD designated surface water bodies in West Oxfordshire are currently failing to achieve Good Status with around a quarter only meeting Poor or Bad Status in the last review cycle linked to numerous activities within the catchment. In such a rural district, agricultural practices have dominant influence on water quality both through runoff of chemicals from arable farming and large movements of sediment from livestock farming. It is therefore difficult to quantify the influence of development on the overall status of a waterbody and whether the influence of growth can be linked to failure to achieve Good Status.

The Thames RBMP identifies pollution from wastewater treatment as a factor affecting the achievement of Good Status on parts of both the River Evenlode and Windrush catchments, although certainty is only suspected or probable and often combined with agricultural influences. In addition, there are no specific RBMP measures in place related to wastewater discharges.

As part of this Scoping WCS, the existing permits at WwTWs in West Oxfordshire have been reviewed alongside their current measured flow and anticipated additional flow resulting from current growth projections. This initial review has highlighted that there is sufficient permitted headroom capacity within the WwTW permits to accept all proposed growth with the exception of Cassington works which serves Eynsham.

In order to accommodate all of the planned growth at Eynsham including the Oxford unmet need, an increase in the volume of permitted treated effluent discharges will be required at the Cassington WwTW. The impact of this on the

receiving River Thames should be subject to detailed analysis of the permitted loadings of Phosphate, ammonia and BOD within the permit to ensure growth does not lead to deterioration of the waterbody status or prevent the achievement of good status in the river

The analysis undertaken in this Scoping study demonstrates that the majority of growth should be achievable without significantly affecting water quality or WFD targets. However, whilst proposed housing growth can be accommodated largely within current discharge permits, this study has shown that Cassington WwTW will require a new permit to discharge. In addition, the Environment Agency may look to tighten discharge permits at other WwTW serving the District area as part of their ongoing permit review process under the WFD, where it could be perceived to improve the status of a waterbody.

Recommendation

Further work within an Outline Study be undertaken to determine the impact of a new permit at Cassington WwTW which serves Eynsham. This work could also review the usable permitted headroom within existing permits elsewhere to determine whether using this headroom will have WFD implications. In particular, discharge from Stanton Harcourt WwTW and the WFD status of the Chil and Limb Brooks needs to be considered as well as the water quality requirements of hydrologically linked downstream ecological designations. Collaborative work will be required with Thames Water and the Environment Agency, particularly to define baseline usable headroom within the existing permitting regime

The implementation of SuDS in new development should mitigate potential pollution associated with urban runoff from new developments. Additionally preventing surface water from entering the sewerage system can contribute to relieving sewer flooding problems and the number of untreated spills into water bodies during wet periods. It is recommended that Local Plan policy sets minimum requirements for runoff reduction and treatment through the use of Sustainable drainage systems.

Recommendation

WODC should work with OCC as the Lead Local Flood Authority for Oxfordshire and statutory consultee on the use of Sustainable Drainage in new developments to clarify minimum requirements for SuDS relevant to the district.

- **Will the quality standard on the Environmental Permit need to be tightened to meet existing or future water quality standards as a result of the proposed growth (e.g. WFD)?**
- **If not, are there alternative discharge locations that will not cause a failure of water quality targets or causing deterioration in water quality?**

The Scoping Study has identified that there will be a need to apply for a new permit for Cassingston WwTW and that further work is required to determine whether the quality conditions need to be tightened. The potential for alternative discharge locations will need to be considered as part of the further assessment work.

Is there an increased risk of discharges from storm water overflows causing an adverse water quality impact?

Whilst this has not been highlighted as a risk in this Scoping WCS, the strict implementation of sustainable drainage systems in new developments, overseen by Oxfordshire County Council (OCC) as statutory consultee, should reduce pressure on combined sewers form large storm events, separating it completely or releasing at a controlled rate. With this policy in place, new development should not increase the risk of discharges from storm water overflows.

Can the existing sewerage and wastewater treatment networks cope with the increased wastewater the proposed growth with generate?

As well as assessing the capacity of WwTW and receiving watercourses, it is essential to determine the capacity in the sewer network and transmissions of wastewater to the works from individual developments. A number of settlements in the district have suffered from sewer flooding which is often influenced by wider concurrent flooding issues. TWUL has identified issues of sewer capacity which they are addressing through the development of drainage strategies for Witney (Brize Norton), Carterton and Standlake. WODC should engage with TWUL and OCC to progress solutions where sewer surcharging is linked to surface water entering the foul sewer network. The scale of growth planned for Eynsham will require significant upgrades to the sewerage network. It is likely that a focussed infrastructure study will be required there.

Recommendation

As part of an Outline study, further investigation could be carried out in collaboration with TWUL and OCC in relation to locations of known sewer flooding particularly where surface water is entering the foul sewer network to ensure new development does not exacerbate known problems and where possible alleviates existing risk.

If new major infrastructure is required (wastewater treatment works, major pumping mains or sewer mains) can they be provided and funded in time?

It has not been identified in this Scoping WCS, that major infrastructure, in terms of new WwTWs, would be required to accommodate proposed growth; however, this conclusions is dependent on further work related to Cassingston WwTW and assessment of usable headroom at other WwTWs.

Large developments will require new sewer networks to serve them, which should be planned in detail with TWUL as they are brought forward. The Cassington WwTW serving Eynsham has significant capacity to accommodate growth at present including a large proportion of Oxford's unmet need. However if this size of development is to be progressed within the plan period, it will be essential to work strategically with TWUL and the Environment Agency to ensure adequate network infrastructure, appropriate flood mitigation and protection of the water environment are in place. Whilst the WwTW does currently have significant treatment capacity, it is unlikely that the sewer network will have sufficient capacity to transmit wastewater flows to the WwTW when growth from Oxford's unmet need is considered.

