Forest Heath
District Council

Hyder

Forest Heath District Council

Water Cycle Study

Stage 2: Full Strategy

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Stage 2: Full Strategy

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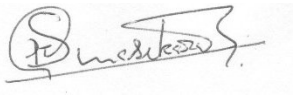
Approver	R Gunasekara	

Report No 5001-UA000034-BMR-06-Forest Heath Detailed WCS

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CONTENTS

1 Summary

This Stage 2 Water Cycle Study (WCS) builds on the conclusions and recommendations from the 2009 Outline WCS for Forest Heath District Council (FHDC) and St. Edmundsbury Borough Council.

This study aligns with the adopted FHDC Core Strategy (2010), and analyses the impact of the proposed growth in the District on the existing water and wastewater infrastructure, and the water environment, in light of the changes in policy and stakeholder data since 2009.

Consultation has been undertaken with Anglian Water Services (AWS); the Environment Agency (EA); Natural England (NE); and the Ely Group of Internal Drainage Boards (IDB); to gather the latest data on infrastructure and environmental capacity, and stakeholder policies and aspirations.

Additional water and wastewater infrastructure capacity required, to accommodate the proposed growth whilst protecting the water environment and responding to climate change, has been identified. Recommendations have been made to stakeholders (and developer) regarding the responsibilities, opportunities, constraints and risks associated with the provision of the required infrastructure.

Individual proposed sites which may be particularly constrained by infrastructure requirements (in terms of location, size or phasing) have been identified to assist FHDC with the Site Specific Allocations (SSA) process, and encourage developers to begin investigation in partnership with AWS and the EA.

The study concludes that the long term AWS plan for water resources in the study area (including local demand management, and resource development in the wider area) will allow the provision of adequate potable water for the proposed growth, and the existing population, whilst allowing sufficient resilience against climatic change risks. The FHDC policy regarding water efficiency in new dwellings (if supported long term by homeowners) will assist AWS to meet the challenges of balancing public health and environmental obligations in the future, and increase the resilience of the area to climate change.

FHDC policy imposes that land will not be released for development unless adequate infrastructure is in place, or can be provided as part of the development.

The existing potable water strategic supply network in and around the study area is well placed to serve the proposed growth locations, and will be enhanced by AWS as required; funded through their typical business cycle. More locally, any required upgrades to the distribution network will be funded by developers. Developer Forums, facilitated by FHDC, are recommended as a means to promote the efficient design and implementation of upgrades once sites are confirmed. In areas of particularly intensive proposed growth, such as to the west of Red Lodge, this approach would be particularly beneficial.

The provision of sewerage infrastructure presents more of a constraint to a number of sites, due to their position in relation to the existing networks serving the urban areas. In some locations, the connection of sites will require extensive upgrades to sewers through the urban area, or the provision of considerable lengths of new pumped bypass sewers. These risks have been identified to FHDC to assist with the SSA process.

The cost and phasing implications of these matters on developers should not be underestimated. Developers are advised to contact AWS as soon as practicable to ensure that all constraints (and opportunities for partnership working with neighbouring developers) are

considered. Again, Developer Forums facilitated by FHDC are recommended to drive the efficient design and implementation of the necessary upgrades.

Indicative effluent quality standards have been calculated in partnership with the EA, to demonstrate where improvements in wastewater treatment process technology will be required to protect the receiving watercourses. As identified in the previous study, the provision of sufficient wastewater treatment capacity, whilst complying with strict environmental standards, remains the largest constraining factor to growth. Lakenheath and Red Lodge remain areas of concern; however, FHDC policy to postpone additional development here will allow the stakeholders to design and implement the required infrastructure improvements.

In particular, the stakeholders have begun work to determine a solution for the constraints identified at Red Lodge. A number of potential options have been discussed through this study, to provide FHDC with confidence that suitable solutions can be implemented.

The Level 2 Strategic Flood Risk Assessment, produced in parallel with this study, has concluded that the proposed development sites are suitably located to comply with national policy on flood risk.

Appropriate management of surface water drainage on the proposed sites is required to comply with existing and emerging policy, and prevent any increase in flood risk to downstream areas. Sustainable Drainage System (SuDS) offer the opportunity to enhance biodiversity and amenity whilst potentially reducing costs and energy intensity. The latest stakeholder requirements and aspirations in relation to such systems have been highlighted in this study, and high level guidance given to FHDC as to the appropriateness of solutions for the proposed sites.

The study has also analysed the impact of increased treated wastewater discharges on flood risk in receiving watercourses. Using a methodology agreed by the stakeholders, it has been concluded that the estimated increases in effluent discharges due to the proposed growth do not appreciably increase flood risk beyond that currently posed by the existing discharges.

However, at Tuddenham, the WwTW discharge accounts for a high proportion of the flow in the watercourse, and as such, is classed as high risk under both the existing situation and future growth options. Modelling was undertaken as part of this WCS, to assess the impact of the increased WwTW discharges on water levels in the Tuddenham Stream. This concluded that, for the reach between Tuddenham village and the River Lark, there would be no appreciable increase in flood risk; however, additional investigation and modelling will be required by the stakeholders to determine the extent of any increase in flood risk between Tuddenham WwTW and Tuddenham village.

Regardless of the development location, it is recommended that FHDC policy (perhaps enforced through a policy in the SSA) is amended to require developers on sites of all sizes to consult with AWS, and the EA, regarding provision and phasing of water, drainage and wastewater infrastructure, and provide this evidence to FHDC and the EA, and that this is considered a material planning consideration.

There remains a considerable degree of uncertainty in the study area, due to the successful challenge to Policy CS7 of the adopted Core Strategy. FHDC are working to address this uncertainty, but there is now a risk that the distribution of development in the District will not be confirmed until 2013, and that decisions regarding the SSA will be delayed until after this date. Whilst background analysis may continue (such as the AWS investigation into capacity to accommodate growth at Red Lodge), there is a risk that these delays will impact on the ability of AWS to fund strategic infrastructure improvements through their typical business cycle.

It is recommended that this Stage 2 WCS is reviewed in 2013 to incorporate any changes in development distribution. Such a review would offer the opportunity to:

- Ensure that the impact on infrastructure provision, due to the above delays, is understood and factored into the SSA and that potential mechanisms for funding the asset provision are captured at an earlier stage in the process for development up to 2031;
- Incorporate the results of stakeholder investigation and modelling to determine the impacts of the increased WwTW discharges on the Tuddenham Stream and the Lakenheath IDB area;
- Reflect the emerging changes in the surface water management regime driven by national policy; and
- Update the conclusions of this study to account for any changes in stakeholder policies and plans.

2 Introduction

As part of the East of England Regional Spatial Strategy (RSS)[1], Forest Heath District Council (FHDC) and St Edmundsbury Borough Council (SEBC) were tasked with delivering a minimum number of 16,400 new homes and 18,000 new jobs between 2001 and 2021.

FHDC, in partnership with SEBC, appointed Hyder Consulting (UK) Limited in June 2008 to prepare a joint Strategic Flood Risk Assessment (SFRA) and Water Cycle Strategy (WCS), for the two Local Authorities. These studies (referred to as the Outline WCS[2] throughout this study) assisted FHDC in the development of their Core Strategy by allowing potential development areas to be screened with regards to existing water and wastewater infrastructure, and their potential impact on the water environment.

The UK Government intends to abolish Regional Strategies through the Localism Bill, which is currently being considered in Parliament. Until future guidance on forward planning becomes available, FHDC have chosen to continue to progress work on the WCS based around the original RSS growth targets. This will assist FHDC in the future if they seek to review growth targets at a local level. The RSS tasked FHDC with providing 6,400 new homes between 2001 and 2021.

The Outline WCS identified a number of wastewater infrastructure and water environment constraints that would require further investigation by the WCS stakeholders in order to support the proposed growth in the District. FHDC took these constraints into account in their Core Strategy by proposing that the majority of development in areas such as Lakenheath and Red Lodge be constructed towards the end of the plan period (post 2021), hence allowing adequate time for the identified constraints to be resolved.

The purpose of this Stage 2 WCS is to analyse in detail the water and wastewater infrastructure requirements, along with other environmental constraints such as water quality, identify the party responsible for overcoming these constraints, and then give guidance on the phasing of solutions to support the proposed growth. The Stage 2 WCS will also update the conclusions of the Outline WCS based on current legislation and stakeholder opinions, in consultation with the Environment Agency (EA), Natural England (NE) and Ely Group of Internal Drainage Boards (IDB). A summary of the information received is included in Appendix A.

The study will be a key part of the evidence base for the FHDC Local Development Framework (LDF), and provide guidance to FHDC as they develop Generic Development Control Policies and progress through their LDF to Site Specific Allocations (SSA), allowing the further screening of proposed sites.

In addition, this Stage 2 WCS serves to involve AWS and the EA in discussions regarding proposed development locations at an early stage. This allows the identification of any water infrastructure and environmental constraints, and the development of integrated solutions, and should serve as a catalyst to encourage early developer involvement in overcoming any water infrastructure capacity constraints at specific sites.

3 Policy Context

3.1 National - Planning Policy Statements

Planning Policy Statements (PPS) are national planning documents that provide guidance to Local Planning Authorities (LPAs) on planning policy. LPAs should ensure that planning documents consider these policies, and may be able to use some of the policies contained within PPS to make decisions on individual planning applications.

The most relevant PPS to this WCS are:

- PPS1: Delivering Sustainable Development (and the 2007 Supplement entitled Planning and Climate Change);
- PPS3: Housing;
- PPS9: Biodiversity and Geological Conservation;
- PPS23: Planning and Pollution Control; and
- PPS25: Development and Flood Risk (discussed in the Outline WCS and SFRA).

Relevant topics that consistently occur within the above mentioned PPS are:

- Resilience to climate change;
- Conservation / biodiversity;
- Sustainable use of resources;
- Mitigation of flood risk and the use of Sustainable Drainage Systems (SuDS);
- Suitable infrastructure capacity; and
- Protection of groundwater and freshwater.

Key extracts from the above PPS are included in Appendix B.

3.2 Local – Core Strategy

The FHDC Core Strategy[3], adopted May 2010, contains several objectives pertinent to water supply/ wastewater infrastructure, and the water environment.

Policy CS4 stipulates that:

- Water efficient fittings and grey water recycling are to be considered;
- Development should avoid areas of current and future flood risk in line with PPS25; and
- The implementation of SuDS will be sought where technically feasible.

These aspects of Policy CS 4 are discussed in more detail in the relevant report sections below.

4 Development Programme

The RSS housing requirement for FHDC is a minimum of 6,400 new dwellings in the period 2001–2021. The Local Development Framework will also have to make continued provision for housing beyond 2021, in accordance with national policy (PPS3: 'Housing' – see Appendix B). This requires the identification of a 15 year supply of new dwellings from the date of Core Strategy adoption (2010). The requirement for the period 2021–2031 is calculated as 3,700 dwellings – giving a total requirement for the District of 10,100 new dwellings in the period 2001–2031.

The 2009 Annual Monitoring Report states that 1,935 new dwellings had been constructed from April 2001 to March 2009; thus reducing the 2031 target to 8,165 total dwellings. FHDC report that between 2009 and 2010, a further 368 dwellings were constructed, meaning that the total development target in the period 2010–2031 is a minimum of **7,797** new dwellings.

4.1 Core Strategy

The FHDC Core Strategy contains Policy CS7[*], which sets out the following broad distribution of development to meet the RSS growth targets and comply with PPS3, as discussed above. The total new dwelling targets for each market town, key service centre and primary village are illustrated in Table 4-1.

Location	2010-2015	2015-2020	2020-2025	2025-2031	Total
Brandon*	360 *(460)*	100 *(300)*	150 *(300)*	150 *(200)*	**760 *(1,260)***
Lakenheath	70	200	200	200	**670**
Mildenhall	310	290	350	380	**1,330**
Newmarket	400	440	400	400	**1,640**
Red Lodge	0	0	690	510	**1,200**
Beck Row, Exning, Kentford and West Row	150	150	200	200	**700**

Table 4-1 Summary of FHDC Policy CS7 development trajectory

** The Brandon allocations in brackets are alternative figures, dependant on provision of a deliverable relief road. This adds 500 additional dwellings to the target for this settlement.*

The Core Strategy offers no further clarity on how development will be split between the primary villages of Beck Row, Exning, Kentford and West Row. FHDC have provided guidance, illustrated in Table 4-2, based on work undertaken preparing the Site Allocations Issues and Options (Regulation 25) draft DPD for consultation, and the analysis of potential sites through the Strategic Housing Land Availability Assessment (SHLAA).

[*] Subject to May 2011 legal challenge, discussed in more detail in Section 13

New Dwellings by Timeframe					
Location	**2010-2015**	**2015-2020**	**2020-2025**	**2025-2031**	**Total**
Beck Row	163	69	0	0	**232**
Exning	189	0	0	0	**189**
Kentford	95	0	0	0	**95**
West Row	180	17	0	0	**197**

Table 4-2 Assumed breakdown of primary village development targets

713 total potential dwellings identified – conservative approach compared against Table 4-1

4.2 Residential Development

In addition to the 6,300 dwellings identified in Table 4-1, FHDC are expecting the completion of a number of committed sites (those with planning permission as of April 2009). This includes an additional 682 dwellings to be completed as an extension to the east of the existing Red Lodge development, as per extant planning permission.

Table 4-3 summarises the committed sites, as described in the revised FHDC Housing Topic Paper[4] (subsequently revised following consultation with FHDC).

Location	Dwelling N°	Location	Dwelling N°
Brandon	154	Red Lodge	682
Lakenheath	66	Beck Row	195
Mildenhall	204	Exning	14
Newmarket	279	Kentford	93
		West Row	17

Table 4-3 FHDC committed dwellings

For the purpose of this WCS, it is assumed that the committed sites will be developed within the period 2010–2020 at a steady annual rate.

As these sites already have planning permission, AWS will be obligated to provide water and wastewater services under the provisions of the Water Industry Act 1991. Whilst there is little value in providing strategic advice in relation to these individual sites, it is imperative that their cumulative impact on water and wastewater infrastructure capacity is considered in this WCS.

Combining the dwelling numbers from Table 4-1, Table 4-2 and Table 4-3, results in the following total development trajectory for the District, displayed in Table 4-4.

Location	2010-2015	2015-2020	2020-2025	2025-2031	Total
Brandon*	437 *(537)*	177 *(377)*	150 *(300)*	150 *(200)*	914 *(1,414)*
Lakenheath	103	233	200	200	736
Mildenhall	412	392	350	380	1,534
Newmarket	540	579	400	400	1,919
Red Lodge	341	341	690	510	1,882
Beck Row	260	167	0	0	427
Exning	196	7	0	0	203
Kentford	142	46	0	0	188
West Row	189	25	0	0	214
Total	2,620 *(2,720)*	1,967 *(2,167)*	1,790 *(1,940)*	1,640 *(1,690)*	8,017 *(8,517)*

Table 4-4 Projected development trajectory used for Stage 2 WCS

** Brandon allocation in brackets includes 500 additional dwellings dependant on provision of a deliverable relief road*

FHDC have provided details of the development sites which are available in the locations above to achieve the required targets. These sites are based on allocations from the Local Plan, the outcomes of the SHLAA and on-going work in the production of the Site Specific Allocations DPD. In some settlements, the capacity of the sites available exceeds the targets in Table 4-4 .

This Stage 2 WCS has considered the impact of the proposed growth on wastewater treatment and potable water provision based on the figures in Table 4-4, as these represent the current growth for the District as defined in the Core Strategy and the committed sites. However, sewerage network capacity has been considered for all the possible sites (see Section 10.1) to provide FHDC with guidance to assist site screening, and the development of site specific policies.

Figure C1, in Appendix C, illustrates the general development locations and quantities in relation to the existing settlements, watercourses, WwTW and sensitive environmental sites.

It should be noted that the Suggested Settlement Boundary Changes which FHDC are considering have not been considered further in this WCS; due to the scale of these proposals, their impact on the water and wastewater infrastructure is thought to be negligible.

4.3 Employment Development

The RSS required FHDC to provide a share of 18,000 new jobs between 2001–2021, shared between the District, St Edmundsbury Borough and Mid Suffolk District.

Since the completion of the Outline WCS, Suffolk County Council has completed an Employment Land Review[5] (ELR) for Western Suffolk, to identify the number of jobs required by area, and broad locations to accommodate these jobs. After reviewing the ELR, FHDC have amended Policy CS6 in their Core Strategy to:

- Make provision for 7,300 additional jobs by 2026;
- Allocate 16 ha of employment land for development 2006-2026, to provide a mix of business (B1), general industrial (B2) and distribution (B8) uses;

- Promote strategic employment growth in Newmarket (5 ha), Mildenhall (4.5 ha) and Brandon (2 ha);
- Promote the development of employment sites in keeping with residential growth at both Lakenheath and Red Lodge; and
- Encourage a mix of employment classes (see Table 4-5).

The ELR included estimates of plot ratios (the amount of land to the actual floor space developed) and employment density (the number of m^2 of floor space per employee). This information, displayed in Table 4-5, has been used to equate employment land into employee numbers, for discussion with AWS regarding water and wastewater infrastructure requirements.

Employment Class	Description	Plot Ratio	Employment Density
		Developed floor space / employment land	m2 / employee
B1a	Office Space	1.0	18
B1b	Research and Development	1.0	18
B1c	Light Industry	0.4	32
B2	General Industry	0.4	32
B8	Storage and Distribution	0.4	50

Table 4-5 Employment Classes to be encouraged by FHDC

As the exact mix of employment, and hence the demand for water and wastewater services (from employees and industrial processes), will be dictated by market forces, it is impossible to reliably quantify the impacts of Policy CS6 on water and wastewater infrastructure and the wider water environment at this time.

However, FHDC have provided the Stage 2 WCS with an indication of the employment and mixed use sites emerging through the SSA process, along with an indication of possible employment classes for these sites. This allows water supply and wastewater infrastructure requirements to be discussed at an early stage with AWS, ensuring possible constraints and solutions are identified where practicable. As discussed in Section 8.2.1, AWS are under no obligation to accept trade effluent, and will negotiate with businesses during the planning process to ensure that an appropriate financial agreement is in place to provide the required infrastructure for conveying and treating such effluent.

Regarding demand for potable water and wastewater services from employees, for previous WCS, AWS have adopted the position that this is offset by other workers in the catchment not being in their dwellings during the day, hence the overall impact (for example at the WwTW) is negligible. However, localised network capacity constraints must still be considered, particularly where strategic employment growth is proposed.

Identifying the possible employment sites emerging from the SSA process to AWS as early as possible through this Stage 2 WCS should allow any localised network capacity issues to be identified in the future.

5 Infrastructure Provision

This Section outlines the current mechanism for the provision of water and wastewater services in the District.

Water and sewerage undertakers have a duty within their statutory area to establish how development can be serviced. This Stage 2 WCS is intended to identify options which provide a viable, strategic, sustainable infrastructure solution to service the development plans for the District, taking account of environmental capacity and constraints.

As development proposals progress and planning applications are submitted, alternative infrastructure options may be found as more detailed engineering appraisals are undertaken by AWS. The actual solution may be market-led and determined by negotiation between AWS and developers.

Close consultation is required between FHDC and AWS to ensure that the funding required to accommodate the proposed growth in the District is identified and included in AWS plans going forward.

5.1 Current Funding Mechanism

Water companies have a duty to supply potable water to customers under Section 52 of the Water Industry Act 1991, and are hence obliged to connect developments to the network once planning permission has been received.

The investment plans of water companies are based on a five-year cycle. In general, infrastructure funding comes from investment through the business plan process whereby the water regulator, Ofwat, sets customer bills. Water companies are required by Ofwat to plan in five-year periods known as Asset Management Periods (AMPs).

The current AMP is AMP5 (2010–2015) and the water companies have just recently completed the process of preparing their programme and capital expenditure plan, referred to as Price Review 2009 (PR09). The PR09 process involved Ofwat reviewing the water companies Final Business Plans, which set out the investment, resource development and infrastructure improvements required over the AMP. Ofwat regulate the levels of expenditure of water companies to a level that they see as being affordable by their existing customers.

Figure 5-1 illustrates the AMP5 process to 2015, which may dictate the constraints on capital project planning and funding and thereby influence the capacity available for the planned development in the short term. Continued liaison between FHDC and AWS is required, particularly as the LDF develops, as there is a risk that the funding required for the design and construction of upgrades to WwTW, trunk sewers and the strategic potable supply network will be delayed by the AMP funding cycle unless specific growth points are considered during future Price Review processes.

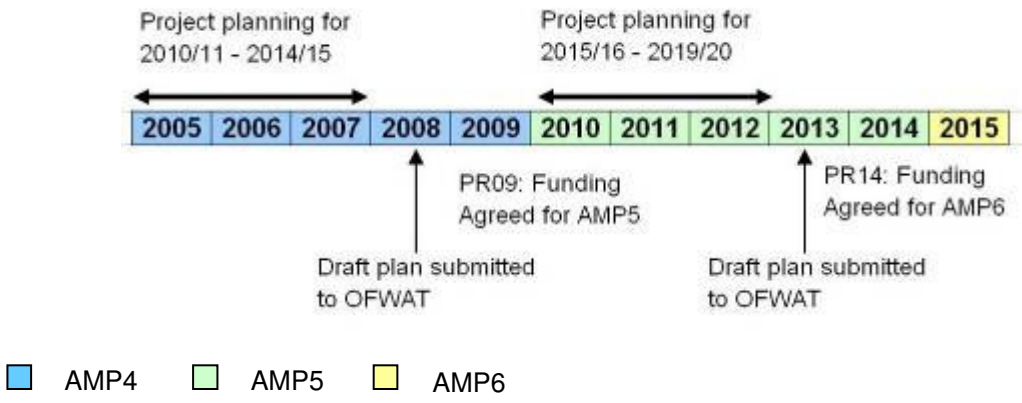

Figure 5-1 Water company capital funding cycle

Adapted from Rye Meads Water Cycle Strategy Scoping Report; EA, August 2007

Wastewater treatment improvements are generally agreed by Ofwat and funded through customer bills as above. However, the prime source of funding for sewerage network improvements is by developers through the requisition process described below.

Water and sewerage undertakers have limited powers under the Water Industry Act 1991 to prevent connection of new dwellings ahead of infrastructure upgrades, and therefore rely on the planning system (through appropriate planning conditions) to ensure that development does not lead to an unacceptable risk of flooding or pollution of watercourses. The situation, with regards to the connection of surface water drainage to public sewers, should be improved by the implementation of the Flood and Water Management Act 2010 (Section 11.1).

Where new infrastructure is required to serve development, developers may requisition infrastructure in accordance with S41 and S98 of the Water Industry Act 1991. The difference between the costs of infrastructure upgrades (including reinforcement to the existing network to ensure adequate capacity) and the predicted revenue from the new customers can be passed onto developers from water companies using Requisitioning Agreements. The amount charged is referred to as the 'relevant deficit', and can be paid over a 12 year period, or one lump sum discounted to a net present value.

For infrastructure serving more than one development site, the Water Industry Act assumes that the first developer will pay the majority if the costs. In most cases, however, it will be preferable to share costs equitably between developers. Such an agreement would require facilitating by FHDC.

6 Water Resources

Consultation with the EA suggests that their position regarding the availability of water resources in and round the District has not significantly altered since the Outline WCS. This section summarises any significant changes or updates to the strategies of the EA and AWS, and policy (both national and local), regarding the supply of potable water.

The impacts of the FHDC Core Strategy on water resources across the District have been tested against a range of scenarios.

6.1 Defra/ EA Strategy

The UK Government's strategy for water in England is described in Defra's Future Water[6] document. This strategy sets out an aspirational target for average per capita consumption (PCC), across all dwellings, of 130 litres per person per day (l/p/d). Defra predict this target can be achieved by 2030 through a combination of water efficiency and demand management measures, such as low consumption appliances and fittings, and changes in metering and tariffs. Defra suggest that 120 l/p/d may also be achievable dependent on new technological developments and innovation.

In 2009 the EA published its strategy for managing water resources in England and Wales to 2050 and beyond, entitled Water for People and the Environment[7]. This strategy supports the 130 l/p/day PCC target aspired to by Defra, and shows that the average PCC for England and Wales could be reduced from around 150 l/p/day to close to 120 l/p/day by 2030. To achieve this, PCC for new dwellings would have to meet Code for Sustainable Homes[*] (CSH) Level 3 (105 l/p/day plus 5 l/p/day for outside use) and near universal metering of properties in water stressed areas would be required by 2020.

The EA strategy concludes that this demand management approach has the potential to be cost effective, when compared to the development of new water resources or desalination plants.

The EA also suggest that, as metering becomes more widespread and incentives to use water efficiently increase, rainwater harvesting and grey water recycling systems will become more cost effective, and could play an increasingly important part in managing water resources in the future.

In addition, the EA strategy suggests that all planning applications for significant new housing developments should be accompanied by a water cycle strategy.

6.2 AWS Strategy

As stated in the Outline WCS, AWS are responsible for maintaining the public water supply across the study area, which falls within their Cambridgeshire and West Suffolk Water Resource Zone (WRZ), referred to as WRZ09. AWS supply WRZ09 from a combination of surface and groundwater sources.

AWS are required to set out their strategic requirements the next 25 years (from 2010 – 2035) in a Water Resource Management Plan (WRMP). The production of this plan coincided with the PR09 process and production of the Final Business Plan.

[*] See Technical Glossary for explanation of the Code for Sustainable Homes

The Outline WCS previously referred to AWS's draft WRMP, as this document was emerging through the WCS stakeholder consultation period. AWS have since finalised their WRMP and published the final document, which highlights the strategic solutions that AWS are promoting for the next 25 years. This document includes allowances for the RSS growth targets, albeit with a lower trajectory for this AMP, offset by higher trajectories in subsequent AMPs, to account for the current economic situation.

A review of the revised WRMP[8] indicates that AWS are proposing that by developing existing groundwater resources they will be able to supply this WRZ with an additional 6.4 Ml/d, from the AMP8 period (2025-2030) onwards. Prior to this, AWS propose that additional supply may be provided in this WRZ by developing a number of strategic water transfers within the WRZ, hence avoiding a supply demand deficit occurring for the WRZ as a whole.

WRZ09 contains nine Planning Zones (PZ), of which the following three serve the FHDC growth areas:

- PZ36 Brandon
- PZ50 Ely
- PZ52 Newmarket

According to the AWS WRMP, under their baseline scenario, the Ely PZ (which incorporates a large proportion of the WCS study area) is predicted to be in a supply demand deficit before the end of the 2035 planning period.

As stated in the Outline WCS, AWS will continue to meet and maintain the supply demand balance through a twin track approach comprising of demand management, treated water transfers and future development of remaining locally available resources.

In order to maintain security of supply in the Ely PZ, AWS are planning (beginning in this AMP) additional meter penetration; continued active leakage detection and repair; water efficiency measures and water transfers from other PZs.

According to the WRMP, AWS are forecasting metered customers will achieve a PCC of less than 130 l/p/day by 2030, to reflect the aspirational target of Defra described in Future Water.

To facilitate this, AWS are proposing to increase the proportion of metered customers from 65% to over 90% by 2035, by metering properties when they change ownership or the current owner requests it. AWS may also utilise a programme of targeted enhanced metering, which involves the mass installation of meters at all properties within a PZ where practicable (to benefit from economies of scale), which are then activated when the ownership of the property changes or the occupant requests a meter. However, according to the AWS WRMP, the Brandon, Ely, and Newmarket PZ are not currently planned to be included in the AWS enhanced metering programme.

When developing their WRMP and Final Business Plan, AWS take account of the potential impacts of climate change. The final target headroom for each WRZ will make provision for any potential increases in demand due to increased temperatures, and reductions in the deployable output* from existing sources. In addition, AWS make an allowance for potential variations in growth rate, occupancy rates and PCC when calculating headroom.

* See Technical Glossary for definition of Deployable Output

AWS are working to incorporate the latest climate change projections (UKCIP09[9]) into their planning process, however the delayed release of the projections has prevented them being incorporated into the WRMP. Once AWS have analysed the UKCIP09 data, they will incorporate it into the annual review process of the WRMP, and notify Ofwat if there is any need for additional expenditure to address the potential impacts on supply and demand.

6.3 Ely Ouse to Essex Transfer Scheme

The Outline WCS highlighted uncertainty regarding the future use of the Ely Ouse to Essex Transfer Scheme (EOETS), and the impact this would have on the ability of AWS to supply the study area.

The EOETS is a network of underground pipelines, pumping stations and existing rivers (including the Cut-Off Channel) managed by the EA, which transfers raw water from the Great Ouse in Norfolk to the headwaters of the Rivers Stour and Pant. It augments flows in the River Stour and River Pant/Blackwater to enable public water supply abstractions in Essex to take place when natural flows in these rivers are not sufficient. In a dry year, up to a third of the water supplied in Essex is derived from the EOETS.

The AWS WRMP proposes that the planned optimisation of the EOETS will allow groundwater resources (currently reserved for the support of this transfer), to be reallocated to serve growth in Norfolk and Suffolk, particularly for Bury St Edmunds, subject to approval by the EA. However, the EA advise that groundwater resources within the study area are fully committed to existing abstractors and the water environment, and that they would be highly unlikely to issue a new or increased abstraction licence from this source.

Whilst this presents a challenge for the neighbouring Bury St. Edmunds Planning Zone, it should be noted that the AWS WRMP does not require resources from the EOETS, or supporting groundwater licences, to remedy the predicted deficit in the Ely Planning Zone. As discussed in Section 6.2, the deficit in this Planning Zone will be met by continued active leakage detection and repair, water efficiency measures and water transfers from other PZs.

6.4 National, Regional and Local Policy

The following sections highlight any revisions to the relevant National, Regional and Local Policy that were discussed in the Outline WCS, which have the potential to affect the demand of potable water in the District.

6.4.1 Building Regulations

In April 2010 a new requirement in the Building Regulations Part G came into force. Regulation 17K requires that water consumption in new dwellings must not exceed 125 litres per person per day (l/p/d). This also applies when a building is changed to a residential use, or where additional flats are added to existing premises.

A new regulation, 20E, requires that Local Authorities are provided with a notice specifying the calculated potential consumption within five days of work being completed. Local Authorities will not be able to grant a completion certificate until this notice has been received.

The Regulations require that potential consumption is calculated using the methodology described in The Water Efficiency Calculator for New Dwellings[10], as amended in September 2009. This methodology also replaces the existing methodology used to calculate water consumption under the Code for Sustainable Homes (CSH)[11].

6.4.2 FHDC Core Strategy Policy CS4

The Outline WCS referred to Final Policy Option CS5, from the FHDC Core Strategy Final Policy Option[12] document. This development policy required all new development to meet CSH Level 3, with Level 6 being achieved from 2016 onwards. These CSH Levels equate to a PCC of 105 l/p/day and 80 l/p/day respectively.

In the adopted FHDC Core Strategy[3], this same requirement is now included under Policy CS4. Whilst this policy no longer specified that CSH Level 6 is a requirement by 2016, it does state that at least Level 3 should be achieved, and that FHDC will consider introducing a requirement for higher sustainable construction standards where there is evidence to justify doing so. Given the potential supply demand deficit which AWS predict would occur without intervention (see Section 6.2), and the existing concerns of the EA regarding low quantities of flows in rivers (see Section 9.1), it may still be possible for FHDC to justify CSH Level 5/6 standards with regards to water consumption.

Policy CS4 also highlights the importance of considering grey water recycling to achieve the required reductions in consumption.

6.5 Potable Water Demand Projections

The Outline WCS estimated that the growth proposed for the District would increase potable water demand by 1.73 Ml/day by 2031, or 2.25 Ml/day (including 30% headroom to account for security of supply and climate change risks).

Following revisions to the baseline data and AWS strategy, it is important that potable demand projections are revised.

6.5.1 Methodology

The change in District wide potable water demand (from domestic properties) due to the proposed development has been estimated using the following equation:

Total District Demand = Change in demand from existing dwellings + new dwelling demand

Where demand from new and existing dwellings is calculated from:

number of dwellings x occupancy rate x PCC

Traditionally, an additional allowance of 5 l/p/day is added to the CSH PCC rates, for outside use, which makes these rates more coherent with the Building Regulations recommendations. However, it is assumed that the majority of outside water use will be supplied from locally collected sources, such as rainwater harvesting, rather than the potable supply network, in keeping with the water efficiency aspirations of Policy CS4.

Following discussions with AWS, it has been assumed that the demand for potable water from businesses remains constant across the District for the foreseeable future. Intensification of existing employment areas is unlikely to result in a net increase in industrial demand, as it is predicted that companies with heavy water use will be replaced with service-orientated industry over time.

However, the development of new employment sites will obviously require modification and upgrades to the existing potable supply network. Where new sites are proposed, any likely constraints that may restrict the provision of potable water have been highlighted in Section 7.

6.5.2 Demand Scenarios

Six demand scenarios have been considered by this WCS, to demonstrate how FHDC Policy CS4 can enable the potential growth to be accommodated whilst minimising the impact on water resources.

These are based on predicted changes to PCC driven by AWS strategy, and the implementation of regulation 17K of the revised Building Regulations and CSH. Table 6-6 below describes these scenarios in more detail.

All scenarios assume that occupancy rate remains constant at 2.27, as described in the Outline WCS. The conventional understanding within the water industry is that smaller households tend to have higher PCC rates, as there are less opportunities to 'share' demand for washing machines, dishwashers etc. It is therefore considered conservative to discount any potential demand reductions due to falling occupancy rates. In addition, all scenarios start from an existing PCC of 144 l/p/day, which is a representative value estimated by AWS to facilitate the WCS process.

It should be noted that the following consumption rates do not include an additional allowance to provide planning headroom for AWS. However, as stated in Section 6.2, AWS are planning to maintain an appropriate headroom allowance between supply and the demand predicted by the RSS growth targets.

Scenario	Description	PCC used (l/p/day)	
		Existing Properties	New Properties
D1	Current PCC remains constant	144	144
D2	Existing properties remain at current PCC, new properties achieve 17K Building Regs	144	125
D3	Existing properties remain at current PCC, new properties achieve FHDC Policy CS4	144	105
D4	AWS baseline drop, new properties achieve FHDC Policy CS4	144-130 by 2031	105
D5	Existing properties remain at current PCC, new properties achieve FHDC Policy CS4 and then CSH Level 5/6	144	105 (2010-2015) 80 (2016-2031)
D6	AWS baseline drop, new properties achieve FHDC Policy CS4 and then CSH Level 5/6	144-130 by 2031	105 (2010-2015) 80 (2016-2031)

Table 6-6 Scenarios for Potable Water Supply

The reduction in PCC for existing dwellings referred to in scenarios D4 and D6 relates to the AWS demand forecast for existing metered customers, as described in Section 6.2.

6.5.3 Potable Water Demand Projection Results

Figure 6-2 below illustrates the results of the potable water demand projections.

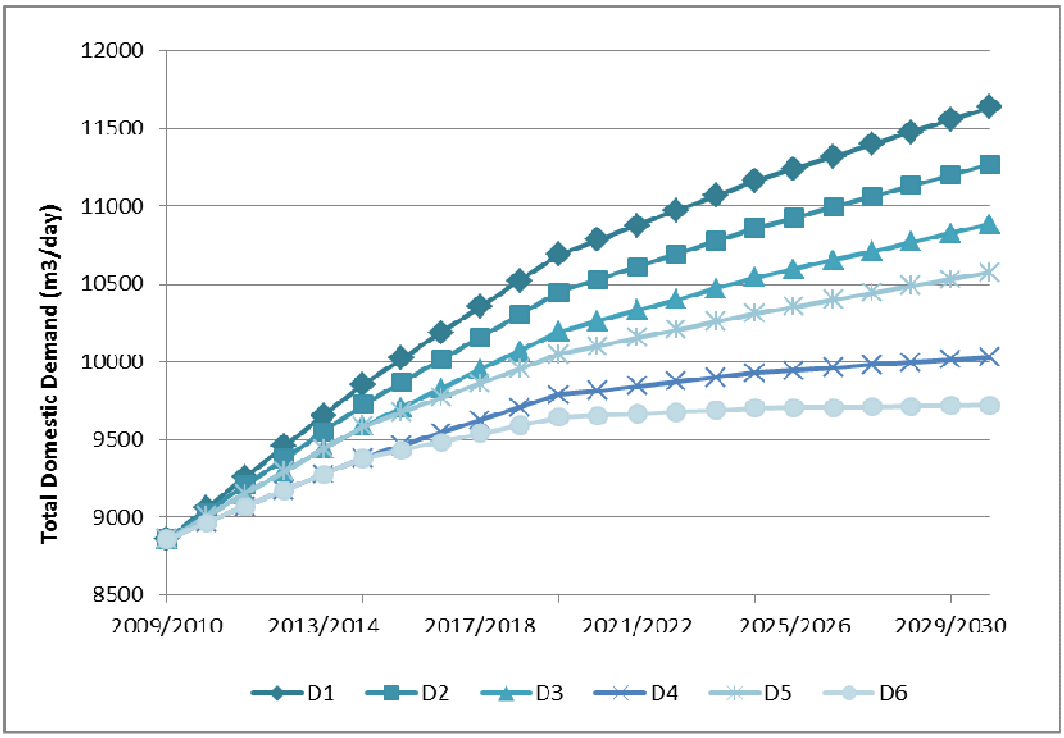

Figure 6-2 Results of domestic potable water demand projections by Demand Scenario

The projections imply that, if PCC rates remain constant for both new and existing properties, the domestic demand of potable water in the District is set to increase by approximately 32% by 2031. However, implementation of FHDC Policy CS4 (i.e. achieving CSH Level 3 targets for all new dwellings) will limit this increase to 24%.

Setting water consumption targets beyond those stipulated in Policy CS 4, at levels equating to CSH Level 6 from 2016 onwards for example, would limit this increase further to 20%.

If these efficiency targets are matched by reductions in PCC in the existing dwellings within the District (as aspired to by Defra and planned for by AWS), the net increase in domestic potable water demand will be limited to 11%. Table 6-7 below shows the estimated net increase in potable water demand within the District resulting from the potable water demand projections.

Scenario	Increase in Demand by 2031	Increase including 30% headroom
	m3/day	*m3/day*
D1	2,850	3,705
D2	2,483	3,228
D3	2,097	2,727
D4	1,243	1,616
D5	1,788	2,325
D6	934	1,214

Table 6-7 Potable Water Demand Projection Results

Table 6-7 highlights the importance of FHDC Policy CS4 being implemented, and implies that if these water efficiency targets are achieved, the impact of the proposed growth in the District on the net potable water demand can be reduced by approximately 26% compared to current PCC rates, or 16% compared to just implementing regulation 17K of the Building Regulations.

If FHDC seek to impose lower water consumption standards in the future, such as CSH level 5/6 from 2016 onwards, the impact of the proposed growth in the District on the net potable water demand can be reduced by approximately 37% compared to current PCC rates, or 28% compared to just implementing regulation 17K of the Building Regulations.

Reducing the impact of the new development on overall potable water demand has multiple benefits:

- The reduction in new demand allows AWS to better manage the risks of climate change, as the strain on existing resources will be lessened, allowing greater flexibility;
- The planned strategic water transfers (described in Section 6.2) may be able to operate less frequently/ at lower flow rates. This reduces the impact of pumping this water in terms of energy/ carbon and cost to consumers, and can increase the asset lifespan; and
- The local distribution network reinforcements which may be required to supply the District in the future, such as increases to the capacity of mains and service reservoirs, may be lessened in scale and frequency, again allowing for a potential energy and cost saving, and an increase in asset lifespan.

Achieving the required reductions in PCC to minimise the impact of the new development will require multiple stakeholder engagement. The consumer awareness required, particularly to encourage the installation of water efficient fittings into existing dwellings and adoption of water saving practices, will need to be generated by AWS and FHDC working in cooperation with the local community.

Particular emphasis will also need to be placed on encouraging occupants of new dwellings to retain their water efficient fittings, as there is a risk that occupants may revert to higher usage fittings due to consumer preference. Rigorous specification through the planning process and monitoring of the water usage of new developments post construction will be required.

6.6 Future Risks

The EA position regarding the availability of water resources in the District has not altered since the completion of the Outline WCS.

As stated in the Outline WCS, the District lies within the area traditionally supplied by Anglian Water Services (AWS). The EA assume that water will be supplied to accommodate the proposed growth using existing sources and under existing abstraction licence permissions (or any additional resource developments agreed to following consultation), as described in the AWS WRMP.

The planning process employed by AWS, when determining the strategy for future resource management, includes an element of headroom to account for variations in demand caused by changes to both demographics and climate, and variations in resource availability due to climate change and environmental protection. This ensures that any solutions proposed by AWS to supply potable water to facilitate the growth in the District will be robust. There is however a risk that future changes to the regulation of the water industry (currently being considered by Defra) may require AWS to amend their WRMP. Amended legislation is anticipated by 2012; and should the legislative and regulatory framework change significantly, FHDC may wish to revisit sections of this WCS to ensure that LDF policies remain robust.

AWS are proposing to address the predicted deficit between supply and demand in the Ely and Newmarket PZ, by undertaking resource improvements and demand management schemes. In addition, AWS will continue to liaise with the EA to determine the feasibility of increased abstraction as described in the WRMP. It must be noted that the EA may not be able to recommend a new or increased abstraction licence where water resources are fully committed to existing abstraction and the environment. In addition, further reductions in existing abstraction licenses may be required in the future to aid compliance with the Habitats Directive and the Water Framework Directive; subject to the EA, NE and AWS determining a suitable balance of the environmental, technical and economic constraints.

The impact of such a restriction can in part be mitigated by FHDC demanding more stringent PCC targets than Policy CS4 in the future (for example CSH Levels 5/6 post 2016). The EA supports all initiatives aimed at reducing water use, and assume that new houses will be constructed with water meters fitted. The EA also supports the idea of greywater recycling, providing it can be achieved in a safe and hygienic manner. It should be noted that the EA estimate that the cost of installing the fixtures and fittings required to meet this stricter level (including an allowance for rainwater harvesting devices) could be similar to the current cost of achieving CSH Levels 3/4, due to an expansion in the market for such technologies, and economies of scale, by 2016[13].

Policy C4 affords FHDC the flexibility to specify more stringent water efficiency targets, if evidence to justify such targets comes forward in the future. Given the current uncertainty in the industry regarding the whole life cost and carbon intensity of rainwater harvesting, and greywater recycling schemes, in comparison to mains water; this flexible approach to future policy is justified.

FHDC and developers should refer to the guidance, best practice, and examples of fittings and fixtures available from Waterwise*, through their Water Efficient Buildings project, which is supported by AWS, the EA and the East of England Development Agency.

Increasing public awareness of water resource issues, and their enthusiasm to conserve water, is an important factor for AWS, FHDC, the EA and developers to consider. Consumers may find (or perceive) that some water efficient fittings limit their water use experience to unsatisfactory levels. It is vital that consumers understand the local implications of conserving water, and the personal cost savings they might potentially achieve, in order to prevent any water efficient fittings and fixtures being replaced with less efficient models by the homeowner in the future. Smart water meters with internal displays offer the potential to engage consumers and highlight the cost savings they can achieve, whilst information placards, strategically placed at water features throughout development sites (for example at attenuation basins) can highlight the importance of water resources to the environment.

Whilst the requirements of Part G of the Building Regulations require developers to produce evidence of calculated water consumption prior to the issue of a completion certificate, and it is anticipated that FHDC will require similar evidence prior to granting planning approval (in order to show compliance with Core Strategy Policy CS4), there is at present no legislation allowing the on-going monitoring and subsequent enforcement of water consumption.

FHDC do not include this issue in the Monitoring or Performance Indicator requirements of the Core Strategy, although it is recognised that other stakeholders, such as AWS, will be monitoring water use as part of their own strategy. Influencing public perception, through education and price signals, may therefore be the only mechanisms available to the stakeholders at present.

* Waterwise is a UK Non-Governmental Organisation focused on decreasing water consumption in the UK. See: http://www.water-efficient-buildings.co.uk

7 Potable Water Supply Infrastructure

As discussed in Section 6.2, AWS are proposing to supply the District in the future via the optimisation of existing local groundwater and surface water abstractions, and the transfer of additional resources via new strategic links between Planning Zones.

The distribution of this water throughout the District, and the potential impact of the proposed development on the distribution network, is described in more detail below.

7.1 Existing Infrastructure

A high level review of AWS asset records suggests that potable water supply to the District can be considered in two separate areas. Brandon is linked to the network supplying the Thetford area, whilst the remaining settlements are connected to the network supplied from local abstractions, and Water Treatment Works (WTW) to the south and west of the District. Whilst locally these networks appear separate (primarily due to the physical barrier to infrastructure imposed by the Breckland Forest), AWS maintain a level of connectivity beyond the District to ensure that their WTW, service reservoirs and treated water pumping stations maintain the required levels of resilience and robustness.

Figure 7-3 below illustrates an indicative schematic of the strategic water distribution network in and around the District.

