BIRD IN HAND PUB

LONDON BOROUGH OF CAMDEN

FLOOD RISK AND SUSTAINABLE DRAINAGE STRATEGY

PEACOCK AND SMITH

DOCUMENT REFERENCE:

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Authorisation and Version Control

Water Environment was commissioned by Peacock and Smith to investigate the risks and assess the consequences of flooding on the site at known as the Bird in Hand Pub, as well as to develop a Sustainable Drainage Strategy for the proposed development.

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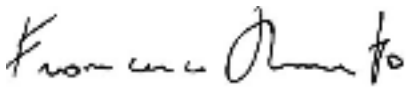
Checker:	**Francesco Rossato** MSc (Civil-Hydraulics) BSc (Civil)	
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EXECUTIVE SUMMARY

The site being reviewed in this Flood Risk Assessment (FRA) and Sustainable Drainage Assessment (SuDS) is known as the Bird in Hand Public House (pub) located on West End Lane in the London Borough of Camden (LBC).

The Bird in Hand has been vacant since 2002 and includes a public house at its ground floor and a single residential dwelling above. Number 14 West End Lane sits alongside the former Bird in Hand Pub, forming its eastern elevation, however, this does not form part of the Application Site. The former Bird in Hand Pub has an associated basement and rear courtyard. The site is currently completely hard paved.

The current proposals are for the change of use and conversion of the former Bird in Hand Pub and its associated flat, to provide one single dwelling, and the erection of a five-storey building to provide nine new apartments to its rear with associated landscaping, refuse and cycle storage. The total proposed units on the site will be ten. The current basement is not to be extended in any form (depth or area).

The Environment Agency's Flood Map for Planning shows that the site is located in Flood Zone 1 and typically sites within this designation do not require an FRA to be submitted at planning. However, the site lies with a Critical Drainage Area (CDA) and consequently the LBC requires an FRA to be submitted with any planning application at the site.

LBC is known to have experienced surface water flooding from high rainfall events in 1975, 2002, and 2021 which attributed to overland flow and sewer flooding. West End Lane is recorded as having flooded during all these events; however, the records are not detailed, and the entire road has been highlighted without reference to specific locations or to which properties were flooded on these roads. That said, the site is known to have experienced flooding in 1975 and a plaque on the site notes the 1975 flood water level. This is at least 700 mm above the general ground levels. In addition, the 25th July 2021 flood event resulted in approximately 200 m of flood water at the site.

The Long Term Flood Water Maps – surface water correlate with the past surface flood event(s) at the site. The surface water maps show the site to be located within an establish surface water flow path. As such the development has been designed with the required mitigation measure to ensure a safe development in relation to flood risk.

The surface water flood maps show the site to have a flood water level of 33.1 m AOD. In line with the EA standing advice on flood risk, the new building portion of the development will raise FFL by 300 mm above the flood water level. The FFL of the new portion of the development will be 33.4 m AOD.

The current pub building is to be furbished into a single residence. During this work, the development will include property flood resilience to prevent the ingress of surface water flooding. The building will also be designed to ensure quick recovery after a flood event. The resilience measures to ensure flood protection and recoverability will follow the CIRIA C790 guidelines.

All other sources of flooding have been assessed in accordance with the NPPF and are considered to pose a low risk to the site.

The site is located above the Ranelagh Sewer and permission from Thames Water will be required via a Build Cover Consent Application.

The development is also implementing SuDS to ensure that the development does not increase surface water runoff post development. The development is proposing to reduce surface water rates to 2 l/s, which is less than the current site runoff. This will be a marked improvement compared to the current site.

The SuDS components which can help deliver this flow rate reduction by including increased permeable areas on the site, green roof, and a blue roof. Design decisions to recommend these SuDS features following the SuDS and discharge hierarchy. The outline design presented ensures that the 1 in 100 year plus 40% event is contained on the site. This will make sure that there is no increased risk to others.

This report has demonstrated the development can be made safe from flooding and the inclusion of SuDS ensures that the site does not increase surface water rates post development.

ABBREVIATIONS

Acronym	Definition
AOD	Above Ordnance Datum
BGS	British Geological Survey
CDA	Critical Drainage Area
DEFRA	Department for Environment Food and Rural Affairs
EA	Environment Agency
FEH	Flood Estimation Handbook
FFL	Finished Floor Levels
FRA	Flood Risk Assessment
LBC	London Borough of Camden
LiDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority
NPPF	National Planning Policy Framework
PFR	Property Flood Resilience
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Practice Guidance
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
WFD	Water Framework Directive

1 INTRODUCTION

General Information

1.1 The purpose of this assessment is to consider the effect on flooding at site known as the Bird in Hand Public House on West End Lane and any required mitigation measures for the proposed development.

1.2 The Bird in Hand has been vacant since 2002 and includes a public house at its ground floor and a single residential dwelling above. Number 14 West End Lane sits alongside the former Bird in Hand Pub, forming its eastern elevation, however, this does not form part of the Application Site.

1.3 Proposals are for the redevelopment of the pub building (including the dwelling) at the site into one large residential unit and to build nine new residential units at the rear of the site. The existing pub contains one residential unit at the first floor. Post development there will be a total of ten residential units at the site.

1.4 The site could be deemed as "Major" development, and as such a Sustainable Drainage Strategy (SuDS) has to be submitted at planning. This report also includes the outline SuDS Strategy.

1.5 The site is located in Flood Zone 1 and therefore a Flood Risk Assessment (FRA) is not typically required. However, the site is located in a Critical Drainage Areas (CDAs) and the local policy requires an FRA to be submitted at planning.

1.6 The existing basement at the site is to be refurbished but not extended. No new basements are proposed and as such a Basement Impact Assessment is not required.

1.7 The site is within the jurisdiction of the London Borough of Camden (LBC). The Lead Local Flood Authority (LLFA) is also within LBC.

Scope of Study

1.8 The study includes a Flood Risk Assessment (FRA) and Sustainable Drainage Systems (SuDS) Assessment as part of the report. The scope of the FRA (see Chapter 3) and SuDS Assessment (see Chapter 4) is as follows:

- To provide a flood risk assessment for the site compliant with the guidelines set out in the National Planning Policy Framework (NPPF) and associated Planning Practice Guidance (PPG);
- To assess the risk and implications of flooding on the site including flooding from tidal, fluvial, groundwater, surface water runoff and artificial sources;
- To provide advice on the site design that will ensure safe operation of the site in the design flood event;
- Consider potential future climate change over the lifetime of the proposed development,
- To consider the pre- and post-development drainage systems and calculate pre- and post-development runoff rates and volumes based on standard methodologies; and
- To provide advice and guidance on the management of surface water runoff at the site to ensure the risk of surface water flooding on the site and on nearby sites does not increase post-development.

Authors

1.9 Water Environment Limited has over 16 years of experience of consulting engineering in the water sector including flood risk assessment and drainage system design. Water Environment staff are skilled in the assessment of flood risk and groundwater, and are members of the Institution of Civil Engineers (ICE) and the Institute of Water and Environmental Management (CIWEM). All Water Environment Directors and Associates are Chartered Members of the ICE or CIWEM or have Member status.

1.10 Water Environment Limited is supplying the assessment for flood risk (FRA) and sustainable drainage (SuDS).

Sources of Information

1.11 Baseline data have been drawn from the following sources:

- Current and historical Ordnance Survey mapping;
- Geological mapping and hydrogeological data taken from the British Geological Survey Geology of Britain, BGS Hydro and open data Web Map Services;
- Hydrological information from the Flood Estimation Handbook web service;
- Flood risk mapping from the UK government Environmental Open Data Web Map Services and environmental information from DEFRA's Magic Map;
- LiDAR ground level information data from the Environment Agency (EA);
- London Borough of Camden (LBC) Strategic Flood Risk Assessment[1] (SFRA), Preliminary Flood Risk Assessment[2] (PFRA), Surface Water Management Plan[3] (SWMP), Floods in Camden Report[4], London Review[5] for the July 2021 flash flooding; and
- LBC Local Plan Policy A5 and Camden Geological, Hydrogeological and Hydrological Study[6] (GHHS)

[1] URS, London Borough of Camden SFRA, July 2014
[2] Drain London/London Borough of Camden, Preliminary Flood Risk Assessment, v0.2, April 2011
[3] Drain London/London Borough of Camden, Surface Water Management Plan, v0.5, July 2011
[4] London Borough of Camden, Floods in Camden Report of the Floods Scrutiny Panel, June 2003
[5] Mott MacDonald, London Flooding Review (July 2021), March 2022
[6] London Borough of Camden, Camden geological, hydrogeological and hydrological study – Guidance for subterranean development, Issue 01, November 2010

2 DESCRIPTION OF DEVELOPMENT

Location

2.1 The development site is located on West End Lane in Kilburn. The disused pub is located on the southern side of the road opposite the junction with Mutrix Road as shown in Figure 1.

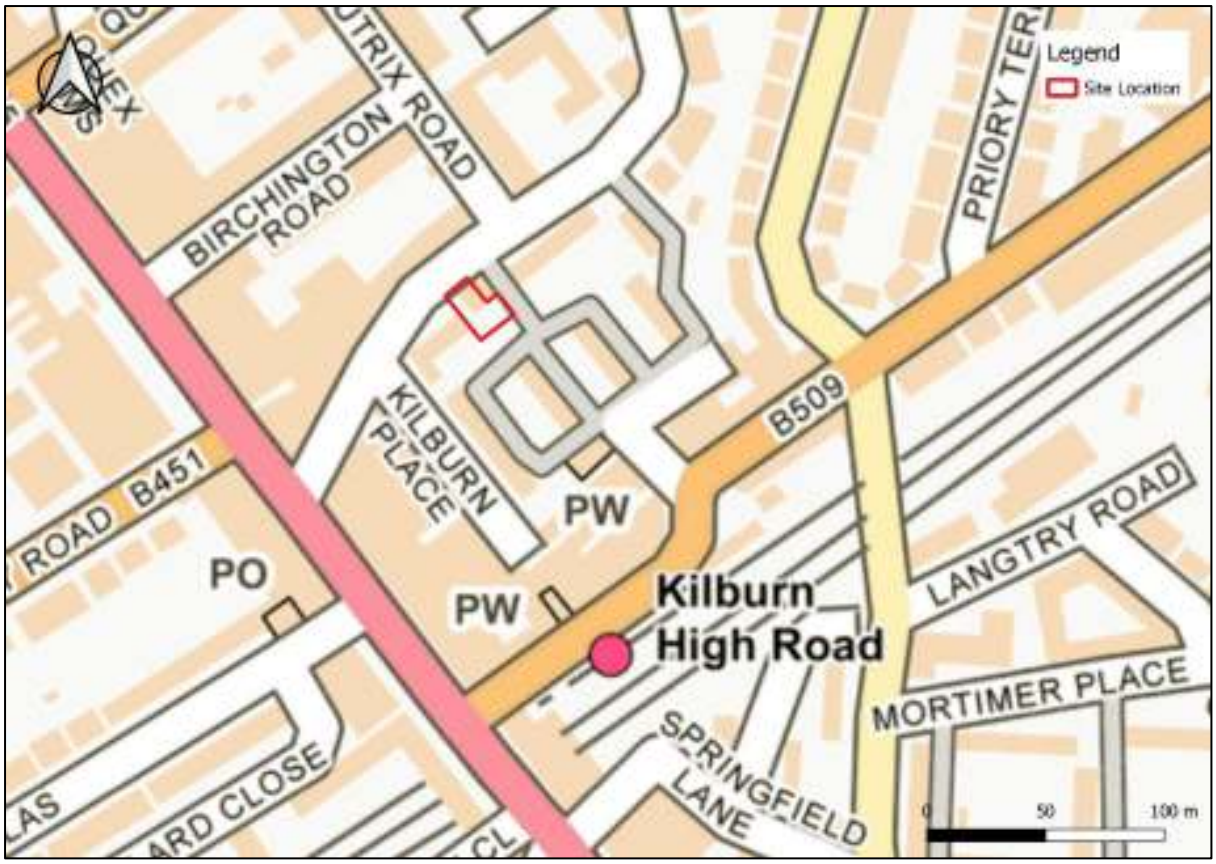


Figure 1: Location of proposed development

2.2 The site is located to the north of Maida Vale and St John's Wood. The red line boundary coincides with the property boundary, and the site is bounded by other residential properties (including access roads) on all sides, with West End Lane to the front (north).

2.3 The Bird in Hand has been vacant since 2002 and includes a public house at its ground floor and a single residential dwelling above. Number 14 West End Lane sits alongside the former Bird in Hand Pub, forming its eastern elevation, however, this does not form part of the Application Site.

Existing Site

2.4 The site is currently occupied by the Bird in Hand Public House and is completely hard standing. The pub has not been used as a Public House since 2002. The Bird in Hand Pub has always contained a single dwelling on the upper floors.

2.5 M.J. Zara Survey Limited undertook a topographic survey of the site in November 2016. The survey shows that the site slopes gently to the south but is approximately at 32.00m AOD

Proposed Development

2.6 The proposals comprise of a change of use and conversion of the former Bird in Hand Pub and its associated flat, to provide a single dwelling, and the erection of a five-storey building to provide nine new apartments to its rear with associated landscaping, refuse and cycle storage.

