



## **SEWER IMPACT STUDY**

**X4503 – 619**

**SMG 0990**

**PROPOSED CONNECTION AT  
GRAVEN HILL SITE D & E, BICESTER GARRISON, BICESTER**

**FOUL SYSTEM**

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**Appendices**

- A Site Plan
- B Plan Showing Local Sewers

## 1.0 Introduction

The following report was commissioned by Thames Water's Developer Services to investigate the capacity within the existing foul network and to ascertain the impact of a proposed new connection on the foul network at Bicester Garrison, Bicester.

The scope of the study is to undertake a preliminary desktop study based upon an existing hydraulic model.

The scope of the study includes:

- Carry out a manhole survey, pumping station survey and a short-term flow survey
- Model enhancement with manhole and pumping station survey data
- Verify the model using flow survey data
- Check the current performance of the existing network during both dry and wet weather events.
- Add development flows to the model and check the impact of additional flow to the sewer network during both dry and wet weather events.
- Suggest possible options to allow flows to be accepted into the existing network with no detriment to existing levels of service. It should be noted that these options are indicative and are likely to be subject to change based on site conditions, other utilities and requirements of third parties. However, the options indicate the feasibility of connecting the site to the sewerage system and the ability of the sewerage system to accept the development.

## 2.0 Background

The proposed new development is on a mixed Greenfield/Brownfield site and the Developer has proposed to accommodate 1750 residential units, a school, employment and general industries. The development area is situated in the town of Bicester, Oxfordshire, approximately 23km to the southeast of Banbury.

The development area is bounded by the A41 to the northeast and a railway line to the southwest.

The foul flow from the development area has been calculated, using the latest Thames Water guidelines, as an average gravity flow of 46.06l/s.

The development site is divided into five catchments. The flow for each catchment and connection manhole provided by Developer is as below,

Catchment 1A - Foul flow of 6.93l/s from catchment 1A has been connected to manhole SP58218201, located upstream of Rodney House Sewage Pumping Station.

Catchment 1B - Foul flow of 2.67l/s from catchment 1B has been connected to manhole SP58218201, located upstream of Rodney House Sewage Pumping Station.

Catchment 1C - Foul flow of 4.66l/s from catchment 1C has been connected to manhole SP59206201, located upstream of Graven Hill Sewage Pumping Station.

Catchment 2A - Foul flow of 1.11l/s from catchment 2A has been connected to manhole SP58200203, located upstream of Graven Hill Sewage Pumping Station.

Catchment 2B (B1a) - Foul flow of 4.01l/s from catchment 2B (B1a) has been connected to Graven Hill Sewage Pumping Station.

Catchment 2B (B2) - Foul flow of 26.68l/s from sub catchment 2B (B2) has been connected to Graven Hill Sewage Pumping Station.

A plan showing the location of the development and connection points is provided in Appendix A.

### **3.0 Existing Sewerage System**

The area in the vicinity of the development site is served by a separate foul and surface water sewer network.

From the development site, flows would drain in a north-easterly direction towards Rodney House Sewage Pumping Station, or in a southerly direction towards Graven Hill Sewage Pumping Station. Flows ultimately arrive at Bicester Sewage Treatment Works (STW), which is located to the northwest of the development site.

Flows travel through sewers ranging from 225mm diameter to 900mm diameter from the development area towards Bicester STW.

The local foul sewers are shown in the plan provided in Appendix B.

### **4.0 Thames Water Drainage Requirements**

It is necessary to provide separate foul and surface water drainage systems and to ensure that each system is connected to an appropriate drainage system.

As the Developer proposes to connect only foul flows into the existing network, this report only covers the impact of the foul sewage flows from the proposed development on the existing foul sewer networks adjacent to and downstream of the proposed development. Surface water flows from the proposed development are not considered in this report and should not be connected to the foul sewer network.

Additional development flows should not cause new or additional flood risk to the existing system in either dry or wet weather.

### **5.0 Sewer Impact Assessment**

Assessment of the hydraulic loading of the foul network was carried out by means of an existing hydraulic model.

The model was enhanced with the results of a manhole and pumping station survey carried out in the study area. A flow survey was also completed to enable a verification exercise to be completed, and to confirm the current flows in the sewer network.

The proposed new development area and connection point details were added to the model and the assessment completed to identify the impact of the proposed new development.

The analysis of the catchment indicates that the foul network is responsive to rainfall, with flooding being a risk in the catchment for extreme events.

The impact of the proposed foul connection manholes was assessed based on the design flows detailed in Section 2.0.

## 5.1 Foul Sewers

### 5.1.1 Assessment of Existing Catchment

The hydraulic model indicates that the existing foul network does have available capacity downstream of the proposed connection manholes. The hydraulic model has been used to assess wet weather scenarios of various durations. During these wet weather events, the hydraulic model predicts network surcharge and flooding to occur.

### 5.1.2 Assessment of Development Catchment

An analysis has been completed to assess the impact of connecting the flows from the development into the public sewer. An allowance of 46.06l/s average gravity flow was used to represent the development.

**Table 1: Proposed Development Connection Details**

Connection	Manhole	Diameter of Outgoing Sewer
Development Site 1A	SP58218201	225mm
Development Site 1B	SP58218201	225mm
Development Site 1C	SP59206201	225mm
Development Site 2A	SP58200203	375mm
Development Site 2B (B1a)	SP58199701 (Graven Hill SPS)	---
Development Site 2B (B2)	SP58199701 (Graven Hill SPS)	---

### 5.1.3 Foul System Improvement Works

On removal of existing flows and inclusion of proposed development flows, the hydraulic model indicates that the foul network is able to accept the proposed development flows without causing detriment to the current level of service provided. Therefore, improvements to the existing foul sewer network would not be required.

