103 St Margaret's Ave, Sutton

Sustainable Urban Drainage System (SuDS) Strategy

Revision: P01

Date: 22nd July 2023

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1. Introduction

1.1 We are appointed by our client to prepare a site-specific SuDS Strategy report for this project (case reference: DM2023/00891) to address London Borough of Sutton planning officer's comments below:

A SuDS strategy must be provided setting out details of all proposed site drainage/SuDS measures and documentary evidence to demonstrate how the proposed development will meet the following requirements in Policy 32;

> *use SuDS unless there are practical reasons for not doing so and aim to achieve greenfield run-off rates by managing run-off as close to source as possible in line with the Mayor's drainage hierarchy;*
>
> *if greenfield rates cannot be achieved, ensure that the runoff rate in the 1 in 100 year rainfall event (plus climate change) is no more than three times the calculated greenfield rate for the same event;*
>
> *demonstrate that the proposed site drainage/SuDS strategy can contain the 1 in 30 year rainfall event (plus climate change) without flooding; any flooding occurring between the 1 in 30 and 1 in 100 year event (plus 30% for climate change) will be safely*

Figure 1- Site Location Plan

2. Site Description

2.1 Site Location

2.1.1 The site is located on east side of 103 Margaret side garden which is also within the owners plot.

2.1.2 The site address is: 103 St Margarets Avenue North Cheam Sutton SM3 9TX. The site location plan is shown in Figure 1.

2.2 Existing Development

2.2.1 The site is currently an existing side end of the garden owned by the resident at No 103 St Margarnet road. The existing garage is detached from the main house and the garage will be demolished and cleared for new proposal.

2.3 Proposed Development

2.3.1 The proposal of the development is an erection of a semi-detached two storey extension with refuse storage and parking to the front and cycle storage to rear.

2.3.2 A copy of proposed architect plans is included in the Appendix A.

3. Planning Policy

3.1 National Planning Policy Framework (NPPF) – July 2021

3.1.1 The National Planning Policy Framework (NPPF) was revised on 20 July 2021 and sets out the government's planning policies for England and how these are expected to be applied. This revised NPPF is supported by the Planning Practice Guidance (PPG), an online resource published in 2016. The PPG supersedes the PPS25 Practice Guide and the Technical Guidance to the National Planning Policy, as detailed in the Ministerial Statement 'Making the planning system work more efficiently and effectively.

3.1.2 The NPPF and PPG must be taken into account in the preparation of local and neighbourhood plans, and are a material consideration in planning decisions. They constitute guidance for local planning authorities (LPAs) and decision-takers, both in drawing up plans and as a material consideration in determining applications.

3.1.3 The NPPF and PPG recommend that Local Plans should be supported by a SFRA and develop policies to manage flood risk from all sources, taking account of advice from the EA and other relevant flood risk management bodies, such as LLFAs and Internal Drainage Boards (IDBs). Paragraph 161 of the NPPF states *"All plans should apply a sequential, risk-based approach to the location of development – taking into account the current and future implications of climate change – so to avoid, where possible, flood risk to people and property, they should do this, and manage any residual risk, by:*

- *Applying the Sequential Test and then, if necessary, the Exception Test as set out below;*
- *Safeguarding land from development that is required, or likely to be required, for current and future flood management;*
- *Using opportunities provided by new development and improvements in green and other infrastructure to reduce the causes and impacts of flooding, (making as much use as possible of natural flood management techniques as part of an integrated approach to flood risk management); and*
- *Where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to relocate development, including housing, to more sustainable locations*".

3.2 Regional Planning Policy – The London Plan March 2021

Policy SI 13 *– Sustainable Drainage*

A. 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. Increases in surface water run-off outside these areas also need to be identified and addressed.

B. 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.

C. Development proposals for impermeable surfacing should normally be resisted unless they can be shown to be unavoidable, including on small surfaces such as front gardens and driveways.

D. Drainage should be designed and implemented in ways that promote multiple benefits including increased water use efficiency, improved water quality, and enhanced biodiversity, urban greening, amenity and recreation.

3.3 Local Planning Policy – Sutton Local Plan 2016-2031

Policy 32 – Flood Risk and Sustainable Drainage

Sustainable Drainage (SuDS)

Proposed developments should incorporate effective sustainable drainage (SuDS) measures as part of the design and layout of the development in order to manage surface water run-off as close to its source as possible and achieve the following minimum SuDS performance standards through application of the Mayor's drainage hierarchy:

1) *Greenfield sites: ensure that peak run-off rates and volumes for the 1 in 100 year rainfall event never exceed greenfield run-off rates for the same event.*

2) *Previously developed sites: ensure that peak run-off rates and volumes for the 1 in 100 year event achieve greenfield run-off rates for the same event, unless it can be demonstrated that all opportunities to minimise final site run-off, as close as reasonably practicable to greenfield runoff rates, have been taken in line with the Mayor's drainage hierarchy. In such cases, run-off rates must not exceed 3 times the calculated greenfield rate in accordance with the Mayor's Sustainable Design and Construction SPG; and*

3) *ensure that the site drainage strategy can contain the 1 in 30 year event (+ climate change) without flooding and that any flooding occurring between the 1 in 30 and 1 in 100 year event (+ climate change) will be safely contained on site.*

All major development proposals should be accompanied by a Drainage Assessment Form and relevant surface water run-off calculations to demonstrate that the council's minimum SuDS performance standards in Part (b) have been met, having regard to national SuDS standards, London Plan Policy 5.13, the Mayor's Sustainable Design and Construction Supplementary Planning Guidance (SPG), Sutton's SFRA Level 1 Report and other sources of guidance and best practice.

All development proposals should include details of how each SuDS measure, and the site drainage strategy as a whole, will be managed and maintained throughout its lifetime, including proposed arrangements for adoption where relevant.

All proposed SuDS measures should be designed to contribute towards the aims of Policy 33 'Climate Change Adaptation', Policy 34 'Environmental Protection', Policy 26 'Biodiversity' with regard to urban cooling, biodiversity, water resources, air quality and creating linked networks of blue and green spaces. Developments adjacent to the Wandle should seek to contribute to the aims of: Policy 5 'Wandle Valley Renewal', the Wandle Catchment Plan, the Mayor's All London 'Green Grid' EA's Thames Basin Management Plan. Strategic Documents

3.4 Strategic Documents

3.4.1 The following strategic documents were used to inform the report's findings:

The London Plan, March 2021
Sutton Local Plan 2016-2032, February 2018
CIRIA – The SuDS Manual (C753), December 2015
CIRIA – Development and Flood Risk Guidance for Construction Industry (C624), 2004
Building Regulations 2010 – Approved Document Part H (Drainage and waste disposal)
BS8582 – Code of practice for surface water management for development sites

4. Existing Drainage

4.1 Existing Drainage Arrangement

4.1.1 The existing house foul water is currently served by an existing foul water drainage running underneath the existing kitchen via gravity.

