Guildford Borough Council Water Quality Assessment

Stage 2 – Final Report

October 2017

Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
0	March 2017	Stage 2 - Interim Draft		Carl Pelling	Associate Director
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Table of Contents

Figures

Tables

List of Acronyms

AMP	Asset Management Plan
BAP	Biodiversity Action Plan
BGS	British Geological Society
BOD	Biochemical Oxygen Demand
CIRIA	Construction Industry Research and Information Association
CRC	Carbon Reduction Commitment
DEFRA	Department for Environment, Food and Rural Affairs
DWF	Dry Weather Flow
EA	Environment Agency
GBC	Guildford Borough Council
GI	Green Infrastructure
l/h/d	Litres/head/day (a water consumption measurement)
LCT	Limits of Conventional Treatment
LFE	Low Flow Enterprise (low flow model)
LNR	Local Nature Reserve
LPA	Local Planning Authority
NE	Natural England
NPPF	National Planning Policy Framework
OAHN	Objectively Assessed Housing Need
OFWAT	The Water Services Regulation Authority (formerly the Office of Water Services)
ONS	Office for National Statistics
OR	Occupancy Rate
P	Phosphorous
Q95	The river flow exceeded 95% of the time
RAG	Red/Amber/Green Assessment
RBMP	River Basin Management Plan
RoC	Review of Consents (under the Habitats Directive)
RQP	River Quality Planning (tool)
S106	Section 106 (Town and Country Planning Act 1990)
SAC	Special Area for Conservation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
TWUL	Thames Water Utilities Limited
UKTAG	United Kingdom Technical Advisory Group (to the WFD)
UWWTD	Urban Wastewater Treatment Directive
WFD	Water Framework Directive
WCS	Water Cycle Study
WQA	Water Quality Assessment
WwTW	Waste Water Treatment Work

Non-Technical Summary

The Borough of Guildford is expected to experience a significant increase in housing provision and economic growth over the period between 2013 and 2033. This growth represents a challenge in ensuring that both the water environment and water services infrastructure has the capacity to sustain this level of growth and development proposed.

This Guildford Borough Council Water Quality Assessment (WQA) forms an important part of the evidence base of the emerging Local Plan that will help to ensure that development does not have a detrimental impact on the water environment within the borough. The WQA will also help to guide development towards the most appropriate locations (with respect to water infrastructure and the water environment).

The WQA has assessed proposed future development with regards to wastewater infrastructure capacity and environmental capacity. Any water quality issues, associated water infrastructure upgrades that may be required and potential constraints have subsequently been identified and reported. This WQA then provides information at a level suitable to demonstrate that there are workable solutions to key constraints to deliver future development for major development sites (committed and potential allocations), including recommendations required to deliver it.

The WQA identifies that in total five Wastewater Treatment Works (WwTW) will serve the proposed future development across the Borough. The table below provides an indication of the WwTWs which have available capacity and those that are likely to require changes to environmental permits that control discharge and potentially infrastructure upgrades.

WwTW	Summary
Ash Vale	Limited flow capacity, therefore growth upgrades and careful development phasing will be required. Will also require treatment process upgrades using conventional and possibly non-conventional treatment technologies to meet river quality targets.
Godalming	Flow capacity available for planned growth within Guildford Borough, and current treatment processes are sufficient. Consideration of planned growth within neighbouring authorities and its impact on available capacity will be necessary for this WwTW.
Guildford	Flow capacity available for planned growth with some flow capacity available for growth beyond the plan period. Treatment process upgrades will be required using conventional treatment technologies to meet river quality targets.
Hockford	Flow capacity available for planned growth with some flow capacity available for growth beyond the plan period. Current treatment processes are sufficient.
Ripley	Flow capacity available for planned growth with some flow capacity available for growth beyond the plan period. Treatment process upgrades will be required using conventional treatment technologies to meet river quality targets.
Wisley	No planned growth within the Borough of Guildford, therefore capacity unaffected.

Three WwTWs (Ash Vale, Guildford and Ripley) do not currently have sufficient flow capacity and/or have insufficient treatment processes to accept all future development proposed within the plan period. Therefore solutions are required in order to accommodate the growth to ensure that the increased wastewater flow discharged does not impact on the current quality of the receiving watercourses, their associated ecological sites and also to ensure that the watercourses can still meet with legislative requirements.

Assessment Result: Green

The results from the headroom capacity assessment has shown that these WwTWs have capacity within their current discharge permits to accept the additional wastewater flows from proposed development, and therefore did not require any further assessment as part of the WQA.

Assessment Result: Amber

The detailed assessments have shown that improvements to Guildford and Ripley WwTWs are possible using wastewater treatment technologies currently available (conventional) for each phase of growth which would ensure the water quality targets in the River Wey can be achieved. This therefore demonstrates that an engineering solution is feasible and hence treatment capacity should not be seen as a barrier to growth at these WwTWs.

Ash Vale WwTW may, however, require advanced treatment technologies (non-conventional) to ensure future development can be accepted without significantly compromising water quality targets in the River Blackwater. Due to the nature of advanced treatment technologies, they may potentially be expensive and not sustainable in the long term. The proposed solution is a catchment based approach to assess the impact of all future development within the River Blackwater catchment proposed by all relevant local authorities, balancing technical and economic feasibility with environmental requirements and water quality objectives at each of the WwTW assets discharging to the river.

Alternative options which could also be considered in consultation with Thames Water Utilities Limited may include;

- investigating unconventional treatment technologies at Ash Vale WwTW,
- limiting growth until treatment technology improves,
- diverting wastewater flows to alternative WwTWs, or
- reducing planned growth within the Ash Vale WwTW catchment.

The phasing of developments draining to Guildford, Ripley and Ash Vale WwTWs should be discussed and agreed between Guildford Borough Council and Thames Water Utilities Limited to ensure no development occurs before the necessary upgrades are in place, and development is phased in line with Thames Water's asset management plans for these WwTWs.

Conclusion

The WQA has therefore concluded that feasible solutions are possible to ensure environmental conditions and legislative objectives are met. However, this WQA recommends that Guildford Borough Council, the Environment Agency, and Thames Water Utilities Limited work together to determine when solutions will need to be implemented in order to conclude the timing and quantity of development that can be accommodated across the Borough in the early phases of the emerging Local Plan delivery period.

To ensure that the planned level of development within the Plan period does not result in a negative impact upon wildlife both inside and outside of designated sites, it is recommended that Guildford Borough Council and Thames Water Utilities Limited use the results of this WQA to inform the emerging Plan and asset management plans respectively. By working together, this will ensure that as developments come online there is sufficient capacity available locally to ensure all objectives of the Water Framework Directive (WFD) continue to be met.

Recommendations

The WQA should also set out recommendations for what is required, when, and where in order to address any emerging issues from investigating the key questions. These recommendations must take account of the likely phasing of development, potential environmental impacts, and the availability of funding and future management arrangements to ensure that adverse impact on the water environment is minimised as a result of development arising from the Local Plan process.

In order to support the further development of Guildford Council's emerging Local Plan with respect to water services infrastructure and the water environment; the WQA provides a site specific assessment of the potential constraints on each of the proposed major development sites.

1. Introduction

Guildford Borough Council are currently progressing a New Local Plan 2013 – 2033 with submission to the Secretary of State planned prior to expected adoption by December 2017. The New Local Plan will include:

- 'Local Plan: strategy and sites' - sets out the vision, aims and strategy for the Borough up to 2033 including: allocating land for housing, employment, community facilities and other types of development.
- 'Local Plan: Development Management Policies' - sets out detailed development control policies to ensure sustainability and effective place-making.

The New Local Plan was consulted on during June and July 2016 with responses considered by the Council, in preparation for submission to the Secretary of State. The New Local Plan sets out the strategic policies and identifies strategic sites for housing, employment and supporting infrastructure required in the Borough up to 2033.

In line with the policy requirements of the National Planning Policy Framework (NPPF), Local Plans should consider wastewater and water quality concerns in relation to growth numbers and allocation sites they propose. With this in mind, the need for a Water Quality Assessment (WQA) has been identified to support the Council's New Local Plan. The WQA considers the capacity of wastewater treatment facilities to serve proposed new growth and potential effects on water quality as a result of discharge of treated wastewater.

A Stage 1 report was provided to Guildford Borough Council, setting out the baseline environmental condition of watercourses and the wastewater treatment infrastructure provision within the study area. A Stage 2 Interim draft report was then produced for the Council, presenting initial findings from the Stage 2 assessment of the preferred growth strategy to the Council providing an interim position in the Borough with respect to the effect of the preferred growth strategy on wastewater treatment, environmental water quality and potential for fundamental issues which may materially affect the Council's plan making process.

This report provides details of the outcome of the full Stage 2 assessments, demonstrating the potential impact of growth on wastewater treatment and water quality for stakeholder review and comment.

1.1 Study background

Guildford Borough Council was a partner in the Blackwater Valley Water Cycle Study (WCS) Scoping Report (published 2011) which formed part of the evidence base for the Council's current Local Plan (adopted 2003). The scoping WCS was completed together with neighbouring councils to gather relevant planning information and define likely discharge points and abstraction sources. However, the WCS scoping report was not progressed to a Phase 1 (Outline) study sufficient to support a Local Plan submission. In addition, the new Local Plan development targets across the Borough have changed and assessments within the 2011 WCS scoping study related to wastewater treatment and water quality need to be revisited.

Following consultation on the Proposed Submission Local Plan in June/July 2016, representation from Thames Water and the Environment Agency identified the requirement for further study related to water quality as part of the New Local Plan evidence base. Whilst a full WCS was deemed not required, significant concerns remained regards wastewater treatment capacity and environmental water quality within the waterbodies where wastewater is discharged. A WQA is therefore seen as the most appropriate scope of study to address these stakeholder concerns and to support the emerging Local Plan update.

1.2 Study scope

This WQA provides information at a level suitable to demonstrate that there are feasible wastewater treatment solutions to deliver growth for the preferred development allocations, including the policy required to deliver it. In so doing, it provides evidence that if delivered, these solutions will ensure no detriment to achieving legulsative water quality targets in the receiving environment.

The outcome is the development of a study for the Borough which informs the Councils new Local Plan, sustainability appraisals and appropriate assessments specific to the environment water quality and wastewater infrastructure issues as set out in the NPPF.

The following sets out the key objectives of the WQA:

- determine the impact of proposed growth on the receiving waterbodies in relation to legislative water quality targets as a result of increases in wastewater discharges;
- provide a strategy for wastewater treatment across the Borough which determines what solutions to wastewater treatment are required and whether or not the solutions are viable in terms of the provision of conventional treatment;
- describe how the wastewater treatment strategy might impact phasing of development;
- determine impact of infrastructure and mitigation provision on housing delivery phasing; and
- provide policy recommendations.

1.3 Key assumptions and conditions

1.3.1 Household occupancy rate and consumption

The latest Office for National Statistics (ONS) population projections[2] and household projections[3] have been used to determine the occupancy rate of each household coming forward in the plan period, and have been provided in Table 1-1 below.

Table 1-1: Calculation of Occupancy Rate

	Projection for 2033
Population	166,300
Number of households	66,723
Calculated Occupancy Rate (people per household)	2.49

Source: ONS

1.3.2 Wastewater treatment

The wastewater treatment provider for the Borough is Thames Water Utilities Limited (TWUL). TWUL own and operate several Wastewater treatment Works (WwTW) across the study are providing facilities to treat wastewater and return it safely to the environment. This process is regulated by the Environment Agency via the issuing of permits to discharge under the Environmental Permitting Regulations.

TWUL are required to use the best available techniques (defined by the Environment Agency as the best techniques for preventing or minimising emissions and impacts on the environment) to ensure emission limit values stipulated within each WwTWs permit conditions are met.

Through application of the best available technologies in terms of wastewater treatment, the reliable limits of conventional treatment (LCT) have been determined for the key parameters of Biochemical Oxygen Demand (BOD)[4], ammonia and phosphate, and are provided in Table 1-2.

Table 1-2: Reliable limits of conventional treatment technology for wastewater

Water Quality Parameter	LCT
Ammonia	1.0 mg/l 95 percentile limit[5]
BOD	5.0 mg/l 95 percentile limit
Phosphate	0.5 mg/l annual average[6]

[2] 2014-based Subnational Population Projections (ONS) (May 2016). Available at https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/bulletins/nationalpopulationprojections/2015-10-29
[3] 2014-based Household Projections to 2039 for England (ONS) (July 2016). Available at https://www.gov.uk/government/statistical-data-sets/live-tables-on-household-projections
[4] Amount of oxygen needed for the biochemical oxidation of the organic matter to carbon dioxide in 5 days. BOD is an indicator for the mass concentration of biodegradable organic compounds
[5] Considered within the water industry to be the current LCT using best available techniques
[6] Environment Agency (2015) Updated River Basin Management Plans Supporting Information: Pressure Narrative: Phosphorus and freshwater eutrophication

1.4 Report structure

Section 2 of this document sets out in more detail the need for the study and the main study drivers. Section 3 provides the growth context and outlines the total proposed number of dwellings which will need to be catered for in terms of wastewater treatment. Section 4 provides an assessment of the current wastewater treatment facilities in regards to both capacity and compliance with legislation and environmental permits. Section 5 provides the detailed assessment of water quality impacts and infrastructure requirements as a result of wastewater capacity and growth implications.

Whilst sections 2 to 4 cover the Borough wide assessment of growth, the report also covers the proposed major development sites (defined as having more than 10 dwellings) in more detail (Section 6), assessing site specific water environment constraints by identifying local receptors such as watercourses, and outlining current and future flood risks (inclusive of surface water and groundwater flood risks).

2. Study drivers

There are two key overarching drivers shaping the direction of the WQA as a whole:

a. Delivering sustainable water management – ensure that provision of wastewater infrastructure and mitigation is sustainable and contributes to the overall delivery of sustainable growth and development and that the Local Plan meets with the requirements of the NPPF with respect to wastewater and water quality; and

b. Water Framework Directive (WFD) compliance – to ensure that growth, through abstraction of water for supply and discharge of treated wastewater, does not prevent waterbodies within the Borough (and more widely) from achieving the standards required of them as set out in the WFD River Basin Management Plans (RBMPs).

A full list of the key legislative drivers shaping the study is detailed in a summary table in Appendix B for reference. However, it is important to note that the key driver for this study is WFD compliance.

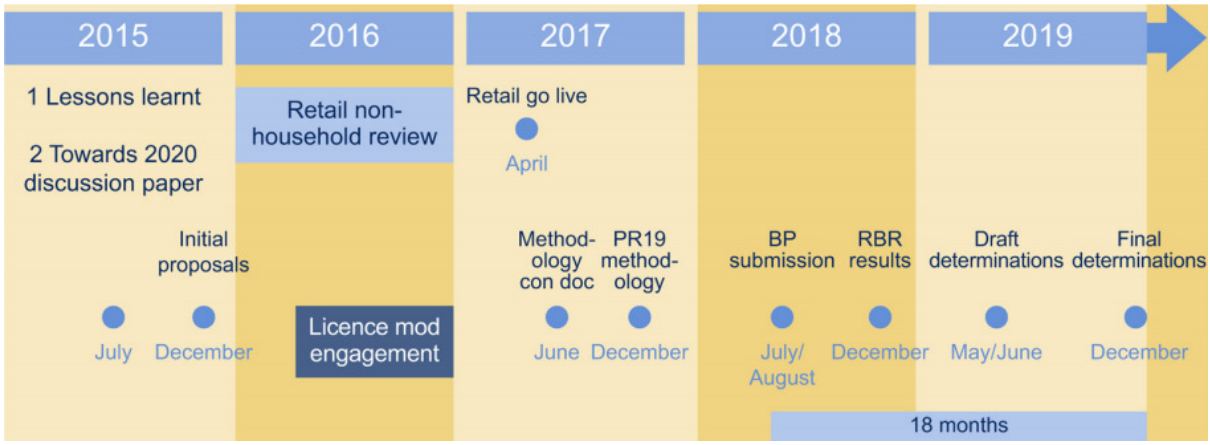
Other relevant studies that have a bearing on the provision of water services infrastructure for development are provided in Appendix A and include, but are not limited to, key documents including the Guildford Borough Council SFRA Update (Capita 2016).

2.1 OFWAT Price Review

The price review is a financial review process governed by the Water Services Regulatory Authority (Ofwat) - the water industry's economic regulator. Ofwat determines the limits that water companies can increase or decrease the prices charged to customers over consecutive five year periods.

