



**SUSTAINABLE URBAN DRAINAGE SYSTEMS STRATEGY:
SURFACE WATER RUNOFF AND WATER DEMAND REDUCTION STRATEGY
MARCH 2024**

24 AND 26 MAIDSTONE ROAD

LONDON
N11 2TL
UK

EC  STUDIO **XV**

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SUSTAINABLE URBAN DRAINAGE SYSTEMS REPORT



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1. INTRODUCTION



1. INTRODUCTION

INTRODUCTION

This report was commissioned by vPPR Architects to provide a Sustainable Drainage Systems including surface water runoff and water demand reduction strategies for the proposed development located at 24 and 26 Maidstone Road, Oak Lane, N11 2TL.

Reason:

1. To comply with Policy DM21 of the Development Management Document which requires developments to demonstrate sustainable design:
 - Set out how water demand will be reduced, e.g. rainwater harvesting, grey water system.
 - Set out how surface water runoff will be reduced, that it will be separated from wastewater and not discharge into the sewer.

2. To comply with Haringey's Local Plan and Haringey Council Strategic Flood Risk Assessment which states the following:

The Haringey Local Plan (2017) requires that all development in Haringey to be water efficient during construction and operation and to reduce all forms of flood risk, also to implement Sustainable Drainage Systems (SUDs) from strategic to individual site level to improve water attenuation, quality and amenity.

Surface water discharge from proposed development sites should mimic that of a present day green field site, up to and including a 1:100 AEP critical storm event including an allowance for climate change. Green field runoff rates should be maintained irrespective of whether the site falls within an area designated as being effected by flood risk from any source.

Use SuDS measures wherever practical and achieve 50% attenuation of undeveloped site's surface water runoff at peak times.

ECostudio XV Ltd, has prepared this SUDs report in line with the following guidance:

- London Borough of Haringey Local Plan Strategic Policies (2013-2026)
- Haringey Council Strategic Flood Risk Assessment 2015.
- The National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) explains that sustainable development should not increase flood risk elsewhere, and it gives priority to the use of sustainable drainage systems. This is reflected in the Government's guidance on Flood Risk and Coastal Change updated in March 2015.

The Sustainable Urban Drainage System (SUDs) strategies taken into account in this report includes:

- 3no X 100 litres water butt
- 3no X 1000 litres rainwater tank
- 3.80 m3 of storage capacity in green roof (108.5 m2 area)

The proposed attenuation volume of the proposed SUDS would be **7.10 m3**, including rainwater reuse. The amount of storage required to achieve the greenfield run off rate for a 100 year 60 minutes storm duration, including +40% climate change factor is **6.26 m3**.

METHODS EMPLOYED TO DELAY (ATTENUATE) AND CONTROL THE RATE OF SURFACE WATER DISCHARGED FROM THE SITE

- **3no X 100 litres water butt for re-use**
- **108.5 m2 Green Roof with 100mm depth (3.80 m3)**
- **3no X 1000 litres rainwater tank for re-use**

The combination of the above methods would delay (attenuate) and control the rate of surface water discharged from the site to mimic greenfield runoff rates. This way the surface water run off will be separated from wastewater and not discharged into the sewer. There is an overflow in the remote case that the system collapses, which is unlikely.

The SUDs and water calculations presented in this report will need to be continuously updated through the detailed design and construction stages to reflect any changes in the project performance.

2.0 SITE LOCATION AND PROPOSED CONDITIONS



2.0 SITE LOCATION AND PROPOSED CONDITIONS

SITE LOCATION

The site of the proposed development is located at 24 and 26 Maidstone Road, Oak Lane, N11 2TL.

The site coordinates are 51.60° N and 0.12° W. The site location is shown in red colour in the mas below.

FIGURE 01 – SITE PLAN



FIGURE 02 – SITE LOCATION-AERIAL VIEW



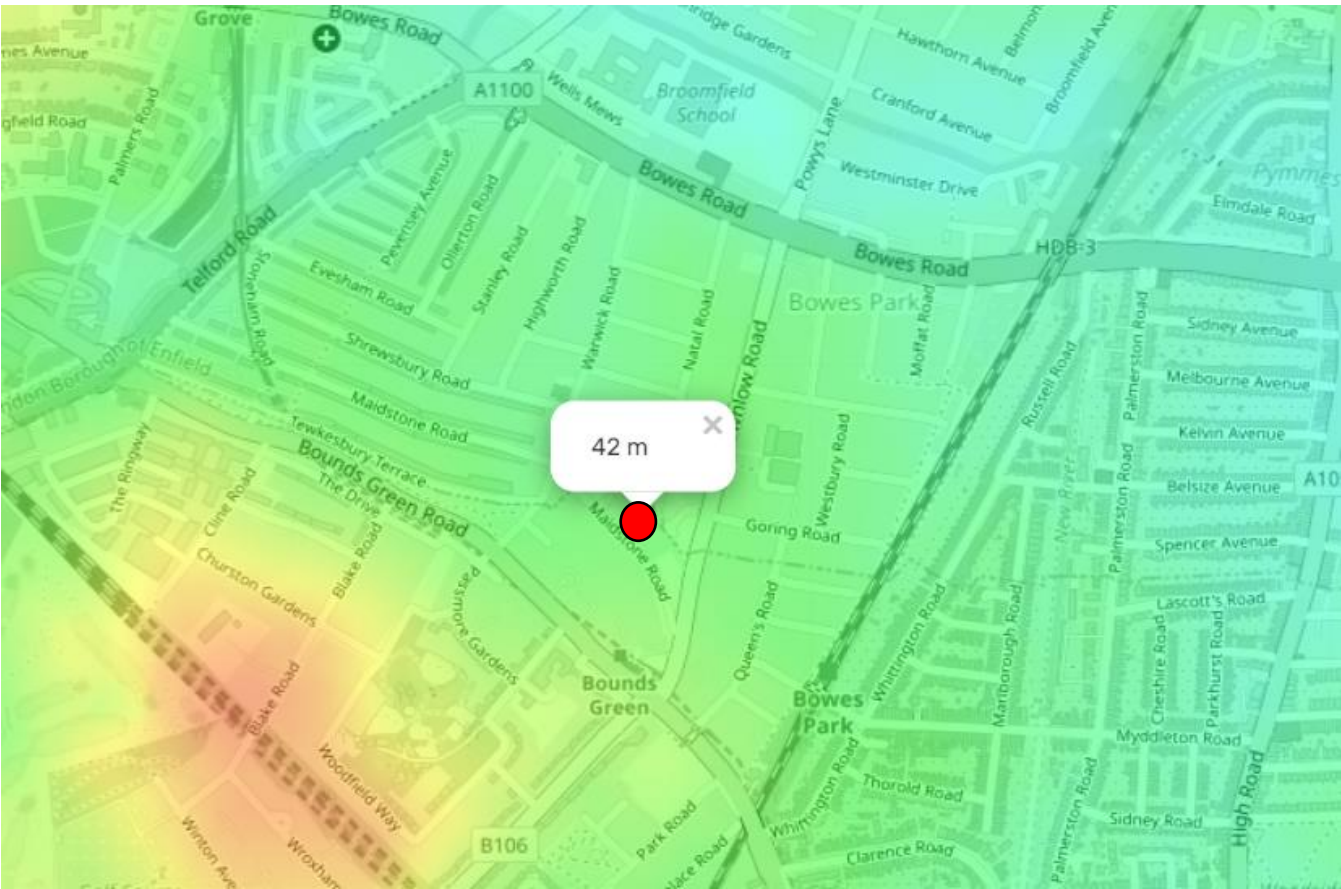
2.0 SITE LOCATION AND PROPOSED CONDITIONS

TOPOGRAPHY

The map below provides an idea of the topography and contour where the proposed development is located.

The site is located at an elevation of approximately 42 meters. The site is adjacent to 24 Maidston Road to West and to Haywood Court to North.

FIGURE 03 – LONDON MAP ELEVATION. SOURCE <https://en-gb.topographic-map.com>



GEOLOGY

The site is located in the London Clay Formation - Clay, silt and sand. Sedimentary bedrock formed between 56 and 47.8 million years ago during the Palaeogene period.

The London Clay mainly comprises bioturbated or poorly laminated, blue-grey or grey-brown, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay. It commonly contains thin courses of carbonate concretions ('cementstone nodules') and disseminated pyrite. It also includes a few thin beds of shells and fine sand partings or pockets of sand, which commonly increase towards the base and towards the top of the formation.

Therefore, the site is not suitable for infiltration strategies, just re-use and retention.

FIGURE 04 – LONDON MAP GEOLOGY. BRITISH GEOLOGICAL SURVEY



London Clay Formation - Clay, silt a...