4.1.2 The existing house also has 1no. rainwater downpipe at the rear. The runoff from rainwater downpipe drains into a manhole and flows into the same existing foul water drainage run. Both existing foul and surface water pipe runs will be remained.

4.2 Greenfield Runoff Rates

4.2.1 Greenfield runoff rates for the site have been estimated from the www.uksuds.com website using IH124 method. Table 1 below shows the Greenfield runoff rates for the site.

4.2.2 A copy of the greenfield runoff calculation is included in the Appendix B of this report.

Return Period	Greenfield Runoff Rates (l/s)
1 in 1 year	0.14
Qbar	0.16
1 in 30 year	0.38
1 in 100 year	0.52

Table 1 – Greenfield Runoff Rates

4.3 Existing Surface Water Discharge

4.3.1 The existing surface water runoff rates have been calculated in accordance with the Modified Rational Method. See Table 2 below summary of the existing surface water discharge rates.

Return Period	Existing Runoff Rates (l/s)
1 in 1 year	1.21
1 in 30 year	2.97
1 in 100 year	3.86

Table 2 – Existing surface water discharge rate

4.3.2 A copy of the existing surface water flow rate calculation and catchment plan is included in the Appendix C of this report.

5. Proposed Drainage Strategy

5.1 Surface Water Drainage Hierarchy

5.1.1 The proposed drainage strategy for the design of the surface water system should in line with London Plan Policy 5.13 SuDS Hierarchy as below:

1) Store rainwater for later use

A water butt is proposed so that surface water runoff can be reused for garden irrigation.

2) Use infiltration techniques, such as porous surfaces in non-clay areas;

Full infiltration is not feasible due to space constraints, as well as the sits above London Clay Formation. However, a shallow partial infiltration system with perforated pipe underneath is still a viable option.

We've proposed a permeable paving system in the front driveway to allow water partially infiltrate into the ground and collected in the perforated pipe before discharge into the existing surface water sewer.

3) Attenuate rainwater in ponds or open water features for gradual release;
Not feasible.

4) Attenuate rainwater by storing in tanks or sealed water features for gradual release;
It's neither economic nor sustainable solution to build a below ground attenuation tank for this scale project.

5) Discharge rainwater direct to a watercourse;
Not applicable. There is no watercourse in the vicinity of the site.

6) Discharge rainwater to a surface water sewer/drain;
The proposal is to discharge surface water runoff into a site wide surface water sewage system at Windsor Ave.

7) Discharge rainwater to the combined sewer.
Not applicable. We have separate existing Thames Water surface and foul water sewers at Windsor Ave.

5.2 Sustainable Urban Drainage Systems (SuDS)

5.2.1 SuDS will be used where practicable and viable throughout the site to provide source control management, improve water quality, reduce flood risk and provide amenity and biodiversity.

5.2.2 A variety of SuDS have been considered for the site to aid in the capture of surface water. An analysis of the suitability of each of these systems for the site is described below.

Rainwater Harvesting

Rainwater harvesting tanks are used to store surface water for later reuse either for irrigation purposes or for flushing of toilets. This water is taken directly from the roof and not paving areas to ensure that pollution of water is kept to a minimum. An overflow from the rainwater tank is required to connect to the surface water drainage system to allow for surplus water to be disposed of.

A water butt is proposed to collect surface water runoff from the extension. Water stored in the water butt can be reused for garden irrigation.

Green Roofs

Green roofs aid with slowing down the runoff from the site and in dry periods capturing the first few millimetres of rain that falls. They will also help clean any water prior to it discharging off site. Blue roofs store rainwater at high level prior to discharge to the below ground drainage system.

Green roof is not proposed as the extension has a pitched roof.

Soakaways

Soakaway systems are reliant on infiltration into the ground to drain surface water. The feasibility of infiltrating surface water into the ground is reliant on the hydrogeology of the site.

A soakaway systems rely on a good infiltration rate. However, the site sits above London Clay formation which makes the site is not suitable for full infiltration.

Attenuation Basins/Ponds

Attenuation basins and ponds typically rely on infiltration into the ground to drain surface water. They can also be used to store large volumes of rainwater which can then be drained away from the site in a controlled manner using a flow restriction device.

An attenuation basin is not feasible due to space constraints and low infiltrate rate.

Permeable Paving / Porous surface

Permeable paving / porous surface allows water to soak through the surface course into a clean washed stone below for storage before either infiltrating into the ground of discharging into perforated drains set beneath the stone layers. The depth of this paving construction is typically 350-450mm in depth to allow for storage in the stone layers.

Permeable paving is proposed in the front driveway and parking bays to provide water treatment for petrol spillage, as well as attenuation storage for surface water runoff.

5.3 Proposed Surface Water Drainage Strategy

5.3.1 SuDS will be used where practicable and viable throughout the site to provide source control management, improve water quality, reduce flood risk and provide amenity and biodiversity.

5.3.2 In practice the proposed drainage strategy will aim to manage surface water runoff from the source via a range of measures, which are expected to comprise:

- A water butt is proposed to allow surface water runoff to be reused for garden irrigation.
- Permeable paving is proposed to provide attenuation storage for surface water runoff, and it also acts as a water quality control measure petrol spillage.
- Runoff from driveway and extension will be attenuated and treated via open grade aggregate sub-base underneath permeable paving.

5.3.3 Following London Borough of Sutton planning officer's response, we've proposed our site surface water discharge rate to be 3 times of the 1 in 30 years greenfield runoff rate. The greenfield runoff rates (Table 1 above) are too low to be used as proposed surface water flow rate. A minimum flow rate of 1l/s is required to minimise the risk of pipe blockage.

