



**Longford Park,
Banbury**

Foul Drainage Strategy

Final Report for



**BARRATT
HOMES**



**Taylor
Wimpey**

January 2016 Version 5

Hydrock Ref: C151016/FDS-01

16/00042/DISC

DOCUMENT CONTROL SHEET

Issued by: Hydrock Consultants Limited
Over Court Barns
Over Lane
Almondsbury
Bristol
BS32 4DF

Tel: 01454 619533
Fax: 01454 614125
www.hydrock.com

Client: Barratt Homes, Bovis Homes and Taylor Wimpey

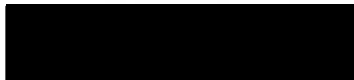

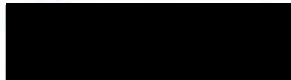
Project: Longford Park, Banbury

Title: Foul Drainage Strategy

Status: Draft

Date: January 2016

Document Production Record

Issue Number:	5	Name	Signature
Prepared		Eirian Crabbe <i>Senior Infrastructure Engineer</i>	
Checked		Ted Stokes <i>Infrastructure Director</i>	
Approved		Eirian Crabbe <i>Senior Infrastructure Engineer</i>	

Document Revision Record

Issue number	Date	Revision Details
1	16 th October 2015	Draft report for comment
2	7 th December 2015	Final Report for approval
3	12 th January 2016	Updated Final Report for approval
4	18 th January 2016	Updated Final Report for approval
5	19 th January 2016	Updated Final Report for approval

Hydrock Consultants Limited has prepared this report in accordance with the instructions of the above named clients for their sole and specific use. Any third parties who may use the information contained herein do so at their own risk.

CONTENTS

1.0	INTRODUCTION.....	2
2.0	SITE INFORMATION.....	3
2.1	Location.....	3
2.2	Topography.....	3
2.3	Proposed Development.....	4
3.0	FOUL DRAINAGE STRATEGY.....	5
3.1	Background.....	5
3.2	Phasing Strategy.....	6
3.3	Phasing Summary.....	10
3.4	Conclusion.....	11

FIGURES

Figure 1	Site Location.....	3
Figure 2	Proposed Development and Phases.....	4
Figure 3	Location of Existing Thame Waster Infrastructure.....	5
Figure 4	Foul Drainage Strategy.....	8

TABLES

Table 1	Site Referencing Information.....	3
Table 2	Phasing and storage requirement up to the end of 2016.....	10
Table 3	Phasing and storage requirement after the end 2016.....	10

APPENDICES

Appendix A: C151016 SKC02 - Proposed Rising Main Layout

1.0 INTRODUCTION

This report has been prepared by Hydrock on behalf of Barratt Homes, Bovis Homes and Taylor Wimpey (hereafter referred to as the Consortium). Outline planning permission has been granted for the proposed development of 1070 residential dwellings with associated facilities including primary school, playing fields shops and community facilities. This report specifically targets condition 24 of the Notice of Decision that grants consent for the development REF 05/01337/OUT:

- 24** *No development shall commence until a scheme for dealing with foul drainage from the site, including phased works, has been submitted to and approved in writing by the Local Planning Authority. The foul drainage shall thereafter be carried out in accordance with the approved scheme.*

Reason - To ensure that the development/site is served by proper arrangements for the disposal of foul sewage, to comply with the Environmental Statement government advice in PPS25, Policy NRM4 of the South East Plan 2009 and Policy ENV1 of the adopted Cherwell Local Plan.

A foul drainage strategy was produced by Atkins in March 2015 Ref; FWDS LP. The foul drainage strategy outlined in this report relies on over 4km of sewer upgrades downstream of the proposed development. Ongoing discussions with Thames Water have identified an alternative approach which is documented in this report. The purpose of this report is to confirm the phased foul strategy that will be implemented for this development.