2.0 SITE LOCATION AND PROPOSED CONDITIONS

SITE PLAN AS PROPOSED

The proposed development consists of 3no. X 3 Storey 4-bedroom terraced dwelling houses, with a basement.

The proposed development consists of the following:

• The total site area as proposed is	400.0 m2
• Roof (impermeable area)	44.0 m2
• Paving (impermeable area for rainwater harvesting)	117.8 m2
• Garden	129.7 m2
• Green Roof	108.5 m2
The total impermeable area as proposed is	161.8 m2
The total permeable area as proposed is	238.2 m2

FIGURE 05-PROPOSED ROOF PLAN



SYMBOLOLOGY

	Green Area 238.2 m2		Impermeable area 161.8 m2
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2.0 SITE LOCATION AND PROPOSED CONDITIONS

VULNERABILITY CLASSIFICATION

The Environment Agency Flood Map for Planning shows that this type of development is in **Flood Zone 1 with a low probability of flooding from rivers and the sea.**

Based on Haringey SFRA **the Sequential Test does not normally need to be applied for individual developments proposals in Flood Zone 1** (unless the SFRA for the area, or any other recent information, indicates there may be flooding issues now or in the future, which is not the case.)

FIGURE 06– FLOOD ZONES OVERVIEW BY ENVIRONMENT AGENCY

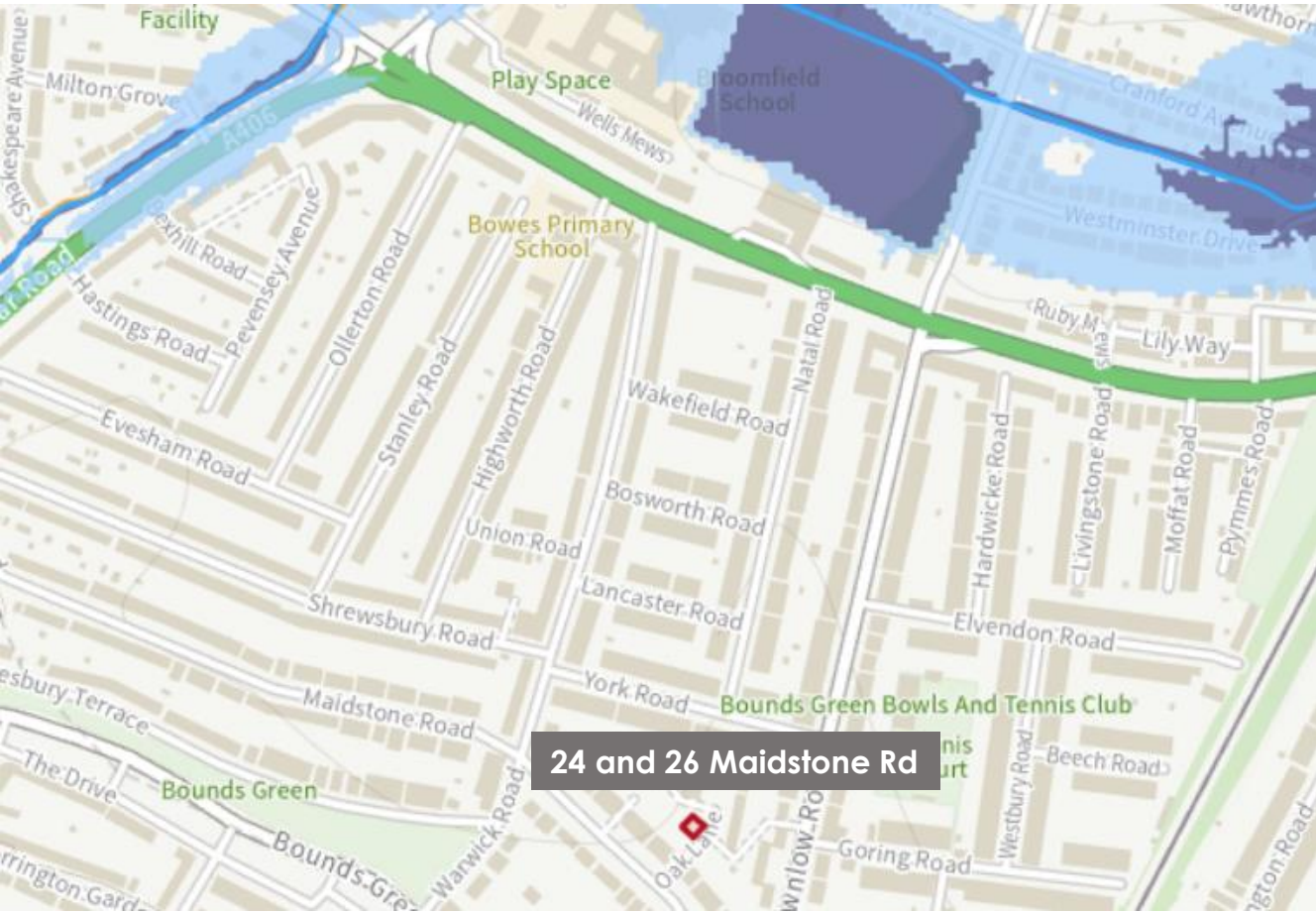


TABLE 1 – DEFINITIOS OF FLOOD ZONES SET OUT BY HARINGEY SFRA

Probability		Description
Zone 1	Low	This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).
Zone 2	Medium	This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (0.1% - 1%) or between 1 in 200 and 1 in 1000 annual probability of sea flooding (0.1% – 0.5%) in any year.
Zone 3a	High	This zone comprises land assessed as having a greater than 1 in 100 annual probability of river flooding (>1.0%) or a greater than 1 in 200 annual probability of flooding from the sea (>0.5%) in any year.
Zone 3b	Function Floodplain	This zone comprises land where water has to flow or be stored in times of flood. SFRAs should identify this Flood Zone in discussion with the LPA and the Environment Agency. The identification of function floodplain should take account of local circumstances.



2.0 SITE LOCATION AND PROPOSED CONDITIONS

FLOOD RISK FROM SURFACE WATER

Based on Environment Agency Flood Map the property has a **LOW RISK OF SURFACE WATER FLOODING. Low Risk means that THIS AREA HAS A CHANCE OF FLOODING BETWEEN 0.1% AND 1% CHANCE EACH YEAR.** Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