5.3.4 Table 3 below shows our proposed surface water discharge rates compared to 3 times greenfield runoff rates.

Return Period	Existing Flow Rate (l/s)	3 Times Greenfield Runoff Rates(l/s)	Proposed maximum discharge rates (l/s)
1 year	1.21	0.42	1.14
30 year	2.97	1.14	
100 year	3.86	1.56	

Table 3 – Comparison between Greenfield and Proposed Discharge Rates

Proposed surface water discharge rate is limited to a 3 times greenfield runoff rate at 1 in 30 years by using an hydrobrake device installed within the downstream manhole. Attenuation is provided within the Type 3 open-grade aggregate sub-base layer (150mm deep) underneath the permeable paving. A perforated pipe is proposed running within the sub-base layer to convey surface water runoff.

5.3.5 Thames Water has been consulted and they've agreed that a new surface water connection into their existing surface water sewer at Windsor Ave is acceptable (see Appendix). Contractor will liaise with Thames Water for the Section 106 connection approval for the new connection before they carry out construction work on site.

5.3.6 A proposed drainage plan is included in the Appendix E of this report, and a copy of filled-in Sutton SuDS proforma is include in the Appendix F of this report.

5.4 MicroDrainage Simulation Results

5.4.1 A simulation analysis for the proposed drainage network has been carried out for all storm events (1 in 1 year, 1 in 30 year, 1 in 100 years, and 1 in 100 years + 30% climate change) using Innovyze MicroDrainage.

5.4.2 Simulation results are summarised in Table 6 below:

Return Period	Surcharge (Y/N)	Flooding (Y/N)	Critical Flooding Volume (m3)
1 in 1 year	N	N	N/A
1 in 30 year	Y	N	N/A
1 in 100 year + 30%	Y	N	N/A

Table 4 – Simulation Results

The proposed drainage system has no flooding or surcharge for 1 in 1 year period, and no flooding for 1 in 30 years return period beyond.

5.4.3 A copy of the simulation analysis results is included in the Appendix G of this report.

5.5 SuDS Maintenance

5.5.1 The ongoing management and maintenance of the proposed surface water drainage systems will fall under the responsibility of the site owner.

5.5.2 Best practice maintenance information is provided within the CIRIA SUDS Manual. A copy of SuDS maintenance plan is included in the Appendix H of this report.

5.6 Proposed Foul Water Strategy

5.6.1 Proposed foul water will discharge into a new foul water inspection chamber and flow into the existing foul water run at the rear of the house via gravity. Contractor will liaise with Thames Water for a new drainage connection if required.

5.6.2 A copy of the proposed foul water strategy in included in the Appendix E of this report.

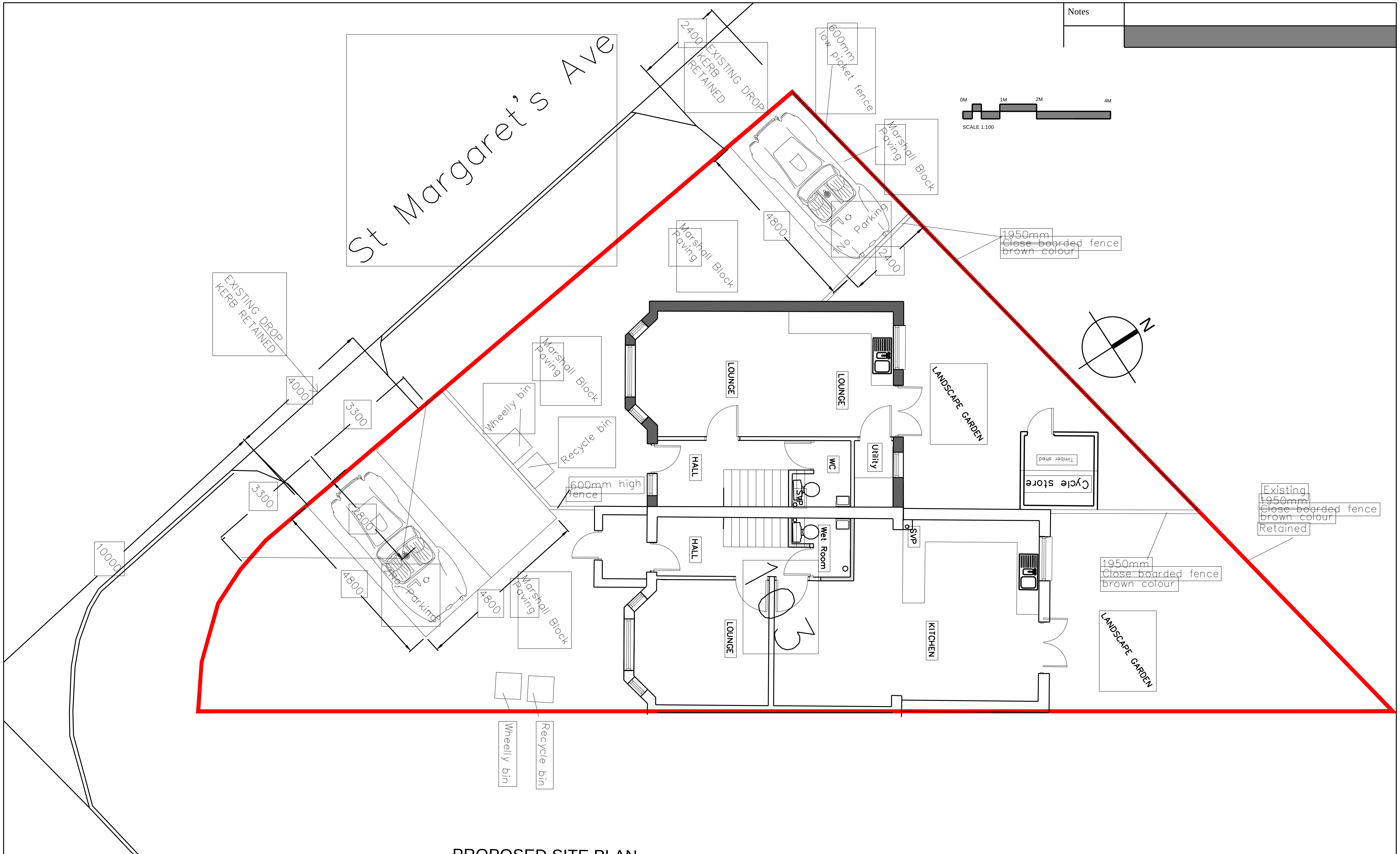
6. Conclusion

6.1.1 The SuDS Strategy can be summarised as follows:

- Water butt and permeable paving are proposed to improve water quality, reduce flood risk, and reduce downstream flooding risk
- Proposed surface water flow rate will be restricted to 1.14l/s which is equivalent to 3 times of the greenfield runoff at 1 in 30 years. This is the minimum flow rate required to avoid any pipe blockage.
- Attenuation storge is provided within the open grade aggregate sub-base under the permeable paving.
- Proposed foul water will drain into the existing foul water pipe run at the rear of the house via gravity.

