



Sipson Centre of Excellence for Airside
Support Vehicles
Sipson Road, Sipson

Flood Risk Assessment and Drainage
Strategy

For

Lewdown Holdings Ltd

Document Control Sheet

Sipson Centre of Excellence for Airside Support Vehicles

Sipson Road, Sipson

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This document has been issued and amended as follows:

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Contents

1.0	Introduction	1
2.0	Site Description	2
3.0	Flood Risk Legislative and Policy Framework	7
4.0	Current Flood Risk.....	10
5.0	Future Flood Risk & Climate Change	15
6.0	Summary of Flood Risk	16
7.0	Surface Water Drainage Strategy.....	17
8.0	Foul Water Drainage	24
9.0	Surface Water Runoff Quality	25
10.0	Residual Risk.....	26
11.0	Summary and Conclusion	27

Appendices

A	Existing Site Layout
B	Proposed Development Layout
C	Topographic Survey
D	BGS Borehole Log TQ07NE337
E	Thames Water Asset Location Plans
F	Environment Agency Flood Map for Planning
G	Risk of Flooding from Surface Water Mapping
H	JBA Pluvial Flood Risk Mapping
I	Groundwater Susceptibility Mapping
J	Historic Flood Map
K	UKSuDS Greenfield Runoff Calculation
L	Proposed Drainage Strategy Layout
M	MicroDrainage Network Hydraulic Model Results
N	Drainage Management and Maintenance Plan
O	Hillingdon Council SuDS Proforma

1.0 Introduction

- 1.1 This Flood Risk Assessment (FRA) and Drainage Strategy has been produced by Motion on behalf Lewdown Holdings Ltd. It supports the proposed development at the former Sipson Village Garden Centre on the A408 Sipson Road.
- 1.2 As part of Heathrow Airport's move to decarbonise its airside operations, AGS require a facility for the maintenance of an electric vehicle fleet of special purpose vehicles. As well as AGS having limited capacity within their current estate, the existing Ground Operators License means that any supporting facilities must be within 2km of the Airport. Therefore, the land at the former Sipson Village Garden Centre offers an ideal location.
- 1.3 The current proposals feature a two-storey office building and a principal service centre formed of 8no. service bays. The existing greenspace will be maintained, and the existing areas of hardstanding will be removed to provide a landscape buffer, BNG and screening when viewed from the M4.
- 1.4 An existing site layout and location plan of the proposed development can be seen in [Appendix A](#) and the layout of the proposed development can be seen in [Appendix B](#).
- 1.5 According to the Environment Agency's (EA's) Flood Map for Planning the site is located within Flood Zone 1. However, because the site's red line boundary exceeds one hectare in area, a flood risk assessment is required that will review flood risk to the site from all sources.
- 1.6 As a major development, a drainage strategy is also required to demonstrate how the development will manage and discharge surface water generated in all rainfall events up to and including the 1 in 100-year + climate change.
- 1.7 Therefore, this FRA and drainage strategy has been produced to discuss the flood risks to the proposed development, from all sources. This FRA and drainage strategy will also define how the development will manage its surface water and foul sewage so that the development does not increase flood risk in the area or to neighbouring properties/land.
- 1.8 This FRA and drainage strategy follows the guidance set out in:
 - „ Hillingdon Council's Sustainable Drainage and SuDS guidance¹, which is referenced where applicable throughout this report.
 - „ National Planning Policy Framework (NPPF)
 - „ Planning Practice Guidance (PPG) to the National Planning Policy Framework
 - „ CIRIA SuDS Manual 2015 (C753)
 - „ Environment Agency Rainfall Runoff Management for Developments
 - „ Non-Statutory Technical Standards for SuDS (NSTSfS)
- 1.9 This FRA and drainage strategy report pertains only to the drainage strategy for the development. It does not provide details of how the site will be drained during the construction phase. This report is also not a drainage verification report, which can only be produced post-construction.
- 1.10 Similarly, this report does not provide information on how the drainage infrastructure will be protected during the construction phase of the project. The provision of this information is the responsibility of the appointed contractor.

¹ <https://www.hillingdon.gov.uk/article/5919/Sustainable-drainage-requirements-and-SuDS>

2.0 Site Description

Table 2.1 – Site Summary

Site Name	Sipson Centre of Excellence
Location	A408 Sipson Road, Sipson, West Drayton, London
Grid Reference	TQ 07254 78249
Site Area	29,807m ² (2.981 ha)
Development Type	Commercial
Flood Zone	1
Surface Water Flood Risk	Low, Medium and High Risk
Local Waste Water Authority	Thames Water
Local Planning Authority	Hillingdon Council
Lead Local Flood Authority	Hillingdon Council

Site Location and Description

- 2.1 The site comprises a large, irregularly shaped parcel of land located to the west of the A408 Sipson Road. It lies to the north of Sipson Village, south of the M4 and east of the M4 Tunnel Road. The site lies approximately 1.3km north of Heathrow Airport.
- 2.2 The site was formerly Sipson Village Garden Centre, which closed in 2011. The site is currently characterised by a large area of tarmac on the former parking areas to the front the site and a large expanse of concrete to rear of the site. The centre of the site is occupied by old polytunnels and the old glasshouses, which have fallen into disrepair.
- 2.3 All other areas of the site are covered with unmaintained grassland and dense brambles.
- 2.4 An existing site layout can be seen in [Appendix A](#).

Topography

- 2.5 A topographic survey of the site has been carried out and the outputs of this can be seen in [Appendix C](#).
- 2.6 The site is flat with topographic levels remaining predominantly between 28.10 metres Above Ordnance Datum (mAOD) and 28.80 mAOD with only a few spot levels lying outside of this.

Geology

- 2.7 The 1:50,000 British Geological Survey (BGS) online Geoindex Mapping identifies that the site is underlain by a bedrock geology of the London Clay, which is primarily characterised by clay, silt and sand. The BGS mapping lists the superficial deposits present on site as the Langley Silt Member, which comprises of Clay and Silt.
- 2.8 Nearby superficial deposits are described as the Taplow Gravel Member, which is made up of sands and gravels.

- 2.9 To understand more about the depth of the above strata and the nature of the geology in this location, local borehole records were referenced.
- 2.10 Borehole TQ07NE337 is located within the site and provides a detailed record of the geological strata down to 30.5 metres below ground level (BGL) as well as water level observations within the borehole, which is discussed further, below.
- 2.11 Borehole TQ07NE337 shows the following geology (from surface to base of the borehole) as summarised in Table 2.2, below. The surface of the borehole was taken as 28.50 mAOD. The full BGS borehole record can be seen in [Appendix D](#).

Table 2.2: Site Geological Makeup

Geological Horizon	Thickness (m)	Depth (m)	Reduced Level (mAOD)
Topsoil	0.30	0.30	28.20
Alluvial Clay	2.20	2.50	26.00
River Terrace Deposits	3.90	6.40	22.10
Weathered London Clay	0.50	6.90	21.60
London Clay	18.50	25.40	3.10
Claystone (Driller's description)	0.40	25.80	2.70
London Clay	4.70	30.50	-2.00

Hydrogeology and Groundwater

- 2.12 Hillingdon Council's Sustainable Drainage and SuDS guidance states:
- "In order to inform the right choice of sustainable drainage system, a suitable on-site investigation must be provided including information on groundwater levels, not just a desktop study using nearby Borehole information."*
- 2.13 To that end, site-specific BRE365 compatible infiltration testing is currently being carried out, which will also return observations of the local groundwater levels. Results are pending and will be submitted to the LPA in support of the Drainage Strategy section of this study.
- 2.14 In the meantime, there is confidence that groundwater is absent in the terrace gravels that are shown to be present between 26.00 mAOD and 22.10 mAOD and have a thickness of 3.90m. These gravels would be suitable for the discharge of surface water by infiltration and is where the aforementioned BRE365 infiltration testing is to be focused.
- 2.15 The BGS borehole record TQ07NE337, which can be seen in [Appendix D](#), provided water level depth observations during boring. The borehole was drilled between the 23rd and 24th November 1989, thus within the autumn-winter period and showed that the borehole remained dry from surface down to the base of the borehole at -2.00mAOD. Figure 2.1, below, is an excerpt of the borehole record TQ07NE337 showing this information.

Figure 2.1: Water Level Observations During Boring

Water Level Observations During Boring					
Date	Time	Depth of Hole (m)	Depth of Casing (m)	Depth to Water (m)	Remarks
1989 23.11	—	3.00	3.00	DRY	Falling head test
23.11	—	6.50	6.50	DRY	
23.11	—	20.00	6.50	DRY	End of shift
24.11	—	20.00	6.50	DRY	Start of shift
24.11	—	30.50	6.50	DRY	End of borehole

- 2.16 Groundwater Source Protection Zones (SPZ's) are defined around groundwater abstraction sources such as wells, boreholes and springs that are used for public drinking water supply.
- 2.17 SPZ's show the risk of contamination to groundwater from any activities that might cause pollution in the area. The closer the activity to the source of abstraction, the greater the risk. The maps show three main zones; inner – Zone 1; outer – Zone 2 and; total catchment – Zone 3.
- 2.18 Defra's Magic Map was reviewed and the site is not within in any SPZ's.
- 2.19 The site is not within a bedrock aquifer location (London Clay is hydraulically unproductive). The drift geology is also not listed as an aquifer. This is reflected in the lack of groundwater within the River Terrace Gravels in the BGS borehole log.
- 2.20 The groundwater vulnerability risk is negligible.

Infiltration Potential

- 2.21 As discussed above BRE365 infiltration testing is currently being carried out on site and the results are pending. This testing is being carried out so that this study complies with Hillingdon Council's Sustainable Drainage and SuDS guidance.
- 2.22 In the interim and to allow the hydraulic design of the proposed drainage strategy to take place, assumed infiltration rates have been used to represent the soakage potential of the River Terrace Gravels.
- 2.23 Table 2 of BS 7533-13:2009 lists 'well-graded sandy gravel' as having infiltration coefficients of between 1×10^{-5} and 1×10^{-3} . Furthermore, Table 25.1 of the C753 CIRIA SuDS Manual lists gravel as good infiltration media and states that sandy gravel would yield a typical infiltration coefficient of between 3×10^{-4} and 3×10^{-2} .
- 2.24 Therefore, there is confidence that the River Terrace Gravels observed between 26.00 mAOD and 22.10 mAOD on site will be suitable for infiltration and that good infiltration coefficients of at least 1×10^{-5} will be returned from the BRE365 soakage testing.
- 2.25 Notwithstanding this, and to provide a conservative approach during the development of the drainage strategy, an assumed infiltration rate of 1×10^{-6} has been used in the hydraulic modelling so that the attenuation structures are not under designed. If the BRE365 soakage testing returns more favourable infiltration coefficients than those assumed, then the hydraulic models will be updated, and the size of the attenuation structures reduced accordingly.

