JOHN DAVIES ASSOCIATES
Consulting Engineers

43A WOODSTOCK GARDENS
HAYES
LONDON
UB4 8BA

DRAINAGE STRATEGY
(Rev C)

30th APRIL 2025

Issue Sheet.

Prepared	Date		Checked	Date
MJM	31-01-25		JD	31-01-25

Revisions	Comment	Date
A	Initial Issue	31-01-25
B	Drainage plans updated	14-02-25
C	Drainage plans updated	30-04-25

The report is based on the information that has been acquired and / or made available to John Davies Associates Limited via the various searches and consultations undertaken as part of the Drainage Strategy Report. In some cases, anecdotal information has been relied upon, where documented evidence has been lacking.

The conclusions drawn in the following report are considered correct although any subsequent additional information may allow refinement of the conclusions.

All work carried out in preparing this report has utilised and is based upon John Davies Associates current professional knowledge and understanding of current UK standards and codes, technology and legislation. Changes in this legislation and guidance may occur at any time in the future and cause any conclusions to become inappropriate or incorrect.

This report has been prepared using information contained in maps and documents prepared by others. John Davies Associates can accept no responsibility for the accuracy of such information.

Table of Contents

1 Introduction

1.1 This document is provided as a drainage strategy to discharge a planning condition for a proposed development located at a piece of land off Woodstock Gardens in hayes, London.

1.2 The site is surplus land belonging to 43A Woodstock Gardens and is considered greenfield land.

1.3 The overall site area is approx. 644m² (0.064ha), the site is bounded on all side by existing residential dwellings, to the northeast corner of the site is an existing driveway off Woodstock Gardens from which the site is accessed.

1.4 The nearest postcode is UB4 8BA and the co-ordinates are 509492E, 181810N, see below for location plan.

1.5 The proposal is the construction of a 3-bedroomed dwelling in the garden space adjacent to 43A, this includes new driveway and parking spaces. (See Appendix A for the layout plans).

2 Existing Drainage

2.1 The local water authority is Thames Water, we have obtained the sewer records and there is an existing foul and surface water sewer under Woodstock Gardens. (See Appendix B for sewer records).

2.2 As there is an existing dwelling on the site then it is expected that there should be existing connections located on site, at the time of writing no survey had been undertaken therefore we were unable to comment further.

3 Proposed Surface Water Drainage

3.1 In accordance with the SUDS hierarchy when considering surface water drainage then consideration to each of the below discharge options should be considered in sequence:

SOURCE (INFILTRATION)

WATERCOURSE

SURFACE WATER SEWER

COMBINED SEWER

3.2 Soakaway testing has been undertaken on site and failed to achieve a positive result, it has therefore been concluded that soakaways are not viable on this site. (See Appendix C for soakaway results).

3.3 Next in the SUDS hierarchy would be to discharge to a water course but as there are no watercourses in the vicinity of the site then this has also been discounted.

3.4 Therefore it is proposed to connect into the public surface water sewer under Woodstock gardens. A survey should be undertaken to investigate the existing on site sewers for the potential of connecting into the public sewer via an existing connection.

3.5 The site is a greenfield site and therefore the surface water runoff should be restricted to exiting greenfield rates, which for this site are as follows: (see appendix D for greenfield calc):

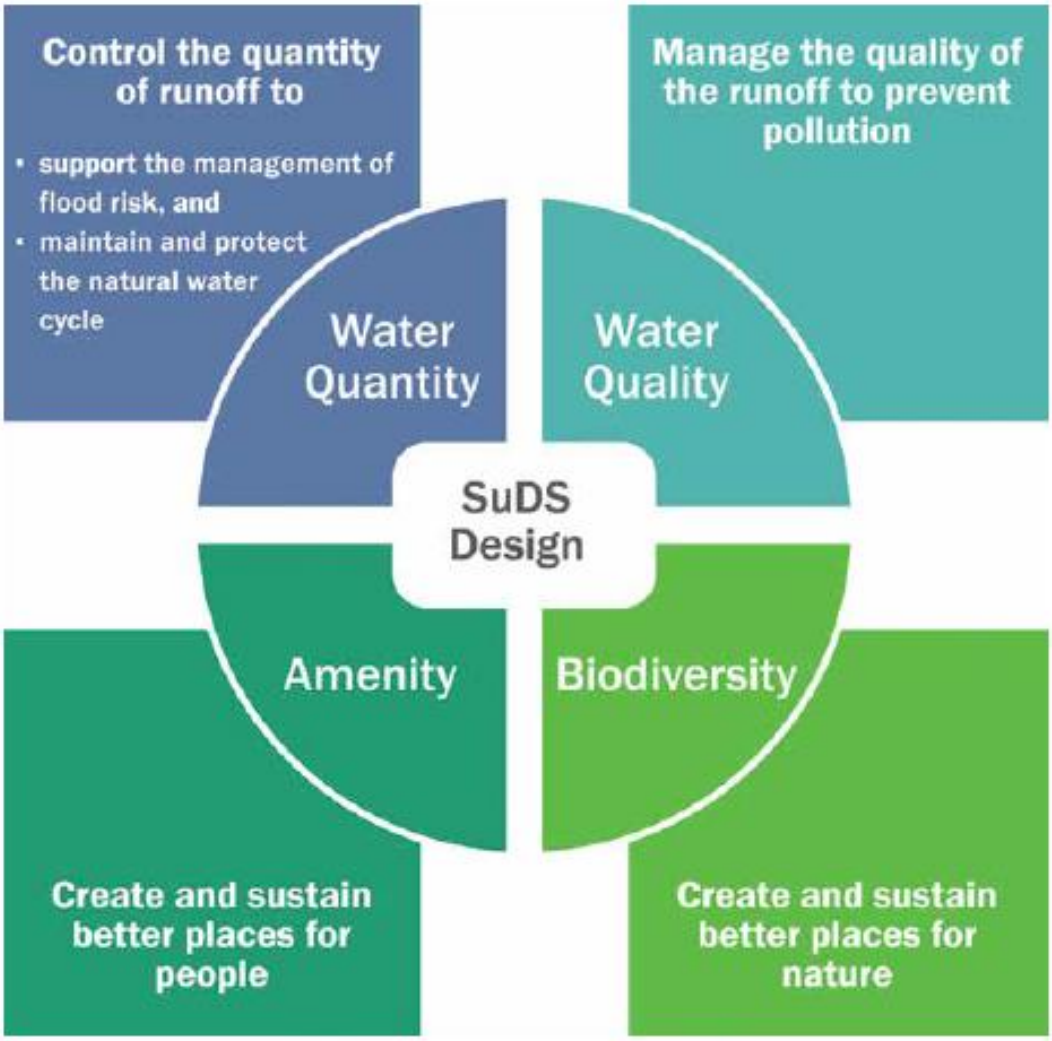
QBar = 0.42 l/s
1 in 1Year = 0.36 l/s
1 in 30 Year = 0.96 l/s
1 in 100 Year = 1.34 l/s

3.6 It is considered that the above QBAR rate is too low to be practically achievable as the orifice required would be such as size that it would be at risk of frequent blockages, therefore it is proposed to restrict the flow to **1.0l/s** which is less than the equivalent 1 in 100 Year event.

