

Outline SuDS Strategy

in connection with proposed development at

No. 5 Camden Road

Camden

London

NW1 9LG

for

Maida Vale Spaces (UK) Ltd

LBH4577suds Ver. 1.0

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LBH WEMBLEY

ENGINEERING

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Foreword-Guidance Notes

GENERAL

This report has been prepared for a specific client and to meet a specific brief. The preparation of this report may have been affected by limitations of scope, resources or time scale required by the client. Should any part of this report be relied on by a third party, that party does so wholly at its own risk and LBH WEMBLEY disclaims any liability to such parties.

The observations and conclusions described in this report are based solely upon the agreed scope of work. LBH WEMBLEY has not performed any observations, investigations, studies or testing not specifically set out in the agreed scope of work and cannot accept any liability for the existence of any condition, the discovery of which would require performance of services beyond the agreed scope of work.

VALIDITY

Any use of or reliance upon the report in circumstances other than those for which it was commissioned shall be at the client's sole risk. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should therefore not be relied upon in such altered circumstances.

THIRD PARTY INFORMATION

The report may present an opinion based upon information received from third parties. However, no liability can be accepted for any inaccuracies or omissions in that information.

1. Introduction

1.1 Background

It is proposed to construct a basement beneath the entire footprint of the existing property at No. 5 Camden Road, including both the existing structure and a small wedge-shaped yard to the rear. This drainage report has been prepared to support a planning application to the London Borough of Camden for the proposed development.

1.2 Guidance

Developments should provide betterment to the risk of surface water runoff by aiming to attenuate surface water on site through the use of SuDS.

The London Borough of Camden Planning Guidance for Sustainability (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.”

A surface water drainage strategy for this site is therefore required to incorporate SuDS principles as laid out in the Non-Statutory Technical Standards¹ for Sustainable Drainage Systems and the London Plan².

SuDS systems are designed to control surface water run off close to where it falls and mimic natural drainage as closely as possible. They provide opportunities to:

- reduce the causes and impacts of flooding;
- remove pollutants from urban run-off at source;
- combine water management with green space with benefits for amenity, recreation and wildlife.

The aim is to discharge surface run off 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.

¹ DEFRA March 2015 Non-Statutory Technical Standards (NSTS) for sustainable drainage systems

² London Plan Chapter Five - London's Responses to Climate Change Policy 5.1.3 Sustainable Drainage

1.3 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.

2. The Site

2.1 Site Location

The site is situated on the northwestern side of Camden Road, approximately 60m to the northeast of Camden Town underground station.

The site may be located approximately by postcode NW1 9LG or by National Grid Reference 528960, 183940.

2.2 Topographical Setting

The site lies on a very gentle southeastwards falling slope on the west bank of the now culverted River Fleet, which runs approximately 200m from the site.



Location Plan

2.3 Site Description

The site is occupied by a late 19th Century three storey terraced building with ground floor level set at approximately +26.4m OD. A single storey extension, roughly trapezoid in shape, is present to the rear.

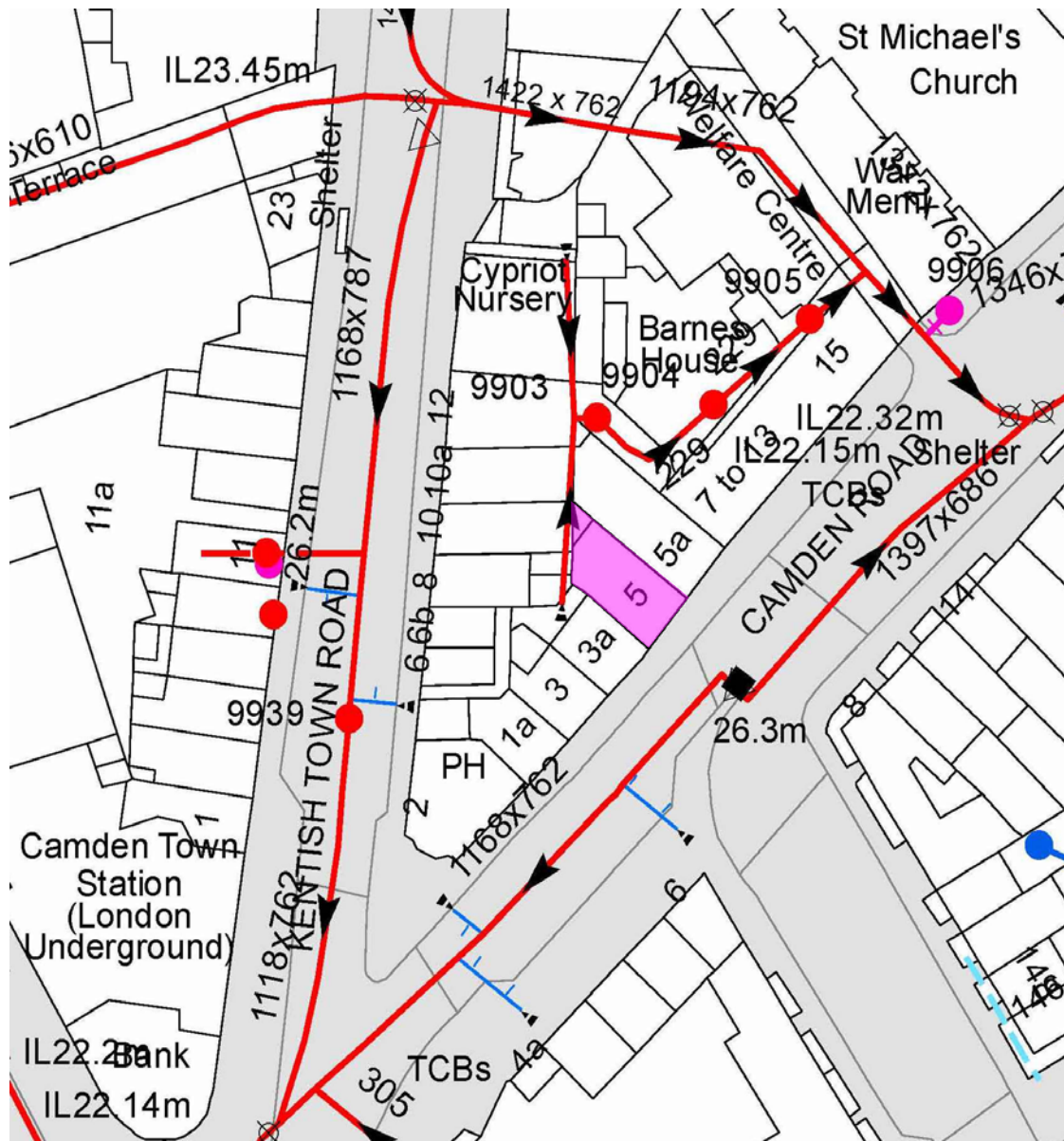
The extension opens up to a very small, wedge-shaped hard surfaced yard area placed between Nos. 5 & 5a Camden Road and Nos. 10-12 Kentish Town Road. A manhole connecting to a combined sewer running along the backs of the properties along Camden Road is present within the yard.

The building is adjoined by similar three storey buildings at No. 3a and No. 5a Camden Road.

To the rear the site backs onto No. 8 and Nos. 10-12 Kentish Town Road, part two part three storey terraced buildings with a mansard roof.

2.4 Site Characteristics

Thames Water public sewer records show that the site is served by a combined sewer (probably 229mm diameter) that runs northward beneath the rear of the property. This sewer is believed to have an invert at approximately +24m OD (2.5m depth).



Plan of sewers

2.5 Ground Conditions

A site-specific ground investigation is yet to

3. SuDS Objectives and Drainage Route Appraisal

The drainage strategy follows the guidance set out in 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

- **Water Quantity**
- **Water Quality**
- **Amenity**
- **Biodiversity**

These are outlined in the following sections.

3.1 Water Quantity Objective

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 Drainage Systems (SuDS) are to be incorporated into the design of a development. 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 Route Appraisal		
Drainage Route Option:	Suitable for the site? (Y/N)	Comment:
Store rainwater for later use	N	There is no opportunity to harvest rainwater.
Use infiltration techniques	N	The site is directly underlain by the London Clay, inhibiting infiltration on the site.
Attenuate rainwater in ponds or open water features for gradual release	Y	There is opportunity for a blue roof at the rear extension and within the yard area.
Attenuate rainwater by storing in tanks or sealed water features for gradual release	N	There is no opportunity for closed tanks at this site.
Discharge rainwater direct to a watercourse	N	There is no available watercourse.
Discharge rainwater to a surface water sewer/drain	N	There is no surface water sewer serving the site.
Discharge rainwater to the combined sewer	Y	It is proposed that the new drainage system should ultimately include a discharge to the existing combined sewer serving the site as at present.

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.

3.2 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.

3.3 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

3.4 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

4. Potential SuDS Components

The feasibility of various potential SuDS components are assessed in the following table:

Assessment of Potential SuDS Components			
SUDS Component	Description	Suitable for the site? (Y/N)	Comment
Rainwater harvesting	Collection of rainwater runoff from roofs or impermeable areas for reuse.	N	There is not sufficient space to harvest rainwater.
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	There is insufficient scope for a green roof.
Blue roofs	Roof design intended to store water providing attenuation storage.	Y	There may possibly be scope for a small area of blue roof over the rear extension.
Infiltration systems	Infiltration can contribute to reducing runoff rates and volumes while supporting base flow and groundwater recharge processes.	N	Infiltration is not possible into the London Clay Formation.
Proprietary treatment systems	Proprietary treatment systems are manufactured products which remove specified pollutants from surface water runoff.	N	Not required.
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	Not required.
Swales	Swales are shallow, flat bottomed, vegetated open channels designed to convey, treat, and attenuate surface water runoff.	N	Not required.
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	There is insufficient space to create a Bioretention system.
Trees	Trees aid surface water management through transpiration, inception, infiltration and phytoremediation.	N	No new tree planting is proposed.
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	The potentially retained external area in the northeastern corner of the site will be too small to allow for an effective pervious pavement installation.

Attenuation storage tanks	Attenuation storage tanks provide below-ground void space for the temporary storage of surface water before infiltration, controlled release or use.	N	There is insufficient space to install attenuation storage tanks at this site.
Detention basins	Attenuation storage in the form of dry landscaped depressions.	N	Not required.
Ponds and wetlands	Permanent water filled ponds or wetlands that provide attenuation storage or treatment of surface water runoff.	N	Not required.