Existing Drainage Regime

- 2.26 To help gain an understanding of the local drainage regime, asset location plans were obtained from Thames Water, who are the local sewerage operator in the area. The asset location plans can be seen in [Appendix E](#).

Surface Water

- 2.27 There are no public surface water sewers in the local area. It is assumed that the former Sipson Village Garden Centre allowed surface water to runoff to the surrounding land whereby vegetation and natural soakage absorbed surface water runoff, or would have connected to the foul sewer in Sipson Road. There are no records of the existing private on-site drainage, thus it is unsure how surface water currently is discharged from the site.

Foul Water

- 2.28 A 525mm public foul sewer is indicated to pass the site on Sipson Road. It flows north to south and the nearest manhole to the site (node 0302), which is upstream of the site entrance, has an invert level of 23.10 mAOD. As above, it is uncertain whether the existing site has a connection to the public foul sewer in Sipson Road but noting that the foul sewer is at least five metres below ground level, it will be possible to connect to this foul sewer by gravity.

Brownfield Runoff Rate

- 2.29 Because the site is already developed it is a brownfield site. It has extensive impermeable areas consisting of tarmac, concrete, glasshouses and polytunnels. Because of this, it is important to investigate the brownfield runoff rates for the existing site to understand the impact that it is currently having on the local hydraulic system. It will also demonstrate the extent that the proposed development can improve the existing situation,
- 2.30 The current site has 10,429m² (1.043 ha) of impermeable areas.
- 2.31 The brownfield runoff rates have been calculated using the Modified Rational Method with rainfall intensities for different return periods extracted from Table 1(a) of the Transport and Road Research Laboratory Report – Estimated Rainfall for Drainage Calculations in the United Kingdom (TRRL Report LR 595) by C. P. Young.
- 2.32 The Modified Rational Method Equation is:

$$Q_n = 2.78CiA$$

Where:

C = Runoff Coefficient (which is assumed to be '1' in this case to represent impermeable areas)

i_n = Rainfall intensity for a n return period (mm/hr) as prescribed by Table 1(a) of TRRL LR 595

A = Impermeable Area

Q_n = Runoff for n return period

- 2.33 The rainfall intensities for different return periods extracted from Table 1(a) of TRRL Report LR 595 are:

$$i_1 = 50.8 \text{ mm/hr}$$

$$i_{30} = 113.02 \text{ mm/hr}$$

$$i_{100} = 143.9 \text{ mm/hr}$$

- 2.34 Using the above calculation and inputs, the brownfield runoff rates for the existing impermeable areas on site of 1.043 ha are as follows in Table 2.3.

Table 2.3 – Brownfield Runoff Rate From Existing Impermeable Areas

Return Period	1 in 1	1 in 30	1 in 100
Discharge Rate (l/s)	147.30 l/s	327.71 l/s	417.24 l/s

- 2.35 These brownfield runoff rates are significant. Even the existing 1 in 1-year runoff rate from the site is 147.30 l/s.
- 2.36 The proposed surface water discharge rates for the site will look to offer betterment over the existing situation and will even reduce off-site surface water discharge to zero by using infiltration and the highest tiers of the drainage hierarchy.

Hydrology

- 2.37 There are no watercourses within the site boundary or in the local vicinity. Some land drainage ditches are present in the fields west of Sipson Road.
- 2.38 The nearest main rivers are the Duke of Northumberland's River, the River Colne and Wraysbury River, which are approximately 2km west of the site.

3.0 Flood Risk Legislative and Policy Framework

- 3.1 The Flood and Water Management Act 2010 (FWMA) received Royal Assent on 8th April 2010. The Act was introduced to enforce some of the key proposals set out within UK Government flood and water strategies along with UK Government's response to the Sir Michael Pitt's Review of the summer 2007 floods.
- 3.2 LLFA's including Hillingdon Borough Council have a responsibility under the FWMA to develop, maintain, apply and monitor the application of a strategy for local flood risk in their area. Local flood risk is defined as flood risk arising from local sources, such as surface water run-off, groundwater and ordinary watercourses (i.e. non main rivers). The Environment Agency plays a role in managing the watercourses designated as 'main rivers'.

The Environment Agency Flood Map for Planning

- 3.3 The Environment Agency's Flood Map for Planning gives an indicative prediction of areas at risk of fluvial and tidal flooding. The mapping is an amalgamation of modelled flood levels and historical flood event outlines.
- 3.4 The Flood Map is split into 'Flood Zones', which demarcate the extent of flooding from rivers or the sea for different return periods. The Flood Map for Planning shows the extent of the natural floodplain if there were no defences or other man-made structures. They do not provide a definitive picture of where flooding would occur; rather, they provide an indicative prediction of areas at risk.
- 3.5 Table 3.1, below, lists the flood zone categories and explains the flood risk probabilities they represent.

Table 3.1 – Flood Zone Categories

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of tidal flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of tidal flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water must flow or be stored in times of flood, which is typically the 1 in 30-year flood event or greater. Local planning authorities should identify in their SFRAs areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map, but may be distinguished in Product 4 information, for example)

The National Planning Policy Framework

- 3.6 The NPPF sets out the Government's national policies on different aspects of land use planning in England in relation to flood risk. The Planning Practice Guidance (PPG) to the NPPF provides further information on the policies set out in the NPPF. It encourages development to take place in areas of lower flood risk wherever possible and stresses the importance of preventing increases in flood risk off-site to the wider catchment area. This includes ensuring that flood risk is taken into account at all stages of the planning process, avoiding inappropriate development in areas at risk of flooding and directing development away from those areas where risks are highest.

- 3.7 A site-specific FRA is required for proposals of 1ha or greater in Flood Zone 1, all proposals for development in Flood Zones 2 and 3, or in an area within Flood Zone 1 that has critical drainage problems (as notified to the local planning authority by the EA). The site is located within Flood Zone 1 and is greater in size than one hectare and, therefore, an FRA is required.
- 3.8 The FRA should identify and assess the risks of all forms of flooding to and from the development and demonstrate how these flood risks will be managed so that the development remains safe throughout its lifetime, taking climate change into account.
- 3.9 Within each Flood Zone, a key factor in determining planning applications for development is the flood risk vulnerability of a development. Table 2 of the PPG to the NPPF categorises different development types according to their vulnerability to flooding. These categories are:
- „ Essential infrastructure;
 - „ Highly vulnerable development;
 - „ More vulnerable development;
 - „ Less vulnerable development, and;
 - „ Water-compatible development.
- 3.10 Within the different Flood Zones each of the above development categories are considered appropriate or not permissible. The Technical Guidance to the NPPF lists these as:
- Flood Zone 1:
- „ All the development categories listed above are appropriate.
- Flood Zone 2:
- „ Water-compatible, less vulnerable development, more vulnerable development and essential infrastructure is appropriate in this zone.
- Flood Zone 3a:
- „ Water-compatible and less vulnerable development is appropriate in this zone. Highly vulnerable development should not be permitted in this zone.
- Flood Zone 3b:
- „ Only water-compatible development and essential infrastructure that has to be there should be permitted in this zone.
- 3.11 The above information sets out the basis by which developments must be assessed in terms of flood risk. Later in this the site will be reviewed against the Flood Zone in which it is located, and, noting the proposed site layout in [Appendix B](#), an assessment will be made of the appropriateness of the proposed development, as per the advice within the Technical Guidance to the NPPF.

Lead Local Flood Authority

- 3.12 As of April 2015, the LLFA became a statutory consultee on all major planning applications. The LLFA is required to assess planning applications in respect of surface water drainage and sustainable drainage systems. As a unitary authority, Hillingdon Borough Council is the LLFA for Sipson.

The Sequential and Exception Tests

- 3.13 The NPPF specifies that the suitability of all new development in relation to flood risk should be assessed by applying the Sequential Test to demonstrate that there are no reasonably alternative sites available

in areas with a lower probability of flooding that would be appropriate to the type of proposed development.

- 3.14 All forms of flood risk should be taken into account. Following the review of flood risk from all sources, the sequential test will be discussed further to determine whether the proposed development is appropriate in this location and whether further sites should be considered.

4.0 Current Flood Risk

- 4.1 Flooding can arise from a variety or combination of sources. These may be natural or artificial and may be affected by climate change. These are discussed, below, in the following two sections and summarised in Table 6.1. The probability of any likely impacts is also assessed, where necessary.

Flooding from Rivers and the Sea

- 4.2 The Environment Agency's Flood Map for Planning ([Appendix F](#)) shows that the entire site and its environs are within Flood Zone 1. Therefore, the site is at very low risk of fluvial flooding.
- 4.3 The proposed commercial development is considered to be 'less vulnerable' according to the classifications in the NPPF.
- 4.4 The Flood Map for Planning shows that the site is currently in Flood Zone 1. Table 3 of the PPG to the NPPF (see below) states that 'less vulnerable' development is appropriate in Flood Zone 1, thus the proposed development is appropriate in this location and with the current and future level of flood risk.

Table 3 of the NPPF - Flood Risk Vulnerability and Flood Zone Compatibility

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

Key:

✓ Development is appropriate

✗ Development should not be permitted.

Surface Water Flooding

- 4.5 Surface water, or pluvial flooding, results from rainfall-generated overland flow, where rainwater has not yet reached a watercourse or sewer and where the local drainage systems become overwhelmed. Pluvial flooding often occurs during short, very intense storms, but can also occur during longer periods of rainfall when the ground is already saturated, or where land has low permeability due to development.
- 4.6 In these conditions surface water can build up where the topography allows it to converge or pond. Where it gathers it will travel down prevailing gradients. Pluvial flooding then occurs at locations where significant surface water flow paths converge, at localised low points and/or due to overland obstructions. In urban areas pluvial flooding often occurs where the built environment channels overland flow routes (down roads that are bounded by kerbs, for example) or where there are obstacles to the natural overland flow routes. Boundary walls and buildings are often the main causes and, hence, the likelihood of pluvial flooding to impact property and gardens.