3.7 The site is therefore proposed to discharge to the public surface water sewer via a new connection on the public sewer manhole, with a restricted discharge rate of **1.0 l/s** with attenuation provided on site in the sub-base of the permeable paving, sized to accommodate the **1 in 100 year + 40%** climate change rainfall event. (See Appendix E for the drainage layout and Appendix F for drainage calcs)

4 SUDS

4.1 All new surface water should be designed in accordance with 'The SUDS Manual' which identifies 4 pillars of a sustainable drainage solution, these four elements are shown as:



4.2 **WATER QUANTITY:** The surface water from the site is being restricted to the equivalent greenfield runoff rates of 1.0 l/s which attenuation on site in the sub-base of the permeable paving, we have also incorporated the use of rain gardens where practical.

4.3 **WATER QUALITY:** All the new roof and hard paved areas are being discharged via permeable paving which offers 2 levels of treatment, as well the rain gardens where possible.

4.4 **AMENITY AND BIODIVERSITY:** New Garden areas are being provided to the new dwelling, due to the size of the site then no other amenity space is practical.

4.5 All new surface water drainage systems should implement SUDS features where reasonably possible, these features are incorporated to offer benefits in Water Quality, Water Quantity, Amenity and Biodiversity. Below we have considered each SUDS element and determined it use within this particular development.

COMPONENT	SUITABILITY	REASON
Rainwater Harvesting	✓	Potential for a rainwater harvesting unit to be placed in the rear garden of each property.
Green Roof	X	Roof is pitched and therefore not suitable for a Green Roof.
Blue Roof	X	Roof is pitched and therefore not suitable for a Green Roof.
Infiltration Systems	X	Infiltration is not suitable on this site.
Proprietary Treatment Systems	✓	Flow control device to be utilised.
Filter Strips	X	Infiltration is not suitable on this site.
Filter Drains	X	Infiltration is not suitable on this site.
Swales	X	Infiltration is not suitable on this site / Insufficient space.
Bioretention Systems	X	Insufficient land available.
Trees	✓	New trees have been included in the rear gardens.
Pervious Pavements	✓	All parking bays are permeable paving.
Attenuation Storage Tanks	X	Storage is being provided in the subbase of the permeable paving.
Detention Basins	X	Insufficient land available.
Ponds and Wetlands	X	Insufficient land available.

5 Proposed Foul Drainage

5.1 The new foul drainage is proposed to discharge to the public foul sewer via an existing connection located on site.

6 SUDS Operations and Maintenance Plan

6.1 The proposed drainage strategy consists of several SUDS elements which can have different responsibilities on the operation and maintenance and each one will require routine checks and repairs, these different SUDS elements and their require maintenance are as outlined in the table below.

ELEMENT	RESPONSIBILITY		
	PUBLIC	PRIVATE	MAINTENANCE COMPANY
RAINWATER HARVESTING			✓
FLOW CONTROL			✓
PERMEABLE PAVING			✓

6.2 RAINWATER HARVESTING

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

6.4 FLOW CONTROL DEVICE MAINTENANCE

Maintenance schedule	Required action	Typical frequency
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	Six monthly
	Change the filter media	As recommended by manufacturer
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Six monthly
	Inspect filter media and establish appropriate replacement frequencies	Six monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every six months

6.6 PERMEABLE PAVING MAINTENANCE

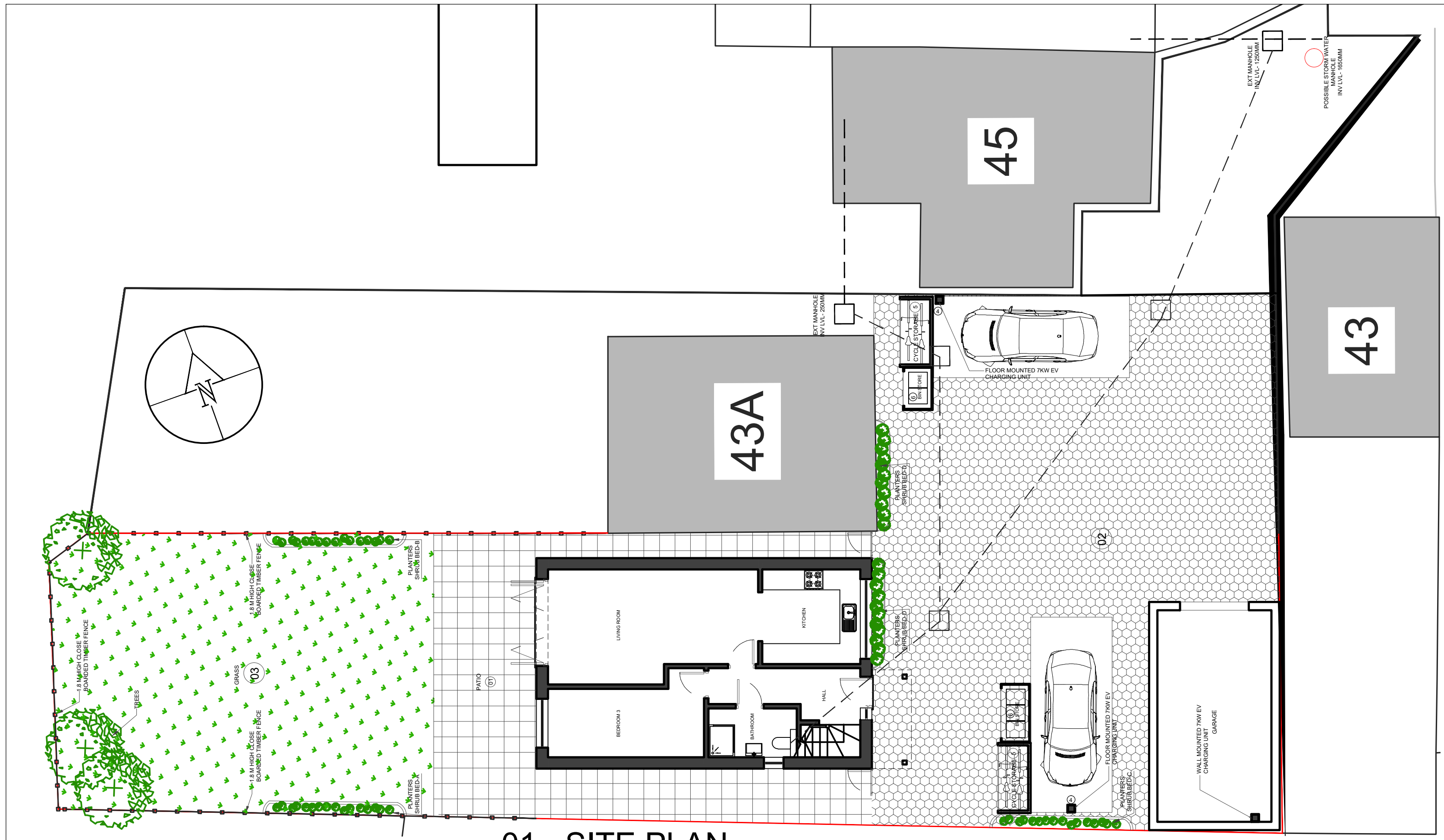
Operation and maintenance requirements for pervious pavements

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator 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 50 mm of the level of the paving	As required
	Remedial work 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 of surface and upper substructure by remedial sweeping	Every 10 to 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, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

7 Flood Exceedance Event

7.1 Although the drainage has been designed to accommodate the 1 in 100 year + 40%cc rainfall event consideration has to be given to the exceedance event to the drainage, this is the event where the surface water system is pushed to such a point that it is forced to flood so that the resultant flow paths can be identified on a plan. (See Appendix G for plan).

