SuDS Report

J5423 City House

Ref: J5423-C-RP-0002

Revision: 00

Status: S2

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CONTENTS

DOCUMENT CONTROL

Document number:	J5423-C-RP-0002		
Status:	S2	**Reason for issue:**	Issued for Planning
Date:	01/02/2024	**Revision:**	00

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Approver:	Tom Webster	**Signature**	

REVISION HISTORY

Date	Status	Revision

1. INTRODUCTION

Webb Yates Engineers Ltd (WYE) is part of a design team commissioned by Macar Living (City House) Ltd to undertake a Sustainable Urban Drainage Strategy (SuDS) Report for the proposed development at City House, Sutton Park Rd, Sutton SM1 2AE. The purpose of this report is to outline the drainage strategy and design philosophy associated with the below ground drainage for the proposed development.

The scope of works for this report covers the following items:

- Assessment of storage volume requirements and discharge rates
- Assessment of various Sustainable Drainage Systems (SuDS) options and their suitability for the site
- Conceptual drainage design including outfall connections to existing sewers withing and/or off the site
- Requirements to achieve third party approvals if required.

This document has been prepared with reference to:

- National Planning Policy Framework (NPPF) December 2023
- National Planning Practice Guidance (NPPG) September 2023
- DEFRA: Sustainable Drainage Systems: Non-Statutory technical standards for sustainable drainage systems March 2015
- Water UK: Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England ("the Code") May 2021
- The SuDS Manual (C753): 2015
- The Building Regulations 2010 Approved Document H (2015 edition)
- The Wallingford Procedure: Design and Analysis of Urban Storm Drainage.
- The Surface Water Management Plan of the London Borough of Sutton October 2011
- The Local Plan of the London Borough of Sutton February 2018
- Webb Yates Flood Risk Assessment report (J5432-C-RP-0001).

2. GENERAL DESCRIPTION OF SITE

The site sits on the corner of Cheam Road and Sutton Park Road in Sutton, located in the London Borough of Sutton. The development area currently contains an office building located in the centre of the site with a car park located in the south and eastern sides with vehicular access obtained from the south through the neighbouring property. From visual inspection the topography of the site falls from South to North.

Details of the site location are included below in Table 1, supported by Figure 1.

Table 1: Site location

Description	Site Location
Nearest post code	SM1 2AE
Lead Local Flood Authority	London Borough of Sutton
Area	0.175 ha
Lat, Long	51.361066, -0.19509012
Nat Grid	TQ257639
OS X (Eastings)	525760
OS Y (Northings)	163990
Nearest watercourse	Pyl Brook 1.25km north

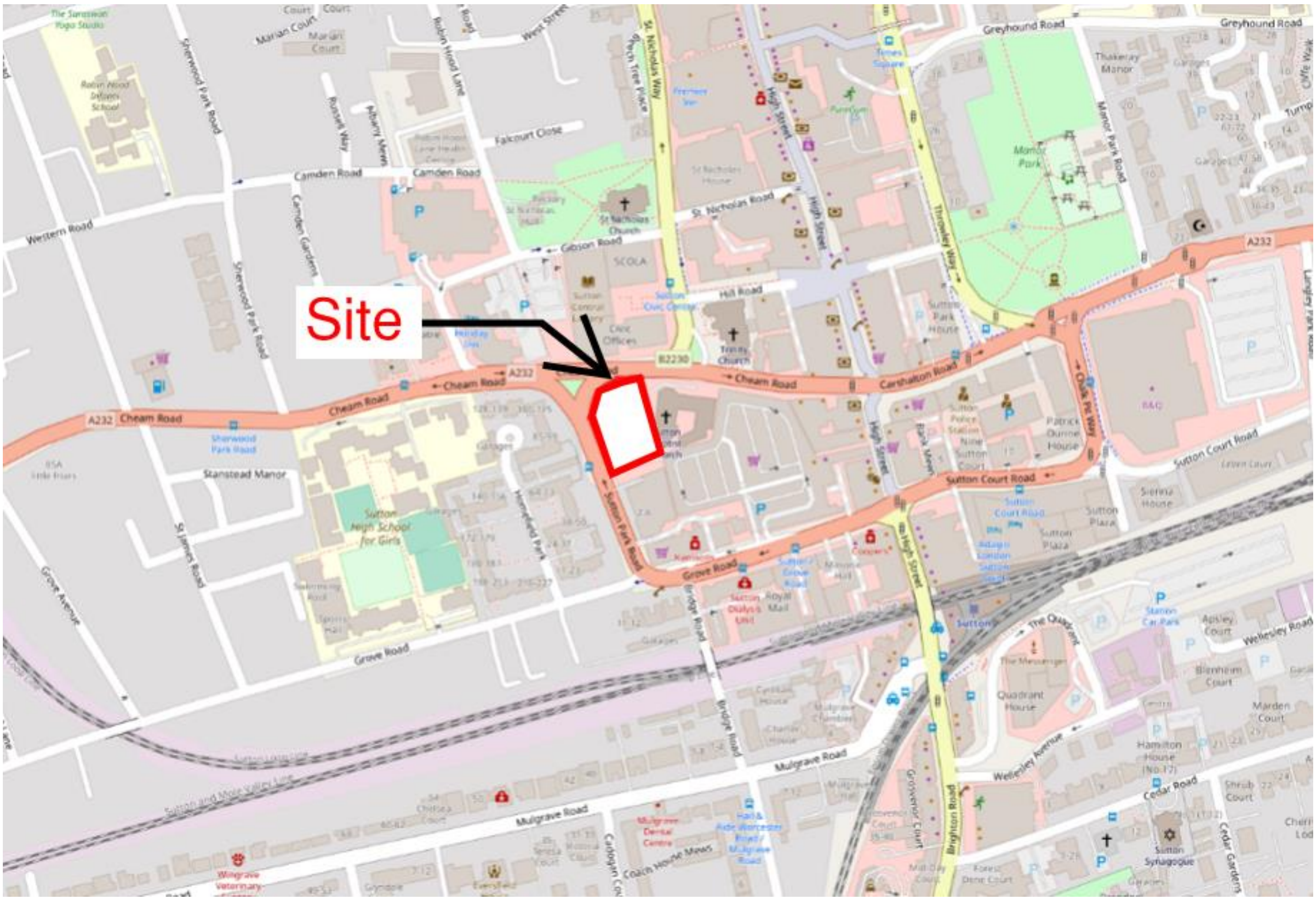


Figure 1: Site location (OpenStreetMap)

3. SITE CONTENXT

3.1. Topography

A site-specific topographical survey has been provided (undertaken by Survey Solutions). The survey shows a small fall in levels in a north and north westerly direction, with a high point of 61.27 AOD in the south of the site, falling to a low of 57.72m AOD in the north western corner of the site and 57.94 AOD in the northern portion of the site.

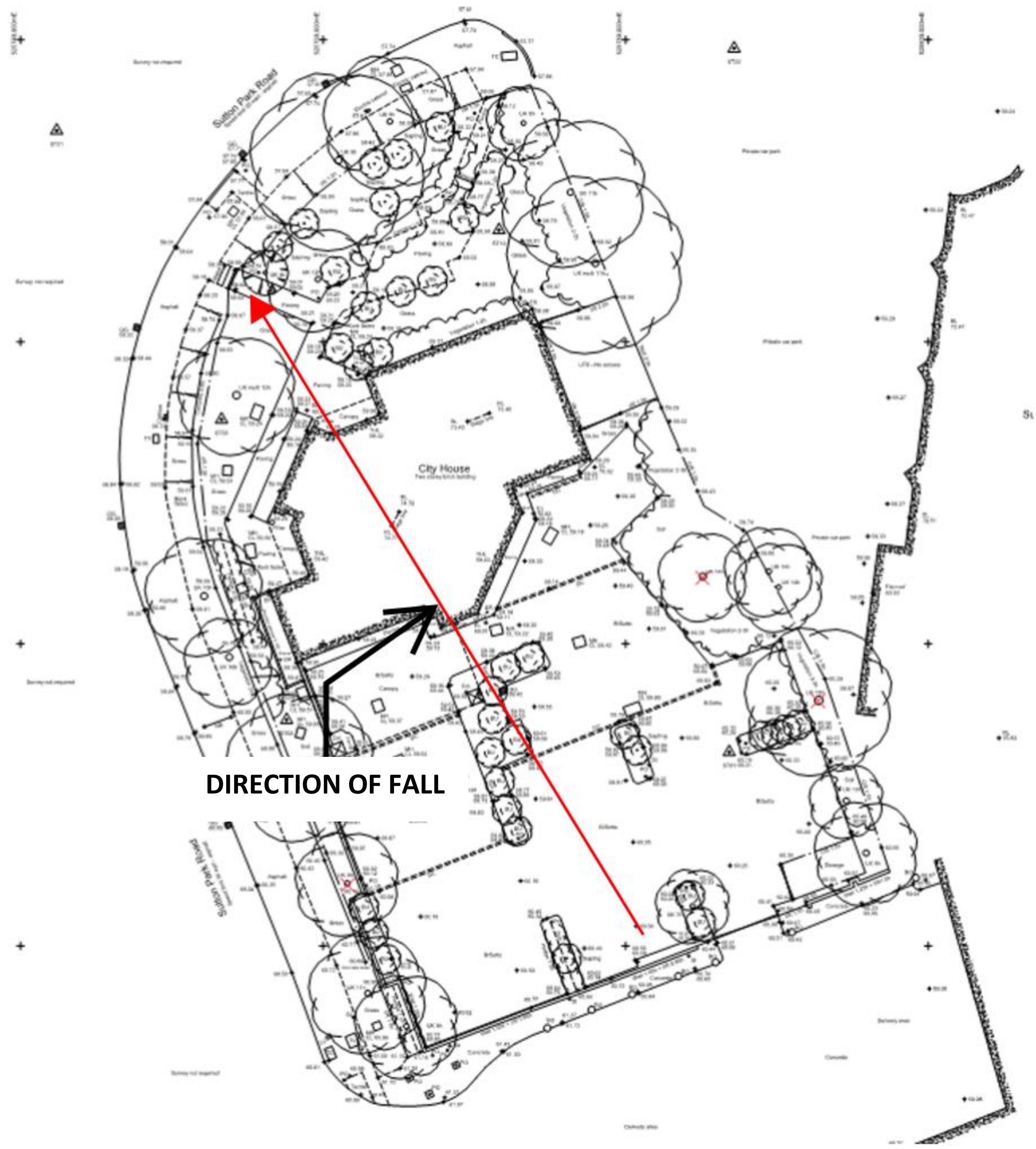


Figure 2: Extract from Topographical Survey (Survey Solutions)

3.2. Geology

A desktop review of the geology of the area was undertaken using the British Geological Survey (BGS) maps. The BGS data shows the bedrock geology as chalk sedimentary bedrock formation – Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation that is undifferentiated. This is a sedimentary bedrock formed between 93.9 and 72.1 million years ago during the Cretaceous period, Figure 3. There is no information available, from the BGS geology viewer, for the superficial geology at the site, though nearby data shows clay silt, sand and gravel deposits, see Figure 4: BGS Superficial Material According to nearby borehole data, the topsoil consists of brown sandy clay and hard white chalk with flints. It shows as predominantly chalk with localised patches of surface clay. The chalk extends beyond 10+m of the site.