- 4.7 Pluvial flooding is exacerbated in many cases by the mistreatment or failure of the below ground infrastructure (including partial or full blockages of gullies and/or within the combined sewers and the accumulation of fats, oils and greases within the sewer networks).
- 4.8 The EA's Risk of Flooding from Surface Water (RoFSW) map for the site can be found in [Appendix G](#). It shows that there are isolated patches of low, medium and high surface water flood risk on the site; one on the area of the existing car park in front of the greenhouses and one to the rear of the site. A larger area of high surface water flood risk exists on the site's north-western boundary with the neighbouring land.
- 4.9 These areas of surface water flood risk do not connect and are not part of a wider surface water pathway. They are a result of how the national scale mapping interprets topography and geology of the flat site and, to understand this further, a discussion of how the RoFSW mapping is created is necessary.

RoFSW Map Accuracy

- 4.10 The following discussion regarding the accuracy and reliability of the RoFSW mapping has been taken from the Environment Agency's document 'What is the Risk of Flooding from Surface Water map?' (Report version 2.0, April 2019).
- 4.11 Risk of Flooding from Surface Water is not intended for precise interpretation of flood risk at a property level. It was produced on a national scale to indicate broad areas likely to be at risk from surface water flooding.
- 4.12 The RoFSW maps have digital terrain mapping (DTM) information at 2m resolution or finer for most urban areas in England and Wales. Rural areas are often mapped with coarser resolution data (5m), which means that the RoFSW maps will be less accurate in non-urban areas and cannot represent every detail of the landscape and local mechanisms of flooding.
- 4.13 Although the RoFSW is a significant improvement on past nationally produced surface water flood mapping, it is important not to lose sight of the limitations that remain. These include the following:
 - „ The RoFSW also makes assumptions about the drainage rate and how it 'removes' rainfall. In urban areas, this is a nationalised average of 12mm/hour and other average hydrological losses are applied in rural areas. Small changes to the drainage rate can have a big effect on the RoFSW and local drainage features and capacities are generally not taken into account. On sites such as the former Sipson Village Garden Centre, where the topography is very flat, drainage rates and capacities are assumed to be reduced due to the lack of gradient. This overestimates the amount of standing water that might be present.
 - „ The RoFSW maps assumes natural infiltration rates. This is based on geology that has been built on a national scale model and is built on 5km² areas, so does not represent local changes in geology and the effect that they have on infiltration and runoff.
 - „ The EA assumed a single drainage rate for all nationally produced modelling unless LLFAs were able to give them better local data. Modelled flood extents are particularly sensitive to the way drainage is taken into account. Omitting subsurface drainage elements such as culverts and flood storage can also significantly affect the modelled pattern of flooding.
 - „ Limited recorded surface water flood data exists for LLFAs, so in many places LLFAs have not yet been able to validate the nationally produced modelling.
 - „ As with many other flood models the input information, model performance and modelling that are used to create the nationally produced modelling vary for different areas. For example, in many areas, the ground level data is based on detailed LIDAR information, but where this is not available ground levels are much less accurate. These variations affect the reliability of the mapped flood extents and, in turn, the suitability for different applications.

- 4.14 As a result of the above, the RoFSW are not considered to be an accurate tool for understanding surface water flood risk at a site-specific level, especially in non-urban areas such as that of the former Sipson Village Garden Centre.

JBA Pluvial Flood Modelling

- 4.15 A Flood Screening Report was obtained from Envirocheck and this contains JBA's Flood Map. This is a more accurate surface water flood risk model than the RoFSW (but still uses broad-scale assumptions) and the outputs of JBA's pluvial flood model can be seen in [Appendix H](#).
- 4.16 The JBA mapping shows that in the 1 in 100-year pluvial flood event there would be no pluvial flooding or flood depths on site. Therefore, this means that the site is not at risk of flooding in the 'design' surface water flood risk event.

Drainage Strategy Impact and Residual Risk

- 4.17 Further to the above discussions, the drainage strategy for the site will be designed to positively drain, attenuate and discharge surface water from the 1 in 100-year + climate change rainfall event. This means that any surface water runoff generated by the site's proposed impermeable areas will be controlled and discharged on site and would not cause flooding on- or off-site.
- 4.18 This means that the residual risk of surface water flooding is negligible to zero.

Summary

- 4.19 The available surface water flood mapping products have been reviewed. Any surface water flood risk shown is a result of the way that the national scale RoFSW has been produced and is known to have inaccuracies that make it unsuitable for site-specific assessment. The JBA mapping provides a more moderate view of surface water flood risk and shows that the overall pluvial flood risk to the site is very low in the 1 in 100-year 'design' rainfall event. Future, residual surface water flood risk will also be low due to the effect that the surface water drainage strategy will have on surface water management on the developed site.

Groundwater Flooding

- 4.20 There are no flood risk maps for groundwater, as stated by the Environment Agency in their 2011 guidance note 'flooding from groundwater'. Mapping products currently available only show areas where the geological and hydrogeological conditions *may* combine to cause groundwater flooding, but they should not be considered as groundwater flood risk maps. They only show *susceptibility* to groundwater flooding.
- 4.21 There are several mapping products that depict areas that may be susceptible to groundwater flooding, but they are not comparable in detail to the risk maps developed for fluvial, tidal and surface water, such as those used by practitioners and risk management authorities to support planning decisions. The mapping does not show the likelihood of groundwater flooding occurring and can only be considered as a hazard, but not a risk-based dataset.
- 4.22 As such, the mapping products can be viewed as indicative at best and should only be used as a prompt to review site-based information to determine whether groundwater is a risk factor that should be considered. Indeed, the Environment Agency state that:
- "The susceptibility data should not be used on its own to make planning decisions at any scale and, in particular, should not be used to inform planning decisions at the site scale. The susceptibility data cannot be used on its own to indicate risk of groundwater flooding."*
- 4.23 This FRA will review the groundwater flooding susceptibility mapping made available in the Envirocheck Flood Screening Report, which can be seen in [Appendix I](#).

BGS Geological Indicators of Flooding

- 4.24 The BGS Geological Indicators of Flooding map shows that the site is within an area where there are inland geological indicators of flooding.

BGS Groundwater Flooding Susceptibility

- 4.25 The BGS Groundwater Flooding Susceptibility map shows that the site is in an area where there is no potential for groundwater flooding to occur.

Geosmart Information Groundwater Flood Map

- 4.26 The Geosmart Information Groundwater Flood Map places the site in an area of 'negligible' risk.

Local Sources of Information

- 4.27 The BGS borehole record in [Appendix D](#) showed that there is London Clay at depth, which is hydraulically unproductive, and a layer of River Terrace Gravels that was shown to be dry with no groundwater struck during boring. Therefore, there is nothing to indicate that groundwater is present in the geology below the site.

Summary

- 4.28 The groundwater susceptibility mapping places the site in an area where there appears to be a low to negligible susceptibility to groundwater flooding and the local borehole records did not encounter groundwater. Therefore, groundwater flood risk on the site is very low.

Flooding from Infrastructure Failure

- 4.29 Sewer flooding can occur when the capacity of the infrastructure is exceeded by excessive flows, or because of a reduction in capacity due to collapse, siltation, blockage, or if the downstream system becomes surcharged. This can lead to the sewers flooding onto the surrounding ground via manholes and gullies, which can generate overland flows.
- 4.30 Typically, sewer systems are constructed to accommodate rainstorms with a 30-year return period or less, depending on their age. Consequently, rainstorm events greater than 1 in 30-years would be expected to result in surcharging of some parts of the sewer system. In fact, due to most gullies being poorly maintained and often partially blocked with silt, leaves and other debris, their capacity is often estimated to be closer to the 1 in 10-year storm.
- 4.31 With regards to the proposed development's drainage system and risk of failure, it will be designed to attenuate the 1 in 100-year + climate change rainfall event. A drainage management and maintenance plan will also be provided, which will prescribe how the onsite drainage infrastructure should be looked after so that it works at optimum capacity. This will ensure that residual flood risks to the site from its internal drainage systems will be minimised.

Flooding from Artificial sources

- 4.32 The EA provides a map showing the maximum potential flood extent should all reservoirs with a capacity of greater than 25,000 cubic metres fail and release the water they hold.
- 4.33 The map shows that the former Sipson Garden Centre site would not experience flooding in this scenario.
- 4.34 There are no canals in the local area to create flood risk either.

Historic Flooding

- 4.35 The Envirocheck Landmark FSR includes Historic Flood Mapping. The Historic Flood Map in the Envirocheck Landmark FSR can be seen in [Appendix J](#).

- 4.36 These maps show that there are two areas of historic flooding to the west and southwest of the site, but the site has never been affected.

5.0 Future Flood Risk & Climate Change

- 5.1 The NPPF and the supporting Technical Guidance document sets out how flood risk should be considered over the lifetime of a development. This requires an increase in flood risk due to climate change to be taken into account. Both peak river flows and rainfall intensity should be assessed.

Peak River Flows

- 5.2 The site is not within proximity of any watercourses or flood risk areas, thus future peak river flows do not need to be assessed.

Peak Rainfall Intensity and Climate Change

- 5.1 Hillingdon Borough Council's Sustainable Drainage and SuDS guidance states that for commercial premises, surface water attenuation should be provided on site for up to the 1 in 100-year event plus 20 percent for climate change.
- 5.2 Therefore, the hydraulic design of the drainage system will consider a peak rainfall intensity increase of 20%.
- 5.3 With the climate change increase outlined above, it is unlikely that surface water flood risk will increase on the site to the extent that the development would become inappropriate due to the capacity of the proposed drainage strategy.

6.0 Summary of Flood Risk

6.1 Table 6.1, below, summarises the level of flood risk to the developed Centrum site.

Table 6.1: Summary of Flood Risk

Flood Source	Risk Level				Comment
	High	Medium	Low	Very Low	
Fluvial				X	Flood Zone 1
Tidal				X	Not within a tidal flood risk area
Groundwater			X		No evidence of groundwater
Surface Water			X		Site generally at very low risk of surface water flooding. Residual risk will be very low.
Canals				X	There are no canals in the vicinity
Reservoirs				X	The Reservoir Flood Risk Map places the site well outside a maximum extent of flooding
Infrastructure Failure				X	The site's infrastructure will be properly managed and maintained, as per the prescription in the drainage management and maintenance plan, which will minimise the risk of flooding due to infrastructure failure.
Increase due to Climate Change			X		Future fluvial flood risk has been discussed and the drainage strategy will accommodate surface water generated in the 1 in 100 + 20% rainfall event.

The Sequential Test

6.2 The proposed development is within Flood Zone 1, and is at low surface water, groundwater, reservoir, canal and infrastructure flood risk. Therefore, the proposed development can be considered to have passed the sequential test and alternative sites do not need to be considered for this commercial development, which is appropriate in this location.