Appendix A – Proposed Architect Plans

Notes



PROPOSED SITE PLAN

Project:	PROPOSED EXTENSION 103 St Margaret's Ave Sutton SM3 9TX
CLIENT:	
DATE:	01/02/19
CHECKED BY:	---
SCALE:	1/50@A3
DRAWN BY:	TA
REV:	Date

AH DESIGNS STUDIO

Loft conversion & Extension Specialists

PROPOSED SITE PLAN

190225/40G

REV: A

Appendix B – Greenfield Runoff Rate Calculation

hrwallingford

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff

Calculated by:	Yu Wu
Site name:	103 St Margarets Avenue
Site location:	SM3 9TX

Site Details

Latitude:	51.37112° N
Longitude:	0.21588° W
Reference:	963426078
Date:	Jul 18 2023 18:12

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

Runoff estimation approach: IH124

Site characteristics

Total site area (ha): 0.1

Methodology

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

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	638	638
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates

Default Edited

Q_{BAR} (l/s):	0.16	0.16
1 in 1 year (l/s):	0.14	0.14
1 in 30 years (l/s):	0.38	0.38
1 in 100 year (l/s):	0.52	0.52
1 in 200 years (l/s):	0.61	0.61

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

Appendix C – Existing Surface Water Runoff Calculation Results

Overview

In accordance with the CIRIA SuDS Manual 2015 where a site has been previously developed, there may be agreement that discharge limits can correspond to rates that the exist for the current state of the site (or a proportion of those rates). The preferred position should be to aspire to meet greenfield runoff rates and volumes, and any relaxation of this should be subject to an assessment of the current and future capacity of the receiving sewer or watercourse and agreement with the environmental regulator, drainage approving body and/or relevant sewerage company.

Pre-development Runoff Rates

The pre-development runoff rates have been calculated based on the Wallingford Procedure 'Modified Rational Method' equation shown below.

$$Q = 2.78\,C\,i\,A$$

where:

Q = design event peak rate of runoff (l/s)

C = non-dimensional runoff coefficient which is dependent on the catchment characteristics

$$C = C_V\,C_R$$

where C_V = volumetric runoff coefficient

C_R = dimensionless routing coefficient

i = rainfall intensity for the design return period (in mm/hr) and for a duration equal to the "time of concentration" of the network

A = total catchment area being drained (ha)

Note: 2.78 is a conversion factor to address the rainfall unit being in mm/hr.

Pre-development 1-year	

From Wallingford Procedure, Volume 3 Maps	
Rainfall Depths (M5 – 60min)	20
Rainfall Ratio (r)	0.406
Design Storm Return Period (P)	1 year
Time of Concentration (T_c)	15 mins
Therefore, average point intensity, i	31.144 mm/hr
Non-dimensional runoff coefficient, C	1.0
Total catchment area being drained, A	0.014 ha
Q1 = 2.78 x C x i x A	**1.21 l/sec**

Pre-development 30-year	
From Wallingford Procedure, Volume 3 Maps	
Rainfall Depths (M5 – 60min)	20
Rainfall Ratio (r)	0.406
Design Storm Return Period (P)	30 year
Time of Concentration (T_c)	15 mins
Therefore, average point intensity, i	76.42 mm/hr
Non-dimensional runoff coefficient, C	1.0
Total catchment area being drained, A	0.014 ha
Q_{30} = 2.78 x C x i x A	**2.97 l/sec**

Pre-development 100-year	
From Wallingford Procedure, Volume 3 Maps	
Rainfall Depths (M5 – 60min)	20
Rainfall Ratio (r)	0.406
Design Storm Return Period (P)	100 year
Time of Concentration (T_c)	15 mins
Therefore, average point intensity, i	99.19 mm/hr
Non-dimensional runoff coefficient, C	1.0
Total catchment area being drained, A	0.014 ha
Q_{100} = 2.78 x C x i x A	**3.86 l/sec**

Appendix D – Thames Water Response

------- Forwarded Message -------
From: DEVELOPER.SERVICES@THAMESWATER.CO.U
<DEVELOPER.SERVICES@THAMESWATER.CO.UK>
Date: On Wednesday, July 12th, 2023 at 07:46
Subject: RE: 103 St Margarets Avenue, North Cheam SM3 9TX _ Preapplication advice
To: [redacted]
m <[redacted]

Hello Mr Alege

Thank you for the email enquiry.

I have checked the site address and can confirm that we have a separate surface water system within a few meters of the proposed site hence, you will be able to connect the surface water drain from this development to the surface water sewer on Windsor Avenue.

Please feel free to call me if you have any other issue regards the enquiry.

Kind regards

AdeOluwa Bankole
Technical Coordinator – Waste Connections, London
Service Delivery
[redacted]
developer.services@thameswater.co.uk
Clearwater Court, Vastern Road, Reading, RG1 8DB
Find us online at Developer services | Thames Water
Get advice on making your sewer connection correctly at connectright.org.uk

Original Text

From:	ahdesigns <ahdesigns@protonmail.com>
To:	DEVELOPER.SERVICES@THAMESWATER.CO.U <DEVELOPER.SERVICES@THAMESWATER.CO.UK>;[redacted]
CC:	

Sent: 05.07.23 21:18:50
Subject: 103 St Margarets Avenue, North Cheam SM3 9TX_Preapplication advice

Dear Sirs,

With reference to the above property located at 103 St Margerets Avenue. Recently, we contacted your development team to inquire about the availability of assets related to this property. Regrettably, we were informed that no assets were found in this specific location.

Upon conducting desktop searches, it has come to our attention that the presence of London clay in the area may render soak-away or filtration systems ineffective. In light of this information, we are considering submitting a planning application for the construction of one new 2-bedroom dwelling within the garden area of 103 St Margerets Avenue. To proceed with the application, it is imperative for us to ascertain whether the existing sewer drainage system has the capacity to accommodate the surface water runoff into the public sewer.

