



Wykham Park Farm Drainage Strategy Report

For L & Q Estates

Date: 24 November 2020

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1. INTRODUCTION

This report has been prepared by Hydrock Consultants Limited (Hydrock) on behalf of our client L & Q Estates in support of a discharge of conditions application for condition 10 of the outline planning permission 14/01932/OUT to be submitted to Cherwell District Council for the proposed residential development at Wykham Park Farm, Banbury.

Condition 10

"Prior to the commencement of any development on this site, including the preliminary earthworks proposed under condition 50, full details of a site wide sustainable drainage strategy, in accordance with the principles set out in Section 14 of the NPPF, together with the results of the assessment provided to the LPA and details for its future management, required in relation to the whole development, shall be submitted to and approved in writing by the Local Planning Authority. Thereafter, the agreed drainage works shall be carried out and completed in accordance with approved strategy."

2. SITE INFORMATION

2.1 Existing Situation

2.1.1 Location

Table 1 provides the summary site location details and figure 1 shows the site location and redline boundary.

Table 1: Site Referencing Information

Site Address	Wykham Park Farm, Bloxham Road, Banbury, OX16 9UP
Grid Reference	444236, 238728 SP44663869

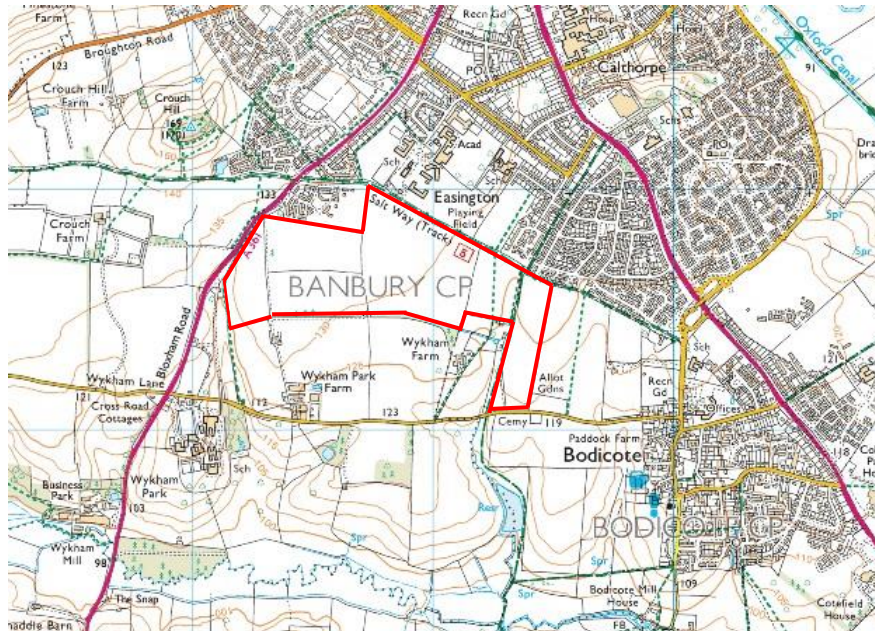


Figure 1: Location & Site Boundary

2.1.2 Existing Land Use

The site is approximately 52.5Ha in size located to the south of the centre of Banbury. The surrounding area is mainly characterised by agricultural land to the south & west and residential areas to the north and east. The site is bounded by Bloxham Road to the west the Salt Way public footpath to the north agricultural fields to the east and south.

The site is currently wholly greenfield with no significant areas of hardstanding. An existing field drainage ditch runs from west to east along the southern boundary of the site. This ditch runs in a southerly direction before discharging to the Sor Brook approximately 1.2km to the south.

2.1.3 Topography

A site-specific topographical survey has been provided and indicates that the site falls from west to east. With levels ranging from 132.90mAOD in the north west corner to 119.45mAOD in the south east corner. A copy of the topographical survey is included in Appendix A.

2.1.4 Proposed Development

The proposed development is for up to 1000 properties with a mixed-use local centre, primary school, secondary school, public open space and sports facilities. This also includes provision of a new access off Bloxham Road in the form of a new roundabout a central spine road through the centre of the site and provision of cycling and pedestrian routes.

3. SURFACE WATER DRAINAGE

3.1 Pre-Development

The site is currently agricultural land and is therefore considered to be wholly greenfield with very few impermeable areas. The topography of the site drains to the south east corner where an existing field ditch running along the southern boundary will collect any overland flow, which will eventually discharge to the Sor Brook to the south of the site.

There are existing Thames Water public surface water sewers within the site boundary running along the western most edge of the site from north to south and also in the far edge of the north western corner of the site. Thames Water asset plans can be found within Appendix D

It has been found that existing ground conditions are not conducive to the use of infiltration techniques due to the presence of Whitby Mudstone Formations over the majority of the site, Marlstone Rock formations in the south and south west of the site and Dryham formations in the far western end of the site. A Hydrock ground investigation report (Ref: WPF-HYD-XX-XX-RP-G-1001) carried out infiltration testing at 9 separate locations across the site where it was not possible to record a suitable infiltration rate due to the impermeability of the underlying strata.

