Gatwick Sub-Region Water Cycle Study

Final Report

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Crawley Borough Council,
Horsham District Council,
Mid Sussex District Council &
Reigate and Banstead District Council

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Contract

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Purpose

This document has been prepared as a Final Report for Crawley Borough Council acting on behalf of the councils in the Gatwick Sub-Region (Crawley Borough Council, Horsham District Council, Mid Sussex District Council, and Reigate and Banstead District Council, hereby referred to as "the Councils"). JBA Consulting accepts no responsibility or liability for any use that is made of this document other than by the Councils for the purposes for which it was originally commissioned and prepared.

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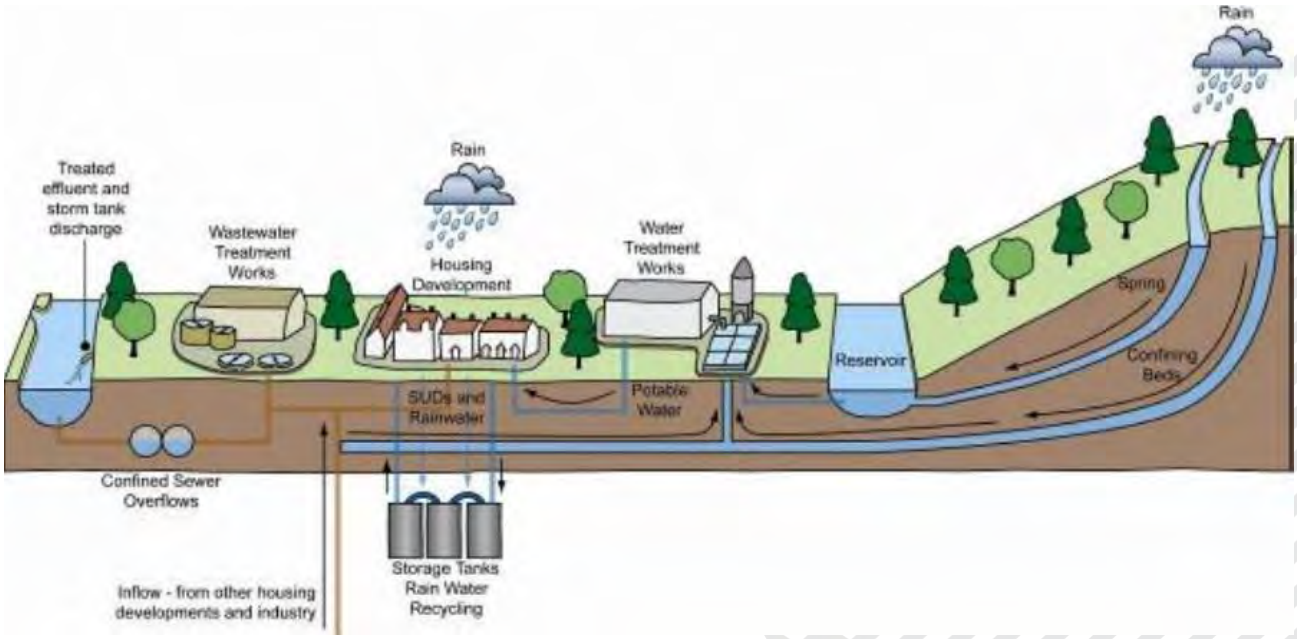
Executive Summary

In November 2019, JBA Consulting was commissioned by Crawley Borough Council acting on behalf of the councils in the Gatwick Sub-Region (Crawley Borough Council, Horsham District Council, Mid Sussex District Council and Reigate and Banstead Council), to undertake a joint Water Cycle Study (WCS) to inform and provide updated evidence for the councils pre-existing and emerging Local or District Plans. This study assesses the potential issues relating to future development within the Gatwick Sub-Region and the impacts on water supply, wastewater collection and treatment and water quality. The Water Cycle Study is required to assess the constraints and requirements that will arise from potential growth on the water infrastructure.

New homes require the provision of clean water, safe disposal of wastewater and protection from flooding. The allocation of large numbers of new homes in certain locations may result in the capacity of existing available infrastructure being exceeded, a situation that could potentially cause service failures to water and wastewater customers, adverse impacts to the environment, or high costs for the upgrade of water and wastewater assets being passed on to the bill payers.

In addition to increased housing demand, future climate change presents further challenges to the existing water infrastructure network, including increased intensive rainfall events and a higher frequency of drought events. Sustainable planning for water must now take this into account. The water cycle can be seen in the figure below and shows how the natural and man-made processes and systems interact to collect, store or transport water in the environment.

The Water Cycle



Source: Environment Agency – Water Cycle Study Guidance

This study will assist the councils in the Gatwick Sub-Region to select and develop sustainable development allocations where there is minimal impact on the environment, water quality, water resources, infrastructure and flood risk. This has been achieved by identifying areas where there may be conflict between any proposed development, the requirements of the environment (and the environmental legislative tests) and by recommending potential solutions to these conflicts.

The Water Cycle Study has been carried out in co-operation with the water companies, the Environment Agency (EA) and Natural England (NE) whilst also using published information from the neighbouring Local Planning Authorities (LPAs).

Potential development sites were provided by Crawley Borough Council (CBC), Horsham District Council (HDC), Mid Sussex District Council (MSDC) and Reigate & Banstead Borough Council

(RBBC) and wastewater treatment works (WwTW) likely to serve growth in the area were identified using the Environment Agency Consented Discharges to Controlled Waters database.

Each development site was then allocated to a WwTW in order to understand the additional wastewater flow resulting from the planned growth. Available information was collated on water policy and legislation, water resources, water quality, and environmental designations within the study area.

The objective of the study is to provide evidence to guide development towards the most sustainable sites. Red / Amber /Green (RAG) assessments have been prepared at the site scale where possible for the different aspects of the water cycle. It should be remembered that where a development is scored amber or red in a water supply or wastewater infrastructure assessment, it does not mean that development cannot or should not take place in that location, merely that significant infrastructure may be required to accommodate it. The decision on the suitability of sites is made up of a number of assessments outside the scope of this report.

Many of the assessments in this report are based on the assumption that every identified potential allocation will come forward during the plan period and as such represents the 'worst case' for growth within each wastewater catchment. In reality the level of growth in each catchment is likely to be less and further analysis will be undertaken based on the final selection of sites.

Water Resources

South East Water (SEW), SES Water (SESW) and Southern Water (SW) are responsible for supplying the study area with water. In common with most of the south east, all of the Gatwick Sub-Region is an area of serious water stress. The more stringent water efficiency target for new development of 110 l/p/d allowed under Building Regulations is justified, however there is a clear need to go further than this. Southern Water have made reducing per capita consumption to 100 l/p/d an integral part of their water resource management plan.

The WCS therefore recommends that the councils adopt a policy requiring all new development to achieve 100 l/p/d and to achieve 80 l/p/d in strategic developments. This approach is supported by all three water supply companies in the study area, the Environment Agency and Natural England.

Growth plans defined in Water Resource Management Plans (WRMPs) are broadly in line with Ministry of Housing Communities and Local Government household projections. Planned growth during the plan period for Horsham, Mid Sussex and Reigate and Banstead exceeds the percentage level of growth accounted for in WRMPs. In Crawley it is in line with the WRMP.

SES Water, SEW and SW have confirmed that they have sufficient water resources to serve the proposed level of growth, however challenges have been identified in the Hardham catchment and discussions are ongoing to investigate the sustainability of this abstraction.

Water supply infrastructure

All the sites assessed in the study were given a green or amber score by SEW and SW based on the size of the development, and the likelihood of network reinforcement being required. No constraints to providing this reinforcement were identified. SESW did not provide a site by site assessment, advising that this would be done on a case by case process and the local plan develops.

Wastewater collection infrastructure

Southern Water and Thames Water (TW) provide wastewater services to the Gatwick Sub-Region Sewerage Undertakers have a duty under Section 94 of the Water Industry Act 1991 to provide sewerage and treat wastewater arising from new domestic development. Except where strategic upgrades are required to serve very large or multiple developments, infrastructure upgrades are usually only implemented following an application for a connection, adoption, or requisition from a developer. Early developer engagement with SW and TW is therefore essential to ensure that sewerage capacity can be provided without delaying development.

Wastewater infrastructure upgrades would be required in order to serve the proposed level of growth. No constraints to providing this infrastructure have been identified by SW or TW.

Wastewater treatment capacity

SW and TW provided an assessment of the WwTW serving growth in their area based on the size of the development. JBA also performed a flow permit assessment in parallel to this based on the current flows provided by the water companies, flow permit and the additional effluent from growth.

Nine wastewater treatment works (WwTW) in the Gatwick Sub-Region are predicted to or are already exceeding their flow permit during the plan period. This is based on every identified potential allocation coming forward in each wastewater catchment and as such represents the 'worst case' for growth.

At these WwTWs upgrades may be required in order to accommodate planned growth. Phasing of these development sites needs to be carefully considered and early engagement with SW and TW is required to ensure that additional capacity is provided prior to occupation.

The Mayfield development, which consists of 7,000 houses, is closest to Henfield WwTW. This WwTW does not have capacity to serve this level of growth and SW are currently discussion with the EA how this development could be served including an option for a new WwTW. It is important that phasing of this significant development is aligned with delivery of a solution, and early engagement between Horsham District Council, Southern Water, the Environment Agency and developers is required.

If no action were taken, Crawley WwTW would exceed its flow permit during the plan period. Options exist to pump this flow to Horley, but both WwTWs are scored as "red" by Thames water indicating the scale of upgrades required. Schemes to address capacity concerns at these works may take a considerable time to deliver (3 to 5 years) it is therefore important that phasing of development within these wastewater catchments is aligned with the delivery of additional capacity, and early and continues discussion with Thames Water is required.

Odour

Ten sites were identified that were within 800 m of a WwTW. At these sites it is recommended that an odour assessment it carried out as part of the planning process. The cost of this should be met by the developer.

Water quality

The impact of growth on water quality in receiving watercourses was modelled using the Environment Agency's SIMCAT water quality modelling tool.

It was predicted that growth would cause a significant deterioration in water quality at many sites in the study area, but in most cases, this could be prevented by treatment at the technically achievable limit (TAL).

At Hogsmill and Rusper deterioration cannot be prevented by treatment at TAL. At Henfield WwTW, growth could prevent good ecological status being achieved in the receiving watercourse in the future. A strategic solution is required for the Mayfield development that was modelled as being served by Henfield WwTW. Discussions are ongoing between SW and the EA.

Flood risk from additional foul flow

The impact of increased effluent flows at WwTW from any of the proposed development has been assessed and is not predicted to have a significant impact upon flood risk in any of the receiving watercourses.

Environmental constraints

A number of Special Areas of Conservation (SAC), Special Protection Areas (SPA), Sites of Special Scientific Interest (SSSI) and Ramsar sites exist within or close to the Gatwick Sub-Region as well as many Priority Habitats and Rivers.

An assessment of water quality in the watercourses adjacent to protected sites identified a risk of deterioration of the conservation status as a result of higher phosphate concentrations. In all cases, improvement in treatment processes at WwTW to treat at the technically achievable limit could prevent this deterioration.

Runoff from development sites is a potential source of diffuse pollution and could be managed through implementation of a Sustainable Drainage System (SuDS) with a focus on treating water quality of surface runoff from roads and development sites. Opportunities also exist for these SuDS schemes to offer multiple benefits of flood risk reduction, amenity value and biodiversity.

In the wider area, opportunities also exist to implement natural flood management techniques to achieve the same multiple benefits as SuDS.

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Abbreviations / Glossary

ALS	Abstraction Licensing Strategy
AMP	Asset Management Plan
AONB	Area of Outstanding Natural Beauty
AP	Assessment Point
ASNW	Ancient Semi-Natural Woodland
BIDS	Business, Industrial, distribution and Storage
BOD	Biochemical Oxygen Demand
BREEAM	Building Research Establishment Environmental Assessment Methodology
CAMS	Catchment Abstraction Management Strategies
CAPEX	Capital Expenditure
CBC	Crawley Borough Council
CFMP	Catchment Flood Management Plan
CSO	Combined Sewer Overflow
DCLG	Department of Communities and Local Government (Replaced by MHCLG)
DWF	Dry Weather Flow
DWI	Drinking Water Inspectorate
DWMP	Drainage and Wastewater Management Plan
EA	Environment Agency
EFI	Ecological Flow Indicator
EP	Environmental Permit
EU	European Union
FEH	Flood Estimation Handbook
FWMA	Flood and Water Management Act
FZ	Flood Zone
GIS	Geographic Information Systems
HDC	Horsham District Council
HOF	Hands-Off Flow
HOL	Hands-off Level
JBA	Jeremy Benn Associates
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
l/p/d	Litres per person per day
Ml/d	Mega (Million) litres per day
MHCLG	Ministry of Housing Communities and Local Government
MSDC	Mid Sussex District Council
NH4	Ammonia
NMP	Nutrient Management Plan
NPPF	National Planning Policy Framework
OAN	Objectively Assessed Need
OfWAT	Water Service Regulation Authority
OS	Ordnance Survey
P	Phosphorous
RAG	Red / Amber / Green assessment
RBD	River Basin District

RBBC	Reigate and Banstead Borough Council
RBMP	River Basin Management Plan
ReFH	Revitalised Flood Hydrograph
RoFSW	Risk of Flooding from Surface Water (replaced uFMfSW)
RQP	River Quality Planning tool
SA	Sustainability Appraisals
SAC	Special Area of Conservation
SBP	Strategic Business Plan
SEA	Strategic Environmental Assessment
SESW	SES Water
SEW	South East Water
SfA	Sewers for Adoption
SFRA	Strategic Flood Risk Assessment
SHELAA	Strategic Housing and Economic Land Availability Assessment
SHMA	Strategic Housing Market Assessment
SPA	Special Protection Area
SPD	Supplementary Planning Document
SPS	Sewage Pumping Station
SPZ	Source Protection Zone
SS	Suspended Solids
SSSI	Site of Special Scientific Interest
SU	Sewerage Undertaker
SuDS	Sustainable Drainage Systems
SW	Southern Water
SWMP	Surface Water Management Plan
TW	Thames Water
UWWTD	Urban Waste Water Treatment Directive
WaSC	Water and Sewerage Company
WCS	Water Cycle Study
WFD	Water Framework Directive
WINEP	Water Industry National Environment Programme
WRMP	Water Resource Management Plan
WRZ	Water Resource Zone
WTW	Water Treatment Works
WwTW	Wastewater Treatment Works

1 Introduction

1.1 Terms of Reference

JBA Consulting was commissioned by Crawley Borough Council acting on behalf of the councils in the Gatwick Sub-Region (Crawley Borough Council, Horsham District Council, Mid Sussex District Council and Reigate and Banstead Council), to undertake a joint Water Cycle Study (WCS) to inform the councils emerging Local or District Plans. This study assesses the potential issues relating to future development within the Gatwick Sub-Region and the impacts on water supply, wastewater collection and treatment and water quality. Unmitigated future development and climate change can adversely affect the environment and water infrastructure capability. A WCS will provide the required evidence, together with an agreed strategy to ensure that planned growth occurs within environmental constraints, with the appropriate infrastructure in place in a timely manner so that planned allocations are deliverable.

1.2 The Water Cycle

Planning Practice Guidance on Water Supply, Wastewater and Water Quality[1] describes a water cycle study as:

"A voluntary study that helps organisations work together to plan for sustainable growth. It uses water and planning evidence and the expertise of partners to understand environmental and infrastructure capacity. It can identify joined up and cost-effective solutions, that are resilient to climate change for the lifetime of the development.

The study provides evidence for Local Plans and sustainability appraisals and is ideally done at an early stage of plan-making. Local authorities (or groups of local authorities) usually lead water cycle studies, as a chief aim is to provide evidence for sound Local Plans, but other partners often include the Environment Agency and water companies."

The Environment Agency's guidance on WCS[2] recommends a phased approach:

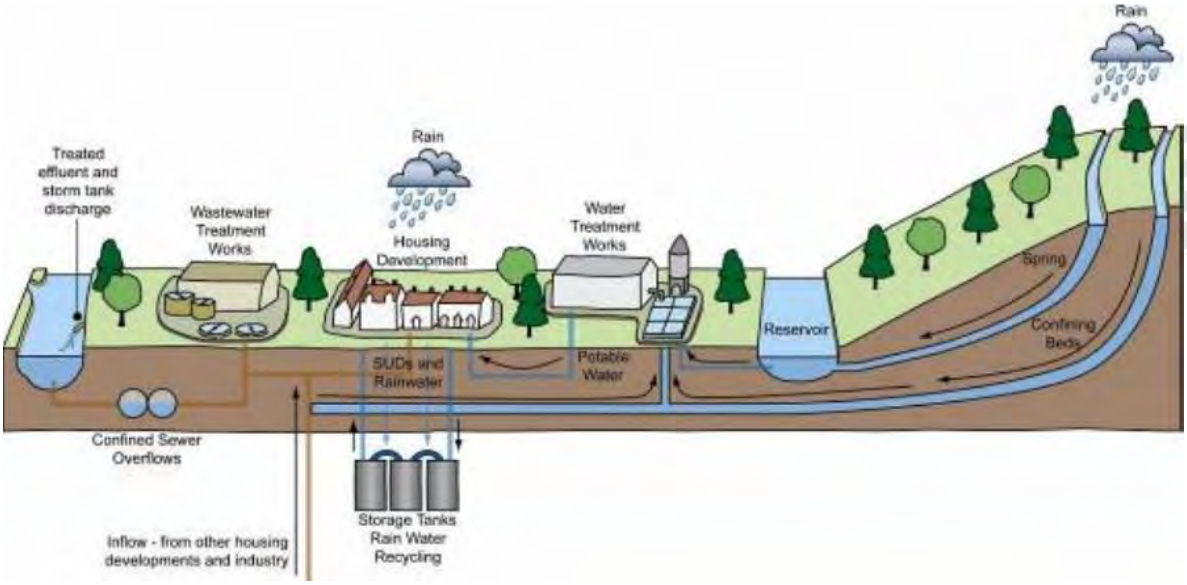
- Phase 1: Scoping study, focussing on formation of a steering group, identifying issues for consideration and the need for an outline study.
- Phase 2: Outline study, to identify environmental constraints, infrastructure constraints, a sustainability assessment and consideration of whether a detailed study is required.
- Phase 3: Detailed study, to identify infrastructure requirements, when they are required, how they will be funded and implemented and an overall assessment of the sustainability of proposed infrastructure.

Figure 1.1 below shows the main elements that compromise the Water Cycle and shows how the natural and man-made processes and systems interact to collect, store or transport water in the environment.

1 Planning Practice Guidance: Water supply, wastewater and water quality, Department for Communities and Local Government (2014). Accessed online at: http://planningguidance.planningportal.gov.uk/blog/guidance/ on: 14/02/2020

2 Water Cycle Study Guidance, Environment Agency (2009). Accessed online at: http://webarchive.nationalarchives.gov.uk/20140328084622/http://cdn.environment-agency.gov.uk/geho0109bpff-e-e.pdf on: 14/02/2020

Figure 1.1: The Water Cycle



Source: Environment Agency – Water Cycle Study Guidance

1.3 Impacts of Development on the Water Cycle

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

1.4 Objectives

As a WCS is not a mandatory document, Local Planning Authorities are advised to prioritise the different stages of the WCS to integrate with their Local and District Plan programme. This report is written to support the emerging Local or District Plans of councils in the Gatwick Sub-Region.

The WCS brief stated that the overall objective of the WCS is to understand the environmental and physical constraints of development and identify opportunities for more sustainable planning and improvements that may be required to achieve the required level of development. This should be assessed by considering the following issues:

- Water demand and supply
- Wastewater infrastructure and treatment
- Water quality and the environment
- Flood risk and drainage.

1.5 Study Area

The Gatwick Sub-Region covers an area of approximately 1,040km^2 and has a population of 515,593 reported in the 2011 census. The region is made up of four local authorities, Crawley Borough Council (CBC), Horsham District Council (HDC), Mid Sussex District Council (MSDC) and Reigate & Banstead Borough Council (RBBC). The main urban areas are Crawley, Horsham, Redhill, East Grinstead, Haywards Heath, Horley and Burgess Hill.

The Gatwick Sub-Region is located within the Thames river basin and the South East river basin. The sub-region contains the River Mole, River Arun, River Medway, River Ouse and River Adur.

Water supply is provided by SES Water (SESW), Southern Water (SW), South East Water (SEW) and Thames Water (TW). The region falls within the Thames and Southern Sewerage Service Boundaries.

Wastewater is managed by Thames Water in the north of the study area and Southern Water in the south of the study area.

1.6 Record of Engagement

1.6.1 Introduction

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

1.6.2 Scoping Study Engagement

The preparation of this WCS was supported by the following engagement:

Inception Meeting

Engaged Parties	Crawley Borough Council Horsham District Council Mid Sussex District Council Reigate & Banstead Borough Council West Sussex County Council Natural England SES Water South East Water Southern Water The Environment Agency and Thames Water were invited but could not attend.

Neighbouring Authorities

Engaged Parties	Epsom and Ewell Borough Council Sutton London Borough Council Croydon London Borough Council Tandridge District Council Wealden District Council Lewes District Council	Brighton and Hove City Council Adur District Council Arun District Council Chichester District Council Waverley Borough Council Mole Valley District Council
Details	JBA prepared a WCS for Tandridge District Council who were contacted to confirm that the growth scenario used was still current. Growth information from the remaining councils was taken from published local plan documents with a focus on housing growth that would be served by WwTW within or shared with the Gatwick Sub-Region.	

Collaboration with Water and Wastewater Companies

	Water Companies	Wastewater Companies
Engaged Parties	SES Water (SESW) Southern Water (SW) South East Water (SEW)	Thames Water (TW) Southern Water (SW)
Details	Water company assessments of water and wastewater infrastructure and capacity constraints.	

2 Future Growth in the Gatwick Sub-Region

2.1 Growth in the Gatwick Sub-Region

The councils in the Gatwick Sub-Region are at different stages in their Local and District Plan process. The following section summarises how each council is expected to grow during their respective plan period and allows a forecast to be created that can be used to estimate the volume of water and wastewater required in the future and the resulting pressure on water infrastructure.

This forecast consists of:

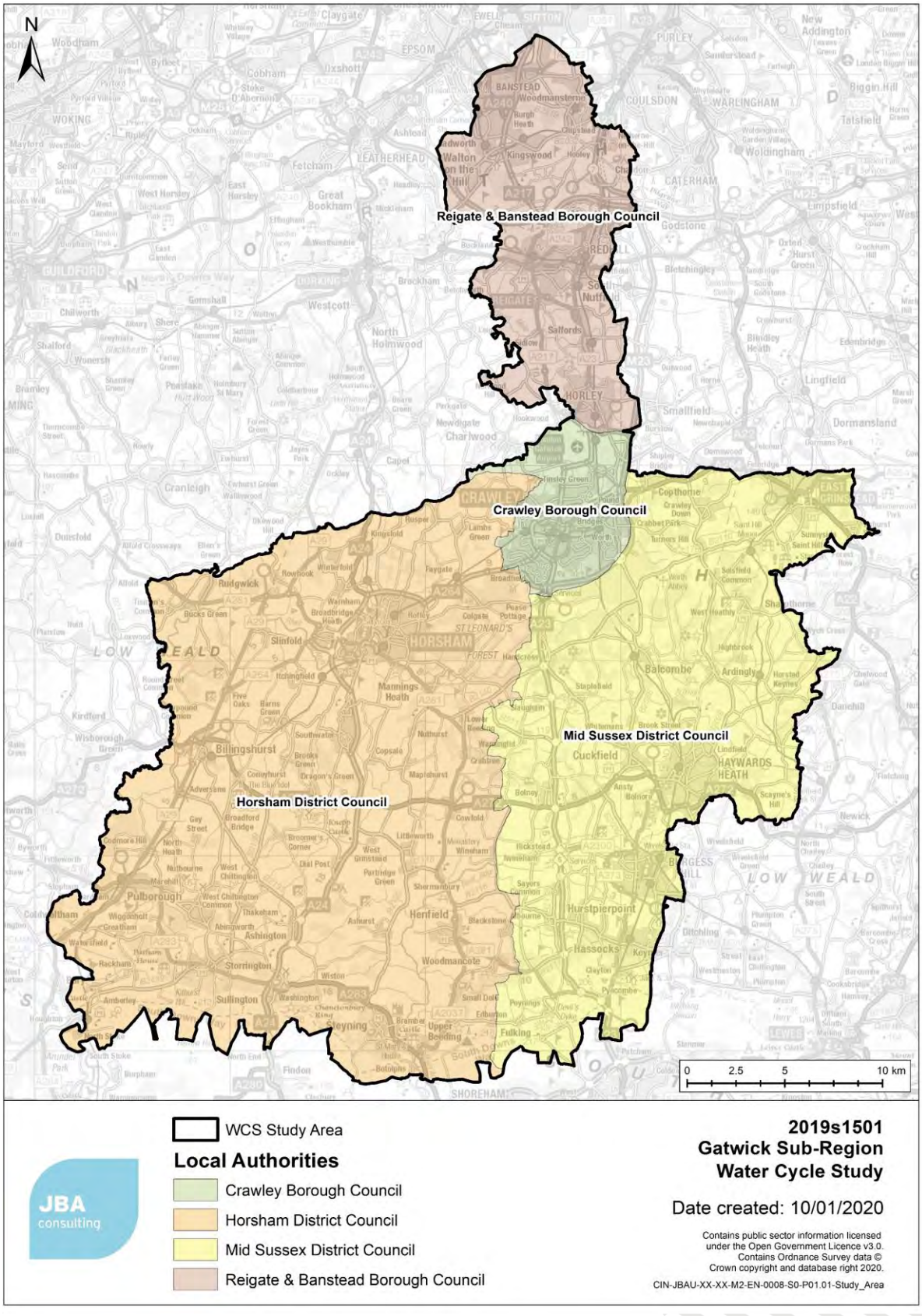
- Allocations - sites allocated, or planned to be allocated in Local Plans
- Committed sites – sites already in the planning system
- Recent completions – sites completed in the last year that may not yet appear in flow data provided by the water companies
- Windfall – sites that have not been specifically identified in the Local Plan. They normally comprise previously developed sites that have unexpectedly become available
- Neighbouring authority growth – growth served by infrastructure within or shared with the study area

Each council provided information on expected growth during the plan period which was collated into a forecast for housing and employment. This is summarised for each council in Table 2.1 to Table 2.4: Summary of growth in Mid Sussex. As each council's local plan period varies, the growth forecast collated for this WCS does not necessarily match the published figures in draft or adopted plans and is used for the purposes of estimating water demand.

A map of the study area showing the relative locations of the local authorities is found in Figure 2.1.

In light of the COVID-19 pandemic, and its significant impacts on aviation and related sectors that are of important within the Gatwick sub-region, there is considerable uncertainty in the employment forecasts. Many of these may need to be revisited as the medium to long term impacts are understood.

Figure 2.1: Map of the Water Cycle Study Area



2.2 Crawley Borough Council

The emerging Northern West Sussex Strategic Housing Market Assessment (SHMA) shows Crawley borough will have a housing need (based on the standard methodology) of up to 11,820 (720pa) new homes over the plan period 2020 to 2035. Crawley Borough Council has also produced its draft Local Plan 2020 – 2035[3] which is currently out for public consultation.

The Local Plan makes provision for the development of a minimum of 5,355 net dwellings in the borough in the period 2020 to 2035.

- Years 1-5 (2020-25): 500 dwellings per annum (dpa)
- Years 6-10 (2025-30): 450dpa
- Years 11-15 (2030-35): 121dpa

There will be a remaining unmet housing need, of approximately 5,925 dwellings, arising from Crawley over the Plan period. The council will continue to work closely with its neighbouring authorities, particularly those which form the Northern West Sussex Housing Market Area, in exploring opportunities and resolving infrastructure and environmental constraints in order to meet this need in sustainable locations. This will include continued assessment of potential urban extensions to Crawley.

For the avoidance of doubt, this unmet need has been factored into all of the analysis within this water cycle study.

CBC provided details of growth identified within the Borough, which is summarised in Table 2.1 below. The Reg. 19 Draft Local Plan is planning for 33ha of employment land based on the Employment Growth Assessment 'continuation of past trends' scenario. The potential employment site allocations provided by CBC for this study are in excess of 33ha, but not all of these sites will be developed. The wastewater capacity assessment and water quality modelling in chapters 7 and 9 consider the 'worst case' scenario of all of the sites promoted to the council coming forward. Further work is required to understand the precise scale and location of these employment sites. The majority of these sites are contained within the Crawley Area Action Plan zone shown in Figure 2.2.

Table 2.1: Summary of Growth in Crawley

Type of Growth	Number of Houses	Employment land
Allocations	2,367	33ha (Continuation of Past Development Rates) 113ha (Baseline Labour Supply) job growth based on CBC standard figure of 752dpa indicates a job growth figure of approx. 20,500 between 2019-36 of which approx. 9,750 are in B Use Class sectors
Commitments	2,754	
Completions (18/19)	512	
Windfall	880	
TOTAL	6,001	
Objectively Assessed Need (OAN)	11,820	
Reg. 19 Draft Crawley Borough Local Plan (January 2020)	5, 355	

Also present within Crawley Borough is Gatwick airport, the second largest airport in the UK, handling an estimated 49 million passengers in 2020. The airport has a very large water and wastewater demand, and changes to usage and passenger numbers can have a significant impact on water infrastructure within the study area. Gatwick Airport

3 Crawley Borough Council. January 2020. Crawley 2036 – Draft Crawley Borough local Plan 2020 - 2035

Limited (GAL) published its master plan in July 2019[4] and this contains three scenarios for growth.

- Scenario 1 – retain the current single runway, two terminal configuration. In this scenario passenger numbers are expected to grow to 61 million passengers per annum by 2032.
- Scenario 2 – Bring the northern standby runway into operational use alongside the existing runway. This would increase passenger numbers to 70 million by 2032.
- Scenario 3 – Build an additional runway to the south of the airport, using land currently safeguarded. This scenario is not currently being pursued by GAL.

Scenarios 1 and 2 have been modelled in the WCS by translating the additional passenger numbers into an increase in water demand for use in the study.

An Area Action Plan is proposed by the Draft Local Plan in the area north of Crawley between the town and Gatwick Airport. This land had previously been safeguarded for the purposes of building an additional runway at Gatwick Airport. This is shown in Figure 2.2.

4 Gatwick Airport Master Plan, Gatwick airport Limited, (2019). Accessed online at: https://www.gatwickairport.com/business-community/future-plans/long-term-plans/ on: 13/02/2020

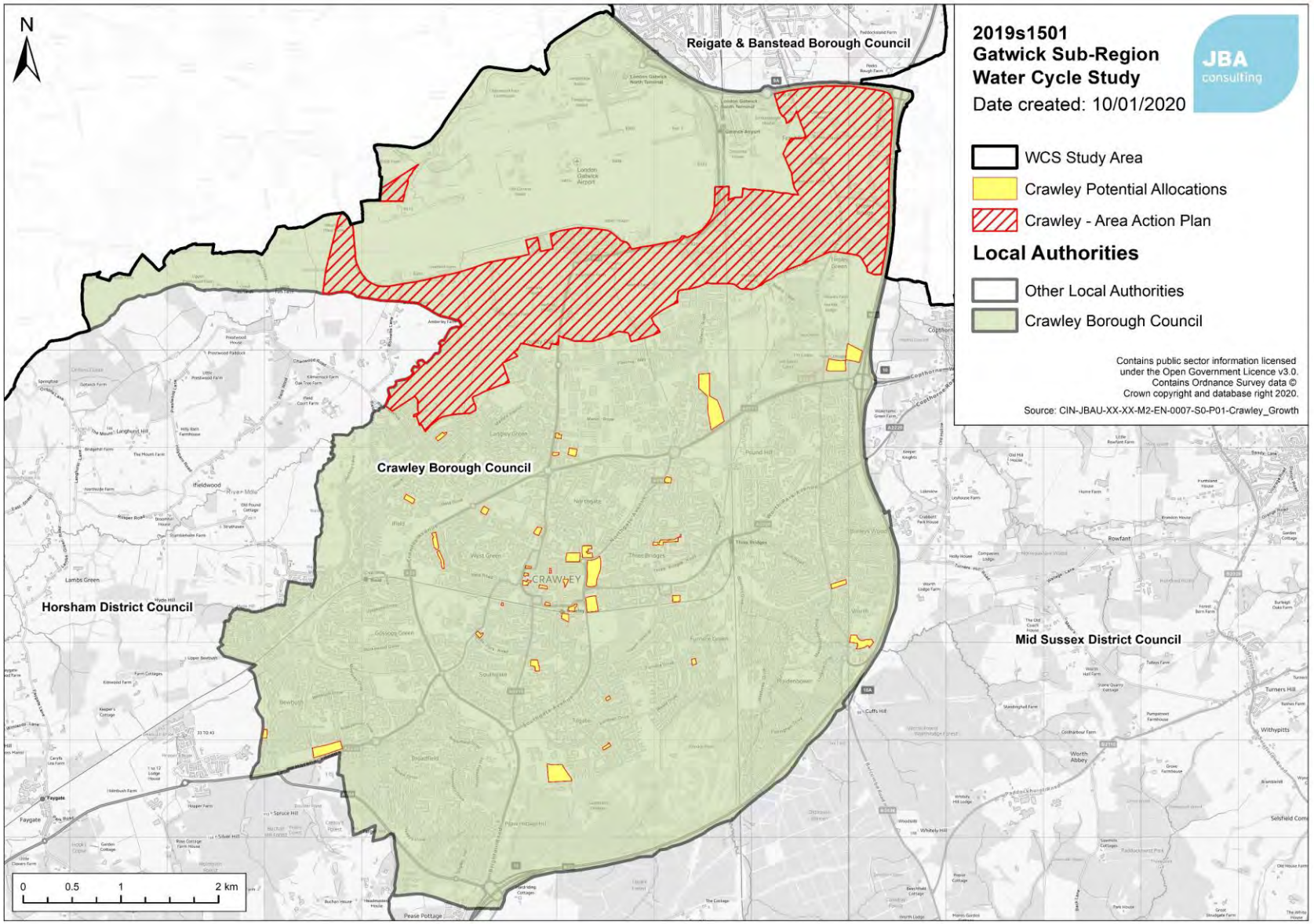


Figure 2.2 Growth in Crawley

2.3 Reigate and Banstead Borough Council

Reigate and Banstead Borough Council's Local Plan is in two parts. Its Core Strategy was adopted on 3 July 2014. This includes provision of at least 460 dwellings per annum between 2012 and 2027. On 2 July 2019, the Council completed a review of all the 2014 Core Strategy policies, which concluded that the Core Strategy remains up to date, and that none of its policies currently need modifying or updating.

RBBC adopted its Development Management Plan (DMP) in September 2019. The DMP includes specific site allocations to deliver the level of growth and the spatial strategy set out in the Core Strategy.

The Objectively Assessed Need is 9,000-9,600 over the plan period (2012-27), however the Housing Requirement in RBBC's adopted and reviewed Core Strategy is 6,900 due to constraints.

The indicative number of employees quoted in the table below is based on a standard employment density being applied to the employment sites supplied to JBA for this study. Actual employee numbers are likely to differ.

RBBC provided shapefiles of their allocated sites, commitments and recent completions as well as an estimate of windfall. This is summarised in Table 2.2 and the distribution of growth is shown in Figure 2.3.

Table 2.2: Summary of growth in Reigate and Banstead

Type of Growth	Number of Houses	Indicative No. Employees
Allocations	1,700*	11,701
Commitments	2,569*	716
Completions (18/19)	520*	0
Windfall	1,200	-
TOTAL	5,989	12,417
Objectively Assessed Need (OAN)	RBBC's objectively 6,900	N/A

*The wastewater capacity assessments and water quality model use figures originally provided in the study of 1,952, 2,816, and 384 for allocations, commitments and completions respectively. The figures quoted above are therefore a minor reduction from that modelled, but the impact on results and conclusions is not thought to be significant.

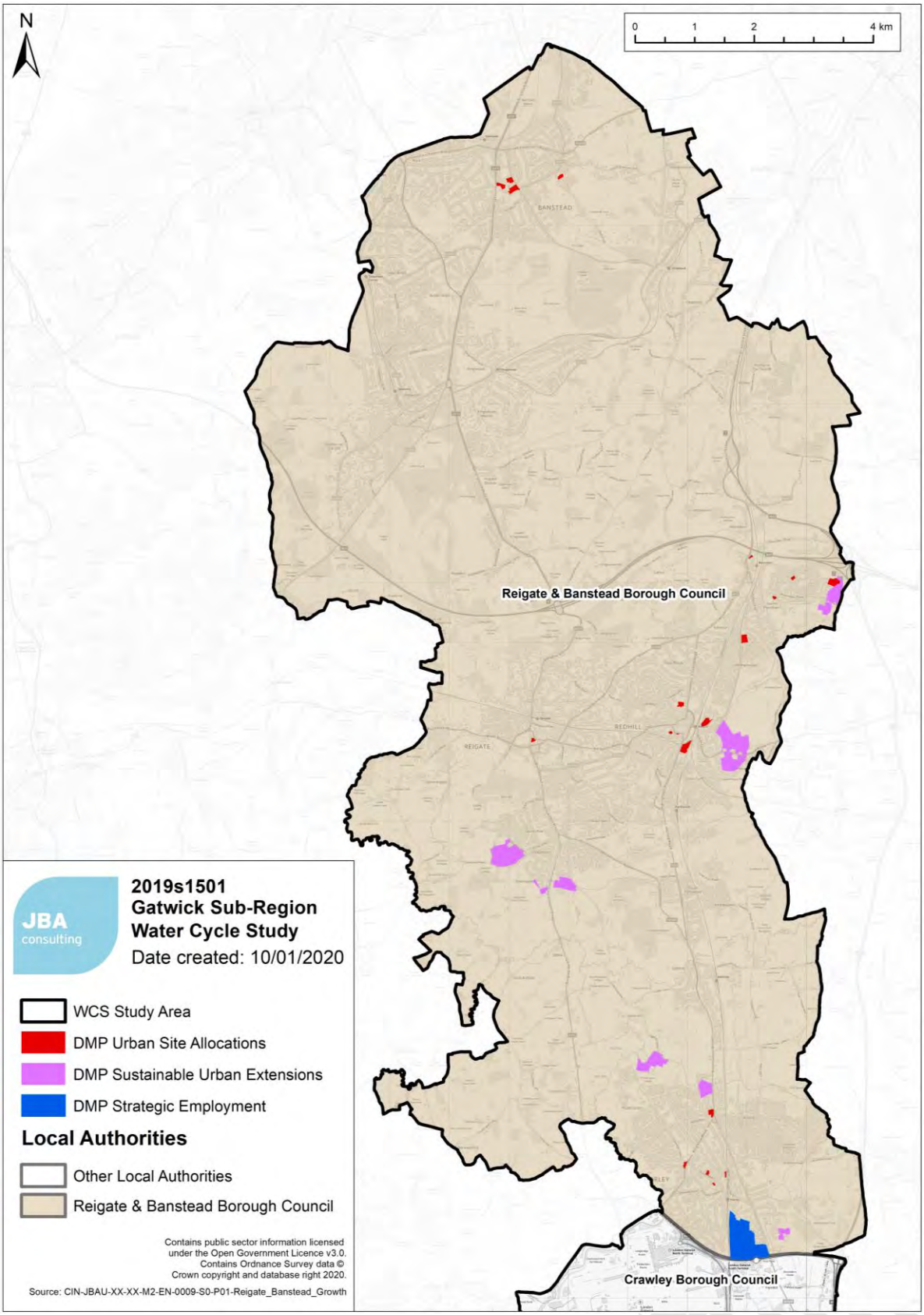


Figure 2.3 Growth in Reigate and Banstead

2.4 Horsham District Council

Horsham District Council are in the process of reviewing their Local Plan which will be submitted in 2021.

Shapefiles identifying potential large sites were provided to JBA, as well details of commitments, recent completions and windfall. This is summarised in Table 2.3 below, and the distribution of growth shown in Figure 2.4.

In the WwTW capacity assessment and water quality modelling JBA used an earlier estimate of Windfall of 500 houses over the plan period, which has since been increased to 535 houses over the next five years and 125 houses per year over the remainder of the plan period. As the assessment includes the 'worst case' of every allocation coming forward in every wastewater catchment, the increase in windfall is not expected to make a significant difference.

The indicative number of employees quoted in the table below is based on a standard employment density being applied to the employment sites supplied to JBA for this study. Actual employee numbers are likely to differ.

Table 2.3: Summary of growth in Horsham

Type of Growth	Number of Houses	Indicative No. Employees
Allocations	37,625*	0
Commitments	8,576	1,163
Completions (18/19)	1,368	0
Windfall	2,035	-
TOTAL	49,604	1,163
Objectively Assessed Need (OAN)	15,440	N/A

* This figure represents every large site identified and is not the number of houses planned to be delivered. Once broken down into wastewater catchments, this could be thought of as a "worst case" for water demand in each catchment. The OAN has been used in water resource estimation.

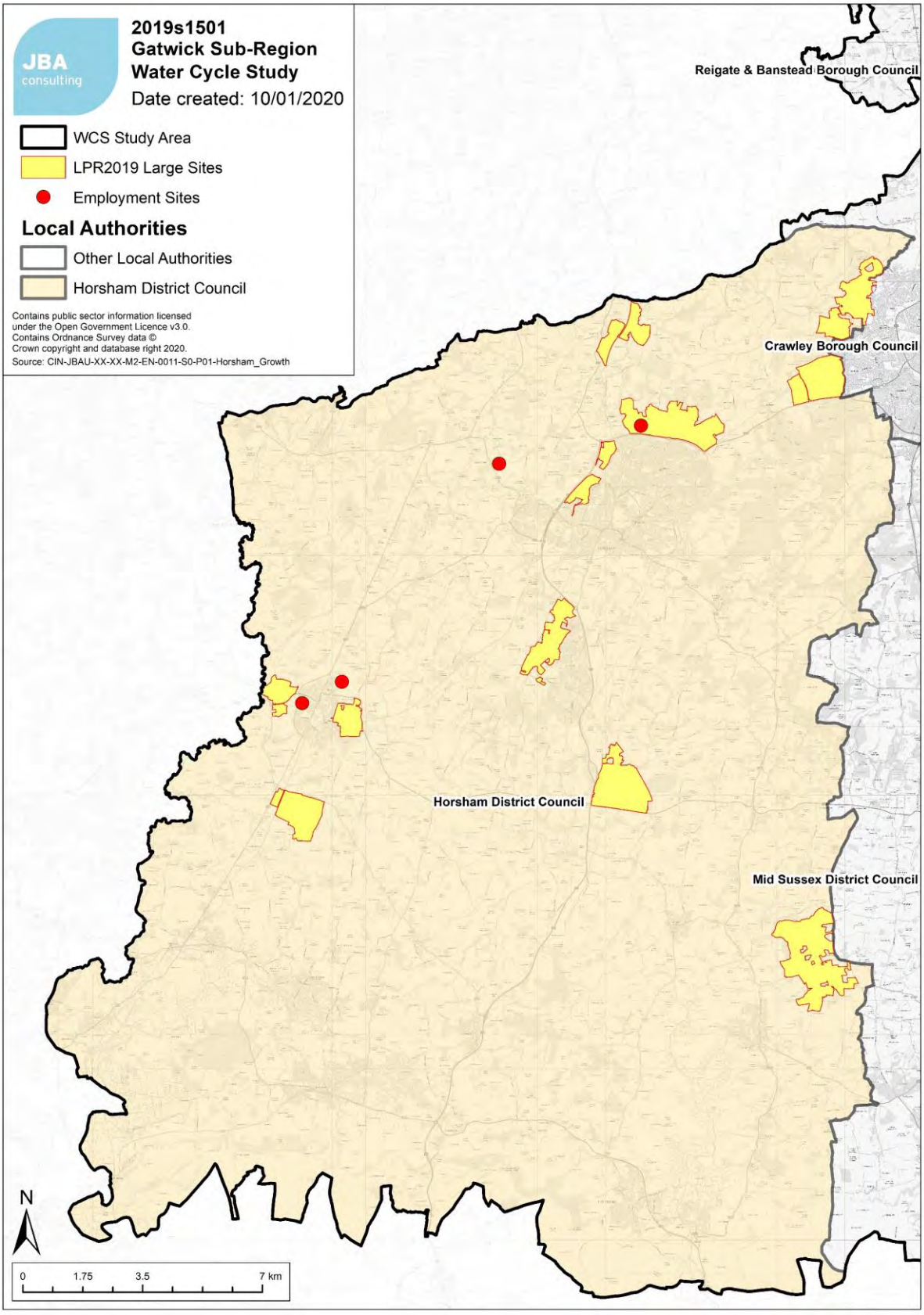


Figure 2.4 Growth in Horsham

2.5 Mid Sussex District Council

The Mid Sussex District Plan 2014 – 2031[5] was adopted in March 2018 and identified a housing requirement of 16,390 over the plan period as well at 25ha of employment land. MSDC provided shapefiles containing their allocations, commitments and recent completions and an estimation of windfall. This is summarised on Table 2.4: Summary of growth in Mid Sussex and the distribution of growth is shown in Figure 2.5.

The Mid Sussex adopted housing requirement is higher than the OAN as it contains an element of unmet need from Crawley.

Table 2.4: Summary of growth in Mid Sussex

Type of Growth	Number of Houses	Indicative No. Employees
Allocations*	1,962	5,904
Commitments	10,381	0
Completions (2014/15-2018/19**)	3,914	0
Windfall	588	-
TOTAL	16,845	5,904
Objectively Assessed Need (OAN)	14,892	N/A
Adopted Housing Requirement	16,390	N/A

*Represents proposed allocations in the Regulation 18 Site Allocations DPD (not yet adopted)

** Only completions from 2018/19 have been included in the growth forecast used in the WCS analysis

5 Mid Sussex District Council. March 2018. Mid Sussex District Plan 2014 – 2031.

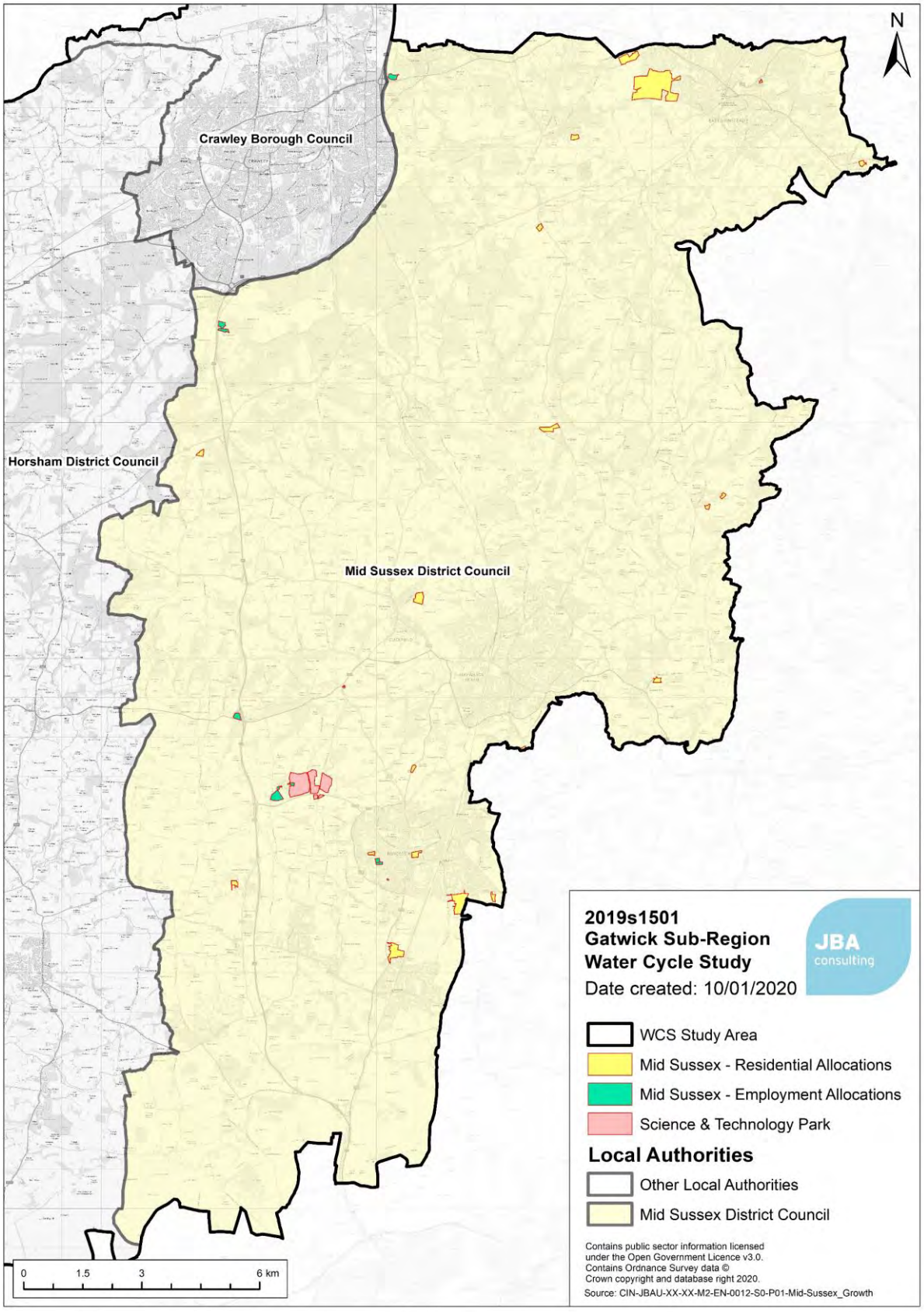


Figure 2.5 Growth in Mid Sussex (not yet adopted)

2.6 Growth Outside the Gatwick Sub-Region

The sewer catchments provided by Southern Water and Thames Water were used to identify neighbouring Local Planning Authority (LPA) areas that may be served by infrastructure within or shared with the Gatwick Sub-Region. Published information from each LPA was then used to inform an estimate of growth. This was added to the growth forecast collated from information within the study area. Where there was no trajectory specified by the neighbouring councils, committed development was spread evenly over the next five years (2019/20 to 2023/24) and Local Plan development was spread evenly from 2019/20 to the end of the Local Plan period.

2.6.1 Epsom and Ewell Borough Council

The Strategic Housing Market Assessment (SHMA) Update (Sept,2013)[6] was produced to support the development of the Epsom and Ewell Local Plan. This report determines that between 2019 and 2039, a minimum of 579 dwellings per annum are required in the area.

This informs growth at Hogsmill WwTW, located in the Royal Borough of Kingston upon Thames, which also serves the northern portion of Reigate and Banstead.

Table 2.5: Summary of Growth in Epsom and Ewell Served by Shared Infrastructure

WwTW	Proposed number of dwellings (per annum)	Time Period	Shared With
Hogsmill	579	2019 - 2039	Reigate and Banstead

2.6.2 Royal Borough of Kingston Upon Thames

Although the Royal Borough of Kington Upon Thames does not share a boundary with the study area, the entirety of the wastewater from the Local Authority area is managed by Hogsmill WwTW, which also serves the northern portion of Reigate and Banstead.

The Local Plan Early Engagement document[7] states that the annual housing target for the Local Authority has been steadily increasing. Over the whole plan period proposed for the new borough of Kingston Local Plan, 2019 to 2041, this would be about 1,364 new homes per annum over 22 years.

Table 2.6: Summary of Growth in Kingston Served by shared infrastructure

WwTW	Proposed number of dwellings (per annum)	Time Period	Shared With
Hogsmill	1,364	2019 - 2041	Reigate and Banstead

6 Cobweb Consulting. September 2019. Strategic Housing Market Assessment Update - Epsom and Ewell Borough Council
7 The Royal Borough of Kingston Upon Thames. May 2019. Local Plan – Early Engagement (Regulation 18)

2.6.3 Sutton London Borough Council

The Sutton London Borough Council adopted their Local Plan as a Development Plan Document (DPD) in February 2018[8]. This document states that over the plan period 2016 – 2031, the aim is to deliver 427 residential dwellings per annum.

It is also stated that there will be at least ten additional hectares of land for industrial uses, 23,000m^2 additional gross office floorspace, 39,000m^2 additional gross retail floorspace and 10,000m^2 additional gross floorspace for restaurants over the period.