Figure 2-1 summarises the timescale in the build up towards the next price review. The price limits for the next period (2020 to 2025) will be set at the end of 2019 to take effect on 1st April 2020 and is referred to as Price Review 19 (PR19). Each water company will submit a Business Plan (BP) for the next period which will be assessed by Ofwat, before being agreed. Price limit periods are referred to as AMP (Asset Management Plan) periods, with the current AMP period being referred to as AMP6.

Figure 2-1: Proposed timescales for PR19 (Water 2020) programme[7]



As the wastewater undertaker for the Borough, TWUL has a general duty under Section 94 of the Water Industry Act 1991 to provide effectual drainage which includes providing additional capacity as and when required to accommodate planned development. However this legal requirement must also be balanced with the price controls as set by the regulatory body Ofwat which ensure TWUL has sufficient funds to finance its functions, and at the same time protect consumers' interests. The price controls affect the bills that customers pay and the sewerage services consumers receive, and ultimately ensure wastewater assets are managed and delivered efficiently.

Consequently, to avoid potential inefficient investment, TWUL generally do not provide additional infrastructure to accommodate growth until there is certainty that development is due to come forward.

[7] Water 2020: Regulatory framework for wholesale markets and the 2019 price review (December 2015)

2.2 Water Framework Directive

The environmental objectives of the WFD, as published in the Environment Agency's RBMPs and relevant to this WQA are:

- to prevent deterioration of the status of surface waters and groundwater,
- to achieve objectives and standards for protected areas, and
- to aim to achieve good status for all water bodies or, for heavily modified water bodies and artificial water bodies, good ecological potential and good surface water chemical status.

These environmental objectives are legally binding, and all public bodies should have regard to these objectives when making decisions that could affect the quality of the water environment. The Environment Agency publish the status and objectives of each surface waterbody on the Catchment Data Explorer[8], and describe the status of each waterbody as detailed in Table 2-1. The Environment Agency is the competent Authority for the delivery of the WFD and its objectives in England.

Table 2-1: Description of status in the WFD

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

Source: Environment Agency RBMPs

2.3 Local Plan consultation responses

All Local Authorities have the duty to cooperate under the Localism Act 2011, throughout the planning process which includes consultation on Guildford Borough Councils Local Plan 2013-2033: Strategy and Sites. To this end, Guildford Borough Council commissioned a consultation on the draft local plan from 6th June to 18th July 2016. This section summarises the consultation responses with reference to wastewater only.

2.3.1 Thames Water

TWUL is the statutory sewerage undertaker for the whole of the Borough. The submission response noted the New Local Plan would benefit from developing policies further around:

- The provision of infrastructure for wastewater as required under the NPPF;
- Assessing the quality and capacity of infrastructure for wastewater and its treatment, taking into account the need for strategic infrastructure;
- Ensuring developers demonstrate there is adequate wastewater capacity and surface water drainage to serve the existing development, including the avoidance of problems for existing or new users;
- Inclusion of the need for developers to fund studies to identify if proposed developments may overload the existing wastewater or sewerage infrastructure; and
- Ensuring the timely identification of development sites which may exceed sewerage and wastewater infrastructure capacity, and the inclusion of planning conditions attached to developments which may require an upgrade.

[8] http://environment.data.gov.uk/catchment-planning/

TWUL made specific reference to Policy A24, the Slyfield Area Regeneration Project, in Guildford. If progressed, this project would require relocation of the Guildford (Slyfield) WwTW to facilitate development of the site. TWUL confirmed in principle its support for relocation of the WwTW, in the form of a new WwTW, noting the importance of detailed technical and feasibility assessments in conjunction with the Council.

2.3.2 Environment Agency

The Environment Agency response noted a number of concerns with the New Local Plan in its present form, specifically with reference to wastewater:

- The New Local Plan was found not to be consistent with the NPPF, paragraph 109, with reference to wastewater capacity issues and the potential impact on water quality and so was classified as unsound;
- Within the draft Infrastructure Delivery Plan (IDP) there was no evidence focused on environmental capacity and water quality, specifically with reference to sewerage infrastructure needs and impact on the WFD;
- The Environment Agency noted that the smaller allocated sites anticipated to be built within the first five years of the plan might be built in advance of sufficient funding and infrastructure being in place, which would be inconsistent with paragraph 177 of the NPPF; and,
- To overcome these challenges the Environment Agency recommended the completion of a Water Cycle Study or equivalent assessment to assess the impacts on water quality and WFD objectives of proposed growth during the plan period to 2033.

3. Proposed growth

The purpose of the WQA is to assess the potential impact of increased development upon wastewater treatment and environmental water quality across the Borough and to address concerns raised by stakeholders in the consultation of the emerging Local Plan.

The increased development is to accommodate the minimum housing requirement for the Council to the end of the plan period. This level of projected growth has required the Council to revise their spatial approach of future expected development up to 2033. These growth figures therefore form the basis for the WQA.

3.1 Housing

The OAHN Study for the Guildford Borough identified a significant number of dwellings would be required in the Borough from 2013 to 2033. This target will be met under the new Local Plan which sets out the strategy for the growth of the Borough from 2013 to 2033.

The WQA incorporates all proposed major development sites across the Borough at differing stages of development which have been put forward to meet this target, including;

- Committed developments (with planning permission, under construction);
- Outstanding commitments (with planning permission, construction not yet started);
- Current allocations (without full planning permission); and,
- Proposed allocations (no planning permission).

Table 3-1 provides an overview of the number of dwellings to be built within the plan period and which have been assessed as part of the WQA.

Table 3-1: Guildford Borough Council Housing Commitments and Allocations

Type of Site	No. Dwellings	Included within assessment
Completed developments (2015-16)	521	Excluded
Committed developments	447	Included
Outstanding commitments	1,101	Included
Proposed allocations	10,915	Included
Total dwellings	**12,984**	

Completed developments (approximately 1,000) have not been included within the assessments, as it has been assumed that wastewater flow from these houses are already factored into the baseline estimates of wastewater flow used in the assessment. All other housing proposals (included committed) have been included.

3.2 Phases of growth

Growth across the plan period (up to 2033) has been assessed in three 'phases' as provided by the Council. This growth has then been assigned to the WwTW which is likely to receive wastewater from the growth. The quantity of growth per phase at each WwTW has been provided in Table 3-2.

Table 3-2 Number of new dwellings per phase of growth at WwTWs

WwTW	Number of new dwellings		
	Phase 1 (2018 – 2022)	Phase 2 (2023 – 2027)	Phase 3 (2028 – 2033)
Ash Vale	1,176	450	369
Guildford	1,551	2,281	2,980

Ripley	1,310	873	1,020

3.3 Employment

The WQA has also taken account of the projected increase in employment across the Borough up to 2033; a total of approximately 3,200 new jobs.

A percentage of the projected employment growth has been assigned to each of the allocated employment sites, based on the size (square metres) of each site (i.e. the larger the site, the greater the proportion of full time employment jobs allocated), as shown in Table 3-3.

Table 3-3 Employment growth within the Borough

Site ID	Allocation Ref	Total Industrial and Office (sq. m)	% Employment Land	Estimated no. jobs
245	A24	6500	10%	325
46	A25	12500	20%	624
311	A26	31000	48%	1549
53	A35	5000	8%	250
8	A9	2056	3%	103
152	-	7000	11%	350

To align with the phasing of housing development as indicated in Section 3.2 the phasing of employment growth has been assumed for the purposes of this WQA and the employment sites assigned to the nearest WwTW likely to receive wastewater from the site. Table 3-4 provides a summary of the assumed employment growth per phase of growth per WwTW.

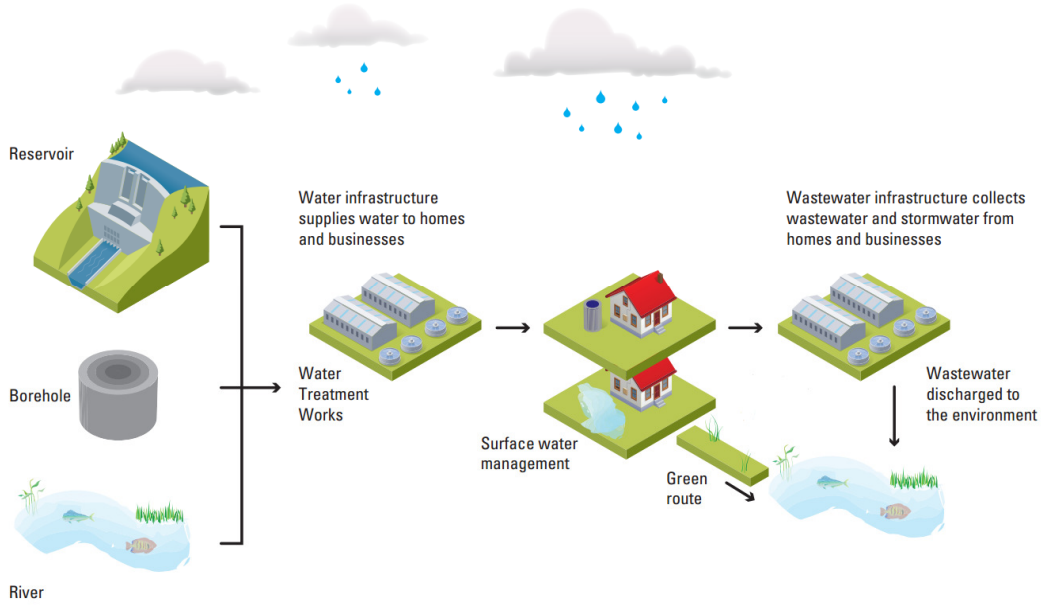
Table 3-4 Number of new jobs per phase of growth per WwTW

WwTW	Number of new jobs		
	Phase 1 (2018 – 2022)	Phase 2 (2023 – 2027)	Phase 3 (2028 – 2033)
Ash Vale	0	0	0
Guildford	867	867	867
Ripley	200	200	200

4. Wastewater treatment

4.1 Wastewater treatment in the Borough

Figure 4-1: The water environment and infrastructure components[9]



A broad overview of the interaction between the water environment and water and wastewater infrastructure is illustrated in Figure 4-1. Wastewater is generally produced following the use of potable water in homes, businesses, industrial processes and in certain areas can include surface water runoff (where sewerage networks are combined foul and surface water).

The administrative area of Guildford Borough Council covers Guildford town centre in addition to the settlements of Ripley, West Horsley, East Horsley, East Clandon, Shere, Albury, Chilworth, Compton, Onslow, Tongham, Ash Vale, Pirbright and Seale.

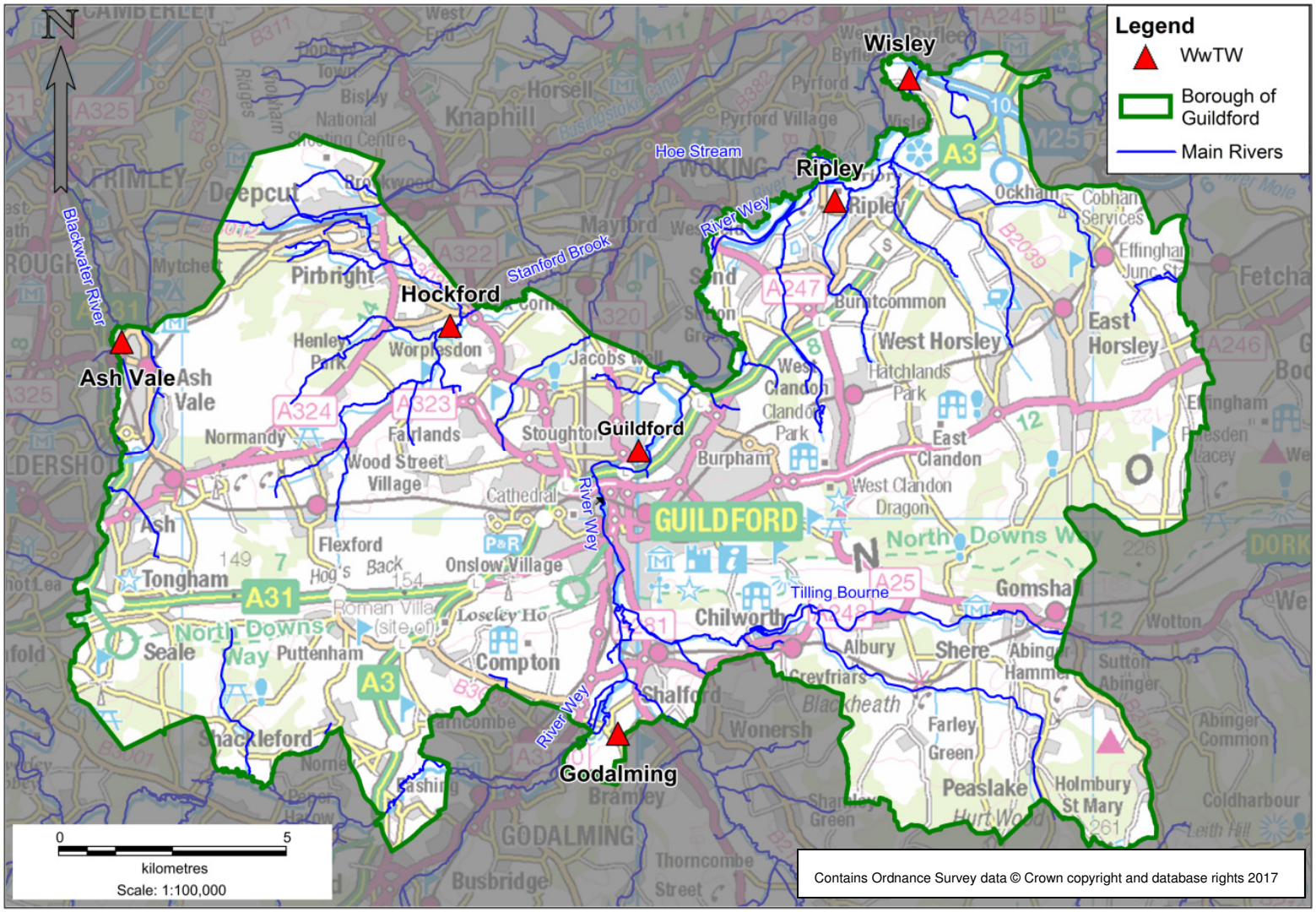
Wastewater treatment in the Borough is provided via WwTWs operated and maintained by TWUL, ultimately discharging treated wastewater to nearby fluvial watercourses. Wastewater from the Borough is treated at six WwTWs which fall in the Guildford's administrative boundary:

- Ash Vale;
- Godalming;
- Guildford;
- Wisley;
- Hockford; and
- Ripley.

Figure 4-3 illustrates Guildford Borough Council's administrative boundary, as well as the main settlements, the location of the six WwTWs and the key watercourses in the study area.

[9] Adapted from the Sustainable Urban Drainage Scottish Working Party's Water Assessment and Drainage Assessment Guide (2016)

Figure 4-2: Study area, incuding location of WwTWs, key settlements and watercourses



4.2 Management of WwTW discharge permits

All WwTWs are issued with a permit to discharge by the Environment Agency, which sets out conditions on the maximum volume of treated wastewater that it can discharge and also limits on the quality of the treated discharge. These limits are set in order to protect the water quality and ecology of the receiving waterbody.

4.2.1 Flow condition

The flow element of the discharge permit, measured as Dry Weather Flow (DWF)[10], determines an approximation of the maximum number of properties that can be connected to a WwTW catchment. When discharge permits are issued, they are generally set with a flow 'headroom', which acknowledges that allowance needs to be made for future development and the additional wastewater generated. This allowance is referred to as 'permitted headroom'.

This headroom therefore determines how many properties can be connected to the WwTW before a new discharge permit would need to be considered.

4.2.2 Quality conditions

The quality conditions applied to the discharge permit are derived to ensure that the water quality of the receiving waterbody is not adversely affected in terms of concentration of physico-chemical elements such as ammonia, Biological Oxygen Demand (BOD) and phosphate. However, not all WwTW discharge permits are set to equate to maintaining the current WFD status of the receiving waterbody due to the discharge permits being issued prior to the implementation of the WFD. Consequently, some discharge permits, if operated to the full flow limit (i.e. all permitted headroom has been used), could lead to a significant deterioration in water quality and possibly WFD status.

An assessment needs to be undertaken to determine what new quality conditions would need to be applied to the discharge under the following circumstances:

- When a new or revised discharge permit is required, or
- When a new or revised discharge permit is not required, but a significant quantity of development is proposed to connect to a WwTW.

If the quality conditions remain unchanged, the increased flow of wastewater received at the WwTW would result in an increase in the pollutant load[11] of some substances being discharged to the receiving waterbody. This may have the effect of deteriorating water quality and hence in most cases, an increase in permitted discharge flow results in more stringent (or tighter) conditions on the quality of the discharge.

