



Gavray Drive, Bicester Drainage Strategy (East)

For L&Q Estates Ltd.

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CONTENTS

1.	INTRODUCTION.....	1
2.	SITE INFORMATION.....	2
2.1	Location and Setting	2
2.2	Topography.....	2
2.3	Proposed Development	3
3.	ASSESSMENT OF FLOOD RISK.....	3
3.1	Surface Water Flooding	3
3.2	Fluvial Flooding	3
4.	SURFACE WATER MANAGEMENT	5
4.1	Pre-Development.....	5
4.2	Post-Development	5
5.	FOUL WATER MANAGEMENT	8
6.	CONCLUSIONS.....	9

Tables

Table 1:	Site Address.....	2
Table 3:	FEH Catchment Data	6

Figures

Figure 1:	Site Location.....	2
Figure 2:	EA’s Flood Risk from Surface Water Mapping.....	3
Figure 3:	EA’s Flood Risk from Fluvial Source.....	4
Figure 4:	FEH Catchment	5

Appendices

- Appendix A
- Appendix B
- Appendix C

1. INTRODUCTION

This report has been prepared by Hydrock on behalf of L&Q Estates Ltd. in support of the planning application for the proposed residential development and associated parking, highways and infrastructure at the site known as Gavray Drive.

Local Planning Authorities are advised by the Government's National Planning Policy Framework (NPPF) to consult the Environmental Agency (EA) on development proposals in areas at risk of flooding and/or for sites greater than 1ha in area.

This Drainage Strategy has been prepared to address the requirements of the NPPF, through:

- Assessing whether the site is likely to be affected by flooding.
- Assessing whether the proposed development is appropriate in the suggested location.
- Presenting any flood risk mitigation measures necessary to ensure that the proposed development and occupants will be safe from flooding, whilst ensuring flood risk is not increased elsewhere.

This report considers the requirements for undertaking a Drainage Strategy as detailed in the NPPF however it does not constitute as a Flood Risk Assessment.

Pre-application advice has been taken prior to the production of this document and is available in Appendix A for reference.

2. SITE INFORMATION

2.1 Location and Setting

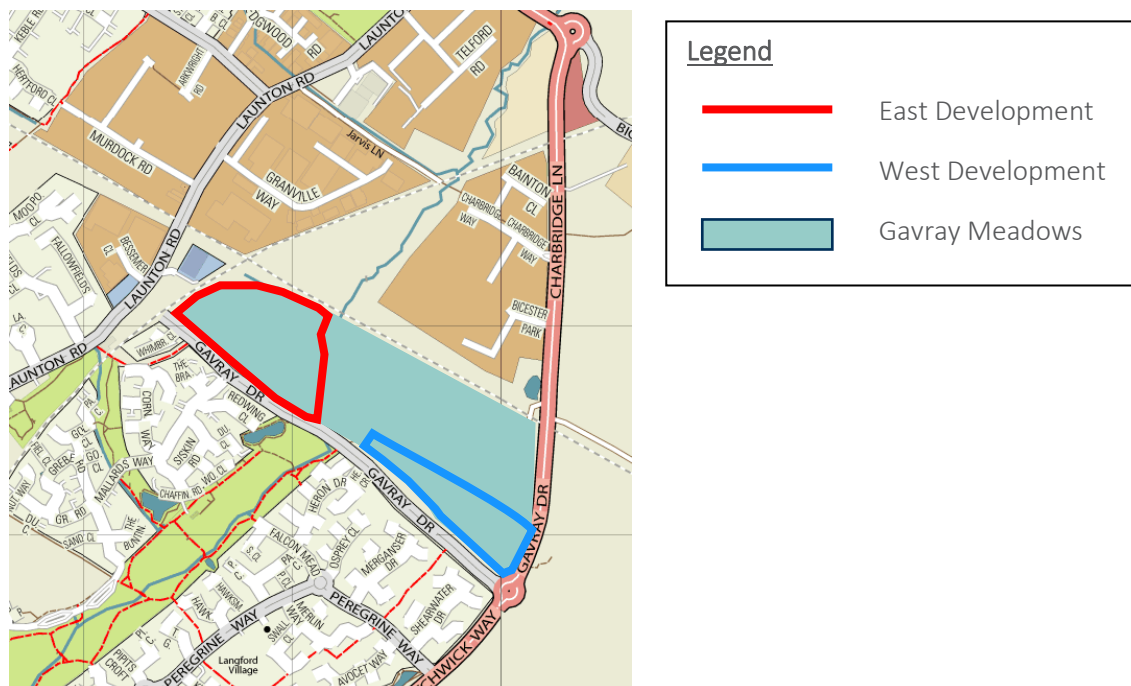
The site in its entirety, Gavray Meadows, is approximately 22.545ha, greenfield in nature and has been allocated as part of the Chertwell Local Plan 2011. The proposed Gavray Drive West development occupies circa. 6.798ha and the Gavray Drive East development occupies circa. 2.545ha with the remaining circa 13.202ha retained as Gavray Meadows

