Document Ref.: 5128 SuDS Report

Sustainable Drainage System Strategy Report

St John's Place, Harley Road, London NW3 3BY

Issue	Date	Details	Produced By	Checked By
A	16.12.22	FOR REVIEW AND COMMENT	GAP	BS

CONTENTS

1 Introduction; Local, Regional and National Policies and Guidance

Genever and Partners have been appointed by the Client to produce a Sustainable Drainage System Strategy Report for the proposed development at St John's Studio, Harley Road, London Borough of Camden NW3 3BY.

The proposed development is for demolition of front, side and rear of existing building and re-modelling to form a new 4 storey 5 bedroom house with re-modelled front and rear hardstanding/garden including a bin store.

This report has been prepared in response to the Draft Decision to Application ref 2022/2145/P from 06/10/2022 and the relevant condition below:

14 Prior to commencement of development details of a sustainable urban drainage system shall be submitted to and approved in writing by the local planning authority. Such system shall be based on achieving greenfield levels of runoff. The system shall be implemented as part of the development and thereafter retained and maintained.

Reason: To reduce the rate of surface water run-off from the buildings and limit the impact on the storm-water drainage system in accordance with Policies CC1, CC2, CC3 of the London Borough of Camden Local Plan 2017.

This report is also intended to show compliance with relevant local, regional and national planning policies and guidance:

- Camden Local Plan 2017,

  Policy CC2 Adapting to climate change*. All development should adopt appropriate climate change adaptation measures such as:*

  a. the protection of existing green spaces and promoting new appropriate green infrastructure;

  b. not increasing, and wherever possible reducing, surface water run-off through increasing permeable surfaces and use of Sustainable Drainage Systems;

  c. incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate;

  Sustainable drainage and biodiversity, para 8.37. *To support a sustainable approach to drainage, all development should install green roofs, permeable landscaping, green walls and combination green and blue roofs, where appropriate.*

  Policy CC3 Water and flooding*. The Council will seek to ensure that development does not increase flood risk and reduces the risk of flooding where possible. We will require development to:*

  b. avoid harm to the water environment and improve water quality;

e. utilise Sustainable Drainage Systems (SuDS) in line with the drainage hierarchy to achieve a greenfield run-off rate where feasible;

- Camden Planning Guidance (CPG) Water and Flooding March 2019,

  Developments *must not increase the risk of flooding, and are required to put in place mitigation measures where there is known to be a risk of flooding (Local Plan policies CC2 and CC3).*

  Major developments will be required to constrain runoff volumes for a 1 in 100 year, 6 hour rainfall event, where feasible.

- Camden Section 19 Flood Investigation report, flood incidents on the 12th and 25th July 2021

  5.2.4 Sustainable Drainage Systems (SuDS) solutions should be implemented, as part of a long-term approach to flood risk alleviation. Solutions should seek to relieve pressure on the sewer network and target areas where surface water flooding is known to occur.

- Surface Water Management Plan (SWMP) 2011
- Camden Strategic Flood Risk Assessment (SFRA) 2014

  7.1.2 It is strongly recommended that suitable surface water mitigation measures are incorporated into any development plans in order to reduce and manage surface water flood risk to, and posed by the proposed development. This should ideally be achieved by incorporating SuDS.

- Camden SFRA 2014, updated figure 6 'Local Flood Risk Zones'
- The London Plan 2021, *Policy SI 13 Sustainable drainage*

  Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible. There should also be a preference for green over grey features, in line with the (…) drainage hierarchy.

  9.13.2 Development proposals should aim to get as close to greenfield run-off rates as possible depending on site conditions

- Non-statutory technical standards for sustainable drainage systems 2015
- The SuDS Manual (CIRIA C753) 2015
- National Planning Policy Framework (NPPF) 2021
- National Planning Practice Guidance (NPPG)
- London Borough of Camden Section 19 Flood Investigation Report, Flood incidents on the 12th and 25th July 2021, AECOM Revision 003/20.06.2022

2 Existing site

The existing site is occupied by an existing 3-storey semi-detached dwelling house at St John's Studio, Harley Road, London Borough of Camden NW3 3BY. Existing external areas (Figure 2 and Figure 10) at the front of the property are covered in block paving with very limited softscaping as shrubs and with limited paved areas at the rear of the property with extensive softscape areas.

Figure 1. – Existing site plan - site boundary in red.

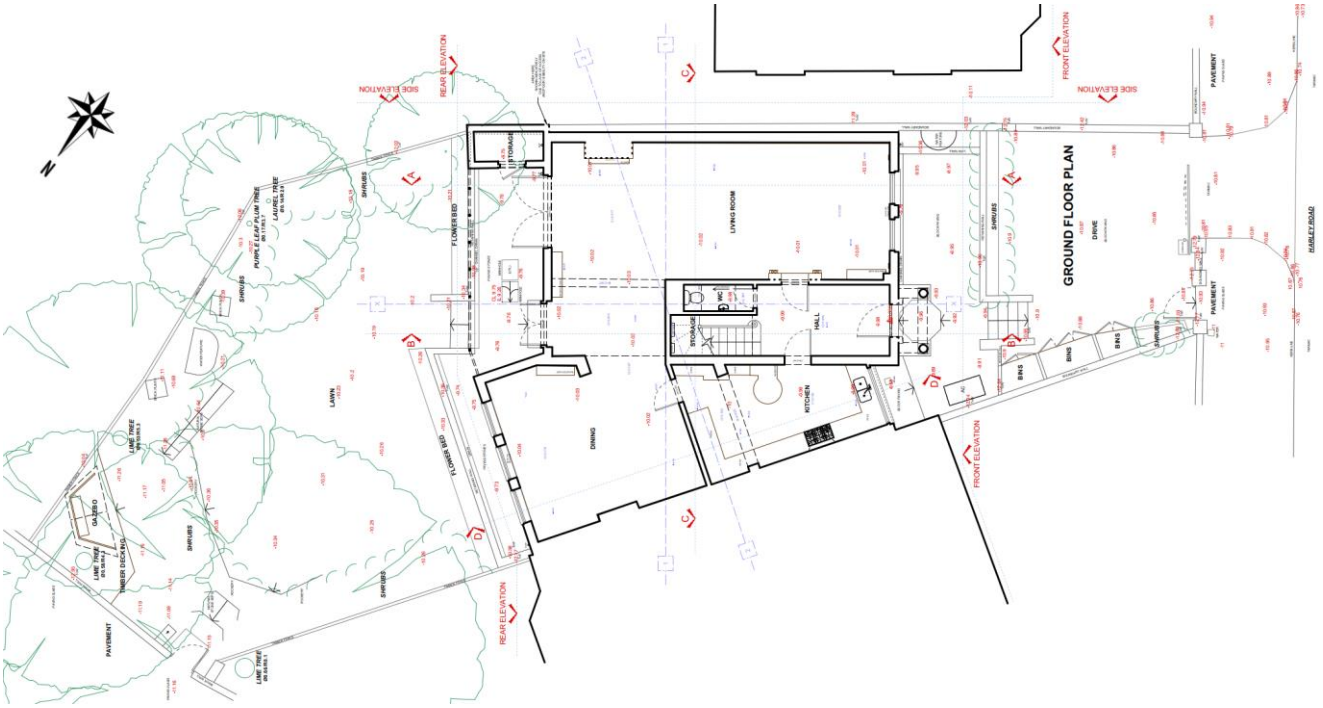

Figure 2. – Topographical survey layout

3 Geology

According to the Camden's SFRA 2014, the site bedrock comprises London Clay Formation, but no information is available for superficial deposits (Figure 3). No superficial geology information was available from the British Geological Survey (BGS) Maps as accessed online at https://geologyviewer.bgs.ac.uk/