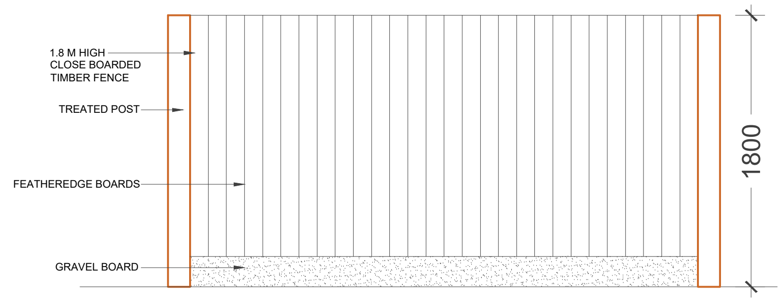
Appendix A
Proposed Layouts



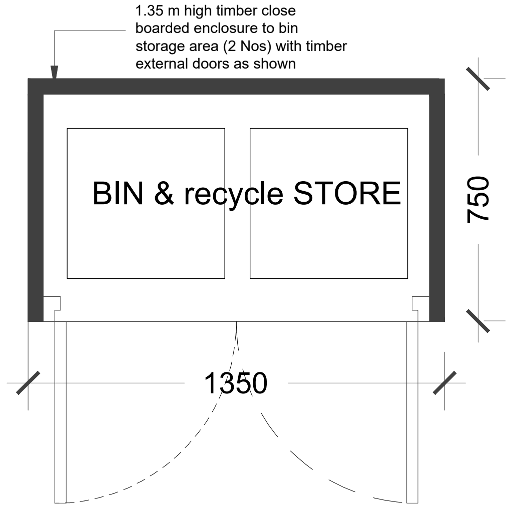
01 - SITE PLAN

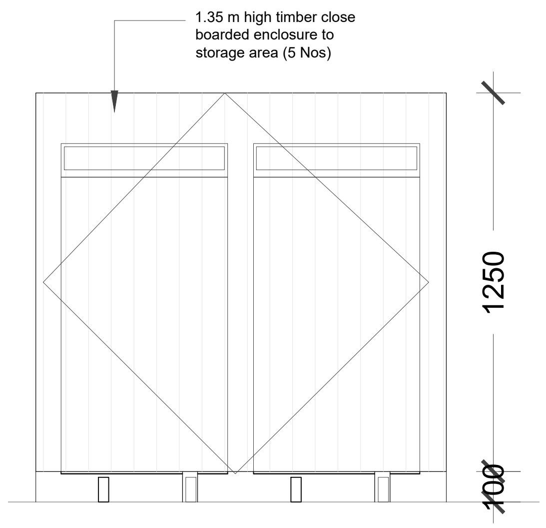
NOTES

- Dimensions are not to be scaled from this drawing by contractors. The contractor is requested to check all dimensions before the work started.
- Report any discrepancies to the client or architect before undertaking the work described in the drawings.
- Dimensions are approximate site dimensions and are to be verified by the contractor on site before any fabrication/site works i.e foundations etc occur
- Contractor is responsible for all temporary propping to existing structure

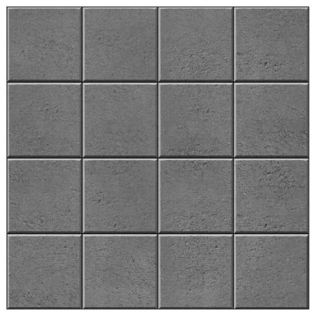


1.8 M HIGH CLOSE BOARDED TIMBER FENCE WITH REFERENCE IMAGE





TYPICAL BIN STORAGE PLAN & ELEVATION 1:25



PERMEABLE PAVING AT PATIO (1)

PERMEABLE PAVING HONEYCOMB (2)

GRASS (3)

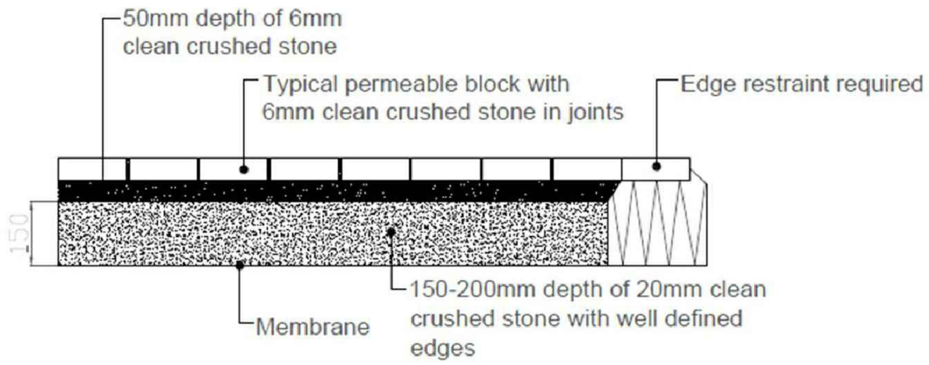
0 1 2m 3 4 5m
Scale

REVISIONS			
NO.	DESCRIPTION	DATE	BY

COVERED BIN STORE (6)

COVERED 2 CYCLES STORE (5)

2NO. FLOOR MOUNTED 7kw EV CHARGING UNIT (4)



