SUDS Strategy

in connection with the proposed development at

46 Holmdale Road
London
NW6 1BL

for

Alex Wills & Artemis Doupa

LBH4507suds Ver. 1.1

June 2018

LBH WEMBLEY
ENGINEERING

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1. Introduction

1.1 Background

It is proposed to extend and deepen the existing partial basement present at this three storey terraced Victorian property to provide further habitable space.

It is also proposed to construct a single storey infill extension to the rear of the building.

1.2 Brief

LBH WEMBLEY have been appointed by Alex Wills and Artemis Doupa to prepare a SUDS Strategy for submission to London Borough of Camden in support of a planning application (Ref: 2018/0599/P).

1.3 Planning Policy

The Camden Local plan provides guidance for water and flooding under Policy CC3, where the council will seek to ensure a development reduces the risk of flooding where possible and will require a development to :

- *a. incorporate water efficiency measures;*
- *b. avoid harm to the water environment and improve water quality;*
- *c. consider the impact of development in areas at risk of flooding (including drainage);*
- *d. incorporate flood resilient measures in areas prone to flooding;*
- *e.* ***utilise Sustainable Drainage Systems (SuDS) in line with the drainage hierarchy to achieve a greenfield run-off rate where feasible;*** *and*
- f. *not locate vulnerable development in flood-prone areas.*"

Additionally, the Camden Planning Guidance for Sustainability (CPG3) (July 2015, updated March 2018) states:

"*All developments are expected to manage drainage and surface water on-site or as close to the site as possible, using Sustainable Drainage Systems (SUDS) and the hierarchy set out below.*

The Council will expect plans and application documents to describe how water will be managed within the development, including an explanation of the proposed SUDS, the reasons why certain SUDS have been ruled out and detailed information on materials and landscaping.

The Council will expect developments to achieve a greenfield surface water run-off rate once SUDS have been installed. As a minimum, surface water run-off rates should be reduced by 50% across the development."

1.4 Report Structure

This report describes the site characteristics, following which consideration is given to the feasibility of SUDS techniques for this site. Finally, the recommended SUDS strategy to mitigate the risk of flooding across the site is presented in accordance with the 2015 CIRIA C753 SUDS Manual.

1.5 Documents Consulted

The following documents have been taken into consideration in the preparation of this report:

- Basement Impact Assessment of 46 Holmdale Road by LBH Wembley, Ref: LBH4507 Ver. 1.1), January 2018
- Camden Local Plan June 2017 (Policy CC3 "Water and Flooding")
- Camden Planning Guidance - Basements March 2018
- London Borough of Camden SFRA, URS, July 2014
- Surface Water Management Plan for London Borough of Camden, July 2011
- Floods in Camden, Report of the Floods Scrutiny Panel, June 2003
- Camden Geological, Hydrogeological and Hydrological Study (CHGGS), November 2010, Ove Arup & Partners Limited

2. Surface Water Management (SWM)

2.1 Site Location

2017 Map

The site is situated on the western side of Holmdale Road, approximately 60m south of the junction with Mill Lane.

The site may be located approximately by postcode NW6 1BL or by National Grid Reference 525210, 185180.

2.2 Site characteristics

The site lies on the lower southwestern slopes of Hampstead Heath on land that that falls gently to the south.

Street level at the front of the site appears to be situated at approximately +58m OD.

The site is occupied by a Victorian, three storey terraced house with a partial basement beneath the front of the dwelling. A topographical survey undertaken by CSL Surveys (Ref: 22116RB F0, dated October 2016) indicates that the existing ground floor level is at approximately +58.5m OD and the existing basement floor level is approximately +56.5m OD.

3D illustration showing the proposed development

Extracts from public sewer records have been obtained from Thames Water[1] and are included within the Appendix. A 600mm diameter and 229mm combined sewer run along Holmdale Road falling southwards within the vicinity of the site. The nearest manholes for the 600mm and 229mm diameter combined sewers are referenced 211C and 211D with invert levels +55.01m OD and +50.28m OD respectively.

Rainfall incident on the roof is directed to the basement level where it will discharge via a gully within the front lightwell to the combined sewer. A gully is also present on the rear patio directing surface water runoff to the combined sewer. However, it is not clear from the Thames Water records as to which combined sewer serves the property directly.

[1] *Thames Water, December 2017*, Asset Location Search, Ref: ALS/ALS Standard/2017_3709869

The Flood Risk Assessment[2] indicates that there is a low risk of flooding from all sources; however, given the potential increase of surface water flood risk associated with climate change and the high vulnerability of basement developments, consideration of SUDS for the site is required.