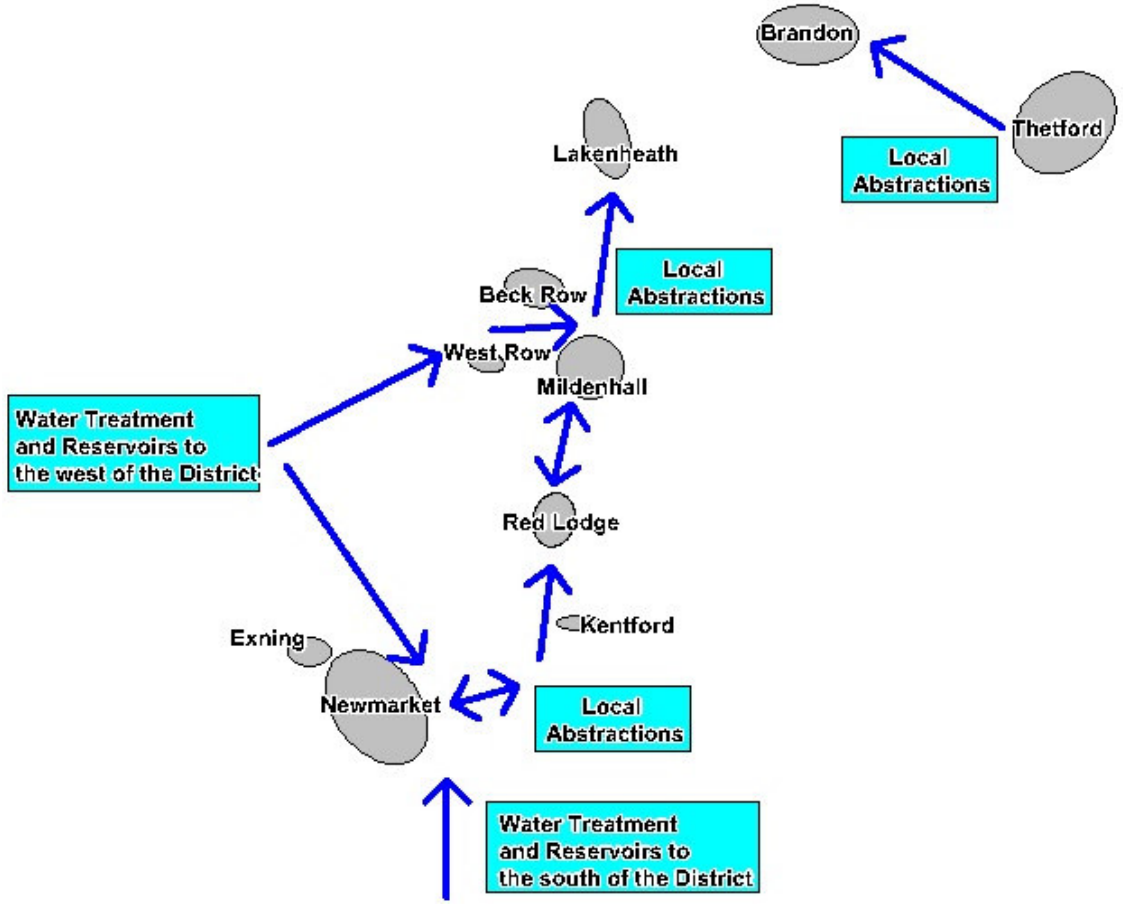

Figure 7-3 Indicative Schematic of Potable Water Supply

7.2 Development Impact

AWS will take the proposed growth into account when determining which aspects of their strategic supply network to upgrade in each AMP, based on a cost benefit analysis, which will take account of risks such as occupancy rate changes, PCC fluctuations, and climate change. AWS will fund the majority of these improvements through revenue from customers as discussed in Section 5.1. It is unlikely that upgrades such as this will constrain the development on a particular site, as the new demand from a site will be a negligible proportion of the volume of water considered at this strategic level.

More locally, the potential PCC reductions, discussed in Section 6.5, will reduce the impact of the proposed growth on the existing water distribution infrastructure. However, a requirement will remain for new water mains to link the sites to the nearest trunk main (or large diameter distribution main with available capacity), or the potential need for reinforcement and capacity upgrades to the surrounding distribution mains. Such upgrades would be funded through the developer requisition process discussed in Section 5.1, during which AWS would investigate the most efficient solution to connect the proposed site, utilising existing capacity where available.

AWS advise that, due to the proximity of the proposed sites to the existing trunk main and distribution network, they are not concerned that the necessary upgrades will constrain development on any of the proposed sites. Therefore, whilst the conclusions in the Outline WCS stand (regarding which areas may be closer to the larger diameter mains), water supply infrastructure should not be considered as a determining factor between sites in the SSA process.

7.3 Conclusions and Recommendations

FHDC and developers should continue to consult with AWS throughout the LDF, and as planning applications are developed, to identify where new network may be put in place, and the existing network reinforced, to serve a number of sites. Neighbouring developers, consulting with AWS (perhaps facilitated by FHDC) will increase the efficiency of the planning and construction of network upgrades, which should serve to reduce overall costs to developers, and the disruption to the existing settlements. It is recommended that FHDC consider the implementation of local Developer Forums, to facilitate a coherent approach to strategic discussions with AWS.

The area where the benefits of the above approach would be most apparent is the west of Red Lodge. Given the scale of the growth proposed, it is likely that the distribution network in the Turnpike Road area will require reinforcement, and the diversion of additional water from the trunk main between Red Lodge and Mildenhall.

Also, following confirmation of the Brandon relief road decision, FHDC should confirm the total development numbers expected at site **B/17** to AWS; as this site may require the construction of a new large diameter main bypassing the town to the north. This new main may require constructing through areas of FZ2 and FZ3, however would be classed as water compatible, and therefore appropriate, under PPS25.

8 Wastewater Treatment

As discussed in the Outline WCS, AWS own and operate the Wastewater Treatment Works (WwTW) within the District.

The EA, as the competent authority, seeks to protect water quality and the environment, through regulation of the quality of point source discharges, including WwTW effluent discharges. This is undertaken through the issue of discharge consents, which categorise the allowable flow volumes and expected effluent quality standards for each discharge.

In order to demonstrate that the growth aspired to in the FHDC Core Strategy can be accommodated by the WwTW, it is necessary to consider the following issues:

- The headroom between the existing Dry Weather Flow* (DWF) and the volumetric discharge consent available to accommodate the additional volumes of wastewater (see Sections 8.2 and 8.3);
- The available hydraulic and process capacity of the WwTW, which may be less than the volumetric discharge consent (see Section 8.3);
- The feasibility of expanding the WwTW to provide the necessary hydraulic and process capacity, following consultation with AWS (see Sections 8.3 and 8.4);
- The feasibility of increasing the volumetric discharge consent in the future, following consultation with the EA (see Section 9.3);
- The feasibility of achieving stricter consents with regards to physio-chemical and biological determinands** standards that will be required to prevent breaches of environmental legislation (see Section 9.3); and
- The potential increase in flood risk to downstream properties due to increased effluent discharges from WwTW (see Section 11.2).

8.1 Cordon Sanitaire

The strength of the odours from a WwTW (or pumping station) at any particular time will depend on a number of factors, including the distance from the source, wind strength and direction and ambient temperature. The concentration of odour will normally diminish as the distance from the source increases. AWS recommend that a cordon sanitaire should be respected around the WwTW, to ensure that dwellings, offices and other development which are likely to be sensitive to odours are not constructed in locations likely to be affected by odour nuisance.

AWS strongly recommend that LPAs safeguard a cordon sanitaire of 400 m from WwTW boundaries. This distance may be relaxed (following consultation with AWS) on a case by case basis depending upon the processes in place at the WwTW, the sensitivity of its location, and the type and scale of the proposed development.

AWS also recommend that development is excluded from within 15 m of sewage pumping stations, subject to similar conditions as above.

* see Technical Glossary for definition of DWF

** See Discharge Consent in Technical Glossary for description of physio-chemical and biological determinands

As discussed throughout Section 8.3 (and displayed in Figures E1 through E9 in Appendix E), the following development sites fall with 400 m of the existing WwTW:

- B/12 and B/17;
- L/12; and
- M/19.

The locations of these sites are displayed in the Figures

It is imperative that developers contact AWS as soon as practicable to discuss the implications of possible odour nuisance for these sites. FHDC should strongly consider facilitating these discussions by including specific policies in the SSA process, requiring developers to present evidence that such discussions have taken place. FHDC may also wish to take the outcome of these discussions into account when screening possible sites through the SSA process, which should highlight the importance of developers contacting AWS promptly.

In addition, the following sites also fall within 15 m of a sewage pumping station.

- B/12, B/20 and B/26;
- BR/01 and BR/10;
- L/11;
- M/29 and M/33;
- N/17 and N/20;
- RL/02, RL/04, RL/10, RL/13, and RL/16; and
- WR/08 and WR/22.

Similar to above, it is recommended that developers consult with AWS to ensure any possible constraints are fully appreciated; again FHDC may wish to facilitate this by incorporating this guidance into the SSA policies.

8.2 Wastewater Projections

The Outline WCS highlighted that the growth proposed in the emerging Core Strategy may be constrained by the limited headroom between consented volumetric discharge and current DWF at the following WwTW:

- Brandon;
- Lakenheath; and
- Tuddenham (which serves the Red Lodge development).

This assessment was based on existing flow data at the WwTW compiled by AWS for their June Return 2008 (JR08) process. Since the completion of the Outline WCS, AWS have provided updated flow data for the WwTW in the District, from their JR10 process.

This data, along with the revised housing trajectory described in Section 4.2, has been used to update the projections of the likely impact of the proposed growth on the WwTW in the District.

The methodology used to assess the impact of the proposed growth on wastewater flows at the WwTW, and hence determine any required hydraulic or process capacity upgrades, is described in the following sections.

8.2.1 Methodology

As the District is served by a number of WwTW, the impacts of the potential residential development must be assessed at the individual WwTW catchment scale. Projected changes to the DWF received by the WwTW have been estimated using the following equation:

Total DWF = Existing DWF + DWF from new dwellings

Where DWF is calculated from:

(*number of dwellings x occupancy rate x PCC) + allowance for infiltration + trade flow*

The PCC rate used is 144 l/p/day, following consultation with AWS. For wastewater infrastructure planning purposes, this PCC is not reduced in line with CSH, to allow for the most conservative estimate of future impacts.

The allowance for infiltration, which accounts for water entering the sewerage network from incorrect or illegal connections, and through defects in the existing assets, is estimated to be an additional 25% of the DWF from dwellings, based on guidance from AWS.

AWS have provided two current baseline DWF figures for each WwTW; the flows as measured in 2010, and the flows as calculated based on their current understanding of the catchment. In some instances these vary significantly. Reasons for this could be:

- AWS are underestimating the proportion of the catchment connected to private sewage systems, such as cess pits and septic tanks;
- Domestic flows from businesses have reduced due to the current economic climate, and the implementation of water efficiency measures;
- The networks may be experiencing leakage; or
- Faults in metering have skewed the results (unlikely given a recent AWS and EA audit).

It has been assumed that trade effluent from businesses remains constant for the foreseeable future across the District. Intensification of existing employment areas is unlikely to result in a net increase in industrial demand, as it is predicted that companies with heavy water use will improve efficiency, and be replaced with service-orientated industry over time.

However, the development of new employment sites will obviously require modification and upgrades to the existing wastewater network. Whilst AWS have been made aware of the sites emerging through the SSA process, FHDC and developers must liaise with AWS, once plans for these sites have progressed, to identify any likely constraints that may restrict the provision of wastewater services, and the funding and phasing implications of these.

In addition, AWS are under no obligation to accept trade effluent to their wastewater systems. In doing so, they may require improvements to the capacity of their networks and process streams, depending on the volume and chemical consistency of the effluent. The capital required for this work will be a consideration that the water companies take into account when making a financial agreement with the businesses in question.

High level discussions with AWS engineers and planners, based on their knowledge of current capacity and performance at the WwTW, have been undertaken to assess the potential impact from the proposed development. Where AWS estimate that upgrades will be required, the feasibility of such upgrades, along with potential timeframes, has been discussed in the following sections.

8.3 Wastewater Treatment Constraints

8.3.1 Beck Row

Wastewater from Beck Row is treated at Mildenhall WwTW. See Section 8.3.6 below for details of relevant constraints and solutions.

8.3.2 Brandon

DWF Projection

Figure 8-4 below illustrates the results of the DWF projection to 2031.

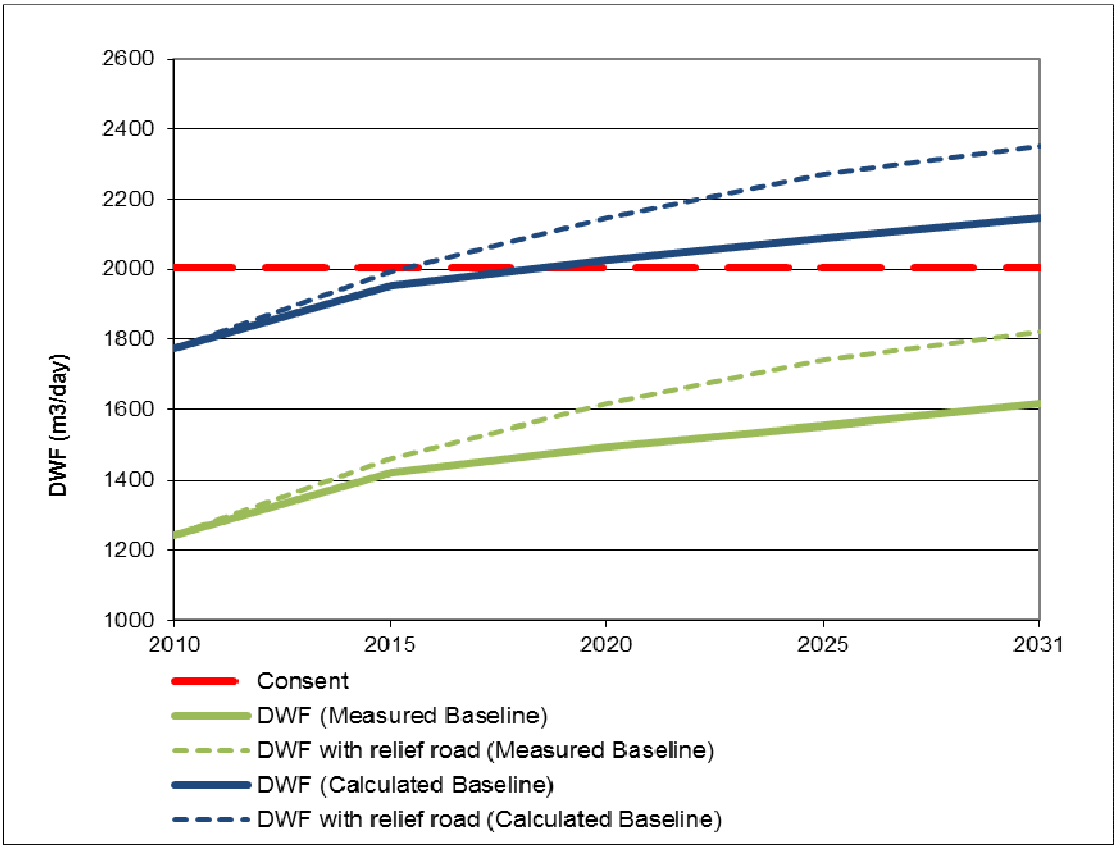

Figure 8-4 Projected DWF at Brandon WwTW

(Showing growth with and without provision of the relief road)

The current DWF at Brandon WwTW, calculated by AWS, is significantly higher than the measured flow in 2010. Based on the measured flow, it would appear that both growth scenarios at Brandon could be accommodated within the existing DWF consent.

However, based on the current calculated DWF, it is estimated that the growth proposed in the Brandon WwTW catchment will exceed the current volumetric discharge consent by 2020. The additional Brandon growth, subject to the provision of the relief road, would cause this consent to be exceeded by 2015.

Any additional dwellings completed after these points will require AWS to negotiate an increased volumetric discharge consent with the EA. It is likely that for the EA to consent to an

increase in volumetric discharge, tighter physio-chemical standards would be required for the effluent. This is discussed in more detail in Section 9.3.1.

Hydraulic and Process Capacity

AWS estimate that the current installed hydraulic and process capacity at the WwTW will not be sufficient to accommodate the increased flows from the committed and proposed dwelling numbers in the long term.

In order to accommodate the proposed growth levels, the WwTW will require the installation of an additional filter tank and associated infrastructure, and the provision of an aeration ditch to treat this water prior to filtration. In addition, AWS will have to investigate solutions to a possible limitation of hydraulic capacity through the inlet works. AWS envisage that the provision of such infrastructure would be investigated and constructed from AMP6 (2015) onwards, and that the growth proposed before then can be accommodated by the existing processes. The available land within the current site footprint appears to be adequate, although further investigation is required by AWS on this matter.

To accommodate the increase in flows generated by the additional growth associated with the relief road, AWS suggest that a change of process may be required at the WwTW. However, the need for such a process change is considered marginal, and may be negated by increases in water efficiency in the catchment, and changes to demographics.

If AWS determine that a change of process will be required, the current biological filter WwTW would need to be replaced with an activated sludge WwTW. A major upgrade such as this would have a planning and construction timeframe of up to ten years. As AWS have not included funds for this in PR09, it is likely that such an upgrade would not come online prior to 2020.

Availability of land will need to be further investigated by AWS, as it is likely that the current site footprint does not have enough space to accommodate the construction of the new process whilst continuing to provide treatment for the catchment through the existing process. It should be noted that such an extension may bring the site boundary closer to existing and proposed residential areas, which will have implications on the AWS requirement for a 400 m cordon sanitaire (see Section 8.1).

It is imperative that FHDC keep AWS informed as to the status of the relief road proposal. Timely notice of any increase in proposed dwellings will be required in order to ensure that AWS progress with the design and construction of the required process and hydraulic upgrades at the WwTW, investigate if a change of process will actually be required (and therefore if this will in fact constrain development), and ensure appropriate funding is in place.

8.3.3 Exning

Wastewater from Exning is treated at Newmarket WwTW. See Section 8.3.7 below for details of relevant constraints and solutions.

8.3.4 Kentford

Wastewater from Kentford is treated at Newmarket WwTW. See Section 8.3.7 below for details of relevant constraints and solutions.

8.3.5 Lakenheath

DWF Projection

Figure 8-5 below illustrates the results of the DWF projection to 2031.

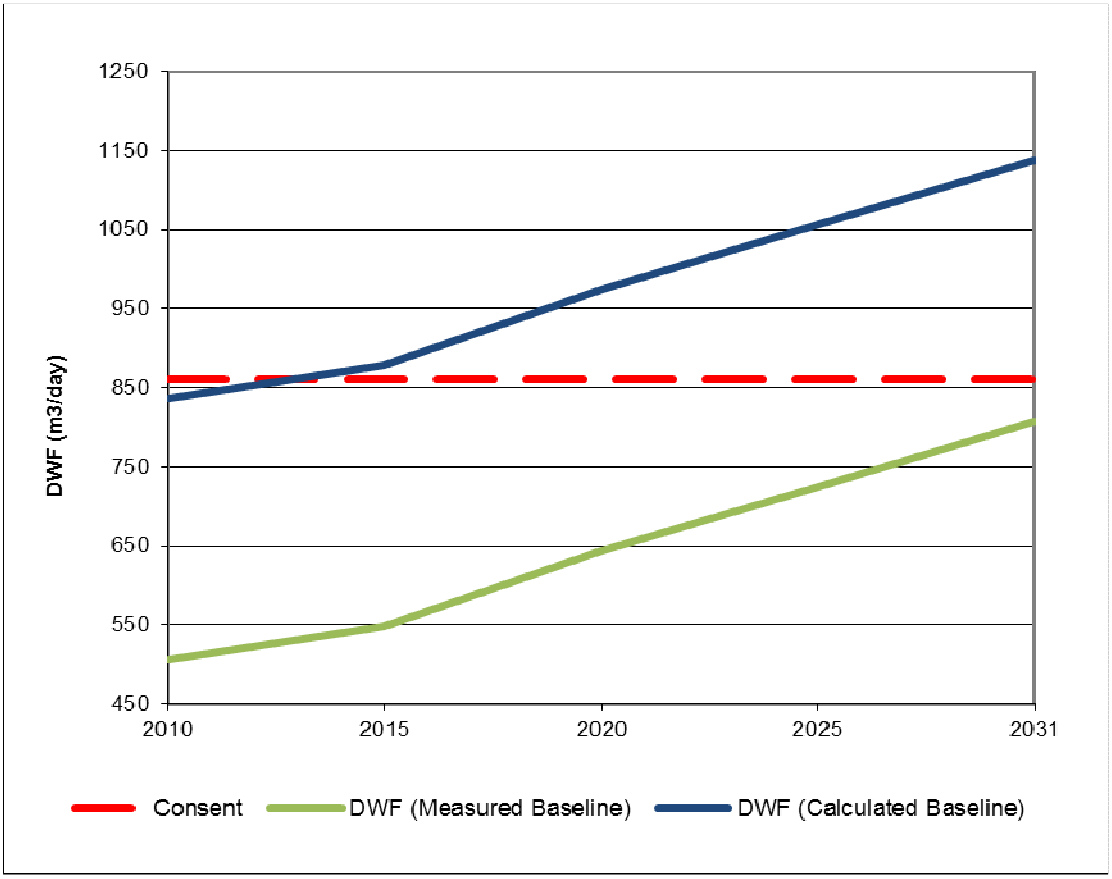

Figure 8-5 Projected DWF at Lakenheath WwTW

The current DWF at Lakenheath WwTW, calculated by AWS, is significantly higher than the measured flow in 2010. Based on the measured flow, it would appear that the proposed growth at Lakenheath can be accommodated within the existing DWF consent.

However, based on the current calculated DWF, it is estimated that the growth proposed in the Lakenheath WwTW catchment will exceed the current volumetric discharge consent by 2012, and that the WwTW will only marginally have the headroom within its existing consent to accommodate those dwellings which are already committed.

AWS advise that this is not the case, and that at Lakenheath the measured DWF should be assumed as the baseline (this has been investigated in conjunction with the EA in a recent audit of flows)[*]. Whilst applying the projected DWF increase to the current measured baseline does not predict that a new volumetric consent will be required prior to 2031, it must be noted that the estimated total DWF at 2031 is within 10% of the current volumetric consent.

[*] AWS plan to meet with the EA in Nov 2011 to discuss the disparity between the audited flows at Lakenheath and the current consent. This is a permitting issue, requiring discussion regardless of growth; and is therefore beyond the influence of FHDC policy.

Should this materialise, AWS and the EA may seek to negotiate an increased volumetric discharge consent, to maintain a buffer to allow for seasonal variations. The indicative physio-chemical standards, which may be applied to such an increased consent, are discussed in Section 9.3.2.

Hydraulic and Process Capacity

AWS estimate that the existing activated sludge process capacity at Lakenheath can be optimised to accommodate the flows from dwellings already committed by FHDC.

However, any further growth will require the installation of additional process capacity. AWS estimate that sufficient land is available within the WwTW site boundary to accommodate the additional process capacity. However, significant upgrades to WwTW infrastructure such as this may involve a planning and construction timeframe of up to five years from when development sites are confirmed.

AWS currently estimate that such an upgrade would be investigated during AMP5 and constructed during AMP6, dependant on the actual growth that occurs within the catchment.

FHDC modified their original development proposals at Lakenheath to phase the majority of the growth from 2015 onwards, based on the concerns highlighted during the Outline WCS process, hence avoiding what would have been a major constraint.

Under PPS25, an extension to a WwTW is appropriate for areas of Flood Zone (FZ) 2/3a, as it would be classed as “less vulnerable” if adequate pollution control measures are in place. As such, the fact that the WwTW site lies partially within FZ 2/3 (in the area drained by the Lakenheath IDB), should not significantly constrain development. However, additional capital costs may be required to ensure that adequate pollution control measures, such as raised defences and bunds, are provided for any new WwTW processes.

The water levels in the Lakenheath IDB area are controlled by the IDB through the use of pumping. The volume and rate at which water can be expelled from the area are constrained by installed pump capacity and downstream flood risk issues. The IDB estimate that any significant increase in discharge from Lakenheath WwTW, such as that proposed when using the calculated DWF baseline, would require some form of mitigation, either on site or within the IDB area, to ensure that they can continue to manage water levels effectively.

Whilst AWS advise that the increase in DWF (based on the current measured flows) would not require an increased consent with the EA, it is likely that discharge increases of this magnitude will still require mitigation of some sort. AWS consider that any land drainage improvements needed as a consequence of increased flows arriving at, and discharged from, the WwTW should be agreed between FHDC and the IDB.

The IDB do not currently have a model for the receiving system, and hence cannot advise on the details of any mitigation at this time. The IDB advise that they are unable to raise funding directly from developers for the mitigation works associated with treated effluent discharges, and therefore would be reliant on FHDC raising said funding.

8.3.6 Mildenhall

DWF Projection

Figure 8-6 below illustrates the results of the DWF projection to 2031.

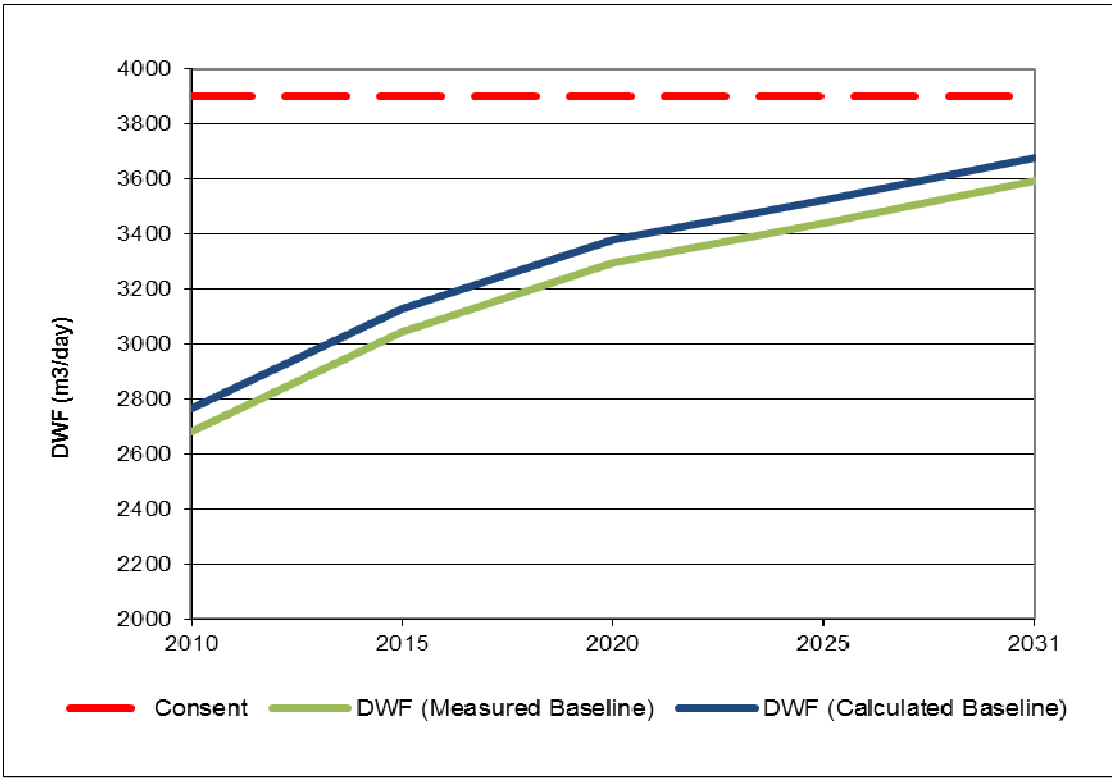

Figure 8-6 Projected DWF at Mildenhall WwTW

WwTW also serves Beck Row and West Row

The current DWF at Mildenhall WwTW, calculated by AWS, is marginally higher than the measured flow in 2010. Based on either of the current DWF values, it would appear that the proposed growth at Mildenhall, Beck Row and West Row can be accommodated within the existing DWF consent.

However, similar to at Lakenheath, the projections estimate that the total DWF may fall within 10% of the existing consent prior to 2031.

Should this materialise, AWS and the EA may seek to negotiate an increased volumetric discharge consent to maintain a buffer to allow for seasonal variations. The indicative physio-chemical standards, which may be applied to such an increased consent, are discussed in Section 9.3.3.

Hydraulic and Process Capacity

AWS estimate that the current installed hydraulic and process capacity at the WwTW is sufficient to accommodate the increased flows from the committed and proposed dwelling numbers without the need for significant upgrades.

8.3.7 Newmarket

DWF Projection

Figure 8-7 below illustrates the results of the DWF projection to 2031.

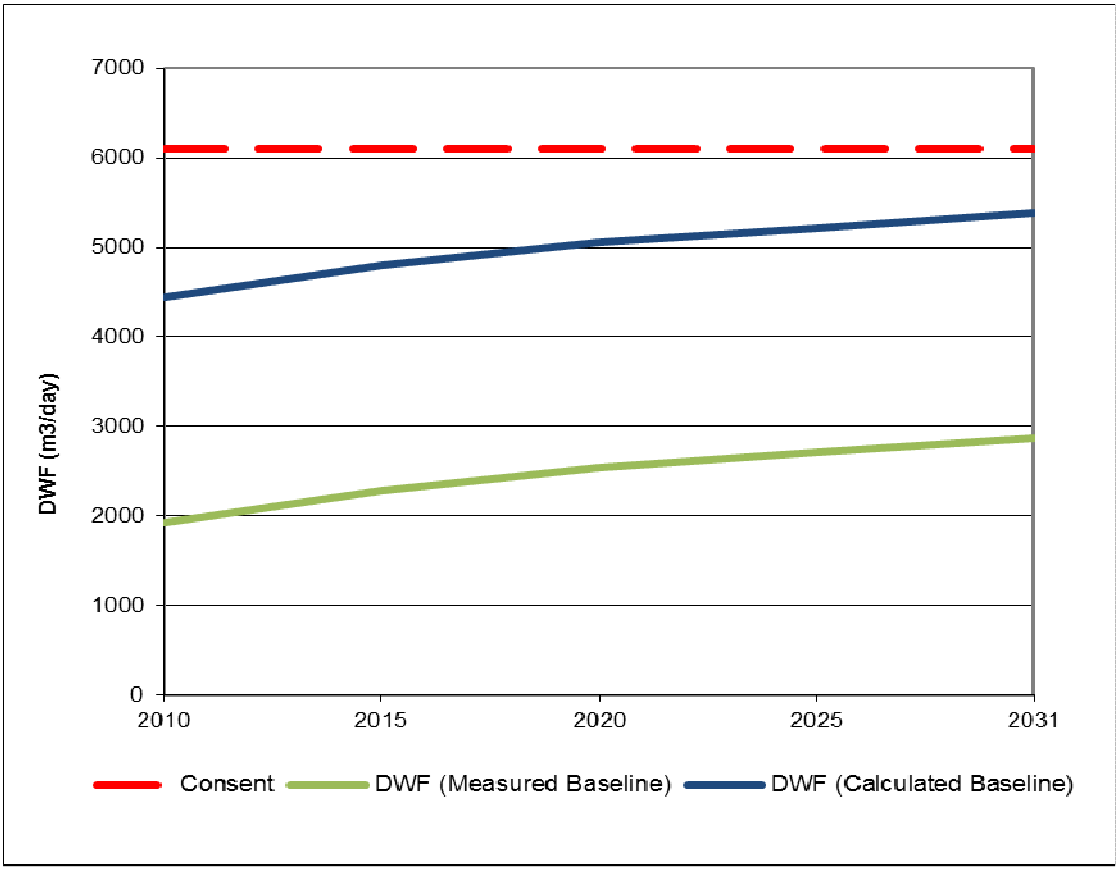

Figure 8-7 Projected DWF at Newmarket WwTW*

WwTW also serves Kentford and Exning

The current DWF at Newmarket WwTW, calculated by AWS, is significantly higher than the measured flow in 2010. Regardless of this, based on either of the current DWF values, it would appear that the proposed growth at Newmarket, Exning and Kentford can be accommodated within the existing DWF consent. As such, there is no need to consider indicative consent standards at this time.

FHDC should however continue to liaise with AWS and the EA, as changes may be required to the physio-chemical consent standards at the WwTW to aid compliance with the Water Framework Directive. This risk is discussed in more detail throughout Section 9.

Hydraulic and Process Capacity

AWS estimate that the current installed hydraulic and process capacity at the WwTW is sufficient to accommodate the increased flows from the committed and proposed dwelling numbers without the need for significant upgrades.

* DWF (Measured Baseline) shown is average of recorded DWF 2004 - 2010

8.3.8 Red Lodge

As described in the Outline WCS, and Section 10.1.8, wastewater from the Red Lodge settlement is currently conveyed via a series of pumping stations and rising mains to Tuddenham WwTW, to be treated and then discharged into the Tuddenham Stream.

DWF Projection

Figure 8-7 below illustrates the results of the DWF projection to 2031.

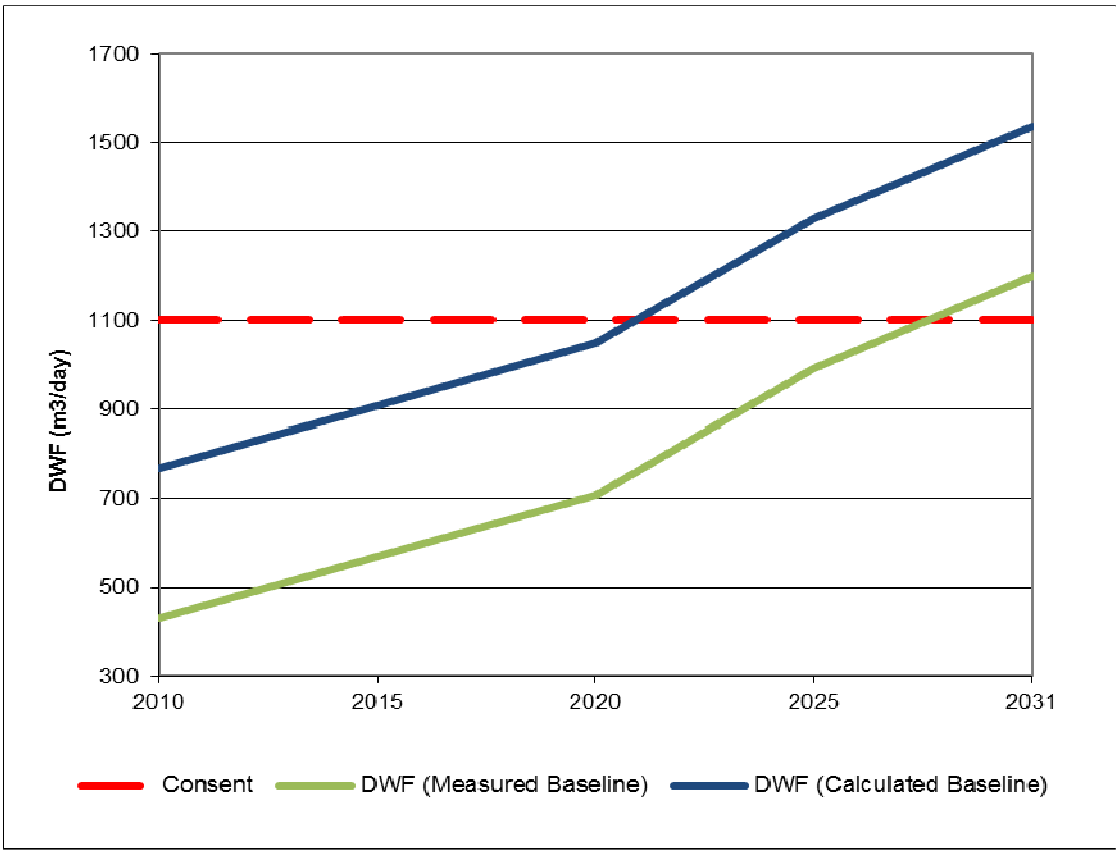

Figure 8-8 Projected DWF at Tuddenham WwTW

The current DWF at Tuddenham, calculated by AWS, is significantly higher than the measured flow in 2010. However, the projections estimate that the current DWF consent will be exceeded prior to 2031, due to the proposed growth, regardless of which baseline DWF value is assumed.

The WCS has therefore used the current calculated DWF (the higher of the two) to facilitate a conservative approach to further work, and focus the stakeholders on investigating and resolving the environmental constraints (discussed further in Sections 8.4.3 and 9.3.4) as soon as possible, to ensure that a solution is in place in time for the proposed Core Strategy growth post 2021. Therefore, it is estimated that the committed growth expected at Red Lodge will marginally exceed the current volumetric discharge consent at Tuddenham WwTW.

FHDC modified their original development proposals at Red Lodge to phase the additional growth from 2021 onwards, based on the concerns highlighted during the Outline WCS process.

Any additional dwellings completed after this point will require the negotiation of an increased volumetric discharge consent with the EA. For the EA to consent to an increase in volumetric

discharge, tighter physio-chemical standards will be required for the effluent, discussed further in Section 9.3.4.

Hydraulic and Process Capacity

AWS advise that Tuddenham WwTW currently has capacity to accommodate the existing commitments at Red Lodge, but no further capacity to accept the increased flows from the proposed development post 2021.

Following past consultation with developers, AWS had previously developed an internal strategy for the Tuddenham WwTW and sewerage network. This strategy made provision for the remaining committed dwellings at Red Lodge to be connected to the Tuddenham network. AWS advise that, in order to accommodate the committed dwellings, Tuddenham WwTW would require:

- Further upgrades to the sewage pumping station in the Herringswell area (discussed in more detail in Section 10.1.8);
- Upgrading of the inlet works to increase the hydraulic capacity of the WwTW;
- Installation of additional storage tanks to allow balancing of the increased flows prior to treatment; and
- Additional process capacity, through the installation of a moving bed bioreactor (MBBR).

AWS had previously determined that these upgrades would be required during AMP5, and given the on-going nature of development at Red Lodge, and the lack of current capacity, it is envisioned that AWS will proceed with these upgrades as soon as reasonably practicable. However, in the longer term, a new strategy is required to accommodate the proposed development at Red Lodge.

As identified in the Outline WCS, land availability at Tuddenham WwTW may pose a constraint to hydraulic and process upgrades. The WwTW site is surrounded by the Breckland SPA and Breckland Farmland SSSI, and falls within the SPA Constraint Zone for Stone Curlews described in the FHDC Core Strategy. This has the potential to cause a delay to the delivery of the required hydraulic/process upgrades, should additional site footprint be required.

The following issues must be considered by AWS should the footprint of Tuddenham WwTW require extension:

- Under Regulation 48 of the Habitats Regulations 1994 (as amended), FHDC will have to liaise with NE to undertake an Appropriate Assessment to determine if the impacts of the WwTW extension on the SPA will be significant, and agree how this should be mitigated in conjunction with AWS, prior to granting planning permission for such an extension; and
- AWS, once owners of the land required, must give NE notice under section 28H of the Wildlife and Countryside Act 1981 (as amended) before carrying out any operations which are likely to damage any of the features of interest of an SSSI. Work should only go ahead with NE assent, which may include conditions being imposed to protect the interest of the site.

AWS may be able to minimise the land required for the upgrades by utilising space saving technology such as vertical sand filters for tertiary treatment, however this will have implications on the capital cost they will have to meet through customer bills.

In the longer term, AWS estimate that the WwTW would require a change of process to accommodate all the growth proposed in the Core Strategy at Red Lodge. The current submerged aerated filter process, (and suggested MBBR installed to accommodate the

committed sites) would need to be replaced with an activated sludge process, either in traditional form or a sequencing batch reactor (SBR), to efficiently treat the required volume of wastewater to the physio-chemical standards required. This would incur a high capital and embedded carbon cost, and may be constrained by land availability; as it would be necessary to accommodate the construction of the new process whilst continuing to provide treatment for the catchment through the existing process.

A major upgrade such as this would have a planning and construction timeframe of up to ten years, and it is likely that such an upgrade would not come online prior to 2025, given the current capacity and process upgrades planned for Tuddenham WwTW in AMP5.

This would mean that, post 2021, the existing WwTW process would have to be operated at additional operating costs (and higher risk of pollution events) to accommodate the growth until the further upgrades are completed, or development delayed until the required upgrades are completed. The constraints, and possible solutions, at Tuddenham WwTW, are further discussed in Section 8.4.3.

8.3.9 West Row

Wastewater from West Row is treated at Mildenhall WwTW. See Section 8.3.6 above for details of relevant constraints and solutions.

8.4 Treated Effluent Discharge Options

In order to ensure the most sustainable strategy is developed regarding wastewater treatment in the District, a range of options to accommodate the increased discharges from Brandon, Lakenheath and Tuddenham WwTW were considered during the WCS. This allowed the EA to provide indicative consent standards for the projected increases in effluent discharge, the feasibility of which were then discussed with AWS.

8.4.1 Brandon Option

The Outline WCS initially raised a concern that the growth proposed in the Core Strategy for Brandon would increase the population equivalent (PE) of the WwTW to beyond 10,000. Under the Urban Waste Water Treatment Directive (UWWTD), WwTW are required to implement phosphorus stripping once they exceed 10,000 PE. AWS were initially concerned that the increased costs associated with this treatment would be an undesirable consequence of the proposed growth, and as such, this issue warranted investigation through the Stage 2 WCS.

An option was considered involving relocating the current Brandon WwTW discharge point on the Little Ouse, to a location further downstream, to benefit from the greater dilution available.

However, an AMP5 scheme is now planned to improve the existing discharge standards at Brandon WwTW, to aid compliance with the Water Framework Directive, (see Section 9.1) regardless of the proposed growth. For this reason, this option has not been considered further in this study.

8.4.2 Lakenheath Option

This option involved relocating the current effluent discharge point from Lakenheath WwTW (currently into the Crooked Dyke/ Twelve Foot Drain system) to the Cut-Off Channel.

Relocating the Lakenheath WwTW discharge point to the Cut-Off Channel has the potential to improve water quality in the Lakenheath IDB area, by removing a point source of pollution. This may be advantageous for downstream users, especially given the concern on the impacts of discharges on agricultural use raised by the IDB at the Outline WCS stage. This option also eradicates the requirement for mitigation of increased water levels throughout the IDB area.

Relocating the Lakenheath WwTW discharge to the Cut-Off Channel would require that effluent is stored following treatment and then raised approximately 3 m by a pump and rising main. This creates an increase in energy (and carbon) requirement and operational cost, along with the additional capital costs and embodied energy required to construct the pumping infrastructure.

The Cut-Off Channel is an important asset for flood risk mitigation and the transfer of water resources in the region. It is controlled by a series of sluices, and used to intercept the Rivers Lark, Little Ouse and Wissey at times of high flow and divert these to the Great Ouse at Denver, to prevent flooding where these three rivers would normally converge with the Ely Ouse.

The Cut-Off Channel is also utilised to transfer large quantities of river water down to Essex in order to support public water supply reservoirs. This option could add significant polluting load to the water being transferred, and therefore a detailed assessment would be required to look at potential impacts on the receptor rivers in Essex, and additional treatment costs incurred by Essex & Suffolk Water.

The Lakenheath IDB area is a pumped system, with water levels managed for flood risk mitigation and agricultural uses. Relocating the Lakenheath WwTW discharge away from this system could potentially reduce a significant volume of water available for downstream use. The EA advise that the area around Mildenhall and Lakenheath is often the first to suffer during periods of drought, hence removing this discharge to the local system of drains may worsen the water resource situation.

According to the EA, currently no Public Right of Navigation exists on the Cut-Off Channel, however permissive access has been granted on one off occasions for canoe passage. The EA have been looking at ways to improve the potential recreation amenity the Cut-Off Channel has to offer. Any changes to base flows or levels may have a potential future impact for this activity, as would any water quality changes.

This option was first considered when it appeared that the current DWF discharge from the WwTW was close to breaching its consent. The potential water quality and level concerns associated with a higher consented discharge were therefore of concern to the IDB. Subsequent information from AWS (that the lower measured DWF should be considered as the baseline) now reduces the apparent benefit of this option.

For the above reasons this option is not discussed further in this study; the existing discharge to the IDB system is preferred by the stakeholders, providing adequate mitigation of water level increases can provided (as discussed in Section 8.3.5).

8.4.3 Tuddenham Options

As discussed in the Outline WCS and Section 8.3.8, the stakeholders advised that the proposed growth levels at Red Lodge were cause for significant concern. FHDC took account of these concerns by proposing that only the existing commitments would be delivered prior to 2021, with the remainder of the Core Strategy growth proposed from 2021 onwards.

AWS estimate that whilst some upgrades at the works are planned to accommodate the existing commitments, the additional growth is likely to require a change in process at the WwTW. This

could potentially take until 2025 to be realised, and may be constrained by the availability of land (due to the sensitivity of the surrounding habitats).

As the current discharge from the WwTW contributes a significant proportion of the overall flow in the Tuddenham Stream (particularly during dry periods), any changes will impact flood risk and the availability of water for the environment, as well as the obvious water quality concerns.

The low dilution available in the Tuddenham Stream will require strict physio-chemical standards to be applied to any increased discharge, to maintain the existing water quality and aid compliance with the Water Framework Directive. There is a risk that this could be beyond the levels which can be achieved economically using conventional methods (discussed further in Section 9.3.4).

For these reasons, a number of alternative options were considered for treating and discharging the wastewater from Red Lodge. These options were:

- Upgrade the existing WwTW capacity, treat the wastewater to the required quality; and continue to discharge to the Tuddenham Stream (the constraints of which are discussed in Sections 8.3.8 and 9.3.4);
- Construct a new pumped sewer system to convey wastewater from Red Lodge to Mildenhall WwTW for treatment, for discharge to the River Lark, potentially allowing more achievable consent standards because of the higher dilution available;
- Construction of a new WwTW at Red Lodge, discharging to the River Kennett.
- Upgrade the existing WwTW capacity, but transfer the additional effluent to the River Lark for discharge, potentially allowing more achievable consent standards because of the higher dilution available; and
- As above, but transferring the entirety of the current Tuddenham discharge to the River Lark.

The advantages and disadvantages of these options are discussed in more detail below.

Transfer to Mildenhall WwTW

This option would involve the construction of a new pumped sewer, connecting the Red Lodge network to the southern extents of the Mildenhall network, or directly to Mildenhall WwTW. This new connection would potentially involve the construction / upgrading of close to 5 km of sewer, requiring crossings of the River Lark and A11.

There are clear advantages to this option, due to the process and treatment capacity (and surrounding land) available at Mildenhall, and the higher dilution available in the River Lark to accommodate the increased discharge. However, given the extent of the new assets required, AWS do not judge this option to be cost effective, particularly as they already operate an established pumped network from Red Lodge to Tuddenham.

The financial implications of abandoning these assets (including the recent work to improve capacity near Herringswell) would deter AWS from pursuing this option at the present time. For this reason, the WCS will not consider this option further.

New WwTW

The EA advised that the River Kennet is winterbourne (i.e. it does not flow for its full length during summer or dry periods). The installation of a new WwTW discharging to the river could result in this treated effluent making up a significant proportion, if not all, of the flow in the sections of the river that dry up. This would be likely to have a detrimental impact on water

quality, and hence ecology, which is of particular concern, as the river already currently exhibits high phosphate concentrations and poor fish levels.

According to the EA, it is likely that a discharge in this location would require the removal of phosphorus and oestrogenic compounds, and the possible increases in downstream flood risk would have to be carefully assessed and mitigated.

Whilst this option may result in less pumping of wastewater, these operational cost and energy savings may be heavily outweighed by the capital costs and embedded energy required to construct a new WwTW in this location. Given these concerns, the stakeholders concluded that the WCS should not consider this option further.

Discharge to the Lark

Consultation with the EA and AWS throughout the Stage 2 WCS suggested that the physio-chemical consent standards, which might apply to an increased discharge from Tuddenham WwTW, would likely be beyond the standards which can be economically achieved through conventional technology; particularly due to the requirement to improve the phosphate concentrations in the Tuddenham Stream in line with the requirements of the WFD post 2015 (discussed further in Section 9.3.4).