2.0 SITE INFORMATION

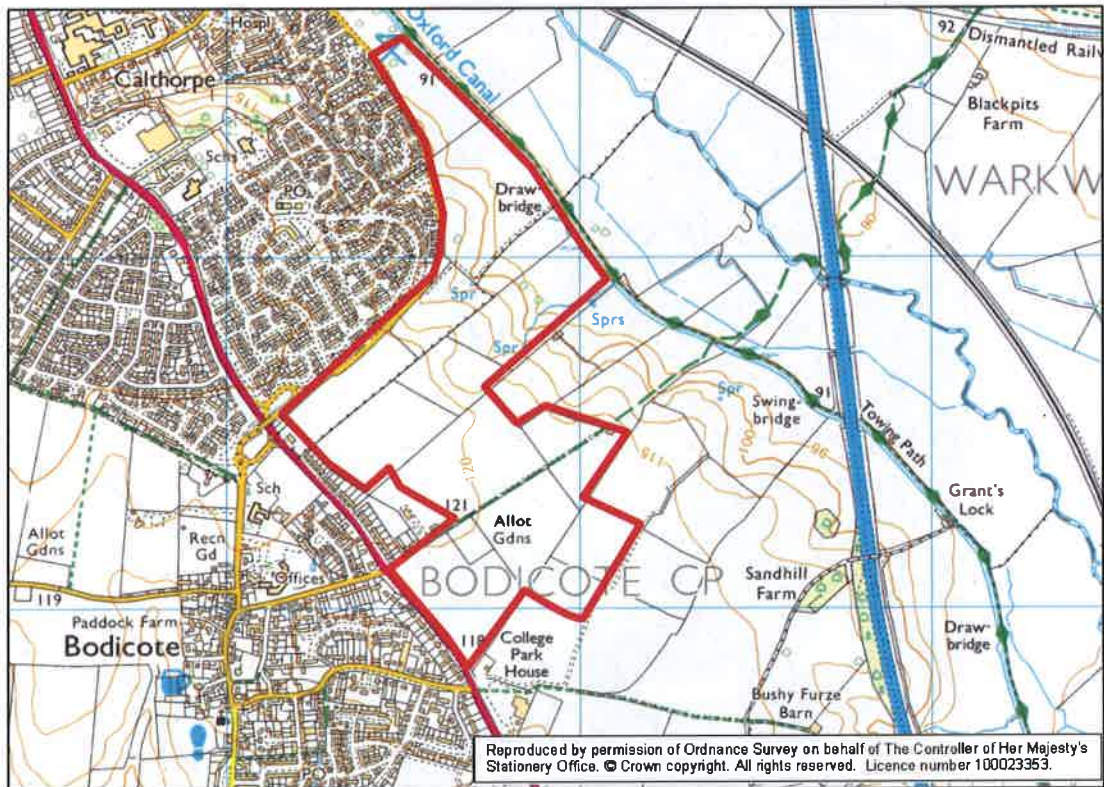
2.1 Location

The site is located to the south of Banbury and to the east of Bodicote, Oxfordshire. The address and Ordnance Survey grid reference of the site are given in Table 1.

Table 1 Site Referencing Information

Site Address	Longford Park, Banbury, OX14 4AE (approximate)		
Site Area	75ha (including open space and parkland)		
Grid Reference	OSX 446600, OSY 238500	SP 466385	Lat: 52.0295 Long: -1.32198