PAVING BUILT-UP DETAIL

DESIGN ENDEAVOURS LTD
M: 07869580774, 07824773079
E: design.endeavour@gmail.com

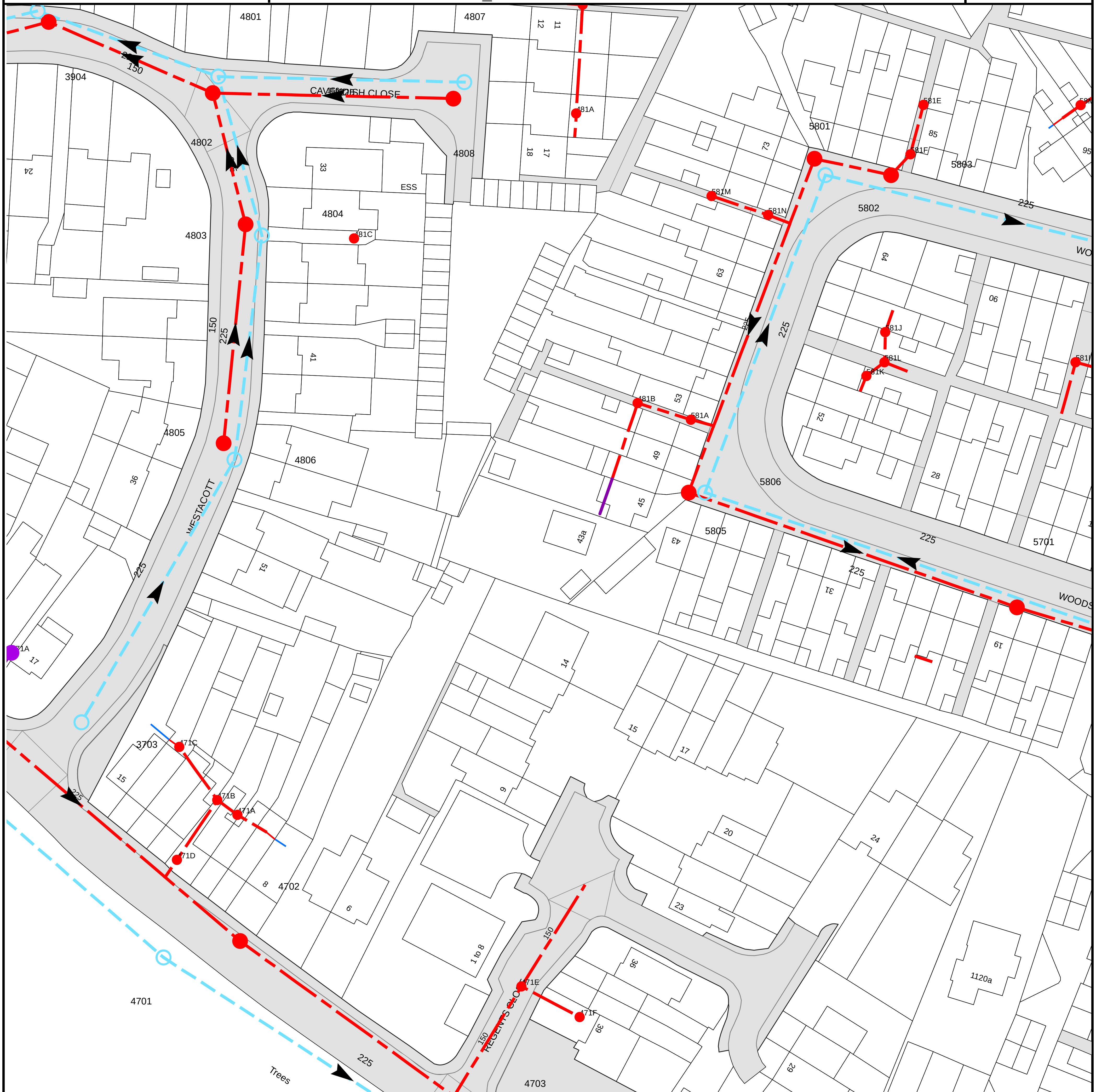
Project: 43A WOODSTOCK GARDENS HAYES
LONDON , UB4 8BA

Title: PROPOSED SITE LANDSCAPING

Scale	Drawn	Approved	Date
1:100 @A3	SZ		DEC 24
Job No.	Drawing No.		Rev.
DE-1203/24	DoC-43aWG-02		A

Appendix B
Sewer Records

Asset Location Search Sewer Map - ALS/ALS Standard/2025_5112944



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 509479,181806

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
581K	n/a	n/a
581I	n/a	n/a
581L	n/a	n/a
581J	n/a	n/a
481C	n/a	n/a
581N	n/a	n/a
581M	n/a	n/a
5802	39.72	37.82
5803	39.63	38.65
5801	39.72	38.58
581F	n/a	n/a
481A	n/a	n/a
58MH	n/a	n/a
581E	n/a	n/a
4808	40.05	38.75
4807	40.05	39.04
471F	n/a	n/a
471E	n/a	n/a
5701	40.05	38
5806	40.31	38.79
5805	40.31	38.23
581A	n/a	n/a
481B	n/a	n/a
4701	41.15	39.02
4702	41.09	38.21
471D	n/a	n/a
471A	n/a	n/a
471B	n/a	n/a
471C	n/a	n/a
3703	41.15	39.82
371A	n/a	n/a
4806	40.57	39.25
4805	40.53	38.9
4804	39.98	38.98
4803	40	38.66
4802	39.82	38.42
4801	39.83	38.7
3904	39.91	38.36
491B	n/a	n/a
3903	39.86	38.62

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

Foul Sewer: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water Sewer: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined Sewer: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

- Storm Sewer
- Sludge Sewer
- Foul Trunk Sewer
- Surface Trunk Sewer
- Combined Trunk Sewer
- Foul Rising Main
- Surface Water Rising Main
- Combined Rising Main
- Vacuum
- Thames Water Proposed
- Vent Pipe
- Gallery

Other Sewer Types (Not operated and maintained by Thames Water)

- Sewer
- Culverted Watercourse
- Proposed
- Decommissioned Sewer
- Content of this drainage network is currently unknown
- Ownership of this drainage network is currently unknown

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

- Air Valve
- Meter
- Dam Chase
- Vent
- Fitting

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

- Ancillary
- Drop Pipe
- Control Valve
- Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol. Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

- Inlet
- Outfall
- Undefined End

Other Symbols

Symbols used on maps which do not fall under other general categories.

- Change of Characteristic Indicator
- Public / Private Pumping Station
- Invert Level
- Summit

Areas

Lines denoting areas of underground surveys, etc.

- Agreement
- Chamber
- Operational Site

Ducts or Crossings

- Casement
- Conduit Bridge
- Subway
- Tunnel

Ducts may contain high voltage cables. Please check with Thames Water.

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plan are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the direction of flow.
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
5) 'na' or '0' on a manhole indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology, please contact Property Searches on 0800 009 4540.

Appendix C
Soakaway Results

JOHN DAVIES ASSOCIATES
Consulting Engineers

PANKAJ DHIR ESQ;