The stakeholders considered that a feasible option may be to transfer this increased effluent to the River Lark for discharge, thereby making use of the greater dilution available in this watercourse. Similarly, the impact of this option on water quality is discussed further in Section 9.3.4.

Whilst this option would incur a large initial capital expense, and continued costs associated with pumping the effluent, AWS suggested that this may still be preferred given the constraints to upgrading the existing works (see Section 8.3.8). For this reason, the Stage 2 WCS has considered this option in more detail below.

Currently, the discharged effluent from Tuddenham WwTW is conveyed in channel approximately 3.3 km via the Tuddenham Stream, to its confluence with the River Lark. This option would involve intercepting some or all of this effluent, prior to its discharge to the Tuddenham Stream, and conveying it to the River Lark (in a similar location to the confluence) via a network of new pumps and pumping stations.

It is likely that the first section of the route for this discharge would be from the WwTW to the area north of Tuddenham village, along High Street. A new pumping station would likely be required in the Higham Road area to lift the intercepted effluent over the crest of the hill, allowing it to gravitate from here to the area north of the village. An AWS sewage pumping station is already located north of the village. It is likely that a new pumping station would be required on land adjacent to this, to convey the effluent onwards to the River Lark, given the limited gradients available.

Two possible options were considered for the route from the village to the River Lark. Initially, a route parallel to the Tuddenham Stream was considered, to maximise the use of the (limited) available gradients, and hence minimise pump requirements, and minimise the length of new discharge pipe required. However, such a route would be located primarily in FZ 3, and require at least nine field drains to be negotiated. The route would also pass through an area of floodplain grazing marsh (a UKBAP priority habitat), and potentially part of the Breckland SPA and Cavenham-Icklingham Heaths SSSI.

Any work in the Breckland SPA would have to be carefully planned (an Appropriate Assessment undertaken under the Habitats Regulations) to ensure that any potential impacts on Stone

Curlews and their nesting sites are sufficiently mitigated. This could restrict the construction period to the winter months, potentially incurring additional costs for AWS, and also restrict future maintenance regimes for assets in this location.

A more suitable route (preferred by AWS) would be for the discharge pipe to continue along Tuddenham Road, from the north of Tuddenham Village to Barton Mills, allowing discharge to the River Lark west of the A11 bridge. Whilst this route is approximately 20% longer than above, it avoids crossing any SPA, SSSI or UK BAP habitats, and the majority of FZ 3. In addition, the construction of such a pipe along a public highway entails simpler land access issues (for both construction and on-going maintenance) than a route through private land.

It should however be noted that this route will incur additional pumping costs (and energy) due to the higher elevations along Tuddenham Road (compared to the route of the Stream) which must be overcome. For this reason, the final route chosen for this option will depend on a full cost benefit analysis to be undertaken by AWS as they develop their future strategy for Tuddenham WwTW.

Regardless of the overall route, it is likely that the construction of first 180 m of discharge pipe from the WwTW will involve work in the Breckland SPA/ Breckland Farmland SSSI. As discussed above, the impact of such work on Stone Curlews (and other conservation interests) must be assessed in partnership with Natural England. Any impacts may be mitigated if the capacity of the existing discharge pipe from the WwTW to the Tuddenham Stream is sufficient to convey all the increased flows (to be confirmed by AWS); this would allow the new discharge pipe to intercept this existing asset beyond the Breckland SPA/ Breckland Farmland SSSI boundary.

The impacts of this option, in terms of water quality/ quantity and flood risk, are discussed in Sections 9.3.4 and 11.2.2 respectively. The preference of this option, over upgrading the existing WwTW process (to discharge at the current location), requires additional investigation by the stakeholders, including:

- Detailed water quality/ ecological assessments and site surveys to confirm the environmental impacts of both the existing and proposed discharge points;
- Confirmation of flood risk implications for both discharge points; and
- A detailed cost benefit analysis to be undertaken by AWS (likely with support from the EA) to determine which scheme has the lower initial and whole life cycle economic (and carbon) costs, and quantify the environmental and social risks of both options.

It should be noted that there remain a number of constraints to increasing the discharge from Tuddenham WwTW, to accommodate the proposed growth post 2021. However, the WCS stakeholders are satisfied that a potential alternative option exists; and that the timeframe allowed (by the later phasing of this development) provides a suitable window to investigate, plan and construct the solution which emerges as the more economically viable, technically feasible and environmentally sustainable.

9 Environmental Capacity (Water Quality)

The Outline WCS reported that the majority of watercourses within the District were of moderate or good biological and chemical quality*. The Outline Study also highlighted that the majority of watercourses in the District exhibited high or very high levels of nitrate and phosphate, risking eutrophication of the watercourses.

Water quality has always been an important consideration; however, more stringent standards on surface and groundwater quality (and hence discharges into rivers from WwTW) are being applied by the EA, as the Water Framework Directive (WFD) is gradually implemented at regional and local levels.

9.1 Water Framework Directive

The WFD sets out a strategy for protecting and enhancing the quality of groundwater, rivers, lakes, estuaries and coasts. It introduces the integrated approach to river basin management that the EA is currently applying to the 11 River Basin Districts in England and Wales; identifying and characterising the water bodies and protected areas in each river basin, and the pressures and risks upon them.

The main objectives of the WFD are to prevent any deterioration in current water quality, and bring all water bodies up to 'good status' by 2015. The quality parameters for the assessment of a river have been set by the UK Technical Advisory Group (UK TAG)[14]. A requirement of the WFD is that a no deterioration policy is adopted for the WFD quality parameters, which could have potential implications for future developments.

All of the watercourses in the District which could potentially receive an increase in discharge from the WwTW are classified as being Heavily Modified under the WFD. This categorisation of Heavily Modified Water Body (HMWB) means that the channel has undergone significant morphological changes. In the District the majority of these historical changes were for flood protection and navigation. The WFD requirement for HMWBs is to reach good ecological potential (GEP), as opposed to 'good status', however the water quality standards required are consistent, regardless of the designation as HMWB.

River Basin Management Plans (RBMPs), developed by the various regional offices of the EA, were published in December 2009. The RBMPs set out a strategy including a Programme of Measures for each catchment to comply with the requirements of the WFD. An assessment of the current status of the rivers has been made, showing the rivers and lakes that currently fall below the 'good status' (or GEP) required to meet the WFD. The documents then set out those rivers that should be at 'good status' (or GEP) by 2015 with the remainder aiming for 'good status' (or GEP) by 2027.

The District falls within the Anglian RBMP area. Further information regarding the WFD, and the current status and future targets of the watercourses, is included in Appendix D.

Reviewing the RBMP[15] reveals that none of the receiving watercourses in the District are currently classed as achieving GEP, with the exception of the Twelve Foot Drain (downstream of the drainage system which Lakenheath WwTW discharges to). The majority of the receiving watercourses are classed as having Moderate EP.

* based on the now defunct General Quality Assessment and River Quality Objectives data from 2006

Throughout the District the main barriers to achieving GEP are:

- Excessive phosphate concentrations;
- Low fish and invertebrate population levels;
- Low river flows / poor flow dynamics; and
- Failure to adequately mitigate the impacts of modification (which is preventing the majority of the HMWB in the District achieving GEP).

Discharges from WwTW and industry, and surface water run-off (in particular from agricultural areas) can lead to nutrient enrichment, or eutrophication, of the receiving watercourses. High levels of nutrients such as phosphates or nitrates can encourage excessive algal growth. This can adversely affect the biodiversity of the watercourse, particularly as it decreases the oxygen levels in the water that other life forms depend upon.

Phosphate levels are a concern throughout the majority of the East of England, and will require on-going cooperation between water companies, the EA and other parties such as Defra to overcome this issue at a national and regional level. The EA have indicated that they would not require phosphorus concentrations more stringent than can be achieved economically using conventional methods in the first period of the WFD (to 2015). However there is a risk that future iterations of the RBMPs may require more stringent standards.

The EA recognise that phosphorus removal at all WwTW[*] is not cost effective and may not be immediately achievable. For this reason, WwTW that are negatively impacting conservation sites, and those where strong evidence shows they are causing watercourses to become eutrophic, have been prioritised for phosphorus removal with schemes agreed through the AMP process (see Section 5.1). Brandon WwTW is such a scheme; phosphate removal is required at the site by the end of 2012. A scheme was also proposed for Mildenhall WwTW that would have improved downstream water quality in the River Lark to WFD Good status, however this was judged to be disproportionately expensive and therefore not included in AMP5.

Regardless of the proposed growth, such an improvement may still be included in future iterations of the RBMP, again subject to a cost benefit analysis, considering the available treatment technology at the time.

Whilst the EA is the 'competent body' tasked with implementing the WFD in England and Wales, other stakeholders will have an important part to play. The Programmes of Measures included in the RBMPs contain integrated solutions requiring input and action from Natural England, the water companies, local authorities and developers. Liaison panels have been setup within each of the River Basin areas, and include representatives from water companies, agriculture and industry, and non-government organisations amongst others.

[*] WwTW that serve a population equivalent (PE) of more than 10,000 are required to employ phosphorus removal processes under the Urban Wastewater Treatment Directive

9.2 Methodology

The results of the wastewater projections (Section 8) provided an estimate of the worst case increases in DWF which could be expected at the receiving WwTWs, if the growth occurs as proposed by FHDC; hence the worst case DWF discharge expected from the WwTWs by 2031.

These estimated discharges were passed to Environmental Planning Officers at the EA for calculation of the indicative physio-chemical consent standards which would apply to these increased discharges. The physio-chemical consent standards of concern are Biochemical Oxygen Demand (BOD), Ammoniacal Nitrogen (Amm. N) and Phosphorus (P). The indicative standards were calculated using the EA River Quality Planning tool, or in some cases, simple mass balance calculations to determine load constant values.

The total projected discharges were increased to allow a 10% buffer between the predicted 2031 DWF (from Section 8) and the DWF consent considered by the EA, as it is unlikely that a future consent would be negotiated with no headroom above observed discharges. For this reason, indicative consent calculations were also undertaken for Lakenheath and Mildenhall WwTWs, as they are predicted to be approaching their existing consented DWF by 2031 (see Section 8.3.5 and 8.3.6 respectively).

It must be noted that the results of this exercise are indicative only, and that the actual consent standards will be determined at the time of consent review.

The RBMP suggests that for the receiving watercourses (where an increase in consented DWF will be required); Phosphate is the only element which is not currently achieving Good status. Therefore, indicative BOD and Amm. N standards have been calculated at levels which would prevent any deterioration in current water quality class (the absolute requirement of the WFD), whilst P standards have been calculated for no deterioration, and to show the standards that would potentially be required to bring water quality to GEP levels.

These indicative consent standards have been discussed with AWS to establish whether they can be achieved by using technology considered economically achievable using conventional methods. Where the calculations show that GEP (in terms of Phosphate) cannot be achieved following the proposed growth, a ‘before-and-after’ comparison has been carried out to show whether it is the growth that is preventing the achievement of GEP.

The scope of the WCS is to demonstrate that the achievement of all relevant WFD requirements is not compromised by the proposed growth. Whilst no deterioration is an absolute requirement of the WFD, improvements towards Good status (particularly if the growth is not the primary reason for failure) will be subject to technical feasibility and disproportionate cost assessments.

Where improvements towards Good status are identified, the technical feasibility and disproportionate cost assessment elements will be carried out by AWS and the EA, as part of future Periodic Review processes, and any agreed improvements included in the quality enhancement section of future AMPs.

The indicative consent standards calculated by the EA are illustrated in Section 9.3 below.

9.3 New discharges

The following sections illustrate the current physio-chemical consent standards for Brandon, Lakenheath, Mildenhall and Tuddenham WwTW, the results from the EA indicative consent modelling, and discussion as to whether these standards are considered by the stakeholders to be economically achievable using conventional methods.

9.3.1 Brandon Consent Standards

The EA have provided a set of indicative physio-chemical consent standards, which correspond with the projected increases in volumetric discharge consents, shown below.

		No Deterioration			Good Status
	DWF Volume	Biochemical Oxygen Demand	Ammoniacal Nitrogen	Phosphorus	Phosphorus
Consent Description	*m^3/day*	*mg/l (95%ile)*	*mg/l (95%ile)*	*mg/l (Annual Average)*	*mg/l (Annual Average)*
Existing consent	2,006	35	25	n/a	1 - AMP5 scheme
Required consent to accommodate all growth (inc. 10% buffer)	2,387	35	25	1	1
Required consent to accommodate growth inc. relief road (inc. 10% buffer)	2,614	35	25	1	1

Table 9-8 Indicative physio-chemical consent standards for Brandon WwTW

The EA advise that BOD and Ammonia levels in the Little Ouse are already achieving High status under the WFD. Retaining the existing consent standards for these elements would not cause deterioration of water quality under either growth scenario, given the high dilution available.

The EA also advise that the proposed 1 mg/l annual average limit for phosphorus, to be implemented at Brandon WwTW during AMP5, will improve phosphate concentrations in the Little Ouse to Good status, regardless of the proposed growth.

It can therefore be concluded that the proposed growth in the Brandon catchment is not currently constrained by the need to achieve no deterioration, or Good status, under the WFD.

9.3.2 Lakenheath Consent Standards

The EA have provided a set of indicative physio-chemical consent standards, which correspond with the projected increases in volumetric discharge consents, shown below.

		No Deterioration			Good Status
	DWF Volume	Biochemical Oxygen Demand	Ammoniacal Nitrogen	Phosphorus	Phosphorus
Consent Description	*m^3/day*	*mg/l (95%ile)*	*mg/l (95%ile)*	*mg/l (Annual Average)*	*mg/l (Annual Average)*
Existing consent	860	10	8	n/a	n/a
Required consent to accommodate all growth (inc. 10% buffer)	897	9.5	7.7	5	0.14

Table 9-9 Indicative physio-chemical consent standards for Lakenheath WwTW

Whilst obtaining existing water quality data for these calculations, the EA discovered that the observed levels of phosphate (at the nearest downstream monitoring point – the Twelve Foot Drain) had experienced a significant improvement since 2007. The EA have no records of improvements in processes at Lakenheath WwTW at this time, and therefore suggest that the significant changes observed may be caused by an alteration in the effluent route/ pumping regime in the IDB area. This appears to be a valid explanation, given the complex network of drains, and the distance between the WwTW discharge point and the river water quality monitoring point.

Given the uncertainty regarding existing downstream water quality, the EA have adopted a conservative approach to calculating the indicative consent standards. Mass balance calculations were used to determine the standards which would be required to maintain the existing pollutant loads (and hence ensure no deterioration), compared to the existing discharge quality as measured at the WwTW outlet.

Given the results in Table 9-9, it can be concluded that the proposed growth in the Lakenheath catchment is not currently constrained by the need to achieve no deterioration under the WFD. If the observed data is considered accurate, the lack of dilution available at the WwTW means that Good status cannot currently be achieved economically using conventional treatment methods, regardless of the proposed growth.

Any proposal by the EA to move the watercourse quality towards GEP will be subject to cost-benefit and technical feasibility considerations. It is imperative that FHDC maintain a degree of flexibility throughout their LDF to enable growth proposals in this area to react to the above risks.

9.3.3 Mildenhall Consent Standards

The EA have provided a set of indicative physio-chemical consent standards, which correspond with the projected increases in volumetric discharge consents, shown below.

		No Deterioration			Good Status
	DWF Volume	Biochemical Oxygen Demand	Ammoniacal Nitrogen	Phosphorus	Phosphorus
Consent Description	*m^3/day*	*mg/l (95%ile)*	*mg/l (95%ile)*	*mg/l (Annual Average)*	*mg/l (Annual Average)*
Existing consent	3,900	25	10	2	0.7
Required consent to accommodate all growth (inc. 10% buffer)	4,088	25	5	2	0.7

Table 9-10 Physio-chemical consent standards for Mildenhall WwTW

The EA advise that BOD and Ammonia levels in the River Lark are already achieving High status under the WFD. Retaining the existing consent standards for BOD would not cause deterioration of water quality, given the high dilution available. The EA would however seek to tighten the Amm. N standard, to prevent a reduction from High to Good status. The suggested consent standard of 5 mg/l is considered to be achievable using conventional technology, hence it can be concluded that the proposed growth in the Mildenhall catchment is not currently constrained by the need to achieve no deterioration under the WFD.

The EA advise that the current P standard of 2 mg/l would allow the proposed growth to be accommodated without deterioration in water quality. However, the current phosphate concentration in the River Lark is considered to be less than Good status. The EA have suggested that a P consent standard of 1 mg/l (rather than 0.7 mg/l) may be sufficient to improve the phosphate levels to Good status, regardless of the growth. However, a scheme to improve the current discharge to these levels was rejected form AMP5 on the basis of disproportionate cost. This situation may change in the future as treatment technologies improve, as discussed in Section 9.1.

Again, whilst the proposed growth may marginally exacerbate the problem, it would not be the main driver for future decisions regarding P consents.

9.3.4 Tuddenham Consent Standards

As discussed in Section 8.4.3, there are a number of remaining options for the discharge of the treated effluent from Tuddenham WwTW. The water quality impacts of discharging to the River Lark, compared to the Tuddenham Stream, require analysis. A key consideration will be whether AWS would choose to divert all of the current discharge, for technical reasons, or only the proportion related to the Core Strategy growth (post 2021); and the impact this choice will have on flows (and ecology) in the Tuddenham Stream.

The WCS has therefore considered the following variations regarding the Tuddenham WwTW discharge:

Option	2031 discharge to Tuddenham Stream *m3/day*	2031 discharge to River Lark *m3/day*	Comments
A	1,709	0	All flows (inc. growth) to existing discharge point.
B	1,164	545	Existing flow plus existing commitments to existing discharge point. Discharge from growth (post 2021) to River Lark.
C	1,100	609	Existing discharge used until existing consent reached. Remaining flows discharged to River Lark.
D	0	1,709	All flows (inc. growth) discharged to River Lark. Existing discharge abandoned.

Table 9-11 Tuddenham WwTW discharge options

As previously, it should be noted that the above values include an allowance to ensure a 10% buffer between the consented DWF and the estimated DWF by 2031.

The EA have provided a set of indicative physio-chemical consent standards based on the above options, shown in Table 9-12 below.

Discharge Description	Discharge Location	DWF Volume	No Deterioration			Good Status
			Biochemical Oxygen Demand	Ammoniacal Nitrogen	Phosphorus	Phosphorus
		m^3/day	*mg/l (95%ile)*	*mg/l (95%ile)*	*mg/l (Annual Average)*	*mg/l (Annual Average)*
Existing consent and flows	Tuddenham Stream	1,100	15	5	n/a	n/a
	River Lark	0	n/a	n/a	n/a	n/a
A	Tuddenham Stream	1,709	6	1	4.5	0.14
	River Lark	0	n/a	n/a	n/a	n/a
B	Tuddenham Stream	1,164	7	1	6	0.15
	River Lark	545	250*	16	22*	5
C	Tuddenham Stream	1,100	15	5	n/a	0.15
	River Lark	609	125*	8	11	2.5
D	Tuddenham Stream	0	n/a	n/a	n/a	n/a
	River Lark	1,709	85*	5	9	1.5

Table 9-12 Physio-chemical consent standards for Tuddenham WwTW discharge options

* These very lax consent limits are for illustrative purposes only. In practice consent limits will likely be aligned with the minimum requirements of the UWWTD.

The EA advise that BOD and Ammonia levels in the Tuddenham Stream are already achieving Good status under the WFD. However, given that the WwTW discharge makes up a significant proportion of the flow in the Stream, these standards would have to be tightened to ensure no deterioration for Options A or B. The suggested Amm. N standard is at the edge of what can be considered economically achievable using conventional technology, and as discussed in Section 8.3.8, may require a change of process at the WwTW, with the associated time, costs and land availability risks.

The P standards required to bring the levels in the Stream to Good status are beyond the levels considered to be economically achievable using conventional methods, for Options A, B and C. However, it is worth noting that the EA advise the low dilution available means that even if the current discharge were treated to the highest standards currently economically achievable, the watercourse would not be able to meet Good status. AWS may be required to introduce P removal to economically achievable levels as early as 2015, regardless of growth, to assist in moving towards GEP.

As AWS estimate that replacing the WwTW processes at Tuddenham WwTW may take up to ten years, there is a risk that the required processes will not be in place to treat the increased wastewater to the required standards when the Core Strategy growth begins (from 2021). The timeframe for designing and laying a new discharge pipe is estimated to be closer to five years. For these reasons, Options B, C and D are preferred over Option A.

The large dilution available from the River Lark results in readily achievable standards being required for the new discharge, to avoid any deterioration. In addition, the P standard required to achieve GEP in the watercourse, under Options B, C and D, is also considered to be within the range considered to be economically achievable.

Regarding Option D, there are a number of arguments for diverting the entirety of the Tuddenham WwTW discharge to the River Lark:

- The majority of the costs associated with laying such a pipe are incurred due to the length and depth of excavation required. In this respect, the change in diameter needed in the pipe to accommodate the Option D discharge (in comparison with Options B or C) would have a small effect on overall cost;
- The technical and legislative complexities of providing two discharge points, potentially at different quality standards, to two separate locations, would be avoided;
- The risks of future compliance with the WFD are better mitigated, due to the dilution available in the River Lark; and similarly
- The impact of the increased discharge, in terms of flood risk, is reduced, due to the greater difference between the river flows and the discharge flows (discussed further in Section 11.2).

However, the EA advise that they are currently investigating the impact of low flows in the Tuddenham Stream with regards to compliance with the WFD; there is an indication that flows are impacting on the ecology. For this reason, Option D cannot be recommended as a preferred option at this time, as removing any current discharge from the Tuddenham Stream may lead to deterioration in the overall ecological status of the watercourse in terms of the WFD.

Options A, B C and D will require further assessment by the WCS stakeholders (as their policies and strategies for the region, and study area develop), to determine which is the most economically viable, technically feasible and environmentally sustainable. The preferred option will be investigated, planned and constructed prior to the commencement of the Core Strategy development at Red Lodge (from 2021 onwards); therefore a continuing dialogue is required

between stakeholders as the FHDC LDF progresses, and the EA work towards determining the priorities for the next round of RBMP.

9.4 Future Risks

Upgrading processes at WwTW to improve the quality of the discharge may require an increase in capital and operational expenditure by AWS. Operation of more advanced processes typically increases power consumption, hence increasing operational costs and environmental impact. As water company funding is primarily from consumers, and regulated by Ofwat, AWS must consider all of the above factors when planning WwTW upgrades; to ensure the correct balance of technical feasibility, economic viability, and environmental sustainability is achieved.

Any application from AWS, post 2015, to increase a volumetric discharge consent (for a WwTW) will at the least require the 'no deterioration' consent standards to be met.

Regardless of growth, the EA may seek to further tighten consent standards in the future to assist in meeting the long term objectives of the WFD (i.e. achieving GEP in all watercourses by 2027). Modifications to consent standards could be sought as early as 2015.

However, improvements towards GEP will be dependent upon cost/ benefit tests through the appropriate Periodic Review process. The EA recommend that policies throughout the FHDC LDF need to be flexible enough to deal with this potential deliverability issue, whilst recognising that growth will not be the primary driver for any required improvements in quality.

It is imperative that the available treatment capacity is not exceeded by the connection of wastewater from new developments, as this would increase the risk of pollution events and associated impacts on water quality.

It is therefore recommended that FHDC consider including a policy within the SSA process that requires developers to provide evidence to FHDC that they have consulted with AWS regarding wastewater treatment capacity, and the outcome of this consultation, prior to development approval. The Environment Agency should be provided with this information with the planning permission consultation.

This early consultation by developers will enable AWS to identify any immediate capacity constraints, and make informed decisions regarding operational requirements at the WwTW (and the planning and investment of any capacity upgrades) and hence determine the capacity required to manage future operational and environmental risks whilst meeting their statutory requirements.

10 Sewerage Network

AWS records suggest that their sewerage networks serving the market towns, key service centres and primary villages are separate systems (i.e. separate foul and surface water systems).

However, historic misconnections, and infiltration, will mean that the separate foul sewer networks are still impacted to some degree by surface water during storm events. This can increase the risk of sewer flooding in the main settlements. Guidance on the management of surface water drainage is included in Section 11.2.3.

New development connected to the existing sewerage network may exceed the capacity of certain network capacity bottlenecks, causing surcharging of sewers, increasing the risk of properties being flooded with wastewater and emergency outfalls (from sewage pumping stations) discharging to watercourses. This risk will be increased during storm events, as increased infiltration of surface water from the existing catchment area will also add to the flows.

An increase in risk such as this is considered unacceptable by the EA, and would be in breach of discharge consent conditions in place at these overflow locations. AWS indicate that this is a particular concern at Kentford, discussed in more detail in Section 10.1.4. Developers must contact AWS to ensure that adequate infrastructure capacity is in place prior to development, in compliance with FHDC Core Strategy Policy CS13.

10.1 Foul Sewer Capacity

Within the District, AWS only have a sewerage network model available for the Newmarket catchment, and limited resources to model the individual sites within the WCS timeframe. For this reason, the capacity of the existing AWS foul sewer networks in the District to accept the wastewater from the proposed development sites has been assessed through high levels discussions with engineers and planners at AWS.

AWS have based their estimate of capacity on the size of the existing sewers, the population they already serve, and the scale and location of the proposed development site. The suitability of the existing network, and the upgrades required to accept the increased flows, are discussed in the following sections for the individual sites.

These sections of the study should be read in conjunction with Figures E1 through E9 (in Appendix E), where the individual sites are displayed along with a ranking of their potential impact, and any indicative solutions proposed by AWS.

10.1.1 Beck Row

(See Figure E1 in Appendix E)

Wastewater from Beck Row is currently treated at Mildenhall WwTW. The existing sewerage network conveys the wastewater from west to east through the settlement via an extensive number of pumping stations and rising mains, to a pumping station in the vicinity of Holywell Row. From here the wastewater is pumped through 1.7 km of rising main to the centre of the Mildenhall sewerage network, and then pumped again from a pumping station near the A1101, through 2.2 km of rising main, to the WwTW.

Subject to land availability, and the availability of developer funding, it may be possible for AWS to provide additional wastewater storage to buffer wastewater flows between Beck Row and

Mildenhall, and hence minimise the requirement for upgrades to the existing rising mains and pumping facilities through Mildenhall.

As described in the Outline WCS, development sites to the east of the Beck Row settlement will be most preferable, as this reduces the upgrades required through the existing urban area. Whilst FHDC have adhered to this guidance, AWS advise that the current capacity of the pumping stations and rising mains within the Beck Row settlement will require significant upgrades to accommodate the levels of growth proposed.

Alternatively, it may be possible for sites **BR/09** and **BR/10** to be connected to the Holywell Row area via the construction of a new sewer to bypass the existing network and urban area. Such a sewer would pass through agricultural land and a number of field drains, and hence may be constrained by planning and technical considerations.

Connecting the proposed development sites directly to Mildenhall WwTW via the construction of a new sewer through, or around, the airfield, is very likely to be cost prohibitive, given the 2.5 km distance (or 4.5 km, if suitable easements and construction access cannot be agreed).

AWS are currently investigating the sewerage network upgrades required to accommodate the additional wastewater from the 260 committed dwellings (sites **BR/03** and **BR/07**). There is a risk that the network upgrades required to accommodate the additional proposed dwellings, at sites **BR/01**, **BR/09**, **BR/10** and **HR/02**, will be cost prohibitive compared to the scale of development.

However, there may be scope for AWS to include the proposed sites in design considerations for the committed sites, subject to early developer involvement. This is favourable for site **BR/01**, as FHDC estimate that development at this site will be from 2016 onwards, hence allowing adequate time for the network to be upgraded to accommodate the committed, and proposed, sites. Development at sites **BR/09**, **BR/10** and **HR/02** may be constrained until AWS have upgraded the network to provide this capacity. This may take one to three years, subject to developer requisitions.

FHDC and developers should consult AWS at the earliest possible stage in development to ensure that suitable upgrades to the pumping stations and rising main network can be provided, and determine the likely costs. The responsibility of providing funding for such upgrades is likely to be passed from AWS to developers using the requisition process described in Section 5.1. The costs and disruption associated with the required sewer upgrades may be able to be reduced, if developers consult in partnership with AWS (perhaps facilitated by FHDC via Developer Forums).

10.1.2 Brandon

(See Figure E2 in Appendix E)

Wastewater from Brandon is currently conveyed via a network of gravity sewers (and a number of pumping stations at the extents of the town) to the north, for treatment at Brandon WwTW.

AWS estimate that sites **B/20** and **B/26** can be accommodated by the existing sewerage network with only minor local upgrades, to be funded via developer requisitions.

The Outline WCS suggested that development sites to the west of the town would be preferable, allowing direct connection to the WwTW via a new sewer. In this respect, sites **B/17** and **B/12** will not be constrained by the capacity of the existing sewerage network. The scale of the development at these sites will however require the construction of significant new sewerage network, potentially requiring some pumped network in the southern extents of **B/17**.

It is important for developers to work with AWS as master plans develop, to ensure the construction of the required network takes account of the future development phasing, and is therefore constructed efficiently.

Subject to appropriate developer requisitions, and the above considerations regarding efficient planning, it is likely that the new network required could be largely constructed in parallel to the development of the sites. However, consideration must be given to the AWS cordon sanitaire requirement (see Section 8.1), which may limit the development that is appropriate, particularly on site **B/12**.

Site **B/13** is a brownfield site; hence there may be some local capacity in the sewerage network to accept the proposed development. However, AWS estimate that upgrades will be required to the downstream sewers and pumping stations in the Mile End and London Road area, particularly when the impacts of site **B/27** are also considered. It is anticipated that such upgrades would take one to three years to complete, subject to developer requisitions. The proposed timeframe for site **B/13** (218 dwellings prior to 2016) will therefore not be unduly constrained by sewerage network capacity, providing developers begin discussions with AWS now.

AWS estimate that site **B/14** would have a significant impact on the local network. To provide adequate capacity, it is likely that developers would need to requisition a new sewer from the site, through the town (at least 1.2 km), to join the network near the WwTW. Such a new sewer would need to pass through either Rattler's Road or Bury Road. It may be possible for such a sewer to be operated via gravity, hence reducing operational costs and energy use; however it is likely that the construction would cause considerable disruption and potentially incur high costs relative to the size of the development. Developers should contact AWS as soon as possible to discuss the options available; otherwise the proposed timeframe (167 dwellings prior to 2016) may not be achievable.

It must be noted that whilst site **B/17** appears to be the more preferable of the larger sites with regards to sewerage, FHDC consider that the full development of this site would be dependent on the construction of the relief road. Dependant on the outcome of AWS and developer discussions, it may be preferable to reduce the number of proposed dwellings at **B/14** in favour of **B/17**, providing that other planning constraints, such as transport, can be overcome. FHDC should consider building this flexibility into its SSA process.

10.1.3 Exning

(See Figure E3 in Appendix E)

Wastewater from Exning is currently conveyed north via a network of gravity sewers to a pumping station near Cotton End Road, and then pumped onwards to Newmarket WwTW for treatment.

AWS estimate that the current large diameter sewers in the vicinity of sites **E/03** and **E/04** can accommodate the flows from the proposed sites with only minor local upgrades to the network. However, AWS are concerned that the proposed growth may impact the pumping station near Cotton End Road.

Dependent on the availability of developer funding through the requisition process, the investigation, design and construction of improvements to this pumping station may take three to five years. This may appear to conflict with the estimated timeframe for development at **E/03** and **E/04** (prior to 2016), however it is likely that upgrades at the pumping station could occur in parallel to the development at these sites.

Developers should contact AWS to ensure that the potential impacts of both sites on the pumping station are considered by AWS.

10.1.4 Kentford

(See Figure E4 in Appendix E)

Wastewater from Kentford is currently conveyed towards the river via a network of gravity sewers, to a central pumping station, and then pumped onwards (over 6 km) to enter the Newmarket sewer network, for eventual treatment at Newmarket WwTW.

Site **K/07** has extant planning permission. AWS are currently investigating the local network improvements required to improve the capacity of the 300 m of sewers between this brownfield site and the central pumping station in Kentford. Any local upgrades required will be funded through the developer requisition process. The developers of site **K/08** should contact AWS immediately to ensure any local capacity improvements planned take account of the future employment use on this site.

AWS are yet to confirm the extent of the upgrades required to accommodate sites **K/05**, **K/09** and **K/10** within the existing sewerage network to the east of the river, however even if upgrades are required along Bury Road (approximately 600 m of sewer) it is unlikely that this would be particularly cost prohibitive, particularly if all three sites are considered together, to share the costs. Considered separately, it is likely that site **K/05** could be accommodated with only minor local upgrades to the existing network.

However, the combined effect of the committed and proposed development in Kentford may impact the centrally located pumping station, increasing the risk of overflows (and hence pollution) to the River Kennett. The growth targets proposed in the Core Strategy, plus the existing committed sites, have the potential to approximately double the population of the village. This is significantly above the 10% population increase margin for combined sewer overflows which AWS recommend should trigger an assessment of the increased risk of spills (and subsequent harm to the water environment), using urban pollution management techniques.

Whilst the risks to the River Kennet from such spills should not be underestimated, it is anticipated that the mitigation work needed to negate any increase in risk due to the development would be relatively straightforward for AWS to undertake, given the small scale of the catchment, and the availability of adjacent land should additional storage be required. AWS will continue to monitor the flows received at the pumping station, and will assess the scale of the upgrades required as they receive requisitions from developers, before assessing the upgrades required.

It would therefore be beneficial for all developers to contact AWS now to initiate discussions (perhaps via a Developer Forum facilitated by FHDC), particularly as the estimated timeframe for development in Kentford is primarily prior to 2016. Whilst some development may be allowable in parallel with upgrades to the pumping station, it is important to ensure that there will be no additional risk of pollution from the overflow at the site, and that an agreed long term solution is implemented prior to the development.

In addition, the capacity of the pumped sewer to the Newmarket network must be considered. Upgrades to this asset would be extremely cost prohibitive given the scale of growth in Kentford, and also disruptive. It is therefore likely that AWS would seek to manage the additional flows at the existing pumping station, perhaps through the construction of additional storage, rather than upgrade the sewer to Newmarket.

10.1.5 Lakenheath

(See Figure E5 in Appendix E)

Wastewater from Lakenheath is currently conveyed westwards by a network of gravity sewers, to a series of pumping stations along its western boundary. These pump the wastewater to a terminal pumping station in the northwest of the town, which then pumps (over the Cut-Off Channel) northwards to Lakenheath WwTW.

AWS estimate that site **L/12** would not be able to be accommodated by the local sewers in the north of the town. However, the site is within 300 m of the terminal pumping station. The construction of a new bypass sewer to serve the site, direct to the terminal pumping station, is therefore likely to be more cost effective. The estimated timeframe for development at this site (post 2016) allows adequate time for the construction required, subject to developer requisition.

It is unlikely that a direct connection to the WwTW would be considered due to the requirement to cross the Cut-Off Channel. Consideration must also be given to the AWS cordon sanitaire requirement (see Section 8.1), which may limit the development that is appropriate on the majority of this site.

In addition, the developer will have to take account of the AWS surface water sewer which runs through the site; whereby AWS may impose restrictions on the type and proximity of developments, or request the developer funds the relocation of the asset.

It is unlikely that sites **L/13**, **L/28** or **L/14** could be accommodated within the existing capacity of the local sewerage network, particularly when their combined impact is considered. To accommodate these sites, upgrades to the existing network in the Station Road and High Street area would be required (potentially 700 m of sewers). Whilst this would be disruptive and incur significant costs, it is likely that the upgrades would be considered more cost effective should all three sites contribute to the costs via the developer requisition process. It would therefore be beneficial for the developers of these sites to contact AWS in partnership (perhaps via a Developer Forum facilitated by FHDC) to discuss the requisition of the required network improvements.

Similarly, sites **L/14**, **L/18**, **L/22** and **L/27** will require upgrades to the existing sewerage network (approximately 600 m of sewers) in the Broom Road area. The scale of the upgrades required will be influenced by which sites come forward, however it is unlikely that any of the sites could be accommodated within the existing network capacity without some upgrades. Again, the construction of the required upgrades may be more cost effective if the sites are considered in combination; developers should discuss this with AWS at the earliest opportunity.

Site **L/26** could potentially be connected to the existing sewage pumping stations via the construction of a new sewer (approximately 400 m) alongside the Cut-Off Channel. This could potentially link into the sewerage network of the site to the north of **L/26** (currently being developed). A new sewer such as this would prevent disruption to the Eriswell Road area and should prove to be cost effective given the scale of the development.

The anticipated timeframe for development at the above sites (post 2016) should allow adequate time for the network improvements to be investigated and constructed, providing developers contact AWS shortly to discuss the requisition process, and opportunities to work in partnership are explored by developers and FHDC.

AWS are concerned that site **L/25** would be the most problematic to connect to the sewerage network, given the limited local capacity available and its distance from the existing pumping stations. Connecting this site to the existing pumping stations may require up to 1 km of

upgrades to the sewers in the Eriswell Road area. Alternatively, this site could be connected via the construction of new bypass sewers, reducing the possible disruption and cost. Potential routes for this would either be to the west (hence linking to the new network required for **L/26**) or to the east (linking to the network improvements required for sites **L/15**, **L/18**, **L/22** and **L/27**). Considered independently, the upgrades required for site **L/25** may prove to be cost prohibitive, however, in combination with other sites around the southern periphery, the upgrades appear more cost effective.

It is also likely that the development of sites **L/15**, **L/18**, **L/22**, **L/25**, **L/26** and **L/27** will impact on the existing pumping stations along the western edge of the town. Additional storage may be required at this location to buffer the flows before onwards transmission to the terminal pumping station. AWS are unable to confirm the scale of upgrades required until the quantum of development is confirmed in this area. The costs of these downstream network improvements would be passed to developers through the requisition process, and again, may be more cost effective if a number of the sites come forward in combination, through a Developer Forum process.

Similarly, regardless of which sites come forward to meet the development target for Lakenheath, it is likely that the existing terminal pumping station will require upgrading, and AWS may wish to include a contribution towards these costs in the developer requisition process. It is likely that AWS would continue to monitor the capacity at the terminal pumping station, whilst assessing the potential impact of the proposed growth, allowing upgrades to be planned and constructed in parallel to the growth. The proposed timeframe for the majority of the development in the town (post 2016) allows adequate time for AWS to consider the current capacity and future requirements of this asset.

AWS estimate that sites **L/04**, **L/09**, **L/10**, **L/11** and **L/29** would have a limited impact on the existing sewerage network, and can likely be accommodated through minor local upgrades. However, as stated above, they may contribute to future capacity issues at the existing pumping stations. Developers should contact AWS for further advice on this matter.

10.1.6 Mildenhall (and Freckenham)

(See Figure E6 [and E3] in Appendix E)

AWS estimate that the scale of the proposed development at Freckenham can be accommodated by the capacity of the existing pumped sewer system to Mildenhall. Local sewer upgrades may be required adjacent to the proposed sites, to be achieved through the developer requisition process.

Wastewater from Mildenhall is currently conveyed to the centre of the town via a network of gravity sewers (with some localised pumping at the southern periphery) to two terminal pumping stations – one for the northern and central areas of the town, and one for the southern periphery. These terminal pumping stations pump the wastewater westwards to Mildenhall WwTW, approximately 2 km away.

Regarding the proposed development at Mildenhall, AWS estimate that the scale of development at sites **M/25**, **M/28** and **M/34** would have a limited impact on the existing sewerage network, and can likely be accommodated through minor local upgrades, subject to developer requisitions.

Site **M/19** is ideally placed for wastewater collection and treatment, in line with the conclusions of the Outline WCS. The new sewerage network constructed for this site could be linked directly to the WwTW via a new trunk sewer (which may require pumping). The short distance (approximately 300 m between site boundary and the WwTW) of new sewer required would

likely prove extremely cost effective given the scale of the development proposed. This solution would avoid the need for upgrades to the existing network through the town, and the associated disruption and costs.

However, the developers of this site must consider phasing of sewerage infrastructure along with their development plans, to avoid the requirement for connecting the eastern areas of this site to the existing network in a piecemeal fashion. Liaison with AWS at an early stage is required to ensure the efficient design and construction of the required new sewerage infrastructure, and ensure that a suitable method of developer funding is agreed upon.

Consideration must also be given to the AWS cordon sanitaire requirement (see Section 8.1), which may limit the development that is appropriate on the western periphery of this site. In addition, the developer will have to take account of the two AWS pumped trunk sewers which run through the south of the site; whereby AWS may impose restrictions on the type and proximity of developments, or request the developer funds the relocation of the asset.

Sites **M/21**, **M/33** and **M/40** would likely require upgrades to the pumping stations in the Folly Road area to allow connection into the existing local sewerage network. The scale of such upgrades would be determined once AWS are provided with a clearer picture of the anticipated development on these mixed-use and employment sites. The terminal pumping station in the north of the town may also require some upgrades (to be determined by AWS through on-going assessment) given the scale of development. Contributions to this downstream reinforcement may be required from these sites, to be collected through the requisition process.

Alternatively, dependent on the phasing of site **M/19**, it may be possible to accommodate the above sites into the new sewerage network required to the west of the town. This would reduce the disruption and costs associated with upgrading the existing network, however will require developers of all the western sites to work in partnership with AWS (perhaps via a Developer Forum) to ensure the efficient planning and construction of the required sewerage network.

Site **M/29** is adjacent to a recently developed area, which involved the relocation of a pumping station in the Worlington Road area. Capacity here may be able to be utilised to accommodate the new wastewater, however additional network and storage improvements may be required to a downstream pumping station (in the Wamil Way area). It is anticipated that such improvements would take one to three years to plan and construct, subject to developer requisitions. The anticipated development timeframe of this site (post 2015) will therefore not present a constraint.

Site **M/16** is judged as the most heavily constrained site regarding sewerage network capacity, in line with the conclusions of the Outline WCS. The location and size of this proposed site would likely require extensive improvements to the network and pumping stations throughout eastern Mildenhall, estimated to take three to five years, which may be particularly disruptive and incur significant costs, to be funded by developers. There is a risk that such requirements may be cost prohibitive.

An alternative solution, again funded by developers, would involve the construction of a new (pumped) sewer, bypassing the north of the town, at a length of over 2 km. This could potentially link into the new network required for sites to the west of Mildenhall; however this would be dependent on developer cooperation and the suitable phasing of development. There are technical concerns with long distance pumping of wastewater, such as septicity and odour control, which may increase the overall cost of this option. Again, this solution may prove to be cost prohibitive. It is therefore imperative that the developers of this site liaise with AWS as soon as practicable to investigate the extent of the sewerage network improvements required, and the phasing and funding implications.

10.1.7 Newmarket

(See Figure E7 in Appendix E)

Wastewater from Newmarket is currently conveyed northwards by a network of gravity sewers, including a large diameter trunk sewer through the centre of the town, which conveys the flows northwards to Newmarket WwTW for treatment. Some areas such as the Industrial Parks in the north and the Stables in the west are served by short lengths of pumped sewers, connecting them to the central gravity sewer system.

AWS estimate that the scale of development at sites **N/01**, **N/02**, **N/03**, **N/05**, **N/15**, **N/17**, **N/21**, **N/23**, **N/25**, **N/26**, **N/27**, **N/28**, **N/29**, and **N/30** would have a limited impact on the existing sewerage network. Given the existing capacity (assumed by AWS), and multitude of possible options for connection, it is likely that these sites could be accommodated with minor local upgrades, subject to developer requisitions.

Site **N/11** may require more extensive upgrades to the network in the Rowley Drive area, dependent on the scale of development which is realised here. The developer and FHDC should continue to liaise with AWS as proposals for the site are confirmed to discuss the extent of the network improvements required. The anticipated timeframe for such improvements would be one to three years, dependent on developer requisitions and the scale of the development. Therefore, the site should not be unduly constrained.

Similarly, AWS estimate that site **N/20** may require upgrades to the pumping station and sewer network in the Churchill Road area, subject to an assessment of local capacity. Such upgrades may require one to three years to plan and construct. Developers must therefore liaise with AWS to ensure that the proposed timeframe for this development (prior to 2015) allows adequate time for the necessary improvements, to be funded through the developer requisition process.

Site **N/18** may also require upgrades to the pumping station and sewer network in the Willie Snaith Road area, which again may require a timeframe of one to three years, subject to local capacity and developer requisitions. However, the proposed timeframe of this development (post 2015) should allow adequate time for the necessary improvements to be investigated.

Site **N/14** is ideally placed for wastewater collection and treatment, in line with the conclusions of the Outline WCS. Wastewater from this site could be connected into the existing large diameter trunk sewer, subject to an assessment of capacity by AWS, or conveyed directly to the site via the construction of a new sewer (approx. 1.2 km), to be funded through the developer requisition process. Some local pumping of wastewater will be required within the site boundary due to the limited gradient available. It is likely that the scale of the development proposed will be able to support the costs of such upgrades. It is anticipated that much of the new network required could be constructed alongside development, however the construction of a new sewer to the WwTW may take three to five years to plan and construct. The developer should liaise with AWS now to ensure that any development on site proposed prior to 2015 is suitably phased and located, so as to allow connection to the existing network in the interim. Development in the western periphery of the site may be preferable in this respect.

In addition, the developer will have to take account of the existing pumped sewer which runs east to west through the length of the site; whereby AWS may impose restrictions on the type and proximity of developments, or request the developer funds the relocation of the asset.

10.1.8 Red Lodge

(See Figure E8 in Appendix E)

The current sewerage system in Red Lodge relies on a complex network of gravity sewers, assisted by short lengths of pumped sewers from local pumping stations to overcome the limited gradients available.

Wastewater from the existing properties between Warren Road and Turnpike Road is conveyed southwards, by a series of sewers and pumping stations, to a large pumping station on the southern fringe of the town. This pumping station then pumps the wastewater to Herringswell, from where it is then pumped to Tuddenham WwTW for treatment.

Wastewater from the Turnpike Road area is currently conveyed north eastwards, again via a series of local pumping stations and gravity sewers, to then join into the northern fringe of the system described above.

Committed Sites

Regarding the existing commitment at Red Lodge, AWS plan to convey the wastewater from the majority of this development northwards via a network of gravity sewers (some of which have already been constructed), to the pumping station already constructed (via developer requisition) on the northern fringe of the development. This pumping station pumps the wastewater from the new dwellings southwards, to join the existing network at the existing pumping station on the southern fringe of the town (discussed above). It may also be possible for the southern areas of this site to be directly connected to the existing southern pumping station. The developer of this site should continue to liaise with AWS to facilitate the timely planning, funding (through developer requisitions) and construction of the required network.