The Gavray Drive East site is bounded to the north and west by a local wildlife site with railway lines and embankments further north and and Langford Brook further to the west. The site is bounded by Gavray Drive and Charbridge Lane (A4421) to the south and east respectively.

The site address and location are shown below in Table 1: Site Address and Figure 1: Site Location.

Table 1: Site Address

Address	Land north of Gavray Drive, Bicester
Post Code	OX26 6UG
OS Grid Reference	SP5982200 / SP5989922063



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Figure 1: Site Location

Note: For detailed boundary outline please refer to site location plans

2.2 Topography

The site topography ranges from an approximate 68mAOD to 66mAOD. A ridge / crest is located centrally and spans north to south at 68mAOD falling west and east to 66mAOD.

2.3 Proposed Development

The proposed development is residential in nature and covers an approximate 2.545ha of the overall 22.54ha site as indicated in the submitted masterplan.

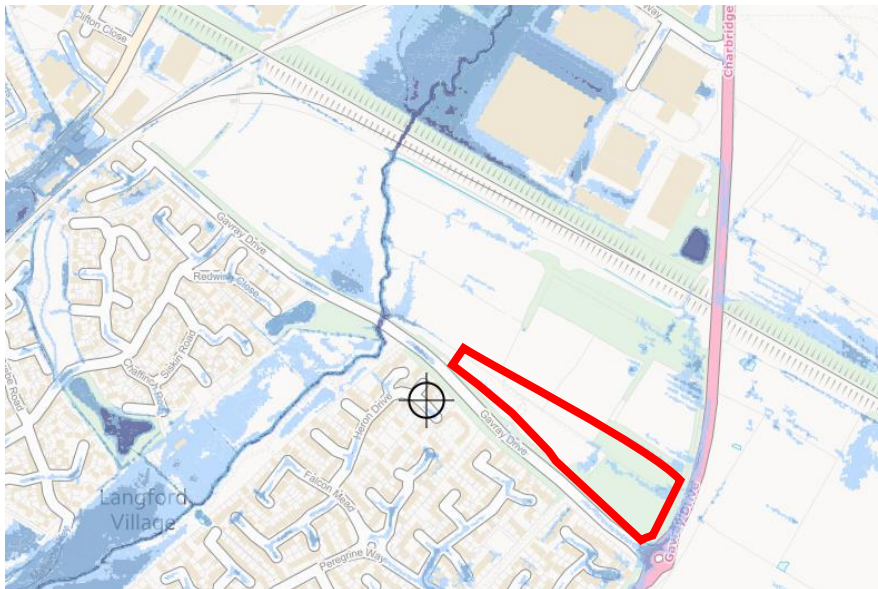
3. ASSESSMENT OF FLOOD RISK

For full details of flood risk please refer to the site-specific FRA (ref: 15114-HYD-XX-XX-RPFR-0001) in accordance with the requirements of the NPPF. The following has been provided to provide a broad overview only.