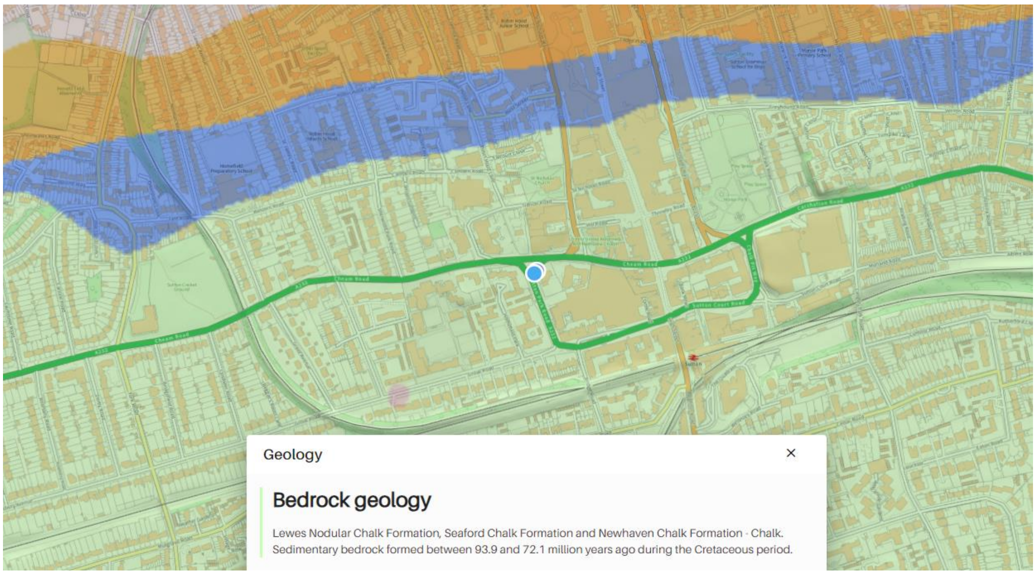


Figure 3: BGS Bedrock Material

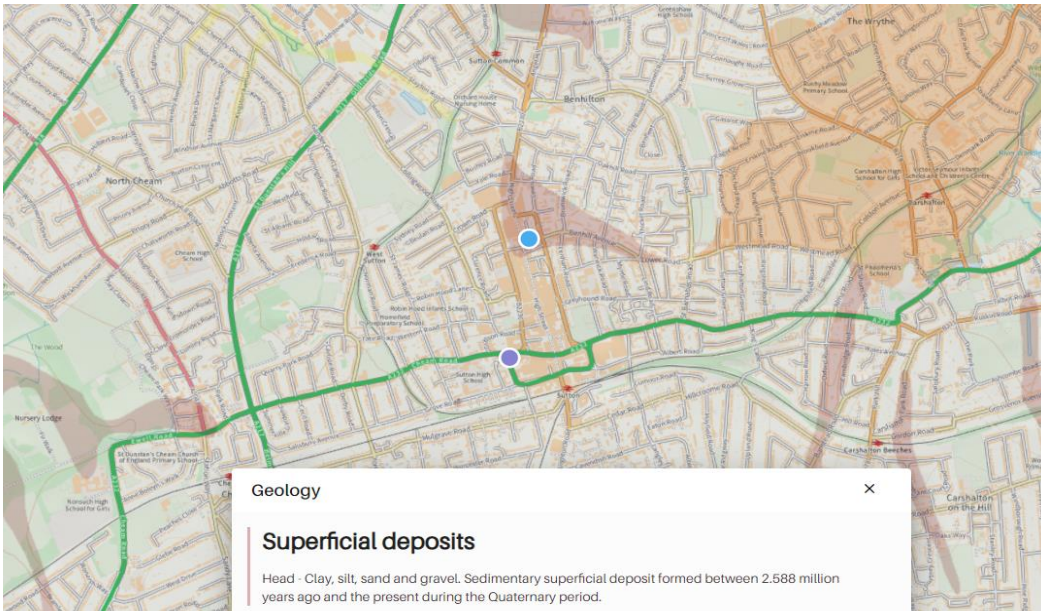


Figure 4: BGS Superficial Material

3.3. Hydrology

The site sits on the corner of Cheam Road and Sutton Park Road in Sutton, where there are buried with sewer mains that manage overland flow as the development sits within a largely built up area.

There are no watercourses that run through the site.

The site lies 1.26km away from the Pyl Brook at its closest point. There are 2 lakes further away from site, such as the Beverly Brook that leads to the Thames River. It is situated north west of the site, approximately 3.4km away and on the east of the site there is River Wandle situated 2.3km away.

3.4. Existing Site Drainage

Thames Water asset records in the local area show multiple surface and foul water drainage networks. Viable connections are in the northwest and southern parts of the development sit. As the site is a brownfield site with an existing building it is assumed a positive drainage network exists on site. As part of the development of the drainage strategy, utilities surveys and CCTV surveys have been undertaken to determine the existing outfalls of the network and have determined that retaining part of the system is viable.

Figure 5: Existing drainage (Survey Solutions)

4. PLANNING POLICY AND GUIDANCE

4.1. London Plan

Under the legislation establishing the Greater London Authority (GLA), the Mayor is required to publish a Spatial Development Strategy (SDS) and keep it under review. The SDS is known as the London Plan. As the overall strategic plan for London, it sets out an integrated economic, environmental, transport and social framework for the development of London over the next 20-25 years.

Policy SI 13 Sustainable drainage states:

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:

   a. rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)

   b. rainwater infiltration to ground at or close to source

   c. rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)

   d. rainwater discharge direct to a watercourse (unless not appropriate)

   e. controlled rainwater discharge to a surface water sewer or drain

   f. 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.

4.2. Sutton Council Water Management Study: Level 1 Strategic Flood Risk Assessment (2014)

A Strategic Flood Risk Assessment (SFRA) has been produced for Sutton Council, the study covered the following London Boroughs: London Borough of Croydon, London Borough of Merton, London Borough of Sutton, and London Borough of Wandsworth. The study assesses the flood risk from all types of flooding, currently and considering the predicted effects of climate change.

The SFRA says the 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.

This hierarchy has been followed, in so that the assess, avoid, and substitute aspects have been covered as part of this document.

5. PROPOSED DEVELOPMENT

The proposed development includes the removal of the existing building from the site and includes a new build consisting of multiple residential properties and commercial units, that includes a roof terrace with a child's play space and a community amenity space.