One test was carried out within Dryham formation found in the western end of the site; this test provided a suitable infiltration rate however this formation is only exposed in the far west of the site remote from the proposed housing areas so is not considered representative of the ground below the wider development.

3.2 Post-Development Surface Water Drainage Strategy

The proposed development will create an increase in impermeable areas within the site and as such will increase both the volume and run-off rate of surface water.

As outlined above it is not considered that discharge of surface water via infiltration is a viable method of surface water discharge, therefore the next preferable option is to discharge to the nearest water course. The discharge from the site shall be restricted to the QBAR greenfield run-off rate of 2 litres/second/hectare (l/s/h). This discharge rate has been agreed with the Environment Agency as shown in the Wardell-Armstrong Flood Risk Assessment (Ref: CA10769 002).

It is proposed that the site is separated in to two separate catchment areas with a separate discharge point for each catchment. In accordance with the Flood Risk Assessment and strategy submitted as part of the outline application it was always assumed that the site would need to drain in to outfalls outside

of the application site. In this instance, surface water will be drained via two points of connection in Wykham Lane. The areas for each of the catchments can be seen in Figure 2 below.

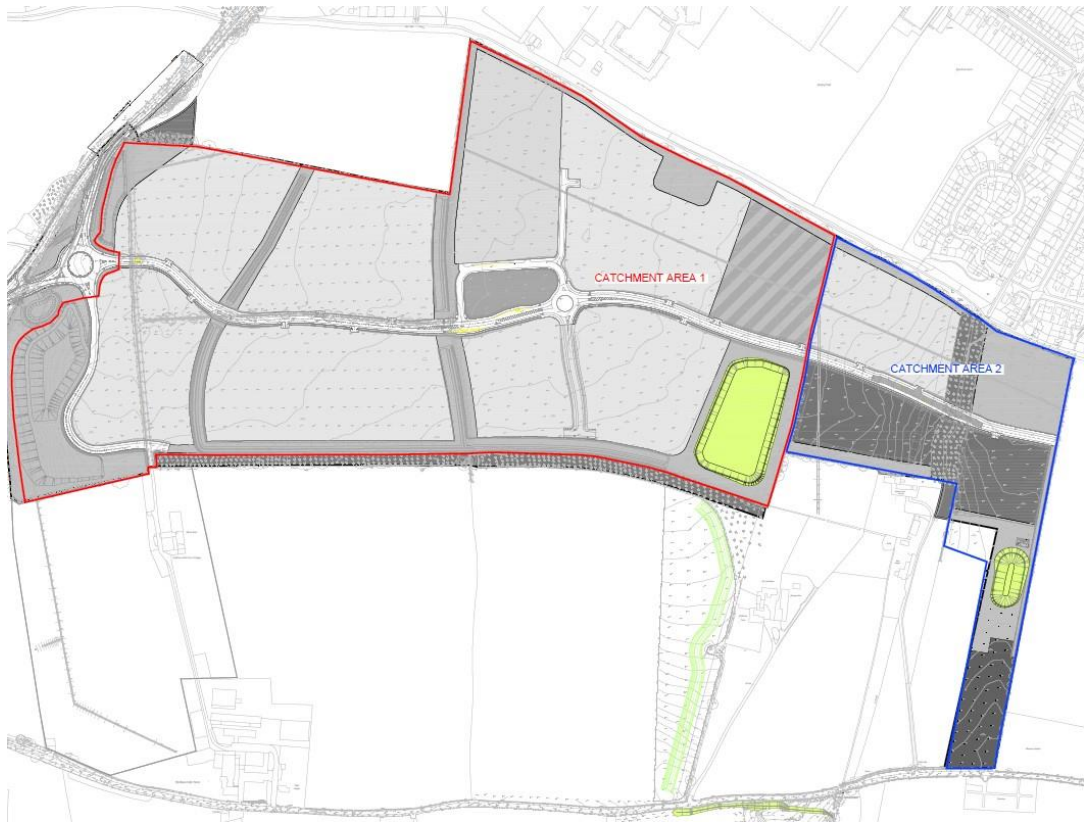


Figure 2: Surface Water Discharge Catchment Areas

The total proposed impermeable area for catchment 1 is 19.82ha and catchment 2 is 2.50ha. Tables 3 & 4 give a breakdown of the individual proposed impermeable areas for each catchment, consisting of residential parcels, primary school, secondary school sports pitches, local centre, spine road and sports pitches. Without a defined layout for each of the proposed development parcels the following impermeability rates shown in Table 2 have been used for the different development types.

Table 2: Development Impermeability Rates

Development Type	Percentage Impermeable (%)
Residential	65
Primary School	50
Secondary School (Sports Pitches)	50
Local Centre	90
Spine Road	100

In addition to the rates shown in Table 2 an additional 10% of impermeable area has been added to the residential parcels to compensate for urban creep.

