



**Basingstoke  
and Deane**

## Basingstoke Water Cycle Study

### Phase 2 Water cycle study report

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Executive Summary

**Basingstoke and Deane Borough Council Water Cycle Study**

**Phase 2 water cycle study report**

Revision schedule

Date	Document reference	Stage	Author	Approver
18/08/2009	WUWCSB004	Confidential draft	Andy McConkey	
03/09/2009	WUWCSB005	Final draft	Andy McConkey	
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# 1 Executive Summary

Water Cycle Studies (WCS) are required to ensure that proposed growth does not adversely impact on the existing water cycle environment and that new Water Services Infrastructure (WSI) can be planned for and provided alongside new development in a sustainable and cost effective manner. Due to the scale of development proposed for Basingstoke, a WCS is required to ensure that the proposed growth targets can be met without adversely impacting on the water environment and that required infrastructure can be planned for and brought online alongside new development, in a timely and phased manner.

The Regional Spatial Strategy (RSS) for the South East of England (known as the South East Plan) was published in May 2009 and sets out the long term spatial planning framework for the region over the years 2006-2026. The Plan is a key tool to help achieve more sustainable development, protect the environment and combat climate change.

The plan has set a housing allocation for Basingstoke and Deane of 915 (945) dwellings per year as an annual average, with a total of 18,300 (18,900) over the plan period<sup>1</sup>. However, in light of concerns raised about environmental capacity the council have maintained their formal position of 740 dwellings per annum, and the plan specifically acknowledges the uncertainty about environmental capacity and wastewater treatment capacity, and states that:

*Provision levels at Basingstoke, for locations within the catchment of Blackwater Sewage Treatment Works and any other locations where potential water quality, supply or treatment issues are identified will need to be informed by a water cycle study. Similarly, the distribution of development should be informed by strategic flood risk assessments. The results of these studies will need to be reflected in local development frameworks and future reviews of the RSS.*

The issue of environmental capacity and wastewater treatment in particular had been raised by the Environment Agency in representations to the emerging South East Plan, and led to a phase 1 water cycle study to further investigate the issues. The phase 1 study completed in March 2007, and formed part of representations to the Examination in Public of the South East Plan. It recommended that a second phase study needed to be carried out to further reduce some of the uncertainties still remaining, and to work alongside the preparation of the LDF.

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<sup>1</sup> The figures in brackets are the provisional allocation for the whole of the Basingstoke and Deane Borough. The first values are the provisional allocation for that part of the Borough that falls within the Blackwater and Western Corridor sub-region, including the principal urban area of Basingstoke.



In September 2007 Basingstoke and Deane Borough Council commissioned Halcrow to produce a phase 2 water cycle study, in accordance with the recommendations of the Phase 1 water cycle study. The study aim is to provide a water cycle strategy that:

- all partners can commit to;
- will show how water infrastructure can be put in place alongside development rather than afterwards;
- sets out design standards for sustainable drainage, and;
- builds on the work being done on the strategic flood risk assessment to reduce the risk and harmful impacts of flooding.

In addition to and in association with the water cycle study, Halcrow were commissioned in September 2007, to undertake an ecological and water quality modelling assessment.

This water cycle study and the associated ecology and water quality report form part of the evidence base for the Core Strategy, and will help ensure that the strategic allocations in the Core Strategy, and the phasing of these allocations are within environmental capacity. The study will also help inform the infrastructure delivery plan to ensure that water services infrastructure delivery is sustainable, and the infrastructure is delivered in advance of houses being occupied.

The study area for this water cycle study is primarily set by the constraints identified in the phase 1 study. The phase 1 study identified that the critical risk to ongoing development was the environmental and infrastructure capacity for wastewater treatment. The urban area of Basingstoke, and the areas being tested for new development all drain towards the River Loddon. For this reason, this study focuses on the wastewater catchments that discharge to the River Loddon or its tributaries. As Chapter 2 explains, the impact of development, particularly the impact of additional treated effluent discharge, on the River Loddon was the primary cause of concern following the phase 1 study. The approximate study area is shown in Figure E1 below.