PROPOSED NEW HOUSE

AT

43A WOODSTOCK GARDENS

HAYES

LONDON UB 4 8BA

SOAKAWAY TEST REPORT

JCD/jad/566/1/1 **JANUARY 2025**

Registered Address: 1, St. John's Road, Queen's Park, Chester, Cheshire CH4 7AL

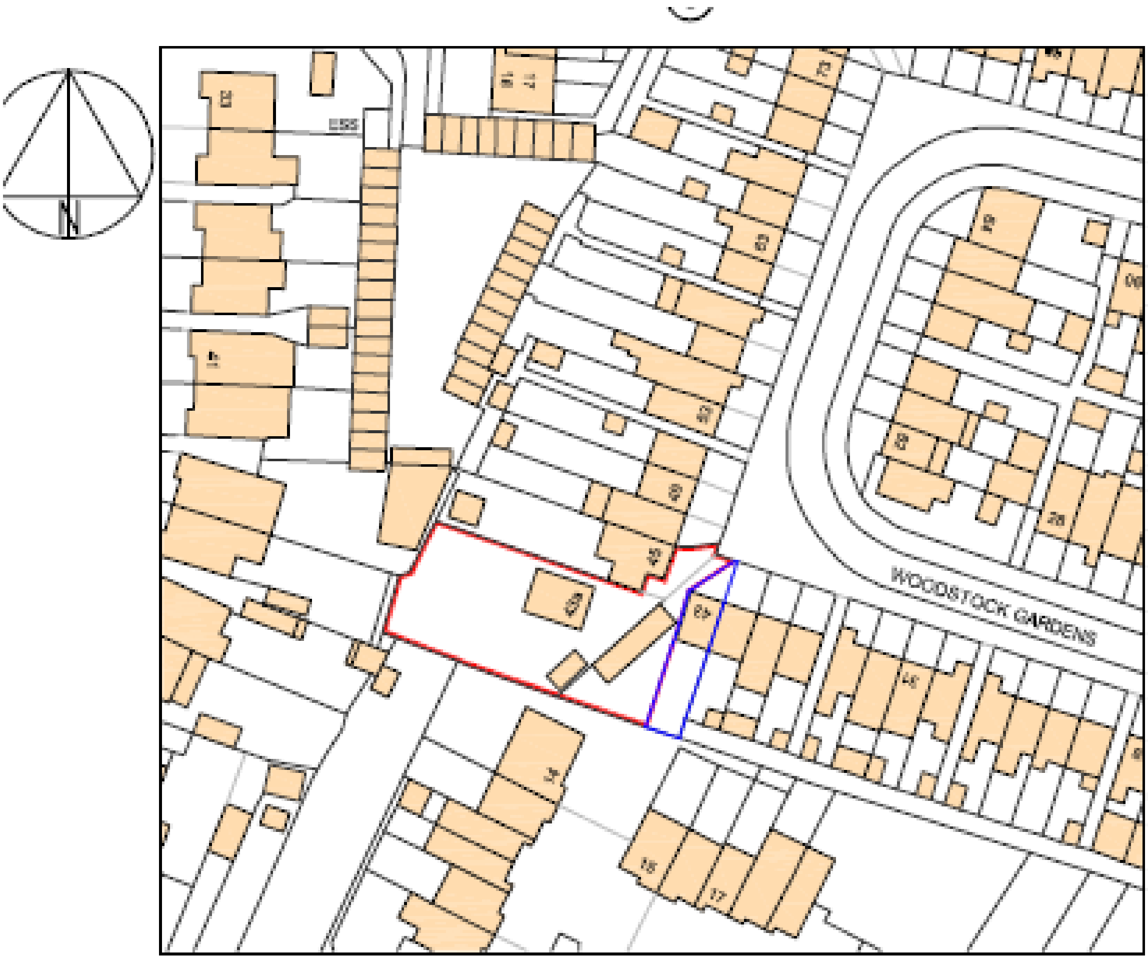
Version Control Record				
Issue	**Description of Status**	**Date**	**Reviewer Initials**	**Authors Initials**
01	Draft Report	21:01: 25	SD	JCD

This report has been prepared by John Davies Associates with all reasonable care, skill and diligence and taking account of the Contract between John Davies Associates and its Client, Sohail Iqbal Ltd This report is confidential to the Client and John Davies Associates accepts no liability whatsoever to any Third Parties to whom this report or any part thereof is made known unless formally agreed beforehand by John Davies Associates.

1.0 INTRODUCTION

1.1 Pankaj Dhir Esq; has instructed John Davies Associates, Consulting Engineers to undertake Soakaway Tests on his site at 43A Woodstock Gardens, Hayes London UB4 8BA as a pre-cursor to the design of a Sustainable Urban Drainage Scheme for the proposed development of the site with a new three bedroomed house.

1.2 The site is an area of undeveloped land on the southern side of the garden to No 43A Woodstock Gardens which is shown edged red on the site location plan at Figure 1.



Site Plan – 1 : 1250

FIGURE 1 – SITE LOCATION PLAN.

1.3 A sustainable urban drainage system is to be employed in connection with the disposal of the storm water arising from the proposed new house. The first step in this process is to establish whether the strata beneath the proposed development site is capable of allowing stormwater from the proposed new house to be disposed of via one or more soakaways on the site.

1.4 Arrangements were made for a Soakaway Test in accordance with BRE 365 to be undertaken on Thursday 23rd January 2025 which were overseen by Mr. J.C. Davies M.Sc. C.Eng., FICE, MCIOB who was assisted by staff from a local Contractor; and their very helpful assistance is gratefully acknowledged.

1.5 The weather at the time of the soakaway test was fine but cold and cloudy, following a cold, dry night.

1.6 The position of the proposed location for a soakaway was chosen because it was in an area of undeveloped land which was sufficiently clear of the vehicles and other materials stored on the site to enable the mini-digger to safely operate. It was also located towards the centre of the site and therefore deemed representative of the area.

1.7 The first 1.3m length of the test trench was excavated to a depth of 1.20m when ground water started to ingress into the excavation. As the excavation progressed more water was seen to enter the trench once it reached a depth of 1.2m

1.8 At this point the trench excavation was halted and a trial pit 1.0m x1.0m was excavated and again at a depth of 1.2m ground water began to ingress into the trial pit.

1.9 The excavation of the trial pit continued for a further 0.5m by which time it was clear that the standing water in the site was at a depth of 1.200m below existing ground level.

1.10 Photograph 1 shows the standing water in the trial pit at 9.30am.

1.11 In view of the water table being so high it was concluded that soakaways would not be suitable for the disposal of stormwater from the proposed new development, as the Building Regulations require that there is at least 1m depth of free draining material between the underside of the soakaway and the top of the standing groundwater level.

Photograph 1 Showing Standing Water at 1.2m in Trial Pit

1.12 Photograph 2 shows the level of the standing water in the Trial Pit at 17.49.

Photograph 2 Showing Level of Standing Water at 17.49

2 CONCLUSIONS

2.1 It is concluded that due to the high level of the water table under this site it will not be possible to dispose of the stormwater by soakaways and therefore an alternative method of disposal for the stormwater must be used.

J C Davies M.Sc. C.ENG FICE MCIOB

29 January 2025

Appendix D
Greenfield Calc

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Michael Micklethwaite
Site name:	Woodstock gardens
Site location:	London

Site Details

Latitude:	51.52454° N
Longitude:	0.42282° W
Reference:	642267497
Date:	Jan 31 2025 08:38

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:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	620	620
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.