2.7 The proposed dwelling will retain the existing floors (basement, ground floor, first floor and second floor), and will include three bedrooms at upper levels with an open-plan kitchen-diner and living area, a WC/utility area, a study, a gym and a cinema room for the ground and basement levels. A private garden is also proposed, positioned to the west of the dwelling. The basement level of the former Bird in Hand Pub is to be retained as existing in terms of its current depth and extent.

2.8 The creation of a five-storey building to the rear of the former Bird in Hand Pub, comprise of nine apartments. The apartments and associated facilities will be set across five floors. The ground floor flat has a private garden.

2.9 The proposed development increases the number of residential units on site from one to a total of ten.

2.10 No new basements are to be created as part of this application.

3 ASSESSMENT OF FLOODING

3.1 In assessing the risk of flooding to the site, the LBC PFRA[2], SFRA[1], SWMP[3] have been reviewed alongside the EA flood data and the London Flood Review[5]. No Section 19 Flood Investigation Reports are publicly available from LBC.

Historic Flooding

3.2 The EA hold no information on historic flooding at the site.

3.3 The London Flood Review for the July 2021 flash flooding events have shown that the local area did experience flooding. The London Review complied flooding history from Thames Water, local councils, Section 19 Reports, and social media reports.

3.4 The scale of the mapping within the London Review does not pinpoint streets or houses. It is a large scale record of flooding across London. As such, the site is located close to Kilburn High Road Station and this place marker, within London was used to assess if the site flooded in the July 2021 events.

3.5 The London Review confirmed that no properties within the vicinity of Kilburn High Road Station were recorded as having flooded in the 25th July 2021 event. This is typical for this area of London, as this event predominantly affected North East London. However, the 12th July 2021 event shows that multiple below (basements) and above ground properties were affected by flooding around Kilburn High Road Station. The Bird in Hand Pub was affected by the 25th July 2021 flood event.

3.6 The Bird in Hand Pub experienced between 200 mm and 225 mm of flooding on the 25th July 2021 according to the owners of the site. This depth of water was sufficient to overtop the front step and gain entry to the pub and into the basement.

3.7 The London Review concluded that the 25th July 2021 event was in the proximity to a 1 in 170 year rainfall event.

3.8 Camden's Section 19 Flood Investigation Report for the July 2021 event is not in the public realm at the time of writing this report.

3.9 The Camden SWMP show West End Lane within Figure 1.3 to have been affected by the 1975 and 2002 flood events.

3.10 The 1975 rainfall event was recorded as 170 mm of rainfall in two to three hours. This was event was noted as the worst rainfall event in London to date, at the time. A plaque on the current building marks the flood water levels of the 14th August 1975 flood event at the site. The flood water line is 700-800 mm above the external ground level at the site.

3.11 The 2002 rainfall event was documented as recording 60 mm of rain in under an hour resulting in flooding primarily in West and South Hampstead and Kentish Town according to the SWMP.

3.12 The SFRA does state the mapping from the 1975 and 2002 event are "*relatively course used to indicate roads where flooding was experienced and not to identify the exact extent of flood waters during the rainfall event.*"

3.13 No further records of historic flooding affecting the site or surrounding area were identified.

Flooding from Rivers and the Sea

3.14 The site is located within Flood Zone 1. The nearest fluvial watercourse with associated Flood Zone Mapping is the River Brent, located over 4km to the north of the site. This is also the nearest classified river under the Water Framework Directive (WFD).

3.15 The site is also shown to not be within the floodplain of the River Thames and thus is not at risk of tidal flooding.

3.16 The River Westbourne is a well documented "lost" river within North London. The River Westbourne was merged in to the London sewer system during the 1850's. The sewer which contains the River Westbourne is known as the Ranelagh Sewer and is owned and maintained by Thames Water. The risk from this source is reviewed in "Flooding from Sewers" section.

3.17 The site and proposed development are at low risk of fluvial and tidal flooding.

Flooding from Surface Water

3.18 Flooding from surface water arises during intense rainfall events when flood waters are unable to infiltrate into the ground or discharge into local ditches or artificial drainage infrastructure. In an urban environment, the risk of flooding from surface water and from overloaded sewers is closely related, and both are included in the relevant surface water flooding datasets. Flooding events are typically of short duration (unless there is a drainage system blockage) but can be severe.

3.19 The site is located within the Group 3_010 Critical Drainage Area. The site is not located within a Local Flood Risk Zone.

3.20 According to the GHHC Figure 15 historical mapping figure, the site is recorded as being on a road that has flooded in the past. The same map shows there is no potential risk of surface water flooding.

3.21 The Gov.UK Risk of Flooding from Surface Water (RoFSW) map, presented in Figure 4, shows that the site is at risk of flooding from surface water.

3.22 The site is located within a surface water flow path which follows Kingsgate Road, across to Birchington Road and onto West End Lane. The flow path then crosses through the Kilburn Vale Housing Estate, which is directly to the northeast of the site.

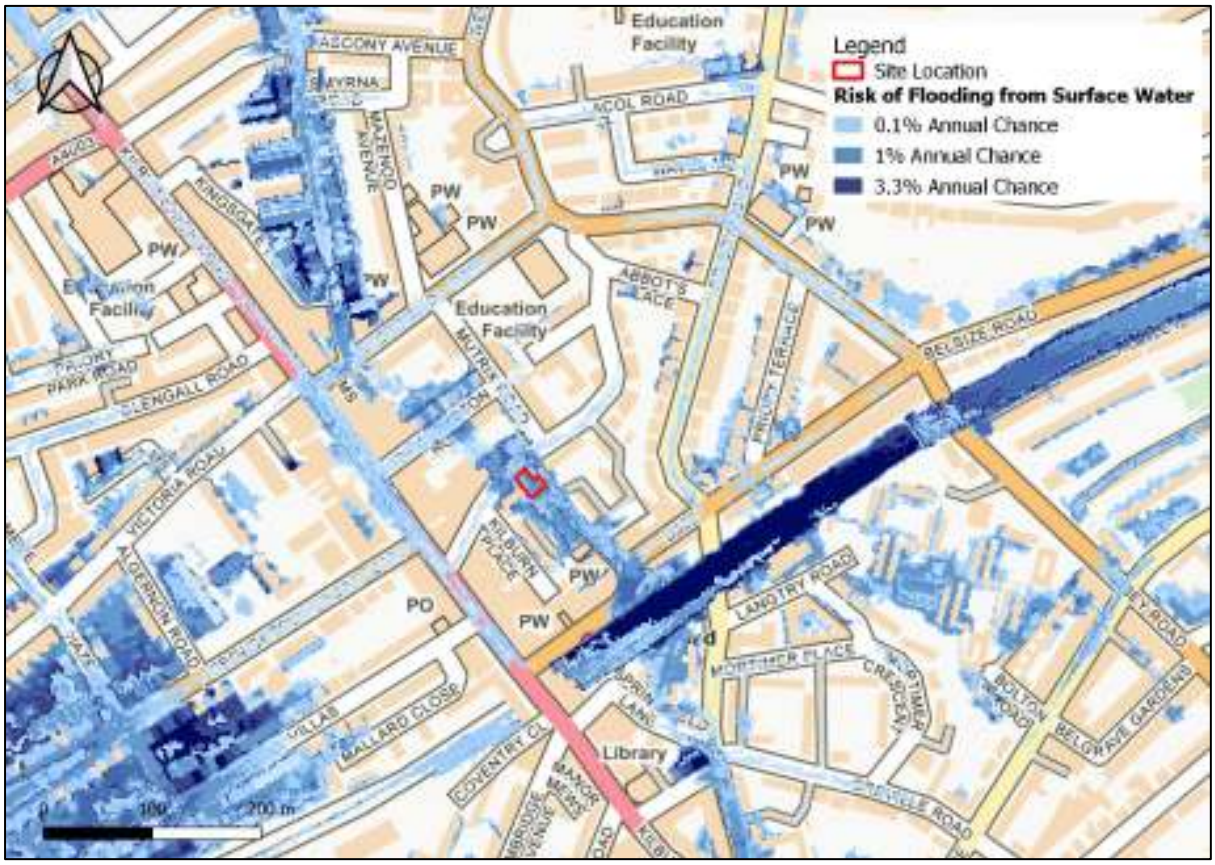


Figure 2: Gov.UK Risk of Flooding from Surface Water map

3.23 Analysing the surface water maps with open-source LiDAR and the topographic survey, the flood water level is approximately 33.10 m AOD.

3.24 The design of the new build section of the development is proposing to raise floor levels above this source of flooding. The EA guidance is for 300 mm above the flood water level. At minimum, the finished floor levels (FFL) should be set at 31.40 m AOD.

3.25 For the existing property, which is to be refurbished, raising FFL is extremely difficult. As such, this part of the development will implement property flood resilience (PFR).

3.26 PFR measures for flood water depth below 300 mm should implement the "Water Exit" strategy outlined in the Camden SFRA, CIRIA C790 Code of Practise for PFR, the Communities and Local Government Improving the Flood Performance of New Buildings and British Standards.

3.27 For depths of the flooding over 600 mm, the "Water Entry" method should be implemented. This means allowing flood water to enter the building. This is required to ensure the structural integrity of the building. Typical with new buildings, outside walls can withstand the hydrostatic pressure from flood water up to 600 mm.

3.28 The redevelopment of the Bird in Hand pub should be assessed by a structural engineer to determine the integrity of the walls and how much flood water the building can adequately resist without structural faults. This survey is required to understand the depth of flooding that the current walls can withstand.

3.29 Measures to prevent the ingress of flood water should include flood doors, demountable flood barrier and flood resilient construction such as hard or tiled floors, raising electrical sockets, placing plasterboard horizontal (instead of vertical to ensure only one board needs replacing),

sealing all utilities entrances up to 600 mm above the general ground level. Design specifics are requested to be conditioned by the LLFA, if required.

3.30 Any demountable defences to be installed should be located in a public place and occupants should be able to install them easily. This is because surface water flooding happens without warning and quick implantation is required to adequately protect the development.

3.31 Management and maintenance of the PFR measures should take place at least one a year, to inspect and check for any damage such as broken seals.

3.32 As the development is proposing raised FFL and PFR techniques, subject to these being properly implemented and managed, the development should be a low risk of flooding.

Flooding from Sewers

3.33 Sewer flooding generally results in localised short term flooding caused by intense rainfall events overloading the capacity of sewers. Typically, flooding would be expected to be similar and scale and hydraulics to surface water flooding.

3.34 The SWMP states that within post code NW6 1, 104 properties affected from 2003 to 2013.

3.35 Thames Water has confirmed that there have been no records of flooding at the site because of surcharging public sewers.

3.36 The asset location information indicates that there is public combined sewer in the vicinity and on the site. Within West End Lane, a 305 mm diameter combined sewer and 1168 x 762 mm egg shaped sewer converge with the southerly flowing 1346 x 838 mm egg shaped sewer outside the northern boundary of the proposed development. These sewers then become the Ranelagh Sewer (West End Branch) sewer. This sewer runs across the site in a southerly direction.

3.37 The Ranelagh Sewer is the culverted River Westbourne. The River Westbourne was culverted in the 19th century and incorporated into the Thames Water network.

3.38 The invert level of the Ranelagh Sewer on the site is 26.64 m AOD which is approximately 5.50 m below the ground level at the existing site.

3.39 The proposed development is over the Ranelagh Sewer. The development will need to seek permission from Thames Water before any works are commenced on the site. This will be in the form of a Build Over Agreement.

3.40 The existing site has a basement which is to be refurbished as part of the development proposals. The design at present does not include any bathrooms or toilets. If this is to change or if the proposed bar area is to have a sink, a positive pumped system is recommended.

3.41 The proposed development is not at significant risk of flooding from sewers.

Flooding from Groundwater

3.42 According to the 1:50,000 scale BGS mapping, the site is located above a bedrock of London Clay. No superficial deposits are recorded for the site or the local area.

3.43 Whilst the BGS mapping provides an excellent resource for understanding the likely geology and general geological sequence within an area, this is not intended to be site specific and therefore on-site ground investigation should be undertaken to provide further information on the geology encountered directly beneath the site.

3.44 The BGS borehole logs provides some further clarity on the geology at the site. BGS Borehole TQ28SE451 was undertaken for the creation of the Kilburn Vale Estate and is within 100 m of

the site. The borehole shows the local area is underlain by clay and no superficial deposits are recorded.

3.45 According to DEFRA's Magic Map, the site is located in an unproductive bedrock and superficial drift body. The Aquifer is not designated as a groundwater body under the WFD, and there are no associated groundwater Source Protection Zones (SPZ).

3.46 London Clay is a predominantly unproductive bedrock, and whilst significant groundwater flows are not expected to be typical, local or perched pockets of groundwater may be encountered during construction. To prevent ingress of groundwater to the current basement, it should be determined if current waterproofing is adequate and if required it should be improved to current standards and best practice.

3.47 If groundwater was to emerge at the surface, slopes in the area are such that this would generally be expected to flow overland without ponding, either being collected into highway or local drainage, or following the pathways indicated by the surface water map.

3.48 The current basement is not at significant risk of flooding from groundwater due to being positioned within London Clay formation. However, the basement should be protected from unforeseen groundwater seepage. This is a standard precaution in basement construction.