FIGURE 07 –SURFACE WATER FLOOD RISK BY ENVIRONMENT AGENCY

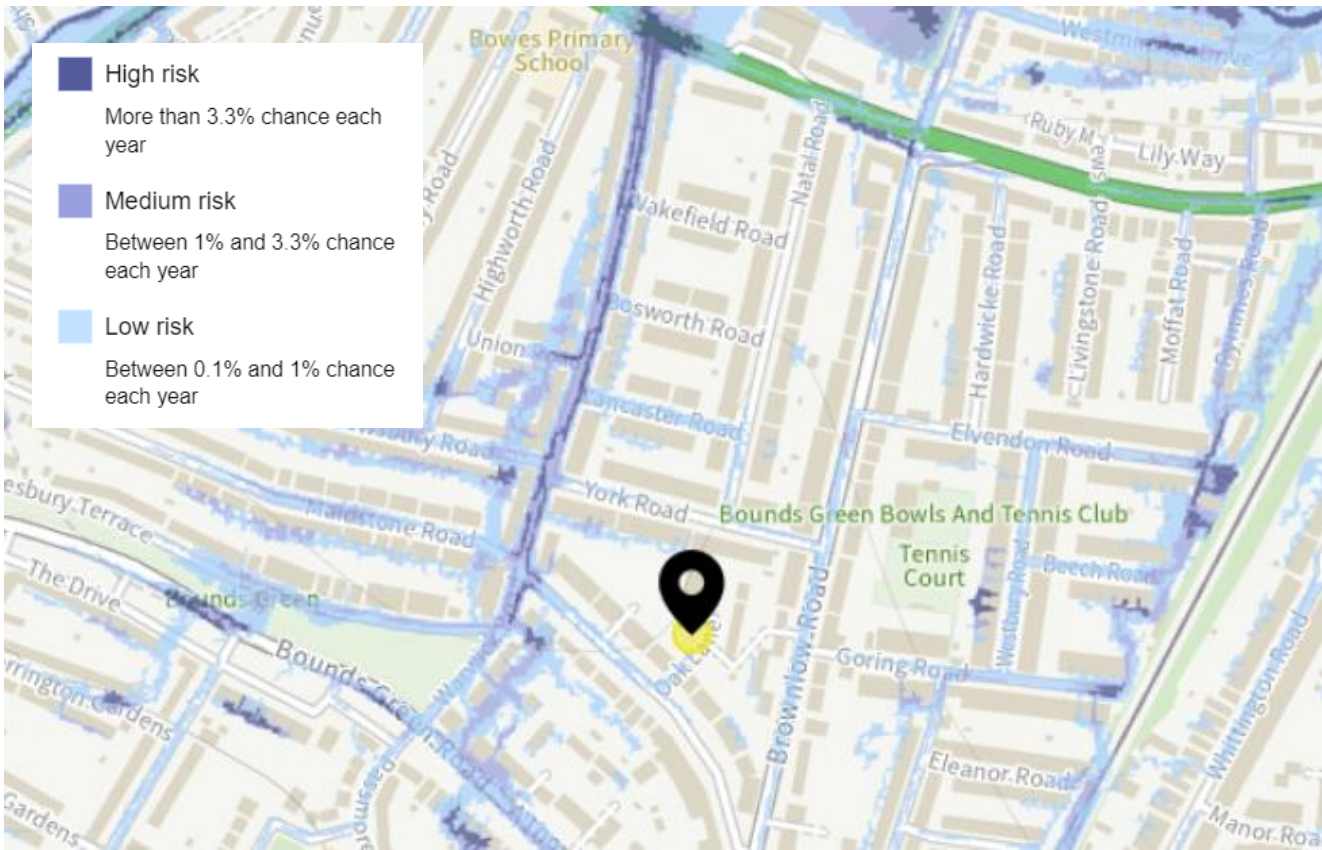
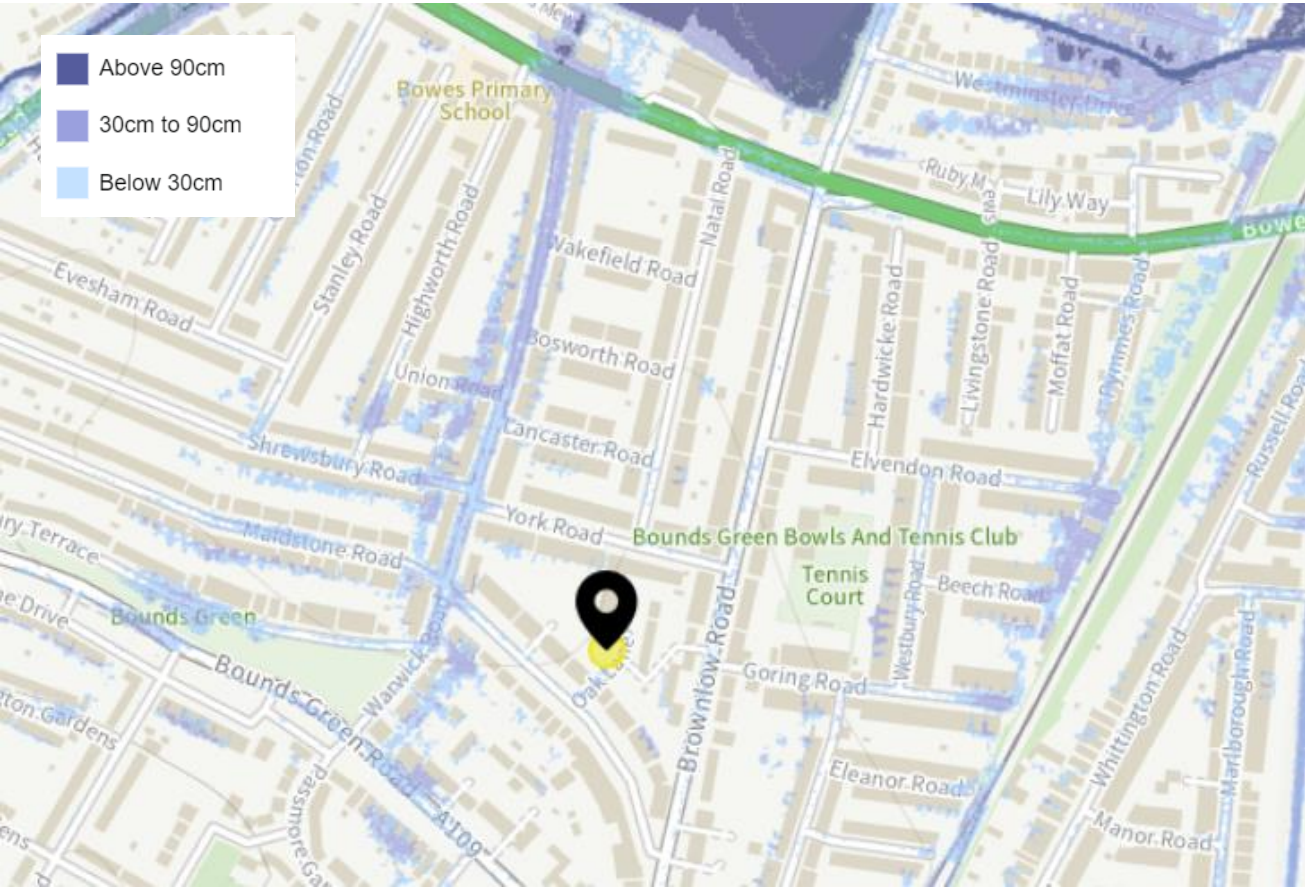


FIGURE 08 –SURFACE WATER DEPTH IN A LOW RISK SCENARIO FLOOD BY ENVIRONMENT AGENCY

Based on the information provided by Environment Agency in a Low Risk Scenario, **the property has a depth of flooding below 30cm.**



Considering the local geology of the LB of Haringey is predominantly London Clay, there is little opportunity for surface water to infiltrate the ground resulting in increased volumes of surface water runoff. The extent of surface water flooding is controlled by the topography as well as the impermeability of the land surface. (Haringey SFRA 2015).

A primary method of reducing surface water flood risk is though managing the source of the risk. To achieve this, use of Sustainable Drainage Systems (SuDS) is recommended. SuDS aim to mimic natural drainage processes so that developments do not increase surface water runoff and negatively impact water quality. (Haringey SFRA 2015).

Further information would show 24 and 26 Maidstone Road SuDS Strategy.

3.0 LONDON PLAN POLICY SUSTAINABLE DRAINAGE



3.0 LONDON PLAN POLICY SUSTAINABLE DRAINAGE

This policy is contained within Chapter Five of the London Plan titles "London's Response to Climate Change"

"A Development should utilise sustainable urban drainage systems (SUDS) unless there are practical reasons for not doing so, and 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. Store rainwater for later use.
2. Use infiltration techniques, such as porous surfaces in non-clay areas.
3. Attenuate rainwater in ponds or open water features for gradual release.
4. Attenuate rainwater by storing in tanks or sealed water features for gradual release.
5. Discharge rainwater direct to a watercourse.
6. Discharge rainwater to a surface water sewer/drain.
7. Discharge rainwater to the combined sewer.

Drainage should be designed and implemented in ways that deliver other policy objectives of this Plan, including water use efficiency and quality, biodiversity, amenity and recreation."

LDF preparation

Within LDFs boroughs should, in line with the Flood and Water Management Act 2010, utilise Surface Water Management Plans to identify areas where there are specific surface water management issues and develop actions and policy approaches aimed at reducing these risks.

Supporting text

There will also be increased surface water flood risk, with the likelihood of more intense storms. The Flood and Water Management Act 2010 gives London boroughs clearer responsibilities related to surface water flood risk.

Implementation mechanisms including the national Sustainable Drainage Systems Standards are emerging. Moreover, the Drain London Forum brings together the key agencies involved in managing London's drainage system and has delivered draft Surface Water Management Plans for every London borough. As the RFRA illustrates, it has also made significant progress in the understanding of surface water flood risk.

In the meantime, the now well established sustainable drainage hierarchy contained within (**Policy 5.13**) will lead to a steady reduction in the overall amount of rainfall being discharged to the drainage system. The sustainable drainage hierarchy in policy **5.13A** is intended to ensure that all practical and reasonable measures are taken to manage surface water higher up the hierarchy (1 being the highest) and that the amount of surface water managed at the bottom of the hierarchy, is minimised.

The hierarchy is designed to apply across the whole of London. In addition, green roofs (see **Policy 5.11**) can also make a contribution to sustainable urban drainage by absorbing a proportion of surface water and therefore reducing rates of water flow. Implementing such measures will not only reduce run-off but provide multiple benefits to London amenity, biodiversity and better water quality to name but three. Changes to the General Permitted Development Order 2008 restricting permitted development rights for impermeable surfaces within the curtilage of dwelling houses should also contribute to a reduction of surface water run-off.

Source: The London Plan, The Current London Plan, London Plan Chapter Five response to Climate Change, Policy 5.13 Sustainable Drainage, March 2016.