3.1 Surface Water Flooding

The EA's flooding from surface water mapping (Contains OS data © Crown copyright (2019) and Environment Agency data under OGLv3

Figure 2: EA's Flood Risk from Surface Water Mapping (shown below) shows that the site is classified as a mix of medium, low and very low risk.



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Figure 2: EA's Flood Risk from Surface Water Mapping

The areas shown at risk from surface water flooding within the site originate from within the site itself. As such, the proposed development will mitigate any risk generated from the site through the introduction of the proposed Drainage Strategy.

3.2 Groundwater Flooding

British Geological Survey mapping shows the central portion of the site, immediately adjacent to Langford Brook, to be underlain by superficial Alluvium deposits comprising Clay, Silt, Sand and Gravel. The superficial deposits are classified as a Secondary A Aquifer (defined as 'permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers', and, 'generally aquifers formerly classified as minor aquifers').

In terms of bedrock geology, broadly: the eastern portion of the site is shown to be underlain by the Peterborough Member comprising Mudstone; the central portion of the site by the Kellaways Sand Member, having a 'high' vulnerability (defined as 'areas able to easily transmit pollution to

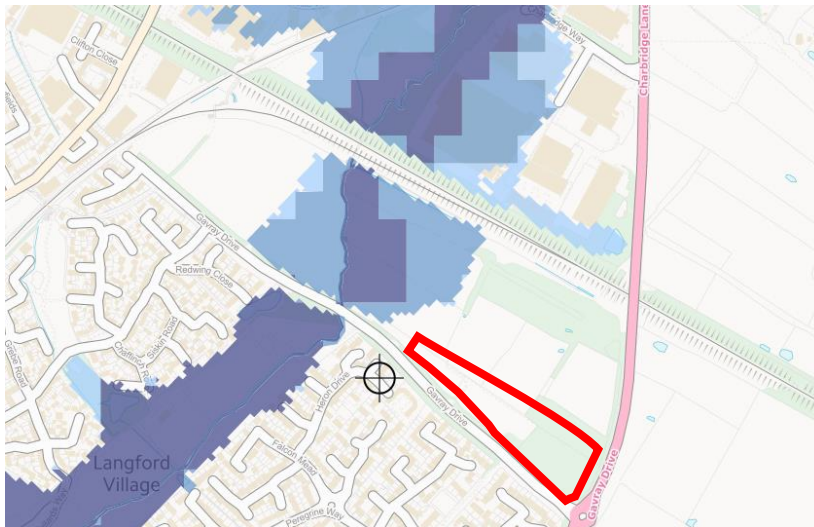
groundwater’, and, ‘likely to be characterised by high leaching soils and the absence of low permeability superficial deposits’); and the western portion of the site by the Kellaways Clay Member, which is defined as ‘unproductive’.

The groundwater table will be hydraulically linked to water levels of the adjacent Langford Brook and, as such, there is potential for groundwater emergence, but this would be expected to be consistent with predicted flood outlines and to impact only a small area of the site. It is likely that any groundwater emergence would be at the boundaries in geology and therefore probably limited to the immediate river corridor. It is, however, possible that 'near surface' groundwater may be encountered within lower lying areas of the site.

3.3 Fluvial Flooding

The EA's flooding from fluvial sources mapping (Contains OS data © Crown copyright (2019) and Environment Agency data under OGLv3

Figure 3: EA's Flood Risk from Fluvial Source below) shows that the site is predominantly classed as Flood Zone 1 with areas of Flood Zone 2 and 3 located adjacent the watercourse to the East.



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Figure 3: EA's Flood Risk from Fluvial Source

The mapping shows the site area of proposed development to be located within Flood Zone 1. As such the development is at low risk from fluvial sources. The Flood Zone 2 (1 in 100 year) area in the west of the site is situated at a level of 66.70mAOD. As such, the topography as described in Section 2.2 ensures the proposed development is safe however any proposed surface water discharge to the adjacent watercourse below 66.70mAOD would be subject to surcharge.

Given the sites dependency on topography any units located along the ridge / crest of the site must maintain an FFL (Finished Floor Level) of 68.00mAOD as a minimum.