## 6.0 Risks and Issues

Current understanding of the hydrology of urban environments recognises that the effective pervious area (the pervious proportion of the catchment that produces surface runoff and generates flow in the sewer) is likely to exhibit a dynamic nature in relation to increasing volumes of rainfall, i.e. the more rainfall the greater the resulting effective pervious area is likely to be.

Whilst the hydrological models deployed attempt to simulate this dynamic behaviour, there is a risk that the model, when extrapolated to storm events, will not accurately predict the flows in the system. Therefore, any potential error is multiplied when the system is tested against a large design storm.

The proposed development site is located within the Environment Agency's Risk of Flooding from Surface Water area, and the drainage of the site is therefore at risk of surface water ingress. The Developer should undertake necessary measures to ensure that the foul sewers are adequately protected against surface water ingress.

## **7.0 Conclusions**

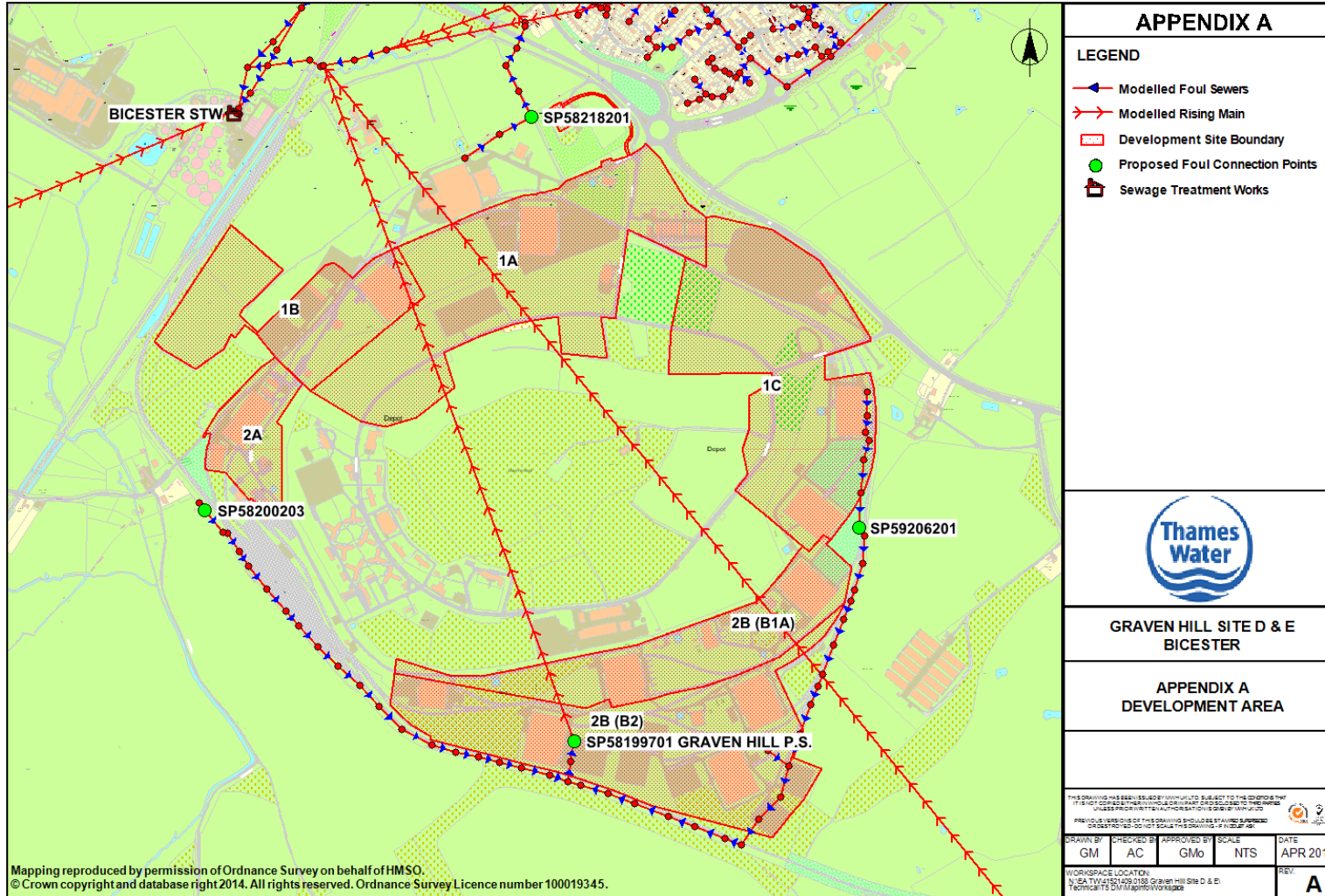
The desktop study has successfully investigated and identified the implications of the proposed new development on a mixed Greenfield/Brownfield site at Bicester Garrison, Bicester to the existing foul network.

The hydraulic model indicates that the foul network does have available capacity downstream of the proposed connection manholes to accept the proposed development flows on removal of the existing flows from the site.

Improvements to the existing foul network are not required to enable the proposed connection to the sewer network, without causing any detriment to the level of service provided.

The issues highlighted and discussed throughout this report are recommendations to Thames Water Utilities and may be altered/added to based upon local operational knowledge of the system.

Appendix A – Site Plan



Appendix B – Local Sewers