It has been established that, contrary to the SFRA suggestion of permeable soils, are present, , indications of the BGS mapping that , The site is directly underlain by the London Clay Formation and therefore infiltration is not suitable for the proposed development.

Trees and hedgerows are currently present on the site in addition to a lawn in the rear garden, which support local habitat connectivity and biodiversity across the site.

2.2.1 Ground Conditions

The SFRA guidance acknowledges that local confirmation of ground conditions is required before infiltration SUDs can be considered.

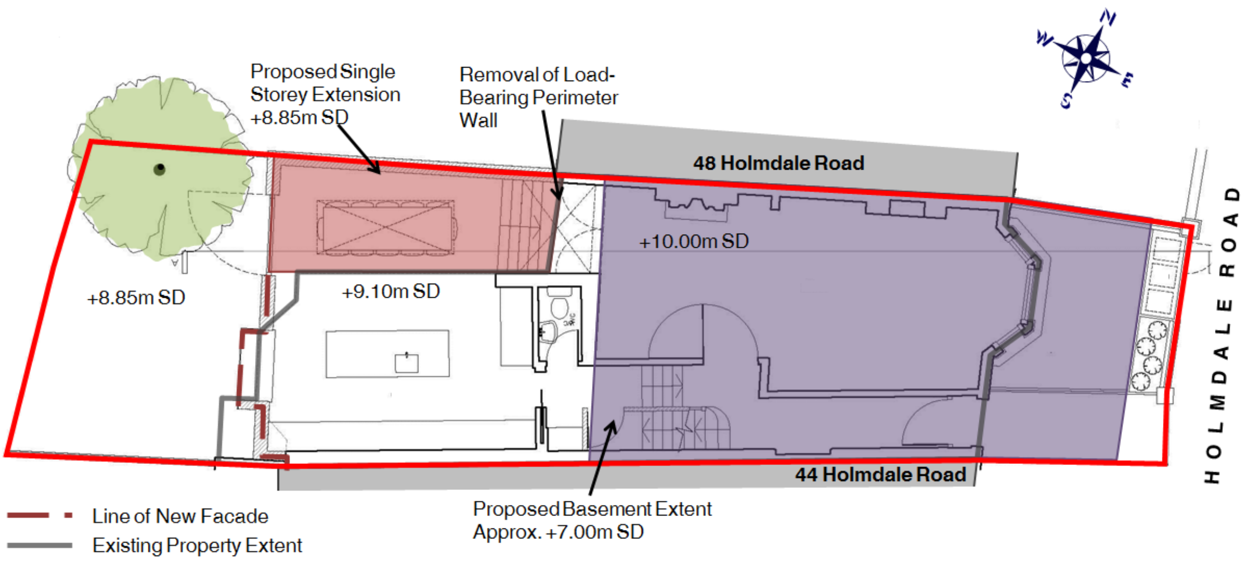
Figure 4c of the 2014 URS SFRA suggests that the site is located in an area that is potentially suitable for infiltration SUDs. However, this assessment is based on an assumption that there are permeable soils present and that the depth to a water table within these soils is less than 3m depth for part of the year.

In this case a site-specific ground investigation has been undertaken, in December 2017, and is reported in the basement impact assessment. This investigation has shown that, contrary to the SFRA suggestion of permeable soils, the site is, as indicted by BGS mapping, directly underlain by the London Clay Formation.

The London Clay is essentially impermeable and hence no groundwater table is present.

2.3 Proposed Development

It is proposed to deepen the existing basement by approximately 1.1m and to extend this laterally beneath the front half of the existing house footprint, as well as extending and deepening the front lightwell. A single storey infill extension is also proposed to the rear of the property.



Plan showing the proposed layout

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[2] *LBH Wembley, January 2018,* Flood Risk Assessment, Ref: LBH4507FRA

2.4 SWM objectives for the development

The drainage strategy follows the guidance from the 2015 CIRIA C753 SUDS Manual; the principle of SUDS design is that surface water runoff is managed for maximum benefit. The types of benefits that may be achieved by utilising SUDS are categorised by the design objectives outlined in the following section.

2.4.1 Water quantity

The design objective is to control the quantity of runoff to support the management of flood risk and maintain and protect the natural water cycle.

In order to ensure that the surface water runoff from a developed site does not have a detrimental impact on people, property and the environment, it is important to control the rate and volume of the discharge from the site.