The Ground investigation Report ref No C15606/April 2022 from Ground Engineering found head deposits of firm, brown, orange brown and grey mottled clay at depths 1.2 to 1.4m, and London Clay Formation at depth from 1.85m to 2.6m in the inspection pits.

Soakage is unlikely to be suitable subject to further site investigations (soakaway tests to BRE Digest 365) to confirm.

.

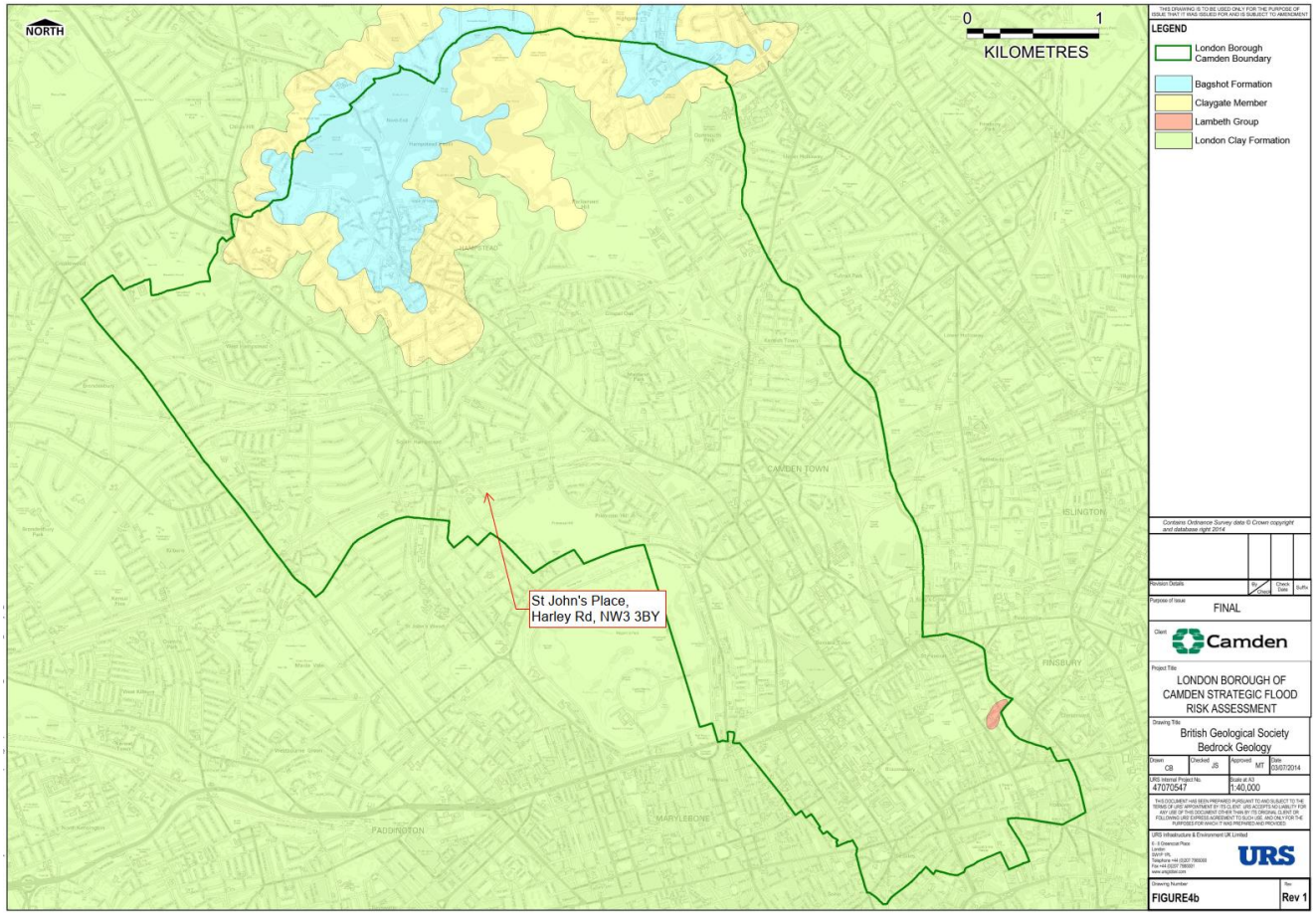

Figure 3. Site geology, from Camden SFRA 2014

4 Flood Risk

According to the Environment Agency the site lies within Flood Zone 1 (Figure 4) - low probability of flooding, having a less than 1 in 1,000 annual probability of river or sea flooding, therefore no mitigations measures are required in the drainage strategy.

