UK Flood Risk
Flood Risk Consultants

Flood Risk Assessment (FRA) & Sustainable Urban Drainage Systems (SuDS)

5-7 Adamson Road, London NW3 3HX

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Executive Summary

UK Flood Risk Consultants has been commissioned to prepare this Flood Risk Assessment (FRA)/SuDS in support of a proposal consisting of extensions and alterations at lower ground, first floor and roof level including minor alterations located at 5-7 Adamson Road, London NW3 3HX.

The main sources of information to undertake flood risk assessment are the site-specific flood maps and data obtained from the Environment Agency and previous flood studies undertaken by the Local Authority.

The proposed development is categorised as ‘more vulnerable’. The site is located in Flood Zone 1 (i.e., low probability flooding). The proposed development is therefore considered appropriate at this location.

There are no major watercourses in the vicinity of the site.

According to the information available from the Council’s SFRA and the Environment Agency, there were no records of flooding from any sources at the site.

The Environment Agency’s Flood Map around the site shows that the site lies within the Flood Zone 1 (low probability flooding). Flood Zone 1 is an area where flooding from rivers is very unlikely. There is less than a 1 in 1000 chance of flooding occurring in any one given year (i.e., a less than 0.1% annual probability of flooding).

The Environment Agency’s flood risk map indicates that the site is located outside of the flood risk zone.

The overall risk of surface water flooding to the site is 'low'.

The flood risk from other sources including underground water, sewer and reservoir is low.

Thames Water’s Sewer Asset Map shows that a combined sewer runs on Adamson Road. The surface runoff from the roof and hardstanding area discharges into this Combined Sewer on Adamson Road. The current drainage system will be continued to be used to discharge the surface runoff from the site.

Appropriate SuDS mitigation measures will be used for improving the surface runoff from the site. Based on the general assessment of the potential SuDS measures, permeable paving and a planting bed will be implemented in order to improve the surface runoff from the site. In addition, various water efficiency measures will be adopted in order to save the water.

The landowners will be fully responsible for the repair and management of the implemented SuDS throughout the lifetime of the proposed development.

The development will not give rise to backwater affects or divert water towards other properties.

This report demonstrates that the proposal will be safe, in terms of flood risk, for its design life and will not increase the flood risk elsewhere.

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Abbreviations

Abbreviation	Description
mAOD	Metres Above Ordnance Datum
DEFRA	Department for Environment, Food, and Rural Affairs
EA	Environment Agency
FRA	Flood Risk Assessment
LLFA	Lead Local Flood Authority
NPPF	National Planning Policy Framework
SFRA	Strategic Flood Risk Assessment
PFRA	Preliminary Flood Risk Assessment
SuDS	Sustainable Drainage Systems

1.0 Background

UK Flood Risk Consultants has been commissioned to prepare this Flood Risk Assessment (FRA)/SuDS in support of a proposal consisting of extensions and alterations at lower ground, first floor and roof level including minor alterations located at 5-7 Adamson Road, London NW3 3HX.

This FRA/SuDS has been carried out in accordance with the requirements of the National Planning Policy Framework (NPPF, July 2021) and the Environment Agency's Flood Risk Assessment (FRA) Guidance Notes and the best practices in flood risk management.

The National Planning Policy Framework sets out planning policy in order to avoid inappropriate development in areas at risk of flooding by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere.

2.0 FRA Requirements and Objectives

The site-specific FRA should address the following:

- how flood risk affects the proposed development,
- whether the development type is appropriate for the proposed location,
- whether the site's flood risk is too great for the development,
- whether the proposed development will increase flood risk elsewhere,
- carry out the Sequential Test and the Exception Test where necessary,
- meet the additional flood resistance and resilience requirements where necessary.

The objectives of this site-specific flood risk assessment are to establish:

- whether the proposed development is likely to be affected by current or future flooding from any source,
- whether it will increase flood risk elsewhere,
- whether the measures proposed to deal with these effects and risks are appropriate,

3.0 General Description of the Site and the Proposals

3.1. Description of the site

The proposal site located at 5-7 Adamson Road, London NW3 3HX approximately centred on the OS NGR TQ 26770 84447(**Appendix A Figure 1**). The site is located within the administrative boundary of London Borough of Camden.

The site comprises a building along with hardstanding and soft landscaping area. The site occupies an area of approximately 191m^2. Approximately 80m^2 is occupied by the building footprint, and approximately 32m^2 is covered by hardstanding. The remainder is covered by soft landscaping (i.e. 79m^2).

The access to the site is via Adamson Road. The surrounding area consists of predominantly residential use (**Appendix A Figure 2)**.

The British Geological Survey's geological maps are provided in **Appendix A Figure 3**. The geological maps show that the bedrock of the site comprises London Clay Formation - Clay, silt and sand that formed between 56 and 47.8 million years ago during the Palaeogene period.