This informs growth at Hogsmill WwTW and Beddington WwTW, which also serve the northern portion of Reigate and Banstead. The Sutton Local Plan anticipates that growth will be delivered in defined primary and secondary growth areas, including in Sutton, Hackbridge, Wallington and other smaller district centres. Utilising this information, it is assumed that approximately 38% on new growth will be served by Hogsmill WwTW and 62% at Beddington WwTW.

Table 2.7: Summary of Growth in Sutton Served by Shared Infrastructure

WwTW	Proposed number of dwellings (per annum)	Time Period	Shared With
Hogsmill	162	2016 – 2031	Reigate and Banstead
Beddington	265	2016 – 2031	Reigate and Banstead

2.6.4 Croydon London Borough Council

The Croydon Local Plan 2018[9] was adopted in February 2018. However, the Council is currently updating this to reflect the strategic direction outlined in the Draft London Plan. The Council is working towards the publication of the Local Plan in 2022. The Emerging Croydon Local Plan has a plan period of 2019-2036.

The Strategic Housing Market Assessment Update[10] states three figures for housing need:

- The Standard Method housing need for Croydon results in 2,302 dwellings per annum.
- Croydon Local Plan scenario identifies a need of 1,644 dwellings per annum.
- The Draft London Plan Scenario identifies a need of 2,949 dwellings per annum.

In this situation, the worst-case scenario of 2,949 dwellings per annum has been used.

West Croydon is served by Beddington WwTW and east Croydon is served by Longreach WwTW. Beddington WwTW also serves the northern portion of Reigate and Banstead.

The Local Plan shows that growth will be concentrated in the western portion of the Local Authority area. Therefore, two thirds of growth has been applied to Beddington STW.

Table 2.8: Summary of Growth in Croydon Served by Shared Infrastructure

WwTW	Proposed number of dwellings (per annum)	Time Period	Shared With
Beddington	1,966	2019 - 2036	Reigate and Banstead

8 London Borough of Sutton. February 2018. Sutton Local Plan 2016 - 2031
9 London Borough of Croydon. February 2018. Croydon Local Plan 2018
10 GL Hearn. November 2019. Strategic Housing Market Assessment Update - London Borough of Croydon

2.6.5 Tandridge District Council

In 2015 Tandridge assessed its local housing needs. The Tandridge Local Plan aims to provide 6,056 dwellings, or 303 dwellings per annum in the plan period to 2033. For the longer term and beyond the Plan period, new homes will be delivered through the development of the South Godstone Garden Community.

In December 2018, the Tandridge District Council Phase 3 Detailed Water Cycle Study (WCS) was completed by JBA Consulting. Housing allocation sites, provided by Tandridge District Council, show that over the plan period approximately 2,344 dwelling would impact wastewater infrastructure shared with Reigate & Banstead and Mid Sussex.

Table 2.9: Summary of Growth in Tandridge Served by Shared Infrastructure

WwTW	Proposed number of dwellings (per annum)	Time Period	Shared With
Beddington	133	2019 - 2033	Reigate and Banstead
Burstow	383	2019 - 2033	Reigate and Banstead
Reigate (Earlswood)	5	2019 - 2033	Reigate and Banstead
Felbridge	2	2019 - 2033	Mid Sussex

2.6.6 Wealden District Council

Wealden District Council withdrew their draft Local Plan 2019 on the 19th February 2020. The Local Plan outlined the growth and change that would take place within Wealden District between 2013 and 2028[11]. This plan proposed to deliver 14,228 dwellings across the plan period, comprising of 2,421 dwellings already completed, 5,279 dwellings with extant planning permission, 4,012 dwellings on allocated sites, and 2,516 windfalls.

In the absence of any more up-to-date information, the withdrawn plan was used to inform growth at Luxfords Lane East Grinstead WwTW, which serves both Wealden and Mid Sussex within the Gatwick Sub Region. The report identifies that there is an allowance of 33 properties per year across the plan period in the area served by Luxfords Lane WwTW.

Table 2.10: Summary of Growth in Wealden Served by Shared Infrastructure (based on withdrawn draft Local Plan)

WwTW	Proposed number of dwellings (per annum)	Time Period	Shared With
Luxfords Lane East Grinstead	33	2013 and 2028	Mid Sussex

11 Wealden District Council. August 2018. Proposed Submission Document – Wealden Local Plan.

2.6.7 Lewes District Council

The Lewes District Local Plan is formed of two parts. Part 1 is the Joint Core Strategy 2010 – 2030[12] and Part 2 is Site Allocations and Development Management Policies[13]. The document states that across the plan period, 6,926 dwellings are required, this is 346 per annum.

This informs growth at Goddards Green WwTW, which serves Mid Sussex and the settlement of Burgess Hill. The eastern extents of Burgess Hill are located in Lewes district, 100 additional dwellings are proposed for the planned period in this location.

Table 2.11: Summary of Growth in Lewes Served by Shared Infrastructure

WwTW	Proposed number of dwellings (per annum)	Time Period	Shared With
Goddards Green	5	2010 - 2030	Mid Sussex

2.6.8 Brighton and Hove City Council

No shared wastewater infrastructure has been identified therefore development in Brighton and Hove is unlikely to have an impact on any wastewater infrastructure serving Mid Sussex.

2.6.9 Adur District Council

No shared wastewater infrastructure has been identified therefore development in Adur is unlikely to have an impact on any wastewater infrastructure serving Horsham.

2.6.10 Worthing Borough Council

No shared wastewater infrastructure has been identified therefore development in Worthing is unlikely to have an impact on any wastewater infrastructure serving Horsham.

2.6.11 Arun District Council

The Arun Local Plan 2011 – 2031[14] was adopted in July 2018. As the southern portion of the district does not border Horsham, this growth will not impact the study area.

The northern portion of the district falls within the South Downs National Park. The South Downs Local Plan 2014 – 2033[15] was adopted in July 2019 and covers the portion of the District bordering Horsham.

Within the National Park, the objectively assessed need is 447 dwellings per annum over the plan period. However, a Sustainability Appraisal (SA) has confirmed that the National Park Authority would not be meeting its statutory purpose if it were to seek to fully meet this objectively assessed need within the National Park Boundaries. Therefore, the South Down Local Plan is looking to provide 250 dwellings per annum, 4,750 in total over the plan period, with a shortfall of 3,743 dwellings.

The Local Plan has identified 53 settlements that are well placed to accommodate growth. It is unlikely that there will be significant growth in the Arun portion of the South Downs National Park that will impact infrastructure shared with the study area.

12 Lewes District Council. May 2016. Lewes District Local Plan – Part 1: Joint Core Strategy 2010 - 2030
13 Lewes District Council. December 2018. Lewes District Local Plan – Part 2: Site Allocations and Development Management Policies Submission Document
14 Arun District Council. July 2018. Adoption Arun Local Plan 2011-2031
15 South Downs National Park Authority

2.6.12 Chichester District Council

The northern and southern portions of Chichester are covered by the Chichester Local Plan 2014 – 2029[16]. The southern portion does not share a boundary with the study area and therefore growth will not impact the Gatwick Sub-Region. The Northern portion shares a boundary with Horsham. As there is no wastewater infrastructure shared with Horsham in this area, it is again unlikely that future growth will have an impact on the study area.

The central portion of the District is covered by the South Downs Local Plan 2014 – 2033, which has been discussed in Section 2.4.11. Minimal growth is proposed in the areas of the National Park neighbouring the study area.

2.6.13 Waverley Borough Council

The Waverley Local Plan Part 1: Strategic Policies and Sites[17] was adopted in February 2018 and covers a plan period 2013 - 2032. The plan sets out a strategy to developed at least 11,210 dwellings within the plan period. This is 590 dwellings per annum, made up of 507 dwellings and 83 dwellings to meet Woking's unmet housing need.

Rudgewick WwTW, located in Horsham, serves Ellen's Green, a small village located in Waverley. The Local Plan does not identify growth in Ellen's Green and therefore it is unlikely that growth will impact shared wastewater infrastructure at this location.

2.6.14 Mole Valley District Council

The Mole Valley Local Development Framework Core Strategy[18] was adopted in October 2009 and will cover a plan period 2006 - 2026. Over the plan period, Mole Valley must make provision for at least 3,760 new dwellings in accordance with the South East Plan.

The Local Plan is currently under review and the Future Mole Valley 2018 – 2033 Consultation Draft Local Plan[19] was available for review at the time of writing. This draft document shows that the housing demand in the District is now 449 dwellings per annum, totalling 6,735 across the 15-year plan period.

Based on the settlement hierarchy most development will be directed towards the Principal Towns - Dorking (including North Holmwood) and Leatherhead and then the Suburban Villages - Ashtead, Bookham and Fetcham. However, some limited development may be considered in the rural villages.

Horley WwTWs is located within Reigate and Banstead but serves the large rural villages of Charlwood and Hookwood in Mole Valley. There are three allocated sites in Hookwood:

- Land west of Reigate Road, Hookwood - 450 dwellings and two gypsy and traveller pitches
- Land south of Kennel Lane, Hookwood – 21 dwellings
- Land Adjacent to Three Acres – 19 dwellings

This means around 490 dwellings are proposed in total during the plan period that would drain to Horley WwTWs.

Table 2.12: Summary of Growth in Mole Valley Served by Shared Infrastructure

WwTW	Proposed number of dwellings (per annum)	Time Period	Shared With
Horley	490	2006 - 2026	Reigate and Banstead

16 Chichester District Council. May 2015. Chichester Local Plan: Key Policies 2014 – 2029.
17 Waverley Borough Council. February 2018. Waverley Borough Local Plan Part 1: Strategic Policies and Sites.
18 Mole Valley District Council. October 2019. The Mole Valley Local Development Framework – Core Strategy
19 Mole Valley District Council. January 2020. Future Mole Valley 2018 – 2033 – Consultation Draft Local Plan.

3 Legislative and Policy Framework

3.1 Introduction

The following sections introduce several national, regional and local policies that must be considered by the LPA, water companies and developers during the planning stage. Key extracts from these policies relating to water consumption targets and mitigating the impacts on the water from the new development are summarised below.

3.2 National Policy

3.2.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF)[20] was published on 27th March 2012, as part of reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth. A comprehensive revision was issued in July 2018. This was further revised in February 2019[21], but the changes were not significant from the July 2018 version for policy areas relevant to the WCS. The NPPF provides guidance to planning authorities to take account of flood risk and water and wastewater infrastructure delivery in their Local Plans. Key paragraphs include:

Paragraph 34:

> *"Plans should set out the contributions expected from development. This should include setting out the levels and types of affordable housing provision required, along with other infrastructure (such as that needed for education, health, transport, flood and water management, green and digital infrastructure). Such policies should not undermine the deliverability of the plan."*

Paragraph 149:

> *"Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply..."*

Paragraph 170 (e):

> *"...preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans".*

20 National Planning Policy Framework, Department for Communities and Local Government (2012)
21 National Planning Policy Framework, Ministry of Housing, Communities and Local Government (2019). Accessed online at: https://www.gov.uk/government/publications/national-planning-policy-framework--2 on: 04/11/2019

In March 2014, the Planning Practice Guidance was issued by the Department for Communities and Local Government, with the intention of providing guidance on the application of the National Planning Policy Framework (NPPF) in England. The MHCLG is in the process of updating the Guidance to consider the necessary 2018 and 2019 updates of the NPPF. Of the sections relevant to this study, only the Water Supply, Wastewater and Water Quality section has been updated.

- Flood Risk and Coastal Change[22]
- Water Supply, Wastewater and Water Quality[23].
- Housing - Optional Technical Standards[24].

3.2.2 Planning Practice Guidance: Flood Risk and Coastal Change

Diagram 1 in the Planning Practice Guidance sets out how flood risk should be considered in the preparation of Local Plans (Figure 3.1). These requirements are addressed principally in the Council's Strategic Flood Risk Assessment.

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

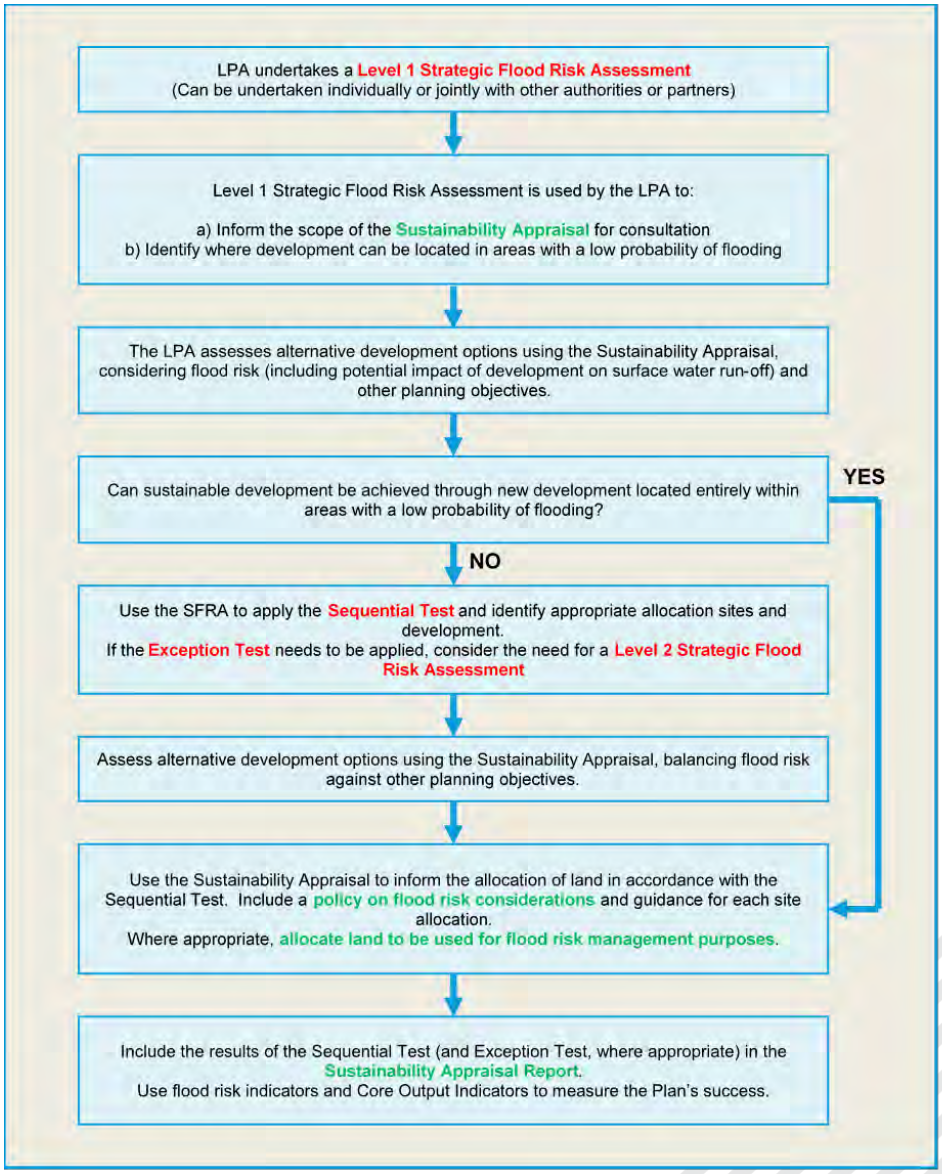
A summary of the specific guidance on how infrastructure, water supply, wastewater and water quality considerations should be accounted for in both plan-making and planning applications is summarised below in Figure 3.2.

22 Planning Practice Guidance: Flood Risk and Coastal Change, Department for Communities and Local Government (2014). Accessed online at: http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/ on: 05/11/2019.

23 Planning Practice Guidance: Water supply, wastewater and water quality, Department for Communities and Local Government (2014). Accessed online at: https://www.gov.uk/guidance/water-supply-wastewater-and-water-quality on: 05/11/2019

24 Planning Practice Guidance: Housing - Optional Technical Standards, Department for Communities and Local Government (2014). Accessed online at: https://www.gov.uk/guidance/housing-optional-technical-standards on: 05/11/2019

Figure 3.1: Flood Risk and the Preparation of Local Plans[25]



25 Based on Diagram 1 of NPPF Planning Practice Guidance: Flood Risk and Coastal Change (paragraph 004, Reference ID: 7-021-20140306

Figure 3.2: PPG: Water Supply, Wastewater and Water Quality Considerations for Plan-Making and Planning Applications

Plan-Making		Planning Applications
Infrastructure	Identification of suitable sites for new or enhanced infrastructure. Consider whether new development is appropriate near to water and wastewater infrastructure. Phasing new development so that water and wastewater infrastructure will be in place when needed.	Wastewater considerations include: First presumption is to provide a system for foul drainage discharging into a public sewer. Phasing of development and infrastructure. Circumstances where package sewage treatment plants or septic tanks are applicable.
Water Supply	Not Specified	Planning for the necessary water supply would normally be addressed through the Local Plan, exceptions might include: Large developments not identified in Local Plans; Where a Local Plan requires enhanced water efficiency in new developments. This is recommended in all areas of water stress.
Water Quality	How to help protect and enhance local surface water and groundwater in ways that allow new development to proceed and avoids costly assessment at the planning application stage. The type or location of new development where an assessment of the potential impacts on water bodies may be required. Expectations relating to sustainable drainage systems.	Water quality is only likely to be a significant planning concern when a proposal would: Involve physical modifications to a water body; Indirectly affect water bodies, for example as a result of new development such as the redevelopment of land that may be affected by contamination etc. or through a lack of adequate infrastructure to deal with wastewater.
Wastewater	The sufficiency and capacity of wastewater infrastructure. The circumstances where wastewater from new development would not be expected to drain to a public sewer.	If there are concerns arising from a planning application about the capacity of wastewater infrastructure, applicants will be asked to provide information about how the proposed development will be drained and wastewater dealt with.
Cross-Boundary Concerns	Water supply and water quality concerns often cross local authority boundaries and can be best considered on a catchment basis. Recommends liaison from the outset.	No specific guidance (relevant to some developments).
SEA and Sustainability	Water supply and quality are considerations in strategic environmental assessment and sustainability appraisal … sustainability appraisal objectives could include preventing deterioration of current water body status, taking climate change into account and seeking opportunities to improve water bodies.	No specific guidance (should be considered in applications).

3.2.4 Planning Practice Guidance: Housing – Optional Technical Standards

This guidance, advises planning authorities on how to gather evidence to set optional requirements, including for water efficiency. It states that "all new homes already have to meet the mandatory national standard set out in the Building Regulations (of 125 litres/person/day). Where there is a clear local need, local planning authorities can set out Local Plan policies requiring new dwellings to meet the tighter Building Regulations optional requirement of 110 litres/person/day. Planning authorities are advised to consult with the EA and water companies to determine where there is a clear local need, and also to consider the impact of setting this optional standard on housing viability. A 2014 study[26] into the cost of implementing sustainability measures in housing found that meeting a standard of 110 litres per person per day would cost only £9 for a four-bedroom house. In some cases, the connection charge may also be waived by the water company where developers can demonstrate that development will be water efficient (110 l/p/d or less).

3.2.5 Building Regulations

The Building Regulations (2010) Part G[27] was amended in early 2015 to require that all new dwellings must ensure that the potential water consumption must not exceed 125 litres/person/day, or 110 litres/person/day where required under planning conditions.

3.2.6 BRE Standards

The Building Research Establishment (BRE) publish an internationally recognised environmental assessment methodology for assessing, rating and certifying the sustainability of a range of buildings.

New homes are most appropriately covered by the Home Quality Mark[28], and commercial, leisure, educational facilities and mixed-use buildings by the Building Research Establishment Environmental Assessment Methodology (BREEAM) UK New Construction Standard[29].

Using independent, licensed assessors, BREEAM/HQM assesses criteria covering a range of issues in categories that evaluate energy and water use, health and wellbeing, pollution, transport, materials, waste, ecology and management processes.

In the Homes Quality Mark, 400 credits are available across 11 categories and lead to a star rating. 18 credits are available for water efficiency and water recycling. A greater number of credits are awarded for homes using water efficient fittings (with the highest score achieving 100l/p/d or less), and further credits are awarded for the percentage of water used in toilet flushing that is either sourced from rainwater or from grey water.

The BREEAM New Construction Standard awards credits across nine categories, four of which are related to water: water consumption, water monitoring, leak detection and water efficient equipment. This leads to a percentage score and a rating from "Pass" to "Outstanding".

The Councils have the opportunity to seek BREEAM or HQM status for all new, residential and non-residential buildings.

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26 Housing Standards Review: Cost Impacts, Department for Communities and Local Government (2014). Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/353387/021c_Cost_Report_11th_Sept_2014_FINAL.pdf on: 05/11/2019

27 The Building Regulations (2010) Part G - Sanitation, hot water safety and water efficiency, 2015 edition with 2016 amendments. HM Government (2016). Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/504207/BR_PDF_AD_G_2015_with_2016_amendments.pdf on: 05/11/2019

28 Home Quality Mark, BRE, (2018). Accessed online at: https://www.homequalitymark.com/professionals/standard/ on: 16/04/2020

29 BREEAM UK New Construction, BRE, (2018). Accessed online at: https://www.breeam.com/NC2018/ on: 16/04/2020

3.2.7 Sustainable Drainage Systems (SuDS)

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

- The National Planning Policy Framework, which requires that development in areas already at risk of flooding should give priority to sustainable drainage systems.
- The House of Commons written statement[30] setting out governments intentions that LPAs should "ensure that sustainable drainage systems for the management of run-off are put in place, unless demonstrated to be inappropriate" and "clear arrangements in place for ongoing maintenance over the lifetime of the development." This requirement is also now incorporated in the 2019 update of the NPPF (paragraph 165). In practice, this has been implemented by making Lead Local Flood Authorities (LLFAs) statutory consultees on the drainage arrangements of major developments.
- The Defra non-statutory technical standards for sustainable drainage systems[31]. These set out the government's high-level requirements for managing peak flows and runoff volumes, flood risk from drainage systems and the structural integrity and construction of SuDS. This very short document is not a design manual and makes no reference to the other benefits of SuDS, for example water quality, habitat and amenity.
- Surrey County Council is the LLFA in the northern portion of the Gatwick Sub-Region covering Reigate and Banstead. The Surrey County Council SuDS Design Guidance[32] provides advice relating to surface water drainages and sets out minimum operating requirements as required in the NPPF.
- West Sussex Council is the LLFA in the southern portion of the Gatwick Sub-Region, covering Crawley, Horsham and Mid Sussex. West Sussex has worked with its partnering authorities to produce design guidance for developers, highlighting the need to consider SuDS[33], which is due to be implemented on the 1st April 2020. The County Council have also developed a Policy for the Management of Surface Water[34] which was updated in November 2018.
- An updated version of the CIRIA SuDS Manual[35] was published in 2015. The guidance covers the planning, design, construction and maintenance of SuDS for effective implementation within both new and existing developments. The guidance is relevant for a range of roles with the level of technical detail increasing throughout the manual. The guidance does not include detailed information on planning requirements, SuDS approval and adoption processes and standards, as these vary by region and should be checked early in the planning process.

30 Sustainable drainage systems: Written statement - HCWS161, UK Government (2014). Accessed online at: http://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2014-12-18/HCWS161/ on: 05/11/2019

31 Sustainable Drainage Systems: Non-statutory technical standards for sustainable drainage systems, Defra (2015). Accessed online at: https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards on: 05/11/2019

32 Surrey County Council. July 2019. Surrey County Council – SuDS Design Guidance.

33 Aecom. September 2013. Water. People. Places – A Guide for Master Planning Sustainable Drainage into Developments

34 West Sussex County Council, November 2018 – West Sussex LLFA Policy for the Management of Surface Water

35 The SuDS Manual (C753), CIRIA (2015).

- CIRIA also publish "Guidance on the Construction of SuDS" (C768)[36], which contains detailed guidance on all aspects of SuDS construction, with specific information on each SuDS component available as a downloadable chapter.
- Prior to April 2020, Sewers for Adoption version 7, the standard for designing sewers to be adopted by UK water companies did not include SuDS, and neither Southern Water not Thames Water adopted SuDS.
- As of April 2020, the new Design and Construction Guidance (DCG) came into force in England. This contains details of the water sector's approach to the adoption of SuDS, which meet the legal definition of a sewer. The guidance replaces Sewers for Adoption 7, and compliance by water companies in England is now mandatory. It is however, as of July 2020, the subject of a legal challenge led by Thames Water which is supported by Southern Water.

36 Guidance on the Construction of SuDS (C768), CIRIA (2017), Accessed online at: https://www.ciria.org/ItemDetail?iProductcode=C768&Category=BOOK on: 04/10/2019

3.3 Regional Policy

3.3.1 Catchment Flood Management Plans

Catchment Flood Management Plans (CFMP) are high level policy documents covering large river basin catchments. They aim to set policies for sustainable flood risk management for the whole catchment covering the next 50 to 100 years.

In the Thames River Basin District, the following CFMPs are relevant to the study are:

- Thames: Catchment Flood Management Plan[37]
- Medway: Catchment Flood Management Plan[38]

In the South East River Basin District, the following CFMPs are also relevant:

- Adur: Catchment Flood Management Plan[39]
- Arun and Western Streams: Catchment Flood Management Plan[40]
- River Ouse: Catchment Flood Management Plan[41]

3.3.2 Surface Water Management Plans (SWMPs)

SWMPs outline the preferred surface water management strategies in a given location and establish a long-term action plan to manage surface water. SWMPs are undertaken, when required, by LLFAs in consultation with key local partners who are responsible for surface water management and drainage in their area.

The Gatwick Sub-Region is covered by West Sussex and Surrey County Councils. These LLFAs have produced SWMPs in the areas identified in their Preliminary FRAs. As it stands, only the Hassocks SWMP[42] is within the Gatwick Sub-Region.

3.3.3 Water Resource Management Plans

Water Resource Management Plans (WRMPs) are 25-year strategies that water companies are required to prepare, with updates every five years. In reality, water companies prepare internal updates more regularly. WRMPs are required to assess:

- Future demand (due to population and economic growth)
- Future water availability (including the impact of sustainability reductions)
- Demand management and supply-side measures (e.g. water efficiency and leakage reduction, water transfers and new resource development)
- How the company will address changes to abstraction licences
- How the impacts of climate change will be mitigated

Where necessary, they set out the requirements for developing additional water resources to meet growing demand and describe how the balance between water supply and demand will be balanced over the period 2015 to 2040.

- Using cost-effective demand management, transfer, trading and resource development schemes to meet growth in demand from new development and to restore abstraction to sustainable levels.
- In the medium to long term, ensuring that sufficient water continues to be available for growth and that the supply systems are flexible enough to adapt to climate change.

37 Environment Agency. December 2009. Thames Catchment Flood Management Plan.
38 Environment Agency. December 2009. River Medway Catchment Flood Management Plan.
39 Environment Agency. December 2009. River Adur Catchment Flood Management Plan.
40 Environment Agency. December 2009. Arun and Western Streams Catchment Flood Management Plan.
41 Environment Agency. December 2009. River Ouse Catchment Flood Management Plan.
42 . Final Technical Report' Hassocks Surface Water Management Plan. Prepared for West Sussex County Council by CH2M, July 2016

The following WRMPs cover the Gatwick Sub-Region and have been reviewed in Section 4:

- Thames Water – Revised Draft WRMP 2019[43]
- South East Water – WRMP 2020 - 2080[44]
- Southern Water – WRMP 2020 - 2070[45]
- SES Water – WRMP 2019[46]

3.4 Local Planning Policy

3.4.1 Localism Act

The Localism Act (2011) changes the powers of local government, it re-distributes the balance of decision making from central government back to councils, communities and individuals. In relation to the planning of sustainable development, provision 110 of the Act places a duty to cooperate on Local Authorities. This duty requires Local Authorities to *"engage constructively, actively and on an ongoing basis in any process by means of which development plan documents are prepared so far as relating to a strategic matter"*[47].

The Localism Act also provides new rights to allow local communities to come together and shape the development and growth of their area by preparing Neighbourhood Development Plans, or Neighbourhood Development Orders, where the ambition of the neighbourhood is aligned with strategic needs and priorities for the area. This means that local people can decide where new homes and businesses should go and also what they should look like. As neighbourhoods draw up their proposals, Local Planning Authorities are required to provide technical advice and support.

3.5 International Environmental Policy

3.5.1 Ramsar

The Convention on Wetlands of International Importance, more commonly known as the Ramsar convention after the city where it was signed in 1971, aims to protect important wetland sites. Under the treaty, member counties commit to:

- Wise use of all their wetlands
- Designating sites for the Ramsar list of "Wetlands of International Importance" (Ramsar Sites) and their conservation
- Cooperating on transboundary wetlands and other shared interests.

"Wise use" of wetlands is defined under the convention as "the maintenance of their ecological character, achieved through the implementation of ecosystem approaches, within the context of sustainable development". A handbook on the wise use of wetlands is available from the Ramsar Convention Secretariat[48].

Ramsar Sites are designated by the National Administrative Authority, responsible for the Ramsar Convention in each country. In the case of the UK this is the Joint Nature Conservation Committee (JNCC).

In general, the designation of UK Ramsar sites is underpinned through prior notification of these areas as Sites of Special Scientific Interest (SSSIs) and as such receive statutory protection under the Wildlife and Countryside Act 1981 (as amended). More recently,

43 Thames Water. April 2019. Update to the Revised Draft Water Resources Management Plan 2019 – Technical Update Note.
44 South East Water. 2019. Water Resources Management Plan 2020 to 2080
45 Southern Water. Water Resources Management Plan 2020 to 2070 – Technical Overview
46 SES Water. August 2019. Water Resources Management Plan – Main Report – Issue No.1.
47 Localism Act 2011: Section 110, UK Government (2011). Accessed online at: http://www.legislation.gov.uk/ukpga/2011/20/section/110 on: 30/07/2019
48 Wise use of wetlands, Ramsar Convention Secretariat (2010). Accessed online at: https://www.ramsar.org/sites/default/files/documents/library/hbk4-01.pdf on: 11/05/2020

Paragraph 176 of the NPPF states that Ramsar sites should be given the same protection in the planning process as sites designated under the EU Habitats Directive.

3.6 European Environmental Policy

3.6.1 Urban Wastewater Treatment Directive (UWWTD)

The UWWTD[49] is an EU Directive that concerns the collection, treatment and discharge of urban wastewater and the treatment and discharge of wastewater from certain industrial sectors. The objective of the Directive is to protect the environment from the adverse effects of wastewater discharges. More specifically Annex II A(a) sets out the requirements for discharges from urban wastewater treatment plants to sensitive areas which are subject to eutrophication. The Directive has been transposed into UK legislation through enactment of the Urban Wastewater Treatment (England and Wales) Regulations 1994 and 'The Urban Wastewater Treatment (England and Wales) (Amendments) Regulations 2003'.

3.6.2 Habitats Directive

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

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

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

3.6.3 The Water Framework Directive

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

River Basin Management Plans (RBMP) are required under the WFD and document the baseline classification of each waterbody in the plan area, the objectives, and a programme of measures to achieve those objectives. The Gatwick Sub-Region falls into the Thames[50] and South East[51] River Basin Districts (RBD). Under the WFD the RBMPs, which were originally published in December 2009 were reviewed and updated in December 2015. A primary WFD objective is to ensure 'no deterioration' in environmental status, therefore all water bodies must meet the class limits for their status class as declared in the River Basin Management Plan. Another equally important objective requires all water bodies to achieve good ecological status. Future development needs to be planned carefully so that it helps towards achieving the WFD and does not result in further pressure on the water environment and compromise WFD objectives. The issues and WFD objectives, outlined in the updated RBMPs are summarised below:

49 UWWTD. Accessed online at: https://ec.europa.eu/environment/water/water-urbanwaste/index_en.html
50 Defra and Environment Agency. December 2015. Thames River Basin District – River Basin Management Plan.
51 Defra and Environment Agency. December 2015. South East River Basin District – River Basin Management Plan.

Main Issues:

- Physical modifications
- Pollution from wastewater
- Pollution from towns, cities and transport
- Changes to the natural flow and level of water
- Negative effects of invasive non-native species
- Pollution from rural areas

Objectives:

- Prevent deterioration of the status of surface waters and groundwater
- Achieve objectives and standards for protected areas
- Achieve good status for all water bodies or, for heavily modified water bodies and artificial water bodies, good ecological potential and good surface water chemical status
- Reverse any significant and sustained upward trends in pollutant concentrations in groundwater
- Stop discharges/emissions of priority hazardous substances into surface waters
- Progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants

LPAs must have regard to the Water Framework Directive as implemented in the Environment Agency's River Basin Management Plans. It is of primary importance when assessing the impact of additional wastewater flows on local river quality.

3.6.4 Protected Area Objectives

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

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

The types of protected areas are:

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

Many WFD protected areas coincide with water bodies; these areas will need to achieve the water body status objectives in addition to the protected area objectives. Where water body boundaries overlap with protected areas the most stringent objective applies;

that is the requirements of one EC Directive should not undermine the requirements of another. The objectives for Protected Areas relevant to this study are as follows:

Drinking Water Protected Areas

- Ensure that, under the water treatment regime applied, the drinking water produced meets the requirements of the Drinking Water Directive plus any UK requirements to make sure that drinking water is safe to drink
- Ensure the necessary protection to prevent deterioration in the water quality in the protected area in order to reduce the level of purification treatment required

Economically Significant Species (Freshwater Fish Waters)

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

Nutrient Sensitive Areas (Nitrate Vulnerable Zones)

- Reduce water pollution caused or induced by nitrates from agricultural sources
- Prevent further such pollution

Nutrient Sensitive Areas (Urban Wastewater Treatment Directive)

- Protect the environment from the adverse effects of urban wastewater discharges and wastewater discharges from certain industrial sectors

Natura 2000 Protected Areas (water dependent SACs and SPAs)

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

- Protect and, where necessary, improve the status of the water environment to the extent necessary to achieve the conservation objectives that have been established for the protection or improvement of the site's natural habitat types and species of importance

3.6.5 Groundwater Source Protection Zones

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

Zone 1 (Inner Protection Zone)

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

Zone 2 (Outer Protection Zone)

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

Zone 3 (Total Catchment)

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

Zone of Special Interest

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

The Environment Agency's approach to Groundwater protection[52] sets out a series of position statements that detail how the Environment Agency delivers government policy on groundwater and protects the resources from contamination. The position statements that are relevant to this study with regard to discharges to groundwaters, include surface water drainage and the use of SuDS, discharges from contaminated surfaces (e.g. lorry parks) and from treated sewage effluent.

3.6.6 European Derived Legislation and Brexit

Much of the legislation behind the regulation of the water environment derives from the UK enactment of European Union (EU) directives. Following the departure of the United Kingdom from the European Union on 31st January 2020, this legislation remains in force during the transition period, until 31st December 2020. The UK government has signalled that "the UK will in future develop separate and independent policies in areas such as … the environment … maintaining high standards as we do so."[53]

As the details of future changes to environmental regulation are not yet known, this study has used existing, European Union derived environmental legislation, most significantly the Water Framework Directive, to assess the environmental impacts of planned development during the plan period for the Local Plan. Should this situation change, a review of this Water Cycle Study may be required considering any new emerging regulatory regime.

3.7 UK Environmental Policy

3.7.1 Conservation of Habitats and Species Regulations 2017 (as amended)

The Conservation of Habitats and Species Regulations 2010 (commonly referred to as the Habitats Regulations) consolidated the Conservation (Natural Habitats, &c.) Regulations 1994, and transposed the EU Habitats Directive in England and Wales. This was further amended in 2017.

The Habitats Regulations define the requirement for a Habitats Regulations Assessment (HRA) to be carried out. The purpose of this is to determine if a plan or project may affect the protected features of a "habitats site". These include:

- A special area of conservation (SAC)
- A site of Community Importance
- A site hosting a priority natural habitat type or priority species protected in accordance with Article 5(4) of the Habitats Directive
- A Special Protection Area (SPA)
- A potential SPA

All plans and projects (including planning applications) which are not directly connected with, or necessary for the conservation management of a habitat site require

52 The Environment Agency's approach to groundwater protection, Environment Agency (2018). Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/598778/LIT_7660.pdf on: 30/07/2019

53 The Future Relationship between the UK and the EU (2020) Accessed online at https://www.gov.uk/government/speeches/the-future-relationship-between-the-uk-and-the-eu on 25/02/2020

consideration of whether the plan or project is likely to have significant effects on that site.

This is referred to as the "Habitats Regulations Assessment screening" and should take into account the potential effects of both the plan/project itself and in combination with other plans or projects.

Part 6 of the conservation of Habitats and Species Regulations 2017 states that where the potential for likely significant effects cannot be excluded, a competent authority must make an appropriate assessment of the implications of the plan or project for that site, in view of the site's conservation objectives.

The competent authority may agree to the plan or project only after having rules out adverse effects on the integrity of the habitats site.

If adverse effects cannot be rules out, and where there are no alternative solutions, the plan r project can only proceed if there are imperative reasons of over-riding public interest and if the necessary compensatory measures can be secured.

The "People over Wind" ECJ ruling (C-323/17) clarifies that when making screening decisions for the purposes of deciding whether an appropriate assessment is required, competent authorities cannot take into account any mitigation measures. This must be part of the appropriate assessment itself.

3.7.2 Wildlife and Countryside Act 1981

Sites of Special Scientific Interest (SSSI) are designated and legally protected under the Wildlife and Countryside Act 1981, Section 28G places a duty to take reasonable steps, consistent with the proper exercise of the authority's functions, to "further to the conservation and enhancement of the flora, fauna or geological or physiographical features by reason of which the site is of special scientific interest."[54]

The Government's 25-year Environment Plan[55] has a target of "restoring 75% of our one million hectares of terrestrial and freshwater protected sites to favourable condition, securing their wildlife value for the long term." In line with this, and the Wildlife and Countryside Act 1981, Local Authorities should look put forward options that contribute to conservation or restoration of favourable condition, and at the very least must not introduce policies that hinder the restoration of favourable condition by increasing existing issues.

A site is said to be in "favourable condition" when the designated feature(s) within a unit are being adequately conserved and the results from monitoring demonstrate that the feature(s) in the unit are meeting all the mandatory site specific monitoring targets set out in the favourable condition targets (FCT).

3.7.3 The Natural Environment Rural Communities Act (NERC)

The Natural Environment and Rural Communities Act 2006 (commonly referred to the as the NERC Act), was intended to implement key aspects of the Government's Rural Strategy published in 2004 and established Natural England as a new independent body responsible for conserving, enhancing and managing England's natural environment.

Section 40 of the NERC Act places a duty to conserve biodiversity on public authorities, including Local Planning Authorities and water companies. "The 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."[56]

54 Wildlife and Countryside Act 1981, HM Government (1981). Accessed online at: http://www.legislation.gov.uk/ukpga/1981/69/section/28G on: 11/05/2020
55 A Green Future: Our 25 Year Plan to Improve the Environment, HM Government (2018). Accessed online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693158/25-year-environment-plan.pdf on: 11/05/2020
56 Natural Environment and Rural Communities Act 2006, HM Government (2006). Accessed online at: http://www.legislation.gov.uk/ukpga/2006/16/section/40 on: 11/05/2020

Section 41 requires the Secretary of State to publish and maintain a list of species and types of habitat which in the Secretary of State's opinion (in consultation with Natural England) are of "principal importance for the purpose of conserving biodiversity."

3.8 Water Industry Policy

3.8.1 The Water Industry in England

Water and sewerage services in England and Wales are provided by 10 Water and Sewerage Companies (WaSCs) and 12 'water-only' companies. The central legislation relating to the industry is the Water Industry Act 1991. The companies operate as regulated monopolies within their supply regions, although very large water users and developments are able to obtain water and/or wastewater services from alternative suppliers - known as inset agreements.

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

- Non-domestic customers have been able to switch their water supplier and/or sewerage undertaker from April 2017
- New businesses are now able to enter the market to supply these services
- Measures to promote a national water supply network
- Enabling developers to make connections to water and sewerage systems

3.8.2 Regulations of the Water Industry

The water industry is primarily regulated by three regulatory bodies;

- The Water Services Regulation Authority (OfWAT) – economic/ customer service regulation
- Environment Agency - environmental regulation
- Drinking Water Inspectorate (DWI) - drinking water quality

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

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

3.8.3 Drainage and Wastewater Management Plans

The UK Water Industry Research (UKWIR) "21st Century Drainage" programme has brought together water companies, governments, regulators, local authorities, academics and environmental groups to consider how planning can help to address the challenges of managing drainage in the future. These challenges include climate change, population growth, urban creep and meeting the Water Framework Directive.

The group recognised that great progress has been made by the water industry in its drainage and wastewater planning over the last few decades, but that, in the future, there needs to be greater transparency and consistency of long-term planning. The

Drainage and Wastewater Management Plan (DWMP) framework[57] sets out how the industry intends to approach these goals, with the objective of the water companies publishing plans by the end of 2022, in order to inform their business plans for the 2024 Price Review.

DWMPs will be prepared for wastewater catchments or groups of catchments and will encompass surface water sewers within those areas which do not drain to a treatment works. The framework defines drainage to include all organisations and all assets which have a role to play in drainage, although, as the plans will be water company led, it does not seek to address broader surface water management within catchments.

LPAs and LLFAs are recognised as key stakeholders and will be invited to join, alongside other stakeholders, the Strategic Planning Groups (SPGs) organised broadly along river basin district catchments.

DWMPs cannot inform this study, as process is only just commencing. In the future, however, DWMPs will provide more transparent and consistent information on sewer flooding risks and the capacity of sewerage networks and treatment works, and this should be taken into account in SFRAs, Water Cycle Studies, as well as in site-specific FRAs and Drainage Strategies.

3.8.4 Developer Contributions and Utility Companies

Developments with planning permission have a right to connect to the public water and sewerage systems, however, there is no guarantee that the capacity exists to serve a development.

Developers may requisition a water supply connection or sewerage system or self-build the assets and offer these for adoption by the water company or sewerage undertaker. Self-build and adoption are usually practiced for assets within the site boundary, whereas requisitions are normally used where an extension of upgrading the infrastructure requires construction on third party land. The cost of requisitions is shared between the water company and developer as defined in the Water Industry Act 1991.

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

The above arrangements are third party transactions because the Town and Country Planning Act Section 106 agreements and Community Infrastructure Levy agreements may not be used to obtain funding for water or wastewater infrastructure.

3.8.5 Changes to Charging Rules for New Connections

OfWAT, the water industry's economic regulator, has published new rules covering how water and wastewater companies may charge customers for new connections[58]. These rules apply to all companies in England and commenced on 1st April 2018.

The four relevant water companies for the study area have now published their charging arrangements which can be found in the footnotes[59,60,61,62].

The key changes include:

57 A framework for the production of Drainage and Wastewater Management Plans, UK Water Industry Research (2018). Accessed online at:
http://www.water.org.uk/wp-content/uploads/2018/12/Water-UK-DWMP-Framework-Report-Main-Document.pdf on: 30/07/2019.
58 Charging rules for new connection services (English undertakers), OfWAT (2017). Accessed online at:
https://www.ofwat.gov.uk/publication/charging-rules-new-connection-services-english-undertakers/ on: 30/07/2019
59 Thames Water. Charging Arrangements for New Connection Services – 1st April 2019 to 31st March 2020
60 Southern Water. January 2019. New Connections Services – Charging Arrangements 2019 – 2020.
61 South East Water. Charging Arrangements for New Connection Services 2019 – 2020.
62 SES Water. January 2019. Developer Services – Charging Arrangements for 2019/20

- More charges will be fixed and published on water company websites. This will provide greater transparency to developers and will also allow alternative connection providers to offer competitive quotations more easily
- There will be a fixed infrastructure charge for water and one for wastewater
- The costs of network reinforcement will no longer be charged directly to the developer in their connection charges. Instead, the combined costs of all of the works required on a company's networks, over a five-year rolling period, will be covered by the infrastructure charges payed for all new connections.
- The definition of network reinforcement has changed and will now apply only to works required as a direct consequence of the increased demand due to a development. Where the water company has not been notified of a specific development, for example when developing long-term strategic growth schemes, the expenditure cannot be recovered through infrastructure charges.
- Some suppliers offer charging incentives to encourage environmentally sustainable development

3.8.6 Design and Construction Guidance (DCG)

The Design and Construction Guidance contains details of the water sector's approach to the adoption of SuDS, which meet the legal definition of a sewer. This replaces Sewers for Adoption and differs from previous sewers for adoption guidance as compliance by water companies in England will be mandatory.

Sewers for Adoption, up to and including Version 7, had a narrow definition of adoptable sewers as below-ground systems comprising of gravity sewers and manholes, pumping stations and rising mains. This essentially excluded the adoption of SuDS by water companies, with the exception of below-ground storage comprising of oversized pipes or chambers.

The new DCG provides a mechanism for water companies to secure the adoption of a wide range of SuDS components which are now compliant with the legal definition of a sewer. There are however several non- adoptable components such as green roofs, pervious pavements and filter strips. These components may still form part of a drainage design so long as they remain upstream of the adoptable components.

The Design and Construction Guidance states that the drainage layout of a new development should be considered at the earliest stages of design. It is hoped that the new guidance will lead to better managed and more integrated surface water systems which incorporate amenity, biodiversity and water quality benefits.

4 Water Resources and Water Supply

4.1 Introduction

4.1.1 Objectives

The aim of the water resources assessment is to ensure that sufficient water is available in the region to serve the proposed level of growth, and that it can be abstracted without a detrimental impact on the environment, both during the plan period and into the future. The report characterises the study area, identifying the key surface water and groundwater bodies, and local geology. It highlights the pressures on water resources in the region, identifies existing constraints on abstraction and provides evidence for adopting tighter water efficiency targets.

4.1.2 Surface Waters

Figure 4.1 shows the main watercourses within the study area. These watercourses are located within the Thames and South East River Basin Management Plan (RBMP) catchments.

The River Mole flows in a north-westerly direction through Reigate and Banstead in the north portion of the study area. The River Mole discharges into the River Thames between East Molesey and Thames Ditton.

The River Arun flows in a westerly direction through the northern portion of Horsham and southwards along the western boundary of the study area. This watercourse discharges into the English Channel at Littlehampton.

The River Adur catchment dominates the southern portion of the study area, flowing southwards through Horsham and Mid Sussex, eventually reaching the English Channel at Shoreham-by-Sea.

In the eastern portion of the study area, the upper reaches of the River Medway and River Ouse both flow in an easterly direction through Mid Sussex and out of the study area. The Ardingly Reservoir is located on the River Ouse within Mid Sussex. Weir Wood Reservoir is located in Wealden District, directly on the Mid Sussex boundary.

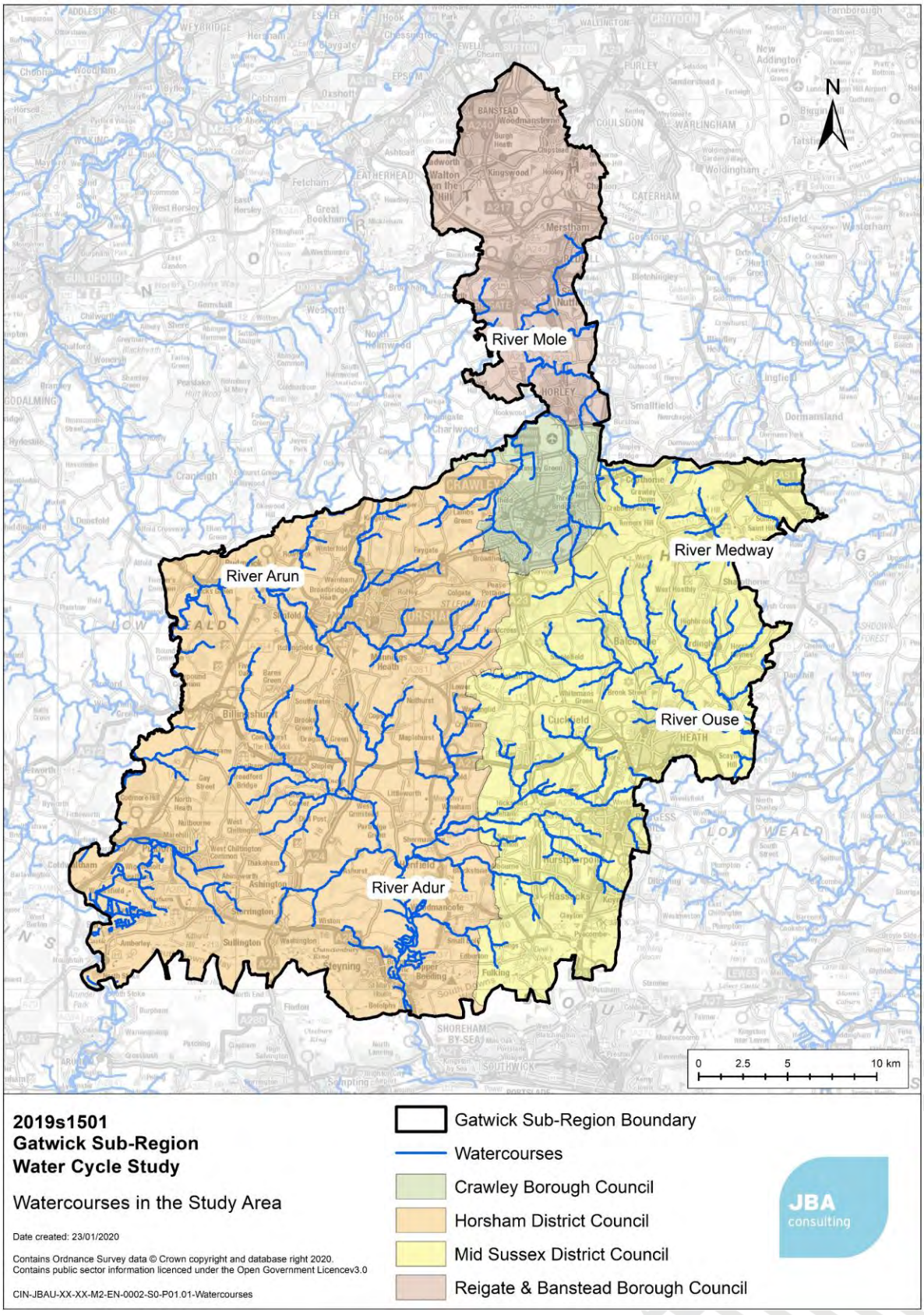


Figure 4.1 Significant surface waterbodies

4.1.3 Groundwaters

There are twelve groundwater bodies within the study area which are shown in Figure 4.2 and their corresponding WFD classification is summarised in Table 4.1 below. Seven of these have poor quantitative status, which in the case of five of these, is due to over-abstraction for water supply. The effect of further abstraction in these areas could be a reduction in river flow in dependent surface waterbodies, or a deterioration in dependent water sensitive ecosystems.