Proposed Sites to the West

AWS estimate that the scale of the combined development in the Turnpike Road area (sites **RL/01**, **RL/02**, **RL/03**, **RL/04**, **RL/08** and **RL/11**) will require extensive upgrades to the sewers and pumping stations in this area, or the construction of a new pumping station to convey this wastewater to the existing network. It is likely that AWS would choose to connect this improved/ new network to the pumping station at the north of the town, which may also require upgrades to its capacity (and the pumped sewer in the Warren road area). Whilst these upgrades may be costly, the scale of the development proposed across all the sites could result in relatively cost effective solutions, providing developers liaise with FHDC and AWS to reduce piecemeal connections. It would therefore be beneficial for the developers of these sites to contact AWS in partnership, facilitated by FHDC through a Developer Forum, to discuss the requisition of the required network improvements. The anticipated development timeframe for these sites (**RL/01** and **RL/02** post 2016, with the remainder post 2021) should allow adequate time for developers to undertake the necessary discussion with FHDC and AWS, and agree on funding and phasing arrangements. The anticipated timeframe for major upgrades such as these is three to five years.

In addition, developers of sites **RL/01**, **RL/02**, **RL/03** and **RL/04** will also have to take account of the existing sewer which runs through their sites; whereby AWS may impose restrictions on the type and proximity of developments, or request the developers fund the relocation of the asset.

Following contact from the developers of site **RL/17**, AWS plan to construct a new pumping station, to pump wastewater from this site into the existing network via a new pumped sewer connected to the existing southern pumping station. This is to be funded through developer requisitions. It is imperative that the developers of site **RL/09** contact FHDC and AWS as soon

as practicable to ascertain if additional capacity can be incorporated into these new assets, and whether it would be beneficial to develop this site sooner than presently anticipated.

Proposed Sites to the North

The impact of site **RL/13** and **RL/16** on the existing sewerage network will depend largely on the density and type of employment uses which are ultimately developed on site. However, these sites are benefitted by their proximity to the existing northern pumping station. Direct connection to this pumping station may be possible via the construction of new sewers (subject to developer requisitions). However, the combined effect of the new wastewater from these sites, with the other proposed sites off Turnpike Road, may require the developers to contribute towards capacity or storage enhancements at the existing northern pumping station.

Developers should liaise with AWS to determine the extent of the upgrades required to the existing northern pumping station, and how development can be phased, given the anticipated timeframe for such upgrades (likely to be three to five years).

Given the scale of development proposed at site **RL/10**, AWS estimate that the impacts on the surrounding network (i.e. the northern pumping station) would be negligible. A connection to the network prior to the inlet of northern pumping station should be cost effective and feasible, although developers should still consult with AWS now to discuss the timing and funding of such a connection, and any possible land constraints, given that a number of large diameter AWS sewers run under this site.

Proposed Sites to the East

A number of sewerage options are visible for site **RL/06**. Depending on available downstream capacity, some areas of this site may be able to be connected into the eastern periphery of the network being constructed to serve the existing commitment. However, where this capacity does not exist, it may prove costly and disruptive to facilitate such a connection.

If this capacity cannot be provided, it may be more cost effective for a new sewer to be constructed to bypass the existing commitment to the north, allowing direct connection (of the northern areas of site **RL/06**) to the existing northern pumping station. Similar to the sites discussed above, the developer may also be required to fund capacity improvements at this pumping station. Liaison would also be required with the promoters of site **RL/16** to facilitate the construction of a bypass sewer in this location. The developers of site **RL/06** should consult AWS as soon as practicable to determine the costs and timescales for such infrastructure (likely to be three to five years). Given the scale of the development proposed, such a solution may prove cost effective.

Similarly, it may prove more cost effective for the southern half of site **RL/06** to be connected directly to the existing southern pumping station, subject to availability of land for a new sewer, and possible capacity improvements to this pumping station. Again, the developers should consult with AWS to determine the existing/ planned capacity in the network serving the existing commitment, and the feasibility and costs of a bypass sewer.

For either of the above options, the timeframe for the planning and construction of any required bypass sewers, and capacity improvements to the existing pumping stations, is estimated to be three to five years, depending on appropriate and timely developer requisitions. For this reason, it may be appropriate to defer development at this site until post 2016 (in line with the FHDC Core Strategy). However, developers may be able to accelerate this process, if their consultation with AWS reveals that additional suitable capacity can be provided, in the network planned to serve the existing commitment.

Red Lodge to Tuddenham Network

Depending on the strategy employed by AWS, the extent of the development around the town may also require upgrades to the storage capacity of the existing southern pumping station, to balance flows prior to pumping to Herringswell and Tuddenham.

AWS have recently upgraded the capacity at the pumping station near Herringswell, to account for the additional flows predicted from the existing commitment. AWS may require contributions from developers of all the proposed Red Lodge sites to further increase capacity here again in the future.

10.1.9 West Row

(See Figure E9 in Appendix E)

Wastewater from West Row is currently conveyed south-easterly via a network of gravity sewers, assisted by short lengths of pumped sewers, from local pumping stations, to overcome the limited gradient available. This is then pumped eastwards to Mildenhall WwTW for treatment.

AWS estimate that the combined scale of development proposed at sites **WR/07**, **WR/08** and **WR/22** will require extensive upgrades to the existing network through the settlement. There is a risk that this would be highly disruptive and prove to be cost prohibitive for developers. An alternative solution would be the construction of a new pumped bypass sewer from these sites, to the pumping station in the southeast of the settlement (approximately 1.5 km), although again this may prove to be cost prohibitive, depending on the land required for the route.

It would be beneficial for developers to liaise with AWS as a group, facilitated by FHDC through a Developer Forum, to investigate the feasibility and costs of potential options. The planning and construction of the necessary infrastructure may take three to five years to complete, depending on developer requisitions. For this reason it is imperative that developers jointly begin discussions with AWS, given the anticipated timeframe for this development (prior to 2016).

AWS estimate that the scale of development proposed at site **WR/02** can be accommodated by the existing network with limited local upgrades.

11 Flood Risk Mitigation

The Level 1 SFRA contains information on the management of existing floor risk, including data on historical flooding from all sources, flood defences, flood warning arrangements, and the extent of the fluvial flood zones in relation to the development areas.

Since the completion of the Outline WCS and Stage 1 SFRA, the following critical change has occurred to the legislative environment in which flood risk is managed.

11.1 Flood and Water Management Act 2010

The Flood and Water Management Act[16], passed into statute in April 2010, sets out a number of changes to the way that new development and water infrastructure will interact, including the proposed future mechanism for utilising SuDS where practical.

SuDS assist in reducing the rates (and potentially volumes) of surface water arising from new developments, and therefore reduce the impacts on the existing water cycle. Importantly, this ensures that existing flood risks do not increase as a consequence of new developments, and can reduce (or even eliminate) the need to use existing sewerage systems to convey surface water. This reduces unnecessary expenditure in uprating existing sewers and WwTW, and can delay the requirement to negotiate increased discharge consents at WwTW.

The Act establishes a SuDS Approving Body (the "SAB") at county or unitary local authority levels, which will have responsibility for the approval of proposed drainage systems in new developments and redevelopments. This approval must be given before the developer can commence construction.

In order to be approved, the proposed drainage system would have to meet new National Standards for sustainable drainage (currently being drafted). The National Standards will set out the criteria by which the form of drainage appropriate to any particular site or development can be determined, as well as requirements for the design, construction, operation and maintenance of SuDS.

Where planning permission is required, applications for drainage approval and planning permission can be lodged jointly with the planning authority, but the SAB will still determine the outcome of the drainage application.

The Act also makes the right to connect surface water drainage from new development to the public sewerage system conditional on the surface water drainage system being approved by the SAB.

Before determining an application the SAB must consult, amongst others, any sewerage undertaker with whose public sewer the new drainage system will connect to and the EA, if the drainage system directly or indirectly involves the discharge of water into a watercourse.

The right to connect newly built foul sewers to the public network remains, but an adoption agreement must be in place with the relevant sewerage undertaker. The sewerage undertaker will be obliged to adopt and maintain new foul sewers connecting to the public system, and those (very few) surface water sewers with no SuDS alternative connecting to the public system, where this has been approved by the SAB.

11.2 Flood Risk from WwTW Discharges

Increased discharges from WwTW to watercourses can increase fluvial flood risk. At the request of the stakeholders, a multi-criteria scoring system (developed as part of the AWS Waste Water Environmental Capacity Assessment[17]) has been applied as part of this WCS.

The assessment used a multi-criteria approach to assess the increase in peak flow, the sensitivity of the watercourse to changes in flood levels, and the potential impact of flooding, to determine a combined flood risk index. In particular, the evaluation of flood risk has comprised three elements:

- Quantification of the increase in peak river flows, resulting from the predicted increase in treated effluent discharges;
- Evaluation of the likely sensitivity of flood levels to increases in flood flows; and
- Evaluation of the impact of increases in flood levels.

For each element, the impact at each discharge site has been classified as high, medium or low, and the multi-criteria analysis applied to combine these elements.

11.2.1 Methodology

The analysis has been conducted using the 1 in 2 year flood. The 1 in 2 year flood has a probability of occurrence in any one year of 50% and is more correctly referred to as the 50% Annual Exceedance Probability event, or QMED. According to the AWS methodology, this flood severity was selected because:

- Increases in WwTW discharge would contribute a relatively greater proportion of flood flows than if a more extreme flood event had been used, and hence results are likely to be conservative;
- The 1 in 2 year event is, very crudely, considered to approximate bank full conditions. Any increase in the 1 in 2 year event would therefore be expected to result in out of bank flooding; and
- The 1 in 2 year event is the smallest event which can practically be estimated using standard techniques.

The increase in the 1 in 2 year peak flow in the receiving watercourse has been calculated, firstly, by calculating the baseline peak flow using the Flood Estimation Handbook (FEH) method; and, secondly, by estimating the increase in discharge from the WwTW as per Section 8.2.

DWF received at the WwTWs will increase following the connection of new dwellings to the sewerage network. Whilst some of this increase may be stored on the WwTW site during peak flows, an increase to the volumetric flow rate of the discharge is likely. This may be within the existing volumetric discharge consent, as stipulated by the EA, and discussed in Section 8.3. However, WwTW typically discharge up to three times their DWF (referred to as flow to full treatment – FTFT)[*] at peak. An increase in FTFT, due to growth in the catchment, may increase the flood risk to properties and environmental sites on the watercourse downstream of the discharge point.

[*] See Technical Glossary for definition of FTFT

Multi-criteria analysis (as described above) has been utilised to provide a risk score for each of the impacted discharge points. Flood risk scores were assigned to each discharge by determining the contribution that the increased FTFT (due to the proposed growth to 2031) make to the flow levels in the watercourses during a 1 in 2 year flood. This was then weighted to account for the sensitivity of the watercourse to flow increases, and the potential local impacts of any flooding.

Detailed technical information regarding the methodology applied, and the results of the multi-criteria analysis, are presented in Appendix F.

11.2.2 Results

It must be highlighted that the above methodology compares the total 2031 FTFT from the WwTW (flows from both existing and proposed dwellings) against the 1 in 2 year flood events for the watercourses, hence providing a risk score for the total predicted flows by 2031.

However, if FTFT from the existing properties is considered to be an integral part of the current river flows, it can be shown that the actual increase in total peak flows in the rivers by 2031, which is solely attributable to the proposed growth, makes up a considerably smaller proportion.

In accordance with PPS25, an additional 20% was added to the 1 in 2 year flood flows. The new FTFT values have been projected to 2031 at each site; therefore considering river flow values, without an allowance for climate change, would make the impact of the future FTFT flows seem more significant than they could possibly be by 2031.

		Increase in river flows by 2031 based on entire WwTW FTFT (includes existing flows)			Increase in river flows by 2031 based on WwTW FTFT attributable to growth (excludes existing flows)		
Discharge Site	**Option**	**Increase in 1 in 2 year river flow**	**Combined Risk Value**	**Risk Assessment**	**Increase in 1 in 2 year river flow**	**Combined Risk Value**	**Risk Assessment**
Mildenhall	-	1.66%	1.4	Low	0.41%	1	Low
Lakenheath	-	4.19%	2.4	Low	1.08%	2	Low
Newmarket	-	5.67%	3	Medium	0.95%	2.2	Low
Tuddenham (River Lark discharge)	B	n/a	n/a	n/a	0.23%	2.2	Low
	C	n/a	n/a	n/a	0.25%	2.2	Low
	D	n/a	n/a	n/a	0.71%	2.2	Low
Brandon	-	0.29%	2.8	Medium	0.05%	2.8	Medium
	Relief Road	0.32%	2.8	Medium	0.08%	2.8	Medium
Tuddenham (existing discharge)	A	64.16%	4.4	High	24.34%	4.4	High
	B	43.67%	4.4	High	8.82%	3.6	High
	C	41.26%	4.4	High	7.00%	3.6	High

Table 11-13 Summary of flood risk multi-criteria analysis results

As discussed in Appendix F, none of the proposed increases in WwTW discharges appreciably change the combined risk score compared against the current situation. However, the increased discharges to the Tuddenham Stream, purely attributable to growth, would be classed as high risk in their own rights.

At Tuddenham WwTW, the results suggest that the increase in peak river flows due to the FTFT (under all three Options) should be considered as high, regardless of whether the entire discharge is considered, or just the proportion attributable to the proposed growth. As discussed in Appendix F, it is recommended that AWS investigate the downstream constraints on site, and undertake hydraulic modelling, to determine the significance of the potential increase in river flows, and discuss possible mitigation methods with the EA.

It is likely that these issues will need to be taken in account when AWS are determining which Tuddenham discharge Option to pursue. Initial modelling has been undertaken as part of this WCS, discussed further in Section 11.2.3.

However, it must be noted that the nature of the Tuddenham sewerage network may assist in mitigating these risks. As the majority of the wastewater in the catchment is pumped to the WwTW, opportunities may exist to buffer the FTFT throughout the network, perhaps through additional storage at Herringswell, as well as at the WwTW itself. Delaying the peak discharge until after the peak river flows may be possible, depending on the capacity installed by AWS.

Table 11-13 also highlights an advantage of the proposed discharge to the River Lark; the Tuddenham discharge would have a much less significant effect on flood risk here, given the relatively larger flows which occur in the river.

As discussed in Appendix F; the Brandon discharge is ranked as a medium risk (with or without the relief road growth), mainly due to the potential impact of any flooding given the sites proximity to the town. However, due to the channel characteristics, and the distance to any downstream structures, the risk of increased flooding from the relatively small increase in peak river flows attributable to the growth (0.05%, or 0.08% with the relief road) is not considered to present a cause for concern.

As shown in Table 11-13, total 2031 FTFT from Newmarket WwTW would contribute to over a 5% increase in peak river flows. However, the majority of this contribution is from the existing properties. When the increase in peak river flows directly attributable to the proposed growth is considered on its own, it presents a low risk.

At Lakenheath, the combined risk score is low, before and after the proposed growth. However, there are some local considerations relating to the operation of the IDB area which must be considered, as discussed in Section 8.3.5.

It is acknowledged that climate change will impact flood risk in the future. This is a risk that the frequency and intensity of future rainfall events may increase due to climate change, leading to higher run-off rates into surrounding rivers, altering the hydraulic response of the river to the rainfall event.

Therefore, the flows rates associated with 1 in 2 year event described above are predicted to occur more frequently in the future. Whilst the significance of the WwTW discharges, and downstream impacts and sensitivity, are likely to remain the same for any given river flows, the frequency of flooding may increase. FHDC should therefore ensure that flood resilience and mitigation continue to remain key components of planning decisions.

11.2.3 Additional Tuddenham Stream Assessment

Given the results of the above assessment, it was determined that additional assessment was needed to quantify the increase in flood risk on the Tuddenham Stream, due to the estimated increase in discharge from Tuddenham WwTW.

A simple steady state ISIS model was constructed based on survey data (1991) for the Tuddenham Stream provided by the EA. The survey data does not extend upstream of Tuddenham Road / High Street bridge. Appendix F includes further information regarding the extent of this data, and the methodology used in constructing and running the model.

The stakeholders decided not to extend the scope of the assessment at this time. This imposes the following limitations on any assessment made:

- The Tuddenham Road / High Street bridge, the culvert under the track from Hall Farm, and any restrictions at Tuddenham Mill, are not included in the assessment. The hydraulic capacity of these features could be determining factors in the level of risk during extreme events;
- Downstream (north) of the bridge, the stream is thought to be supported by base flows from the chalk aquifer, meaning that the WwTW discharge will make up a smaller proportion of the overall flow, hence will have less impact on flood risk here;
- South of the bridge, the stream is thought to be primarily ephemeral in nature, meaning that the WwTW discharge will have a greater influence on flows here, making it the most important area for assessment; and
- South of the bridge, a number of drains interconnect with the Tuddenham Stream. These may involve control structures, and it would be beneficial to understand the impact these features have on flood risk.

It is recommended that AWS undertake further investigation and modelling as part of a future investigation into the Tuddenham discharge options, to address the above limitations.

The modelling assessment undertaken as part of this WCS does however add clarity to the conclusions of the risk assessment undertaken in Section 11.2.2.

The results from the ISIS model are displayed in the following figures. Water levels (height above minimum recorded bed level) are displayed for the following flows:

- Estimated natural 1 in 2 year flow, i.e. QMED;
- QMED plus the existing FTFT discharge from Tuddenham WwTW;
- QMED plus the total FTFT discharge associated with Option A, Option B and Option C respectively (see Section 8.4.3).

The results are also shown for a 1 in 100 year event, and a 1 in 100 year + 20% event, to illustrate the impact of the WwTW discharge during such events.

In addition, the graphs show an average of the left and right bank heights. This illustrates that for all the events modelled, the modelled water levels are well within the channel, before and after the proposed growth.

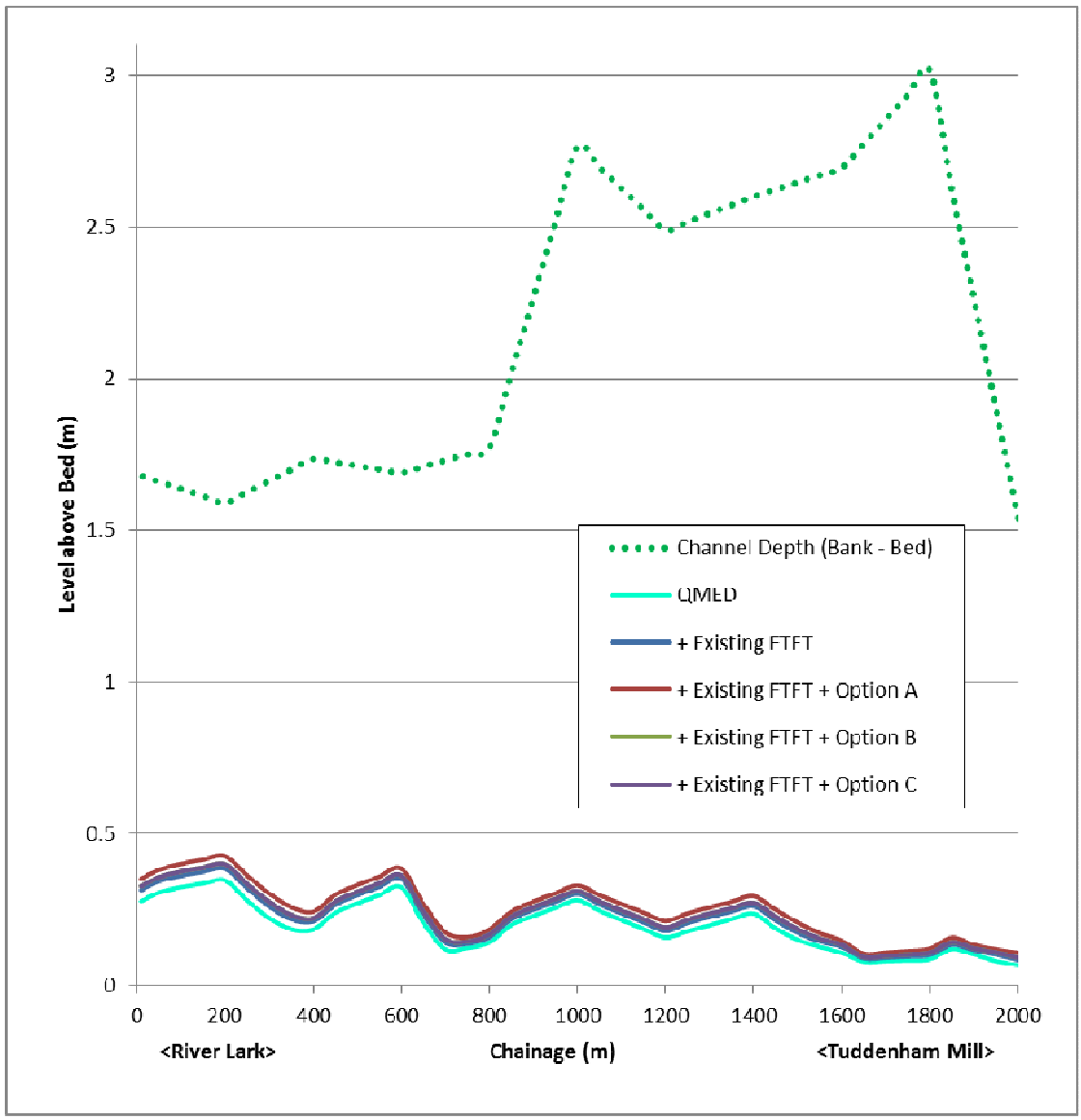

Figure 11-9 Water Level above channel bed based on QMED flows

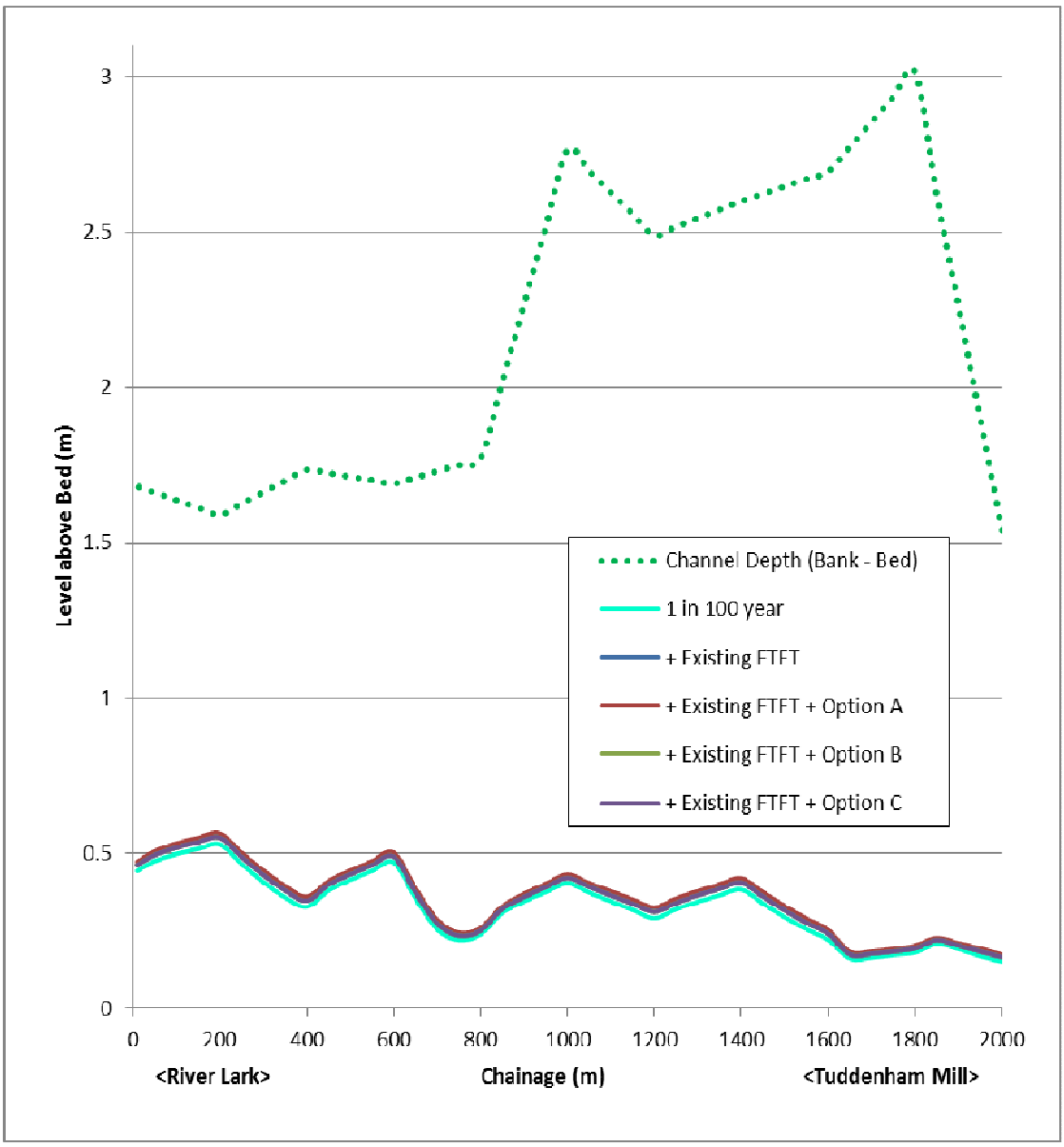

Figure 11-10 Water levels above channel bed based on 1 in 100 year flows

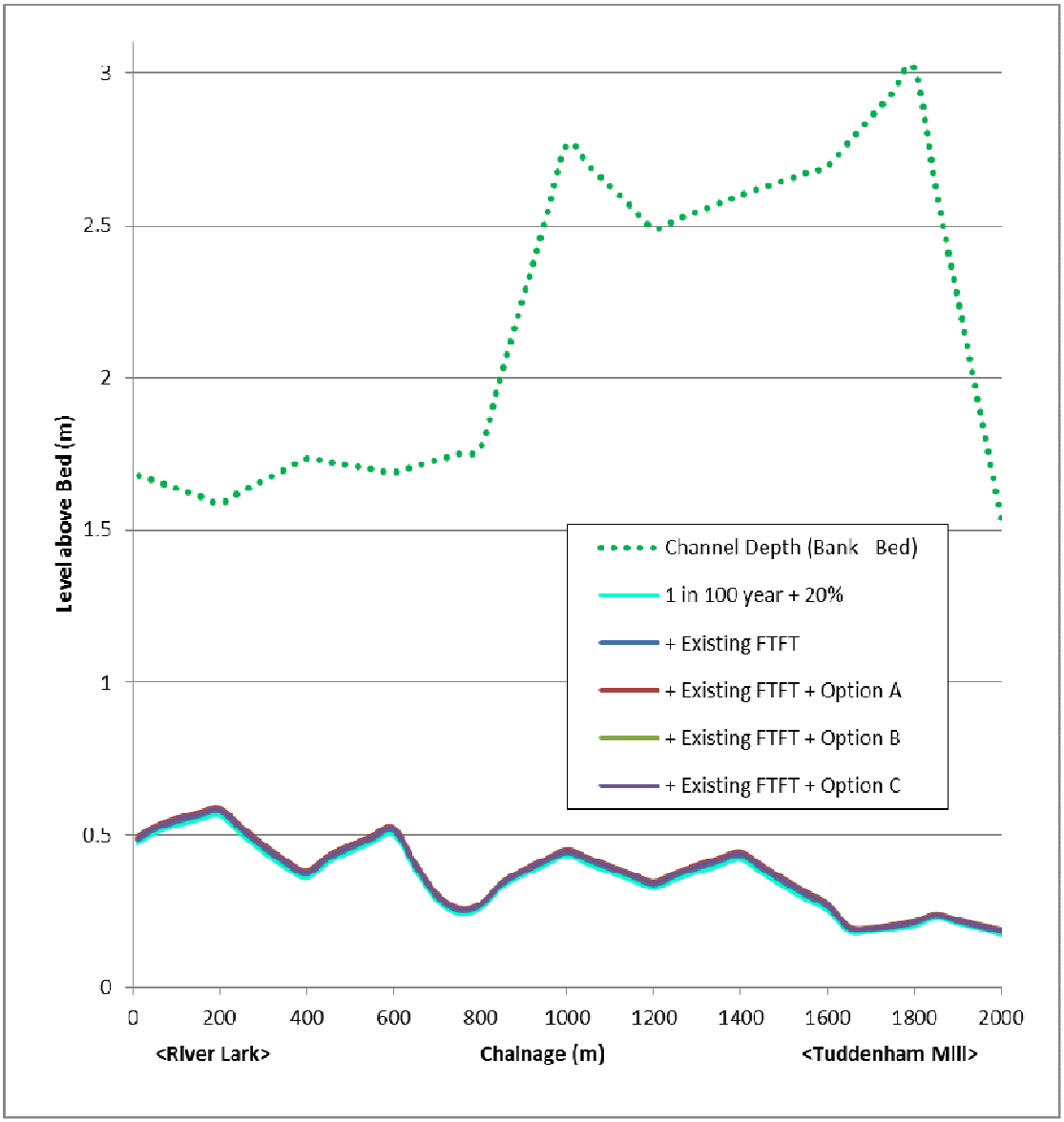

Figure 11-11 Water Levels above channel bed based on 1 in 100 year flows + 20% climate change allowance

The above figures illustrate that, whilst the discharge from Tuddenham WwTW to the Tuddenham Stream is given a high combined risk rating using the methodology in Section 11.2.1; the modelled results do not support this view (in the reach of watercourse between the Tuddenham Road / High Street bridge and the confluence with the River Lark).

For this reach, it can be concluded from the model that the proposed increase in discharge from Tuddenham WwTW will have a marginal effect on water levels during 1 in 2 year flows, and a negligible effect on water levels during the 1 in 100 year (and 1 in 100 year + 20%) events, and that for all of these events, the modelled water levels will not result in out of channel flooding.

However, as discussed above, the limitations associated with the geographical extent of the model mean that these conclusions will not be applicable to the reach of the Tuddenham Stream between the WwTW and the Tuddenham Road/ High Street Bridge. Additional modelling is required to determine the impact of the increased WwTW discharge on flood risk here.

11.3 Surface Water Management

Areas of undeveloped land are predominantly reliant on the natural processes of conveyance and infiltration to drain surface water. The effect of development is to generally reduce the site permeability, thus changing the way in which it responds to rainfall in terms of the quantity of surface water flowing through, and off, the site, as well as the quality of this water. PPS25 stresses the importance of managing surface water arising from a developed site, in a sustainable manner which reduces flood risk to the site and surrounding area.

Where a proposed surface water drainage system will require connection to either a separate or combined sewerage system, it would be preferable to the stakeholders that the discharge rate is limited to the equivalent greenfield run-off rate where practicable. This reduces the impact on the existing sewerage network, reducing the risk of an increase in downstream sewer flooding/ pollution events. On-site SuDS should be employed to reduce the volume and rate of water arising from roofs, hard standings and other impermeable surfaces, which will ultimately discharge to the surface water sewer.

In addition to the emerging framework for surface water management on new development, as described in the Flood and Water Management Act (see Section 11.1), the following policy/legislation should also be taken into account when considering the optimum attenuation and disposal route for surface water run-off.

11.3.1 Building Regulations

Part H of the Building Regulations requires that developers consider the following solutions regarding the drainage of surface water, in order of priority:

- Connection to a soakaway or other adequate infiltration system;
- Discharge to a river/watercourse (which may require a consent); or
- Connection to a surface water sewer (or combined sewer if capacity exists).

FHDC should continue to robustly apply this approach; in conjunction with the evaluation of drainage proposals by the SuDS Approval Board (see Section 11.1).

11.3.2 Groundwater Protection: Policy and Practice

In 2008 the EA published a document that set out the legislative and policy framework within which they will protect and manage groundwater, entitled Groundwater Protection: Policy and Practice. Part 4[18] of this document is directly relevant to this WCS, particularly the policies that set out the EA's requirements for surface water drainage, in relation to its possible detrimental impact on underlying aquifers if pollution risks are not adequately managed.

The approval of a proposed surface water drainage system from the EA will be required before the SAB can grant overall approval for a development site. However, in the policy vacuum (prior to the finalisation of the National Standards and full implementation of the requirements by SCC), FHDC should liaise with the EA to ensure that any applications for planning permission take the above policy into account.

11.4 Sustainable Drainage Systems (SuDS)

By replicating natural drainage patterns, SuDS can attenuate surface water run-off and so reduce flood risk, improve water quality and encourage the recharge of groundwater resources.

They can protect water quality by trapping and breaking down pollutants, provide amenity and wildlife enhancements, and provide cooling from open water surfaces. 'Living' roofs (often referred to as green or brown) can also be considered as SuDS, and by controlling rainfall at its source can provide a pivotal role in flood management, reducing the amount of surface run-off and easing demand on sewerage systems.

As described in the Outline WCS and SFRA, the EA currently suggest that the SuDS hierarchy is adopted when considering the management of surface water from new development, showing the preferred order in which different SuDS techniques should be considered for a site. SuDS techniques at the top of the hierarchy are preferable for their potential ecological and water quality benefits, as illustrated by Figure 11-12. This aligns with the approaches of both the Building Regulations Part H and the FWMA.

	SUDS technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit
Most Sustainable	**Living roofs**	✓	✓	✓
	Basins and ponds - Constructed wetlands - Balancing ponds - Detention basins - Retention ponds	✓	✓	✓
	Filter strips and swales	✓	✓	✓
	Infiltration devices - soakaways - infiltration trenches and basins	✓	✓	✓
	Permeable surfaces and filter drains - gravelled areas - solid paving blocks - porous paviors	✓	✓	
Least Sustainable	**Tanked systems** - over-sized pipes/tanks - storms cells	✓		

Figure 11-12 SuDS Hierarchy[19]

Attenuation basins and wetlands can provide amenity to the local community, valuable habitats for wildlife, and form an important component of green corridors between environmentally important sites. FHDC should work with the EA and SCC to encourage developers to incorporate SuDS from the higher levels of the SUDS hierarchy (Figure 11-12) into development sites wherever practicable.

However, it must be noted that FHDC and developers should also consult with the United States Air Force regarding any proposals to incorporate large areas of open water within development sites, given the risk that these may attract additional wildfowl to the area, increasing the risk of bird strike on planes. The initial suggested buffer zone for undertaking such consultation is 13 km from Lakenheath and Mildenhall airfields, which would include the majority of the proposed sites within the District, with the exception of those in south Newmarket. This should not however be considered a blanket ban on such SuDS features; there are excellent examples of wetland habitat being managed within this buffer, such as the Lakenheath Fen RSPB reserve.

The common method of developing SuDS schemes is through the concept of a 'management train', illustrated in Figure 11-13. This shows that a combination of individual SuDS elements may be required to contribute to the overall effectiveness of the SuDS scheme. Single elements such as a soak away or infiltration basin may not be suitable in a number of circumstances due to, for example, the potential to contaminate groundwater sources.

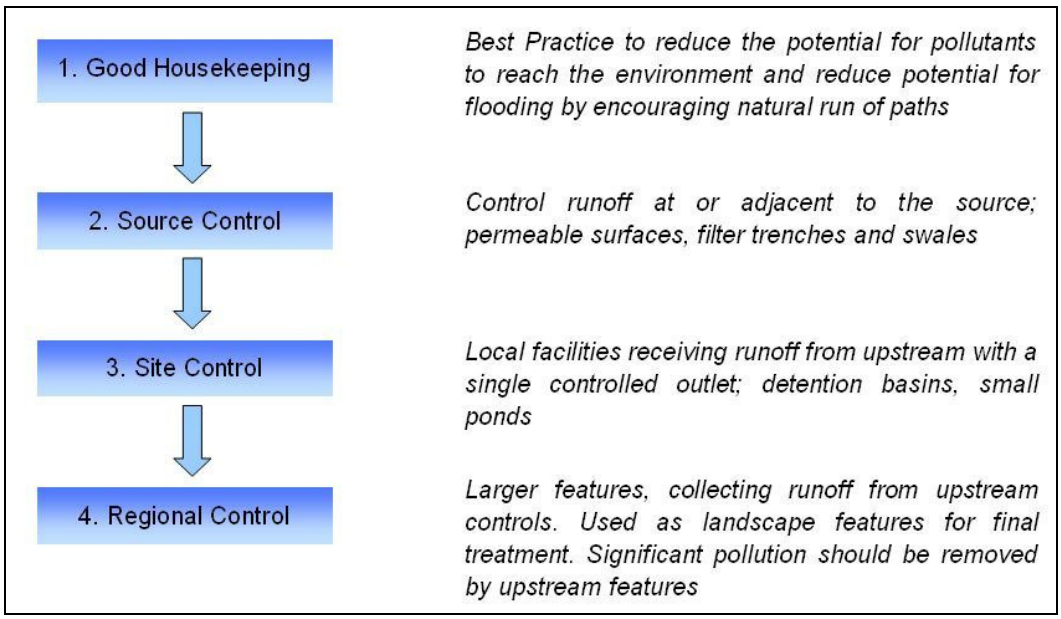

Figure 11-13 SUDS management train

The Interim Code of Practice[20] for SuDS, published by the Construction Industry Research and Information Association Research (CIRIA) in 2004, sets out the management and adoption of SuDS elements within the context of urban planning policy. CIRIA have also produced three model agreements[21] that have been designed as a binding agreement between the organisation involved in developing the SuDS scheme, the Local Authority and the water company. FHDC may wish to investigate the use of such agreements for any development proposals in the short term, prior to the finalisation of the National Standards.

Following the requirements of PPS25, and best practice advocated by the WCS stakeholders, it is recommended that the surface water run-off from new and refurbished sites be controlled to be equal to the greenfield run-off rate prior to development. Attenuation facilities will be required to store the critical storm on site. For sites 1 ha and over, discussions with the local EA office are recommended, to ensure that they are designed to the correct criteria, unless another drainage body has jurisdiction.

Site specific flood risk considerations (including surface water drainage designs as required under the FWMA) should take account of current flood risk from all sources, potential increases in flood risk due to development, and the potential impacts of climate change on future flood risk.

There is however a risk that the SuDS aspirations and best practice described above may not be practicable on specific sites, due to local ground permeability, proximity to watercourses and space/ cost factors. As such, connection into the existing surface water sewerage system may be required. Even if limited to the corresponding greenfield run-off, this will increase the flows in the existing network (and at the WwTW if the network is combined), and may increase the risk of flooding/ pollution events.

The implications of the FWMA are that such a connection will be conditional on the approval of the SAB, who are obliged to consult with the water company concerned. AWS advise that it is very unlikely the existing surface water sewers will have capacity to accept any development, and as such developers may have to build or requisition new piped systems, which would be the least preferred option from the SuDS hierarchy. Whilst the National Standards and SAB are yet to be established, the principle of liaising with AWS to consider surface water drainage capacity

must be included in initial developer discussions; FHDC should consider including a policy through the SSA process requiring developers to provide evidence of such discussions.

Prior to the finalisation of the National Standards, FHDC and developers should make reference to the SuDS Adoption Manual[22] and SuDS Guidance[23] recently published by AWS, which draws on the CIRIA standards discussed above, and highlights possible adoption and maintenance regimes that may be negotiable with AWS in the absence of a SAB.

11.4.1 SuDS Suitability

Underlying Geology

As identified in the Outline WCS, the majority of the District is underlain by a chalk aquifer, exposed in some locations, and covered by relatively permeable deposits in others. The chalk geology has a varying level of exposure due to the extensive superficial deposits of clays, gravels and sands laid down over the over the past 250,000 years. The Rivers Lark, Little Ouse and their associated tributaries drain the chalk uplands and are mainly fed by base flow from the chalk aquifer. The EA are currently investigating the construction of the Cam and Bedford Ouse groundwater model.

Wallingford Soil maps shows that Forest Heath is located on soil type 1 well drained permeable sandy or loamy soils and shallower analogues over highly permeable limestone chalk, sandstone or related drifts.

Ground Water Vulnerability

The vulnerability of the underlying aquifer, and therefore the constraints to infiltration SuDS, are visualised by the EA's Groundwater Vulnerability Zones (GWV). These zones were created based on existing soil maps and databases, and provide an indication of the vulnerability of the underlying groundwater resources to pollution from surface contaminants, as high, intermediate or low. This EA classification of the land surface reflects the ability of contaminants to leach through the covering soils and pose a potential risk to groundwater at depth. The maps also indicate areas where the presence of low permeability drift may provide additional groundwater protection.

Source Protection Zones (SPZ)[*] are defined based on the way in which groundwater moves through the underlying geology, including the condition of the ground and how the groundwater is removed. They are defined for major abstractions of groundwater for potable purposes. Source Protection Zones indicate the level of pollution risk over a range of distances from the abstraction point. Generally, activities closest to the abstraction point have a great probability of polluting the water source.

All of the proposed development sites within the District are located in areas of major groundwater vulnerability. In addition, a significant number of sites are also within Source Protection Zones (SPZ).

[*] SPZ are illustrated and discussed in detail in the Outline WCS

Flood Zones

The presence of Flood Zones restricts the space available for SUDS, as flooded infiltration areas are water logged and thus cannot infiltrate any water, and flooded attenuation areas have their storage reduced by flooding from non surface water sources. Reviewing the FHDC proposed development sites; site N/17 in Newmarket contains areas of Flood Zone 2 and 3.

SuDS Policy Units

As indicated in Figure 11-12, basins, ponds and wetlands are considered the most sustainable SuDS techniques (aside from living roofs), due to their inherent wildlife benefits. Wetland habitat can play an important role in mitigating the effects of climate change, including the management of floodwater and the adverse effects of low rainfall. Every opportunity should be taken by FHDC and developers to incorporate techniques such as these into the potential development sites. However, the size of land needed, and in some cases safety considerations, can preclude such techniques on some sites.

Where the use of the more sustainable SUDS is constrained, underground storage and infiltration techniques may be the only option available to developers, although it must be noted that “tanked” systems are regarded as the least sustainable option.

Attenuation and infiltration of surface water, close to site, (providing ground conditions allow) can reduce the requirement for the construction of new surface water drainage networks. This can reduce the impact of the development on flood risk in receiving watercourses, as the immediate run-off during a storm event is not conveyed directly to the river.

All SuDS schemes should ensure that their design, construction and maintenance incorporate appropriate measures for the protection of groundwater. It is generally recommended that sites in SPZ1 (inner) should not use infiltration SuDS due to the high risk of pollution of drinking water sources. In SPZ2/ 3, if infiltration based SuDS are to be used, the construction should be as shallow as possible, and above the soil zone, to minimise the risks to underlying groundwater. However, localised infiltration tests and ground investigations will be required to confirm any constraints (see Section 11.3.2).

Six SuDS policy units have been defined for the study area based on the available information concerning ground conditions. The policy units are described in Table 11-14 below.

SUDS Policy Unit	Description	SuDS Guidance
1	SPZ 1 (inner)	▪ No infiltration SuDS to be used ▪ Surface water to be discharged to conventional systems on site ▪ Potential for surface water to be conveyed to SuDS further downstream ▪ Attenuation based SuDS if ground investigations indicate that no pollutants will inadvertently infiltrate from such a feature. Discharge limited to Greenfield rates
2	SPZ 2 (outer) and 3 (total catchment)	▪ Infiltration based SuDS with shallow construction, above soil zone ▪ Attenuation based SuDS if ground investigations indicate that infiltration is not possible. Discharge limited to Greenfield rates
3	Areas with superficial clay deposits	▪ Attenuation based SuDS which limit discharge from the site to Greenfield rates
4	Deposits of peat and gravels, including river terrace gravels. High infiltration potential over aquifer	▪ Controlled infiltration based SuDS with shallow construction above soil zone ▪ Ensure pollution protection measures are in place
5	Glacial till; lower permeability	▪ Attenuation based approach, localised infiltration based on site specific testing
6	No classified superficial deposits, area overlies chalk bedrock, and is over or adjacent to major chalk aquifer	▪ Site specific ground investigations must be undertaken to inform SuDS selection ▪ Pollution protection measures to be incorporated to protect aquifer

Table 11-14 Summary SuDS Policy Units

The extent of these SuDS policy units across the District, with respect to the existing settlements, is displayed in Figure G1, in Appendix G.

Figures G2 through G5, in Appendix G, illustrate the FHDC SSA sites, in relation to the SuDS Policy Units they fall within.

The SuDS Policy Unit figures are intended to assist FHDC and developers in making high level decisions regarding the initial suitability of using SuDS techniques in developments, during early discussions. The figures will allow developers to identify which SuDS techniques may be suitable, and should ensure they are considered during the early stages of the design process, and accommodated within the overall development layout.

Suitable SuDS schemes should also take into consideration the characteristics of the development site including proposed use, size and density. FHDC should take this into account when discussing possible site densities with developers. However, techniques suited to high density developments such as green roofs (www.environment-agency.gov.uk/greenroofs) should be encouraged where appropriate.

The non-residential development sites proposed by FHDC are generally not predicted to involve heavy industrial uses; therefore no special measures for surface water drainage will be required. However, areas where traffic is anticipated to be heavy must ensure that robust solutions for pollution prevention measures are put in place to protect the underlying aquifers.

Risk of pollution can be partially managed by implementing good housekeeping measures such as regular sweeping of paved areas, grey water re-use, and focussing site layouts around keeping higher polluting activities in similar locations.

In the absence of the National SuDS Standards, the following recommendations are made in relation to applicable SuDS techniques. Methods which should be considered for Policy Units 2, 4 and 5 are:

- Pervious pavements which facilitate the inflow of water into soil;
- Filter Drains/Strips; linear drains filled with permeable materials;
- Swales/Ponds/Wetlands; and
- Green Roofs; vegetated roofs which reduce run-off volume and rate.

All infiltration solutions are to be constructed to as shallow a depth as is practicable and above the soil zone. Consultation must be undertaken with EA at all stages of the design.

In areas where the underlying conditions are predominantly impermeable or of limited permeability, SuDS should focus on the use of surface water attenuation systems rather than infiltration measures. Water butts and green roofs are prime examples of highly effective source control SuDS which also provide a local non-potable water reuse system. Other examples of suitable approaches are:

- Retention Ponds/ Sub-surface Storage;
- Wetlands;
- Filtration Devices – Sand filters;
- Detention Basins;
- Open Channels – Swales; and
- Green Roofs; vegetated roofs which reduce run-off volume and rate.

Whilst the presumption embedded throughout the Building Regulations, FWMA and AWS guidance is that infiltration will be utilised where practicable, given the sensitivity of the underlying groundwater resources there will be sites where attenuation followed by discharge to a watercourse will be the only viable option.

Developers of sites at Beck Row, Lakenheath and West Row should liaise with the relevant IDB to discuss the possibility of any remaining surface water run-off, following as much attenuation and infiltration as possible, being discharged into the IDB drainage systems (for which the IDB will require payment from the developer).