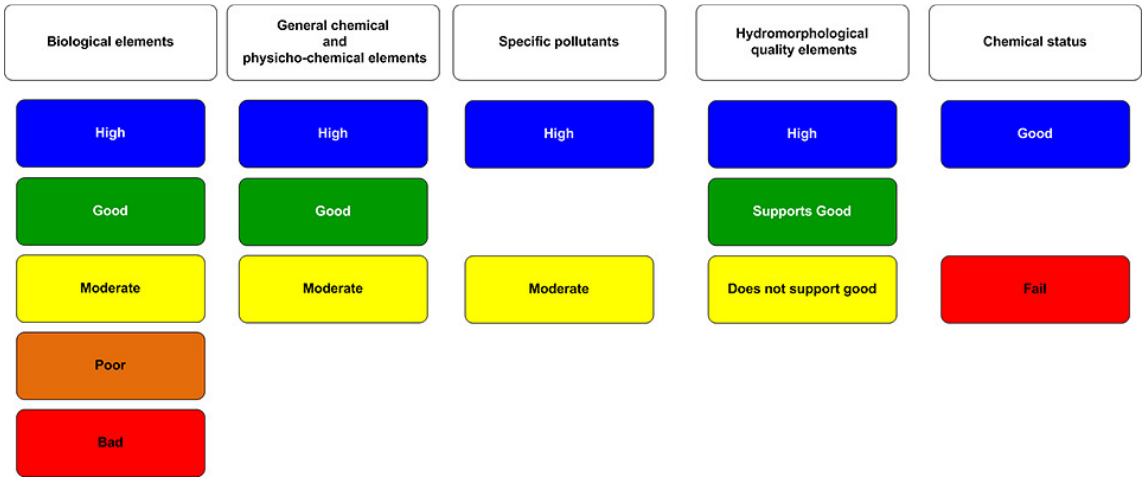
The requirement to provide a higher standard of treatment may result in an increase in the intensity of treatment processes at a WwTW, which may also require improvements or upgrades to be made to the WwTW to allow the new conditions to be met. In some cases, it may be possible that the quality conditions required to protect water quality and ecology are not achievable with conventional treatment processes and as a result, this WQA assumes that a new solution would be required in this situation to allow growth to proceed.

4.3 WFD compliance

The definition of a waterbody's overall WFD 'status' is a complex assessment that combines standards for chemical quality and hydromorphology (habitat and flow conditions), with the ecological requirements of an individual waterbody catchment. A waterbody's 'overall status' is derived from the classification hierarchy made up of 'elements', and the type of waterbody will dictate what types of elements are assessed within it. Figure 4-3 illustrates the classifications applied within the hierarchy.

[10] DWF is an estimate of the measure of the flow of to a WwTW which is not made up of rainfall.
[11] Concentration is a measure of the amount of a pollutant in a defined volume of water, and load is the amount of a substance discharged during a defined period of time.

Figure 4-3: WFD status classifications used for surface water elements



The two key aspects of the WFD relevant to the wastewater assessment in this WQA are the policy requirements that:

- Development must not cause a deterioration in WFD water body status (of WFD element status) or waterbody sampling point; and
- Development must not prevent a waterbody (or WFD element) from achieving its future target status (default Good status).

Deterioration is an important term to define. For example, if a waterbody's overall status is less than Good as a result of another element, it is not acceptable to justify a deterioration in another element because the status of a waterbody is already less than Good. All quality elements must be protected from deterioration even where the overall water body status would not change. In light of a ruling by the European Court of Justice (The Weser Ruling) relating to a WFD assessment, any deterioration in an element classified as Bad is to be considered a deterioration in the context of the objectives of the WFD.

4.4 European ecological legislation

In addition to the WFD requirements, other European Directives (namely the Habitats Directive and Birds Directive) designate sites for the ecological importance, and many of these sites are water dependent and/or are water bodies directly designated under the associated regulations.

The Habitats Directive and the Habitats Regulations have designated some sites as areas (referred to as Special Areas of Conservation or SAC) that require protection in order to maintain or enhance the rare ecological species or habitat associated with them. In addition, the Birds Directive has designated sites as Special Protection Areas (SPAs) classified for rare and vulnerable birds (as listed on Annex I of the Directive), and for regularly occurring migratory species.

A retrospective review process has been on-going since the translation of the Habitats Directive and Birds Directive into UK regulations called the Review of Consents (RoC). In relation to water dependent sites, the RoC process requires the Environment Agency to consider the impact of the abstraction licences and discharge permit it has previously issued on sites which became protected (and hence designated) under the regulations.

If the RoC process identifies that an existing licence or permit cannot be ruled out as having an impact on a designated site, then the Environment Agency are required to either revoke or alter the licence or permit. As a result of this process, restrictions on some discharge permits have been introduced to ensure that any identified impact on downstream designated sites is mitigated. Although the Habitats and Birds Directives do not directly stipulate conditions on discharge, the associated regulations can, by the requirement to ensure no detrimental impact on designated sites, require restrictions on discharges to (or abstractions) from water dependent habitats that could be impacted by anthropogenic manipulation of the water environment.

Whilst this WQA is not designed to undertake a full impact assessment of likely significant effects on relevant protected sites, any development conforming to Local Plan policies must undertake project level appropriate assessment where necessary. The specific relevance to the WQA is that some water-dependent sites have specific water quality standards and where these are relevant for an SAC or SPA, a WQA must demonstrate that

these targets (in addition to the WFD targets) will not be compromised by growth so as to inform the relevant Appropriate Assessment of the Local Plan.

4.4.1 Designated site screening

A high level screening exercise has been undertaken for this WQA. The only SAC site that is geographically close to the study area is Thursley, Ash, and Pirbright & Chobham SAC. This internationally designated site does not receive surface water from watercourses which are likely to receive wastewater discharge from development. In addition, its features for designation are not sensitive to changes in water quality that could be associated with wastewater discharges. Therefore, it has been screened out as needing specific water quality assessment.

The only SPA with some potential for linkage with wastewater discharges from growth is the Thames Basin Heaths SPA (a composite site across Surrey, Hampshire and Berkshire). The River Wey (receiving discharges from several WwTW in the study area) flows in proximity to individual site components of the SPA north of Guildford and at Wisley. Whilst these sites support important heathland habitats that in turn support internationally important bird populations, it is very unlikely that the wet heath within these sites is maintained by riverine inundation, and is more likely to be reliant on perched groundwater levels or surface runoff. Therefore, SPAs sites have been screened out as needing specific water quality assessment.

Due to the need to consider specific water quality targets for European designated sites, the WQA has therefore focused on compliance with the WFD standards and objectives.

4.5 Water quality assessment overview

4.5.1 Objectives

An increase in residential and employment growth will have a corresponding increase in the volume and flow of wastewater generated within the Borough and hence it is essential to consider both the infrastructure capacity to treat the wastewater and the environmental capacity of the waterbodies to accept the additional treated flow without affecting water quality objectives.

4.5.1.1 Infrastructure capacity

Infrastructure capacity is defined in this WQA as the ability of the wastewater infrastructure to collect, transfer and treat wastewater from homes and businesses. The objectives to be answered by the assessment are:

- Is there sufficient treatment capacity within the existing wastewater infrastructure treatment facilities (WwTWs)?
- Will new infrastructure be required to accept the additional wastewater flows and to provide sufficient wastewater treatment?

4.5.1.2 Environmental capacity

Environmental capacity is defined in this WQA as the water quality needed in the receiving waterbodies to maintain the aquatic environment and its wildlife. The objectives to be answered by the assessment are:

- Will development cause greater than a 10% deterioration in water quality from the current baseline? Can a feasible solution be implemented to limit deterioration to 10%? This is an aspirational target set by the Environment Agency to ensure that all the environmental capacity is not taken up by one phase of development and there is remaining environmental capacity for future development beyond the plan period.
- Will development cause a deterioration in WFD status of any element in the receiving waterbody?
- Where a receiving waterbody's current status is less than 'Good', could development alone prevent the receiving waterbody from achieving its future target Status or Potential? This can be separated into the following two assessments:
  - Is the future target status technically possible *now* with current technology (pre-development)? This step determines if it is limits in current technology that would prevent the future target status being achieved.
  - Is the future target status technically possible post-development? This step determines if it is growth that would prevent the future target status being achieved.

4.5.2 Methodology

4.5.2.1 WwTW headroom assessment

This assessment is a scoping exercise to determine which WwTW's will require water quality assessment as a result of development. A WwTW flow headroom calculator has been developed and the outcome of its use reported in Section 5.

The first step identifies which WwTWs within the Borough will receive development and the quantity of development in order to determine the additional wastewater flow generated at each WwTW. The remaining permitted flow headroom at each WwTW is then calculated. In addition, the quantity of growth has also been compared against the calculated population equivalent (PE)[12] of each WwTW[13]. A detailed explanation of this methodology is provided in Appendix C.

The scoping criteria detailed in Table 4-1 have therefore been applied to determine whether the quantity of growth will trigger the requirement for a WwTW to undergo a water quality assessment and subsequent review of its current discharge permit.

Table 4-1: WwTW Headroom Assessment scoping criteria

Scope In for WQ assessment	Scope Out
WwTWs where permitted flow headroom capacity is exceeded as a result of growth	-
WwTWs which are already at or exceed their permitted flow headroom capacity and will also receive additional flow from growth	WwTWs which are already at or exceed their permitted flow headroom capacity but do not receive any additional flow from growth
WwTWs which remain within their permitted flow headroom capacity but the PE of growth is >=10% of the WwTW's calculated PE as monitored by the Environment Agency	WwTWs which remain within their permitted flow headroom capacity but the PE of growth is <10% of the WwTW's calculated PE

4.5.2.2 Water quality modelling

Modelling scenarios have been developed in line with the objectives listed in Section 4.5.1 in order to assess environmental capacity and ensure compliance with water quality objectives. The modelling scenarios are:

- Maintaining the current quality of the receiving waterbody (i.e. no change from the current quality),
- Limiting deterioration to 10% of the current river quality baseline (where technically and economically feasible),
- Ensuring no deterioration in status, and
- Achieving the future target status.

In order to complete each modelling scenario, River Quality Planning (RQP) software (as used by the Environment Agency) has been applied to determine the required ammonia and phosphate quality conditions for each WwTW.

Load standstill calculations have been used to determine the BOD quality conditions required to maintain the current quality of the discharge as flows increase. This has been applied for all WwTWs requiring water quality assessment. The calculation does not require river quality or discharge quality monitoring data and is considered a suitable approach for this WQA given the lack of up to date BOD monitoring data.

SIMCAT software (as used by the Environment Agency) has specifically been applied to model ammonia and phosphate quality at a catchment scale in the River Blackwater, which receives multiple WwTW discharges. SIMCAT is capable of assessing the cumulative effect of multiple discharges and ensure compliance with water quality objectives.

[12]Defined in the Urban Waste Water Treatment Directive (UWWTD) (91/271/EEC) as the biodegradable load (matter) in wastewater having a 5-day biochemical oxygen demand (BOD) of 60g oxygen per day, equivalent to the approximate load from one person. It should also be noted that population equivalent doesn't necessarily reflect the actual population of a community as a proportion of the total load may be from commercial/industrial trade effluent.
[13] Collected by the Environment Agency as part of UWWTD monitoring data

4.5.3 Water quality assessment results

The results for each WwTW assessment are presented in a Red/Amber/Green (RAG) assessment for ease of planning reference. The RAG code refers broadly to the following categories;

- **Green**: water quality objectives will not be adversely affected. Growth can be accepted with no changes to the WwTW infrastructure or quality permit required.
- **Amber**: in order to meet the required water quality objectives, changes to the quality permit are required, and upgrades may be required to WwTW infrastructure which may have phasing implications.
- **Red**: in order to meet water quality objectives changes to the quality permit are required which are beyond the limits of what can be achieved with conventional treatment.

5. WwTW headroom assessment

The volume of wastewater, measured as DWF, which would be generated from the proposed housing and employment growth over the plan period within each WwTW catchment has been calculated and assessed against the permitted flow headroom capacity at each WwTW.

In assigning growth sites to WwTW catchments, it is concluded that no development is planned within the Wisley WwTW catchment. Therefore, no assessment of capacity was required in relation to Wisley WwTW or the receiving waterbody. A summary of the headroom capacity assessment for the remaining five WwTWs summarised in the following sub-sections.

5.1.1 Available permitted headroom

The growth proposed within these WwTW catchments is not considered to be significant (equal to or less than 10% of the current population equivalent of the receiving WwTWs) and can be accepted within the current permitted headroom of the WwTWs current flow permit. On this basis, it has been assumed that the ammonia, BOD and phosphate quality conditions on the current discharge permit are sufficient to ensure there is no significant deterioration in water quality.

Consequently, there is considered to be no barrier in terms of wastewater infrastructure capacity or environmental capacity in the receiving waterbodies to deliver the proposed quantity of growth within the catchments of;

- Godalming WwTW; and
- Hockford WwTW.

5.1.2 Significant growth

Significant growth has been defined as the quantity of development within a WwTW catchment which would be equal to or greater than 10% of the current population equivalent of the receiving WwTWs. This is due to certain WwTW discharge permits having flow headroom capacity, but if operated to their full permitted discharge volumes (i.e. all permitted headroom is used up by growth), there is a high risk of significant deterioration in water quality and potentially a deterioration in WFD status.

The WwTWs which have been identified as receiving significant growth, as defined above, are;

- Guildford WwTW;
- Ripley WwTW; and,
- Ash Vale WwTW.

To ensure that the significant quantity of growth proposed within these WwTW catchments and the use of available permitted headroom does not impact on downstream water quality objectives, these WwTWs have been scoped in for the water quality assessment to determine whether theoretically achievable quality conditions for ammonia, BOD and phosphate can be applied to revised discharge permits.

5.1.3 No available permitted headroom

The calculations of flow headroom capacity found that Ash Vale WwTW would not have sufficient headroom for all the proposed growth within the WwTW catchment. Ash Vale WwTW would exceed its maximum permitted DWF under its existing discharge permit within the first phase of growth, and a revised discharge permit with an increase in permitted DWF would be required to accommodate the additional flows from growth.

To ensure that an increase in permitted DWF would not impact on water quality objective, water quality modelling has been undertaken to determine whether theoretically achievable quality conditions can be applied to revised discharge permits.

5.1.4 Summary

The WwTW headroom assessment has identified three WwTWs, as highlighted in Table 5-1 which will require water quality assessment to determine whether theoretically achievable quality conditions can be applied to future revisions to discharge permits in order to meet the water quality objectives of the receiving waterbodies.

The results of the water quality modelling are provided in Section 6, with detailed results from the modelling provided in Appendix C.

Table 5-1: WwTW headroom capacity assessment

	Headroom Assessment							Significant Growth		Outcome
WwTW	Measured DWF (m3/d)	DWF Permit (m^3/d)	Available Headroom (m^3/d)	Quantity of dwellings	DWF post growth (m^3/d)	Headroom Capacity post growth (m^3/d)	Approx. residual capacity (dwellings)	Current PE	PE of growth as % of Current PE	
Godalming	6,909	8,749	1,840	136	6,951	1,798	4,508	33,171	1%	Available permitted headroom, but growth not significant: scoped out for water quality assessment
Hockford	3,865	6,275	2,860	272	3,950	2,325	5,831	16,353	4%	
Guildford	20,685	26,254	5,569	6,812	22,849	3,405	8,539	99,019	17%	Available headroom but significant growth: scoped in for water quality assessment
Ripley	4,935	8,296	3,334	3,203	5,942	2,354	5,902	17,240	46%	
Ash Vale	5,828	6,134	306	1,995	6,450	-316	-791	16,279	31%	No permitted headroom – scoped in for water quality assessment

6. Water quality assessment

The WwTWs identified in Section 5 as requiring water quality modelling are:

- Guildford WwTW;
- Ripley WwTW; and,
- Ash Vale WwTW.

Statistical-based water quality modelling is required for each of these WwTWs to determine the discharge permit quality conditions required to ensure compliance with the water quality objectives. Consultation with the Environment Agency has determined the modelling requirements which are outlined in detail in Appendix C.

6.1 Guildford WwTW

RQP modelling has been applied to determine the impact of growth and the required permit quality conditions for ammonia and phosphate. Load standstill calculations have been used to determine the required permit quality conditions for BOD.

6.1.1 Environmental baseline

The River Wey (from Shalford to the River Thames confluence at Weybridge) receives treated effluent from Guildford WwTW. It should also be noted that the same waterbody also receives treated effluent from Ripley WwTW and Wisley WwTW both within the study area. Ammonia and BOD are classified as being at 'High' status (2015).