5. Initial Design Considerations

An analysis has been undertaken of the pre- and post- development surface water run-off rates and volumes over a range of storm intensities and durations.

5.1 Greenfield runoff rate

The Greenfield runoff rates from the site have been calculated using the UK SuDS online tool and the Institute of Hydrology (IoH) 124 methodology.

Greenfield Rates:	
Qbar:	0.03 l/sec
1 in 1	0.03 l/sec
1 in 30	0.09 l/sec
1 in 100	0.12 l/sec
1 in 200	0.14 l/sec

5.2 Existing runoff rate

The site comprises an area of approximately 90m² of impermeable (100%) surfacing. There are considered to be no present SuDS features.

The existing peak storm runoff for the 1% (1 in 100 year) annual probability rainfall event on the site is estimated to be 4.1l/sec. The calculation was based on the Wallingford Procedure and the resulting runoff was calculated using the Modified Rational Method with an M5-60 of 20mm, an 'r' value of 0.42 and a critical rainfall intensity of 163.2 mm/hr.

The rainfall runoff volume for the 1% (1 in 100 year) annual probability, 6 hour duration storm from the existing site is estimated to be 5.7 m³.

6. Proposed Development

The proposed development will result in no change in impermeable area, as the site will remain being fully covered with impermeable building or paving.

Schedule of estimated approximate areas for outline SuDS assessment								
	Existing	Cv	%	%	Proposed	Cv	%	%
Garden	0m ²	0.40	0	0	0m ²	0.40	0	0
Building	87 m ²	0.77	97	100	90 m ²	0.77	100	100
Impermeable	3 m ²	0.77	3		0 m ²	0.77	0	
Total:	90 m ²		100	100	90 m ²		100	100

6.1 Proposed Drainage Scheme

The proposed development will not alter the amount of impermeable surfacing.

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.

The guidance seeks to limit the peak storm runoff for the 1% (1 in 100) annual probability rainfall event plus 40% allowance for future climate change to at least 50% of the current rate.

6.2 Attenuation storage

In order to limit the discharge rate to the combined sewer serving the site, attenuation storage is to be included as a SuDS element.

HR Wallingford's Surface water storage volume estimation tool has been used to undertake attenuation storage volume calculations. On the basis of a default minimum discharge rate of 5 l/sec 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.

Nevertheless, it is proposed that the surface water could possibly be collected in a 100mm deep blue roof to the rear extension and the yard area providing approximately 2m³ capacity prior to discharge to the combined sewer serving the property.

6.3 Review of SuDS Objectives

6.3.1 Water Quantity

It is anticipated the use of a blue roof could reduce runoff rates and volumes by providing a potential storage capacity of around 2m³.

6.3.2 Water Quality

Given that the surface water runoff from the roofs and rear garden is not expected to pick up any contamination. There is no expectation that any treatment will be necessary to meet the appropriate water quality requirements for the method of discharge.

6.3.3 Amenity

There is not considered to be space in this case for opportunities to provide any above ground amenity features.

6.3.4 Biodiversity

There is not considered to be space in this case for opportunities to provide any above ground SuDS features that could make a positive contribution to biodiversity.

6.4 Maintenance

Suds Component	Maintenance	
Blue roof	Regular	<ul style="list-style-type: none">Inspect and clear outlets

7. Conclusion

This assessment has shown that there is little opportunity to incorporate Sustainable Drainage System (SuDS) to manage the discharge of water from the site.

It may be possible to incorporate an area of blue roof over the rear extension.

However, the benefits of reducing the risks of any sewer flooding in this way should be balanced with the need to not increase the flood risk at the site.

Thus, it may not be wise to introduce any flow controls that would limit the sewer discharge rate to less than 5 l/sec.

Additionally, it is suggested that consideration must be given to the inclusion of a one-way valve to prevent any sewer backup affecting the site.

Surface Water Drainage Pro-forma for new developments

1. Site Details

Site	5 Camden Road
Address & post code or LPA reference	NW1 9LG
Grid reference	528950, 183940
Is the existing site developed or Greenfield?	Developed
Is the development in a LFRZ or in an area known to be at risk of surface or ground water flooding? If yes, please demonstrate how this is managed, in line with DP23?	No
Total Site Area served by drainage system (excluding open space) (Ha)*	0.009

* The Greenfield runoff off rate from the development which is to be used for assessing the requirements for limiting discharge flow rates and attenuation storage from a site should be calculated for the area that forms the drainage network for the site whatever size of site and type of drainage technique. Please refer to the Rainfall Runoff Management document or CIRIA manual for detail on this.

2. Impermeable Area

	Existing	Proposed	Difference (Proposed-Existing)	Notes for developers
Impermeable area (ha)	0.009	0.009	0	If the proposed amount of impermeable surface is greater, then runoff rates and volumes will increase. Section 6 must be filled in. If proposed impermeability is equal or less than existing, then section 6 can be skipped and section 7 filled in.
Drainage Method (infiltration/sewer/watercourse)		Combined Sewer	N/A	If different from the existing, please fill in section 3. If existing drainage is by infiltration and the proposed is not, discharge volumes may increase. Fill in section 6.

3. Proposing to Discharge Surface Water via

	Yes	No	Evidence that this is possible	Notes for developers
Existing and proposed Drainage calculations	Yes		HR Wallingford	Please provide calculations of existing and proposed run-off rates and volumes in accordance with a recognised methodology or the results of a full infiltration test (see line below) if infiltration is proposed.
Infiltration		No	Infiltration will not be possible as the site is directly underlain by impermeable London Clay.	e.g. soakage tests. Section 6 (infiltration) must be filled in if infiltration is proposed.
To watercourse		No	There is no nearby watercourse.	e.g. Is there a watercourse nearby?
To surface water sewer		No	There is no nearby surface water sewer	Confirmation from sewer provider that sufficient capacity exists for this connection.
Combination of above		No	See above - Not possible.	e.g. part infiltration part discharge to sewer or watercourse. Provide evidence above.
Has the drainage proposal had regard to the SuDS hierarchy?	Yes		HR Wallingford	Evidence must be provided to demonstrate that the proposed Sustainable Drainage strategy has had regard to the SuDS hierarchy as outlined in Section 2.5 above.
Layout plan showing where the sustainable drainage infrastructure will be located on site.	Yes		Possible small area of blue roof on rear extension	Please provide plan reference numbers showing the details of the site layout showing where the sustainable drainage infrastructure will be located on the site. If the development is to be constructed in phases this should be shown on a separate plan and confirmation should be provided that the sustainable drainage proposal for each phase can be constructed and can operate independently and is not reliant on any later phase of development.

4. Peak Discharge Rates — This is the maximum flow rate at which storm water runoff leaves the site during a particular storm event.

	Existing Rates (l/s) (from Wallingford online tool and Procedure)	Proposed Rates (l/s) (taken as 50% Existing)	Difference (l/s) (Proposed - Existing)	% Difference (Difference / existing x 100)	Notes for developers
Greenfield QBAR	0.04	N/A	N/A	N/A	QBAR is approx. 1 in 2 storm event. Provide this if Section 6 (QBAR) is proposed.
1 in 1	0.03	0.01	0.02	-50%	Proposed discharge rates (with mitigation) should aim to be equivalent to greenfield rates for all corresponding storm events. As a minimum, peak discharge rates must be reduced by 50% from the existing sites for all corresponding rainfall events.
1 in 30	0.09	0.04	0.05	-50%	
1 in 100	0.12	0.06	0.06	-50%	
1 in 100 plus climate change	N/A	0.06	N/A	N/A	The proposed 1 in 100 +CC peak discharge rate (with mitigation) should aim to be equivalent to greenfield rates. As a minimum, proposed 1 in 100 +CC peak discharge rate must be reduced by 50% from the existing 1 in 100 runoff rate sites.

5. Calculate additional volumes for storage – The total volume of water leaving the development site. New hard surfaces potentially restrict the amount of stormwater that can go to the ground, so this needs to be controlled so not to make flood risk worse to properties downstream.

	Greenfield runoff volume (m ³)	Existing Volume (m ³)	Proposed Volume (m ³)	Difference (m ³) (Proposed-Existing)	Notes for developers
1 in 1	1	2	3	0	Proposed discharge volumes (with mitigation) should be constrained to a value as close as is reasonably practicable to the greenfield runoff volume wherever practicable and as a minimum should be no greater than existing volumes for all corresponding storm events. Any increase in volume increases flood risk elsewhere. Where volumes are increased section 6 must be filled in.
1 in 30	2	4	6	2	
1 in 100 6 hour	3	6	8	2	
1 in 100 6 hour plus climate change	N/A	N/A	8	2	The proposed 1 in 100 +CC discharge volume should be constrained to a value as close as is reasonably practicable to the greenfield runoff volume wherever practicable. As a minimum, to mitigate for climate change the proposed 1 in 100 +CC volume discharge from site must be no greater than the existing 1 in 100 storm event. If not, flood risk increases under climate change.

6. Calculate attenuation storage – Attenuation storage is provided to enable the rate of runoff from the site into the receiving watercourse to be limited to an acceptable rate to protect against erosion and flooding downstream. The attenuation storage volume is a function of the degree of development relative to the greenfield discharge rate.

		Notes for developers
Storage Attenuation volume (Flow rate control) required to meet greenfield run off rates (m ³)	5.5	Volume of water to attenuate on site if discharging at a greenfield run off rate. Can't be used where discharge volumes are increasing
Storage Attenuation volume (Flow rate control) required to reduce rates by 50% (m ³)	2	Volume of water to attenuate on site if discharging at a 50% reduction from existing rates. Can't be used where discharge volumes are increasing
Storage Attenuation volume (Flow rate control) required to meet [OTHER RUN OFF RATE (as close to greenfield rate as possible)] (m ³) 3 x Greenfield	5.5	Volume of water to attenuate on site if discharging at a rate different from the above – please state in 1 st column what rate this volume corresponds to. On previously developed sites, runoff rates should not be more than three times the calculated greenfield rate. Can't be used where discharge volumes are increasing
Storage Attenuation volume (Flow rate control) required to retain rates as existing (m ³)	4	Volume of water to attenuate on site if discharging at existing rates. Can't be used where discharge volumes are increasing
Percentage of attenuation volume stored above ground,	100%	Percentage of attenuation volume which will be held above ground in swales/ponds/basins/green roofs etc. If 0, please demonstrate why.