In the other settlements, developers will need to discuss the potential construction of new piped surface water drainage networks with FHDC, AWS, the EA, and the SAB once established. As with the sewerage infrastructure discussed in Section 10, this issue may be addressed more efficiently if developers of neighbouring sites liaise with each other.

The majority of Newmarket contains a dedicated AWS surface water drainage network, however AWS advise that any capacity for development in this system is highly unlikely. There may however be an opportunity for the proposed sites to connect their surface water flows (equivalent to greenfield run-off or better), if additional capacity can be created by better

attenuating flows in the existing network, subject to the approval of the SAB in the future. AWS should be contacted by developers for capacity information regarding individual sites.

According to AWS asset records, Brandon, Mildenhall and Lakenheath also contain limited areas with a dedicated surface water drainage network, however these may only present an opportunity to a limited number of the proposed sites – again, AWS advise that significant capacity for growth is highly unlikely; developers should contact AWS for specifics.

11.4.2 SuDS Policy Units Assumptions and Limitations

Primarily, it must be noted that the SuDS Policy Unit figures are provided as a strategic assessment tool to assist with the policy development for FHDC. The figures have been created using large scale datasets, which make several assumptions, and therefore have limitations when used in more local or area based situations. The SuDS Policy Unit figures have been created using three main sources of data:

- British Geological Survey – 625k bedrock and superficial deposits;
- Environment Agency – Source Protection Zones (SPZ); and
- Environment Agency – Groundwater Vulnerability (GWV) Maps: note that these maps were designed to increase general public awareness and aid developers who were planning new activities, and planners who were assessing new proposals or drawing up development plans.

Developers must utilise detailed analysis, based on site specific ground investigations and consultations with the EA, to determine the range of SuDS techniques which will be suitable on individual sites. As discussed previously, guidance can be found in CIRIA and AWS publications, and the forthcoming National Standards.

11.4.3 Retro-Fitting

SUDS elements can also be retrofitted to existing developments or to the current urban fabric. An example is the use of rainwater harvesting techniques. A water butt collects a proportion of the rainwater that falls onto the roof of a property, which subsequently can be used, for example, to water the garden. Full rainwater harvesting systems can be installed which pipe rainwater for non-potable use within the house.

Although legislation cannot oblige residents to fit such solutions to their property, the promotion of these elements through guidance by FHDC and AWS is vital to increase the uptake within the community.

The main sites within the District where large areas of land are to be developed which could have a significant effect on surface water management are; Red Lodge, where residential development is planned; and Newmarket and Mildenhall, where considerable employment development sites have been identified.

Retrofitting can provide catchment wide benefits by:

- Reducing the amount of run-off entering local watercourses and consequently the fluvial flood risk;
- Reducing surface water run-off and associated overland flood risk; and
- Reducing water demand by providing an additional source of non-potable water for the occupier.

It is recommended that a policy regarding the retrofitting of SuDS is developed by FHDC to encourage the uptake of such measures. This could be combined within a regeneration policy. CIRIA guidance on the retrofitting of SuDS is expected in the summer of 2011.

11.4.4 Surface Water Management Policy and Recommendations

Findings from this WCS should make recommendations in order to reinforce policies set out in the Core Strategy and inform the SSA process and other future Supplementary Planning Documents. A review of the Core Strategy highlights the following policies of relevance:

Policy CS2 Natural Environment: Areas of landscape, biodiversity and geodiversity interest and local distinctiveness within the District will be protected from harm and their restoration, enhancement and expansion will be encouraged and sought through a variety of measures. Links between such areas will also be sought.

This report supports this policy, with particular respect to the protection of, and increasing, green infrastructure links. Green infrastructure links can provide a key element of a SuDS management train and when managed effectively can enhance areas of green space. It is recommended that a link is made between Policy CS2 and the sustainable management of surface water. It is also recommended that, where practicable (and not detrimental to flood risk), a specific policy is included within the Site Specific Allocations DPD process to encourage the opening up of any culverted watercourses on applicable sites, and that FHDC seek to identify opportunities for this throughout the District regardless of growth.

Policy CS4 Reduce Emissions, Mitigate and Adapt to future Climate Change: 'The Council will seek the implementation of Sustainable Urban Drainage Systems into all new developments where technically feasible'

This report supports this policy however it should be stronger and define more rigorously the need for SuDS in new developments. It is suggested that guidelines are developed to determine what is classified as 'technically feasible'. The WCS recommends the following statements and objectives for inclusion in planning and Core Strategy policies:

- The management of surface water should be integral to all new developments;
- Surface water run-off rates and volumes from new developments should be appropriately controlled;
- A drainage hierarchy should be followed when considering the disposal of surface water:
  - Storage for subsequent use
  - Infiltration based techniques
  - Attenuation in open water features for gradual release to a watercourse
  - Attenuation in sealed water features for gradual release to a watercourse
  - Direct discharge to a watercourse
  - Discharge to a surface water drain
  - Discharge to a combined sewer
- All new developments should incorporate appropriate SuDS techniques to manage surface water; in accordance with relevant guidance produced by CIRIA, AWS and the forthcoming national standards;
- SuDS schemes should be appropriately located within the development and should follow the principles of the SuDS hierarchy and should focus on both water quality and quantity, and the amenity and environmental benefit offered by above ground features;

- Where appropriate, all SUDS proposals should take into account and create links with emerging Green Infrastructure strategies;
- Maintenance schedules must be developed for all new SUDS schemes in order to prevent increased flood risk through dilapidation, siltation and general disrepair;
- SuDS must consider exceedance routes for run-off higher than primary systems;
- Potentially contaminated run-off from roads and hardstandings must pass through at least one form of treatment before discharge to sewers;

In addition, it is also recommended that:

- Urban creep must be managed to prevent the laying of impermeable surfaces in gardens and curtilages;
- FHDC instigate polices to provide for 'day-lighting' (opening up) of existing surface water systems and urban watercourses. This will help foster the links identified within the Green Infrastructure Strategy and provide corridors for linking habitats, and the more natural provision of space for surface water;
- Where a number of developments are proposed in the same area, a holistic overview of all SuDS schemes must be taken both to determine cumulative impacts and to provide the most efficient management of surface water. This may result in higher allowable run-off rates on an individual development site as a result of its strategic position higher up a SUDS train, coupled with known additional storage potential sites on development sites further down the train. This is likely to be most appropriate for large scale development in Red Lodge and south east of Newmarket, and must be driven by SCC in their emerging role as the SAB;
- Investigations into the interest in forming an Integrated Urban Drainage (IUD) Group for Newmarket should be made to identify the support for a Surface Water Management Plan (SWMP); and
- A partnership approach should be adopted to review the issues surrounding surface water ingress including specifically the ownership of connections into the Newmarket Drains.

FHDC should consider implementing the above through the use of Supplementary Planning Documents.

12 Conclusions

The Stage 2 WCS has shown that the development targets proposed for the market towns, key service centres and primary villages, by FHDC in the Core Strategy, will not be unduly constrained by the water resources or the provision of the required potable water infrastructure capacity.

However, the Stage 2 WCS has also demonstrated the benefits apparent from FHDC Core Strategy Policy CS4; regarding the requirement for water efficient fittings and fixtures in dwellings, to achieve a reduction in consumption rates in line with CSH Level 3. In addition, the benefits of striving for further efficiencies over the plan period have been highlighted.

The Stage 2 WCS has concluded that the proposed development at Brandon, Beck Row, Kentford, Mildenhall, Newmarket and West Row will not be unduly constrained by the provision of wastewater treatment. AWS have estimated that whilst some of the WwTW will require capacity and process upgrades, the proposed scale and phasing of the development should allow the existing WwTW to be upgraded in parallel with the development. Where possible variations in overall development numbers may cause a constraint, due to the nature of the WwTW upgrades required, such as at Brandon; this has been highlighted, along with recommendations to mitigate this risk.

The Stage 2 WCS has also illustrated that the action taken by FHDC during the development of their Core Strategy, to delay additional development at Lakenheath to post 2015, and Red Lodge to post 2021, will now allow adequate time for the stakeholders to determine and implement the most sustainable wastewater treatment option to serve this growth. A number of options have been assessed in partnership with the stakeholders, and where further work is required to determine the most sustainable option, the requirements of such work have been identified. These requirements are described in more detail in Section 13, along with the associated risks this uncertainty may pose to development should this work not be undertaken, or the implementation of solutions delayed.

The legislative requirement to protect and improve the water quality in the receiving watercourses has been highlighted and indicative consent standards provided, to allow AWS and the EA to consider if the increased discharges from the WwTW can be treated to the required standards. Future risks associated with achieving the required water quality standards, and the risks this may pose to the delivery of the proposed development, have been discussed.

The fluvial flood risk associated with the potential increases in discharge from WwTW has been assessed, and recommendations made as to the further work required on this subject.

Possible sewerage network constraints for the individual proposed SSA sites have been identified, and indicative solutions identified in consultation with AWS. The proposed development timeframes for these sites has been compared with an estimate of the timeframes required to provide the necessary sewerage infrastructure, and any challenges, which developers must now overcome with AWS, the EA and FHDC, identified.

The Stage 2 WCS has highlighted the increasing importance of SuDS in managing surface water flood risk, and the legislative framework which will drive the use of such technologies going forwards. High level advice as to the suitability of certain SuDS technologies across the District has been supplied, with the aim of stimulating discussions between developers, FHDC, AWS and the EA (and SCC in their future role as the SAB).

The following sections summarise the key conclusions for each of the topics discussed above.

12.1 Water Resources Conclusions

The EA position regarding the limited availability of water resources in the District has not altered since the completion of the Outline WCS.

The AWS WRMP sets out how AWS plan to supply the District, and wider area, with potable water (including the growth proposed in the RSS) by managing existing demand, optimising the abstraction from current groundwater supplies, and constructing assets to facilitate the transfer of available water across the region. Proposals to modify the use of the EOETS are anticipated to improve the resource situation.

The planning process employed by AWS, when determining the strategy for future resource management, includes an element of headroom to account for variations in demand caused by changes to both demographics and climate, and variations in resource availability due to climate change and environmental protection. This ensures that any solutions proposed by AWS to supply potable water to facilitate the growth in the District will be robust.

FHDC can reduce the impact of their development proposals on water resources by demanding more stringent PCC targets than Policy CS4 in the future (for example CSH Levels 5/6 post 2016). This will reduce the reliance of the District on water transfers (which can be costly and environmentally damaging) and assist AWS in ensuring that the supply of water is more robust against the risks from changes to climate, demographics, and consumer behaviour.

12.2 Water Supply Infrastructure Conclusions

Naturally, some of the proposed sites are close to the trunk mains or large diameter distribution mains; hence the required upgrades may be minimal, whilst at some sites, further from the existing network, the upgrades required may be more costly.

The location and sizes of the proposed sites means that it is unlikely that the necessary potable water network improvements would be cost prohibitive, especially if developers approach AWS in partnership. There is a clear funding mechanism in place for the delivery of such upgrades, through the developer requisition process. Once developers begin this process at individual sites (or in partnership if facilitated by FHDC through a Developer Forum), AWS will assess the available network capacity and advise the cost and timeframe of the new assets required, and the reinforcement to the existing network.

It may be beneficial for FHDC and AWS to raise this issue now with developers of sites to the west of Brandon, and the west of Red Lodge, as it is estimated that the improvements required would benefit from early discussion to ensure efficient planning and construction.

Regardless of the development location, it is recommended that FHDC policy (perhaps enforced through a policy in the SSA) is amended to require developers on sites of all sizes to consult with AWS and the EA regarding potable water network capacity and phasing of development in line with upgrades, and provide this evidence to FHDC and the EA, and that this is considered a material planning consideration.

12.3 Wastewater Treatment/ Environmental Capacity Conclusions

AWS estimated of the capacity of the WwTW and water environment to accommodate the increased wastewater from the proposed development can be summarised in the following table, based on the discussion in Sections 8.3 and 9.3:

Key

	Growth can be accommodated with limited modification of capacity/ flow consents. Required standards for 'no deterioration', and GEP status, can be readily achieved.
	Upgrades/ increases in flow consents are required to accommodate the growth. Required standards for 'no deterioration' can be achieved, although process upgrades will be required. Timeframe of development should allow the necessary upgrades to be completed in time. Additional risks are highlighted for further investigation by stakeholders.
	Upgrades/ increases in flow consents are required to accommodate the growth. Required standards for 'no deterioration' cannot be economically achieved using conventional technology. Timeframe of development will not allow the necessary upgrades to be completed in time. *Note that no such constraints have been identified by the WCS stakeholders.*

WwTW	Hydraulic/ Process Capacity	Consented DWF (based on 2010 measured baseline)	Consented DWF (based on AWS calculated baseline)	Discharge Consent Standards
Brandon	Upgrades required by 2015, although suggested development scale should allow this. Relief Road growth may require change of process. Requires further assessment by AWS once growth numbers are confirmed.	Consented DWF will not be exceeded prior to 2031, with or without Relief Road growth.	Increased DWF consent required from 2020, or 2015 with Relief Road Growth.	Current consent standards (and AMP5 P removal scheme) should achieve both 'no deterioration', and GEP under the WFD.
Lakenheath	Existing commitment can be served. Further growth requires upgrades, although suggested development timeframe should allow this.	Consented DWF will not be exceeded prior to 2031; however an increased consent may be required to allow a 10% buffer after 2031.	n/a – AWS advise that 2010 measured baseline is appropriate for this site.	Indicative consent standards required for 'no deterioration' are considered achievable following process upgrades. However, GEP, with respect to P levels, may not be able to be achieved economically, regardless of growth.

WwTW	Hydraulic/ Process Capacity	Consented DWF (based on 2010 measured baseline)	Consented DWF (based on AWS calculated baseline)	Discharge Consent Standards
Mildenhall (inc. Beck Row and West Row)	Estimated that existing capacity can accommodate the proposed growth.	Consented DWF will not be exceeded prior to 2031; however an increased consent may be required to allow a 10% buffer after 2031.	Consented DWF will not be exceeded prior to 2031; however an increased consent may be required to allow a 10% buffer after 2031.	Indicative consent standards required for 'no deterioration' are considered achievable. However, GEP with respect to P, levels may not be able to be achieved economically, regardless of growth.
Newmarket (inc. Kentford)	Estimated that existing capacity can accommodate the proposed growth.	Consented DWF will not be exceeded prior to 2031.	Consented DWF will not be exceeded prior to 2031.	No change in consent proposed, however risk of GEP requirement must be considered in the future.
Tuddenham (serving Red Lodge)	Upgrades required to accommodate flows from committed have been identified. Growth beyond 2021 may require change of process, depending on discharge option selected and consent standards required.	Increased DWF consent required from 2027. Viable options exist for discharging some of the additional flow to the River Lark. Proposed timeframe for development allows time for options to be further assessed.	Increased DWF consent required from 2021. Viable options exist for discharging some of the additional flow to the River Lark. Proposed timeframe for development allows time for options to be further assessed.	Indicative consent standards required for 'no deterioration' appear achievable, although may require change in process. Discharge options exist which would avoid this. However, GEP, with respect to P levels, may not be able to be achieved economically, regardless of growth.

Table 12-15 Summary of wastewater / environmental capacity constraints

The above conclusions mean that, in order for developers and planners to comply with FHDC Core Strategy Policy CS13 and the messages in Section 4 of the Core Strategy (Monitoring and Implementation Framework: Infrastructure Capacity); growth beyond committed sites must be postponed until post 2015 for Lakenheath, and post 2020 for Red Lodge, to allow adequate provision of wastewater treatment infrastructure.

Similarly, any acceleration of growth at Brandon, beyond the committed sites, and the trajectory proposed in policy CS7 of the Core Strategy, is unlikely to be acceptable given the likely timeframe for AWS capacity upgrades (2015 onwards).

Regardless of the development location, it is recommended that FHDC policy (perhaps enforced through a policy in the SSA) is amended to require developers on sites of all sizes to consult with AWS and the EA regarding wastewater treatment capacity and phasing of development in line with upgrades, and provide this evidence to FHDC and the EA, and that this is considered a material planning consideration.

The EA currently estimate that the increased flows from the WwTW due to the proposed growth will not be the primary cause for the watercourses failing to meet GEP with regards to phosphate levels. Depending on Defra/ EA policy, and water quality improvements from other

sources (such as diffuse pollution), there is a risk that future iterations of the RBMP process (2015 onwards) may require AWS to implement/ improve phosphorus removal at the WwTW, regardless of growth.

Whilst achieving these standards will be subject to a cost benefit analysis performed by AWS and the EA, there is a risk that process changes will be required at the WwTWs to meet the higher standards. Any growth which is proposed in these catchments would exacerbate this problem, potentially leading to higher operation/ energy costs, and potentially more frequent failures of standards, until such a time as the required processes have been installed.

The EA recommend that FHDC polices are flexible enough to allow alteration of growth targets, or the delaying of preferred sites, to ensure that growth across the District is not wholly constrained should this risk materialise. It should be noted that the conclusions in this WCS are based on the distribution of the proposed growth described in Section 4, and as such may not be valid should the development targets for the settlements change.

12.4 Fluvial Flood Risk Conclusions

The results of the multi-criteria assessment of downstream flood risk, from the increased discharges due to the growth, indicated that the increase in flood risk from Lakenheath WwTW, Mildenhall WwTW, and the River Lark (with regard to the Tuddenham WwTW discharge options), should be considered as low, hence it is unlikely that mitigation would be required. However, further consultation may be required with the IDB to ascertain the level of mitigation required (and the funding arrangements for this) due to the increase in discharge expected from Lakenheath WwTW in the future.

At Newmarket WwTW, the current discharge should be considered as presenting a medium risk, however the increase in this risk levels due to the proposed growth would be negligible.

At Brandon WwTW, the results suggested that a medium risk is presented from the overall discharge, regardless of the growth, due to the proximity of the discharge to the town. However, the impact of the proposed growth on this risk can be considered as negligible.

Any of the Tuddenham discharge options involving discharge to the Tuddenham Stream are classed as high risk, due to the current discharge forming a large proportion of the total flow in the stream. Whilst this may not result in an appreciable increase in risk downstream of the Tuddenham Road/ High Street bridge, upstream of here remains a concern. Options to transfer some of this discharge to the River Lark can significantly reduce this risk. The future analysis (to be undertaken by AWS), to determine the most sustainable discharge solution for Tuddenham WwTW, should take account of the flood risk mitigation required at the Tuddenham Stream, in consultation with the EA and riparian owners.

12.5 Sewerage Network Conclusions

As discussed throughout Section 10, based on a high level assessment of the existing sewerage network, AWS have made the following estimates regarding sewerage network capacity:

Key

	Sites can be accommodated with limited upgrades to the local sewerage network.
	Significant upgrades may be required to the local and downstream sewerage network and pumping stations to accommodate these sites. The timeframe proposed for the development of these sites should allow adequate time for provision of the necessary infrastructure.
	Significant upgrades may be required to the local and downstream sewerage network and pumping stations to accommodate these sites. The timeframe proposed for the development of these sites may not allow adequate time for provision of the necessary infrastructure, and / or the location of the sites may make such upgrades cost prohibitive.
	AWS have identified that no acceptable cost effective sewerage solution can be provided for this site, and will object to the approval of such a site. *Note that no such constraints have been identified by the WCS stakeholders.*

Due to their location and scale, and the capacity in the surrounding network, the following proposed sites will have no major impact, localised upgrades may be required to allow connection, funded through developer requisitions:
▪ B/20 and B/26; ▪ F/01, F/02, F/05, and F/06; ▪ K/05; ▪ L/04, L/09, L/10, L/11 and L/29; ▪ M/25, M/28, and M/34, ▪ N/01, N/02, N/03, N/05, N/15, N/17, N/21, N/23, N/25, N/26, N/27, N/28, N/29 and N/30; ▪ RL/10 and RL/17; and ▪ WR/02
The following proposed sites may require significant upgrades to the existing sewerage network, which could also involve capacity upgrades at downstream pumping stations, or the construction of new bypass sewers. The timeframe proposed for the development of the sites should allow adequate time for the necessary infrastructure to be provided/ upgraded, subject to appropriate developer requisitions. Liaison between neighbouring developers may allow more efficient design and construction, increasing the cost effectiveness of such solutions:
▪ B/12, B/13, B/17 and B/27; ▪ E/03 and E/04; ▪ HR/02 ▪ K/07, K/08, K/09 and K/10; ▪ L/12, L/13, L/14, L/15, L/18, L/22, L/26, L/27 and L/28; ▪ M/19, M/21, M/29, M/33 and M/40; ▪ N/11, N/14, N/18, and N/20; and ▪ RL/01, RL/02, RL/03, RL/04, RL/06, RL/08, RL/09, RL/11, RL/13, and RL/16
It is likely that the following proposed sites will require significant upgrades to extensive sections of the existing network, or the construction of new bypass sewers. The extent of the upgrades required, compared to the scale of development, may be cost prohibitive. Developers and FHDC should contact AWS as soon as practicable to discuss the feasibility of providing the required upgrades:
▪ B/14; ▪ BR/01, BR/03, BR/07, BR/09 and BR/10; ▪ L/25; ▪ M/16; ▪ WR/07, WR/08 and WR/22

Table 12-16 Summary of sewerage capacity constraints

In addition, the possible constraint from the AWS 'cordon sanitaire' around WwTW and sewage pumping stations (as discussed in Section 8.1) should be considered for all affected sites.

Regardless of the development location, it is recommended that FHDC policy (perhaps enforced through a policy in the SSA) is amended to require developers on sites of all sizes to consult with AWS and the EA regarding sewerage network capacity and phasing of development in line with upgrades, and provide this evidence to FHDC and the EA, and that this is considered a material planning consideration.

12.6 Surface Water Management Conclusions

A high level assessment of the suitability of various SuDS techniques has been undertaken.

With the exception of parts of site K/07, M/16 and N20, infiltration SuDS may be allowable on the majority of sites, although due to the sensitivity of the underlying groundwater resources, localised on site investigation and consultation with the EA will always be required. There will be sites where attenuation followed by discharge to a watercourse will be the only viable option.

Developers of sites at Beck Row, Lakenheath and West Row should liaise with the relevant IDB to discuss the possibility of any remaining surface water run-off, following as much attenuation and infiltration as possible, being discharged into the IDB drainage systems (for which the IDB will require payment from the developer). In the other settlements, developers will need to discuss the potential construction of new piped surface water drainage networks with FHDC, AWS, the EA, and the SAB once established.

Developers of sites in Brandon, Lakenheath, Mildenhall, and Newmarket should contact AWS for surface water drainage network capacity information applicable to their individual sites.

SuDS guidance from CIRIA and AWS should be adhered to in the absence of the National Standards and intervention from the SAB.

13 Recommendations and Risks

The section below reiterates the recommendations contained throughout the Stage 2 WCS, illustrates the stakeholders responsible for action, and the possible consequences of this work not being undertaken.

Recommendation	Main Stakeholder Responsible	Supporting Stakeholder	Timeframe	Consequence of delay/ non-action
		Potable Water		
Consider implementing stricter targets for water efficiency in new dwellings than Policy CS4, through the SSA process and development control.	FHDC	AWS	As soon as policy can be justified. In the short term, it may only be cost effective for large sites, ~>500 dwellings, to install the required technologies.	An opportunity is missed to reduce the impact of the proposed development on the overall potable water demand in the area. Less headroom is available for AWS to manage the risks of climate changes. Transfer of water resources happens sooner, and at higher volumes, increasing capital and operational costs and energy.
Developers in the Turnpike Road area of Red Lodge should consult AWS to determine the improvements to the potable water distribution network required.	Developers of sites **RL/01, RL/02, RL/03, RL/04, RL/08, RL/09, RL/11, RL/13** and **RL/17**	FHDC AWS	Following confirmation of preferred sites through SSA process.	The opportunity will be missed to cost effectively design and construct an extension to the existing distribution network. Piecemeal connection will increase costs and disruption.
		Wastewater		
Assess the impacts of the proposed growth on the pumping station in Kentford, including the risks of increased spills to the River Kennett.	AWS	Developers (facilitated by FHDC) EA	2011 – 2016, although the existing commitment may also warrant such a study in the short term.	Capacity of pumping station is not adequate to accept the increase in flows. Development is constrained. Risks of sewer flooding, and overflow spills (and hence pollution events) during storm events are increased.

Recommendation	Main Stakeholder Responsible	Supporting Stakeholder	Timeframe	Consequence of delay/ non-action
Consider the implications on the development sites of the recommended 400 m cordon sanitaire around WwTW.	Developers of sites **B/12**, **B/17**, **L/12** and **M/19**.	AWS FHDC	As soon as practicable to assist further SSA screening.	Sites become preferred through SSA without all constraints/ costs being understood. Odour nuisance potentially reduces the value of new homes, and dealing with potential complaints increases costs to AWS.
Consider the implications on the development sites of the recommended 15 m cordon sanitaire around sewage pumping stations.	Developers of sites **B/12**, **B/20**, **B/26**, **BR/01**, **BR/10**, **L/11**, **M/29**, **M/33**, **N/17**, **N/20**, **RL/02**, **RL/04**, **RL/10**, **RL/13**, **RL/16**, **WR/08** and **WR/22**.	AWS FHDC	As soon as practicable to assist further SSA screening.	Sites become preferred through SSA without all constraints/ costs being understood. Odour nuisance potentially reduces the value of new homes, and dealing with potential complaints increases costs to AWS.
FHDC should liaise with AWS and the IDB to ensure that the extent (and funding mechanism) for mitigation which may be required downstream of the Lakenheath WwTW discharge is understood.	FHDC	AWS IDB Developers in Lakenheath	By 2015	Additional costs (to potentially be passed to developers/ FHDC) may not be fully understood. Any increases in pump capacity may not be implemented prior to development, leading to increased flood risk
Determine the preferred option for the Tuddenham WwTW process, and discharge route, based on water quality and flood risk requirements, including investigation and modelling of the receiving watercourse.	AWS	EA NE	By 2015 – if funding is required to start construction in AMP6, this will need to be included in PR14.	Additional Red Lodge growth begins to come online post 2021, with no agreed discharge solution. Increased DWF consent is required, along with tighter quality standards. Flood risk mitigation costs are not fully understood and passed to developers. Development may have to be delayed until the WwTW process has been upgraded. Increased risk of pollution to the Tuddenham Stream.

Recommendation	Main Stakeholder Responsible	Supporting Stakeholder	Timeframe	Consequence of delay/ non-action
Ensure that SSA and future DPD polices are flexible; to account for the uncertainty regarding the WFD requirements post 2015.	FHDC	EA AWS	By 2015	Development plans are unable to react if, for example, AWS are required to change entire WwTW processes to meet GEP status. Development may have to be delayed until WwTW has been upgraded.
Confirm the downstream water quality requirements for Lakenheath WwTW	EA	AWS IDB	By 2015	Any changes required of AWS at Lakenheath WwTW to comply with the WFD, or not, would not be based on accurate conditions.
Follow the advice to developers as discussed throughout Section 10.1	Developers as discussed in Section 10.1, particularly those highlighted in Table 12-16Table 12-16	AWS FHDC	Following SSA process	Development sites are constrained due to a delay in providing the necessary sewerage infrastructure, and opportunities to share costs are missed
Surface Water				
Implement the recommended polices and guidance regarding management of surface water in Section 11.4.4 through Supplementary Planning Documents or Development Control Policies.	FHDC	EA AWS	On-going	Opportunities to encourage an integrated approach to surface water management will be missed. Piecemeal solutions may be required, with greater costs, disruption and risk of flooding/ pollution events.
Require developers to provide evidence of EA/ AWS/ IDB approval to surface water drainage designs, guided by Building Regulations, and CIRIA and AWS guidance, in the period before the SAB and National Standards are established.	FHDC	EA AWS Developers	Prior to confirmation of National Standards for SuDS and full implementation from the SAB.	Surface water will not be managed in accordance with best practice. The EA may refuse to approve planning applications. Existing surface water networks may be overloaded, increasing the risk of flooding and potential water quality issues.
Encourage developers to consider SuDS techniques higher up the SuDS hierarchy, potentially through SSA policies.	FHDC	EA AWS IDB NE	On-going.	Opportunities to provide ecological benefit, and increase amenity for occupiers, are missed.

Recommendation	Main Stakeholder Responsible	Supporting Stakeholder	Timeframe	Consequence of delay/ non-action
Liaise with USAF regarding bird strike risk from open water SuDS features.	Developers within 13 km of Lakenheath and Mildenhall airfields.	FHDC EA NE	On-going.	Planning applications including open water SuDS features may be delayed.
		General		
Facilitate liaison between neighbouring developers (through Developer Forums) to ensure that they jointly consult with AWS to improve efficiency and reduce disruption. Consider including policy in SSA process.	FHDC	Developers AWS	Throughout SSA	Opportunities are missed to increase cost effectiveness of network solutions. Some upgrades may be considered cost prohibitive for individual sites, as first developer typically pays more, under the current framework.
Include the availability of water and wastewater infrastructure as a planning condition, so that planning permission is not granted until developers have consulted with AWS regarding potable, foul and surface water network capacity and phasing of development in line with infrastructure upgrades, and provided this evidence to FHDC and the EA.	FHDC	Developers EA AWS	Prior to planning application	Development is approved without understanding the potential costs/ delays. Piecemeal connection to the water/ sewerage network will miss an opportunity to cost-effectively deal with the overall increase in demand/ flows and deal with surface water in a more sustainable manner. The risk of sewer flooding and pollution events may increase.
Inform AWS as to the status of the relief road proposal, to allow AWS to progress with the design and construction of the required process and hydraulic upgrades at Brandon WwTW, investigate if a change of process will be required, and determine if a new trunk main is required to bypass the existing town.	FHDC	SCC AWS	As soon as Relief Road decision and Brandon growth targets are finalised	AWS will not undertake analysis of the capacity of the existing infrastructure to accommodate the higher growth levels. WwTW process, and potable water network, upgrades may be delayed. Development may have to be delayed, or the existing process operated at additional costs and risk of pollution, until upgrades are completed.

Table 13-17 Summaries of further work and responsibilities

There is a risk that the recent legal challenge to the adopted Core Strategy (May 2011) will significantly delay the FHDC LDF process. This could result in the adoption of the Site Specific Allocations DPD being delayed until 2014.

This may delay the ability of FHDC to implement policies based on the above recommendations, particularly the requirement for developer forums, and the introduction of a requirement relating to surety of infrastructure provision.

In the absence of such policies, the provision of sustainable infrastructure alongside growth may have to be encouraged in the short term by:

- AWS continuing to promote best practice in terms of SuDS design when discussing the potential adoption of surface water drainage schemes with developers, prior to the roll-out of the national standards and full implementation of the SAB;
- The EA recognising the infrastructure constraints identified in this WCS, and requesting developers to demonstrate that they have consulted with AWS on these matters (including odour issues relating to the cordon sanitaire), when undertaking their role as a statutory consultee on planning application consultations and pre-planning enquiries for sites of over 1 ha; and
- FHDC, AWS and the EA reinforcing the message of the potential reductions in cost and delays which may be realised if multiple developers in a similar locale are able to discuss, in unison, infrastructure improvements with AWS.

Regarding the second suggestion, approximately 40% of the proposed sites identified by FHDC are below the 1 ha area which would result in the EA being classified as a statutory consultee. It will however still be possible for FHDC to request the required evidence of developer consultation for all of the proposed sites, given that the legal challenge did not quash subparagraph (1) of Policy CS7, which states that '*development will be phased to ensure that it does not occur until the appropriate infrastructure is available or provided as part of the development'.*

In addition, Policy CS13 reinforces the message that development must be aligned with adequate infrastructure provision, and states the release of land for development will be dependent on the provision of waste water treatment capacity in accordance with this WCS. Therefore, despite the uncertainty regarding Policy CS7 and the SSA progress, FHDC have policies in place which will require developers to liaise with AWS and the EA to discuss infrastructure provision.

Delays in the confirmation of preferred sites, caused by uncertainty regarding Policy CS7 (following the Core Strategy challenge), will exacerbate the other risks highlighted in Table 13-17. Whilst potable water and local sewerage infrastructure improvements will remain mainly driven by developer requests to AWS, there is a risk that decisions regarding strategic sewers, surface water drainage and wastewater treatment improvements may have to be delayed until development distribution is confirmed. Whilst background analysis may continue (such as the investigation into the preferred discharge location from Tuddenham WwTW), there is a risk that the delay in the Core Strategy and SSA will result in no funding being allocated by AWS for the required capital improvements in PR14.

As discussed in Section 8.3.8, the timeframe required for upgrades to Red Lodge requires AWS to begin design work in AMP6 – if FHDC cannot provide assurance of development distribution in Red Lodge prior to 2014/15; AWS will be unable to allocate resources through their conventional business cycle until 2020/21.

AWS are unlikely to make resources available for strategic infrastructure modelling unless they have surety in the future development distribution. As FHDC respond to the Core Strategy challenge and continue the SSA process, they must share information on site preferences with AWS as soon as they are confirmed.

14 Timeframe for Review

It is recommended that FHDC review the WCS as and when further information from the recommended investigations and discussions, described in Section 13, are completed.

It is estimated that a review of the WCS in 2013 would present the following benefits:

- Investigation, modelling and stakeholder discussions regarding the mitigation of flood risk, from the increased effluent discharges from Lakenheath and Tuddenham WwTW, should have progressed, which would provide further steer to FHDC policy;
- FHDC will be preparing to submit a revised Core Strategy, taking account of any changes to the development distribution in Policy CS7 (and will have potentially resolved the uncertainty regarding the Brandon relief road), allowing for more detailed discussions with AWS regarding WwTW and sewerage capacity;
- FHDC may understand more clearly the implications of the Localism Bill on the LDF, which may alter the overall distribution and timing of the proposed sites;
- The outcomes from preliminary developer discussions with AWS (potentially through Developer Forums) should be available to allow a more detailed analysis of the sewerage and potable network enhancements required;
- SCC should be fully mobilised in their role as the SAB, allowing a coherent approach to surface water management across the District to be refined and implemented more efficiently;
- The EA will be progressing their work towards the next round of RBMPs (2015) and should be able to present a clearer idea of any requirements to move watercourses towards GEP, and hence what constraints this may pose to the proposed growth; and
- AWS and the EA will be progressing their work towards the next Price Review (2014), which should be based on further investigations into the environmental benefits/ constraints and technical feasibility of the WwTW solutions proposed in this report (for example the Tuddenham WwTW discharge issues). This should provide FHDC with increased confidence that the necessary infrastructure can be provided in a timely fashion.

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Glossary of Terms

Acronym	Term
Amm. N	Ammoniacal Nitrogen (re Discharge Consent)
AMP	Asset Management Period
AWS	Anglian Water Services
BAP/ (L)BAP	(Local) Biodiversity Action Plan
BOD	Biochemical Oxygen Demand
CAMS	Catchment Abstraction Management Strategies
CIRIA	Construction Industry Research and Information Association
CSH	Code for Sustainable Homes
DEFRA	Department for Environment, Food and Rural Affairs
DWF	Dry Weather Flow
EA	Environment Agency
ELR	Employment Land Review
EOETS	Ely Ouse to Essex Transfer Scheme
FTFT	Flow to Full Treatment
FWMA	Flood and Water Management Act
FZ2 / 3	Flood Zone 2 / 3
GEP	Good Ecological Potential
GWV Zone	Groundwater Vulnerability Zone
HMWB	Heavily Modified Water Body
IDB	Internal Drainage Board – Ely Group of Drainage Boards
LDF	Local Development Framework
LPA	Local Planning Authority
MBBR	Moving Bed Bioreactor
NE	Natural England
OFWAT	The Water Services Regulation Authority
P	Phosphorous (re Discharge Consent)
PCC	Per Capita Consumption
PE	Population Equivalent
PPS	Planning Policy Statement
PR09/ 14	Price Review 2009/ 2014
PZ	Planning Zone
RBMP	River Basement Management Plan
RSS	Regional Spatial Strategy
SAB	SuDS Approving Body
SCC	Suffolk County Council
SFRA	Strategic Flood Risk Assessment
SHLAA	Strategic Housing Land Availability Assessment
SPD	Supplementary Planning Document
SPZ	Source protection Zone
SSA	Site Specific Allocations
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage Systems
UKTAG	United Kingdom Technical Advisory Group
UWWTD	Urban Waste Water Treatment Directive
WFD	Water Framework Directive
WRMP	Water Resource Management Plan
WRZ	Water Resource Zone
WTW	Water Treatment Works
WwTW	Wastewater Treatment Works

Technical Glossary

- **Asset Management Period (AMP)** - A period of five years in which water companies implement planned upgrades and improvements to their asset base. For example, AMP4 was 2005-2010 and AMP5 is 2010-2015.
- **Aquifer** – a layer of permeable rock, which acts as a store of groundwater. Water is stored within fissures, or within the rock matrix itself.
- **Biochemical Oxygen Demand (BOD) –** a measure of the oxygen demand that results from bacteria breaking down organic carbon compounds in water. High levels of BOD can use up oxygen in a watercourse, to the detriment of the ecology.
- **Catchment Abstraction Management Strategies (CAMS)** - the production of a strategy by the EA to assess and improve the amount of water that is available on a catchment scale. The first cycle of CAMS have recently been produced and are currently being reviewed.
- **Code for Sustainable Homes (CSH)** - released in 2007 and aims to make newly built homes more efficient in the future. The code gives a star rating (between 1 and 6) for a home based on nine different categories including water, waste and energy. In May 2008 the government announced a timetable to ensure the implementation of the CSH through the tightening up of building regulations. At present all new homes are required to be assessed for a CSH star rating.
- **Deployable Output –** the amount of water that can be abstracted from a source (or bulk supply) as constrained by environment, license, pumping plant and well/aquifer properties, raw water mains, transfer, treatment and water quality.
- **Discharge Consent –** a consent issued and reviewed by the EA which permits an organisation or individual to discharge sewage or trade effluent into surface water, groundwater or the sea. Volume and quality levels are set to protect water quality, the environment and human health. Regarding water quality, pollutant levels are controlled by setting limits on the concentrations that may be discharged. The determinands controlled under a discharge consent which are particularly important to this WCS are:
  - Suspended Solids;
  - Biochemical Oxygen Demand; and
  - Ammoniacal Nitrogen (Amm. N) and Phosphorous (P), where the UWWTD conditions or other drivers apply.
- **Dry Weather Flow (DWF)** – an estimation of the flow of wastewater to a WwTW during a period of dry weather.
- **Eutrophication –** higher than natural levels of nutrients in a watercourse, which may lead to the excessive build up of plant life (especially algae). Excessive algal blooms remove valuable oxygen from the watercourse, block filters at water treatment works, affect the taste and smell of water, and can be toxic to other wildlife.
- **Flow to Full Treatment (FTFT) –** the maximum flow passed from the sewerage network to direct treatment and discharge at the WwTW during storm events. Typically this is estimated as 3 x DWF. Flows above this are either stored on site for treatment after the storm event, or discharged directly as a storm overflow.
- **Hands Off Flow (HOF)** – the minimum river flow that must be achieved at a monitoring point to allow abstraction to take place at any associated upstream abstraction points.
- **Local Development Framework (LDF)** – A folder of development documents outlining the spatial planning strategy for each local authority. The LDF will contain a number of statutory Local Development Documents, such as a Statement of Community Involvement, Annual Monitoring Reports, Core Strategy, Local Development Scheme as well as a number of optional Supplementary Planning Documents.
- **National Nature Reserve (NNR) –** are areas of national importance, protected because they are amongst the best examples of a particular habitat in the country. Details of NNR can be found at http://www.natureonthemap.org.uk/.

- **Per Capita Consumption (PCC) –** the volume of water used by one person in the house over a day, expressed in units of litres per person per day (l/p/d).
- **Planning Policy Statement (PPS)** - set out the Government's national policies on different aspect of planning. The policies in these statements apply throughout England and focus on procedural policy and the process of preparing local development documents.
- **Population Equivalent (PE) –** a method of measuring the loading on a WwTW, and is based on a notional population comprising; resident population, a percentage of transient population, cessed liquor input expressed in population, and trade effluent expressed in population**.**
- **Potable Water –** water that is fit for drinking, being free of harmful chemicals and pathogens. Raw water can be potable in some instances, although it usually requires treatment of some kind to bring it up to this level.
- **Price Review –** the process with which Ofwat reviews water company business plans and subsequently sets limits on the prices the companies can charge their customers for the following AMP. The business plan submissions are often referred to as the Price Review submission, e.g. business plan submitted in 2009 for AMP5 (2010–2015) is referred to as the PR09 submission.
- **Raw Water -** water taken from the environment, which is subsequently treated or purified to produce potable water.
- **Riparian Landowner** – the owner of land adjacent to a watercourse.
- **River Basin Management Plans (RBMP)** – documents produced by each of the EA regions to catalogue the water quality of all watercourses and set out actions to ensure they achieve the ecological targets stipulated in the WFD.
- **Site of Special Scientific Interest (SSSI) -** an area of special interest by reason of any of its flora, fauna, geological or physiographical features (basically, plants, animals, and natural features relating to the Earth's structure). A map showing all SSSI sites can be found at http://www.natureonthemap.org.uk/**.**
- **Sustainable Drainage Systems (SuDS)** – a combination of physical structures and management techniques designed to drain, attenuate, and in some cases treat, runoff from urban (and in some cases rural) areas.
- **UK Biodiversity Action Plan (BAP) –** the Government's response to the Convention on Biological Diversity 1992. It describes the UK's biological resources, both species and habitats, and details a plan to protect them. UK BAP habitats are often encompassed within the other sites listed above, however smaller pockets of UK BAP habitat may also exist outside these sites.
- **Urban Wastewater Treatment Directive -** European Union directive (91/271/EEC), which sets treatment levels on the basis of sizes of WwTW discharges and the sensitivity of waters receiving the discharges.
- **Water Framework Directive (WFD) 2000** - European Union directive (2000/60/EC) which commits member states to make all water bodies of good qualitative and quantitative status by 2015.
- **Water Resource Zone (WRZ) –** are areas based on the existing potable water supply network and represent the largest area in which water resources can be shared.
- **Wastewater -** is any water that has been adversely affected in quality by anthropogenic influence. It comprises liquid waste discharged by domestic residences, commercial properties, industry, and/or agriculture.
- **Water Treatment Works (WTW)** – a facility that treats abstracted raw water to bring it up to potable standards.
- **Wastewater Treatment Works (WwTW)** – a facility that treats wastewater through a combination of physical, biological and chemical processes.