The water body currently has an overall WFD status of 'Moderate', with the alternative objective to maintain 'Moderate' status by 2021. Its current overall status is limited to 'Moderate' status due to the less than 'Good' status of the classification elements as listed in Table 6-1.

Table 6-1 Classification elements of less than Good status for River Wey

Classification Element	Current Status at downstream sampling point (2015)	Waterbody Objective	Justification for alternative objective
Phosphate	Poor	Moderate by 2021	No known technical solution is available – Technically infeasible
Macrophytes and Phytobenthos Combined	Moderate	Moderate by 2021	No known technical solution is available – Technically infeasible
Fish	Moderate	Good by 2027	Cause of adverse impact unknown – Technically infeasible

The Reasons for Not Achieving Good (RNAG) as outlined in the Thames RBMP, relevant to the River Wey are listed in Table 6-2. The RBMP sets out that it is 'suspected' that the high phosphate concentrations in the waterbody are attributed to sewerage discharges and is confirmed to be having an impact on the biological quality of the waterbody, specifically on the macrophytes and phytobenthos communities. The current 'Moderate' fish status, targeted to be 'Good' by 2027 is linked to numerous pressures including impoundments from navigation and rural land management, barriers to fish migration and urbanisation.

Table 6-2 Reasons for not achieving good status on the River Wey (GB106039017630)

Classification Element	Category	Activity	Activity Certainty
Macrophytes and Phytobenthos Combined	Water Industry	Sewage discharge (continuous)	Confirmed
Phosphate			Suspected
Fish	Agriculture and rural land management	Impoundment - no water storage	Suspected
	Other	Barriers to fish migration	Suspected
	Navigation	Inland navigation	Suspected
	Urban and transport	Urbanisation - urban development	Suspected

6.1.2 Impact of growth – current permitted quality

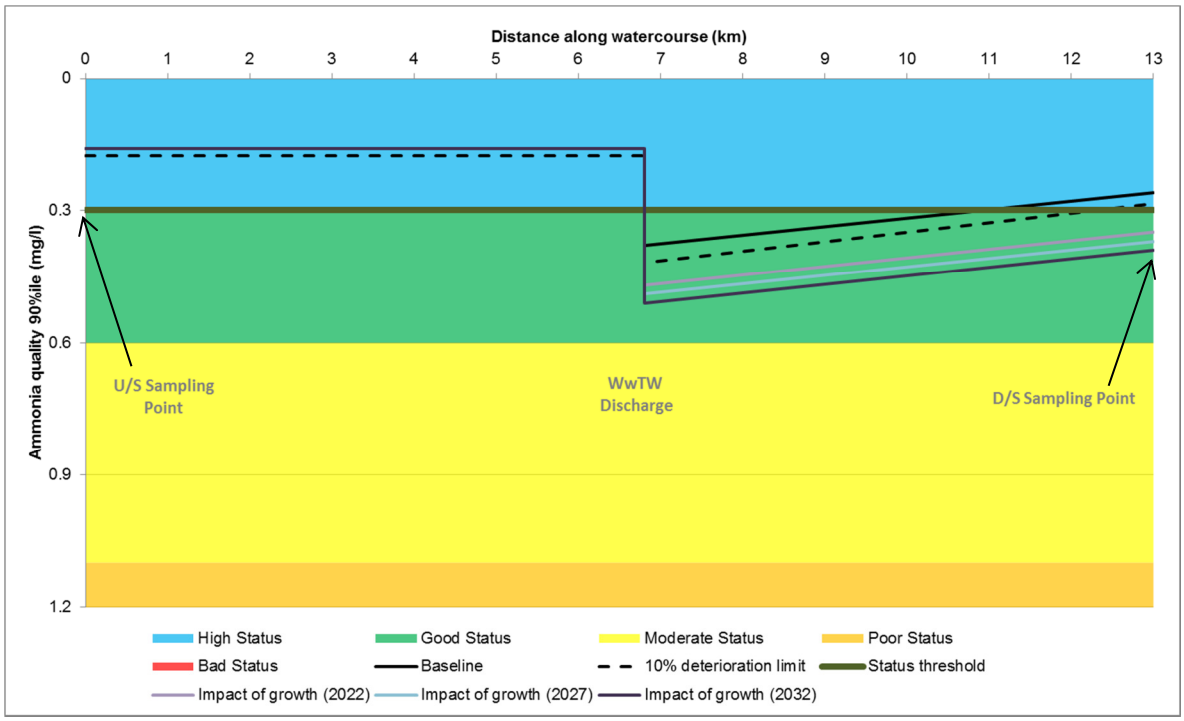
6.1.2.1 Ammonia

The modelling results for growth demonstrate that, if water quality conditions on the permit remain unchanged, each phase of growth will cause more than 10% deterioration in ammonia quality under the current permit quality condition (See Figure 6-1), and as a result, may lead to a deterioration in ammonia status at the downstream sampling point.

The modelling scenario target of *Maintain Current Quality* has therefore been applied to each phase of growth for Guildford WwTW. This is to determine the quality condition required to maintain the current ammonia quality (at the mixing point of the WwTW) in the River Wey. The selection of this more precautionary scenario has been justified on the basis that the there is a risk that allowing a 10% deterioration in quality for growth may lead to a deterioration in status at the downstream sampling point. A precautionary approach has therefore been taken to assess whether it is technically feasible to maintain the current downstream quality in the future, in order to significantly reduce the risk of a deterioration in ammonia status.

The revised quality conditions required after each phase of growth have been provided in Section 6.1.3.

Figure 6-1 Guildford WwTW modelled ammonia concentrations (Baseline and growth)[14]



[14] RQP has been used for the calculations so the modelled downstream 'impact of growth' depiction is indicative and based on a proportional representation of impact at the point of mixing

6.1.2.2 Phosphate

Modelling the current discharge volumes and quality gives a Poor status at the point of mixing (changing from Moderate status upstream) as shown in Figure 6-2. The phosphate status at the downstream sampling point is classified by the Environment Agency as Poor.

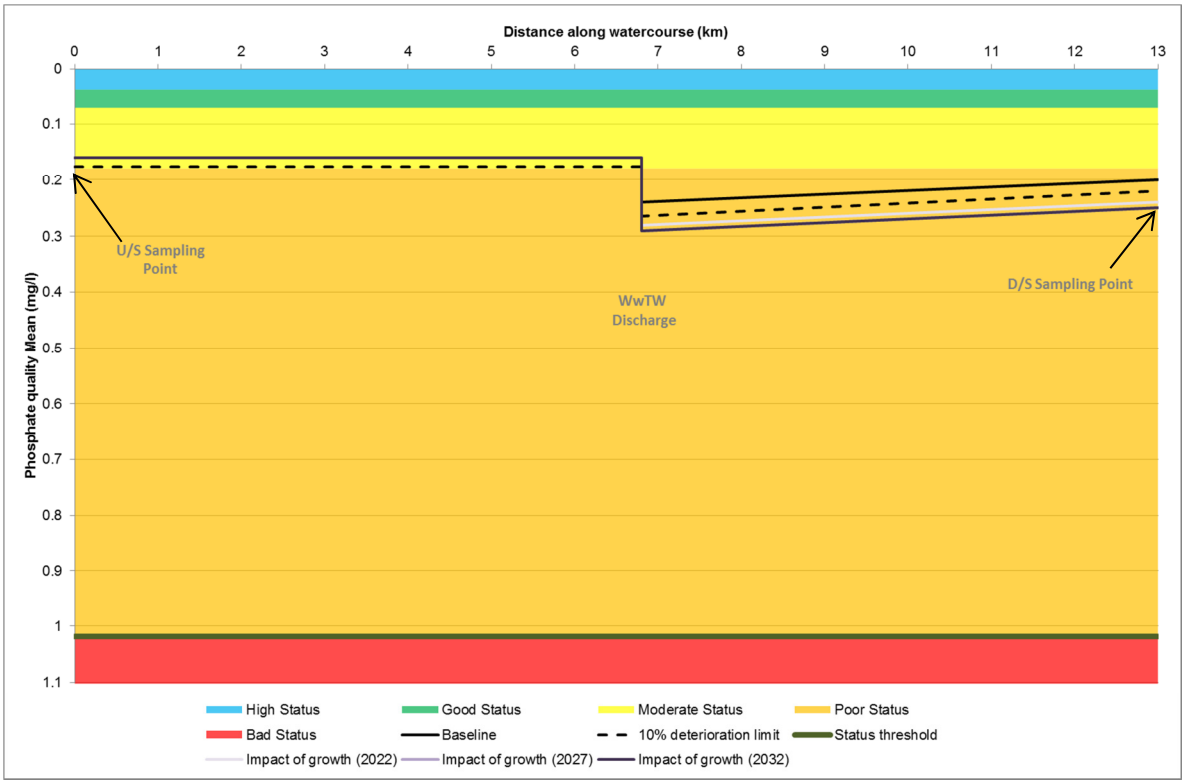
The modelling results for growth demonstrate that each phase of growth will cause more than 10% deterioration in phosphate quality under the current permit quality condition, but will not cause deterioration in phosphate status at the downstream sampling point.

The modelling scenario (*10% Deterioration Limit*) has therefore been applied to each phase of growth to determine the quality condition required to limit deterioration to no more than 10% of the current phosphate quality (at the mixing point) in the River Wey.

As the phosphate status is currently less than Good, a future target status test has also been applied.

The revised quality conditions required after each phase of growth have been provided in Section 6.1.3.

Figure 6-2 Guildford WwTW modelled phosphate concentrations (Baseline and growth)[14]



6.1.3 Revised permit conditions – modelling results

The revised discharge permit quality conditions required by the end of the plan period for each determinand and for each modelled scenario are presented in Table 6-3.

Table 6-3 Guildford WwTW modelled permit requirements

Determinand	Current permit quality condition (mg/l)	Future permit quality condition required to (mg/l)		
		Maintain current quality	Limit to 10% deterioration	Achieve future target status
BOD (mg/l 95%ile)	**20.0**	By 2022: **19.1** By 2027: **18.1** By 2033: **17.1**	-	N/A
Ammonia (mg/l 95%ile)	**6.0**	By 2022: **4.4** By 2027: **4.2** By 2033: **4.0**	-	

Phosphate (mg/l annual average)	**2.0**	**-**	By 2022: **1.7** By 2027: **1.7** By 2033: **1.6**	Current: **1.0** By 2021: **0.9**

6.1.3.1 BOD – no deterioration

A revised (tighter) BOD quality condition is required for each phase of growth to ensure the current BOD quality in the River Wey is maintained throughout the plan period. The revised BOD quality conditions (Table 6-3) can be achieved with current conventional treatment technology (within the limits of conventional treatment) and would also ensure no deterioration in BOD status.

6.1.3.2 Ammonia – no deterioration

A revised (tighter) ammonia quality condition is required for each phase of growth to ensure the current water quality in the River Wey is maintained throughout the plan period. The revised ammonia quality conditions (Table 6-3) can be achieved with current conventional treatment technologies (within limits of conventional treatment) and would also ensure no deterioration in ammonia status.

6.1.3.3 Phosphate – no deterioration

A revised (tighter) phosphate quality condition is required for each phase of growth to ensure the 10% deterioration limit is adhered to. The revised phosphate quality conditions (Table 6-3) can be achieved with current conventional treatment technology (within the limits of conventional treatment) and would also ensure no deterioration in phosphate status.

6.1.3.4 Achieving future target status

The modelling scenario (*Achieving Future Target Status*), which assesses whether growth may prevent the River Wey from achieving its future target status, is not applicable for BOD and ammonia. This is because the water body is already at High Status for these determinands and ensuring no deterioration from current status will ensure its future target status is met.

The 'Achieving Future Target Status' test has been applied in relation to phosphate to the current and future discharge flows. This has been undertaken to determine the quality conditions required to ensure growth does not compromise the River Wey from achieving its future target phosphate status. The water body's future phosphate target status is 'Moderate' by 2021, which was set due to it being technically infeasible to meet Good status targets in the waterbody.

The results demonstrate that a revised phosphate quality condition (1.0mg/l) would be required to ensure the River Wey could achieve 'Moderate' status for phosphate today (i.e. pre-growth). A marginally tighter phosphate quality condition (0.9mg/l) would be required to ensure the 'Moderate' status can still be achieved post growth. As both quality conditions can be achieved with conventional treatment technology, it can be concluded that future growth would not prevent future 'Moderate' phosphate status from being met.

6.2 Ripley WwTW

RQP modelling has been applied to determine the impact of growth and the required permit quality conditions for ammonia and phosphate. Load standstill calculations have been used to determine the required permit quality conditions for BOD.

6.2.1 Environmental baseline

The River Wey (from Shalford to the River Thames confluence at Weybridge) receives treated effluent from Ripley WwTW. The baseline description provided for Guildford WwTW is therefore applicable to the Ripley WwTW assessment (See section 6.1.1); however it should be noted that the downstream monitoring point for Ripley WwTW is at moderate status for phosphate and not Poor.

6.2.2 Impact of growth – current permitted quality

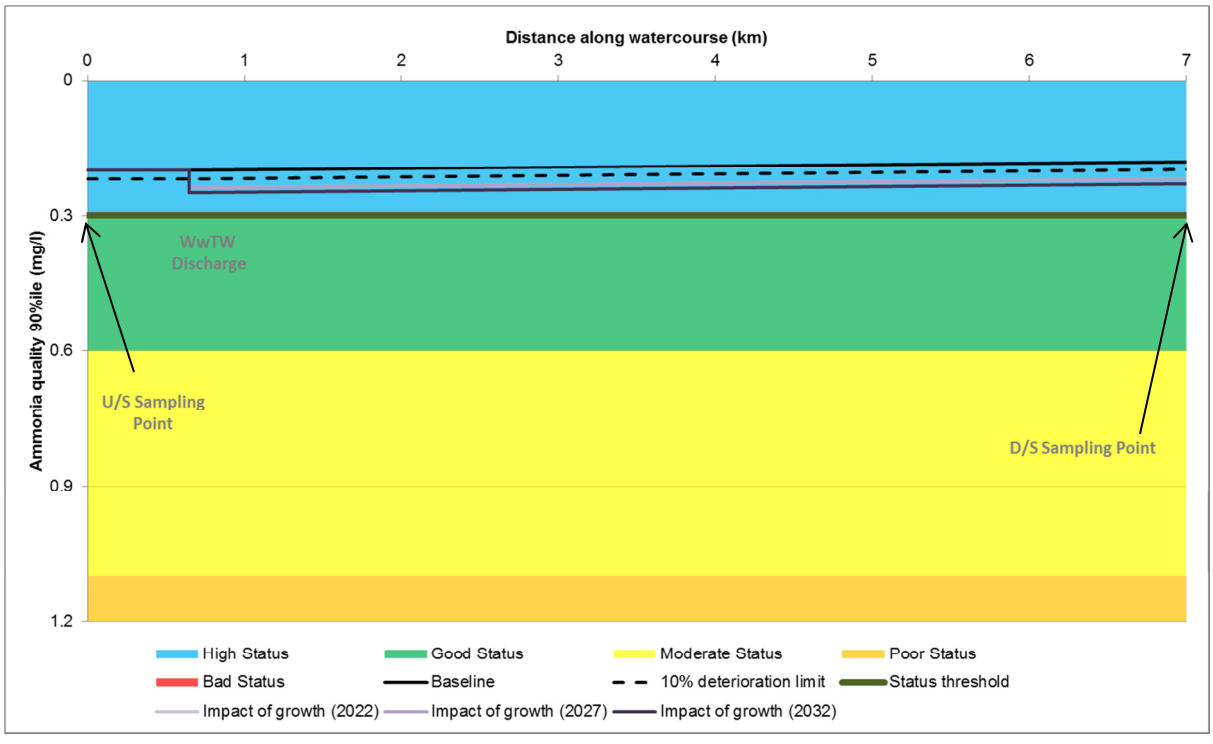
6.2.2.1 Ammonia

Modelling of the baseline ammonia quality and discharge volumes does not change the status at the point of mixing from that of the upstream status (Figure 6-3). The modelling results for growth demonstrate that each phase of growth will cause more than 10% deterioration in ammonia quality under the current permit quality condition, but will not cause a deterioration in ammonia status at the downstream sampling point.

The modelling scenario (*10% Deterioration Limit*) has therefore been applied to each phase of growth to determine the quality condition required to limit deterioration to no more than 10% of the current ammonia quality (at the mixing point) in the River Wey.

The revised quality conditions required after each phase of growth have been provided in Section 6.2.3.