7. How is Storm Water stored on site?

Storage is required for the additional volume from site but also for holding back water to slow down the rate from the site. This is known as attenuation storage and long term storage. The idea is that the additional volume does not get into the watercourses, or if it does it is at an exceptionally low rate. You can either infiltrate the stored water back to ground, or if this isn't possible hold it back with on site storage. Firstly, can infiltration work on site?

			Notes for developers
Infiltration	State the Site's Geology and known Source Protection Zones (SPZ)	London Clay (nil SPZ)	Avoid infiltrating in made ground. Infiltration rates are highly variable and refer to Environment Agency website to identify and source protection zones (SPZ)
	Are infiltration rates suitable?	No	Infiltration rates should be no lower than 1×10^{-6} m/s.
	State the distance between a proposed infiltration device base and the ground water (GW) level	n/a	Need 1m (min) between the base of the infiltration device & the water table to protect Groundwater quality & ensure GW doesn't enter infiltration devices. Avoid infiltration where this isn't possible.
	Were infiltration rates obtained by desk study or infiltration test?	n/a	Infiltration rates can be estimated from desk studies at most stages of the planning system if a back up attenuation scheme is provided..
	Is the site contaminated? If yes, consider advice from others on whether infiltration can happen.	No	Advice on contaminated Land in Camden can be found on our supporting documents webpage Water should not be infiltrated through land that is contaminated. The Environment Agency may provide bespoke advice in planning consultations for contaminated sites that should be considered.
In light of the above, is infiltration feasible?	Yes/No? If the answer is No, please identify how the storm water will be stored prior to release	No	If infiltration is not feasible how will the additional volume be stored?. The applicant should then consider the following options in the next section.

Storage requirements

The developer must confirm that either of the two methods for dealing with the amount of water that needs to be stored on site.

Option 1 Simple — Store both the additional volume and attenuation volume in order to make a final discharge from site at the greenfield run off rate. This is preferred if no infiltration can be made on site. This very simply satisfies the runoff rates and volume criteria.

Option 2 Complex — If some of the additional volume of water can be infiltrated back into the ground, the remainder can be discharged at a very low rate of 2 l/sec/hectare. A combined storage calculation using the partial permissible rate of 2 l/sec/hectare and the attenuation rate used to slow the runoff from site.

		Notes for developers
Please confirm what option has been chosen and how much storage is required on site.	Simple	The developer at this stage should have an idea of the site characteristics and be able to explain what the storage requirements are on site and how it will be achieved.

8. Please confirm

		Notes for developers
Which Drainage Systems measures have been used, including green roofs?	2m ³ Storage comprising a blue roof to the rear extension and yard	SUDS can be adapted for most situations even where infiltration isn't feasible e.g. impermeable liners beneath some SUDS devices allows treatment but not infiltration. See CIRIA SUDS Manual C697.
Drainage system can contain in the 1 in 30 storm event without flooding	YES	This a requirement for sewers for adoption & is good practice even where drainage system is not adopted.
Will the drainage system contain the 1 in 100 +CC storm event? If no please demonstrate how buildings and utility plants will be protected.	YES	National standards require that the drainage system is designed so that flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.
Any flooding between the 1 in 30 & 1 in 100 plus climate change storm events will be safely contained on site.	YES	Safely: not causing property flooding or posing a hazard to site users i.e. no deeper than 300mm on roads/footpaths. Flood waters must drain away at section 6 rates. Existing rates can be used where runoff volumes are not increased.

How will exceedance events be catered on site without increasing flood risks (both on site and outside the development)?	As present	Safely: not causing property flooding or posing a hazard to site users i.e. no deeper than 300mm on roads/footpaths. Flood waters must drain away at section 6 rates. Existing rates can be used where runoff volumes are not increased. Exceedance events are defined as those larger than the 1 in 100 +CC event.
How are rates being restricted (vortex control, orifice etc)	Orifice	Detail of how the flow control systems have been designed to avoid pipe blockages and ease of maintenance should be provided.
Please confirm the owners/adopters of the entire drainage systems throughout the development. Please list all the owners.	TBA	If these are multiple owners then a drawing illustrating exactly what features will be within each owner's remit must be submitted with this Proforma.
How is the entire drainage system to be maintained?	by management	If the features are to be maintained directly by the owners as stated in answer to the above question please answer yes to this question and submit the relevant maintenance schedule for each feature. If it is to be maintained by others than above please give details of each feature and the maintenance schedule. Clear details of the maintenance proposals of all elements of the proposed drainage system must be provided. Details must demonstrate that maintenance and operation requirements are economically proportionate. Poorly maintained drainage can lead to increased flooding problems in the future.

9. Evidence Please identify where the details quoted in the sections above were taken from. i.e. Plans, reports etc. Please also provide relevant drawings that need to accompany your proforma, in particular exceedance routes and ownership and location of SuDS (maintenance access strips etc)

Pro-forma Section	Document reference where details quoted above are taken from	Page Number
Section 2	Suds Report	var
Section 3	Suds Report	var
Section 4	Calculation Sheets	var
Section 5	Calculation Sheets	var
Section 6	Calculation Sheets	var
Section 7	Suds Report	var
Section 8	Suds Report	var

The above form should be completed using evidence from the Flood Risk Assessment and site plans. It should serve as a summary sheet of the drainage proposals and should clearly show that the proposed rate and volume as a result of development will not be increasing. If there is an increase in rate or volume, the rate or volume section should be completed to set out how the additional rate/volume is being dealt with. drainage proposals and should clearly show that the proposed rate and volume as a result of development will not be increasing.

If there is an increase in rate or volume, the rate or volume section should be completed to set out how the additional rate/volume is being dealt with.

This form is completed using factual information from the Flood Risk Assessment and Site Plans and can be used as a summary of the surface water drainage strategy on this site.

VERSION	DATE	COMMENT	AUTHORISED
1	29th May 2019	Initial Issue	SRLB

GREENFIELD RUN-OFF



Catchment Area: 90sqm 0.009ha

PO Code : NW1 9LG

Hydrological Region: 6 *From Wallingford on-line tool*

SAAR: 625mm *From Wallingford on-line tool*

SOIL type: 4 *From Wallingford on-line tool*

SPR: 0.47 *Derived as follows:*

SOIL	Sand	Clayey Sand	Sandy Clay	Clay	Rock
	1	2	3	4	5
SPR	0.1	0.3	0.37	0.47	0.53

From Wallingford on-line tool using IH 124 Method

Qbar: 211.42 *Calculated from SPR and SAAR*

Greenfield Peak Run-off Rate:

1 in 1	179.7 l/sec	<i>Growth curve Factor</i>	0.85
1 in 30	486.3 l/sec		2.30
1 in 100	674.4 l/sec		3.19
1 in 200	790.7 l/sec		3.74

Qbar:	0.04 l/sec
Greenfield Peak Run-off Rate:	
1 in 1	0.03 l/sec
1 in 30	0.09 l/sec
1 in 100	0.12 l/sec
1 in 200	0.14 l/sec

National Non-Statutory Guidance:

For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should never exceed the peak greenfield runoff rate for the same event.

For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.

Where reasonably practicable, for greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event should never exceed the greenfield runoff volume for the same event.

Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.

SuDs CALCULATIONS

Project: 5 Camden Road

GREENFIELD RUN-OFF

Sheet 1 of 7

Project Reference: LBH 4577

Date: 28/05/2019Rev:

Client: Maida Vale Spaces (UK) Ltd

LBH WEMBLEYENGINEERING

RAINFALL PEAK INTENSITY (i)

M5-60 : 20
r: 0.42

From Wallingford Fig A1
From Wallingford Fig A2

D Duration		Z1	M5-D
5min	5min	0.38	7.6mm
10min	10min	0.55	11.0mm
15min	15min	0.65	13.0mm
30min	30min	0.75	15.0mm
1hr	60min	1.00	20.0mm
2hr	120min	1.20	24.0mm
4hr	240min	1.40	28.0mm
6hr	360min	1.60	32.0mm
10hr	600min	1.70	34.0mm
24hr	1440min	2.20	44.0mm
48hr	2880min	2.50	50.0mm

			Z2								
D Duration		M5-D	M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	7.6mm	0.62	0.79	0.89	0.97	1.02	1.19	1.36	1.43	1.79
10min	10min	11.0mm	0.61	0.79	0.90	0.97	1.03	1.22	1.41	1.49	1.91
15min	15min	13.0mm	0.61	0.79	0.90	0.97	1.03	1.22	1.41	1.49	1.91
30min	30min	15.0mm	0.62	0.81	0.90	0.97	1.03	1.24	1.44	1.53	1.99
1hr	60min	20.0mm	0.64	0.81	0.90	0.97	1.03	1.24	1.45	1.54	2.03
2hr	120min	24.0mm	0.64	0.81	0.90	0.97	1.03	1.24	1.45	1.54	2.03
4hr	240min	28.0mm	0.66	0.82	0.91	0.97	1.03	1.24	1.44	1.53	2.01
6hr	360min	32.0mm	0.68	0.83	0.91	0.97	1.03	1.22	1.42	1.51	1.97
10hr	600min	34.0mm	0.68	0.83	0.91	0.97	1.03	1.22	1.42	1.51	1.97
24hr	1440min	44.0mm	0.70	0.84	0.92	0.97	1.02	1.19	1.38	1.47	1.89
48hr	2880min	50.0mm	0.72	0.85	0.93	0.98	1.02	1.17	1.34	1.42	1.81