3.49 The proposed development is not at significant risk of flooding from groundwater.

Flooding from Other Sources

3.50 According to the Gov.UK long term reservoir flood extents, the site is not at risk of flooding as a result of reservoir failure on either a dry day or in combination with fluvial flooding.

3.51 There are no other surface waterbodies in the area that could present a risk of flooding due to overtopping or embankment failure.

3.52 There are no other sources of flooding that present a risk to the site.

Climate Change

3.53 The projected impacts of climate change are likely to cause long term variations in the probability and risk of flooding. Risk of flooding from groundwater is generally likely to be reduced due to reduced winter rainfall and a move to more intense summer storms which cannot infiltrate into the ground, but risks from other sources are likely to increase. This will affect the site in terms of the likelihood of flooding from surface water and this has been taken into consideration throughout this assessment in accordance with the latest government guidance.

Summary of Flood Risk

3.54 The site is at risk of flooding from surface water. All other sources of flooding have been shown to be at low risk for the site and the proposed development. Mitigation measures are required to prevent the ingress of surface water into the development.

3.55 The proposed new building on the site has set FFL 300 mm above the surface water flood water level (33.1 m AOD). The proposed FFL are at 33.40m AOD. The refurbishment of the current building will require PFR measures to prevent the ingress of surface water.

3.56 The refurbishment of the basement will not increase the risk of groundwater flooding elsewhere because it is already in situ and no changes to its footprint are occurring. It is recommended, if the proposed bar areas are to include a sink, that the drainage system includes a positive pumped system.

3.57 The refurbishment of the basement could also include tanking (if possible) to prevent any ingress of seepage. This is standard practise for basements.

3.58 There is a risk that the development could affect the risk of flooding downstream due to increased rates of runoff arising from increased proportions of man-made surfaces on the site and the future effects of climate change. It is therefore necessary to undertake a drainage assessment and outline design for the proposed development to ensure no increased risk to others.

4 SUDS ASSESSMENT

Policy

4.1 As the proposed development could be constituted as "Major Development", an outline SuDS strategy has been prepared for the planning application. The outline design has been undertaken in line with the SuDS and drainage hierarchy.

Sustainable Drainage Principles

4.2 The aim of SuDS is to emulate natural drainage processes such that watercourses and storage areas receive the hydrological profiles under which they evolved, and that water quality in local ecosystems is protected or improved. The best practice guide states that SuDS will:

- Reduce the impact of additional urbanisation on the frequency and size of floods;
- Protect or enhance river and groundwater quality;
- Be sympathetic to the needs of the local environment and community; and
- Encourage natural groundwater recharge.

4.3 Table 1 shows the hierarchy of SuDS techniques. The SuDS techniques that are proposed to manage surface water for the development will be discussed in relation to this hierarchy.

Table 1: SuDS Hierarchy[7]

	SUDS Technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife
Most Sustainable	**Green roofs**	✓	✓	✓
	Basins and ponds 1. Constructed wetlands 2. Balancing ponds 3. Detention basins 4. Retention ponds	✓	✓	✓
	Filter strips and swales	✓	✓	✓
	Infiltration devices 5. Soakaways 6. Infiltration trenches and basins	✓	✓	✓
	Permeable surfaces and filter drains 7. Gravelled areas 8. Solid paving blocks 9. Porous paviors	✓	✓	
Least Sustainable	**Tanked systems** 10. Over-sized pipes/tanks 11. Box storage systems	✓		

4.4 Living roofs are feasible for the development due to a flat roof construction. In order to provide source control and retain rainwater on site for reuse, it is strongly recommended that any

[7] Available at: http://www.sustainabledrainagecentre.co.uk/suds-hierarchy_c2236.aspx [Retrieved 02/11/2016]

associated landscaped areas are designed as bioretention areas, tree pits and /or rain gardens to retain and utilise rainfall. Water butts should be installed on rainwater downpipes.

4.5 Basins, ponds, filter strips and swales are not suitable for use within the development due to a lack of available space.

4.6 Local BGS borehole data demonstrate that the sub-surface geology is made up of London Clay which is not considered to be suitable for infiltration devices (e.g. soakaways) generally. However, it would be beneficial to undertake infiltration testing and a more detailed geological investigation post-planning to determine whether it would be possible to allow paved areas to infiltrate to ground.

4.7 Table 2 includes a summary of potential SuDS options for the site, with reference to the SuDS hierarchy.

Table 2: Summary of proposed SuDS with reference to SuDS hierarchy

SUDS Technique	Practicable	Proposed	Notes
Green roofs, bioretention areas, tree pits	✓	✓	A flat roof construction is suitable for green roofs. Bioretention areas and tree pits should be incorporated where possible
Basins and ponds	×	×	Insufficient space available on the site
Filter strips and swales	×	×	Insufficient space available on the site
Infiltration devices	×	×	Ground conditions not considered to be suitable
Permeable surfaces and filter drains	✓	✓	Paved areas should be formed of permeable block paving with a suitable porous sub-base (subject to infiltration testing)
Tanked systems	✓	✓	Attenuation tanks to be used to provide additional attenuation storage where necessary. Below ground tanks are not appropriate due to development proposal layouts. A blue roof is also appropriate.

Discharge Strategy

4.8 The discharge hierarchy should be considered and the relevant Planning Practice Guidance states:

> *"Generally the aim should be to discharge surface runoff as high up the following hierarchy of drainage options as reasonably practicable:*
>
> *1. Into the ground (infiltration);*
>
> *2. To a surface water body;*
>
> *3. To a surface water sewer, highway drain or another drainage system;*

4. To a combined sewer."

4.9 The proposed drainage strategy should discharge water falling on paved areas to the ground if it is found to be feasible. This is subject to infiltration testing at the post-planning stage. Unfortunately, the desk study on the geology at the site suggests that ground conditions are such that this is not likely to be possible, although the infiltration capacity of London Clay is highly locally variable.

4.10 The only alternative option is to discharge at attenuated rates to existing connections, namely the Thames Water combined sewer. Typically, development which re-use a connection do not need to apply to Thames Water for a connection to the existing on-site private demarcation chamber. However, this is not the case when a site is subdivided or more dwelling are proposed on the site. The development will need to apply to Thames Water for permission.

4.11 Capacity check have been undertaken with Thames Water and there is suitable capacity in the network for the development. Thames Water have confirmed a surface water discharge rate of 2 l/s is required. The correspondence is attached to this report.

Site Runoff Characteristics

4.12 The current site is completly hard paved and drains via gullies to the Thames Water combined sewer. A CCTV survey will need to be undertaken to determine how and which Thames Water manhole the site connects to. The existing site has no SuDS measures and discharges surface water freely with no flow controls.

4.13 Greenfield runoff rates in the 100 year return period event, for the entire site, are 0.5 l/s, calculated using the IH 124 calculation method.

4.14 Detailed runoff calculations have been undertaken for the site in its existing and post-development state. The existing site produces a runoff rate of 12.90 l/s in the 100-year, 7.8-minute storm event.

4.15 The proposals for the site are to include planted areas (52 m^2) and a green roof with 150 mm substrate across 155 m^2 of the site. This is an overall increase in permeable areas on the site post-development. The increase in permeable area will help reduce the surface water discharge rate from the site.

4.16 Post-development, as per the NPPF and local policy, an uplift for climate change (40% for the London Management Catchment in the 2070's epoch[8]) is required and thus the site runoff rate increases to **14.59 l/s for the 1% AEP event plus 40% climate change rainfall event**, even with the implementation of permeable areas on the site.

4.17 Similarly, the 3.3% AEP event (30 year) has been calculated with a climate change uplift. The uplift for climate change for the 3.3% AEP event is 35%. The calculations sheet uses the highest climate change uplift for all events and thus the results appended to this report use 40% uplift. The **3.3% AEP event plus 40% climate change rainfall event is 11.4 l/s**.

4.18 **The proposed surface water runoff rate is 2 l/s.** This rate has been chosen because a new connection will need to be sought from Thames Water (as the development is increasing units on the site), and Thames Water has confirmed that a new connection to the sewer is acceptable as long as a rate of 2 l/s is achieved for the surface water discharge. Discussions are ongoing at present with Thames Water regarding the capacity and connection points.

[8] Taken from: https://hydrology-test.epimorphics.net/hydrology/climate-change-allowances/rainfall [Retrieved on 16/05/2022]

4.19 The detailed runoff calculations identify that the site will only need to provide an additional attenuation volume of 7.90 m^3 in order to reduce surface water runoff rates to 2 l/s.

Proposed Surface Water Drainage System

4.20 The proposed drainage outline is in accordance with the drainage hierarchy set out in standard methodology and the Camden Planning Guidance on Water and Flooding.

4.21 The proposed development has included a green roof and increased permeable areas on the site. Calculations have shown additional attenuation is required on the site to ensure runoff rates can be reduced safely to 2 l/s.

4.22 The inclusion of a 155 m^2 green roof with 150 mm substrate and permeable areas increases the amenity and biodiversity of the development. In addition, the green roof can improve water quality.

4.23 The ground conditions on the site should be tested to determine whether it is feasible to discharge surface water from proposed paved areas directly to ground. However, BGS records indicate the site lies directly on impermeable London Clay, which may mean infiltration is difficult. In addition, the development does not have sufficient space in line with Building Regulations H2 to implement a formal soakaway. Formal soakaways are required to be at least 5 m from any building.

4.24 Although formal soakaways are not feasible for the site, shallow infiltration such as permeable paving with a gravel subbase may be suitable. Infiltration testing should be undertaken with an onsite ground investigation to determine the suitability of shallow infiltration to ground.

4.25 Below ground attenuation tanks are not suitable for the development because the tank would need to be located under the proposed new building on the site. Locating an attenuation tank under the proposed new building would not be suitable due to impractical access for inspections and for maintenance.

4.26 To ensure surface water runoff rates can be reduced to 2 l/s, the development will introduce a blue roof under the green roof. This would result in 5 cm of surface water being held on the roof during the 1 in 100 years plus 40% event.

4.27 The flow of surface water can be controlled to 2 l/s by specific blue and green roof flow control device. The provider of this flow control will be determined at detailed design stage.

4.28 It is recommended that the permeable paving is implemented where possible, as this is a requirement of the London Plan and the inclusion of rain gardens or tree pits (bio-retention) where possible.

4.29 Any exceedance event on the site would result in flooding of the SuDS network. The design presented is conservative because it assumes all water discharges from the site with no infiltration or interception from planted or permeable areas. If the system was to flood, from an event greater than the 1 in 100 year plus 40% event, the water would follow the flow routes shown on the Long Term Flood Risk Maps from Surface Water Flooding.

4.30 Management and maintenance of the SuDS should follow the manufacturers guidance and the CIRIA SuDS Guide. These can be found in the Appendix.

4.31 The freeholder will be responsible for upkeep and management of the SuDS system on the site.

4.32 This outline SuDS will be finalised in the detailed drainage design of the site. It is typical that this and the management and maintenance plans are conditioned as part of granting planning permission.

5 CONCLUSIONS

5.1 The site is located at the Bird in Hand Public House located on West End Lane in the LBC. The existing site consists of the pub and the garden. The pub has one residential unit at present and has an associated basement. The site is currently completely hard paved at present.

5.2 The proposals for the site are to refurbish the Bird in Hand Pub to one single residential unit and create nine new dwellings on the rear of the site. The total units of the site will be ten. The current basement is not to extended in depth or plan area. Therefore, a Basement Impact Assessment is not required.

5.3 The Environment Agency's Flood Map for Planning indicates that the site is located in Flood Zone 1 (Low Risk). In accordance with the Flood Risk and Coastal Change Guidance to the NPPF, this zone comprises land assessed as having a less than 1 in 1000 annual probability of fluvial or tidal flooding.

5.4 However, the site is located in a CDA and the Long-Term Maps for Flooding shows the site to experience surface water flooding. As such a full FRA has been undertaken.

5.5 The site is located above the Ranelagh Sewer and permission from Thames Water will be required via a Build Cover Consent Application. Thames Water discussion have occurred and there is capacity in the surface water and foul network for the development. Thames Water have confirmed a surface water discharge of 2 l/s is required.

5.6 LBC experienced flooding in 1975, 2002, and more recently in 2021 which was attributed to overland flow and sewer flooding. West End Lane is recorded as having flooded during all these events; however, the records are not detailed, and the entire road has been highlighted without reference to specific locations or to which properties were flooded on these roads. The site is known to have experienced flooding during the 1975 and 2021 events.

5.7 The surface water flood maps show the site to have a flood water level of 33.1 m AOD. In line with the EA standing advice on flood risk, the new building portion of the development will raise FFL by 300 mm above the flood water level. The FFL of the new portion of the development will be 33.4 m AOD.

5.8 The current building is to be refurbished and this will include property flood resilience to prevent the ingress of surface water flooding. The building will also be designed to ensure quick recovery after a flood event. The measures to ensure flood protection and recoverability will follow the CIRIA C790 guidelines. If further details on the flood protection are required, we request this is conditioned as part of detail design.

5.9 No onsite ground investigation has been undertaken but publicly available records show that the site is underlain by London Clay, a predominantly unproductive bedrock, and whilst significant groundwater flows are not expected to be typical, local or perched pockets of groundwater may be encountered during construction. To prevent ingress of groundwater to the current basement, the waterproofing should be checked and if required updated to current standards and best practice.