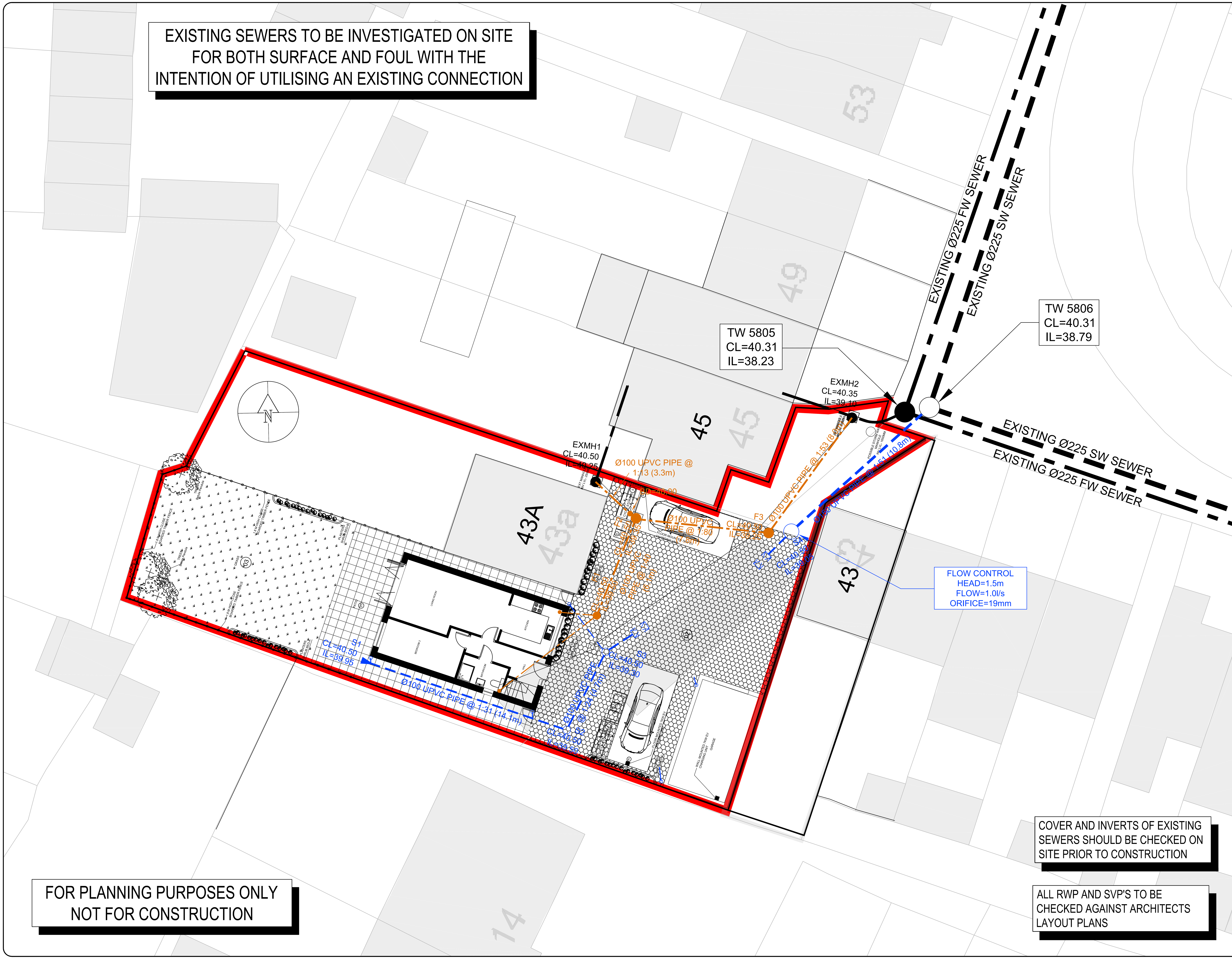
(3) Is SPR/SPRHOST ≤ 0.3?

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):	0.42	0.42
1 in 1 year (l/s):	0.36	0.36
1 in 30 years (l/s):	0.96	0.96
1 in 100 year (l/s):	1.34	1.34
1 in 200 years (l/s):	1.57	1.57

Appendix E
Drainage Layout



Notes

1. This drawing is produced for use in this project only and may not be used for any other purpose. The consulting Engineers accept no liability for the use of this drawing other than the purpose for which it was intended in connection with this project as recorded on the title block fields 'Purpose for Issue' and 'File Status Code'.
2. This drawing may not be reproduced in any form without prior written agreement.
3. Do not scale from the drawing, use written dimensions only.
4. All dimensions are in millimetres unless otherwise specified.
5. Discrepancies must be reported back to the engineer prior to construction.

Key

EXISTING FW SEWER

EXISTING SW SEWER

PROPOSED SW SEWER

PROPOSED FW SEWER

PERMEABLE PAVING

DRAINAGE STRATEGY

SURFACE WATER

In accordance with the SuDS Hierarchy then infiltration should be considered in the first instance, soakaway testing has been undertaken on site in which unsatisfactory soakaway results where obtained.

If soakaways do not work then the surface water should discharge to a water course wherever possible, as there are no watercourses within the vicinty of the site then this has been discounted.

We are therefore proposing to discharge to the public sewer a new connection on the existing public sewer, at a controlled rate of 1.0 l/s with attenuation on site to store the 1 in 100 Year + 40% climate change rainfall event. (Refer to JDA Drainage Strategy Report)

FOUL DRAINAGE

It is proposed to discharge the foul drainage via a new connection on to the existing public sewer.

REV.	DESCRIPTION	DWN	CHK	DATE
C	LAYOUT UPDATED	MJM	JD	25.04.25
B	FOUL UPDATED TO NEW OUTFALL	MJM	JD	14.02.25
A	INITIAL ISSUE	MJM	JD	30.01.25

CLIENT
DESIGN ENDEAVOURS

PROJECT
LAND ADJACENT
43A WOODSTOCK GARDENS
LONDON, UB4 8BA

TITLE
PROPOSED DRAINAGE
LAYOUT PLAN

DWN	DATE	CHK	DATE	APP.	DATE	SCALE
MM	FEB '25					1:100

John Davies Associates
1 St John's Rd.
Queen's Park
Chester. CH4 7AL
Tel/Fax: 01244 677991

Drawing Number
JDA/566/2/1
A1
REV.
C

Appendix F
Drainage Calculations

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	1	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Adoptable Manhole Type

Max Width (mm)	Diameter (mm)	Max Width (mm)	Diameter (mm)
374	1200	749	1500
499	1350	900	1800

>900 Link+900 mm

Max Depth (m)	Diameter (mm)	Max Depth (m)	Diameter (mm)
1.500	1050	99.999	1200

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100	150

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1	0.010	5.00	40.500	600	-902.862	6652.485	0.550
S2			40.500	600	-898.346	6665.878	1.000
S3	0.016	5.00	40.500	600	-903.654	6668.533	1.200
S4			40.500	900	-910.784	6679.589	1.500
5806			40.310	1200	-917.993	6687.593	1.520

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S1	S2	14.134	0.600	39.950	39.500	0.450	31.4	150	5.13	50.0
1.001	S2	S3	5.935	0.600	39.500	39.300	0.200	29.7	150	5.18	50.0
1.002	S3	S4	13.156	0.600	39.300	39.050	0.250	52.6	150	5.34	50.0
1.003	S4	5806	10.772	0.600	39.000	38.790	0.210	51.3	150	5.47	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.802	31.9	1.8	0.400	0.850	0.010	0.0	24	0.980
1.001	1.855	32.8	1.8	0.850	1.050	0.010	0.0	24	0.993
1.002	1.390	24.6	4.7	1.050	1.300	0.026	0.0	44	1.072
1.003	1.408	24.9	4.7	1.350	1.370	0.026	0.0	44	1.086