Appendix A

Incoming Data

COMING DOCUMENT REGISTER

Project Title: Forest Heath SFRA & WCS

Project Code: BM01397 / UA000034

Hyder Doc Ref	Incoming Date	Originator	Originator's Doc. Ref	Originator's Organisation	Document Title/ Description	Format of incoming info	Project Aspect
IN001	15-May-08	Website		FHDC	IN001 - Core Strategy Extracts I&O	Word	A) Develop Scenarios
IN002	15-May-08	Website		FHDC	IN002 - Site Allocation DPD Issues and Options	Word	A) Develop Scenarios
IN003	15-May-08	Website		FHDC	IN003 - AmendedLDStimetableMarch2006	PDF	A) Develop Scenarios
IN004	15-May-08	Website		FHDC	IN004 - Doc3KEYFACTS	PDF	A) Develop Scenarios
IN005	15-May-08	Website		FHDC	IN005 - StatementoffiveyearsupplyofHousingLandFHwebsitedoc	PDF	A) Develop Scenarios
IN006	15-May-08	Website		FHDC	IN006 - NewmarketEmploymentSites2	PDF	A) Develop Scenarios
IN007	15-May-08	Website		FHDC	IN007 - MildenhallEmploymentSites	PDF	A) Develop Scenarios
IN008	15-May-08	Website		FHDC	IN008 - BrandonEmploymentSites2	PDF	A) Develop Scenarios
IN009	15-May-08	Website		FHDC	IN009 - LakenheathEmploymentSites2	PDF	A) Develop Scenarios
IN010	15-May-08	Website		FHDC	IN010 - RedLodgeEmploymentSites	PDF	A) Develop Scenarios
IN011	15-May-08	Website		FHDC	IN011 - Map Extracts	Word	A) Develop Scenarios
IN025	26-Jun-08	Adam Ireland		EA	IN025 - Great Ouse CFMP	PDF	E) SW & Flood Risk
IN026	26-Jun-08	Adam Ireland		EA	IN026 - Cam and Ely Ouse CAMs	PDF	B) Water Resource & Supply
IN027	26-Jun-08	Website		ECDC	IN027 - SFRA	PDF	E) SW & Flood Risk
IN028	26-Jun-08	Website		EA	IN028 - anglian RBMP	PDF	C) Water Quality
IN029	8-Jul-08	Website		FHDC	IN29 -LDF Core strategy Policy: Housing	PDF	A) Develop Scenarios
IN030	8-Jul-08	Website		FHDC	IN030 - Briefing Statement Overall Housing Provision	PDF	A) Develop Scenarios
IN031	8-Jul-08	Website		FHDC	IN031 - HousingStrategy 2007-2010	PDF	A) Develop Scenarios
IN032	8-Jul-08	Website		FHDC	IN032 - Approved LDS	PDF	A) Develop Scenarios
IN033	8-Jul-08	Website		FHDC	IN033 - RedLodgeMasterPlanmap	PDF	A) Develop Scenarios
IN034	8-Jul-08	Website		FHDC	IN034 - Suffolk Structural Plan - Economy	PDF	A) Develop Scenarios
IN035	8-Jul-08	Website		FHDC	IN035 - Suffolk Structural Plan - County Strategy	PDF	A) Develop Scenarios
IN036	8-Jul-08	Website		FHDC	IN036 - East of England Plan - Core Strategy	PDF	A) Develop Scenarios
IN037	8-Jul-08	Website		FHDC	IN037 - East of England Plan - Economic	PDF	A) Develop Scenarios
IN038	8-Jul-08	Website		FHDC	IN038 - East of England Plan - Housing	PDF	A) Develop Scenarios
IN039	8-Jul-08	Website		FHDC	IN039 - Local Plan Issues	PDF	A) Develop Scenarios
IN040	8-Jul-08	Website		FHDC	IN040 - Green Infrastructures Map	PDF	A) Develop Scenarios
IN041	8-Jul-08	Cambridge Horizons			IN041 - Planning for Housing Delivery, info on FHDC and SEBC	PDF	A) Develop Scenarios
IN042	8-Jul-08	Cambridge Horizons			IN042 - Economic Context and Forcasting for IN041	PDF	A) Develop Scenarios
IN043	10-Jul-08	MS		FHDC	IN043 - Core Strategic Development Map	Picture	A) Develop Scenarios
IN044	10-Jul-08	MS		FHDC	IN044 - LDF Site Specific Policies & Allocations - Issues & Options (includes A3 plans)		A) Develop Scenarios
IN045	10-Jul-08	MS		FHDC	IN045 - Folder containing current planning applications for all parish sites	Word	A) Develop Scenarios
IN046	10-Jul-08	RM		AWS	IN046 - Map of STW (A1)	Picture	D) FW Sewerage & Treatment
IN048	10-Jul-08	MS		FHDC	IN048 - LocalPlan1996 contains density and allocation till 2006	PDF	A) Develop Scenarios
IN049	10-Jul-08	MS		FHDC	IN049 - Implementation of RedLodge 98	PDF	A) Develop Scenarios
IN050	10-Jul-08	MS		FHDC	IN050 - RedLodgeMasterPlan 98	PDF	A) Develop Scenarios
IN051	10-Jul-08	MS		FHDC	IN051 - Annual Report 06/07	PDF	A) Develop Scenarios
IN052	10-Jul-08	MS		FHDC	IN052 - Key Paragrahs from Core Strategy extracted from web documents	Word	A) Develop Scenarios
IN053	14-Jul-08	Adam Ireland		EA	River Lark - Flood Extent Maps (1 to 2,5,10,25,100)		E) SW & Flood Risk
IN054	14-Jul-08	Adam Ireland		EA	River Lark - IDB_Pump_Stations		E) SW & Flood Risk

COMING DOCUMENT REGISTER

Project Title: Forest Heath SFRA & WCS

Project Code: BM01397 / UA000034

Hyder Doc Ref	Incoming Date	Originator	Originator's Doc. Ref	Originator's Organisation	Document Title/ Description	Format of incoming info	Project Aspect
IN055	14-Jul-08	Adam Ireland		EA	River Lark - Model_Cross_Section_Locations		E) SW & Flood Risk
IN056	14-Jul-08	Adam Ireland		EA	River Lark - stat_main_river_sw		E) SW & Flood Risk
IN057	14-Jul-08	Adam Ireland		EA	River Lark - Telemetry_Stations		E) SW & Flood Risk
IN058	14-Jul-08	Adam Ireland		EA	Parkenham - 100yr_final		E) SW & Flood Risk
IN059	14-Jul-08	Adam Ireland		EA	Parkenham - 1000yr_final		E) SW & Flood Risk
IN060	14-Jul-08	Adam Ireland		EA	Newmarket - flood10_nm_clean		E) SW & Flood Risk
IN061	14-Jul-08	Adam Ireland		EA	Newmarket - flood50_nm_clean		E) SW & Flood Risk
IN062	14-Jul-08	Adam Ireland		EA	Newmarket - nm_point_final_wl&xsect		E) SW & Flood Risk
IN063	14-Jul-08	Adam Ireland		EA	Newmarket - outline-option1_clean		E) SW & Flood Risk
IN064	14-Jul-08	Adam Ireland		EA	Ixworth - 100yr_final		E) SW & Flood Risk
IN065	14-Jul-08	Adam Ireland		EA	Ixworth - 1000yr_final		E) SW & Flood Risk
IN066	14-Jul-08	Adam Ireland		EA	General - AreaBenefiting_region_Clip		E) SW & Flood Risk
IN067	14-Jul-08	Adam Ireland		EA	General - FEO_region_Clip (EA0521951,EA052194703,EA052196809,EA052197805,EA052199804)		E) SW & Flood Risk
IN068	14-Jul-08	Adam Ireland		EA	General - flood zone2&3		E) SW & Flood Risk
IN069	14-Jul-08	Adam Ireland		EA	General - fm defence		E) SW & Flood Risk
IN070	14-Jul-08	Adam Ireland		EA	General - MFO_region_Clip (EA05213,EA05214,EA05236,EA05238,EA05247,EA05259, EA05260,EA05261,EA05264,EA05265,EA05267,EA052102, EA052134,EA052224,EA052225,EA0522290)		E) SW & Flood Risk
IN071	14-Jul-08	Adam Ireland		EA	General - ModelledFloodGroup_polyline		E) SW & Flood Risk
IN072	14-Jul-08	Adam Ireland		EA	General - nodes_new		E) SW & Flood Risk
IN073	14-Jul-08	Adam Ireland		EA	General - rivers_clip_Clip		E) SW & Flood Risk
IN074	14-Jul-08	Adam Ireland		EA	General - study_area		E) SW & Flood Risk
IN076	16-Jul-08	Adam Ireland		EA	Anglian Region CFMP - Wash Catchments - Selected FRM Policies V2	PDF	E) SW & Flood Risk
IN077	16-Jul-08	Adam Ireland		EA	Anglian Region CFMP - Wash Catchments - Policy Unit Justifications	Excel	E) SW & Flood Risk
IN078	18-Jul-08	Adam Ireland		EA	Culford Stream SOP, Hydraulic Models & Landline tiles		E) SW & Flood Risk
IN079	30-Jul-08	Adam Ireland		EA	Monitoring Station Locations for SFRA	Word	E) SW & Flood Risk
IN081	11-Aug-08	Adam Ireland		EA	Central Region - NFCDD Database GIS tables	GIS Files	E) SW & Flood Risk
IN082	12-Aug-08			FHDC	FHDC LDF - Core Strategy 'Final Policy Option'		Z) General
IN083	12-Aug-08	Adam Ireland		EA	Discharge Data and compliance data (in excel format)		Z) General
IN085	19-Aug-08	RM		AWS	FH & SE STW Data 18-08-08	Excel	D) FW Sewerage & Treatment
IN086	19-Aug-08	RM		AWS	7 files showing Braintree boundary (all shp files on sharepoint)	GIS Files	Z) General
IN087	19-Aug-08	RM		AWS	Braintree Buffer Area	PDF	Z) General
IN088	20-Aug-08	Breckland DC		Breckland DC	Thetford WCS Stage 1 Report	PDF	Z) General
IN089	26-Aug-08	Adam Ireland		EA	4 x CAMS Technical Documents (Cam & Ely Ouse, Combined Essex, Broadland Rivers & East Suffolk)	Paper	Z) General
IN090	26-Aug-08	RM		AWS	Zip folder of shape files for sewer flooding, blocks, collapses etc	GIS Files	E) SW & Flood Risk
IN091	6-Aug-08	RM		AWS	4 Zip folders with OS tiles and clean and dirty network shape files + pdf map of STW locations plus DWRMP	Various	Z) General
IN092	22-Aug-08	Adam Ireland		EA	5 zip files: flood warning, GQA data and sample points, GWV, Pollution Incidents and source protection zones	GIS Files	Z) General
IN093	22-Aug-08	Adam Ireland		EA	LIDAR Licence	PDF	Z) General
IN095	28-Aug-08	RM		AWS	Shape files for STW locations	GIS Files	D) FW Sewerage & Treatment
IN096	28-Aug-08	Tom Parker		FHDC	OS data for FHDC - 10k and 50k (Tile TL68) Raster & Mapinfo Tabs	GIS Files	Z) General

COMING DOCUMENT REGISTER

Project Title: Forest Heath SFRA & WCS

Project Code: BM01397 / UA000034

Hyder Doc Ref	Incoming Date	Originator	Originator's Doc. Ref	Originator's Organisation	Document Title/ Description	Format of incoming info	Project Aspect
IN097	28-Aug-08	Tom Parker		FHDC	District Boundaries (SEBC & FHDC) Mapinfo Tabs	GIS Files	Z) General
IN098	28-Aug-08	Tom Parker		FHDC	Local Plan Mapinfo Tabs	GIS Files	A) Develop Scenarios
IN099	28-Aug-08	Tom Parker		FHDC	LDF Options 2006 Mapinfo Tabs	GIS Files	A) Develop Scenarios
IN100	28-Aug-08	Tom Parker		FHDC	Employment Land Review - Report & Mapinfo Tabs	GIS Files	A) Develop Scenarios
IN101	28-Aug-08	Ross Chilvers		Ely Gp - IDB	Employment Land Review - Report & Mapinfo Tabs	GIS Files	E) SW & Flood Risk
IN102	29-Aug-08	Adam Ireland		EA	Bumstead Brook - Model Files (10,25,50,75,100,100CC,1000)	Model Files	E) SW & Flood Risk
IN103	29-Aug-08	Adam Ireland		EA	Chad Brook - Model Files (10,25,50,75,100,100CC,1000)	Model Files	E) SW & Flood Risk
IN104	29-Aug-08	Adam Ireland		EA	Chilton Stream - Model Files (10,25,50,75,100,100CC,200,1000)	Model Files	E) SW & Flood Risk
IN105	29-Aug-08	Adam Ireland		EA	Shape Files - Historic Flood Outlines	GIS Files	E) SW & Flood Risk
IN106	29-Aug-08	Adam Ireland		EA	Historic Flooding Table Plus Shapefiles of 1968 & 2001 events	GIS Files	E) SW & Flood Risk
IN107	29-Aug-08	Adam Ireland		EA	Flood Outlines - Stour ABD,75,100,100CC,1000	GIS Files	E) SW & Flood Risk
IN108	29-Aug-08	Adam Ireland		EA	Lower Stour & Brett - Model Files (10,25,50,75,100,100CC,1000,ABD)	GIS Files	E) SW & Flood Risk
IN109	29-Aug-08	Adam Ireland		EA	Middle Stour - Model Files (10,25,50,75,100,100CC,1000)	GIS Files	E) SW & Flood Risk
IN110	29-Aug-08	Adam Ireland		EA	Stour Brook - Model Files (10,25,50,75,100,200,100CC,1000)	GIS Files	E) SW & Flood Risk
IN111	29-Aug-08	Adam Ireland		EA	Upper Stour - Model Files (10,25,50,75,100,200,100CC,1000)	GIS Files	E) SW & Flood Risk
IN112	29-Aug-08	Adam Ireland		EA	Stour Flood Risk Study Vol 1 Main Report (Jan 08)	PDF	E) SW & Flood Risk
IN113	29-Aug-08	Adam Ireland		EA	Flood Warning Shape Files (Stour)	GIS Files	E) SW & Flood Risk
IN114	29-Aug-08	Adam Ireland		EA	Eastern Region - NFCDD Database GIS tables	GIS Files	E) SW & Flood Risk
IN115	29-Aug-08	Adam Ireland		EA	Stour - Low Flow Model Files	Model Files	B) Water Resource & Supply
IN116	29-Aug-08	Russell Smith		Entec	Braintree Stage 1 WCS	PDF	Z) General
IN117	1-Sep-08	Adam Ireland		EA	LiDAR Data	GIS Files	Z) General
IN118	2-Sep-08	Lakenheath Internal Drainage Board		Ely Gp - IDB	Water Level Management Plan - Pashford Poors Fen	Paper	E) SW & Flood Risk
IN119	2-Sep-08	Lakenheath Internal Drainage Board		Ely Gp - IDB	Water Level Management Plan - Lakenheath Poors Fen	Paper	E) SW & Flood Risk
IN120	2-Sep-08	Hannah, Reed and Associates Limited		Ely Gp - IDB	Alder Fen Strategic Catchment Review - C203116	PDF	E) SW & Flood Risk
IN121	3-Sep-08	Lakenheath Internal Drainage Board		Ely Gp - IDB	Restorations of Lakenheath Poors SSSI - pdf document and 12 figures	PDF	F) Conservation & Env
IN122	4-Sep-08	Adam Ireland		EA	Essex River Authority - Haverhill Flood Relief Scheme Part II - Meldham Washland - Engineer's Report (~1970)	Paper	E) SW & Flood Risk

COMING DOCUMENT REGISTER

Project Title: Forest Heath SFRA & WCS

Project Code: BM01397 / UA000034

Hyder Doc Ref	Incoming Date	Originator	Originator's Doc. Ref	Originator's Organisation	Document Title/ Description	Format of incoming info	Project Aspect
IN123	4-Sep-08	Adam Ireland		EA	Essex River Authority - Haverhill Flood Relief Scheme Part II - Meldham Washland - Engineer's Report (~1970) - Appendices & Graphs (A3)	Paper	E) SW & Flood Risk
IN124	4-Sep-08	Adam Ireland		EA	Dwg - 70/2855/8-9g Haverhill FRS Part II - Meldham Washland - General Site Plan & Earthworks Layout (1970)	Paper	E) SW & Flood Risk
IN125	4-Sep-08	Adam Ireland		EA	Essex River Authority - Report on the Ely Ouse - Essex Scheme (Water Transfer) - Binnie & Partners	Paper	E) SW & Flood Risk
IN126	25-Sep-08	Adam Ireland		EA	Pre-feasibility study - Flood Protection - Newmarket	PDF	E) SW & Flood Risk
IN127	25-Sep-08	Adam Ireland		EA	River Linnet SoP, Hydrology and Modelling Reports	PDF	E) SW & Flood Risk
IN127-1	10-Oct-08	Adam Ireland		EA	Comments on September Issue Stage 1 Report	Word	Z) General
IN130	26-Nov-08	Robin Poole		EA	12 Disks - CD & DVDs of hydraulic models and GIS files	Various	E) SW & Flood Risk
IN131	26-Nov-08			Suffolk Wildlife	3 jpgs showing County Wildlife Sites	Picture	F) Conservation & Env
IN132	28-Nov-08	Steve Hopper		EA	Additional monitoring point data	Word	C) Water Quality
IN133	4-Dec-08	MS		FHDC	SHLAA Outputs - Excel Spreadsheet of potential sites	Excel	A) Develop Scenarios
IN136	9-Dec-08	RM		AWS	Water Supply Strategy for the Bury Area	Word	B) Water Resource & Supply
IN137	12-Dec-08	Tom Parker		FHDC	SHLAA Outputs - Jpg Images and GIS files of Potential SHLAA sites	Various	A) Develop Scenarios
IN138	19/12/2008	Steve Hopper		EA	WwTW - Future Likely consents (from EA calculations)	Excel	C) Water Quality
IN139-1	22/12/2009			EA	Draft River Basin Management Plans Published for USE IN STUDY	Pdf	Z) General
IN139	14-Jan-09	Rob Morris		AWS	WwTW - Discharge Consent Sheets for 33 works within the LA	PDF	D) FW Sewerage & Treatment
IN140	14-Jan-09	Rob Morris		AWS	Tuddenham STW Stage 2 Report	PDF	D) FW Sewerage & Treatment
IN141	14-Jan-09	Rob Morris		AWS	Sewerage Stage 2 reports - Fornham All Saints, Haverhill and Tuddenham	Word	D) FW Sewerage & Treatment
IN142	14-Jan-09	Rob Morris		AWS	Ely Water Asset Plan	Word	B) Water Resource & Supply
IN143	14-Jan-09	Rob Morris		AWS	AWS - Strategic Water Supply Schematic	Pdf	B) Water Resource & Supply
IN144	14-Jan-09	Rob Morris		AWS	STW Data - 14/01/09 (update)	Excel	D) FW Sewerage & Treatment
IN145	26-Jan-09	Shyama Trivedy		NLP	New Strategic Plans.zip	Various	A) Develop Scenarios
IN146	26-Jan-09	Shyama Trivedy		NLP	Settlement Opportunity Mapping.zip	Various	A) Develop Scenarios
IN147	26-Jan-09	Richard Leishman		NE	Comments on September Issue Stage 1 Report	Word	Z) General
IN148	28-Jan-09	Adam Ireland		EA	Comments on December 2009 Stage 1 Draft Report	Word	Z) General
IN151	9-Jun-09	Adam Ireland		EA	Comments on May 2009 Stage 1 Draft Report Issue	Word	Z) General
IN152	21-Jul-09	Rob Morris		AWS	Comments on May 2009 Stage 1 Draft Report Issue	Word	Z) General

COMING DOCUMENT REGISTER

Project Title: Forest Heath SFRA & WCS

Project Code: BM01397 / UA000034

Hyder Doc Ref	Incoming Date	Originator	Originator's Doc. Ref	Originator's Organisation	Document Title/ Description	Format of incoming info	Project Aspect
IN155	14-Aug-09	Magnus Magnusson		FHDC	Link to Core Strategy Submission Documentation - Consultation link - Submission released March 2009	Various	A) Develop Scenarios
IN157	19-Aug-09	James Meyer		FHDC	Specific Sites Allocation GIS Files	Various	A) Develop Scenarios
IN158	21-Aug-09	Magnus Magnusson		FHDC	Red Lodge dwelling umbers - email received 12/08/09 14:51 - Latest numbers	Various	A) Develop Scenarios
IN159	26-Aug-09	Magnus Magnusson		FHDC	Provisional' sites - latest list - not 100% but best there is !	Various	A) Develop Scenarios
IN160	7-Sep-09	Robin Poole		EA	Guidance on modelling needs for SFRA modelling updates (4 files)	Various	E) SW & Flood Risk
IN161	14-Sep-09	James Meyer		FHDC	Latest SSA Sites- Mapinfo Tabs.	GIS Files	A) Develop Scenarios
IN162	16-Oct-09	James Meyer		FHDC	Updates SAA sites spreadsheet	Excel	A) Develop Scenarios
IN163	16-Oct-09	James Meyer		FHDC	Indication of site phasing	Word	A) Develop Scenarios
IN164	16-Oct-09	James Meyer		FHDC	Details of sites under construction	Word	A) Develop Scenarios
IN165	16-Oct-09	James Meyer		FHDC	Updates GIS of sites following request	GIS Files	A) Develop Scenarios
IN166	16-Oct-09	James Meyer		FHDC	Missing background map file	GIS Files	A) Develop Scenarios
IN167	16-Oct-09	Robin Poole		EA	Draft report on Flood zone outline improvements to River Lark & Linnet through Bury St Edmunds.	Word	E) SW & Flood Risk
IN168	21-Oct-09	Website		AWS	AWS response to dWRMP consultation	PDF	B) Water Resource & Supply
IN169	21-Oct-09	Website		AWS	AWS supplementary response to dWRMP consultation	PDF	B) Water Resource & Supply
IN170	22-Oct-09	James Meyer		FHDC	Employment types and confirmation of dwelling numbers	Word	A) Develop Scenarios
IN171	22-Oct-09	James Meyer		FHDC	Revised GIS data for Brandon and Red Lodge	GIS Files	A) Develop Scenarios
IN172	22-Oct-09	James Meyer		FHDC	Revised Site spreadsheet to take accoutn of above GIS	GIS Files	A) Develop Scenarios
IN173	26-Oct-09	Rob Morris		AWS	JR09 WwTW stats	Excel	D) FW Sewerage & Treatment
IN174	26-Oct-09	Rob Morris		AWS	Revised AWS GIS data for CSO locations	GIS Files	D) FW Sewerage & Treatment
IN175	27-Oct-09	Magnus Magnusson		FHDC	Details on mixed use sites	Word	A) Develop Scenarios
IN176	29-Oct-09	Adam Ireland		EA	Report - how to use SW susceptibility maps and present the information	Pdf	E) SW & Flood Risk
IN178	2-Nov-09	Tom Parker		FHDC	SW susceptibility outlines - More, less & Intermediate	GIS Files	E) SW & Flood Risk
IN179	4-Nov-09	Magnus Magnusson		FHDC	EIP Topic Paper - Housing. Detailing current status of CS	Word	A) Develop Scenarios
IN180	25-Nov-09	Adam Ireland		EA	Comments on several options for WwTW Options in FHDC area - Updated on 26/11 and re-submitted - Both versions on file	Word	D) FW Sewerage & Treatment
IN181	22-Dec-09	Steve Hopper		EA	Revised Indicative Consents for Detalied FHDC WCS - based on options presented	Excel	D) FW Sewerage & Treatment
IN182	23-Dec-09	Ross Chilvers		Ely Gp - IDB	Lakenheath catchment map and discussion on options relating to Discharge from Lakenheath WCS		D) FW Sewerage & Treatment
IN183	23-Dec-09	Adam Ireland		EA	North Essex CFMP Summary Report - December 2009	pdf	E) SW & Flood Risk
IN184	23-Dec-09	Adam Ireland		EA	Final outlines of Rougham Hill Flood Zone changes - Word report and GIS File outlines	Various	E) SW & Flood Risk
IN185	5-May-10	Magnus Magnusson		FHDC	Housing Topic Paper 1 v3	PDF	A) Develop Scenarios

COMING DOCUMENT REGISTER

Project Title: Forest Heath SFRA & WCS

Project Code: BM01397 / UA000034

Hyder Doc Ref	Incoming Date	Originator	Originator's Doc. Ref	Originator's Organisation	Document Title/ Description	Format of incoming info	Project Aspect
IN186	5-May-10	Magnus Magnusson		FHDC	C7 Insp Draft - Housing Allocation policy	PDF	A) Develop Scenarios
IN187	5-May-10	Magnus Magnusson		FHDC	Primary Village Site Allocations	Word	A) Develop Scenarios
IN188	5-May-10	Magnus Magnusson		FHDC	Red Lodge Build Out plans	PDF	A) Develop Scenarios
IN189	11-May-10	Rob Morris		AWS	JR10 WwTW figures (draft)	Excel	D) FW Sewerage & Treatment
IN190	11-May-10	Rob Morris		AWS	FHDC Preferred sites GIS originally from MM	GIS Files	A) Develop Scenarios
IN191	14-May-10	Magnus Magnusson		FHDC	FHDC Preferred sites spreadsheet	Excel	A) Develop Scenarios
IN192	21-May-10	Magnus Magnusson		FHDC	Revised Lakenheath Allocation	Excel	A) Develop Scenarios
IN193	26-May-10	Adam Ireland		EA	Updated EA Options Brief	Word	C) Water Quality
IN194	26-May-10	Adam Ireland		EA	Signed SoGC	Word	C) Water Quality
IN195	26-May-10	Adam Ireland		EA	Answer to LF queries via email	Word	C) Water Quality
IN196	27-May-10	Adam Ireland		EA	Tuddenham Stream Abstraction Points	Excel	B) Water Resource & Supply
IN197	21-Jun-10			AWS	Final WRMP	PDF	B) Water Resource & Supply
IN198	22-Jun-10	Trisha Harewood		EA	SFRA information	Various	E) SW & Flood Risk
IN199	25-Jun-10	Trisha Harewood		EA	SFRA information - further answer to questions on Hyder.1644.B..doc	Various	E) SW & Flood Risk
IN200	23-Jun-10	Trisha Harewood		EA	SFRA information - CD with Newmarket PFS (2004 & 2007 Addendum) plus models and shapefiles and River Lark SoP report	Various	E) SW & Flood Risk
IN201	23-Jul-10	Magnus Magnusson		FHDC	Consultation responses to Core Strategy from EA and AWS	Various	A) Develop Scenarios
IN202	16-Sep-10	Tom Parker		FHDC	Updated Core Strategy GIS files and tables	GIS Files	A) Develop Scenarios
IN203	8-Nov-10	Magnus Magnusson		FHDC	Updated Sites spreadsheet with phasing	Excel	A) Develop Scenarios
IN204	23-Nov-11	Rob Morris		AWS	Updated JR10 flows	Excel	D) FW Sewerage & Treatment
IN205	28-Jan-11	Suffolk Resilience Website		SCC	Multi Agency Flood Plan - Sept 10	Pdf	E) SW & Flood Risk
IN206	31-Jan-11	Steve Hopper		EA	Indicative Consent Results plus methodology description	Various	C) Water Quality
IN207	2-Feb-11	Steve Hopper		EA	Revised Indicative Consent Results plus methodology description	Various	C) Water Quality
IN208	19/10/2011	Suffolk CC Website		SCC	PFRA	Word	E) SW & Flood Risk
IN209	19/10/2011	Tom Parker		FHDC	Flood Map for Surface Water	GIS Files	E) SW & Flood Risk
IN210	20/10/2011	Tom Parker		FHDC	Areas Suceptible to Groundwater Flooding	GIS Files	E) SW & Flood Risk
IN211	20/10/2011	Lee Thornley		EA	Survey data for Tuddenham Stream. Supplied as part of Eastern Rivers SFRA but EA agreed we could use for FH.	GIS Files	E) SW & Flood Risk

Appendix B

Planning Policy Context

National Policy

National policy for development and planning is set by the Government. The planning system has changed significantly in recent years due to the Governments planning reform. This reform has included the introduction of the 'Planning for a Sustainable Future: White Paper' and the 'Planning and Compulsory Purchase Act' which has led to the need for local authorities to develop unified Local Development Frameworks. The planning reform has also lead to the revision of a number of planning policy documents. Extracts from the most relevant Planning Policy Statement (PPS) documents are set out below. This is not an exhaustive list, but includes the key areas where Local Authorities are required to contribute to the protection of the water environment.

Planning Policy Statement (PPS)

PPS 1: Delivering Sustainable Development[i]

PPS1 sets out the overarching planning policies on the delivery of sustainable development through the planning system. Regional planning authorities and local authorities should promote… *the sustainable use of water resources; and the use of sustainable drainage systems in the management of run-off.*

Development plan policies should take account of environmental issues such as:

- the protection of groundwater from contamination;
- the conservation and enhancement of wildlife species and habitats and the promotion of biodiversity; and
- the potential impact of the environment on proposed developments.

The Government is committed to promoting a strong, stable, and productive economy that aims to bring jobs and prosperity for all. Planning authorities should…*ensure that infrastructure and services are provided to support new and existing economic development and housing.*

In preparing development plans, planning authorities should seek to…*address, on the basis of sound science, the causes and impacts of climate change, the management of pollution and natural hazards, the safeguarding of natural resources, and the minimisation of impacts from the management and use of resources.*

[i] Planning Policy Statement 1: Delivering Sustainable Development, Office of the Deputy Prime Minister, 2005

PPS Planning and Climate Change: Supplement to PPS1[ii]

This PPS on climate change supplements PPS1 by setting out how planning should contribute to reducing emissions and stabilising climate change, and take into account the unavoidable consequences. In deciding which areas and sites are suitable, and for what type and intensity of development, planning authorities should assess their consistency with the policies in this PPS. In doing so, planning authorities should take into account:

- the capacity of existing and potential infrastructure (including for water supply, sewage and sewerage, waste management and community infrastructure such as schools and hospitals) to service the site or area in ways consistent with cutting carbon dioxide emissions and successfully adapting to likely changes in the local climate;
- the effect of development on biodiversity and its capacity to adapt to likely changes in the climate;
- the contribution to be made from existing and new opportunities for open space and green infrastructure to urban cooling, sustainable drainage systems, and conserving and enhancing biodiversity; and
- known physical and environmental constraints on the development of land such as sea level rises, flood risk and stability, and take a precautionary approach to increases in risk that could arise as a result of likely changes to the climate.

In their consideration of the environmental performance of proposed development, taking particular account of the climate the development is likely to experience over its expected lifetime, planning authorities should expect new development to…*give priority to the use of sustainable drainage systems, paying attention to the potential contribution to be gained from water harvesting from impermeable surfaces, and encourage layouts that accommodate waste water recycling.*

PPS 3: Housing[iii]

PPS3 sets out the national planning policy framework for delivering the Government's housing objectives. Local Planning Authorities should set out in Local Development Documents, their policies and strategies for delivering the level of housing provision, including identifying broad locations and specific sites that will enable continuous delivery of housing for at least 15 years from the date of adoption

Local Planning Authorities should encourage applicants to bring forward sustainable and environmentally friendly new housing developments, including affordable housing developments, and in doing so should reflect the approach set out in the PPS on climate change.

[ii] Planning Policy Statement: Planning and Climate Change. Supplement to Planning Policy Statement 1, Office of the Deputy Prime Minister, December 2007

[iii] Planning Policy Statement 3: Housing, Office of the Deputy Prime Minister, November 2006

PPS 9: Biodiversity and Geological Conservation[iv]

PPS9 sets out planning policies on the protection of biodiversity and geological conservation through the planning system. Regional planning bodies and local planning authorities should adhere to the following key principles to ensure that the potential impacts of planning decisions on biodiversity and geological conservation are fully considered.

Development plan policies and planning decisions should be based upon up-to-date information about the environmental characteristics of their areas. These characteristics should include the relevant biodiversity and geological resources of the area. In reviewing environmental characteristics local authorities should assess the potential to sustain and enhance those resources.

Plan policies and planning decisions should aim to maintain, and enhance, restore or add to biodiversity and geological conservation interests. In taking decisions, local planning authorities should ensure that appropriate weight is attached to designated sites of international, national and local importance; protected species; and to biodiversity and geological interests within the wider environment.

Plan policies on the form and location of development should take a strategic approach to the conservation, enhancement and restoration of biodiversity and geology, and recognise the contributions that sites, areas and features, both individually and in combination, make to conserving these resources.

Plan policies should promote opportunities for the incorporation of beneficial biodiversity and geological features within the design of development. Development proposals where the principal objective is to conserve or enhance biodiversity and geological conservation interests should be permitted.

The aim of planning decisions should be to prevent harm to biodiversity and geological conservation interests. Where granting planning permission would result in significant harm to those interests, local planning authorities will need to be satisfied that the development cannot reasonably be located on any alternative sites that would result in less or no harm. In the absence of any such alternatives, local planning authorities should ensure that, before planning permission is granted, adequate mitigation measures are put in place. Where a planning decision would result in significant harm to biodiversity and geological interests which cannot be prevented or adequately mitigated against, appropriate compensation measures should be sought. If that significant harm cannot be prevented, adequately mitigated against, or compensated for, then planning permission should be refused.

Local development frameworks should indicate the location of designated sites of importance for biodiversity and geodiversity, making clear distinctions between the hierarchy of international, national, regional and locally designated sites. They should also identify any areas or sites for the restoration or creation of new priority habitats, which contribute to regional targets, and support this restoration or creation through appropriate policies.

[iv] Planning Policy Statement 9: Biodiversity and Geological Conservation, Office of the Deputy Prime Minister, August 2005

PPS 23: Planning and Pollution Control[v]

The following matters (not in any order of importance) should be considered in the preparation of development plan documents and may also be material in the consideration of individual planning applications where pollution considerations arise:

- the potential sensitivity of the area to adverse effects from pollution, in particular reflected in landscape, the quality of soil, air, and ground and surface waters, nature conservation (including Sites of Special Scientific Interest (SSSIs), National Parks, Areas of Outstanding Natural Beauty (AONBs), Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Wetland of International Importance (RAMSAR sites), agricultural land quality, water supply (Source Protection Zones), archaeological designations and the need to protect natural resources;
- the possible adverse impacts on water quality and the impact of any possible discharge of effluent or leachates which may pose a threat to surface or underground water resources directly or indirectly through surrounding soils;
- the need to make suitable provision for the drainage of surface water; and
- the provision of sewerage and sewage treatment and the availability of existing sewage infrastructure.

PPS 25: Development and Flood Risk[vi]

LPAs should adhere to the following principles in preparing planning strategies:

- LPAs should prepare Local Development Documents (LDDs) that set out policies for the allocation of sites and the control of development which avoid flood risk to people and property where possible and manage it elsewhere, reflecting the approach to managing flood risk in this PPS and in the RSS for their region;
- where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, LPAs should consider whether there are opportunities in the preparation of LDDs to facilitate the relocation of development, including housing to more sustainable locations at less risk from flooding;

In addition, LPAs should in determining planning applications:

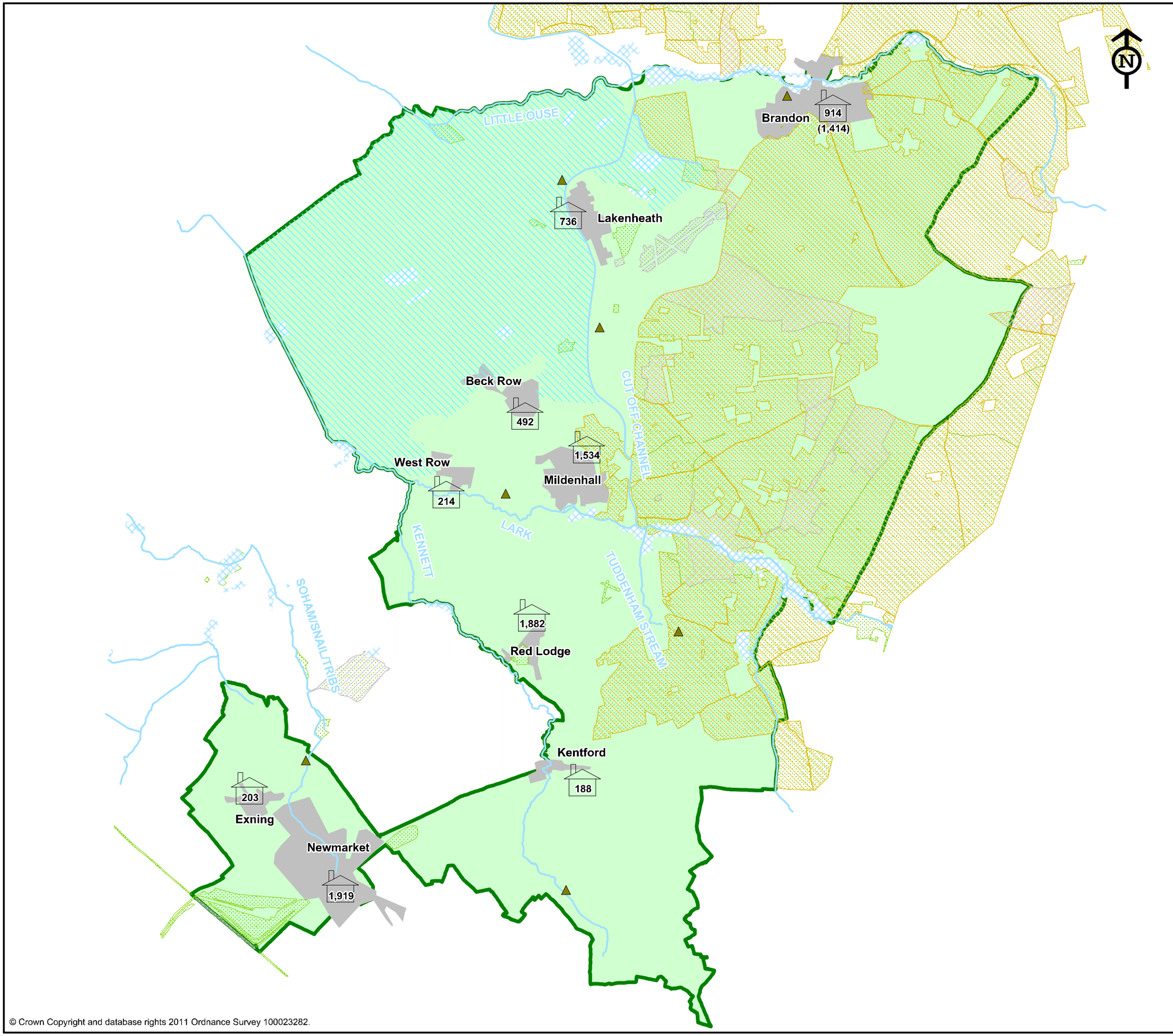
- give priority to the use of SUDS; and
- ensure that all new development in flood risk areas is appropriately flood resilient and resistant, including safe access and escape routes where required, and that any residual risk can be safely managed.

[v] Planning Policy Statement 23: Pollution Control, Office of the Deputy Prime Minister, 2004

[vi] Planning Policy Statement 25: Development and Flood Risk, Communities and Local Government, 2010

Appendix C

Development Locations



LEGEND

- Watercourse
- Waste Water Treatment Works
- Forest Heath District
- Market Towns. Key Service Centres and Primary Villages
- Site of Special Scientific Interest
- Special Protection Area
- Special Area of Conservation
- Biodiversity Action Plan Priority Habitat: Coastal and Floodplain Grazing Marsh
- Area drained by Ely Group of Internal Drainage Boards
- 914 — Total proposed development, inc. committed sites, for this settlement

Rev	Drw	Chk	Apd		Date
01	DV	LAF	RG		19/05/11

FOREST HEATH DISTRICT COUNCIL DETAILED WATER CYCLE STUDY

Forest Heath District Council

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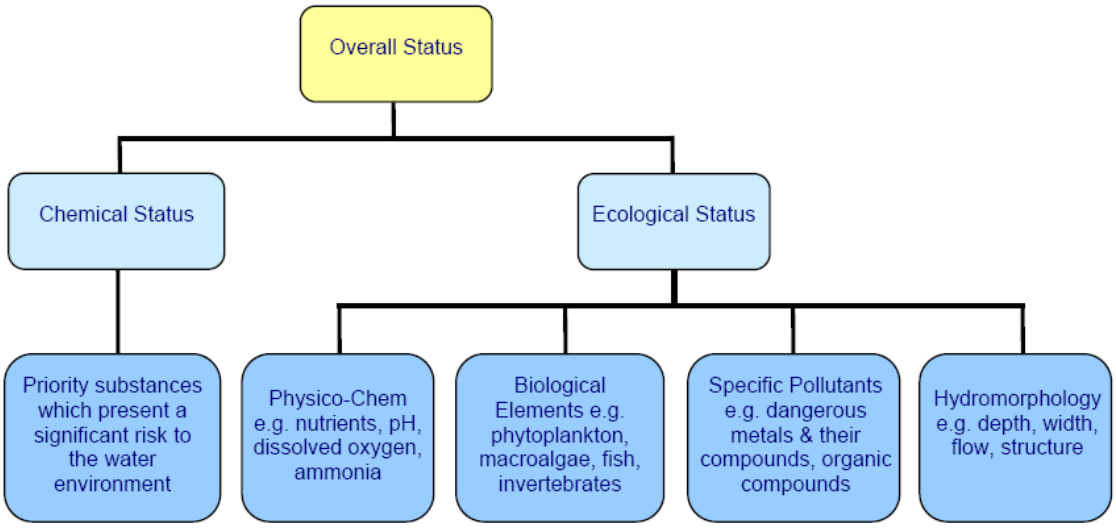
DEVELOPMENT LOCATIONS AND WATER ENVIRONMENT FEATURES

Drawing	Figure	Scale	Rev
049-UA000034-BMD-01	C1	NTS	01

Appendix D

Water Framework Directive

The methodology of assessing the status of a watercourse, and contributing factors, is shown in the Figure below.



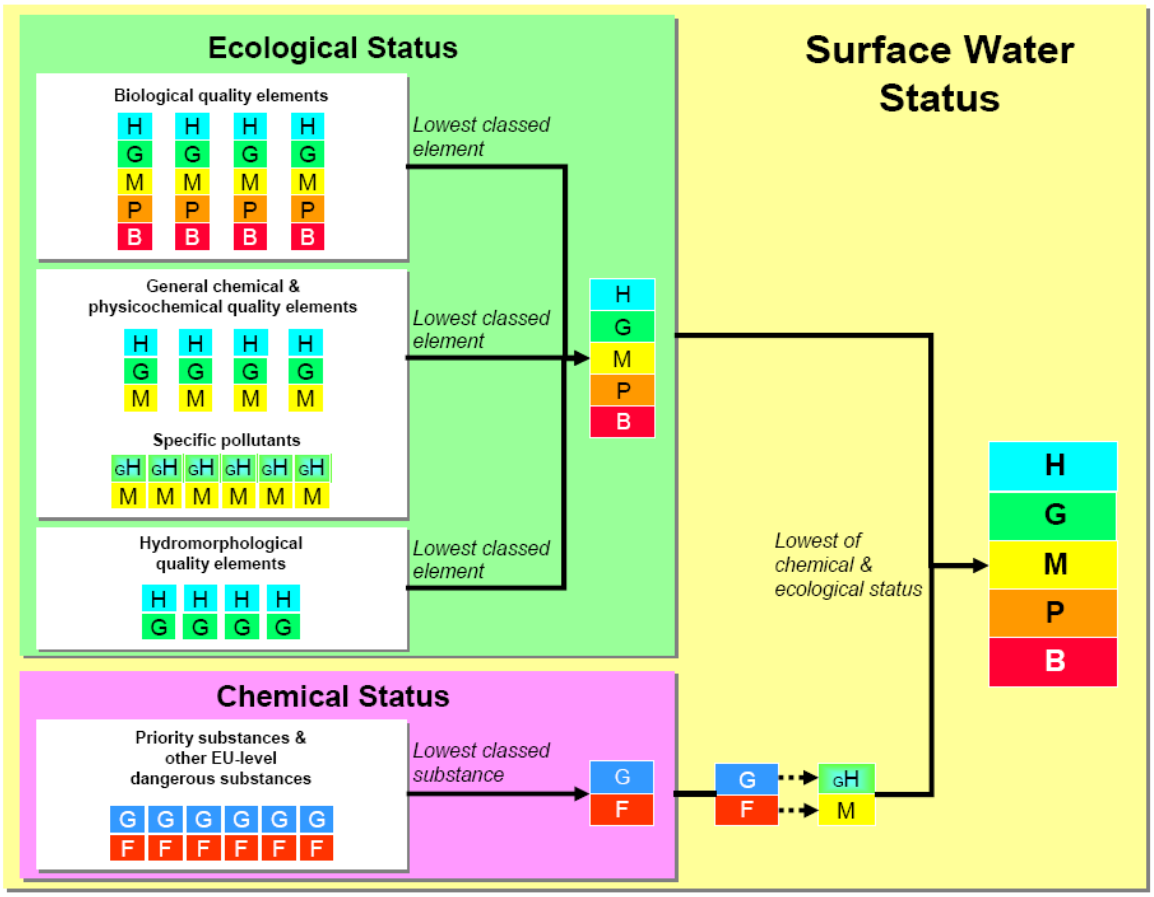
Components of WFD surface water status

Environment Agency Draft River Basin Management Plan, Thames River Basin District December 2008

Surface water status, and ecological status (or ecological potential with respect to HMWB), is assessed on a scale from high to bad, shown in the Table below. Concentrations of individual priority substances and other chemicals deemed dangerous by the EU are classed as either good, or failing to meet good.

Ecological Status	Chemical Status Grades
High	Good
Good	
Moderate	Fail
Poor	
Bad	

Details of the classification components that make up surface water status under the WFD are displayed below.



WFD classification

UKTAG Recommendations on Surface Water Classification Schemes for the purposes of the Water Framework Directive, 2007

Key dates for the implementation of the WFD and RBMPs are:

- 2009: Final River Basin Management Plans completed following consultation;
- 2012: Programs of measures for improvements to be fully operational;
- 2015: Achieve the first set of water body objectives, publish second RBMP;
- 2021: Achieve the second set of water body objectives, publish third RBMP;
- 2027: Achieve the third set of water body objectives, final deadline for achieving objectives.

However, if it is determined that the solutions required to bring a watercourse up to good status (or GEP) by 2015 are either technically infeasible or disproportionately costly, lower objectives can be set for the short term, with 2027 being the latest date at which the objectives should be met. Under the WFD, there is also a provision for good status not to be met for reasons of overriding public interest.

Further details on the WFD are available from the EA RBMP, Defra and http://www.wfduk.org/.