<https://www.london.gov.uk/what-we-do/planning/london-plan/current-london-plan/london-plan-chapter-five-londons-response/policy-513-sustainable>

4.0 NATIONAL SUDS STANDARD



4.0 NATIONAL SUDS STANDARDS

THE NATIONAL PLANNING POLICY FRAMEWORK (NPPF)

SUSTAINABLE DRAINAGE AND THE PLANNING PROCESS IN ENGLAND

The National Planning Policy Framework (NPPF) and its associated technical guidance (that replaced Planning Policy Statement 25 (PPS25) in 2012) states that priority should be given to sustainable drainage and discusses the impact of new development on flood risk.

LOCAL PLANS

The NPPF stresses that Local Plans should consider climate change, covering factors like changes to flood risk, coastal areas and water supply. A local planning authority may develop local planning policies that facilitate:

- The protection of watercourse corridors within a green network and their use in place making.
- Avoidance of new culverting and effort to open existing culverted watercourses.
- Requiring sustainable drainage systems (SuDS) in new developments.

Local Plans should be supported by Strategic Flood Risk Assessments (SFRAs) which are carried out by local planning authorities. The SFRA should be used to improve knowledge of flooding and inform the sustainability appraisal of local development documents. It is also a requirement of the NPPF that site-specific flood risk assessments (FRAs) are undertaken and submitted together with a planning application. (A site-specific FRA may also be required even when the site is not in a flood risk area.

Some local authorities have combined these policies with Surface Water Management Plans and presented these in the form of surface water management supplementary planning documents (SPDs) or local adoption and guidance documents.

Source: Susdrain, SuDS and planning. Local Plans.
<http://www.susdrain.org/delivering-suds/using-suds/delivery/planning.html>

SUDS PRINCIPLES

Sustainable drainage is a departure from the traditional approach to draining sites. There are some key principles that influence the planning and design process enabling SuDS to mimic natural drainage by:

- storing runoff and releasing it slowly (attenuation).
- harvesting and using the rain close to where it falls.
- allowing water to soak into the ground (infiltration).
- slowly transporting (conveying) water on the surface.
- filtering out pollutants.
- allowing sediments to settle out by controlling the flow of the water.

Source: Susdrain, SuDS principles.
<http://www.susdrain.org/delivering-suds/using-suds/suds-principles/suds-principals.html>

5.0 SUSTAINABLE URBAN DRAINAGE SYSTEMS CALCULATIONS



5.0 SUSTAINABLE URBAN DRAINAGE SYSTEMS CALCULATIONS

8.1 CALCULATIONS FOR SURFACE WATER RUN OFF

SUSTAINABLE URBAN DRAINAGE SYSTEMS CALCULATIONS

These requirements include London Plan Policy 5.13 Drainage hierarchy contained within National SuDS Standards.

- Sustainable Drainage Strategies Calculations include:
- Information about the design storm period and intensity
 - Method employed to delay (attenuate) and control the rate of surface water discharged from the site as close to greenfield runoff rates as reasonably practicable, and
 - The measures taken to prevent pollution of the receiving groundwater and / or surface waters.

CALCULATIONS

London Borough of Haringey SFRA says that “Surface water discharge from proposed development sites should mimic that of a present day green field site, up to and including a 1:100 AEP critical storm event including an allowance for climate change. Green field runoff rates should be maintained irrespective of whether the site falls within an area designated as being effected by flood risk from any source”.

The following calculations are based on Constant Rate Method for green areas runoff, Wallingford Procedure for impermeable areas runoff and IH 124 Method for greenfield runoff.

PERMEABLE RUN OFF RATES

The proposed permeable area it is made from:

- 108.5 m2 of green roof
- 129.7 m2 of garden

For a peak run off rate for 60 minutes in a 100-year storm return period + 40% climate change, the existing flow rate is 1.40 l/sec.

Based on Constant Rate Method, the formula is as follows:

FORMULA			
Runoff= Area x RC x RI	Area	Catchment Area	Area in m2
	RC	Runoff Coefficient	0.3
	RI	Rainfall Intensity	0.014 l/s/m2

Peak Run off rate for 60 minutes storm a 100 year return period

Runoff=	Area x 0.3 x 0.014	1.00l/sec
	+40% Climate Change	1.40l/sec

POST- DEVELOPMENT RUN OFF FROM GARDEN +GREEN ROOF (INCLUDING 40% CLIMATE CHANGE FACTOR)	5.04m3
--	--------

IMPERMEABLE RUN OFF RATE

- The proposed impermeable area is 161.8 m2 which corresponds to:
- 44.0 m2 of roof
 - 117.8 m2 of paving

For a peak run off rate for 60 minutes in a 100-year storm return period, the proposed flow rate is 0.44 l/sec, with a 40% increase for climate change is 0.62 l/ sec. Based on Wallingford Procedure, the formula used is as follows:

FORMULA	
Pr (-) = 0.829*PIMP + 25*SOIL + 0.078*UCWI – 20.7	
PIMP	Percentage Impermeable
WRAP SOIL Index	Winter Rain Acceptance Potential
UCWI	Urban Catchment Wetness Index

Peak Run off rate for 60 minutes storm a 100 year return period

Total Design Runoff	0.44 l/sec
+40% climate change	0.62 l/sec

POST- DEVELOPMENT RUN OFF M100-60 FROM IMPERMEABLE ROOF AND HARDLANDSCAPED AREAS (INCLUDING 40% CLIMATE CHANGE FACTOR)	2.23m3
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5.0 SUSTAINABLE URBAN DRAINAGE SYSTEMS CALCULATIONS

GREENFIELD RUNOFF VOLUME

For Greenfield runoff calculations, the IH 124 Method was used and the formula is as follows:

FORMULA			
Runoff= Area x RC x RI	Area	Catchment Area (400 m2)	Area in m2
	SOIL	Winter Rainfall Acceptance Potential	0.3
	SAAR	Standard Annual Average Rainfall	613

Peak Runoff rate for 60 minutes storm 100 year return period

Runoff=	Area x 0.3 x 613	0.20 l/sec
	+40% CLIMATE CHANGE	0.28 l/sec

GREENFIELD RUNOFF RATE AS PER CONSTANT RATE METHOD	1.01m3
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POST-DEVELOPMENT RUNOFF FROM IMPERMEABLE ROOF AND HARDLANSCAPED AREAS (INCLUDING 40% CLIMATE CHANGE FACTOR)	2.23m3
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POST-DEVELOPMENT RUNOFF FROM GREEN ROOF AND GARDEN (INCLUDING 40% CLIMATE CHANGE FACTOR)	5.04m3
---	--------

TOTAL STORAGE REQUIRED TO MIMIC GREENFIELD RUNOFF RATE (2.23 m3 + 5.04 m3 – 1.01 m3)	6.26m3
---	--------

The Haringey SFRA indicates to use SuDS measures wherever practical and achieve 50% attenuation of undeveloped site's surface water runoff at peak times.

The proposed development will achieve best practice as it would discharge less surface water than the greenfield run off rates of the site with an attenuation volume of 7.10m3, including

- 3.80m3 of green roof
- 3no x 1000 litres rainwater tanks and
- 3no x 100 litres rainwater butts.

SUDS CAPACITY

There are 3no systems to minimize rainwater runoff. These include

- 3.80 m3 of green roof (108.5 m2 area)
- 3no x 1000 LT Rainwater tanks
- 3no X 100 LT Water Butts

SUDS	ATTENUATION VOLUME
Green roof (108.5 m2) 100 mm total depth	3.80 m3
3no X 100 LT Water Butts	0.30 m3
3no. X 1000 LT Rainwater Tanks	3.00 m3
TOTAL STORAGE VOLUME ACHIEVED	7.10 m3



6.0 WATER DEMAND REDUCTION STRATEGY



6.0 WATER DEMAND REDUCTION STRATEGY

RAINWATER TANK

The proposed development should achieve an internal water efficiency consumption of less than 110 litres / person / day.

These water efficiency calculations show the outline the specifications for maximum water consumption rates calculated per person per day.

Calculations were performed for a typical house based on the guidance shown in the BRE Code for Sustainable Homes.

The following water fittings preliminary specification would achieve Code Level 4 water efficiency with a consumption of less than the requirement of 110 litres per person per day.

The below combination is shown in Table 01 and Figure 09 would achieve 94 litres per person per day.

The maximum number of users in the development per dwelling would be 6no. Therefore:
6no x 94 litres x 1 day = 564 litres per dwelling per day

Rainwater will be collected for WCs and washing machines, which is estimated to be around 33 litres per person per day.