Figure 6: Proposed Site Plan, Landscape layout

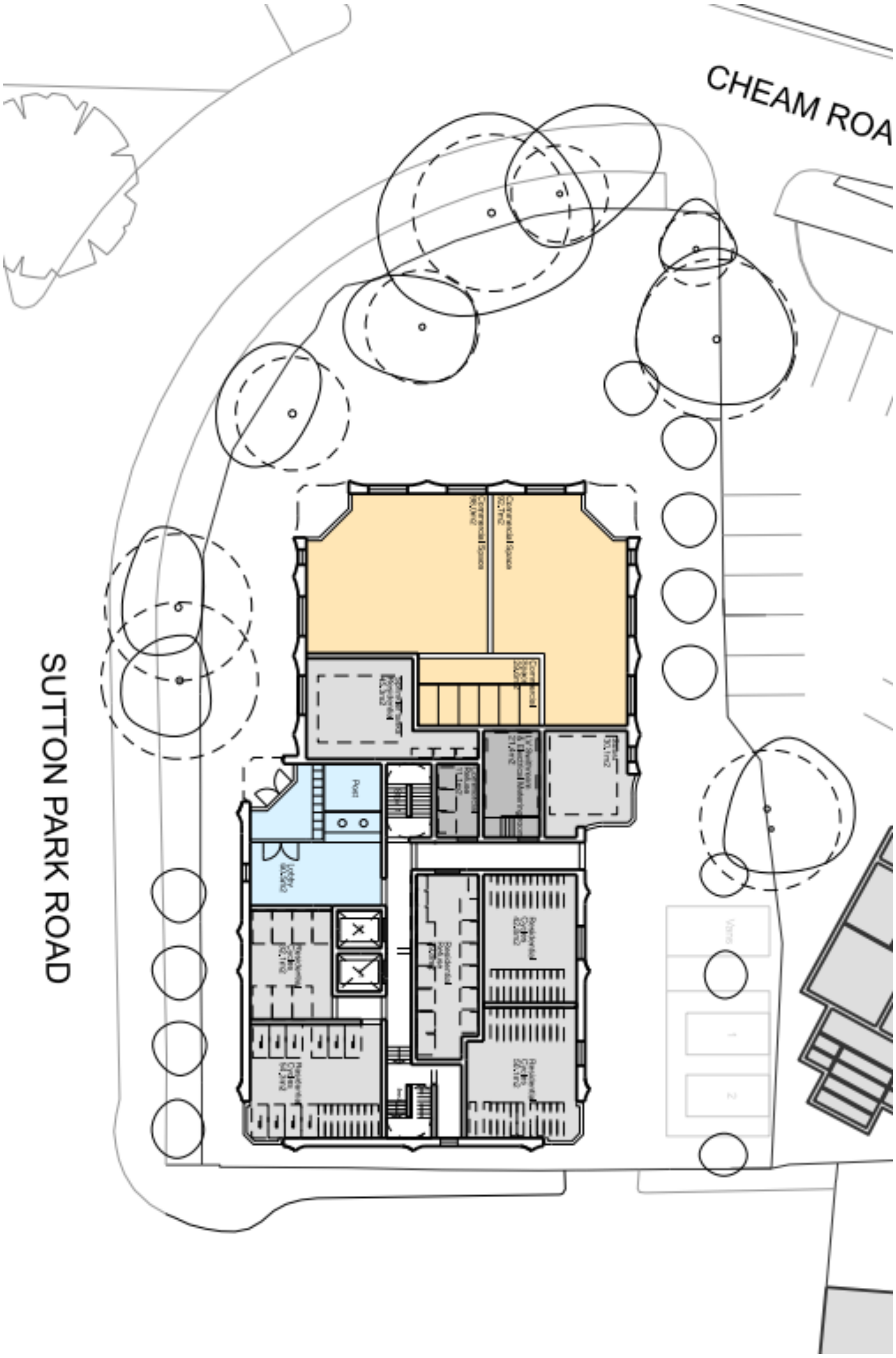


Figure 7: Proposed Site Plan, Ground floor layout

6. DESIGN ASSUMPTIONS, CONSTRAINTS AND PARAMETERS

6.1. Spatial Constraints

The development sits within a built-up area of Sutton, bounded on the North and West by Adopted Highway, on the East by the Sutton Baptist Church building and on the south by a courtyard and high-rise building. There are existing trees that will be retained.

6.2. Climate Change Effects

In accordance with the National Planning Policy Framework (NPPF), the effects of climate change are included within the assessment to reduce future flood risk. Following the recommended contingency allowances from the 19th February 2016, the following allowances should be made for the proposed development:

- Peak Rainfall Intensity: +40% (Upper End Allowance) for 2070 to 2115
- Peak Rainfall Intensity: +20% (Central Allowance) for 2070 to 2115

The new surface water drainage systems for the site will include SuDS and will be designed to accommodate increases in peak rainfall intensity.

The same advice is provided within the London Plan and by the Environmental Agency. Both want the consideration of a 40% increase in flow rate when looking at the 100-year storm event to allow for the effects of climate change, which will be carried out within this report.

6.2.1. Assumed Impermeable Areas

Table 1 below identifies the total area of the site and the respective surface areas belonging to hard and soft landscaping.

Table 2: Table of Impermeable Areas

Usage		Existing Area (ha)	Proposed Area (ha)	Difference (ha)
Hardstanding	Building Footprint	0.044	0.083	+0.040
	External Hardstanding	0.078	0.058	-0.020
Soft Landscaping		0.053	0.034	-0.019
Site Area		0.175	0.175	+0.000

6.2.2. Hydrological Parameters

Details of the assumed drainage design hydrological parameters are included below in Table 3.

Table 3: Assumed Hydrological Parameters

Hydrological Character	Parameter	Unit	Value
Rainfall Model	-	-	FSR Rainfall*
	M5-60	mm	20.000
	Ratio R	-	0.400
Summer Volumetric Run-off Coefficient	-	-	1.000
Winter Volumetric Run-off Coefficient	-	-	1.000

*FSR rainfall data was used as it is considered conservative when the critical storm duration is less than 60 minutes

6.3. SuDS Hierarchy

It is proposed to reuse the existing drainage where practical, and to provide new surface and foul water drainage where required to serve the proposed development and associated hardstanding area. New private surface and foul will be kept separate where possible to provide the required sustainable drainage strategies; the site currently fulfils this, and it will be maintained. Both foul and surface water Thames Water sewers are situated on Sutton Park Road.

The entire site shall be fully attenuated, as the plans are to redevelop the entire site, as shown in section 5. Permeable surfacing shall be used across the landscape and the soft standing areas to provide infiltration where feasible. Infiltration is dependent on the results of a BRE 365 Soakaway test. As the site is chalk overlain by a superficial clay, silt, sand, and gravel layer, it is likely some infiltration shall take place, however due to the lack of available infiltration testing a worst case of 1×10^{-6} m/s has been assumed. This will both reduce the peak surface water run off rate and volume of run off from site and is considered a betterment of the existing brownfield state – currently there is no attenuation provided on the site.

The proposed SuDS strategy will be proposed for the entire site and will create a net reduction in peak flows and volumes from the site, that are aligned with the Sutton Local Plan.

Table 4: SuDS hierarchy

	SuDS hierarchy	Constraints/ Opportunities
1	Store rainwater for later use	Water reuse is not proposed as part of the phase 1 development, as space is extremely limited.
2	Use infiltration techniques, such as porous surfaces in non-clay areas	Unlined permeable paving will be used on all the hardstanding surfaces on this site. Infiltration will take place in the soft standing areas.

3	Attenuate rainwater in ponds or open water features for gradual release.	Open water features have not been considered as a viable option for the site, as space is extremely limited.
4	Attenuate rainwater by storing in tanks or sealed water features for gradual release.	A cellular attenuation tank has been proposed for the site. This shall attenuate flow to 2 l/s prior to discharge into the existing Thames Water surface water Sewer.
5	Discharge rainwater direct to watercourse	This option is not viable as there is no watercourse on or close enough to the site
6	Discharge rainwater to a surface water sewer/drain	Attenuated rainwater from the proposed buildings shall be discharged into an existing surface water sewer.
7	Discharge rainwater to the combined sewer.	There is no proposed discharge of surface water into a combined water sewer.

6.4. Discharge rate objective and storage

6.4.1. Greenfield Runoff

The total catchment area of the works area is approximately 0.175 ha. The Greenfield runoff rate calculations was calculated using UKSUDS.com tool, a summary of it can be seen in Table 5 below. Full UKSUDS output is included in Appendix C.

Table 5: Greenfield Runoff Rates

Storm Event	Value (l/s)
QBar	0.8
1 in 1 year	0.68
1 in 30 year	1.85
1 in 100 year	2.56

6.4.2. Existing runoff rate

The existing development is a brownfield site; for the purposes of understanding the existing site flow and being able to gauge the existing network the brownfield runoff rate will be calculated. Historically development would target a 50% betterment of the brownfield runoff rate for overall runoff restriction rate. Since the updates to the London Plan and to local Sustainable Drainage guidance policy Sutton now require that the runoff from the development be restricted to greenfield runoff rate.

The existing impermeable area has been estimated at 0.1 hectares, with a brownfield runoff rate of 35mm/hr the existing outflow from the development can be estimated at 10 litres per second.

This has been calculated to provide context on the betterment undertaken as part of the development works and will not form part of the justification of drainage strategy proposals.

6.5. Proposed Drainage Strategy

The proposed drainage strategy is for both the surface and foul water to drain out of the development area through separated networks of pipes and manholes. It is envisaged that both the systems will connect to the existing drainage network prior to an outfall connection to the Thames Water networks located in the vicinity.

Due to the prevailing topography of the site falling from south toward the north it is expected that the existing drainage network follows this topography and flows through this route. Therefore, it is expected the foul and surface water will drain to the separated networks under Cheam Road.

The surface water will be restricted in flow prior to outfall to the existing network. Due to reasonable minimum levels of water flow retention the surface water will be restricted to a value of 2 l/s, this leads to an attenuation requirement of 60m^3. This will be provided through geocellular attenuation crates

The proposed drainage strategy is shown in Appendix B of this report.

Details of the Info Drainage assessment are shown in Table 6 below and results is included in Appendix D

Table 6. Surface Water Design Performance

	Existing Unmitigated	**Proposed**	**Difference**	**% change**
1:1 yr Max outflow (l/s)	22.7	2.0	-20.7	**-91.2**
1:30 yr Max outflow (l/s)	56.0	2.0	-54.0	**-96.4**
1:100 yr Max outflow (l/s)	72.7	2.0	-70.7	**-97.2**
1: 100 yr + 40%CC Max outflow (l/s)	NA	2	NA	**NA**

6.6. Water Quality

SuDS features for water treatment are achieved by the car park and the pavement areas being self-draining permeable paved structures and the lower section of the roof terracing having green roof features. Due to topographical constraints it is not possible to utilise the porous paving as the primary attenuation method for this development.

Due to the site being in a zone 1 source protection zone there is an effect on the infiltration that can take place in this area such that contaminated water cannot enter the system. However, the site does not have any contaminated issues, thus infiltration can occur.

There will be storm attenuation at the rear of the site to provide attenuation in the experience of high rainfall.

6.7. Foul Water Drainage

The foul water drainage will drain from a series of interconnected pipes and manholes directly to the existing network and ultimately to the Thames Water network. There will be no new connection required as it will be connected to the existing main connection.

7. MAINTENANCE

The drainage system will be designed to minimise maintenance requirements; however, a full maintenance scheme will be established for those elements not being offered for adoption. The surface and foul drains, will be maintained by the Freeholder to the manufacturer's recommendations as part of their property maintenance program. The downstream public combined sewer will be maintained by Thames Water as part of their maintenance works.

7.1. Below Ground Drainage Piped Systems

The below ground piped system (based on assessed flood risk) should be inspected every 10 years as a minimum and repaired and cleansed where necessary.

7.2. Foul Water & Surface Water Manholes

Manholes and inspection chambers need to be inspected at least every 6 months or as required if there are foul odours or suspected blockages. If the chambers show any signs of blockage, specialist contractors should be called to undertake the clearance work. A CCTV inspection of the gravity pipelines should be inspected every 10 years as a minimum and repaired and cleansed where and when necessary.

7.3. Attenuation Storage Tanks

Maintenance of modular systems should be carried out in accordance with the manufacturer's recommendations and is expected to contain as a minimum a maintenance regime as outlined in the SuDS manual copied below.