Figure 1 Site Location



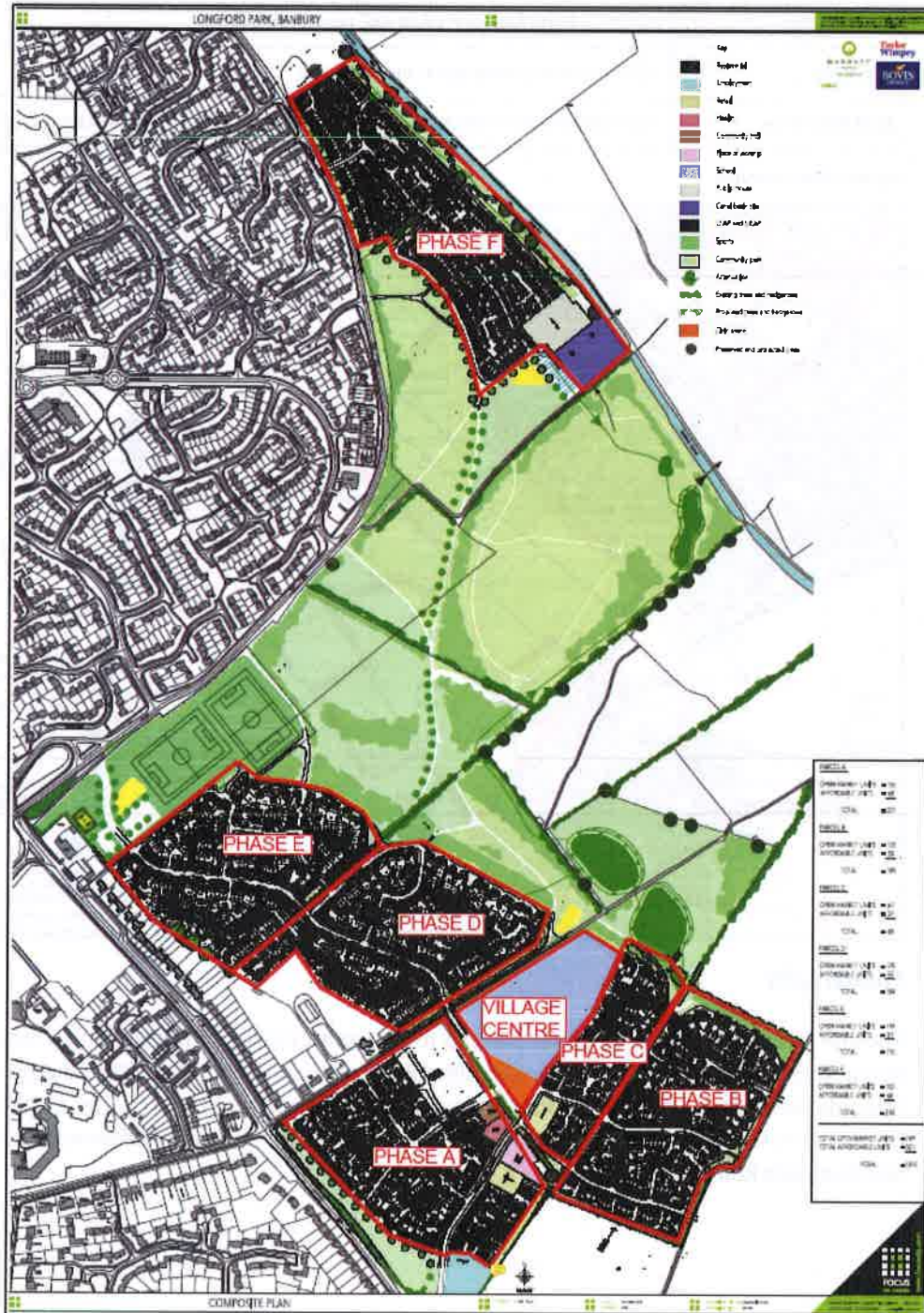
2.2 Topography

The site has a gently sloping upper plateau to the south (max 123m AOD) and a steeply sloping mid and lower section to the north (min 89m AOD). The site generally falls to the north and east towards the Oxford Canal which forms the northern boundary of the site. The eastern boundary of the site is formed by farmland with the south and western boundaries formed by Oxford Road and Bankside Road respectively.