			MT-D								
D Duration		M5-D	M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	7.6mm	4.7mm	6.0mm	6.8mm	7.4mm	7.8mm	9.0mm	10.3mm	10.8mm	13.6mm
10min	10min	11.0mm	6.7mm	8.7mm	9.9mm	10.7mm	11.3mm	13.4mm	15.5mm	16.4mm	21.0mm
15min	15min	13.0mm	7.9mm	10.3mm	11.7mm	12.6mm	13.4mm	15.9mm	18.3mm	19.4mm	24.8mm
30min	30min	15.0mm	9.3mm	12.2mm	13.5mm	14.6mm	15.5mm	18.6mm	21.6mm	22.9mm	29.9mm
1hr	60min	20.0mm	12.8mm	16.2mm	18.0mm	19.4mm	20.6mm	24.8mm	29.0mm	30.9mm	40.6mm
2hr	120min	24.0mm	15.4mm	19.4mm	21.6mm	23.3mm	24.7mm	29.8mm	34.8mm	37.0mm	48.7mm
4hr	240min	28.0mm	18.5mm	23.0mm	25.5mm	27.2mm	28.8mm	34.7mm	40.3mm	42.9mm	56.3mm
6hr	360min	32.0mm	21.8mm	26.6mm	29.1mm	31.0mm	33.0mm	39.0mm	45.4mm	48.4mm	63.0mm
10hr	600min	34.0mm	23.1mm	28.2mm	30.9mm	33.0mm	35.0mm	41.5mm	48.3mm	51.5mm	67.0mm
24hr	1440min	44.0mm	30.8mm	37.0mm	40.5mm	42.7mm	44.9mm	52.4mm	60.7mm	64.5mm	83.2mm
48hr	2880min	50.0mm	36.0mm	42.5mm	46.5mm	49.0mm	51.0mm	58.5mm	67.0mm	71.0mm	90.5mm

			Intensity i								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	56.5mm/hr	72.0mm/hr	81.2mm/hr	88.5mm/hr	93.0mm/hr	108.5mm/hr	124.0mm/hr	130.1mm/hr	163.2mm/hr
10min	10min	0.17hr	40.3mm/hr	52.1mm/hr	59.4mm/hr	64.0mm/hr	68.0mm/hr	80.5mm/hr	93.1mm/hr	98.3mm/hr	126.1mm/hr
15min	15min	0.25hr	31.7mm/hr	41.1mm/hr	46.8mm/hr	50.4mm/hr	53.6mm/hr	63.4mm/hr	73.3mm/hr	77.5mm/hr	99.3mm/hr
30min	30min	0.50hr	18.6mm/hr	24.3mm/hr	27.0mm/hr	29.1mm/hr	30.9mm/hr	37.2mm/hr	43.2mm/hr	45.8mm/hr	59.7mm/hr
1hr	60min	1.00hr	12.8mm/hr	16.2mm/hr	18.0mm/hr	19.4mm/hr	20.6mm/hr	24.8mm/hr	29.0mm/hr	30.9mm/hr	40.6mm/hr
2hr	120min	2.00hr	7.7mm/hr	9.7mm/hr	10.8mm/hr	11.6mm/hr	12.4mm/hr	14.9mm/hr	17.4mm/hr	18.5mm/hr	24.4mm/hr
4hr	240min	4.00hr	4.6mm/hr	5.7mm/hr	6.4mm/hr	6.8mm/hr	7.2mm/hr	8.7mm/hr	10.1mm/hr	10.7mm/hr	14.1mm/hr
6hr	360min	6.00hr	3.6mm/hr	4.4mm/hr	4.9mm/hr	5.2mm/hr	5.5mm/hr	6.5mm/hr	7.6mm/hr	8.1mm/hr	10.5mm/hr
10hr	600min	10.00hr	2.3mm/hr	2.8mm/hr	3.1mm/hr	3.3mm/hr	3.5mm/hr	4.1mm/hr	4.8mm/hr	5.1mm/hr	6.7mm/hr
24hr	1440min	24.00hr	1.3mm/hr	1.5mm/hr	1.7mm/hr	1.8mm/hr	1.9mm/hr	2.2mm/hr	2.5mm/hr	2.7mm/hr	3.5mm/hr
48hr	2880min	48.00hr	0.6mm/hr	0.8mm/hr	0.8mm/hr	0.9mm/hr	0.9mm/hr	1.1mm/hr	1.3mm/hr	1.3mm/hr	1.7mm/hr
48hr	2880min	48.00hr	0.8mm/hr	0.9mm/hr	1.0mm/hr	1.0mm/hr	1.1mm/hr	1.2mm/hr	1.4mm/hr	1.5mm/hr	1.9mm/hr

SuDs CALCULATIONS

Project: 5 Camden Road

RAINFALL PEAK INTENSITY

Sheet 2 of 7

Project Reference: LBH 4577

Date: 28/05/2019Rev: A

Client: Maida Vale Spaces (UK) Ltd

LBH WEMBLEYENGINEERING

GREENFIELD PEAK RUN-OFF

Hydrological
Region:

6

From Wallingford on-line tool

Qbar: 0.04 l/sec

			Run-Off Q								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	0.03 l/sec	0.03 l/sec	0.04 l/sec	0.04 l/sec	0.05 l/sec	0.06 l/sec	0.07 l/sec	0.09 l/sec	0.12 l/sec
10min	10min	0.17hr	0.03 l/sec	0.03 l/sec	0.04 l/sec	0.04 l/sec	0.05 l/sec	0.06 l/sec	0.07 l/sec	0.09 l/sec	0.12 l/sec
15min	15min	0.25hr	0.03 l/sec	0.03 l/sec	0.04 l/sec	0.04 l/sec	0.05 l/sec	0.06 l/sec	0.07 l/sec	0.09 l/sec	0.12 l/sec
30min	30min	0.50hr	0.03 l/sec	0.03 l/sec	0.04 l/sec	0.04 l/sec	0.05 l/sec	0.06 l/sec	0.07 l/sec	0.09 l/sec	0.12 l/sec
1hr	60min	1.00hr	0.03 l/sec	0.03 l/sec	0.04 l/sec	0.04 l/sec	0.05 l/sec	0.06 l/sec	0.07 l/sec	0.09 l/sec	0.12 l/sec
2hr	120min	2.00hr	0.03 l/sec	0.03 l/sec	0.04 l/sec	0.04 l/sec	0.05 l/sec	0.06 l/sec	0.07 l/sec	0.09 l/sec	0.12 l/sec
4hr	240min	4.00hr	0.03 l/sec	0.03 l/sec	0.04 l/sec	0.04 l/sec	0.05 l/sec	0.06 l/sec	0.07 l/sec	0.09 l/sec	0.12 l/sec
6hr	360min	6.00hr	0.03 l/sec	0.03 l/sec	0.04 l/sec	0.04 l/sec	0.05 l/sec	0.06 l/sec	0.07 l/sec	0.09 l/sec	0.12 l/sec
10hr	600min	10.00hr	0.03 l/sec	0.03 l/sec	0.04 l/sec	0.04 l/sec	0.05 l/sec	0.06 l/sec	0.07 l/sec	0.09 l/sec	0.12 l/sec
24hr	1440min	24.00hr	0.03 l/sec	0.03 l/sec	0.04 l/sec	0.04 l/sec	0.05 l/sec	0.06 l/sec	0.07 l/sec	0.09 l/sec	0.12 l/sec
48hr	2880min	48.00hr	0.03 l/sec	0.03 l/sec	0.04 l/sec	0.04 l/sec	0.05 l/sec	0.06 l/sec	0.07 l/sec	0.09 l/sec	0.12 l/sec

			Run-Off Volume								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	0.0 m3	0.0 m3	0.0 m3	0.0 m3	0.0 m3	0.0 m3	0.0 m3	0.0 m3	0.0 m3
10min	10min	0.17hr	0.0 m3	0.0 m3	0.0 m3	0.0 m3	0.0 m3	0.0 m3	0.0 m3	0.1 m3	0.1 m3
15min	15min	0.25hr	0.0 m3	0.0 m3	0.0 m3	0.0 m3	0.0 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3
30min	30min	0.50hr	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.2 m3	0.2 m3
1hr	60min	1.00hr	0.1 m3	0.1 m3	0.1 m3	0.2 m3	0.2 m3	0.2 m3	0.3 m3	0.3 m3	0.4 m3
2hr	120min	2.00hr	0.2 m3	0.2 m3	0.3 m3	0.3 m3	0.4 m3	0.4 m3	0.5 m3	0.7 m3	0.9 m3
4hr	240min	4.00hr	0.5 m3	0.5 m3	0.6 m3	0.6 m3	0.7 m3	0.9 m3	1.1 m3	1.3 m3	1.7 m3
6hr	360min	6.00hr	0.7 m3	0.7 m3	0.8 m3	0.9 m3	1.1 m3	1.3 m3	1.6 m3	2.0 m3	2.6 m3
10hr	600min	10.00hr	1.2 m3	1.2 m3	1.4 m3	1.6 m3	1.8 m3	2.2 m3	2.7 m3	3.3 m3	4.4 m3
24hr	1440min	24.00hr	2.8 m3	2.9 m3	3.3 m3	3.8 m3	4.2 m3	5.3 m3	6.5 m3	7.9 m3	10.5 m3
48hr	2880min	48.00hr	5.6 m3	5.8 m3	6.7 m3	7.5 m3	8.4 m3	10.7 m3	12.9 m3	15.8 m3	21.0 m3