Therefore, 33 l/p/day x 6 users x 5no day storage = **990 litres**

THE PROPOSED RAINWATER TANK FOR EACH PROPERTY WOULD STORE **1000 LITRE FOR RE-USE.**

RAINWATER TANK	
3no X 1000 LT Rainwater tank for re-use	3.0 m3

TABLE 2– LOW WATER USE FITTINGS – PRELIMINARY SPECIFICATION

INSTALLATION TYPE	QUANTITY	CAPACITY / FLOW RATE	UNITS	COMPLIANT EXAMPLE	IMAGE
WC DUAL FLUSH	1	3 / 4.5	LITRES / FLUSH	VILLEROY & BOCH ARCHITECTURA PLUS	
TAPS	1	2	LITRES / MINUTE	ARMITAGE SHANKS CONTOUR 21 A4 169 AA	
BATH (ONLY)	1	110 MAXIMUM	LITRES TO OVERFLOW	ARMITAGE SHANKS SANDRINGAM 21 S183901	
SHOWER	1	6	LITRES / MINUTE	Armaglide 2 – 1861– B9304AA	
SINK TAPS / KITCHEN	1	5	LITRES / MINUTE	ARMITAGE SANDRINGHAM SL 1855 B444 9A	
DISHWASHER	1	1.25	LITRES/ SETTING	GENERIC	N/A
WASHING MACHINE	1	8.17	LITRES/ KG DRY LOAD	GENERIC	N/A



6.0 WATER DEMAND REDUCTION STRATEGY

FIGURE 09– WATER CALCULATION SUMMARY

You are within your target maximum consumption of potable water (105 litres per person per day)

Total water consumption from your calculation 94.36 litres per person per day

This calculator is intended to inform design choices by demonstrating the likely impact of specification changes on total water consumption. Results can only be used to demonstrate compliance with the Code for Sustainable Homes when the calculations have been verified by suitably qualified. Code for Sustainable Homes assessor.

Installation type	Unit of measure	Capacity/ flow rate	Use factor	Fixed use	Litres/person/day
WCs (single flush)	Flush volume (litres)		4.42	0	15.47
WCs (dual flush)	Average effective flushing volume (litres)	3.5			
Taps (excl. Kitchen/utility room)	Flow rate (litres/minute)	2	1.58	1.58	4.74
Bath (shower also present)	Capacity to overflow (litres)	130	0.11	0	14.3
Shower (bath also present)	Flow rate (litres/minute)	2	1.58	1.58	4.74
Kitchen/utility room sink taps	Flow rate (litres/minute)	5	0.44	10.36	12.56
Washing machine	Litres/kg/ dry load	8.17	2.1	0	17.16
Dishwasher	Litres/place setting	1.25	3.6	0	4.5
Waste disposal unit	Litres/use		3.08	0	
Contribution from Grey Water					undefined
Contribution from Rain Water					32 liters (average contribution in liters per day in rainwater for WCs and washing machine)
Normalisation factor					>x 0.91

RAINWATER BUTT

The rainwater butt proposed for each property would store 100 litre for re-use for irrigation.

RAINWATER BUTT	
3no X Rainwater butt 100LT for re-use	0.30 m3

GREEN ROOF

There is a growing body of evidence that green roofs considerably reduce the volume of runoff in warmer periods when the soil moisture deficit is high.

The process is as follows:

Roof Area X Depth X Maximum water holding capacity (MWHC) = Total Volume

GREEN ROOF	
Area of Green Roof	108.5 m2
Total Depth	0.10 m
MWHC	35 %
Volume of Storage	3.80 m3

TOTAL SUDS	
GREEN ROOF (AREA 108.5 m2 X 100mm DEPTH)	3.80 m3
3NO. X WATER BUTT (3no. X 100 LITRES)	0.30 m3
3no. RAINWATER TANK (3no. X 1000 LITRES)	3.00 m3
TOTAL STORAGE VOLUME	7.10 m3



7.0 SUSTAINABLE URBAN DRAINAGE SYSTEMS BENEFITS



7. SUSTAINABLE URBAN DRAINAGE SYSTEMS (SUDS) BENEFITS

SUSTAINABLE URBAN DRAINAGE SYSTEMS (SUDS)

Surface water arising from a developed site should, as far as is practicable, be managed in a sustainable manner to mimic the surface water flows arising from the site prior to the proposed development, while reducing the flood risk to the site itself and elsewhere, taking climate change into account.

Reducing the rate of surface water discharge from urban sites is one of the most effective ways of reducing and managing flood risk. Sustainable Drainage Systems (SuDS) is an effective way of mitigating food risk, and as such is encouraged in policy LP21.

Policy LP21 of the Redbridge Local Plan 2015-2030 says that utilising Sustainable Drainage Systems (SuDS) in line with the drainage hierarchy, to achieve a greenfield runoff rate where feasible. Where possible, SuDS should also be designed to deliver other benefits, such as improved water quality, and enhancing biodiversity.

Based on the London Plan 2021 Policy SI 13 Sustainable Drainage:

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

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

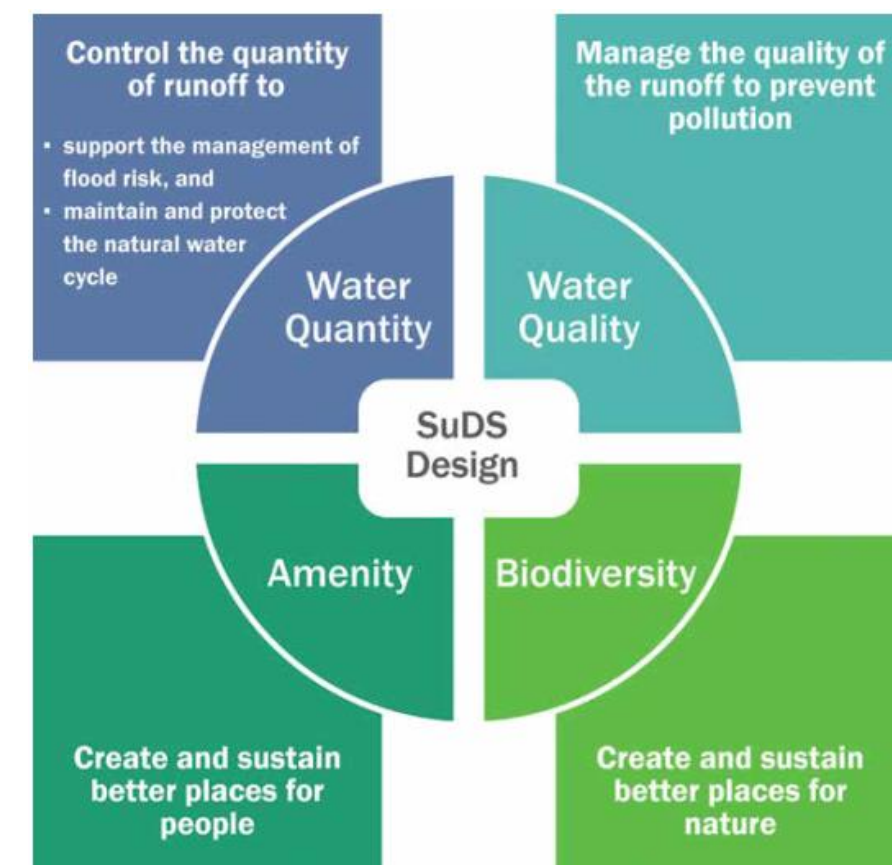
The SUDs strategies proposed in this report comply with the drainage hierarchy as follows:

- 3no x 1000 LT rainwater tanks
- 3no x 100 LT water butts
- 3.80 m3 of green roof