7.0 Surface Water Drainage Strategy

Sustainable Drainage Overview

- 7.1 Current planning policy and Environment Agency guidance requires developments to employ SuDS (Sustainable Drainage Systems) techniques wherever feasible. Careful design of SuDS features can ensure that a development's surface water drainage closely reflects the natural hydrology of the pre-developed site.
- 7.2 SuDS will attenuate and treat surface water run-off quantities at the source (source control) in line with current guidance and best practice.
- 7.3 Source control systems treat surface water close to the point of origin, in features such as soakaways, permeable paving and swales, to name a few.
- 7.4 The key benefits of SuDS are as follows:
- „ Improving water quality over a conventional piped system by removing pollutants from diffuse pollutant sources (e.g., roads);
 - „ Improving amenity through the provision of open green space;
 - „ Improving biodiversity through increased areas for wildlife habitat; and
 - „ Enabling a natural drainage regime that recharges groundwater (where possible).
- 7.5 SuDS provide a flexible approach to drainage, with a wide range of components from soakaways to large-scale basins or ponds. The individual techniques should be used where possible in a management train that mimics the natural pre-developed pattern of drainage.

Site Areas

- 7.6 The site areas to undergo development are as follows in Table 7.1.

Table 7.1 – Site Areas

Breakdown of site areas	Proposed (ha)
Total Area	2.981
Total developable area (inc. non-significant greenspace)	0.642
Building Area	0.123
Hardstanding Areas	0.504
Total impermeable areas	0.627
Total permeable areas	2.354

Greenfield Runoff Rate

- 7.7 The greenfield runoff rate for the site has been calculated following the IH124 method as outlined in the document 'Rainfall run-off management for urban developments' (Defra/Environment Agency, SC030219, 2013).
- 7.8 The IH124 method, which is made available through HR Wallingford's UKSuDS online calculator, uses the developable area of a site (excluding any large parkland areas being allocated as public open space that

will remain unmodified) to calculate the greenfield runoff. This accounts for all the pervious and impervious areas that may contribute to the surface water runoff from a development.

- 7.9 Therefore, the greenfield runoff rates have been calculated using HR Wallingford's UKSuDS online calculator and these are presented in Table 7.2, below. The greenfield runoff rates have been calculated from the total developable area (including non-significant greenspace) of 0.642 ha.
- 7.10 The full greenfield runoff calculations can be seen in [Appendix K](#).

Table 7.2 – Greenfield Runoff Rate/Volume – Total Impermeable Areas

Return Period	1 in 1	1 in 30	1 in 100	QBAR
Discharge Rate (l/s)	0.85	2.31	3.21	1.01

- 7.11 The calculated QBAR greenfield runoff rate of 1.01 l/s provides a runoff rate equal to 1.57 l/s/ha.
- 7.12 It is not expected that an offsite surface water discharge will be necessary, but if it is this would be done in line with Hillingdon Borough Council's Sustainable Drainage and SuDS guidance, where it is stated that *"we expect a likely discharge rate of 1-2 l/s/ha. A 5 l/s rate should not be used as a minimum, as flow control devices have evolved to allow smaller discharge rates."* The QBAR greenfield runoff rate of 1.57 l/s/ha falls in line with this guidance.

The Drainage Hierarchy

- 7.13 The NPPF states that opportunities to reduce overall flood risk should be sought and achieved through sustainable development and careful drainage design. This can be achieved through the layout and form of development, including green infrastructure and the appropriate application of sustainable drainage systems (SuDS). SuDS are designed to control surface water runoff close to where it falls and mimic natural drainage as closely as possible. They provide opportunities to:
- „ Reduce the causes and impacts of flooding;
 - „ Remove pollutants from urban run-off at source;
 - „ Combine water management with green space with benefits for amenity, recreation and biodiversity.
- 7.14 To deliver SuDS benefits and ensure that a development reduces overall flood risk, there is an established hierarchy of surface water drainage methods that should be considered. The most preferable and sustainable are at the top and the least preferable and least sustainable at the bottom.
- 7.15 The drainage hierarchy is a sequential check that intends to ensure that all practical and reasonable measures are taken to manage surface water as high up the hierarchy (with '1' being the highest) as possible, and that the amount of surface water managed at the bottom of the hierarchy is minimised. The Planning Practice Guidance to the National Planning Policy Framework (NPPF) states that *"Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable"*.
- 7.16 The drainage hierarchy presented in the NPPF presents only four tiers of drainage options. This has been expanded on and adopted by others and now can be viewed as the following:
1. Store rainwater for later use
 2. Use infiltration techniques, such as porous surfaces in non-clay areas
 3. Attenuate rainwater in ponds or open water features for gradual release

4. Attenuate rainwater by storing in tanks or sealed water features for gradual release
 5. Discharge rainwater direct to a watercourse
 6. Discharge rainwater to a surface water sewer/drain
 7. Discharge rainwater to the combined sewer
 8. Discharge rainwater to the foul sewer
- 7.17 Developers should not choose the method that is the most convenient or represents the lowest cost. LPA's, LLFA's and Water Authorities may enforce the surface water drainage hierarchy and demand that the highest practicable tier of the hierarchy is used.
- 7.18 The first two tiers of the drainage hierarchy ensure that surface water is retained within the site boundary and does not increase flood risk to others. This is always the most preferable method of surface water management.
- 7.19 The next six tiers of the hierarchy provide regional control, but with decreasing levels of pollution removal and reduced potential for amenity and habitat creation.
- 7.20 Within the lower six tiers of the drainage hierarchy, there must be some form of flow restriction, so that off-site surface water discharge is reduced, as much as is reasonably practicable. This requires on-site storage facilities, which may include ponds, swales, subsurface storage tanks and System C (non-infiltration) permeable pavements with flow control devices. Again, methods that provide the most potential for amenity and pollution removal should be favoured.

Drainage Strategy Overview

- 7.21 The proposed drainage strategy is for surface water to be positively drained to two separate SuDS Basins. Each of these will drain at a restricted rate to a geocellular soakaway set at a depth within the dry river terrace gravels detailed in Section 2 of this report and these will use infiltration to discharge the site's surface water to ground.
- 7.22 The building will have a green roof, which will reduce surface water runoff in low intensity rainfall events and will slow down surface water runoff in higher order storms.
- 7.23 The rear (east) of the site will drain to SuDS Basin No. 1, which is proposed in the open space south of the service yard. The front (west) of the site will drain to SuDS Basin No. 2, which proposed to be north of the access drive.
- 7.24 The two SuDS basins have the following characteristics/details, as in table 7.3, below.

Table 7.3: SuDS Basin Characteristics

SuDS Feature	Cover Level (mAOD)	Invert Level (mAOD)	Depth (m)	Surface Area	Side Slopes	Volume
SuDS Basin No.1	28.530	26.429	2.101	278.8m ²	1:3	325m ³
SuDS Basin No.2	28.575	26.795	1.780	159.1m ²	1:3	151m ³

- 7.25 SuDS Basin No. 1 will drain to a 4m x 4m x 0.4m (L x W x D) geocellular soakaway with an invert level of 25.530 mAOD.

- 7.26 SuDS Basin No. 2 will drain to a 3m x 3m x 0.4m (L x W x D) geocellular soakaway with an invert level of 25.650 mAOD.
- 7.27 Pervious surfaces have been eschewed for use in the drainage strategy because of the requirement of the site to be used by heavy goods vehicles. This requires a cohesive and hardwearing surface, whereas permeable pavements, pervious tarmacs and resin-bonded surfaces are easily damaged by manoeuvring heavy goods vehicles.
- 7.28 The proposed drainage strategy provides the requisite pollution mitigation requirements and has been modelled in MicroDrainage's Network hydraulic modelling module, which shows that the proposed drainage strategy can attenuate and discharge surface water from the 1 in 100-year + 20% rainfall event without flooding.
- 7.29 The proposed layout of the drainage strategy can be seen in [Appendix L](#) of this report.

Design Criteria

- 7.30 The drainage strategy has been designed in accordance with the design criteria outlined in Hillingdon Council's Sustainable Drainage and SuDS guidance.
- 7.31 This ensures that the current drainage strategy accords with local policy requirements (as well as those of the NPPF).
- 7.32 A notable requirement of Hillingdon Council's Sustainable Drainage and SuDS guidance is that a Cv value of less than 0.9 should be justified and that Sewers for Adoption 7th Edition (SFA7) suggests a Cv of 1.0 from all hard surfaces. The latter is not correct, and the below discussion illustrates why using a Cv value of 1.0 is incorrect and leads to an over estimation of runoff from impermeable areas.
- 7.33 The value of C (the runoff coefficient) is derived in the Modified Rational Method (MRM) from a combination of two coefficients (Cv and Cr), which are multiplied together determine the appropriate runoff coefficient value (C).
- 7.34 Cr is a constant of 1.3, thus if a Cv value of 0.75 is specified, then this gives a resultant runoff coefficient (C) of 1.0, meaning 100% of rainfall inputs is included in the drainage calculations. This is the correct approach.
- 7.35 If Cv value of 1.0 is used, then when it is multiplied by the Cr of 1.3, it gives a C value that calculates that 130% of rainfall is included in the drainage calculations. This, therefore, results in an overestimation of 30% and is incorrect. However, the above is not often understood by risk management authorities and it is presumed that by specifying a Cv value 1.0 that it will capture 100% of rainfall inputs, when, in fact, a Cv value of 0.75 already achieves that.
- 7.36 Regarding the statement that the superseded SFA7 requires a Cv value of 1.0 this is also not correct. The relevant sentence from the superseded SFA7, which has been carried over to the extant DCG, states that:
- 7.37 *"Surface water sewer systems should be designed to take the runoff from roofs, yards belonging to those buildings and, subject to the agreement of the sewerage company, the runoff from streets (see A8) including any flows through pervious pavements where they discharge into the system. For these areas, an impermeability of 100% should be assumed unless it can be demonstrated that the proposed management arrangements will limit the rate of runoff to a lower level."*
- 7.38 Therefore, SFA7 and the DCG doesn't say that a Cv of 1.0 should be used. What it does say is that areas that discharge to the drainage system should have their percentage impermeability (PIMP value) set to 100%.

- 7.39 In accordance with this, all impermeable areas in the MicroDrainage model have their PIMP value (percentage impermeable) set to 100%, so that all areas positively producing surface water are shown to have 100% of their surface water contributing to the drainage system.
- 7.40 And, as shown above, the correct calculation of $C_v \times C_r$ produces a 'total' runoff of 100% (and the winter coefficient of 0.84 actually overestimates runoff).
- 7.41 Consequently, the C_v value has been properly and appropriately determined. To use a C_v value of 1 would result in an additional 30% runoff, which is an unnecessary factor of safety when combined with those already used in the calculations.