Sustainable Urban Drainage Systems (SUDS) should be incorporated into the design of a development unless there are practical reasons for not doing so. In aiming to achieve greenfield runoff rates, surface water runoff should be managed using the following techniques, as outlined in order of priority by the following drainage hierarchy:

SUDS Drainage Hierarchy	Suitable for the site? (Y/N)	Comment
Store rainwater for later use	N	There is very limited space for a gravity driven system within the property or a pumped solution within the garden.
Use infiltration techniques	N	The site is directly underlain by the London Clay, and hence there is no scope for infiltration.
Attenuate rainwater in ponds or open water features for gradual release	N	No ponds or open water features nearby.
Attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Attenuation within a pumping chamber within the front garden will store run-off from the rear garden and front lightwell.
Discharge rainwater direct to a watercourse	N	No nearby watercourse.
Discharge rainwater to a surface water sewer/drain	N	No surface water sewer is serving the site.
Discharge rainwater to the combined sewer	Y	Discharge to existing combined sewer serving the site.

The hierarchy above seeks to ensure that surface water runoff is controlled as near to its source as possible to mimic natural drainage systems and retain water on or near to the site.

Before disposal of surface water to the public sewer is considered, all other options set out in the above hierarchy need to be exhausted.

2.4.2 Water quality

The water quality design objective is to manage the quality of runoff to prevent pollution, supporting the management of water quality in the receiving surface waters and groundwater and design system resilience to cope with future change.

Surface water runoff will need treatment where necessary to meet the appropriate water quality requirements for the method of discharge.

2.4.3 Amenity

The amenity design objective is to create and sustain better places for people by implementing the following criteria for the site:

- Maximise multi-functionality
- Enhance visual character
- Deliver safe surface water management systems
- Support development resilience/adaptability to future change
- Maximise legibility
- Support community environmental learning

2.4.4 Biodiversity

The biodiversity design objective is to create and sustain better places for nature by implementing the following criteria for the site:

- Support and protect natural local habitats and species
- Contribute to the delivery of local biodiversity objectives
- Contribute to habitat connectivity
- Create diverse, self-sustaining and resilient ecosystems

2.5 Conceptual Drainage Plan

The following sections set out the presently envisaged proposals for drainage components.

2.5.1 Feasible Discharge routes

The surface water runoff from the front lightwell and rear garden will be stored and directed to the combined sewer, to prevent surface water flooding in front lightwell and in the rear garden.

2.5.2 Feasible Drainage Components

SUDS Component	Description	Suitable for the site? (Y/N)
Rainwater harvesting	Collection of rainwater runoff from roofs or impermeable areas for reuse.	N
Green roofs	Vegetated areas installed on the top of buildings provide visual and ecological benefits in addition to surface water runoff reduction and enhanced building performance.	N
Blue roofs	Roof design intended to store water providing attenuation storage.	N
Infiltration systems	Infiltration can contribute to reducing runoff rates and	N

	volumes while supporting base flow and groundwater recharge processes.	
Proprietary treatment systems	Proprietary treatment systems are manufactured products which remove specified pollutants from surface water runoff.	N
Filter strips/drains	Filter strips are gently sloping strips of grass that provide treatment of runoff from adjacent impermeable areas. Filter drains are gravel or stone filled trenches which provide temporary subsurface storage for attenuation conveyance and filtration of surface water runoff.	N
Swales	Swales are shallow, flat bottomed, vegetated open channels designed to convey, treat, and attenuate surface water runoff.	N
Bioretention systems	Rain gardens or shallow landscaped depressions that may reduce surface water runoff rates and volumes and/or treat pollution using engineered soils and vegetation.	N
Trees	Trees aid surface water management through transpiration, inception, infiltration and phytoremediation.	N
Pervious Pavements	Pervious pavements facilitate the infiltration of surface water into a subsurface structure where filtration, adsorption, biodegradation or sedimentation may also provide treatment of the runoff.	N
Attenuation storage tanks	Attenuation storage tanks provide below-ground void space for the temporary storage of surface water before infiltration, controlled release or use.	Y
Detention basins	Attenuation storage in the form of dry landscaped depressions.	N
Ponds and wetlands	Permanent water filled ponds or wetlands that provide attenuation storage or treatment of surface water runoff.	N

2.5.3 Water Quantity

Attenuation storage provided by the proposed pumping chamber will allow long term storage of surface water runoff and controlled release to the nearby combined sewer.

The proposed components will meet the requirements in the case of a 1:100 year storm event + climate change (CC) to prevent flooding of the site or surrounding areas.

2.5.4 Water Quality

The proposed pumping chamber will allow for finer sediment to settle before the surface water discharges to the combined sewer.