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	Remove sediment from pre-treatment structures and/or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

7.4. Flow Control

Maintenance of flow control systems should be carried out in accordance with the manufacturer's recommendations and is expected to contain as a minimum a maintenance regime as outlined in the SuDS manual copied below.

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly if required, take remedial action	Monthly (for 3 months following installation)
	Inspect and identify any areas that are not operating correctly if required, take remedial action. Remove sediment from pre-treatment structures.	Six Monthly
Following all significant storm events	Inspect and carry out essential recovery works to return the feature to full working order	As required

7.5. Permeable Pavement

Maintenance of permeable pavement should be carried out in accordance with the manufacturer's recommendations and is expected to contain as a minimum a maintenance regime as outlined in the SuDS manual copied below.

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface area)	Twice a year, after autumn leaf fall and 6 months later
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosphate applied directly into the weeds by an application rather than spraying	As required – once per year on less frequently used pavements
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the parking	As required
	Remedial works to any depressions, rutting, and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation or surface and upper substructure by remedial sweeping	Every 10-15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48h after large storms in the first 6 months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

8. CONCLUSION

The site wide drainage strategy outlined above meets the requirements set out by Building Regulations Part H, the London Borough of Sutton's SFRA, the London Plan, and the CIRIA SuDS manual.

The proposed surface water strategy has a broadly positive overall benefit when assessed against the London Borough of Sutton's SFRA requirements, as the development will include the use of SuDS in the form of an attenuation tank, as well as permeable paving and infiltration if deemed suitable following infiltration testing, which will help slow the rate of discharge of surface water into the existing combined Thames Water sewer. The attenuation provided shall restrict the surface water runoff to 91% of the existing runoff rate for the 1 in 1 year rainfall event, and provide a reduction of circa 96% or greater for the 1 in 30-year up to the 97% in 100-year return period rainfall event plus the 40% allowance for climate change.

The foul drainage is proposed to discharge into the existing Thames Water foul sewer.

As mentioned in Section 7, the site drainage scheme would be managed and maintained by the freeholder after completion, as part of their upkeep works for the site.

9. APPENDIX A TOPOGRAPHIC SURVEY AND EXISTING DRAINAGE

TOPOGRAPHICAL & MEASURED BUILDING SURVEYS

ABBREVIATIONS & SYMBOLS

AH	Arch Head Height	ER	Earth Rod	RSD	Roller Shutter Door
A/B	Air Brick	ET	EP+Transformer	RSJ	Rolled Steel Joist
AR	Assumed Route	FB	Flower Bed	SI	Sign Post
AV	Air Valve	FBD	Floor Board Direction	SP	Arch Spring Point Height
BB	Belisha Beacon	FH	Fire Hydrant	SV	Stop Valve
BH	Bore Hole	FL	Floor Level	SW	Surface Water
BL	Bed Level	FP	Flag Pole	SY	Cable Stay
BO	Bollard	FW	Foul Water	Tac	Tactile Paving
BrP	Brace Post	GG	Gully Grate	TC	Telecom Cover
BS	Bus Stop	GV	Gas Valve	TH	Trial Pit
BU	Bush	HH	Head Height	THL	Threshold Level
B/W	Barbed Wire Fence	IC	Inspection Cover	TL	Traffic Light
BX	Box (Utilities)	IL	Invert Level	ToW	Top of Wall
C/B	Close Board Fence	I/R	Iron Railings	TP	Telegraph Pole
CH	Cill Height	KO	Kerb Outlet	TS	Traffic Signal Cover
CL	Cover Level	LP	Lamp Post	TV	Cable TV Cover
C/L	Chain Link Fence	MH	Manhole	UB	Universal Beam
C-Lev	Ceiling Level	MP	Marker Post	UC	Unknown Cover
Col	Column	NB	Name Board	UK	Unknown Tree
C/P	Chestnut Paling Fence	OHL	Overhead Line (approx)	UMG	Unmade Ground
CR	Cable Riser	Pan	Panel Fence	USB	Under Side Beam
C/W	Chicken Wire	PB	Post Box	UTL	Unable To Lift
DC	Drainage Channel	PM	Parking Meter	UTS	Unable To Survey
DH	Door Head Height	PO	Post	VP	Vent Pipe
Dil.	Dilapidated	P/R	Post & Rail Fence	WB	Waste Bin
DP	Down Pipe	P/W	Post & Wire Fence	WH	Weep Hole
DR	Drain	P/Wall	Partition Wall	WL	Water Level
EBx	Electric Box	RE	Rodding Eye	WM	Water Meter
EC	Electric Supply Cover	RL	Ridge Level	WO	Wash Out
EL	Eaves Level	RP	Reflector Post	X.XX	Floor to Ceiling Height
EP	Electric Pole	RS	Road Sign	X.XX F/C	Floor to False Ceiling Ht
					Survey Control Station

DRAWING NOTES

Topographical Surveys

Trees are drawn to scale showing the average canopy spread. Descriptions and heights should be used as a guide only.

All building names, descriptions, number of storeys, construction type including roof line details are indicative only and taken externally from ground level.

All below ground details including drainage, voids and services have been identified from above ground and therefore all details relating to these features including; sizes, depth, description etc will be approximate only. All critical dimensions and connections should be checked and verified prior to starting work.

Detail, services and features may not have been surveyed if obstructed or not reasonably visible at the time of the survey.

Surveyed physical features may not necessarily represent the legal boundary line.

Measured Building Surveys

Measurements to internal walls are taken to the wall finishes at approx 1m above the floor level and the wall assumed to be vertical.

Cill heights are measured as floor to the cill and head heights are measured from cill to the top of window.

General

The contractor must check and verify all site and building dimensions, levels, utilities and drainage details and connections prior to commencing work. Any errors or discrepancies must be notified to Survey Solutions immediately.

The accuracy of the digital data is the same as the plotting scale implies. All dimensions are in metres unless otherwise stated.

The survey control listed is only to be used for topographical surveys at the stated scale. All control must be checked and verified prior to use.

Do not scale from this drawing.

SURVEY CONTROL CO-ORDINATES

STATIONS	EASTINGS	NORTHINGS	LEVEL	DESCRIPTION
ST01	525786.849	163972.833	60.157	PK Nail
ST02	525757.588	163974.961	59.783	Peg & Nail
ST03	525753.291	163994.856	59.307	Peg & Nail
ST10	525771.628	164007.402	58.909	Peg & Nail
ST21	525742.389	164013.993	58.089	PK Nail
ST22	525787.170	164019.433	58.485	PK Nail
ST30	525750.579	163938.180	61.349	PK Nail

SURVEY GRID AND LEVEL DATUM

The coordinate system established for this survey is related to Ordnance Survey (OS) national grid at a single point using Smartnet, then orientated to grid north with a scale factor of 1.000.

The level datum established for this survey is related to Ordnance Survey (OS) using GPS Smartnet.

To avoid discrepancies any coordinated data used in conjunction with this survey must be derived directly from this control data.

REV	DESCRIPTION	DRAWN	APPR	DATE

Original Sheet Size A1V

SURVEY SOLUTIONS

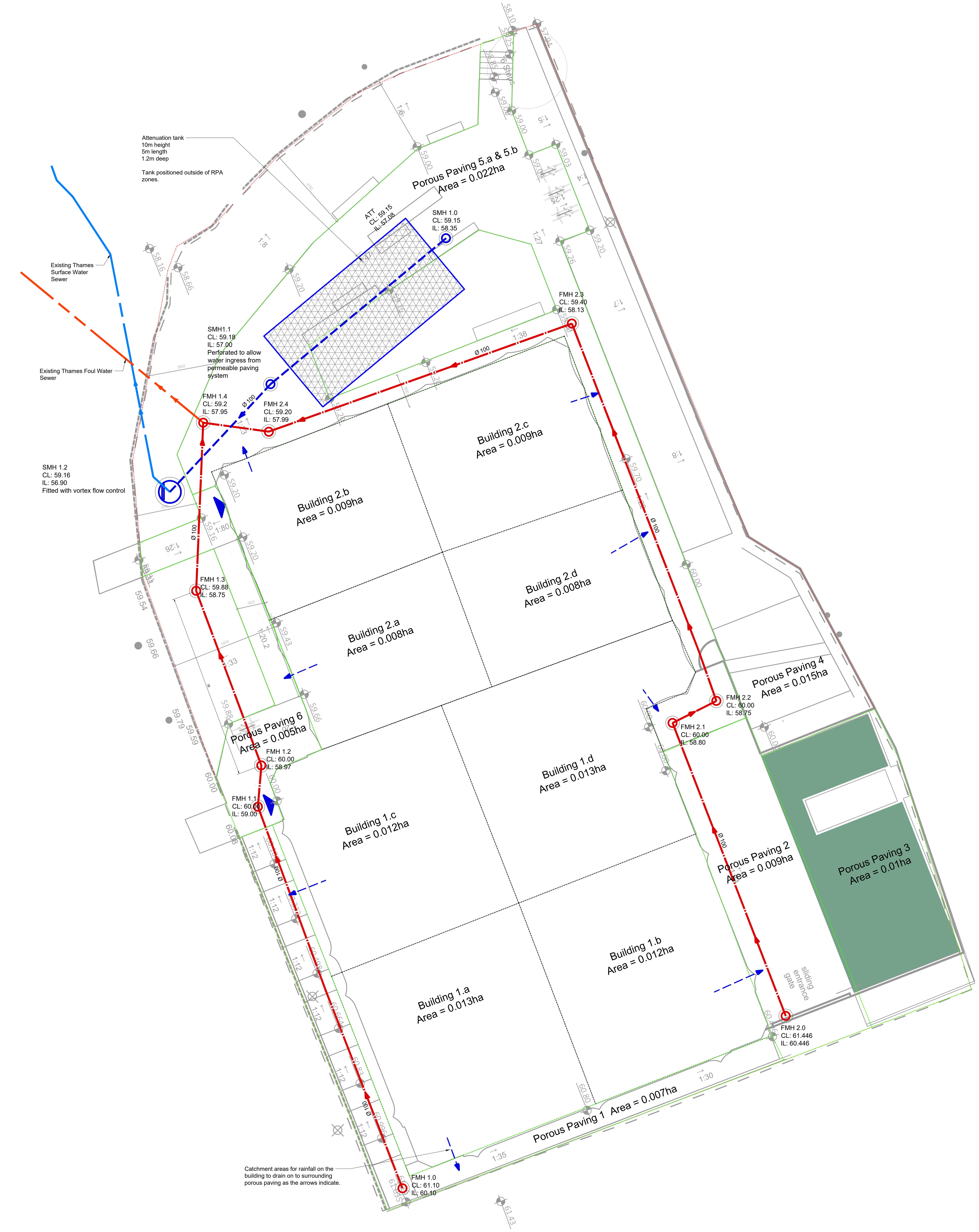
LAND SURVEYING
BUILDING SURVEYING
UNDERGROUND SURVEYING
SITE ENGINEERING
MONITORING