5.10 All other sources of flooding have been assessed in accordance with the NPPF and are considered to pose a low risk to the site.

5.11 In accordance with the NPPF and local policy, SuDS is being implemented to ensure that surface water rates from the site do not increase in a 1 in 100 year plus 40% event. The proposal is to implement permeable surfaces, green roof with 150 mm substrate and a 5 cm deep blue roof on

the site. This will ensure the development can discharge surface water at 2 l/s with no flooding occurring on site and no increased risk to others.

5.12 The inclusion of permeable paving with infiltration to ground requires infiltration testing to determine if this is viable. The use of bio-retention areas such as rain gardens and tree pits are strongly recommended within the landscaping design to add further attenuation on the site.

5.13 Whilst retrofitted rainwater harvesting techniques such as rainwater butts (for watering gardens etc.) are encouraged, these are not included within any calculations as a conservative measure because it cannot be guaranteed these will be empty during a storm event. Full rainwater reuse measures are not considered to be appropriate since proposals are for refurbishment and not new construction.

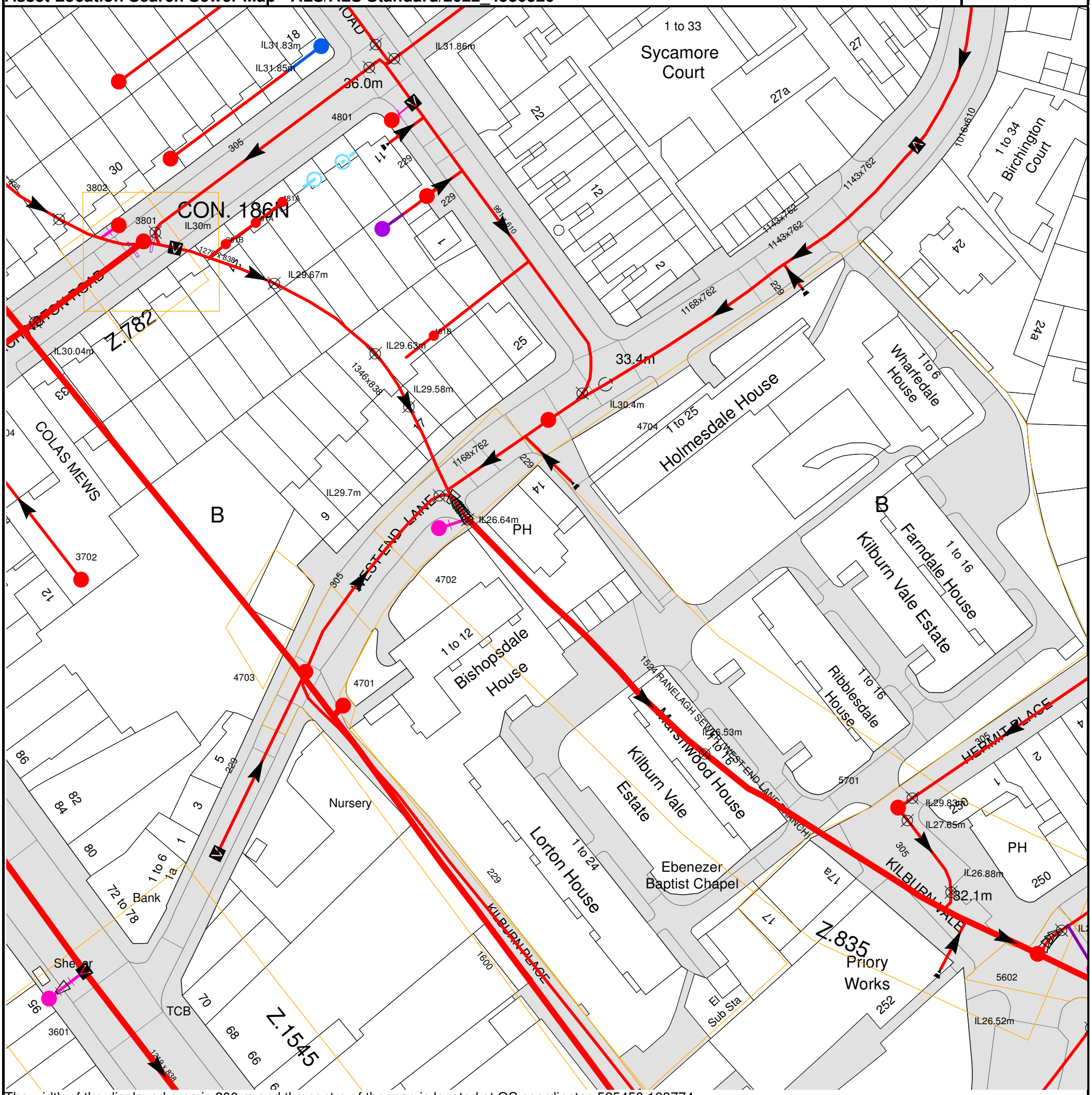
5.14 The development can be made safe from flooding and the inclusion of SuDS ensures that the site does not increase surface water rates post development.

APPENDIX A: SITE SPECIFIC DATA

The following data for the site and surrounding area have been obtained:

- Thames Water Asset Location Data
- Thames Water Capacity Check

Asset Location Search Sewer Map - ALS/ALS Standard/2022_4586326



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 525450,183774

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.

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
5602	32.55	26.45
5701	32.53	27.65
4701	33.83	n/a
4702	n/a	n/a
4704	n/a	n/a
4819	n/a	n/a
4820	n/a	n/a
4818	n/a	n/a
4801	n/a	n/a
561A	n/a	n/a
4703	33.77	31.55
3702	36.34	33.41
481B	n/a	n/a
381B	n/a	n/a
3801	35.83	29.71
3802	n/a	n/a
381A	n/a	n/a
481A	n/a	n/a
4817	n/a	n/a
38DJ	n/a	n/a
38DD	n/a	n/a
48CF	n/a	n/a
3601	n/a	n/a

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

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 — Ducts may contain high voltage cables. Please check with Thames Water.
- Conduit Bridge
- Subway
- Tunnel

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.
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.

Sewer Flooding
History Enquiry

Thames Water Property Searches

History of Sewer Flooding

Is the requested address or area at risk of flooding due to overloaded public sewers?

The flooding records held by Thames Water indicate that there have been no incidents of flooding in the requested area as a result of surcharging public sewers.

For your guidance:

- A sewer is "overloaded" when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.
- "Internal flooding" from public sewers is defined as flooding, which enters a building or passes below a suspended floor. For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.
- "At Risk" properties are those that the water company is required to include in the Regulatory Register that is presented annually to the Director General of Water Services. These are defined as properties that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the Company's reporting procedure.
- Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included on the At Risk Register.
- Properties may be at risk of flooding but not included on the Register where flooding incidents have not been reported to the Company.
- Public Sewers are defined as those for which the Company holds statutory responsibility under the Water Industry Act 1991.
- It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the Company. This report excludes flooding from private sewers and drains and the Company makes no comment upon this matter.
- For further information please contact Thames Water on Tel: 0800 316 9800 or website www.thameswater.co.uk

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13

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

0800 009 4540

Miss Claire Burroughs

Water Environment Ltd
6 Coppergate Mews
Brighton Road
Surbiton
KT6 5NE

Wastewater pre-planning
Our ref DS6094984

25 May 2022

Pre-planning enquiry: Confirmation of sufficient capacity

Site Address: Bird in Hand Pub, 2A West End Lane, London, NW6 1XL

Dear Claire,

Thank you for providing information on your development.

Proposed site: Redevelopment of one residential dwelling into a 1 house and 9 apartments. Proposed Foul Water to re-use existing connection on site by a gravity connection. Proposed Surface water reduced to 2l/s from unrestricted by introducing green roof, permeable paving and expanding green space. Attenuation is not possible due to the existing basement. Proposed connection into existing surface water sewers on site. Existing system in the area is combined.

We have completed the assessment of the foul water flows and surface water run-off based on the information submitted in your application with the purpose of assessing sewerage capacity within the existing Thames Water sewer network.

Foul Water

If your proposals progress in line with the details you've provided, we're pleased to confirm that there will be sufficient sewerage capacity in the adjacent combined sewer network to serve your development.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

You'll need to keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient capacity.

Surface Water

When developing a site, policy 5.13 of the London Plan and Policy 3.4 of the Supplementary Planning Guidance (Sustainable Design And Construction) states that every attempt should be made to use flow attenuation and SuDS/Storage to reduce the surface water discharge from the site as much as possible.

In accordance with the Building Act 2000 Clause H3.3, positive connection of surface water to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable. Before we can consider your

surface water needs, you'll need written approval from the lead local flood authority that you have followed the sequential approach to the disposal of surface water and considered all practical means.

The disposal hierarchy being:

1) rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)
2) rainwater infiltration to ground at or close to source
3) rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)
4) rainwater discharge direct to a watercourse (unless not appropriate)
5) controlled rainwater discharge to a surface water sewer or drain
6) controlled rainwater discharge to a combined sewer.

Where connection to the public sewerage network is required to manage surface water flows, we will accept these flows at a discharge rate in line with CIRIA's best practice guide on SuDS or that stated within the sites planning approval.

If the above surface water hierarchy has been followed and if the flows are restricted to a total of 2 l/s then Thames Water would not have any objections to the proposal.

What happens next?

Please make sure you submit your connection application, giving us at least 21 days' notice of the date you wish to make your new connection/s.

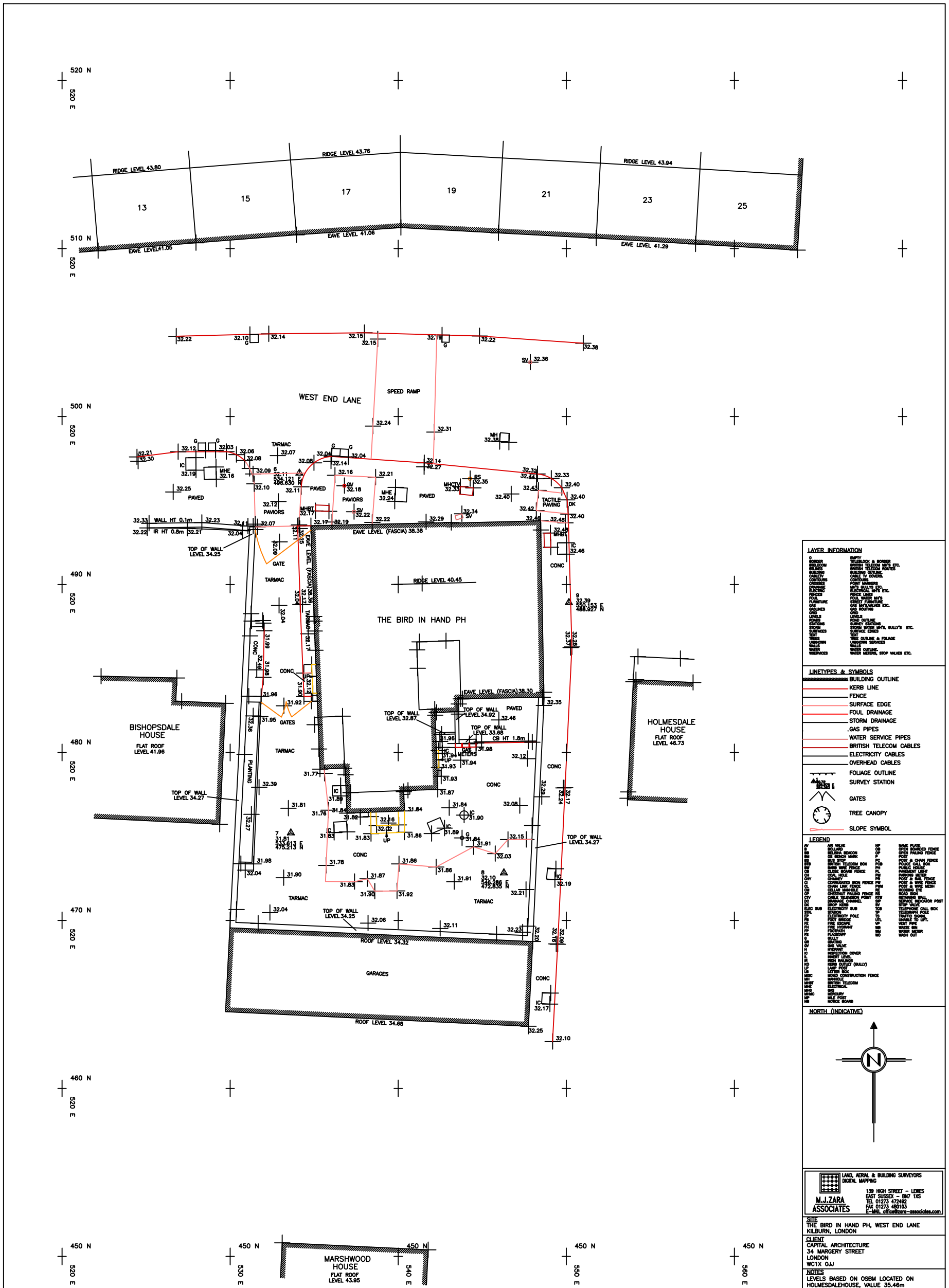
If you've any further questions, please contact me on the number below.