2.3 Proposed Development

The proposed development consists of 1070 residential dwellings split between 6 phases along with a mixed used Village Centre phase as shown in Figure 2 below. The development was allocated in Cherwell District Local Plan in 2000 and received outline planning consent in 2009, REF 05/01337/OUT.

Figure 2 Proposed Development and Phases



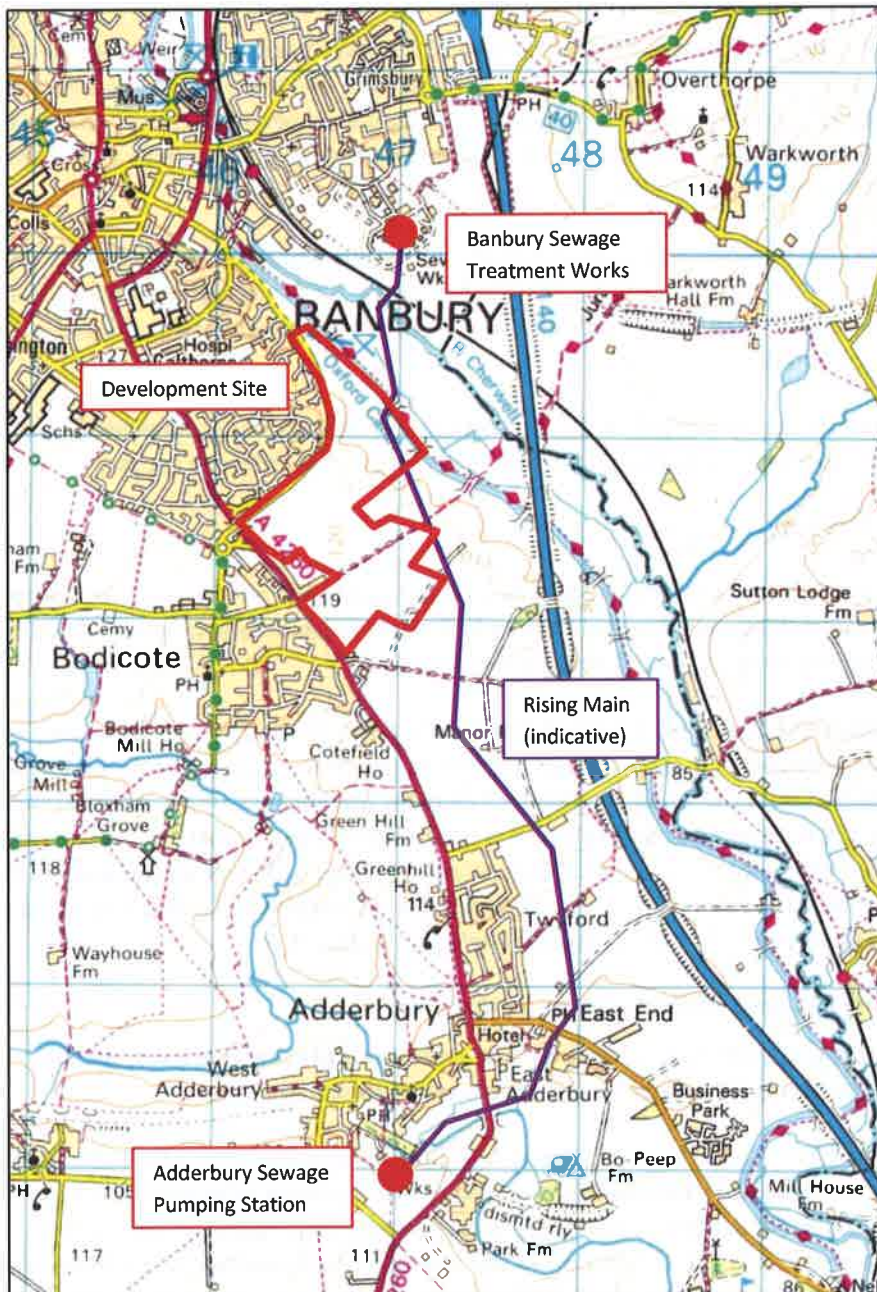
The number of dwellings in each phase and the expected construction timescales are shown in Section 3.3.