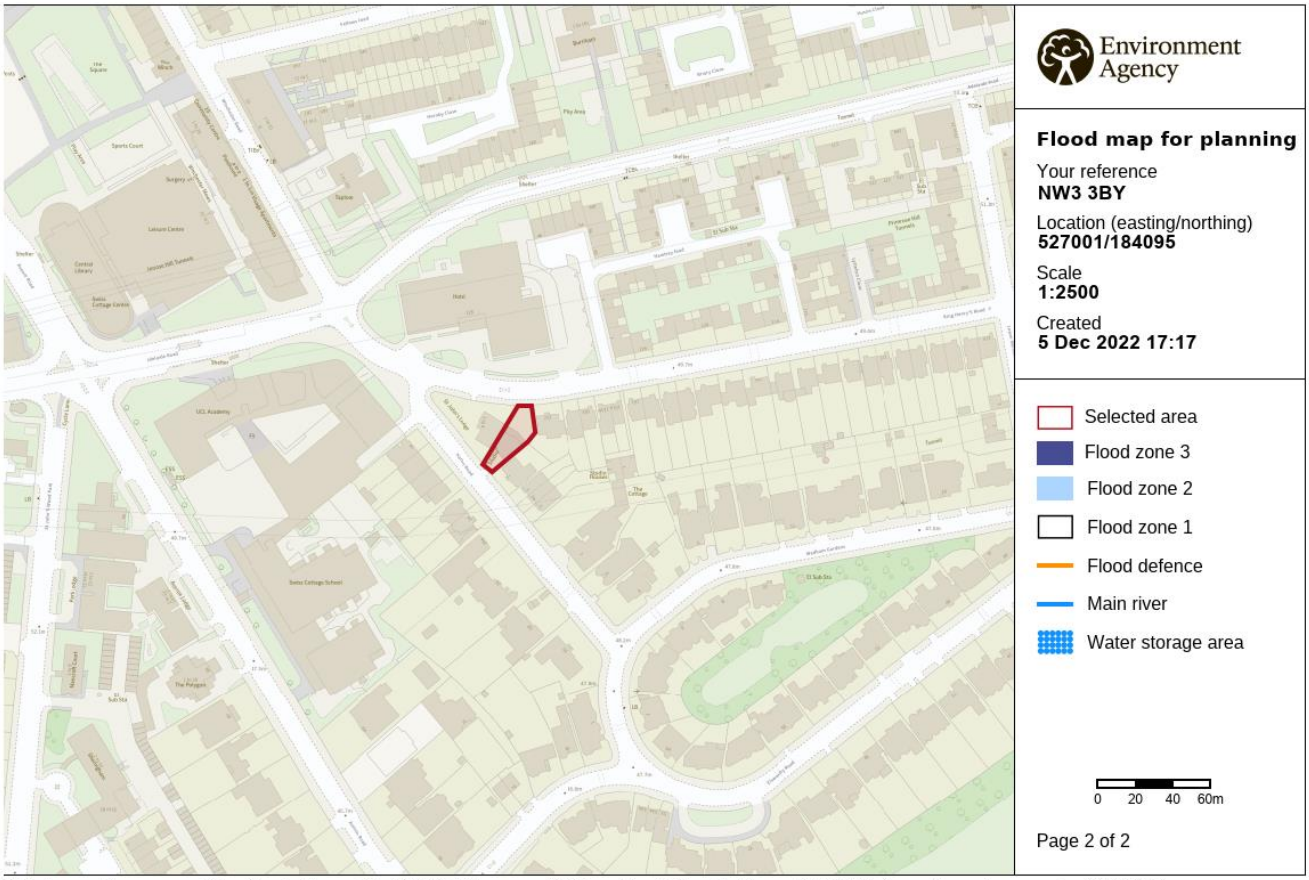

Figure 4. – EA Flood map for planning

The site is in an area of low risk of flooding from surface water with a probability of flooding between 0.1% and 1% each year (Figure 5).

This type of flooding would generally only occur if sewers have no capacity and/or are overflowing thus producing overland flows from high to low lying areas.

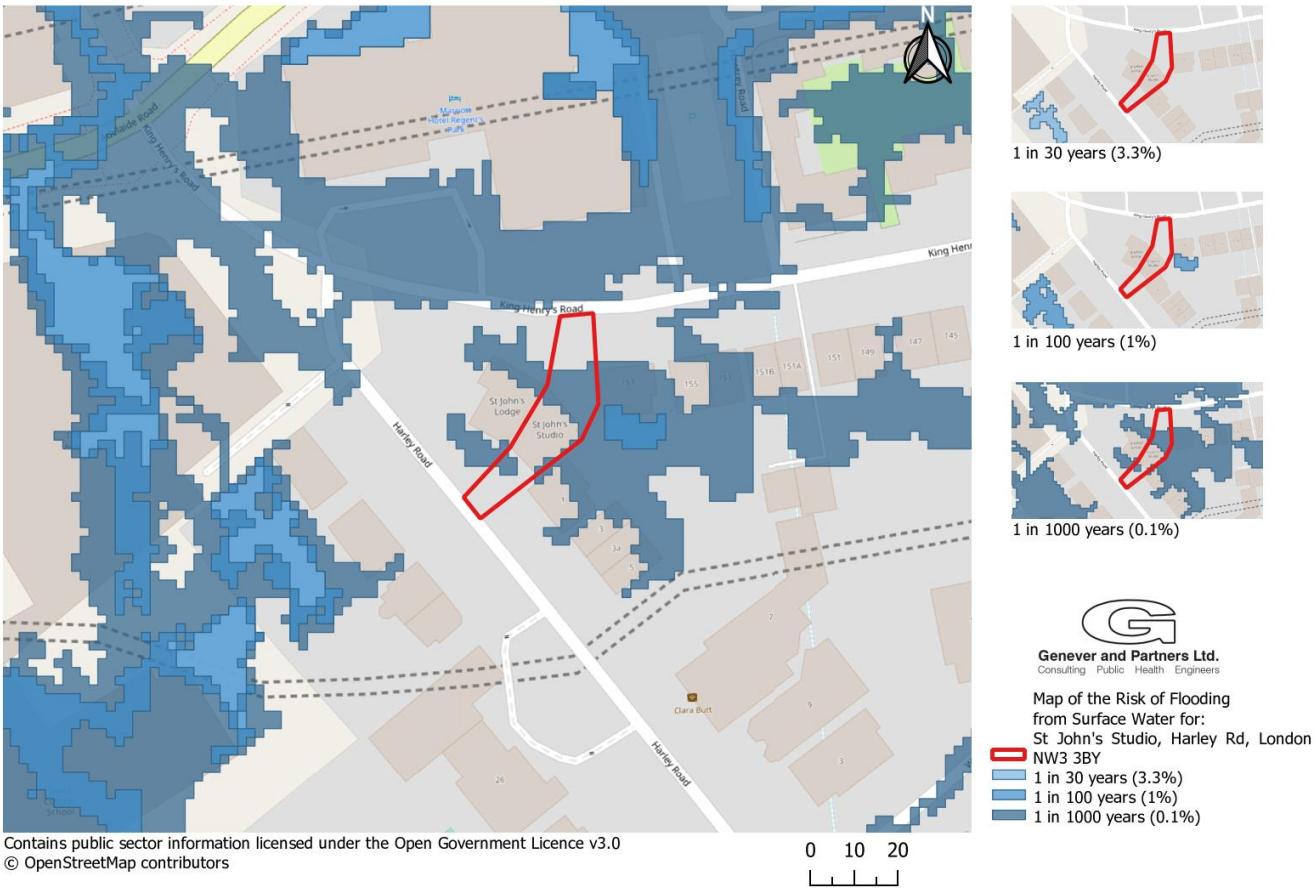

Figure 5. EA Surface water flooding map

The site is in *Group3_005 East Westminster* Critical Drainage Area (CDA) made up of a large part of the City of Westminster and parts of the London Borough of Camden (Figure 6) – it represents the area draining to the east of the City of Westminster through Regents Park. LBC does not list Group3_005 among its CDAs within Camden's SWMP, therefore no mitigations measures are required in the drainage strategy in direct relation to the CDA, but further information was available in regard to surface water flooding – see next paragraph, i.e. Flood Investigation Report.