0845 040 5969
survey-solutions.co.uk

IPSWICH BEDFORD COVENTRY GLASGOW LONDON MANCHESTER NORWICH NOTTINGHAM YEOVIL

PROJECT TITLE CITY HOUSE, SUTTON PARK ROAD, SUTTON LONDON, SM1 2AE				
DRAWING DETAIL TOPOGRAPHICAL SURVEY Sheet 1 of 1				
CLIENT MACAR DEVELOPMENTS LTD				SCALE 1:200
SURVEYOR GB	SURVEY DATE 06/06/2022	CHECKED BY SB	APPROVED BY RC	DWG STATUS FINAL
DRAWING NUMBER 42439BWLS-01			REVISION	ISSUE DATE 09/06/2022

10. APPENDIX B PROPOSED DESIGN DRAWINGS AND DRAINAGE STRATERGY



Notes

1. Do not scale the drawing
2. All dimensions are in millimetres unless noted otherwise
3. Any discrepancies between structural and architectural setting out dimensions must be brought to the attention of the Architect and Engineers

DRAINAGE KEY

- Proposed Surface Water Drain
- Proposed Foul Drain
- SMH#.# FMH#.# Proposed Manhole Surface Water / Foul
- Existing Thames Water Foul / Combined Sewer
- Existing Thames Water Storm Sewer
- ATT# Proposed Attenuation Tank
- SMH#.# Proposed Manhole with Flow Control
- PP Proposed Area of Porous Surfacing

Rev	Date	Description	Drn	App
01	01.02.24	Updated with revised tank position	ZA	RW
00	15.01.24	Drainage Scheme according to ID	ZA	RW

WEBB YATES ENGINEERS
48-50 Scrutton Street
London EC2A 4HH
020 3696 1550
www.webbyates.co.uk
info@webbyates.co.uk

Project
City House

Drawing Title
SuDS Drainage Scheme

Drawing Status
Status

Drawn by	Checked by	Sheet size	Scale	Rev status
ZA	RW	A1	1:50	S0

Drawing Number: J5423-C-DR-0001
Revision: 01

11. APPENDIX C GREENFIELD RUNOFF RATES

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	zulakha asif
Site name:	City House
Site location:	Sutton

Site Details

Latitude:	51.36090° N
Longitude:	0.19495° W
Reference:	4111851613
Date:	Jan 19 2024 16:39

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): 0.175

Methodology

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

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	671	671
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):	0.8	0.8
1 in 1 year (l/s):	0.68	0.68
1 in 30 years (l/s):	1.85	1.85
1 in 100 year (l/s):	2.56	2.56
1 in 200 years (l/s):	3.01	3.01

12. APPENDIX D INFODRAINAGE CALCULATIONS

Project:	Date: 18/12/2023		
	Designed by: zulakha.asif	Checked by:	Approved By:
Report Details: Type: Junctions Storm Phase: Phase	Company Address:		

Name	Junction Type	Easting (m)	Northing (m)	Cover Level (m)	Depth (m)	Invert Level (m)	Chamber Shape	Diameter (m)
1	Manhole	525753.577	163991.484	59.160	2.260	56.900	Circular	2.400
3	Manhole	525750.363	163993.447	58.800	1.990	56.810	Circular	1.200
SMH 1.0	Manhole	525768.988	164005.315	59.150	0.800	58.350	Circular	1.200
2	Manhole	525758.450	163995.630	59.180	2.180	57.000	Circular	1.200

Name	Lock
1	None
3	None
SMH 1.0	None
2	None

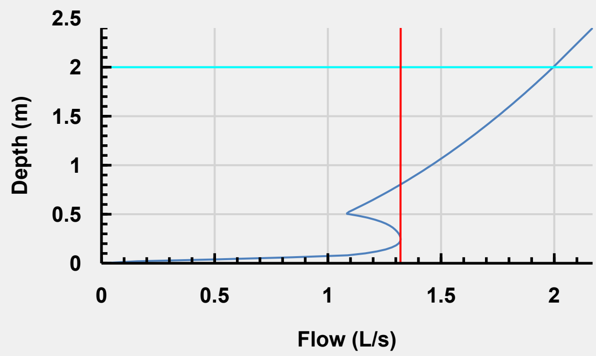
Inlets

Junction	Inlet Name	Incoming Item(s)	Bypass Destination	Capacity Type
1	Inlet	1.005	(None)	No Restriction
	Inlet (1)	2.003	(None)	No Restriction
	Inlet (3)	6.000	(None)	No Restriction
3	Inlet	1.006	(None)	No Restriction

Outlets

Junction	Outlet Name	Outgoing Connection	Outlet Type
1	Outlet	1.006	Hydro-Brake®

Invert Level (m)	56.900
Design Depth (m)	2.000
Design Flow (L/s)	2.0
Objective	Minimise Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☑
Unit Reference	SHE-0057-2000-2000-2000



Junction	Outlet Name	Outgoing Connection	Outlet Type
SMH 1.0	Outlet	Pipe 1	Free Discharge
2	Outlet	Pipe 2	Free Discharge
	Outlet (1)	6.000	Free Discharge

Project:	Date: 18/12/2023		
	Designed by: zulakha.asif	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Porous Paving 1

Type : Porous Paving

Dimensions

Exceedance Level (m)	60.575
Depth (m)	0.520
Base Level (m)	60.055
Paving Layer Depth (mm)	120
Membrane Percolation (m/hr)	324.0
Porosity (%)	30
Length (m)	20.370
Long. Slope (1:X)	500.00
Width (m)	1.921
Total Volume (m^3)	4.697

Inlets

Inlet (1)

Inlet Type	Lateral Inflow
Incoming Item(s)	Paving 1
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (2)

Inlet Type	Lateral Inflow
Incoming Item(s)	Building 1.c
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet

Inlet Type	Lateral Inflow
Incoming Item(s)	1.000
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	1.001
Outlet Type	Free Discharge

Advanced

Conductivity (m/hr)	10000.0

Porous Paving 2 Type : Porous Paving

Dimensions

Exceedance Level (m)	60.803
Depth (m)	0.520
Base Level (m)	60.283
Paving Layer Depth (mm)	120
Membrane Percolation (m/hr)	324.0
Porosity (%)	30
Length (m)	22.976
Long. Slope (1:X)	500.00
Width (m)	1.290
Total Volume (m³)	3.557

Inlets

Inlet (1)

Inlet Type	Lateral Inflow
Incoming Item(s)	Building 1.a
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	1.000
Outlet Type	Free Discharge

Advanced

Conductivity (m/hr)	10000.0

Project:	Date: 18/12/2023		
	Designed by: zulakha.asif	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Porous Paving 3 Type : Porous Paving

Dimensions

Exceedance Level (m)	60.223
Depth (m)	0.520
Base Level (m)	59.703
Paving Layer Depth (mm)	120
Membrane Percolation (m/hr)	324.0
Porosity (%)	30
Length (m)	20.240
Long. Slope (1:X)	500.00
Width (m)	4.893
Total Volume (m³)	11.885

Inlets

Inlet

Inlet Type	Lateral Inflow
Incoming Item(s)	Building 1.b
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (1)

Inlet Type	Lateral Inflow
Incoming Item(s)	Paving 2
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (2)

Inlet Type	Lateral Inflow
Incoming Item(s)	Building 1.d
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	3.000
Outlet Type	Free Discharge

Advanced

Conductivity (m/hr)	10000.0

Porous Paving 4 Type : Porous Paving

Dimensions

Exceedance Level (m)	60.550
Depth (m)	0.520
Base Level (m)	60.030
Paving Layer Depth (mm)	120
Membrane Percolation (m/hr)	324.0
Porosity (%)	30
Length (m)	20.226
Long. Slope (1:X)	500.00
Width (m)	6.674
Total Volume (m³)	16.199

Inlets

Inlet

Inlet Type	Lateral Inflow
Incoming Item(s)	Paving 3
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	2.000
Outlet Type	Free Discharge

Advanced

Conductivity (m/hr)	10000.0

Porous Paving 5 Type : Porous Paving

Dimensions

Exceedance Level (m)	60.000
Depth (m)	0.520
Base Level (m)	59.480
Paving Layer Depth (mm)	120
Membrane Percolation (m/hr)	324.0
Porosity (%)	30
Length (m)	4.410
Long. Slope (1:X)	500.00
Width (m)	7.293
Total Volume (m³)	3.859

Inlets

Inlet

Inlet Type	Lateral Inflow
Incoming Item(s)	2.000
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (1)

Inlet Type	Lateral Inflow
Incoming Item(s)	3.000
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	2.001
Outlet Type	Free Discharge

Outlet (1)

Outgoing Connection	4.000
Outlet Type	Free Discharge

Advanced

Conductivity (m/hr)	10000.0

Porous Paving 6 Type : Porous Paving

Dimensions

Exceedance Level (m)	60.000
Depth (m)	0.520
Base Level (m)	59.480
Paving Layer Depth (mm)	120
Membrane Percolation (m/hr)	324.0
Porosity (%)	30
Length (m)	31.590
Long. Slope (1:X)	500.00
Width (m)	5.393
Total Volume (m³)	20.443