Recommendation

It is recommended that a focused local strategy led by TWUL, covering detailed assessment of wastewater network capacity and flood risk is carried out once the details of the proposed development are better understood at Eynsham.

5.2.1 Summary

The analysis undertaken in this Scoping study demonstrates that the majority of growth should be achievable without significantly affecting water quality or WFD targets. However, whilst proposed housing growth can be accommodated largely within current discharge permits, this study has shown that Cassington WwTW will require a new permit to discharge. In addition, the Environment Agency may look to tighten discharge permits at other WwTW serving the District area as part of their ongoing permit review process under the WFD, where it could be perceived to improve the status of a waterbody.

In addition, a number of constraints in the existing sewer system have been identified and are being addressed by TWUL through local drainage strategies. WODC should consult TWUL in relation to locations of new development in these areas to ensure existing problems are not exacerbated.

Further work should therefore be undertaken and reported in an Outline study to determine the type and timing of infrastructure solutions required to protect water quality, and supply the required wastewater infrastructure.

5.3 Ecology and Biodiversity

There is only one European designated site on the edge of West Oxfordshire (Cassington Meadows) but a number of SSSIs have been identified with wetland flora supporting protected species, which could potentially be affected by development within the District. Based on the scoping review of the impact of growth on water resources and wastewater treatment discussed above, there is no indication that proposed growth would have an adverse effect on water dependant sites through wastewater discharge; however, this should be confirmed as part of the Outline study.

Regular reviews by TWUL have not identified negative impacts on environmental designation as a result of abstraction within West Oxfordshire.

5.4 Flood Risk & Surface Water Management

The updated West Oxfordshire Strategic Flood Risk Assessment (2016) should be consulted for a more detailed assessment of flood risks in West Oxfordshire alongside these WCS scoping conclusions.

The predominant flood risks in the District are fluvial with areas of medium to high risk identified associated with all the major rivers in the District affecting settlements of Kelmscott, Bampton, Chimney, Northmoor, Minster Lovell, Crawley, Witney, Kingham, Ascott-under-Wychwood and Eynsham.

Development considerations must include a number of factors in relation to this risk; that existing risk to properties must not be increased by development and that development should avoid areas identified at highest risk, in line with the sequential approach. Where development is not specifically identified in a settlement at risk, the downstream consequences of larger developments such as at Witney or Eynsham must be taken into consideration. This includes potential increase in discharge from WwTWs as a result of new development.

Whilst flooding from surface water is not currently identified as a major source of flooding in West Oxfordshire, increasing urban expansion and pressure on the drainage network combined with more intense storms as a result of climate change are likely to increase the risk. TWUL has already identified issues of illegal surface water connections and incursion of surface water into the foul sewer network as a contributing factor to sewer flooding of properties. Policies encouraging the implementation of SuDS on all new developments are recommended to help address risks from surface water and sewer flooding but also to contribute to water quality improvements where urban runoff is affecting waterbody status.

6 Conclusion

The findings of this Phase 1 Scoping WCS indicate that future water supply is a concern in West Oxfordshire. TWUL has demonstrated that they are regularly monitoring water usage and planning both for options with a short lead in time, to ensure supply is maintained in the short to medium term, and considering bringing forward planned measures to meet longer term need. The potential for water availability shortages in the plan period underline the need for all parties to pursue policies which encourage reduction in water use and improve efficiencies. TWUL are planning for their next WRMP which will account for the increased housing projection now planned for West Oxfordshire. However based on a review of constraints to future water supply and potential for a supply-demand deficit within the plan period, there is strong justification to include a water efficiency policy within the Local Plan in line with the Building Regulations optional requirement of 110 l/h/d to support TWUL's resource management planning and to help achieve more sustainable water usage.

Waterbodies classified under the WFD in West Oxfordshire are subject to a number of pollution sources with agricultural runoff contributing significantly to high phosphate levels and physical modifications. However, pollution from wastewater treatment is also highlighted as reason for not achieving Good status in some waterbodies. The Environment Agency may want to address this in further detail through the ongoing review of consents. It should be noted that this may have implications for future permitted flow and therefore capacity to accept growth. The Environment Agency may consider this suitable justification for more focussed work in this area.

Initial analysis of capacity at WwTWs in West Oxfordshire suggests there is sufficient headroom in terms of permitted discharge volumes for the majority of projected housing development in the Plan period within existing permits with the exception of growth planned around Eynsham. The capacity assessment suggests that around 80% of Eynsham's projected growth could be accommodated before the permit would be exceeded which would allow for phasing of upgrades over time. It is also possible that existing permits for other WwTWs may need to be revised in relation to WFD compliance affecting the amount of usable headroom at other locations.

TWUL has prepared Stage 1 drainage strategies to address known constraints in the existing sewer network which may be exacerbated by new development. However, it is recommended that these be revisited by TWUL in line with increased housing projections. It is also recommended that inclusion of local plan policy on the implementation of SuDS is considered to support improvements in water quality, flood risk and pressures on sewer infrastructure.

Based on the outputs of this Phase 1 Scoping WCS, it is considered that there is a requirement for a further Outline study specifically related to planned growth at Eynsham, ensuring that development can be accommodated sustainably, through provision of appropriate infrastructure and standard of wastewater treatment. A partnership approach between WODC, TWUL and the Environment Agency would be required to deliver the further work, particularly in relation to amount of usable permitted headroom at other WwTWs in the District.

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