For levels below ground level in order to ensure the risk of flooding from surface water and sewers is minimised, it is recommended using anti-flood devices or by pumping the lower area drainage outlets.

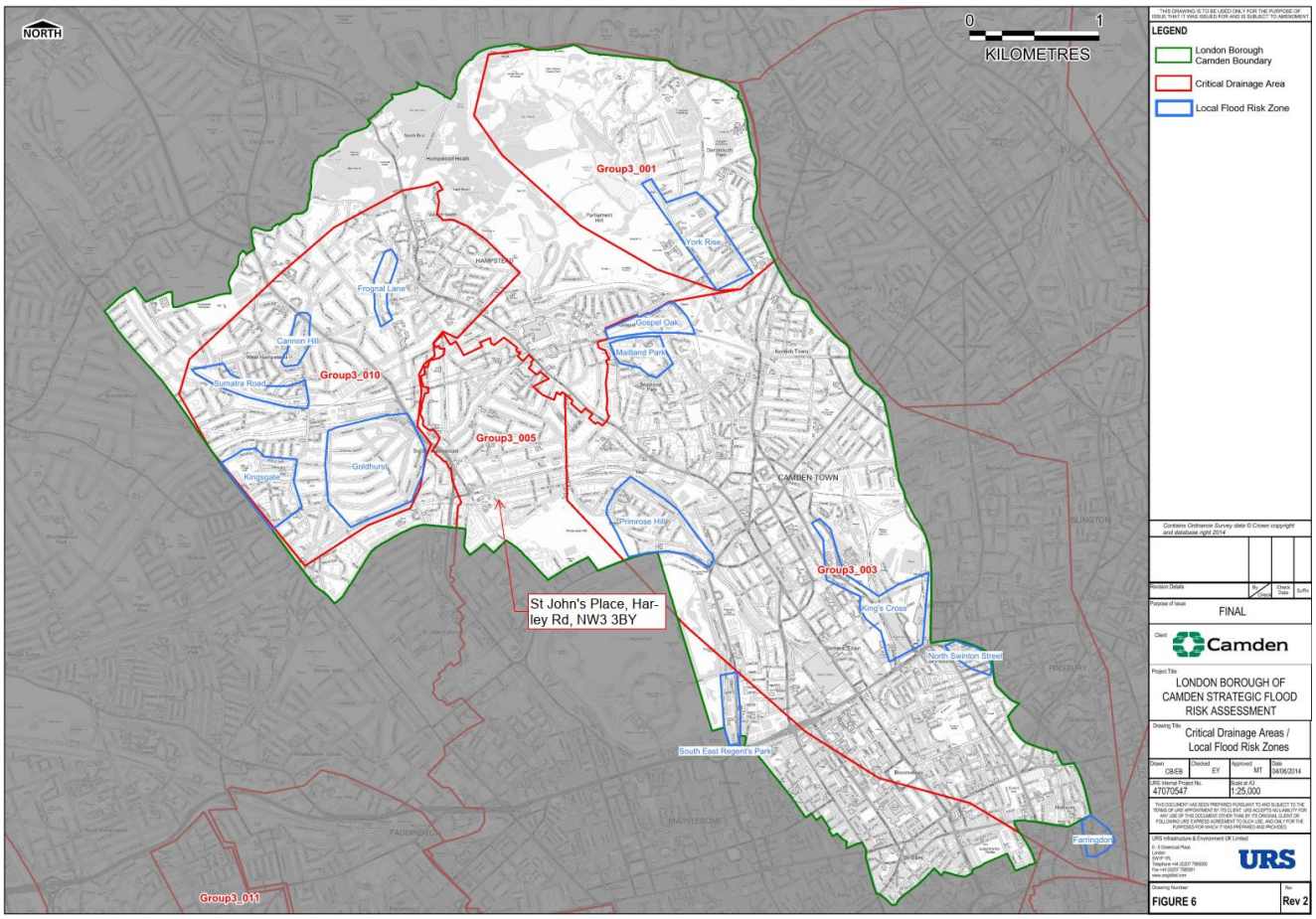

Figure 6. Camden Critical Drainage Areas, from Camden SFRA 2014

The Flood Investigation Report by AECOM revised in 2022 of the flood incidents on the 12th and 25th July 2021 has found surface water ponding north of the site in Adelaide Road and Winchester Road (Figure 7) as these are the lower lying areas in that section of the Belsize Park Swiss Cottage wider hotspot area. Although no mitigation measures are required, it is recommended not to increase the surface water discharge over ground in softscape areas.