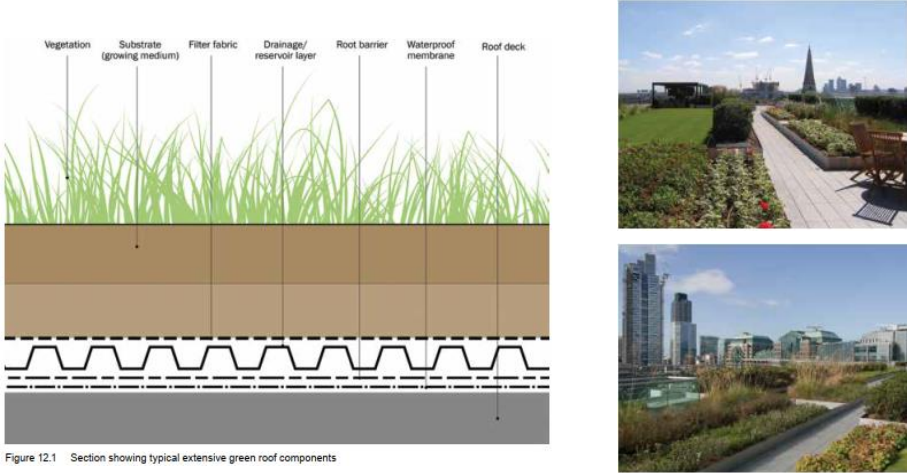
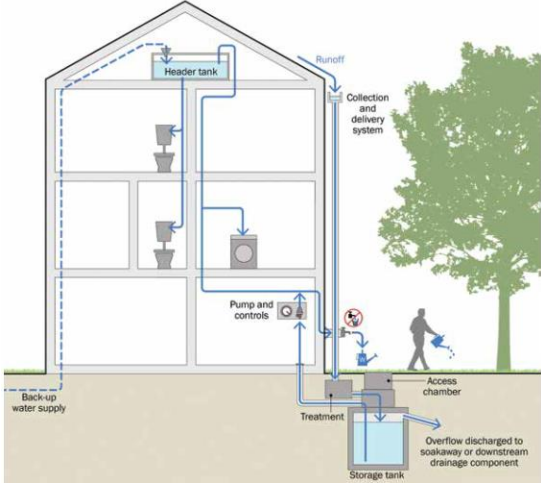
The various types of SUDS which can include:

- Permeable Paving (Infiltration).
- Soakaways (Infiltration).
- Swales and Basins.
- Green roofs and rainwater re-use.
- Infiltration trenches and filter drain.
- Ponds and Wetlands.
- Geocellular Systems.
- Storm storage tanks.
- French drains
- Bioretention systems (rain gardens)

Preferably a combination of these techniques should be used as part of the surface water management train, and it is important for all stakeholders, to work together at the planning stage in order to determine a feasible solution.



7. SUSTAINABLE URBAN DRAINAGE SYSTEMS (SUDS) BENEFITS

COMPONENT TYPE	DESCRIPTION	FIGURE	FEASIBLE FOR THE PROPOSED DEVELOPMENT?
GREEN ROOF Performance Peak flow reduction: Medium Volume reduction: Medium Water quality treatment: Good Amenity potential: Good Ecology potential: Good	Green roofs comprise a multi-layered system that covers the roof of a building or podium structure with vegetation cover/landscaping. The roof is likely to consist of an impermeable layer, a substrate or growing medium and a drainage layer (although not all green roofs require a drainage layer). Green roofs are designed to intercept and retain precipitation, reducing the volume of runoff and attenuating peak flows. In this case an extensive roof is proposed, this type of green roofs have low substrate depths, simple planting and low maintenance requirements; they tend not to be accessible.	 Figure 12.1 Section showing typical extensive green roof components	
RAINWATER HARVESTING Performance Peak flow reduction: High (depends on design) Volume reduction: High (depends on design) Water quality treatment: Poor Amenity potential: Poor Ecology potential: Poor	Rainwater harvesting (RWH) is the collection of rainwater runoff for use. Runoff can be collected from roofs and other impermeable areas, stored, treated (where required) and then used as a supply of water for domestic, commercial, industrial and/or institutional properties. RWH systems have a number of key benefits: ▪ They can meet some of the building's water demand, delivering sustainability and climate resilience benefits. ▪ They can help reduce the volume of runoff from a site. ▪ They can help reduce the volume of attenuation storage required on the site. The collected water is proposed to be used for flushing toilets, washing machines and for external uses such as car washing and irrigation.	 Figure 11.4 A conceptual pumped rainwater harvesting system	
RAINWATER BUTT 100L FOR RE-USE Performance Peak flow reduction: depends on design Volume reduction: depends on design Water quality treatment: Poor Amenity potential: Poor Ecology potential: Poor	Small-scale garden water storage device that collects rainwater from the roof via the drainpipe. In practice, their value is limited to domestic watering during dry periods when there is garden water in the container. Water butts do not guarantee that storage will always be available, unless the system is designed so that any water stored above a set threshold drains slowly to the downstream drainage system or to soakaway. The collected water can generally be used for a range of external uses such as car washing and irrigation or any other outdoor job.		

8.0 SUSTAINABLE URBAN DRAINAGE SYSTEMS STRATEGY



8.0 SUSTAINABLE URBAN DRAINAGE SYSTEMS (SUDS) STRATEGY

METHODS EMPLOYED TO DELAY (ATTENUATE) AND CONTROL THE RATE OF SURFACE WATER DISCHARGED FROM THE SITE AS CLOSE AS POSSIBLE TO GREENFIELD RUNOFF RATES

- The proposed development will have a total of 3no systems to minimize rainwater runoff. These include: 3no X 1000 litres rainwater harvesting tanks, 3.80 m3 of storage capacity in green roof and 3no X 100 litres water butts.
- For each dwelling the process would be as follows:
- Two thirds of the main green roof and impermeable roofs will collect rainwater towards a 1000 litres rainwater tank. All of the rear hard landscaped areas will drain into a manhole with a sump pump to divert rainwater towards the rainwater tank. In the case of overflow, this will go towards a French drain. If saturated it will divert into Oak Lane surface water sewer.
- One third of the main roof will collect rainwater for 100 litres rainwater butts. Its overflow and front sunken patios will collect rainwater in a manhole with a sump pump that will collect rainwater towards the rear rainwater tanks.
- The rainwater tanks will have a minimum water level of 100 litres supply fed from Thames Water with a sensor to always supply WCs and washing machines.

The combination of the above methods would delay (attenuate) and control the rate of surface water discharged from the site, reducing the current discharge rates, including rainwater storage, to mimic greenfield runoff rates, including 40% climate change factor.

The SUDs and water calculations presented in this report will need to be continuously updated through the detailed design and construction stages to reflect any changes in the project performance.

FIGURE 10 –1000 LITRE UNDERGROUND STORM STORAGE (ENDURAMAXX OR SIMILAR)