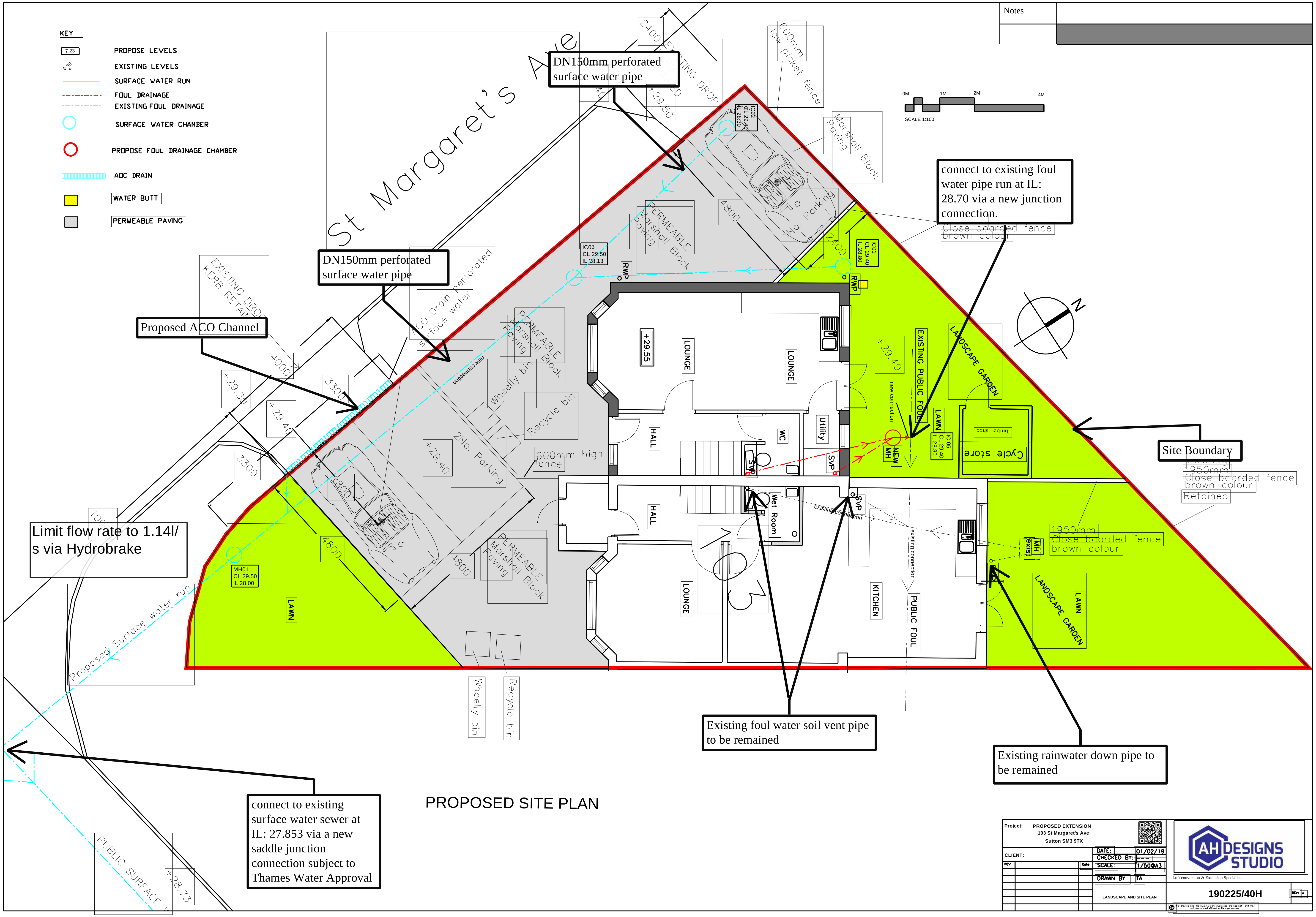
Therefore, we kindly request your assistance in confirming the capacity of the sewer drainage system to handle the additional surface water that would result from our proposed development. This information is crucial for our planning application and will allow us to proceed accordingly.

We appreciate your prompt attention to this matter. Should you require any additional details or if there are any further requirements from our end, please do not hesitate to let us know.

Regards,

Mr Toyin Alege
AH Designs Studio
[redacted]

Appendix E – Proposed Drainage Plan


KEY
PROPOSE LEVELS
EXISTING LEVELS
SURFACE WATER RUN
FOUL DRAINAGE
EXISTING FOUL DRAINAGE
SURFACE WATER CHAMBER
PROPOSE FOUL DRAINAGE CHAMBER
AOC DRAIN
WATER BUTT
PERMEABLE PAVING
Notes
St Margaret's Ave
DN150mm perforated surface water pipe
DN150mm perforated surface water pipe
Proposed ACO Channel
connect to existing foul water pipe run at IL: 28.70 via a new junction connection.
Site Boundary
Limit flow rate to 1.14l/s via Hydrobrake
connect to existing surface water sewer at IL: 27.853 via a new saddle junction connection subject to Thames Water Approval
Existing foul water soil vent pipe to be remained
Existing rainwater down pipe to be remained
PROPOSED SITE PLAN
LOUNGE
HALL
WC
Utility
SVP
RWP
Wet Room
KITCHEN
LAWN
LANDSCAPE GARDEN
EXISTING PUBLIC FOUL
PUBLIC FOUL
Cycle store
PERMEABLE Marshall Block Paving
2No. Parking
1No. Parking
Wheelly bin
Recycle bin
600mm high fence
600mm low picket fence
1950mm Close boarded fence brown colour
Close boarded fence brown colour
Retained
NEW MH
MH01 CL 29.50 IL 28.00
IC01 CL 29.40 IL 28.80
IC03 CL 29.50 IL 28.13
IC05 CL 29.40 IL 28.80
PUBLIC SURFACE
SCALE 1:100
Project: PROPOSED EXTENSION
103 St Margaret's Ave
Sutton SM3 9TX
CLIENT:
DATE: 01/02/19
SCALE: 1/50@A3
DRAWN BY: TA
LANDSCAPE AND SITE PLAN
190225/40H
AH DESIGNS STUDIO
Loft conversion & Extension Specialists

Appendix F – London Borough of Sutton SUDS Proforma

The London Sustainable Drainage Proforma

Introduction

This proforma is intended to accompany a drainage strategy prepared for a planning application where required by national or local planning policy. It should be used to summarise the key outputs from the strategy to allow assessing officers at the Lead Local Flood Authority (LLFA) to quickly assess compliance with sustainable drainage (SuDS) planning