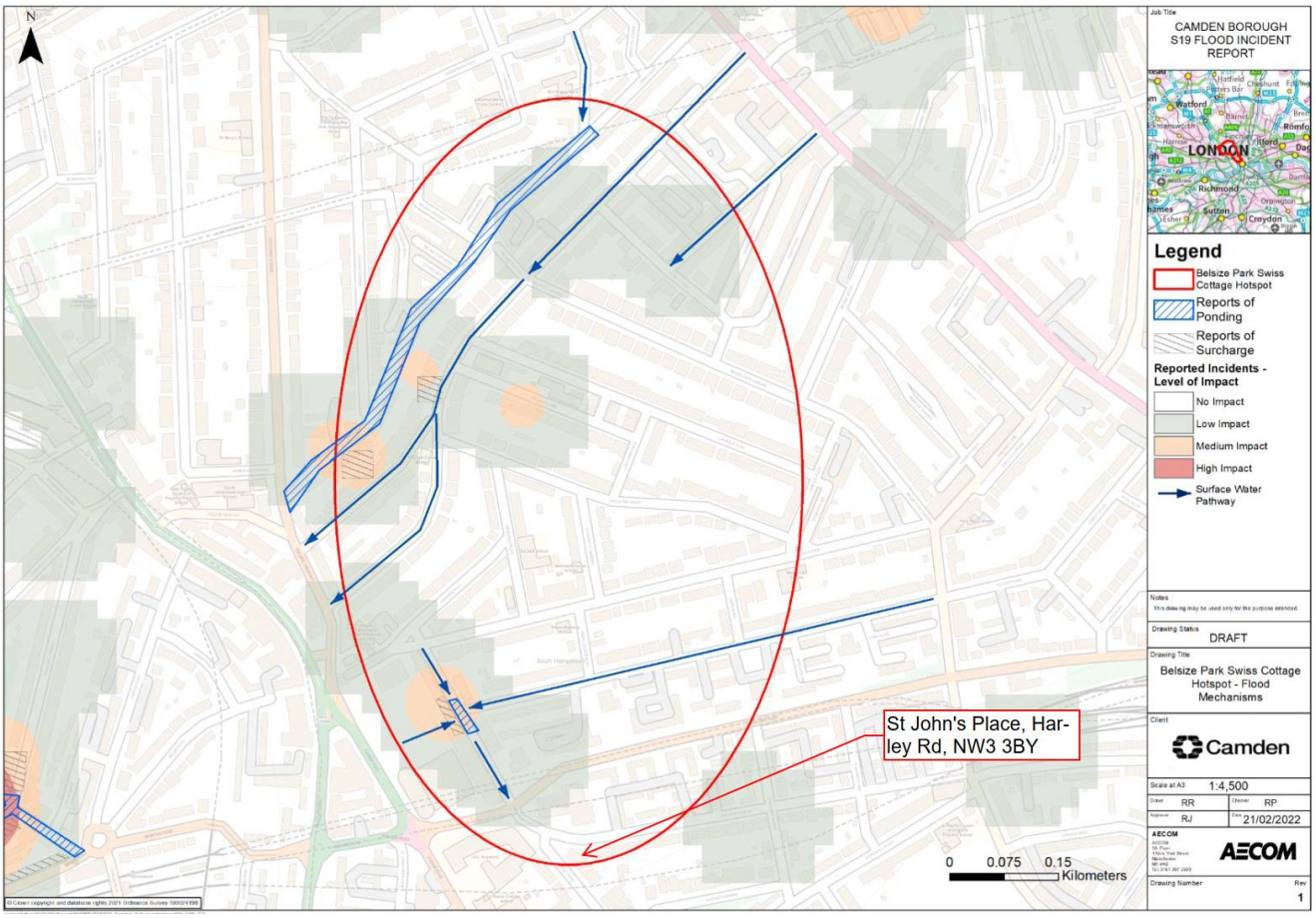

Figure 7. Belsize Park Swiss Cottage Hotspot, from Camden SFRA 2014

5 Existing drainage scheme

A Thames Water sewer map indicates an existing 1168x870mm combined sewer system in Harley Road (running from north-west to south-east) joining another 940x600mm sewer in Harley Rd (running from south-east to north-west) with an approx. depth of 4.5m (TBC).

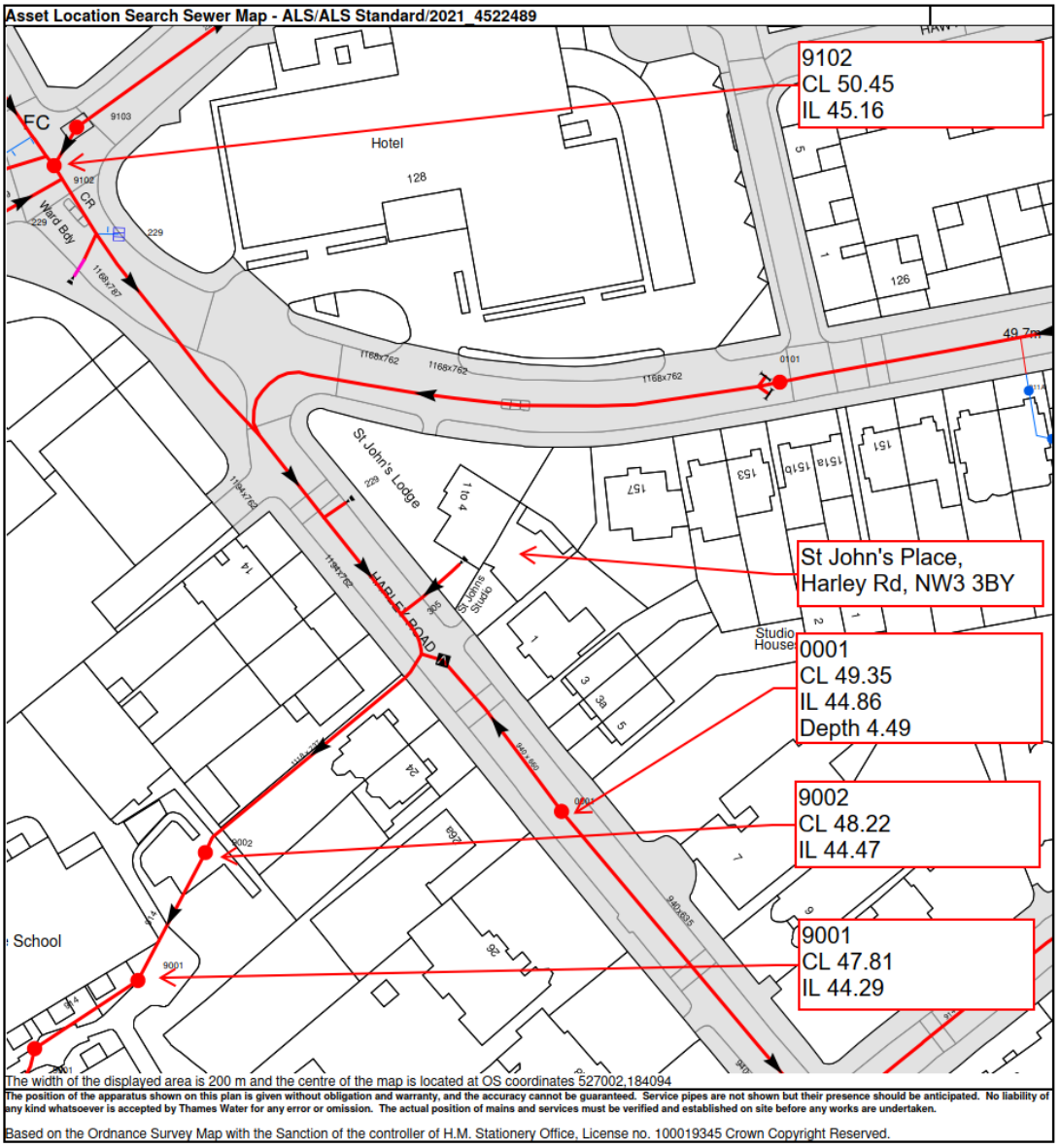

Figure 8. Thames Water sewer map

A CCTV survey of the drainage was undertaken by JPD Technical Services on the 12th October 2022 with their findings issued on the 15st October 2022. Genever and Partners have attended on site the survey and have produced a *Drainage Report on the Existing System* dated 19th October 2022. A record mark-up drawing was created (Figure 9).