Dimensions (mm) 1420 L x 1100 W x 1020 H

8.0 SUSTAINABLE URBAN DRAINAGE SYSTEMS (SUDS) STRATEGY

FIGURE 11 – WATER BUTT WALL MOUNTED 100 LITRES

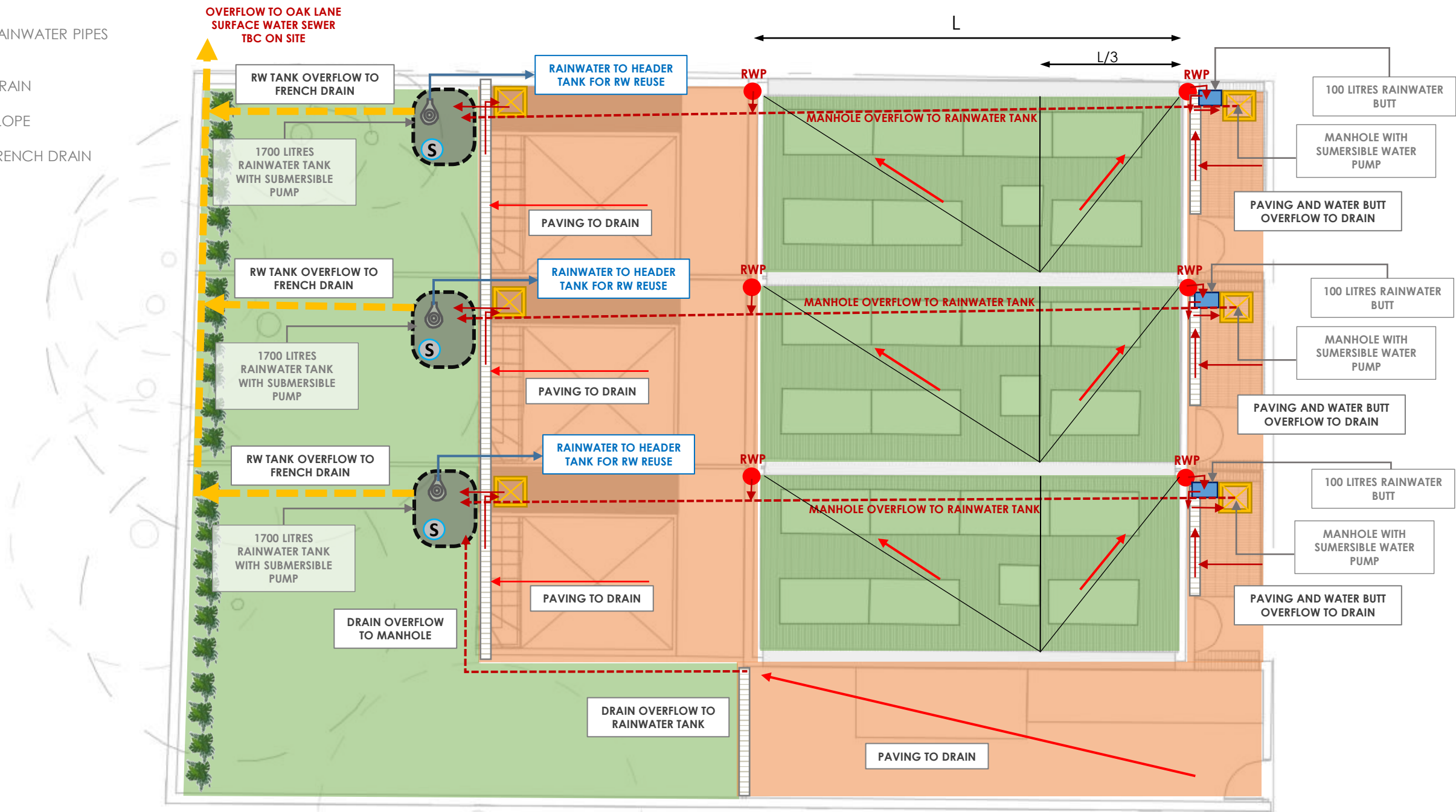


8.0 SUSTAINABLE URBAN DRAINAGE SYSTEMS (SUDS) STRATEGY

FIGURE 12 – PROPOSED LOWER GROUND FLOOR (SUDS)

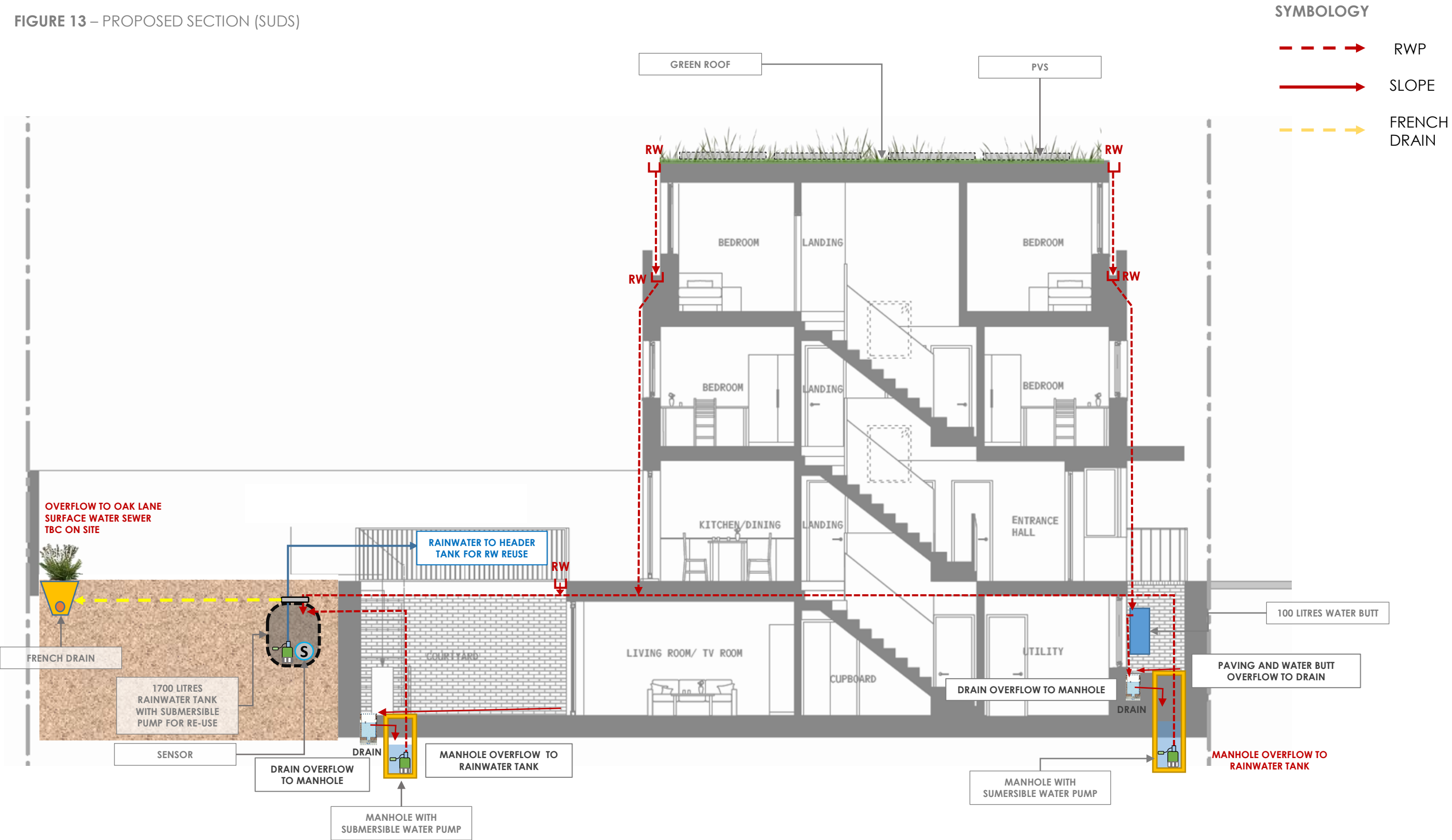
SYMBOLOLOGY

- DRAINAGE PIPE AT 2% SLOPE
- RWP RAINWATER PIPES
- DRAIN
- SLOPE
- FRENCH DRAIN



8.0 SUSTAINABLE URBAN DRAINAGE SYSTEMS (SUDS) STRATEGY

FIGURE 13 – PROPOSED SECTION (SUDS)



9.0 SUSTAINABLE URBAN DRAINAGE SYSTEMS MAINTENANCE



9.0 SUSTAINABLE URBAN DRAINAGE SYSTEMS (SUDS) MAINTENANCE

RAIN WATER TANKS

One of the benefits of a rainwater tank is that it requires little maintenance. Rainwater itself is relatively clean. However, the sedimentation tanks would need cleaning every 6no months. The rainwater tanks should be cleaned once a year.

Rainwater is collected from the roof (in the gutters) and flows down the downpipes into the rainwater tank.

The downpipes will be fitted with a leaf diverter, to stop leaves travelling through the downpipe and then in to the tank. They should also be fitted with a First Flush device or sedimentation tank, which helps divert a small amount of water away from the tank when it first rains, thereby preventing roof debris from entering.

Rainwater enters the tank through a screen at the top, being the final pre-filtration. This screen and the overflow pipe screen prevent mosquitos and other animals entering the tank. Rainwater is transported from the tank by a pump residing either within, or outside of the tank.

This pump will deliver water to the WCs and urinals. To facilitate rainwater harvesting, the system will be fitted with a Mains Bypass Device or Tank Top-up System. This means that when there is no available rainwater, the system will automatically use mains water.