Urban Creep

- 7.42 In terms of impermeable areas, an uplift of 10% is sometimes applied to the proposed impermeable areas to account for future development that may increase areas of hardstanding. This is because, as residential developments mature, property owners may extend patios, install decking, or increase driveways to accommodate extra vehicles.
- 7.43 However, the proposed commercial development has no privately owned outdoor spaces, gardens or parking areas where the above process of urban creep could occur. As such, it would not be appropriate to uplift the impermeable areas as urban creep will not occur on this development.
- 7.44 The approach to the layout and design of the surface water drainage strategy for the development has been outlined. With specific reference to each tier of the drainage hierarchy, the proposed drainage strategy is discussed, below.
- 7.45 However, prior to the discussion of the drainage hierarchy, the office building will have a green roof, and this sits outside of the drainage hierarchy structure, so this merits discussion first.

Green Roofs

- 7.46 The office building will have an extensive green roof. This will be used in the areas not set aside for the photovoltaic units. The area available for green roofs covers approximately 570m². Extensive green roofs use hardy plants that do not require as many nutrients and are low maintenance as a result. The plants are perennial and do not decline in winter. The sedum blankets are pre-grown on mats and quickly installed.
- 7.47 During low intensity rainfall events these green roofs will intercept, store, filter and provide potential for the evaporation and evapotranspiration of roof water prior to it reaching the downpipes.
- 7.48 Green roofs can also provide small amounts of surface water storage and can often assist in achieving zero discharge for rainfall depths up to 5mm, which covers 50% of annual rainfall events (according to the EA's Rainfall Runoff Management for Developments report – SC030219).
- 7.49 Although the green roof will be able to provide water storage, treatment and dispersion for low-intensity rainfall events, it is unlikely that it will be able to restrict the rate of runoff from the buildings during high-intensity rainfall events. Consequently, further measures are needed to attenuate surface water runoff on site. These are provided by the further tiers of the drainage hierarchy.

Tier 1 - Store rainwater for later use

- 7.50 Water re-use systems can rarely manage 100% of the surface water discharged from a development. This requires the surface water yield from the building and hardstanding areas to balance perfectly with the demand from the proposed development; too much demand will result in lack of water supply; too little demand will cause the storage systems to become overwhelmed and could result in flooding when the next rainfall event happens. Consequently, even if there are opportunities and a need for rainwater recycling systems, further solutions for attenuating and discharging surface water will almost always be required.

7.51 There is likely to be a substantial rainwater yield from the roof areas of the development in higher order rainfall events (but little in the lower order rainfall events, as described above). However, because there is little use for recycled rainwater on the site (for activities such as gardening/landscaping), it is unlikely that water butts would be suitably used and emptied regularly and would, in all likelihood, remain full and unused.

7.52 However, should the development wish to include some rainwater harvesting for the purpose of non-wholesome water uses on site (toilet flushing, for example) then this would be recommended and would benefit the local water cycle and hydraulic regime.

Tier 2 - Use Infiltration techniques, such as porous surfaces in non-clay areas

7.53 As discussed earlier in this report, BRE365 infiltration testing is currently being carried out on site and the results are pending. This testing is being carried out so that this study complies with Hillingdon Council's Sustainable Drainage and SuDS guidance.

7.54 In the interim and to allow the hydraulic design of the proposed drainage strategy to take place, assumed infiltration rates have been used to represent the soakage potential of the River Terrace Gravels.

7.55 Table 2 of BS 7533-13:2009 lists 'well-graded sandy gravel' as having infiltration coefficients of between 1×10^{-5} and 1×10^{-3} . Furthermore, Table 25.1 of the C753 CIRIA SuDS Manual lists gravel as good infiltration media and states that sandy gravel would yield a typical infiltration coefficient of between 3×10^{-4} and 3×10^{-2} .

7.56 Therefore, there is some certainty that the River Terrace Gravels observed between 26.00 mAOD and 22.10 mAOD on site will be suitable for infiltration and that good infiltration coefficients of at least 1×10^{-5} will be returned from the BRE365 soakage testing.

7.57 Notwithstanding this, and to provide a conservative approach during the development of the drainage strategy, an assumed infiltration rate of 1×10^{-6} has been used in the hydraulic modelling so that the attenuation structures are not under designed. If the BRE365 soakage testing returns more favourable infiltration coefficients than those assumed, then the hydraulic models will be updated, and the size of the attenuation structures reduced accordingly.

7.58 It is proposed to discharge the surface water generated on site via two geocellular soakaways that will be within the River Terrace Gravels. These will follow 2no. SuDS basins, which will provide the requisite attenuation and pollution mitigation. The proposed location and size of these soakaways can be seen in the drainage layout plan in [Appendix L](#).

Tier 3 - Attenuate rainwater in ponds or open water features for gradual release

7.59 Prior to the surface water discharge by infiltration, surface water will be attenuated in two separate SuDS basins with the characteristic outlined in paragraphs 7.21 to 7.24 and Table 7.3 of this report.

7.60 Outflow from the SuDS basins to the geocellular soakaways will be restricted using flow control devices so that the attenuation volume on offer is maximised.

Tier 4 - Attenuate rainwater by storing in tanks or sealed water features for gradual release

7.61 It is anticipated that this tier of the drainage hierarchy will not be needed for surface water discharge.

Tier 5 - Discharge rainwater direct to a watercourse

7.62 It is anticipated that this tier of the drainage hierarchy will not be needed for surface water discharge.

Tier 6 - Discharge rainwater to a surface water sewer/drain

7.63 It is anticipated that this tier of the drainage hierarchy will not be needed for surface water discharge, but there are no public surface water sewers in the area for this option to be realised if it was needed.

Tier 7 - Discharge rainwater to the combined sewer

- 7.64 It is anticipated that this tier of the drainage hierarchy will not be needed for surface water discharge.

Tier 8 - Discharge rainwater to the foul sewer

- 7.65 It is anticipated that this tier of the drainage hierarchy will not be needed for surface water discharge.

MicroDrainage Hydraulic Modelling

- 7.66 The drainage strategy outlined above has been designed in MicroDrainage's Network hydraulic modelling module.
- 7.67 The results of the MicroDrainage hydraulic modelling for the proposed development can be seen in **Appendix M**.
- 7.68 The results of the hydraulic modelling show that the drainage strategy as outlined above can attenuate and discharge all surface water generated in the 1 in 100-year + 20% rainfall event, without flooding, and entirely on site through infiltration.

8.0 Foul Water Drainage

- 8.1 Thames Water's asset plans in [Appendix E](#) show that there is a 525mm public foul sewer that passes the site on Sipson Road. It flows north to south and the nearest manhole to the site (node 0302), which is upstream of the site entrance, has an invert level of 23.10 mAOD. As above, it is uncertain whether the existing site has a connection to the public foul sewer in Sipson Road but, noting that the foul sewer is at least five metres below ground level, it will be possible to connect to this foul sewer by gravity.
- 8.2 The baseline foul flow rate from the proposed development has been estimated using The Office of Project and Programming Advice and Training (OffPAT) employment densities and British Water's Flows and Loads Code of Practice.
- 8.3 OffPAT's Employment Densities Guide provides an appraisal of employment density and density variances across different use types². Employment density is expressed as a ratio of the number of square metres per employee, where lower numbers imply a higher density of employment and higher numbers imply a lower density of employment.
- 8.4 For Use Class B1c 'Light Industrial' it is estimated that there is one FTE per 47m² of Net Internal Area (NIA) of the building. At this stage the NIA cannot be calculated as detailed floor plans have not yet been produced, thus the full footprint of the building will be used instead. The building footprint is 1,227m² so over two floors that is 2,454m². At 47m² per FTE, that yields an FTE estimate of 52.2 FTE's.
- 8.5 British Water's Flows and Loads provides a foul flow estimate for offices/factory spaces without a canteen of 50 litres/person/day.
- 8.6 50 litres/person/day multiplied by 52.2 FTE's provides a daily foul discharge estimate of 2,610 litres/day.
- » $2,610 \text{ litres per day} \div 24 \text{ (hours)} = 108 \text{ litres per hour}$
 - » $108 \div 60 \text{ (minutes)} = 1.81 \text{ litres per minute}$
 - » $1.81 \div 60 \text{ (seconds)} = 0.03 \text{ litres per second.}$
- 8.7 Therefore, the calculated design foul flow from the proposed development is 0.03 l/s. It is expected that the 525mm foul sewer in Sipson Road will have capacity for this, but this will be checked with Thames Water in due course.

²https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/378203/employ-den.pdf

9.0 Surface Water Runoff Quality

- 9.1 Hillingdon has separate systems of drainage, so all surface water ends up in the local rivers. Appropriate controls should be included to capture and manage pollution. The NPPF states that developments should not have a detrimental impact on the environment, including the water environment. The PPG to the NPPF provides further advice on the benefits of ensuring runoff quality is to an appropriate standard.
- 9.2 The CIRIA SuDS Manual provides guidance on the treatment of surface water runoff. With regards to the proposed development, Table 4.3 of the CIRIA SuDS Manual rates the pollution hazard from roof water runoff as 'very low'. The only requirement for roof water runoff is the removal of gross solids and sediments, which would largely be achieved by the green roof, but would be 'topped up' by the settling out of sediments that would occur in the SuDS Basins.
- 9.3 With regards to the roads and parking areas, Table 4.3 of the CIRIA SuDS Manual rates the pollution hazard from commercial yards and delivery areas as 'medium'. To mitigate a 'medium' pollution hazard, the CIRIA SuDS Manual recommends using a simple index approach in line with Section 26.7.1. This is discussed, below.
- 9.4 Table 26.2 of the CIRIA SuDS Manual provides pollution hazard indices for different land use classifications. The land use classification that requires consideration for the commercial yard and delivery areas on the site is in Table 9.1 below.

Table 9.1: Excerpt from Table 26.2 of CIRIA SuDS Manual

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydro-Carbons
Commercial yard and delivery areas	Medium	0.7	0.6	0.7

- 9.5 To deliver adequate pollution treatment and mitigation, the CIRIA SuDS Manual recommends using a SuDS component that has a total pollution mitigation index (for each contaminant type) that equals or exceeds the pollution hazard index (for each contaminant type).
- 9.6 Table 26.15 of the CIRIA SuDS Manual provides SuDS mitigation indices for detention basins. Table 9.2, below, which is an excerpt from Table 26.15, shows the mitigation indices for detentions basins.