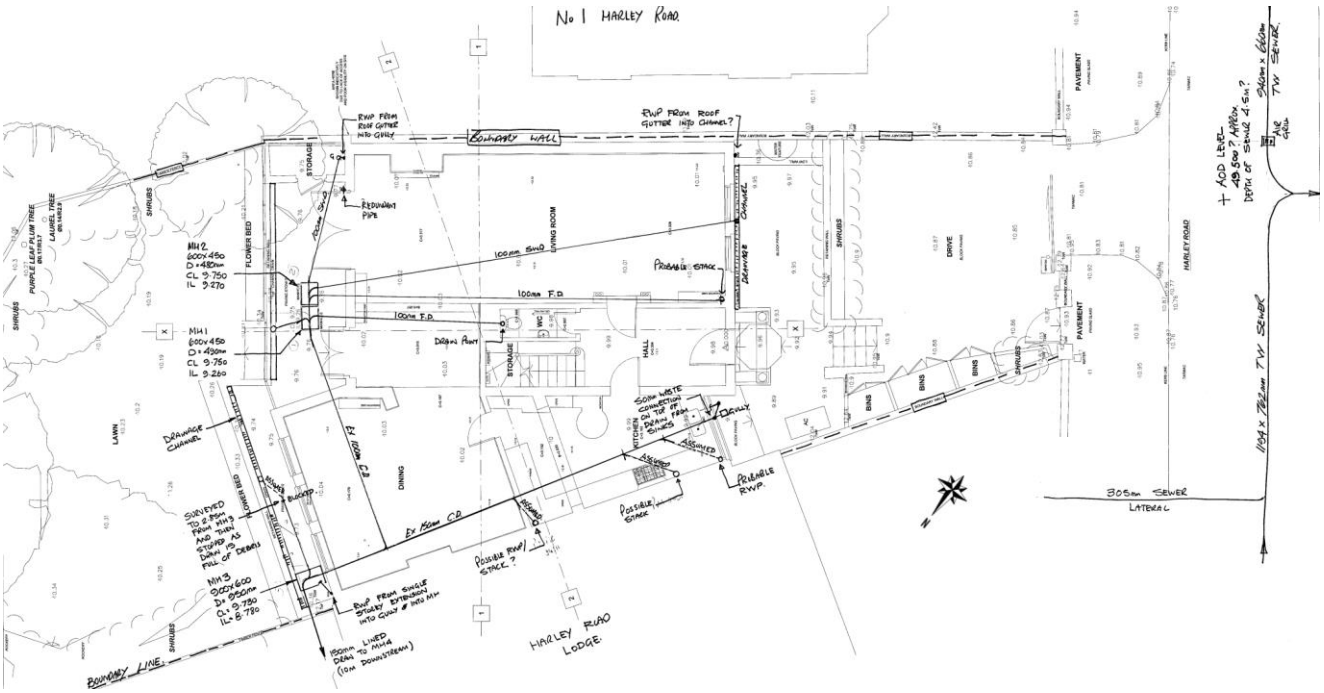

Figure 9. Existing drainage scheme

As existing, there is a combined foul and surface water system on site, with the roofs being collected by rainwater pipes discharging over gullies or channels and into the combined drainage network flowing towards the rear of the property. The final manhole MH/3 has a 150mm outfall found to run downstream into a manhole next door (north-west) at Harley Road Lodge. Currently the front block paved drive has no positive drainage and it drains into the public pavement.

6 Pre- and Post-development surface type area

The existing site is made from the building footprint, a block paved drive area at the front with further block paving lower areas and very limited softscape as shrubs; at the rear there is a small area of paving stones and flower beds, with the rest of the rear of the site being softscape. Several small bin stores are located at the front of the property, assumed over paving, and a gazebo on timber decking assumed over ground at the rear near to the boundary line.

The total site area is approx. 432 sqm and is 60% impermeable (approx. 261sqm) – all type areas are presented in Figure 10, and topographical survey in Figure 2.

The proposal introduces permeable paving over all the external areas at the front and for the proposed rear patio area leading into the proposed pond. Green roofs over 2-storey part of the

building, and a new permanent pond with an attenuation volume available for the surface water drainage system.

The post-development site is overall approx. 40% impermeable (approx. 170 sqm).

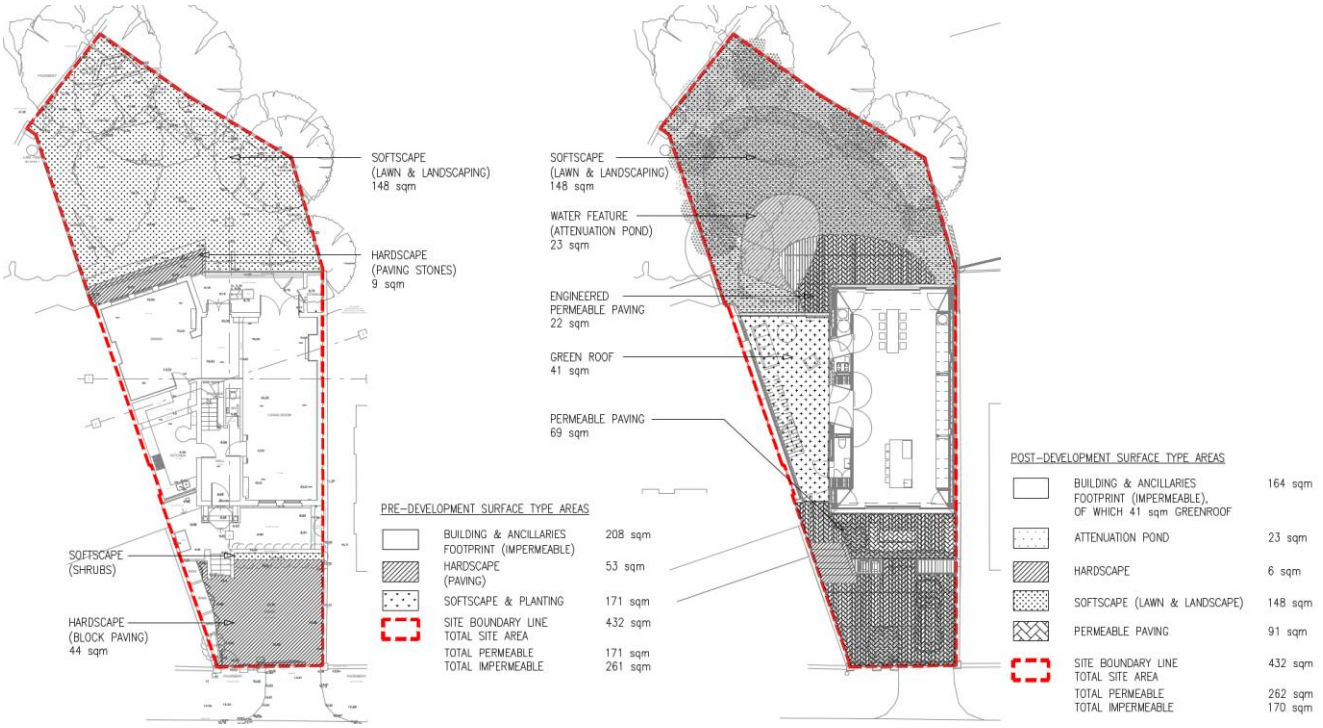

Figure 10 – Pre- and Post-development surface-type areas (ground floor layouts)

7 Proposed drainage scheme

The proposed drainage (Figure 11) is a new separate surface and foul water system, with the external areas at the front as permeable paving with a network of perforated pipes to collect the excess water where there is limited infiltration into the ground as per the current assumption due to the geology of the site. The permeable rear patio will infiltrate the surface water collected solely on the surface of the paving, into the ground where infiltration is limited to ground conditions - it will further infiltrate into the proposed pond subject to site conditions.