4. SURFACE WATER MANAGEMENT

4.1 Pre-Development

As described in Section 2.1, the existing greenfield site is host to a local wildlife site and as such no hard infrastructure is present.

As such, rainfall will infiltrate the ground until infiltration capacity is reached at which point flows will travel overland following the topography. Site investigation works demonstrate the soils to be of low infiltration. As such rainfall will predominantly result in the generation of overland flows which will travel east and west.

4.2 Post-Development

In accordance with the Sustainable Drainage Systems (SUDS) hierarchy, rainfall run-off should be managed in the following preferential order:

1. Infiltrated to ground.
2. Discharged to local watercourse.
3. Discharged to a local surface water sewer network.
4. Discharged to a local combined water sewer network.

As described in the ground investigation report, infiltration has been shown to not be viable. Therefore, considering the sites close proximity to a watercourse, option two is the most sustainable method of surface water discharge.

In line with NPPF requirements, to ensure no detrimental effect downstream of the proposed development, all attenuation structures have been designed to accommodate up to and including the 1 in 100 year storm event plus an allowance of 40% for climate change in accordance with the upper end of the UKCP18 allowance whilst discharging at a Qmed greenfield runoff rate.

4.2.1 Catchment

The Flood Estimation Handbook (FEH) as published by the UK Centre for Ecology and Hydrology indicates the site falls within the catchment of the adjacent Langford Brook (as shown in Figure 4: FEH Catchment below).



Figure 4: FEH Catchment

Of the circa. 2.545ha that forms the east development site, the proposed development has an impermeable area of circa 0.835ha.

4.2.2 Discharge

It is proposed to discharge from the site to an existing culverted tributary of the Langford Brook, located parallel to Charbridge Lane (A4421). At current, topography dictates flows enter the culverted section of watercourse, by uncontrolled flows onto Charbridge Lane (A4421).

As agreed with the Lead Local Flood Authority (LLFA) and in accordance with the NPPF to ensure no detrimental downstream effect, all storm events up to and including the 1 in 100 year storm plus an allowance of 40% for climate change shall be limited to a discharge rate not greater than that of Qmed (Median Annual Maximum Flood Event) at 0.8l/s/ha as per the calculations located in Appendix C.

Therefore, given the impermeable area of 0.835ha, discharge for events up to and including the 1 in 100 year storm event plus 40% climate change allowance, is to be restricted to 0.7l/s.

4.2.3 Hydraulic Modelling

A surface water MicroDrainage model has been constructed detailing the full proposed surface water network including SuDS features. Rainfall simulations have been conducted for storm events up to and including the 1 in 100 year event plus a 40% climate change allowance.

All models have been simulated with a Run-off Coefficient (CV) for impermeable areas of 0.95. This satisfies the requirements set out by the LLFA in the pre-application correspondence (Appendix A) and subsequent discussions.

Further to this, in accordance with CIRIA non-statutory guidance, an additional allowance is to be made within the designed system to cater for an impermeable area increase of 10% to accommodate any future 'urban creep' of the residential areas.

FEH Rainfall Models have been used in all simulations and calculations as per the FEH catchment data shown below.

Table 2: FEH Catchment Data

C1 (1km)	-0.022	D3 (1km)	0.249
D1 (1km)	0.323	E (1km)	0.289
D2 (1km)	0.315	F (1km)	2.478

A full set of modelling results and calculations are in Appendix B of this report.

4.2.4 Storage

In accordance with the NPPF all surplus flows generated onsite for storm events up to and including those of the 1 in 100 year event plus 40% for climate change allowance, must be retained within the site until such time they are discharged. Further to this, no flooding is to be present up to and including the 1 in 30 year across the proposed drainage network.

Storage is to be provided in an open attenuation basin and storage tank, to be located adjacent the proposed Public Open Space (POS). The structures will provide an attenuation volume of 924m³ and 143m³ for the basin and tank respectively.

4.2.5 *Sustainable Drainage Systems*

In accordance with NPPF requirements, Sustainable Drainage Systems (SuDS) have been applied across the site where practicable.