Table 4.1 WFD status of groundwater bodies

Groundwater Body	Quantitative Status	Chemical Status	Overall Status - WFD Cycle 2 (2016)
Adur & Ouse Hastings Beds	Good	Good	Good
Arun & Western Streams Hastings Beds	Good	Good	Good
Brighton Chalk Block	Poor (Groundwater abstraction – water supply	Poor	Poor
Chichester Chalk	Poor (Groundwater abstraction – water supply	Poor	Poor
Copthorne Tunbridge Wells Sands	Good	Good	Good
Dorking North Downs Chalk	Poor (Groundwater abstraction – Water supply)	Good	Poor
Epsom North Downs Chalk	Poor (Groundwater abstraction – Water supply)	Good	Poor
Kent Weald Western – Medway	Poor	Poor	Poor
Lower Greensand Adur & Ouse	Good	Good	Good
Lower Greensand Arun & Western Streams	Good	Poor	Poor
Reigate Lower Greensand	Poor	Good	Poor
Worthing Chalk	Poor (Groundwater abstraction – Water supply)	Good	Poor

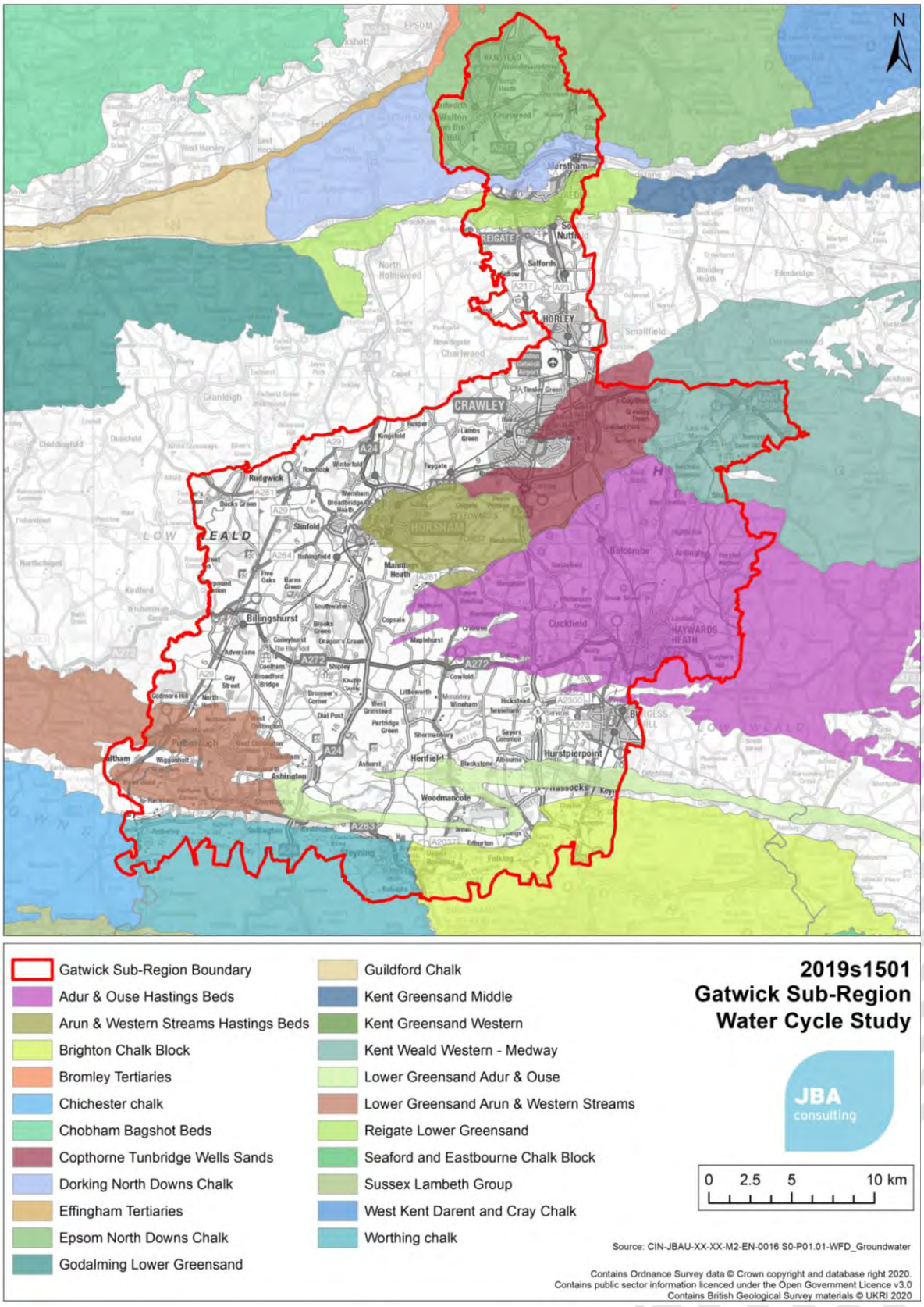


Figure 4.2 Groundwater bodies

4.1.4 Geology

The geology of the catchment is an important influencing factor in the way that water runs off the ground surface. This is primarily due to variations in the permeability of the surface material and bedrock stratigraphy.

Figure 4.3 shows the varying bedrock geology of the Gatwick Sub-Region.

In general, the northern portion of Reigate and Banstead is underlain by chalks, whereas the southern portion is underlain by mudstones, siltstones and sandstones.

The north western portion of Crawley is made up of mudstone, siltstone and sandstone and the south eastern portion is interbedded sandstones and siltstones. There is some faulting between these two geologies.

The northern portion of Mid Sussex is largely underlain by interbedded sandstones and siltstones with areas of mudstone siltstone and sandstone. The northern portion of Horsham in made up of a combination of the same interbedded sandstones and siltstones with more significant areas of mudstone siltstone and sandstone. The southern portions of Mid Sussex and Horsham are made up of mudstone siltstones and sandstones and chalk is located along the southern boundary of the study area.

Figure 4.4 shows superficial deposits of clay, silt, gravel and sand across the Gatwick Sub-Region.

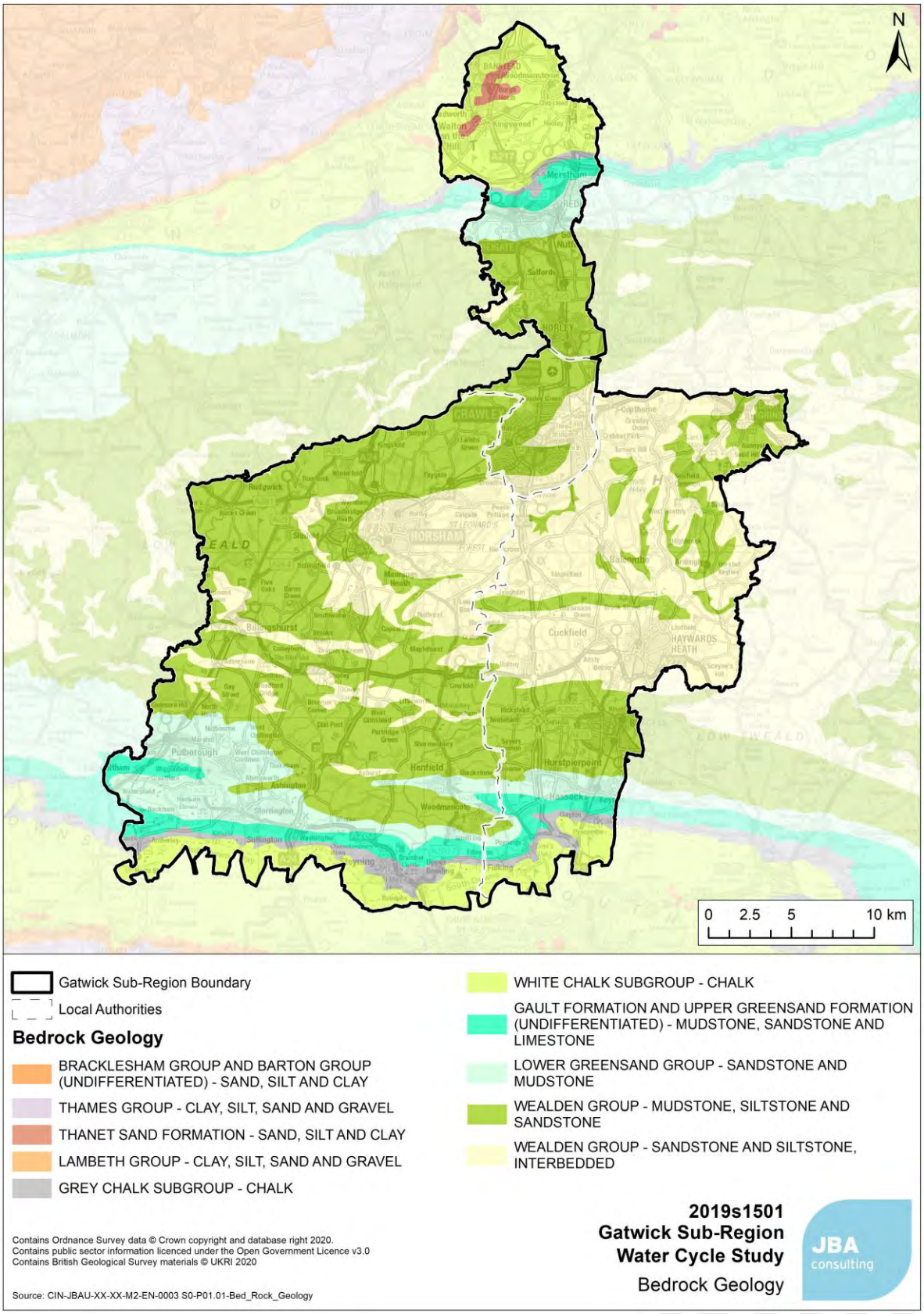


Figure 4.3 Bedrock Geology of the Gatwick Sub-Region

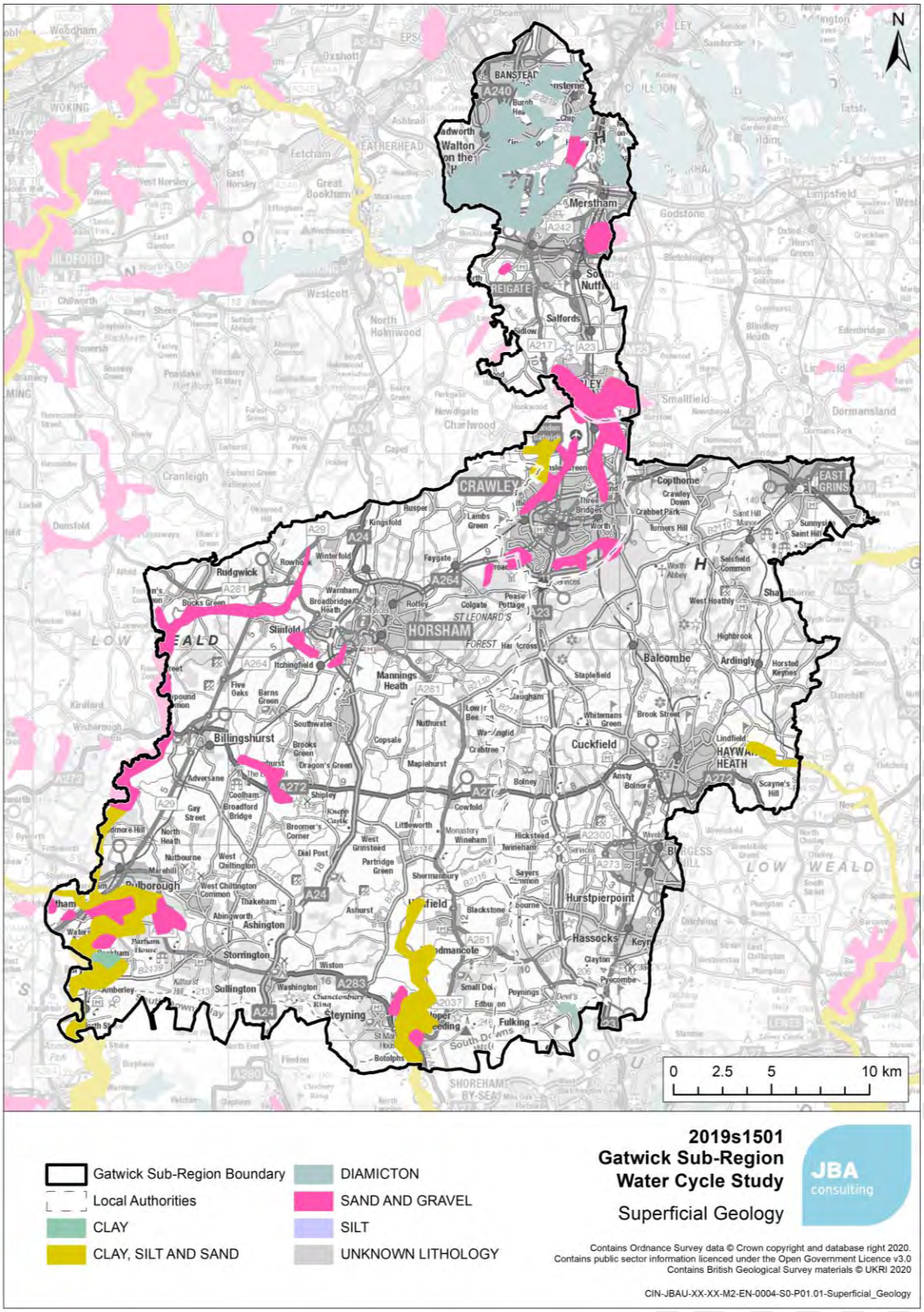


Figure 4.4 Superficial Geology of the Gatwick Sub-Region

4.2 Availability of Water Resources

4.2.1 Abstraction Licencing Strategy

The Environment Agency (EA), when working through their Catchment Abstraction Management Strategy (CAMS) process, prepare an Abstraction Licensing Strategy (ALS) for each sub-catchment within a river basin. This licensing strategy sets out how water resources are managed in different areas of England and contributes to the implementation of the Water Framework Directive (WFD). The ALS report provides information on the resources available and what conditions might apply to new licences. The licences require abstractions to stop or reduce when a flow or water level falls below a specific threshold, as a restriction to protect the environment and manage the balance between supply and demand for water users. Thresholds are usually defined by the flow percentiles which can be calculated using gauged daily flow data, where for example Q10 is the flow exceeded or equalled for 10% of the time. The CAMS process is published in a series of ALSs for each river basin.

All new licences, and some existing licenses, are time limited. This allows time for a periodic review of the specific area as circumstances may have changed since the licences were initially granted. These are generally given for a twelve-year duration, but shorter license durations may also be granted. This is usually based on the resource assessment and environmental sustainability. In some cases, future plans or changes may mean that the EA will grant a shorter time limited licence, so it can be re-assessed following the change. If a licence is only required for a short time period, it can be granted either as a temporary licence or with a short time limit. If a licence is considered to pose a risk to the environment it may be granted with a short time limit while monitoring is carried out. The licences are then replaced with a changed licence, revoked or renewed near to the expiry date.

The ALS are important in terms of the Water Resource Management Plan (WRMP) as this helps to determine the current and future pressures on water resources and how the supply and demand will be managed by the relevant water companies[63]. The Gatwick Sub-Region is covered by five ALS areas which are shown in Figure 4.5 below:

- Arun and Western Streams
- Adur and Ouse
- Medway
- Mole
- London

63 Environment Agency (2018) Managing Water Abstraction. Accessed Online at: https://www.gov.uk/government/collections/water-abstraction-licensing-strategies-cams-process on: 03/09/2019

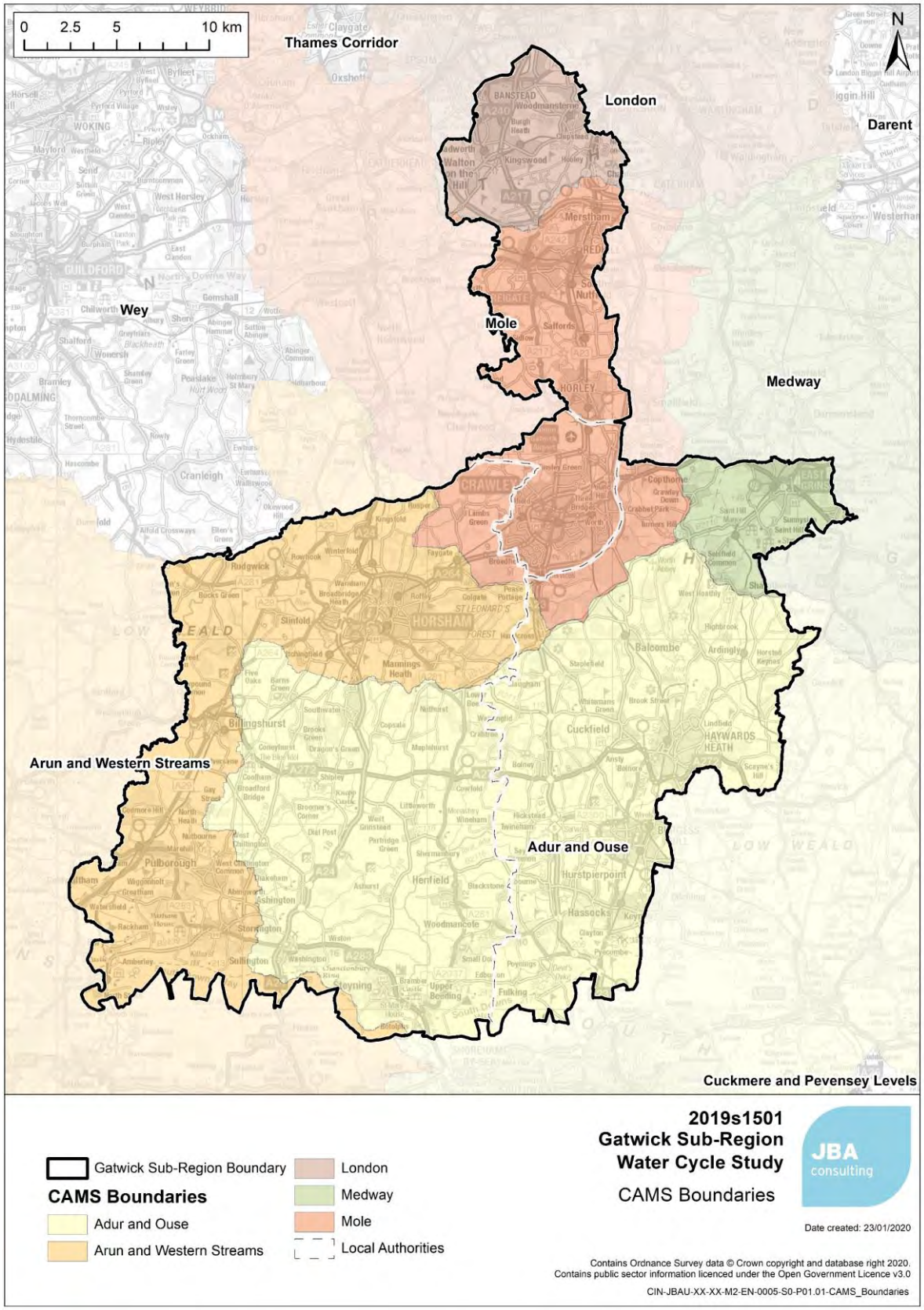


Figure 4.5 CAMS Boundaries Covering the Gatwick Sub-Region

4.2.2 Resource Availability Assessment

In order to abstract surface water, it is important to understand what water resources are available within a catchment and where abstraction for consumptive purposes will not pose a risk to resources or the environment. The Environment Agency has developed a classification system which shows:

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

The availability of water for abstraction is determined by the relationship between the fully licensed (all abstraction licences being used to full capacity) and recent actual flows (amount of water abstracted in the last 6 years) in relation to the Environmental Flow Indicator (EFI). Results are displayed using different water resource availability colours, further explained in Table 4.2. In some cases, water may be scarce at low flows, but available for abstraction at higher flows. Licences can be granted that protect low flows, this usually takes the form of a "Hands-off Flow" (HOF) or Hands-off Level (HOL) condition on a licence, which mean abstractions have to stop when the river flow or level falls below a particular value. This value is known as the HOF or HOL and ensures there is always a minimum flow in the river. Surface Water Flows can be assessed at Assessment Points (APs) which are significant points on the river, often where two main rivers join or at a gauging station.

Groundwater availability as a water resource is assessed similarly, unless better information on principle aquifers is available or if there are local issues that need to be taken into account.

Table 4.2: Implications of Surface Water Resource Availability Colours

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

HMWBs (and /or discharge rich water bodies)	These water bodies have a modified flow that is influenced by reservoir compensation releases or they have flows that are augmented. There may be water available for abstraction in discharge rich catchments.

Water resource availability is assessed under four different flow conditions:

- Q95 – very low flows which are exceeded 95% of the time
- Q70 – low flows which are exceeded 70% of the time
- Q50 – median flows which are exceeded 50% of the time
- Q30 – high flows which are exceeded 30% of the time

4.2.3 Adur and Ouse ALS

The Adur and Ouse ALS[64] encompasses the catchments of the River Adur, River Ouse and their tributaries. It also contains the Brighton Chalk aquifer and is largely within the South Downs National Park.

The Ouse River system is dominated by one large surface water abstraction, managed by South East Water, which is supported by augmentation releases from Ardingly reservoir. Comparatively, the River Adur is dominated by discharges from wastewater treatment works. These outflows represent a large net loss of water from the ALS area since only a third of wastewater is discharged as surface water.

The majority of the Adur and Ouse ALS encompassed by the Gatwick Sub-Region has water available for licencing at Q30 and Q50 flows (high and median flows), with only a small section in the North breaking this trend. Under Q70 and Q95 (low and very low flows) conditions most of the area becomes influenced by heavily modified water bodies and flows become dependent on reservoir compensation releases.

There are nine Assessment Points (APs) within the Adur and Ouse ALS, four of which fall within the Gatwick Sub-Region, AP1, AP2, AP7 and AP8. There is water available for licensing at AP1 and 2 and no water available at AP7 and AP8.

Where groundwater abstractions are known to directly impact surface water flows, the groundwater availability in the Adur and Ouse ALS region is guided by the surface water assessment points. However, this is not the case for the southern Brighton Chalk Block, which does not contribute significantly to river flow. Here the largest abstraction issue is to prevent saline intrusion. Resource availability maps for the Adur and Ouse ALS are presented below.

All remaining streams within the region are managed on a case-by-case basis and potential abstractors are encouraged to apply to take water during winter high flow periods to provide reservoir storage for subsequent re-use during drier months.

Since the Environment Agency has no control over the operation of discharges, there is no water available in the River Adur catchment during low and summer flows. Decisions about applications are made on a case-by-case basis.

4.2.4 Arun and Western Streams ALS

The Arun and Western Streams ALS[65] covers the south western boundary of the Gatwick Sub-Region, encompassing the River Arun, Western Rother and the West Sussex coastal plains. Chalk and Greensand aquifers underlay these catchments and provide the most important water resources, supporting water supply and freshwater inputs to the designated statutory conservation sites.

64 Environment Agency. March 2019. Adur and Ouse Abstraction Licensing Strategy
65 Environment Agency. March 2019. Arun and Western Streams Abstraction Licensing Strategy

The majority of the Arun and Western Streams ALS becomes reliant on reservoir compensation once flows decrease from Q30 (high flows). This cannot be relied on and so the Environment Agency cannot grant licences made up from these discharges.

There are eleven APs within the Arun and Western Streams ALS, five of which fall within the Gatwick sub-Region: AP1, AP5, AP6, AP7 and AP11. There is no water available for licensing at these any of these APs except AP11 where abstraction is restricted.

The groundwater availability in the Arun and Western Streams ALS region is guided by the surface water assessment unless specific information on principal aquifers exists or local issues that need protecting overrule it.

There is water available in two of the groundwater abstraction areas and restricted water available in the remaining three, meaning no new consumptive licences will be granted.

Resource availability for APs within the Gatwick sub-Region is presented below.

4.2.5 Mole ALS

The Mole ALS[66] covers an area in the north of the Gatwick Sub-Region, including the urban areas of Crawley, Horley, Reigate and Redhill. The area forms nearly 5% of the River Thames catchment and contains the River Mole and its tributaries. Groundwater abstraction accounts for 72% all licenced abstractions in this catchment, and the majority of these come from a chalk aquifer.

The Mole ALS has water resources available at least 50% of the time, though limits are dependent on the Thames Q50 (median) HoF. There are also areas within the Gatwick Sub-Region with groundwater either fully available or available on a restricted basis.

There are six APs within the Mole ALS, three of which fall within the Gatwick Sub-Region: AP4, AP5 and AP6. There is water resource availability 50% of the time at these assessment points.

The groundwater availability in the Mole ALS is guided by the surface water assessment unless specific information on principal aquifers exists or local issues that need protecting overrule it.

Consumptive groundwater licences which do not have a direct impact upon main river flows may be permitted but may be subject to restrictions such as prescribed groundwater levels. Restrictions will be determined on a case-by-case basis, dependent upon the nature and scale of any abstraction.

Resource availability for AP4, AP5 and AP6 is presented below.

Since the River Mole will eventually flow into the non-tidal River Thames, the abstraction strategy of this watercourse must consider the flow requirements of the Thames. It is for this reason that all surface abstractions will be subject to a dual HoF system, linked to both local flows and the Q50 (median) HOF at Kingston Gauging station.

4.2.6 Medway ALS

The Medway ALS[67] is the largest river basin in Kent and contains 260 km of main river. However, only a small portion of the study area, the eastern edge of Mid Sussex, is contained within this basin.

There are eight APs within the Medway ALS, none of which are located in the Gatwick Sub-Region. In the area contained within the Gatwick Sub-Region, there is either restricted water available for licensing or no water available for licensing. Water resources are available less than 30% of the time in this area.

66 Environment Agency. February 2013. Mole Abstraction Licensing Strategy
67 Environment Agency. February 2013. Medway Abstraction Licensing Strategy

4.2.7 London ALS

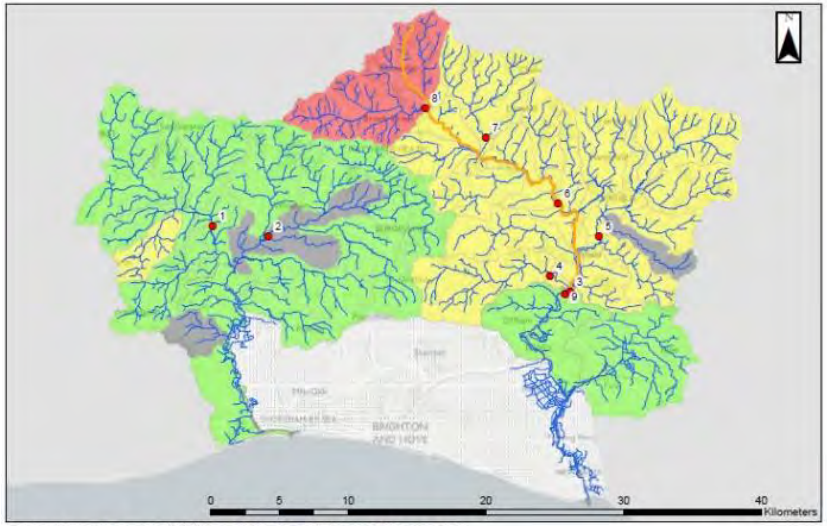
The London ALS[68] covers the northern portion of Reigate and Banstead, north of the M25, primarily Banstead. This catchment covers tributaries of the River Thames. The hydrology across most of the catchment is influenced by the impermeable London Clay. The Confined Chalk underneath London is designated as a principal aquifer.

There are ten AP points within the London ALS, none of which are located within the Gatwick Sub-Region however, AP1, AP2 and AP3 are downstream of the study area.

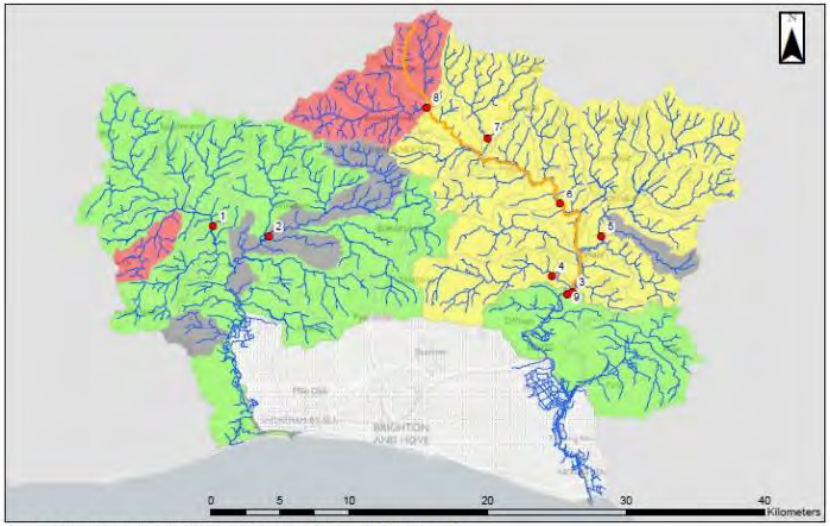
In the study area, there is restricted water available for licencing, with consumptive abstraction available at least 30% of the time.

68 Environment Agency. March 2019. London Abstraction Licensing Strategy

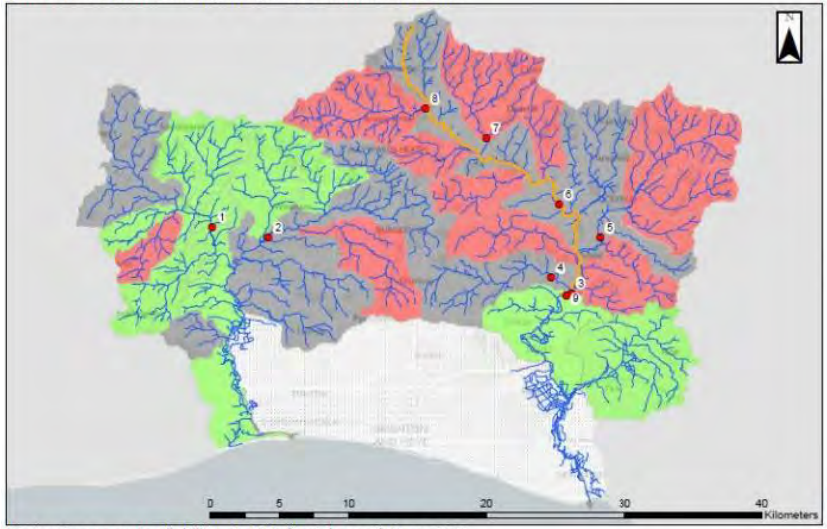
Figure 4.6: Water Resource Availability of the Adur and Ouse ALS



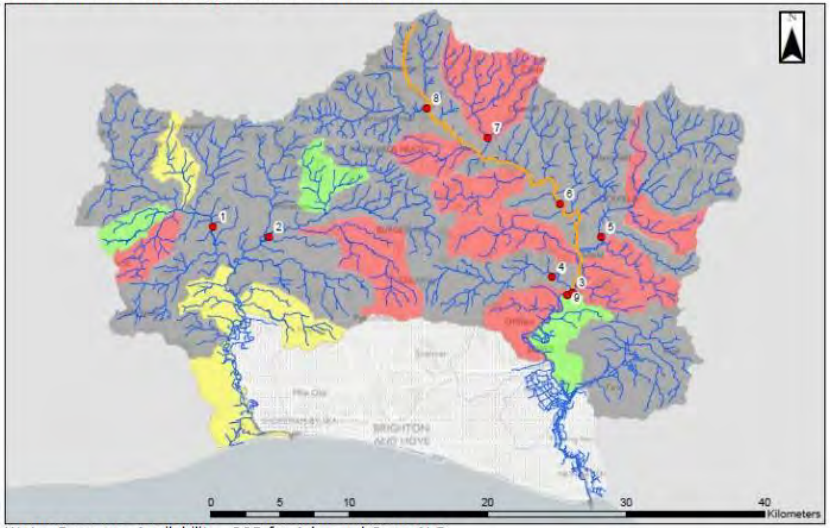
Water Resource Availability at Q30 for Adur and Ouse ALS



Water Resource Availability at Q50 for Adur and Ouse ALS



Water Resource Availability at Q70 for Adur and Ouse ALS



Water Resource Availability Q95 for Adur and Ouse ALS

Legend:
- Assessment Points
- Heavily Modified and Artificial Rivers
- Rivers

Water Availability at Q95:
- Water available
- Restricted water available
- Water not available

- Discharge Rich Waterbodies
- Chalk Block surface water body (licensed separately)

Figure 4.7: Water Resource Availability of the Arun and Western Streams ALS

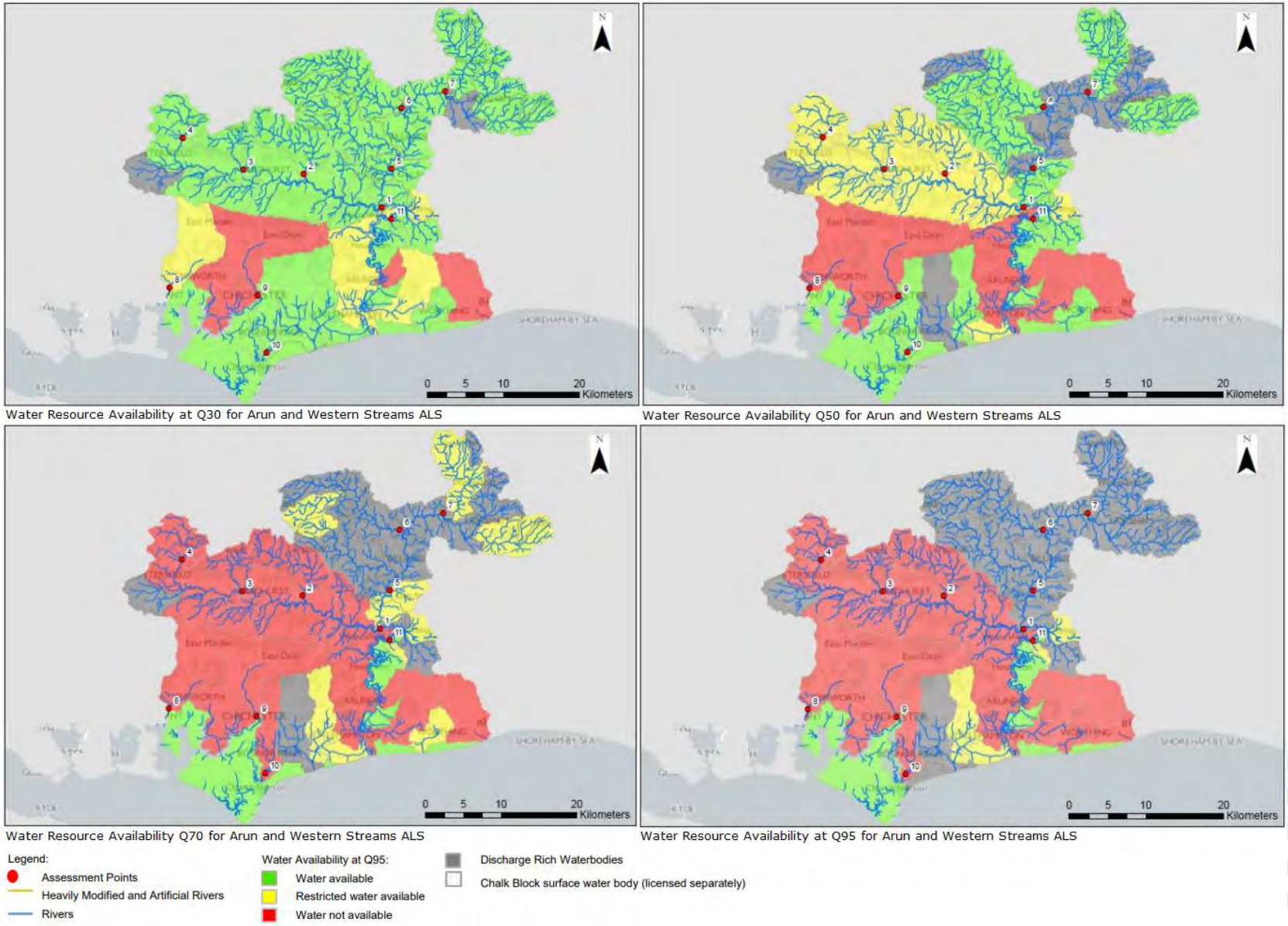


Figure 4.8: Water Resource Availability of the Mole ALS

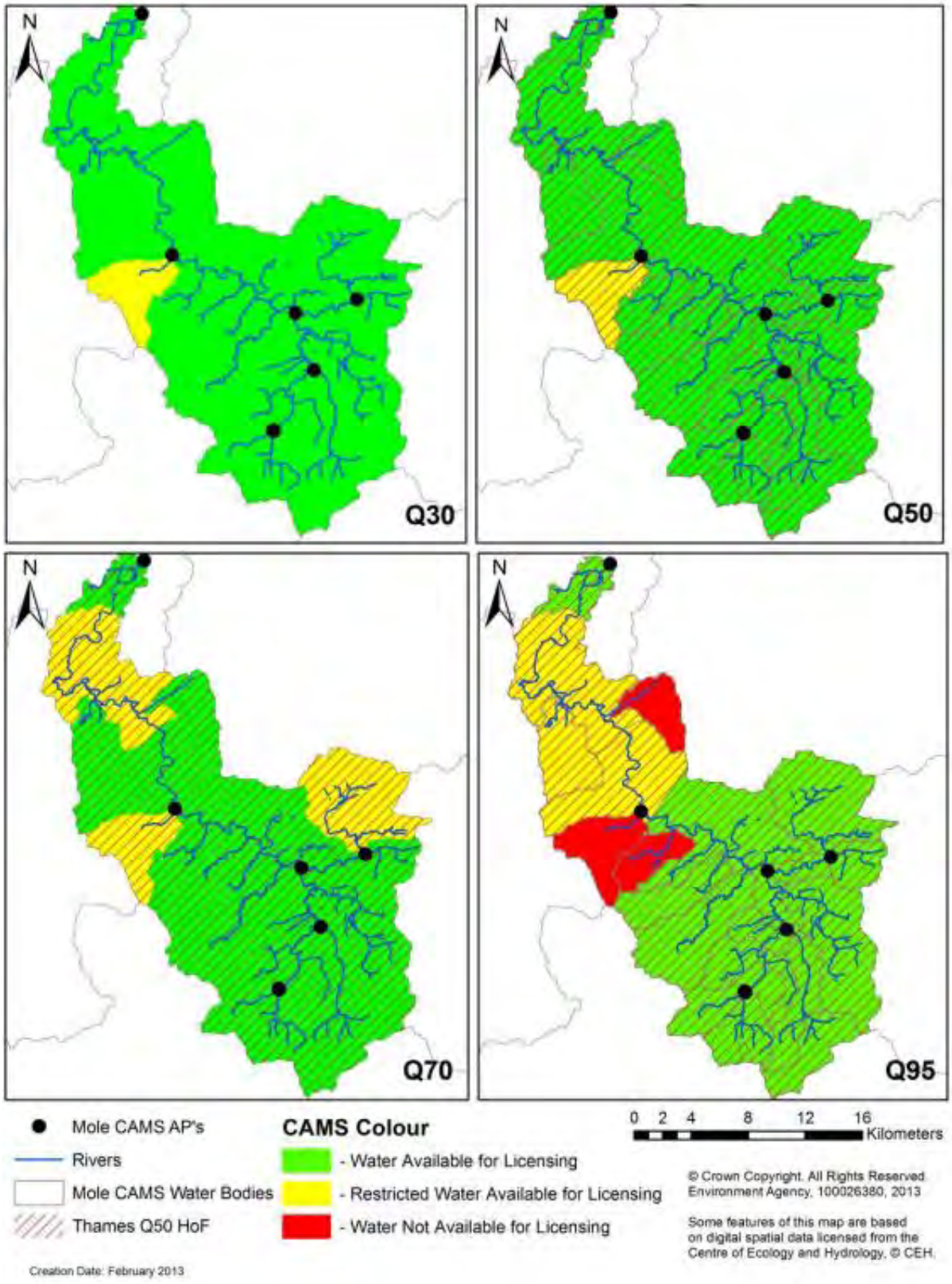


Figure 4.9: Water Resource Availability of the Medway ALS

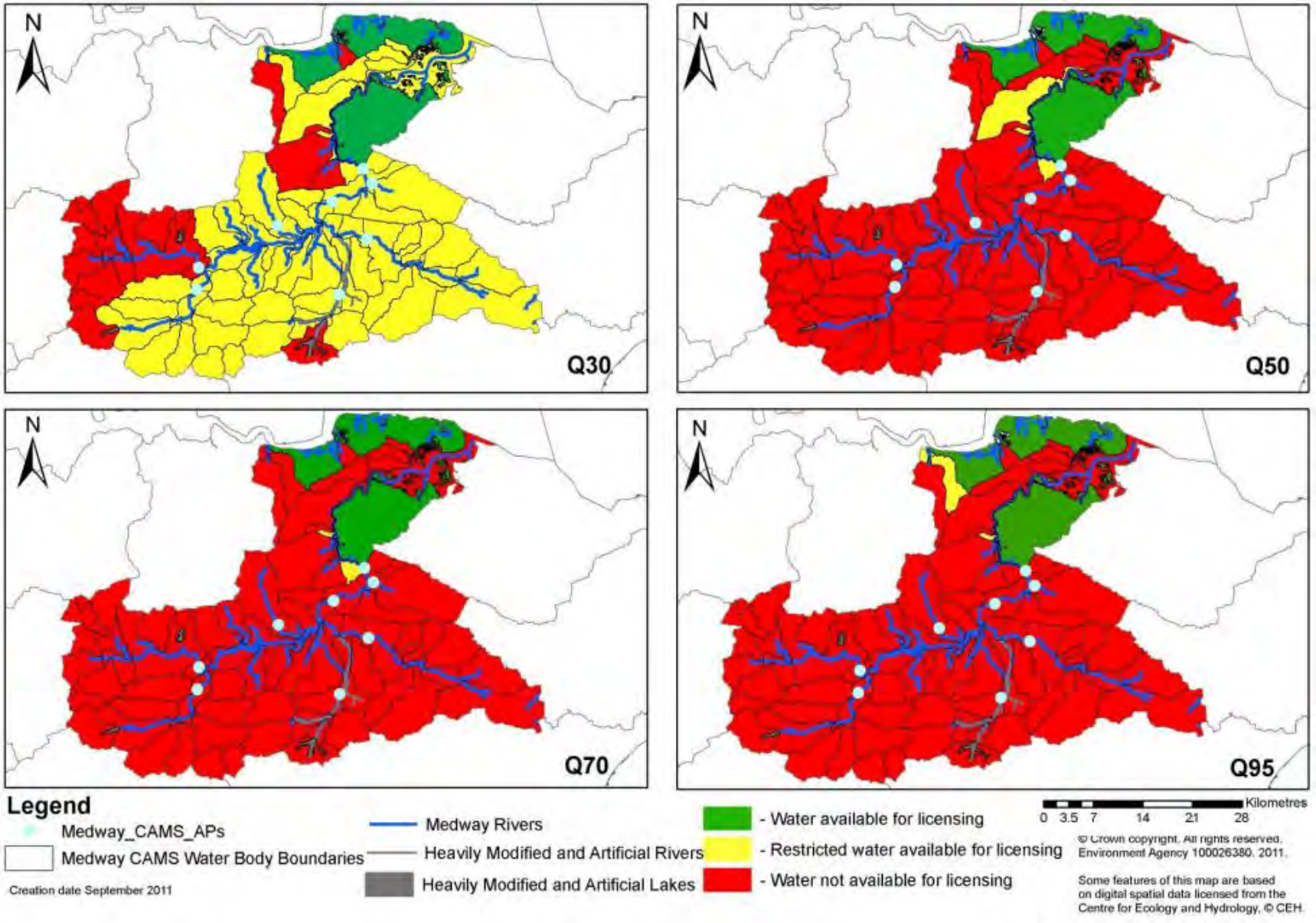
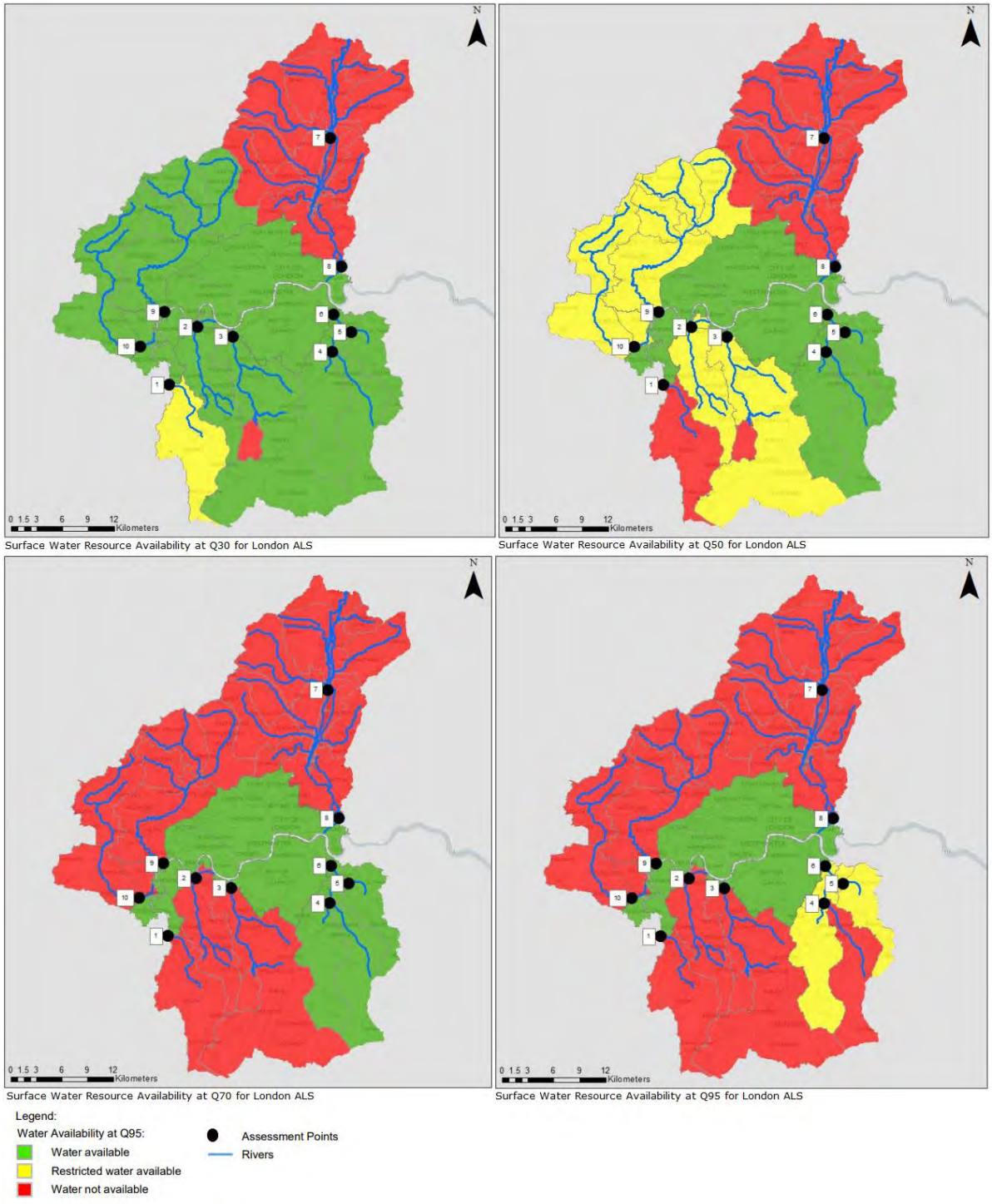


Figure 4.10: Water Resource Availability of the London ALS



4.3 Recommendations for Better Management Practices

The main options identified in the ALSs are to adopt water efficiency and demand management techniques, including:

- Testing the level of water efficiency before granting an abstraction licence,
- Promoting efficient use of water,
- Encouraging grey water recycling and alternative water sources such as effluent reuse,
- Taking actions to limit the demand,
- Reducing leakage; and
- Embedding policies for low-water consumption design in new buildings into spatial plans.

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

4.3.1 Abstraction at Hardham

The Environment Agency and Natural England made JBA aware of specific issues with Southern Water's abstraction at Hardham and its impact on the Arun Valley SPA/SAC and Pulborough Brooks SSSI. Discussions on this abstraction are ongoing, and further analysis of this issue is beyond the scope of the water cycle study, however this may provide additional supply-demand challenges for Southern Water in the Sussex North water resource zone (Figure 4.11 shows the extents of this zone which covers all of Horsham District and most of Crawley Borough).

The EA recommends that LPAs *"consider further discussions with Southern Water to understand any impacts this may have for developments proposed in this Supply Zone to understand whether phasing development would be required in line with infrastructure investment".*

4.4 Water Resource Assessment: Water Resource Management Plans

4.4.1 Introduction

When new development within a Local Planning Authority is being planned, it is important to ensure that there are sufficient water resources in the area to cover the increase in demand without risk of shortages in the future or during periods of high demand, and without causing a negative impact on the waterbodies from which water is abstracted.

The aim of this assessment was to compare the future additional demand as a result of the development proposed within the emerging Local Plans, with the demand allowed for by SES Water, Southern Water and South East Water in their Water Resource Management Plans.

The water resources assessment has been carried out utilising two approaches; initially by reviewing the water company Water Resource Management Plans (WRMPs) and secondly by providing the water companies with a growth estimate, allowing them to assess the impact of planned growth on their water resource zones.

4.4.2 Water Companies and Water Resources Zones

Three water companies supply the Gatwick Sub-Region.

- SES Water (SESW) serves Reigate and Banstead and the northern portion of Crawley, notably including Gatwick Airport.
- Southern Water serves Horsham and the majority of Crawley.
- South East Water serves Mid Sussex and the south eastern edge of Crawley.

Water companies divide their supply areas into Water Resource Zones (WRZ), the WRZs providing water to the study are shown in Table 4.3 and Figure 4.11.

Table 4.3: WRZs Impacting the Gatwick Sub-Region

Water Company	WRZ	Gatwick Sub-Region LPA	Other Local Authorities
SES Water	Sutton WRZ	Reigate and Banstead	Epsom and Ewell London Borough of Sutton London Borough of Merton London Borough of Croydon
	East Surrey WRZ	Reigate and Banstead Crawley (North)	Mole Valley Guildford Elmbridge Tandridge Croydon Sevenoaks
Southern Water	Sussex North WRZ	Horsham Crawley	Chichester Arun
	Sussex Brighton WRZ	Mid Sussex	Adur Brighton and Hove Lewes
South East Water	Haywards Heath WRZ	Mid Sussex Crawley (South East)	Lewes Wealden

4.4.3 Water Resources in the South East

All of these water companies are members of the Water Resources in the South East (WRSE) Group, an alliance of six water companies, the Environment Agency, OfWAT, Consumer Council for Water, Natural England and Defra. The group aims to develop an affordable, sustainable and resilient approach to water resource management in the region. They do this by:

- Developing and maintaining a regional water resources model, contributed to by all of the water companies. This will be used to assess the impact of both demand and supply-side measures, including testing new options for inter-company transfers. This modelling has informed the 2019 WRMPs and is being further developed to inform the next round of WRMPs, due to be finalised in 2024.
- WRSE is moving towards developing a regional plan covering multi-sector resilience, considering the needs of the environment, industry and agriculture as well as public water supply as is covered by WRMPs.
- WRSE is currently tendering for an organisation to produce forecasts of population and properties for the entire WRSE region for the period 2019 to 2100 at the Water Resource Zone (WRZ) level with locations of development sites earmarked for future development by the local authorities.

4.4.4 Methodology

The following Water Resource Management Plans were reviewed:

- SES Water – Revised Draft Water Resources Management Plan 2019[69]
- Southern Water – Water Resource Management Plan 2020[70]
- South East Water – Water Resources Management Plan 2020 to 2080[71]

Attention was mainly focussed upon:

- The available water resources and future pressures which may impact upon the supply element of the supply/demand balance
- The allowance within those plans for housing and population growth and its impact upon the demand side of the supply/demand balance

The spatial boundaries of the WRZs have been used to overlay the Local Authority boundaries.