There are no major watercourses in the vicinity of the site.

The site topography is relatively flat and level with the general elevation varying from 56.68mAOD to 57.65mAOD. Further details about the existing site are provided in **Appendix B**.

3.2. Proposed Development

The proposal comprises extensions and alterations at lower ground, first floor and roof level including replacement mansard roof, installation of balconies/ terraces and alterations to fenestration to enable the reconfiguration of the residential units and create a shared access core resulting in a reduction from 19 units to 16 units with associated refuse and cycle storage and the erection of a front boundary treatment. Further details about the proposals have been provided in **Appendix B**.

4.0 Development and Flood Risk Policy

4.1. National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF, July 2021) sets out the government's planning policies for England. The NPPF sets out planning and policies related to development planning and flood risk using a sequential characterisation of risk based on planning zones and the Environment Agency's Flood Maps. The aim of the flood risk assessment is to identify which Flood Zones the site is located in and vulnerability classification relevant to the proposed development, based on an assessment of current and future conditions.

4.2. Flood Zones

The Flood Zones refer to the probability of river and sea flooding which ignores the presence of defences. The national flood maps have been developed by the Environment Agency that shows the risk of tidal and/or fluvial flooding across England and Wales for different return period events. The Environment Agency's Flood Maps are the maps which have been developed using broad scale hydraulic modelling. It is therefore important to understand that the flood maps may not be very accurate at a site-specific level which may need further field observation and measurements. The Flood Zones do not take into account of the climate change impacts which must be considered in any flood risk assessment as required by the NPPF.

4.3. Sequential and Exception Tests

As set out in the NPPF, the overall aim of the Sequential Test should be to steer new development to Flood Zone 1 (Low Probability Flooding). Where there are no reasonably available sites in Flood Zone 1, the Local Authority should take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2, applying the Exception Test if required. Where there are no reasonably available sites in Flood Zones 1 or 2, the suitability of sites in Flood Zone 3 should be considered, taking into account the flood risk vulnerability of land uses and applying the Exception Test if required.

As the proposal site is located in Flood Zone 1 (i.e. low probability flooding), the Sequential Test will not be required.

The Exception Test, as set out in the NPPF Framework, is a method to demonstrate and help ensure that flood risk to people and property will be managed satisfactorily, while allowing necessary development to go ahead in situations where suitable sites

at lower risk of flooding are not available. There are two requirements to meet for the Exception Tests. The proposed development will provide wider sustainability benefits to the community that outweigh flood risk, and that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce flood risk overall.

4.4. Vulnerability of Use and Flood Risk Assessment

The proposed development is categorised as 'more vulnerable' (**Table 2**). The site is located in Flood Zone 1 (i.e. low probability flooding). The proposed development is therefore considered appropriate at this location (**Table 3**). It should be ensured that all types of flood risk are considered as part of the Flood Risk Assessment: *'A site-specific Flood Risk Assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall'.*

This FRA aims to demonstrate that the proposal will remain safe for its lifetime and will not increase flood risk elsewhere.

4.5. NPPF Flood Zones

Table 1 below shows the NPPF Flood Zones and the requirements and policy aims in terms of undertaking site-specific flood risk assessment.

Table 1 - NPPF Flood Zones and Requirements (NPPF Technical Guidance Table 1)

Zone 1: Low Probability Flood Zone	**This is defined as the land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).**
Appropriate uses	All uses of land are appropriate in this zone.
FRA requirements	For development proposals on sites comprising 1 ha or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a FRA.
Policy aims	Developers and local authorities should seek opportunities to reduce the overall level of flood risk through the layout and form of the development, and

	the appropriate application of sustainable drainage techniques.
Zone 2: Medium Probability Flood Zone	**This is defined as the land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year.**
Appropriate uses **FRA requirements** **Policy aims**	The water-compatible, less vulnerable and more vulnerable uses of land and essential infrastructure in Table 2 are appropriate in this zone. Highly vulnerable uses in Table 2 are only appropriate in this zone if the Exception Test is passed. All proposals in this zone should be accompanied by a FRA. Developers and local authorities should seek opportunities to reduce the overall level of flood risk through the layout and form of the development, and the appropriate application of sustainable drainage techniques.
Zone 3a: High Probability Flood Zone	**This is defined as the land assessed as having a 1 in 100 or greater annual probability of river flooding (<1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.**
Appropriate uses **FRA requirements** **Policy aims**	The water-compatible and less vulnerable uses of land in Table 2 are appropriate in this zone. The highly vulnerable uses (Table 2) should not be permitted in this zone. The more vulnerable and essential infrastructure uses in Table 2 should only be permitted in this zone if the Exception Test is passed. All proposals in this zone should be accompanied by a FRA. Developers and local authorities should seek opportunities to:

	❖ reduce the overall level of flood risk through the layout and form of the development and the appropriate application of sustainable drainage techniques; ❖ relocate existing development to land with a lower probability of flooding; ❖ create space for flooding to occur by allocating and safeguarding open space for flood storage.
Zone 3b: Functional Floodplain	**This is the land where water has to flow or be stored in times of flood. This zone is generally defined as the land which would flood with an annual probability of 1 in 20 (5%AEP) or greater in any year. The Local Council may define the Functional Floodplain area with a different annual probability of event.**
Appropriate uses	Only the water-compatible uses and the essential infrastructure listed in Table 2 that has to be there should be permitted. It should be designed and constructed to: ❖ remain operational and safe for users in times of flood; ❖ result in no net loss of floodplain storage; ❖ not impede water flows; ❖ not increase flood risk elsewhere.
FRA requirements	All proposals in this zone should be accompanied by a FRA.
Policy aims	In this zone, developers and local authorities should seek opportunities to: ❖ reduce the overall level of flood risk through the layout and form of the development and the appropriate application of sustainable drainage techniques; ❖ relocate existing development to land with a lower probability of flooding.

Table 2 - Flood Risk Vulnerability Classification (NPPF Technical Guidance Table 2)

Essential Infrastructure	Essential transport infrastructure and strategic utility infrastructure, including electricity generating power stations and grid and primary substations.
Highly Vulnerable	❖ Police stations, Ambulance stations and Fire stations and Command Centres and telecommunications installations and emergency dispersal points. ❖ Basement dwellings, caravans, mobile homes and park homes intended for permanent residential use. ❖ Installations requiring hazardous substances consent.
More Vulnerable	❖ Hospitals, residential institutions such as residential care homes, children's homes, ❖ Social services homes, prisons and hostels. ❖ Buildings used for: dwelling houses, student halls of residence, drinking establishments, nightclubs, hotels and sites used for holiday or short-let caravans and camping. ❖ Non–residential uses for health services, nurseries and education. ❖ Landfill and waste management facilities for hazardous waste.
Less Vulnerable	❖ Buildings used for shops, financial, professional and other services, restaurants and cafes, offices, industry, storage and distribution, and assembly and leisure. ❖ Land and buildings used for agriculture and forestry. ❖ Waste treatment (except landfill and hazardous waste facilities), minerals working and processing (except for sand and gravel). ❖ Water treatment plants and sewage treatment plants (if adequate pollution control measures are in place).

Water-compatible Development	❖ Flood control infrastructure, water transmission infrastructure and pumping stations. ❖ Sewage transmission infrastructure and pumping stations. ❖ Sand and gravel workings. ❖ Docks, marinas and wharves, navigation facilities. ❖ MOD defence installations. ❖ Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location ❖ Water-based recreation (excluding sleeping accommodation). ❖ Lifeguard and coastguard stations. ❖ Amenity open space, nature conservation and biodiversity, outdoor sports and recreation. ❖ Essential sleeping or residential accommodation for staff required by uses in this category, subject to a warning and evacuation plan.

Table 3 - Flood Risk Vulnerability and Flood Zone 'compatibility'

Vulnerability Classification (Refer Table 2)		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zones	Flood Zone 1	✓	✓	✓	✓	✓
	Flood Zone 2	✓	✓	Exception Test	✓	✓
	Flood Zone 3a	Exception Test	✓	×	Exception Test	✓
	Flood Zone 3b	Exception Test	✓	×	×	×

✓ Development is appropriate

× Development should not be permitted

4.6. Strategic Flood Risk Assessment (SFRA)

The London Borough of Camden's Strategic Flood Risk Assessment (SFRA, July 2014) is a comprehensive study that assesses the potential risks and impacts of flooding in the borough. The SFRA provides important information to support land use planning, development control, emergency planning, and community resilience.

The SFRA considers a range of potential flood risks, including those from rivers, surface water, and groundwater sources. The study includes detailed flood risk maps that identify areas at risk of flooding and the potential consequences of flooding, such as property damage, business disruption, and loss of life.

The SFRA also provides guidance on flood risk management strategies and measures that can be implemented to mitigate the potential impacts of flooding. This includes measures such as flood defences, land use planning controls, emergency response planning, and public awareness and education campaigns.

The SFRA provides a strategic overview of all forms of flood risk throughout the borough, now and in the future. This document, and the associated web-based mapping delivered as part of the SFRA, is designed to help address local requirements, manage development requirements, and manage the risk of flooding posed to both residents and buildings.

The London Borough of Camden's SFRA is an important tool for ensuring that flood risk is considered in land use planning and development decisions. It supports the borough's efforts to manage flood risk and build resilience in the face of potential flooding events.