3.0 FOUL DRAINAGE STRATEGY

3.1 Background

The development is located 1 km south of Banbury Sewage Treatment Works (STW) however due to the topography of the site a gravity sewer connection to this STW is not possible. Existing properties in Bodicote to the west of the site are served by a Thames Water gravity system that flows approximately 2.5km south to Adderbury Sewage Pumping Station (SPS). The Adderbury SPS connects to the Banbury STW by a 500mm diameter rising main that runs, partly by gravity, along the eastern edge, and within the northern are of the development site. Locations of existing drainage infrastructure are shown in figure 3 below. Thames Water plans of the existing rising main are included in Appendix A.

Figure 3 Location of Existing Thame Waster Infrastructure



Thames Water have confirmed that the Banbury STW has sufficient capacity to receive all foul flows from the proposed development. However the existing sewer network between Bodicote and Adderbury SPS is known to have capacity issues and hydraulic modelling carried out by Thames Water confirms that surcharge and flooding occurs during the 1 in 20 year return period. Furthermore, Thames Water have identified a potential resilience concern with the existing rising main between Adderbury SPS and Banbury STW.

Two Sewer Impact Studies have been completed by Thames Water for the Consortium. The first study (ref; X4503-586 SMG 1381) looked at the impact of a new connection from Phase A of the development. The study confirmed that if a foul connection of 9.85l/s from the 215 dwellings was to be made then significant sewer upgrades would be required downstream. The study also identified a temporary option of providing an on-site pump station with attenuation that would attenuate foul flow when the downstream system is at capacity.

The second study (Atkins ref; X4503-586 SMG 1382) looked at the impact of a new connection from the whole of the development. The study outlines two options; one for a foul connection to the existing sewer network in Canal Lane with significant sewer upgrades downstream; and a second option of a new pump station serving the whole development with a rising main connection to the Banbury STW.

The Atkins Foul Strategy Report, March 2015, confirms the proposed strategy is to provide an on-site pump station for phases A-E (PS1) and a second on-site pump station for Phase F (PS2), it also confirms that the 4km of sewer upgrades between the development site and Adderbury SPS would be required.

Subsequent discussions between the Consortium and Thames Water have resulted in an alternative approach being developed that is detailed in the following section.

3.2 Phasing Strategy

Phase A is already constructed and foul flows discharge to the on-site pumping station PS1. Flows are currently pumped to the existing foul sewer in Canal Lane at a rate of 9.85l/s in line with the agreed strategy with Thames Water.

Thames Water have previously agreed that for any flows discharging to Canal Lane, attenuation storage and emergency storage is required. The attenuation storage is required for 12 hrs, which equates to 300 litres per dwelling (plus 14.3 cu.m for the Village Centre), whilst emergency storage is 160 litres per dwelling (plus 7.9 cu.m for the Village Centre). PS1 has already been constructed with a total storage of 250 cu.m, and provides sufficient attenuation and emergency storage for all flows from phases A to C and flows from the Village Centre. A breakdown of the storage requirements for each phase is including in Section 3.3.

In summary PS1 has sufficient storage capacity for:

- **495 plots and Village Centre with attenuation and emergency storage; or**
- **1513 plots and Village Centre with emergency storage only**

Subsequently Thames Water have now agreed that all flows from the whole development can discharge to the existing 500mm diameter rising main between Adderbury SPS and Banbury STW. This will avoid the reliance of upgrade works being undertaken on the existing downstream network. The connection to this existing rising main can be made following completion of a condition survey of the rising main and completing any improvement works required. Thames Water has also agreed to fully fund the 'condition survey' and all identified pumping main improvements arising from the survey findings.