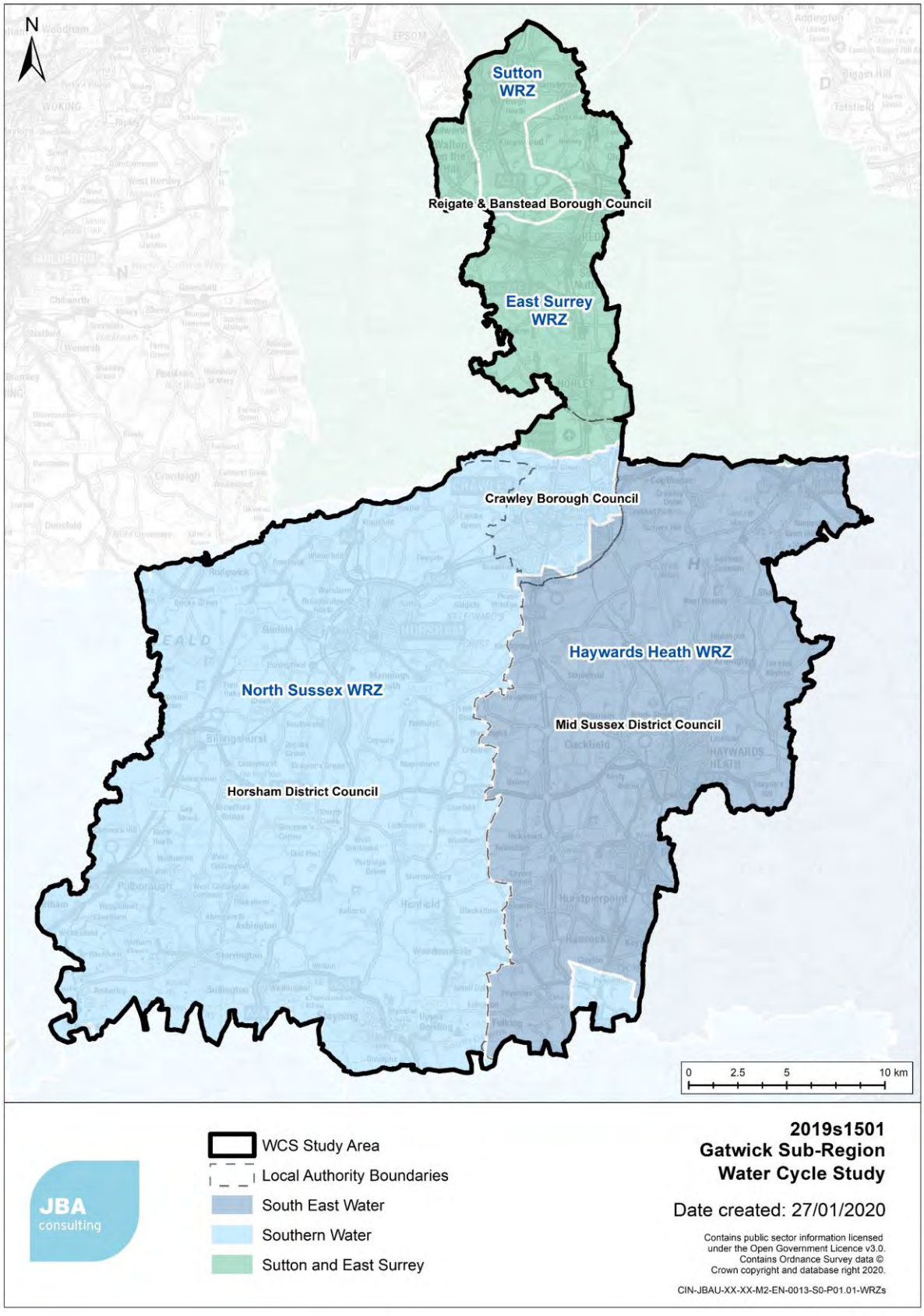
The Ministry for Housing, Communities and Local Government (MHCLG) 2014-based estimates of household growth up to 2041[72] were collated for the local authorities which lie within each WRZ. The percentage of the current population of each local authority within the WRZ was estimated from the OS CodePoint dataset and the WRZ boundary. The assessment has used MHCLG figures, because they are available for all LPAs within the water resource zone, and over a consistent timescale and methodology. The resulting total number of households in the base year within the WRZ is comparable with the figures quoted in the WRMPs.

The results were assessed using a red/amber/green traffic light definition to score the water resource zone:

Adopted WRMP has planned for the increase in demand, or sufficient time to address supply demand issues in the next WRMP.	Adopted WRMP has planned for the increase in demand, or sufficient time to address supply demand issues in the next WRMP. The site is located in an area that is significantly affected by WFD WINEP and would not be a favoured site.	Adopted WRMP does not take into consideration the planned increase in demand. Additional water resources may be required.

69 SES Water. April 2019. Revised Draft Water Resources Management Plan 2019 – Main Report.
70 Southern Water. Water Resource Management Plan 2020: Technical Overview
71 South East Water. Water Resources Management Plan 2020 to 2080
72 2014-Based Household Projections for England, Office for National Statistics (2018). Accessed online at: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/datasets/householdprojectionsforengland on: 31/10/2018

Figure 4.11: Water Resource Zones within the Gatwick Sub-Region



4.5 Water Resource Management Plan Reviews

4.5.1 SES Water

SES Water (SESW) is responsible for supplying Reigate and Banstead and the northern portion of Crawley, including Gatwick Airport. For the purposes of water resource planning, the SESW supply area has been divided into 2 Water Resource Zones (WRZ). The Gatwick Sub-Region is covered by both the northern Sutton WRZ and the southern East Surrey WRZ.

Currently, SESW supply 707,000 consumers in over 286,000 properties. At present, 85% of the water supplied is being extracted from groundwater resources and 15% from Bough Beech Reservoir, supplied by a pumped river abstraction from the River Eden in Kent.

The Revised Draft WRMP[73] covers a plan period of 60 years, 2020 to 2080.

Change in Demand

The total number of households is expected to increase from 263,000 to 447,000, a 64% increase over the 60-year plan period. The population is expected to increase by 41% to just under one million by 2079/80. There is a decline in forecast occupancy rates from 2.59 to 2.23 over the plan period.

As with the other water companies, SESW have forecast household consumption using micro-component analysis and metering segmentation. Metering is forecast to increase to 70% by 2025 and 93% by 2080 under baseline conditions. Normal year per capita consumption (PCC) declines from 147.6 litres per person per day in the base year to 135.8 litres per person per day, whereas dry year PCC starts at 159.8 in the base year and drops to 144.9 by 2080.

Non-household demand is largely stable and is forecast to maintain at current levels.

Dry year demand (in millions of litres per day (Ml/d)) within the SESW supply area from each component is summarised in Table 4.4.

Table 4.4: Baseline Demand Forecast (Dry Year Annual Average)

Component	Demand at 2020/21 (Ml/d)	Demand at 2079/80 (Ml/d)
Household demand	109.99	154.24
Non-household demand	27.63	27.94
Distribution Losses	15.82	13.55
Water Taken Unbilled	1.74	1.74
Distribution System Operational Use	2.64	2.64
TOTAL	166.00	200.24

Supply-Demand Balance

This section of the WRMP compares the supply and demand forecasts, including headroom, to determine whether resources are projected to be in surplus or deficit at any point in the planning period.

There is a forecast surplus until 2048/49 and after this point there is a deficit. By the end of the plan period, there is a projected deficit of 22.7 Ml/d.

73 SES Water. April 2019. Revised Draft Water Resources Management Plan 2019 – Main Report.

Options

SESW has considered options that could resolve the supply-demand deficit. These options explore enhancing supplies or reducing demand separately.

Supply-Side Options:

- Abstraction at new or existing sites, and those where new or additional treatment would result in an increase in yield
- Water treatment options
- Pipeline transfer and bulk supplies

Demand-Side Options:

- Leakage management and reduction
- Improved household and non-household water efficiency
- Tariffs for sprinkler use or increasing volumetric charges
- Metering and smart metering
- Rainwater harvesting or greywater recycling.

A preferred programme of fourteen demand and supply options, plus a strategic transfer to South East Water, was taken forward for public consultation.

SESW model outputs show that the identified demand management measures are sufficient to solve the deficit in the baseline supply-demand. The plan, at a cost of £170.2M, results in a surplus of over 7 Ml/d under average conditions by 2080.

4.5.2 Southern Water

Southern Water is responsible for supplying the entirety of Horsham and most of Crawley. A small portion of southern Mid Sussex is also supplied by Southern Water. For the purposes of water resource planning, the Southern Water supply area is divided into fourteen WRZs. These fourteen WRZs have been amalgamated into three larger sub-regional supply areas.

The Gatwick Sub-Region is covered by the Sussex North WRZ and Sussex Brighton WRZ, two of three WRZs forming the Central supply area.

The Southern Water WRMP[74] identifies strategies to water supply and demand over the plan period 2020 to 2070. In the Central supply area, the next 10-15 years is dominated with potential future uncertain sustainability reductions.

Southern Water is mainly dependant on groundwater sources in the chalk aquifer, and this makes up 70% of the total water supply. River abstraction accounts for 23% of water supply. Four surface water impounding reservoirs provide the remaining 7% water supply in the Southern Water supply area.

Change in Demand

Southern Water have found that total household demand is forecast to increase from 305.3 Ml/d at present to 352.2Ml/d by 2069-70, an increase of 16% over the plan period.

Total non-household demand is forecast to increase by 10% from 116.4 Ml/d at present to 127.7Ml/d by 2069-70.

Supply-Demand Balance

Southern Water anticipate that in the Central Area, the supply demand balance would move into deficit early in the planning period, with a further decrease anticipated as a result of potential sustainability reductions in 2027-28. Sustainability reductions are reductions in the amount of water abstracted in order to ensure continued sustainability

74 Southern Water. Water Resource Management Plan 2019: Technical Overview

of a water resource. For example, a reduction in river abstraction may be required in order for a river to meet its WFD targets.

Options

Southern Water have assessed a range of options to both increase water supply and reduce water demand.

- The following schemes are included within the strategy for the Central supply area:
    - Extend universal metering programme and enhance meter reading frequency.
    - Encourage the more efficient use of water
    - Increased leakage reduction activity
    - An indirect water reuse scheme from Littlehampton WwTW
    - A desalination scheme on the tidal River Arun
    - A coastal desalination scheme at Shoreham
    - An indirect water reuse scheme from Brighton WwTW, working jointly with South East Water
    - An aquifer storage and recovery scheme north of Worthing
    - Rehabilitation and enhancement of three existing sources in Sussex North
    - Implement planned infrastructure development to allow the existing Sussex Worthing to Sussex Brighton main to be enhanced.
    - Catchment management and infrastructure solutions to reduce nitrates and pesticides and increase resilience

The timing of these schemes can be found within the Technical Overview of Southern Water's WRMP.

Target 100

Southern Water have committed in their WRMP to water efficiency policy that aims to achieve a per capita consumption (PCC) of 100 l/p/d by 2040. This consists of four key strands:

- Installation of smart metering technology
- Home audits
- Proactive customer contact – this includes a system to engage with customers where significant increases in consumption are identified
- Incentivising water efficiency behaviour

4.5.3 South East Water

South East Water (SEW) is responsible for supplying the majority of Mid Sussex and the south eastern boundary of Crawley. For the purposes of water resource planning, the South East Water supply area is divided into eight Water Resource Zones. The Gatwick Sub-Region study area is covered by the Haywards Heath WRZ.

The SEW WRMP[75] states that 73% of the supply comes from groundwater sources from more than 250 boreholes and wells, 19% is from surface water abstractions, including six river intakes, three surface water reservoirs and 8% from neighbouring water companies.

In the Haywards Heath WRZ, 55% is supplied by two surface water sources and 38% of water is supplied by fourteen groundwater sources from the Ashdown Beds and chalk

75 South East Water. Water Resources Management Plan 2020 to 2080

aquifers. The remaining 7% is supplied by inter-company transfer from Southern Water, with this contract due to be next reviewed in 2021.

Change in Demand

Across the entirety of the supply area, a deficit is reached at 2044/45 for both dry year annual average and summer peak period. The supply demand balance is shown in Table 4.5.

Table 4.5: South East Water Forecast Demand Increase

	Dry Year Annual Average (Ml/d)				Summer Peak Period (Ml/d)			
	2019/20	2024/25	2044/45	2079/80	2019/20	2024/25	2044/45	2079/80
Supply forecast	635.6	616.4	559.2	556.0	763.3	740.7	683.1	679.4
Demand forecast	524.2	534.0	572.6	672.4	644.5	658.6	714.7	859.8
Target headroom	34.3	42.4	63.8	79.4	36.0	44.5	69.5	87.2
Demand + target headroom	558.5	576.4	636.4	751.8	680.5	703.1	784.2	947.0
Supply demand balance	77.1	40.0	-77.2	-195.8	82.8	37.6	-101.1	-267.6

Options

South East Water has defined a preferred plan to address the future deficit of water supply. This plan includes:

- Adopting a mix of demand management and supply side options
- Addressing deficits in both dry year annual average and summer peak period for all WRZs across the plan period

Within the Haywards Heath WRZ, the preferred plan is detailed in Table 4.6.

Table 4.6: South East Water – Haywards Heath WRZ Preferred Plan

Water Resource Zone	Year	Preferred Plan
Haywards Heath WRZ2	2020-2025	Reduced leakage Water efficiency
	2025-2045	Increased connectivity between WRZ2 and WRZ7 (Cranbrook) Water re-use to the River Ouse Improved connectivity within the zone
	2045-2080	Internal transfer from WRZ3 to WRZ2 Integrated use of surface and groundwater near the River Ouse Goose Green Reservoir

4.5.4 Household Growth – Water Supply Boundaries

The MHCLG Household Projections (2014) is used throughout this section and defines a "household" as "one person living alone, or a group of people (not necessarily related) living at the same address with common housekeeping – that is, sharing a living room or sitting room or at least 1 meal a day". For purpose of this WCS one dwelling equals one household.

SES Water

Table 4.7 shows the household growth forecasts for the SES Water supply area, using the Ministry of Housing Communities and Local Government (MHCLG) 2014-based household projections. The MHCLG 2014-based forecast show an 18.6% increase in the number of households across the entirety of the SES water supply area.

Table 4.7: MHCLG 2014-Based Household Growth - SES Water

Forecast	2020	2035	% Increase
MHCLG 2014-based forecast – SES WRZ	309,950	367,704	18.6%

Table 4.8 shows the household growth forecast for the SES Water supply area, using WRMP Water Resources Market Information[76]. This information has not been split between the two WRZs and has been assessed for the entire supply area. The data tables are based on the revised draft Water Resource Management Plan 2019. The Water Resources Market Information forecasts a 16% increase in the number of households across the two WRZs between 2020 and 2035.

Table 4.8: Water Resources Market Information - Household Growth – SES Water

Forecast	2020	2035	% Increase
WRMP Water Resources Market Information – Sutton WRZ and East Surrey WRZ	299,154	347,810	16.3%

Southern Water

Table 4.9 shows the household growth forecasts for the two Southern Water WRZs within the study area, using the Ministry of Housing Communities and Local Government (MHCLG) 2014-based household projections. The MHCLG 2014-based projections forecast a 15.6% increase in the number of households in the Sussex North WRZ and a 14.4% increase in the Sussex Brighton WRZ between 2020 and 2035.

Table 4.10 shows the household growth forecasts for the Southern Water WRZ within the study area, using WRMP Water Resources Market Information[77]. The Water Resources Market Information forecasts an 11.3% increase in the number of households in the Sussex North WRZ and a 10.1% increase in the Sussex Brighton WRZ.

Table 4.9: MHCLG 2014-Based Household Growth - Southern Water

Forecast	2020	2035	% Increase
MHCLG 2014-based forecast – All LPAs in Sussex North WRZ	118,498	137,032	15.6%

76 SES Water. Water Resources Market Information. https://www.waterplc.com/mobile/default.asp?pageid=912
77 Southern Water. Water Resources Market Information. https://www.southernwater.co.uk/our-story/water-resources-planning/water-resources-management-plan-2020-70

Forecast	2020	2035	% Increase
MHCLG 2014-based forecast – All LPAs in Sussex Brighton WRZ	162,832	186,257	14.4%

Table 4.10: Water Resources Market Information - Household Growth - Southern Water

Forecast	2020	2035	% Increase
WRMP Water Resources Market Information – Sussex North WRZ	119,230	132,652	11.3%
WRMP Water Resources Market Information – Sussex Brighton WRZ	169,163	186,300	10.1%

South East Water

Table 4.11 shows the household growth forecast for the Haywards Heath WRZ, using the Ministry of Housing Communities and Local Government (MHCLG) 2014-based household projections. The MHCLG 2014-based projections forecast a 17.1% increase in the number of households in the Haywards Heath WRZ from 2020 to 2035.

Table 4.12 shows the household growth forecast for the Haywards Heath WRZ, using WRMP Water Resources Market Information[78]. The Water Resources Market Information forecasts an 15.2% increase in the number of households in the Haywards Heath WRZ.

Table 4.11: MHCLG 2014-Based Household Growth - South East Water

Forecast	2020	2035	% Increase
MHCLG 2014-based forecast – All LPAs in Haywards Heath WRZ	135,358	158,522	17.1%

Table 4.12: Water Resources Market Information - Household Growth in the South East Water Haywards Heath WRZ

Forecast	2020	2035	% Increase
WRMP Water Resources Market Information – Haywards Heath WRZ	138,942	160,033	15.2%

4.5.5 Household Growth – Local Authority Boundaries

Horsham District Council – Planned Growth

The Draft Local Plan states that the minimum local housing need is 965 dwellings per annum across the 2019 to 2036 plan period, 17,370 dwellings in total[79].

Table 4.13 uses the MHCLG 2014-Based 2019 housing forecast as a baseline and shows the impact of the proposed growth over the plan period. The forecast percentage increase in dwellings by 2036 is 29%.

Table 4.14 shows the MHCLG 2014-Based housing forecasts for 2019 and 2036. This forecasts a 16% increase in dwellings across the plan period, less than the growth proposed by the Horsham Draft Local Plan.

Horsham is likely to accommodate part of Crawley's unmet need. For the purpose of this study, Crawley's unmet need of 5,925 has been divided between Mid Sussex (1,498 houses) and Horsham (4,427 houses).

Table 4.13: Horsham Housing Provision Forecast – Local Plan

MHCLG 2014-Based Household Forecast 2019	Horsham Local Plan Housing Need 2019 - 2036	2036 Forecast Household Number	Forecast % Increase
59,734	15,440 + 4,427	79,601	33%

78 Southern Water. Water Resources Market Information. https://www.southernwater.co.uk/our-story/water-resources-planning/water-resources-management-plan-2020-70

79 Horsham District Council. The Horsham District Local Plan 2019-2036.

Table 4.14: Horsham Housing Provision Forecast – MHCLG 2014-Based

MHCLG 2014-Based Household Forecast 2019	MHCLG 2014-Based Forecast Growth	MHCLG 2014-Based Household Forecast 2036	Forecast % Increase
59,734	9,839	69,573	16%

Using the water resources market information published by SW, it can be seen that over the period covered by Horsham's Local Plan, the Southern Water's Sussex North WRZ is predicted to experience 12% overall growth in households, considerably less than the predicted increase in growth in Horsham District using either the Local Plan or MHCLG forecasts.

Crawley Borough Council – Planned Growth

Crawley Borough Council is in the process of reviewing and updating its local plan to cover the plan period 2020 to 2035. The Northern West Sussex Strategic Housing Market Assessment[80], states the minimum local housing need of 15,040 dwellings over the period of 2019 to 2039. Taken over the 15 year Local Plan period 2020-2035, this equates to a total need of 11,280 new homes, or 752 dwellings per annum.

The Local Plan makes provision for the 'supply-led' development of a minimum of 5,355 dwelling across the plan period resulting in an unmet housing need of approximately 5,925 dwellings, arising from Crawley over the Plan Period. This has been accounted for within the equivalent assessment for Horsham and Mid Sussex. Table 4.15 uses the MHCLG 2014-Based 2020 household forecast as a baseline and shows the impact of the Local Plan proposed growth over the plan period. In Crawley, the forecast percentage increase in dwellings is 24%.

Table 4.16 shows the MHCLG 2014-Based housing forecasts for 2020 and 2035. This forecasts a 18% increase in dwellings across the plan period, more than the 'supply-led' growth that can be accommodated within Crawley as proposed by the Crawley Draft Local Plan.

Table 4.15: Crawley Housing Provision Forecast – Local Plan

MHCLG 2014-Based Household Forecast 2020	Crawley Local Plan **'Supply-led'** Housing Need 2020 - 2035	2035 Forecast Household Number	Forecast % Increase
47,944	5,355	53,299	11%

Table 4.16: Crawley Housing Provision Forecast – MHCLG 2014-Based

MHCLG 2014-Based Household Forecast 2020	MHCLG 2014-Based Forecast Growth	MHCLG 2014-Based Household Forecast 2035	Forecast % Increase
47,944	8,470	56,414	18%

Using the water resources market information published by SESW and SW, it is can be seen that household numbers in the Sutton and East Surrey WRZ and Sussex – North WRZ which cover the south and north of Crawley respectively are predicted to grow by

[80] Iceni. November 2019. Northern West Sussex Strategic Housing Market Assessment – Final Report

15% and 10% over Crawley's Local Plan period. This is broadly in line with the percentage growth predicted in Crawley in their Local Plan, but less than the MHCLG projections, as their unmet need is being accommodated elsewhere.

Reigate and Banstead Borough Council – Planned Growth

Reigate and Banstead Borough Council adopted its Core Strategy on 3 July 2014. On 2 July 2019[81], the Council adopted a review of all of the 2014 Core Strategy policies, which concluded that the Core Strategy remains up to date, and that none of its policies currently need modifying or updating. The Development Management Plan adopted in 2019 allocates specific development sites to deliver the spatial strategy and housing numbers established in the Core Strategy to 2027.

The Reigate and Banstead housing delivery policy states that at least 6,900 homes are required between 2012 and 2027, equating to an average annual provision of 460 dwellings per annum.

Table 4.17 uses the MHCLG 2014 based household forecasts and shows the impact of the proposed growth over the plan period. The forecast percentage increase in dwellings in 2027 is 12%.

Table 4.18 shows the MHCLG 2014-Based housing forecasts for 2012 and 2027. This shows a 22% increase in dwellings across the plan period, greater than the growth proposed by the Adopted Core Strategy.

Table 4.17: Reigate and Banstead Housing Provision Forecast – Local Plan

MHCLG 2014-Based Household Forecast 2012	Core Strategy Housing Requirement 2012 - 2027	2027 Forecast Household Number	Forecast % Increase
56,304	6,900	63,204	12%

Table 4.18: Reigate and Banstead Housing Provision Forecast – MHCLG 2014-Based

MHCLG 2014-Based Household Forecast 2012	MHCLG 2014-Based Forecast Growth	MHCLG 2014-Based Household Forecast 2027	Forecast % Increase
56,304	12,412	68,716	22%

RBBC is within SESW's Sutton and East Surrey's WRZ, and using the published water resource market information, it can be seen that a 7% increase in the number of households is expected over the remaining RBBC plan period, less than the percentage growth predicted by RBBC's Local Plan or by the MHCLG forecasts.

Mid Sussex District Council – Planned Growth

Mid Sussex adopted the Mid Sussex District Plan in March 2018[82], covering the plan period 2014-2031. The District Plan sets a minimum housing provision of 16,390 dwelling across the plan period 2014 – 2031 to meet the OAN as well as contributing towards the unmet need of neighbouring authorities, primarily the unmet need arising in the Northern West Sussex Housing Market Area from Crawley:

- 2014/15 to 2023/24: 876 dwellings per annum
- 2024/25 to 2030/31: 1,090 dwellings per annum

[81] Reigate and Banstead Borough Council. June 2019. Review of the Reigate & Banstead Local Plan: Core Strategy
[82] Mid Sussex District Council. March 2018. Mid Sussex District Plan 2014 – 2031

Table 4.19 uses the MHCLG 2014 based household forecast as a baseline and shows the impact of the proposed growth over the plan period. The forecast percentage increase in dwellings across the plan period is 12%.

Table 4.20 shows the MHCLG 2014-Based housing forecasts for 2014 and 2013. This shows a 20% increase in the number of dwellings across the plan period, less than the growth proposed by the District Plan. The adopted District Plan housing requirement is greater than the Objectively Assessed Need (OAN – based on MHCLG projections) as Mid Sussex are accommodating an element of unmet housing need (1,498 houses) from Crawley.

Table 4.19: Mid Sussex Housing Provision Forecast – Local Plan

MHCLG 2014-Based Household Forecast 2014	Mid Sussex District Plan Housing Need 2014 - 2031	2031 Forecast Household Number	Forecast % Increase
59,737	16,390	76,127	27%

Table 4.20: Mid Sussex Housing Provision Forecast – MHCLG 2014-Based

MHCLG 2014-Based Household Forecast 2014	MHCLG 2014-Based Forecast Growth	MHCLG 2014-Based Household Forecast 2031	Forecast % Increase
59,737	12,139	71,876	20%

Mid Sussex is within SEW's Haywards Heath WRZ, and using the published water resource market information, an 11% increase in households is predicted for the remaining Mid Sussex plan period. This is significantly less than the predicted percentage growth in the Mid Sussex local plan and in the MHCLG forecasts.

4.5.6 Summary

- The water supply in the Gatwick Sub-Region is managed by SES Water, Southern Water and South East Water.
- The study area divided between five Water Resource Zones.
- In the SES supply area, assessed as one area rather than two separate WRZ, the 2035 forecast number of houses is 5.4% greater in the MHCLG 2014-based forecast compared to the Water Resources Market Information forecast, which is used to inform the WRMP.
- In the Southern Water Sussex North WRZ, the 2035 forecast number of houses is 3.2% greater in the MHCLG 2014-based forecast compared to the Water Resources Market Information forecast. In the Sussex Brighton WRZ, the difference between the MHCLG 2014-based forecast and the Water Resources Market Information forecast is insignificant.
- In the South East Water Haywards Heath WRZ, the 2035 forecast number of houses is 1.0% greater in the Water Resources Market Information forecast compared to the MHCLG 2014-based forecast.
- Predicted growth in Horsham, Mid Sussex and Reigate and Banstead is higher than the overall percentage growth forecast in the water resource zones that cover them. Growth in Crawley is broadly in line with SESW's Sutton and East Surrey WRZ and SW's Sussex North WRZ, however their unmet need is being accommodated outside Crawley in Horsham and Mid Sussex

4.6 SES Water Assessment

SESW were provided details of development sites within the Gatwick sub-region. They confirmed that "whilst we could accommodate the additional demand it would impact on our infrastructure and demand management plans, and potentially transfers with other companies."

The growth information collated from this water cycle study in particular for Gatwick will be used in SESW's non-household demand forecast for the next Water Resource Management Plan, work on which commences in 2020 with publication in 2024. Household forecasts from both ONS trends and Local Plans will also be used to create this plan.

SESW confirmed there is sufficient capacity at Water Treatment Works to serve this level of growth and additional land is not required to be safeguarded for strategic infrastructure or large-scale transfer.

SESW are in favour of, and will be promoting the importance of, Local Authority Local Plan developments and those commercial developments specifically associated with Gatwick Airport to incorporate grey water recycling and/or rainwater harvesting alongside the incorporation of water-efficient fixtures and fittings.

Growth at Gatwick Airport represents a significant additional demand on water resources. Gatwick Airport Limited (GAL) is understood to have put on hold its work on Development Consent Order to bring the northern standby runway into operational use whilst there is significant uncertainty over the impact of COVID-19, with work anticipated to reconvene in 2021. GAL are aware of the SESW position on the use of greywater recycling and rainwater harvesting.

4.7 Southern Water Assessment

Southern Water asked for all sites within their water resource zone to be given a "green" assessment and commented that it *"has recently published its Water Resources Management Plan for the next 50 years 2020-2070. The strategy takes account of future growth as well as various scenarios of climate change. Our strategy for the provision of future water resources for the Central area (which includes Sussex North) can be found here; "*

https://www.southernwater.co.uk/media/2990/wrmp19-annex10-strategy-for-the-central-area.pdf

Concerns over abstraction at Hardham in the Sussex North water resource zone, and its impact on the Arun Valley SPA/SAC and Pulborough Brooks SSSI have been identified. Further discussion with Southern Water to identify the impact on additional water resource demands with this water resource zone are required (see also section 4.3.1).

4.8 South East Water Assessment

SEW commented that there is sufficient water resource to serve all of the planned growth in the Gatwick Sub-Region supplied by SEW, as set out in their WRMP

https://corporate.southeastwater.co.uk/news-info/publications/wrmp19-wrmp/

"*This plan was developed following engagement with the local planning authorities in our supply area and accommodates all planned growth. It also incorporates an addition 'headroom' capacity to enable us to provide water if growth is greater than predicted. Our resources tables for water resource zone 2 – (Haywards Heath) contains the area of Mid Sussex and shows a positive Supply Demand Balance for the forecasted period based on our preferred options. You can see in both Dry Year Annual Average and Critical Period tables on Table 9.*"

"*Our WRMP takes account of water treatment work capacity along with a whole host of other considerations such as network constraints, climate change, the amount of water we can transfer between our water resources zones and from other water companies, uncertainty, environmental constraints, and population growth.*"

"We currently have no options within our preferred plan that requires any land to be safeguarded for strategic infrastructure."

4.9 Water Efficiency and Water Neutrality

4.9.1 Introduction

The Gatwick Sub-Region has been identified as an area of serious water stress, and there are actions under the Water Industry National Environment Programme (WINEP)[83] to investigate sustainability of water resources within the study area and assess groundwater abstraction.

It is widely recognised that the climate is changing, and Crawley Council are one of many in the country to declare a climate emergency. Climate change is predicted to increase pressure on water resources, increasing the potential for a supply-demand deficit in the future, and making environmental damage from over abstraction of water resources more likely. Furthermore, the delivery of water and wastewater services and the heating of water in the home require high energy inputs, and therefore contribute directly to emissions of greenhouse gases. Water efficiency therefore reduces energy use and carbon emissions.

It is important that new development does not cause an unsustainable increase in water abstraction. This can be done in a number of ways from reducing the water demand from new houses through to achieving "water neutrality" in a region by offsetting a new development's water demand by improving efficiency in existing buildings.

4.9.2 Required evidence

It is for Local Authorities to establish a clear need to adopt the tighter water efficiency target through the building regulations. This should be based on:

- Existing sources of evidence such as:
    - The Environment Agency classification of water stress
    - Water resource management plans produced by water companies
    - River Basin Management Plans which describe the river basin district and the pressure that the water environment faces. These include information on where water resources are contributing to a water body being classified as 'at risk' or 'probably at risk' of failing to achieve good ecological status, due to low flows or reduced water availability.
- Consultations with the local water and sewerage company, the Environment Agency and catchment partnerships
- Consideration of the impact on viability and housing supply of such a requirement

4.9.3 Water Stress

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

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

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

83 WINEP sets out the actions that water companies will need to complete to meet their environmental obligations.

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

In the 2013 Environment Agency and Natural Resources Wales water stress assessment[84], the supply regions serving the Gatwick Sub-Region are classified as follows in terms of final stress:

- SES Water – Serious Stress
- Southern Water - Serious Stress
- South East Water - Serious Stress
- Thames Water - Serious Stress

4.9.4 River Basin Management Plans

One of the challenges identified in both the Thames RBMP and the South East RBMP is "changes to natural flow and levels of water". The management recommendations from both RBMP are listed below:

- All sectors take up or encourage water efficiency measures, including water industry work on metering, leakage, audits, providing water efficient products, promoting water efficiency and education.
- Local Government sets out local plan policies requiring new homes to meet the tighter water efficiency standard of 110 litres per person per day as described in Part G of Schedule 1 to the Building Regulations 2010.
- Industry manufacturing and other business implement tighter levels of water efficiency, as proposed by changes to the Building Regulations.
- Agriculture and rural land management manage demand for water and use water more efficiently to have a sustainable water supply for the future.
- Local government commissions water cycle studies to inform spatial planning decisions around local water resources.

The RBMP goes on to state that "dealing with unsustainable abstraction and implementing water efficiency measures is essential to prepare and be able to adapt to climate change and increased water demand in the future."

4.9.5 National Water Resources Framework

A new National Framework for Water Resources was published by the Government in March 2020. This outlines the water resources challenges facing England and sets out the strategic direction for the work being carried out by regional water resource groups.

A range of options were explored, and the most ambitious scenarios rely on policy change to introduce mandatory labelling of water using fittings and associated standards. The Government is currently reviewing policy on water efficiency following a recent consultation. The framework proposes that regional groups plan to help customers reduce their water use to around 110 l/p/d. This is achievable without policy interventions.

This aligns with the tighter standard of 110 l/p/d per day as described in building regulations. An adopted water efficiency target higher than 110 l/p/d would make the overall target for the UK harder to achieve and considering the difficulty of retro-fitting existing properties to reduce water demand, new build properties may need to be more efficient than 110l/p/d in order to achieve this.

84 Environment Agency. July 2013. Water Stressed Areas - Final Classification. Developed by the Environment Agency and Natural Resources Wales

4.9.6 Impact on viability

As outlined in section 3.2.4 the cost of installing water-efficient fittings to target a per capita consumption of 110l/d has been estimated as a one-off cost of £9 for a four-bedroom house. Research undertaken for the devolved Scottish and Welsh governments indicated potential annual savings on water and energy bills for householders of £24-£64 per year as a result of such water efficiency measures[85] . Water efficiency is therefore not only viable but of positive economic benefit to both private homeowners and tenants.

4.9.7 Target 100

The South East of England is under severe water stress and there is clear evidence for the adoption of the tighter water efficiency target of 110l/p/d allowed for under Building Regulations as a minimum for development sites in the Gatwick sub-region. However, the Building Regulations were last updated some time ago, and are designed to apply nationally. They do not take into account the situation in the South East, and the need to adapt to climate change.

Southern Water have committed in their Water Resource Management Plan to a water efficiency policy that aims to achieve a per capita consumption (PCC) of 100 l/p/d by 2040. SW have therefore advised the Councils that a target of 100 l/p/d should be adopted in policy for new build properties, and 80l/p/d for strategic developments where master planning and community level schemes can provide greater saving.

South East Water and SES Water have confirmed that they also support this approach.

The Environment Agency have commented that *"We support the recommendation that LPAs go beyond the 110l/p/d and welcome the higher ambition of Southern Water to reduce consumption to an average of 100 litres per person per day which reflects both the overall water stress in the area and the specific supply-demand challenges in some locations. We also support consideration of water neutrality, a concept that whilst not entirely new, has not been fully explored."*

4.9.8 Water Neutrality Concept

Water neutrality is a relatively new concept for managing water resources, but one that is receiving increased interest as deficits in future water supply/demand are identified. The definition adopted by the Government and the Environment Agency[86] is:

> **"For every development, total water use in the wider area after the** development must be equal to or less than total water use in the wider **area before development".**

It is useful to also refer to the refined definition developed by Ashton:

"For every new significant development, the predicted increase in total water demand in the region due to the development should be offset by reducing demand in the existing community, where practical to do so, and these water savings must be sustained over time" (V Ashton, 2014)[87]

This definition states the need to sustain water saving measures over time, and the wording "predicted increase in total water demand" reflects the need for water neutrality to be designed in at the planning stage.

Both definitions refer to water use in the region or "wider area", and the extent of this area should be appropriate to Local Authority boundaries, Water Resource Zones, or water abstraction boundaries depending on what is appropriate for that particular location. For instance, if a development site is in an area of water stress relating to a

85 Waterwise (2018) Advice on water efficient new homes in England. Accessed online at: https://waterwise.org.uk/wp-content/uploads/2019/10/Advice-on-water-efficient-homes-for-England061118.pdf on: 06/04/2020
86 Water Neutrality: An improved and expanded water resources management definition (SC080033/SR1), Environment Agency, 2009.
87 Water Resources in the Built Environment, edited by Booth and Charlesworth (2014). Published by Wiley.

particular abstraction source, offsetting water use in a neighbouring town that is served by a different water source will not help to achieve water neutrality.

In essence, water neutrality is about accommodating growth in a region without increasing overall water demand.

Water neutrality can be achieved in a number of ways:

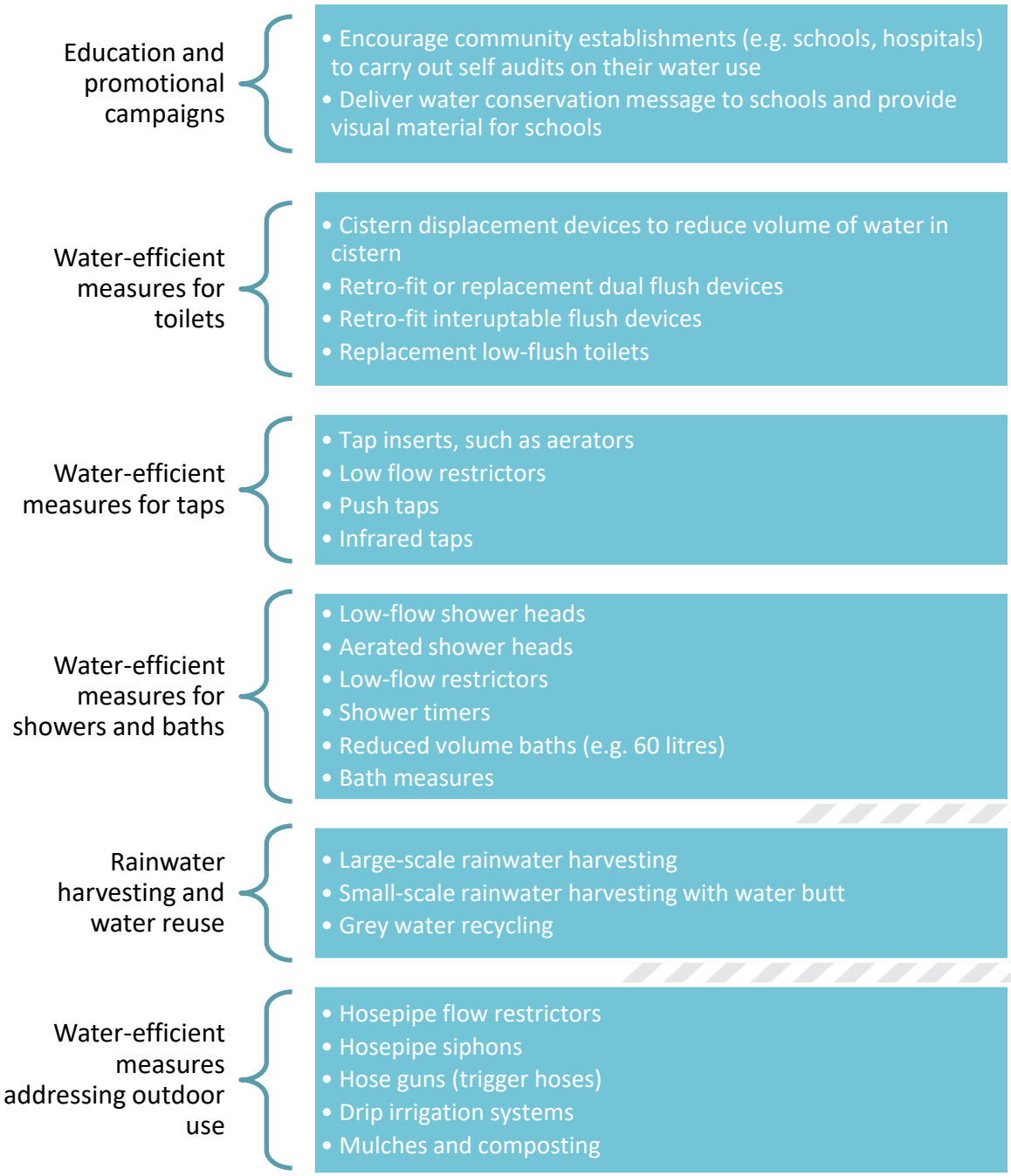
- Reducing leakage from the water supply networks
- Making new developments more water-efficient
- "Offsetting" new demand by retrofitting homes with water-efficient devices
- Encouraging existing commercial premises to use less water
- Implementing metering and tariffs to encourage the wise use of water
- Education and awareness-raising amongst individuals

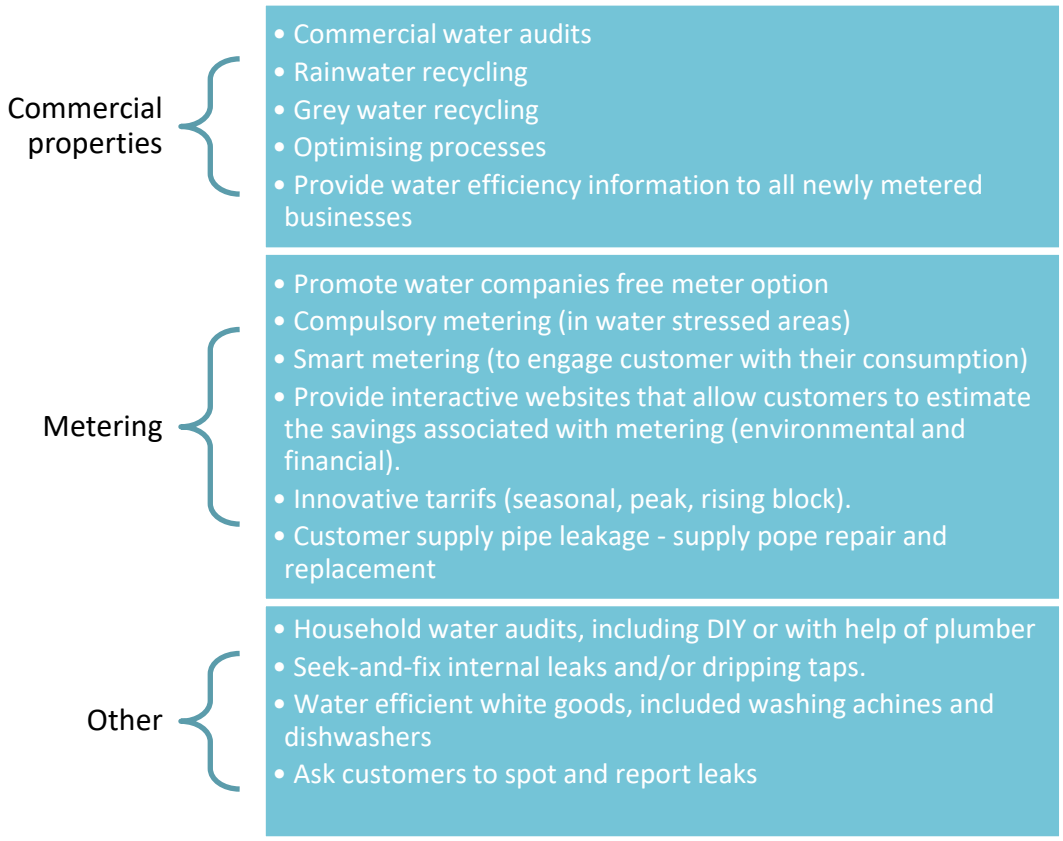
Suggestions for water-efficiency measures are listed in Figure 4.12 below.

Both the Environment Agency and Natural England welcome this concept, and NE advise that *"this is the only way for Sussex North that housing can be delivered – as the existing abstraction cannot conclude no AEOI (Adverse Effect on Integrity) on Arun Valley. NE welcome this concept and encourage the LPAs to embed this in the Local Plan".*

4.9.9 Consumer Water Efficiency Measures

Figure 4.12: Consumer Water-Efficiency Measures





Source: Adapted from Booth and Charleswell (2014)

Many interventions are designed to reduce water use if operated in a particular way, and so rely on the user being aware and engaged with their water use. The educational aspect is therefore important to ensure that homeowners are aware of their role in improving water efficiency.

4.9.10 Rainwater and Greywater Recycling

Rainwater Harvesting

Rainwater recycling or rainwater harvesting (RwH) is the capture of water falling on buildings, roads or pathways that would normally be drained via a surface water sewer, infiltrate into the ground or evaporate. In the UK this water cannot currently be used as a drinking water supply as there are strict guidelines on potable water, but it can be used in other systems within domestic or commercial premises.

Systems for collection of rainwater can be simple water butts attached to a drainpipe on a house, or it could be a complex underground storage system, with pumps to supply water for use in toilet flushing and washing machines. By utilising rainwater in this way there is a reduced dependence on mains water supply for a large proportion of the water use in a domestic property.

Benefits of Rainwater Harvesting

- RwH reduces the dependence on mains water supply – reducing bills for homeowners and businesses
- Less water needs to be abstracted from river, lakes and groundwater
- Stormwater is stored in a RwH system reducing the peak runoff leaving a site providing a flood risk benefit (for smaller storms)
- By reducing surface water flow, RwH can reduce the first flush effect whereby polluted materials adhering to pavement surfaces during dry periods are removed by the first flush of water from a storm and can cause pollution in receiving watercourses.

Challenges of Rainwater Harvesting

- Dependency on rainfall can limit availability of harvested rainwater during drought and hot weather events.
- Increased capital (construction) costs to build rainwater harvesting infrastructure into new housing (£2,674 for a 3/4bed detached home)
- Payback periods are long as the cost of water is low so there is little incentive for homeowners to invest. For further information see: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/353387/021c_Cost_Report_11th_Sept_2014_FINAL.pdf

Greywater Harvesting

Greywater refers to water that has been "used" in the home in appliances such as washing machines, showers and hand basins. Greywater recycling or greywater harvesting (GwH) is the treatment and re-use of this water in other systems such as for toilet flushing. By their nature, GwH systems require more treatment and are more complex than RwH systems, and there are limited examples so far of their use in the UK, although usage is increasing in other countries.

Greywater *re-use* refers to systems where wastewater is taken from source and used without further treatment. An example of this would be water from a bath or shower being used on plants in the garden. This sort of system is easy to install and maintain, however as mentioned above the lack of treatment to remove organic matter means the water cannot be stored for extended periods.

Greywater *recycling* refers to systems where wastewater undergoes some treatment before it is used again. These systems are more complex and require a higher level of maintenance than RwH or greywater re-use systems.

Domestic water demand can be significantly reduced by using GwH, and unlike with a RwH system where the availability of water is dependent on the weather, the source of water is usually constant (for instance if it is from bathing and showering).

The payback period for a GwH system is relatively long, as the initial outlay is large, and the cost of water relatively low. This limits the viability of greywater systems for individual domestic customers as a retro-fit option, and can make it less attractive than RwH in a new build due to the increased maintenance cost.

However, these challenges can be overcome, and large water savings can be realised if GwH schemes are incorporated at a communal level where costs can be shared between multiple households. Whilst GwH systems at a communal scale can be retrofitted, they are most cost effective when incorporated into a new housing scheme at the master-planning stage.

Employment sites offer significant opportunities for both RwH and GwH.

SESW have recommended that new developments coming forward through the Local Plan and those commercial developments specifically associated with Gatwick Airport Limited's growth plans incorporate greywater recycling and/or rainwater harvesting, alongside the incorporation of water efficient fixtures and fittings.

4.9.11 Energy and Water Use

According to EU statistics (Eurostat 2017), 17% of the UK's domestic energy usage is for water heating. If less water was being used within the home, for instance through more water efficient showers, less water would need to be heated, and overall domestic energy usage would be reduced.

The Government is currently consulting on a Future Homes Standard that will involve changes to Part L (conservation of fuel and power) of the Building Regulations for new dwellings. Whilst there is no direct mention of water efficiency in this consultation, there is an important link between water use and energy use, and therefore between water use and carbon footprint.

4.9.12 Funding for Water Neutrality

Water neutrality is unlikely to be achieved by just one type of measure, and likewise it is unlikely to be achieved by just one funding source. Funding mechanisms that may be available could be divided into the following categories:

- Infrastructure-related funding (generally from developer payments)
- Fiscal incentives at a national or local level to influence buying decisions of households and businesses
- Water company activities, either directly funded by the five-year price review or as a consequence of competition and individual company strategies
- Joint funding through energy efficiency schemes (and possibly to integrate with the heat and energy saving strategy).

Currently in the UK, the main funding resource for the delivery of water efficiency measures is the water companies, with some discretionary spending by property owners or landlords. For water neutrality to be achieved, policy shifts may be required in order to increase investment in water efficiency. Possible measures could include:

- Further incentivisation of water companies to reduce leakage and work with customers to reduce demand
- Require water efficient design in new development
- Developer funding to contribute towards encouraging water efficiency measures
- Require water efficient design in refurbishments, when a planning application is made

- Tighter standards on water using fittings and appliances.

4.10 Conclusions

The Gatwick Sub-Region contains three water resource zones, all of which are classified by the Environment Agency as being under serious water stress, justifying as a minimum the more stringent target of 110l/p/d under building regulations. This is supported by the River Basin Management Plans and aligns with the National Water Resources Framework national target.

However, there is a clear requirement within the Gatwick sub-region to go further than the optional target allowed for in Building Regulations.

Southern Water have committed to achieving a water demand of 100l/p/d day across their supply region by 2040 and have advised the Councils to adopt this as policy for new developments in their local plan, and to achieve 80l/p/d in strategic developments.

This approach is also supported by South East Water, SES Water, the Environment Agency and Natural England.

Policies to reduce water demand from new developments, or to go further and achieve water neutrality in certain areas, could be defined to reduce the potential environmental impact of additional water abstractions in the Gatwick Sub-Region, and also help to achieve reductions in carbon emissions

A comparison was carried out between the level of growth anticipated in each water company's water resource management plan, the MHCLG household projections dataset, and the current local plan forecasts. It was found that the WRMPs were broadly in line with MHCLG projections, but current local plan growth in Horsham, Mid Sussex and Reigate and Banstead is higher than is accounted for in the WRMPs. This is the case before factoring in unmet need from Crawley. Supply-led growth in Crawley is broadly in line with the level of growth identified for the two WRZs that cover it, however unmet need for Crawley is accommodated within Horsham and Mid Sussex.

Each local authority's growth forecasts were shared with the water companies and asked to comment on the availability of water resources to serve the expected level of growth.

SEW, SESW and SW responded that they have sufficient water resource to serve the proposed level of growth. Although the predicted level of growth exceeds that accounted for in the WRMPs, part of their analysis includes uncertainty in the forecast and 'headroom' is included in their supply-demand calculations. These calculations are also reviewed on an annual basis and published as part of a WRMP every five years so there is sufficient time to adapt to emerging population trends. However, issues have been highlighted by the Environment Agency and Natural England on the sustainability of abstractions at Hardham and further discussions are required in order to assess the impact on Local Plan allocations within this water resource zone.

4.11 Recommendations

The recommendations for water resources are provided in Table 4.21 below.

Table 4.21: Recommendations for Water Resources in The Gatwick Sub-Region

Action	Responsibility	Timescale
Continue to regularly review forecast and actual household growth across the supply region through WRMP Annual Update reports, and where significant change is predicted, engage with Local Planning Authorities.	SEW, SESW, SW	Ongoing

Action	Responsibility	Timescale
Provide yearly profiles of projected housing growth to water companies to inform the WRMP update.	Councils	Ongoing
Use planning policy to require all new development to achieve a water efficiency of 100l/person/day in the Gatwick sub-region and 80l/p/d in strategic developments.	Councils	In Local Plan Review
The concept of water neutrality has potentially a lot of benefit in terms of resilience to climate change and enabling all waterbodies to be brought up to Good status. Explore further with the water companies and the Environment Agency how the Council's planning and climate change policies can encourage this approach.	Councils, EA, SEW, SESW, SW	In Local Plan Review and Climate Change Action Plan
Strategic residential developments, and commercial developments should consider incorporating greywater recycling and/or rainwater harvesting into development at the master planning stage in order to reduce water demand.	Councils, SW, SESW, SEW	In Local Plan Review
Water companies should advise the Councils of any strategic water resource infrastructure developments within the study area, where these may require safeguarding of land to prevent other type of development occurring.	SEW, SESW, SW	In Local Plan Review
Southern Water should engage with the Councils on any requirement to phase development in the Sussex North Water Resource Zone in order to align development with infrastructure investment in response to sustainability concerns on the Hardham abstraction	SW, Councils, EA, NE	In Local Plan Review

5 Water Supply Infrastructure

5.1 Introduction

An increase in water demand due to growth can exceed the hydraulic capacity of the existing supply infrastructure. This is likely to manifest itself as low pressure at times of high demand. An assessment is required to identify whether the existing infrastructure is adequate or whether upgrades will be required. The time required to plan, obtain funding and construct major pipeline works can be considerable and therefore water companies and planners need to work closely together to ensure that the infrastructure is able to meet growing demand.

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

In addition to the work undertaken by water companies, there are opportunities for the local authority and other stakeholders to relieve pressure on the existing water supply system by increasing water efficiency in existing properties. This can contribute to reducing water consumption targets and help to deliver wider aims of achieving water neutrality.

A cost-effective solution can be for local authorities to co-ordinate with water supply companies and "piggyback" on planned leakage or metering schemes, to survey and retrofit water efficient fittings into homes[88]. This is particularly feasible within property owned or managed by the local authorities, such as social housing.

5.2 Methodology

SES Water, Southern Water and South East Water were provided with a complete list of sites and potential/equivalent housing numbers. Using this information, the water supply companies were asked to comment on the impact of the proposed growth on water supply infrastructure in the Gatwick Sub-Region.

5.3 Results

5.3.1 Southern Water Assessment

Due to the large number of sites, and the timescales of the project, Southern Water provided guidance on how to apply a RAG assessment to the site allocations. This is contained in Table 5.1.

No specific cut-off is defined between green and amber for sites larger than 100 houses, but smaller than 1000 houses. For this reason, a conservative approach has been taken and all of these sites have been scored as amber. This reflects the fact that some network reinforcement may be required. Early consultation with SW is required to ensure that this can be provided in a timely manner.