Table 3: Catchment 1 Proposed Impermeable Areas

Parcel Name	Parcel Area (Ha)	Developed Area (Ha)	Urban Creep (Ha)	Total Developed Area (Ha)
R1 (Residential Area 1)	2.85	1.85	0.185	2.035
R2	2.90	1.88	0.188	2.068
R3	3.40	2.20	0.22	2.42
R4	4.16	2.70	0.27	2.97
R5	4.00	2.60	0.26	2.86
R6	4.66	3.03	0.303	3.33
Primary School	3.03	1.52	n/a	1.52
Secondary School (Sports Pitches)	1.83	0.92	n/a	0.92
Local Centre	0.8	0.72	n/a	0.72
Spine Road	2.40	2.40	n/a	2.40
Total	30.03	19.82		
			Total	21.255

Table 4: Catchment 2 Proposed Impermeable Areas

Parcel Name	Parcel Area (Ha)	Developed Area (Ha)	Urban Creep (Ha)	Total Developed Area (Ha)
R7	2.00	1.30	0.13	1.43
Sports Pitches	2.288	0.684	n/a	0.684
Spine Road	0.506	0.506	n/a	0.506
			Total	2.62

The location of the parcels outlined in Table 3 & 4 can be seen on the drainage strategy drawings (WPF-HYD-XX-XX-DR-C-0601-0605) in Appendix B.

3.2.1 Catchment 1

The total proposed developed impermeable area for Catchment 1 (not including urban creep) is 19.82ha. The surface water discharge rate from this catchment will therefore be restricted to the QBAR run-off rate of 39.6l/s

Attenuation will be provided for the total proposed impermeable area including the urban creep which is 21.255ha. The attenuation is provided within a proposed basin in the south west corner of the catchment. This has been sized to accommodate surface water discharge for events up to and including the 1 in 100-year event plus 40% allowance for climate change. The maximum volume of storage required for catchment 1 for this event is 15113m³

In addition to the proposed attenuation basin a network of swales will provide additional storage and conveyance for each of the individual parcels. The proposed network of swales is shown on drainage strategy drawings WPF-HYD-XX-XX-DR-C-0601 to 0605. The swale network is designed to hold water upstream to slow the rate of discharge to the attenuation basin. This will also prevent rainfall from smaller storms i.e. 5mm or less from reaching the water course at the final discharge point.

The swale sections are designed to be two stage in profile with storms up to the 1 in 30 year event remaining in the lower stage and events up to and in excess of 1 in 100 year plus climate change using the higher stage of the swale section. Profiles of the proposed swales can be seen in Appendix C.

3.2.2 Catchment 2

The total proposed development area for catchment 2 (not including urban creep) is 2.50ha. The surface water discharge rate from this catchment will therefore be restricted to QBAR run-off rate 5.0l/s (based on 2l/s/ha)

A separate attenuation basin will be provided for catchment 2 for the total proposed impermeable area including urban creep of 2.62ha. The attenuation basin provided is situated at the eastern end of the development adjacent to the allotments. This basin has also been sized to provide attenuation for storms up to and including the 1 in 100-year event plus 40% allowance for climate change.

The maximum storage volume required for catchment 2 for this event is 1897m³. The discharge location for catchment 2 is via the same field drainage ditch as catchment 1. This connection is to be made via a new surface water sewer along Wykham Lane to the south of the development.

Table 5: Attenuation Storage Half Drain Times

Catchment	Attenuation Volume (m ³)	Critical Storm	Half Drain Time (mins)
Catchment 1	17525	960 min	3687
Catchment 2	2278	960 min	3796

3.2.3 The approved Flood Risk Assessment demonstrates how the site drains and outfalls to the south of the application site, directing flows towards Wykham Lane and ultimately discharging to a watercourse south of Wykham Lane to an existing reservoir. The FRA provides for flexibility of conveyance routing in the section between the southern boundary of the site and Wykham Lane.

The drainage strategy proposed for catchment 1 accords with the FRA, and presents two conveyance routes from the southern boundary to Wykham Lane, each attenuating flows to greenfield run-off rates. One option (conveyance route east) routes to an existing ditch at the southern edge of the application boundary, the alternative option (conveyance route south) is the preferred route, as it presents opportunity for further enhanced attenuation and sustainability credentials on land within the applicant's control. Whilst the southern conveyance route is the preferred option, due to its location outside the outline application boundary its delivery is subject to securing planning consent for the works, therefore the drainage strategy also presents a deliverable solution (conveyance route east) which is within the outline planning application boundary. The two conveyance routes for catchment 1 and the conveyance route for catchment 2 are shown in Figure 3.