Inlets

Inlet

Inlet Type	Lateral Inflow
Incoming Item(s)	Paving 4
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (1)

Inlet Type	Lateral Inflow
Incoming Item(s)	Paving 5.a
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (2)

Inlet Type	Lateral Inflow
Incoming Item(s)	Building 2.d
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (3)

Inlet Type	Lateral Inflow
Incoming Item(s)	2.001
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (4)

Inlet Type	Lateral Inflow
Incoming Item(s)	4.000
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	2.002
Outlet Type	Free Discharge

Outlet (1)

Outgoing Connection	5.000
Outlet Type	Free Discharge

Project:	Date: 18/12/2023		
	Designed by: zulakha.asif	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Advanced

Conductivity (m/hr)	10000.0

Porous Paving 7

Type : Porous Paving

Dimensions

Exceedance Level (m)	59.100
Depth (m)	0.520
Base Level (m)	58.580
Paving Layer Depth (mm)	120
Membrane Percolation (m/hr)	324.0
Porosity (%)	30
Length (m)	20.993
Long. Slope (1:X)	500.00
Width (m)	4.272
Total Volume (m^3)	10.762

Inlets

Inlet

Inlet Type	Lateral Inflow
Incoming Item(s)	Paving 5.b
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (1)

Inlet Type	Lateral Inflow
Incoming Item(s)	2.002
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (2)

Inlet Type	Lateral Inflow
Incoming Item(s)	5.001
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	2.003
Outlet Type	Free Discharge

Advanced

Conductivity (m/hr)	10000.0

Project:	Date: 18/12/2023		
	Designed by: zulakha.asif	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Porous Paving 8

Type : Porous Paving

Dimensions

Exceedance Level (m)	59.200
Depth (m)	0.520
Base Level (m)	58.680
Paving Layer Depth (mm)	120
Membrane Percolation (m/hr)	324.0
Porosity (%)	30
Length (m)	15.241
Long. Slope (1:X)	500.00
Width (m)	1.554
Total Volume (m³)	2.843

Inlets

Inlet

Inlet Type	Lateral Inflow
Incoming Item(s)	Building 2.c
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (1)

Inlet Type	Lateral Inflow
Incoming Item(s)	5.000
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	5.001
Outlet Type	Free Discharge

Advanced

Conductivity (m/hr)	10000.0

Project:	Date: 18/12/2023		
	Designed by: zulakha.asif	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Porous Paving 9

Type : Porous Paving

Dimensions

Exceedance Level (m)	59.880
Depth (m)	0.520
Base Level (m)	59.360
Paving Layer Depth (mm)	120
Membrane Percolation (m/hr)	324.0
Porosity (%)	30
Length (m)	5.905
Long. Slope (1:X)	500.00
Width (m)	2.631
Total Volume (m³)	1.864

Inlets

Inlet

Inlet Type	Lateral Inflow
Incoming Item(s)	1.001
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	1.002
Outlet Type	Free Discharge

Advanced

Conductivity (m/hr)	10000.0

Project:	Date: 18/12/2023		
	Designed by: zulakha.asif	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Porous Paving 10

Type : Porous Paving

Dimensions

Exceedance Level (m)	59.410
Depth (m)	0.520
Base Level (m)	58.890
Paving Layer Depth (mm)	120
Membrane Percolation (m/hr)	324.0
Porosity (%)	30
Length (m)	15.848
Long. Slope (1:X)	500.00
Width (m)	1.532
Total Volume (m^3)	2.913

Inlets

Inlet

Inlet Type	Lateral Inflow
Incoming Item(s)	Paving 6
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (2)

Inlet Type	Lateral Inflow
Incoming Item(s)	1.003
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	1.004
Outlet Type	Free Discharge

Advanced

Conductivity (m/hr)	10000.0

Porous Paving 11

Type : Porous Paving

Dimensions

Exceedance Level (m)	59.235
Depth (m)	0.520
Base Level (m)	58.715
Paving Layer Depth (mm)	120
Membrane Percolation (m/hr)	324.0
Porosity (%)	30
Length (m)	3.913
Long. Slope (1:X)	500.00
Width (m)	1.851
Total Volume (m³)	0.869

Inlets

Inlet

Inlet Type	Lateral Inflow
Incoming Item(s)	Building 2.b
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (1)

Inlet Type	Lateral Inflow
Incoming Item(s)	1.004
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	1.005
Outlet Type	Free Discharge

Advanced

Conductivity (m/hr)	10000.0

Porous Paving 12

Type : Porous Paving

Dimensions

Exceedance Level (m)	59.880
Depth (m)	0.520
Base Level (m)	59.360
Paving Layer Depth (mm)	120
Membrane Percolation (m/hr)	324.0
Porosity (%)	30
Length (m)	3.176
Long. Slope (1:X)	500.00
Width (m)	1.912
Total Volume (m^3)	0.729

Inlets

Inlet

Inlet Type	Lateral Inflow
Incoming Item(s)	Building 2.a
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (2)

Inlet Type	Lateral Inflow
Incoming Item(s)	1.002
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	1.003
Outlet Type	Free Discharge

Advanced

Conductivity (m/hr)	10000.0

Cellular Storage

Type : Cellular Storage

Dimensions

Exceedance Level (m)	59.300
Depth (m)	1.200
Base Level (m)	56.980
Number of Crates Long	10
Number of Crates Wide	10
Number of Crates High	3
Porosity (%)	100
Crate Length (m)	1
Crate Width (m)	0.5
Crate Height (m)	0.4
Total Volume (m³)	61.120

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Pipe 1
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	Pipe 2
Bypass Destination	(None)
Capacity Type	No Restriction

Project:	Date: 18/12/2023		
	Designed by: zulakha.asif	Checked by:	Approved By:
Report Details: Type: Inflow Summary Storm Phase: Phase	Company Address:		

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
Building 1.a	Porous Paving 2		Time of Concentration	0.013	100	0	100	0.013
Building 1.b	Porous Paving 3		Time of Concentration	0.012	100	0	100	0.012
Building 1.c	Porous Paving 1		Time of Concentration	0.012	100	0	100	0.012
Building 1.d	Porous Paving 3		Time of Concentration	0.013	100	0	100	0.013
Building 2.a	Porous Paving 12		Time of Concentration	0.008	100	0	100	0.008
Building 2.b	Porous Paving 11		Time of Concentration	0.009	100	0	100	0.009
Building 2.c	Porous Paving 8		Time of Concentration	0.009	100	0	100	0.009
Building 2.d	Porous Paving 6		Time of Concentration	0.008	100	0	100	0.008
Paving 1	Porous Paving 1		Time of Concentration	0.007	100	0	100	0.007
Paving 2	Porous Paving 3		Time of Concentration	0.009	100	0	100	0.009
Paving 3	Porous Paving 4		Time of Concentration	0.010	100	0	100	0.010
Paving 4	Porous Paving 6		Time of Concentration	0.015	100	0	100	0.015
Paving 5.a	Porous Paving 6		Time of Concentration	0.009	100	0	100	0.009
Paving 5.b	Porous Paving 7		Time of Concentration	0.013	100	0	100	0.013
Paving 6	Porous Paving 10		Time of Concentration	0.005	100	0	100	0.005
TOTAL		**0.0**		**0.151**				**0.151**

Project:	Date: 18/12/2023		
	Designed by: zulakha.asif	Checked by:	Approved By:
Report Title: Rainfall Analysis Criteria	Company Address:		

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Rainfall

FSR

Type: FSR

Region	England And Wales
M5-60 (mm)	20.0
Ratio R	0.400
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
1.0	0.000
30.0	0.000
100.0	0.000
100.0	40.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
240	480
360	720
480	960
960	1920
1440	2880

Project:	Date: 18/12/2023		
	Designed by: zulakha.asif	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		

FSR: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
1	FSR: 30 years: +0 %: 240 mins: Winter	59.160	56.900	57.608	0.708	7.9	3.204	0.000	1.3	62.819	Surcharged
3	FSR: 30 years: +0 %: 15 mins: Summer	58.800	56.810	56.832	0.022	1.3	0.000	0.000	1.3	1.759	OK
SMH 1.0	FSR: 30 years: +0 %: 15 mins: Summer	59.150	58.350	58.350	0.000	0.0	0.000	0.000	0.0	0.000	OK
2	FSR: 30 years: +0 %: 240 mins: Winter	59.180	57.000	57.608	0.608	6.1	0.688	0.000	0.0	41.382	Surcharged

Project:	Date: 18/12/2023		
	Designed by: zulakha.asif	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		

FSR: 100 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
1	FSR: 100 years: +40 %: 360 mins: Winter	59.160	56.900	58.773	1.873	11.9	8.473	0.000	1.9	126.534	Surcharged
3	FSR: 100 years: +40 %: 360 mins: Winter	58.800	56.810	56.837	0.027	1.9	0.000	0.000	1.9	63.297	OK
SMH 1.0	FSR: 100 years: +40 %: 360 mins: Winter	59.150	58.350	58.773	0.423	0.5	0.478	0.000	0.2	0.496	Surcharged
2	FSR: 100 years: +40 %: 360 mins: Winter	59.180	57.000	58.773	1.773	9.6	2.005	0.000	0.2	81.241	Surcharged

Project:	Date: 18/12/2023		
	Designed by: zulakha.asif	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