4.7. Flood and Water Management Act 2010

The method of drainage of surface water from the site is bound by the Flood and Water Management Act 2010. Schedule 3 Paragraph 5 of the Flood and Water Management Act 2010 states that the following hierarchy is to be applied to surface water runoff in the following order or priority:

- Discharge into the ground (infiltration)
- Discharge to a surface water body (lake, river, drain);
- Discharge to a surface water sewer, highway drain or another drainage system; or Discharge into a combined sewer.

4.8. Drainage Hierarchy

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 in line with the following drainage hierarchy as set out by the Non-Statutory Technical Standards for Sustainable Drainage Systems (March 2015):

1. rainwater harvesting (including a combination of green and blue roofs)
2. infiltration techniques and green roofs
3. rainwater attenuation in open water features for gradual release
4. rainwater discharge direct to a watercourse (unless not appropriate)
5. rainwater attenuation above ground (including blue roofs)
6. rainwater attenuation below ground
7. rainwater discharge to a surface water sewer or drain
8. rainwater discharge to a combined sewer.

4.9. The London Plan 2021

The London Plan 2021 is the Spatial Development Strategy for Greater London. It sets out a framework for how London will develop over the next 20-25 years and the Mayor's vision for Good Growth. The Plan includes policies and guidelines for a wide range of planning and development issues, including Sustainable Urban Drainage Systems (SuDS). SuDS are an essential component of urban planning and development in London to manage surface water runoff effectively and mitigate flood risks.

The London Plan places a strong emphasis on the use of SuDS to manage surface water runoff from new developments. It requires that major developments incorporate SuDS in their design to control and manage rainwater locally.

SuDS play a critical role in managing flood risk in London, given the city's susceptibility to surface water flooding. The London Plan encourages the use of SuDS to reduce flood risk and protect vulnerable areas. The Plan promotes the integration of SuDS with green infrastructure, such as parks, green spaces, and natural watercourses. This approach helps enhance biodiversity, improve air quality, and create attractive urban environments.

The Policy SI13 Sustainable Drainage of the London Plan has set out the following in order to address the surface runoff issues resulting from the development proposals:

B. Lead Local Flood Authorities should identify – through their Local Flood Risk Management Strategies and Surface Water Management Plans – areas where there are particular surface water management issues and aim to reduce these risks.

C. 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 in line with the following drainage hierarchy:

    1. rainwater harvesting (including a combination of green and blue roofs)
    2. infiltration techniques and green roofs
    3. rainwater attenuation in open water features for gradual release
    4. rainwater discharge direct to a watercourse (unless not appropriate)
    5. rainwater attenuation above ground (including blue roofs)
    6. rainwater attenuation below ground[136]
    7. rainwater discharge to a surface water sewer or drain
    8. rainwater discharge to a combined sewer.

D. Development proposals for impermeable paving should be refused where appropriate, including on small surfaces such as front gardens and driveways.

E. Drainage should be designed and implemented in ways that address issues of water use efficiency, river water quality, biodiversity, amenity and recreation.

5.0 Assessment of Flood Risk

5.1. History of Flooding

The London Borough of Camden's Strategic Flood Risk Assessment (SFRA, July 2014) has provided brief information about past flooding events in the area. The SFRA reported some past flooding incidents in the area, however, there were no records of any flooding event at the site.

In addition, information on historic flooding was obtained from the Environment Agency's online records of historic flood events in the area. However, there were no records of any flooding incidents around the site.

Information on the past flooding event was also obtained from the landowner. They were not aware of any flooding issues at the site.

5.2. Risk of Fluvial Flooding

There are no major watercourses in the vicinity of the site. The Environment Agency's Flood Map around the site is shown in **Appendix A Figure 4** which shows that the site lies within the Flood Zone 1 (low probability flooding). Flood Zone 1 is an area where flooding from rivers and the sea is very unlikely. There is less than a 1 in 1000 chance of flooding occurring in any one given year (i.e. a less than 0.1% annual probability of flooding).

Figure 5 shows the Environment Agency's flood risk map which indicates that the site is located outside of the flood risk zone.

5.3. Modelled Water Levels

As the site lies within the Flood Zone 1 (low probability flooding), the modelled water levels are not relevant.

5.4. Risk of Tidal Flooding

There are no other Main Rivers/watercourses influenced by tidal waves near the site. The risk of tidal flooding is therefore low.

5.5. Risk of Flooding From Artificial Water Bodies

There were no known flood risks from any artificial water bodies near the site.

5.6. Risk of Groundwater Flooding

In recent years groundwater has been recognised as a significant source of flooding in the UK. According to the British Geological Survey, groundwater flooding occurs when the water table in permeable rocks rises to enter basements/cellars or comes up above the ground surface. Groundwater flooding is not necessarily linked directly to a specific rainfall event and is generally of longer duration than other causes of flooding (possibly lasting for weeks or even months).

Evidence of historical groundwater flooding within the SFRA is very limited, however it is important to recognise that the risk of groundwater flooding is highly variable and heavily dependent upon local conditions at any particular time.