SuDs CALCULATIONS

Project: 5 Camden Road

GREENFIELD PEAK RUN-OFF

Sheet 3 of 7

Project Reference: LBH 4577

Date: 28/05/2019 Rev: A

Client: Maida Vale Spaces (UK) Ltd

LBH WEMBLEY
ENGINEERING

EXISTING PEAK RUN-OFF

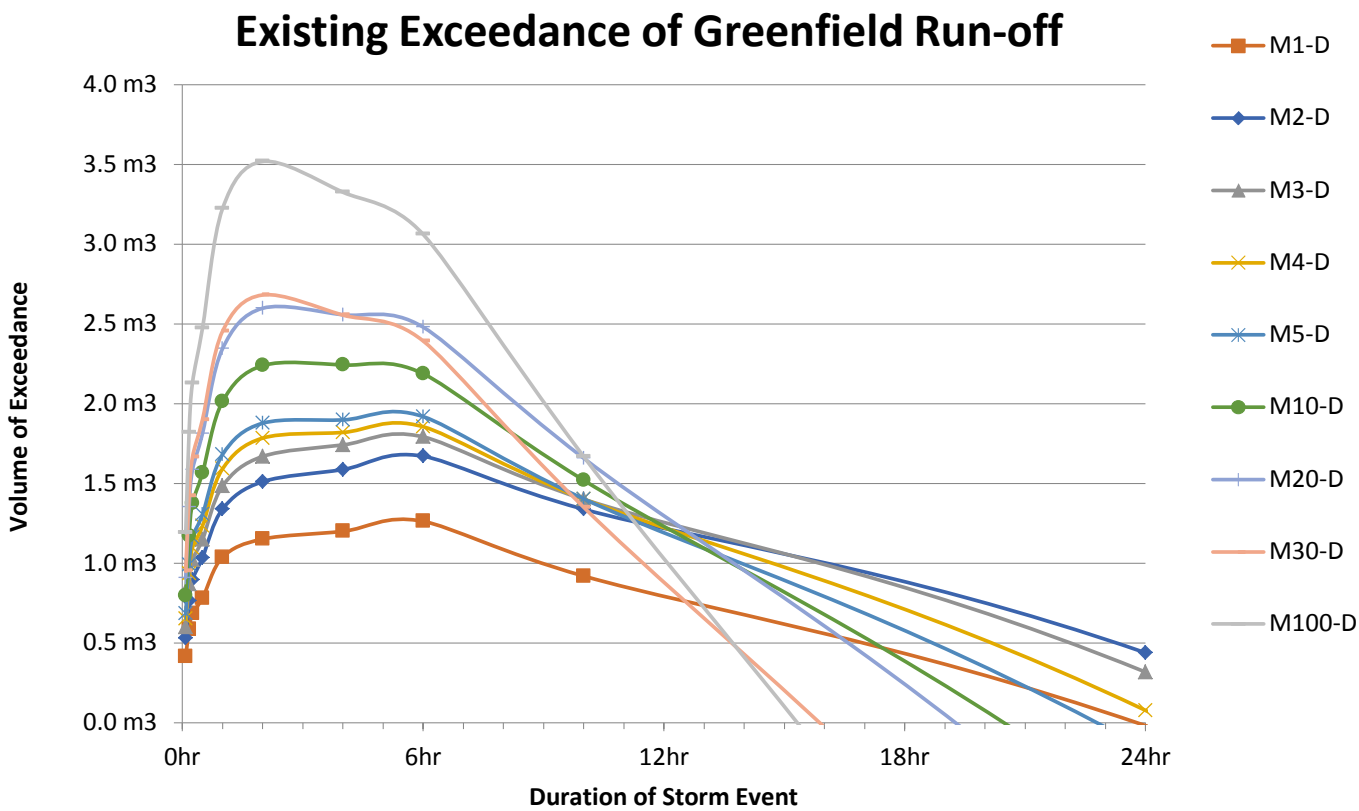
C_v: 0.77 Volumetric Run-Off Coefficient
C_R: 1.3 Routing Coefficient

			Run-Off Q								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	1.4 l/sec	1.8 l/sec	2.0 l/sec	2.2 l/sec	2.3 l/sec	2.7 l/sec	3.1 l/sec	3.3 l/sec	4.1 l/sec
10min	10min	0.17hr	1.0 l/sec	1.3 l/sec	1.5 l/sec	1.6 l/sec	1.7 l/sec	2.0 l/sec	2.3 l/sec	2.5 l/sec	3.2 l/sec
15min	15min	0.25hr	0.8 l/sec	1.0 l/sec	1.2 l/sec	1.3 l/sec	1.3 l/sec	1.6 l/sec	1.8 l/sec	1.9 l/sec	2.5 l/sec
30min	30min	0.50hr	0.5 l/sec	0.6 l/sec	0.7 l/sec	0.7 l/sec	0.8 l/sec	0.9 l/sec	1.1 l/sec	1.1 l/sec	1.5 l/sec
1hr	60min	1.00hr	0.3 l/sec	0.4 l/sec	0.5 l/sec	0.5 l/sec	0.5 l/sec	0.6 l/sec	0.7 l/sec	0.8 l/sec	1.0 l/sec
2hr	120min	2.00hr	0.2 l/sec	0.2 l/sec	0.3 l/sec	0.3 l/sec	0.3 l/sec	0.4 l/sec	0.4 l/sec	0.5 l/sec	0.6 l/sec
4hr	240min	4.00hr	0.1 l/sec	0.1 l/sec	0.2 l/sec	0.2 l/sec	0.2 l/sec	0.2 l/sec	0.3 l/sec	0.3 l/sec	0.4 l/sec
6hr	360min	6.00hr	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.2 l/sec	0.2 l/sec	0.2 l/sec	0.3 l/sec
10hr	600min	10.00hr	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.2 l/sec
24hr	1440min	24.00hr	0.0 l/sec	0.0 l/sec	0.0 l/sec	0.0 l/sec	0.0 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec
48hr	2880min	48.00hr	0.0 l/sec	0.0 l/sec	0.0 l/sec	0.0 l/sec	0.0 l/sec	0.0 l/sec	0.0 l/sec	0.0 l/sec	0.0 l/sec

			Run-Off Volume								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	0.4 m3	0.5 m3	0.6 m3	0.7 m3	0.7 m3	0.8 m3	0.9 m3	1.0 m3	1.2 m3
10min	10min	0.17hr	0.6 m3	0.8 m3	0.9 m3	1.0 m3	1.0 m3	1.2 m3	1.4 m3	1.5 m3	1.9 m3
15min	15min	0.25hr	0.7 m3	0.9 m3	1.1 m3	1.1 m3	1.2 m3	1.4 m3	1.7 m3	1.7 m3	2.2 m3
30min	30min	0.50hr	0.8 m3	1.1 m3	1.2 m3	1.3 m3	1.4 m3	1.7 m3	1.9 m3	2.1 m3	2.7 m3
1hr	60min	1.00hr	1.2 m3	1.5 m3	1.6 m3	1.7 m3	1.9 m3	2.2 m3	2.6 m3	2.8 m3	3.7 m3
2hr	120min	2.00hr	1.4 m3	1.8 m3	1.9 m3	2.1 m3	2.2 m3	2.7 m3	3.1 m3	3.3 m3	4.4 m3
4hr	240min	4.00hr	1.7 m3	2.1 m3	2.3 m3	2.4 m3	2.6 m3	3.1 m3	3.6 m3	3.9 m3	5.1 m3
6hr	360min	6.00hr	2.0 m3	2.4 m3	2.6 m3	2.8 m3	3.0 m3	3.5 m3	4.1 m3	4.4 m3	5.7 m3
10hr	600min	10.00hr	2.1 m3	2.5 m3	2.8 m3	3.0 m3	3.2 m3	3.7 m3	4.4 m3	4.6 m3	6.0 m3
24hr	1440min	24.00hr	2.8 m3	3.3 m3	3.6 m3	3.8 m3	4.0 m3	4.7 m3	5.5 m3	5.8 m3	7.5 m3
48hr	2880min	48.00hr	3.2 m3	3.8 m3	4.2 m3	4.4 m3	4.6 m3	5.3 m3	6.0 m3	6.4 m3	8.2 m3

			Exceedance of Greenfield Run-Off Volume								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	0.4 m3	0.5 m3	0.6 m3	0.7 m3	0.7 m3	0.8 m3	0.9 m3	1.0 m3	1.2 m3
10min	10min	0.17hr	0.6 m3	0.8 m3	0.9 m3	0.9 m3	1.0 m3	1.2 m3	1.4 m3	1.4 m3	1.8 m3
15min	15min	0.25hr	0.7 m3	0.9 m3	1.0 m3	1.1 m3	1.2 m3	1.4 m3	1.6 m3	1.7 m3	2.1 m3
30min	30min	0.50hr	0.8 m3	1.0 m3	1.1 m3	1.2 m3	1.3 m3	1.6 m3	1.8 m3	1.9 m3	2.5 m3
1hr	60min	1.00hr	1.0 m3	1.3 m3	1.5 m3	1.6 m3	1.7 m3	2.0 m3	2.3 m3	2.5 m3	3.2 m3
2hr	120min	2.00hr	1.2 m3	1.5 m3	1.7 m3	1.8 m3	1.9 m3	2.2 m3	2.6 m3	2.7 m3	3.5 m3
4hr	240min	4.00hr	1.2 m3	1.6 m3	1.7 m3	1.8 m3	1.9 m3	2.2 m3	2.6 m3	2.6 m3	3.3 m3
6hr	360min	6.00hr	1.3 m3	1.7 m3	1.8 m3	1.9 m3	1.9 m3	2.2 m3	2.5 m3	2.4 m3	3.1 m3
10hr	600min	10.00hr	0.9 m3	1.3 m3	1.4 m3	1.4 m3	1.4 m3	1.5 m3	1.7 m3	1.4 m3	1.7 m3
24hr	1440min	24.00hr	0.0 m3	0.4 m3	0.3 m3	0.1 m3	-0.2 m3	-0.6 m3	-1.0 m3	-2.1 m3	-3.0 m3
48hr	2880min	48.00hr	-2.3 m3	-2.0 m3	-2.5 m3	-3.1 m3	-3.8 m3	-5.4 m3	-6.9 m3	-9.4 m3	-12.8 m3

			C _v :
Catchment Area:	90sqm	100%	0.40
Permeable:	0sqm	0%	
Impermeable:	90sqm	100%	
			0.77



SuDs CALCULATIONS	
Project:	5 Camden Road
EXISTING PEAK RUN-OFF	
Sheet 4 of 7	
Project Reference:	LBH 4577
Date:	28/05/2019
Rev:	A
Client:	Maida Vale Spaces (UK) Ltd
LBH WEMBLEY ENGINEERING	