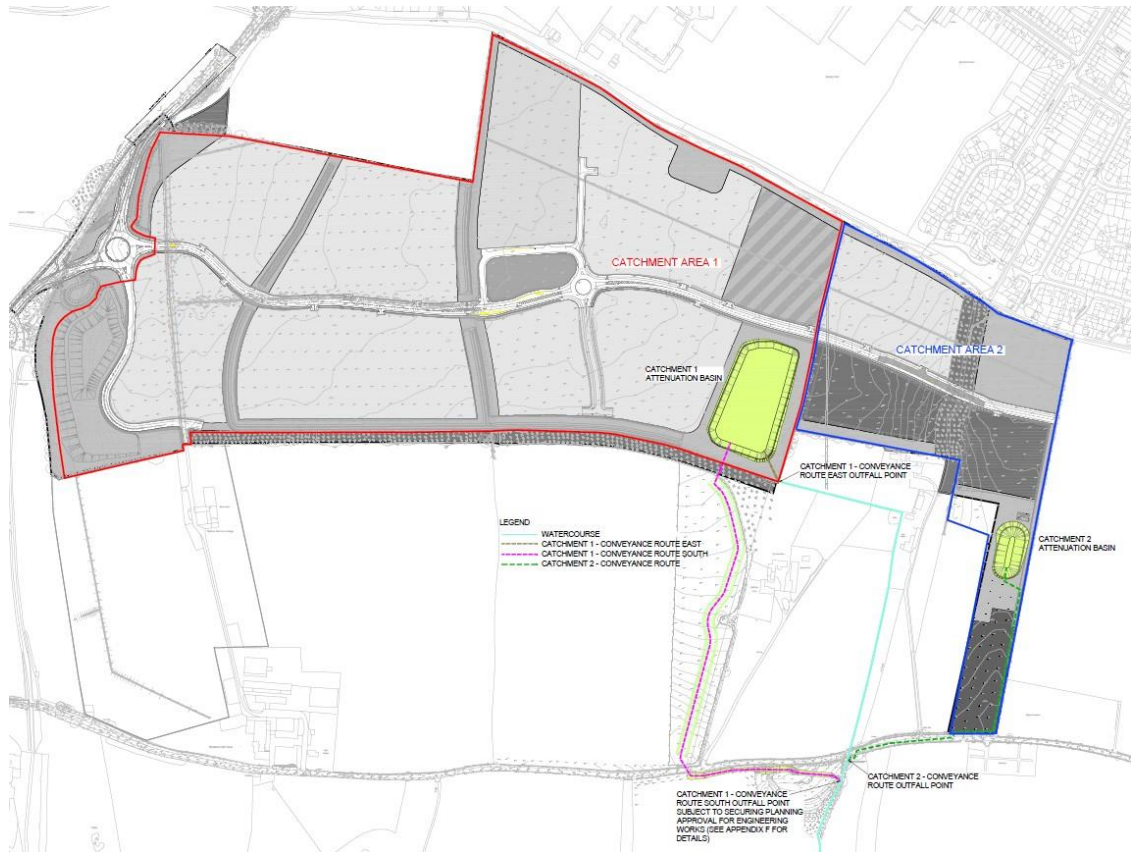


Figure 3: Catchment 1 & 2 Conveyance Route Outfall Locations

3.3 Sustainable Drainage Systems

The sustainable credentials of the drainage strategy can be assessed in accordance with the guidance contained within the SuDS Manual (Ciria C753) which refers to four pillars of SuDS design.

3.3.1 Quantity

The cohesive nature of on-site soils precludes the use of infiltration (soakaways) drainage. So, a discharge to the existing swale system is proposed. Storage has been provided for events up to and including the 1 in 100 year event plus 40% allowance for climate change.

3.3.2 Quality

In accordance with Table 26.2 of the SuDS Manual the site has a low pollution hazard level. The pollution hazard indices for the site are:

Table 6: Pollution hazard level (taken from table 26.2 CIRIA SuDS Manual)

	Total suspended solids	Metals	Hydro-carbons
Individual driveways, residential car parks, low traffic roads.	0.5	0.4	0.4
Residential Roofs	0.2	0.2	0.05

In accordance with Table 26.3, the proposed SuDS within the site offer mitigation indices of:

Table 7: Pollution Hazard Mitigation Table

	Total suspended solids (TSS)	Metal	Hydro-carbons
Swale	0.5	0.6	0.6
Attenuation Basin	0.5	0.5	0.6

With the extensive network of swales proposed within the site and the attenuation basins and the mitigation indices for the swale and attenuation basin are greater than the indices for low traffic roads and residential roofs, the catchments are deemed to provide an acceptable level of water treatment.

3.3.3 Amenity

The proposed swale network will be enhanced as part of the site wide landscape strategy and will include pedestrian and cycle networks to all parts of the development and provide connection to adjacent urban areas.

3.3.4 Biodiversity

The extensive swale network and attenuation basins will allow a variety of planting to be used including wildflower grass seed mixes providing habitat and food for insects, invertebrates and birds. The swale profiles have been considered to give more variety in their appearance. The swale channel side slopes vary from 1 in 3 to 1 in 4 along their length to give a more natural appearance.