88 Water Efficiency Retrofitting: A Best Practice Guide, Waterwise (2009). Accessed online at: http://www.waterwise.org.uk/wp-content/uploads/2018/01/Waterwise-2009_Water-efficiency-Retrofitting_Best-practice.pdf on: 30/09/2019

Table 5.1: SW Guidance for Water Supply Assessment

Size of Site	SW Assessment
All sites < 100 houses	"Should largely be Green. If a large number of smaller sites come forward in close proximity to each other in close succession, this may impact on water pressure for existing and new customers. Provided developers contact Southern Water with their proposals early in the process, this issue can be avoided before it arises by giving Southern Water time to reinforce the network ahead of development occupation."
Sites > 100 houses	"Many at the lower end of the scale should still be Green however the higher the number of new homes proposed, the increase in likelihood that there will be an impact on the existing network, in terms of water pressure and/or the need to provide new or improved water supply infrastructure to service new development. These larger numbers would be classified as Amber in the RAG." SW have not "provided a specific cut off point between green and amber since this will vary dependent upon location. As above, developers should contact Southern Water with their proposals early in the process, giving Southern Water time to reinforce the network where required."
Sites > 1000 houses	"Will be passed to our Asset Planners for consideration of infrastructure requirements through the Business Plan."

5.3.2 SES Water Assessment

SES Water did not provide an assessment of allocated sites instead advising "this would be addressed on a case-by-case basis as/if-and-when local plan developments take shape. Specific mains reinforcement work may be undertaken in specific cases and dependent on the type of developments taking place, and the standards they are designed to."

For the purpose of this water cycle study, and to allow a comparison to sites served by SEW and SW, the same RAG assessment criteria used in SW's assessment was applied to sites served by SESW.

5.3.3 South East Water Assessment

SEW reviewed the sites within their supply area and their network modelling team highlighted a number of sites where local reinforcement may be required in order to deliver those sites. For example, if all the sites in Hassocks and in East Grinstead are developed reinforcement will be required. In addition, due to the scale of the combined development at Burgess Hill, SEW will be looking to lay a strategic main to the area.

They also provided the following general comment:

"We plan future water resources at a water resources zone level – this means that all customers within a zone have the same level of water supply service and accompanying risk level. This means that we can accommodate new properties wherever in a zone they are developed – and will plan network improvements as required once the location of planned developments is confirmed."

The sites identified by the SEW modelling team as requiring reinforcement have therefore been given an amber assessment, and all other sites have been given a green assessment.

No sites were given a red assessment.

Table 5.2: SEW RAG Assessment guidelines

RAG Score	SEW Assessment
Green	Capacity available to serve the proposed growth
Amber	Infrastructure and/or treatment work upgrades are required to serve proposed growth, but no significant constraints to the provision of this infrastructure have been identified.
Red	Infrastructure and/or treatment upgrades will be required to serve proposed growth. Major constraints have been identified.

The RAG assessments applied to each site can be found in Appendix A.

5.4 Conclusions

- Allocations across the study were reviewed by SEW, SESW and SW
- All allocations were given green or amber assessment, with amber assessment largely being based on size of development, and the likelihood of requiring network reinforcement.
- SESW did not provide a site by site assessment, so JBA applied the same size criteria described by SW.
- No allocations were identified with major constraints on water supply, so long as there is early engagement between developers, Local Planning Authorities and water companies to enable infrastructure upgrades to be constructed prior to occupation of new developments.

5.5 Recommendations

Table 5.3: Recommendations for water supply infrastructure

Action	Responsibility	Timescale
Undertake network modelling where appropriate to ensure adequate provision of water supply is feasible	SEW, SESW, SW	As part of the planning process
The Councils and Developers should engage early with the water companies to ensure infrastructure is in place prior to occupation.	Councils SEW, SESW, SW Developers	Ongoing

6 Wastewater Collection

6.1 Sewerage Undertakers

Southern Water and Thames Water are the Sewerage Undertakers (SU) for the majority of the study area, with Southern Water serving Horsham, and Mid Sussex., and Thames Water serving Crawley, Gatwick Airport and Reigate and Banstead Borough.

The role of the sewerage undertaker includes the collection and treatment of wastewater from domestic and commercial premises, and in some areas, it also includes the drainage of surface water from building curtilages to combined or surface water sewers. It excludes, unless adopted by the SU, systems that do not connect directly to the wastewater network, e.g. Sustainable Drainage Systems (SuDS) or highway drainage.

Increased wastewater flows into collection systems due to growth in populations or per-capita consumption can lead to an overloading of the infrastructure, increasing the risk of sewer flooding and, where present, increasing the frequency of discharges from Combined Sewer Overflows (CSOs). Within the study area CSOs are present in most of the major towns.

In combined sewerage systems, or foul systems with surface water misconnections through which wastewater incorrectly end up in the surface drainage system rather than sewers, there is potential to create headroom in the system, thus enabling additional growth, by the removal of surface water connections. This can most readily be achieved during the redevelopment of brownfield sites which have combined sewerage systems, where there is potential to discharge surface waters via sustainable drainage systems (SuDS) to groundwater, watercourses or surface water sewers. In some areas of the Gatwick Sub-Region, there are known issues of surface water causing localised flooding. Strategic schemes to provide improved local surface water drainage may be required in such areas, rather than solely relying upon on-site soakaways on brownfield or infill plots.

The Drainage Hierarchy should be used to direct surface water to natural outfall routes such as infiltration to the ground or into watercourses, before utilising sewers, as supported by paragraph 80 of the NPPG. Surface water should also not be permitted to connect to a foul sewer.

6.2 Sewerage System Capacity Assessment

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

It may be the case that an existing sewerage system is already working at its full capacity and further investigations have to be carried out to define which solution is necessary to implement an increase in its capacity. New infrastructure may be required if, for example, a site is not served by an existing system. Such new infrastructure will normally be secured through private third-party agreements between the developer and utility provider.

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

6.3 Methodology

Southern Water and Thames Water were provided with the list of proposed allocations, along with the anticipated capacity and trajectory of each of these sites. Using this information, they were asked to assess each site using the range of datasets they hold. Where appropriate the water companies also provided site specific comments.

A red RAG score given by the water companies reflects the presence of sewer flooding, CSO spills or pollution events in the vicinity of the site, on the assumption that an increase in wastewater flows from development would make those occurrences more likely in the future. It also takes into account the size of the site, with larger sites more likely to exacerbate existing issues in the network.

A red assessment does not reflect a "showstopper" and the water companies have a statutory duty to serve new development under the Water Industry Act 1991 – but they show where the most amount of new infrastructure or network reinforcement will be required.

An amber assessment indicates where further modelling may be required to understand local capacity in the network, and a green assessment indicates that no constraints have been identified.

It should be noted that this assessment does not replace appropriate assessments or modelling as part of developer engagement with the sewerage undertaker, evidence of which should be demonstrated to the LPA as an application progresses through the planning process.

6.4 Data Collection

The following datasets were used to assess the sewerage system capacity:

- Locations of preferred and strategic sites in GIS format (provided by the councils)
- Site tracker spreadsheet (see Appendix A)
- Wastewater catchments (provided by SW and TW)

6.5 Results

6.5.1 Foul Sewer Network Assessment

The complete list of sites with their corresponding RAG assessments can be found in Appendix A.

Southern Water

Southern Water reviewed the sites within the area they serve. A detailed site by site assessment was not completed, but they did provide general comments based on the size of the site, and specific comments where known issues exist. The general comments and assessment applied to sites is summarised in Table 6.1 below.

Table 6.1: SW RAG assessment guidance

Size of site	SW Assessment
All sites < 20 houses	"Sites of 19 units or less are deemed to have negligible impact on the sewer network. No network reinforcement would be required, and the site could connect to the network. However, multiple small sites connecting to the same point in the network may necessitate network reinforcement, and this will be monitored by Southern Water."
Sites > 20 houses <100 houses	"Will be a mix of Green and Amber and would require individual assessment. Where a site's impact on the network is modelled and the results demonstrate a lack of capacity, Southern Water would require around 24 months to plan and implement the requisite network reinforcements. It is therefore important that Southern Water is consulted on planning applications for major development, and developers engage early in the process."
Sites > 100	"Will likely be mostly Amber, however again these would require individual assessment. Reinforcement of the network may take longer than 24 months in some cases and on larger sites, therefore early engagement is encouraged."
Sites > 1000 houses	"Will be passed to our Asset Planners for consideration of infrastructure requirements through the Business Plan."

Southern Water also provided comments specific to large sites outside of existing sewer catchment boundaries:

"Large sites outside existing wastewater catchment boundaries (such as Mayfields and Buck Barn) may require significant planning and investment in new sewer networks (dependent on wastewater treatment options), and should be classified as Red. This is not a 'showstopper' to the development of these sites, but a new sewer network and associated pumping stations should be included as part of the master planning process for these new settlements."

Thames Water

Thames Water reviewed the development sites in their area, and as above, provided comments on the sewer network capacity based on the size of the proposed site and its position in the network. They also provided comments on the sewer capacity at the catchment level, based on the scale and timing of required upgrades. It should be noted that this assessment refers to capacity in the sewer network and not capacity at the receiving WwTW.

Table 6.2: Thames Water Wastewater Network Assessment

Sewer catchment	JBA site reference	TW site specific comments	TW sewer catchment assessment
21020110 - CRAWLEY STW (20)	CRAW15, CRAW16, CRAW24, CRAW27, CRAW29, CRAW30, CRAW32, CRAW34, CRAW36, CRAW37, CRAW38, CRAW40, CRAW41, CRAW44, CRAW46, CRAW47,CRAW48, CRAW49, CRAW50, CRAW51, CRAW52, CRAW54, CRAW56, CRAW57, CRAW58, CRAW59, CRAW60, CRAW63, CRAW64, CRAW65, CRAW66	On the information available to date we do not envisage infrastructure concerns regarding wastewater networks in relation to this development/s.	Scale of growth can be accommodated significant upgrades will be required these may take between 3 and 5 years to design and deliver
21020411 - COPTHORNE SPS (20)	MSUS242	On the information available to date we do not envisage infrastructure concerns regarding wastewater networks in relation to this development/s.	Scale of growth can be accommodated significant upgrades will be required these may take between 3 and 5 years to design and deliver
21020610 - PEASE POTTAGE SPS (20)	MSUS237	On the information available to date we do not envisage infrastructure concerns regarding wastewater networks in relation to this development/s.	Scale of growth can be accommodated significant upgrades will be required these may take between 3 and 5 years to design and deliver
	MSUS240	The scale of development/s is likely to require upgrades to both the wastewater network and sewage treatment infrastructure. It is recommended that the Developer and the Local Planning Authority liaise with Thames Water at the earliest	

Sewer catchment	JBA site reference	TW site specific comments	TW sewer catchment assessment
		opportunity to agree a housing and infrastructure phasing plan. The plan should determine the magnitude of spare capacity currently available within the network and what phasing may be required to ensure development does not outpace delivery of essential network upgrades to accommodate future development/s. Failure to liaise with Thames Water will increase the risk of planning conditions being sought at the application stage to control the phasing of development in order to ensure that any necessary infrastructure upgrades are delivered ahead of the occupation of development.	
21020710 - COUNTY OAK SPS (20)	CRAW33, CRAW43, CRAW45, CRAW56	On the information available to date we do not envisage infrastructure concerns regarding wastewater networks in relation to this development/s.	Scale of growth can be accommodated significant upgrades will be required these may take between 3 and 5 years to design and deliver
21020810 - POOLE LANE SPS (20)	CRAW26, CRAW28, HDC74, HDC85	On the information available to date we do not envisage infrastructure concerns regarding wastewater networks in relation to this development/s.	Scale of growth can be accommodated significant upgrades will be required these may take between 3 and 5 years to design and deliver
21020910 - RUSPER ROAD SPS (20)	HDC75	The scale of development/s is likely to require upgrades to both the wastewater network and sewage treatment infrastructure. It is recommended that the Developer and the Local Planning Authority liaise with Thames Water at the earliest opportunity to agree a housing and infrastructure phasing plan. The plan	Scale of growth can be accommodated significant upgrades will be required these may take between 3 and 5 years to design and deliver

Sewer catchment	JBA site reference	TW site specific comments	TW sewer catchment assessment
		should determine the magnitude of spare capacity currently available within the network and what phasing may be required to ensure development does not outpace delivery of essential network upgrades to accommodate future development/s. Failure to liaise with Thames Water will increase the risk of planning conditions being sought at the application stage to control the phasing of development in order to ensure that any necessary infrastructure upgrades are delivered ahead of the occupation of development.	
21021712 - CRAWLEY DOWN (GRAVITY) (SW) (20)	CRAW31	On the information available to date we do not envisage infrastructure concerns regarding wastewater networks in relation to this development/s.	Scale of growth can be accommodated significant upgrades will be required these may take between 3 and 5 years to design and deliver
21022212 - WITHY PITTS SPS (SW) (20)		On the information available to date we do not envisage infrastructure concerns regarding wastewater networks in relation to this development/s.	Scale of growth can be accommodated significant upgrades will be required these may take between 3 and 5 years to design and deliver
21190110 - EARLSWOOD STW (50)	RBBC155, RBBC156, RBBC157, RBBC162, RBBC163, RBBC164, RBBC234, RBBC235	On the information available to date we do not envisage infrastructure concerns regarding wastewater networks in relation to this development/s.	Scale of growth can be accommodated significant upgrades will be required these may take between 3 and 5 years to design and deliver
21190810 - CASTLE DRIVE SPS (50)	RBBC236, RBBC237, RBBC238, RBBC239	On the information available to date we do not envisage infrastructure concerns regarding wastewater networks in relation to this development/s.	Scale of growth can be accommodated significant upgrades will be required these

Sewer catchment	JBA site reference	TW site specific comments	TW sewer catchment assessment
			may take between 3 and 5 years to design and deliver
21190910 - BANCROFT ROAD SPS (50)	RBBC233	On the information available to date we do not envisage infrastructure concerns regarding wastewater networks in relation to this development/s.	Scale of growth can be accommodated significant upgrades will be required these may take between 3 and 5 years to design and deliver
21191610 - SUBROSA DRIVE SPS (50)	RBBC159	On the information available to date we do not envisage infrastructure concerns regarding wastewater networks in relation to this development/s.	Scale of growth can be accommodated significant upgrades will be required these may take between 3 and 5 years to design and deliver
21740110 - HORLEY TOWN (40)	RBBC303, RBBC304,RBBC305, RBBC306, RBBC308	On the information available to date we do not envisage infrastructure concerns regarding wastewater networks in relation to this development/s.	Scale of growth can be accommodated significant upgrades will be required these may take between 3 and 5 years to design and deliver
	RBBC375	The scale of development/s is likely to require upgrades to both the wastewater network and sewage treatment infrastructure. It is recommended that the Developer and the Local Planning Authority liaise with Thames Water at the earliest opportunity to agree a housing and infrastructure phasing plan. The plan should determine the magnitude of spare capacity currently available within the network and what phasing may be required to ensure development does not outpace delivery of essential network upgrades to accommodate future development/s. Failure to liaise with Thames Water will increase the risk of planning conditions	

Sewer catchment	JBA site reference	TW site specific comments	TW sewer catchment assessment
		being sought at the application stage to control the phasing of development in order to ensure that any necessary infrastructure upgrades are delivered ahead of the occupation of development.	
21740210 - POYNES ROAD SPS (40)	RBBC307	On the information available to date we do not envisage infrastructure concerns regarding wastewater networks in relation to this development/s.	Scale of growth can be accommodated significant upgrades will be required these may take between 3 and 5 years to design and deliver
22120110 – MERSTHAM (10)	RBBC159, RBBC160, RBBC161, RBBC165, RBBC166, RBBC167	On the information available to date we do not envisage infrastructure concerns regarding wastewater networks in relation to this development/s.	Scale of growth can be accommodated upgrades will be required these may take 18 months – 3 years to design and deliver
25020610 - BANSTEAD SOUTH (GRAVITY) (2)	RBBC87	On the information available to date we do not envisage infrastructure concerns regarding wastewater networks in relation to this development/s.	Scale of growth can be accommodated; minor upgrades may be required these may take up to 18 months to design and deliver
25043710 - BANSTEAD (GRAVITY) (100)	RBBC85, RBBC86	On the information available to date we do not envisage infrastructure concerns regarding wastewater networks in relation to this development/s.	Scale of growth can be accommodated; minor upgrades may be required these may take up to 18 months to design and deliver

6.6 Summary

It should be remembered that both Southern Water and Thames Water as Sewerage Undertakers have a duty under Section 94 of the Water Industry Act 1991 to provide sewerage and treat wastewater arising from new domestic development. Except where strategic upgrades are required to serve very large or multiple developments, infrastructure upgrades are usually only implemented following an application for a connection, adoption, or requisition from a developer. Early developer engagement with water companies is therefore essential to ensure that sewerage capacity can be provided without delaying development.

6.7 Conclusions

Development in areas where there is limited wastewater network capacity will increase pressure on the network, increasing the risk of a detrimental impact on existing customers, and increasing the likelihood of CSO operation. Early engagement with developers, Southern Water and Thames Water is required, and further modelling of the network may be required at the planning application stage. Furthermore, for SW and TW, there are areas where the current network is a combined sewer system, and further separation of foul and surface water may be required, as well as suitably design SuDS.

The results in section 6.5.1 show that in order to serve the proposed growth in a number of settlements in the Gatwick Sub-Region, wastewater infrastructure and/or treatment upgrades would be required. Early engagement between developers, the Councils, SW and TW is recommended to allow time for the strategic infrastructure required to serve these developments to be planned.

6.8 Recommendations

Table 6.3: Recommendations from Wastewater Network Assessment

Action	Responsibility	Timescale
Early engagement between the councils, SW and TW is required to ensure that where strategic infrastructure is required, it can be planned in by SW/TW.	Councils SW TW	Ongoing
Take into account wastewater infrastructure constraints in phasing development in partnership with the sewerage undertaker	Councils SW TW	Ongoing
Developers will be expected to work with the sewerage undertaker closely and early in the planning promotion process to develop an outline Drainage Strategy for sites. The Outline Drainage strategy should set out the following: What – What is required to serve the site? Where – Where are the assets / upgrades to be located? When – When are the assets to be delivered (phasing)? Which – Which delivery route is the developer going to use s104 s98 s106 etc. The Outline Drainage Strategy should be submitted as part of the planning application submission, and where required, used as a basis for a drainage planning condition to be set.	SW, TW and Developers	Ongoing
Developers will be expected to demonstrate to the Lead Local Flood Authority (LLFA) that surface water from a site will be disposed using a sustainable drainage system (SuDS) with connection to surface water sewers seen as the last option. New connections for surface water to foul sewers will be resisted by the LLFA.	Developers LLFA	Ongoing

7 Wastewater Treatment

7.1 Wastewater Treatment Works in the Gatwick Sub-Region

Headroom at Wastewater Treatment Works (WwTW) can be eroded by growth in population or per-capita consumption, requiring investment in additional treatment capacity. As the volumes of treated effluent rises, even if the effluent quality is maintained, the pollutant load discharged to the receiving watercourse will increase. In such circumstances the Environment Agency as the environmental regulator, may tighten consented effluent consents to achieve a "load standstill", i.e. ensuring that as effluent volume increases, the pollutant discharged does not increase. Again, this would require investment by the water company to improve the quality of the treated effluent.

Southern Water and Thames Water operate all the WwTWs serving growth within the Gatwick Sub-Region. The location of these WwTWs is shown in Figure 7.1 below.

Each development site identified by the councils, alongside windfall and neighbouring authority growth was assigned to a WwTW using the sewerage drainage area boundaries provided by SW and TW. Where a development site was not within a boundary, the nearest sewer catchment was chosen.

Actual connection of a development site to a particular WwTW may be different and will depend on the capacity of the receiving works, and the local sewer network.

Very small developments in rural areas may be suitable for on-site treatment and discharge, however the Environment Agency will not usually permit this where there is a public sewerage system within a distance calculated as 30m per dwelling.

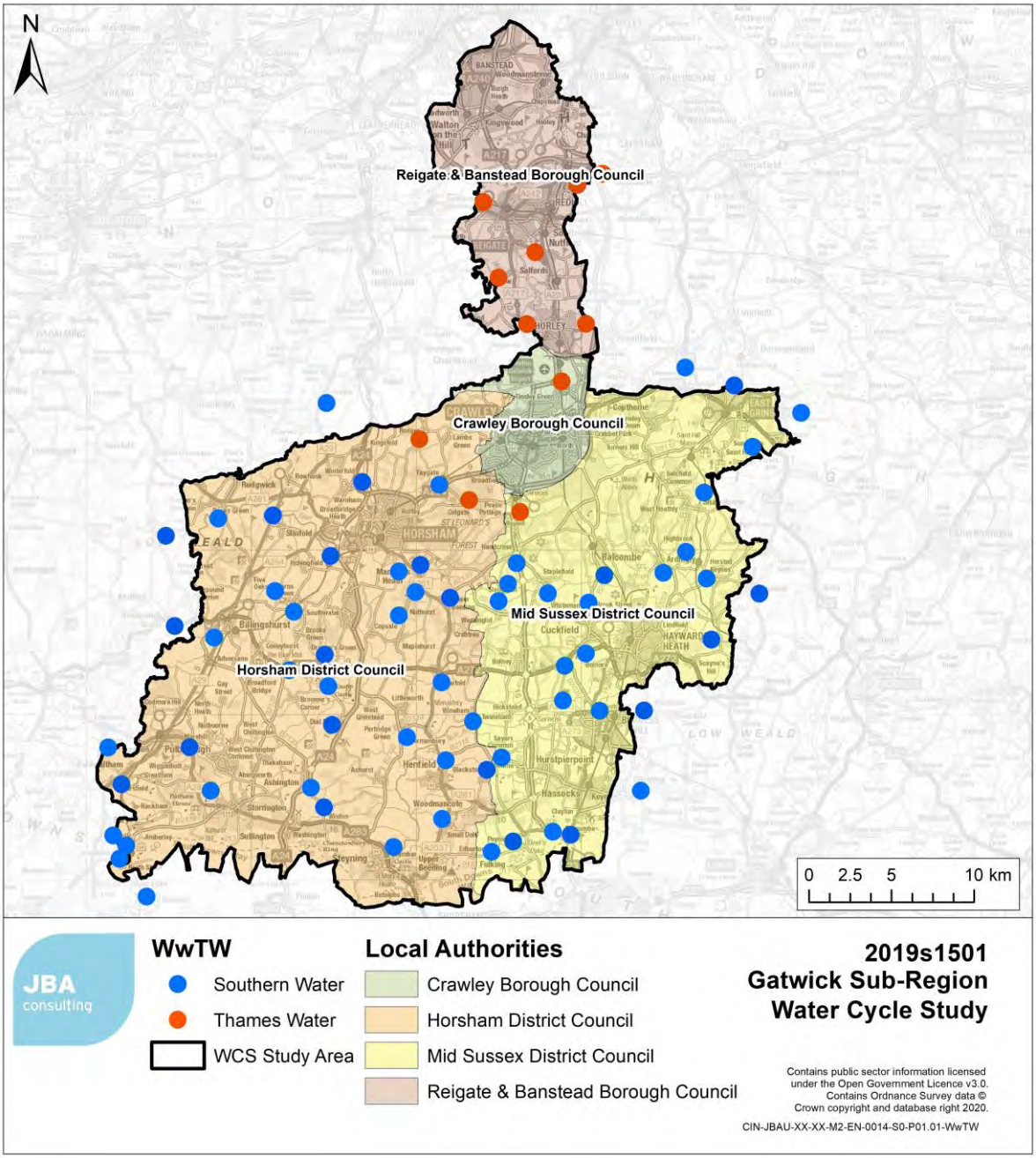


Figure 7.1 Location of WwTW serving growth in the study area

7.2 Wastewater Treatment Works Flow Permit Assessment

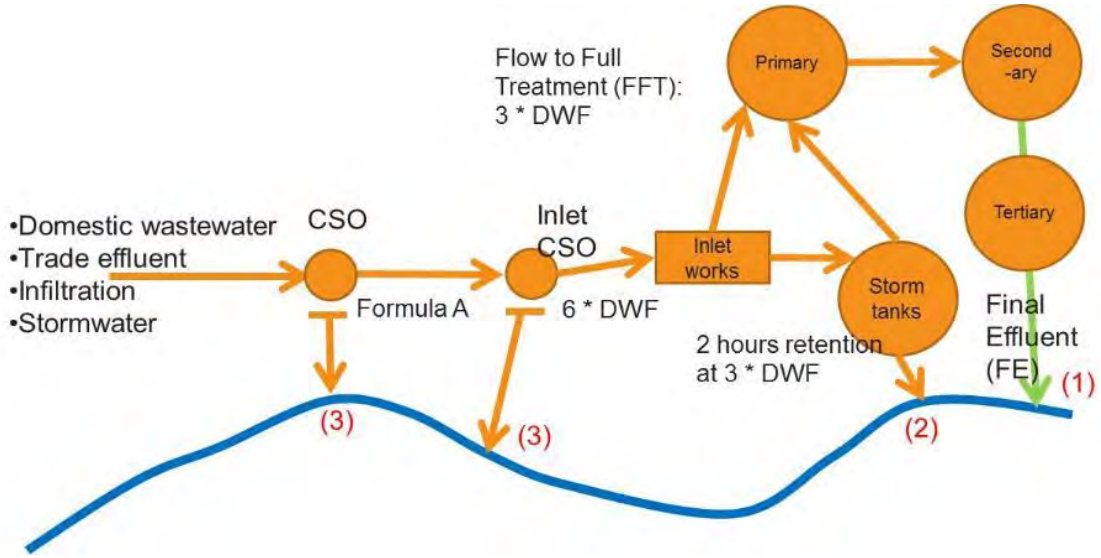
7.2.1 Introduction

The Environment Agency is responsible for regulating sewage discharge releases via a system of Environmental Permits (EPs). Monitoring for compliance with these permits is the responsibility of both the EA and the plant operators. Figure 7.2 summarises the different types of wastewater releases that might take place, although precise details vary from works to works depending on the design.

During dry weather, the final effluent from the Wastewater Treatment Works (WwTW) should be the only discharge (1). With rainfall, the storm tanks fill and eventually start discharging to the watercourse (2) and Combined Sewer Overflows (CSOs) upstream of the storm tanks start to operate (3). The discharge of storm sewage from treatment works is allowed only under conditions of heavy rain or snow melt, and therefore the

flow capacity of treatment systems is required to be sufficient to treat all flows arising in dry weather and the increased flow from smaller rainfall events. After rainfall, storm tanks should be emptied back to full treatment, freeing their capacity for the next rainfall event.

Figure 7.2: Overview of typical combined sewerage system and WwTW discharges



Environmental permits are used alongside water quality limits as a means of controlling the pollutant load discharged from a WwTW to a receiving watercourse. Sewage flow rates must be monitored for all WwTWs where the permitted discharge rate is greater than 50 m^3/day in dry weather.

Permitted discharges are based on a statistic known as the Dry Weather Flow (DWF). As well as being used in the setting and enforcement of effluent discharge permits, the DWF is used for WwTW design, as a means of estimating the 'base flow' in sewerage modelling and for determining the flow at which discharges to storm tanks will be permitted by the permit (Flow to Full Treatment, FFT).

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

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

7.3 Methodology

Southern Water and Thames Water were provided with the proposed sites and the potential housing numbers and employment space for each site (see Appendix A). SW and TW were then invited to provide an assessment of the receiving WwTW and provide any additional comments about the impacts of development.

The assessment consists of two factors, the hydraulic capacity of the WwTW (consented flow vs current flow) and the capacity of the WwTW to treat a given load. The assessment may also reflect upgrades already planned at WwTW.

A parallel assessment of WwTW capacity was carried out by JBA using measured flow data supplied by the water companies. The process was as follows:

- SW and TW provided their Dry Weather Flow (DWF) statistics, and from this the 20th percentile (80% exceedance flow) for 2016-2019 was calculated. The flow data was cleaned to remove zero values and low outlier values which would bring the measured DWF down.
- Growth was assigned to a WwTW using the sewerage drainage area boundaries as described above.
- For each site, the future DWF was calculated using the occupancy rates and per-capita consumption values obtained from the Water Resource Management Plans (Table 7.1), and the assumption that 95% of water used is returned to sewer. Permitted headroom was used as a substitute for actual designed hydraulic capacity for each WwTW being assessed.
- For the purposes of this assessment, every site identified in a wastewater catchment was assumed to be developed, Gatwick Airport scenario 2 was adopted (standby runway utilised), and the Crawley Area Action Plan resulted in a large additional demand from employment growth. This represents a worst case scenario for wastewater treatment demand – particularly at Crawley WwTW.

Table 7.1: Per Capita Consumption Values Used in Water Demand Calculations

Water Company	Water Resource Zone	Occupancy rate (persons per dwelling)	Per capita consumption (m3/person/day)
South East Water	Haywards Heath	2.5	0.152
Southern Water	Sussex North	2.5	0.134
SES Water	Sutton and East Surrey	2.4	0.145
Thames Water	London	2.3	0.119

7.4 Results

7.4.1 Southern Water

Southern Water reviewed the sites within the area they serve. A detailed site by site assessment was not completed, but they did provide general comments based on the size of the site. These are summarised in Table 7.2.

Table 7.2: SW RAG assessment guidance for wastewater treatment

Size of Site	SW Assessment
All sites < 100 houses	"Should largely be Green, unless the development is > 5% of the total number of households currently served by the WwTW (which is likely to apply only to the smallest WwTWs in the region). In these cases (where Southern Water has been notified of proposals, either through consultation on a planning application or a developer enquiry) a wastewater treatment capacity assessment is triggered. This will determine whether capacity exists, and if it does not, when it is anticipated that this will be provided.
Sites > 100 houses	"Many at the lower end of the scale should still be Green however the higher the number of new homes proposed, the increase in likelihood that there will be an impact on wastewater treatment capacity. As above, where development is > 5% of the total number of households currently served by the WwTW, provided Southern Water has been notified of proposals, a wastewater treatment capacity assessment will be triggered. This will determine whether capacity exists, and if it does not, when it is anticipated that this will be provided" "Larger sites would be classified as Amber in the RAG." SW "haven't provided a specific cut off point between green and amber since this will vary dependent upon location and the relative impact on the WwTW – the smaller the wastewater catchment and the larger the proposed development, the more likely a site is to be Amber status."
Sites > 1000 houses	"Will be passed to our Asset Planners for consideration of infrastructure requirements through the Business Plan, and would be classified as amber"

SW also provided additional comments:

"It should be noted that planning for investment in additional wastewater treatment capacity is carried out through the water industry's 5 yearly investment planning process (the Business Plan). Details of the Business Plan for 2020-2025 can be found online; https://www.southernwater.co.uk/our-story/our-plans-2020-25/our-business-plan-2020-25 Predictions of future growth within wastewater catchments are made on the basis of population forecasts (commissioned every 5 years to inform the business plan), and ongoing monitoring of local authority published data such as 5 Year Housing Land Supply, Authority Monitoring Reports and adopted Local and Neighbourhood Plans. This enables Southern Water to assess when additional capacity will be required at its WTWs and ensure the necessary funding is secured for it through the next Business Plan."

7.4.2 Thames Water

TW provided a RAG score on six of their WwTW (Table 7.3). Rusper WwTW is included in the headroom assessment in 7.4.3, and was expected to serve an additional 20 houses during the plan period. However, TW have advised that this WwTW will be closed and wastewater pumped to Crawley WwTW. This was deemed to be a more cost-effective solution than upgrading Rusper WwTW.

Both Crawley and Horley WwTW were given a "red" assessment, reflecting the scale of upgrades needed.

Table 7.3 Thames Water assessment of WwTW capacity

WwTW	TW Assessment
Beddington Hogsmill	Scale of growth can be accommodated; minor upgrades may be required these may take up to 18 months to design and deliver
Reigate (Earlswood) Merstham	Scale of growth can be accommodated; upgrades will be required these may take 18 months – 3 years to design and deliver
Crawley Horley	Scale of growth can be accommodated, but significant upgrades will be required, and these may take between 3 and 5 years to design and deliver. If the scale of growth triggers a consent change then time to upgrade could be significantly different especially if the consent goes beyond best available technology

7.4.3 JBA flow capacity assessment

Figure 7.3 shows the results of JBA's flow capacity assessment applied to each WwTW catchment and represents the capacity of that catchment to receive the planned growth. Planned growth within a catchment shown as green can be accommodated within the current flow permit. Catchments shown as amber are already exceeding or predicted to exceed their permit within the plan period. In these cases, an increase in the permit limit may be required in order accommodate growth. This may require an upgrade to the WwTW to increase hydraulic capacity. This may be accompanied by a tightening of the environmental permit in and/or improvement in treatment processes in order to maintain the current effluent quality (load standstill). No constraints to providing upgrades or land requiring safeguarding were identified by the water companies.

Many of the Wastewater Treatment Works within rural areas are small, serving populations (or population equivalents) of less than 250 people. In these cases, a descriptive permit may be in place that requires discharges from these sites to be of "good visual quality". Where population is likely to increase above 250 in a catchment with a descriptive permit, this is reviewed and a programme of monitoring and sampling initiated, before a numeric permit may be issued. A number of the WwTW expected to serve growth within the study area have descriptive permits which may need to be reviewed.

Table 7.4 summarises the assessments provided by the water companies alongside the JBA assessments. The housing growth during the plan period quoted in the table is all the additional houses that could be served by that WwTW during the plan period including allocations, commitments, completions and windfall.

Where a WwTW was given an amber or red assessment, the graph showing predicted flow vs the current permit is shown in Appendix B.

Henfield WwTW is the nearest treatment works to a large number of proposed developments and has a large number of houses therefore allocated to it in Table 7.4. As this is a relatively small WwTW it is unlikely that this amount of growth would be served by this works alone. Southern Water and the EA are already having discussions about how growth here will be served, including providing a new WwTW. It should be noted that phasing of development in this area needs to be carefully aligned with provision of either capacity upgrades, transfer schemes or the construction of a new WwTW.

SW advised that "*large sites outside existing wastewater catchment boundaries (such as Mayfields and Buck Barn) would require significant planning and investment in wastewater treatment options. This is not a 'showstopper' to these sites, but wastewater treatment should be included as part of the master planning process for these new settlements.*"

The assessment shows that permitted flow at Crawley WwTW is likely to be exceeded if all sites, including all employment sites promoted within the Area Action Plan area, were to come forward, in conjunction with growth at Gatwick Airport that is being pursued separately by GAL through the DCO process. In reality, the level of employment growth will be guided by the Economic Growth Assessment and the scope to identify an appropriate site or sites for strategic employment growth. As such, the level of employment growth considered in this Water Cycle Study represents a 'worst case' and additional work will be required to understand in more detail the impact of accommodating Crawley's employment growth needs. TW are aware of the Gatwick DCO work and were discussing how growth at Gatwick Airport could be accommodated, with pumping to Horley being an option. At the time of writing these discussions were on hold due to the impact of COVID-19 and the uncertainty that has caused for economic growth, particularly in the aviation sector. Both Crawley and Horley WwTWs were given a "red" score by Thames Water reflecting the scale of upgrades required. Early and continued engagement with Thames Water is required to ensure that phasing of development is in line with upgrades in these catchments.

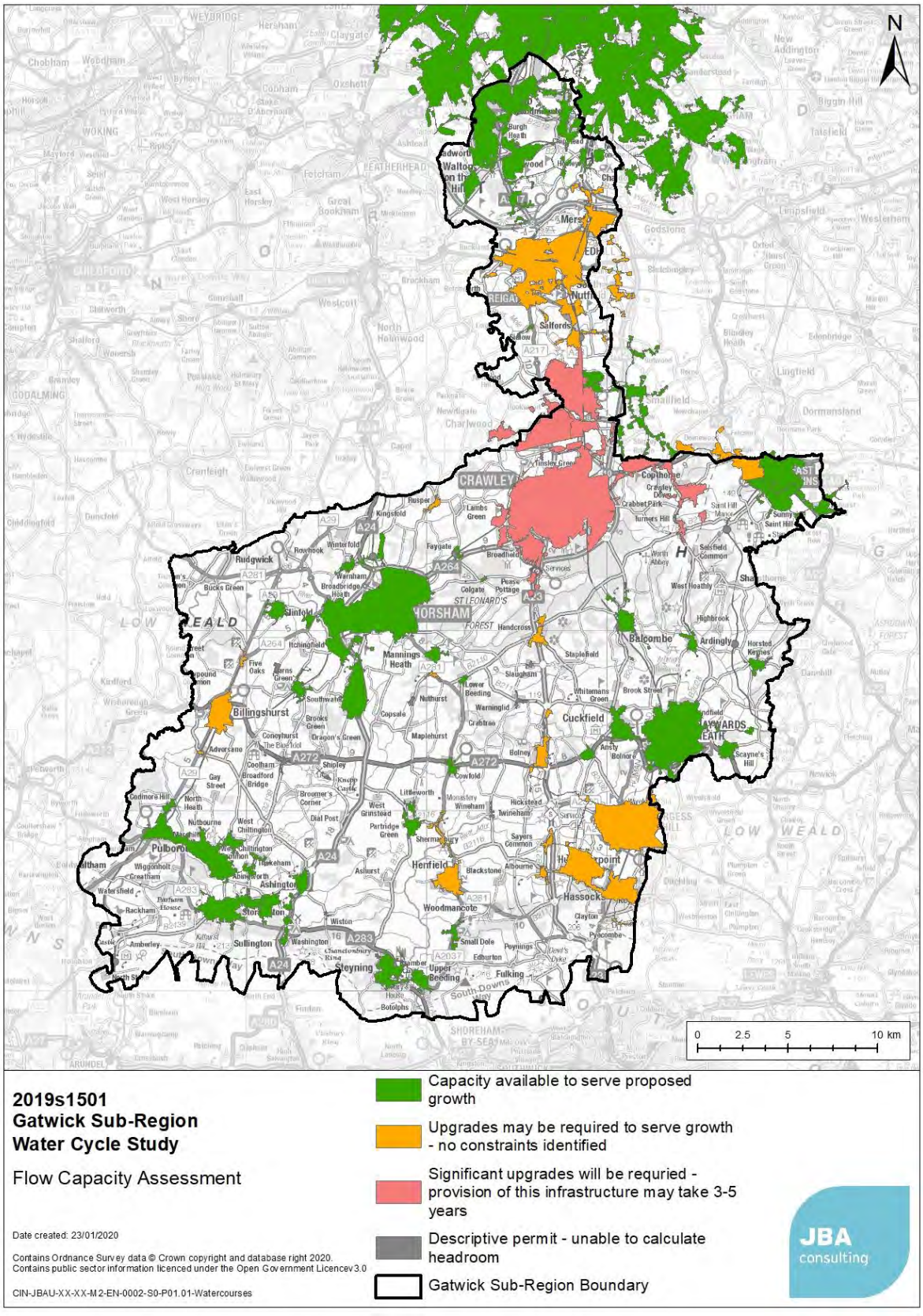


Figure 7.3 JBA flow capacity assessment

Table 7.4: Summary of WwTW Flow Assessment

WwTW	Housing growth over plan period (dwellings)	Indicative number of employees	Does DWF flow exceed permitted flow before 2045? (JBA assessment)	Comments
Ansty	35		No	
Ardingly	114		No	
Ashington	636		No	
Balcombe	51		No	
Barns Green	57		No	
Beddington	38,706	329	No	TW – "Scale of growth can be accommodated; minor upgrades may be required, and these may take up to 18 months to design and deliver"
Billingshurst	7,930	338	Yes, between now and 2020	
Burgess Hill (Goddards Green)	7,391	5,723	Yes – date uncertain	SW have commented that Goddards Green has sufficient headroom till 2025. The JBA assessment showed the WwTW already exceeding its permit. SW advised that this is due to a flow measurement error (caused by a downstream blockage) that has been identified and rectified. Tightening of the phosphorus consent in AMP7 diminishes head room for future growth.
Burstow	391	14	No	
Colgate	3		No	
Coolham	1		Descriptive permit	
Cowfold	115		No	
Crawley	22,717	44,536	Yes – between 2025 and 2030	JBA assessment shows the flow permit would be exceeded due to growth if no action was taken. TW gave this a "red" assessment due to the scale of infrastructure upgrades required. This represents a 'worst case' impact on Crawley WwTW, and further work will be required once the identified level of employment growth has been refined. It should be noted that Crawley WwTW serves growth in neighbouring authority areas.

WwTW	Housing growth over plan period (dwellings)	Indicative number of employees	Does DWF flow exceed permitted flow before 2045? (JBA assessment)	Comments
Cuckfield	80		No	
Eden Vale	703		No	
Faygate	86		No	
Felbridge	994	896	Yes, between 2030 and 2035	
Handcross	189		Yes, between 2020 and 2025	
Henfield	7,657		Yes, between 2020 and 2025	This WwTW is unlikely to receive this level of growth. SW are currently discussing the EA options to serve growth in this area including a new WwTW. SW have stated that Henfield has a capacity for 1000 dwellings.
Hogsmill	44,306	46	No	TW – "Scale of growth can be accommodated; minor upgrades may be required, and these may take up to 18 months to design and deliver"
Horley	2,309	12,251	No	TW – "Scale of growth can be accommodated; significant upgrades will be required, and these may take between 3 and 5 years to design and deliver. If the scale of growth triggers a consent change then time to upgrade could be significantly different especially if the consent goes beyond best available technology." JBA assessment showed capacity during the plan period.
Horsham	16,752	664	No	
Horsted Keynes	60		No	
Ironsbottom (Sidlow)	1		No	
Itchingfield	4		Descriptive permit	
Lower Beeding	36		No	
Luxfords Lane	663		No	

WwTW	Housing growth over plan period (dwellings)	Indicative number of employees	Does DWF flow exceed permitted flow before 2045? (JBA assessment)	Comments
Mannings Heath	34		No	
Merstham	512	21	No	TW - Scale of growth can be accommodated, upgrades will be required, these may take 18months to 3 years to design and deliver. JBA assessment showed capacity for the plan period.
Monks Gate	14		Permitted flow already exceeds DWF	
Nuthurst	19		Descriptive permit	
Partridge Green	208		No	
Pulborough	781		No	
Reigate	3,019	181	No – suspect flow data	TW - Scale of growth can be accommodated, upgrades will be required, these may take 18months to 3 years to design and deliver. JBA assessment showed capacity within the plan period, however data marked as "suspect" by TW was removed. With the suspect data included the flow permit would be exceeded during the plan period.
Rusper	20		Yes, between now and 2020	TW have advised this WwTW will be closed and flows diverted to Crawley
Scaynes Hill	2,345		No	
Shipley	32		Descriptive permit	
Slaugham	32		Descriptive permit	
Slinfold	141		No	
Small Dole	26		No	
Steyning	147		No	
Storrington	445		No	

WwTW	Housing growth over plan period (dwellings)	Indicative number of employees	Does DWF flow exceed permitted flow before 2045? (JBA assessment)	Comments
Warnham	83		No	
Warninglid	1		Descriptive permit	
Wineham	2		Descriptive permit	
Wiston	2		No	

7.4.4 Conclusions

All development sites included within the growth scenario were assigned the most likely WwTW that would serve them. Where infrastructure is shared across the boundary, neighbouring authority growth was also included. Additional effluent from these sites added to the current DWF from at each WwTW provided by the water companies. A comparison was then made against the permitted flow from the EA's database of consented discharges to controlled waters.

Nine WwTWs in the Gatwick Sub-Region are predicted to, or already exceeding their flow permit during the plan period:

- Billingshurst
- Crawley
- Felbridge
- Goddards Green
- Handcross
- Henfield
- Monks Gate
- Reigate (Earlswood) (uncertainty on suspect flow data)
- Rusper

At these WwTWs upgrades may be required in order to accommodate planned growth. Phasing of these development sites needs to be carefully considered and early engagement with SW and TW is required to ensure that additional capacity is provided prior to occupation.

It should be noted that the forecast for Crawley WwTW assumes that all development sites identified within its catchment come forward during the plan period and so represents a 'worst case' for growth. Further work will be required once the identified level of employment growth has been refined.

The Mayfield development, which consists of 7,000 houses, is closest to Henfield WwTW. This WwTW does not have capacity to serve this level of growth and SW are currently discussion with the EA how this development could be served including an option for a new WwTW. It is important that phasing of this significant development is aligned with delivery of a solution, and early engagement between Horsham Council, Southern Water, the Environment Agency and developers is required.

If no action is taken, Crawley WwTW would exceed its flow permit during the plan period. Options exist to pump this flow to Horley, but both of these WwTWs are scored as "red" by Thames Water indicating the scale of upgrades required. Schemes to address capacity concerns at these works may take a considerable time to deliver (3 to 5 years), it is therefore important that phasing of development within these wastewater catchments is aligned with the delivery of additional capacity, and early and continues discussion with Thames Water is required.

7.5 Recommendations

Table 7.5: Recommendations for Wastewater Treatment

Action	Responsibility	Timescale
Consider the available WwTW capacity when phasing development going to the same WwTW.	Councils SW, TW, EA	Ongoing
Provide Annual Monitoring Reports to SW and TW detailing projected housing growth.	Councils	Ongoing

TW to agree a solution for growth in the Crawley catchment as greater certainty in projected growth emerges.	TW	Ongoing
Further work will be required to assess treatment capacity once the identified level of employment growth has been refined	CBC	Local plan process
SW to agree a solution for serving the Mayfield development	SW, EA	Local plan process
SW and TW to assess growth demands as part of their wastewater asset planning activities and feedback to the Council if concerns arise.	SW, TW Councils	Ongoing

8 Odour Assessment

8.1 Introduction

Where new developments are in close proximity to an existing Wastewater Treatment Works (WwTW), odour from that site may become a cause for nuisance and complaints from residents. Managing odour at WwTWs can add considerable capital and operational costs, particularly when retro fitted to existing WwTWs. National Planning Policy Guidance recommends that plan-makers consider whether new development is appropriate near to sites used (or proposed) for water and wastewater infrastructure, due to the risk of odour nuisance.

8.2 Methodology

Sewerage Undertakers suggest that an odour assessment may be required if the site of a proposed development is close to a WwTW or is encroaching closer to the WwTW than existing urban areas. If there are no existing developments close to a WwTW, it is more likely that an odour assessment is required to identify any potential issues. The actual odour experienced is dependent on the size of the works, the type of treatment processes present, and the age and condition of the site. There is also significant variation due to current weather conditions. At Gatwick Airport, within the study area, the prevailing wind is from the west south west (WSW).For each Thames Water and Southern Water WwTW in the Gatwick Sub-Region, the land within an 800m radius of the asset has been identified and any sites that fall within this area have been highlighted.

A red/amber/green assessment was applied by JBA:

Site is unlikely to be impacted by odour from WwTW	Site location is such that an odour impact assessment is recommended	Site is in an area with confirmed WwTW odour issues

8.3 Data Collection

The datasets used to assess the impact of odour from a WwTW were:

- Site location in GIS format (provided by the Gatwick Sub-Region local authorities)
- WwTW locations (from "Consented discharges to controlled waters with conditions" database)

8.4 Results

Table 8.1 identifies the ten sites within the Gatwick Sub-Region which fall within 800m of either a Thames Water or Southern Water WwTW. The 800m buffer does not take into account the size of the works, the treatment processes present or the condition of the WwTW which can all affect the magnitude of the odour. Where there is already urban area closer to the treatment works than the proposed site, the nature of odour on the new site is likely to be known and reported so these sites represent are lower risk. Four sites are closer to the WwTW than existing urban area.

Sites that are given an amber assessment will not necessarily experience nuisance odour but should undergo an odour assessment as part of the planning process.

Table 8.1: Sites within 800m of WwTWs in the Gatwick Sub-Region

WCS Site Ref.	Site Address	WwTW	Water Company	Distance (m)	WwTW Location in Relation to Site	Closer than existing urban area?
Reigate and Banstead						
RBBC161	Former Oakley Centre, Merstham	Warwick Wold WwTW (East of RBBC area)	Thames Water	765	East	No
Crawley						
N/A	Crawley Area Action Plan	Crawley WwTW	Thames Water	N/A	N/A	Likely on some sites
Horsham						
SA296	Land North of Horsham	Warnham WwTW	Southern Water	711	West	No
SA744	Land North of Newbridge Road	Billingshurst WwTW	Southern Water	682	South	No
SA414	Mayfield Proposal	Wineham WwTW	Southern Water	0	North	Yes
		Henfield WwTW	Southern Water	622	South West	No
		Blackstone WwTW	Southern Water	562	South East	Yes
Mid Sussex						
MSUS237	Pease Pottage Nurseries, Brighton Road, Pease Pottage	Pease Pottage WwTW	Southern Water	50	West	Yes
MSUS240	Cedars, Brighton Road Pease Pottage	Pease Pottage WwTW	Southern Water	213	North West	Yes
MSUS16	Land at St. Martin Close, Handcross	Park Road Handcross WwTW	Southern Water	492	West	No
MSUS22	Ansty Cross Garage, Cuckfield Road, Ansty	Ansty WwTW	Southern Water	305	North East	No
N/A	Science and Technology Park	Goddards Green WwTW	Southern Water	40	West	No

8.5 Conclusions

Ten sites across the Gatwick Sub-Region have been identified as being at risk of nuisance odour and given a RAG rating of amber due to their proximities to Thames Water and Southern Water WwTWs. Four of these sites are closer to the WwTW than existing urban area. An odour assessment is recommended as part of the planning process for the sites identified, funded by developers. The remaining sites have been given a rating of green.

8.6 Recommendations

Table 8.2: Recommendations from the Odour Assessment

Action	Responsibility	Timescale
Consider odour risk in the sites identified to be potentially at risk from nuisance odour	Councils	Ongoing
Carry out an odour assessment for sites identified as amber as part of the planning process and paid for by the developer.	Site Developers	Ongoing

9 Water Quality

9.1 Introduction

An increase in the discharge of effluent from Wastewater Treatment Works (WwTW) as a result of development and growth in the area in which they serve can lead to a negative impact on the quality of the receiving watercourse. Under the Water Framework Directive (WFD), a watercourse is not allowed to deteriorate from its current WFD classification (either as an overall watercourse or for individual elements assessed).

It is Environment Agency (EA) policy to model the impact of increasing effluent volumes on the receiving watercourses. Where the scale of development is such that a deterioration is predicted, a variation to the Environmental Permit (EP) may be required for the WwTW to improve the quality of the final effluent, so that the increased pollution load will not result in a deterioration in the water quality of the watercourse. This is known as "no deterioration" or "load standstill". The need to meet river quality targets is also taken into consideration when setting or varying a permit.

The Environment Agency operational instructions on water quality planning and no-deterioration are currently being reviewed. Previous operational instructions[89] (now withdrawn) set out a hierarchy for how the no-deterioration requirements of the WFD should be implemented on inland waters. The potential impact of development should be assessed in relation to the following objectives:

- Could the development cause a greater than 10% deterioration in water quality? This objective ensures that all the environmental capacity is not taken up by one stage of development and there is sufficient capacity for future growth.
- Could the development cause a deterioration in WFD class of any element assessed? This is a requirement of the Water Framework Directive to prevent a deterioration in class of individual contaminants. The "Weser Ruling"[90] by the European Court of Justice in 2015 specified that individual projects should not be permitted where they may cause a deterioration of the status of a water body. If a water body is already at the lowest status ("bad"), any impairment of a quality element was considered to be a deterioration. Emerging practice is that a 3% limit of deterioration is applied.
- Could the development alone prevent the receiving watercourse from reaching Good Ecological Status (GES) or Potential? Is GES possible with current technology or is GES technically possible after development with any potential WwTW upgrades.

The overall WFD classification of a water body is based on a wide range of ecological and chemical classifications. This assessment focuses on three physico-chemical quality elements; Biochemical Oxygen Demand (BOD), Ammonia, and Phosphate.

BOD – Biochemical Oxygen Demand

BOD is a measure of how much organic material – sewage, sewage effluent or industrial effluent – is present in a river. It is defined as the amount of oxygen taken up by micro-organisms (principally bacteria) in decomposing the organic material in a water sample stored in darkness for 5 days at 20°C. Water with a high BOD has a low level of dissolved oxygen. A low oxygen content can have an adverse impact on aquatic life.