Figure 6-3 Ripley WwTW modelled ammonia concentrations (Baseline and growth)[14]



6.2.2.2 Phosphate

Modelling the current discharge volumes and quality gives a Poor status at the point of mixing (changing from Moderate status upstream) as shown in Figure 6-2. The phosphate status at the downstream sampling point is classified by the Environment Agency as Moderate.

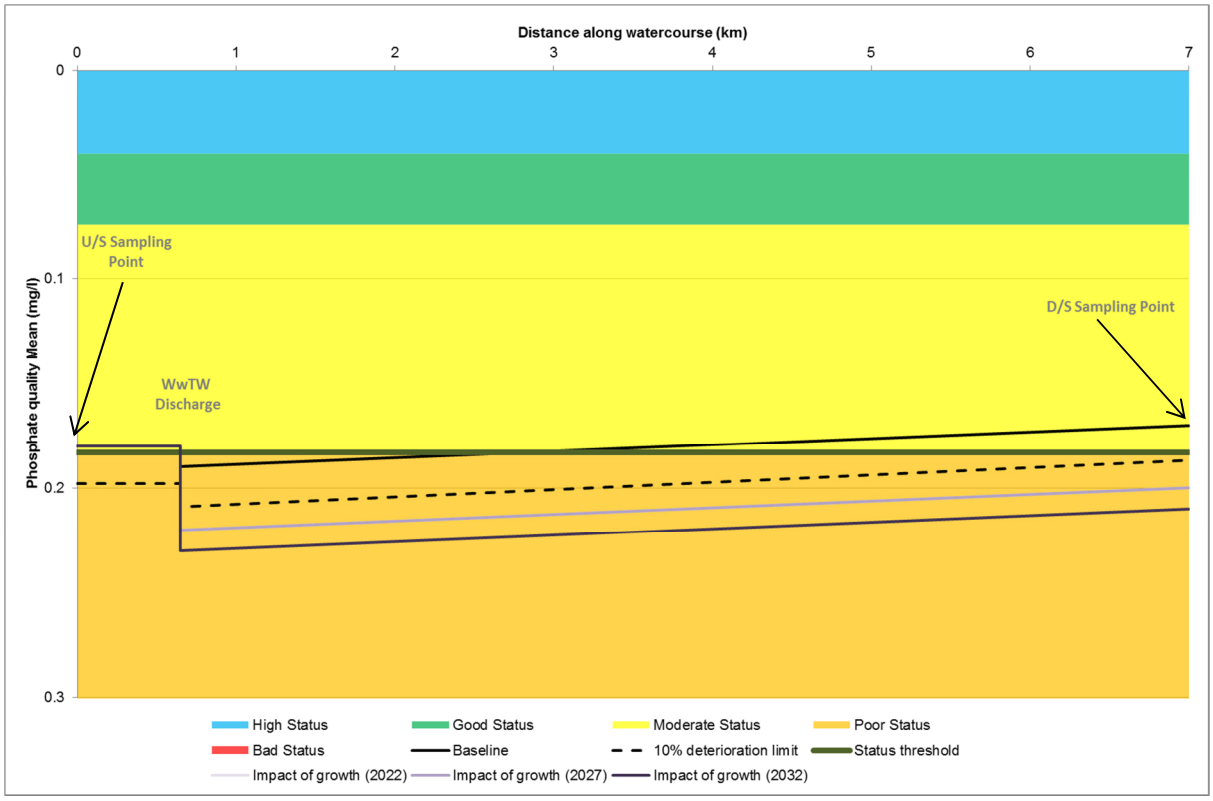
The modelling results for growth demonstrate that each phase of growth will cause more than 10% deterioration in phosphate quality under the current permit quality condition, and potentially a deterioration in phosphate status at the downstream sampling point.

The modelling scenario target of *Maintain Current Quality* has therefore been applied to each phase of growth for Ripley WwTW in relation to phosphate. This is to determine the quality condition required to maintain the current phosphate quality (at the mixing point of the WwTW) in the River Wey. The selection of this more precautionary scenario has been justified on the basis that allowing 10% deterioration in quality for growth may lead to a deterioration in status at the downstream sampling point. A precautionary approach has therefore been taken to assess whether it is technically feasible to maintain the current downstream quality in the future, in order to significantly reduce the risk of deterioration in phosphate status.

As the phosphate status is currently less than Good, a future target status test has also been applied.

The revised quality conditions required after each phase of growth have been provided in Section 6.2.3.

Figure 6-4 Ripley WwTW modelled phosphate concentrations (Baseline and growth)[14]



6.2.3 Revised permit conditions – modelling results

The revised discharge permit quality conditions required by the end of the plan period for each determinand and for each modelled scenario are presented in Table 6-4.

Table 6-4 Required discharge permit quality conditions for Ripley WwTW

Determinand	Current permit quality condition (mg/l)	Future permit quality condition required to (mg/l)		
		Maintain current quality	Limit to 10% deterioration	Achieve future target status
BOD (mg/l 95%ile)	**10.0**	By 2022: 9.3 By 2027: 8.9 By 2033: 8.4	-	N/A
Ammonia (mg/l 95%ile)	**5.0**	-	By 2022: 3.1 By 2027: 2.9 By 2033: 2.9	
Phosphate (mg/l annual	**2.0**	By 2022: 0.6	-	

average)	By 2027: 0.6 By 2033: 0.6

6.2.3.1 BOD – no deterioration

A revised (tighter) BOD quality condition is required for each phase of growth to ensure the current BOD quality in the River Wey is maintained throughout the plan period. The revised BOD quality conditions (Table 6-4) can be achieved with current conventional treatment technology (within the limits of conventional treatment) and would also ensure no deterioration in BOD status.

6.2.3.2 Ammonia

A revised (tighter) ammonia quality condition is required for each phase of growth to ensure the 10% deterioration limit is adhered to. The revised ammonia quality conditions (Table 6-4) can be achieved with current conventional treatment technology (within the limits of conventional treatment) and would also ensure no deterioration in ammonia status.

6.2.3.3 Phosphate

A revised (tighter) phosphate quality condition is required for each phase of growth to ensure the current phosphate quality in the River Wey is maintained throughout the plan period. The tighter phosphate quality condition (Table 6-4) can be achieved with current conventional treatment technologies (within limits of conventional treatment) and would also ensure no deterioration in phosphate status.

6.2.3.4 Achieving future target status

The modelling scenario (*Achieving Future Target Status*), which assesses whether growth may prevent the River Wey from achieving its future target status is not applicable for BOD, ammonia or phosphate and the justification for this has been provided in Table 6-5.

Table 6-5 Justification for not assessing the future target status

Determinand	Justification
BOD	Already at 'High' status – therefore ensuring no deterioration is adequate
Ammonia	
Phosphate	Target status is moderate and waterbody is already at 'Moderate' status – therefore ensuring no change in quality as already modelled is adequate

6.3 Ash Vale WwTW

A combination of SIMCAT and RQP modelling has been applied to determine the impact of growth and the required permit quality conditions for ammonia and phosphate. Load standstill calculations have been used to determine the required permit quality conditions for BOD.

6.3.1 Environmental baseline

The River Blackwater (Aldershot to Cove Brook confluence at Hawley) receives treated effluent from the Ash Vale WwTW. It should also be noted that the same waterbody also receives treated effluent flow from Aldershot WwTW and Camp Farm WwTW situated approximately 4.4km and 1.2km respectively upstream (outside of the Guildford Borough administrative area).

The water body currently has an overall WFD status of 'Poor', with the alternative objective to maintain 'Poor' status by 2021. Its current overall status is limited to 'Poor' status due to the less than 'Good' status of the classification elements as listed in Table 6-6.

Table 6-6 Classification elements of less than Good status for River Blackwater

Classification Element	Current Status (2015)	Objective	Justification for alternative objective
Invertebrates	Moderate	Moderate by 2021	Unfavourable balance of costs and benefits - Disproportionately expensive
Macrophytes and Phytobenthos Combined	Moderate	Moderate by 2021	No known technical solution is available – Technically infeasible
Fish	Poor	Poor by 2021	Unfavourable balance of costs and benefits - Disproportionately expensive
Ammonia	Moderate	Good by 2027	Cause of adverse impact unknown - Technically infeasible
Dissolved Oxygen	Bad	Bad by 2021	Unfavourable balance of costs and benefits - Disproportionately expensive
Phosphate	Poor	Poor by 2021	No known technical solution is available - Disproportionately expensive and Technically infeasible Disproportionate burdens - Disproportionately expensive and Technically infeasible

The Reasons for Not Achieving Good (RNAG) as outlined in the Thames RBMP, relevant to the River Blackwater are listed in Table 6-7.The RBMP sets out numerous activities with varying certainty as reasons for not achieving good status, including high ammonia and phosphate concentrations in the waterbody which are defined by the RBMP as “probably attributed” to sewerage discharges and is “suspected” to be having an impact on the biological quality of the waterbody, specifically on the macrophytes and phytobenthos communities.

Table 6-7 Reasons for not achieving good status on the River Blackwater (GB106039017180)

Classification Element	Category	Activity	Activity Certainty
Fish	Urban and transport	Contaminated land	Confirmed
		Drainage - mixed	Suspected
		Urbanisation - urban development	Confirmed
	Other	Barriers to fish migration	Confirmed
	No sector responsible	North american signal crayfish	Suspected
Invertebrates	Urban and transport	Drainage - mixed	Suspected
		Urbanisation - transport	Confirmed
		Contaminated land	Confirmed
		Drainage - mixed	Probable
		Urbanisation - urban development	Confirmed
	Water Industry	Sewage discharge (continuous)	Probable
	No sector responsible	North american signal crayfish	Suspected
Macrophytes and Phytobenthos Combined	Water Industry	Sewage discharge (continuous)	Suspected
	Industry	Industrial discharge (EPR)	Suspected
Ammonia	Water Industry	Sewage discharge (continuous)	Suspected
Dissolved Oxygen	Water Industry	Sewage discharge (continuous)	Probable
Phosphate	Water Industry	Sewage discharge (continuous)	Probable
	Urban and transport	Drainage - mixed	Probable

6.3.2 Impact of growth – current permitted quality

6.3.2.1 Ammonia

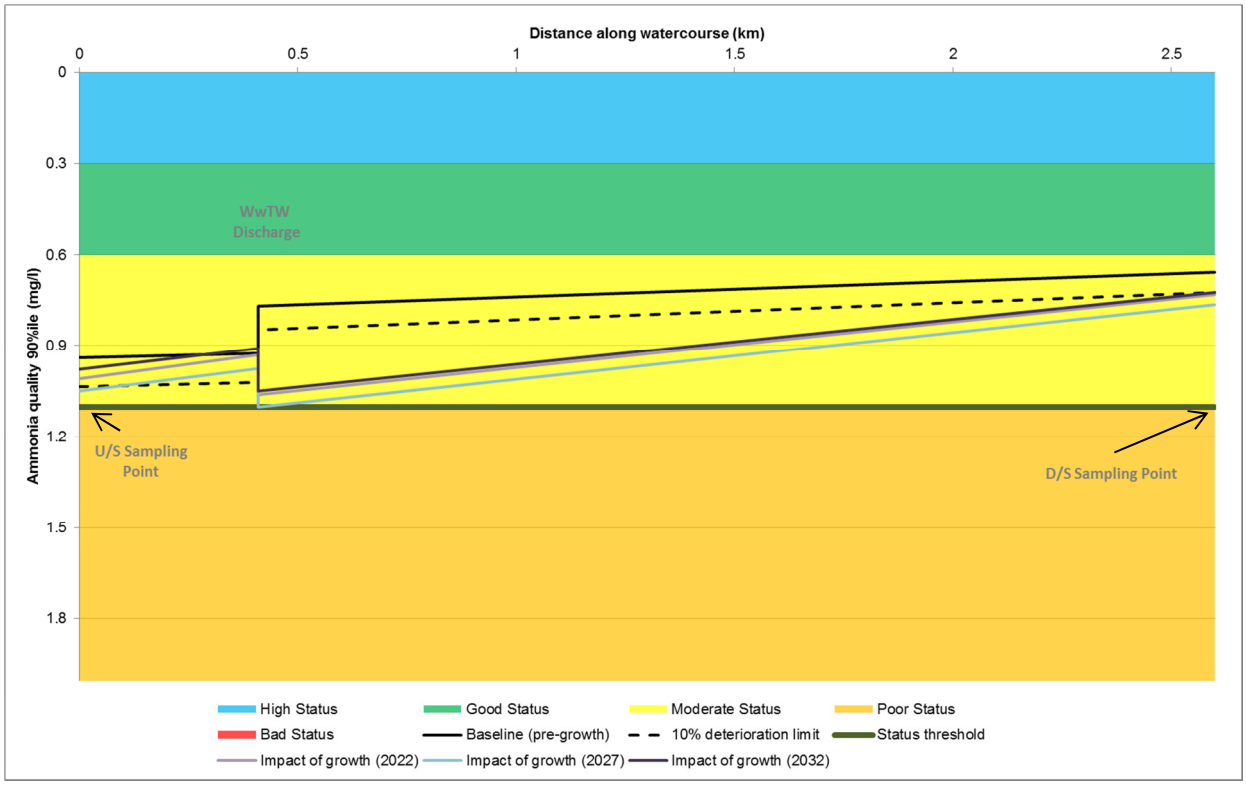
SIMCAT modelling has been used to determine the impact of current discharge and future discharge assuming no change in the quality conditions of the permit.

Modelling of the baseline ammonia quality shows the current discharge improves the ammonia quality in the River Blackwater downstream of the WwTW discharge (Figure 6-5). This is because the current quality of treated flow from the WwTW (based on measured quality) is of a higher standard than the upstream water quality. The future discharge with all growth has been simulated in SIMCAT assuming the quality of discharge moves towards the permitted quality (as opposed to the measured). As a result, the modelling results for growth demonstrate that each phase of growth will cause more than 10% deterioration in ammonia quality under the current permit quality condition. However, SIMCAT demonstrates that this will not cause a deterioration in ammonia status at the downstream sampling point and the water body would remain within moderate status within this monitored river reach.

The modelling scenario (*10% Deterioration Limit*) has therefore been applied to each phase of growth to determine the quality condition required to limit deterioration to no more than 10% of the current ammonia quality (at the mixing point) in the River Blackwater.

The revised quality conditions required after each phase of growth have been provided in Section 6.3.3.

Figure 6-5 Ash Vale WwTW modelled ammonia concentrations (Baseline and growth)



6.3.2.2 Phosphate

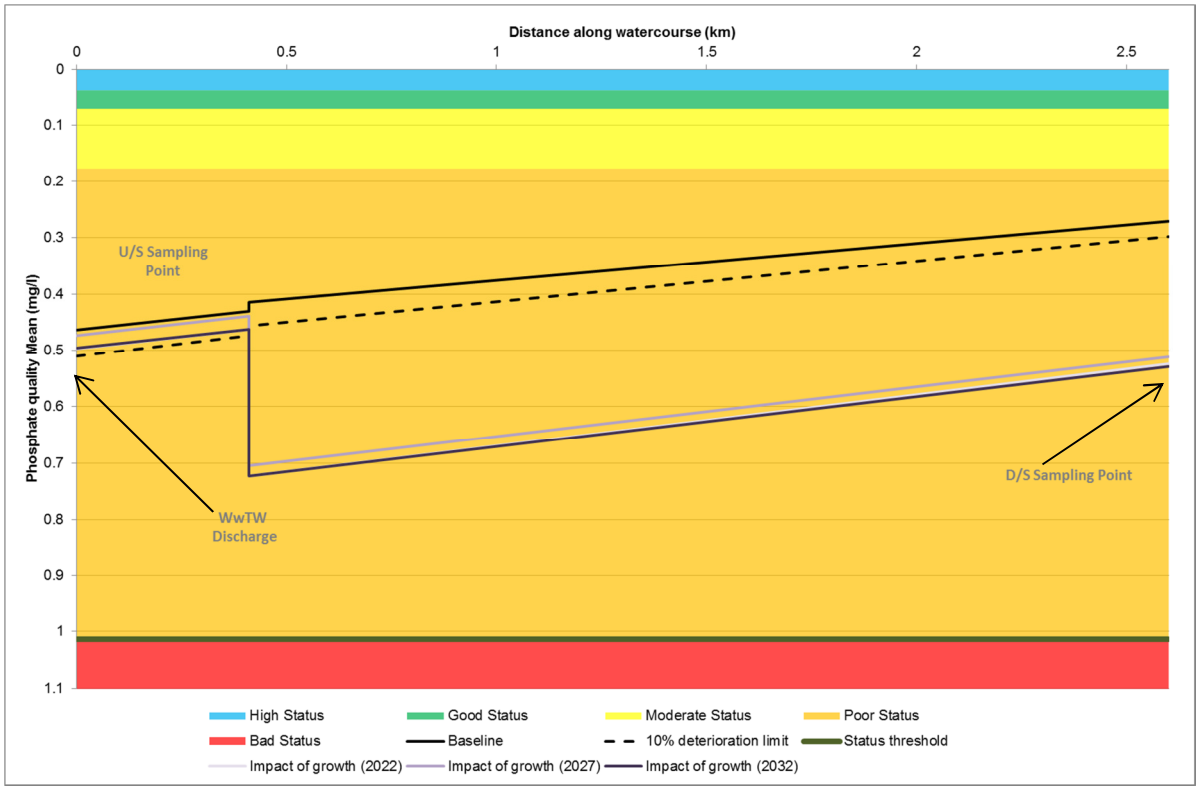
SIMCAT modelling has been used to determine the impact of current discharge and future discharge assuming no change in the quality conditions of the permit.