Source control is to be applied in the form of rainwater harvesting and permeable paving located in gardens and driveways respectively. Proposed highways will be impermeable in nature due to the lack of infiltration prospects, topography and ground conditions detailed in the ground investigation. Flows will be stored in a vegetated basin, offering treatment prior to discharge.

4.2.6 *Maintenance*

The relevant drainage structures are to be offered for adoption to the local authorities. As such they will be maintained by the local authority.

All main sewers and manholes are to be constructed following the Sewer Sector Guidance and offered to Thames Water for adoption under a Section 104 Agreement of the Water Industries Act including the proposed surface water pump system. As part of the Section 104 Agreement the attenuation basin and discharge swale will also be offered for adoption.

If the systems are not acceptable under a Section Agreements then they shall remain private. A management company will be appointed by the developer and prior to this they shall be responsible for the maintenance of all systems.

4.2.6.1 *Overland and Exceedance Flows*

As demonstrated by the overland flows and exceedance drawing located in Appendix B overland flows are directed towards the attenuation basin. In event of failure of the basin flows will inhabit the public open space until such time they can re-enter the proposed drainage network.

5. FOUL WATER MANAGEMENT

5.1.1 *Pre-Development*

As described in Section 2.2, the existing greenfield site is host to a local wildlife site and as such no hard infrastructure is present.

Therefore, it is concluded that no foul effluence is generated by the existing site.

5.1.2 *Post-Development*

In accordance with the Sewerage Sector Guidance as published by Water UK peak foul effluent flows should be calculated based on 4000l/dwelling/day.

As such peak foul effluent flows can be calculated based on an assumed maximum unit density of 35 units/ha of developable area. This equates to an assumed upper end of 54 units and respectively a peak flow of 2.5l/s.

An existing public Thames Water foul sewer is located adjacent the site, along Charbridge Lane (A4421). Thames Water manhole 0901 has been identified as the most practicable means of foul water disposal. Thames Water asset records contain no data regarding the depth at this location however the downstream manhole (0801) is shown to be at a level of 60.61mAOD, giving a sewer depth of 4.7m. as such it is deemed connection is achievable at the proposed outfall level of 62.532mAOD.

6. CONCLUSIONS

This report has considered the flood risk posed to the site from surface water sources of flooding, as defined by the NPPF.

The site has also been concluded as being at low or negligible risk from all other assessed sources of potential flooding. There is a potential surface water flood risk to the west of the site boundary but this will not result in a risk to the proposed scheme.

Owing to the fact that no significant sources of flood risk were identified, no specific mitigation measures are considered necessary.

This report therefore demonstrates that provided a suitable, sustainable drainage system is employed, as described in this document, the proposed scheme:

- » Is suitable in the location proposed.
- » Will be adequately flood resistant and resilient from surface water sources.
- » Will not place additional persons at risk of flooding, and will offer a safe means of access and egress.
- » Will not increase flood risk elsewhere as a result of the proposed development through the loss of floodplain storage or impedance of flood flows.
- » Will put in place measures to ensure surface water is appropriately managed.

As such, the proposals are concluded to meet the surface water flood risk and management requirements of the NPPF.

Appendix A

Pre-application Correspondence

Reference	Title	Type	Originator
20/01309/PREAPP	Pre Application Advice	Correspondence	Oxfordshire County Council

Appendix B

Drainage Strategy

Reference	Title	Type	Originator
15114-HYD-XX-XX-DR-D-2051	Cut and Fill	Drawing	Hydrock
15114-HYD-XX-XX-DR-D-2201	Drainage Strategy	Drawing	Hydrock
15114-HYD-XX-XX-DR-D-2301	Overland Flow	Drawing	Hydrock
FEH Qmed	Qmed MicroDrainage Calculation	Calculation	Hydrock
SW Drainage Model	Surface Water Drainage Model	Calculation	Hydrock
Sewer Records	Thames Water Sewer Asset plans	Correspondence	Thames Water