Ammonia

Nitrogen is an essential nutrient required by all plants and animals for the formation of amino acids. In its molecular form nitrogen cannot be used by most aquatic plants, and so it is converted into other forms. One such form is ammonia (NH_3). This may then be

89 Water Quality Planning: no deterioration and the Water Framework Directive, Environment Agency (2012). Accessed online at: http://www.fwr.org/WQreg/Appendices/No_deterioration_and_the_WFD_50_12.pdf on: 28/09/2019

90 PRESS RELEASE No 74/15, European Court of Justice (2015). Accessed online at: https://curia.europa.eu/jcms/upload/docs/application/pdf/2015-07/cp150074en.pdf on: 28/09/2019

oxidized by bacteria into nitrate (NO3) or nitrite (NO2). Ammonia may be present in water in either the unionized form NH3 or the ionized form NH_4. Taken together these forms care called Total Ammonia Nitrogen.

Although ammonia is a nutrient, in high concentrations it can be toxic to aquatic life, in particular fish, affecting hatching and growth rates.

The main sources in rivers include agricultural sources, (fertilizer and livestock waste), residential sources (ammonia containing cleaning products and septic tank leakages), industrial processes and Water Recycling Centres.

Phosphate

Phosphorus is a plant nutrient and elevated concentrations in rivers can lead to accelerated plant growth of algae and other plants. Its impact on the composition and abundance of plant species can have adverse implications for other aspects of water quality, such as oxygen levels. These changes can cause undesirable disturbances to other aquatic life such as invertebrates and fish.

Phosphorus (P) occurs in rivers mainly as Phosphate (PO_4), which are divided into Orthophosphates (reactive phosphates), and organic Phosphates.

Orthophosphates are the main constituent in fertilizers used in agriculture and domestic gardens and provide a good estimation of the amount of phosphorus available for algae and plant growth and is the form of phosphorus that is most readily utilized by plants.

Organic phosphates are formed primarily by biological processes and enter sewage via human waste and food residues. Organic phosphates can be formed from orthophosphates in biological treatment processes or by receiving water biota.

Although it is phosphorus in the form of phosphates that is measured as a pollutant, the term phosphorus is often used in water quality work to represent the total phosphorus containing pollutants.

9.2 Methodology

9.2.1 General approach

SIMCAT is used by the Environment Agency to model potential deterioration of waterbodies and to support decision making to guide development to locations where environmental deterioration will be reduced. SIMCAT is a 1D stochastic, steady state, deterministic model which represents inputs from point-score effluent discharges and the behaviour of solutes in the river (Cox, 2003).

SIMCAT can simulate inputs of discharge and water quality data and statistically distribute them from multiple effluent sources along the river reach. It uses the Monte Carlo method for distribution that randomly models up to 2,500 boundary conditions. The simulation calculates the resultant water quality as the calculations cascade further downstream.

Once the distribution results have been produced, an assessment can be undertaken on the predicted mean and ninety percentile concentrations or loads.

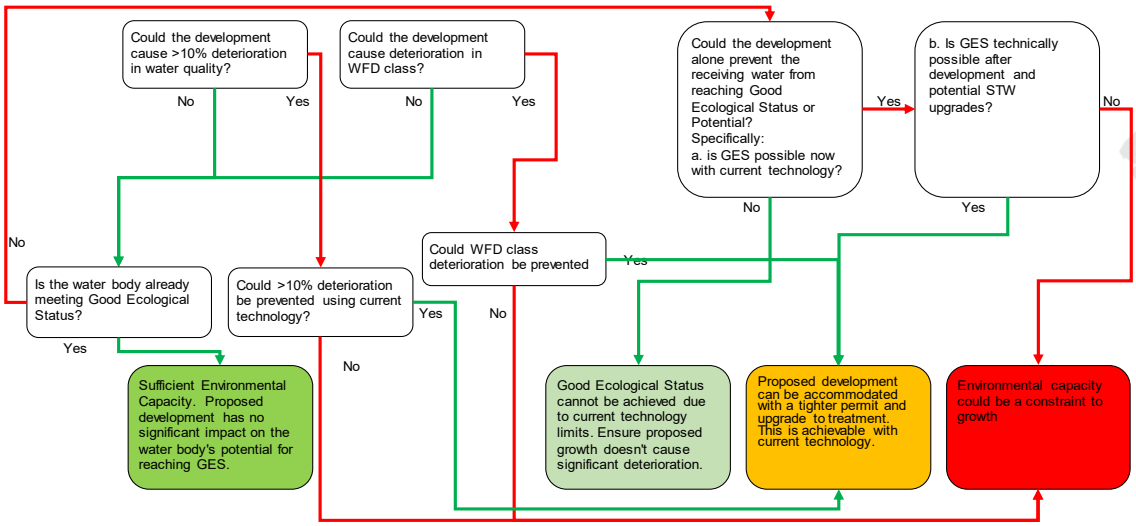


Figure 9.1 Water quality impact assessment following EA West Thames guidance

Where modelling indicated growth may lead to a deterioration in the watercourse (either 10% or in class), or where the watercourse is not currently meeting at least a 'Good' class for each determinand (defined as a constituent describing water quality), the models were used to test whether this could be addressed by applying stricter discharge concentrations. In such cases, a Technically Achievable Limit (TAL) was considered.

The EA advised that the following permit values are achievable using treatment at TAL, and that these values should be used for modelling all WwTW potential capacity irrespective of the existing treatment technology and size of the works:

- Ammonia (95%-ile): 1mg/l
- BOD (95%-ile): 5mg/l
- Phosphorus (mean): 0.25mg/l

This assessment did not take into consideration if it is feasible to upgrade each existing WwTW to best available technology due to constraints of costs, timing, space, carbon costs etc.

9.2.2 Modelling approach

Existing SIMCAT models developed by the Environment Agency were supplied for the River Thames catchment and the South East River Basin District; one modelling Ammonia and BOD, the other modelling Phosphorous. The models were understood to have been largely based on observed flow and quality data for the period 2010 to 2012. A widespread update of the model, and the resultant recalibration were not within scope of this project. It was therefore decided to update just the effluent flow and quality statistics at WwTWs receiving growth in the study area.

The two models were run as received from the Environment Agency to set a baseline and ensure the models worked appropriately. A complete update of the two SIMCAT models and subsequent recalibration were not within scope of the project, and so a limited update was carried out. This means that the modelling work presented should be used to identify areas at risk of water quality deterioration, but not for permit setting. Flow data from the last three years for each WwTW in the study area was supplied by SW and TW and used to update the model. The updated models were then run as a 2018 baseline.

Additional effluent flow from potential growth during the local plan period was added to current flow at WwTWs receiving growth and the model re-run as a future scenario.

In order to assess whether a deterioration in WFD class would be predicted, targets for BOD, Ammonia and Phosphate were provided by the EA.

Where treatment at TAL and reductions in diffuse sources in the present day could improve water quality to meet Good class, it is important to understand whether this could be compromised as a result of future growth within the catchment.

Guidance from the EA suggests breaking this down in to two questions:

a) Is Good Ecological Status possible now with current technology?

b) Is Good Ecological Status technically possible after development and any potential WwTW upgrades?

If the answer to questions a) and b) are both 'Yes' or 'No' then the development can be assessed as having no significant impact on the water bodies potential for reaching GES. However, if the answer to a) is 'Yes' and the answer for b) is 'No' then development is having a significant impact.

In order to answer the question whether growth could prevent good ecological status being achieved in the future. WFD Targets for each determinand were added to the model. Due to the size of the study area, and the range of target values that would need to be applied, it was decided that updating the model with the correct target for that particular reach / input was not appropriate to the scope of the study. Applying a maximum or minimum value or calculating a mean would also introduce a source of error. Two versions of the model were therefore created one with every target set to the maximum target found in the catchment, and a minimum version where every target was set to the minimum value found in the model.

Run type 9 within SIMCAT was then used which assumes that upstream flow each treatment works is at good ecological status. The permit value required to still achieve GES is then calculated by the model.

If GES can be achieved with the upstream quality set to good in the minimum version of the model, then this is likely to be achieved for whatever the actual local WFD target is. If it cannot be achieved, then the maximum version of the model was used. If GES cannot be achieved in this version of the model, then it is unlikely to be achieved whatever the local WFD target is. If it can be achieved in one version but not the other, then with the WwTW treating at TAL, the resulting water downstream water quality is likely to be close to the target. These WwTWs have been identified as having an "inconclusive" assessment.

9.3 Results

9.3.1 Overview

Figure 9.2 shows the Cycle 2 Water Framework Directive overall waterbody ecological classifications for watercourse in the study area. The majority of the waterbodies have a moderate or poor ecological status, and in all of the waterbodies that contain a WwTW serving growth, sewage discharge was cited as one of the "reasons for not achieving good status".

The exception to this is a stretch of the River Mole upstream of Horley which is currently achieving a good ecological status and a number of waterbodies which have a bad ecological status, Lancing Brook in Horsham and Burstow Stream in Crawley, Reigate and Banstead and Mid Sussex.

Also contributing to the good status not being achieved are diffuse sources of phosphate from agriculture (livestock and poor nutrient management), and in some cases from urban and transport sources.

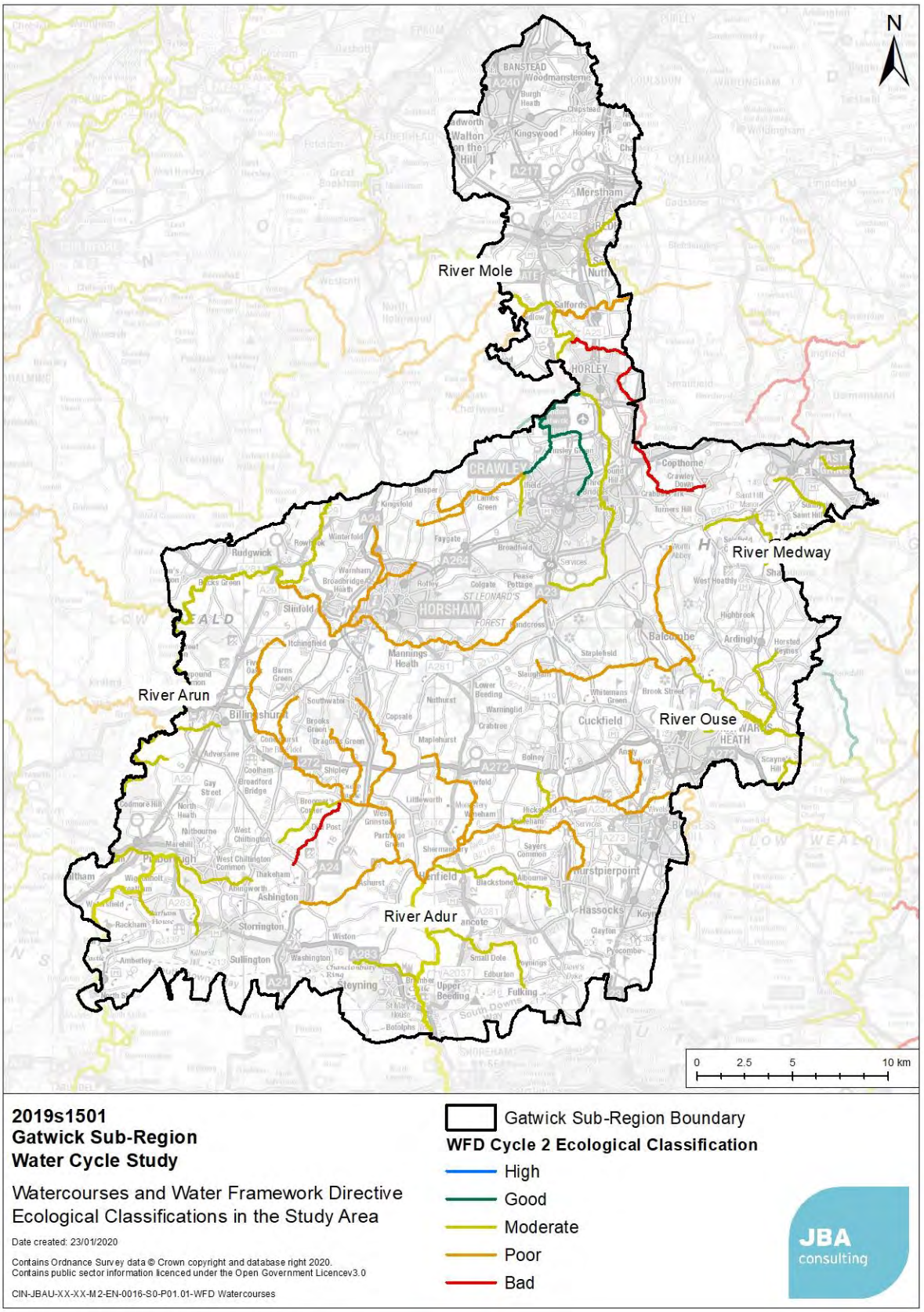


Figure 9.2 WFD Cycle 2 – Ecological status of Watercourses in the study

9.3.2 Modelling Results

Section 9.1 outlines three questions to be answered in this study by the water quality modelling:

- Could the development cause a greater than 10% deterioration in water quality?
- Could the development cause a deterioration in WFD class of any element assessment?
- Could the development alone prevent the receiving watercourse from reaching Good Ecological Status (GES) or Potential?

The first two questions were answered by adding the additional effluent flow from growth into the baseline model and comparing the resulting water quality downstream of each WwTW. The results of this assessment are presented in columns 4 and 5 in the Table 9.1. Where deterioration of 10% or more or a class deterioration was predicted, a further run was carried out in SIMCAT with each WwTW discharging at the technically achievable limit (TAL) to assess if deterioration could be prevented (reduced to 0%). This is shown in column 6.

Additional effluent causes a deterioration of 10% or greater in one or more determinands at fifteen of the 47 WwTWs assessed. In the majority of these, deterioration can be prevented by treatment at the technically achievable limit.

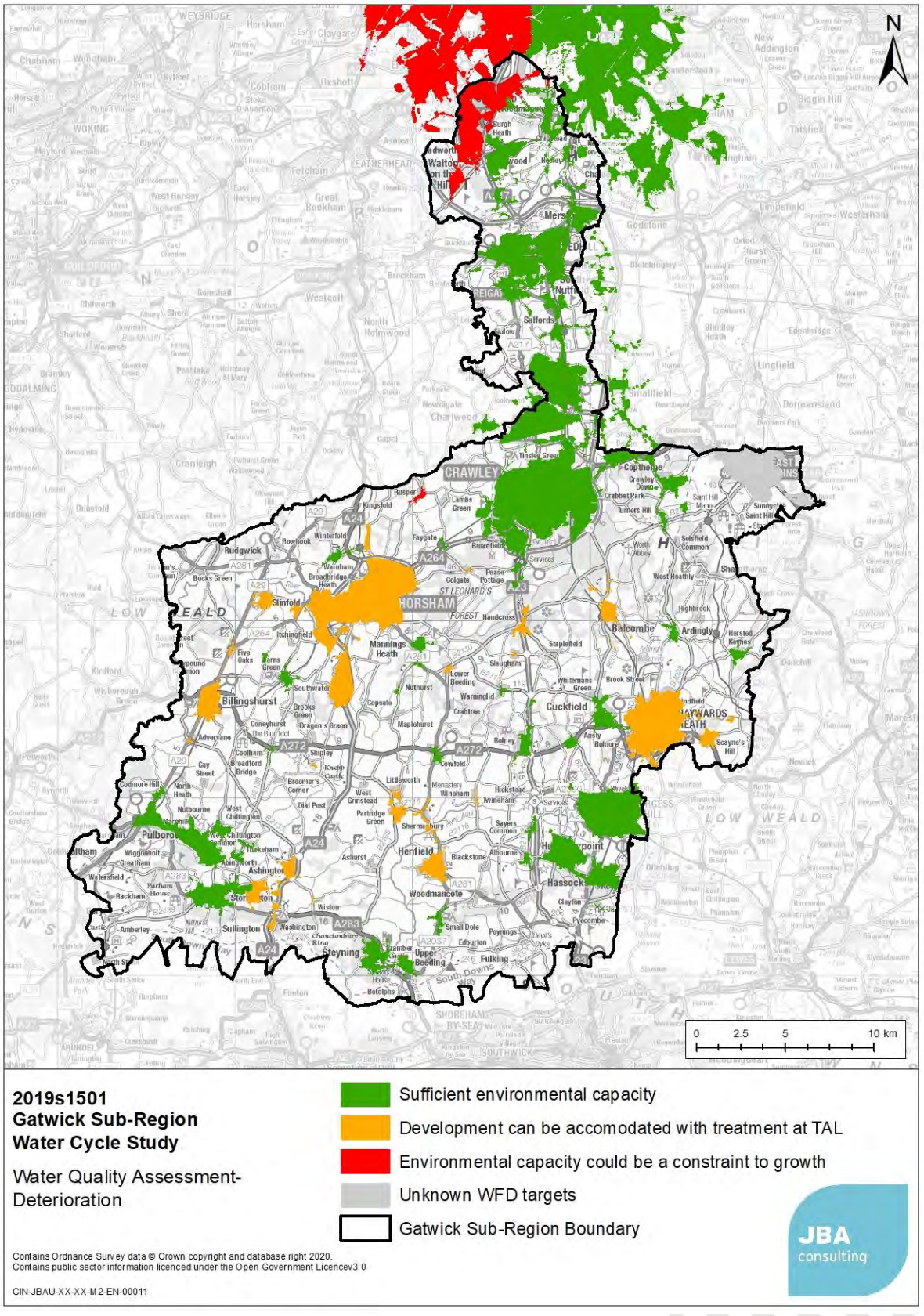
At two WwTWs (Hogsmill and Rusper) deterioration could not be prevented, despite treatment at TAL. TW have since advised that Rusper is due to close and wastewater pumped to Crawley WwTW. Hogsmill WwTW serves growth in RBBC, Epsom and Ewell, Kingston Upon Thames and Sutton, and RBBC only makes up 5% of the forecast growth at this WwTW. The contribution of RBBC to deterioration at Hogsmill is therefore fairly minor, however the total amount of growth from all Local Planning Authorities should be considered by Thames Water when future upgrades are investigated.

At nine treatment works additional effluent flow leads to a deterioration in WFD class for one or more determinands. In every case this can be prevented by treatment at TAL.

The results of this assessment are shown graphically in Figure 9.3. A green assessment was given where there is a less than 10% deterioration and no deterioration in WFD class in any determinand. In these cases, it can be said that there is environmental capacity for growth. A WwTW was given an amber assessment where there was a greater than 10% deterioration or a deterioration in class in one or determinand, but this could be prevented by treatment at TAL. This indicates where a tightening of the permit and/or upgrades to treatment processes may be required.

Where deterioration could not be prevented by treatment at TAL, a red assessment was given. This indicates where environmental capacity could be a constraint to growth. In these cases, the level of growth within that catchment may need to be reduced, or wastewater pumped to an alternative WwTW.

Figure 9.3: Water quality assessment – deterioration



The next assessment assumes that improvements have been made elsewhere in the catchment, and upstream flow at each WwTW has achieved good ecological status. SIMCAT then calculates the permit limit required to maintain Good Ecological Status downstream of the WwTW. Where the permit limit is lower than TAL, it can be said that Good Ecological Status cannot currently be achieved due to the limits of current technology.

Column 7 shows whether growth can prevent good ecological status being achieved in the future.

Where an "inconclusive" assessment was given this indicates that the maximum WFD target for Phosphate used in the study area could be achieved, but not the minimum (refer to the modelling methodology in section 9.2.2).

The results of this assessment are shown graphically in Figure 9.4. A green assessment was given where GES cannot currently be achieved due to the limits of current technology, and or it can be achieved current, and growth would not prevent this. An amber assessment was given where the results were inconclusive (the result achieves GES at the maximum target in the study area, but not the minimum). A red assessment was given where growth could lead to GES being prevented in the future, i.e. GES was achievable now if upstream water quality were improved but would not be in the future with additional growth.

Henfield WwTW is the only WwTW where growth could prevent GES being achieved in the future. However, the level of growth modelled is very unlikely to be served by Henfield and is the subject of ongoing discussions between SW and the EA.

The EA have advised that a number of options have been discussed already including a new wastewater treatment works that could serve the community. It should be noted that a significant investment such as a new WwTW would have a lead time up to five years so as discussed in section 7.4.4 development in this area would need careful phasing.

The Environment Agency recommend that third party agreements should not be restricted to infrastructure improvements but should consider including provision for developers to fund pre- and post-development monitoring, to ensure that their development does not lead to deterioration of water body status.

This assessment should be read in conjunction with the environmental assessment in section 11.

Figure 9.4: Water quality results – GES assessment

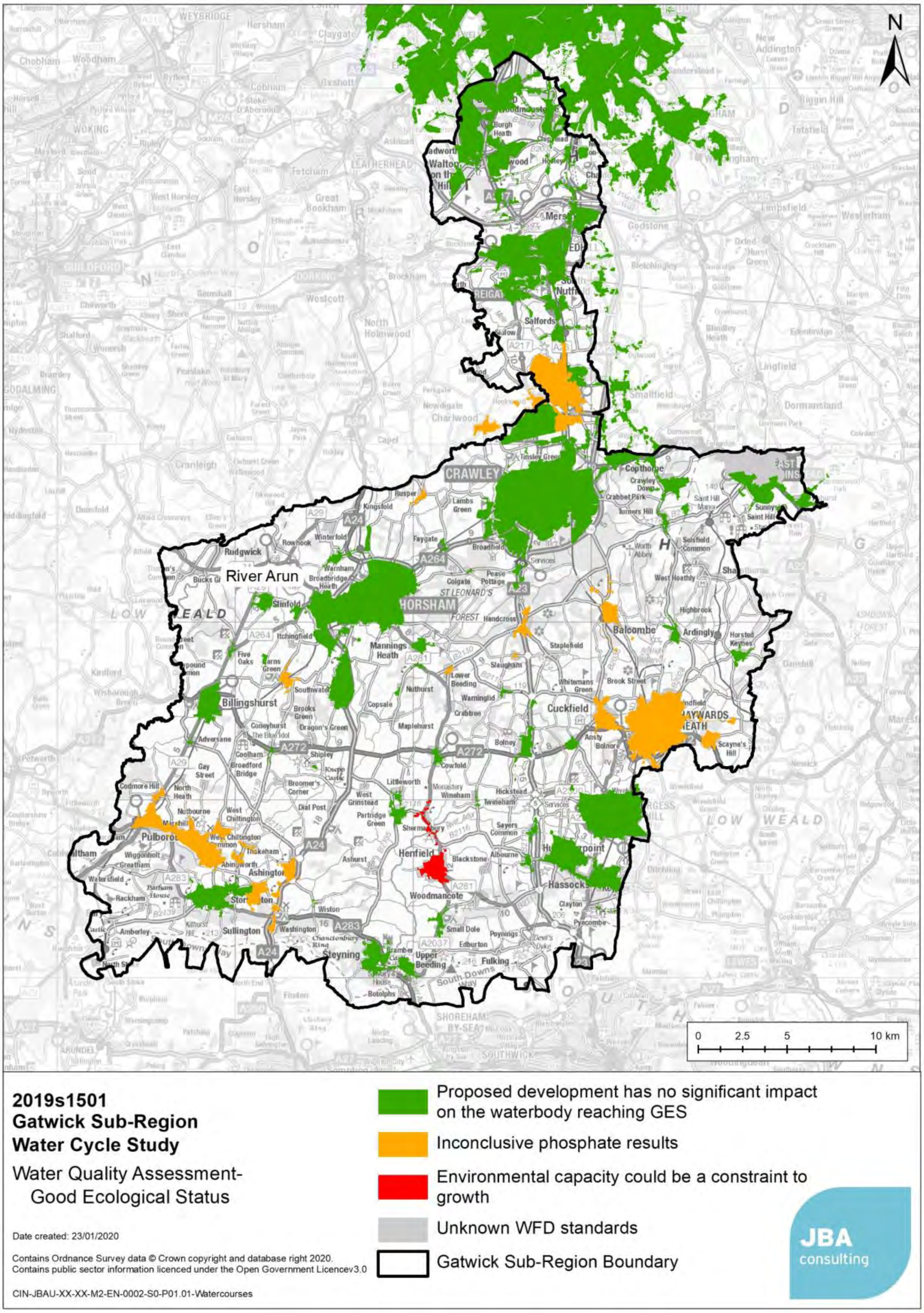


Table 9.1: Water quality assessment results

STW	Housing growth over plan period (dwellings)	Indicative number of employees/ PAX	Could the development cause a greater than 10% deterioration in WQ for one or more determinands?	Class deterioration?	Can the deterioration of class or >10% be prevented by treatment at TAL?	Could the development prevent the water body from reaching Good class?
Ansty	35		Predicted deterioration <10% for all determinands	No	n/a	No
Ardingly	114		Predicted deterioration <10% for all determinands	No	n/a	No
Ashington	636		Predicted deterioration is >10% for Ammonia and Phosphate	No	Yes	Inconclusive (Phosphate)
Balcombe	51		Predicted deterioration is >10% for Ammonia	No	Yes	Inconclusive (Phosphate)
Barns Green	57		Predicted deterioration <10% for all determinands	No	n/a	Inconclusive (Phosphate)
Beddington	38,706	329	Predicted deterioration <10% for all determinands	No	n/a	No*
Billingshurst	7,930	338	Predicted deterioration is >10% for Ammonia and Phosphate	No	Yes	No*
Burgess Hill (Goddards Green)	7,391	5723	Predicted deterioration <10% for all determinands	No	n/a	No*
Burstow	391	14	Predicted deterioration <10% for all determinands	No	n/a	No*
Colgate	3		Predicted deterioration <10% for all determinands	No	n/a	No
Coolham	1		Predicted deterioration <10% for all determinands	No	n/a	No

STW	Housing growth over plan period (dwellings)	Indicative number of employees/ PAX	Could the development cause a greater than 10% deterioration in WQ for one or more determinands?	Class deterioration?	Can the deterioration of class or >10% be prevented by treatment at TAL?	Could the development prevent the water body from reaching Good class?
Cowfold	115		Predicted deterioration <10% for all determinands	No	n/a	Inconclusive (Phosphate)
Crawley	22,717	44,706	Predicted deterioration <10% for all determinands	No	n/a	No*
Cuckfield	80		Predicted deterioration <10% for all determinands	No	n/a	Inconclusive (Phosphate)
Eden Vale	703		Predicted deterioration <10% for all determinands	Unknown WFD Standards	n/a	Unknown WFD Standards
Faygate	86		Predicted deterioration <10% for all determinands	No	n/a	No
Felbridge	994	896	Predicted deterioration <10% for all determinands	Unknown WFD Standards	n/a	Unknown WFD Standards
Handcross	189		Predicted deterioration is >10% for BOD and Ammonia	BOD class deterioration from Poor to Bad - can be prevented by treatment at TAL	Yes	Inconclusive (Phosphate)
Henfield	7,657		Predicted deterioration is >10% for all determinands	All determinands deteriorate in class which can be prevented by treatment at TAL	Yes	Yes (Ammonia and inconclusive Phosphate)
Hogsmill	44,306	46	Predicted deterioration is >10% for Ammonia and Phosphate	No	No	No*

STW	Housing growth over plan period (dwellings)	Indicative number of employees/ PAX	Could the development cause a greater than 10% deterioration in WQ for one or more determinands?	Class deterioration?	Can the deterioration of class or >10% be prevented by treatment at TAL?	Could the development prevent the water body from reaching Good class?
Horley	2,309	12,251	Predicted deterioration <10% for all determinands	No	n/a	Inconclusive (Phosphate)
Horsham	16,752		Predicted deterioration is >10% for BOD and Ammonia	No	Yes	No*
Horsted Keynes	60		Predicted deterioration <10% for all determinands	No	n/a	No
Ironsbottom (Sidlow)	1		Predicted deterioration <10% for all determinands	Unknown WFD Standards	n/a	Unknown WFD Standards
Itchingfield	4		Predicted deterioration <10% for all determinands	No	n/a	No
Lower Beeding	36		Predicted deterioration is >10% for BOD and Ammonia	No	Yes	Inconclusive (Phosphate)
Luxfords Lane	663		Predicted deterioration <10% for all determinands	Unknown WFD Standards	n/a	Unknown WFD Standards
Mannings Heath	34		Predicted deterioration <10% for all determinands	No	n/a	No
Merstham	512	21	Predicted deterioration <10% for all determinands	No	n/a	No*
Monks Gate	14		Predicted deterioration <10% for all determinands	No	n/a	No*
Nuthurst	19		Predicted deterioration <10% for all determinands	No	n/a	No

STW	Housing growth over plan period (dwellings)	Indicative number of employees/ PAX	Could the development cause a greater than 10% deterioration in WQ for one or more determinands?	Class deterioration?	Can the deterioration of class or >10% be prevented by treatment at TAL?	Could the development prevent the water body from reaching Good class?
Partridge Green	208		Predicted deterioration is >10% for Phosphate	Phosphate class deteriorates from Moderate to Poor but can be prevented with treatment at TAL	Yes	No
Pulborough	781		Predicted deterioration <10% for all determinands	No	n/a	Inconclusive (Phosphate)
Reigate	3,019	181	Predicted deterioration <10% for all determinands	No	n/a	No*
Rusper	20		Predicted deterioration is >10% for Ammonia	No	No	Inconclusive (Phosphate)
Scaynes Hill	2345		Predicted deterioration <10% for all determinands	Phosphate class deteriorated from Poor to Bad but can be prevented with treatment at TAL	Yes	Inconclusive (Phosphate)
Shipley	32		Predicted deterioration is >10% for Ammonia	Ammonia class deteriorates from High to Good but can be prevented by treatment as TAL	Yes	No
Slaugham	32		Predicted deterioration is >10% for Ammonia	No	Yes	Inconclusive (Phosphate)
Slinfold	141		Predicted deterioration is >10% for Ammonia	Ammonia and BOD deteriorate in class but can be	Yes	No

STW	Housing growth over plan period (dwellings)	Indicative number of employees/ PAX	Could the development cause a greater than 10% deterioration in WQ for one or more determinands?	Class deterioration?	Can the deterioration of class or >10% be prevented by treatment at TAL?	Could the development prevent the water body from reaching Good class?
				prevented with treatment at TAL		
Small Dole	26		Predicted deterioration <10% for all determinands	No	n/a	No
Steyning	147		Predicted deterioration <10% for all determinands	No	n/a	No*
Storrington	445		Predicted deterioration <10% for all determinands	No	n/a	No*
Warnham	83		Predicted deterioration <10% for all determinands	No	n/a	No
Warninglid	1		Predicted deterioration <10% for all determinands	No	n/a	No
Wineham	2		Predicted deterioration is >10% for Phosphate	BOD class deteriorates from High to Good but can be prevented with treatment at TAL	Yes	No
Wiston	2		Predicted deterioration is >10% for Ammonia and Phosphate	Ammonia and Phosphate classes deteriorate, but can be prevented with treatment at TAL	Yes	No

*the ecological status at these locations cannot reach Good class even without the addition of development, hence it is not what prevents the waterbody from reaching a Good class.

9.3.3 Priority substances

As well as the physico-chemical water quality elements (BOD, Ammonia, Phosphate etc.) addressed above, a watercourse can fail to achieve Good Ecological Status due to exceeding permissible concentrations of hazardous substances. Currently 33 substances are defined as hazardous or priority hazardous substances, with others under review. Such substances may pose risks both to humans (when contained in drinking water) and to aquatic life and animals feeding in aquatic life. These substances are managed by a range of different approaches, including EU and international bans on manufacturing and use, targeted bans, selection of safer alternatives and end-of-pipe treatment solutions. There is considerable concern within the UK water industry that regulation of these substances by setting permit values which require their removal at wastewater treatment works will place a huge cost burden upon the industry and its customers, and that this approach would be out of keeping with the "polluter pays" principle.

We also consider how the planning system might be used to manage priority substances:

- Industrial sources – whilst this report covers potential employment sites, it doesn't consider the type of industry and therefore likely sources of priority substances are unknown. It is recommended that developers should discuss potential uses which may be sources of priority substances from planned industrial facilities at an early stage with the EA and, where they are seeking a trade effluent consent, with the sewerage undertaker.
- Agricultural sources - There is limited scope for the planning system to change or regulate agricultural practices. UK water companies are involved in a range of "Catchment-based Approach" schemes aimed at reducing diffuse sources of pollutants, including agricultural pesticides.
- Surface water runoff sources - some priority substances e.g. heavy metals, are present in urban surface water runoff. It is recommended that future developments would manage these sources by using SuDS that provide water quality treatment, designed following the CIRIA SuDS Manual. This is covered in more detail in sections 11.8.1 and 11.8.2.
- Domestic wastewater sources - some priority substances are found in domestic wastewater as a result of domestic cleaning chemicals, detergents, pharmaceuticals, pesticides or materials used within the home. Whilst an increase in the population due to housing growth could increase the total volumes of such substances being discharged to the environment, it would be more appropriate to manage these substances through regulation at source, rather than through restricting housing growth through the planning system.

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

9.4 Conclusions

The impact of increased discharges of treated effluent as a result of growth in Gatwick Sub-Region has been assessed using the EA's SIMCAT modelling tool. The following conclusions were drawn:

- Growth could cause a deterioration in water quality at many sites in the study area. In most cases this can be prevented by treatment at the technically achievable limit.
- At Hogsmill and Rusper, deterioration cannot be prevented by treatment at TAL, although TW advise that Rusper will be closed and flows diverted to Crawley WwTW. Additional flows from Rusper WwTW into Crawley WwTW would have a negligible impact on water quality.
- At Henfield WwTW, growth could prevent good ecological status being achieved in the future.

9.5 Recommendations

Table 9.2 Water quality recommendations

Action	Responsibility	Timescale
Provide annual monitoring reports to SW and TW detailing projected housing growth in the Local Authority	Councils	Ongoing
Take into account the full volume of growth (from the Gatwick sub-region and neighbouring authorities) within the catchment when considering WINEP schemes or upgrades at WwTW	SW, TW	Ongoing
Identify options to accommodate growth at Henfield WwTW	SW, EA	Aligned with projected growth plan
The impact on downstream protected sites (including SACs, SPAs, SSSIs, Ramsar, and priority habitats) should be considered	Councils, SW, TW, NE, EA	Ongoing

10 Flood Risk from Effluent Discharge

10.1 Introduction

In catchments with a large planned growth in population and which discharge effluent to a small watercourse, the increase in the discharged effluent might have a negative effect on the risk of flooding. An assessment has been carried out to quantify such an effect.

10.2 Methodology

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

- Calculate the increase in DWF attributable to planned growth;
- Identify the point of discharge of these WwTWs;
- At each outfall point, identify the FEH v1.0 catchment descriptors associated with the WwTW;
- Use FEH Statistical method to calculate peak 1 in 30 (Q30) and 1 in 100 (Q100) year fluvial flows;
- Calculate the additional foul flow as a percentage of the Q30 and Q100 flow.

A red/amber/green rating was applied to score the associated risk as follows:

Additional flow ≤5% of Q30. Low risk that increased discharges will increase fluvial flood risk	Additional flow ≥5% of Q30. Moderate risk that increased discharges will increase fluvial flood risk	Additional flow ≥5% of Q100. High risk that increased discharges will increase fluvial flood risk

The following datasets were used to assess the risk of flooding:

- Current and predicted future DWF for each WwTW
- Location of WwTW outfalls
- Catchment descriptors from FEH CD-Rom v1.0

The hydrological assessment of river flows was applied using a simplified approach, appropriate to this type of screening assessment. The Q30 and Q100 flows quoted should not be used for other purposes, e.g. flood modelling or flood risk assessments.

10.3 Results

Table 10.1 reports the additional flow from each WwTW as a percentage of the Q30 and Q100 peak flow. This suggests that additional flows from the WwTW post development would have a negligible effect on the predicted peak flow events with return periods of 30 and 100 years in all cases except Beddington.

As assumption was made that Beddington discharges to a small watercourse (a tributary of the River Wandle). The FEH calculations provide an estimate of flow in the watercourse, but do not take into account that the effluent already makes up a significant proportion of flow in this watercourse. It therefore overestimates the significance of the additional effluent from growth. As effluent discharge at Beddington is predicted to increase by approximately 10% during the plan period (largely from neighbouring authorities) the actual figure for additional effluent as a percentage of storm flow is likely to be under 5% and so the risk is minimal.

Table 10.1: Summary of additional effluent as a % of Q30 and Q100 Peak Flows

WwTW	FEH stat Q30 (m^3/s)	FEH stat Q100 (m^3/s)	Additional effluent (m^3/s)	Flow increase as % of Q30	Flow increase as % of Q100
Ansty	33.81	43.99	0.015	0.05	0.03
Ardingly	46.26	65.41	0.050	0.11	0.08
Ashington	4.06	5.58	0.0024	0.06	0.04
Balcombe	16.73	22.45	0.0003	0.00	0.00
Barns Green	7.19	9.89	0.018	0.25	0.18
Beddington	0.44	0.60	0.1505	34.18	25.03
Billingshurst	3.72	5.04	0.0296	0.80	0.59
Burgess Hill (Goddards Green)	33.15	43.14	0.0440	0.13	0.10
Burstow	20.13	26.45	0.0015	0.01	0.01
Colgate	6.86	9.55	0.013	0.19	0.13
Coolham	10.72	14.70	0.000	0.00	0.00
Cowfold	7.16	9.86	0.037	0.51	0.37
Crawley	14.78	19.46	0.1517	1.03	0.78
Cuckfield	8.43	11.55	0.0004	0.00	0.00
Eden Vale	1.26	1.70	0.0036	0.28	0.21
Faygate	4.24	5.81	0.027	0.65	0.47
Felbridge	7.06	9.72	0.0060	0.08	0.06
Handcross	2.80	3.85	0.083	2.97	2.16
Henfield	18.09	24.27	0.0281	0.16	0.12
Hogsmill	23.98	32.75	0.1577	0.66	0.48
Horley	0.78	1.07	0.0224	2.88	2.09
Horsham	32.78	46.10	0.0626	0.19	0.14
Horsted Keynes	9.20	12.65	0.027	0.29	0.21
Ironsbottom (Sidlow)	113.36	158.19	0.000	0.00	0.00
Itchingfield	5.41	7.43	0.001	0.02	0.01
Lower Beeding	5.52	7.57	0.011	0.21	0.15
Luxfords Lane	8.31	11.47	0.0034	0.04	0.03
Mannings Heath	4.29	5.70	0.011	0.25	0.19
Merstham	1.93	2.65	0.0020	0.10	0.08
Monks Gate	2.26	3.05	0.004	0.20	0.15
Nuthurst	3.16	4.34	0.006	0.19	0.14
Partridge Green	19.46	26.20	0.0008	0.00	0.00
Pulborough	7.05	9.27	0.0029	0.04	0.03
Reigate	2.94	4.06	0.0119	0.41	0.29
Rusper	4.57	6.17	0.009	0.19	0.14
Scaynes Hill	62.54	79.58	0.0120	0.02	0.02
Shipley	38.35	50.60	0.010	0.03	0.02
Slaugham	2.28	3.13	0.014	0.63	0.46

WwTW	FEH stat Q30 (m^3/s)	FEH stat Q100 (m^3/s)	Additional effluent (m^3/s)	Flow increase as % of Q30	Flow increase as % of Q100
Slinfold	82.37	112.05	0.045	0.05	0.04
Small Dole	8.01	11.02	0.008	0.10	0.07
Steyning	5.01	6.94	0.0005	0.01	0.01
Storrington	1.05	1.41	0.0016	0.16	0.12
Warnham	18.95	26.32	0.0003	0.00	0.00
Warninglid	2.13	2.93	0.000	0.00	0.00
Wineham	68.02	88.68	0.001	0.00	0.00
Wiston	5.85	8.09	0.000	0.00	0.00

10.4 Conclusions

The impact of increased effluent flows is not predicted to have a significant impact upon flood risk in any of the receiving watercourses.

Increases in discharges of treated wastewater effluent as a result of growth are not expected to significantly increase flood risk.

10.5 Recommendations

Table 10.2: Recommendations from the Flood Risk Assessment

Action	Responsibility	Timescale
Proposals to increase discharges to a watercourse may also require a flood risk activities environmental permit from the EA (in the case of discharges to Main River), or a land drainage consent from the Lead Local Flood Authority (in the case of discharges to an Ordinary Watercourse).	SW, TW	During design of WwTW upgrades

11 Environmental Opportunities and Constraints

11.1 Introduction

Development has the potential to cause an adverse impact on the environment through a number of routes, such as worsening of air quality, pollution to the aquatic environment or disturbance to wildlife. In the context of a Water Cycle Study, the impact of development on the aquatic environment is under assessment.

A source-pathway-receptor approach can be taken to investigate the risk and identify where further assessment or action is required.

11.2 Sources of pollution

Water pollution is usually categorised as either diffuse or point source. Point source sources come from a single well-defined point, an example being the discharge from a WwTW. Section 9 models the WwTW serving growth within the Gatwick sub-region as point sources of pollution and predicts the likely concentration of pollutants downstream.

Diffuse pollution is defined as "unplanned and unlicensed pollution from farming, old mine workings, homes and roads. It includes urban and rural activity and arises from industry, commerce, agriculture and civil functions and the way we live our lives."

Examples of diffuse sources of water pollution include:

- Contaminated runoff from roads – this can include metals and chemicals
- Drainage from housing estates
- Misconnected sewers (foul drains to surface water drains)
- Accidental chemical/oil spills from commercial sites
- Surplus nutrients, pesticides and eroded soils from farmland
- Septic tanks and non-mains sewer systems

The most likely sources of diffuse pollution from new developments include drainage from housing estates, runoff from roads and discharges from commercial and industrial premises. The pollution risk posed by a site will depend on the sensitivity of the receiving environment, the pathway between the source of the runoff and the receiving waters, and the level of dilution available. After or during heavy rainfall, the first flush of water carrying accumulated dust and dirt is often highly polluting.

Whilst the threat posed by an individual site may be low, a number of sites together may pose a cumulative impact within the catchment.

Runoff from development sites should be managed by a suitably designed SuDS scheme, more information on SuDS can be found in section 11.8.Potential impacts on receiving surface waters include the blanketing of riverbeds with sediment, a reduction in light penetration from suspended solids, and a reduction in natural oxygen levels, all of which can lead to a loss in biodiversity.

11.3 Pathways

Pollutants can take a number of different pathways from their source to a "receptor" – a habitat or species that can be impacted. This could be overland via surface water flow paths, via the river system, or via groundwater or a combination of all three.

11.4 Receptors

A receptor in this case is a habitat or species that is adversely impacted by a pollutant. Both the rivers and groundwater as well as being pathways, can also be considered to be receptors, and the impact on the ecological status of rivers as defined within the Water Framework Directive is the subject of Section 9. Groundwater bodies are also given a status under the WFD which is reported in Section 4.1.3 for the groundwater bodies within the Gatwick sub-region.

Within the study area and downstream are many sites with environmental designations such as:

- Special Areas of Conservation (SAC)
- Special Protection Areas (SPA)
- Sites of Special Scientific Interest (SSSI)
- Ramsar sites (Wetlands of International Importance)
- Priority Habitats and Priority Headwaters

A description of these, and the relevant legislation that defines and protects them, can be found in section 3.5 to 3.7.

11.5 Assessment of impact risk

11.5.1 Methodology

Due to the large number of sources (49 WwTWs) and receptors the study area was divided into river catchments for further analysis. In the case of the River Adur, River Arun and River Ouse, the catchments was extended down to the coast. For the River Mole it was taken to its confluence with the River Thames, and for the River Eden and River Medway catchments the assessment considers up until their confluence.

Section 9 presents an analysis of water quality downstream of each WwTW serving growth in the study area. Equating a deterioration in water quality to a significant impact at a protected site such as a SAC is difficult, but the data can be used to highlight areas of risk for further analysis in the Habitats Regulations Assessment.

In order to identify protected sites that may be at risk, Flood Zone 2 from the Risk of Flood from Rivers and the Sea mapping was used to define an area that was either by a river, or could be reasonably expected to receive surface water from a river. Where a WwTW was present in the catchment upstream of the protected site, the predicted phosphate concentration in the adjacent waterbody was taken from the SIMCAT water quality model. Where there were no WwTW serving growth upstream, these sites were discounted as no deterioration would be predicted by the model, and the impact would be minimal.

However, in these cases the overall catchment water quality should be considered where for example they are designated for migratory fish species that may spend part of their lifecycle elsewhere in the catchment.

Protected sites close to the coast are in transitional waters that are outside the SIMCAT model. The nearest upstream modelled watercourse is therefore used as a proxy for downstream water quality.

11.5.2 River Adur

Table 11.1 contains the protected sites that are within the Adur catchment, and adjacent to a watercourse. Priority habitats are not included in this assessment, but their location can be seen in Figure 11.1.

The Adur Estuary is a significant area of saltmarsh and intertidal mudflats important for wading birds including the Ringed Plover for which the estuary is of national importance for this species.

The Arun Valley is a transitional waterbody and outside the SIMCAT model for the South East river basin. The downstream boundary of the waterbodies upstream of this location (Adur East (Sakeham) and Adur (Lockbridge)) have therefore been used as a proxy for the water quality further downstream.

The analysis in Table 11.2 suggests a significant deterioration in Phosphate concentration of between 6 and 16% is possible in this location. However, treatment at the technically achievable limit at WwTWs upstream could prevent this deterioration.

Table 11.1 Protected sites in the Adur catchment adjacent to watercourses

WwTW in catchment (Sources)	Adjacent watercourse (pathway)	Protected site(s) (Receptor)	Likely impact
WISTON ITCHINGFIELD BARNS GREEN COOLHAM SHIPLEY NUTHURST WINEHAM GODDARDS GREEN CUCKFIELD PARTRIDGE GREEN ANSTY COWFOLD HIGH CROSS HENFIELD SMALL DOLE LOWER BEEDING STEYNING	Woodsmill Stream	Beeding Hill to Newtimber Hill (SSSI)	Low – no upstream WwTW
	Adur (Burgess Hill)	Ditchling Common (SSSI)	Low – no upstream WwTW
	Adur Estuary – transitional waterbody	Adur Estuary (SSSI)	Impact possible

Table 11.2 Adur Estuary WQ Impact assessment

Protected site	Adjacent Waterbody	Protected site(s) (Receptor)	Likely impact
Adur Estuary SSSI	Adur Estuary – transitional waterbody – Adur East (Sakeham) used as proxy	Baseline Phosphate Conc. (mg/l)	0.81
		Future Phosphate Conc. (mg/l)	0.94
		% Deterioration	16%
		Phosphate Conc. After treatment at TAL (mg/l)	0.27
		Can deterioration be prevented?	YES
	Adur Estuary – transitional waterbody – Adur (Lockbridge) used as proxy	Baseline Phosphate Conc. (mg/l)	0.52
		Future Phosphate Conc. (mg/l)	0.55
		% Deterioration	6%
		Phosphate Conc. After treatment at TAL (mg/l)	0.34
		Can deterioration be prevented?	YES

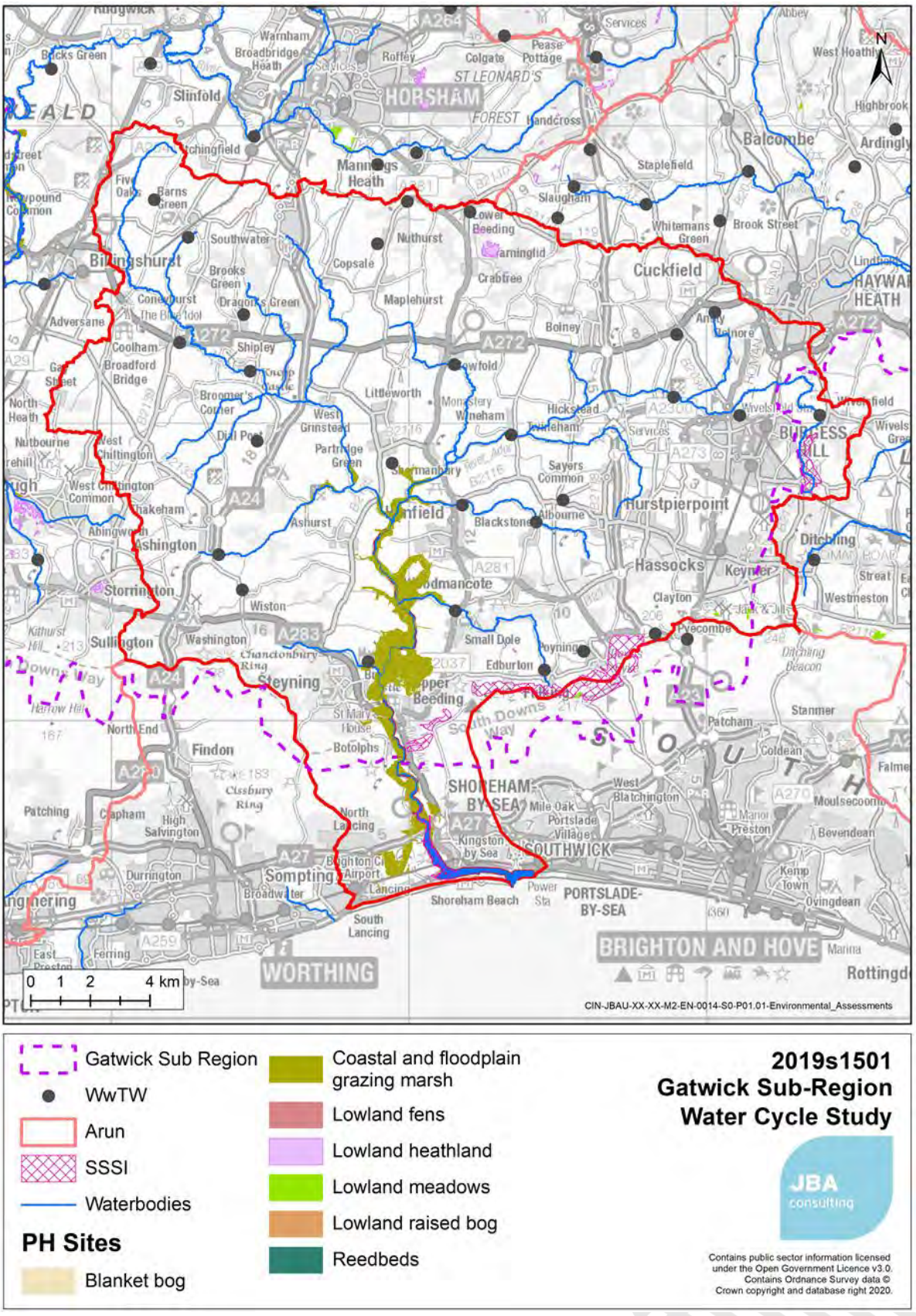


Figure 11.1 Protected sites within the Adur catchment

11.5.3 River Arun catchment

Table 11.3 contains the protected sites that are within the Adur catchment, and adjacent to a watercourse. Priority habitats are not included in this assessment, but their location can be seen in Figure 11.2.

The Arun Valley SAC is an area consisting predominantly of humid grassland, but also containing, bogs, marshes, inland water bodies and deciduous woodland. The site is one of the three main population centres of the Ramshorn Snail (Anisus vorticulus) in the UK which is the qualifying feature for this site. The main threats this aquatic snail species are land drainage, inappropriate habitat management and eutrophication. It can therefore be said to be sensitive to an increase in nutrient load within the catchment.

It overlaps in extent with the Arun Valley SPA (designated for Bewick's swan) and is underpinned by three SSSIs (Amberley Wild Brooks, Pulborough Brooks, and Waltham Brooks.

The Arun Valley is a transitional waterbody and outside the SIMCAT model for the South East river basin. The downstream boundary of the waterbodies upstream of this location (Western Rother and Stor) have therefore been used as a proxy for the water quality downstream. The analysis predicts a deterioration in phosphate concentration in these locations of between 5% and 7%. Treatment at the technically achievable limit at WwTWs upstream could prevent this deterioration.

Natural England are currently reviewing the condition of the Arun Valley international sites over the next twelve months and anticipate they will be in unfavourable condition. The species the Special Area of Conservation is designated for is also likely to be found to be in unfavourable conservation status, and this species is considered to be highly water sensitive.

As a consequence, NE recommend a "nutrient neutrality" approach at all sites discharging into this catchment. The aim of this type of approach is to ensure that the pollutant load in the watercourse is the same after development as it was before. This can be achieved through improvements in treatment processes at the WwTW, or through catchment management schemes that would produce reductions in nutrient load to offset the additional load from the development sites. Some options for nutrient reduction are presented in 11.9, but further study is required in order to investigate how this approach could be implemented in the Gatwick sub-region.