Modelling of the baseline phosphate quality shows the current discharge improves the phosphate quality in the River Blackwater downstream of the WwTW discharge (See Figure 6-6). This is because the current quality of treated flow from the WwTW (based on measured quality) is of a higher standard than the upstream water quality. The future discharge with all growth has been simulated in SIMCAT assuming the quality of discharge moves towards the permitted quality (as opposed to the measured). As a result, the modelling results for growth demonstrate that each phase of growth will cause more than 10% deterioration in phosphate quality under the current permit quality condition; However, the results show growth will not cause a deterioration in phosphate

status at the downstream sampling point as the water body would remain within poor status within this monitored river reach.

The revised quality conditions required after each phase of growth have been provided in Section 6.3.3.

Figure 6-6 Ash Vale WwTW modelled phosphate concentrations (Baseline and growth)



6.3.3 Revised permit conditions – modelling results

The revised discharge permit quality conditions required by the end of the plan period for each determinand and for each modelled scenario are presented in Table 6-8.

Table 6-8 Required discharge permit quality conditions for Ash Vale WwTW

Determinand	Current permit quality condition (mg/l)	Future permit quality condition required to (mg/l)		
		Maintain current quality	10% deterioration	Achieve future target status
BOD (mg/l 95%ile)	**10**	By 2022: **9.5** By 2027: **9.3** By 2033: **9.2**	-	N/A
Ammonia (mg/l 95%ile)	**3**	-	By 2022: **1.3** By 2027: **0.9** By 2033: **1.4**	Current: **2.0** By 2027: **2.0**
Phosphate (mg/l annual average)	**2**	-	By 2022: **0.4** By 2027: **0.5** By 2033: **0.4**	N/A

6.3.3.1 BOD – no deterioration

A revised (tighter) BOD quality condition is required for each phase of growth to ensure the current BOD quality in the River Blackwater is maintained throughout the plan period. The revised BOD quality conditions (Table 6-8) can be achieved with current conventional treatment technology (within the limits of conventional treatment) and would also ensure no deterioration in BOD status.

6.3.3.2 Ammonia – no deterioration

A revised (tighter) ammonia quality condition is required for each phase of growth to ensure the 10% deterioration limit is adhered to. The revised ammonia quality conditions (Table 6-8) required by 2022 and 2033 can be achieved with current conventional treatment technology (within the limits of conventional treatment) and would also ensure no deterioration in ammonia status. The quality condition required by 2027 cannot be achieved with current conventional treatment technology.

The variability in the required quality conditions throughout the plan period is as result of proposed future development within the Camp Farm WwTW catchment, and the corresponding incremental tightening of the ammonia quality condition in order to limit deterioration to 10% in the reach of the River Blackwater between Camp Farm WwTW and Ash Vale WwTW. The modelling has assumed indicative ammonia quality conditions of 6.0mg/l, 5.0mg/l and 4.5mg/ are implemented at Camp Farm WwTW[15] by 2022, 2027 and 2033 respectively.

6.3.3.3 Phosphate – no deterioration

A revised (tighter) phosphate quality condition is required for each phase of growth to ensure the 10% deterioration limit is adhered to. The revised phosphate quality condition (Table 6-8) required by 2027 can be achieved with current conventional treatment technology (within the limits of conventional treatment) and would also ensure no deterioration in phosphate status. The quality conditions required by 2022 and 2033 cannot (in theory) be achieved with current conventional treatment technology.

Similarly to ammonia, the variability in the required quality conditions throughout the plan period is as result of the future development and proposed quality conditions associated with the upstream Camp Farm WwTW, which has been assumed to have revised phosphate quality conditions of 2.5mg/l by 2022, 2.0mg/l by 2027 and 2.0mg/l by 2033[15].

6.3.3.4 Achieving future target status

The modelling scenario (*Achieving Future Target Status*), which assesses whether growth may prevent the River Blackwater from achieving its future target statuses for BOD or phosphate, is not applicable and the justification for this has been provided in Table 6-9.

Table 6-9 Justification for not assessing the future target status

Determinand	Justification
BOD	Already at 'High' status – therefore ensuring no deterioration is adequate
Phosphate	An alternative objective has been set by the Environment Agency in place of the default objective to reach 'Good' status. The alternative objective has been set due to the need for a technically infeasible solution and the disproportionate costs of a solution to resolve the less than 'Good' status of phosphate. This target is 'Poor' status which is the current status and hence the no deterioration assessment results apply equally to the future target status objective.

The modelling scenario (*Achieving Future Target Status*) has been applied to the current and future discharge flows to determine the quality conditions required to ensure growth does not compromise the River Blackwater from achieving its future target ammonia status of 'Good' by 2027.

The modelling has assumed that the upstream water quality is improved to mid-Good status for ammonia, irrespective of whether it would be technically feasible to achieve this considering the proximity of the Camp Farm WwTW upstream. The results found that a revised ammonia quality condition (2.0mg/l) would be required to ensure the River Blackwater could achieve 'Good' status for ammonia today (i.e. pre-growth). The same ammonia quality condition (2.0mg/l) would be required by 2027 (as per objective date) to ensure the 'Good' status can still be achieved post growth. As both quality conditions can be achieved with conventional treatment technology, it can be concluded that future growth would not prevent future 'Good' ammonia status from being met.

[15] It should be noted that these are indicative only based on modelling undertaken for the Hart, Rushmoor and Surrey Heath WCS and do not necessarily represent the actual quality conditions that will be enforced by the Environment Agency at Camp Farm WwTW. The current ammonia quality condition at Camp Farm WwTW is 7.0mg/l 95%ile.

6.4 WwTW infrastructure requirements

TWUL are currently preparing for Asset Management Plan 7 (AMP7) and their PR19 business plan which will outline their investment programme from April 2020 to 2025. TWUL's approach to wastewater treatment asset management requires that sufficient certainty is given that the quantum of development proposed will come forward during the plan period before improvements to WwTW assets can be justified and funding sought.

Development information provided in this WQA represents the first stage in providing the most up to date plans for future development coming forward in the plan period, and can be used by TWUL to inform the next investment programme (AMP7) and future programmes (AMP8 and AMP9) to ensure the provision of additional capacity is planned and development is not delayed. Once funding has been confirmed, there will be a lead-in time for the necessary upgrades to be completed.

6.4.1 Ripley and Guildford WwTW

Growth in the Guildford WwTW and Ripley WwTW catchments will not result in the current permit headroom being exceeded; however growth is likely to need investment in treatment processes at both the WwTW in order to prevent water quality deterioration and potential WFD compliance issues as a result of the use of treatment headroom.

The treatment levels required will be achievable with conventional treatment and hence TWUL will be able to provide treatment solutions at some point in the plan period and with the information provided in this WQA can begin plans for the next AMP period starting in 2020. The assessment of growth phasing in this study has identified that investment will likely be required by TWUL early in AMP7 (particularly in relation to phosphate at Ripley WwTW) and hence developers should be encouraged to seek confirmation of treatment capacity with TWUL prior to submitting applications for planning within these catchments[16].

6.4.2 Ash Vale WwTW

Growth in the Ash Vale catchment will likely cause the current permit headroom to be exceeded and a new permit applied early on in the plan period. The WwTW permit current has headroom for approximately 750 homes before headroom would be utilised.

Water quality modelling has demonstrated that tighter permit conditions will be required for a new permit in relation to ammonia and phosphate to ensure no deterioration in WFD status and ensure future Good ammonia status can be reached. The treatment technologies required are at (and in some cases marginally in excess of) what is considered achievable with current technology. However, this WQA has demonstrated through catchment modelling that the conditions required are sensitive to assumptions applied to upstream WwTWs outside of the Guildford Borough which are also likely to receive significant growth. A solution which could be explored is the further tightening of the indicative ammonia and phosphate quality conditions at the upstream Camp Farm WwTW. A review of the indicative future quality conditions at Camp Farm WwTW (as applied in the modelling) suggests that they could be comfortably achieved with current conventional treatment technologies (subject to necessary investment for the required treatment process upgrades), and therefore it is considered technically feasible to further tighten the indicative quality conditions at Camp Farm WwTW, thereby improving water quality upstream of Ash Vale WwTW and subsequently requiring less stringent and technically feasible quality conditions at Ash Vale WwTW throughout the plan period. In addition, in terms of phosphate treatment, there is currently a programme of phosphate reduction trials by water companies in the UK, trialling new phosphate treatment technologies that are likely to enable phosphate quality conditions of less than 0.5mg/l to become technically and economically viable in the future. The results of the trails are due to be published in 2017.

On this basis, it is concluded that there is a technically viable solution to the proposed growth at Ash Vale, but that significant investment will be required by TWUL at the WwTW as well at other WwTWs upstream to achieve this and hence developers should be encouraged to seek confirmation of treatment capacity with TWUL prior to submitting applications for planning within the catchment[16].

6.4.2.1 Further study

To ensure a technically and economically feasible ammonia and phosphate quality conditions can be implemented at Ash Vale WwTW, it is recommended that TWUL, the operators of Camp Farm WwTW and the

[16] This should not imply that Thames Water would object to growth, but developers need to ensure Thames Water have sufficient time to make upgrades as necessary to accommodate proposals.

Environment Agency undertake a catchment based approach to assessing the impact of all future development within the River Blackwater catchment proposed by all relevant local authorities (both up and downstream of the Guildford Borough), and to determine the most sustainable solutions in terms of balancing technical and economic feasibility with environmental requirements and water quality objectives at each of the WwTW assets discharging to the river.

The Environment Agency has advised that reviewing all the growth from all authorities in one single study would allow optimisation of permit alterations within the catchment to ensure that tighter permits (and upgrades required to achieve them) are focused at WwTWs which will have the greatest benefit and allow the River Blackwater to meet its WFD objectives. It is recommended that all Local Planning Authorities within the River Blackwater catchment work with the Environment Agency and Thames Water to review catchment opportunities to upgrading WwTWs based on each authorities proposed growth.

6.4.3 Overall assessment

A summary of the water quality assessment in relation to each WwTW is provided in Table 6-10.

Table 6-10: overall RAG assessment

WwTW	Watercourse	Is flow headroom available for proposed growth?		Is it technically feasible to			Overall RAG
				Limit deterioration to 10%?	Ensure no deterioration in status?	Achieve future target status?	
Guildford	River Wey	Yes	BOD	Yes	Yes	N/A	
			Ammonia	Yes	Yes	N/A	
			Phosphate	Yes	Yes	Yes	
Ripley	River Wey	Yes	BOD	Yes	Yes	N/A	
			Ammonia	Yes	Yes	N/A	
			Phosphate	Yes	Yes	N/A	
Ash Vale	River Blackwater	Limited – capacity limited up to approx. 770 dwellings	BOD	Yes	Yes	N/A	
			Ammonia	No	Yes	Yes	
			Phosphate	No	Yes	N/A	

7. Major development site assessment

7.1 Introduction

Following the assessment of wastewater treatment capacity and water quality, this section of the WQA addresses additional water environment issues for each of the major development sites (sites containing more than 10 dwellings). It also identifies which of the sites falls into which WwTW catchment for cross-referencing purposes.

The results are presented for each of the major development sites in Appendix D, with detail of the assessment methodologies provided below.

7.2 Site assessment methodologies

7.2.1 Flood risk to Sites

7.2.1.1 Fluvial

The flood risk to each of the major development sites has been considered using the Environment Agency Flood Maps for Planning. The percentage of development site area within each Flood Zone has been provided. The Guildford Strategic Flood Risk Assessment (SFRA) has also been used to help identify the risk of fluvial flooding at each development site.

7.2.1.2 Surface water

Surface water flooding has been reviewed for each of the large development sites using the Risk of Flooding from Surface Water (RoFSW)[17] mapping produced by the Environment Agency.

The flood risk site assessments have been produced to demonstrate where some sites may need specific investment in flood risk management infrastructure or mitigation and this should be considered as sites come forward via site specific Flood Risk Assessments (FRA) to support planning.

7.2.2 Groundwater protection

Information has been provided regards the underlying hydrogeology for each site in relation to whether:

- There are water bearing aquifers beneath the site which could facilitate the adoption of infiltration SuDS; and
- There are sensitivities relating to above ground development/activities that can take place due to the need to protect groundwater quality.

British Geological Survey (BGS) data regards geology has been used in the assessment, alongside Environment Agency data on aquifer designation, and Source Protection Zones which delineate the area of which aquifers support abstractions for public water supply.

7.2.3 Surface water management

The groundwater protection assessment provides information relating to potential for infiltration SuDS. To supplement this assessment, the nearest surface water body to each site has been identified to determine the potential for surface water to be discharged to the environment subject to the required attenuation and quality control.

[17] Previously referred to as the updated Flood Map for Surface Water (uFMfSW)

8. Water quality assessment recommendations

The following recommendations are made regards the impact of growth proposed in the Local Plan on wastewater treatment and environmental water quality.

Major Development in the Guildford, Ripley and Ash Vale WwTW catchments

It is recommended that the Council considers embedding a development control policy within the Local Plan to require that for all Major Development applications within these WwTW catchments, developers provide evidence to them that they have consulted with TWUL regarding wastewater treatment capacity, and the provide outcome of this consultation prior to development approval. The Council should consider the response from TWUL when deciding if the expected timeframe for the development site in question is appropriate.

Where there is uncertainty from TWUL that the necessary capacity is available, a Grampian condition could be imposed, prohibiting development authorised by the planning permission or other aspects linked to the planning permission (e.g. occupation of dwellings) until the provision of the necessary treatment infrastructure to accept the additional flows is in place.

Treatment Capacity Review

It is recommended that the Council continues to update TWUL on future development phasing and changes to growth allocations to ensure that plans for WwTW upgrades in response to permit change requirements or flow capacity constraints take account of the most up to date planning position. This is particularly important for growth in the Ripley and Guildford WwTW catchments which currently have permitted flow headroom, but the use of this headroom may result in water quality deterioration without further investment in treatment infrastructure.

TWUL and the Environment Agency should use this information, in combination with planning information from Rushmoor Council to take a catchment approach to determining how best to set permits at WwTW discharging wo the Blackwater catchment to take account of the cumulative effect of proposed growth.

Development Outside of the Study Area

Communication and future study water cycle study collaboration with neighbouring local authorities (notably Rushmoor for the River Blackwater and Waveney for the River Wey), as part of the Councils duty to co-operate, should be pursued, to ensure that future water quality assessments closely represent the future growth scenarios at WwTWs from different authority areas draining into the same watercourse and therefore more accurately assesses available environmental capacity.