All the rainwater pipes and any positive drainage from the permeable substrate will be discharged by gravity into the proposed pond which will provide the required attenuation volume to discharge via a restricted outfall to the existing site outfall at manhole MH/3.

A hydrobrake or orifice plate shall restrict the pond outfall to 2 l/s which is considered to be the minimal flow rate able to provide self-cleansing velocities in the pipework.

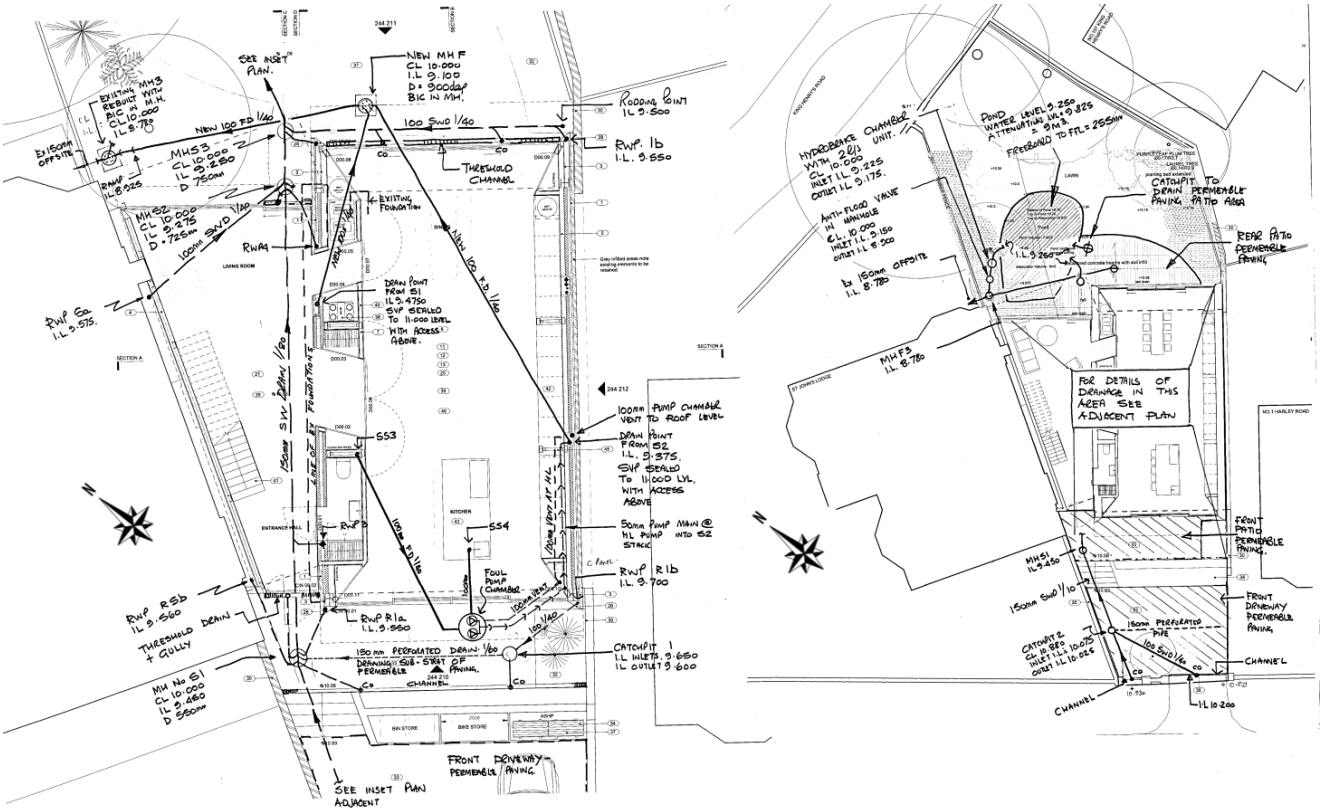

Figure 11 – Proposed drainage scheme

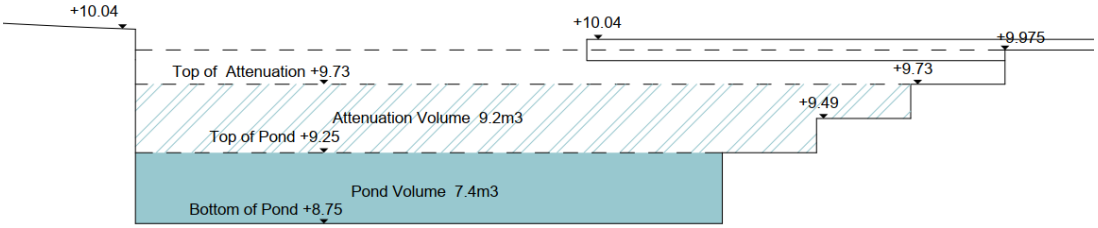

Figure 12 – Attenuation volume strategy available in the pond

Although the site in not in Flood Zone 1 (Figure 4), and is at low risk of flooding from surface water (Figure 5), because the site is in a Critical Drainage Area (Figure 6), an anti-flood valve is proposed to be installed on the outfall from the hydrobrake into the final discharge manhole to protect the surface water system from foul water backflows. It is recommended a minimum 3 m of clear run when installing a Hydrobrake device, from the device to the anti-flood valve, or follow the manufacture's specific recommendations. Also, the provision of perforated pipes within the sub-base of the permeable paving should mitigate the risk of flooding from surface water.

A further approx. 300mm of freeboard (approx. 3 cubic meters of storage) from the top of the attenuation volume is available in the pond to further mitigate the risk of flooding from surface water.

An overflow shall be proposed from the hydrobrake chamber above the level of attenuation to prevent flooding the property due to blockages of the restricted outfall (Figure 12).

8 Surface water calculations

The proposed surface water drainage system is aiming for green-field run-off rates which were calculated at:

- Qbar 4.35 l/s per 1ha,
- or 0.2 l/s for the total site area of 432 sqm.

A more practical 2 l/s restricted discharge was proposed to ensure self-cleansing velocities. Greenfield run-off calculations were done using UKSuDS Greenfield runoff tool as below.