According to the information available from the landowner, there were no records of any groundwater flooding incidents around the site. Based on these evidences and information, it is reasonable to consider that the risk of groundwater flooding to the site is low.

5.7. Risk of Surface Water Flooding

The surface water flooding arises when the infiltration capacity of land or the drainage capacity of a local sewer network is exceeded and the excess rainwater flows overland. The severity of surface water flooding depends on several factors such as the degree of saturation of the soil before the event, the permeability of soils and geology, hill slope steepness and the intensity of land use.

Information on the risk of surface water flooding is held by the Environment Agency. The Environment Agency's Surface Water Flood Risk Maps are provided in **Appendix A Figure 6 and Figure 7** which indicate that the risk of surface water flooding to the site is 'low'.

5.8. Risk of flooding from Reservoirs

The Environment Agency's reservoir flood map in **Appendix A Figure 8** indicated that the proposal site is located outside of the maximum extent of flooding from reservoir. According to the Environment Agency, the reservoir flooding is extremely unlikely to happen and reservoirs in the UK have an extremely good safety record; indeed there has been no loss of life in the UK from reservoir flooding since 1925. The Environment Agency is the enforcement authority for the Reservoirs Act 1975 in England and Wales. All large reservoirs must be inspected and supervised by reservoir panel engineers on a regular basis. It is therefore assumed that these reservoirs are

regularly inspected, and essential safety work is carried out. These reservoirs therefore present a managed residual risk.

5.9. Flood Risk from Sewers

Sewer flooding is often caused by excess surface water entering the drainage network causing sewers to surcharge. The SFRA has provided very limited information on sewer flooding within the area, however, there were no records of sewer flooding incidents at the site. It is important to note that previous sewer flood incidents or the lack thereof do not indicate the current or future risk to the site as upgrade work could have been carried out to alleviate any issues or conversely in areas that have not experienced sewer flooding incidents the local drainage infrastructure could deteriorate leading to future flooding.

According to the information obtained from the landowner, there were no records of sewer flooding incidents at the site in the past.

5.10. Impact of Climate Change

In July 2021 the 'Flood Risk Assessments: Climate Change Allowances' were updated from the originally published Climate Change allowances on GOV.UK. The guidelines outline the peak river flow climate change allowances by management catchment. The range of Climate Change allowances is based on percentiles. A percentile is a measure used in statistics to describe the proportion of possible scenarios that fall below an allowance level. The 50th percentile is the point at which half of the possible scenarios for peak flows fall below it and half fall above it. The central allowance is based on the 50th percentile, higher central is based on the 70th percentile and the upper end is based on the 90th percentile.

The proposal site is located within the London Management Catchment and within the Thames river basin district. The relevant climate change allowances are summarised in **Table 4** below.

Table 4 - Peak river flow allowances by Management Catchment and river basin district

Management Catchment Name / River Basin District	Climate Change allowance	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
London / Thames	Upper end	26%	30%	54%
	Higher central	14%	14%	27%
	Central	10%	7%	17%

Using peak river flow allowances for flood risk assessments

The guideline suggests to consider the flood zone and the appropriate flood risk vulnerability classification to decide which allowances applies to the development or plan.

In flood zones 2 or 3a for:

- essential infrastructure – use the higher central allowance
- highly vulnerable – use central allowance (development should not be permitted in flood zone 3a)
- more vulnerable – use the central allowance
- less vulnerable – use the central allowance
- water compatible – use the central allowance

In flood zone 3b for:

- essential infrastructure – use the higher central allowance
- highly vulnerable – development should not be permitted
- more vulnerable – development should not be permitted
- less vulnerable – development should not be permitted
- water compatible – use the central allowance

Assessment of Climate Change Impact for the Site

The proposal site is located within the London Management Catchment and Thames river basin district. However, as the site is located in Flood Zone 1(i.e. low probability flooding), the climate change allowances are not directly relevant for the fluvial flood risk assessment for this site.

6.0 Mitigation Measures

6.1. Recommended Finished Floor Level

In order to afford a level of protection against flooding it is normally recommended that finished floor levels are set a nominal 300mm above the 1 in 100-year annual probability fluvial flood (1% AEP) including an allowance for climate change. However, as the site is located in Flood Zone 1 (i.e. low probability flooding), raising the finished floor level will not be required.

6.2. Flood Warning and Evacuation

As the site is located in Flood Zone 1(i.e. low probability flooding), the flood warning and evacuation strategy will not be relevant for the site.

7.0 Sustainable Urban Drainage Systems (SuDS)

The London Borough of Camden strongly encourages the principles of SuDS on all forms of development. The developer should seek the most sustainable SuDS solution in order to reduce flood risk, improve water quality and improve the environment overall. The Local Authority encourages the developers to provide SuDS on major developments while paying due regard to the National Planning Policy Framework (NPPF), Planning practice guidance, Non-statutory technical standards for sustainable drainage systems and the local plan policies.