Extracts from the RBMP relevant to the watercourses and WwTW in the study area are included in the table below:

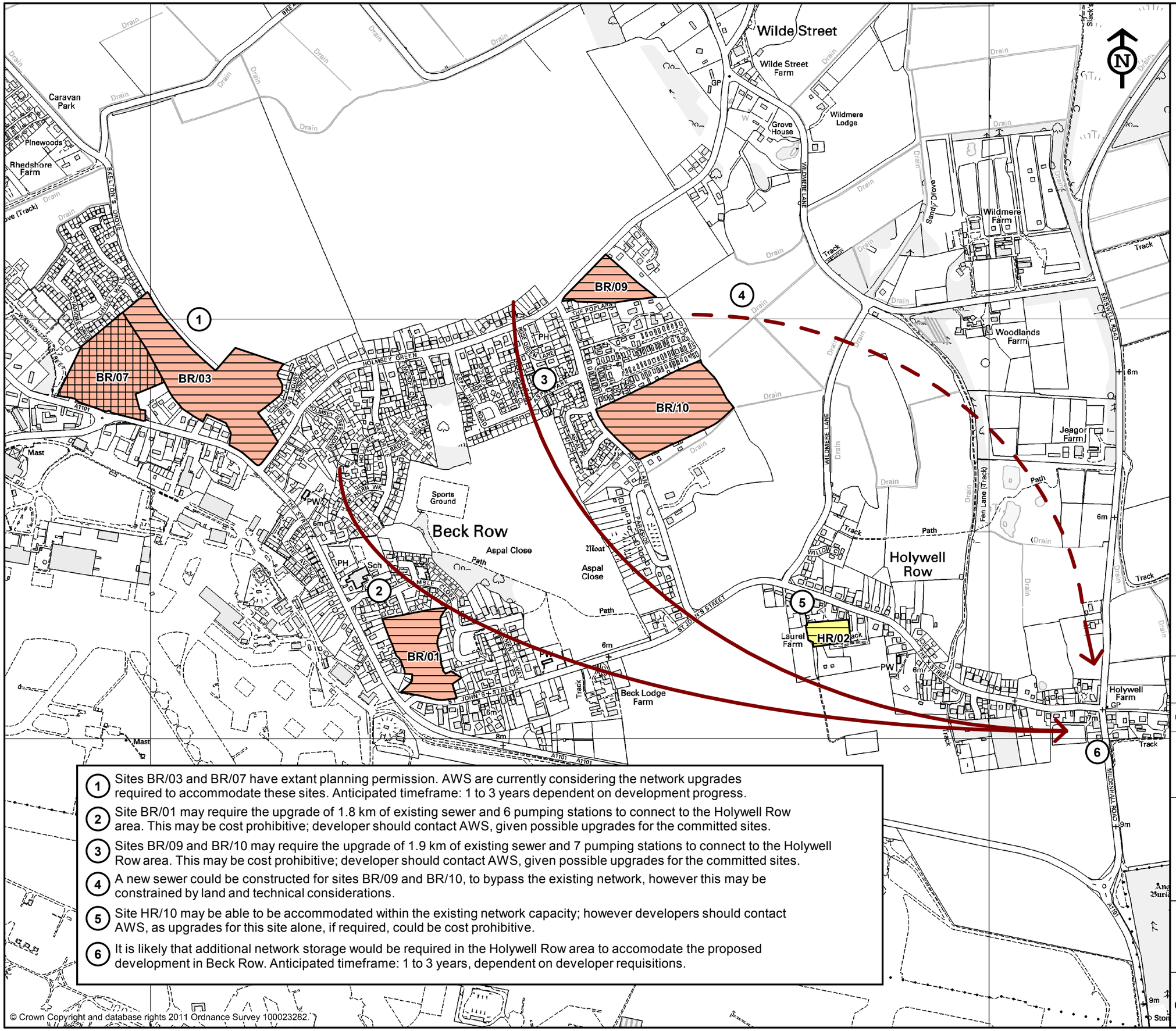
River *(WwTW)*	Reach (with unique reference code) *(HMWB designation)*	Current Ecological Status (or EP in the case of HMWB)	Current Chemical Status	Barriers to Good status (or GEP for HMWB)	Proposed Date for Achieving Good status (or GEP)
Kennett	Source...Lea Brook (GB105033042990) *(HMWB – flood protection)*	Poor	N/A	Fish: Poor Quantity and dynamics of flow do not support good status	2027
Kennett	Lea Brook...River Lark (GB105033043020) *(HMWB – flood protection)*	Moderate	N/A	Invertebrates: Moderate Phosphate: Poor Mitigation Measures: Moderate Quantity and dynamics of flow do not support good status	2027
Lark *(Tuddenham via Tuddenham Stream)*	River Linnet...Mildenhall (GB105033043051) *(HMWB – flood protection, navigation, wider environment)*	Moderate	Good	Fish: Poor Invertebrates: Moderate Dissolved Oxygen: Moderate Mitigation Measures: Moderate	2027; Chemical Status to be Good by 2015
Lark *(Mildenhall)*	Mildenhall...River Kennett (GB105033043052) *(HMWB – flood protection)*	Moderate	Good	Phosphate: Moderate Mitigation Measures: Moderate	2027; Chemical Status to be Good by 2015
Lark	River Kennett...Ten Mile River (GB105033042900) *(HMWB – navigation)*	Moderate	N/A	Phosphate: Moderate Mitigation Measures: Moderate Quantity and dynamics of flow do not support good status	2027
Little Ouse River *(Brandon)*	Thetford...Ten Mile River (GB105033043400) *(HMWB – flood protection, navigation, urbanisation)*	Moderate	Good	Fish: Moderate Phosphate: Moderate Mitigation Measures: Moderate	2027; Chemical Status to be Good by 2015
Soham Lode *(Newmarket)*	Source...Ten Mile River (GB105033042860) *(HMWB – flood protection)*	Moderate	Good	Fish: Poor Ammonia: Moderate Phosphate: Moderate Mitigation Measures: Moderate	2027

Tuddenham Stream *(Tuddenham)*	Source...River Lark (GB105033043010) *(HMWB – land drainage)*	Moderate	N/A	Invertebrates: Moderate Mitigation Measures: Moderate Quantity and dynamics of flow do not support good status	2027
Twelve Foot Drain *(Lakenheath)*	River Lark ... Hockwold Cum Wilton Sluice (GB105033043120) *(HMWB – water storage)*	Good	N/A	None	2015

Source EA, River Basin Management Plan, Anglian River Basin District, Annex B: Water body status objectives, Dec 2009

Appendix E

Sewerage Network Constraints and Solutions



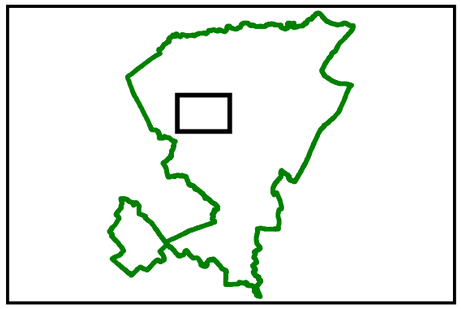
1. Sites BR/03 and BR/07 have extant planning permission. AWS are currently considering the network upgrades required to accommodate these sites. Anticipated timeframe: 1 to 3 years dependent on development progress.
2. Site BR/01 may require the upgrade of 1.8 km of existing sewer and 6 pumping stations to connect to the Holywell Row area. This may be cost prohibitive; developer should contact AWS, given possible upgrades for the committed sites.
3. Sites BR/09 and BR/10 may require the upgrade of 1.9 km of existing sewer and 7 pumping stations to connect to the Holywell Row area. This may be cost prohibitive; developer should contact AWS, given possible upgrades for the committed sites.
4. A new sewer could be constructed for sites BR/09 and BR/10, to bypass the existing network, however this may be constrained by land and technical considerations.
5. Site HR/10 may be able to be accommodated within the existing network capacity; however developers should contact AWS, as upgrades for this site alone, if required, could be cost prohibitive.
6. It is likely that additional network storage would be required in the Holywell Row area to accomodate the proposed development in Beck Row. Anticipated timeframe: 1 to 3 years, dependent on developer requisitions.

LEGEND

- Watercourse
- Indicative Sewerage Network Upgrade
- Alternative Sewerage Option
- Waste Water Treatment Works

SITES

- Mixed Use
- Residential
- Employment
- Retail
- Site is constrained - developers should contact AWS and FHDC
- Major network upgrades required - scale/ location/ phasing of site will be problematic
- Major network upgrades required - scale/ location/ phasing can be accomodated
- No major impact on network - localised upgrades only required



Rev	Drw	Chk	Apd		Date
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FOREST HEATH DISTRICT COUNCIL DETAILED WATER CYCLE STUDY

Forest Heath District Council

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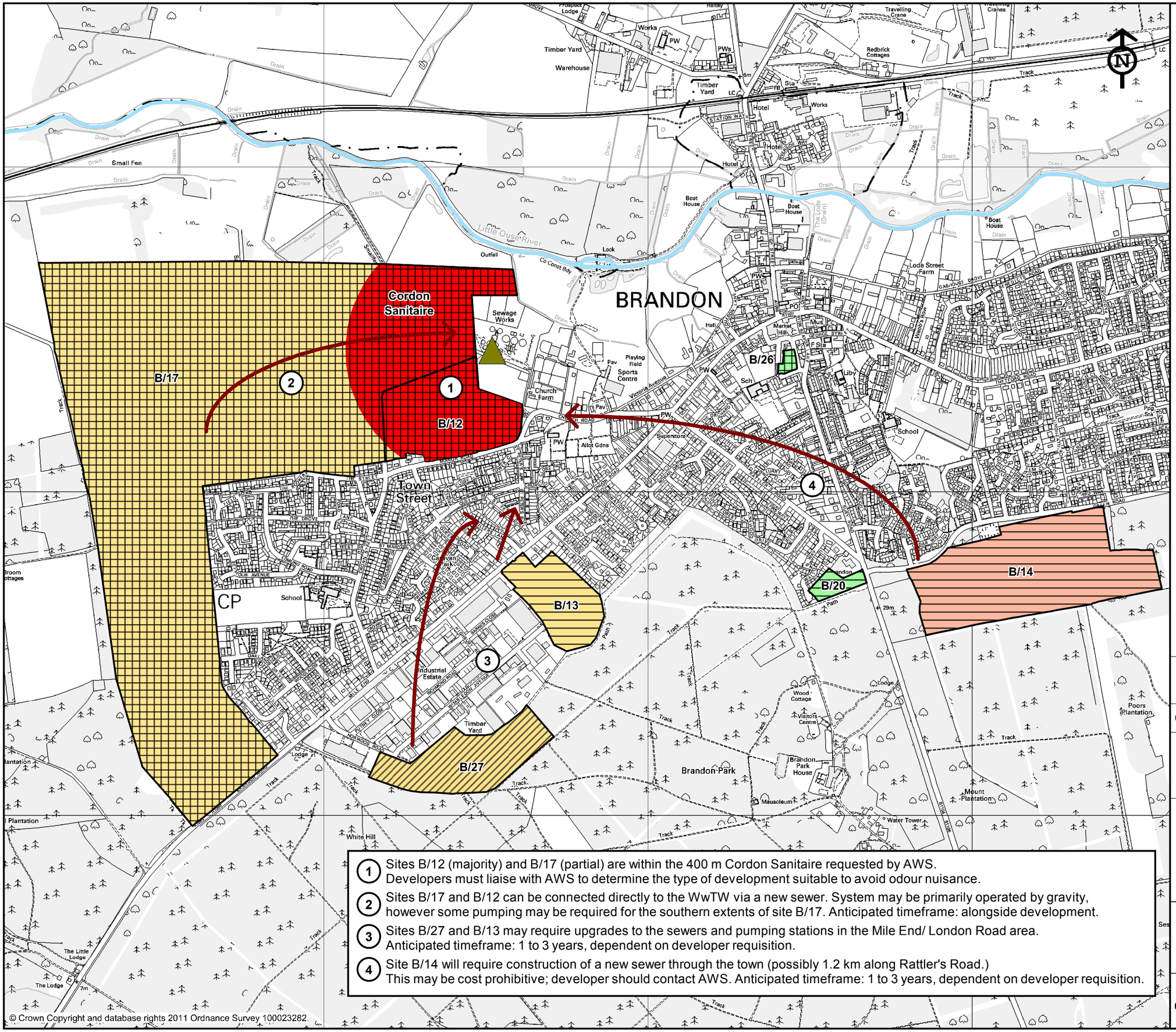
WASTEWATER CONSTRAINTS FOR SSA SITES: BECK ROW

Drawing	Figure	Scale	Rev
051-UA000034-BMD-01	E1	NTS	01



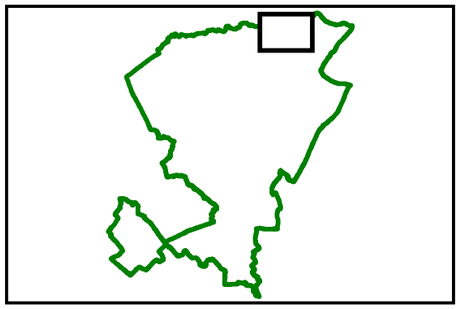
1. Sites B/12 (majority) and B/17 (partial) are within the 400 m Cordon Sanitaire requested by AWS. Developers must liaise with AWS to determine the type of development suitable to avoid odour nuisance.
2. Sites B/17 and B/12 can be connected directly to the WwTW via a new sewer. System may be primarily operated by gravity, however some pumping may be required for the southern extents of site B/17. Anticipated timeframe: alongside development.
3. Sites B/27 and B/13 may require upgrades to the sewers and pumping stations in the Mile End/ London Road area. Anticipated timeframe: 1 to 3 years, dependent on developer requisition.
4. Site B/14 will require construction of a new sewer through the town (possibly 1.2 km along Rattler's Road.) This may be cost prohibitive; developer should contact AWS. Anticipated timeframe: 1 to 3 years, dependent on developer requisition.

LEGEND

- Watercourse
- Indicative Sewerage Network Upgrade
- Waste Water Treatment Works

SITES

- Mixed Use
- Residential
- Employment
- Retail
- Site is constrained - developers should contact AWS and FHDC
- Major network upgrades required - scale/ location/ phasing of site will be problematic
- Major network upgrades required - scale/ location/ phasing can be accomodated
- No major impact on network - localised upgrades only required



Rev	Drw	Chk	Apd		Date
01	DV	LAF	RG		13/05/11

FOREST HEATH DISTRICT COUNCIL DETAILED WATER CYCLE STUDY

Forest Heath District Council

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WASTEWATER CONSTRAINTS FOR SSA SITES: BRANDON

Drawing	Figure	Scale	Rev
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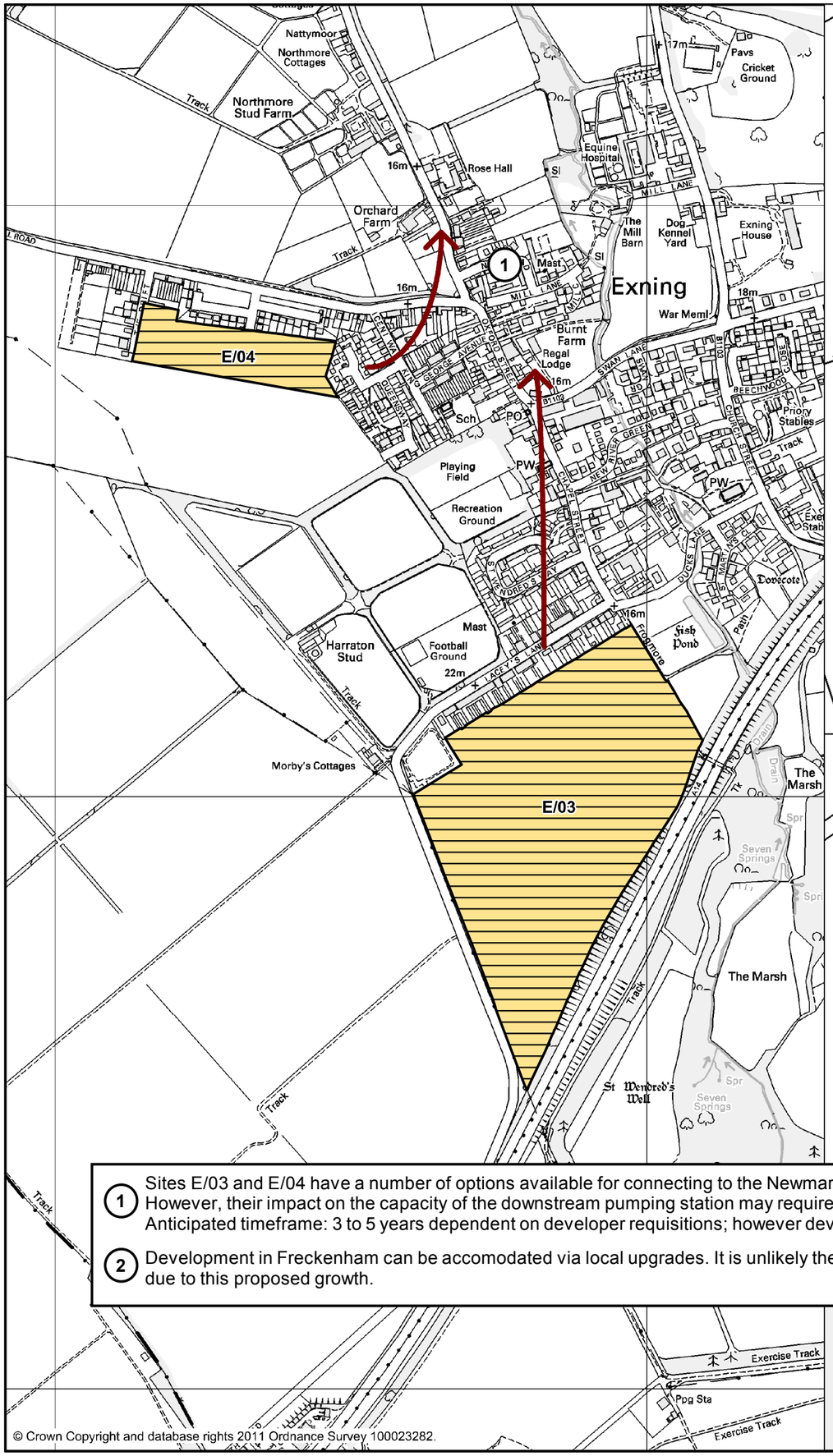
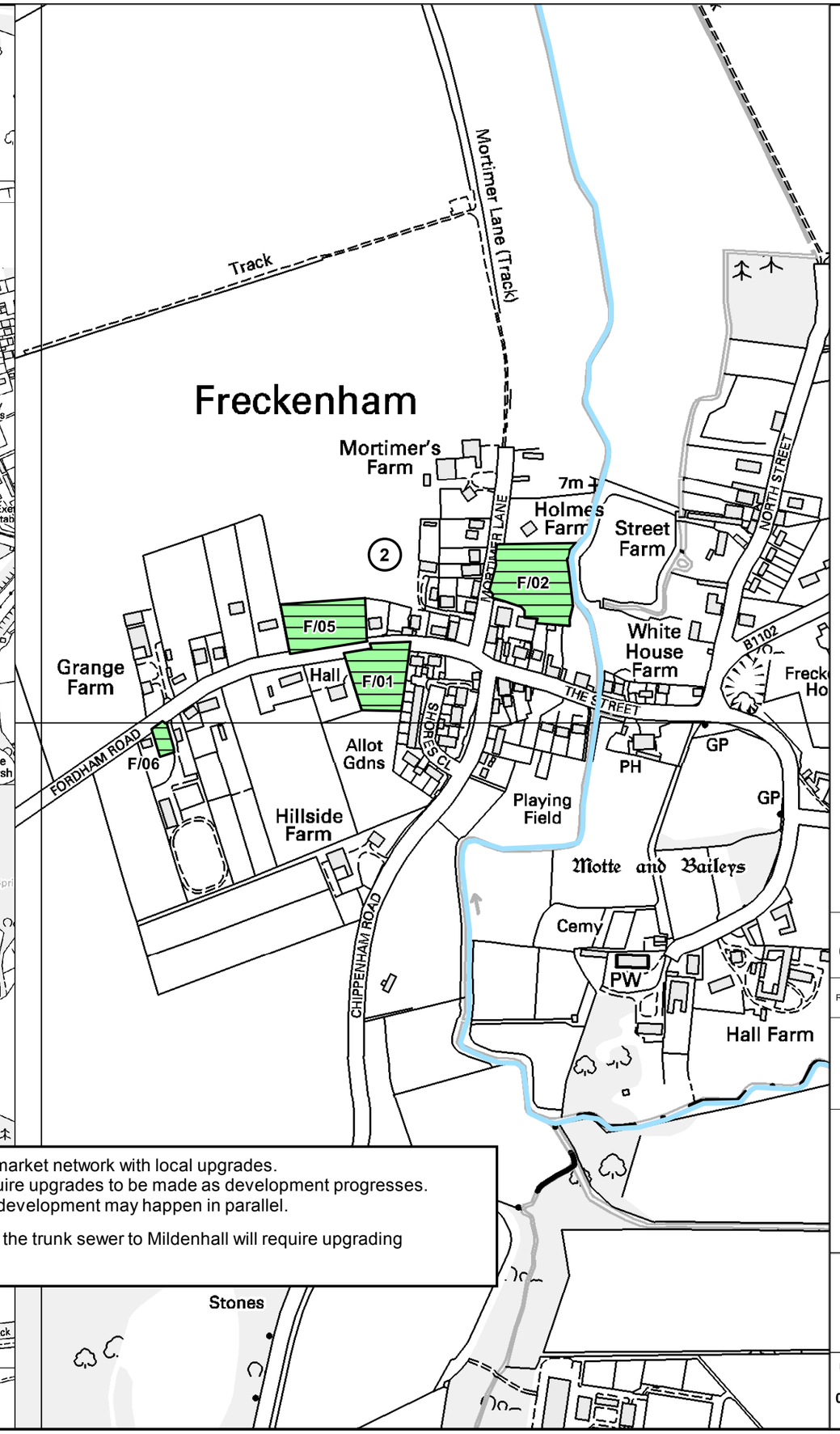




1. Sites E/03 and E/04 have a number of options available for connecting to the Newmarket network with local upgrades. However, their impact on the capacity of the downstream pumping station may require upgrades to be made as development progresses. Anticipated timeframe: 3 to 5 years dependent on developer requisitions; however development may happen in parallel.

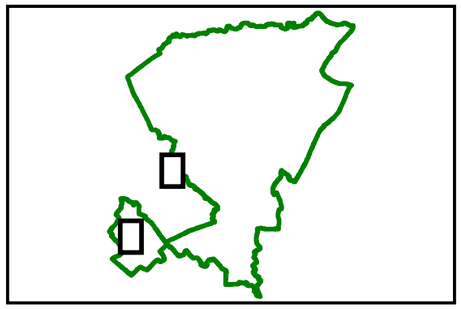
2. Development in Freckenham can be accomodated via local upgrades. It is unlikely the trunk sewer to Mildenhall will require upgrading due to this proposed growth.

LEGEND

- Watercourse
- Indicative Sewerage Network Upgrade
- Alternative Sewerage Option
- Waste Water Treatment Works

SITES

- Mixed Use
- Residential
- Employment
- Retail
- Site is constrained - developers should contact AWS and FHDC
- Major network upgrades required - scale/ location/ phasing of site will be problematic
- Major network upgrades required - scale/ location/ phasing can be accomodated
- No major impact on network - localised upgrades only required



Rev	Drw	Chk	Apd		Date
01	DV	LAF	RG		13/05/11

FOREST HEATH DISTRICT COUNCIL DETAILED WATER CYCLE STUDY

Forest Heath District Council

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WASTEWATER CONSTRAINTS FOR SSA SITES: EXNING AND FRECKENHAM

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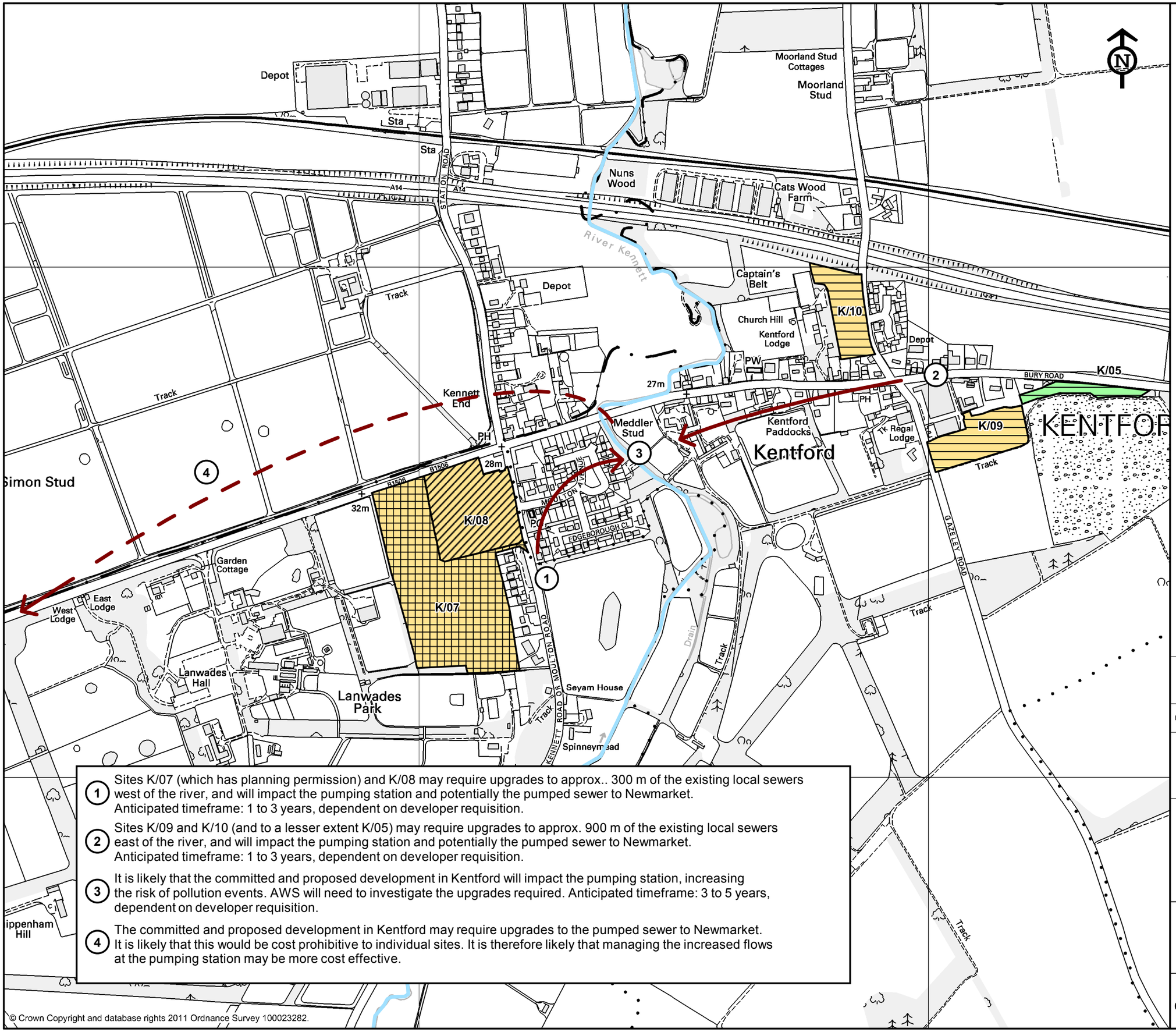


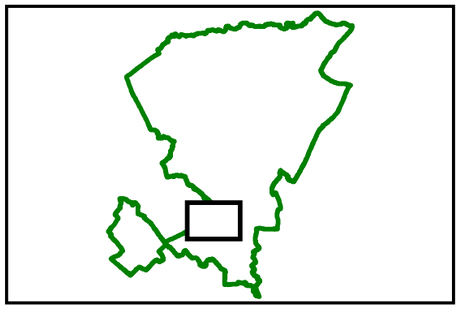
1. Sites K/07 (which has planning permission) and K/08 may require upgrades to approx.. 300 m of the existing local sewers west of the river, and will impact the pumping station and potentially the pumped sewer to Newmarket. Anticipated timeframe: 1 to 3 years, dependent on developer requisition.
2. Sites K/09 and K/10 (and to a lesser extent K/05) may require upgrades to approx. 900 m of the existing local sewers east of the river, and will impact the pumping station and potentially the pumped sewer to Newmarket. Anticipated timeframe: 1 to 3 years, dependent on developer requisition.
3. It is likely that the committed and proposed development in Kentford will impact the pumping station, increasing the risk of pollution events. AWS will need to investigate the upgrades required. Anticipated timeframe: 3 to 5 years, dependent on developer requisition.
4. The committed and proposed development in Kentford may require upgrades to the pumped sewer to Newmarket. It is likely that this would be cost prohibitive to individual sites. It is therefore likely that managing the increased flows at the pumping station may be more cost effective.

LEGEND

- Watercourse
- Indicative Sewerage Network Upgrade
- Potential Sewerage Option
- Waste Water Treatment Works

SITES

- Mixed Use
- Residential
- Employment
- Retail
- Site is constrained - developers should contact AWS and FHDC
- Major network upgrades required - scale/ location/ phasing of site will be problematic
- Major network upgrades required - scale/ location/ phasing can be accomodated
- No major impact on network - localised upgrades only required



Rev	Drw	Chk	Apd		Date
01	DV	LAF	RG		13/05/11

FOREST HEATH DISTRICT COUNCIL DETAILED WATER CYCLE STUDY

Forest Heath District Council

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WASTEWATER CONSTRAINTS FOR SSA SITES: KENTFORD

Drawing	Figure	Scale	Rev
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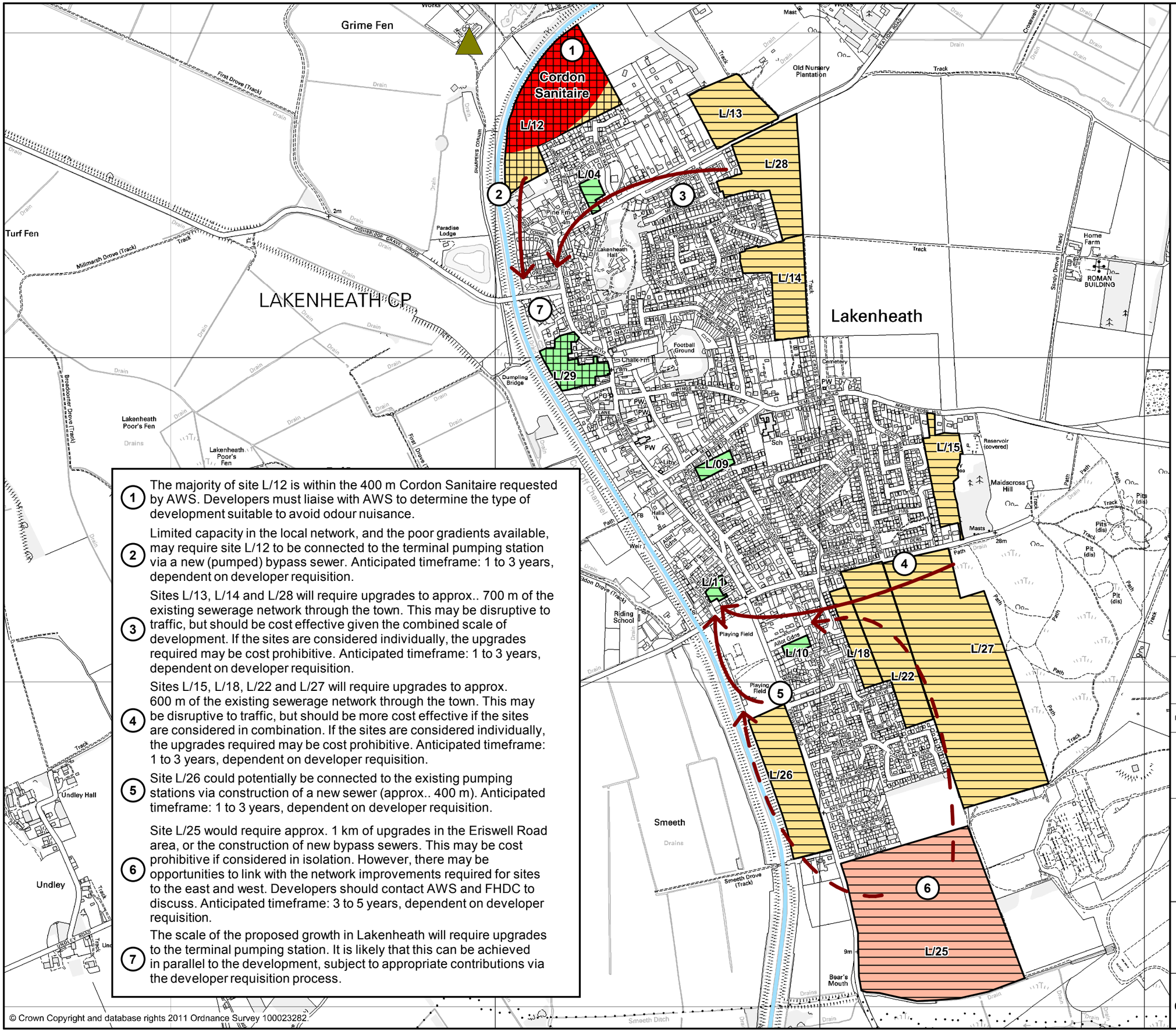


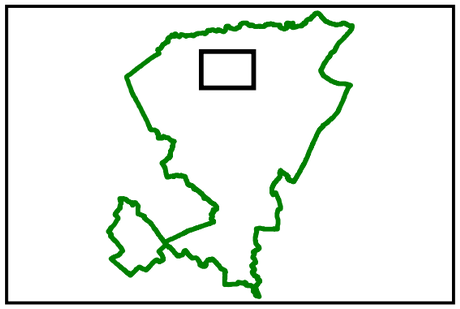
1. The majority of site L/12 is within the 400 m Cordon Sanitaire requested by AWS. Developers must liaise with AWS to determine the type of development suitable to avoid odour nuisance.
2. Limited capacity in the local network, and the poor gradients available, may require site L/12 to be connected to the terminal pumping station via a new (pumped) bypass sewer. Anticipated timeframe: 1 to 3 years, dependent on developer requisition.
3. Sites L/13, L/14 and L/28 will require upgrades to approx.. 700 m of the existing sewerage network through the town. This may be disruptive to traffic, but should be cost effective given the combined scale of development. If the sites are considered individually, the upgrades required may be cost prohibitive. Anticipated timeframe: 1 to 3 years, dependent on developer requisition.
4. Sites L/15, L/18, L/22 and L/27 will require upgrades to approx. 600 m of the existing sewerage network through the town. This may be disruptive to traffic, but should be more cost effective if the sites are considered in combination. If the sites are considered individually, the upgrades required may be cost prohibitive. Anticipated timeframe: 1 to 3 years, dependent on developer requisition.
5. Site L/26 could potentially be connected to the existing pumping stations via construction of a new sewer (approx.. 400 m). Anticipated timeframe: 1 to 3 years, dependent on developer requisition.
6. Site L/25 would require approx. 1 km of upgrades in the Eriswell Road area, or the construction of new bypass sewers. This may be cost prohibitive if considered in isolation. However, there may be opportunities to link with the network improvements required for sites to the east and west. Developers should contact AWS and FHDC to discuss. Anticipated timeframe: 3 to 5 years, dependent on developer requisition.
7. The scale of the proposed growth in Lakenheath will require upgrades to the terminal pumping station. It is likely that this can be achieved in parallel to the development, subject to appropriate contributions via the developer requisition process.

LEGEND

- Watercourse
- Indicative Sewerage Network Upgrade
- Alternative Sewerage Option
- Waste Water Treatment Works

SITES

- Mixed Use
- Residential
- Employment
- Retail
- Site is constrained - developers should contact AWS and FHDC
- Major network upgrades required - scale/ location/ phasing of site will be problematic
- Major network upgrades required - scale/ location/ phasing can be accomodated
- No major impact on network - localised upgrades only required



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01	DV	LAF	RG		13/05/11

FOREST HEATH DISTRICT COUNCIL DETAILED WATER CYCLE STUDY

Forest Heath District Council

Hyder

WASTEWATER CONSTRAINTS FOR SSA SITES: LAKENHEATH

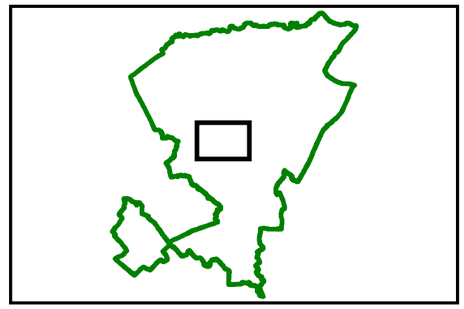
Drawing	Figure	Scale	Rev
055-UA000034-BMD-01	E5	NTS	01

LEGEND

- Watercourse
- Indicative Sewerage Network Upgrade
- Alternative Sewerage Option
- Waste Water Treatment Works

SITES

- Mixed Use
- Residential
- Employment
- Retail
- Site is constrained - developers should contact AWS and FHDC
- Major network upgrades required - scale/ location/ phasing of site will be problematic
- Major network upgrades required - scale/ location/ phasing can be accomodated
- No major impact on network - localised upgrades only required



(1) Part of site M/19 is within the 400 m Cordon Sanitaire requested by AWS. Developers must liaise with AWS to determine the type of development suitable to avoid odour nuisance.

(2) Site M/19 is ideally situated to allow direct connection of a new sewerage network to Mildenhall WwTW via a new trunk sewer. Anticipated timeframe: alongside development. The phasing of the sewerage network required should be considered by developers when planning the site to allow efficient design and construction.

(3) Sites M/21, M/33 and M/40 would likely require upgrades to the pumping stations and network in the north of the town. This may be disruptive to the Folly Road area. Anticipated timeframe: 1 to 3 years, dependent on developer requisition. Alternatively, depending on suitable phasing of sites, an option exists to links these sites to the new network required for site M/19.

(4) Site M/29 requires upgrades to the local sewer network and pumping station near the cricket ground. Recent improvements to serve an adjacent site may allow some capacity in the interim. Anticipated timeframe: 1 to 3 years, dependent on developer requisition.

(5) Site M/16 would require extensive upgrades to the existing sewers and pumping stations within the town. This will be disruptive to the College Heath Road area and could potentially prove to be cost prohibitive. Alternatively, a new pumped bypass sewer, constructed to the north of the town, could connect this site to any new network proposed for the western development sites. This may still prove to be cost prohibitive, given the length involved (+ 2 km). Anticipated timeframe: 3 to 5 years, dependent on developer requisition.

Rev	Drw	Chk	Apd		Date
01	DV	LAF	RG		13/05/11

FOREST HEATH DISTRICT COUNCIL
DETAILED WATER CYCLE STUDY

Forest Heath District Council

Hyder

WASTEWATER CONSTRAINTS FOR SSA SITES: MILDENHALL

Drawing	Figure	Scale	Rev
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EXNING CP

NEWMARKET CP

ARKET

N

1 Site N/14 is ideally situated to allow direct connection of a new pumped sewerage network to Newmarket WwTW via a new trunk sewer. Anticipated timeframe: alongside development.
The phasing of the sewerage network required should be considered by developers when planning the site to allow efficient design and construction.

2 Site N/18 would likely require upgrades to the pumping stations and network in the north of the town. This may be disruptive to the Willie Snaith Road area. Anticipated timeframe: 1 to 3 years, dependent on developer requisition.

3 AWS need to investigate the improvements required to the pumping station and network in the Churchill Road area to accomodate Site N/20. Anticipated timeframe: 1 to 3 years, dependent on developer requisition.

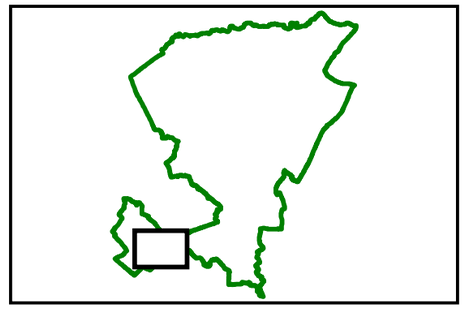
4 Dependent on the scale of growth, Site N/11 may require extensive upgrades to the surrounding network. Anticipated timeframe: 1 to 3 years, dependent on developer requisition.

LEGEND

- Watercourse
- Indicative Sewerage Network Upgrade
- Alternative Sewerage Option
- Waste Water Treatment Works

SITES

- Mixed Use
- Residential
- Employment
- Retail
- Site is constrained - developers should contact AWS and FHDC
- Major network upgrades required - scale/ location/ phasing of site will be problematic
- Major network upgrades required - scale/ location/ phasing can be accomodated
- No major impact on network - localised upgrades only required



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FOREST HEATH DISTRICT COUNCIL DETAILED WATER CYCLE STUDY

Forest Heath District Council

Hyder

WASTEWATER CONSTRAINTS FOR SSA SITES: NEWMARKET

Drawing	Figure	Scale	Rev
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1. In combination, sites RL/01, RL/02, RL/03, RL/04, RL/08 and RL/11 will require extensive upgrades/ new sewers in the Turnpike Road area. Anticipated timeframe: 3 to 5 years. The phasing of the sewerage network required should be considered by developers and FHDC in partnership when planning site phasing, to allow efficient design and construction.
2. The combination of proposed development sites in the north and west of the town may require upgrades to the existing northern pumping station and pumped sewer in the Warren Road area. Anticipated timeframe: 3 to 5 years. Again, developers and FHDC need to discuss phasing with AWS to ensure efficient design and construction
3. Developers of site RL/09 should consult with AWS now to discuss if the network planned to serve site RL/17 can be utilised, or additional capacity provided.
4. It may be possible for the northern half of site RL/06 to connect to the network being provided to serve the existing commitment, however developers must liaise with AWS to confirm the feasibility and cost of this. An alternative may be a new northern bypass sewer to the existing northern pumping station. Anticipated timeframe: 3 to 5 years, subject to developer requisition.
5. Alternatively, a direct connection to the southern pumping station may be more cost effective for the southern half of site RL/06, depending on land availability and discussions with AWS.

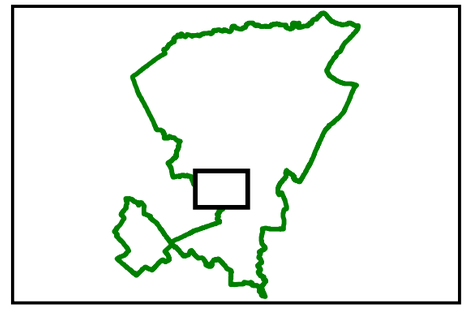
RL/01
RL/02
RL/03
RL/04
RL/08
RL/09
RL/10
RL/11
RL/13
RL/16
RL/17
RL/06 (North)
RL/06 (South)
Existing Commitment
Red Lodge
Chalkpit Beech Belt
Lower Beech Belt
Sir William's Garter
Sir William Belt
Millennium Centre
Heath Farm
Sandholm Masts
Ponderosa
Lephanta
Greenhays Farm
The White House Stud
Pit (disused)
Pit (dis)
Beech Belt
Triangle Wood
Ella's Plantation
Ppg Sta
PW
PO
CP
FB
Stone
Drain
Track
Path
Green Lane
Green Lane (Track)
A11
B1085
18m
NEW MARKET ROAD
BOUNDARY ROAD
TURNPIKE ROAD
HEATH FARM ROAD
TURNPIKE LANE
BRIDGE END ROAD
BENNETT ROAD
CARNATION WAY
HUNDRED ACRE WAY
RUSSET DRIVE
BERGAMO
PIPPIN CT
THYME CL
ORCHID DRIVE
GORSE CL
LAUREL CL
ROSEMARY CL
BLACKBERRY WY
BROOMHILL
MAGNOLIA CLOSE
LABURNUM CLOSE
HEATHERSET WAY
WARREN ROAD
PARK FARM DR

LEGEND

- Watercourse
- Indicative Sewerage Network Upgrade
- Alternative Sewerage Option
- Waste Water Treatment Works

SITES

- Mixed Use
- Residential
- Employment
- Retail
- Site is constrained - developers should contact AWS and FHDC
- Major network upgrades required - scale/ location/ phasing of site will be problematic
- Major network upgrades required - scale/ location/ phasing can be accomodated
- No major impact on network - localised upgrades only required



Rev	Drw	Chk	Apd		Date
01	DV	LAF	RG		13/05/11

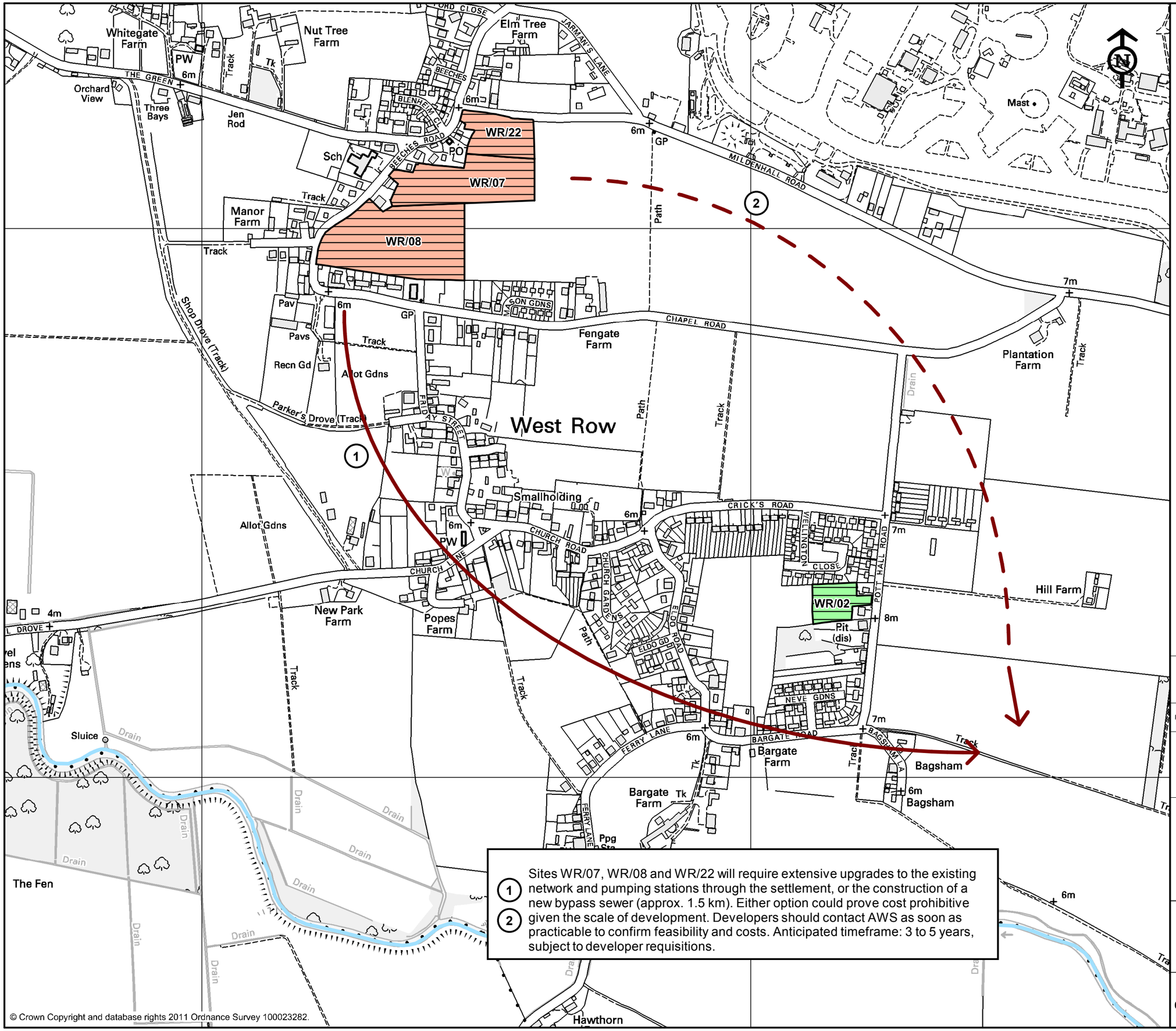
FOREST HEATH DISTRICT COUNCIL DETAILED WATER CYCLE STUDY

Forest Heath District Council

Hyder

WASTEWATER CONSTRAINTS FOR SSA SITES: RED LODGE

Drawing	Figure	Scale	Rev
058-UA000034-BMD-01	E8	NTS	01

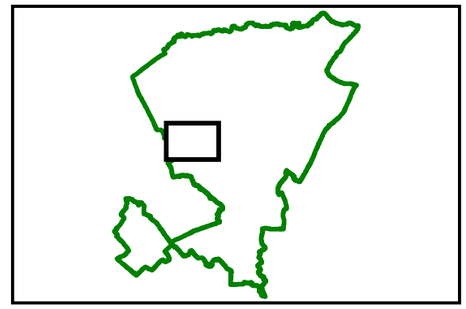


LEGEND

- Watercourse
- Indicative Sewerage Network Upgrade
- Alternative Sewerage Option
- Waste Water Treatment Works

SITES

- Mixed Use
- Residential
- Employment
- Retail
- Site is constrained - developers should contact AWS and FHDC
- Major network upgrades required - scale/ location/ phasing of site will be problematic
- Major network upgrades required - scale/ location/ phasing can be accomodated
- No major impact on network - localised upgrades only required



1. Sites WR/07, WR/08 and WR/22 will require extensive upgrades to the existing network and pumping stations through the settlement, or the construction of a new bypass sewer (approx. 1.5 km). Either option could prove cost prohibitive given the scale of development. Developers should contact AWS as soon as practicable to confirm feasibility and costs. Anticipated timeframe: 3 to 5 years, subject to developer requisitions.
2. Sites WR/07, WR/08 and WR/22 will require extensive upgrades to the existing network and pumping stations through the settlement, or the construction of a new bypass sewer (approx. 1.5 km). Either option could prove cost prohibitive given the scale of development. Developers should contact AWS as soon as practicable to confirm feasibility and costs. Anticipated timeframe: 3 to 5 years, subject to developer requisitions.