3.4 Maintenance

3.4.1 The primary means of conveying surface water from domestic surfaces will be via a network of below ground sewers discharging to the swale network. Where these surface water sewers are conveying flows from both highways and domestic areas then they will be offered for adoption under a Section 104 Legal Agreement to Thames Water, where the surface water sewer is conveying only discharge from adoptable highway surfaces these will be offered for adoption to Oxfordshire County Council under a Section 38 Agreement as highway drainage. With the shortly anticipated implementation of Sewers for Adoption 8th Edition there is potential for the swales and attenuation basin to be adopted by Thames Water. However, in accordance with the terms set out under S106 Planning Agreement prior to the construction of the first dwelling the owner may elect to transfer by agreement any or all of the combined green spaces to the District Council a Management Company; or retain the Combined Spaces or part thereof and maintain and manage either itself or through or through a management company; or a statutory undertaker (in relation to the balancing ponds, ditches/watercourses/swales).

A typical maintenance regime for swales and attenuation basins is outlined in the SuDS Manual as follows:

Table 8: SuDS Features Maintenance Requirements

Operation and maintenance activity	Swale	Attenuation Basin
Regular Maintenance		
Inspection	✓	✓
Litter and debris removal	✓	✓
Sediment removal	✓	✓
Grass cutting	✓	✓
Inspect inlets/outlets	✓	
Occasional Maintenance		
Sediment Management	✓	
Removal of weeds	✓	✓
Remove or control tree roots	✓	
Repair inlets, outlets		✓
Stabilise and mow contributing and adjacent areas		
Remedial Maintenance		
Repair erosion by re-turfing	✓	
Relevel uneven surfaces	✓	✓
Remediate any landscaping		✓

4. FOUL DRAINAGE

4.1 Pre development

There are no existing Thames Water foul sewers within the site boundary. The closest foul sewers to the site are located to the north of the site in Grange Road and Foxwood Close. There are also foul sewers located in Bloxham Road to the North West of the site. Thames Water asset plans can be found in Appendix D.

4.2 Post Development Foul Water Drainage Strategy

Due to the topography of the site it is not possible to discharge all foul flows to an existing Thames Water public foul sewer by gravity. It is therefore proposed that a foul pumping station will be required. As the site topography falls continuously from west to east the pumping station will be positioned within the sports pavilion area.

The pump rate for the site will be approximately as follows:

Up to 1000 dwellings at 4000l/dwelling/day = **46.2l/s**

Local Centre: 0.8ha based on 0.6l/s/ha = **0.504l/s**

Primary School: Average pupil numbers = 281 + 32 staff based on 15l/person/day (taken from the Plumbing Engineering Services Design Guide, The Institute of Plumbing) = **0.16l/s**

Changing Facility Sports Pitches: Assuming 30 people maximum at one time based on 35litres/person/day (taken from the Plumbing Engineering Services Design Guide, The Institute of Plumbing) = **0.073l/s** (based on 4 hour day)

This gives an approximate peak foul flow rate of **46.94l/s**.

This will require a foul pump rate in the region of **27.0l/s**

In case of breakdown, the pumping station will be required to incorporate an element of storage equivalent to 24 hours normal operation. In accordance with the guidance contained within Sewers for Adoption the storage allowance should be based on 160 litres/dwelling.