POST- DEVELOPMENT PEAK RUN-OFF + CC

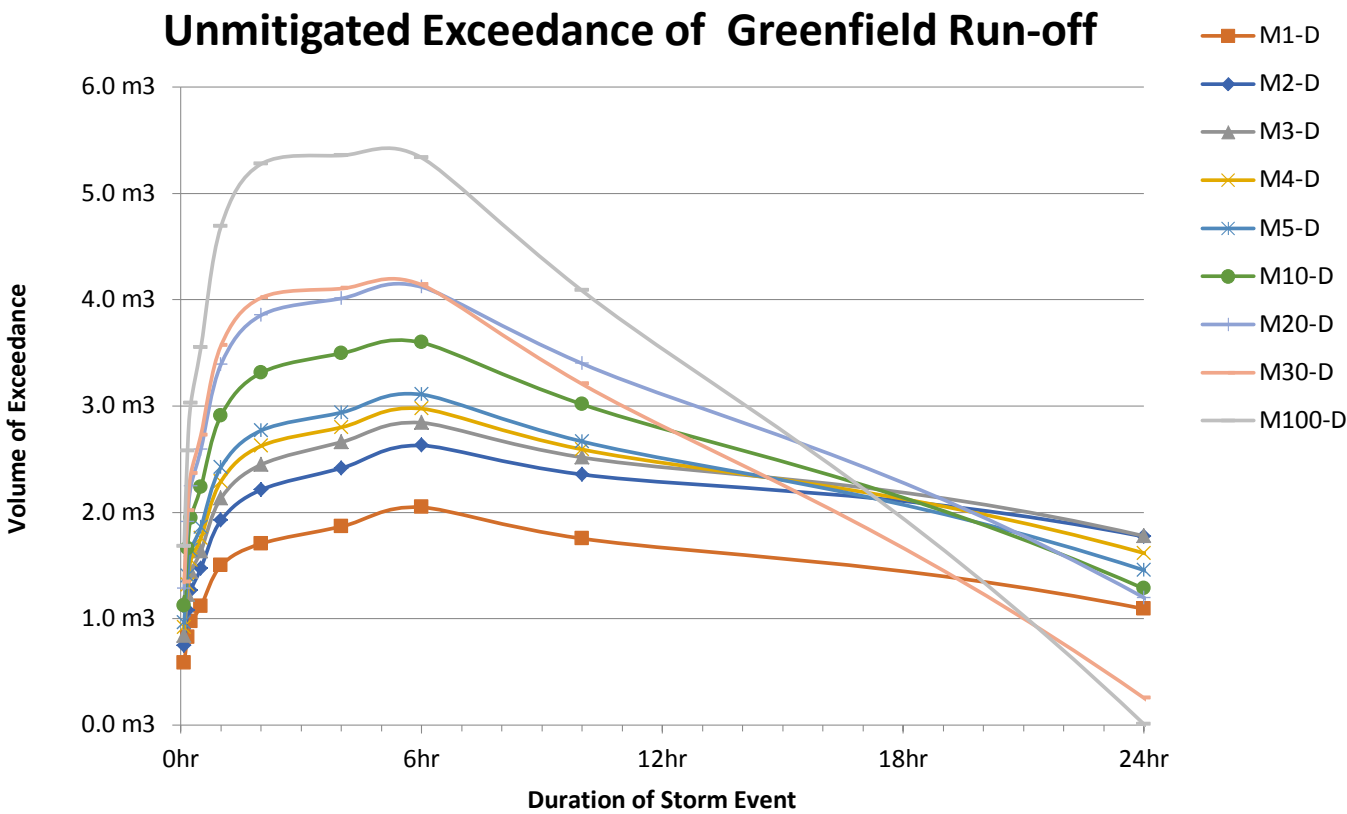
C_v: 0.77 Volumetric Run-Off Coefficient Climate Change Allowance: 40%
C_R: 1.3 Routing Coefficient

			Run-Off Q								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	2.0 l/sec	2.5 l/sec	2.8 l/sec	3.1 l/sec	3.3 l/sec	3.8 l/sec	4.3 l/sec	4.6 l/sec	5.7 l/sec
10min	10min	0.17hr	1.4 l/sec	1.8 l/sec	2.1 l/sec	2.2 l/sec	2.4 l/sec	2.8 l/sec	3.3 l/sec	3.4 l/sec	4.4 l/sec
15min	15min	0.25hr	1.1 l/sec	1.4 l/sec	1.6 l/sec	1.8 l/sec	1.9 l/sec	2.2 l/sec	2.6 l/sec	2.7 l/sec	3.5 l/sec
30min	30min	0.50hr	0.7 l/sec	0.9 l/sec	0.9 l/sec	1.0 l/sec	1.1 l/sec	1.3 l/sec	1.5 l/sec	1.6 l/sec	2.1 l/sec
1hr	60min	1.00hr	0.4 l/sec	0.6 l/sec	0.6 l/sec	0.7 l/sec	0.7 l/sec	0.9 l/sec	1.0 l/sec	1.1 l/sec	1.4 l/sec
2hr	120min	2.00hr	0.3 l/sec	0.3 l/sec	0.4 l/sec	0.4 l/sec	0.4 l/sec	0.5 l/sec	0.6 l/sec	0.6 l/sec	0.9 l/sec
4hr	240min	4.00hr	0.2 l/sec	0.2 l/sec	0.2 l/sec	0.2 l/sec	0.3 l/sec	0.3 l/sec	0.4 l/sec	0.4 l/sec	0.5 l/sec
6hr	360min	6.00hr	0.1 l/sec	0.2 l/sec	0.2 l/sec	0.2 l/sec	0.2 l/sec	0.2 l/sec	0.3 l/sec	0.3 l/sec	0.4 l/sec
10hr	600min	10.00hr	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.2 l/sec	0.2 l/sec	0.2 l/sec
24hr	1440min	24.00hr	0.0 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec
48hr	2880min	48.00hr	0.0 l/sec	0.0 l/sec	0.0 l/sec	0.0 l/sec	0.0 l/sec	0.0 l/sec	0.0 l/sec	0.1 l/sec	0.1 l/sec

			Run-Off Volume								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	0.6 m3	0.8 m3	0.9 m3	0.9 m3	1.0 m3	1.1 m3	1.3 m3	1.4 m3	1.7 m3
10min	10min	0.17hr	0.8 m3	1.1 m3	1.2 m3	1.3 m3	1.4 m3	1.7 m3	2.0 m3	2.1 m3	2.7 m3
15min	15min	0.25hr	1.0 m3	1.3 m3	1.5 m3	1.6 m3	1.7 m3	2.0 m3	2.3 m3	2.4 m3	3.1 m3
30min	30min	0.50hr	1.2 m3	1.5 m3	1.7 m3	1.8 m3	2.0 m3	2.3 m3	2.7 m3	2.9 m3	3.8 m3
1hr	60min	1.00hr	1.6 m3	2.0 m3	2.3 m3	2.4 m3	2.6 m3	3.1 m3	3.7 m3	3.9 m3	5.1 m3
2hr	120min	2.00hr	1.9 m3	2.5 m3	2.7 m3	2.9 m3	3.1 m3	3.8 m3	4.4 m3	4.7 m3	6.1 m3
4hr	240min	4.00hr	2.3 m3	2.9 m3	3.2 m3	3.4 m3	3.6 m3	4.4 m3	5.1 m3	5.4 m3	7.1 m3
6hr	360min	6.00hr	2.7 m3	3.4 m3	3.7 m3	3.9 m3	4.2 m3	4.9 m3	5.7 m3	6.1 m3	8.0 m3
10hr	600min	10.00hr	2.9 m3	3.6 m3	3.9 m3	4.2 m3	4.4 m3	5.2 m3	6.1 m3	6.5 m3	8.5 m3
24hr	1440min	24.00hr	3.9 m3	4.7 m3	5.1 m3	5.4 m3	5.7 m3	6.6 m3	7.7 m3	8.1 m3	10.5 m3
48hr	2880min	48.00hr	4.5 m3	5.4 m3	5.9 m3	6.2 m3	6.4 m3	7.4 m3	8.5 m3	9.0 m3	11.4 m3

			Exceedance of Greenfield Run-Off Volume								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	0.6 m3	0.7 m3	0.8 m3	0.9 m3	1.0 m3	1.1 m3	1.3 m3	1.3 m3	1.7 m3
10min	10min	0.17hr	0.8 m3	1.1 m3	1.2 m3	1.3 m3	1.4 m3	1.7 m3	1.9 m3	2.0 m3	2.6 m3
15min	15min	0.25hr	1.0 m3	1.3 m3	1.4 m3	1.6 m3	1.6 m3	1.9 m3	2.2 m3	2.4 m3	3.0 m3
30min	30min	0.50hr	1.1 m3	1.5 m3	1.6 m3	1.8 m3	1.9 m3	2.2 m3	2.6 m3	2.7 m3	3.5 m3
1hr	60min	1.00hr	1.5 m3	1.9 m3	2.1 m3	2.3 m3	2.4 m3	2.9 m3	3.4 m3	3.6 m3	4.7 m3
2hr	120min	2.00hr	1.7 m3	2.2 m3	2.4 m3	2.6 m3	2.8 m3	3.3 m3	3.9 m3	4.0 m3	5.3 m3
4hr	240min	4.00hr	1.9 m3	2.4 m3	2.7 m3	2.8 m3	2.9 m3	3.5 m3	4.0 m3	4.1 m3	5.4 m3
6hr	360min	6.00hr	2.0 m3	2.6 m3	2.8 m3	3.0 m3	3.1 m3	3.6 m3	4.1 m3	4.1 m3	5.3 m3
10hr	600min	10.00hr	1.8 m3	2.4 m3	2.5 m3	2.6 m3	2.7 m3	3.0 m3	3.4 m3	3.2 m3	4.1 m3
24hr	1440min	24.00hr	1.1 m3	1.8 m3	1.8 m3	1.6 m3	1.5 m3	1.3 m3	1.2 m3	0.3 m3	0.0 m3
48hr	2880min	48.00hr	-1.0 m3	-0.4 m3	-0.8 m3	-1.4 m3	-2.0 m3	-3.3 m3	-4.5 m3	-6.8 m3	-9.6 m3

			C _v :
Catchment Area:	90sqm	100%	
Permeable Garden	0sqm	0%	0.40
Impermeable:	90sqm	100%	0.77
			0.77