Yours sincerely

Natalya Collins
Developer Services – Adoptions Engineer
Mobile: 07747 641 932
Clearwater Court, Vastern Road, Reading, RG1 8DB
Find us online at developers.thameswater.co.uk
Get advice on making your sewer connection correctly at connectright.org.uk

APPENDIX B: EXISTING AND PROPOSED DRAWINGS

- Topographic Survey
- Existing Floor Plans and Elevations
- Proposed Plans and Elevations



LAYER INFORMATION

0	EMPTY
BORDER	TITLEBLOCK & BORDER
BTELECOM	BRITISH TELECOM MH'S ETC.
BTLINES	BRITISH TELECOM ROUTES
BUILDING	BUILDING OUTLINE.
CABLETV	CABLE TV CONDNS.
CONTOURS	CONTOURS
CROSSES	POINT MARKERS
DRAINAGE	MH'S GULLYS ETC.
ELECTRIC	ELECTRICAL MH'S ETC.
FENCES	FENCE LINES
FOUL	FOUL WATER MH'S
FURNITURE	STREET FURNITURE
GAS	GAS MH'S,VALVES ETC.
GASLINES	GAS ROUTING
GRID	GRID
LEVELS	LEVELS
ROADS	ROAD OUTLINE
STATIONS	SURVEY STATIONS
STORM	STORM WATER MH'S, GULLY'S ETC.
SURFACES	SURFACE EDGES
TEXT	TEXT
TREES	TREE OUTLINE & FOLIAGE
UNKNOWN	UNKNOWN SERVICES
WALLS	WALLS
WATER	WATER OUTLINE.
WSERVICES	WATER METERS, STOP VALVES ETC.

LINETYPES & SYMBOLS

- BUILDING OUTLINE
- KERB LINE
- FENCE
- SURFACE EDGE
- FOUL DRAINAGE
- STORM DRAINAGE
- .GAS PIPES
- WATER SERVICE PIPES
- BRITISH TELECOM CABLES
- ELECTRICITY CABLES
- OVERHEAD CABLES
- FOLIAGE OUTLINE
- SURVEY STATION
- GATES
- TREE CANOPY
- SLOPE SYMBOL

LEGEND

AV	AIR VALVE	NP	NAME PLATE
B	BOLLARD	OB	OPEN BOARDED FENCE
BM	BELISHA BEACON	OP	OPEN PAILING FENCE
BS	CS BEACH MARK	P	POST
BS	BUS STOP	PC	POST & CHAIN FENCE
BTB	BRITISH TELECOM BOX	PCB	POLICE CALL BOX
BW	BARB WIRE FENCE	PH	PUBLIC HOUSE
CB	CLOSE BOARD FENCE	PL	PAVEMENT LIGHT
CH	COAL HOLE	PM	PARKING METER
CNV	CHIMNEY	PR	POST & RAIL FENCE
CR	CORRUGATED IRON FENCE	PW	POST & WIRE FENCE
CW	CHAIN LINK FENCE	PWM	POST & WIRE MESH
DCB	CELLAR MANHOLE	RE	ROCKING EYE
DP	CHESTNUT PALING FENCE	RS	ROAD SIGN
DTV	CABLE TELEVISION POINT	RTW	RETAINING WALL
DV	DRAINAGE CHANNEL	SI	SERVICE INDICATOR POST
DK	DROP KERB	SV	STOP VALVE
ELEC SUB	ELECTRICITY SUB	TCB	TELEPHONE CALL BOX
STNL	STATION	TP	TELEGRAPH POLE
EP	ELECTRICITY POLE	TS	TRAFFIC SIGNAL
FB	FOOT BRIDGE	UTL	UNABLE TO LIFT.
FE	FIRE ESCAPE	VP	VENT PIPE
FH	FIRE HYDRANT	WB	WASTE BIN
FP	FOOTPATH	WM	WATER METER
FS	FLAGSTAFF	WO	WASH OUT
G	GULLY		
GRG	GRATING		
GV	GAS VALVE		
H	HYDRANT		
IC	INSPECTION COVER		
IL	INVERT LEVEL		
IR	IRON RAILINGS		
KO	KERB OUTLET (GULLY)		
LP	LAMP POST		
LB	LETTER BOX		
MISC	MIXED CONSTRUCTION FENCE		
MH	MANHOLE		
MHBT	BRITISH TELECOM		
MHE	ELECTRICAL		
MHG	GAS		
MHMC	MERCURY		
MP	MILE POST		
NB	NOTICE BOARD		

NORTH (INDICATIVE)

LAND, AERIAL & BUILDING SURVEYORS
DIGITAL MAPPING
M.J.ZARA ASSOCIATES
139 HIGH STREET – LEWES
EAST SUSSEX – BN7 1XS
TEL 01273 472482
FAX 01273 480103
E-MAIL office@zara-associates.com

SITE
THE BIRD IN HAND PH, WEST END LANE
KILBURN, LONDON

CLIENT
CAPITAL ARCHITECTURE
34 MARGERY STREET
LONDON
WC1X 0JJ

NOTES
LEVELS BASED ON OSBM LOCATED ON HOLMESDALEHOUSE, VALUE 35.46m

JOB REF. 8271

SCALE 1:100	SHEET SIZE A1 (PORTRAIT)
DATE NOVEMBER 2016	SURVEYED BY EH

Revisions

Rev A	08/06/2022	Area key removed.

METASHAPE | ARCHITECTS

STATUS
PLANNING
NOT FOR CONSTRUCTION

PROJECT
Bird In Hand, West End Lane NW6 4NX

TITLE
Existing Site Plan

SCALE
1 : 200 @ A1

DATE
March 2022

DRAWN
DK

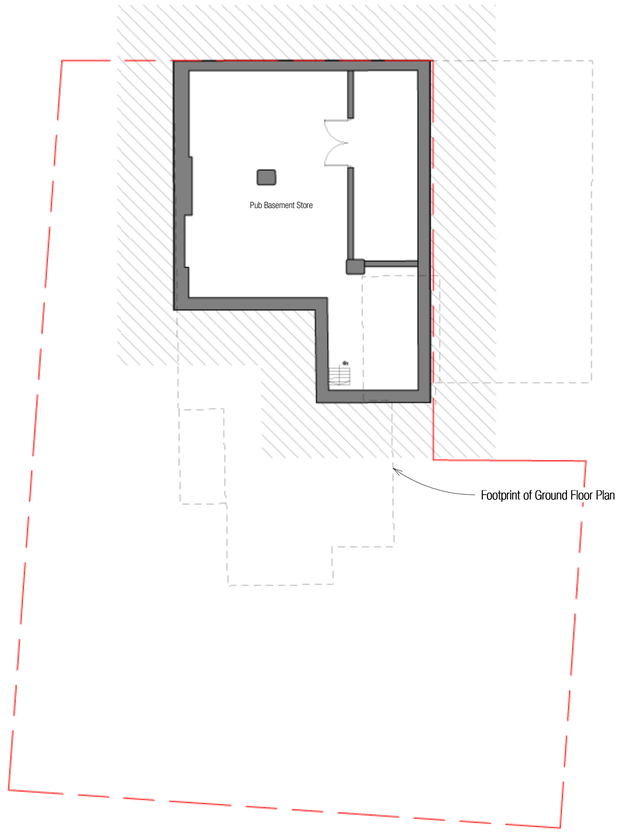
REVIEWED
IPL

DRAWING NUMBER
2019-008_PL1010

REVISION
A

This drawing is for information only and is subject to Planning Approval, Statutory undertaker searches, Building Control Approval and Detailed Design Development.

Do not scale drawing. Figure dimensions to be worked to in all cases.



0 1 2 5 10 m

N

Revisions

METASHAPE | ARCHITECTS

STATUS
PLANNING
NOT FOR CONSTRUCTION

PROJECT
Bird In Hand, West End Lane NW6 4NX

TITLE
Existing Basement

SCALE
1 : 100 @ A1

DATE
December 2021

DRAWN
DK

REVIEWED
IPL

DRAWING NUMBER
2019-008_PL1100

REVISION

This drawing is for information only and is subject to Planning Approval, Statutory undertaker searches, Building Control Approval and Detailed Design Development.

Do not scale drawing. Figure dimensions to be worked to in all cases.

Revisions

Key

14 West End Lane

Existing Walls

METASHAPE | ARCHITECTS

STATUS
PLANNING
NOT FOR CONSTRUCTION

PROJECT
Bird In Hand, West End Lane NW6 4NX

TITLE
Existing Ground Floor Plan

SCALE
1 : 100 @ A1

DATE
December 2021

DRAWN
DK

REVIEWED
IPL

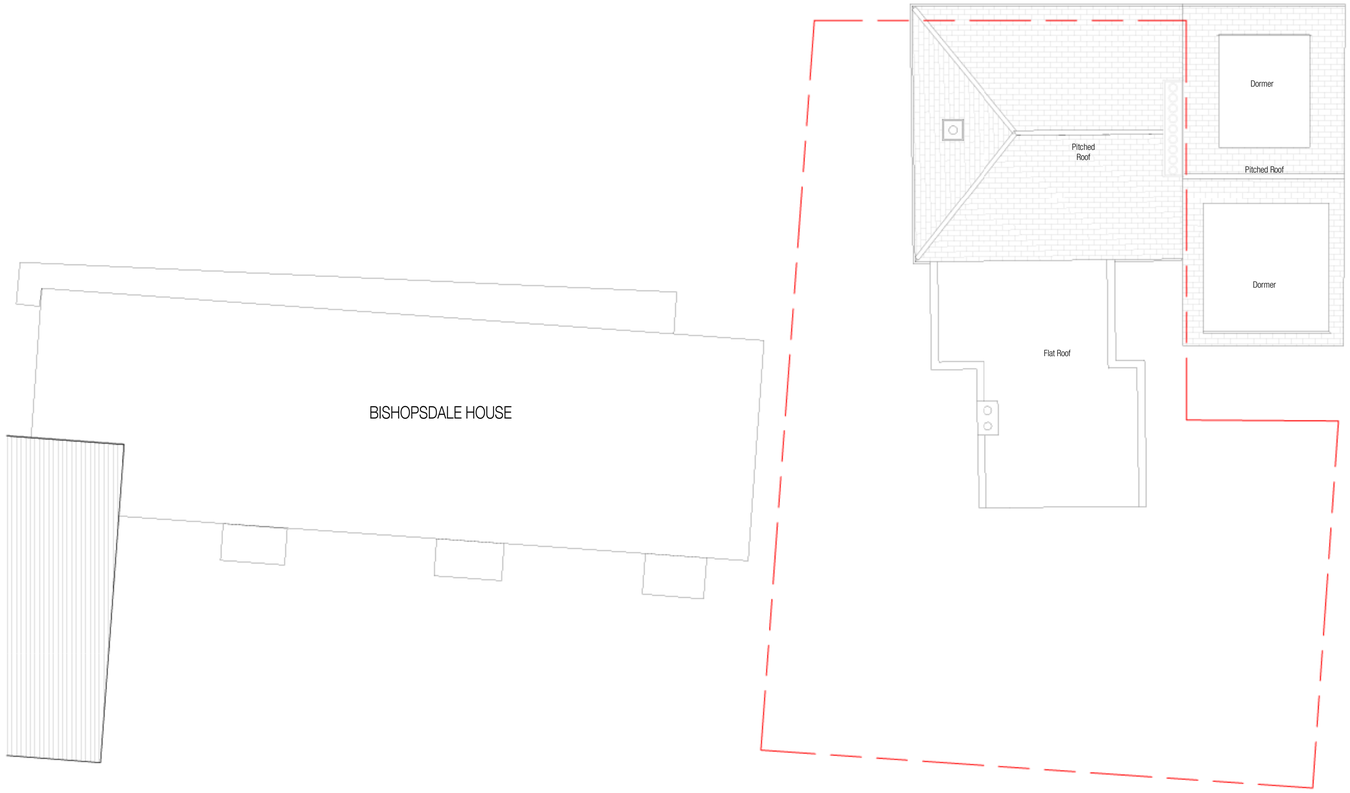
DRAWING NUMBER
2019-008_PL1101

REVISION

This drawing is for information only and is subject to Planning Approval, Statutory undertaker searches, Building Control Approval and Detailed Design Development.

Do not scale drawing. Figure dimensions to be worked to in all cases.

Revisions



Key

14 West End Lane

Existing Walls

METASHAPE | ARCHITECTS

STATUS
PLANNING
NOT FOR CONSTRUCTION

PROJECT
Bird In Hand, West End Lane NW6 4NX

TITLE
Existing Roof Plan

SCALE
1 : 100 @ A1

DATE
December 2021

DRAWN
DK

REVIEWED
IPL

DRAWING NUMBER
2019-008_PL1104

REVISION

This drawing is for information only and is subject to Planning Approval, Statutory undertaker searches, Building Control Approval and Detailed Design Development.

Do not scale drawing. Figure dimensions to be worked to in all cases.

0 2 5 10 20 m

N

Revisions

Rev A	08/06/2022	Area key removed.