Table 9.2: Excerpt from Table 26.3 of CIRIA SuDS Manual

Type of SuDS Component	Total Suspended Solids (TSS)	Metals	Hydro-Carbons
Detention Basin	0.7	0.6	0.7

- 9.7 The mitigation indices for a detention basin match those of the highest pollution hazard index figures from Table 9.1. Therefore, the drainage strategy specified for the Sipson Centre of Excellence development can fully mitigate the expected pollution hazards that will be created on site.

10.0 Residual Risk

- 10.1 Whilst the drainage strategy for the development has been designed to attenuate surface water from the 1 in 100-year plus 45% rainfall event, plus an inclusion for urban creep, there could be a small residual risk of flooding due to blockage or failure of on-site infrastructure. Therefore, appropriate and regular maintenance of the drainage infrastructure should be undertaken by the site management company or their agents.
- 10.2 Hillingdon Council's Sustainable Drainage and SuDS guidance confirms that developments should *"provide a management and maintenance plan for all SuDS to ensure there's ongoing maintenance over the lifetime of the development. Individual landowners should not be responsible for a system which also serves other landowners. This should be made the responsibility of a Private Management Company or offered for adoption to the Water Utility. This should also contain details of the standard of operation."*
- 10.3 To assist with this process, a Drainage Management and Maintenance Plan has been prepared, which sets out the principles for the long-term management and maintenance of the proposed surface water drainage system on the development. The Drainage Management and Maintenance Plan can be seen in [Appendix N](#).
- 10.4 The purpose of this document is to ensure that those responsible for site maintenance have a robust inspection and maintenance plan going forwards. This will help ensure the optimum operation of the surface water drainage system and that it will be regularly maintained for the lifetime of the development. This will contribute to reducing the risk of surface water flooding both on- and off-site.

11.0 Summary and Conclusion

- 11.1 This FRA and Drainage Strategy has been produced by Motion on behalf Lewdown Holdings Ltd. It supports the proposed development at the former Sipson Village Garden Centre. The current proposals feature a two-storey office building and a principal service centre formed of 8no. service bays. The existing greenspace will be maintained, and the existing areas of hardstanding will be removed to provide a landscape buffer, BNG and screening when viewed from the M4.
- 11.2 Thames Water's assets in the local area were investigated, which revealed that there are no public surface water sewers in the vicinity. There is a 525mm public foul sewer that passes the site on Sipson Road. It flows north to south and the nearest manhole to the site (node 0302), which is upstream of the site entrance, has an invert level of 23.10 mAOD. This is approximately five metres below ground level. It is uncertain how the existing site drains its foul waste but noting the presence of the existing foul sewer (and its depth) it is assumed that the site drains to it by gravity.
- 11.3 The existing surface water drainage regime is that the site either allows surface water to runoff from the extensive existing hardstanding, glasshouses and polytunnels to surrounding land, or it is drained to the large public foul sewer in Sipson Road.
- 11.4 The site is flat with topographic levels remaining predominantly between 28.10 mAOD and 28.80 mAOD with only a few spot levels lying outside of this.
- 11.5 The site is at low risk of flooding from all sources.
- 11.6 In terms of surface water management, the drainage strategy for the site has been developed in the context of the drainage hierarchy, with the aspiration to use the highest available and most sustainable tiers. Foremost of these is to discharge surface water on site using infiltration, so that there can be no offsite impact from the site's drainage and to reduce surface water flood risk in the area.
- 11.7 The two-storey office building will utilise an extensive sedum green roof. In low intensity rainfall events the green roof will intercept, store, filter and provide potential for the evaporation and evapotranspiration of roof water prior to it reaching the downpipes.
- 11.8 Site-specific BRE365 compatible infiltration testing is currently being carried out. The local geology and an on-site BGS borehole has been reviewed to investigate infiltration potential in the interim. The BGS borehole record shows that River Terrace Gravels are present between 2.50 to 6.40 metres below ground level. The presence of the River Terrace Gravels relatively close to the surface means that there is a viable geological stratum in which surface water can be discharged via infiltration.
- 11.9 This is especially true because the borehole was dry to the full extent of its depth down to -2.00 mAOD. Consequently, there is also confidence that groundwater will not be a constraint to the discharge of surface water by infiltration.
- 11.10 Therefore, the proposed drainage strategy is for surface water to be positively drained to two separate SuDS basins, which will be set in the uppermost alluvial clay geology. These SuDS basins will provide surface water attenuation, as well amenity, biodiversity and pollution mitigation benefits. Each of these SuDS basins will drain at a restricted rate to a geocellular soakaway set within the dry river terrace gravels and these will use infiltration to discharge the site's surface water to ground. No off-site surface water discharge will be required.
- 11.11 Pervious surfaces have been eschewed for use in the drainage strategy because of the requirement of the site to be used by heavy goods vehicles. This requires a cohesive and hardwearing surface, whereas permeable pavements, pervious tarmacs and resin-bonded surfaces are easily damaged by manoeuvring vehicles.

- 11.12 The proposed drainage strategy has been modelled in MicroDrainage's Network hydraulic modelling module, which shows that the proposed drainage strategy can attenuate and discharge surface water from the 1 in 100-year + 20% (for commercial developments) rainfall event without flooding.
- 11.13 The calculated design foul flows from the proposed development are 0.03 l/s. It is expected that the 525mm foul sewer in Sipson Road will have capacity for this, but this will be checked with Thames Water in due course. Because of the depth of the foul sewer in Sipson Road, it will be possible to connect the foul waste from the site to this foul sewer by gravity.
- 11.14 Residual risk has been addressed through the development of a drainage management and maintenance plan that provides a framework through which the site's drainage system should be managed in perpetuity, including the SuDS features and geocellular soakaway tanks.
- 11.15 In conclusion, the site is at low risk of flooding and the proposed drainage strategy can discharge the 1 in 100-year + 20% (for climate change) rainfall event without flooding. As such, flood risk and surface and foul water management should not form an impediment to the progress of this planning application.
- 11.16 The proposed drainage strategy has been developed in accordance with Hillingdon Council's SuDS guidance and requirements and, in reflection of this, Hillingdon Council's SuDS Proforma has been completed and can be seen in [Appendix O](#). This proforma should be reviewed in conjunction with this FRA and drainage strategy, particularly the referenced paragraphs, so that the full principles of the drainage strategy can be understood.

Appendix A

Existing Site Layout



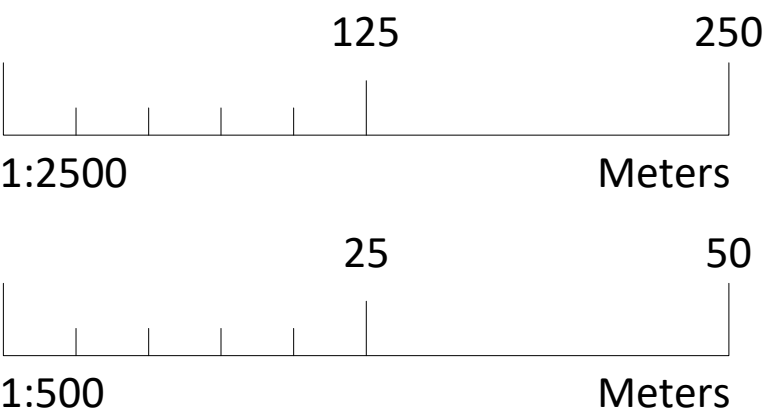
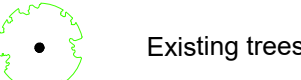
Existing site plan
Scale 1:500

Location Plan
Scale : 1:2500

Creation Date		March 2023	
Revisions			
Rev	Date	Description	By

NOTES:
1. This drawing remains the copyright of BCM
2. All dimensions and levels are to be checked on site prior to works commencing.
3. Do not scale from this drawing. Use figured dimensions only.
4. Any discrepancies found are to be reported to the Project Manager immediately.
5. This drawing is to be read in conjunction with sub-consultants and specialists drawings.
6. CAD File name: EV Scheme F.dwg
7. If BCM logo is not in colour this is not an original drawing

KEY TO DRAWING



PLANNING

Client	Lewdown Holdings LTD.		
Project Name	Heathrow Garden Centre Sipson Road		
Drawing Title	Existing Site and location plan		
Drawn By	JF		
Scale	1:2500 and 1:500	Sheet Size	A1
Drawing No.	10760 .02	Revision	

BCM
The Old Dairy
Winchester Hill
Sutton Scotney
Near Winchester
Hampshire
SO21 3NZ
t 01962 763 900
www.bcm.co.uk

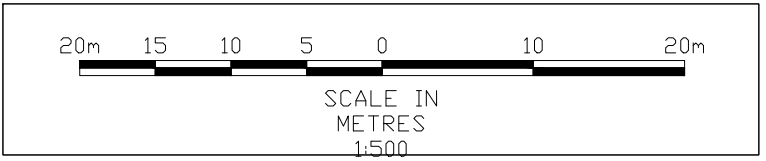
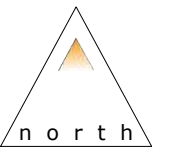


Appendix B

Proposed Development Layout

Appendix C

Topographic Survey



Appendix D

BGS Borehole Log TQ07NE337



Soil Mechanics				BOREHOLE No. H051					
Equipment & Methods Cable tool boring in 150mm diameter from ground level to 30.50m.				Location No. 7600 Location HEATHROW ACCESS ROAD					
Carried out for Heathrow Airport Limited				Ground Level 28.50 m A.O.D.		Coordinates 507205 E 178274 N		Date 23.11.89 to 24.11.89	
Description	Reduced Level	Legend	Depth (Thick)	Samples/Tests			Field Records		
				Depth	Sample Type No.	Test			
TOPSOIL (Driller's description)	28.50		(0.30)						
	28.20		0.30						
Very stiff brown and light orange brown very silty CLAY with rare fine sand. (ALLUVIAL CLAY)				1.00 - 1.45	D 1	S N=13	2,3,3,3,3,4		
				1.00 - 1.50	B 2				
			(2.20)						
				2.00 - 2.45	U 3		45 blows		
Dense light brown/brown and grey brown angular to subrounded fine to coarse (predominantly fine to medium becoming predominantly coarse) flint GRAVEL with a little fine to medium and some coarse sand. (RIVER TERRACE DEPOSITS)	26.00		2.50	2.50	D 4				
				2.60 - 3.10	B 5	C N=47	7,9,10,11,14,12		
			(1.50)						
				3.50 - 4.00	B 6	C N=39	6,8,8,10,9,12		
Dense brown/dark brown, grey and black angular to rounded fine to coarse flint GRAVEL with some fine to coarse sand and rare flint cobble. (RIVER TERRACE DEPOSITS)	24.50		4.00						
				4.50 - 5.00	B 7	C N=35	4,7,9,9,8,9		
			(2.40)						
				5.50 - 6.00	B 8	C N=33	5,6,8,8,8,9		
Stiff brown mottled orange brown CLAY. (WEATHERED LONDON CLAY)	22.10		6.40						
			(0.50)	6.50 - 6.90	U 9		60 blows		
Stiff to very stiff grey brown CLAY with extremely closely spaced subhorizontal to inclined rough irregular generally planar and very rough irregular undulose slightly gleyed fissures with occasional subhorizontal layers of dark grey green silt. (LONDON CLAY)	21.60		6.90	6.95	D 10				
			(3.60)						
				8.50 - 8.95	D 11	S N=23	2,4,4,5,7,7		
Remarks 1. Falling head test performed in the gravel.								Logged by NWSF	
Notes: Materials are described in accordance with Appendices. For explanation of symbols and abbreviations see Fig. 1. (c) Soil Mechanics All depths and reduced levels in metres. Thicknesses given in brackets in depth column.								Scale 1:50 Fig. 48	