Table 11.3 Protected sites in the Arun catchment

WwTW in catchment (Sources)	Adjacent watercourse (pathway)	Protected site(s) (Receptor)	Likely impact
FAYGATE WARNHAM BILLINGSHURST MANNINGS HEATH SLINFOLD RUDGWICK STORRINGTON PULBOROUGH HORSHAM AMBERLEY	Arun (Transitional)	Arun Valley SAC, SPA and Ramsar	Impact possible
	Kird	The Mens (SAC)	Low – no upstream WwTW
	Western Rother (Upstream Petersfield)	East Hampshire Hangers (SAC)	Low – no upstream WwTW
	Kird	Ebernoe Common SAC and SSSI	Low – no upstream WwTW.
	Arun (Transitional)	Amberley Wild Brooks (SSSI)	Impact possible
	Western Rother	Ambersham Common (SSSI) (SSSI)	Low – no upstream WwTW.
	Arun (Transitional)	Arun Banks (SSSI)	Impact possible

WwTW in catchment (Sources)	Adjacent watercourse (pathway)	Protected site(s) (Receptor)	Likely impact
	Arun (Transitional)	Arundel Park (SSSI)	Impact possible
	Western Rother	Burton Park (SSSI)	Low – no upstream WwTW
	Stor	Chantry Mill (SSSI)	Low – no upstream WwTW
	Loxwood Stream	Chiddingfold Forest (SSSI)	Low – no upstream WwTW
	Arun (Transitional)	Climping Beach (SSSI)	Impact possible
	Western Rother	Fyning Moor (SSSI)	Impact possible
	Elsted Stream	Harting Downs (SSSI)	Low – no upstream WwTW
	Stor	Hurston Warren (SSSI)	Impact possible
	North River	Leith Hill (SSSI)	Low – no upstream WwTW
	Loxwood/Chiddingfold Trib	Netherside Stream Outcrops (SSSI)	Low – no upstream WwTW
	Western Rother (Upsteam Petersfield)	Noar Hill (SSSI)	Low – no upstream WwTW
	Arun	Parham Park (SSSI)	Impact possible
	Western Rother	Pulborough Brooks (SSSI)	Low – no upstream WwTW
	Kird	Shillinglee Lake(SSSI)	Low – no upstream WwTW
	Arun Horsham	Slinfold Stream and Quarry (SSSI)	Impact possible
	Arun Source	St. Leonard's Forest (SSSI)	Low – no upstream WwTW
	Kird	The Mens (SSSI)	Low – no upstream WwTW
	Arun (U/S Palingham)	Upper Arun (SSSI)	
	Western Rother (Upsteam Petersfield)	Upper Greensand Hangers : Empshott to Hawkley (SSSI)	Low – no upstream WwTW
	North River	Vann Lake and Ockley Woods (SSSI)	Low – no upstream WwTW
	Arun	Waltham Brooks (SSSI)	Impact possible
	Western Rother (Upsteam Petersfield)	Wealden Edge Hangers (SSSI)	Low – no upstream WwTW
	Western Rother (Upsteam Petersfield)	Woolmer Forest (SSSI)	Low – no upstream WwTW

Table 11.4 River Arun catchment WQ Impact assessment

Protected site	Adjacent Waterbody	Protected site(s) (Receptor)	Likely impact
Arun Valley SAC, SPA and Ramsar Amberley Wild Brooks SSSI Arun Banks SSSI Arundel Park SSSI Climping Beach SSSI Parham Park SSSI Waltham Brooks SSSI	Arun (Transitional waterbody)– Western Rother used as proxy	Baseline Phosphate Conc. (mg/l)	0.28
		Future Phosphate Conc. (mg/l)	0.3
		% Deterioration	7%
		Phosphate Conc. After treatment at TAL (mg/l)	0.11
		Can deterioration be prevented?	YES
	Arun (Transitional waterbody)– River Stor used as proxy	Baseline Phosphate Conc. (mg/l)	0.44
		Future Phosphate Conc. (mg/l)	0.46
		% Deterioration	5%
		Phosphate Conc. After treatment at TAL (mg/l)	YES
		Can deterioration be prevented?	YES
Fyning Moor (SSSI)	Western Rother	Can deterioration be prevented?	YES (See analysis above)
Hurston Warren (SSSI)	Stor	Can deterioration be prevented?	YES (See analysis above)
Slinfold Stream and Quarry (SSSI)	Arun Horsham	Baseline Phosphate Conc. (mg/l)	0.38
		Future Phosphate Conc. (mg/l)	0.39
		% Deterioration	3%
		Phosphate Conc. After treatment at TAL (mg/l)	0.23
		Can deterioration be prevented?	YES
Upper Arun (SSSI)	Arun (U/S Palingham)	Baseline Phosphate Conc. (mg/l)	0.39
		Future Phosphate Conc. (mg/l)	0.47
		% Deterioration	21%
		Phosphate Conc. After treatment at TAL (mg/l)	0.23
		Can deterioration be prevented?	YES

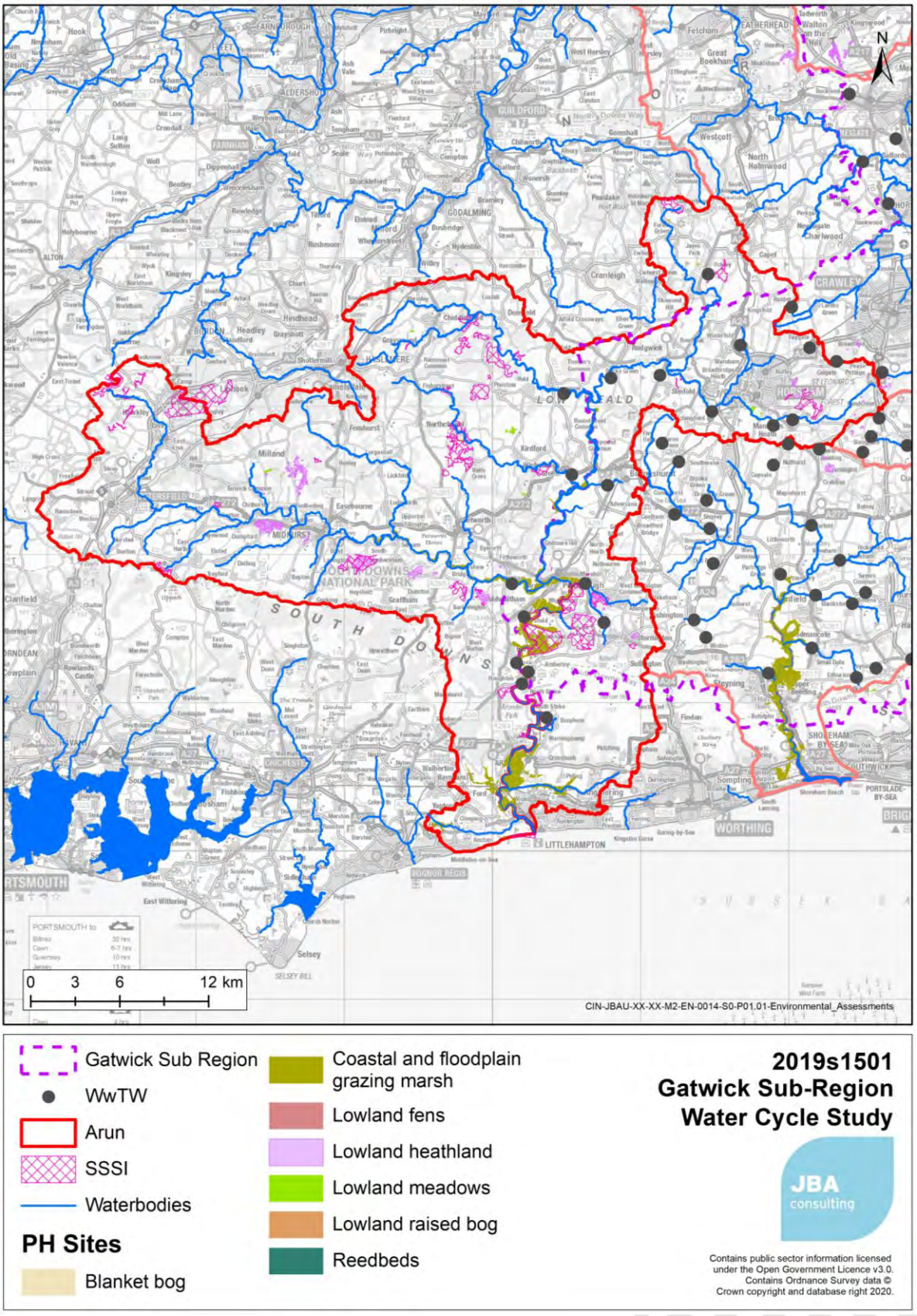


Figure 11.2 Protected sites in the Arun catchment

11.5.4 River Eden catchment

There are five SSSIs within this catchment that are on or close to a watercourse listed in Table 11.5. The location of these is shown in Figure 11.3. One of these (Hedgecourt SSSI) has WwTWs upstream and so a water quality impact is possible. Hedgecourt SSSI is considered by Natural England to be the most important wetland site remaining in south-east Surrey. It contains a range of habitats including woodland, grassland and fen-marginated open water. The NE management advice suggests *"Management should ensure that appropriate water quality is maintained according to the requirements of the wetland communities present. Where swamp is in continuity with a waterbody, the water quality in the waterbody will affect the swamp. While some communities, such as reed swamp are unlikely to be very sensitive to nutritional enrichment, others, such as tussock sedge and narrow leaved reedmace, will be outcompeted by other species (e.g. reed or reed sweet grass) where any increase in the amount of nutrients present occurs."* Hedgecourt SSSI can, therefore, be considered to be at risk of deterioration as a result of increased nutrients within the waterbody.

The change in phosphate concentration in Eden Brook adjacent to the SSSI is presented in Table 11.6. The modelling predicts a 10% increase in phosphate concentration from development during the plan period. However, the modelling also shows that this could be prevented by improvements in treatment processes upstream.

Table 11.5 Protected sites in the River Eden catchment

WwTW in catchment (Sources)	Adjacent watercourse (pathway)	Protected site(s) (Receptor)	Likely impact
EDEN VALE FELBRIDGE	Ray Brook	Blindley Heath (SSSI)	Low – no upstream WwTW
	Gibbs Brook	Godstone Ponds (SSSI)	Low – no upstream WwTW
	Eden Brook	Hedgecourt (SSSI)	Impact possible
	Eden Brook	Lingfield (SSSI)	Low – no upstream WwTW
	Lower Eden	Polebrook Farm (SSSI)	Impact possible

Table 11.6 River Eden catchment WQ impact assessment

Protected site	Adjacent Waterbody	Protected site(s) (Receptor)	Likely impact
Hedgecourt SSSI	Eden Brook	Baseline Phosphate Conc. (mg/l)	1.09
		Future Phosphate Conc. (mg/l)	1.2
		% Deterioration	10%
		Phosphate Conc. After treatment at TAL (mg/l)	0.23
		Can deterioration be prevented?	YES

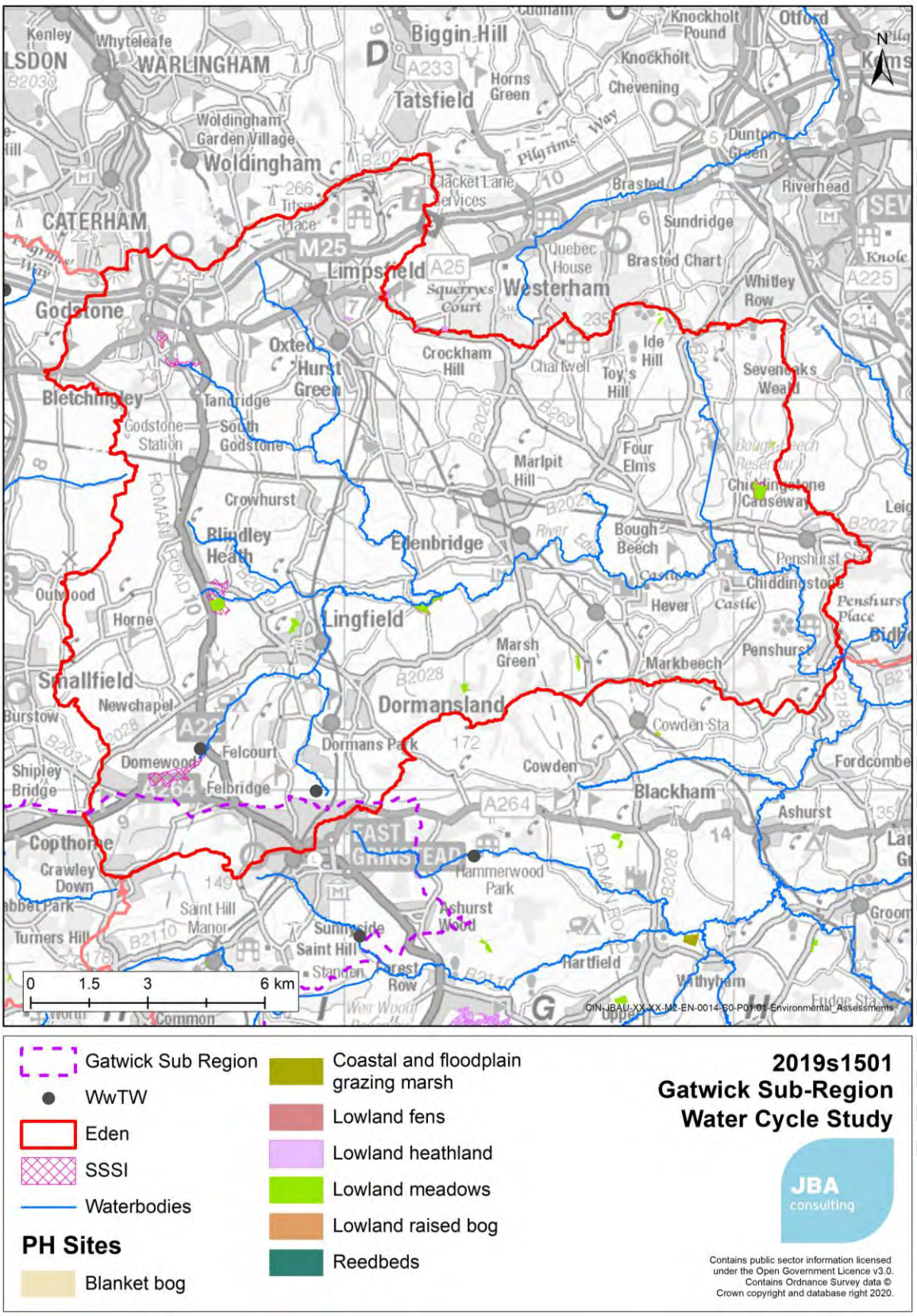


Figure 11.3 Protected sites in the River Eden catchment

11.5.5 River Mole catchment

There are four protected sites within this catchment that are on or adjacent to a watercourse, these are listed in Table 11.7 and the location is shown in Figure 11.4. One of these − Mole Gap to Reigate Escarpment is designated as both an SAC and a SSSI. Of these five, Bookham Common SSSI is unlikely to be impacted by growth in the Gatwick sub-region as no WwTWs serving growth were upstream. The phosphate concentration in the River Mole at the downstream extent of the Horley to Hersham reach was used to estimate the deterioration in water quality at the other four sites. The model predicts there would be no deterioration in the Mole in this reach from growth within the Gatwick Sub-region. Improvements in treatment processes at WwTWs upstream would allow an improvement in water quality should it be required to offset growth.

Table 11.7 Protected sites in the River Mole catchment

WwTW in catchment (Sources)	Adjacent watercourse (pathway)	Protected site(s) (Receptor)	Likely impact
COLGATE IRONSBOTTOM CRAWLEY HORLEY BURSTOW RUSPER REIGATE (EARLSWOOD) MERSTHAM PEASE POTTAGE	Mole (Horley to Hersham)	Mole Gap to Reigate Escarpment (SAC and SSSI)	Impact possible
	Downside Ditches and Bookham Brook	Bookham Commons (SSSI)	Low − no upstream WwTW
	Mole (Horley to Hersham)	Esher Commons (SSSI)	Impact possible
	Mole (Horley to Hersham)	Reigate Heath (SSSI)	Impact possible

Table 11.8 River Mole catchment WQ impact assessment

Protected site	Adjacent Waterbody	Protected site(s) (Receptor)	Likely impact
Mole Gap to Reigate Escarpment SAC and SSSI Esher Commons Reigate Heath	River Mole (Horley to Hersham)	Baseline Phosphate Conc. (mg/l)	0.35
		Future Phosphate Conc. (mg/l)	0.35
		% Deterioration	0%
		Phosphate Conc. After treatment at TAL (mg/l)	0.14
		Can deterioration be prevented?	YES

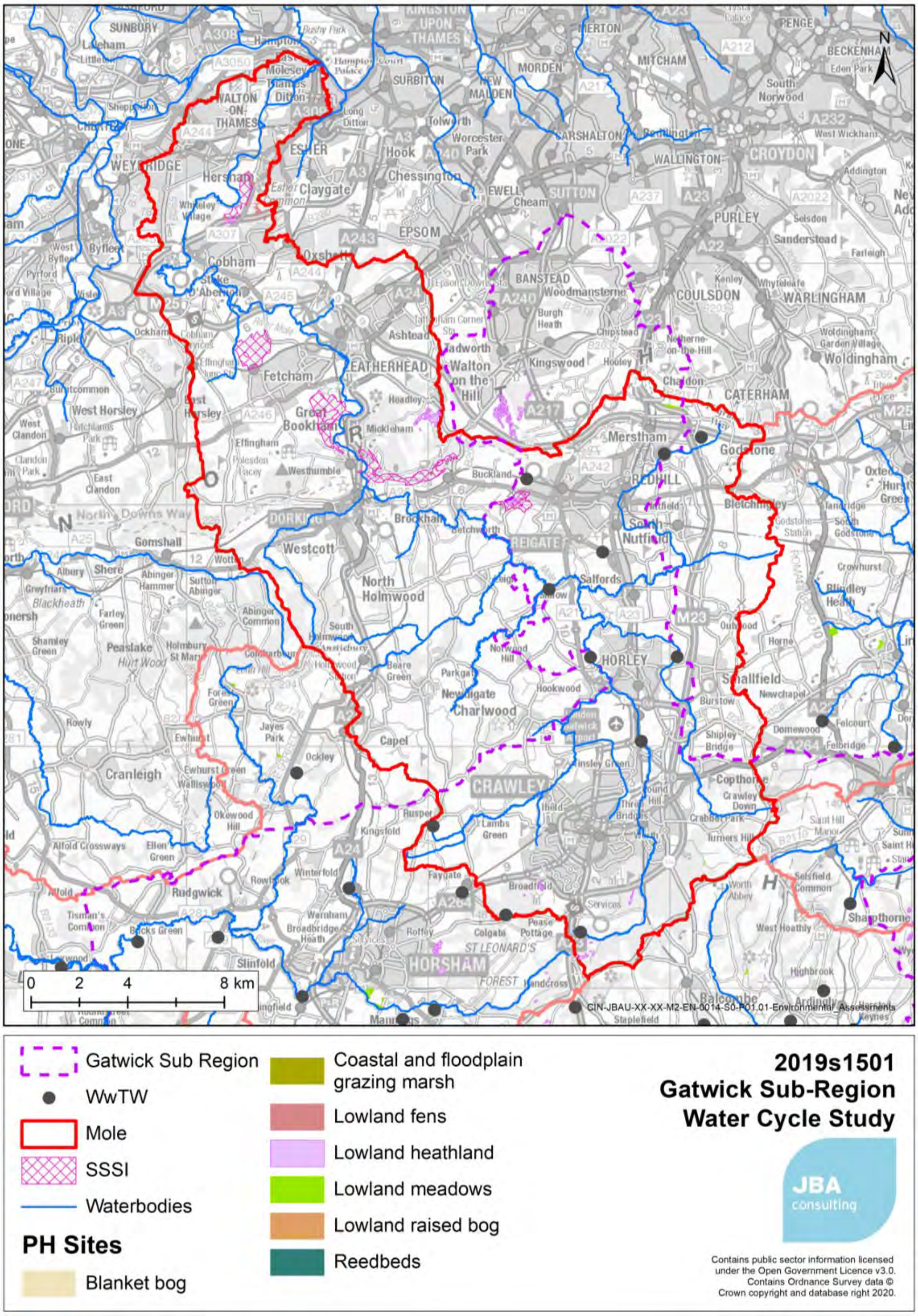


Figure 11.4 Protected sites in the River Mole catchment

11.5.6 River Medway catchment

Within the River Medway catchment there are four sites, one of which, the Ashdown Forest, is designated as a SAC, SPA and SSS and covers a large area at the south of this catchment. These sites are listed in Table 11.9 and the location shown in Figure 11.5. One designated site (Weir Wood Reservoir SSSI) has WwTWs upstream that are serving in growth in Mid Sussex. Natural England advise that "conservation value is largely determined by structural diversity and water quality. Increases in the amount of nutrients within the waterbody can lead to a loss of aquatic plants in favour of excessive growths of algae. This may result in a fundamental shift in the way a waterbody functions, reducing plant and invertebrate abundance and diversity, both of which are important food sources for a range of wetland birds."

Table 11.10 presents an analysis of phosphate concentration in the River Medway at Weir Wood, and the modelling does not predict an increase in phosphate concentration from growth in the Gatwick sub-region. Further analysis shows that a reduction in phosphate concentration could be achieved with improvements in treatment technology upstream should it be required to offset growth.

Table 11.9 Protected sites in the River Medway catchment

WwTW in catchment (Sources)	Adjacent watercourse (pathway)	Protected site(s) (Receptor)	Likely impact
ASHURSTWOOD LUXFORD LANE WEST HOATHLEY	Pippingford Brook	Ashdown Forest SAC SPA and SSSI	Low – no upstream WwTW
	Eridge Stream	Eridge Park (SSSI)	Low – no upstream WwTW
	Grom	High Rocks (SSSI)	Low – no upstream WwTW
	Medway at Weir Wood	Weir Wood Reservoir (SSSI)	Impact possible

Table 11.10 River Medway catchment WQ impact assessment

Protected site	Adjacent Waterbody	Protected site(s) (Receptor)	Likely impact
Weir Wood Reservoir (SSSI)	Medway at Weir Wood	Baseline Phosphate Conc. (mg/l)	0.29
		Future Phosphate Conc. (mg/l)	0.29
		% Deterioration	0%
		Phosphate Conc. After treatment at TAL (mg/l)	0.19
		Can deterioration be prevented?	YES

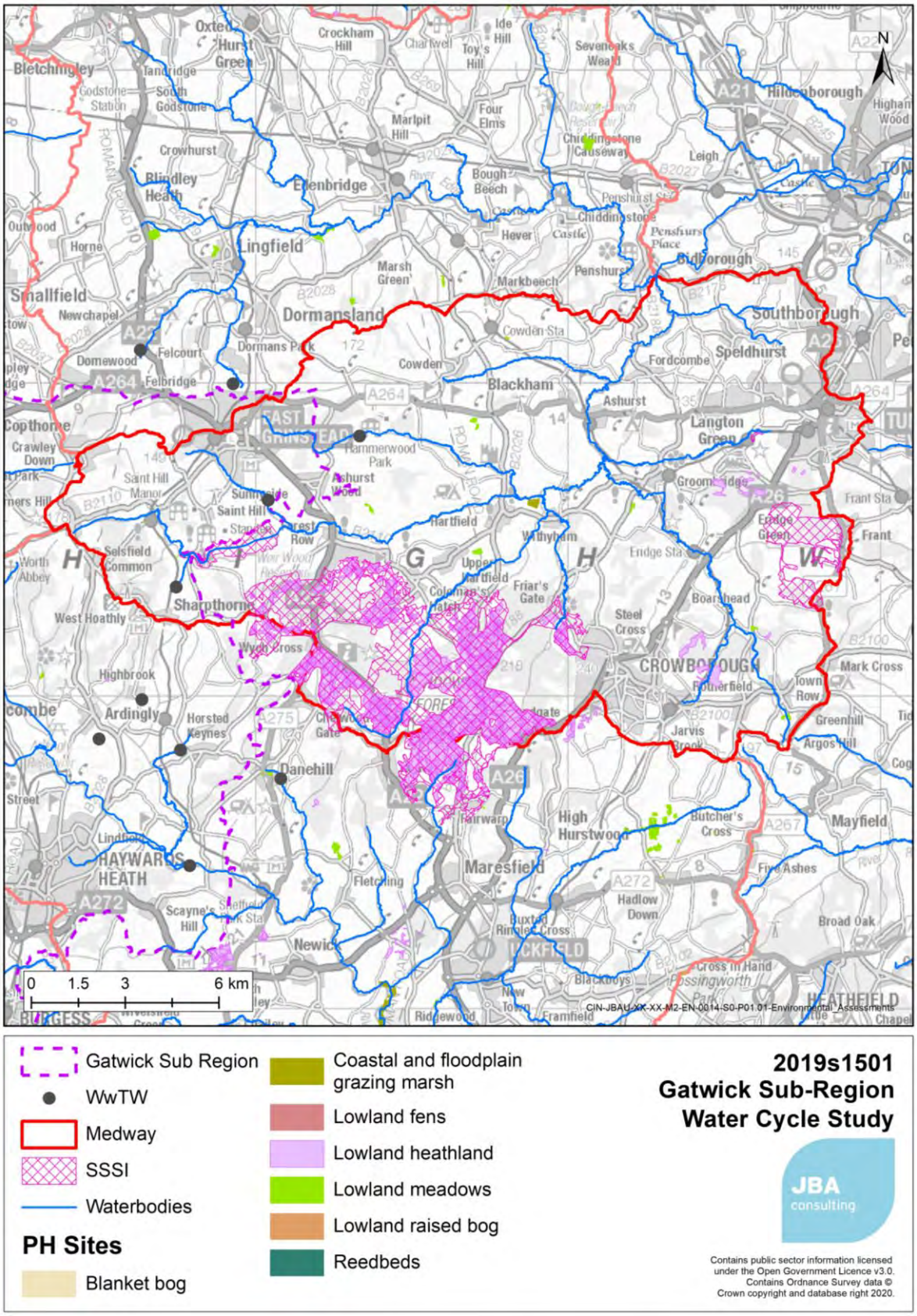


Figure 11.5 Protected sites in the River Medway catchment

11.5.7 River Ouse catchment

Within the River Ouse catchment there are nine designated sites (Ashdown Forest is designated as a SAC, SPA and SSSI). At three of these a water quality impact is unlikely as there are no WwTW serving growth upstream, but an impact is possible at five sites. these are listed in Table 11.11 and their location is shown in Figure 11.6. Chailey Common SSSI is adjacent to Longford Stream and

Table 11.12 presents the predicted change in Phosphate concentration in this watercourse at the end of the Local Plan period. The modelling predicts no deterioration in this location, and as in other locations an improvement in phosphate concentration could be achieved with improvements in treatment technology upstream. Four designated sites are found downstream in the River Ouse, but at this point in the river it is categorised as transitional waters and outside the extent of the SIMCAT model. The downstream boundary of the waterbody immediately upstream of the transitional waters was therefore used as a proxy for water quality in the river adjacent to the designated sites. The modelling predicts a 2% increase in phosphate concentration in this reach, but this could be prevented through improvements in upstream treatment processes.

Table 11.11 Protected sites in the River Ouse catchment

WwTW in catchment (Sources)	Adjacent watercourse (pathway)	Protected site(s) (Receptor)	Likely impact
HANDCROSS SLAUGHAM BALCOMBE SCAYNES HILL BROOK STREET (CUCKFIELD) ARDINGLY HORSTED KEYNES	Pippingford Brook	Ashdown Forest SAC, SPA and SSSI	Low – no upstream WwTW
	Uck Upstream of Buxted	Buxted Park (SSSI)	Low – no upstream WwTW
	Longford Stream	Chailey Common (SSSI)	Impact possible
	Cockhaise Brook	Freshfield Lane (SSSI)	Low – no upstream WwTW
	River Ouse (Transitional)	Lewes Brooks (SSSI)	Impact possible
	River Ouse (Transitional)	Offham Marshes (SSSI)	Impact possible
	River Ouse (Transitional)	Rock Wood (SSSI)	Impact possible
	River Ouse (Transitional)	Southerham Grey Pit (SSSI)	Impact possible
	Shell Brook upstream of Ardingly Reservoir	Wakehurst & Chiddingly Woods	Low – no upstream WwTW

Table 11.12 River Ouse catchment WQ impact assessment

Protected site	Adjacent Waterbody	Protected site(s) (Receptor)	Likely impact
Chailey Common SSSI	Longford Stream	Baseline Phosphate Conc. (mg/l)	0.76
		Future Phosphate Conc. (mg/l)	0.76
		% Deterioration	0%
		Phosphate Conc. After treatment at TAL (mg/l)	0.75
		Can deterioration be prevented?	YES
Lewes Brook (SSSI) Offham Marshes (SSSI) Rock Wood (SSSI) Southerham Grey Pit (SSSI)	River Ouse transitional waterbody – Ouse between Isfield and Coast used as a proxy	Baseline Phosphate Conc. (mg/l)	0.58
		Future Phosphate Conc. (mg/l)	0.59
		% Deterioration	2%
		Phosphate Conc. After treatment at TAL (mg/l)	0.23
		Can deterioration be prevented?	YES

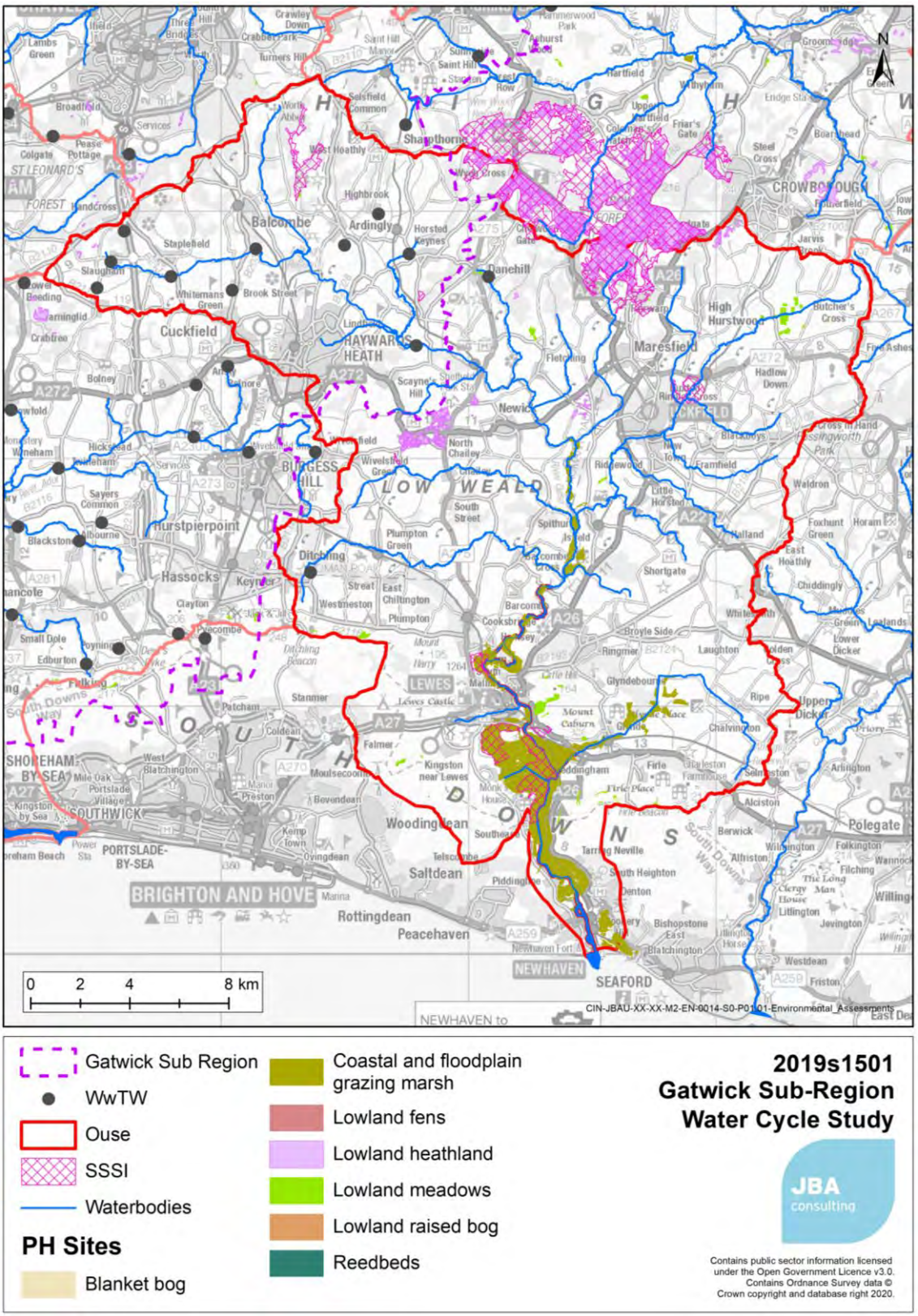


Figure 11.6 Protected sites in the River Ouse catchment

11.6 Summary of water quality impact on protected sites

Section 11.5 presents the predicted water quality impact on protected sites within or downstream of the Gatwick sub-region. In a number of cases, a deterioration in water quality – presented here as where a deterioration in Phosphate concentration is predicted in the watercourses adjacent to protected sites (SAC, SPAs, Ramsar sites, and SSSIs). This deterioration could have a significant impact on designated species or habitats, but this would need to be assessed further in the Habitats Regulations Assessment. In each case it was found that improvements in wastewater treatment works upstream could prevent this deterioration.

Other options for improvement in water quality are outlined below.

11.7 Protection and mitigation

11.7.1 Groundwater Protection

Groundwater is an important source of water in England and Wales.

The Environment Agency is responsible for the protection of "controlled waters" from pollution under the Water Resources Act 1991. These controlled waters include all watercourses and groundwater contained in underground strata.

The zones are based on an estimate of the time it would take for a pollutant which enters the saturated zone of an aquifer to reach the source of abstraction or discharge point (Zone 1 = 50 days, Zone 2 = 400 days, Zone 3 is the total catchment area). The Environment Agency will use SPZs (alongside other datasets such as the Drinking Water Protected Areas (DrWPAs) and aquifer designations as a screening tool to show:

- Areas where is would object in principle to certain potentially polluting activities, or other activities that could damage groundwater,
- Areas where additional controls or restrictions on activities may be needed to protect water intended for human consumption,
- How it prioritises responses to incidents.

The EA have published a position paper[91] outlining its approach to groundwater protection which includes direct discharges to groundwater, discharges of effluents to ground and surface water runoff. This is of relevance to this water cycle study where a development may manage surface water through SuDS.

Sewage and Trade Effluent

Discharge of treated sewage of 2m^3 per day or less to ground are called small sewage discharges (SSDs). The majority of SSDs do not require an environmental permit if they comply with certain qualifying conditions. A permit will be required for all SSDs in source protection zone 1 (SPZ1).

For treated sewage effluent discharges, the EA encourages the use of shallow infiltration systems, which maximise the attenuation within the drainage blanket and the underlying unsaturated zone. Whilst some sewage effluent discharges may not pose a risk to groundwater quality individually, the cumulative risk of pollution from aggregations of discharges can be significant. Improvement or pre-operational conditions may be imposed before granting an environmental permit. The EA will only agree to developments where the addition of new sewage effluent discharges to ground in an area of existing discharges is unlikely to lead to an unacceptable cumulative impact.

Generally, the Environment Agency will only agree to developments involving release of sewage effluent, trade effluent or other contaminated discharges to ground if it is satisfied that it is not reasonable to make a connection to the public foul sewer. The EA would normally expect to only permit new private discharges where the distance (in metres) to connect to the nearest public sewer exceeds the number of dwellings multiplied by 30. So, for example, a development of 100 dwellings would need to be more than 3km from a public sewer. The developer would have to provide evidence of why the proposed development cannot connect to the foul sewer in the planning application. This position will not normally apply to surface water run-off via sustainable drainage systems and discharges from sewage treatment works operated by sewerage undertakers with appropriate treatment and discharge controls.

Deep infiltration systems (such as boreholes and shafts) are not generally accepted by the EA for discharge of sewage effluent as they bypass soil layers and reduce the opportunity for attenuation of pollutants.

91 The Environment Agency's approach to groundwater protection, Environment Agency (2018). Accessed online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/692989/Envirnment-Agency-approach-to-groundwater-protection.pdf on: 04/10/2019

Discharges of surface water run-off to ground at sites affected by land contamination, or from sites for the storage of potential pollutants are likely to require an environmental permit. This could include sites such as garage forecourts and coach and lorry parks. These sites would be subject to a risk assessment with acceptable effluent treatment provided.

Discharge of Clean Water

"Clean water" discharges such as runoff from roofs or from roads, may not require a permit. However, they are still a potential source of groundwater pollution if they are not appropriately designed and maintained.

Where infiltration SuDS schemes are proposed to manage surface runoff they should:

- Be suitably designed;
- Meet Government non-statutory technical standards[92] for sustainable drainage systems – these should be used in conjunction with the NPPF and PPG; and
- Use a SuDS management treatment train

A hydrogeological risk assessment is required where infiltration SuDS is proposed for anything other than clean roof drainage in a SPZ1.

Source Protection Zones in the Gatwick Sub-Region

Source protection zones (SPZs) form a key part of the Environment Agency's approach to controlling the risk to groundwater supplies from potentially polluting activities and accidental releases of pollutants.

The Source Protection Zones (SPZs) that are present in the Gatwick Sub-Region are shown in Figure 11.7 and show that:

- Within Reigate and Banstead, there is a large SPZ system covering the northern portion of the Local Authority.
- In Horsham, the southern boundary and south-western corner of the area is covered by SPZs.
- In Mid Sussex, only the southern boundary is affected by SPZs.
- In Crawley there are no SPZs present.

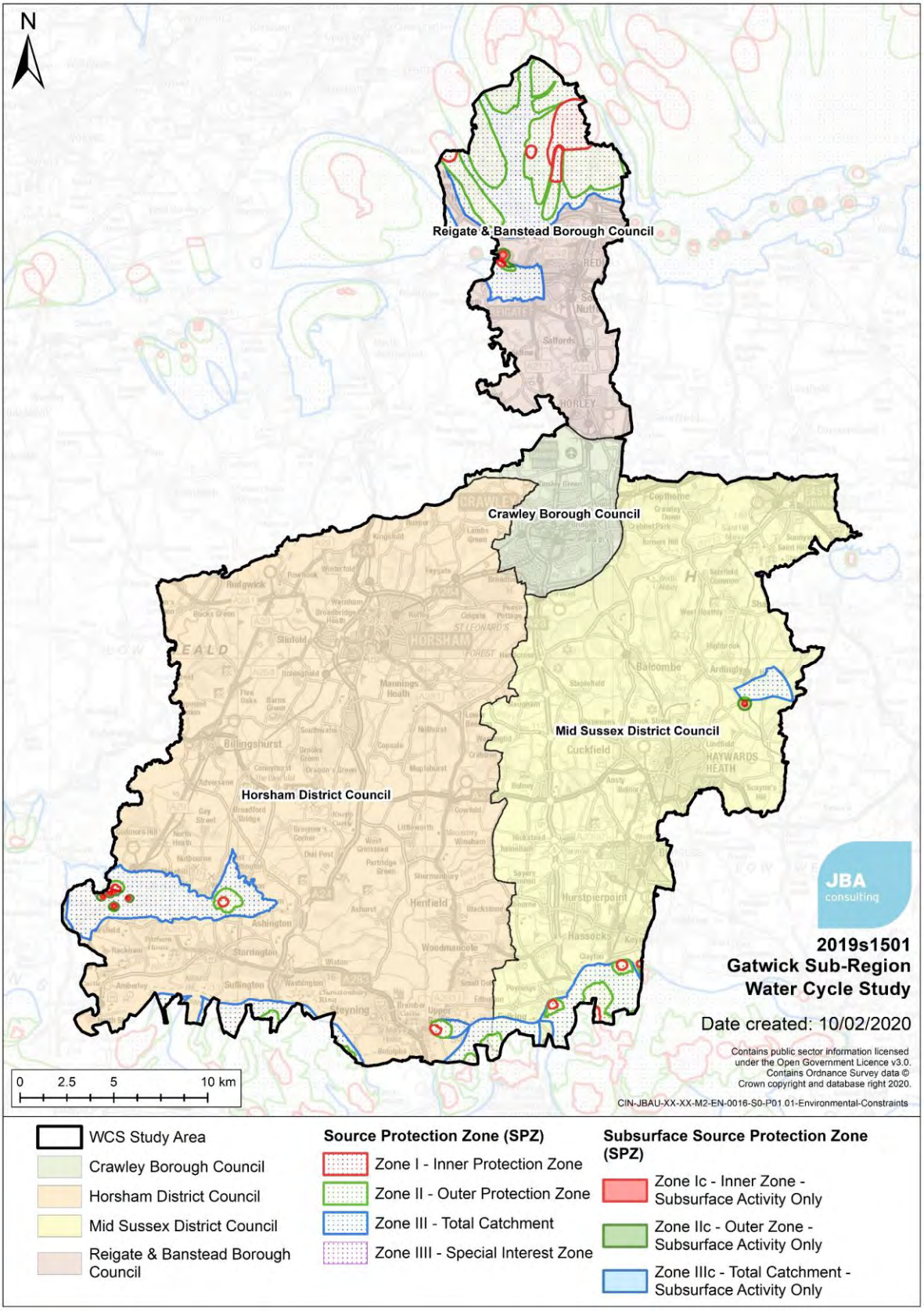
The Environment Agency's Manual for the Production of Groundwater Source Protection Zones[93], details position statements which provide information about the Environment Agency's approach to managing and protecting groundwater.

In each Local Authority area, proposed developments location within or close to Source Protection Zones, should be assessed in relation to the relevant Environment Agency position statements.

92 Sustainable Drainage Systems: non-statutory technical standards, Department for Environment, Food & Rural Affairs (2015). Accessed online at: https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards on: 04/10/2019

93 Environment Agency. March 2019. Manual for the Production of Groundwater Source Protection Zones

Figure 11.7: Source Protection Zones in the Study Area



11.8 Surface Water Drainage and SuDS

Since April 2015[94], management of the rate and volume of surface water has been a requirement for all major development sites, through the use of Sustainable Drainage Systems (SuDS).

Lead Local Flood Authorities (LLFAs) are the statutory consultees to the planning system for surface water management within major development, which covers the following development scenarios:

- 10 or more dwellings
- a site larger than 0.5 hectares, where the number of dwellings is unknown
- a building greater than 1,000 square metres
- a site larger than 1 hectare

SuDS are drainage features which attempt to replicate natural drainage patterns, through capturing rainwater at source, and releasing it slowly into the ground or a water body. They can help to manage flooding through controlling the quantity of surface water generated by a development and improve water quality by treating urban runoff. SuDS can also deliver multiple benefits, through creating habitats for wildlife and green spaces for the community. SuDS also have the advantage of providing effective Blue and Green infrastructure and ecological and public amenity benefits when designed and maintained properly.

National standards on the management of surface water are outlined within the Defra Non-statutory Standards for Sustainable Drainage Systems[95]. The CIRIA C753 SuDS Manual[96] and Guidance for the Construction of SuDS[97] provide the industry best practice guidance for design and management of SuDS

Local guidance, provided by the Lead Local Flood Authorities covering the study area, is detailed below:

Surrey County Council (SCC) is the Lead Local Flood Authority covering RBBC. The SCC Suds Design Guidance[98] document contains advice from the LLFA relating to surface water drainage and sets out the minimum operating requirements as required in the National Planning Policy Framework (NPPF). SCC provides pre-application advice on submitting appropriate surface water drainage strategies. SCC has also contributed to Water. People. Places – A Guide for Masterplanning Sustainable Drainage into Developments. This document was produced by the LLFAs in the South East of England.

- West Sussex County Council (WSCC) is the Lead Local Flood Authority covering CBC, HDC and MSDC. WSCC's Policy for the Management of Surface Water[99] sets out the requirements that the LLFA has for sustainable drainage and surface water management provisions associated with new development. WSCC expect that the principles of this policy and drainage strategy are considered for all developments.

94 Department for Communities and Local Government (2014) House of Commons: Written Statement (HCWS161) Written Statement made by: The Secretary of State for Communities and Local Government (Mr Eric Pickles) on 18 Dec 2014. Available at: https://www.parliament.uk/documents/commons-vote-office/December%202014/18%20December/6.%20DCLG-sustainable-drainage-systems.pdf on: 12/09/2019

95 Sustainable Drainage Systems, Non-statutory technical standards for sustainable drainage systems, DEFRA (2015) Accessed online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf on: 12/09/2019

96 CIRIA Report C753 The SuDS Manual, CIRIA (2015). Accessed online at: https://www.ciria.org/Memberships/The_SuDs_Manual_C753_Chapters.aspx on: 12/09/2019

97 Guidance on the Construction of SuDS (C768), CIRIA (2017), Accessed online at: https://www.ciria.org/ItemDetail?iProductcode=C768&Category=BOOK on: 12/09/2019

98 Surrey County Council. July 2019. Surrey County Council – SuDS Design Guidance.

99 West Sussex County Council. November 2018. West Sussex LLFA – Policy for the Management of Surface Water.

11.8.1 Use of SuDS in Water Quality Management

SuDS allow the management of diffuse pollution generated by urban areas through the sequential treatment of surface water reducing the pollutants entering lakes and rivers, resulting in lower levels of water supply and wastewater treatment being required. This treatment of diffuse pollution at source can contribute to meeting WFD water quality targets, as well as national objectives for sustainable development.

This is usually facilitated via a SuDS Management Train of a number of components in series that provide a range of treatment processes delivering gradual improvement in water quality and providing an environmental buffer for accidental spills or unexpected high pollutant loadings from the site. Considerations for SuDS design for water quality are summarised in Figure 11.8 below.

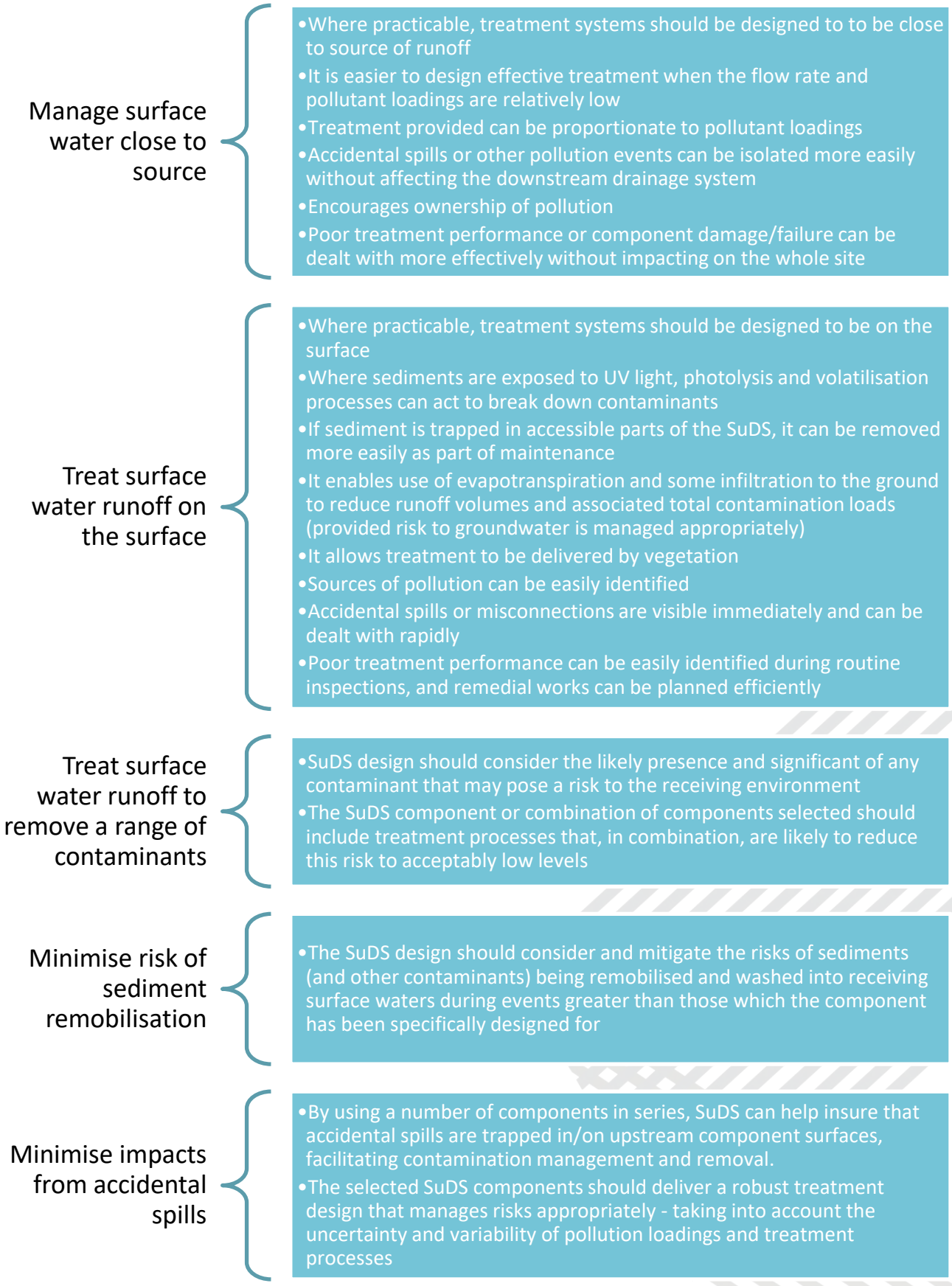


Figure 11.8 Considerations for Suds Design for Water Quality

Managing pollution close to its source can help keep pollutant levels and accumulation rates low, allowing natural processes to be more effective. Treatment can often be delivered within the same components that are delivering water quantity design criteria, requiring no additional cost or land-take.

SuDS designs should control the 'first flush' of pollutants (usually mobilised by the first 5mm of rainfall) at source, to ensure contaminants are not released from the site. Best practise is that no runoff should be discharged from the site to receiving watercourses or sewers for the majority of small (e.g. less than 5mm) rainfall events.

Infiltration techniques will need to consider Groundwater Source Protection Zones and are likely to require consultation with the Environment Agency. Early consideration of SuDS within master planning will typically allow a more effective scheme to be designed.

11.8.2 Additional Benefits

Flood Risk

The Strategic Flood Risk Assessment contains recommendations for SuDS to manage surface water on development sites, with the primary aim of reducing flood risk.

SuDS are most effective at reducing flood risk for relatively high intensity, short and medium duration events, and are particularly important in mitigating potential increases in surface water flooding, sewer flooding and flooding from small and medium sized watercourses resulting from development.

Water Resources

A central principle of SuDS is the use of surface water as a resource. Traditionally, surface water drainage involved the rapid disposal of rainwater, by conveying it directly into a sewer or wastewater treatment works.

SuDS techniques such as rainwater harvesting, allow rainwater to be collected and re-used as non-potable water supply within homes and gardens, reducing the demand on water resources and supply infrastructure.

Climate Resilience

Climate projections for the UK suggest that winters may become milder and wetter and summers may become warmer, but with more frequent higher intensity rainfall events, particularly in the south east. This would be expected to increase the volume of runoff, and therefore the risk of flooding from surface water, and diffuse pollution, and reduce water availability.

SuDS offer a more adaptable way of draining surfaces, controlling the rate and volume of runoff leaving urban areas during high intensity rainfall, and reducing flood risk to downstream communities through storage and controlled release of rainwater from development sites.

Through allowing rainwater to soak into the ground, SuDS are effective at retaining soil moisture and groundwater levels, which allows the recharge of the watercourses and underlying aquifers. This is particularly important where water resource availability is limited, and likely to become increasingly scare under future drier climates.

Biodiversity

The water within a SuDS component is an essential resource for the growth and development of plants and animals, and biodiversity benefits can be delivered even by very small, isolated schemes. The greatest value can be achieved where SuDS are planned as part of a wider green landscape, providing important habitat, and wildlife connectivity. With careful design, SuDS can provide shelter, food, foraging and breeding opportunities for a variety of species including plants, amphibians, invertebrates, birds, bats and other animals.