METASHAPE | ARCHITECTS

STATUS
PLANNING
NOT FOR CONSTRUCTION

PROJECT
Bird In Hand, West End Lane NW6 4NX

TITLE
Proposed Site Plan

SCALE
1 : 200 @ A1

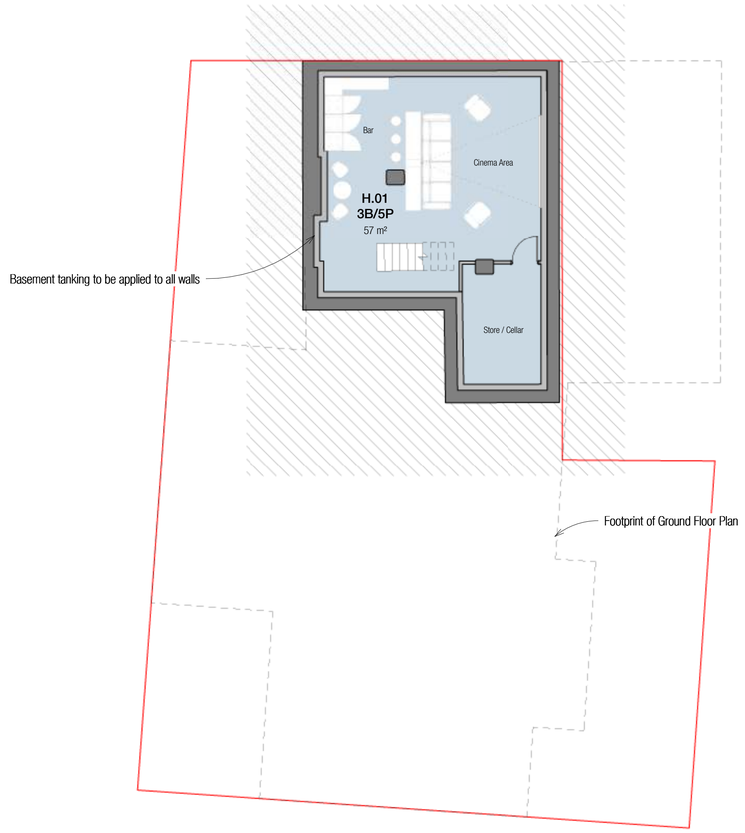
DATE
March 2022

DRAWN
DK

REVIEWED
IPL

DRAWING NUMBER
2019-008_PL2010

REVISION
A



0 1 2 5 10 m

N

Revisions

Key

- 1B/2P
- 2B/4P
- 3B/5P
- 14 West End Lane
- Circulation/Ancillary
- Existing walls to be retained
- New walls

METASHAPE | ARCHITECTS

STATUS
PLANNING
NOT FOR CONSTRUCTION

PROJECT
Bird In Hand, West End Lane NW6 4NX

TITLE
Proposed Basement

SCALE
1 : 100 @ A1

DATE
November 2021

DRAWN
DK

REVIEWED
IPL

DRAWING NUMBER
2019-008_PL2100

REVISION

This drawing is for information only and is subject to Planning Approval, Statutory undertaker searches, Building Control Approval and Detailed Design Development.

Do not scale drawing. Figure dimensions to be worked to in all cases.

0 1 2 5 10 m

N

Revisions

Rev A	07/06/2022	Minor area amendments.

Key

- 1B/2P
- 2B/4P
- 3B/5P
- 14 West End Lane
- Circulation/Ancillary
- Existing walls to be retained
- New walls

METASHAPE | ARCHITECTS

STATUS
PLANNING
NOT FOR CONSTRUCTION

PROJECT
Bird In Hand, West End Lane NW6 4NX

TITLE
Proposed Ground Floor Plan

SCALE
1 : 100 @ A1

DATE
November 2021

DRAWN
DK

REVIEWED
IPL

DRAWING NUMBER
2019-008_PL2101

REVISION
A

Revisions

Rev A	08/06/2022	Annotation amendments.

Key

- 1B/2P
- 2B/4P
- 3B/5P
- 14 West End Lane
- Circulation/Ancillary
- Existing walls to be retained
- New walls

METASHAPE | ARCHITECTS

STATUS
PLANNING
NOT FOR CONSTRUCTION

PROJECT
Bird In Hand, West End Lane NW6 4NX

TITLE
Proposed Roof Plan

SCALE
1 : 100 @ A1

DATE
November 2021

DRAWN
DK

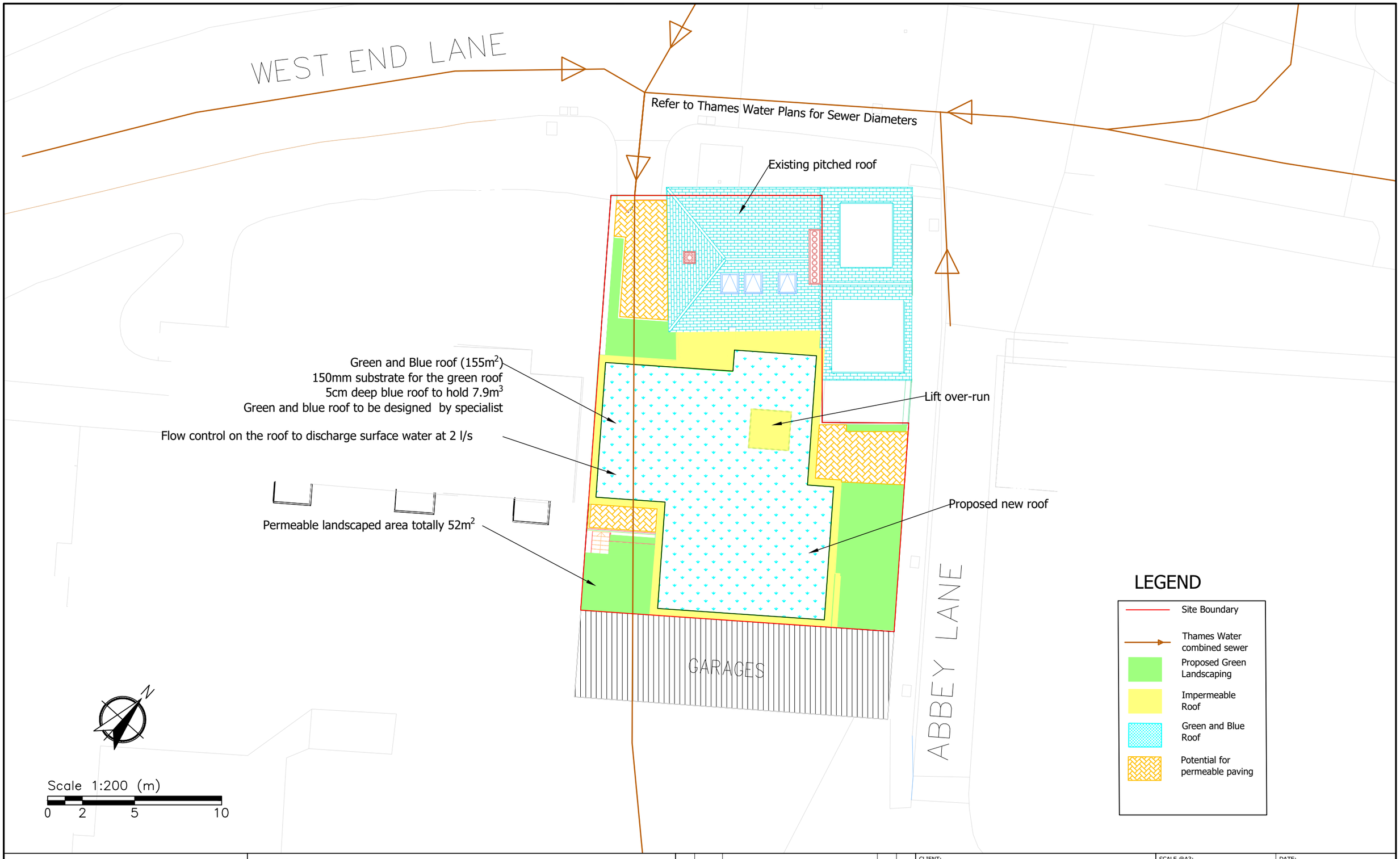
REVIEWED
IPL

DRAWING NUMBER
2019-008_PL2106

REVISION
A

This drawing is for information only and is subject to Planning Approval, Statutory undertaker searches, Building Control Approval and Detailed Design Development.

Do not scale drawing. Figure dimensions to be worked to in all cases.



WATER | ENVIRONMENT
6 Coppergate Mews · Brighton Road · Surbiton · London · KT6 5NE
Tel: 020 8545 9720
Email: contact@waterenvironment.co.uk
Web: www.waterenvironment.co.uk

NOTES
1. Do not scale. This drawing is indicative only
2. To be read in conjunction with WEL FRA and SUDS Document (21170-FRA-RP).
3. Design is subject to detail design. Not for construction
4. Drainage network is based on Thames Water Asset Plans. CCTV required to confirm exact location.

REV	DATE	AMENDMENTS	DR	AP

CLIENT: Peacock and Smith	SCALE @A3: 1:200	DATE: 24/05/2022	
PROJECT: Bird in Hand	DRAWN: CB	CHECKED: FR	APPROVED: GL
DRAWING: Outline SuDS	DRAWING NO: 21170-SWD-SK-01	REVISION: C01	

APPENDIX C: SUDS CALCULATIONS

The following calculations have been referenced within the body of this report:

- D21 Runoff Calculations
- LBC SuDS Pro-Forma

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D21 RUNOFF CALCULATIONS | COVER SHEET

Job No.	21170	
Job Name	Bird in Hand	
Engineer	Claire Burroughs	CB
Checked By	Guy Laister	GL
Date	21.04.22	

Site Characteristics

Site Area (ha): 0.037

	Overall		Discharging from site		
Existing Pervious Surfaces (ha)	0	0%	0	β	0%
Existing Impervious Surfaces (ha)	0.037	100%	0.037	α	100%
Total:	0.037	Total:	0.037		

	Overall		Discharging from site		
Proposed Pervious Surfaces (ha)	0.0052	14%	0.0052	β	100%
Proposed Impervious Surfaces (ha)	0.0163	44%	0.0163	α	100%
Proposed Green Roof	0.0155	42%	0.0155	γ	100%
Total:	0.037	Total:	0.037		

Peak Rate of Runoff

Existing Site	BROWNFIELD
Detailed Modelling Used?	No e.g. Microdrainage, HydroCAD, Multiple Catchments
Runoff Calculation Method (Existing)	Wallingford/Modified Rational Calculation Sheets Attached
Runoff Calculation Method (Proposed)	Wallingford/Modified Rational Calculation Sheets Attached
Allowance for Future Climate Change	To 2115 UE 40%
Surface Water Management Strategy	Attenuated on Site

	1yr	30yr	100yr		
Existing Discharge Rate	**4.2**	**10.1**	**12.9**	l/s	
IoH Greenfield Discharge Rate (full site)	**0.1**	**0.4**	**0.5**	l/s	
Detailed modelling output/FEH:				l/s	
Limiting Discharge Rate	5.0	10.1	12.9	l/s	
Post-Development Discharge Rate	3.4	8.2	10.4	l/s	
Detailed modelling output:				l/s	
including allowance for climate change	**4.7**	**11.4**	**14.6**	l/s	
Proposed Discharge Rate	5.0	10.1	12.9	l/s	
Bespoke Limiting Discharge Rate	2.0	2.0	2.0		
Design discharge rate:	**2.0**	**2.0**	**2.0**	l/s	Bespoke Rate
Minimum Storage Required	**0.8**	**5.4**	**7.9**	m^3	

IH124 : Greenfield Peak Runoff

21170	Bird in Hand	
Calculations By: CB	Checked By: GL	Date: 21.04.22

Catchment Area	AREA	ha	0.037
Drained Area	AREA	ha	0.037
Standard average annual rainfall 1941 - 1970	SAAR	mm	630
Soil Index (from FSR or Wallingford Procedure WRAP maps)*	SOIL		0.47

*SOIL is the SPR for the soil type, and for larger sites is a weighted sum of the individual soil classes for the site, where:

$$SOIL = \frac{0.1ASOIL1 + 0.3ASOIL2 + 0.37ASOIL3 + 0.47ASOIL5 + 0.53ASOIL5}{AREA}$$

For smaller sites, use the SPR for the local soil type, as follows:

SOIL TYPE	1	2	3	4	5	
AREA	0	0	0	0.037	0	**SOIL:**
SPR	0.1	0.3	0.37	0.47	0.53	**0.47**

$QBAR = 0.00108 . (0.01AREA)^{0.89}. SAAR^{1.17}. SOIL^{2.17}$

* The site area is less than 50ha. Since the IoH124 methodology is not calibrated for sites less than 50ha in area, the calculation should be undertaken based on a 50ha site area and proportionately adjusted based on the ratio of the site size to 50ha.