SuDs CALCULATIONS

Project: 5 Camden Road

POST-DEV. PEAK RUN-OFF

Sheet 5 of 7

Project Reference: LBH 4577

Date: 28/05/2019Rev: A

Client: Maida Vale Spaces (UK) Ltd

LBH WEMBLEYENGINEERING

POST- DEVELOPMENT & SOURCE MITIGATION PEAK RUN-OFF + CC ATTENUATION STORAGE REQUIREMENTS

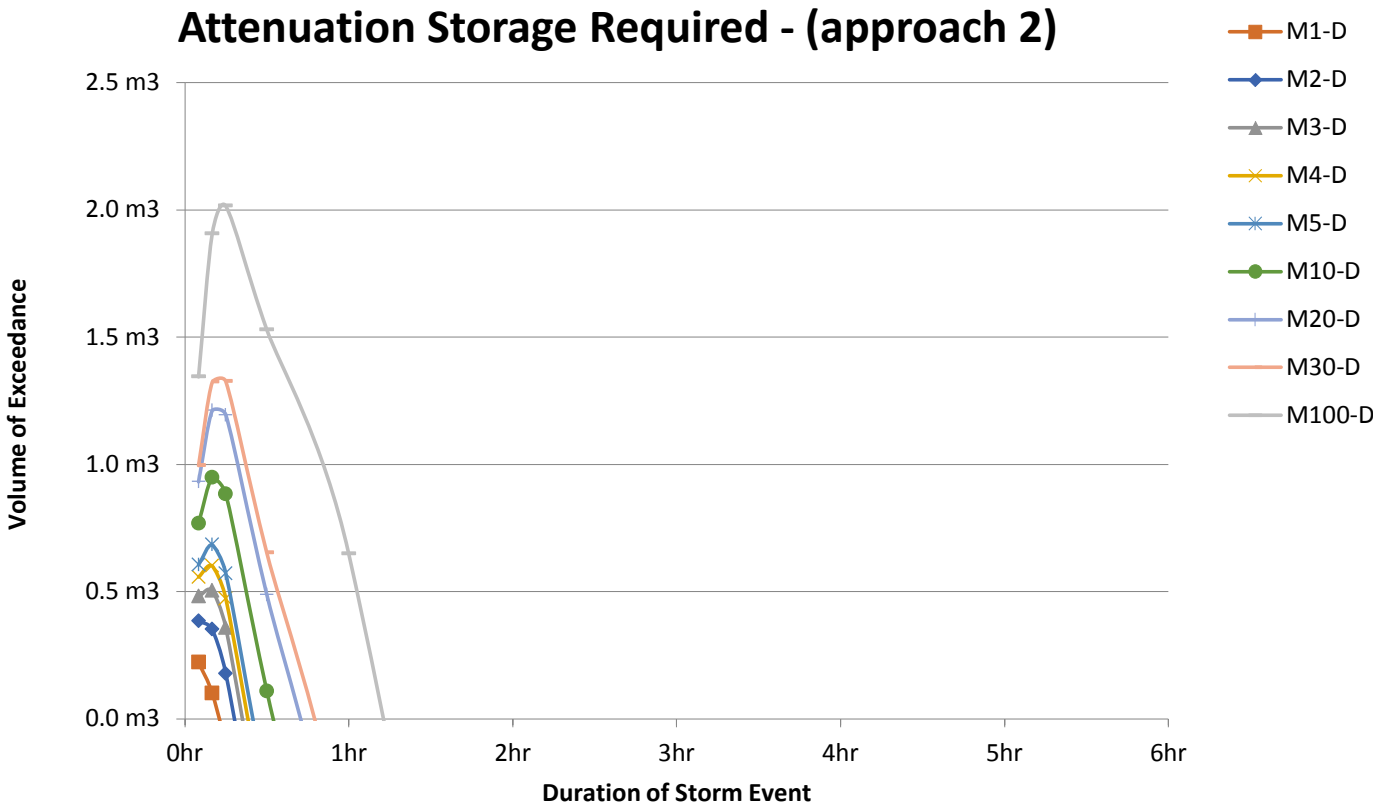
Proposed Discharge Rate: 1.24 l/sec (approach 2 - 50% Existing)
0.04 l/sec QBar

			INFLOW								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	0.6 m3	0.8 m3	0.9 m3	0.9 m3	1.0 m3	1.1 m3	1.3 m3	1.4 m3	1.7 m3
10min	10min	0.17hr	0.8 m3	1.1 m3	1.2 m3	1.3 m3	1.4 m3	1.7 m3	2.0 m3	2.1 m3	2.7 m3
15min	15min	0.25hr	1.0 m3	1.3 m3	1.5 m3	1.6 m3	1.7 m3	2.0 m3	2.3 m3	2.4 m3	3.1 m3
30min	30min	0.50hr	1.2 m3	1.5 m3	1.7 m3	1.8 m3	2.0 m3	2.3 m3	2.7 m3	2.9 m3	3.8 m3
1hr	60min	1.00hr	1.6 m3	2.0 m3	2.3 m3	2.4 m3	2.6 m3	3.1 m3	3.7 m3	3.9 m3	5.1 m3
2hr	120min	2.00hr	1.9 m3	2.5 m3	2.7 m3	2.9 m3	3.1 m3	3.8 m3	4.4 m3	4.7 m3	6.1 m3
4hr	240min	4.00hr	2.3 m3	2.9 m3	3.2 m3	3.4 m3	3.6 m3	4.4 m3	5.1 m3	5.4 m3	7.1 m3
6hr	360min	6.00hr	2.7 m3	3.4 m3	3.7 m3	3.9 m3	4.2 m3	4.9 m3	5.7 m3	6.1 m3	8.0 m3
10hr	600min	10.00hr	2.9 m3	3.6 m3	3.9 m3	4.2 m3	4.4 m3	5.2 m3	6.1 m3	6.5 m3	8.5 m3
24hr	1440min	24.00hr	3.9 m3	4.7 m3	5.1 m3	5.4 m3	5.7 m3	6.6 m3	7.7 m3	8.1 m3	10.5 m3
48hr	2880min	48.00hr	4.5 m3	5.4 m3	5.9 m3	6.2 m3	6.4 m3	7.4 m3	8.5 m3	9.0 m3	11.4 m3

			OUTFLOW								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	0.4 m3	0.4 m3	0.4 m3	0.4 m3	0.4 m3	0.4 m3	0.4 m3	0.4 m3	0.4 m3
10min	10min	0.17hr	0.7 m3	0.7 m3	0.7 m3	0.7 m3	0.7 m3	0.7 m3	0.7 m3	0.7 m3	0.7 m3
15min	15min	0.25hr	1.1 m3	1.1 m3	1.1 m3	1.1 m3	1.1 m3	1.1 m3	1.1 m3	1.1 m3	1.1 m3
30min	30min	0.50hr	2.2 m3	2.2 m3	2.2 m3	2.2 m3	2.2 m3	2.2 m3	2.2 m3	2.2 m3	2.2 m3
1hr	60min	1.00hr	4.5 m3	4.5 m3	4.5 m3	4.5 m3	4.5 m3	4.5 m3	4.5 m3	4.5 m3	4.5 m3
2hr	120min	2.00hr	9.0 m3	9.0 m3	9.0 m3	9.0 m3	9.0 m3	9.0 m3	9.0 m3	9.0 m3	9.0 m3
4hr	240min	4.00hr	17.9 m3	17.9 m3	17.9 m3	17.9 m3	17.9 m3	17.9 m3	17.9 m3	17.9 m3	17.9 m3
6hr	360min	6.00hr	26.9 m3	26.9 m3	26.9 m3	26.9 m3	26.9 m3	26.9 m3	26.9 m3	26.9 m3	26.9 m3
10hr	600min	10.00hr	44.8 m3	44.8 m3	44.8 m3	44.8 m3	44.8 m3	44.8 m3	44.8 m3	44.8 m3	44.8 m3
24hr	1440min	24.00hr	107.5 m3	107.5 m3	107.5 m3	107.5 m3	107.5 m3	107.5 m3	107.5 m3	107.5 m3	107.5 m3
48hr	2880min	48.00hr	214.9 m3	214.9 m3	214.9 m3	214.9 m3	214.9 m3	214.9 m3	214.9 m3	214.9 m3	214.9 m3

			ATTENUATION STORAGE REQUIRED TO MEET PROPOSED DISCHARGE RATE								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	0.2 m3	0.4 m3	0.5 m3	0.6 m3	0.6 m3	0.8 m3	0.9 m3	1.0 m3	1.3 m3
10min	10min	0.17hr	0.1 m3	0.4 m3	0.5 m3	0.6 m3	0.7 m3	0.9 m3	1.2 m3	1.3 m3	1.9 m3
15min	15min	0.25hr	-0.1 m3	0.2 m3	0.4 m3	0.5 m3	0.6 m3	0.9 m3	1.2 m3	1.3 m3	2.0 m3
30min	30min	0.50hr	-1.1 m3	-0.7 m3	-0.5 m3	-0.4 m3	-0.3 m3	0.1 m3	0.5 m3	0.7 m3	1.5 m3
1hr	60min	1.00hr	-2.9 m3	-2.4 m3	-2.2 m3	-2.0 m3	-1.9 m3	-1.3 m3	-0.8 m3	-0.6 m3	0.6 m3
2hr	120min	2.00hr	-7.0 m3	-6.5 m3	-6.2 m3	-6.0 m3	-5.8 m3	-5.2 m3	-4.6 m3	-4.3 m3	-2.8 m3
4hr	240min	4.00hr	-15.6 m3	-15.0 m3	-14.7 m3	-14.5 m3	-14.3 m3	-13.5 m3	-12.8 m3	-12.5 m3	-10.8 m3
6hr	360min	6.00hr	-24.1 m3	-23.5 m3	-23.2 m3	-22.9 m3	-22.7 m3	-21.9 m3	-21.1 m3	-20.8 m3	-18.9 m3
10hr	600min	10.00hr	-41.9 m3	-41.2 m3	-40.9 m3	-40.6 m3	-40.4 m3	-39.5 m3	-38.7 m3	-38.3 m3	-36.3 m3
24hr	1440min	24.00hr	-103.6 m3	-102.8 m3	-102.3 m3	-102.1 m3	-101.8 m3	-100.8 m3	-99.8 m3	-99.3 m3	-97.0 m3
48hr	2880min	48.00hr	-210.4 m3	-209.6 m3	-209.0 m3	-208.7 m3	-208.5 m3	-207.5 m3	-206.5 m3	-206.0 m3	-203.5 m3

Approach 2 ATTENUATION STORAGE REQUIRED: 2.0 m3



SuDs CALCULATIONS	
Project:	5 Camden Road
STORAGE REQUIREMENTS	
Sheet 6 of 7	
Project Reference:	LBH 4577
Date:	28/05/2019
Rev:	A
Client:	Maida Vale Spaces (UK) Ltd
LBH WEMBLEY ENGINEERING	