Amenity

Designs using surface water management systems to help structure the urban landscape can enrich its aesthetic and recreational value, promoting health and well-being and supporting green infrastructure. Water managed on the surface rather than underground can help reduce summer temperatures, provide habitat for flora and fauna and act a resource for local environmental education programmes and working groups and directly influence the sense of community in an area.

11.8.3 Suitable SuDS Techniques

The hydraulic and geological characteristics of each property development site across the Gatwick Sub-Region should be assessed to identify the most appropriate forms of surface water management and any constraining factors to the utilisation of SuDS. These assessments are designed to inform the early stage site planning process and should be followed up the site-specific detailed drainage assessments.

Appropriate SuDS techniques have been categorised into five main groups, as shown in Table 11.13. This table should be used as an indicative guide of general suitability. Further site-specific investigation should be conducted to determine what SuDS techniques could be used on a particular development, informed by detailed ground investigations.

Table 11.13: Summary of SuDS Categories

SuDS Type	Technique
Source Controls	Green Roof, Rainwater Harvesting, Pervious Pavements, Rain Gardens
Infiltration	Infiltration Trench, Infiltration Basin, Soakaway
Detention	Pond, Wetland, Subsurface Storage, Shallow Wetland, Extended Detention Wetland, Pocket Wetland, Submerged Gravel Wetland, Wetland Channel, Detention Basin
Filtration	Surface Sand filter, Sub-Surface Sand Filter, Perimeter Sand Filter, Bioretention, Filter Strip, Filter Trench
Conveyance	Dry Swale, Under-drained Swale, Wet Swale

11.9 Nutrient reduction options

11.9.1 Natural Flood Management

Natural Flood Management (NFM) is used to protect, restore and re-naturalise the function of catchments and rivers to reduce flood risk. A wide range of techniques can be used that aim to reduce flooding by working with natural features and processes in order to store or slow down flood waters before they can damage flood risk receptors (e.g. people, property, infrastructure, etc.). NFM involves taking action to manage flood and coastal erosion risk by protecting, restoring and emulating the natural regulating functions of catchments, rivers, floodplains and coasts. Techniques and measures, which could be applied in the Gatwick Sub-Region include:

- Peatland and moorland restoration in upland catchments
- Offline storage areas
- Re-meandering streams
- Targeted woodland planting
- Reconnection and restoration of functional floodplains
- Restoration of rivers and removal of redundant structures

- Installation or retainment of large woody material in river channels
- Improvements in management of soil and land use
- Creation of rural and urban SuDS

In 2017, the Environment Agency published online evidence base[100] to support the implementation of NFM and with JBA produced maps showing locations with the potential for NFM measures[101]. These maps are intended to be used alongside the evidence directory to help practitioners think about the types of measure that may work in a catchment and the best places in which to locate them. There are limitations with the maps; however, it is a useful tool to help start dialogue with key partners.

11.9.2 Multiple Benefits of NFM

In addition to flood risk benefits, there are also significant benefits in other areas such as habitat provision, air quality, climate regulation and water quality.

Many NFM measures have the ability to reduce nutrient and sediment sources by reducing surface runoff flows from higher ground, reducing soil erosion, trapping sediment at the edge of agricultural land, or encouraging deposition of sediments behind natural dams upstream in watercourses.

Suitable techniques may include:

- Leaky dams
- Woodland planting
- Buffer strips
- Runoff retention ponds
- Land management techniques (soil aeration, cover crops etc.)

100 Working with natural processes to reduce flood risk, Environment Agency (2018). Accessed online at: https://www.gov.uk/government/publications/working-with-natural-processes-to-reduce-flood-risk on: 03/10/2019

101 Mapping the potential for working with natural process, Environment Agency and JBA. Accessed online at: http://wwnp.jbahosting.com/ on: 03/10/2019

Case Study – Black Brook Slow the Flow

Four engineered log dams were installed on Black Brook at an estimated cost of £2,000, funded by Natural England and the Environment Agency to restore Stanley Bank SSSI. The scheme aimed to improve habitat and reduce the risk of flooding. However, the scheme also resulted in reduced levels of phosphate and nitrate in Black Brook, with phosphate concentrations falling by 3.6mg/l. By 2035, it is predicted that 792m^3 of sediment will be stored in three ponds retained by the jams.

Reproduced from Case Study 17. Black Brook Slow the Flow, St Helens, Norbury, Rogers and Brown, EA WwNP Evidence Base 2017. Photograph taken on 8 May 2015; courtesy of Matthew Catherall

11.9.3 Integrated Constructed Wetlands

An integrated constructed wetland (ICW) is an artificial wetland created for the purpose of treating polluted water, whether this is municipal wastewater, grey water from residential properties, or agricultural runoff.

They are usually unlined, free surface flow wetlands, designed to contain and treat influents within emergent vegetated areas.

Defra carried out a systematic review of the effectiveness of various wetland types, including ICWs for mitigating agricultural pollution such as phosphate and nitrate. The overall conclusion was that all wetland types are very effective at reducing major nutrients and suspended sediments, with the exception of nitrite in ICWs. Nitrate is only reduced when passing through overland buffer strips and through constructed wetlands with vegetation, where the systematic review showed a mean reduction of 29% across the evidence included in the study.

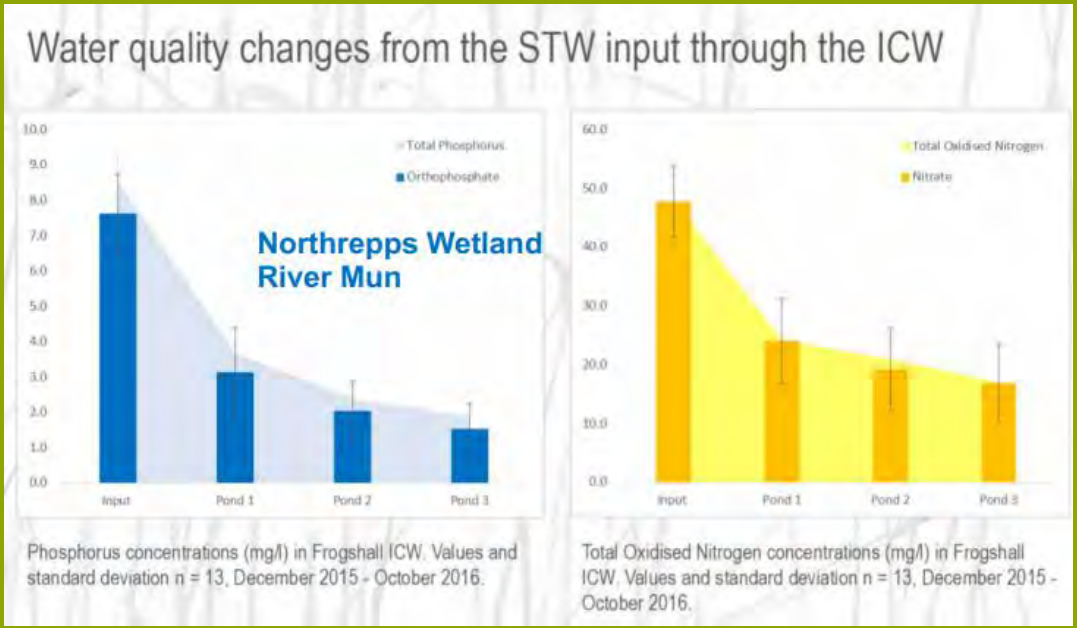
The mean reduction in Total Phosphorus across the evidence base was 78%.

Case Study – Frogshall ICW

The Upper River Mun in Norfolk was experiencing chronic pollution, and a loss in biodiversity in the river. Investigation found that nutrients from a Sewage Treatment Works upstream were contributing to this issue.

A pilot ICW was created consisting of three shallow ponds, filled with 18,000 emergent aquatic plants, and the outfall from the treatment works was diverted to pass through the wetland.

Early monitoring has shown that 90% of the phosphate is being removed by the wetland, and a large increase in biodiversity downstream observed.



Phosphorus concentrations (mg/l) in Frogshall ICW. Values and standard deviation n = 13, December 2015 - October 2016.

Total Oxidised Nitrogen concentrations (mg/l) in Frogshall ICW. Values and standard deviation n = 13, December 2015 - October 2016.

Reproduced from "Stripping the Phosphate" a presentation by the Norfolk Rivers Trust (2018).

https://www.theriverstrust.org/media/2018/08/2.-Stripping-the-phosphate-David-Diggens-Norfolk-Rivers-Trust.pdf

11.9.4 Agricultural Management

There is a big potential to improve water quality by interventions aimed at agricultural sources, especially considering the measures already taken by the water companies to reduce their contribution to phosphate load.

Potential schemes could include:

- Buffer strips
- Cross slope tree planting
- Runoff retention basins
- Contour ploughing
- Cover crops

There is considerable overlap with NFM measures, and the challenges are also very similar. Exact impacts are difficult to measure, although modelling tools such as

Farmscoper[102] exist to help with this. Once a scheme is implemented it relies on the landowner to continue to maintain it in order to maintain the mitigation benefit.

Funding for agricultural interventions could come from Catchment Sensitive Farming or a Payment for Ecosystem Services approach.

Wessex Water and United Utilities have both recently used a reverse auction approach[103], which enables farmers to bid for funding to plant cover crops in winter to manage runoff from agricultural land.

Case Study – Wessex Water - EnTrade

Wessex Water catchment team used EnTrade to invite farmers to bid to grow cover crops over winter to reduce the nitrogen leaching into the watercourse.

This avoided the need to upgrade Dorchester WwTW to provide the same nitrogen removal capacity.

A trial auction was held in 2015, and two further auctions have since taken place attracting 557 bids from 63 farmers to save 153 tonnes of nitrogen.

"Using EnTrade to create a market** in measures to deliver reductions in nitrogen has delivered a 30% saving for Wessex Water compared to **traditional catchment approaches."

Ruth Barden, Director of Environmental Strategy, Wessex Water

11.9.5 Conclusions

- The potential impacts of development on a number of protected sites such as SAC, SPAs, Ramsar sites and SSSIs within, or downstream of the study area should be carefully considered in future plan making. There are also a larger number of Priority Habitats and Priority Rivers.
- An assessment of water quality in the watercourses adjacent to protected sites identified a risk of deterioration in phosphate concentration. In all cases, improvement in treatment processes at WwTW to treat at the technically achievable limit could prevent this deterioration.

102 Farmscoper webpage, ADAS (2020). https://www.adas.uk/Service/farmscoper Accessed on 22/01/2020

103 EnTrade webpage, Entrade (2020). https://www.entrade.co.uk/ Accessed on 22/01/2020

- There are a number of Groundwater Source Protection Zones, primarily in the north and south of the study area. The impact of future development on groundwater should be investigated fully.
- SuDS are required on all development sites. Their design must consider both water quantity and water quality and site level investigations should be undertaken to define the most appropriate SuDS types for each specific development.
- Runoff from these sites should be managed through implementation of a SuDS scheme with a focus on treating water quality of surface runoff from roads and development sites.
- Opportunities exist for these SuDS schemes to offer multiple benefits of flood risk reduction, amenity value and biodiversity.
- Surrey County Council and West Sussex County Council should be consulted at an early stage of development to ensure that SuDS are implemented and designed in response to site characteristics and policy factors.
- In the wider area, opportunities exist to implement natural flood management techniques to achieve multiple benefits of flood risk, water quality and habitat creation.

11.10 Recommendations

Table 11.14: Recommendations from Environmental Constraints and Opportunities Section

Action	Responsibility	Timescale
Consider the environmental impact of development on protected sites downstream of receiving wastewater treatment works in the Habitats Regulations Assessment	Councils	Local Plan Development
The local plan should include policies that require all development proposals with the potential to impact on areas with environmental designations to be considered in consultation with Natural England (for national designations).	Councils	Ongoing
The Local Plan should include policies that require development sites to adopt SuDS to manage water quality of surface runoff.	Councils	Ongoing
In partnership, identify opportunities for incorporating SuDS into open spaces and green infrastructure, to deliver strategic flood risk management and meet WFD water quality targets.	Councils TW and SW EA	Ongoing
Developers should include the design of SuDS at an early stage to maximise the benefits of the scheme	Developers	Ongoing
Work with developers to discourage connection of new developments into existing surface water and combined sewer networks. Prevent connections into the foul network, as this is a significant cause of sewer flooding.	Councils Developers	Ongoing

Action	Responsibility	Timescale
Opportunities for Natural Flood Management that include schemes aimed at reducing / managing runoff should be considered to reduce nutrient and sediment pollution within the Gatwick Sub-Region	Councils EA and NE	Ongoing

12 Climate Change Impact Assessment

12.1 Approach

A qualitative assessment was undertaken to assess the potential impacts of climate change on the assessments made in this water cycle study. This was done using a matrix which considered both the potential impact of climate change on the assessment in question, and also the degree to which climate change has been considered in the information used to make the assessment.

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

Table 12.1: Climate Change Pressures Scoring Matrix

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

12.2 Summary of UK Climate Projections

The UK Climate projections 2018 (UKCP18), released November 2018, provide updated projections of how the climate might change in the UK over the 21st Century. This section provides an overview of the main differences between UKCP18 and UKCP09, and the key issues raised. A detailed analysis can be found in the Final Phase 1 Scoping Study Report. The projections benefit from a new set of emissions scenarios (known as RCPs) that consider mitigation efforts, updated methodology using the newest climate models and climate data and an updated baseline period of 1981-2000.

General climate change trends projected over UK land for the 21st century are broadly consistent with UKCP09 projections, showing an increased chance of milder, wetter winters and hotter, drier summers along with an increase in the frequency and intensity of extremes. Cold, drier winters and cooler, wet summers will still occur due to natural climate variability, but these are likely to become less frequent over the 21st Century. However, there are some differences between UKCP09 and UKCP18 (e.g. temperature and rainfall) that may be important for climate risk assessments. These differences depend on season, location and greenhouse gas emission scenario and there is a large overlap of projected ranges for the majority of climate metrics. The biggest differences are within the highest (95th) and lowest percentiles (5th) (so in the lower probability, extreme range)[104].

The UKCP18 probabilistic projections for the South East of England, for RCP 8.5 (high emissions scenario, to represent a worst-case scenario) by 2080 are as follows:

104 Lowe et al., 2018. UKCP18 Science Overview Report. Available at: https://www.metoffice.gov.uk/pub/data/weather/uk/ukcp18/science-reports/UKCP18-Overview-report.pdf

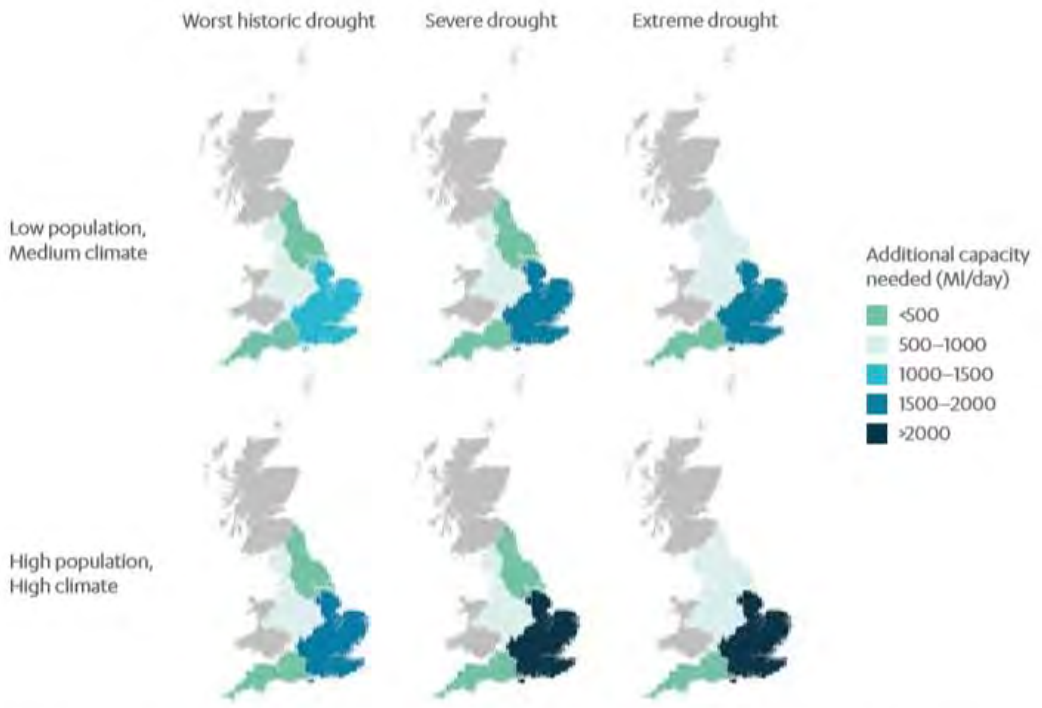
- Drier summers with a change in average summer precipitation of between -2% and -76%. Trends over the 21st century indicate dry summers are going to become much more frequent by 2100.
- Hotter summers will become much more common with a change in average summer temperatures of between 2.9°C and 8.6°C.
- Wetter winters with a change in average winter precipitation of between -2% and 57% (central estimate: 24%). Trends over the 21st century indicate that in general wet winters will become more frequent by 2100.
- Milder winters will become more common with a change in average winter temperatures of between 1.5°C and 5.7°C.

The key differences between UKCP09 and UKCP18 for this region vary dependent on climate metric, season and percentile ranges. For seasonal and annual trends in precipitation, there are some relatively big differences between the two sets of projections in the low and high percentiles. UKCP18 shows slightly larger reductions in precipitation than UKCP09. UKCP18 also shows slightly smaller increases in precipitation (90th percentile) in comparison to UKCP09. For seasonal and annual temperature, the differences between the two sets of projections appear to be dependent on season. The biggest differences are in winter with UKCP18 showing slightly less warming than UKCP09.

12.2.1 Water resources

Drawing from the UKCP18 projections, the Gatwick sub-region is likely to experience drier summers than was originally estimated in the UKCP09 by 2080. It can be assumed that hot, dry summers are likely to become more frequent over the 21st Century, which may have an impact on water demand and on the availability of water for abstraction from rivers during summer months. An overall increase in wet winters over the 21st century as consistent with UKCP09, which should be beneficial for aquifer recharge and the availability of groundwater resources. However, dry winters will still occur due to natural climate variability and it is not possible to estimate the relative probability of multiple dry seasons occurring consecutively (both summer and winter) from the data presented and the impact this will have on water availability. A detailed study of UKCP18 data would be required to fully understand the impact that the UKCP18 projections will have on water resources in the study area.

The National Infrastructure Commission has analysed the UK's long-term infrastructure needs in response to predicted drought. In order to maintain the current standard of resilience (the worst historic drought), the system would require 2,700- 3,000 million additional litres of water per day (Ml/day) to account for a rising population and the environmental and climate pressures expected by 2050. Figure 12.1 displays the spatial variation of the need for additional water capacity. Depending on the drought scenario (0.5% to 0.2% annual probability) an additional shortage as large as 1,000 Ml/day may be encountered. The 'Preparing for a Drier Future' report suggests that a 'twin-track' approach of reducing demand and increasing supply is the most cost efficient and sustainable way to deliver resilience. It is suggested that a minimum of 1,300 Ml/day of additional supply infrastructure will be required, which might be achieved using transfers, reservoirs, re-use and desalination. Comparatively, demand can be reduced by introducing additional metering and reducing leakages.



Note: medium climate refers to an average medium emission scenario, high climate refers to a drier, medium emissions scenario with less water in the South East (see Annex 1).

Figure 12.1 NIC Assessment of additional water resources capacity
Source: 'Preparing for a drier future', National Infrastructure Commission[105]

12.2.2 Wastewater infrastructure

The UKCP18 2.2km local projections provide projections for short duration heavy rainfall (i.e. convective storms) which affect urban drainage systems, but additional analysis will be needed before these projections can be translated into any guidance. Again, it is not possible to comment on how this may change wastewater management in the future. At the time of writing, the most up-to-date projections for future short duration high intensity rainfall are those from the UKWIR (UK Water Industry Water Research) 2017 project 'Rainfall intensity for sewer design - Stage 2', which should be used for wastewater management projects. Thames Water was a member of the project steering group for this research and owns a copy of the report.

12.3 Water company assessments

Southern Water and Thames Water have published a risk assessment[106] for both water resources, wastewater treatment and wastewater sewerage networks that identifies the level of threat from climate change in key service areas. In the case of WwTW, the highest perceived risks are in asset performance and pollution incidents, both of which can be attributed to an increased risk of flooding. In the case of the wastewater network, sewer flooding, resulting from increased rainfall intensity overwhelming the sewer network is added to the risks of impacts on asset performance and pollution incidents.

Consideration of the impact of climate change on water resources is included in SEW, SESW and SW's WRMPs, with the main risk being the increased likelihood of severe drought events. Allowance is made within the baseline supply forecast by adjusting the "Water Available for Use".

105 National Infrastructure Commission (2018) Preparing for a drier future. Accessed Online at: https://www.nic.org.uk/wp-content/uploads/NIC-Preparing-for-a-Drier-Future-26-April-2018.pdf on 17/07/2020
106 Thames Water's progress in planning for climate change, Thame Water (2016). Accessed online at: https://corporate.thameswater.co.uk/-/media/Site-Content/Thames-Water/Corporate/AboutUs/Protecting-our-environment/adaptionreport.pdf on: 21/02/2020

Table 12.2: Climate Change Consequences Scoring for The Water Cycle Study

Assessment	Impact of Pressure (source of information)	Have climate change pressures been considered in the Water Cycle Study?	RAG
Water resources	High	Yes – quantitative assessment within the WRMP. Climate change impacts on consumption have been calculated in accordance with UKWIR report "Impact of Climate Change on Water Demand" (2013).	
Water supply infrastructure	Medium - some increased demand in hot weather	Yes - quantitative assessment within the WRMP.	
Wastewater Collection	High - Intense summer rainfall and higher winter rainfall increases flood risk	Yes – qualitative assessment in climate change adaptation reports by Thames Water and Southern Water. This has not been considered in site by site assessments.	
Wastewater treatment	Medium - Increased winter flows and more extreme weather events reduces flow headroom	Yes – qualitative assessment in the Thames Water climate change adaptation reports. This has not been considered in site by site assessments.	
WwTW odour	Medium – higher temperatures will exacerbate existing odour control issues.	Thames Water have considered odour in WwTW upgrades as part of their climate adaptation plan.	
Water quality	Nutrients: High Sanitary determinands: Medium to High	Qualitative assessments have been included in the climate change adaptation policy papers from Thames Water.	
Flooding from increased WwTW discharge	Low	No - not considered	

(1) River Basin Management Plan

(2) SESW, SEW, SW WRMPs

12.4 Conclusions and Recommendations

The impact of Climate Change on water resources and water infrastructure are receiving increasing levels of attention by water companies and sewerage undertakers at a strategic level. This has not been included in assessments at a site level as detailed modelling has not been carried out by the water companies. Consideration of changes in water and wastewater demand should be considered when carrying out detailed site assessments in the future.

Table 12.3: Conclusions and Recommendations from Climate Change Assessment

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

* "No-Regrets" Approach: "No-regrets" actions are actions by households, communities, and local/national/international institutions that can be justified from economic, and social, and environmental perspectives whether natural hazard events or climate change (or other hazards) take place or not. "No-regrets" actions increase resilience, which is the ability of a "system" to deal with different types of hazards in a timely, efficient, and equitable manner. Increasing resilience is the basis for sustainable growth in a world of multiple hazards (Heltberg, Siegel, Jorgensen, 2009; UNDP, 2010).

13 Summary and Overall Conclusions

13.1 Summary

A summary of the conclusions for each section of the study are shown in Table 13.1.

Table 13.1: Summary of Conclusions from the Study

Assessment	Conclusion
Water resources	• All three WRZs in the study area are classed as being under serious water stress – justifying the more stringent target of 110 l/p/d under building regulations. • There is a clear need to go further than 110l/p/d in the Gatwick sub-region and a policy requiring 100lp/d in new developments and 80l/p/d in strategic development should be adopted. • This approach is supported by all three water supply companies, the Environment Agency and Natural England. • Growth plans defined in WRMPs are broadly in line with MHCLG household growth projections. • Growth in Horsham, Mid Sussex and Reigate and Banstead is higher than that accounted for in WRMPs. Supply-led growth in Crawley is in line with the WRMP. • SESW, SEW and SW have confirmed that they have sufficient water resources to serve the proposed level of growth. • issues have been highlighted by the Environment Agency and Natural England on the sustainability of abstractions at Hardham and further discussions are required in order to assess the impact on Local Plan allocations within this water resource zone.
Water supply infrastructure	• All sites were given a "green" or "amber" assessment by SEW and SW based on the size of the development, and the likelihood of requiring network reinforcement. • SESW did not provide a site by site assessment so the same methodology as SEW and SW was applied. • No allocations were identified with major constraints on water supply, so long as there is early engagement between developers, Local Planning Authorities and water companies to enable infrastructure upgrades to be constructed prior to occupation of new developments
Wastewater collection	• Development in areas where there is limited wastewater network capacity will increase pressure on the network, increasing the risk of a detrimental impact on existing customers, and increasing the likelihood of CSO operation. • Wastewater infrastructure upgrades would be required in order to serve the level of proposed growth. No constraints to providing these upgrades were identified by SW or TW. • Early engagement with Southern Water and Thames Water is required, and further modelling of the network may be required at the planning application stage. • Opportunities to separate surface water from foul on brownfield sites should be considered
Wastewater Treatment Works Flow	• Nine WwTWs in the Gatwick Sub-Region are predicted to, or already exceeding their flow permit during the plan period: o Billingshurst

Permit assessment	o Crawley o Felbridge o Goddards Green o Handcross o Henfield o Monks Gate o Reigate (Earlswood) (suspect flow data) o Rusper (due to close) • It should be noted that this assessment assumes every development site identified comes forward during the plan period and so represents a 'worst-case' for growth. • At these WwTWs upgrades may be required in order to accommodate planned growth. Phasing of these development sites needs to be carefully considered and early engagement with SW and TW is required to ensure that additional capacity is provided prior to occupation. Early engagement with Southern Water and Thames Water would be required at the planning stage to ensure any WwTW upgrades can be phased in line with the proposed development. • The Mayfield development, which consists of 7,000 houses, is closest to Henfield WwTW. This WwTW does not have capacity to serve this level of growth and SW are currently in discussion with the EA how this development could be served including an option for a new WwTW. It is important that phasing of this significant development is aligned with delivery of a solution, and early engagement between Horsham Council, Southern Water, the Environment Agency and developers is required. • If no action is taken, Crawley WwTW would exceed its flow permit during the plan period. Options exist to pump this flow to Horley, but both of these WwTWs are scored as "red" by Thames Water, indicating the scale of upgrades required. Schemes to address capacity concerns at these works may take a considerable time to deliver (3 to 5 years). It is therefore important that phasing of development within these wastewater catchments is aligned with the delivery of additional capacity, and early and continues discussion with Thames Water is required. It should be noted that this represents a 'worse case' for Crawley WwTW. Further work will be required once the identified level of employment growth has been refined.
Odour Assessment	• Ten sites are identified as being at risk of nuisance odour from a WwTW. An odour assessment is recommended as part of the planning process, paid for by developers.
Water quality impact assessment	• Growth could cause a deterioration in water quality at many sites in the study area. In most cases this can be prevented by treatment at the technically achievable limit. • At Hogsmill, and Rusper WwTWs deterioration cannot be prevented by treatment at TAL (although Rusper is due to close). • At Henfield WwTW , growth could prevent good ecological status being achieved in the future. • As discussed in the section on wastewater treatment, a strategic solution for the Mayfield development (served by Henfield WwTW in the WQ modelling) is required.

Flood risk from additional WwTW flow	• The impact of increased effluent flows at WwTW from any of the proposed development is not predicted to have a significant impact upon flood risk in any of the receiving watercourses.
Environmental Constraints and Opportunities	• A number of SAC, SPA, SSSI and Ramsar sites exist within the Gatwick Sub-Region, distributed between the four Local Authorities. There are also a large number of priority habitats and priority rivers. • An assessment of water quality in the watercourses adjacent to protected sites identified a risk of deterioration in phosphate concentration. In all cases, improvement in treatment processes at WwTW to treat at the technically achievable limit could prevent this deterioration. • There are a number of Groundwater Source Protection Zones, primarily in the north and south of the study area. The impact of future development on groundwater should be investigated fully. • Development sites within the study area could be sources of diffuse pollution from surface runoff. • Runoff from these sites should be managed through implementation of a SuDS scheme with a focus on treating water quality of surface runoff from roads and development sites. • Opportunities exist for these SuDS schemes to offer multiple benefits of flood risk reduction, amenity value and biodiversity. • SuDS for a single site could be demonstrated to have limited impact, but it is the cumulative impact of all development across the catchment (combined with the potential effects of climate change) that should be taken into account. For this reason, SuDS should be considered on sites that do not have a direct pathway to a SSSI. • In the wider area, opportunities exist to implement natural flood management techniques to achieve multiple benefits of flood risk, water quality and habitat creation.

13.2 Recommendations

Table 13.2 below summarises the recommendations from each section of the report.

Table 13.2: Summary of Recommendations

Aspect	Action	Responsibility	Timescale
Water Resources	Continue to regularly review forecast and actual household growth across the supply region through WRMP Annual Update reports, and where significant change is predicted, engage with Local Planning Authorities.	SEW, SESW, SW	Ongoing
	Provide yearly profiles of projected housing growth to water companies to inform the WRMP.	Councils	Annually
	Use planning policy to require all new development to achieve a water efficiency of 100l/person/day in the Gatwick sub-region and 80l/p/d in strategic developments.	Councils	In Local Plan Review
	The concept of water neutrality has potentially a lot of benefit in terms of resilience to climate change and enabling all waterbodies to be brought up to Good status. Explore further with the water companies and the Environment Agency how the Council's planning and climate change policies can encourage this approach.	Councils, EA, SEW, SESW, SW	In Local Plan Review and Climate Change Action Plan
	Strategic residential developments, and commercial developments should consider incorporating greywater recycling and/or rainwater harvesting into development at the master planning stage in order to reduce water demand.	Councils, SW, SESW, SEW	In Local Plan Review
	Water companies should advise the Councils of any strategic water resource infrastructure developments within the area, where these may require safeguarding of land to prevent other type of development occurring.	SEW, SESW, SW	In Local Plan Review
	Southern Water should engage with the Councils on any requirement to phase development in the Sussex North Water Resource Zone in order to align development with infrastructure investment in	SW, Councils, EA, NE	In Local Plan Review

Aspect	Action	Responsibility	Timescale
	response to sustainability concerns relating to the Hardham abstraction		
Water Supply	Undertake network modelling where appropriate to ensure adequate provision of water supply is feasible	SEW, SESW, SW	As part of the planning process
	The Councils and Developers should engage early with the water companies to ensure infrastructure is in place prior to occupation.	Councils SEW, SESW, SW Developers	Ongoing
Wastewater Collection	Early engagement between the councils, SW and TW is required to ensure that where strategic infrastructure is required, it can be planned in by SW/TW.	Councils SW TW	Ongoing
	Take into account wastewater infrastructure constraints in phasing development in partnership with the sewerage undertaker	Councils SW TW	Ongoing
	Developers will be expected to work with the sewerage undertaker closely and early in the planning promotion process to develop an outline Drainage Strategy for sites. The Outline Drainage strategy should set out the following: What – What is required to serve the site Where – Where are the assets / upgrades to be located When – When are the assets to be delivered (phasing) Which – Which delivery route is the developer going to use s104 s98 s106 etc. The Outline Drainage Strategy should be submitted as part of the planning application submission, and where required, used as a basis for a drainage planning condition to be set.	SW, TW and Developers	Ongoing
	Developers will be expected to demonstrate to the Lead Local Flood Authority (LLFA) that surface water from a site will be disposed using a sustainable drainage system (SuDS) with connection to surface water sewers seen as the last option. New connections for surface water to foul sewers will be resisted by the LLFA.	Developers LLFA	Ongoing
Wastewater Treatment	Consider the available WwTW capacity when phasing	Councils SW, TW	Ongoing

Aspect	Action	Responsibility	Timescale
	development going to the same WwTW.		
	Provide Annual Monitoring Reports to SW and TW detailing projected housing growth.	Councils	Ongoing
	SW and TW to assess growth demands as part of their wastewater asset planning activities and feedback to the Council if concerns arise.	SW, TW Councils	Ongoing
	TW to agree a solution for growth in the Crawley catchment as greater certainty in projected growth emerges.	TW, EA	Ongoing
	Further work will be required to assess treatment capacity once the identified level of employment growth has been refined	CBC	Local plan process
	SW to agree a solution for serving the Mayfield development	SW, EA	Local plan process
Odour	Consider odour risk in the sites identified to be potentially at risk from nuisance odour	Councils	Ongoing
	Carry out an odour assessment for sites identified as amber as part of the planning process and paid for by the developer.	Site Developers	Ongoing
Water Quality	Provide annual monitoring reports to SW and TW detailing projected housing growth in the Local Authority	Councils	Ongoing
	Take into account the full volume of growth (from the Gatwick sub-region and neighbouring authorities) within the catchment when considering WINEP schemes or upgrades at WwTW	SW, TW	Ongoing
	Identify options to accommodate growth at Henfield WwTW without compromising environmental objectives	SW, EA	Aligned with projected growth plan
	The impact on downstream protected sites such as SACs, SPAs, SSSIs, Ramsar, but also including priority habitats and priority rivers should be considered	Councils, SW, TW, NE, EA	Ongoing
Flood Risk Management	Proposals to increase discharges to a watercourse may also require a flood risk activities environmental permit from the EA (in the case of	SW/TW	During design of WwTW upgrades

Aspect	Action	Responsibility	Timescale
	discharges to Main River), or a land drainage consent from the Lead Local Flood Authority (in the case of discharges to an Ordinary Watercourse).		
Environment	Consider the environmental impact of development on protected sites downstream of receiving wastewater treatment works in the Habitats Regulations Assessment	Councils	Local Plan Review
	The local plan should must include policies that require all development proposals with the potential to impact on areas with environmental designations to be considered in line with the relevant legislation and where stated in consultation with Natural England (for national and international designations and priority habitats).	Councils	Ongoing
	The Local Plan should include policies that require development sites to adopt SuDS to manage water quality of surface runoff.	Councils	Ongoing
	In partnership, identify opportunities for incorporating SuDS into open spaces and green infrastructure, to deliver strategic flood risk management and meet WFD water quality targets.	Councils TW and SW EA	Ongoing
	Developers should include the design of SuDS at an early stage to maximise the benefits of the scheme	Developers	Ongoing
	Work with developers to discourage connection of new developments into existing surface water and combined sewer networks. Prevent connections into the foul network, as this is a significant cause of sewer flooding.	Councils Developers	Ongoing
	Opportunities for Natural Flood Management that include schemes aimed at reducing / managing runoff should be considered to reduce nutrient and sediment pollution within the Gatwick Sub-Region	Councils, EA, NE	Ongoing

Appendices

A Site tracker spreadsheet

B WwTW JBA flow permit assessments

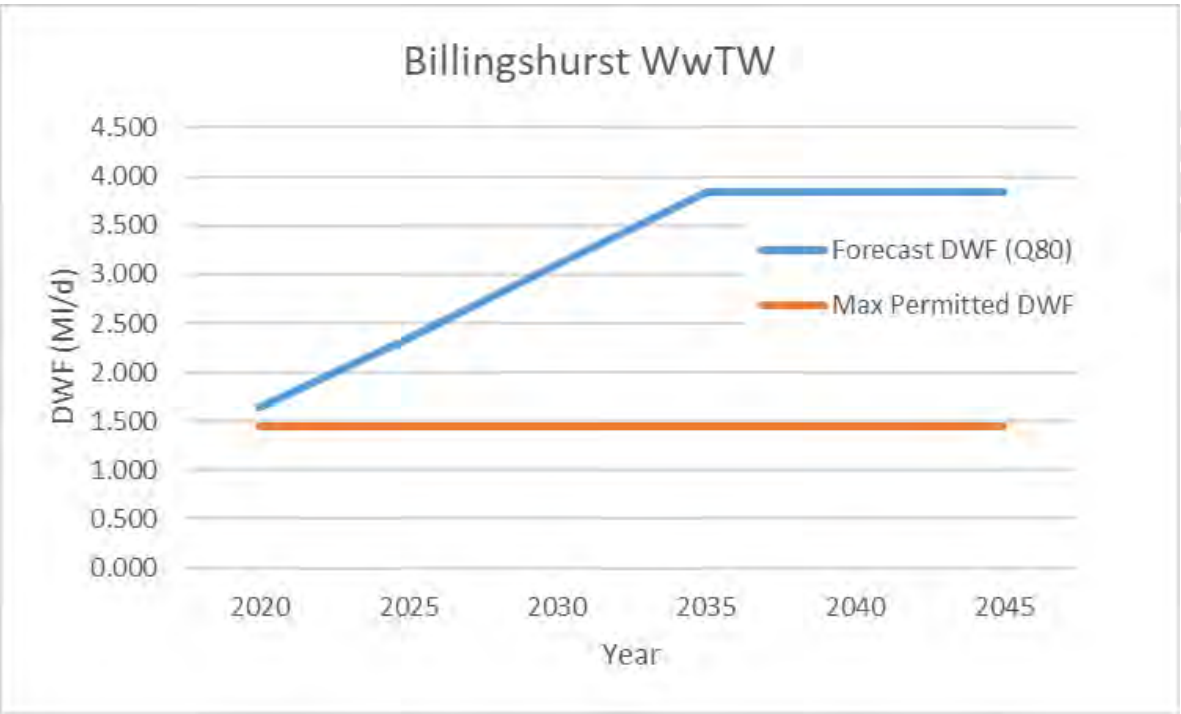


Figure 13.1 Flow Capacity Assessment for Billingshurst

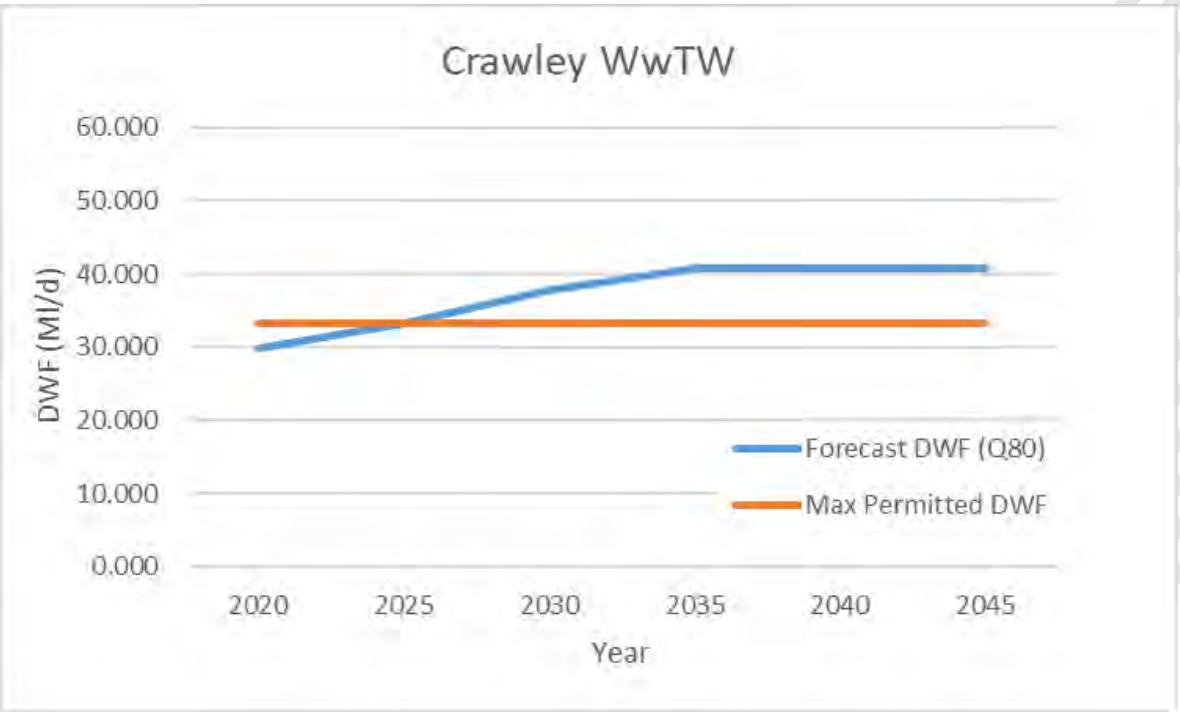


Figure 13.2 Flow Capacity Assessment for Crawley WwTW

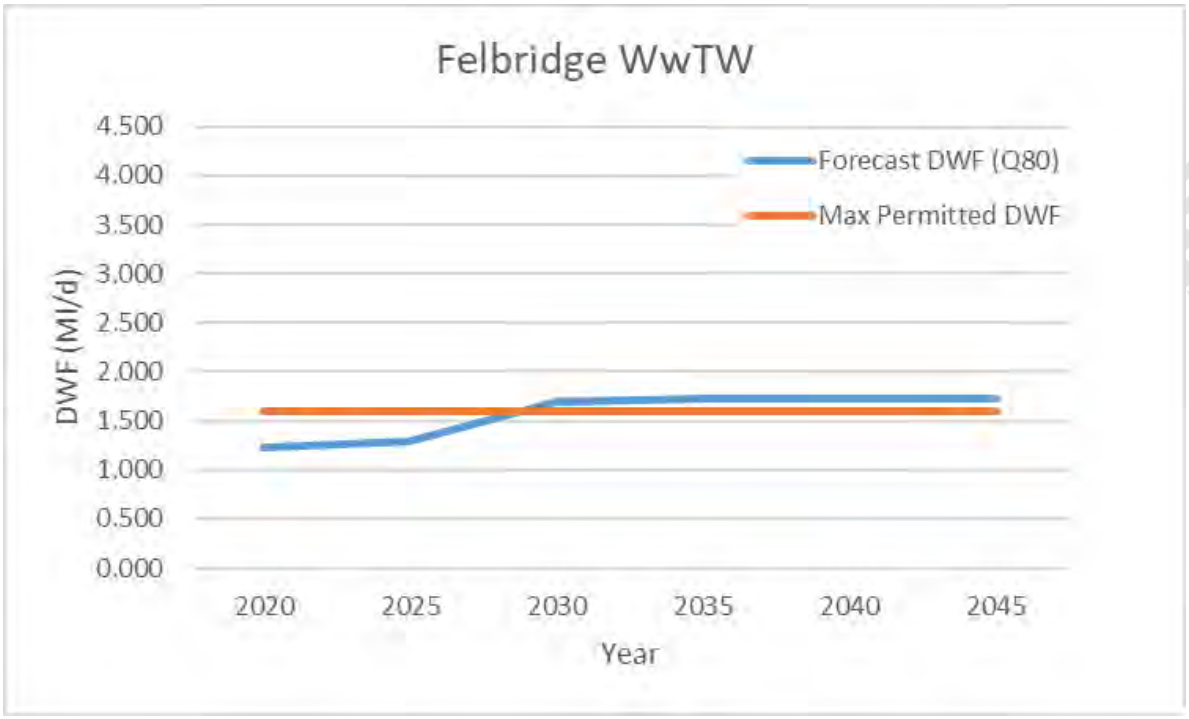


Figure 13.3 Flow Capacity Assessment for Felbridge WwTW

Figure 13.4 Flow Capacity Assessment for Goddards Green WwTW

Figure 13.5 Flow Capacity Assessment for Handcross WwTW

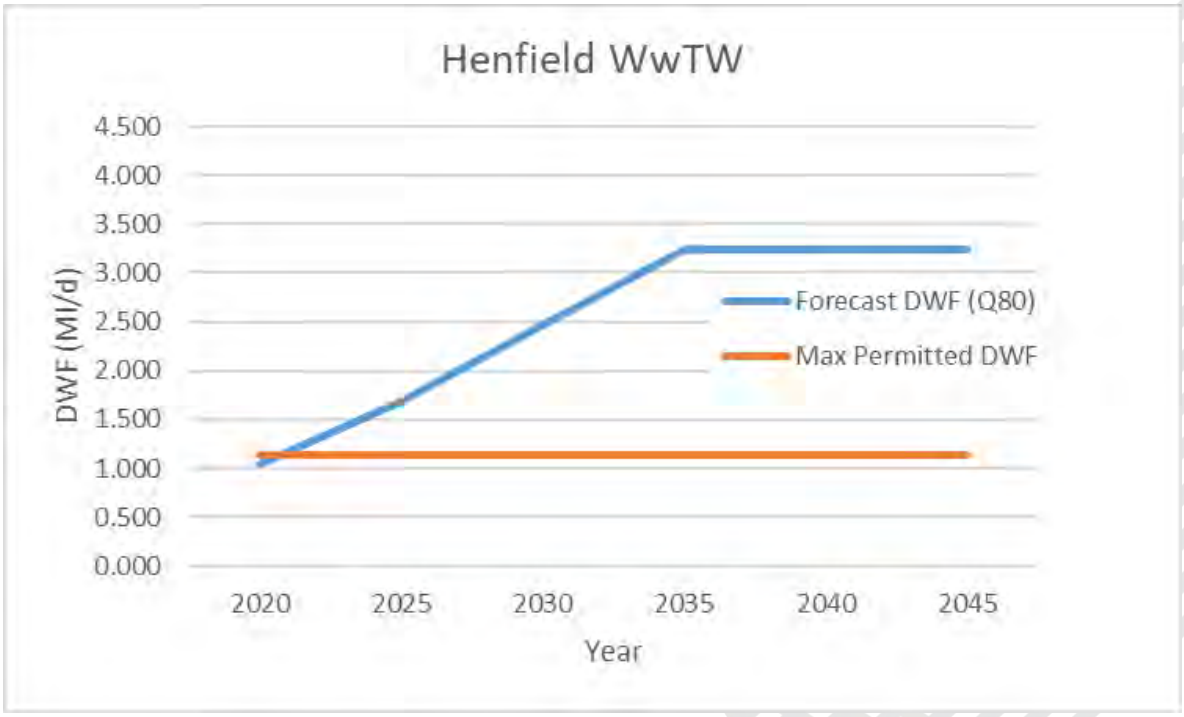


Figure 13.6 Flow Capacity Assessment for Henfield WwTW

Figure 13.7 Flow Capacity Assessment for Monks Gate

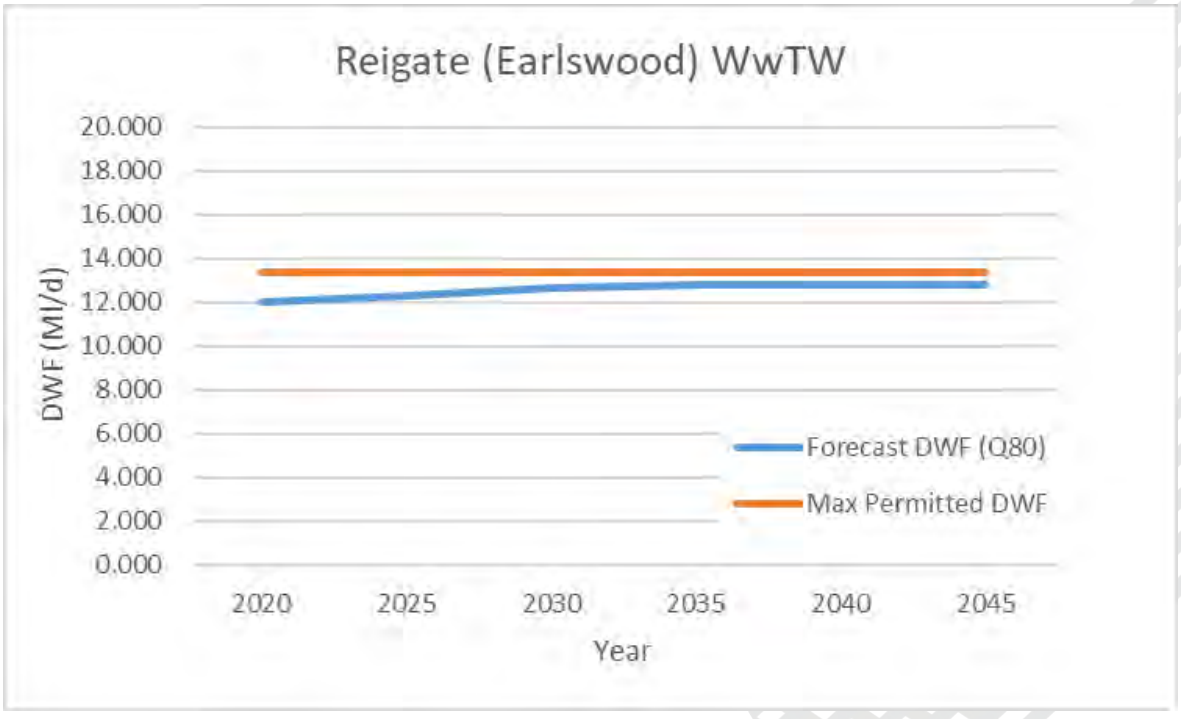


Figure 13.8 Flow Capacity Assessment for Reigate (Earlswood) WwTW

Suspect flow data for 2016 has been removed. With this data included the permit would be exceeded.

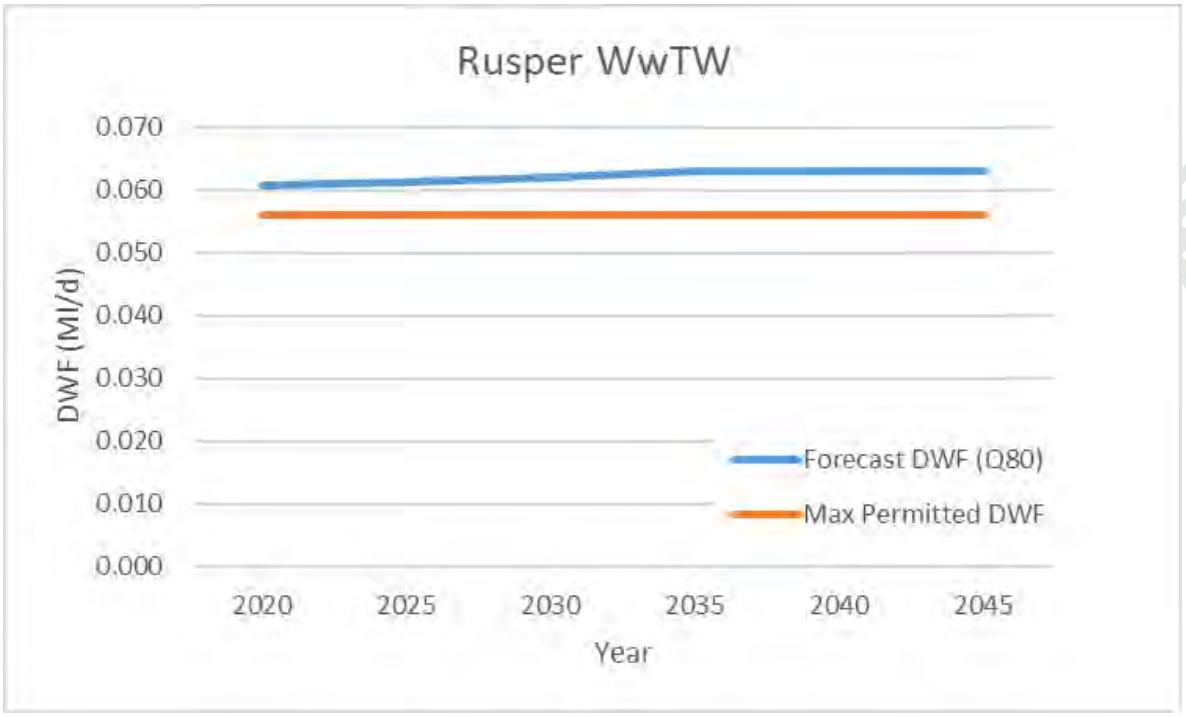


Figure 13.9 Flow Capacity Assessment for Rusper WwTW

Offices at

Coleshill
Doncaster
Dublin
Edinburgh
Exeter
Glasgow
Haywards Heath
Isle of Man
Limerick
Newcastle upon Tyne
Newport
Peterborough
Saltaire
Skipton
Tadcaster
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