FSR: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Half Drain Down Time (mins)	Percentage Available (%)
Porous Paving 1	FSR: 30 years: +0 %: 30 mins: Winter	60.303	60.084	0.208	0.029	6.0	1.741	0.000	0.000	4.6	5.951	8	62.926
Porous Paving 2	FSR: 30 years: +0 %: 30 mins: Winter	60.488	60.307	0.159	0.024	2.9	1.037	0.000	0.000	1.7	2.405	13	70.838
Porous Paving 3	FSR: 30 years: +0 %: 30 mins: Winter	59.869	59.745	0.126	0.042	7.6	2.912	0.000	0.000	4.9	6.369	13	75.503
Porous Paving 4	FSR: 30 years: +0 %: 30 mins: Winter	60.101	60.043	0.031	0.013	2.3	1.155	0.000	0.000	1.0	1.675	26	92.870
Porous Paving 5	FSR: 30 years: +0 %: 60 mins: Winter	59.703	59.697	0.215	0.217	5.2	2.081	0.000	0.000	4.4	10.076	7	46.089
Porous Paving 6	FSR: 30 years: +0 %: 60 mins: Winter	59.692	59.502	0.148	0.022	9.1	5.918	0.000	0.000	5.5	16.590	12	71.049
Porous Paving 7	FSR: 30 years: +0 %: 60 mins: Winter	58.789	58.609	0.167	0.029	7.3	3.292	0.000	0.000	6.5	20.688	5	69.408
Porous Paving 8	FSR: 30 years: +0 %: 60 mins: Winter	58.933	58.807	0.223	0.127	4.2	1.309	0.000	0.000	3.8	11.741	6	53.967
Porous Paving 9	FSR: 30 years: +0 %: 15 mins: Winter	59.527	59.484	0.155	0.124	4.1	0.650	0.000	0.000	4.5	3.504	4	65.155
Porous Paving 10	FSR: 30 years: +0 %: 30 mins: Winter	59.176	58.926	0.254	0.036	6.8	1.231	0.000	0.000	5.9	7.985	2	57.743
Porous Paving 11	FSR: 30 years: +0 %: 30 mins: Winter	58.855	58.734	0.132	0.019	7.4	0.164	0.000	0.000	7.3	9.757	0	81.109
Porous Paving 12	FSR: 30 years: +0 %: 30 mins: Winter	59.472	59.387	0.106	0.027	5.8	0.121	0.000	0.000	5.7	7.343	0	83.414
Cellular Storage	FSR: 30 years: +0 %: 240 mins: Winter	57.608	57.608	0.628	0.628	5.9	31.415	0.000	0.000	0.0	9.737		48.601

Status
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Project:	Date: 18/12/2023		
	Designed by: zulakha.asif	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

FSR: 100 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Half Drain Down Time (mins)	Percentage Available (%)
Porous Paving 1	FSR: 100 years: +40 %: 30 mins: Winter	60.403	60.099	0.307	0.044	11.1	2.566	0.000	0.000	9.4	11.353	5	45.360
Porous Paving 2	FSR: 100 years: +40 %: 15 mins: Winter	60.588	60.413	0.259	0.130	8.0	1.909	0.000	0.000	3.5	3.063	13	46.331
Porous Paving 3	FSR: 100 years: +40 %: 30 mins: Winter	59.955	59.863	0.212	0.160	14.0	5.779	0.000	0.000	6.9	11.936	17	51.379
Porous Paving 4	FSR: 100 years: +40 %: 30 mins: Winter	60.128	60.049	0.057	0.019	4.2	1.925	0.000	0.000	2.2	3.247	19	88.118
Porous Paving 5	FSR: 100 years: +40 %: 60 mins: Winter	59.809	59.800	0.320	0.320	8.0	3.089	0.000	0.000	7.3	19.398	5	19.962
Porous Paving 6	FSR: 100 years: +40 %: 60 mins: Winter	59.781	59.512	0.238	0.032	15.9	9.186	0.000	0.000	11.4	32.512	13	55.066
Porous Paving 7	FSR: 100 years: +40 %: 60 mins: Winter	58.886	58.695	0.264	0.115	15.2	5.694	0.000	0.000	14.0	41.004	7	47.098
Porous Paving 8	FSR: 100 years: +40 %: 60 mins: Winter	59.105	58.969	0.395	0.289	8.6	2.494	0.000	0.000	7.9	22.954	5	12.264
Porous Paving 9	FSR: 100 years: +40 %: 15 mins: Winter	59.629	59.578	0.257	0.218	8.4	1.108	0.000	0.000	9.1	7.208	3	40.554
Porous Paving 10	FSR: 100 years: +40 %: 30 mins: Winter	59.304	59.012	0.382	0.122	13.4	2.024	0.000	0.000	12.2	15.469	4	30.512
Porous Paving 11	FSR: 100 years: +40 %: 30 mins: Winter	58.910	58.743	0.187	0.028	14.1	0.233	0.000	0.000	14.1	18.755	0	73.185
Porous Paving 12	FSR: 100 years: +40 %: 30 mins: Winter	59.518	59.399	0.152	0.039	11.5	0.173	0.000	0.000	11.4	14.048	0	76.212
Cellular Storage	FSR: 100 years: +40 %: 360 mins: Winter	58.773	58.773	1.793	1.793	9.4	60.611	0.000	0.000	0.0	19.514		0.832

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13. APPENDIX E SUDS PROFORMA

Drainage Assessment Form

We require applicants to complete this Drainage Assessment Form (DAF) and submit it to the Local Planning Authority, referencing from where the information in the submission document is taken. The form is supported by the Defra/EA guidance on Rainfall Runoff Management document (www.evidence.environment- agency.gov.uk/FCERM/Libraries/FCERM_Project_Documents/Rainfall_Runoff_Management_for_Developments_-_Revision_E.sflb.ashx) and aligns to the tools on www.UKsuds.com.

1. Site Details

SITE DETAILS		NOTES FOR APPLICANTS & LOCAL AUTHORITIES
Site Name	City House	
LPA reference (if applicable)		
Address & post code	City House, Sutton Park Road, SM1 2AE	
Grid reference	(525760, 163990)	Centre point of the site in eastings, northings (XXXXXX, YYYYYY) format.
Brief description of proposed work	Demolition of existing building, and erection of a part 13-storey and part 5-storey building, for 70 'build to rent' residential apartments (Class C3), 191sqm (NIA) office space (Class E(g)(i)) and associated landscape and public realm improvements	For example, type of development, number of units etc.
Is the existing site Brownfield or Greenfield?	Brownfield	Brownfield = developed. Greenfield = undeveloped.
Total site Area (Ha)	0.175	The area, in hectares, of the whole development site including any large parkland areas and public open space.
Significant public open space (Ha)	N/A	The area, in hectares, of any large parkland areas or public open space situated within the site which remains largely unchanged and is not provided with positive drainage
Area Positively Drained (Ha)*	0.122 ha (Existing area) 0.141 ha (Proposed area)	This is the total development area that is served by the drainage system. It is the difference between the total site area and the significant public open space.
Is the site currently known to be at risk of flooding from any sources? If so, please state and provide evidence.	Ground water flooding at a low risk (refer to report J5423-C-RP-001 - Flood Risk Assessment)	Please attach surface water and fluvial flood risk maps (as shown on the Environment Agency's website) and any records of known historic flooding at the site.

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

2. Impermeable Area

	EXISTING	PROPOSED	DIFFERENCE (PROPOSED-EXISTING)	NOTES FOR APPLICANTS & LOCAL AUTHORITIES
Impermeable area (Ha) Surfaces which do not permit infiltration of water into the ground.	0.122	0.141	+0.019	If proposed > existing, then runoff rates and volumes will be increasing.
Drainage Method Rainwater harvesting/infiltration/SuDS/ watercourse/sewer	0.053	0.102		See the London Plan Policy 5.1.3 Drainage Hierarchy. If the existing drainage was via infiltration and the proposed is not, section 3 should provide evidence as to why.

3. Is infiltration on-site suitable? Storage is required for the additional volume from site but also for holding back water to slow down the rate of discharge from the site. This is known as attenuation storage and long term storage. The idea is that the additional volume is not permitted to flow rapidly overland, into watercourses or into the sewer system and hence potentially increasing flood risk on site and downstream of the site. You can either infiltrate the stored water back into the ground, or if this isn't possible hold it back with on-site storage, allowing gradual discharge at a controlled rate. Please fill in the table to show the extent of your investigations as to whether infiltration is a possible route for runoff to be discharged to.

			NOTES FOR APPLICANTS & LOCAL AUTHORITIES
Infiltration	**State the site's geology (including superficial deposits where known).**	Bedrock Geology – Chalk Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation Sedimentary Deposits – No info Head – Clay, Silt, Sand, Gravel	Infiltration rates are highly variable and infiltrating into made (i.e. unnatural) ground should be avoided.
	State the site's known Source Protection Zones (SPZ).	Zone 1 – Inner Protection Zone	Please refer to the Environment Agency's website to identify any source protection zones (SPZ).
	What is the development site's infiltration rate?	Not done to date	Infiltration rates should be worked out in accordance with BRE 365. If infiltration is the preferred method of drainage, then rates should be no lower than $1x10^{-6}$ m/s.
	Were infiltration rates obtained via a desktop study or from infiltration tests?	Not done to date	If it is not feasible to access the site to carry out infiltration tests before planning approval is granted, a desktop study could be undertaken looking at the underlying geology of the area and assuming a worst-case infiltration rate.
	At what depth below ground is the water table (groundwater level)?	Not mentioned on borehole data	Where known, please use borehole test results and state the time of year these were carried out.
	State the distance between the proposed infiltration device base and the water table.	TBC	Need a minimum of 1m between the base of the infiltration device and the water table to protect groundwater quality and ensure groundwater does not enter infiltration devices. Avoid infiltration where this is not possible.
	Is the site contaminated? If yes, consider advice from others on whether infiltration can happen.	TBC	Water should not be infiltrated through land that is contaminated. The Environment Agency may provide bespoke advice in planning consultations for contaminated sites that should be considered.

In light of the above information, is infiltration feasible?	**TBC**	If infiltration is not feasible the applicant should consider the options in section 4. If infiltration is feasible, then it can be combined with the methods in section 4.

4. Method Proposed to Discharge Surface Water via *(in line with London Plan Policy 5.13 drainage hierarchy).* Please select numerous options if this is the case.