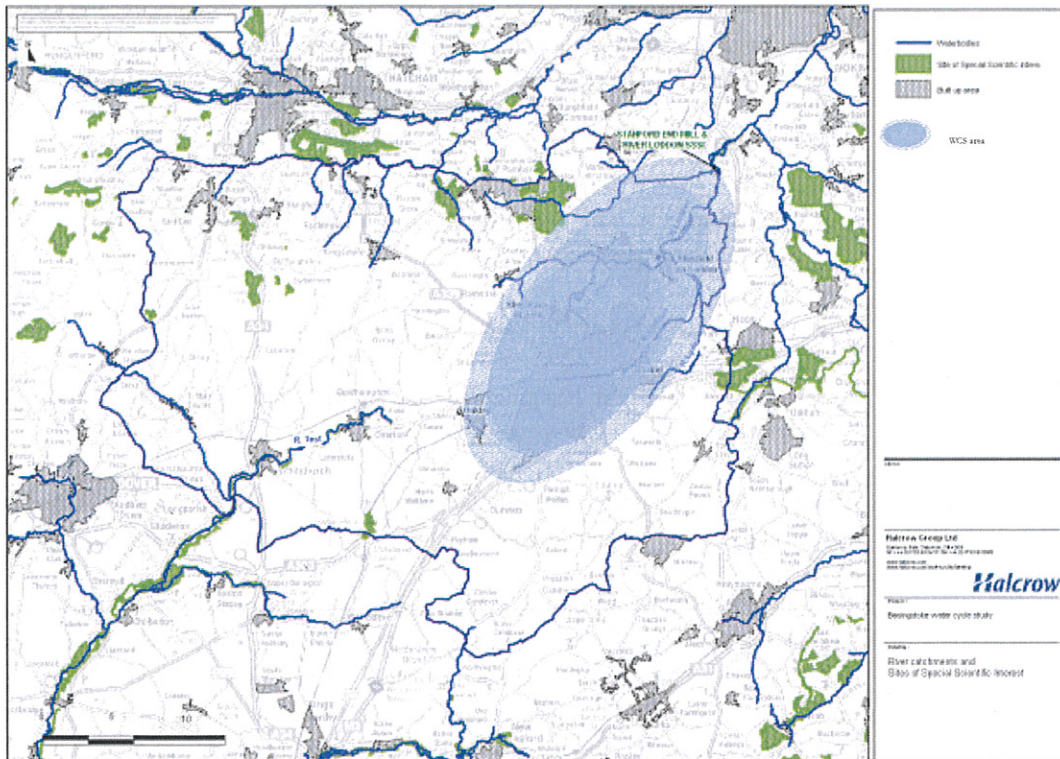



Figure E1 Water cycle study approximate boundary WCS study area denoted by 

### Environmental capacity assessment

The River Loddon catchment downstream of the Basingstoke urban area is not compliant with the Water Framework Directive good ecological status. Based on analysis of the classification data presented, the reasons for this are primarily due to treated sewage effluent discharges into the River Loddon catchment from the Basingstoke urban area, and in particular, the phosphate discharged from Basingstoke and Deane STW.

Even though Basingstoke sewage treatment treats to a very high standard, the scale of the failure of the WFD phosphate target downstream is significant. The phase 1 study identified that the observed phosphate quality in the River Loddon is approximately six times higher than the WFD standard for good status, and the modelling in this study supports that conclusion.

In terms of future population growth, sensitivity testing has been undertaken, based on levels of housing growth arising from the emerging South East Plan. This assesses provision on the basis of the Borough Council's formal position on housing numbers (740 dwellings per year), and the recently published South East Plan (945 dwellings per year, of which 915 fall within the Blackwater and Western Corridor sub-region).



A detailed water quality assessment was carried out to assess the current water quality in the catchment, and to assess the potential impact of growth on water quality. The water quality assessment has been closely linked to the ecological survey carried out by Halcrow, to help build up an over-arching understanding of the catchment.

The baseline assessment suggests water quality in the Loddon catchment is generally very good, and for the most part complies with all statutory river standards and WFD targets. The only consistent failure to achieve a standard was the failure of one component of physicochemical class due to phosphate levels downstream of sewage treatment works discharges, and a failure of the biology classification due to the diatom analysis in 2008.