POST- DEVELOPMENT & SOURCE MITIGATION PEAK RUN-OFF + CC ATTENUATION STORAGE REQUIREMENTS

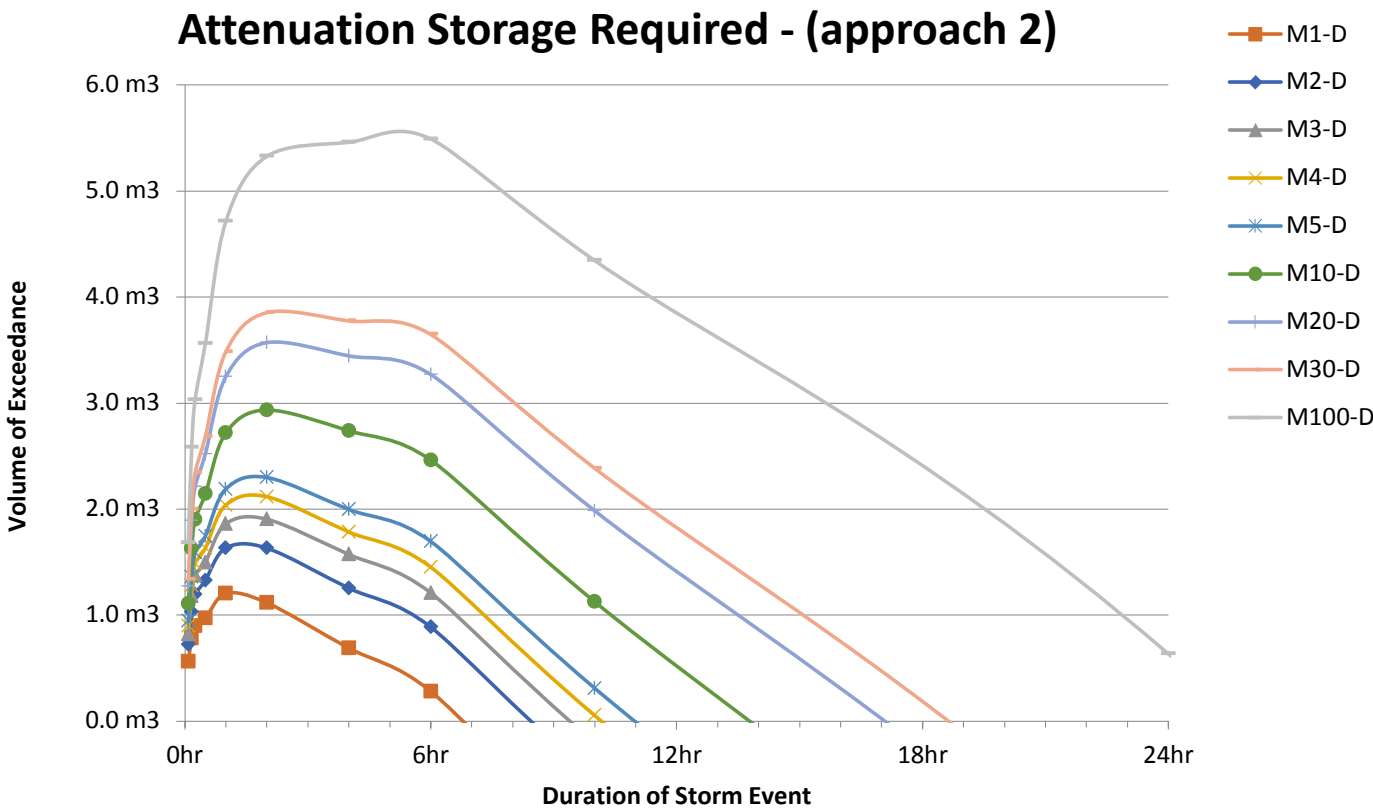
Proposed Discharge Rate: 0.11 l/sec (3 x Qbar approach 2)
0.04 l/sec QBar 0.02 l/sec (2.0 l/sec/ha)

			INFLOW								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	0.6 m3	0.8 m3	0.9 m3	0.9 m3	1.0 m3	1.1 m3	1.3 m3	1.4 m3	1.7 m3
10min	10min	0.17hr	0.8 m3	1.1 m3	1.2 m3	1.3 m3	1.4 m3	1.7 m3	2.0 m3	2.1 m3	2.7 m3
15min	15min	0.25hr	1.0 m3	1.3 m3	1.5 m3	1.6 m3	1.7 m3	2.0 m3	2.3 m3	2.4 m3	3.1 m3
30min	30min	0.50hr	1.2 m3	1.5 m3	1.7 m3	1.8 m3	2.0 m3	2.3 m3	2.7 m3	2.9 m3	3.8 m3
1hr	60min	1.00hr	1.6 m3	2.0 m3	2.3 m3	2.4 m3	2.6 m3	3.1 m3	3.7 m3	3.9 m3	5.1 m3
2hr	120min	2.00hr	1.9 m3	2.5 m3	2.7 m3	2.9 m3	3.1 m3	3.8 m3	4.4 m3	4.7 m3	6.1 m3
4hr	240min	4.00hr	2.3 m3	2.9 m3	3.2 m3	3.4 m3	3.6 m3	4.4 m3	5.1 m3	5.4 m3	7.1 m3
6hr	360min	6.00hr	2.7 m3	3.4 m3	3.7 m3	3.9 m3	4.2 m3	4.9 m3	5.7 m3	6.1 m3	8.0 m3
10hr	600min	10.00hr	2.9 m3	3.6 m3	3.9 m3	4.2 m3	4.4 m3	5.2 m3	6.1 m3	6.5 m3	8.5 m3
24hr	1440min	24.00hr	3.9 m3	4.7 m3	5.1 m3	5.4 m3	5.7 m3	6.6 m3	7.7 m3	8.1 m3	10.5 m3
48hr	2880min	48.00hr	4.5 m3	5.4 m3	5.9 m3	6.2 m3	6.4 m3	7.4 m3	8.5 m3	9.0 m3	11.4 m3

			OUTFLOW								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	0.0 m3	0.0 m3	0.0 m3	0.0 m3	0.0 m3	0.0 m3	0.0 m3	0.0 m3	0.0 m3
10min	10min	0.17hr	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3
15min	15min	0.25hr	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3
30min	30min	0.50hr	0.2 m3	0.2 m3	0.2 m3	0.2 m3	0.2 m3	0.2 m3	0.2 m3	0.2 m3	0.2 m3
1hr	60min	1.00hr	0.4 m3	0.4 m3	0.4 m3	0.4 m3	0.4 m3	0.4 m3	0.4 m3	0.4 m3	0.4 m3
2hr	120min	2.00hr	0.8 m3	0.8 m3	0.8 m3	0.8 m3	0.8 m3	0.8 m3	0.8 m3	0.8 m3	0.8 m3
4hr	240min	4.00hr	1.6 m3	1.6 m3	1.6 m3	1.6 m3	1.6 m3	1.6 m3	1.6 m3	1.6 m3	1.6 m3
6hr	360min	6.00hr	2.5 m3	2.5 m3	2.5 m3	2.5 m3	2.5 m3	2.5 m3	2.5 m3	2.5 m3	2.5 m3
10hr	600min	10.00hr	4.1 m3	4.1 m3	4.1 m3	4.1 m3	4.1 m3	4.1 m3	4.1 m3	4.1 m3	4.1 m3
24hr	1440min	24.00hr	9.9 m3	9.9 m3	9.9 m3	9.9 m3	9.9 m3	9.9 m3	9.9 m3	9.9 m3	9.9 m3
48hr	2880min	48.00hr	19.7 m3	19.7 m3	19.7 m3	19.7 m3	19.7 m3	19.7 m3	19.7 m3	19.7 m3	19.7 m3

			ATTENUATION STORAGE REQUIRED TO MEET PROPOSED DISCHARGE RATE								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	0.6 m3	0.7 m3	0.8 m3	0.9 m3	0.9 m3	1.1 m3	1.3 m3	1.3 m3	1.7 m3
10min	10min	0.17hr	0.8 m3	1.0 m3	1.2 m3	1.3 m3	1.4 m3	1.6 m3	1.9 m3	2.0 m3	2.6 m3
15min	15min	0.25hr	0.9 m3	1.2 m3	1.4 m3	1.5 m3	1.6 m3	1.9 m3	2.2 m3	2.3 m3	3.0 m3
30min	30min	0.50hr	1.0 m3	1.3 m3	1.5 m3	1.6 m3	1.7 m3	2.1 m3	2.5 m3	2.7 m3	3.6 m3
1hr	60min	1.00hr	1.2 m3	1.6 m3	1.9 m3	2.0 m3	2.2 m3	2.7 m3	3.2 m3	3.5 m3	4.7 m3
2hr	120min	2.00hr	1.1 m3	1.6 m3	1.9 m3	2.1 m3	2.3 m3	2.9 m3	3.6 m3	3.9 m3	5.3 m3
4hr	240min	4.00hr	0.7 m3	1.3 m3	1.6 m3	1.8 m3	2.0 m3	2.7 m3	3.4 m3	3.8 m3	5.5 m3
6hr	360min	6.00hr	0.3 m3	0.9 m3	1.2 m3	1.5 m3	1.7 m3	2.5 m3	3.3 m3	3.6 m3	5.5 m3
10hr	600min	10.00hr	-1.2 m3	-0.5 m3	-0.2 m3	0.1 m3	0.3 m3	1.1 m3	2.0 m3	2.4 m3	4.3 m3
24hr	1440min	24.00hr	-6.0 m3	-5.2 m3	-4.8 m3	-4.5 m3	-4.2 m3	-3.3 m3	-2.2 m3	-1.7 m3	0.6 m3
48hr	2880min	48.00hr	-15.2 m3	-14.4 m3	-13.9 m3	-13.5 m3	-13.3 m3	-12.3 m3	-11.3 m3	-10.8 m3	-8.3 m3

Approach 2 ATTENUATION STORAGE REQUIRED: 5.5 m3



SuDs CALCULATIONS

Project: 5 Camden Road

STORAGE REQUIREMENTS

Sheet 7 of 7

Project Reference: LBH 4577

Date: 28/05/2019Rev: A

Client: Maida Vale Spaces (UK) Ltd

LBH WEMBLEYENGINEERING