	YES	NO	EVIDENCE THAT THIS IS OR IS NOT POSSIBLE	NOTES FOR APPLICANTS & LOCAL AUTHORITIES
Rainwater harvesting		X	Water reuse is not proposed as part of the phase 1 development, as space is extremely limited.	Rainwater harvesting is where rainwater is stored on site for reuse. For example, water for gardening, domestic use etc.
Infiltration	X		Infiltration to occur on soft standing landscaping. Unlined permeable paving will be used on all the hardstanding surfaces on this site.	Allowing space for rainwater to soak into the ground, as per natural methods.
Attenuation of rain water in ponds and open water features		X	Open water features have not been considered as a viable option for the site, as space is extremely limited.	Please see the CIRIA SuDS Manual for further details about above ground attenuation techniques.
Attenuation of rain water through tanks or sealed water features	X		A cellular attenuation tank has been proposed for the site. This shall attenuate flow to 2 l/s prior to discharge into the existing Thames Water surface water Sewer.	Underground storage features which gradually release water. Please note that these are less sustainable than above ground methods and are usually more complex to maintain.
To watercourse		X	This option is not viable as there is no watercourse on or close enough to the site	Is there a watercourse nearby? If so please name, stating approximate distance from site.
To surface water sewer	X		Attenuated rainwater from the proposed buildings shall be discharged into an existing surface water sewer.	The confirmation from sewer provider that sufficient capacity exists for this connection will be required.
To combined sewer		X	There is no proposed discharge of surface water into a combined water sewer.	This would only be acceptable in worst case scenarios and certainly not where separate sewer systems currently exist.

5. Supporting Calculations – in order to check that the proposed development is designed to conform to standards, please complete the following three tables showing your calculations.

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

Please circle which method was used to calculate the Greenfield Runoff Estimation for Sites:	IH124 method / FEH method
London Plan policy 5.13*: developers should aim for a Greenfield runoff rate from their developments.*	

London Plan Sustainable Design and Construction SPG section 3.4.10: All developments on Greenfield sites must maintain Greenfield runoff rates. On previously developed sites, runoff rates should not be more than three times the calculated Greenfield rate.				
	GREENFIELD RATES (L/S) (A)	PROPOSED RATES (L/S) (B)	DIFFERENCE (L/S) (PROPOSED-GREENFIELD)	NOTES FOR APPLICANTS & LOCAL AUTHORITIES
QBAR	0.8			QBAR is approximately the 1 in 2 year storm event.
1 in 1 year	0.68	2	-0.04	Proposed discharge rates (with mitigation) should be no greater than the Greenfield rates for all corresponding storm events. Please note that discharging all flow, regardless of the corresponding storm event intensity, from site at the existing 1 in 100 year event rate would increase flood risk during smaller events and therefore would not be permitted.
1 in 30 year	1.85	2	-3.55	
1 in 100 year	2.56	2	-5.68	
1 in 100 year plus climate change		2		To mitigate for climate change the proposed 1 in 100 year +CC runoff rate must be no greater than the Greenfield 1 in 100 year event runoff rate. 30% should be added to the peak rainfall intensity to represent increases due to climate change.
Instructions: To fill in the required 'Difference' boxes, if the site is Greenfield, calculate B-A. If the site is Brownfield prior to development, calculate B-(3xA).				

B. Discharge Volumes Post Development (without mitigation)

The Non-Statutory Technical Guidance for SuDS: Where reasonably practicable, for Greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event should never exceed the Greenfield r0+ unoff volume for the same event. Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the Greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.						
	EXISTING VOLUME		POST-DEVELOPMENT VOLUME (M³) (WITHOUT MITIGATION) (C)	DIFFERENCE (M³)		NOTES FOR APPLICANTS & LOCAL AUTHORITIES
	GREENFIELD VOLUME (M³) (A)	BROWNFIELD VOLUME (M³) (B)		POST-DEVELOPMENT TO GREENFIELD (C-A)	POST-DEVELOPMENT TO BROWNFIELD (IF APPLICABLE) (C-B)	
1 in 100 year, 6 hour event	57	76.372	88.27	31	11.90	These calculations provide an indication of how much storage will be required on site.
Instructions: If the site was Greenfield prior to development, only fill in boxes the green boxes. If the site was Brownfield prior to development, complete all of the boxes.						

C. Storage Methods – Attenuation storage is provided to enable the rate of runoff from the site into the receiving watercourse or sewer to be limited to an acceptable rate to protect against erosion and flooding downstream. The attenuation storage volume is a function of the degree of development relative to the

Greenfield discharge rate. Long term storage is similar to attenuation storage, but aims to specifically address the additional volume of runoff caused by the development compared to pre-development runoff. A combination of SuDS features can account for both types of storage.

London Plan Sustainable Design and Construction SPG section 3.4.8 *Most developments referred to the Mayor have been able to achieve at least 50% attenuation of the site's (prior to re-development) surface water runoff at peak times. This is the minimum expectation from development proposals.*

TYPE OF SUDS FEATURE	VOLUME (M³)	NOTES FOR APPLICANTS & LOCAL AUTHORITIES
1 Permeable Paving	27.20	SuDS can be adapted for most situations even where infiltration isn't feasible e.g. impermeable liners beneath some SuDS devices allows treatment but not infiltration. See the CIRIA SuDS Manual C697. If no storage features have been proposed please explain why this is the case and provide evidence to back up this reasoning in the box below.
2 Attenuation Tank	61.12	
3		
4		
5		
6		
7		
8		
9		
10		
TOTAL	88.32	This value should be equal to or greater than the relevant 'Difference' value in section 5B. If the site was previously Greenfield, this total should be equal to or greater than the (C-A) value. If the site was previously Brownfield, then this total value should be equal to or greater than the (C-B) value, but as close to the (C-A) value as possible.
Percentage (%) attenuation of the site's surface water runoff at 1 in 100 year, 6 hour event (prior to re-development):	100%	As a minimum, 50% attenuation of the site's surface water runoff at 1 in 100 year, 6 hour event (prior to re-development) should be achieved.

Instructions: For the 'Percentage (%) attenuation of the site's surface water runoff at 1 in 100 year, 6 hour event (prior to re-development)' box above, please calculate the percentage of proposed attenuation with respect to sites surface water runoff prior to development.

Therefore, if the site was Greenfield, the sum should be:

$$\frac{\text{Total volume taken from section 5C}}{\text{Existing Greenfield runoff volume taken from section 5B}} \times 100$$

And if the site was Brownfield, the sum should be:

$$\frac{\text{Total volume taken from section 5C}}{\text{Existing Brownfield runoff volume taken from section 5B}} \times 100$$

IF NO STORAGE FEATURES HAVE BEEN PROPOSED IN THE SECTION ABOVE, PLEASE EXPLAIN WHY THIS IS THE CASE AND PROVIDE EVIDENCE TO BACK UP THIS REASONING IN THIS BOX

6. Please confirm…

	EVIDENCE (PLEASE NAME RELEVANT EVIDENCE DOCUMENT(S))	NOTES FOR APPLICANTS & LOCAL AUTHORITIES
That the drainage system can contain the 1 in 30 storm event without flooding.	Info drainage model calculations in report J5423-C-RP-002 in Appendix D	The Non-Statutory Technical Standards for SuDS states that no part of the site should flood during a 1 in 30 year event (unless that area is designated to hold and/or convey water as part of the design). This is also a requirement for Sewers for Adoption and is good practice.
That any flooding between the 1 in 30 & 1 in 100 plus climate change storm events will be safely contained on site.	Info drainage model calculations in report J5423-C-RP-002 in Appendix D	Safely: not causing property flooding or posing a hazard to site users i.e. no deeper than 300mm on roads/footpaths. Flood waters must drain away at section 5A rates.
How runoff flows from storm events in excess of 1 in 100 years will be managed on site.	Attenuation provided in permeable paving as well as the attenuation tank on site. Info drainage model calculations in report J5423-C-RP-002 in Appendix D	As per the Non-Statutory Technical Standards for SuDS, proposed methods for managing excess flows should be demonstrated so as to minimise the risks to people and property, e.g. through evidence of exceedance routes.
How are rates being restricted (hydrobrake etc.)?	Hydrobrake used at 2l/s, refer to report J5423-C-RP-002.	Hydrobrakes to be used where rates are between 2l/s to 5l/s. Orifices not to be used below 5l/s as the pipes may block. Pipes with flows < 2l/s are prone to blockage.

7. Adoption and Maintenance – please provide the following information

	ADOPTION AND MAINTENANCE INFORMATION	NOTES FOR APPLICANTS & LOCAL AUTHORITIES

Please confirm the proposed owners/adopters of the entire drainage systems throughout the life of the development. Please list all the owners and contact details.	Private ownership of drainage system by landowners: Macar Living (City House) Ltd	If there are multiple owners then a drawing illustrating exactly what features will be within each owner's remit must be submitted with this Drainage Assessment Form.
How is the entire drainage system to be maintained?	Refer to J5423-C-RP-002 section 7.	Clear details of the maintenance proposals of all elements of the proposed drainage system over the lifetime of the development must be provided. Poorly maintained drainage can lead to increased flooding problems in the future. If the space provided is not big enough, please attach a separate document containing all relevant information.

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

FORM SECTION	DOCUMENT REFERENCE WHERE DETAILS QUOTED ABOVE ARE TAKEN FROM	PAGE NUMBER
Section 2	J5423-C-RP-002 – Sustainable Drainage Strategy, section 6.2.1	14
Section 3	J5423-C-RP-001 – Flood Risk Assessment, section 3.2	8
Section 4	J5423-C-RP-002 – Sustainable Drainage Strategy, section 6.3.	15
Section 5A	J5423-C-RP-002 – Sustainable Drainage Strategy, section 6.4.1.	16
Section 5B		
Section 5C	J5423-C-RP-002 – Sustainable Drainage Strategy, Appendix B	23

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

This form is completed using factual information from the documents submitted with this application to the LPA, including Site Plans and, if necessary, a Flood Risk Assessment, and can be used as a summary of the surface water drainage strategy on this site.

Form Completed By………… Zulakha Asif ……………………………………………………………………………………………….
Qualification of person responsible for signing off this Drainage Assessment Form ………….. Civil Engineering Consultant ……………………………………….

Company:
On behalf of Macar Living (City House) Ltd
Date:………… 31/01/24 ………………………………………….