Despite these failures many of the indicators of water quality and ecological quality are very good. The baseline ecological survey work also indicated that the River Loddon ecological quality was within the top 10% for rivers of its type according to one of the methods used (Mean Trophic Rank for a Type II River Community “rivers flowing in catchments dominated by clay”)

The modelling in the WCS has shown that the impact of additional treated sewage effluent from the additional development scenarios modelled is unlikely to cause a deterioration of current physicochemical status in the River Loddon. Whilst there is confidence that there will be no deterioration in chemical or physico-chemical status, there remains uncertainty regarding the impact upon biological status that may result from additional developments and an ongoing monitoring program is recommended to manage this risk.

The WCS looked at a number of possible options to meet ‘good status’ and identified that it is not possible to meet good ecological status for phosphate in the River Loddon with current available sewage treatment technology. The results also show that the different population scenarios assessed do not affect the consent changes that would be required to achieve good ecological status.

The River Loddon is already in good ecological status for Biochemical Oxygen Demand (BOD) and ammonia. To achieve good status for phosphate would require the STW to treat to standards significantly better than that achieved within conventional technology within the UK. The consent would need to be tightened from the current 1mg/l to 0.13mg/l as an annual average. There are no sewage treatment works in the UK designed to treat wastewater to meet this standard of discharge, and to treat to this standard would require the application of novel technology, with the associated uncertainties and risks. Such novel technology would require significant investment, both in terms of finance, and in terms of the carbon and energy required over the life of any plant.

The study has concluded that there will not be a deterioration in chemical or physicochemical status due to the levels of growth assessed. It has also identified a small, but unquantifiable risk that minor deterioration in phosphate levels due to growth may



cause a deterioration in diatom quality which may in turn lead to a subsequent deterioration in biological classification. Despite the extensive survey and modelling work undertaken over the last three years, it is impossible to quantify this risk with modelling, and an ongoing risk assessment and monitoring procedure is recommended to manage this risk.

#### **Wastewater treatment infrastructure capacity assessment**

In order to allow informed planning decisions to be made with respect to location and extent of housing development in Basingstoke & Deane BC area, we have looked at sewerage and sewage treatment capacity in a number of settlements.

The results of this capacity assessment shows that in general, capacity is currently limited, but that the water companies have plans and funding to provide additional infrastructure when strategic allocations are made.

Specifically, at Basingstoke STW, Thames Water have also advised that they have assessed the requirement to provide capacity to serve growth until 2021 as part of the recent assessment of capacity, and that between £10m and £20m is required to be spent on infrastructure to ensure that the STW can treat all growth until 2021. The delivery of this infrastructure has been split into two phases and Thames Water are planning this infrastructure to be funded through their asset management plan. Phase 1 of the improvements are planned to be delivered between 2010 and 2015, subject to agreement by their financial regulator in the final determination of their business plan. Phase 2 has been deferred until the next planning period 2015 – 2020.

#### **Flood risk and urban drainage**

The proposed options and areas already at risk from flooding are shown in Chapter 7. They illustrate that some development areas lie within Environment Agency Flood Zone 3. As per the PPS25 practice guide the sequential test should be used to ensure development is located in the areas at lowest risk, and that development should only occur in flood zones 2 and 3 if there are no alternative suitable sites in flood zone 1. Furthermore in zones 2 and 3 PPS25 practice guide specifies different types of land uses which are suitable depending on the flood zone. However, the WCS considers that there is enough land available for development outwith flood zones 2 and 3 for the scale of growth tested.

The WCS has also assessed the potential for proposed development options to increase downstream flood risk, for all sources of flooding. An assessment has been made of:

- foul network capacity and the potential to increase foul flooding (using critical drainage areas identified in SFRA);



- mitigation options to minimise increases in flood risk due to increase in final effluent discharge from Basingstoke STW, and;
- surface water flooding – this has been undertaken by assessing the runoff rates and volumes from the proposed development options to ensure surface water is effectively managed.

## Conclusions

The WCS has identified that the River Loddon catchment is already failing to meet good status, as required under the WFD, and that achieving good status by 2027 is a significant challenge with respect to one chemical pollutant, orthophosphate. Furthermore the evidence shows that achieving good status cannot be done by controlling diffuse pollution; rather it can only be achieved through tightening discharges from sewage effluent beyond currently accepted best available technology.