2.5.5 Amenity

The attenuation storage proposed for the development will be designed with consideration of climate change allowance, providing resilience to future change.

2.5.6 Biodiversity

The proposed pumping chamber will not provide any biodiversity benefits directly, however, controlling the runoff across the site will maximise biodiversity on site and down gradient.

2.5.7 Maintenance

Suds Component	Maintenance	
Attenuation storage	Regular	• Inspect and identify any areas that are not operating correctly. If required, take remedial action (Monthly) • Remove debris from the catchment surface (Monthly) • Check surface of filter for blockage and remove and replace surface medium as necessary (Annually) • Remove sediment from pre-treatment structures and/or internal forebays (Annually)
	Remedial (As required)	• Repair inlets, outlet overflows and vents
	Monitoring	• Inspect 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)

Maintenance plans and schedules should be prepared in the design phase for the specific maintenance needs of each SUDS component, and necessary adjustments made to suit requirements.

2.6 Outline Design

2.6.1 Greenfield runoff rate

$$Q_{bar}(m^3/s) = 0.00108(0.01 \times AREA)^{0.89} \times SAAR^{1.17} \times SPR^{2.17}$$

Qbar - mean annual flood flow from a rural catchment (approximately 2.3 year return period).

AREA- area of the catchment in ha.

SAAR - standard average annual rainfall for the period 1941 to 1970 in mm (SAAR 41-70).

SPR - Standard Percentage runoff coefficient for the SOIL category.

Runoff for the site		
Return Period	Greenfield runoff rate (l/s/ha)	Runoff volume in 6 hour storm event (m^3)
1 in 1 year	0.06	1.2
1 in 30 year	0.15	3.3
1 in 100 year	0.21	4.6

2.7 Existing runoff rate

The existing site is currently approximately 120m^2 impermeably surfaced and the remaining 35m^2 is soft landscaping.

The soft landscaped area will drain at greenfield runoff rates, while the runoff of the impermeable area can be calculated using the Modified Rational Method:

Q=2.78 x CiA

Where Q=flow (l/s), i= rainfall intensity (mm/hr), A= Contributing area (ha) and $C=C_vC_r$. Typically $C_v=0.75$ and $C_r=1.3$, therefore C=0.98.

For the case of the impermeable area on the existing site i=10.5 mm/hr, the rain intensity during a 1 in 100 year 6 hour event and A=120m^2. As a result the hard-standing areas will experience a runoff rate of 0.3l/s and a runoff volume over the 6 hour period of 7.4m^3.

The soft landscaped area is 35m^2, and will experience a runoff of 0.1l/s in a 1 in 100 year event, with a runoff volume over a 6 hour period of 2.1m^3.

The total runoff expected from the site during a 1 in 100 rainfall event is 0.4l/s and the runoff volume over a 6 hour period would be approximately 9.5m^3.

2.8 Proposed Runoff Volumes

Given that there will be no increase in impermeable area post-development it is envisaged that runoff rates from the site would remain unchanged.

Although no increase in runoff is anticipated as a result of the development, there is a potential increase in runoff associated with future climate change.

To mitigate the potential increase in runoff volume in the case of a storm event, the drainage strategy follows the guidance from the 2015 CIRIA C753 SUDS Manual.

2.8.1 Attenuation storage

In order to limit the discharge rate to the surface water sewer serving the site to the greenfield rate of 0.21l/s, attenuation storage is to be included as a SUDS element.

HR Wallingford’s Surface water storage volume estimation tool was used to undertake attenuation storage volume calculations, using the site specific rainfall data from the Centre for Ecology and Hydrology (CEH) and an FEH/FSR Conversion Factor of 1.33; i.e. Flood Studies Report (FSR) rainfall data is 33% larger than Flood Estimation Handbook (FEH) rainfall data for this location. These calculations indicate that no attenuation storage is required to maintain greenfield runoff rates for the 1 in 100 year rainfall event in consideration of up to 40% climate change allowance.

2.8.2 Proposed Drainage Plan

Although attenuation storage is not required to meet greenfield runoff rates from the site in the case of a 1 in 100 year rainfall event with a 40% climate change allowance, it is proposed that runoff is to be collected from rear garden and the front lightwell via aco drains and a gravity driven piped system to a pumping chamber located in the front garden. The pumping chamber will be designed to pump the outflow to the combined sewer currently serving the property at greenfield rates.

Implementing the above SUDS techniques will provide an allowance of attenuation storage within the pumping chamber, therefore providing an overall betterment of the existing surface water drainage regime for the site.

APPENDIX

BURIED SERVICE PLANS