Following completion of the existing rising main condition survey and any necessary remediation, the outflow from PS1 will be diverted into a new pumped connection heading north east towards the gravity section of the existing 500mm rising main, instead of discharging to Canal Lane. Outgoing flows from PS1 will discharge at 15 l/s.

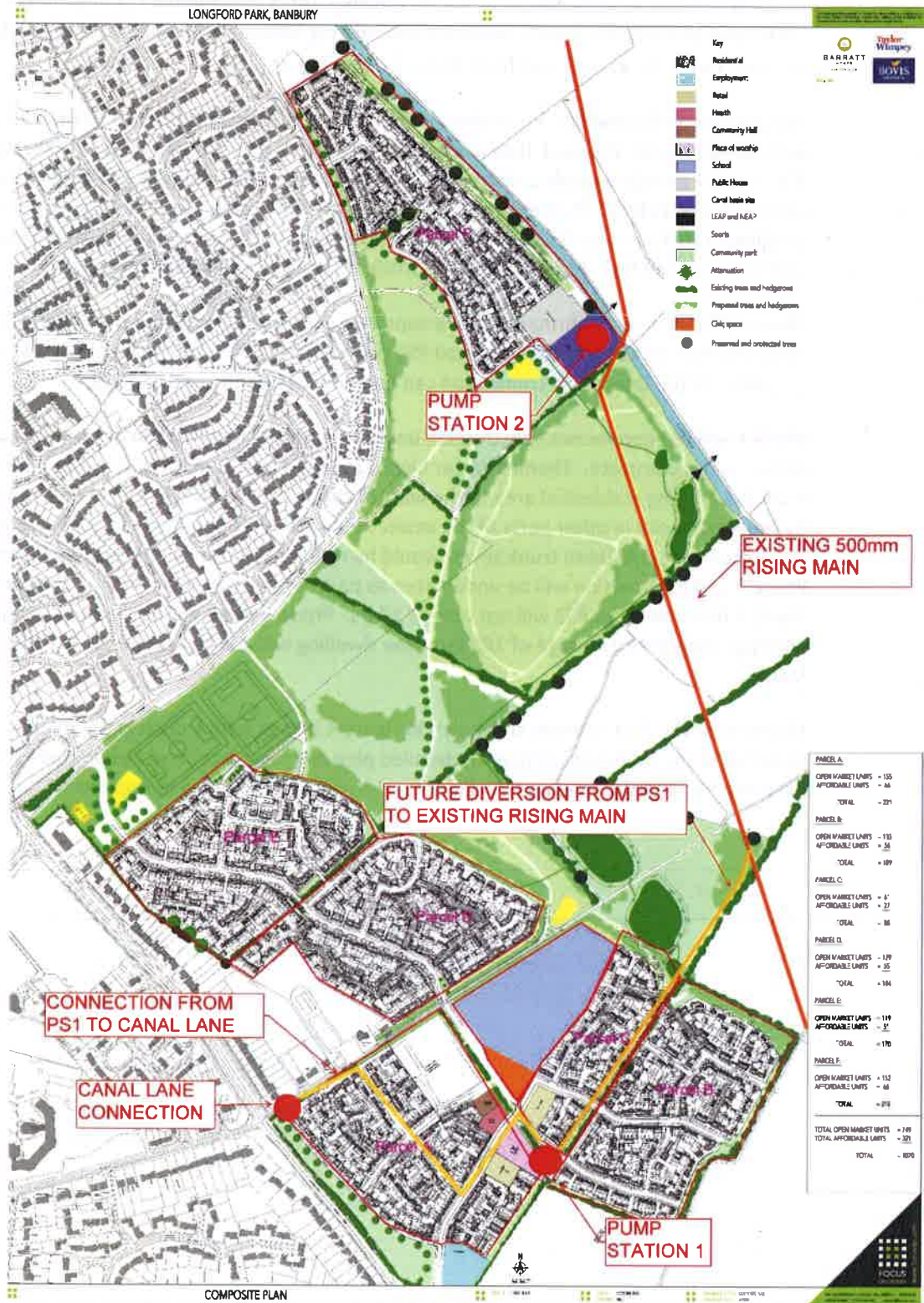
The average daily flow rate for all plots within phases A-E discharging into PS1 is 5.92 l/s (852 plots at 600 l/day). The peak flow discharging into PS1 is 39.4 l/s (852 plots at 4000 l/day). The 250 cu.m of storage already constructed at PS1 provides sufficient capacity for over two hours of continuous peak flow. Thames Water have confirmed that emergency storage of 160 litres per dwelling (136.3 cu.m for 852 plots) is required in the event of pump failure. The existing storage and forward flow from PS1 is therefore sufficient for all plots within Phases A-E.