The WCS has principally assessed whether growth would cause deterioration of the current water quality and ecology in the River Loddon catchment. The water quality assessment has shown that the change in pollutant load is not significant with respect to observation and modelling uncertainty and that none of the growth scenarios examined would cause a deterioration in WFD physicochemical class<sup>2</sup>. Although there is no significant deterioration in the chemical quality of the river system caused by additional treated effluent being discharged into the river, it has not been possible to quantify the impact these small changes may have on biological quality. Based on this assessment, the WCS has shown that planned growth of between 14,800 and 18,900 dwellings can be accommodated without causing significant additional pressure on Water Framework Directive physico-chemical status, although ongoing monitoring will be required to identify potential changes in biological classification. To facilitate this, ongoing ecological surveys are recommended to monitor the impact of the development over time and create a long term (10-year) record to allow correlation of ecology, water quality and hydrology.

Water resources are not considered to be a critical issue for growth. However, the region is water stressed, and firm implementation of the water efficiency standards in the Code for Sustainable Homes through the B&DBC Design and Sustainability Supplementary Planning Document (SPD) is essential to manage demand on the water environment.

This study has shown that there is planned infrastructure capacity in Basingstoke for planned allocations and commitments up until 2016, and that strategic water services infrastructure has been assessed up to 2021.

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<sup>2</sup> There may be deterioration in numerical water quality, but there will not be deterioration of class



The assessment of urban drainage and flood risk has built on the findings of the SFRA, and has identified key constraints and requirements for the proposed development options.

The principal existing groundwater and fluvial flood risk issues in the catchment lie to the east of Basingstoke, and development in this area will need to mitigate against these risks. To the east of Basingstoke (area 7) development can be located away from Flood Zone 3, but in area 6 residential development is not recommended due to the combination of groundwater and fluvial flood risk.

Development to the west is constrained by existing capacity issues in the foul network in this part of the catchment. In the north-west there is capacity in the foul network due to the construction of additional sewage capacity in the area.

In the west and north-west, because the current infiltration regime is high, it will be difficult to maintain greenfield rate and volume from the site; this could lead to increases in runoff rate and volume to the culverted section of the Loddon, with a corresponding impact on surface water flood risk upstream of the culvert. Furthermore development West of Basingstoke will also probably lead to a reduction in groundwater recharge to aquifer, even with excellent implementation of the SUDS train. This will impact on the available developable land within these areas. It is recommended that a strategic approach to surface water drainage is adopted if development is allocated in this area, which will help to address some of the drainage concerns.

If good design standards are implemented for surface water drainage and demand management measures proposed in the Design and Sustainability SPD enforced, this study considers it unlikely that development will cause a deterioration of the ecological status of the River Loddon. The requirement to provide attenuation to manage surface water runoff provides an opportunity to create new wetland habitat as part of any development, and mitigate for any loss of habitat as part of the development

A strategic environmental assessment of the impacts on designated sites of biodiversity importance and BAP habitats is being undertaken by the council's biodiversity officers. Therefore, the risk to priority BAP habitat from impacts other than water quality and changes in hydrological regime will be assessed through this process. Site specific policies for ecological and biodiversity protection, such as policies to protect and enhance the river corridor and minimise habitat fragmentation will be developed if these sites are included within a Local Development Framework allocation policy.





The water cycle study has identified a number of policy themes to be further explored through the Core Strategy and LDF process. We have recommended that specific policies are development that cover:

Implementation of a monitoring programme

Phasing of development & intervention mechanism

Biodiversity protection and enhancement

Implementation of SPD on design and sustainability

Flood risk and surface water management

Water services infrastructure

Development near to a sewage treatment works



The water cycle study has identified a number of policy themes to be further explored through the Core Strategy and LDF process. We have recommended that specific policies are developed that cover:

- Implementation of a monitoring programme
- Review of development & intervention mechanisms
- Bioremediation protection and enhancement
- Implementation of EFD on design and sustainability
- Flood risk and surface water management
- Water services infrastructure
- Development next to a sewage treatment works