Appendix A Relevant Planning Documents to the WQA

Category	Document Name	Publication Date
Water	Environment Agency Thames River Basin District. River Basin Management Plan	2015
Housing	Local Plan – Draft Consultation April 2016	2016
Employment	Local Plan – Draft Consultation April 2016	2016
Flood Risk	Guildford Strategic Flood Risk Assessment	2016
Water	Thames Water Final Water Resource Management Plan 2015	2014

Appendix B Legislative Drivers Shaping the WQA

Directive/Legislation/Guidance	Description
Birds Directive 2009/147/EC	Provides for the designation of Special Protection Areas.
Building Regulations Approved Document G – sanitation, hot water safety and water efficiency (March 2010)	The current edition covers the standards required for cold water supply, water efficiency, hot water supply and systems, sanitary conveniences and washing facilities, bathrooms and kitchens and food preparation areas.
Environment Act 1995	Sets out the role and responsibility of the Environment Agency.
Environmental Protection Act 1990	Integrated Pollution Control (IPC) system for emissions to air, land and water.
Future Water, February 2008	Sets the Government's vision for water in England to 2030. The strategy sets out an integrated approach to the sustainable management of all aspects of the water cycle, from rainfall and drainage, through to treatment and discharge, focusing on practical ways to achieve the vision to ensure sustainable use of water. The aim is to ensure sustainable delivery of water supplies, and help improve the water environment for future generations.
Habitats Directive 92/44/EEC and Conservation of Habitats & Species Regulations 2010	To conserve the natural habitats and to conserve wild fauna and flora with the main aim to promote the maintenance of biodiversity taking account of social, economic, cultural and regional requirements. In relation to abstractions and discharges, can require changes to these through the Review of Consents (RoC) process if they are impacting on designated European Sites. Also the legislation that provides for the designation of Special Areas of Conservation provides special protection to certain non-avian species and sets out the requirement for Appropriate Assessment of projects and plans likely to have a significant effect on an internationally designated wildlife site.
National Planning Policy Framework	Planning policy in the UK is set by the National Planning Policy Framework (NPPF). NPPF advises local authorities and others on planning policy and operation of the planning system.
Pollution Prevention and Control Act (PPCA) 1999	Implements the IPPC Directive. Replaces IPC with a Pollution Prevention and Control (PPC) system, which is similar but applies to a wider range of installations.
Urban Waste Water Treatment Directive (UWWTD) 91/271/EEC	This Directive concerns the collection, treatment and discharge of urban waste water and the treatment and discharge of waste water from certain industrial sectors. Its aim is to protect the environment from any adverse effects caused by the discharge of such waters.
Water Act 2003	Implements changes to the water abstraction management system and to regulatory arrangements to make water use more sustainable.
Water Framework Directive (WFD) 2000/60/EC	The WFD, for the first time, combines water quantity and water quality issues together. An integrated approach to the management of all freshwater bodies, groundwaters, estuaries and coastal waters at the river basin level has been adopted. The overall requirement of the directive is that all river basins must achieve 'good ecological status' by 2015 or by 2027 if there are grounds for derogation. The Environment Agency is the body responsible for the implementation of the WFD in the UK. The Environment Agency have been supported by UKTAG[18], an advisory body which has proposed water quality, ecology, water abstraction and river flow standards to be adopted in order to ensure that water bodies in the UK (including groundwater) meet the required status[19]. Standards, and water body classifications are published via River Management Plans (RBMP) the latest of which were completed in 2015.
Water Resources Act 1991	Protection of the quantity and quality of water resources and aquatic habitats. Parts have been amended by the Water Act 2003.

[18] The UKTAG (UK Technical Advisory Group) is a working group of experts drawn from environment and conservation agencies. It was formed to provide technical advice to the UK's government administrations and its own member agencies. The UKTAG also includes representatives from the Republic of Ireland.
[19] UK Environmental Standards and Conditions (Phase I) Final Report, April 2008, UK Technical Advisory Group on the Water Framework Directive.

Appendix C Wastewater Treatment Assessment

C.1 Modelling assumptions and input data

Modelling of the quality permits required to meet the water quality objectives has been undertaken using RQP 2.5 (River Quality Planning), the Environment Agency's software for calculating permit conditions. The software is a monte-carlo based statistical tool that determines the statistical quality required from discharges in order to meet defined downstream targets, or to determine the impact of a discharge on downstream water quality compliance statistics.

Table C-1 RQP input data sources

WwTW	Upstream river flow	Upstream river quality	WFD status derived from
Guildford	Extracted from SIMCAT model	PWER0151	PWER0034
Ripley	Extracted from SIMCAT model	PWER0037	PWER0038
Ash Vale	Extracted from SIMCAT model	PLDR0011	PLDR0008

Several key assumptions have been used in the water quality modelling as follows:

WwTW discharge flow

- WwTW current flows were taken as the current measured dry weather flow (DWF) (Q80) as provided by TWUL;
- The wastewater generation per new household is based on an assumed Occupancy Rate (OR) of 2.49 people per house and an average consumption of 125l/h/d; and
- WwTW future flows were calculated by adding the volume of additional wastewater generated by new dwellings to the current observed DWF value.

WwTW discharge quality

- The current discharge quality for each determinand (ammonia, BOD and phosphate) was calculated from the WwTW discharge quality monitoring data collected between 2012 and 2014;
- The future discharge quality for each determinand was calculated based on the current permit and the coefficient of variance (calculated by dividing the current standard deviation by the mean);
- BOD and ammonia discharge qualities have been reported as 95 percentiles (as per discharge permits);
- Phosphate discharge qualities have been reported as annual averages (as per discharge permits); and
- For the purposes of this study, the limits of conventionally applied treatment processes are considered to be:
  - 5mg/l 95%ile for BOD;
  - 1mg/l 95%ile for Ammoniacal-N; and
  - 0.5mg/l annual average for Phosphate.

River water quality

- River water quality monitoring data was provided by the Environment Agency for the period between 2012 and 2014 (where this date range was not available, the most recent 3 years of data has been used);
- The Environment Agency provided the published 2015 WFD status for each downstream sampling point (status defined using water quality data collected between 2012 and 2014);
- BOD and ammonia river water qualities have been reported as 90 percentiles; and
- Phosphate discharge qualities have been reported as means.

C.2 Headroom Assessment

The permitted flow headroom capacity within an existing permit is assumed to be usable, therefore the following steps have been applied to calculate approximately how much available headroom each WwTW has:

a. Determine the quantity of growth within a WwTW catchment to determine the additional flow expected at each WwTW;

b. Calculate the additional wastewater flow generated at each WwTW;

c. Calculate the remaining permitted flow headroom at each WwTW;

d. Determine whether the growth can be accommodated within existing headroom by applying the scoping criteria detailed in Table C-2.

Table C-2. Scoping criteria

Scope In	Scope Out
WwTWs where permitted flow headroom capacity is exceeded as a result of growth	-
WwTWs which are already at or exceed their permitted flow headroom capacity and will also receive additional flow from growth	WwTWs which are already at or exceed their permitted flow headroom capacity but do not receive any additional flow from growth
WwTWs which remain within their permitted flow headroom capacity but the PE of growth is >=10% of the WwTW's calculated PE as monitored by the Environment Agency	WwTWs which remain within their permitted flow headroom capacity but the PE of growth is <10% of the WwTW's calculated PE

C.3 Water Quality Modelling Methodology

For those WwTWs which are scoped in, modelling has been undertaken to determine the new quality conditions required for each WwTW discharge permit to ensure:

- No deterioration of more than 10% of the current water quality of the receiving waterbody, or if this is not technically feasible,
- No deterioration from the current WFD status of the receiving waterbody, and
- The future target WFD status is not compromised by growth.

Determining the Water Quality Target

The following calculations are based on the mixing point immediately downstream of the discharge. Due to the limitations of RQP, the potential for dilution in the receiving waterbody between the mixing point and the downstream sampling point is not taken into account.

A. Current risk of status deterioration

Is the current quality at the downstream sampling point within 10% of the current status threshold (i.e. is there already a high risk of status deterioration at the sampling point)?

- YES: **Maintain Current Quality Test**. Due to the limitations of RQP, there is not considered to be sufficient confidence that the downstream sampling point will not deteriorate in status should a 10% deterioration at the mixing point be allowed. Therefore, SIMCAT modelling may be necessary to provide sufficient confidence there will be no deterioration in status at the downstream sampling point with growth.
- NO: Step B.

B. Effect of the Current Discharge

Model the current discharge flow and measured discharge quality to determine what the 90%ile or mean river quality is at the mixing point.

Does the current discharge cause a deterioration in status at the mixing point?

- YES: **Maintain Current Quality Test**. Due to the limitations of RQP, there is not considered to be sufficient confidence that the downstream sampling point will not deteriorate in status should a 10% deterioration at the mixing point be allowed. Therefore, SIMCAT modelling may be necessary to provide sufficient confidence there will be no deterioration in status at the downstream sampling point with growth.
- NO: Step C.

C. The 10% deterioration target

90%ile or mean at the *mixing point* x 1.1 = 10% deterioration target (C).

- If C exceeds the current status of the downstream sampling point, **Status Deterioration Test**.
- If C is within the current status of the downstream sampling point, **10% Deterioration Test.**

D. Phasing of growth.

The future discharge flow for each phase of growth is calculated and the selected test is repeated for each phase of growth.

10% Deterioration Test

E. Calculate the effect of the input discharge quality (Future):

Model the future discharge flow and permitted discharge quality (using CoV). From the results, determine if the future 90%ile or mean (E) exceeds the 10% deterioration target (calculated in C).

- If E exceeds the current status of the downstream sampling point, go to Maintain Current Quality Test.
- If E exceeds the 10% deterioration target (C), limiting deterioration to 10% is not possible under current permit. Go to the next step F to determine what quality permit would be required to limit deterioration to 10%.
- If E does not exceed the 10% deterioration target (C), limiting deterioration to 10% is possible under current permit. Current permit is sufficient therefore no permit review required. **GREEN**

F. Calculate required discharge quality (Future) to limit deterioration to 10%:

Model the future discharge flow and permitted discharge quality (using CoV) against the 10% no deterioration target (C). From the results, determine if the future 95%ile or mean discharge quality required (F) is technically feasible.

- If F is technically feasible, limiting deterioration to 10% is possible. Tightening of the quality permit and process upgrades which are technically feasible will be required. **AMBER**
- If F is not technically feasible, limiting deterioration to 10% is not possible because the tighter quality permit cannot be achieved with conventional treatment technology. Repeat step D and F instead with a 20% deterioration target.

  If limiting deterioration to 20% is not possible, go to Status Deterioration Test to determine what quality permit would be required as a minimum to ensure growth does not cause deterioration in status, and if it is technically feasible.

Maintain Current Quality Test

G. Calculate required discharge quality (Future) to maintain current quality

Model the future discharge flow and permitted discharge quality (using CoV) against the current quality target (B). From the results, determine if the future 95%ile or mean discharge quality required (E) is technically feasible.

- If G is technically feasible, maintaining current quality is possible. Tightening of the quality permit and process upgrades which are technically feasible will be required. **AMBER**
- If G is not technically feasible, maintaining current quality is not possible because the tighter quality permit cannot be achieved with conventional treatment technology. Go to Status Deterioration Test to determine what quality permit would be required as a minimum to ensure growth does not cause deterioration in status, and if it is technically feasible. **SIMCAT modelling will also be required.**

Status Deterioration Test

H. Calculate the required discharge quality (Future) to avoid status deterioration:

Model the future discharge flow and permitted discharge quality (using CoV) against the status of the downstream sampling point river quality target. From the results, determine if the Future 95%ile or mean discharge quality required in the future (H) is technically feasible.

- If H is technically feasible, avoiding status deterioration is possible. Tightening of the quality permit and process upgrades will be required. **AMBER**
- If H is not technically feasible, avoiding status deterioration may not possible because the tighter quality permit cannot be achieved with conventional treatment technology. **RED**.

  Undertake a qualitative assessment by investigating:

  – The distance of the downstream sampling point from the discharge,

  – Other potential inflows/inputs within the reach of watercourse between discharge and sampling point,

  – Current treatment performance of the WwTW (i.e. is it currently performing well within its permit? Is its current performance beyond what is considered achievable with current conventional technology?)

SIMCAT modelling will be required to ensure no deterioration at the downstream sampling point, which cannot be accurately assessed using RQP.

Future Target Status Test

If the sub-element has a future target status set which has not yet been achieved, carry out the following test.

I. Calculate the required discharge quality (Current) to achieve future target status:

Model the current discharge flow and measured discharge quality against a river quality target at the mixing point. The upstream water quality is assumed as the midpoint of the future target status. The river quality target at the mixing point is taken as the future target status of the downstream sampling point. From the results, determine if the current 95%ile or mean discharge quality required (I) is technically feasible. Then go to step J.

J. Calculate the required discharge quality (Future) to achieve future target status:

Model the future discharge flow and measured discharge quality against a river quality target at the mixing point. The upstream water quality is assumed as the midpoint of the future target status. The river quality target at the mixing point is taken as the status of the downstream sampling point.

- If I and J are not technically feasible, it is not possible to achieve the future target status based on current discharge flow (pre-growth). Therefore it is not growth that would be preventing the future target status from being achieved, but current limits in technology. **GREEN**
- If I and J are technically feasible, it is possible to achieve the future target status. Tightening of the quality permit and process upgrades will be required. **AMBER**
- If I is technically feasible LCT and J is not technically feasible LCT, growth will have a significant impact on the waterbody achieving the future target status. Based on current discharge flow (pre-growth), future target status could be achieved, but the addition of growth results in the requirement for a permit which is not currently technically feasible. May potentially require revision to housing figures or Article 4.7. **RED**

C.4 Results

	Guildford WwTW		Ripley WwTW	
	Ammonia 95%ile (mg/l)	Phosphate mean (mg/l)	Ammonia 95%ile (mg/l)	Phosphate mean (mg/l)
Current permit quality condition (95%ile or AA)	6	2	5	2
Limit of Conventional Treatment (LCT) (95%ile or AA)	**1**	**0.5**	**1**	**0.5**
Receiving waterbody	River Wey		River Wey	
Upstream sample point	PWER0151		PWER0037	
Downstream sample point	PWER0034		PWER0038	
A. Baseline Assessment	Ammonia 90%ile (mg/l)	Phosphate mean (mg/l)	Ammonia 90%ile (mg/l)	Phosphate mean (mg/l)
Baseline river quality at downstream sampling point	0.26	0.20	0.18	0.17
Baseline river quality at downstream sampling point + 10%	0.29	0.22	0.20	0.19
Threshold at which status deterioration would occur	0.30	1.019	0.30	0.183
Is the current quality at the downstream sampling point considered to be at risk of status deterioration (i.e. within 10% of status threshold)?	*No - baseline river quality is not within 10% of status threshold*	*No - baseline river quality is not within 10% of status threshold*	*No - baseline river quality is not within 10% of status threshold*	*Yes - baseline river quality is within 10% of status threshold*
	Continue to step B	*Continue to step B*	*Continue to step B*	**Maintain Current Quality**
B. Effect of the Current Discharge	Ammonia 90%ile (mg/l)	Phosphate mean (mg/l)	Ammonia 90%ile (mg/l)	Phosphate mean (mg/l)
Current DWF (m^3/day)				
Baseline river quality at mixing point	0.38	0.24	0.20	0.19
Threshold at which status deterioration would occur	0.30	1.019	0.30	0.183
Is the current discharge already causing a status deterioration at the mixing point?	Yes	No	No	Yes
Modelling scenario selected	**Maintain Current Quality**	**10% Deterioration Limit**	**10% Deterioration Limit**	**Maintain Current Quality**
C. 10% Deterioration Limit	Ammonia 90%ile (mg/l)	Phosphate mean (mg/l)	Ammonia 90%ile (mg/l)	Phosphate mean (mg/l)
10% deterioration limit at mixing point	-	0.26	0.22	-
Phasing of Growth	Ammonia 95%ile (mg/l)	Phosphate mean (mg/l)	Ammonia 95%ile (mg/l)	Phosphate mean (mg/l)
Growth Phase 1 Future DWF (m^3/day)				
Future river quality at mixing point	0.47	0.28	0.24	0.22
Level of deterioration caused by future growth	24%	17%	20%	16%
Revised permit quality condition required (95%ile or AA)	**4.4**	**1.7**	**3.1**	**0.6**
Growth Phase 2 Future DWF (m^3/day)				
Future river quality at mixing point	0.49	0.29	0.24	0.22
Level of deterioration caused by future growth	29%	21%	20%	16%
Revised permit quality condition required (95%ile or AA)	**4.2**	**1.7**	**2.9**	**0.6**
Growth Phase 3 Future DWF (m^3/day)				
Future river quality at mixing point	0.51	0.29	0.25	0.23
Level of deterioration caused by future growth	34%	21%	25%	21%
Revised permit quality condition required (95%ile or AA)	**4.0**	**1.6**	**2.9**	**0.6**
Future Target Status	Ammonia 95%ile (mg/l)	Phosphate mean (mg/l)	Ammonia 95%ile (mg/l)	Phosphate mean (mg/l)
Current status at d/s sampling point	**High**	**Poor**	**High**	**Moderate**
WFD waterbody future target status	**High**	**Moderate by 2021**	**High**	**Moderate by 2021**
River quality target (90%ile or AA)	Future target status already being achieved	0.180	Future target status already being achieved	Future target status already being achieved
Discharge quality required today (95%ile or AA)		**1.0**		
Discharge quality required in the future (2033) (95%ile or AA)		**0.9**		
Will growth prevent the future target status from being achieved?	*No - both quality conditions can be achieved with current conventional technology.*		*N/A*	

Key to 'Effluent Quality Required'

Green Value – no change to current permit required

Amber Value – Permit tightening required, but within limits of conventionally applied treatment processes

Red Value – not achievable within limits of conventionally applied treatment processes