 Soil Mechanics				BOREHOLE No. H051				
Equipment & Methods As sheet 1				Location No. 7600 Location HEATHROW ACCESS ROAD				
Carried out for Heathrow Airport Limited				Ground Level Coordinates As sheet 1		Date TQ 07 NE / 337		
Description	Reduced Level	Legend	Depth (Thick)	Samples/Tests			Field Records	
				Depth	Sample Type No.	Test		
LONDON CLAY (As sheet 1)	18.00		(3.60)					
rare shell fragment			10.50	10.50 - 10.90	U	12		45 blows
				10.95	D	13		
Very stiff grey brown CLAY with extremely to very closely spaced subhorizontal to inclined rough irregular generally planar rarely smooth regular planar slightly gleyed fissures and occasional subhorizontal layers of dark grey and dark grey green silt. (LONDON CLAY)	11.50		(6.50)	12.50 - 12.95	D	14	S N=29	3,5,6,7,8,8
				14.50 - 14.95	U	15		60 blows
				14.95	D	16		
Very stiff grey brown CLAY with very closely to closely spaced subhorizontal to inclined rough irregular generally planar occasionally slightly undulose gleyed fissures. (LONDON CLAY)	11.50		(6.00)	16.50 - 16.95	D	17	S N=33	6,7,7,8,8,10
				18.50 - 18.95	U	18		60 blows
				19.00	D	19		
Remarks							Logged by NEF	
Notes: Materials are described in accordance with Appendices. For explanation of symbols and abbreviations see Fig. 1. (c) Soil Mechanics All depths and reduced levels in metres. Thicknesses given in brackets in depth column.							Scale 1:50 Fig - 48	



 Soil Mechanics				BOREHOLE No. H051				
Equipment & Methods		Location No. 7600		Sheet 3 of 5				
As sheet 1		Location		TQ 07 NE / 337				
Heathrow Airport Limited		HEATHROW ACCESS ROAD						
Carried out for		Ground Level		Coordinates		Date		
		As sheet 1						
Description	Reduced Level	Legend	Depth (Thick)	Samples/Tests			Field Records	
				Depth	Sample Type No.	Test		
LONDON CLAY (As sheet 2)			(6.00)	20.50 - 20.95	D	20	S N=37	5,7,7,9,10,11
				22.50 - 22.85	U	21		70 blows
	5.50		23.00	22.90	D	22		
Very stiff grey brown CLAY with extremely closely spaced subhorizontal to subvertical rough irregular generally planar and smooth regular planar occasionally undulose gleyed fissures with occasional subhorizontal layers of dark grey green silt and occasional shell fragments.			(2.40)	24.50 - 24.95	D	23	S N=41	5,9,10,10,10,11
(LONDON CLAY)	3.10		25.40					
CLAYSTONE (Driller's description)			(0.40)					
	2.70		25.80					
Very stiff grey brown CLAY with extremely closely spaced inclined to subvertical rough irregular generally planar occasionally slightly undulose and smooth regular planar gleyed fissures with occasional 1-5mm lenses of light grey and dark grey green silt, rare shell fragments and occasional pyritic nodules and pyritised wood fragments.			(4.70)	26.50 - 26.90	U	24		70 blows
				26.95	D	25		
(LONDON CLAY)				28.50 - 28.95	D	26	S N=43	4,7,9,10,12,12
Remarks								Logged by
								MEF
								Scale
								1:50
								Fig.
								48
Notes: Materials are described in accordance with Appendices. For explanation of symbols and abbreviations see Fig. 1. (c) Soil Mechanics All depths and reduced levels in metres. Thicknesses given in brackets in depth column. 10.01.90/09.57 (Ver 4.1.1)								



Soil Mechanics				BOREHOLE No. H051																																														
Equipment & Methods				Location No. 7600																																														
As sheet 1				Location TQ 07 NE / 337- HEATHROW ACCESS ROAD																																														
Carried out for Heathrow Airport Limited				Ground Level		Coordinates		Date																																										
				As sheet 1																																														
Description	Reduced Level	Legend	Depth (Thick)	Samples/Tests			Field Records																																											
				Depth	Sample Type	No.																																												
LONDON CLAY (As sheet 3)			(4.70 pen)	30.00 - 30.40	U	27	95 blows																																											
BOREHOLE ENDS AT 30.50 m.	-2.00		30.50	30.45	D	28																																												
<table border="1"><caption>Water Level Observations During Boring</caption><thead><tr><th>Date</th><th>Time</th><th>Depth of Hole (m)</th><th>Depth of Casing (m)</th><th>Depth to Water (m)</th><th>Remarks</th></tr></thead><tbody><tr><td>1989</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>23.11</td><td>-</td><td>3.00</td><td>3.00</td><td>DRY</td><td>Pulling head test</td></tr><tr><td>23.11</td><td>-</td><td>6.50</td><td>6.50</td><td>DRY</td><td></td></tr><tr><td>23.11</td><td>-</td><td>20.00</td><td>6.50</td><td>DRY</td><td>End of shift</td></tr><tr><td>24.11</td><td>-</td><td>20.00</td><td>6.50</td><td>DRY</td><td>Start of shift</td></tr><tr><td>24.11</td><td>-</td><td>30.50</td><td>6.50</td><td>DRY</td><td>End of borehole</td></tr></tbody></table>								Date	Time	Depth of Hole (m)	Depth of Casing (m)	Depth to Water (m)	Remarks	1989						23.11	-	3.00	3.00	DRY	Pulling head test	23.11	-	6.50	6.50	DRY		23.11	-	20.00	6.50	DRY	End of shift	24.11	-	20.00	6.50	DRY	Start of shift	24.11	-	30.50	6.50	DRY	End of borehole	
Date	Time	Depth of Hole (m)	Depth of Casing (m)	Depth to Water (m)	Remarks																																													
1989																																																		
23.11	-	3.00	3.00	DRY	Pulling head test																																													
23.11	-	6.50	6.50	DRY																																														
23.11	-	20.00	6.50	DRY	End of shift																																													
24.11	-	20.00	6.50	DRY	Start of shift																																													
24.11	-	30.50	6.50	DRY	End of borehole																																													
Remarks								Logged by																																										
2. Standpipe installed upon completion.								NWGF																																										
Notes:								Scale																																										
Materials are described in accordance with Appendices. For explanation of symbols and abbreviations see Fig. 1. (c) Soil Mechanics								1:50																																										
All depths and reduced levels in metres. Thicknesses given in brackets in depth column.								Fig.																																										
10.01.90/09.57 (Ver 4.1.1)								48																																										

Appendix E

Thames Water Asset Location Plans

Asset location search



Property Searches

motion
84 north street
GUILDFORD
GU1 4AU

Search address supplied The Plough
239
Sipson Road
Sipson
West Drayton
UB7 0HW

Your reference 1bisip/2309013

Our reference ALS/ALS Standard/2023_4912908

Search date 16 November 2023

Notification of Price Changes

From 1st April 2023 Thames water Property Searches will be increasing the prices of its CON29DW, CommercialDW Drainage & Water Enquiries and Asset Location Searches. Historically costs would rise in line with RPI but as this currently sits at 14.2%, we are capping it at 10%.

Customers will be emailed with the new prices by January 1st 2023.

Any orders received with a higher payment prior to the 1st April 2023 will be non-refundable. For further details on the price increase please visit our website at www.thameswater-propertysearches.co.uk



Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW



searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk



0800 009 4540

Search address supplied: The Plough, 239, Sipson Road, Sipson, West Drayton, UB7 0HW

Dear Sir / Madam

An Asset Location Search is recommended when undertaking a site development. It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This search provides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0800 009 4540, or use the address below:

Thames Water Utilities Ltd
Property Searches
PO Box 3189
Slough
SL1 4WW

Email: searches@thameswater.co.uk

Web: www.thameswater-propertysearches.co.uk

Waste Water Services

Please provide a copy extract from the public sewer map.

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer.

Clean Water Services

Please provide a copy extract from the public water main map.

With regard to the fresh water supply, this site falls within the boundary of another water company. For more information, please redirect your enquiry to the following address:

Affinity Water Ltd
Tamblin Way
Hatfield



AL10 9EZ
Tel: 0345 3572401

For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Payment for this Search

A charge will be added to your suppliers account.

Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

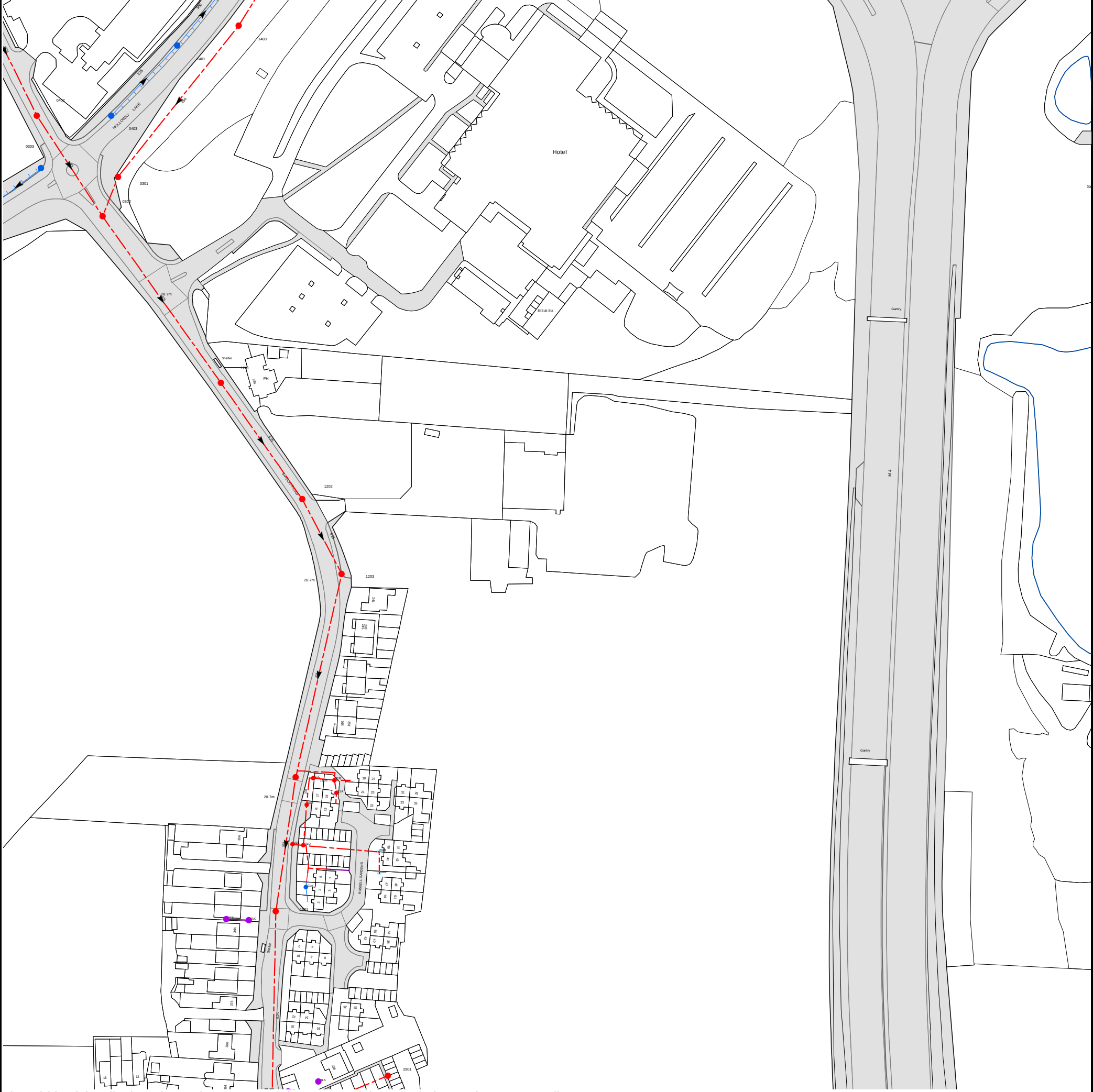
Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 507291,178219
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map (2020) with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
101A	n/a	n/a
101D	n/a	n/a
101E	n/a	n/a
101F	n/a	n/a
111C	n/a	n/a
1001	28.61	22.49
1101	28.68	22.64
1202	28.53	22.86
191A	n/a	n/a
111B	n/a	n/a
111A	n/a	n/a
1203	28.81	22.79
201B	n/a	n/a
201A	n/a	n/a
2901	28.36	26.06
101C	n/a	n/a
101B	n/a	n/a
1201	28.59	22.98
0302	28.86	23.1
0301	29.07	23.23
0303	n/a	n/a
0402	28.83	23.21
0403	n/a	n/a
1401	n/a	n/a
1403	28.44	23.73
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.		



Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

	Foul Sewer: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.
	Surface Water Sewer: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.
	Combined Sewer: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.
	Storm Sewer
	Sludge Sewer
	Foul Trunk Sewer
	Surface Trunk Sewer
	Combined Trunk Sewer
	Foul Rising Main
	Surface Water Rising Main
	Combined Rising Main
	Vacuum
	Thames Water Proposed
	Vent Pipe
	Gallery

Other Sewer Types (Not operated and maintained by Thames Water)

	Sewer
	Culverted Watercourse
	Proposed
	Decommissioned Sewer
	Content of this drainage network is currently unknown
	Ownership of this drainage network is currently unknown

Notes:

- 1) All levels associated with the plans are to Ordnance Datum Newlyn.
- 2) All measurements on the plan are metric.
- 3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the direction of flow.
- 4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

	Air Valve
	Meter
	Dam Chase
	Vent
	Fitting

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

	Ancillary
	Drop Pipe
	Control Valve
	Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol. Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

	Inlet
	Outfall
	Undefined End

Other Symbols

Symbols used on maps which do not fall under other general categories.

	Change of Characteristic Indicator
	Public / Private Pumping Station
	Invert Level
	Summit

Areas

Lines denoting areas of underground surveys, etc.

	Agreement
	Chamber
	Operational Site

Ducts or Crossings

	Casement
	Conduit Bridge
	Subway
	Tunnel

Ducts may contain high voltage cables. Please check with Thames Water.

5) 'na' or '0' on a manhole indicates that data is unavailable.

6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology, please contact Property Searches on 0800 009 4540.

Payment Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment within 14 days of the date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service or will be held to be invalid.
4. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
5. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
6. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800.

If you are unhappy with our service, you can speak to your original goods or customer service provider. If you are still not satisfied with the outcome provided, we will refer the matter to a Senior Manager for resolution who will provide you with a response.

If you are still dissatisfied with our final response, and in certain circumstances such as you are buying a residential property or commercial property within certain parameters, The Property Ombudsman will investigate your case and give an independent view. The Ombudsman can award compensation of up to £25,000 to you if he finds that you have suffered actual financial loss and/or aggravation, distress, or inconvenience because of your search not keeping to the Code. Further information can be obtained by visiting www.tpos.co.uk or by sending an email to admin@tpos.co.uk.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0300 034 2222 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	BACS Payment	Telephone Banking
Please Call 0800 009 4540 quoting your invoice number starting CBA or ADS	Account number 90478703 Sort code 60-00-01 A remittance advice must be sent to: Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW. or email ps.billing@thameswater.co.uk	By calling your bank and quoting: Account number 90478703 Sort code 60-00-01 and your invoice number

Thames Water Utilities Ltd Registered in England & Wales No. 2366661 Registered Office Clearwater Court, Vastern Rd, Reading, Berks, RG1 8DB.

Appendix F

Environment Agency Flood Map for Planning

Flood map for planning

Your reference
Sipson CoE

Location (easting/northing)
507290/178216

Created
5 Dec 2023 14:58

Your selected location is in flood zone 1, an area with a low probability of flooding.

You will need to do a flood risk assessment if your site is **any of the following:**

- bigger than 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

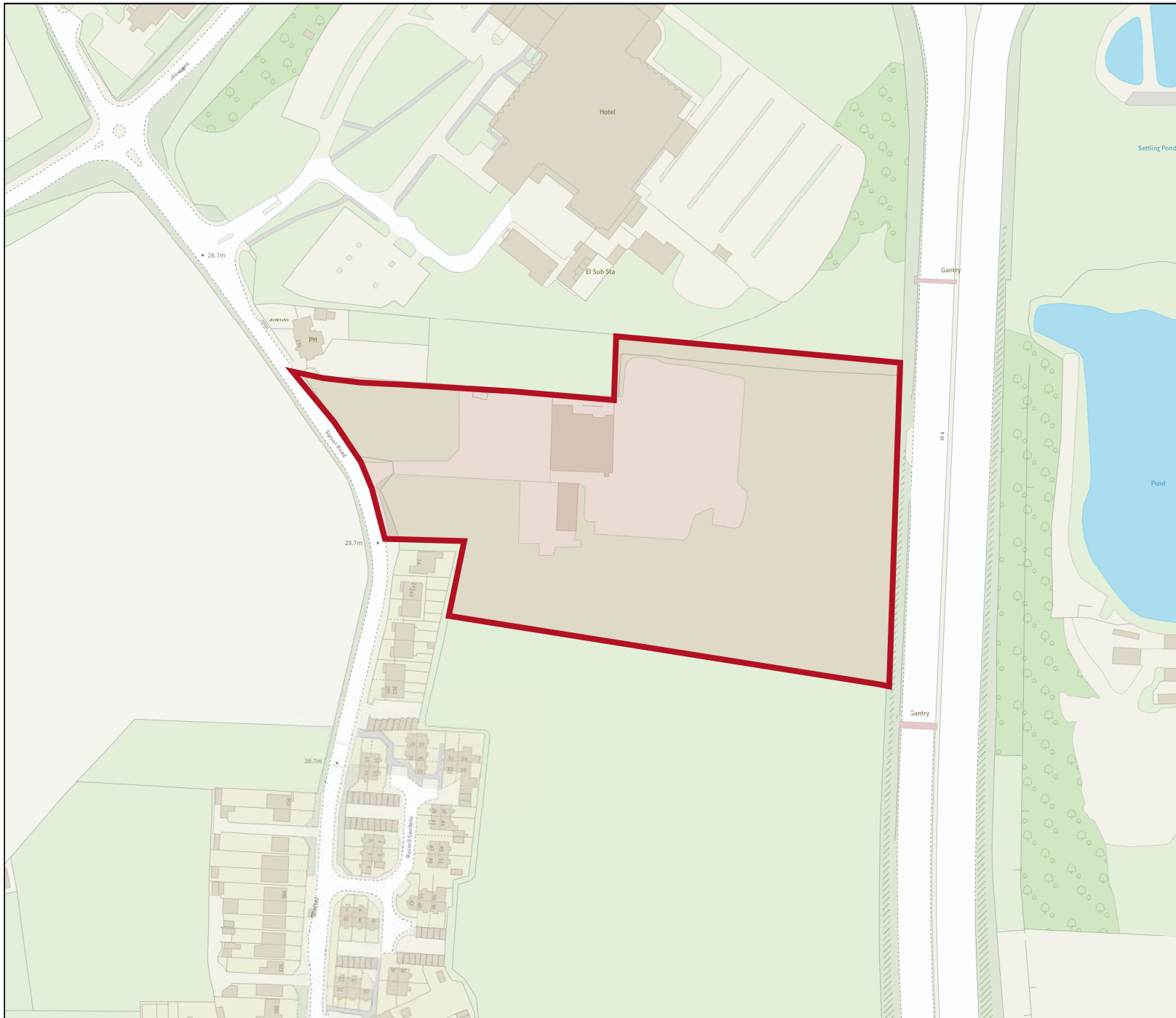
Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence **which** sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

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Flood map for planning

Your reference

Sipson CoE

Location (easting/northing)

507290/178216

Scale

1:2500

Created

5 Dec 2023 14:58

-  Selected area
-  Flood zone 3
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Water storage area