Thames Water have confirmed that the condition survey will be carried out in early 2016 and are committed to authorising the proposed PS1 connection to the rising main as soon as reasonably possible. At the latest, this connection can be made before the end of 2016.

Phase F will not commence construction until all necessary remediation of the existing 500mm rising main is complete. Thames Water have expressed an intention to re-route additional flow from the existing residential area to the west of the site (Bankside) to PS2 in order to improve hydraulic capacity in other parts of the sewer network. Although the full details are yet to be confirmed, a new 450mm trunk sewer would be required to convey the existing flows through Phase F and its provision will be undertaken as part of the Consortium works. Discharge of Phase F foul flow from PS2 will not exceed 10 l/s. Phase F flows will not require attenuation although emergency storage of 160 litres per dwelling will still be required in the event of pump failure.

Elements of the foul strategy are shown in Figure 4 below, with a description of each phase provided in the following sections. A detailed plan and long section of the proposed rising main between PS1 and the existing 500 diameter rising main is included in Appendix A.

Figure 4 Foul Drainage Strategy



3.2.1 Phase A: 221 Plots Completed

Phase A has been constructed with a Section 106 agreement in place for a connection from the development to the existing Thames Water sewer in Canal Lane. PS1 has been constructed with telemetry and on-site attenuation storage that ensures that there are no flows from the development when the existing sewers are surcharged. This pumping station has been built with sufficient storage capacity to facilitate Phase A and receive the additional foul flows from phases B, C, and the Village Centre.

Flows from this pump station will be diverted to the existing 500mm rising main following completion of the condition survey and remedial works. Following the diversion, no attenuation storage will be required. The storage already constructed in PS1 can be used for emergency storage for these plots.

3.2.2 Phases B, C and Village Centre: 277 Plots from Jan 2015 – mid 2018

Foul flows from phases B, C and the Village Centre will discharge by gravity to PS1 that has already been constructed for Phase A. Attenuation and emergency storage has already been constructed to allow for the additional flows from these phases.

Flows from this pump station will be diverted from Canal Lane to the existing 500mm rising main following completion of the condition survey and remedial works no later than the end of 2016. From the total construction period of 3.5 years it can be assumed that 57% of the plots (159) will be completed in the two year period up to the end of 2016.

Following the diversion, no attenuation storage will be required. The storage already constructed in PS1 can be used for emergency storage for these plots.

3.2.3 Phases D and E: 354 Plots from Mid 2016 – end 2018

Foul flows from phases D and E will also discharge by gravity to PS1 that was built for Phase A. From the total construction period of 2.5 years it can be assumed that 20% of the plots (71) will be completed in the half year period up to the end of 2016.

Up to the end of 2016 a total of 451 plots will be constructed plus the Village Centre (221 from Phase A, 159 from Phase B+C and 71 from Phase C+D). As stated in section 3.2 PS1 has been constructed with sufficient attenuation and emergency storage for 495 plots plus the Village Centre. Therefore, up to the end of 2016, PS1 can accommodate flows from all phases whilst continuing to discharge to Canal Lane.