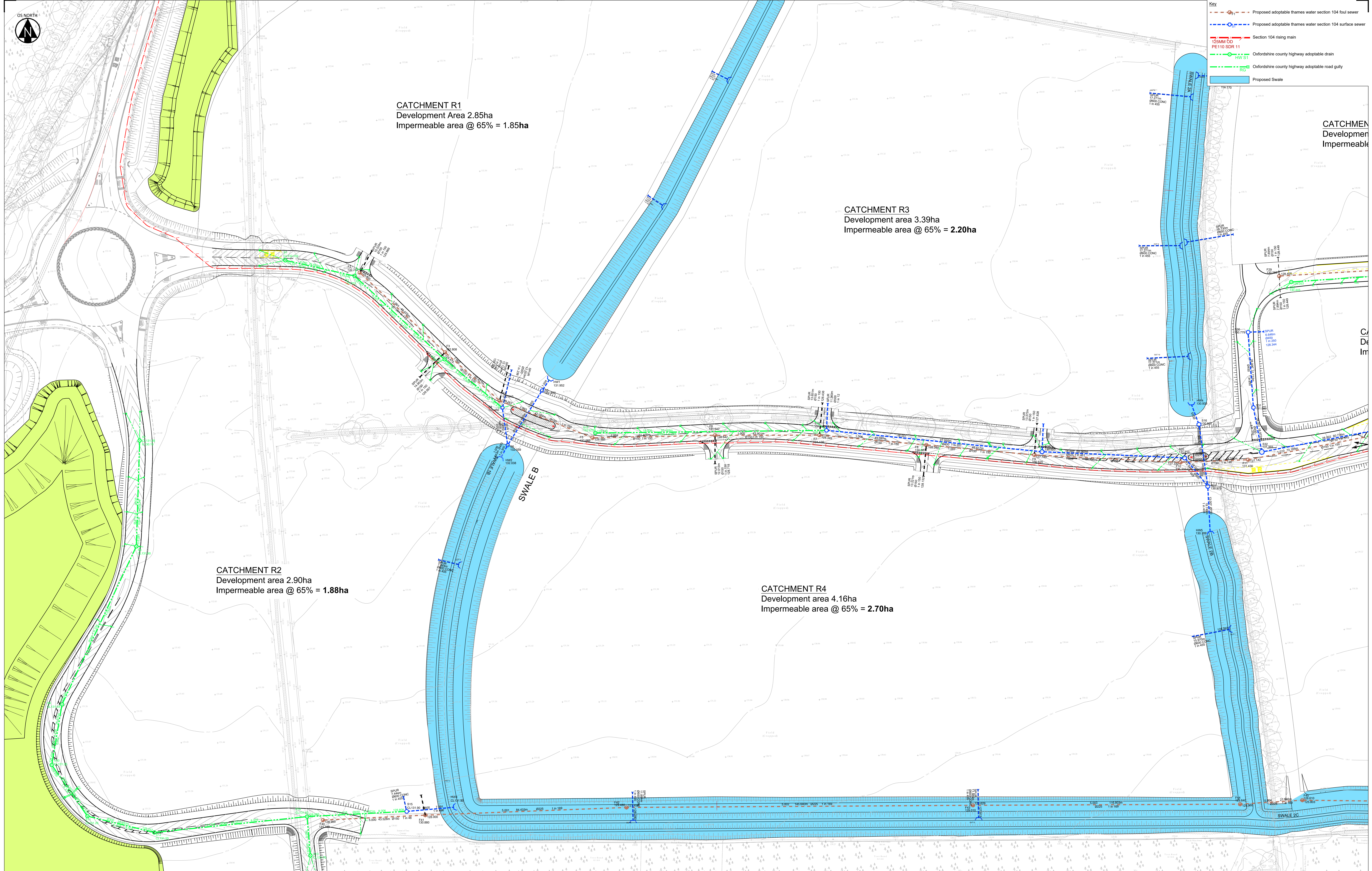
Thames Water are currently doing extensive modelling of the existing foul network serving the greater Banbury area to assess the potential capacity in the system to accommodate future developments and to identify where capacity upgrades are required. These upgrades will be funded by Thames Water. The outcomes from this modelling will not be known for some time. However following consultation with Thames Water, a connection point for the development has been provided at manhole location reference 6101 to the north of the site in Bloxham Road. Thames Water sewer records are included in Appendix D.

5. CONCLUSIONS

- The current site land use is agricultural and considered to be 100% greenfield.
- There are existing Thames Water surface water sewers within the site boundary and an existing field drainage ditch running along the southern boundary of the site.
- All proposed surface water discharges are to be restricted to the agreed QBAR greenfield run-off rate of 2l/s/ha
- Ground investigation reports carried out by Hydrock have concluded that the underlying strata is not conducive to the use of infiltration techniques for the discharge of surface water.
- Sustainable drainage systems in the form of an extensive swale system and basins are to provide attenuation as well as providing amenity and biodiversity improvements.
- Due to topography restrictions the site will need to be served by a foul pumping station with an approximate peak pump rate of 47.65l/s
- As per condition 10 of the outline planning permission 14/01932/OUT, the drainage strategy is *"in accordance with the principals set out in Section 14 of the NPPF."*

Appendix A Topographical Survey

Appendix B Drainage Strategy



Key

- Proposed adoptable Thames water section 104 foul sewer
- Proposed adoptable Thames water section 104 surface sewer
- Section 104 rising main
- 125MM DD PE110 SDR 11
- HM ST
- Oxfordshire county highway adoptable drain
- Oxfordshire county highway adoptable road gully
- Proposed Swale