7.1. Sources of Surface Runoff and Existing Drainage

The main source of the surface water runoff is from the roof and hardstanding area. Due to the flat topography, there are no other sources of surface runoff such as overland flows from higher elevations. Thames Water's Sewer Asset Map shows that

a combined sewer runs on Adamson Road (**Appendix C**). The surface runoff from the roof and hardstanding area discharges into this Combined Sewer on Adamson Road.

7.2. Greenfield Runoff Estimation

The estimation of the Greenfield Runoff rate has been undertaken using the HR Wallingford's Greenfield Runoff Estimation tool available on the website: http://www.uksuds-.com/greenfieldrunoff_js.htm. The aim of the tool is to provide flow rate information based on a minimum amount of data so that anybody can use the tool. The methodology is built around the concept that a flow rate discharge constraint is needed for storm water runoff from a site, resulting in attenuation volume being needed. In addition, current drainage criteria include the requirement for the 100 year 6hr volume to be controlled. The tool is based on the results of simple model analysis and correlating the results against key known site parameters. As such the results need to be treated as providing indicative information only and should not be used to produce final designs of drainage systems without additional modelling being carried out. The peak flow estimation can now be estimated using two different formulae.

1) The formula developed in IH124 (IH 1994) and use of the FSSR growth curve information for regions of the UK (FSSR 14),

2) The use of FEH statistical correlation equation revised in 2008.

However, only the IH124 method can be used without providing specific parameter values. Therefore, this method has been used for estimating greenfield runoff rate from the proposed development site.

Details about the parameters used in the estimation are provided in **Appendix D** and the results are summarised in **Table 5** below. The catchment area of 0.10ha has been used which is the minimum area required for this technique. The proposed development will consider the greenfield runoff rates for addressing surface water discharge requirements from the developed site. The greenfield runoff rates will also be utilised for developing the drainage strategy for the site.

Table 5 – Greenfield Runoff Rates

Events	Greenfield runoff rates (l/s) (Estimated)
Qbar	0.43
1 in 1 year	0.37
1 in 30 year	1.00
1 in 100 year	1.39

7.3. Estimation of Permeable and Impermeable Areas

The changes in land cover have been summarised in **Table 6** below. It can be seen that the proposed development will lead a small increase in the impermeable area by 8m^2. This means the proposed development will not lead to significant increase in the surface runoff from the site.

Table 6 Changes in Land Cover Areas

Land Cover	Pre-development, m^2	Post-development, m^2	Change, m^2
Impermeable Surface Area			
Hard standing	34	20	
Building footprint	80	102	
Total Impermeable	**114**	**122**	**(+) 8**
Permeable Surface Area			
Grass cover	77	51	
Permeable paving	0	18	
Total Permeable	**77**	**69**	**(-) 8**
Total Area	191	191	

7.4. Estimation of peak surface runoff rates

Pre-development Peak Runoff Rates Based on Land Cover

The Rational Method has been used in order to estimate the peak surface runoff from the site.

The Rational Equation is given by:

Q = Ar x P x Ri

Where, Ar = Effective catchment area, m^2

P= Impermeability factor

Ri= Rainfall Intensity, mm/hr, Q= Peak surface runoff, m^3/s

The peak surface runoff rates for the existing site condition are summarised in **Table 7** below. An impermeability factor of 0.90 has been used for the site. Information on the maximum rainfall intensity for a range of return period events has been taken from the Micro Drainage Model developed for the site which is provided in **Appendix E**. The impermeable surface areas pre-development in **Table 6** have been used as catchment area for the calculations.

Table 7 Estimation of Peak Runoff Rates from the site (Pre-development condition) based on the land cover area.

Return Periods	Max Rainfall Intensity, Ri mm/hr	Catchment Area, A m^2	Impermeability factor, P	# Peak Runoff, Q, m^3/sec	Peak Runoff, Q, litres/sec
1/ 1 year	33.24	114	0.9	0.00095	0.95
1/2 year	42.94	114	0.9	0.00122	1.22
1/5 year	55.19	114	0.9	0.00157	1.57
1/10 year	64.22	114	0.9	0.00183	1.83
1/30 year	81.65	114	0.9	0.00233	2.33
1/50 year	91.3	114	0.9	0.00260	2.60
1/100 year	106.23	114	0.9	0.00303	3.03
1/100 year + 40% CC	159.35	114	0.9	0.00454	4.54

Q = (Ri/1000 x A x P)/3600

Ri taken from Micro Drainage model (**Appendix D**).

Post-development Peak Runoff Rates

The peak surface runoff rates for the post-development condition are summarised in **Table 8** below. An impermeability factor of 0.90 has been used for the site. Information on the maximum rainfall intensity for a range of return period events has been taken from the Micro Drainage Model developed for the site which is provided in **Appendix E**. The impermeable surface area for the post-development in **Table 6** has been used as catchment area for the calculations.