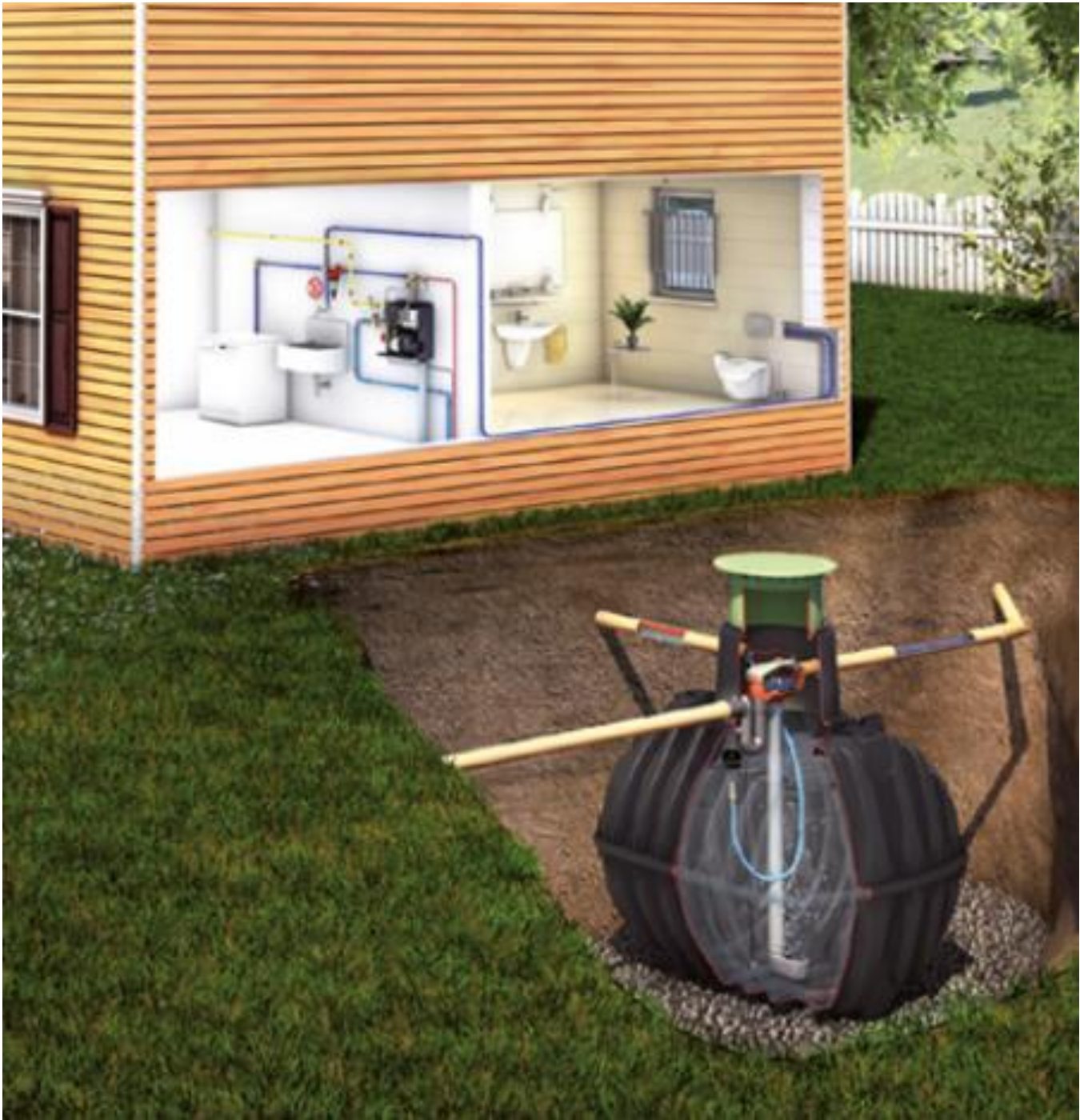


TABLE 11.6 Operation and maintenance requirements for RWH systems			
Maintenance schedule	Required action	Typical frequency	
Regular maintenance	Inspection of the tank for debris and sediment build-up, inlets/outlets/withdrawal devices, overflow areas, pumps, filters	Annually (and following poor performance)	
	Cleaning of tank, inlets, outlets, gutters, withdrawal devices and roof drain filters of silts and other debris	Annually (and following poor performance)	
Occasional maintenance	Cleaning and/or replacement of any filters	Three monthly (or as required)	
Remedial actions	Repair of overflow erosion damage or damage to tank	As required	
	Pump repairs	As required	

9.0 SUSTAINABLE URBAN DRAINAGE SYSTEMS (SUDS) MAINTENANCE

GREEN ROOF

Intensive green roofs are likely to require regular inspection and maintenance. The most maintenance is generally required during the establishment stage (12 to 15 months), and this should usually be made the responsibility of the green roof provider. Maintenance contractors with specialist training in green roof care should be used, where possible.

Table 12.5 of the CIRIA SuDS Manual provides guidance on the type of operational and maintenance requirements that may be appropriate. The list of actions is not exhaustive and some actions may not always be required.



TABLE 12.5	Operation and maintenance requirements for green roofs		
	Maintenance schedule	Required action	Typical frequency
Regular inspections		Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
		Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms
		Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
		Inspect underside of roof for evidence of leakage	Annually and after severe storms
Regular maintenance		Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six monthly and annually or as required
		During establishment (ie year one), replace dead plants as required	Monthly (but usually responsibility of manufacturer)
		Post establishment, replace dead plants as required (where > 5% of coverage)	Annually (in autumn)
		Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
		Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
		Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate	Six monthly or as required
Remedial actions		If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material, and sources of erosion damage should be identified and controlled	As required
		If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

10.0 CONCLUSIONS



10.0 CONCLUSION

INTRODUCTION

This report was commissioned by vPPR Architects to provide a Sustainable Drainage Systems including surface water runoff and water demand reduction strategies for the proposed development located at 24 and 26 Maidstone Road, Oak Lane, N11 2TL.

Reason:

1. To comply with Policy DM21 of the Development Management Document which requires developments to demonstrate sustainable design:
 - Set out how water demand will be reduced, e.g. rainwater harvesting, grey water system.
 - Set out how surface water runoff will be reduced, that it will be separated from wastewater and not discharge into the sewer.

2. To comply with Haringey's Local Plan and Haringey Council Strategic Flood Risk Assessment which states the following:

The Haringey Local Plan (2017) requires that all development in Haringey to be water efficient during construction and operation and to reduce all forms of flood risk, also to implement Sustainable Drainage Systems (SUDs) from strategic to individual site level to improve water attenuation, quality and amenity.

Surface water discharge from proposed development sites should mimic that of a present day green field site, up to and including a 1:100 AEP critical storm event including an allowance for climate change. Green field runoff rates should be maintained irrespective of whether the site falls within an area designated as being effected by flood risk from any source.

Use SuDS measures wherever practical and achieve 50% attenuation of undeveloped site's surface water runoff at peak times.

ECostudio XV Ltd, has prepared this SUDs report in line with the following guidance:

- London Borough of Haringey Local Plan Strategic Policies (2013-2026)
- Haringey Council Strategic Flood Risk Assessment 2015.
- The National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) explains that sustainable development should not increase flood risk elsewhere, and it gives priority to the use of sustainable drainage systems. This is reflected in the Government's guidance on Flood Risk and Coastal Change updated in March 2015.

The Sustainable Urban Drainage System (SUDs) strategies taken into account in this report includes:

- 3no X 100 litres water butt
- 3no X 1000 litres rainwater tank
- 3.80 m3 of storage capacity in green roof (108.5 m2 area)

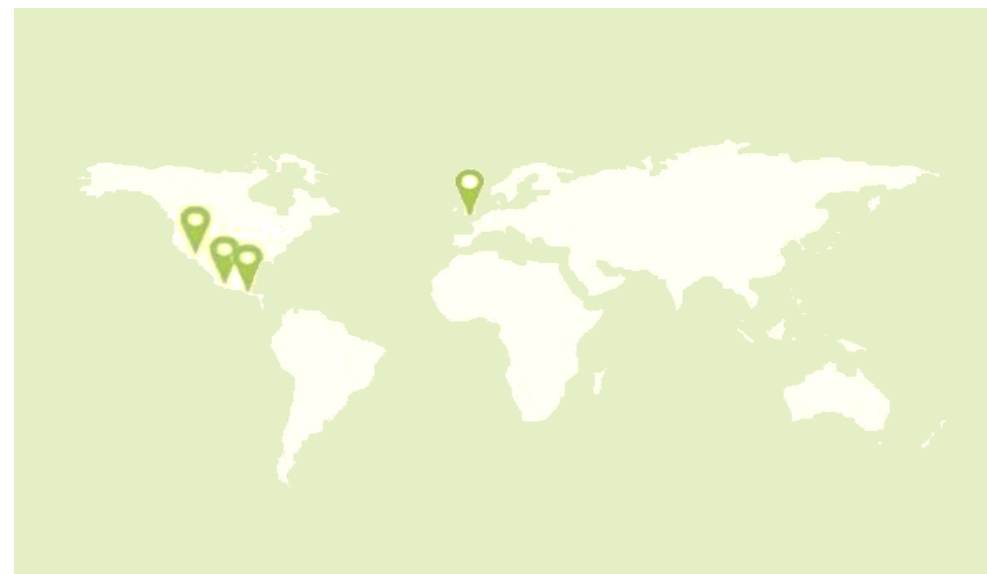
The proposed attenuation volume of the proposed SUDS would be **7.10 m3**, including rainwater reuse. The amount of storage required to achieve the greenfield run off rate for a 100 year 60 minutes storm duration, including +40% climate change factor is **6.26 m3**.

METHODS EMPLOYED TO DELAY (ATTENUATE) AND CONTROL THE RATE OF SURFACE WATER DISCHARGED FROM THE SITE

- **3no X 100 litres water butt for re-use**
- **108.5 m2 Green Roof with 100mm depth (3.80 m3)**
- **3no X 1000 litres rainwater tank for re-use**

The combination of the above methods would delay (attenuate) and control the rate of surface water discharged from the site to mimic greenfield runoff rates. This way the surface water run off will be separated from wastewater and not discharged into the sewer. There is an overflow in the remote case that the system collapses, which is unlikely.

The SUDs and water calculations presented in this report will need to be continuously updated through the detailed design and construction stages to reflect any changes in the project performance.



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