Following the diversion from PS1 to the existing 500 diameter rising main by the end of 2016, no attenuation storage will be required. The storage already constructed in PS1 can then be used for emergency storage for all plots from these phases.

3.2.4 Phase F: 218 Plots from Mid 2018 – end 2020

Foul flows from phase F will discharge by gravity to PS2 to the south of the phase. The condition survey and any necessary remedial works on the 500mm rising main will be undertaken and completed by the time Phase F has commenced.

Thames Water has requested, and it has been agreed, that the Consortium will design and construct a 450mm trunk sewer to accept the diverted flow from Bankside. This sewer will also accommodate future flows from Phase F and connect to PS2. Emergency storage for Phase F plots PS2 will be required in the event of pump failure.

3.3 Phasing Summary

The following tables give a summary of the phases of the development and the storage requirements prior to, and following completion of, the condition survey and remedial works to the existing 500mm rising main by the end of 2016.

Table 2 Phasing and storage requirement up to the end of 2016

Pumping Station 1: Total Storage of 250 cu.m				
PHASE	Dwellings	Construction Period	Dwellings completed by end 2016	Storage Required ^a
A	221	Completed	221	101.7 cu.m
Village Centre	0	Jan 2015 – Mid 2018	0	22.2 cu.m
B	189	Jan 2015 – Mid 2018	108	49.7 cu.m
C	88	Jan 2015 – Mid 2018	51	23.5 cu.m
D	184	Mid 2016 – End 2018	37	17.0 cu.m
E	170	Mid 2016 – End 2018	34	15.6 cu.m
TOTALS	852		451	229.7 cu.m

^a Storage required is based on 300 l/dwelling for attenuation and 160l/dwelling for emergency storage

Table 3 Phasing and storage requirement after the end 2016

Pumping Station 1: Total Storage of 250 cu.m			
PHASE	Dwellings	Construction Period	Storage Required ^b
A	221	Completed	35 cu.m
Village Centre	0	Jan 2015 – Mid 2018	8 cu.m
B	189	Jan 2015 – Mid 2018	30 cu.m
C	88	Jan 2015 – Mid 2018	14 cu.m
D	184	Mid 2016 – End 2018	29 cu.m
E	170	Mid 2016 – End 2018	27 cu.m
TOTALS	852		143 cu.m
Pumping Station 2			
PHASE	Dwellings	Construction Period	Storage Required ^b
F	218	Mid 2018 – End 2020	35 cu.m
Bankside	N/A		250 cu.m ^c
TOTALS	N/A		285 cu.m

^b Storage required is based on 160l/s for emergency storage with no attenuation needed.

^c Existing dwellings from bankside to be diverted to PS2, storage volume provided by Thames Water

3.4 Conclusion

PS1 has already been constructed with 250 cu.m of storage that provides sufficient emergency and attenuation storage for all plots Phases from A-C. This attenuation storage is required due to insufficient capacity in the downstream Thames Water Sewers. The existing outflow from PS1 to the existing Thames Water Sewer in Canal Lane is 9.5 l/s.

In accordance with Thames Water's latest proposals, an alternative connection can be made from PS1 to the existing 500mm diameter rising main. The connection to Canal Lane would then no longer be required. This connection can be made following a condition survey and remedial works on the existing rising main. Thames Water have agreed to fully fund the survey and necessary remedial works and are committed to authorising the proposed PS1 connection to the rising main as soon as reasonably possible. At the latest, this connection can be made before the end of 2016.

Following the new connection to the rising main, attenuation storage is no longer required. Emergency storage is still required and the 250 cu.m already constructed in PS1 provides sufficient storage for all plots from A-E. The discharge rate from PS1 to the existing rising main will be 15.0 l/s.

As a result of these proposals, there will be no adverse impact on the existing off-site Thames Water Sewers or the on-site sewers.