Table 8 Summary of Peak Runoff Rates from the site (Post-development condition based on land cover area)

Return Periods	Max Rainfall Intensity, Ri mm/hr	Catchment Area, A m^2	Impermeability factor, P	# Peak Runoff, Q, m^3/sec	Peak Runoff, Q, litres/sec
1/ 1 year	33.24	122	0.9	0.00101	1.01
1/2 year	42.94	122	0.9	0.00131	1.31
1/5 year	55.19	122	0.9	0.00168	1.68
1/10 year	64.22	122	0.9	0.00196	1.96
1/30 year	81.65	122	0.9	0.00249	2.49
1/50 year	91.3	122	0.9	0.00278	2.78
1/100 year	106.23	122	0.9	0.00324	3.24
1/100 year + 40% CC	159.35	122	0.9	0.00486	4.86

7.5. Hierarchy of SuDS Measures

The surface runoff from the site will be improved by implementing appropriate SuDS. The requirements for SuDS will ensure that any redevelopment or new development does not negatively contribute to the surface water flood risk of other properties and instead provides a positive benefit to the level of risk in the area. It will also ensure that appropriate measures are taken to increase the flood resilience of new properties and developments in surface water flood risk areas, such as those identified as being locally important flood risk areas.

The SuDS hierarchy and management train has been discussed in the SuDS Manual (C753) which aims to mimic the natural catchment processes as closely as possible. The general hierarchy of the SuDS measures is provided in **Table 9** below.

Table 9 General Hierarchy of SuDS Measures

Measures	Definition/Description
Prevention	The use of good site design and housekeeping measures to prevent runoff and pollution (e.g. rainwater harvesting/reuse).
Source control	Control of runoff at or very near its source (e.g. soakaways, porous and pervious surfaces, green roofs).
Site control	Management of water in a local area on site (e.g. routing water to large soakaways, infiltration or detention basins)
Regional control	Management of runoff from a site or several sites (e.g. balancing ponds, wetlands).

7.6. General Assessment of SuDS Measures for the site

Table 10 below presents the feasibility assessment of several SuDS measures for the site. The

Table 10 General Assessment of SuDS measures for the site

SuDS Measures	Issues/Description	Feasibility for the site
Source Control Porous and pervious materials/soakaways/green roof/infiltration trenches/disconnect downpipes to drain to lawns or infiltrate to soakaway.	Permeable paving improves the surface runoff from the site.	Yes. There is a potential for permeable paving in the rear yard area to improve the water quality and improve the surface runoff.
	Planting bed improves the surface runoff by allowing infiltration.	Yes. There is a potential for a planning bed to improve the surface runoff from the site.

Site and Regional Control Infiltration/detention basins/ balancing ponds/ wetlands/underground storage/swales/retention ponds.	Open surface Balancing pond will not be feasible due to limited space available. Implementing an attenuation storage at the site is not possible.	No. The potential for balancing pond is low as there is very limited space available for open ground balancing pond. No. Due to lack of space and site constraints, storage option will not be feasible.

7.7. Proposed SuDS

Based on the general assessment of the potential SuDS measures above, permeable paving and a planting bed will be implemented in order to improve the surface runoff from the site. These SuDS mitigation measures help improve the surface runoff as there will be minimal increase in the surface runoff post-development compared to pre-development condition as indicated in **Table 7** and **Table 8** above. The proposed layout of the SuDS measures is provided in **Appendix F**. The landowners will be fully responsible for the repair and management of the proposed SuDS measures throughout the lifetime of the proposed development which is considered to be 100 years.

7.8. Water Efficiency Measures

The following water efficiency measures will be adopted to save water use:

Water-efficient showerhead

The average shower uses between 10 and 15 litres of water per minute, but a water-efficient showerhead only uses 8 litres. Water will be saved by installing water-efficient showerheads at the property.

Four-minute shower timer

Shortening the time the residents spend in the shower will reduce the volume of water that goes down the drain. Using a four-minute timer can help the residents understand how long they spend in the shower and could save up to 30 litres a day.

Tap aerators

Fitting tap aerators will help to save water in the kitchen and bathroom. They mix air with the water, increasing the pressure while reducing the amount of water that comes out.

Garden hose gun

Fitting a hose gun attachment to the hosepipe can help to control where and when the residents use water in the garden. Hosepipe spray guns use up to 50% less water per use.

Universal plug

If a washing up bowl is not used, using a plug in the kitchen sink can save water when doing the dishes or washing fruit and vegetables. Universal plugs fit all sinks, helping the residents to use only the water they need and saving up to 30 litres a day.

Leaky Loo detection strips

A leaking toilet wastes between 200 and 400 litres of water per day, and they can be hard to spot. By applying a leak detection strip to the back of the pan, they residents should be able to see when water is leaking from your cistern.