CATCHMENT R1
 Development Area 2.85ha
 Impermeable area @ 65% = 1.85ha

CATCHMENT R3
 Development area 3.39ha
 Impermeable area @ 65% = 2.20ha

CATCHMENT R2
 Development area 2.90ha
 Impermeable area @ 65% = 1.88ha

CATCHMENT R4
 Development area 4.16ha
 Impermeable area @ 65% = 2.70ha

SWALE B

SWALE C

SWALE D

SWALE E

SWALE F

SWALE G

SWALE H

SWALE I

SWALE J

SWALE K

SWALE L

SWALE M

SWALE N

SWALE O

SWALE P

SWALE Q

SWALE R

SWALE S

SWALE T

SWALE U

SWALE V

SWALE W

SWALE X

SWALE Y

SWALE Z

- General Drainage Notes:**
- The planning design and construction of sewers shall be in accordance with Sewers for Adoption 6th Edition, a design and construction guide for developers, the Civil Engineering Specification for the Water Industry 7th Edition and Thames Water amendments to CEM 4.
 - All adoptable sewers within adoptable highway with less than 1.2m cover to have reinforced concrete slab protection. All adoptable sewers within grassed areas with cover less than 0.9m to have reinforced concrete slab protection. All areas with greater cover than the minimum required to have type S1 seal and surround.
 - Soiled and lockable covers to be supplied where specified on manhole schedule.
 - Use of this drawing does not absolve the client from his responsibilities under the Health and Safety, The Construction Design and Management Regulations 2015. The Principal Designer is required to contact Hydrock Consultants prior to permitting this drawing to be used in connection with any construction works.
 - All sewers to be laid soft to soils unless otherwise shown.
 - It is the Contractor's responsibility to locate existing services on site accurately.
 - The Contractor should comply with H47 "Avoiding Danger from Underground Services", when excavating around existing services.
 - The Contractor is to verify the line, level and diameter of existing sewers

- All levels are to OS datum.
- Compliance with Health & Safety matters on any trench/manhole is obligatory and a permit to enter a confined space is required when connecting site drainage to the existing public sewerage system. A permit to enter a confined space will be obtained from Thames Water Ltd prior to the works commencing on any public sewerage system.
- Proposed adoptable sewers are only permitted to have other sewerage connections and other services laid at an angle of between 45° and 90° across the line with a vertical clearance in excess of 300mm.
- Where sewers are to be constructed inside the restrict tree zone a suitable tree protection barrier is to be installed to Thames Water's specification.
- Refer to Section 104 drawing for a full set of construction specification notes.
- Contractor to refer to drainage layout drawings for highway gully locations.
- Drawing to be read in conjunction with drainage strategy report WPF-HYD-XX-XX-DR-C-001
- Refer to drawing WPF-HYD-XX-XX-DR-C-2161 for attenuation basins and swale profiles.

Rev	Date	Description	By	Chk
P4	23/11/20	Minor updates to swale profile. Note 14 and 15	RAP	JD
P3	09/10/20	Updated levels on foul run through spine road and southern foul run	RFS	SM
P2	14/09/20	Updated pipework diameters to account for 40% allowance for climate change	RFS	SM
P1	15/03/18	First Issue	RFS	SM

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Project:
 WYKHAM PARK FARM
 BANBURY

Client:
 L&Q ESTATES

Drawing Title:
 DRAINAGE LAYOUT
 SHEET 1

Project Number:
 C-04841-C

Drawn	Checked	Scale @ AD	Drawn Date	First Issue
RFS	SM	1:500		15/03/18

Drawing Status: SUITABLE FOR INFORMATION

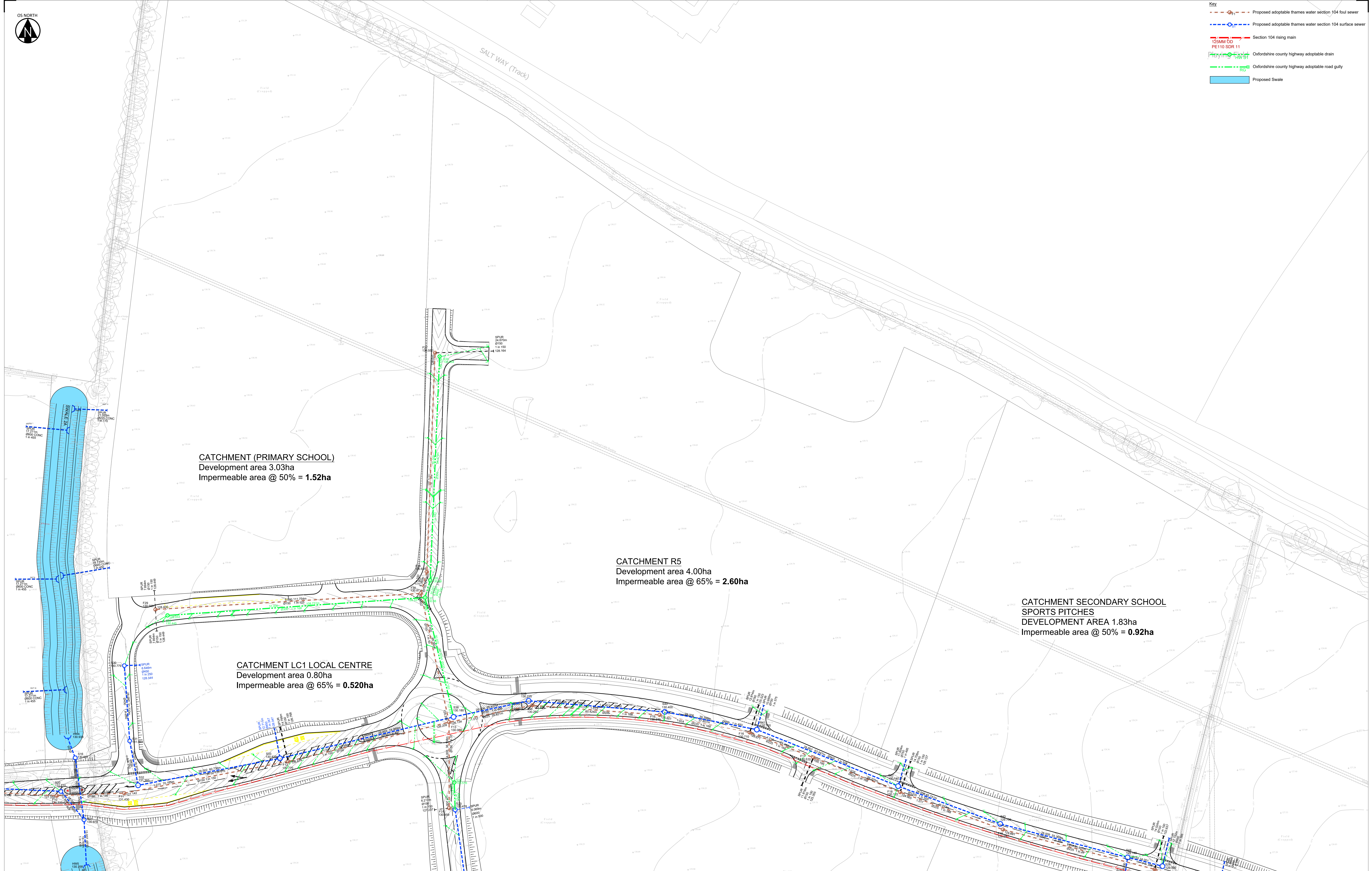
Drawing No.: WPF-HYD-XX-XX-DR-C-0601 **Revision:** P4