The proforma is divided into 4 sections, which are intended to be used as follows:

1. Site and project information - Provide summary details of the development, site and drainage
2. Proposed discharge arrangement – Summarise site ground conditions to determine potential for infiltration. Select a surface water discharge method (or mix of methods) following the hierarchical approach set out in the London Plan.
3. Drainage strategy – Prioritise SuDS measures that manage runoff as close to source as possible and contribute to the four main pillars of SuDS; amenity, biodiversity, water quality and water quantity.
4. Supporting information – Provide cross references to the page or section of the drainage strategy report where the detailed information to support each element can be found. This may be more than one reference for each

Policy

SuDS:

1. London Borough of Sutton Local Plan policy 32
2. London Plan policy 5.13 and draft New London Plan policy SI13
3. The National Planning Policy Framework (NPPF)

Technical Guidance

- Post-development surface water discharge rate should be limited to greenfield runoff rates. Proposals for higher discharge rates should be agreed with the LLFA ahead of submission of the Planning Application. Clear evidence should be provided with the Planning Application to show why greenfield rates cannot be achieved.
- Greenfield runoff rate is the runoff rate from a site in its natural state, prior to any development. This should be calculated using one of the runoff estimation methods set out in Table 24.1 of CIRIA C753 The SuDS Manual.
- Attenuation storage volumes required to reduce post-development discharge rates to greenfield rates should be calculated using one of the runoff estimation methods set out in Table 24.1 of CIRIA C753 The SuDS Manual.
- 'CC' refers to climate change allowance from the current Environment Agency guidance.
- An operation and maintenance strategy for proposed SuDS measures should be submitted with the Planning Application and include the details set out in section 32.2 of CIRIA C753 The SuDS Manual. The manual should be site-specific and not directly reproduce parts of The SuDS Manual.
- Other useful sources of guidance are:
  - The London Plan Sustainable Design and Construction SPG
  - DEFRA non-statutory technical standards for sustainable drainage
  - Environment Agency climate change guidance
  - CIRIA C753 The SuDS Manual

GREATERLONDONAUTHORITY

1. Project & Site Details

Project / Site Name (including sub-catchment / stage / phase where appropriate)	103 St Margarets Avenue
Address & post code	103 St Margarets Avenue, North Cheam, Sutton SM3 9TX
OS Grid ref. (Easting, Northing)	E 524289 N 165075
LPA reference (if applicable)	
Brief description of proposed work	The proposal of the development is an erection of a semi-detached two storey extension with refuse storage and parking to the front and cycle storage to rear.
Total site Area	$296m^2$
Total existing impervious area	$95m^2$
Total proposed impervious area	$140m^2$
Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	No
Existing drainage connection type and location	Into the existing foul water pipe run, refer to proposed drainage plan for existing drainage connection location
Designer Name	YU WU
Designer Position	Chartership Civil Engineer
Designer Company	AH Designs Studio

2. Proposed Discharge Arrangements

2a. Infiltration Feasibility

Superficial geology classification	This information is not available on BGS map
Bedrock geology classification	London Clay Formation
Site infiltration rate	0m/s
Depth to groundwater level	>5m below ground level
Is infiltration feasible?	Not for full infiltration

2b. Drainage Hierarchy

	Feasible (Y/N)	Proposed (Y/N)
1 store rainwater for later use	Y	Y
2 use infiltration techniques, such as porous surfaces in non-clay areas	Y	Y
3 attenuate rainwater in ponds or open water features for gradual release	N	N
4 attenuate rainwater by storing in tanks or sealed water features for gradual release	N	N
5 discharge rainwater direct to a watercourse	N	N
6 discharge rainwater to a surface water sewer/drain	Y	Y
7 discharge rainwater to the combined sewer.	N	N

2c. Proposed Discharge Details

Proposed discharge location	Discharge into Thames Water surface water sewer at Windsor Ave
Has the owner/regulator of the discharge location been consulted?	Yes, Thames Water has agreed that a new connection into their surface water sewer is acceptable. See Appendix D.

3. Drainage Strategy

3a. Discharge Rates & Required Storage				
	Greenfield (GF) runoff rate (l/s)	Existing discharge rate (l/s)	Required storage for GF rate (m^3)	Proposed discharge rate (l/s)
Qbar	0.16			
1 in 1	0.14	0.82	Na	1.14
1 in 30	0.38	2.02	Na	1.14
1 in 100	0.52	2.62	Na	1.14
1 in 100 + CC			Na	1.14
Climate change allowance used		30%		
3b. Principal Method of Flow Control		Hydrobrake Device installed in a manhole		