7.9. Exceedance Flow Paths

It is inevitable that as a result of heavy or extreme rainfall, the capacities of sewers and other drainage systems will be exceeded on occasion. Drainage exceedance will occur when the rate of surface water runoff exceeds the inlet capacity of the drainage system, when the receiving water or pipe system becomes overloaded, when the outfall becomes restricted due to flood levels in the receiving water, or due to poor maintenance of the SuDS features.

An extreme event may lead to the situation where the rate of surface water runoff exceeds the inlet capacity of the drainage system. In such circumstances, the flow routes from the site will naturally follow towards the road (i.e. Adamson Road) following the general slope gradient to this direction, as this will be the only open area for the floodwater to flow across the site. The exceedance flow routes are shown in **Appendix**

G. Due to the relatively low risk of sewer flooding and surcharging sewer drains, no pumping arrangement has been proposed for the site.

7.10. SuDS Management and Maintenance Plan

The owners will be fully responsible for regular repair and maintenance of the proposed SuDS measures as required for the lifetime of the development. The SuDS at this site have been designed for easy maintenance to comprise:

Permeable Paving

The landowners will be fully responsible for regular maintenance of the proposed permeable paving. **Table 11** provides further details on the regular maintenance of the proposed Permeable Paving.

Table 11 Regular Maintenance and remedial measures for permeable paving

Regular Maintenance	Actions/Remedial measures
Monthly	• Refer to manufacturer specifications • For sealed systems, inspection of outfalls should be undertaken.
Six Monthly	• Brushing and vacuuming to manufacturer requirements. Re-grit where necessary after brushing.
As Required	• Inspect/check all inlets, outlets, inspection chambers, surface and overflows (where required) to ensure that they are in good condition, free from blockages and operating as designed. Take action where required (for 3 months following installation) • Removal of weeds where required • Stabilizing and mowing of contributing areas where required.

Following all significant storm events	• Inspect and carry out essential recovery works to return the feature to full working order

8.0 Assessment of Impact on flow of floodwater

The proposed development consists of extensions and alterations at lower ground, first floor and roof level including alterations to fenestration. In order to ensure that the proposed development will not increase flood risk elsewhere the mitigations will ensure that all flood water, surface water and rainwater is processed on-site and not redirected elsewhere through the use of appropriate SuDS measures as mentioned above. The development will not give rise to backwater affects or divert water towards other properties.

9.0 Conclusion

The proposal consists of extensions and alterations at lower ground, first floor and roof level including replacement mansard roof, installation of balconies/ terraces and alterations to fenestration to enable the reconfiguration of the residential units and create a shared access core resulting in a reduction from 19 units to 16 units with associated refuse and cycle storage and the erection of a front boundary treatment located at 5-7 Adamson Road, London NW3 3HX.

The proposed development is categorised as ‘more vulnerable’. The site is located in Flood Zone 1 (i.e., low probability flooding). The proposed development is therefore considered appropriate at this location.

There are no major watercourses in the vicinity of the site.

According to the information available from the Council’s SFRA and the Environment Agency, there were no records of flooding from any sources at the site.

The Environment Agency’s Flood Map around the site shows that the site lies within the Flood Zone 1 (low probability flooding). Flood Zone 1 is an area where flooding from rivers is very unlikely. There is less than a 1 in 1000 chance of flooding occurring in any one given year (i.e., a less than 0.1% annual probability of flooding).

The Environment Agency’s flood risk map indicates that the site is located outside of the flood risk zone.

The overall risk of surface water flooding to the site is 'low'.

The flood risk from other sources including underground water, sewer and reservoir is low.

Thames Water's Sewer Asset Map shows that a combined sewer runs on Adamson Road. The surface runoff from the roof and hardstanding area discharges into this Combined Sewer on Adamson Road. The current drainage system will be continued to be used to discharge the surface runoff from the site.

Appropriate SuDS mitigation measures will be used for improving the surface runoff from the site. Based on the general assessment of the potential SuDS measures, permeable paving and a planting bed will be implemented in order to improve the surface runoff from the site. In addition, various water efficiency measures will be adopted in order to save the water.

The landowners will be fully responsible for the repair and management of the implemented SuDS throughout the lifetime of the proposed development.

The development will not give rise to backwater affects or divert water towards other properties.

This report demonstrates that the proposal will be safe, in terms of flood risk, for its design life and will not increase the flood risk elsewhere.

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Appendix A Collection of Flood Maps and Figures

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Appendix B Existing Site and Proposed Plans

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Appendix C Sewer Asset Map Data

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Appendix D Greenfield Runoff Rates

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Appendix E Rainfall Runoff Summary

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Appendix F Proposed Surface Runoff Improvement Measures (SuDS)

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Appendix G Exceedance Flow Routes