Appendix D Development Site Assessment

Site Details					Surface Water Flood Risk				Fluvial Flood Risk				Groundwater Protection				
Aecom ID	REF ID	Site Name	Site Area (ha)	Total Dwellings	% High SW Flood Risk	% Medium SW Flood Risk	% Low SW Flood Risk	% no SW Flood Risk	% Flood Zone 1	% Flood Zone 2	% Flood Zone 3	Potential Receiving Watercourse	Aquifer Designation Bedrock	Aquifer Designation Superficial	Source Protection Zone	Groundwater Protection	SuDS Constraints
GUIL_1	8	77 to 83 Walnut Tree Close, Guildford	0.4		0	3	6	91	0	0	100	River Wey	Secondary A unproductive	Secondary A	1	High	SuDS may be limited within FZ 3
GUIL_2	15	Land to the west of West Horsley	4.3	135	1	1	3	95	100	0	0	Trib of Mill Tail	Unproductive	N/A	N/A	Low	
GUIL_3	16	Land at and to the rear of Bell and Colvill, Epsom Road, West Horsley	1.4	34	1	9	36	54	100	0	0	Trib of Mill Tail	Secondary A unproductive	N/A	1	High	Infiltration SuDS may be restricted for some land use (SPZ1)
GUIL_4	34	Land at Westway, off Aldershot Road, Guildford	3.5	38	0	0	0	100	100	0	0	Trib of Hoe Stream	Unproductive	N/A	N/A	Low	
GUIL_5	35	Land at Oak Hill, Wood Street Village	4.8	22	0	0	0	100	100	0	0	Trib of Stanford Brook	Unproductive	N/A	N/A	Low	
GUIL_6	46	Gosden Hill Farm, Merrow Lane, Guildford	89.1	2000	4	3	8	85	100	0	0	River Wey	Unproductive	Secondary A	N/A	Low	
GUIL_7	50	Land at Guildford Cathedral, Alresford Road, Guildford	3.4	93	0	0	1	99	100	0	0	River Wey	Unproductive	N/A	1	High	Infiltration SuDS may be restricted for some land use (SPZ1)
GUIL_8	53	Land at former Wisley airfield, Ockham	92.80	2000	4	1	1	94	95	1	4	Trib of Mill Tail	Secondary A unproductive	Secondary A	N/A	Low	SuDS may be limited within FZ 3
GUIL_9	58	Land off Send Hill, Send	0.7	10	0	0	0	100	100	0	0	Ockham Mill Stream	Secondary A unproductive	Secondary A	N/A	Low	
GUIL_10	81	Land at Shalford Station, Station Approach, Shalford	0.4	11	0	0	6	94	100	0	0	Tilling Bourne	Unproductive	Secondary A	N/A	Low	
GUIL_11	90	East Horsley countryside depot and the adjoining telephone exchange, St Martins Close, East Horsley	0.3	15	0	0	10	90	100	0	0	Trib of Mill Tail	Secondary A unproductive	N/A	N/A	Low	
GUIL_12	99	Land at Church Street, Effingham	0.7	22	0	0	0	100	100	0	0	Trib of River Mole	Secondary A unproductive	N/A	N/A	Low	
GUIL_13	115	Land at 148 Broad Street, Wood Street Village	0.3	12	7	3	16	74	100	0	0	Trib of Stanford Brook	Unproductive	N/A	N/A	Low	
GUIL_14	126	Land North of Keen's Lane, Guildford	5.25	150	1	8	7	84	100	0	0	Trib of Hoe Stream	Unproductive	N/A	N/A	Low	
GUIL_15	129	Land adjacent to Farnham Road Hospital, Farnham Road, Guildford	0.1	14	0	0	2	98	100	0	0	River Wey	Major Principal	N/A	2	High	
GUIL_16	131	Land south of Royal Surrey County Hospital, Rosalind Franklin Close, Guildford	1.3		0	0	2	98	100	0	0	River Wey	Unproductive	N/A	N/A	Low	
GUIL_17	134	The Plaza, Portsmouth Road, Guildford	0.4	70	0	0	2	98	100	6	0	River Wey	Major Principal	Secondary A	2	High	
GUIL_18	152	Land around Burnt Common warehouse, London Road, Send	9.3		2	1	5	92	100	0	0	Ockham Mill Stream	Unproductive	Secondary A	N/A	Low	
GUIL_19	164	Land at Home Farm, Effingham	0.7		0	0	3	97	100	0	0	Trib of Mill Tail	Major Principal	N/A	N/A	Medium	
GUIL_20	165	Land at Cobbetts Close, Worplesdon	0.2		0	1	10	89	100	0	0	Trib of Stanford Brook	Secondary A unproductive	Secondary undifferentiated	N/A	Low	
GUIL_21	171	Land and buildings at Guildford Railway Station, Guildford	2.2	350	6	10	26	59	99	1	0	River Wey	Major Principal	Scondary A	1	High	Infiltration SuDS may be restricted for some land use (SPZ1)
GUIL_22	174	Bright Hill Car Park, Sydenham Road, Guildford	0.5	60	0	0	5	95	100	0	0	River Wey	Minor Principal Secondary A	N/A	2	High	
GUIL_23	176	Land at Westborough allotments, Guildford	3.5		0	0	2	98	100	0	0	Trib of Hoe Stream	Unproductive	N/A	N/A	Low	
GUIL_24	178	Guildford Park Car Park, Guildford Park Road, Guildford	2.2	160	3	3	21	77	100	0	0	River Wey	Secondary A unproductive	N/A	1	High	Infiltration SuDS may be restricted for some land use (SPZ1)
GUIL_25	205	North Street redevelopment, Guildford	3.7	400	2	2	6	90	75	22	3	River Wey	Major Principal	Secondary A	1	High	SuDS may be limited within FZ 3
GUIL_26	230	Telephone Exchange, Leapale Lane, Guildford	0.6	100	0	2	4	94	100	0	0	River Wey	Major Principal	N/A	1	High	Infiltration SuDS may be restricted for some land use (SPZ1)
GUIL_27	240	Land near Horsley Railway Station, Ockham Road North, West Horsley	5.7	100	2	2	5	91	69	3	28	Trib of Mill Tail	Unproductive	Secondary A	N/A	Low	SuDS may be limited within FZ 3
GUIL_28	241	Land at Whittles Drive, Aldershot Road, Normandy	2.8		3	10	73	14	74	20	6	Trib of Stanford Brook	Secondary A unproductive	Secondary A	N/A	Low	SuDS may be limited within FZ 3
GUIL_29	245	Slyfield Area Regeneration Project, Guildford	41.1	1000	0	1	11	88	86	11	3	River Wey	Unproductive	Secondary A	1	High	SuDS may be limited within FZ 3
GUIL_30	311	Blackwell Farm, Hogs Back, Guildford	88.6	1800	6	3	15	76	100	0	0	River Wey	unproducitve	Secondary A	N/A	Low	
GUIL_31	350	Carlians Garage, Epsom Road, East Horsley	0.2	15	0	0	38	62	100	0	0	Trib of Mill Tail	Major Principal	N/A	N/A	Medium	
GUIL_32	506	Land south of Grange Road, Ash (including the Coppins and land to the west, and land rear of the Gables, Viden and Birnam)	0.9	14	1	20	55	24	100	0	0	Trib of Blackwater River	Unproductive	N/A	N/A	Low	
GUIL_33	525	York House, Chertsey Street, Guildford	0.1	10	0	9	2	89	100	0	0	River Wey	Major Principal	N/A	2	High	
GUIL_34	975	Land to the north of West Horsley	5.2	120	0	0	9	91	80	3	17	Trib of Mill Tail	Unproductive	Secondary A	N/A	Low	SuDS may be limited within FZ 3
GUIL_35	1040	The Barn, The Street, Effingham	0.7	16	15	7	17	61	100	0	0	Trib of River Mole	Major Principal	N/A	N/A	Medium	
GUIL_36	1107	Jewsons, Walnut Tree Close	0.7	125	4	2	6	88	100	0	0	River Wey	Secondary A unproductive	N/A	1	High	Infiltration SuDS may be restricted for some land use (SPZ1)
GUIL_37	1118	Land off Kings Court, Oxenden Road, Tongham	0.3	10	0	0	0	100	100	0	0	Blackwater River	Unproductive	N/A	N/A	Low	
GUIL_38	1121	Works, Poyle Road, Tongham	0.1	10	0	0	1	99	100	0	0	Blackwater River	Unproductive	Secondary undifferentiated	N/A	Low	
GUIL_39	1139	Public House, Oxenden Road, Tongham	0.2	15	0	0	10	90	100	0	0	Blackwater River	Unproductive	Secondary undifferentiated	N/A	Low	
GUIL_40	1164	Surrey Police Headquarters, Mount Browne, Sandy Lane, Guildford	5.9	116	0	0	1	99	100	0	0	River Wey	Major Principal	Secondary undifferentiated	N/A	Medium	
GUIL_41	1179	Land to the rear of Copse Close, Chilworth	0.2	12	0	0	0	100	100	0	0	Tilling Bourne	Unproductive	Secondary A	N/A	Low	
GUIL_42	1183	Land rear of 6 Send Barns Lane, Send	0.8	20	0	0	0	100	100	0	0	Trib of Mill Tail	Secondary A unproductive	Secondary undifferentiated	N/A	Low	
GUIL_43	1210	The University of Law, Guildford	0.7		0	0	0	100	100	0	0	River Wey	Major Principal	N/A	N/A	Medium	

GUIL_44	1363	Former scrap yard, Aldershot Road, Worplesdon	1.7	10	4	2	19	75	100	0	0	Trib of Stanford Brook	Secondary A unproductive	Secondary undifferentiated	N/A	Low	
GUIL_45	1399	The Orchard, Puttenham Heath Road, Puttenham	0.2		0	0	0	100	100	0	0	River Wey	Major Principal	N/A	N/A	Medium	
GUIL_46	1440	Land at the rear of the Talbot, High Street, Ripley	0.9	18	0	0	4	96	100	0	0	Trib of Mill Tail	Unproductive	Secondary undifferentiated	N/A	Low	
GUIL_47	1502	Former Tyrrell site, Long Reach, Ockham	5.7	12	3	3	9	85	99	1	0	Trib of Mill Tail	Unproductive	Secondary A	N/A	Low	
GUIL_48	1582	The Shed Factory, Portsmouth Road, Ripley	0.4	24	0	0	0	100	100	0	0	Trib of Ockham Mill Stream	Unproductive	N/A	N/A	Low	
GUIL_49	1583		3.0		0	0	2	98	100	0	0	Trib of River Mole	Unproductive	N/A	N/A	Low	
GUIL_50	1584	Former Pond Meadow School, Pond Meadow, Guildford	0.6	10	0	1	5	94	100	0	0	Trib of Hoe stream	Unproductive	N/A	N/A	Low	
GUIL_51	2001	Warren Farm, White Lane, Ash Green	2.9	58	4	3	19	74	100	0	0	Blackwater River	Unproductive	N/A	N/A	Low	
GUIL_52	2002	Land to the east of White Lane, Ash Green	1.9	62	9	11	25	55	100	0	0	Blackwater River	Unproductive	N/A	N/A	Low	
GUIL_53	2003		0.2		0	0	8	92	100	0	0	Trib of Blackwater River	Unproductive	N/A	N/A	Low	
GUIL_54	2018	Land north of Salt Box Road, Guildford	7.9		0	0	0	100	100	0	0	Trib of River Wey	Secondary A unproductive	N/A	N/A	Low	
GUIL_55	2044	Hotel, Guildford Road, East Horsley	1.5	48	0	1	6	93	100	0	0	Trib of Mill Tail	Major Principal	N/A	N/A	Medium	
GUIL_56	2081	Land west of Winds Ridge and Send Hill, Send	0.6	40	0	3	0	97	100	0	0	River Wey	Secondary A unproductive	Secondary A	N/A	Low	
GUIL_57	2082	Clockbarn Nursery, Tannery Lane, Send	2.3	45	0	1	5	94	100	0	0	River Wey Navigation	Secondary A unproductive	Secondary A	N/A	Low	
GUIL_58	2106	Lakeview, Lakeside Road, Ash Vale	2.4		8	1	4	87	100	0	0	Trib of Mill Tail	Major Principal	Secondary undifferentiated	N/A	Low	
GUIL_59	2114	Roundoak, White Hart Lane, Wood Street Village	0.9		0	0	0	100	100	0	0	Trib of Mill Tail	Major Principal	N/A	N/A	Medium	
GUIL_60	2115	Builders Yard (Elms Garden), Glaziers Lane, Normandy	1.3	15	3	6	20	71	100	0	0	Trib of Stanford Brook	Unproductive	Secondary undifferentiated	N/A	Low	
GUIL_61	2119	Four Acre Stables, Aldershot Road, Worplesdon	7.6		44	14	22	20	69	6	25	Trib of Stanford Brook	Unproductive	Secondary A	N/A	Low	SuDS may be limited within FZ 3
GUIL_62	2120	Valley Park Equestrian Centre, East Shalford Lane, Shalford	0.0		0	0	2	98	100	0	0	River Wey	Secondary A unproductive	N/A	1	High	Infiltration SuDS may be restricted for some land use (SPZ1)
GUIL_63	2177	Land at Fangate Manor, St Martins Close, East Horsley	1.8	10	0	0	3	97	100	0	0	Trib of Mill Tail	Secondary A unproductive	N/A	N/A	Low	
GUIL_64	2181	Land between Farnham Road and the Mount, Guildford	0.6	70	8	20	24	48	100	0	0	River Wey	Major Principal	N/A	1	High	Infiltration SuDS may be restricted for some land use (SPZ1)
GUIL_65	2183	Kernal Court, Walnut Tree Close, Guildford	0.6	100	2	5	6	13	77	23	0	River Wey	Unproductive	N/A	2	Medium	
GUIL_67	2226	Wey Corner, Walnut Tree Close, Guildford	0.4	35	0	0	1	99	100	88	12	River Wey	Unproductive	Secondary A	1	High	SuDS may be limited within FZ 3
GUIL_68	2229	Guildford Cinema, Bedford Road, Guildford	0.9		0	1	21	78	0	0	100	River Wey	Major Principal	Secondary A	1	High	SuDS may be limited within FZ 3
GUIL_69	2235	179 Epsom Road, Guildford	0.8		8	16	31	45	100	0	0	River Wey	Minor Principal Secondary A	Secondary undifferentiated	3	Low	
GUIL_70	2247	Land to the south and east of Ash and Tongham	85.2	1075	10	4	14	72	100	0	0	Trib of Blackwater River	Unproductive	N/A	N/A	Low	
GUIL_71	2258	Land at Garlick's Arch, Send Marsh	31.8	400	7	9	7	77	81	9	10	Trib of Mill Tail	Unproductive	Secondary A	N/A	Low	SuDS may be limited within FZ 3
GUIL_72	2276	Land at Coltsfoot Drive, 1 Bryony Road and garages, Guildford	0.6	18	0	2	6	92	100	0	0	River Wey	Unproductive	Secondary A	3	Low	
GUIL_73	2286	Land at Old Manor Farm, Old Manor Lane, Chilworth	2.8	20	0	0	0	100	100	0	0	Tilling Bourne	Unproductive	Secondary A	N/A	Low	
GUIL_74	2292	Paddock adjacent to Cranmore Lane, West Horsley	0.7	15	0	0	4	96	100	0	0	Trib of Mill Tail	Secondary A Unproductive	N/A	N/A	Low	
GUIL_75	2319	Former pub, Southway, Guildford	0.3	18	0	0	0	100	100	0	0	Trib of Hoe Stream	Unproductive	N/A	N/A	Low	
GUIL_76	2323	Land at Guildford college, Guildford	0.7	100	1	4	5	90	100	0	0	River Wey	Unproductive	N/A	1	High	Infiltration SuDS may be restricted for some land use (SPZ1)
GUIL_77	2327	Courier House, Aldershot Road, Ash	0.5	15	1	1	10	88	99	1	0	Blackwater River	Unproductive	Secondary A	N/A	Low	
GUIL_78	2331	Land between Gill Avenue and Rosalind Frankin Close, Guildford	2.4	61	1	1	3	95	100	0	0	Trib of Hoe Stream	Unproductive	Secondary undifferentiated	N/A	Low	
GUIL_79	2343	Palm House Nurseries, Normandy	0.2		16	37	42	5	100	0	0	River Wey	Seconary A Minor Principal	N/A	2	High	
GUIL_80	2362	Land for new road bridge and footbridge scheme to enable level crossing closure on A323 Guildford Road adjacent to Ash railway station, Ash	85.2		10	5	27	58	100	0	0	Basingstoke Canal	Secondary A Unproductive	N/A	N/A	Low	

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