Rev	Drw	Chk	Apd		Date
01	DV	LAF	RG		13/05/11

FOREST HEATH DISTRICT COUNCIL DETAILED WATER CYCLE STUDY

Forest Heath District Council

Hyder

WASTEWATER CONSTRAINTS FOR SSA SITES: WEST ROW

Drawing	Figure	Scale	Rev
059-UA000034-BMD-01	E9	NTS	01

Appendix F

Flood Risk from WwTW Discharges

Detailed Methodology

In order to calculate the potential increase in flood risk due to the increases in effluent discharges, as per the methodology described in the AWS Waste Water Environmental Capacity Assessment, it was necessary to estimate the 1 in 2 year (or QMED) flows for the receiving watercourses.

The FEH revised statistical method was used to generate estimates of QMED at the six WwTW discharge locations, including a new assumed location for the River Lark. In particular, QMED (or median annual flood) was calculated at the location of each WwTW discharge point using the new QMED equation. As there are no flood peak data for the WwTW sites, FEH guidance recommends calculating QMED from catchment descriptors and adjusting by data transfer where possible. Potential donor stations were analysed within WINFAP-FEH 3, in particular the distance between catchment centroids and similarity of catchment descriptors were investigated. It is recommended that identification of donor catchments should be based on geographical closeness rather than on hydrological similarity as defined by catchment descriptors. Therefore, donor sites on the same watercourse as the subject site have been favoured.

The adopted values of QMED are detailed in Table F1 below:

WwTW Site	Receiving Water Course	QMED Value (m^3/s)	QMED Value (m^3/s) with 20% increase in flows to allow for climate change
Brandon	Little Ouse	18.53	22.24
Lakenheath	Brain	0.68	0.82
Mildenhall	River Lark	5.51	6.61
New Market	New Market No1 Public Drain	2.39	2.87
Tuddenham	Tuddenham Mill Stream	0.06	0.07
Tuddenham Lark	River Lark	5.46	6.55

Table F1: Adopted QMED Values

Following estimation of the 1 in 2 year flows, it is necessary to compare the peak effluent discharge i.e. Flow to Full Treatment (FTFT) from the WwTW against the river flows, to provide a risk rating.

Table F2 below shows the percentage difference between the baseline value of QMED and QMED with the increased WwTW FTFT discharge at each site. The percentage increase has been assessed both with and without an allowance for climate change in the baseline QMED value.

Note that the following table includes the existing measured WwTW discharges in addition to the initial QMED estimation, as this best represents the existing situation. The percentage increase therefore corresponds to the new discharge attributable to the growth, versus the calculated QMED flows and existing discharge.

WwTW Site	Option	New FTFT (m^3/s)	% Increase from QMED	% Increase from QMED with 20% increase in baseline flows to allow for climate change
Brandon	-	0.011	0.06	0.05
	Relief road	0.017	0.09	0.08
Lakenheath	-	0.009	1.28	1.08
Mildenhall	-	0.028	0.49	0.41
New Market	-	0.028	1.13	0.95
Tuddenham (existing discharge)	A	0.023	27.86	24.34
	B	0.008	10.1	8.82
	C	0.007	8.01	7.00
Tuddenham (River Lark discharge)	B	0.015	0.27	0.23
	C	0.016	0.30	0.25
	D	0.046	0.85	0.71

Table F2: Percentage increase in flow from the WwTW sites

It can be seen that the percentage increase in flow from the WwTW decreases with the allowance for climate change added to QMED. The decrease ranges from 0.1% to 3.52%. This is due to the WwTW flow making up a smaller proportion of the climate change river flow.

It is considered appropriate to use the QMED with an allowance for climate change values, as the new FTFT values have been projected to 2031 at each site, to account for the planned growth. Therefore, using QMED values without an allowance for climate change would make the impact of the future FTFT flows seem more significant than they could possibly be in 2031.

Assumptions and Limitations

The following assumptions and limitations are associated with the applied methodology:

- The reach length decision tree recommends calculating the backwater effect (upstream reach length) using steady state hydraulic modelling software. Hydraulic modelling is outside the scope of this study, but is not considered crucial anyway, given the small predicted increases in flows. Due to the low calculated increase in

flows from the WwTW it is assumed that the increase in flow does not impact more than 1 km downstream of each subject site;

- Due to the differing channel dimensions and slopes at each site, in reality the backwater reach will vary between watercourses. However, due to the relatively small flow increases the impacts are likely to be negligible;
- Site visits were not undertaken as part of this study. Information regarding downstream structures has been taken from OS mapping and readily available web based information. There is a possibility that there are un-mapped structures which exist that have not been taken into account in this study; and
- It has been assumed that large road bridges are clear span and will not cause significant restrictions to flow under normal flow conditions. It has also been assumed that smaller bridge structures and foot bridges have piers which could cause flow restrictions under low flow conditions. It has not been possible to identify culverts from OS mapping or other readily available information.

Results

The following tables and text highlight the risk score which can be attributed to the current conditions i.e. QMED flow + existing FTFT, and then show how the various options for increased discharges change the overall scores.

Brandon

Brandon WwTW is located on the edge of the floodplain and discharges into the Little Ouse River. OS 1:10000 mapping indicates that the Little Ouse is approximately 13 m wide in the vicinity of the WwTW discharge and the slope of the river is 0.0010. A culvert is located 1000 m downstream. The works are located on the urban edge of the town of Brandon.

Risk Rating	Sensitivity	Impact	Total Flows due to WwTW discharge	Weighted Total Risk Score
Existing Situation with climate change	3 - Medium	5 - High	1 - Low	2.8 - Medium
Following Growth and climate change (no relief road)	3 - Medium	5 - High	1 - Low	2.8 - Medium
Following Growth and climate change (with relief road)	3 - Medium	5 - High	1 - Low	2.8 - Medium

The combined risk value from the multi criteria assessment is higher than 2.5 for the increased flows, with and without the growth associated with the relief road; this is due to the location of the site within urban Brandon. Therefore, the flow from the WwTW site is classified as having a medium risk for both options. However, it can be seen that there is no appreciable increase in risk rating due to the proposed growth, above the current situation. Due to the channel characteristics and the distance of downstream structures, the risk of increased flooding from the diminutive increase in flow of 0.05% (or 0.08% with the relief road) is not considered to present a cause for concern.

Lakenheath

Lakenheath WwTW is located on the edge of the floodplain and discharges into the Crooked Dyke IDB system. OS 1:10000 mapping indicates that the Dyke is 8.7m wide in

the vicinity of the WwTW discharge and the slope of the river is 0.0018. An embankment is located 577 m downstream of the works; it is assumed that there is a culvert to convey flow under the embankment. There are no settlements downstream of the works.

Risk Rating	Sensitivity	Impact	Total Flows due to WwTW discharge	Weighted Total Risk Score
Existing Situation with climate change	3 - Medium	1 - Low	3 - Medium	2.4 - Low
Following Growth and climate change	3 - Medium	1 - Low	3 - Medium	2.4 - Low

The combined risk value is less than 2.5; therefore the increased flow from the WwTW site is classified as having a low risk, both before and after the growth. However, as water levels in the IDB area are controlled by pumping, any additional flows could potentially increase flood risk if sufficient pump capacity is not available. The IDB do not currently have a model for the drains and pumping station in the area – additional investigation will be required to determine suitable mitigation measures.

Mildenhall

Mildenhall WwTW is located on the edge of the floodplain and discharges into the River Lark. OS 1:10000 mapping indicates that the River Lark is approximately 14 m wide in the vicinity of the WwTW discharge and the slope of the river is 0.0007. There is a road bridge located 1200 m downstream of the works. The WwTW is located approximately 900 m upstream of West Row.

Risk Rating	Sensitivity	Impact	Total Flows due to WwTW discharge	Weighted Total Risk Score
Existing Situation with climate change	1 - Low	1 - Low	2 – Low/ Medium	1.4 - Low
Following Growth and climate change	1 - Low	1 - Low	2 – Low/ Medium	1.4 - Low

The combined risk value is 1.4, therefore the increased flow from the WwTW site is classified as having a low risk both before and after the proposed growth.

Newmarket

Newmarket WwTW is located on the edge of the floodplain and discharges into the Newmarket No.1 Public Drain. OS 1:10000 mapping indicates that drain is approximately 8 m wide in the vicinity of the WwTW discharge and the slope of the river is 0.0017. A culvert under a railway line is located 350 m downstream of the works. The nearest downstream settlement is the village of Snailwell, located 835 m downstream.

Risk Rating	Sensitivity	Impact	Total Flows due to WwTW discharge	Weighted Total Risk Score
Existing Situation with climate change	5 - High	1 - Low	3 – Medium	3 - Medium
Following Growth and climate change	5 - High	1 - Low	3 – Medium	3 - Medium

The combined risk value is 3; therefore the increased flow from the WwTW site is classified as having a medium risk. However, it can be seen that there is no appreciable increase in risk rating due to the proposed growth, above the current situation.

Tuddenham (Existing Discharge)

Tuddenham WwTW is located on the edge of the floodplain and discharges into the Tuddenham Mill Stream. OS 1:10000 mapping indicates that the stream is 6 m wide in the vicinity of the WwTW discharge and the slope of the river is 0.0034. There is a culvert under a track located 255 m downstream of the works. The nearest downstream settlement is Tuddenham located 600 m downstream. It should be noted that the primary source of flow in the stream is generated by the discharge from the WwTW.

Risk Rating	Sensitivity	Impact	Total Flows due to WwTW discharge	Weighted Total Risk Score
Existing Situation with climate change	5 - High	3 - Medium	5 – High	4.4 - High
Option A following Growth and climate change	5 - High	3 - Medium	5 – High	4.4 - High
Option B following Growth and climate change	5 - High	3 - Medium	5 – High	4.4 - High
Option C following Growth and climate change	5 - High	3 - Medium	5 – High	4.4 - High

The existing WwTW flow is classed as having a high combined risk rating, regardless of growth, due to the location of the site within the village of Maxton and the culvert 255 m downstream. Despite the large increases in discharges proposed, the proposed increases cannot be given a higher risk score than the existing situation, due to the methodology used.

Option A results in a 24.34% increase in flow over and above the existing situation, which would be classified as having a high risk in its own right.

Option B results in an 8.82% increase in flow over and above the existing situation, which would be classified as having a medium/ high risk in its own right.

Option C results in a 7% increase in flow over and above the existing situation, which again would be classified as having a medium/ high risk in its own right.

The discharge from the WwTW is the primary source of flow and this has resulted in the percentage increase in flow being assessed as having a relatively high risk value. Due to the sites high risk score it is recommended to verify the downstream constraints and channel characteristics with a site visit, and hydraulic modelling if necessary.

Tuddenham (River Lark Discharge)

OS 1:10000 mapping indicates that the River Lark is 12.5m wide in the vicinity of the proposed new discharge point, and the slope of the river is 0.0020. A weir is located

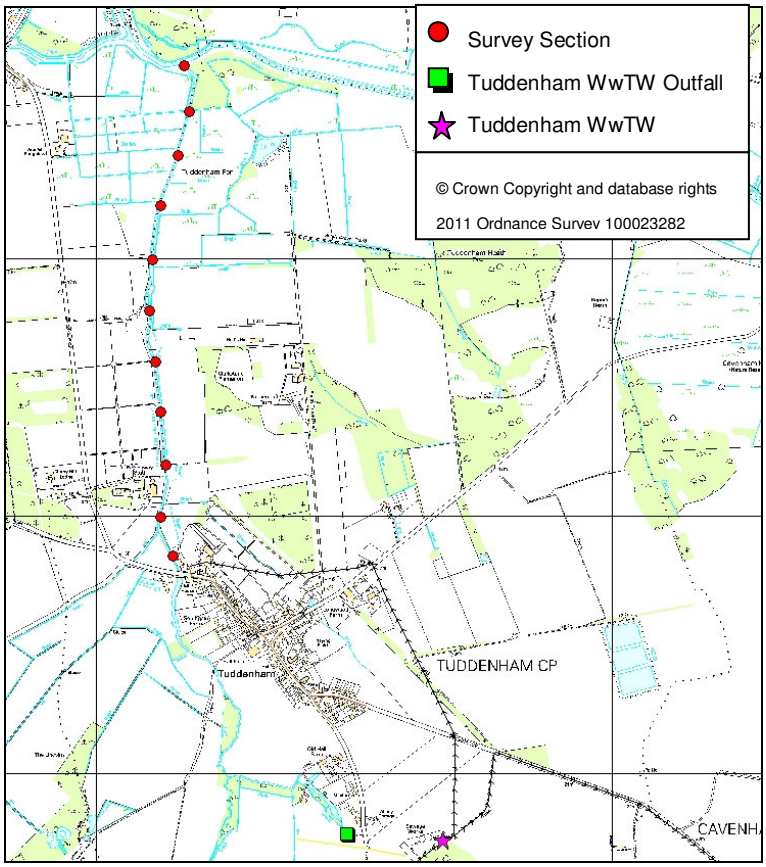
1,500 m downstream of the works. The discharge point is assumed to be located on the urban edge of Barton Mills.

Risk Rating	Sensitivity	Impact	Total Flows due to WwTW discharge	Weighted Total Risk Score
Existing Situation with climate change	1 - Low	5 - High	N/A	N/A
Option B following Growth and climate change	1 - Low	5 - High	1 - Low	2.2 - Low
Option C following Growth and climate change	1 - Low	5 - High	1 - Low	2.2 - Low
Option D following Growth and climate change	1 - Low	5 - High	1 - Low	2.2 - Low

The combined risk value for options B, C and D are all less than 2.5, therefore the increased flow from the proposed discharge site is classified as having a low risk.

Additional Tuddenham Stream Assessment

In order to assess the potential impacts on flood risk of increasing flows in the Tuddenham Stream, as a result of increased FTFT from Tuddenham WwTW, a simple steady state ISIS model was constructed. Survey data for the Tuddenham Stream was provided by the EA. The survey was undertaken in 1991 (by what was then the National Rivers Authority). The figure below shows the extent of the channel survey available.



The survey does not extend upstream of the Tuddenham Road / High Street bridge; the limitations of this are discussed in Section 11.3.2 of the WCS report.

No information on structures in the watercourse has been made available to inform this assessment. Notably, the impacts of the controls imposed by Tuddenham Mill have not been accounted for.

An estimate of the 50% AEP (1 in 2 chance of occurring in any given year, also termed QMED) in the Tuddenham Stream was made using the revised FEH (Flood Estimation Handbook) Statistical Method. An approximation of the 1% AEP flow was made using the regional growth curves used in the Flood Studies Report. It is recognised that this method has a number of limitations but given the strategic and comparative nature of this assessment it is deemed appropriate.

A review of catchments in the National River Flow Archive was carried out to 'sense check' the flow estimates. The small chalk catchment of the River Brett at Cockfield (approximately 20 miles away) has an area of 25.7 km² and a mean annual flow of 0.128 m³/s. Factoring this down to the Tuddenham Stream catchment of 8.1 km² gives 0.04 m³/s.

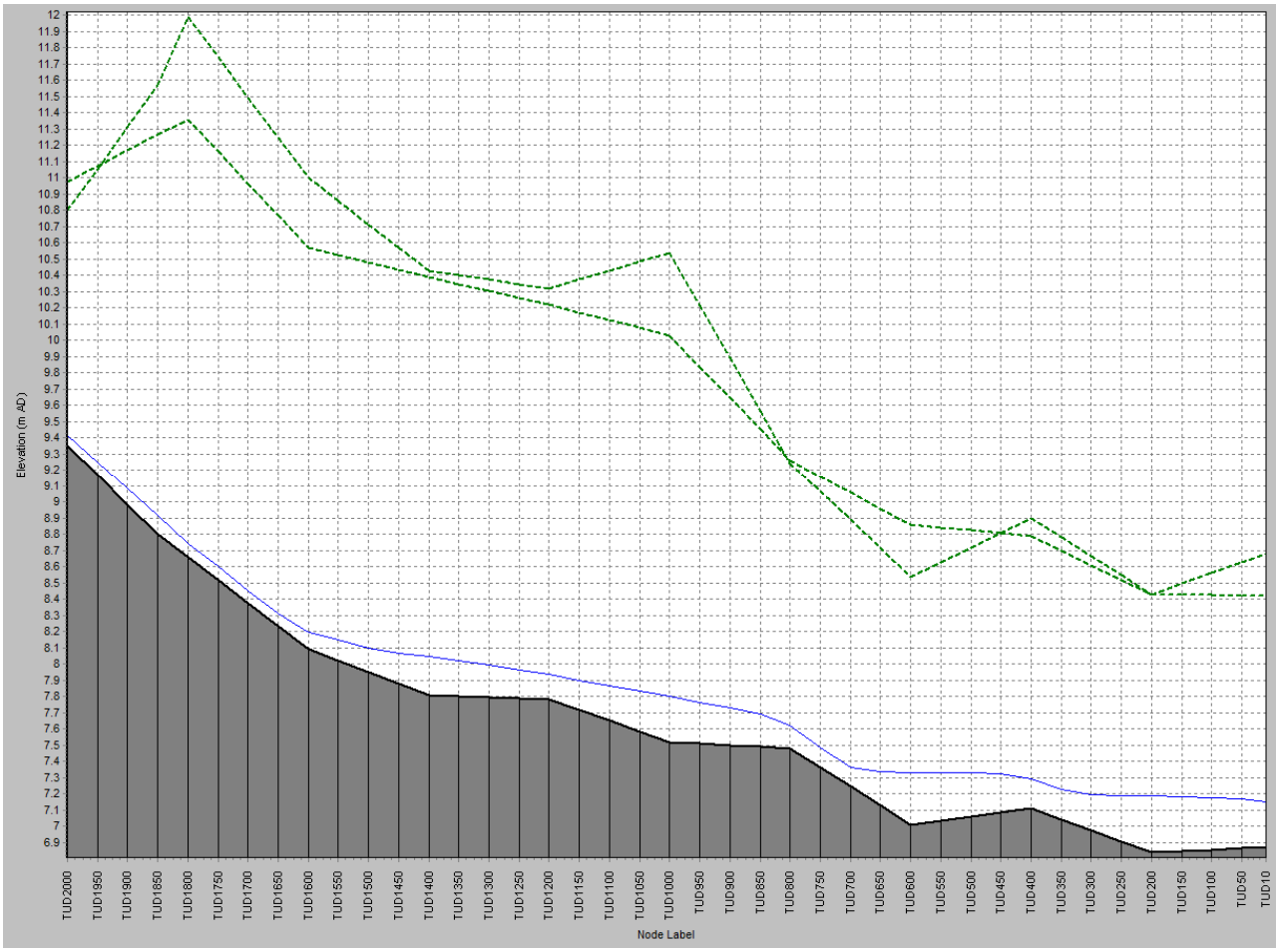
Flows from the Tuddenham Stream and Tuddenham WwTW were combined to create 15 scenarios assessed using the ISIS model. These are listed in the following Table.

Ref	Description		Peak Flow m³/s
BL1	Baseline	QMED	0.06
BL2		1% AEP	0.21
BL3		1% AEP (climate change)	0.26
BL4	Baseline Flows with Existing FTFT	QMED	0.08
BL5		1% AEP	0.24
BL6		1% AEP (climate change)	0.28
A1	Baseline Flows Option A FTFT	QMED	0.11
A2		1% AEP	0.26
A3		1% AEP (climate change)	0.30
B1	Baseline Flows Option B FTFT	QMED	0.09
B2		1% AEP	0.24
B3		1% AEP (climate change)	0.29
C1	Baseline Flows Option C FTFT	QMED	0.09
C2		1% AEP	0.24
C3		1% AEP (climate change)	0.29

Table F3: Percentage increase in flow from the WwTW sites

The survey data was used to construct a simple steady state ISIS model. A constant Manning's n value of 0.035 was applied to all sections and a normal depth applied to the downstream boundary in the absence of any more detailed data. The following figure

shows the channel bed long section, together with the QMED estimated water level and bank levels.

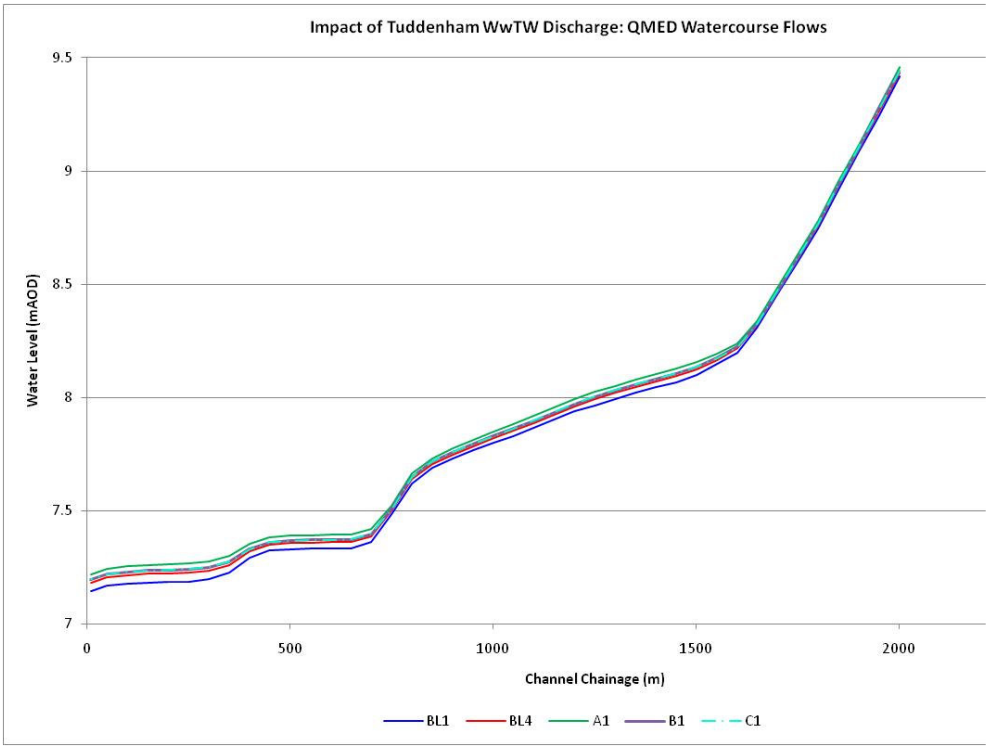


Tuddenham Stream Long Section with QMED water level
Tuddenham Road / High Street Bridge – River Lark

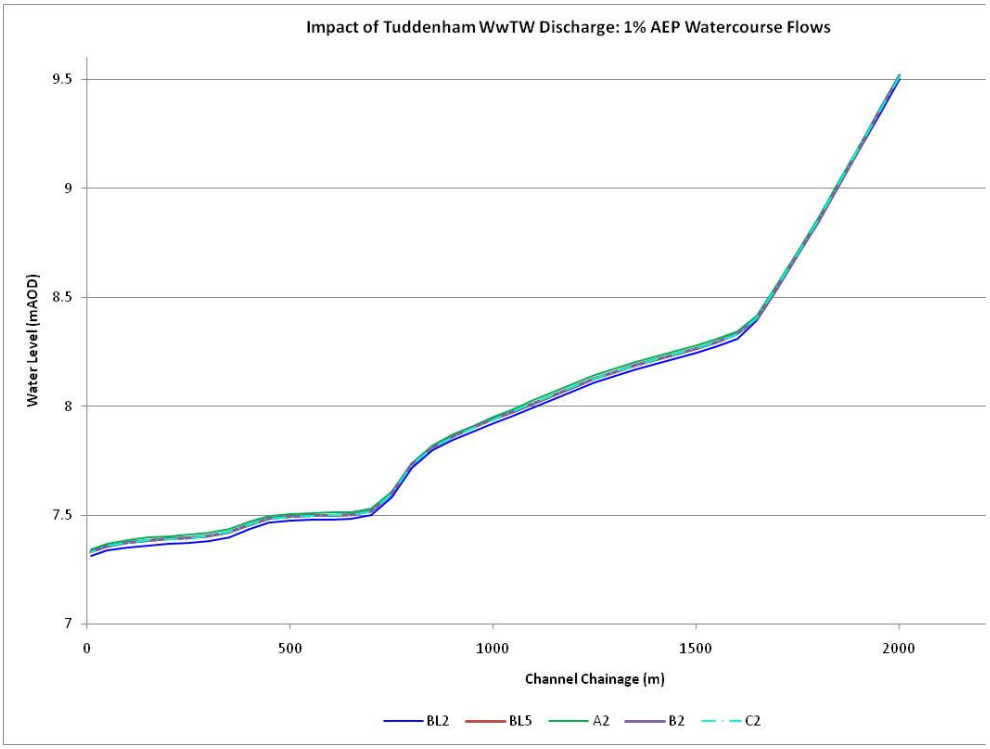
Peak flows were applied as constant QT boundaries.

The following figures illustrate the predicted increases in water level for each of the modelled scenarios. Results have been grouped by fluvial event for ease of comparison.

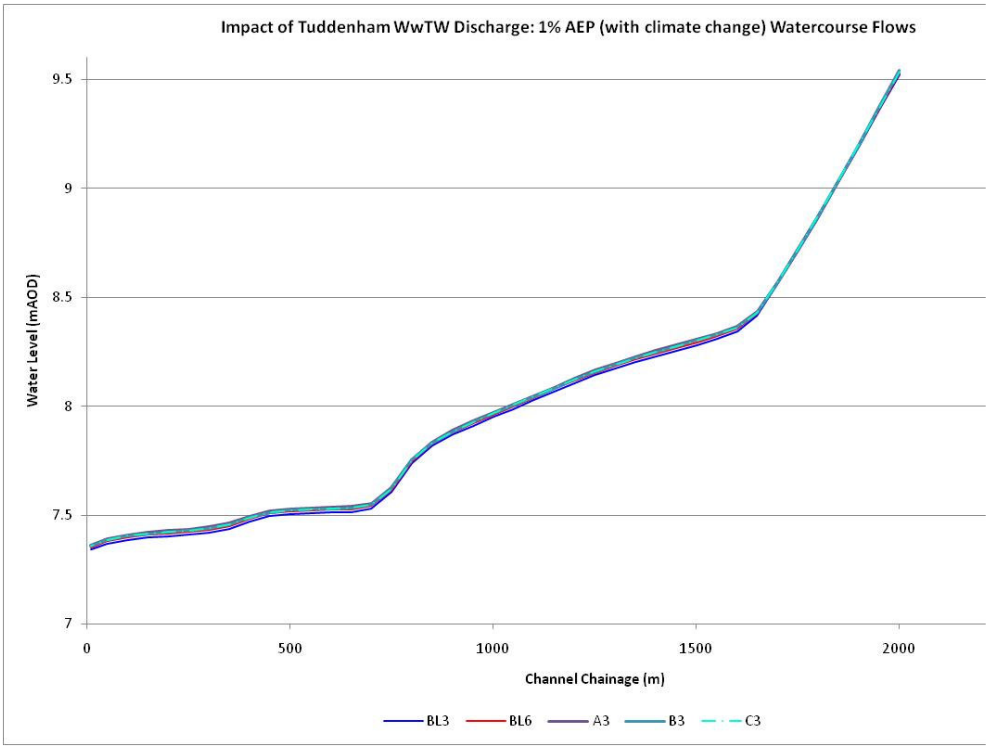
The results highlight that there is a minimal increase in water levels, as a result of increased discharge from Tuddenham WwTW, for all modelled scenarios. Flows are not estimated to be above bank level for any modelled scenario.



QMED Water Levels



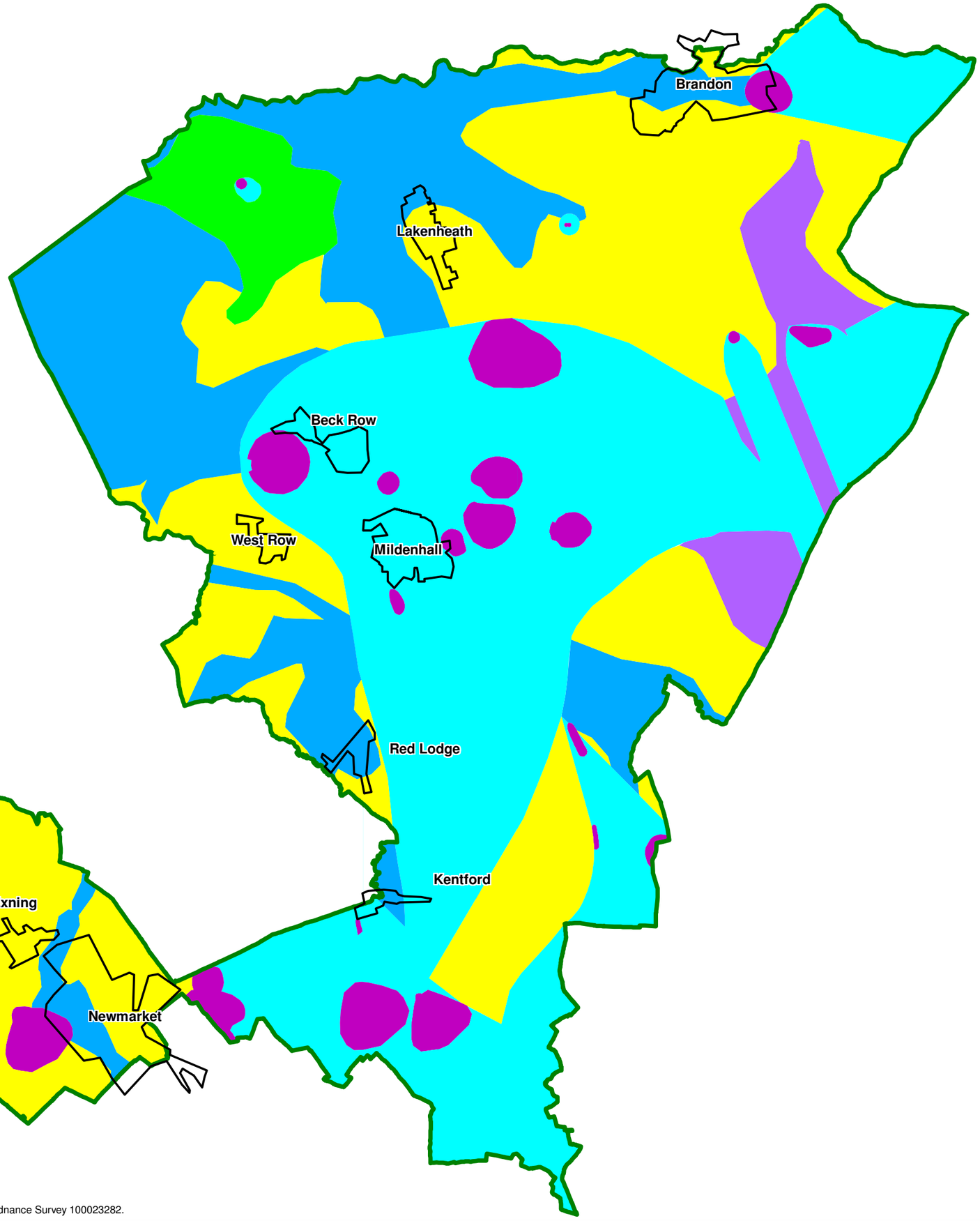
1% AEP Water Levels



1% AEP + 20% Water Levels

Appendix G

SuDS Policy Unit Figures



LEGEND

- Forest Heath District
- Market Towns. Key Service Centres and Primary Villages

SuDS Policy Unit

- Unit 1: SPZ 1 (inner)
- Unit 2: SPZ 2 (outer) and 3 (total catchment)
- Unit 3: Areas with superficial clay deposits
- Unit 4: Deposits of peat and gravels, including river terrace gravels. High infiltration potential over aquifer
- Unit 5: Glacial till; lower permeability
- Unit 6: No classified superficial deposits, area overlies chalk bedrock, and is over or adjacent to major chalk aquifer

Rev	Drw	Chk	Apd		Date
01	DV	LAF	RG		15/05/11

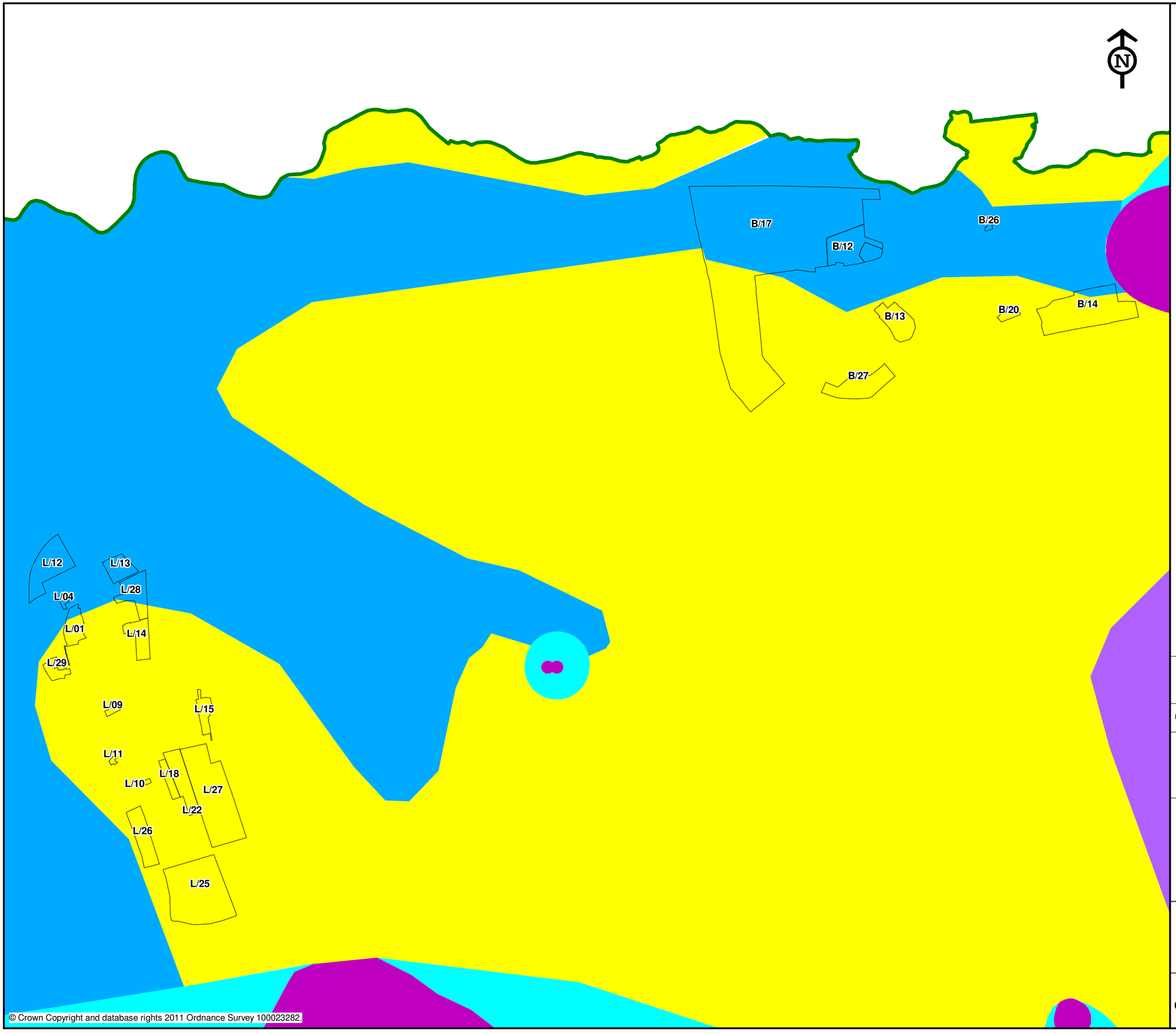
FOREST HEATH DISTRICT COUNCIL DETAILED WATER CYCLE STUDY

Forest Heath District Council

Hyder

SuDS POLICY ZONES FOR SSA SITES: DISTRICT WIDE

Drawing	Figure	Scale	Rev
060-UA000034-BMD-01	G1	NTS	01



LEGEND

Forest Heath District

FHDC SSA Site

SuDS Policy Unit

Unit 1: SPZ 1 (inner)

Unit 2: SPZ 2 (outer) and 3 (total catchment)

Unit 3: Areas with superficial clay deposits

Unit 4: Deposits of peat and gravels, including river terrace gravels. High infiltration potential over aquifer

Unit 5: Glacial till; lower permeability

Unit 6: No classified superficial deposits, area overlies chalk bedrock, and is over or adjacent to major chalk aquifer

Rev	Drw	Chk	Apd		Date
01	DV	LAF	RG		15/05/11

FOREST HEATH DISTRICT COUNCIL DETAILED WATER CYCLE STUDY

Forest Heath District Council

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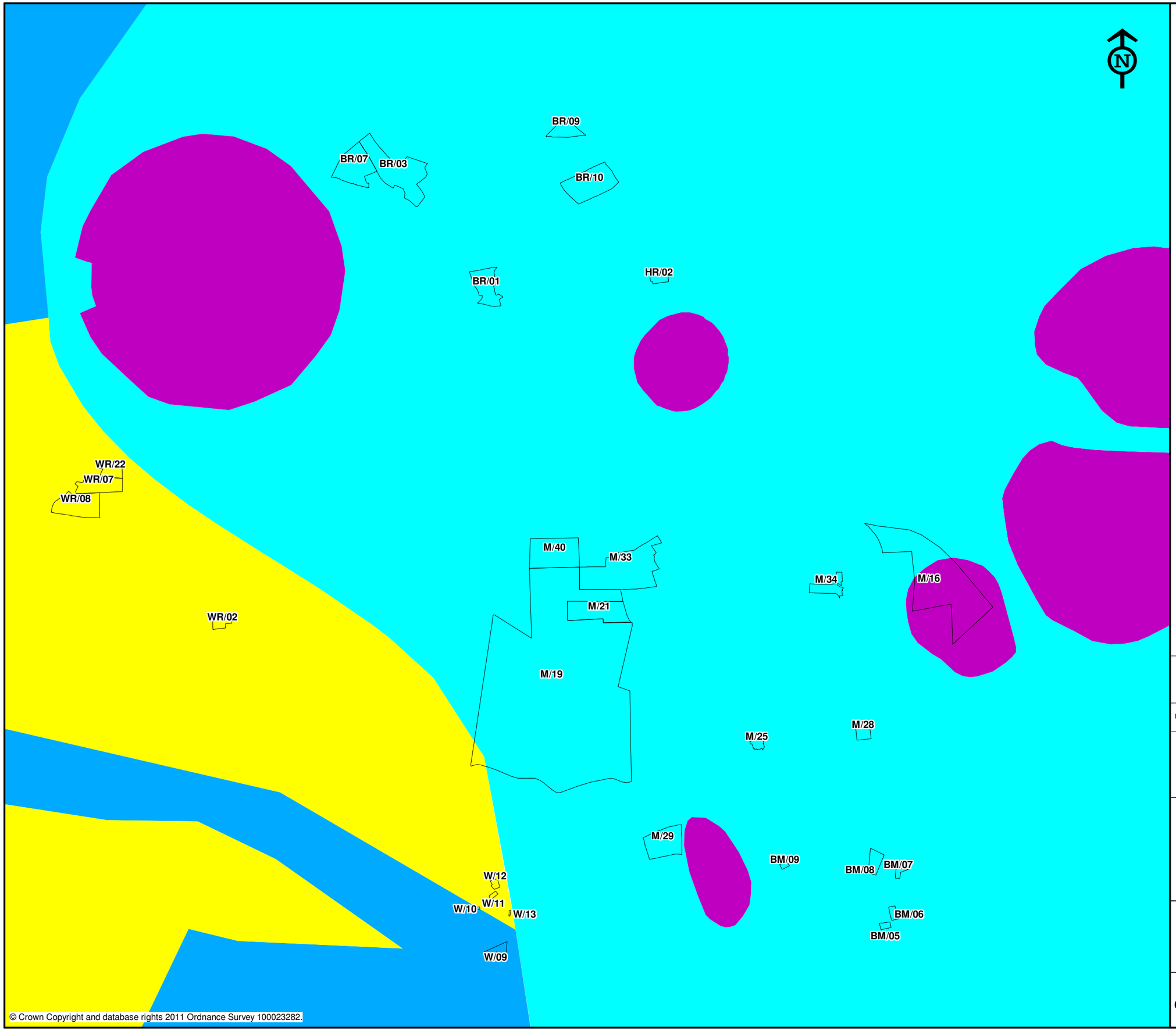
SuDS POLICY ZONES FOR SSA SITES: BRANDON AND LAKENHEATH

Drawing	Figure	Scale	Rev
061-UA000034-BMD-01	G2	NTS	01



LEGEND

Forest Heath District

FHDC SSA Site

SuDS Policy Unit

Unit 1: SPZ 1 (inner)

Unit 2: SPZ 2 (outer) and 3 (total catchment)

Unit 3: Areas with superficial clay deposits

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Unit 5: Glacial till; lower permeability

Unit 6: No classified superficial deposits, area overlies chalk bedrock, and is over or adjacent to major chalk aquifer

Rev	Drw	Chk	Apd		Date
01	DV	LAF	RG		15/05/11

FOREST HEATH DISTRICT COUNCIL DETAILED WATER CYCLE STUDY

Forest Heath District Council

Hyder

SuDS POLICY ZONES FOR SSA SITES: BARTON MILLS, BECK ROW, HOLYWELL ROW, MILDENHALL, WEST ROW AND WORLINGTON

Drawing	Figure	Scale	Rev
062-UA000034-BMD-01	G3	NTS	01

F/07
F/05
F/02
F/01
F/06
RL/16
RL/10
RL/13
RL/01
RL/02
RL/06 (North)
RL/03
RL/04
RL/08
RL/11
RL/17
RL/09
RL/06 (South)
K/10
K/05
K/09
K/08
K/07

N

LEGEND

- Forest Heath District
- FHDC SSA Site

SuDS Policy Unit

- Unit 1: SPZ 1 (inner)
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- Unit 5: Glacial till; lower permeability
- Unit 6: No classified superficial deposits, area overlies chalk bedrock, and is over or adjacent to major chalk aquifer

Rev	Drw	Chk	Apd		Date
01	DV	LAF	RG		15/05/11

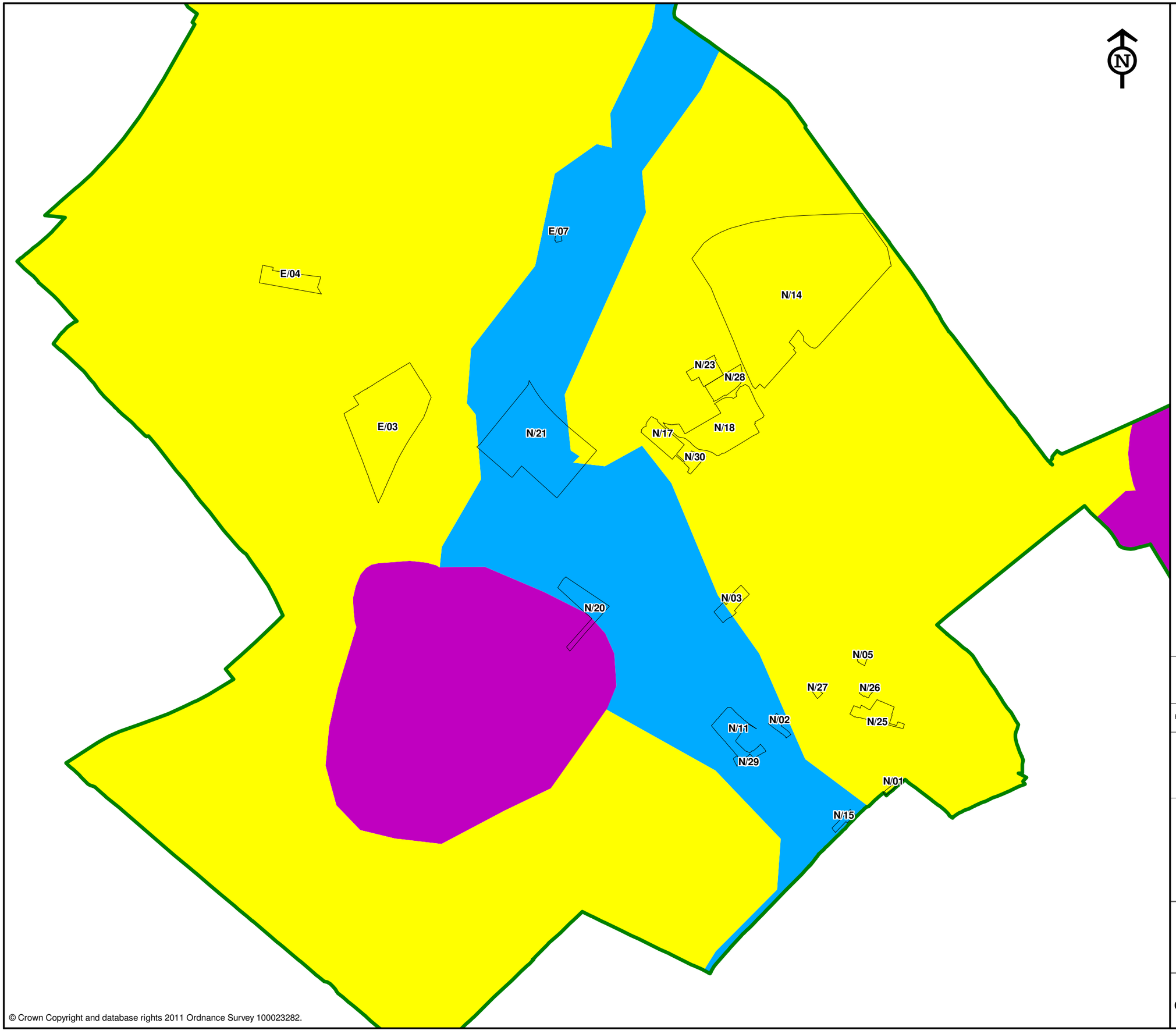
FOREST HEATH DISTRICT COUNCIL DETAILED WATER CYCLE STUDY

Forest Heath District Council

Hyder

SuDS POLICY ZONES FOR SSA SITES: FRECKENHAM, KENTFORD AND RED LODGE

Drawing	Figure	Scale	Rev
063-UA000034-BMD-01	G4	NTS	01



LEGEND

- Forest Heath District
- FHDC SSA Site

SuDS Policy Unit

- Unit 1: SPZ 1 (inner)
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Rev	Drw	Chk	Apd		Date
01	DV	LAF	RG		15/05/11

FOREST HEATH DISTRICT COUNCIL DETAILED WATER CYCLE STUDY

Forest Heath District Council

Hyder

SuDS POLICY ZONES FOR SSA SITES: EXNING AND NEWMARKET

Drawing	Figure	Scale	Rev
064-UA000034-BMD-01	G5	NTS	01