$QBAR_{50ha}$	l/s	213.40
QBAR/ha	l/s/ha	4.27
$QBAR_{site}$	l/s	**0.16**

Hydrological Area	fig 4.2	6

Return Period (years)	Growth Factor (table 4.3)	Discharge rate l/s
1	0.85	**0.13**
2	0.88	0.14
10	1.62	0.26
30	2.3	**0.36**
50	2.62	0.41
100	3.19	**0.50**

Figures and table references from CIRIA C753 The SUDS Manual © CIRIA 2015

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Wallingford Procedure : Existing Peak Runoff

21170	Bird in Hand	
Calculations By: CB	Checked By: GL	Date: 21.04.22

Site Characteristics

Site Area	AREA	ha	0.037
Drained Catchment Area	AREA	ha	0.037
Approximate Longest Drainage Path	L	m	100
Difference in Ground Levels	ΔH	m	1
Slope	Slope (S)		1: 100
Permeable Surfaces (Rational Method runoff coefficient = 0.4)		ha	0%
Impermeable Surfaces (Rational Method runoff coefficient = 0.95)		ha	100%
Area Weighted Rational Method Runoff Coefficient			0.950

Site parameters from The Wallingford Procedure for Europe: Best Practice Guide to urban drainage modelling, HR Wallingford, July 2000 (CD)

60minute, 5 year return period rainfall	M5-60	mm	20
Ratio of M5-60 to 2day, 5 year return period rainfall	r	-	0.40

Time of Concentration

Recommended Tc Method: SCS: Sheet Flow

Tc Method Choice: SCS: Sheet Flow

Sheet Flow

Surface Description			Paving or Brick
Slope			Medium
Roughness Coefficient	(Manning's n)		0.015
Flow Length, L		m	100
M2-24hr		mm	37.70
Land Slope		m/m	0.01000
Tc		hr	0.13

Time of Concentration	T_c	min	7.8
Critical Storm Duration (minimum 5min)	T_{crit}	min	7.8

Critical Storm Rainfall and Runoff

$Z1_{TC}$	0.45	*Wallingford Procedure Figure 3.6
M5-T_{crit}	9.1	
C	0.950	

Discharge Rate

$Q = 2.78CiA$

Return Period (years)	Z2*	Depth (mm)	Intensity (mm/hr)	Discharge Rate l/s
1	0.61	5.6	42.8	**4.18**
2	0.79	7.2	55.3	5.40
10	1.21	11.0	84.9	8.30
30	1.48	13.4	103.4	**10.10**
50	1.63	14.8	114.2	11.16
100	1.89	17.1	132.0	**12.90**

*Wallingford Procedure Table 3.2

Wallingford Procedure : Developed Peak Runoff

21170	Bird in Hand	
Calculations By: CB	Checked By: GL	Date: 21.04.22

Site Characteristics

Site Area	AREA	ha	0.037
Drained Catchment Area	AREA	ha	0.037
Approximate Longest Drainage Path	L	m	100
Difference in Ground Levels	ΔH	m	1
Slope	Slope (S)		1: 100

Permeable Surfaces (Rational Method runoff coefficient = 0.4)				ha	14%
Impermeable Surfaces (Rational Method runoff coefficient = 0.95)				ha	44%
Green Roof of gradient	of up to 15°,	and depth of	20-40mm , c=	0.7 *	42%
Area Weighted Rational Method Runoff Coefficient					0.77

*in line with Table 10.1 of CIRIA C644

Site parameters from The Wallingford Procedure for Europe: Best Practice Guide to urban drainage modelling, HR Wallingford, July 2000 (CD)

60minute, 5 year return period rainfall	M5-60	mm	20
Ratio of M5-60 to 2day, 5 year return period rainfall	r	-	0.40

Time of Concentration

Recommended Tc Method: SCS: Sheet Flow
Tc Method Choice: SCS: Sheet Flow

Sheet Flow

Surface Description			Paving or Brick
Slope			Medium
Roughness Coefficient	(Manning's n)		0.015
Flow Length, L		m	100
M2-24hr		mm	37.70
Land Slope		m/m	0.01000
Tc		hr	0.13

Time of Concentration	T_c	min	7.8
Critical Storm Duration (minimum 5min)	T_{crit}	min	7.8

Critical Storm Rainfall and Runoff

$Z1_{TC}$	0.45	*Wallingford Procedure Figure 3.6
M5-T_{crit}	9.1	
C	0.768	

Discharge Rate
Q = 2.78CiA

Return Period (years)	Z2*	Depth (mm)	Intensity (mm/hr)	Discharge Rate l/s	Future Rate l/s
1	0.61	5.6	42.8	**3.38**	**4.74**
2	0.79	7.2	55.3	**4.37**	6.11
10	1.21	11.0	84.9	**6.71**	9.39
30	1.48	13.4	103.4	**8.17**	**11.43**
50	1.63	14.8	114.2	**9.02**	12.63
100	1.89	17.1	132.0	**10.42**	**14.59**

*Wallingford Procedure Table 3.2

MRM 100 year Event Storage Calculator

21170	Bird in Hand	
Calculations By: CB	Checked By: GL	Date: 21.04.22

Site Parameters

Drained Catchment Area	AREA	ha	0.037
Approximate Longest Drainage Path	L	m	100
Difference in Ground Levels	ΔH	m	1
Slope	Slope (S)		1: 100
Permeable Surfaces (Rational Method runoff coefficient = 0.4)		ha	14%
Impermeable Surfaces (Rational Method runoff coefficient = 0.95)		ha	44%
Green Roof of gradient of up to 15°, and depth of 20-40mm , c=		0.7 *	42%
Area Weighted Rational Method Runoff Coefficient			0.77

*in line with the FLL Guidelines on Planning, Execution and Upkeep of Green Roof Sites, 2002

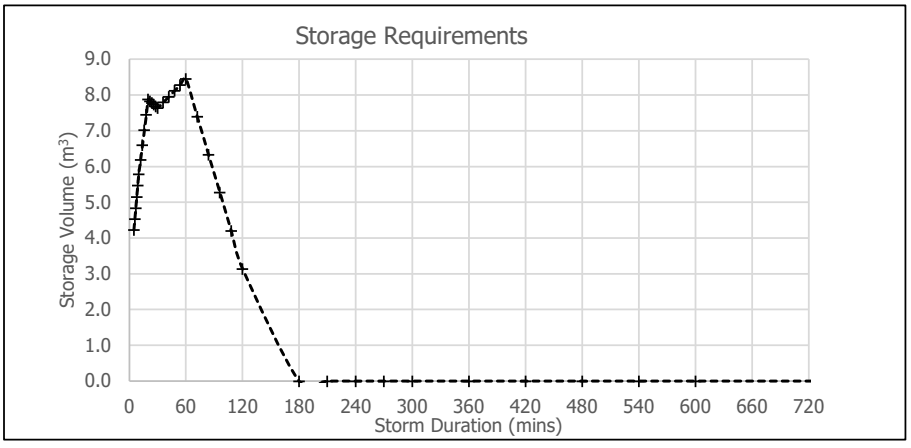
Site parameters from The Wallingford Procedure for Europe: Best Practice Guide to urban drainage modelling, HR Wallingford, July 2000 (CD)

60minute, 5 year return period rainfall	M5-60	mm	20
Ratio of M5-60 to 2day, 5 year return period rainfall	r	-	0.40
Time of Concentration	T_c	min	7.8

Maximum Storm Runoff Storage Volume (modified rational method)

	5	
T_d	20.0	min
$Z1_{TD}$	0.70	*Wallingford Procedure Figure 3.6
M5-T_d	14.0	mm
C	0.77	
$Z2_{100}$	1.97	*Wallingford Procedure Table 3.2
M100-T_d	27.6	mm
Intensity	82.9	mm/hr
Q_d	6.5	l/s
$Q_{d,climate\ change}$	9.2	l/s
$Q_{limiting\ discharge}$	2.0	l/s

Maximum storage required	m^3	7.9



Date Printed: 09/06/2022

MRM 30 year Event Storage Calculator

21170	Bird in Hand	
Calculations By: CB	Checked By: GL	Date: 21.04.22

Site Parameters

Drained Catchment Area	AREA	ha	0.037
Approximate Longest Drainage Path	L	m	100
Difference in Ground Levels	ΔH	m	1
Slope	Slope (S)		1: 100

Permeable Surfaces (Rational Method runoff coefficient = 0.4)		ha	14%
Impermeable Surfaces (Rational Method runoff coefficient = 0.95)		ha	44%
Green Roof of gradient	of up to 15°, and depth of 20-40mm , c=	0.7 *	42%
	Area Weighted Rational Method Runoff Coefficient		0.77

*in line with the FLL Guidelines on Planning, Execution and Upkeep of Green Roof Sites, 2002

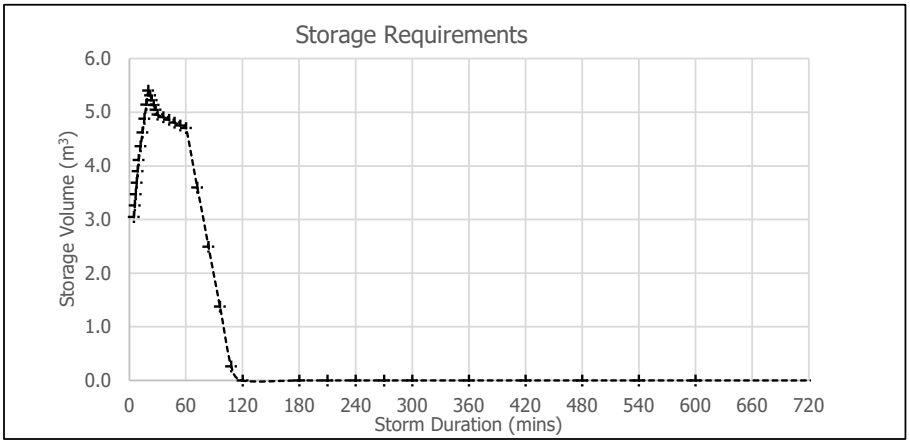
Site parameters from The Wallingford Procedure for Europe: Best Practice Guide to urban drainage modelling, HR Wallingford, July 2000 (CD)

60minute, 5 year return period rainfall	M5-60	mm	20
Ratio of M5-60 to 2day, 5 year return period rainfall	r	-	0.40
Time of Concentration	T_c	min	7.8

Maximum Storm Runoff Storage Volume (modified rational method)

T_d	20.0	min	
$Z1_{TD}$	0.70	*Wallingford Procedure Figure 3.6	
M5-T_d	14.0	mm	
C	0.77		
$Z2_{30}$	1.52	*Wallingford Procedure Table 3.2	
M30-T_d	21.3	mm	
Intensity	63.8	mm/hr	
Q_d	5.0	l/s	
$Q_{d,climate\ change}$	7.1	l/s	
$Q_{limiting\ discharge}$	2.0	l/s	

Maximum storage required	m^3	5.4



WATER | ENVIRONMENT

MRM 1 year Event Storage Calculator

21170	Bird in Hand	
Calculations By: CB	Checked By: GL	Date: 21.04.22

Site Parameters

Drained Catchment Area	AREA	ha	0.037
Approximate Longest Drainage Path	L	m	100
Difference in Ground Levels	ΔH	m	1
Slope	Slope (S)		1: 100
Permeable Surfaces (Rational Method runoff coefficient = 0.4)		ha	14%
Impermeable Surfaces (Rational Method runoff coefficient = 0.95)		ha	44%
Green Roof of gradient of up to 15°, and depth of 20-40mm , c=		0.7 *	42%
Area Weighted Rational Method Runoff Coefficient			0.77

*in line with the FLL Guidelines on Planning, Execution and Upkeep of Green Roof Sites, 2002

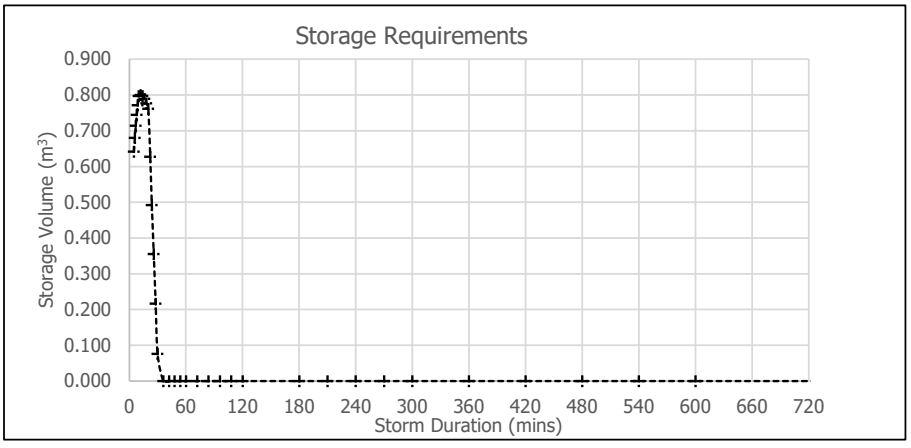
Site parameters from The Wallingford Procedure for Europe: Best Practice Guide to urban drainage modelling, HR Wallingford, July 2000 (CD)

60minute, 5 year return period rainfall	M5-60	mm	20
Ratio of M5-60 to 2day, 5 year return period rainfall	r	-	0.40
Time of Concentration	T_c	min	7.8

Maximum Storm Runoff Storage Volume (modified rational method)