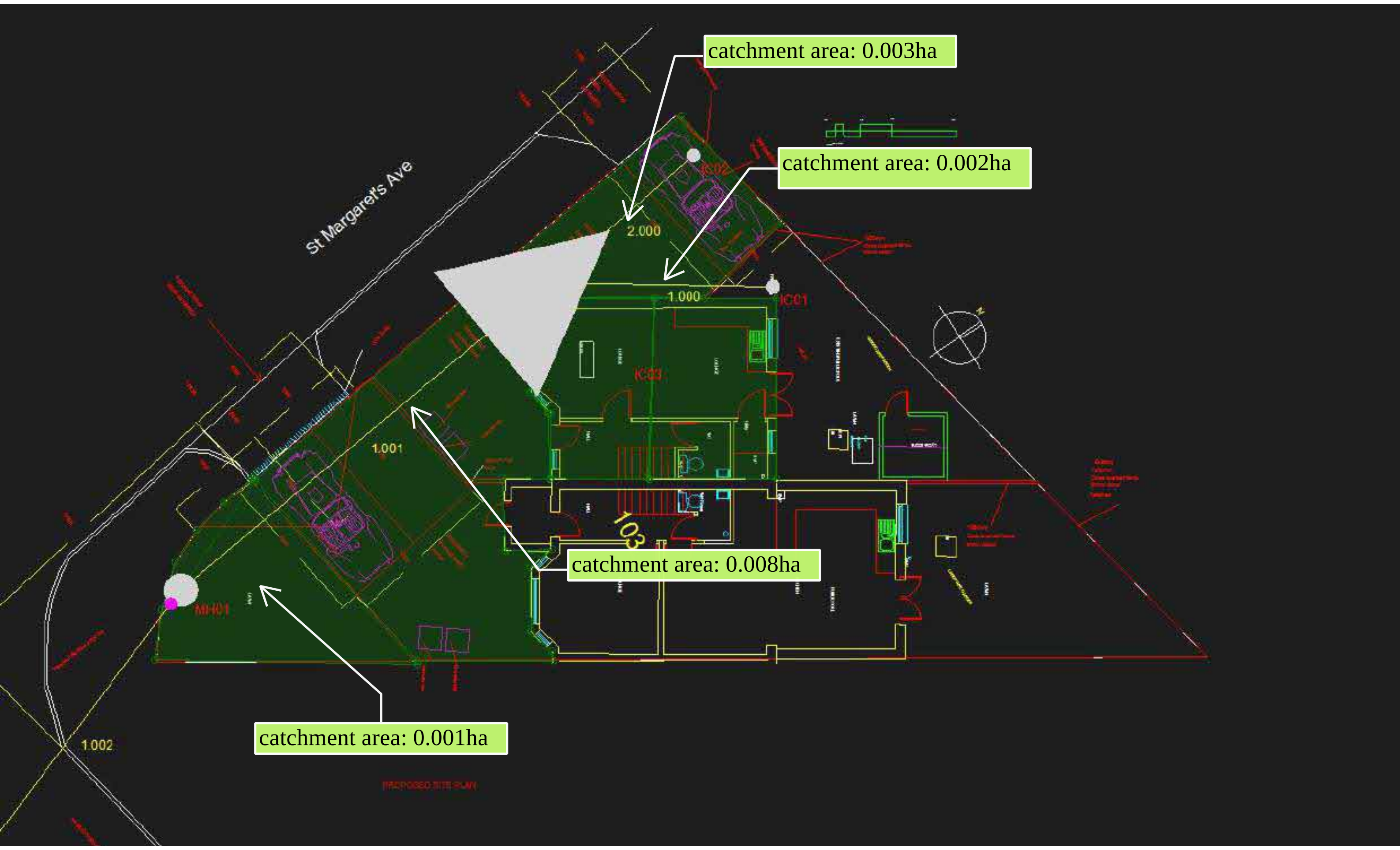
3c. Proposed SuDS Measures			
	Catchment area (m^2)	Plan area (m^2)	Storage vol. (m^3)
Rainwater harvesting	0		0
Infiltration systems	0		0
Green roofs	0	0	0
Blue roofs	0	0	0
Filter strips	0	0	0
Filter drains	0	0	0
Bioretention / tree pits	0	0	0
Pervious pavements	140	0	5
Swales	0	0	0
Basins/ponds	0	0	0
Attenuation tanks	0		0
Total	140	0	5

4. Supporting Information

4a. Discharge & Drainage Strategy	Page/section of drainage report
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	Section 5.1.1
Drainage hierarchy (2b)	Section 5.1.1
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	Section 5.3 / Appendix D / Appendix E
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	Appendix G
Proposed SuDS measures & specifications (3b)	Section 5.2.2

4b. Other Supporting Details	Page/section of drainage report
Detailed Development Layout	Appendix E
Detailed drainage design drawings, including exceedance flow routes	Appendix E
Detailed architect/landscape plans	Appendix A
Maintenance strategy	Appendix H
Demonstration of how the proposed SuDS measures improve:	
a) water quality of the runoff?	Section 5.2.2
b) biodiversity?	Section 5.2.2
c) amenity?	Section 5.2.2

Appendix G – MicroDrainage Results



catchment area: 0.003ha
catchment area: 0.002ha
catchment area: 0.008ha
catchment area: 0.001ha
St Margaret's Ave
2.000
1.000
1.001
1.002
MH01
IC01
IC02
IC03
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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.410	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	150	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.013	4-8	0.001

Total Area Contributing (ha) = 0.014

Total Pipe Volume (m³) = 0.681

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	6.814	0.524	13.0	0.002	2.00	0.0	0.600	o	150	Pipe/Conduit	
2.000	5.806	0.074	78.5	0.003	2.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	14.926	0.185	80.7	0.008	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	10.966	0.137	80.0	0.001	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	96.61	2.04	28.750	0.002	0.0	0.0	0.0	2.78	49.1	0.6
2.000	96.03	2.09	28.300	0.003	0.0	0.0	0.0	1.12	19.8	0.7
1.001	93.43	2.31	28.226	0.013	0.0	0.0	0.0	1.12	19.8	3.4
1.002	91.63	2.47	28.041	0.014	0.0	0.0	0.0	1.12	19.9	3.5

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
IC01	29.500	0.750	Open Manhole	450	1.000	28.750	150				
IC02	29.500	1.200	Open Manhole	450	2.000	28.300	150				
IC03	29.500	1.274	Open Manhole	450	1.001	28.226	150	1.000	28.226	150	
								2.000	28.226	150	
MH01	29.500	1.459	Open Manhole	1050	1.002	28.041	150	1.001	28.041	150	
	29.500	1.596	Open Manhole	0		OUTFALL		1.002	27.904	150	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	150	IC01	29.500	28.750	0.600	Open Manhole	450
2.000	o	150	IC02	29.500	28.300	1.050	Open Manhole	450
1.001	o	150	IC03	29.500	28.226	1.124	Open Manhole	450
1.002	o	150	MH01	29.500	28.041	1.309	Open Manhole	1050

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	6.814	13.0	IC03	29.500	28.226	1.124	Open Manhole	450
2.000	5.806	78.5	IC03	29.500	28.226	1.124	Open Manhole	450
1.001	14.926	80.7	MH01	29.500	28.041	1.309	Open Manhole	1050
1.002	10.966	80.0		29.500	27.904	1.446	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.002	0.002	0.002
2.000	User	-	100	0.003	0.003	0.003
1.001	User	-	100	0.002	0.002	0.002
	User	-	100	0.007	0.007	0.008
1.002	User	-	30	0.003	0.001	0.001
				Total	Total	Total
				0.016	0.014	0.014

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.002		29.500	27.904	0.000	0	0

Online Controls for Storm

Hydro-Brake® Optimum Manhole: MH01, DS/PN: 1.002, Volume (m³): 1.5

Unit Reference	MD-SHE-0049-1100-1000-1100
Design Head (m)	1.000
Design Flow (l/s)	1.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	49
Invert Level (m)	28.041
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**	**Control Points**	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	1.000	1.1	Kick-Flo®	0.437	0.8
Flush-Flo™	0.215	0.9	Mean Flow over Head Range	-	0.9