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Notes:
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- Key**
- - - Proposed adoptable Thames water section 104 foul sewer
 - - - Proposed adoptable Thames water section 104 surface sewer
 - - - Section 104 rising main
 - - - 125MM OD PE110 SDR 11
 - - - Oxfordshire county highway adoptable drain
 - - - Oxfordshire county highway adoptable road gully
 - Proposed Swale



General Drainage Notes:

1. The planning, design and construction of sewers shall be in accordance with Sewers for Adoption 6th Edition, a design and construction guide for developers, the Civil Engineering Specification for the Water Industry 7th Edition and Thames Water sewerage design to CS20.
2. All adoptable sewers with adoptable highway with less than 1.2m cover to have reinforced concrete side protection. All adoptable sewers within graded areas with cover less than 0.8m to have reinforced concrete side protection. All areas with greater cover than the minimum required to have type 'S' bed and surround.
3. Sealed and lockable covers to be supplied where specified on manhole schedule.
4. Use of this drawing does not absolve the client from his responsibilities under the Health and Safety, The Construction Design and Management Regulations 2015. The Principal Designer is required to contact Hydrock Consultants prior to permitting this drawing to be used in connection with any construction work.
5. All sewers to be laid soffit to soffit unless otherwise shown.
6. It is the contractor's responsibility to locate existing services on site accurately.
7. The Contractor shall comply with 'haz' 'A' Avoiding Danger from Underground Services' when excavating around existing services.
8. The Contractor is to verify the line, level and diameter of existing sewers before commencing drainage works.
9. All levels are to OS datum.
10. Compliance with Health & Safety matters on any trench/manhole is obligatory and a permit to enter a confined space is required when connecting site drainage to the existing public sewerage system. A permit to enter a confined space will be obtained from Thames Water Ltd prior to the works commencing on any public sewerage system.
11. Proposed adoptable sewers are only permitted to have other sewer/gully connections and other services laid at an angle of between 45° and 90° across the line with a vertical clearance in excess of 300mm.
12. Where sewers are to be constructed inside the restrict tree zone a suitable tree protection barrier is to be installed to Thames Water's specification.
13. Refer to Section 104 drawing for a full set of construction specification notes.
14. Contractor to refer to drainage layout drawings for highway gully connections.
15. Drawing to be read in conjunction with drainage strategy report WPF-HYD-XX-XX-RP-003
16. Refer to drawing WPF-HYD-XX-XX-DR-C-2101 for attenuation basin and swale profiles.

Notes:

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Rev	Date	Description	By	Chk
P4	23/11/20	Minor updates to swale profile. Note 14 and 15 added	RAP	JD
P3	09/10/20	Updated levels on foul run through spine road and stadium foul run	RFS	SM
P2	14/09/20	Updated pipework diameters to account for 40% allowance for climate change	RFS	SM
P1	15/03/18	First Issue	RFS	SM

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Drawing Title:
 DRAINAGE LAYOUT
 SHEET 2

Project Number:
 C-04841-C

Drawn: RFS
Checked: SM
Scale @ A3: 1:500
Drawn Date: 15/03/18
First Issue: 15/03/18

Drawing Status:
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Revision: P4