T_d	11.9	min
$Z1_{TD}$	0.55	*Wallingford Procedure Figure 3.6
M5-T_d	10.9	mm
C	0.77	
$Z2_1$	0.61	*Wallingford Procedure Table 3.2
M1-T_d	6.7	mm
Intensity	33.8	mm/hr
Q_d	2.7	l/s
$Q_{d,climate\ change}$	3.7	l/s
$Q_{limiting\ discharge}$	2.0	l/s

Maximum storage required	m^3	0.8



WATER | ENVIRONMENT

SUDS Manual Volume Calculation (Existing)	21170	Bird in Hand	
	Calculations By: CB	Checked By: GL	Date: 21.04.22

Site Characteristics

Site Area	AREA	ha	0.037
Permeable Surfaces (Existing Case)			0%
Proportion discharging to sewer network or local watercourses	β		0%
*zero if all runoff collected from unpaved surfaces is retained on site or discharged to ground			
Impermeable Surfaces (Existing Case)	PIMP		100%
Proportion discharging to sewer network or local watercourses	α		100%
*zero if all runoff from paved surfaces remains on site or is collected and discharged to ground			
Soil Index (from FSR or Wallingford Procedure WRAP maps)*	SOIL		0.47

*SOIL is the SPR for the soil type, and for larger sites is a weighted sum of the individual soil classes for the site, where:

$$SOIL = \frac{0.1A_{SOIL1} + 0.3A_{SOIL2} + 0.37A_{SOIL3} + 0.47A_{SOIL4} + 0.53A_{SOIL5}}{AREA}$$

For smaller sites, use the SPR for the local soil type, as follows:

SOIL TYPE	1	2	3	4	5	
AREA	0	0	0	0.037	0	**SOIL:**
SPR	0.1	0.3	0.37	0.47	0.53	**0.47**

Site parameters from The Wallingford Procedure for Europe: Best Practice Guide to urban drainage modelling, HR Wallingford, July 2000 (CD)

60minute, 5 year return period rainfall	M5-60	mm	20
Ratio of M5-60 to 2day, 5 year return period rainfall	r	-	0.40

Volume Calculation for the 100 year return period 6hr storm

$Z1_{6hr}$	1.55	*Wallingford Procedure Figure 3.6
M5-6hr	31.1	
$Z2_{100yr}$	1.97	*Wallingford Procedure Table 3.2
M100-6hr	61.2	

Additional volume (m^3) of existing site runoff over Greenfield runoff:

$$Vol = \text{"M100-6hr"}.AREA.10[PIMP/100\ (0.8\alpha)+(1-PIMP/100)SOIL\ .\ \beta-SOIL]$$

* EQ24.10 CIRIA C753 The SUDS Manual © CIRIA 2015

Additional Volume of Runoff (above Greenfield state): **m^3** **7.5**

SUDS Manual Volume Calculation (Proposed)	21170	Bird in Hand	
	Calculations By: CB	Checked By: GL	Date: 21.04.22

Site Characteristics

Site Area	AREA	ha	0.037
Permeable Surfaces (Proposed Case)			14%
Proportion discharging to sewer network or local watercourses	β		100%
*zero if all runoff collected from unpaved surfaces is retained on site or discharged to ground			
Impermeable Surfaces (Proposed Case)	PIMP		86%
Proportion discharging to sewer network or local watercourses	α		100%
*zero if all runoff from paved surfaces remains on site or is collected and discharged to ground			
Soil Index (from FSR or Wallingford Procedure WRAP maps)*	SOIL		0.47

*SOIL is the SPR for the soil type, and for larger sites is a weighted sum of the individual soil classes for the site, where:

$$SOIL = \frac{0.1A_{SOIL1} + 0.3A_{SOIL2} + 0.37A_{SOIL3} + 0.47A_{SOIL4} + 0.53A_{SOIL5}}{AREA}$$

For smaller sites, use the SPR for the local soil type, as follows:

SOIL TYPE	1	2	3	4	5	
AREA	0	0	0	0.037	0	**SOIL:**
SPR	0.1	0.3	0.37	0.47	0.53	**0.47**

Site parameters from The Wallingford Procedure for Europe: Best Practice Guide to urban drainage modelling, HR Wallingford, July 2000 (CD)

60minute, 5 year return period rainfall	M5-60	mm	20
Ratio of M5-60 to 2day, 5 year return period rainfall	r	-	0.40

Volume Calculation for the 100 year return period 6hr storm

$Z1_{6hr}$	1.55	*Wallingford Procedure Figure 3.6
M5-6hr	31.1	
$Z2_{100yr}$	1.97	*Wallingford Procedure Table 3.2
M100-6hr	61.2	
With Climate Change	85.7	40%

Additional volume (m^3) of development runoff over Greenfield runoff:

$$Vol = \text{M100-6hr}.AREA.10\left[\frac{PIMP}{100}(0.8\alpha) + \left(1 - \frac{PIMP}{100}\right)SOIL.\beta - SOIL\right]$$

* EQ24.10 CIRIA C753 The SUDS Manual © CIRIA 2015

Additional Rainfall Volume (above Greenfield state) for the developed site: **m^3** **9.0**

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SUDS Manual Volume Calculation (Developed)

21170	Bird in Hand	
Calculations By: CB	Checked By: GL	Date: 21.04.22

Site Characteristics

Catchment Area	AREA	ha	0.037
Permeable Surfaces (Proposed Case)	PGF		14%
Areas discharging to soakaway or prevented from leaving site via mitigation		ha	0
	β		100%
Impermeable Surfaces (Proposed Case)	PIMP		44%
Areas discharging to soakaway or prevented from leaving site via mitigation		ha	0
	α		100%
Green Roof Area (Proposed Case)	PGR	Depth of Green Roof	42%
Annual coefficient of discharge*	ψ_a	2-4 cm	0.6

**Inline with Table 3 of the FLL Planning, Execution and Upkeep of Green-roof sites, 2002*

Soil Index (from FSR or Wallingford Procedure WRAP maps)*	SOIL	0.47

*SOIL is the SPR for the soil type, and for larger sites is a weighted sum of the individual soil classes for the site, where:

$$SOIL = \frac{0.1A_{SOIL1} + 0.3A_{SOIL2} + 0.37A_{SOIL3} + 0.47A_{SOIL4} + 0.53A_{SOIL5}}{AREA}$$

For smaller sites, use the SPR for the local soil type, as follows:

SOIL TYPE	1	2	3	4	5	
AREA	0	0	0	0.037	0	**SOIL:**
SPR	0.1	0.3	0.37	0.47	0.53	**0.47**

Site parameters from The Wallingford Procedure for Europe: Best Practice Guide to urban drainage modelling, HR Wallingford, July 2000 (CD)

60minute, 5 year return period rainfall	M5-60	mm	20
Ratio of M5-60 to 2day, 5 year return period rainfall	r	-	0.40

Volume Calculation for the 100 year return period 6hr storm

$Z1_{6hr}$	1.55	*Wallingford Procedure Figure 3.6
M5-6hr	31.1	
$Z2_{100yr}$	1.97	*Wallingford Procedure Table 3.2
M100-6hr	61.2	
With Climate Change	85.7	40%

Additional volume (m^3) of development runoff over Greenfield runoff:

$$Vol = \text{"M100-6hr"}.AREA.10[PIMP/100\ (0.8\alpha) + (\text{PGF}/100)SOIL\ .\ \beta + (\text{PGR}/100)\ .\ \Psi a - SOIL]$$

* Modified from EQ24.10 CIRIA C753 The SUDS Manual © CIRIA 2015

Additional Volume of Runoff (above Greenfield state) leaving the site:	m^3	6.3
Rainwater harvesting or other re-use scheme committed volumes:	m^3	0
Additional Volume of Runoff (above Greenfield state) leaving the site:	**m^3**	**6.3**

Camden GREATERLONDONAUTHORITY LoDEG

1. Project & Site Details		
	Project / Site Name (including sub-catchment / stage / phase where appropriate)	Bird in Hand Public House
	Address & post code	12A West End Land, North Maida Vale, NW6 4QU
	OS Grid ref. (Easting, Northing)	E 525451 N 183785
	LPA reference (if applicable)	N/A
	Brief description of proposed work	
	Total site Area	370 m^2
	Total existing impervious area	370 m^2
	Total proposed impervious area	163 m^2
	Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	Yes, within Critcal Drainage Area
	Existing drainage connection type and location	Thames Water Sewer - Combined
	Designer Name	Claire Burroughs
	Designer Position	Associate
	Designer Company	Water Environment Ltd

2. Proposed Discharge Arrangements			
	2a. Infiltration Feasibility		
	Superficial geology classification	None Recorded - BGS Maps	
	Bedrock geology classification	London Clay Formation	
	Site infiltration rate	N/A	m/s
	Depth to groundwater level	N/A	m below ground level
	Is infiltration feasible?		
	2b. Drainage Hierarchy		
		Feasible (Y/N)	*Proposed (Y/N)*
	1 store rainwater for later use	Y	N
	2 use infiltration techniques, such as porous surfaces in non-clay areas	N	N
	3 attenuate rainwater in ponds or open water features for gradual release	N	N
	4 attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Y
	5 discharge rainwater direct to a watercourse	N	N
	6 discharge rainwater to a surface water sewer/drain	N	N
	7 discharge rainwater to the combined sewer.	Y	Y
	2c. Proposed Discharge Details		
	Proposed discharge location	Thames Water Sewer	
	Has the owner/regulator of the discharge location been consulted?	Yes	

Camden GREATERLONDONAUTHORITY LoDEG

3. Drainage Strategy

3a. Discharge Rates & Required Storage

	Greenfield (GF) runoff rate (l/s)	*Existing discharge rate (l/s)*	*Required storage for GF rate (m^3)*	*Proposed discharge rate (l/s)*
Qbar	0.16			
1 in 1	0.13	4.18	N/A	2
1 in 30	0.4	10.1	N/A	2
1 in 100	0.5	12.9	N /A	2
1 in 100 + CC			N/A	2
Climate change allowance used		40%		
3b. Principal Method of Flow Control		Flow Control		

3c. Proposed SuDS Measures

	Catchment area (m^2)	*Plan area (m^2)*	*Storage vol. (m^3)*
Rainwater harvesting	0		0
Infiltration systems	0		0
Green roofs	155	155	0
Blue roofs	155	155	0
Filter strips	0	0	0
Filter drains	0	0	0
Bioretention / tree pits	0	0	0
Pervious pavements	0	0	0
Swales	0	0	0
Basins/ponds	0	0	0
Attenuation tanks	0		0
Total	**310**	**310**	**0**

4. Supporting Information

4a. Discharge & Drainage Strategy	*Page/section of drainage report*
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	Desktop Study in Groundwater section of FRA&SuDS Report
Drainage hierarchy (2b)	SuDS Section of FRA&SuDS Report
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	SuDS Section of FRA&SuDS Report
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	SuDS Section of FRA&SuDS Report
Proposed SuDS measures & specifications (3b)	SuDS Section of FRA&SuDS Report
4b. Other Supporting Details	*Page/section of drainage report*
Detailed Development Layout	Appendix
Detailed drainage design drawings, including exceedance flow routes	Appendix
Detailed landscaping plans	Appendix
Maintenance strategy	Appendix
Demonstration of how the proposed SuDS measures improve:	SuDS Section of FRA&SuDS Report
a) water quality of the runoff?	SuDS Section of FRA&SuDS Report
b) biodiversity?	SuDS Section of FRA&SuDS Report
c) amenity?	SuDS Section of FRA&SuDS Report

APPENDIX D: MANAGEMENT AND MAINTENANCE PLANS

- Taken from the CIRIA SuDS Manual

Maintenance requirements for green roof

Maintenance schedule	Required action	Typical frequency
Regular inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
	Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
	Inspect underside of roof for evidence of leakage	Annually and after severe storms
Regular Maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six months and annually or as required
	During establishment (i.e. year one), replace dead plants as required	Monthly (but usually responsibility of the manufacturer)
	Post establishment replace dead plants as required (where >5% of coverage)	Annually (in autumn)
	Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
	Remove nuisance and invasive vegetation, including weeds	Six monthly or as required

Maintenance requirements for permeable paving

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required)
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds	As required

Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked of broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost joining material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48h after large storms in first six months
	Inspect silt accumulation	Annually

Maintenance requirements for attenuation storage tanks

Maintenance schedule	Required action	Typical frequency
Regular Maintenance	Inspect and identify and areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of the filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/or internal forebays	Annually, or as required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually
	Survey inside of tank for sediment build up and remove if necessary.	Every 5 years or as required.
Remedial Actions	Repair/rehabilitate inlets, outlets, overflows and vents	As required

Maintenance requirements for bioretention areas

Maintenance schedule	Required action	Typical frequency
Regular Inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary	Quarterly
	Check operation of under drains by inspection of flows after rain	Annually
	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
	Inspect inlets and outlets for blockage	Quarterly
Regular maintenance	Remove litter and surface debris and weeds	Quarterly (or more frequently for tidiness or aesthetic reasons)
	Replace any plants, to maintain planting density	As required
	Remove sediment, litter and debris build-up from around inlets or from forebays	Quarterly to biannually
Occasional maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial Actions	Remove and replace filter medium and vegetation above	As required but likely to be > 20 years

- Flow control will be determined by the product chosen. Typically flow controls need to be inspected every three months and any debris removed. Management and maintenance will be competed in line with the manufacturer's specification.