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	14.134	31.4	150	Circular	40.500	39.950	0.400	40.500	39.500	0.850
1.001	5.935	29.7	150	Circular	40.500	39.500	0.850	40.500	39.300	1.050
1.002	13.156	52.6	150	Circular	40.500	39.300	1.050	40.500	39.050	1.300
1.003	10.772	51.3	150	Circular	40.500	39.000	1.350	40.310	38.790	1.370

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	600	Manhole	Adoptable	S2	600	Manhole	Adoptable
1.001	S2	600	Manhole	Adoptable	S3	600	Manhole	Adoptable
1.002	S3	600	Manhole	Adoptable	S4	900	Manhole	Adoptable
1.003	S4	900	Manhole	Adoptable	5806	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1	-902.862	6652.485	40.500	0.550	600				
						0	1.000	39.950	150
S2	-898.346	6665.878	40.500	1.000	600	1	1.000	39.500	150
						0	1.001	39.500	150
S3	-903.654	6668.533	40.500	1.200	600	1	1.001	39.300	150
						0	1.002	39.300	150
S4	-910.784	6679.589	40.500	1.500	900	1	1.002	39.050	150
						0	1.003	39.000	150
5806	-917.993	6687.593	40.310	1.520	1200	1	1.003	38.790	150

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	1.000	Drain Down Time (mins)	240	Check Discharge Volume	x
Winter CV	1.000	Additional Storage (m³/ha)	0.0		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0

Node S4 Online Orifice Control

Flap Valve	x	Design Depth (m)	1.500	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	1.0		
Invert Level (m)	39.000	Diameter (m)	0.019		

Node S3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	39.300
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.33	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	133.0	0.0	0.300	133.0	0.0	0.301	0.0	0.0

Other (defaults)

Entry Loss (manhole)	0.250	Entry Loss (junction)	0.000	Apply Recommended Losses	x
Exit Loss (manhole)	0.250	Exit Loss (junction)	0.000	Flood Risk (m)	0.300

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	61.944	17.528
1 year 15 minute winter	43.470	17.528
1 year 30 minute summer	39.454	11.164
1 year 30 minute winter	27.687	11.164
1 year 60 minute summer	26.042	6.882
1 year 60 minute winter	17.301	6.882
1 year 120 minute summer	21.063	5.566
1 year 120 minute winter	13.993	5.566
1 year 180 minute summer	17.735	4.564
1 year 180 minute winter	11.528	4.564
1 year 240 minute summer	14.612	3.861
1 year 240 minute winter	9.708	3.861
1 year 360 minute summer	11.461	2.949
1 year 360 minute winter	7.450	2.949
1 year 480 minute summer	9.062	2.395
1 year 480 minute winter	6.020	2.395
1 year 600 minute summer	7.406	2.026
1 year 600 minute winter	5.060	2.026
1 year 720 minute summer	6.575	1.762
1 year 720 minute winter	4.419	1.762
1 year 960 minute summer	5.355	1.410
1 year 960 minute winter	3.547	1.410
1 year 1440 minute summer	3.858	1.034
1 year 1440 minute winter	2.593	1.034
30 year 15 minute summer	307.844	87.109
30 year 15 minute winter	216.031	87.109
30 year 30 minute summer	198.645	56.210
30 year 30 minute winter	139.400	56.210
30 year 60 minute summer	131.107	34.648
30 year 60 minute winter	87.104	34.648
30 year 120 minute summer	82.458	21.791
30 year 120 minute winter	54.783	21.791
30 year 180 minute summer	62.929	16.194
30 year 180 minute winter	40.906	16.194
30 year 240 minute summer	49.076	12.969
30 year 240 minute winter	32.605	12.969
30 year 360 minute summer	36.260	9.331
30 year 360 minute winter	23.570	9.331
30 year 480 minute summer	27.718	7.325
30 year 480 minute winter	18.415	7.325
30 year 600 minute summer	22.124	6.051
30 year 600 minute winter	15.116	6.051
30 year 720 minute summer	19.283	5.168
30 year 720 minute winter	12.959	5.168
30 year 960 minute summer	15.254	4.017
30 year 960 minute winter	10.105	4.017
30 year 1440 minute summer	10.590	2.838
30 year 1440 minute winter	7.117	2.838
100 year 15 minute summer	399.485	113.040
100 year 15 minute winter	280.340	113.040

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year 30 minute summer	259.693	73.484
100 year 30 minute winter	182.241	73.484
100 year 60 minute summer	172.144	45.493
100 year 60 minute winter	114.369	45.493
100 year 120 minute summer	107.005	28.278
100 year 120 minute winter	71.091	28.278
100 year 180 minute summer	81.693	21.022
100 year 180 minute winter	53.102	21.022
100 year 240 minute summer	63.810	16.863
100 year 240 minute winter	42.394	16.863
100 year 360 minute summer	47.258	12.161
100 year 360 minute winter	30.719	12.161
100 year 480 minute summer	36.184	9.562
100 year 480 minute winter	24.040	9.562
100 year 600 minute summer	28.904	7.906
100 year 600 minute winter	19.749	7.906
100 year 720 minute summer	25.200	6.754
100 year 720 minute winter	16.936	6.754
100 year 960 minute summer	19.933	5.249
100 year 960 minute winter	13.204	5.249
100 year 1440 minute summer	13.734	3.681
100 year 1440 minute winter	9.230	3.681
100 year +40% CC 15 minute summer	559.279	158.257

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +40% CC 15 minute winter	392.477	158.257
100 year +40% CC 30 minute summer	363.571	102.878
100 year +40% CC 30 minute winter	255.137	102.878
100 year +40% CC 60 minute summer	241.002	63.690
100 year +40% CC 60 minute winter	160.116	63.690
100 year +40% CC 120 minute summer	149.807	39.589
100 year +40% CC 120 minute winter	99.528	39.589
100 year +40% CC 180 minute summer	114.370	29.431
100 year +40% CC 180 minute winter	74.343	29.431
100 year +40% CC 240 minute summer	89.335	23.608
100 year +40% CC 240 minute winter	59.352	23.608
100 year +40% CC 360 minute summer	66.161	17.025
100 year +40% CC 360 minute winter	43.006	17.025
100 year +40% CC 480 minute summer	50.658	13.387
100 year +40% CC 480 minute winter	33.656	13.387
100 year +40% CC 600 minute summer	40.466	11.068
100 year +40% CC 600 minute winter	27.649	11.068
100 year +40% CC 720 minute summer	35.280	9.455
100 year +40% CC 720 minute winter	23.711	9.455
100 year +40% CC 960 minute summer	27.906	7.348
100 year +40% CC 960 minute winter	18.486	7.348
100 year +40% CC 1440 minute summer	19.227	5.153
100 year +40% CC 1440 minute winter	12.922	5.153