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	0.8	0.800	1.0	2.000	1.5	4.000	2.1	7.000	2.7
0.200	0.9	1.000	1.1	2.200	1.6	4.500	2.2	7.500	2.8
0.300	0.9	1.200	1.2	2.400	1.6	5.000	2.3	8.000	2.8
0.400	0.8	1.400	1.3	2.600	1.7	5.500	2.4	8.500	2.9
0.500	0.8	1.600	1.4	3.000	1.8	6.000	2.5	9.000	3.0
0.600	0.9	1.800	1.4	3.500	1.9	6.500	2.6	9.500	3.1

Storage Structures for Storm

Porous Car Park Manhole: IC03, DS/PN: 1.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	9.0
Max Percolation (l/s)	25.0	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	28.176	Cap Volume Depth (m)	0.150

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.410 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 0.0 DVD Status ON
Analysis Timestep Fine Inertia Status ON
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
1.000	IC01	15 Summer	1	+0%					28.757	-0.143	0.000	0.01
2.000	IC02	15 Summer	1	+0%					28.317	-0.133	0.000	0.03
1.001	IC03	360 Winter	1	+0%					28.232	-0.144	0.000	0.01
1.002	MH01	360 Winter	1	+0%	30/60 Winter				28.062	-0.129	0.000	0.01

PN	US/MH Name	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	IC01		0.4	OK	
2.000	IC02		0.5	OK	
1.001	IC03		0.1	OK	
1.002	MH01		0.2	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 | Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 | MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 | Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 | Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 | Number of Offline Controls 0 | Number of Time/Area Diagrams 0
Number of Online Controls 1 | Number of Storage Structures 1 | Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR | M5-60 (mm) 20.000 | Cv (Summer) 0.750
Region England and Wales | Ratio R 0.410 | Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 0.0 | DVD Status ON
Analysis Timestep Fine | Inertia Status ON
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
1.000	IC01	15 Summer	30	+0%					28.766	-0.134	0.000	0.02
2.000	IC02	15 Summer	30	+0%					28.327	-0.123	0.000	0.07
1.001	IC03	60 Winter	30	+0%					28.253	-0.123	0.000	0.07
1.002	MH01	60 Winter	30	+0%	30/60 Winter				28.235	0.044	0.000	0.05

PN	US/MH Name	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	IC01		1.0	OK	
2.000	IC02		1.2	OK	
1.001	IC03		1.4	OK	
1.002	MH01		0.9	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.410 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 0.0 DVD Status ON
Analysis Timestep Fine Inertia Status ON
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
1.000	IC01	15 Summer	100	+30%					28.769	-0.131	0.000	0.04
2.000	IC02	15 Summer	100	+30%					28.335	-0.115	0.000	0.13
1.001	IC03	60 Winter	100	+30%					28.318	-0.058	0.000	0.12
1.002	MH01	60 Winter	100	+30%	30/60 Winter				28.314	0.123	0.000	0.05

PN	US/MH Name	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	IC01		1.7	OK	
2.000	IC02		2.1	OK	
1.001	IC03		2.2	OK	
1.002	MH01		0.9	SURCHARGED	

Appendix H – Drainage Components and SUDS Maintenance Plan

1. Piped Drainage and Manhole Chamber Maintenance

Drainage infrastructure covered in this section includes all privately-owned manhole covers and surrounding pipework, gullies and drainage channels. Correct operation of this drainage infrastructure allows collection and transportation of water.

Maintenance Schedule	Required Action	Frequency
Before Start up	Removal of any inappropriate material from within the chamber and dispose off-site All pipe lines to be flushed with water to remove silt and check for blockages	At Start At Start
Regular Maintenance	Removal of debris (which could include leaves, rubbish, branches) from areas served by drainage (where it may cause risk to performance)	Monthly
Remedial Actions	For blockages resulting in flooded manhole chambers, drain down manhole chamber and unblock For pipe blockages, rod between access points to unblock	As required As required
Monitoring	Lift covers and inspect chambers. Inspect covers, surrounding gullies and ACO channels for signs of damage and incorrect operation. If required, undertake remedial action.	As required

Table 1 Maintenance Schedule Piped Drainage and Manhole Chambers

2. Sustainable Urban Drainage Systems (SUDS) Maintenance

2.1 Porous Surfacing

The function of the porous surfacing is to provide pre-treatment to the surface water before it enters the surface water drainage system, whilst also providing some element of attenuation.

Maintenance Schedule	Required Action	Frequency
Before Start up – manufacturer to confirm exact requirements	Removal of any debris or inappropriate material above the surfacing material and dispose off-site Check infiltration through the surfacing material to the open graded stone below.	At Start At Start
Regular Maintenance – manufacturer to confirm exact requirements	Brushing and vacuuming of permeable surfacing – manufacturer to confirm their exact requirements	Three time a year at the end of winter, mid-summer and autumn leaf fall or as required based on site specific observations of clogging
Remedial Actions – manufacturer to confirm exact requirements	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the surfacing Remedial work to any depressions and rutting considered detrimental to the structural performance or possible risk to users Rehabilitation of surface	As required As required As required
Monitoring – manufacturer to confirm exact requirements	Evidence for poor operation and/or weed growth. If required, take immediate action Inspection silt accumulation rates and establish brushing/vacuuming frequencies Monitor inspection chambers for siltation	3 monthly, 48 hours after large storms Annually Annually

Table 2 Maintenance Schedule Porous Surfacing (Source: SUDS Manual – Table 12.12)

3. Maintenance of Flow Controls

3.1 Hydro-brake Flow Control

The hydro-brake is located at the end of the system to restrict flows surface water flows from the site.

Maintenance Schedule	Required Action	Frequency
Before Start	Removal of any inappropriate material from within the chambers and dispose off-site	At Start
Regular Maintenance	Removal of debris (which could include leaves, rubbish and branches) from areas served by the drainage (where it may cause risk to performance)	Monthly
Remedial Actions	For blockages resulting in flooded manhole chambers, drain down manhole chamber and unblock	As required
Monitoring	Inspect unit and hose down is required	Monthly at the start for three months, then six monthly

Table 3 Maintenance Schedule Hydro-brakes

(Source: http:/www.hydro-international.biz/stormwater/flowcontrol_maintenance.php)