Although the permeable paving and the green roofs will both slow the flow of rainwater and will also retain some surface water within their substrates, those areas were included as impermeable in the attenuation calculations to provide extra storage in case of low performing permeable paving or green roof because of subsequent rain events locking water in, or lack of maintenance.

The UKSuDS Storage Estimation tool was used with a 2 l/s restricted discharge over the building footprint plus the permeable paving area, as below.

- 2 l/s restricted discharge
- No flooding of the site for up to 1 in 100 year storms plus 40% increase for climate change
- 9 cubic meters of storage required

HR Wallingford
Working with water

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Adrian Buica
Site name:	NW3 3BY St John's Studio,
Site location:	Harley Road NW3 3BY St John's Studio, Harley Road

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.54150° N
Longitude:	0.17013° W
Reference:	3089489395
Date:	Nov 09 2022 14:04

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 1

Methodology

Q_{BAR} estimation method: Calculate from SPR and SAAR

SPR estimation method: Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics	Default	Edited
SAAR (mm):	640	640
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	4.35	4.35
1 in 1 year (l/s):	3.7	3.7
1 in 30 years (l/s):	10	10
1 in 100 year (l/s):	13.87	13.87
1 in 200 years (l/s):	16.26	16.26

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

HR Wallingford
Working with water

Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by:	Adrian Buica
Site name:	St John's Studio, Harley Road
Site location:	NW3 3BY

This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the design of the drainage scheme.

Site Details

Latitude:	51.54143° N
Longitude:	0.17° W
Reference:	2955689297
Date:	Dec 16 2022 17:49

Site characteristics

Total site area (ha):	0.0432
Significant public open space (ha):	0
Area positively drained (ha):	0.0432
Impermeable area (ha):	0.0261
Percentage of drained area that is impermeable (%):	60
Impervious area drained via infiltration (ha):	0
Return period for infiltration system design (year):	10
Impervious area drained to rainwater harvesting (ha):	0
Return period for rainwater harvesting system (year):	10
Compliance factor for rainwater harvesting system (%):	66
Net site area for storage volume design (ha):	0.04
Net impermable area for storage volume design (ha):	0.03
Pervious area contribution to runoff (%):	30

* where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50% of the 'area positively drained', the 'net site area' and the estimates of Q_{BAR} and other flow rates will have been reduced accordingly.

Design criteria

Climate change allowance factor:	1.4
Urban creep allowance factor:	1.1
Volume control approach	Use long term storage
Interception rainfall depth (mm):	5
Minimum flow rate (l/s):	2

Methodology

esti	IH124
Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	4	4
SPR:	0.47	0.47

Hydrological characteristics	Default	Edited
Rainfall 100 yrs 6 hrs:	--	63
Rainfall 100 yrs 12 hrs:	--	103.95
FEH / FSR conversion factor:	1.35	1.35
SAAR (mm):	638	638
M5-60 Rainfall Depth (mm):	20	20
'r' Ratio M5-60/M5-2 day:	0.4	0.4
Hydological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 10 year:	1.62	1.62
Growth curve factor 30 year:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Q_{BAR} for total site area (l/s):	0.19	0.19
Q_{BAR} for net site area (l/s):	0.19	0.19

Site discharge rates	Default	Edited
1 in 1 year (l/s):	2	2
1 in 30 years (l/s):	2	2
1 in 100 year (l/s):	2	2

Estimated storage volumes	Default	Edited
Attenuation storage 1/100 years (m^3):	9	9
Long term storage 1/100 years (m^3):	0	0
Total storage 1/100 years (m^3):	9	9

This report was produced using the storage estimation tool developed by HRWallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at http://uksuds.com/terms-and-conditions.htm. The outputs from this tool have been used to estimate storage volume requirements. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

9 Drainage disposal hierarchy

Foul Water

The foul water system to conform with Building Regs Part H, H1 Foul water drainage disposal hierarchy:

1. **A public sewer**. Yes, re-using existing 150mm from manhole MH/3;
2. **A private sewer** communicating with a public sewer. N/A;
3. Either a **septic tank** which has an appropriate form of secondary treatment or another wastewater treatment system. N/A;
4. Cesspool. N/A.

Surface Water

For surface water disposal strategy, the proposal is referring to the drainage hierarchy as set-out by the London Plan Policy SI 13:

1. **Rainwater use as a resource** (for example rainwater harvesting, blue roofs for irrigation) – not suitable, no extensive irrigation required for the softscaping; green roofs are being proposed.
2. **rainwater infiltration to ground at or close to source** – permeable paving over the external areas are proposed.
3. **rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)** – a new pond is proposed to provide the required attenuation volume, also green roof at level 3 and permeable paving are proposed.
4. **rainwater discharge direct to a watercourse (unless not appropriate)** – N/A.
5. **controlled rainwater discharge to a surface water sewer or drain** – N/A
6. **controlled rainwater discharge to a combined sewer** – yes, proposed 2 l/s restricted discharge to combined drains from pond.

10 Conclusions

The proposal reduces the overall impermeable area from 261 sqm to 170 sqm reflected in the proposed permeable and green roof areas. A restricted discharge rate of 2 l/s has been proposed from the proposed attenuation pond. A 250mm min deep gravel sub-base is proposed over all the external areas at the front and rear of the property to allow for storage and infiltration. Over the 3rd level roof a green roof is also proposed.

The 2 l/s restricted discharge from the attenuation pond means post-development conditions of surface water run-off are significantly improved over the existing pre-development conditions. By contrast, a 5min 1 in 100y rain (intensity of 230mm/hr or 0.064 l/s/sqm) would have a run-off rate of 16.1 l/s calculated over the 261sqm existing impermeable areas – therefore the proposed 2 l/s run-off rate is a reduction of approx. 88% over the surface water run-off for that particular storm event.

The proposed drainage scheme is a significant improvement over the existing one, with reduced peak run-off and volume run-off due to the attenuation in the pond and gradual release in the existing drainage system; further retention will occur in the permeable paving and in the green roof.

The proposed surface water system has implemented SuDS components like storage, permeable paving and green roofs, thus allowing for surface water solids removal and treatment. The proposed drainage reduces the risk of flooding to the property (no flooding of the site for up to 1 in 100 year storms plus 40% increase for climate change), incorporates bio-diverse roofs and it is a sustainable drainage system.

The proposal has aimed to achieve greenfield run-off rates, or the lowest practical restricted run-off rate at 2 l/s, thus the proposal is in line with both Policies CC2 and CC3 from the LBC Local Plan 2017, and with the London Plan 2021, in terms of using SuDS, and keeping with Policy SI 13 and its drainage hierarchy of surface water disposal.

It is expected this report will discharge the condition 14 from the Draft Decision to Application ref 2022/2145/P from 06/10/2022.

G/5096/Reports/MAB
16th December 2022