Results for 1 year Critical Storm Duration. Lowest mass balance: 98.02%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	11	39.968	0.018	1.0	0.0052	0.0000	OK
15 minute summer	S2	10	39.520	0.020	1.0	0.0057	0.0000	OK
180 minute summer	S3	116	39.328	0.028	1.2	1.2472	0.0000	OK
180 minute summer	S4	120	39.328	0.328	0.9	0.2084	0.0000	SURCHARGED
15 minute summer	5806	1	38.790	0.000	0.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1	1.000	S2	1.0	0.779	0.031	0.0186	
15 minute summer	S2	1.001	S3	1.0	1.093	0.031	0.0066	
180 minute summer	S3	1.002	S4	0.9	0.429	0.039	0.1309	
180 minute summer	S4	Orifice	5806	0.4				3.5

Results for 30 year Critical Storm Duration. Lowest mass balance: 98.02%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	10	39.991	0.041	5.0	0.0116	0.0000	OK
15 minute summer	S2	10	39.541	0.041	5.0	0.0116	0.0000	OK
120 minute winter	S3	118	39.477	0.177	3.9	7.8220	0.0000	SURCHARGED
120 minute winter	S4	118	39.477	0.477	1.2	0.3033	0.0000	SURCHARGED
15 minute summer	5806	1	38.790	0.000	0.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1	1.000	S2	5.0	1.284	0.156	0.0552	
15 minute summer	S2	1.001	S3	5.0	1.307	0.152	0.0406	
120 minute winter	S3	1.002	S4	1.2	0.465	0.047	0.2316	
120 minute winter	S4	Orifice	5806	0.5				9.4

Results for 100 year Critical Storm Duration. Lowest mass balance: 98.02%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	10	39.997	0.047	6.5	0.0134	0.0000	OK
180 minute winter	S2	172	39.549	0.049	1.5	0.0139	0.0000	OK
180 minute winter	S3	172	39.549	0.249	3.8	11.0020	0.0000	SURCHARGED
180 minute winter	S4	172	39.549	0.549	0.8	0.3491	0.0000	SURCHARGED
15 minute summer	5806	1	38.790	0.000	0.5	0.0000	0.0000	OK

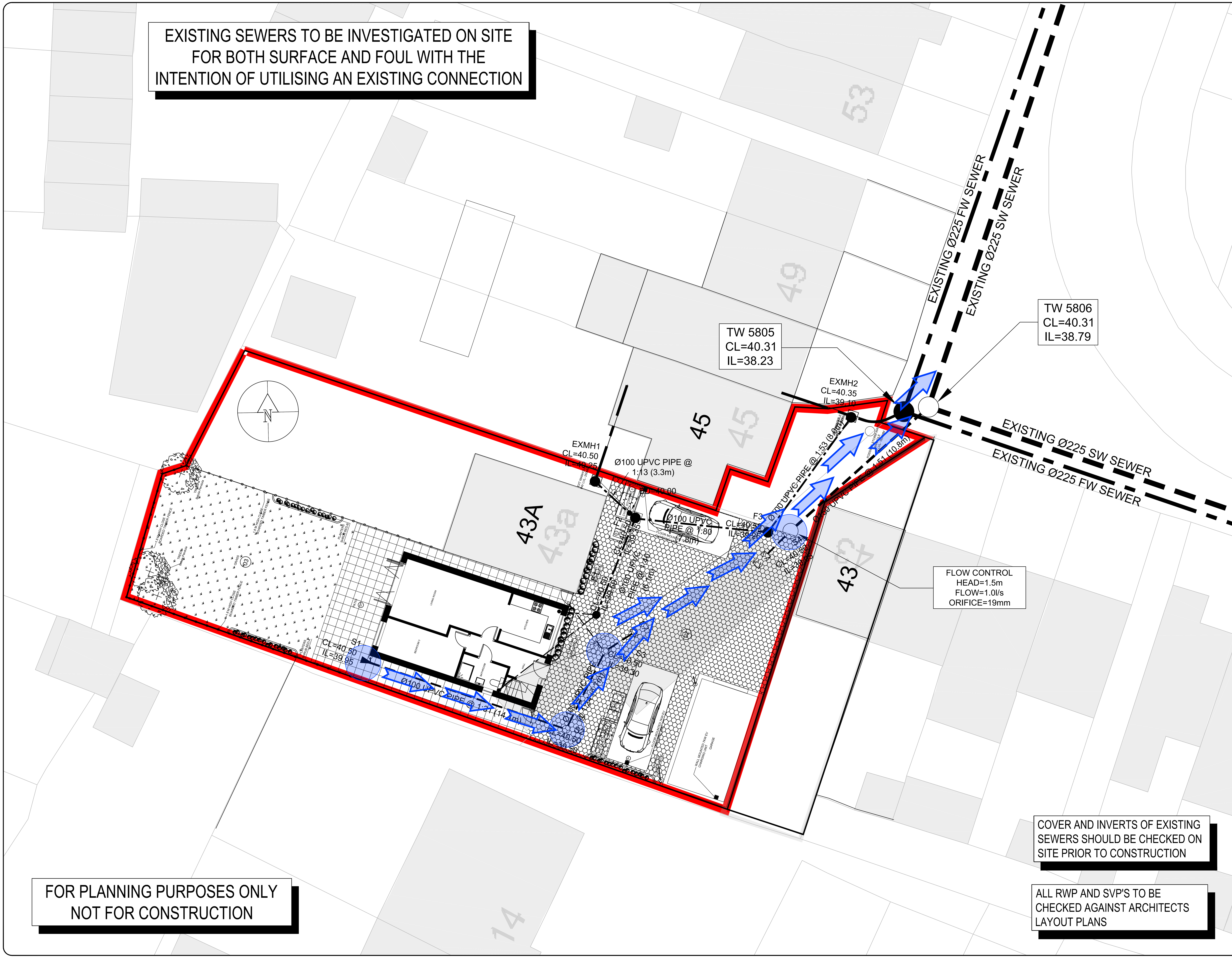
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1	1.000	S2	6.5	1.380	0.203	0.0667	
180 minute winter	S2	1.001	S3	1.5	0.759	0.046	0.0670	
180 minute winter	S3	1.002	S4	0.8	0.432	0.031	0.2316	
180 minute winter	S4	Orifice	5806	0.6				11.8

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 98.02%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	S1	168	40.301	0.351	2.0	0.0994	0.0000	FLOOD RISK
180 minute winter	S2	168	40.301	0.801	2.0	0.2268	0.0000	FLOOD RISK
180 minute winter	S3	168	40.301	1.001	5.3	13.4723	0.0000	FLOOD RISK
180 minute winter	S4	168	40.301	1.301	1.5	0.8274	0.0000	FLOOD RISK
15 minute summer	5806	1	38.790	0.000	0.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute winter	S1	1.000	S2	2.0	1.004	0.063	0.2488	
180 minute winter	S2	1.001	S3	2.0	0.830	0.061	0.1045	
180 minute winter	S3	1.002	S4	1.5	0.436	0.061	0.2316	
180 minute winter	S4	Orifice	5806	0.9				14.3

Appendix G
Flood Exceedance Layout & Calcs



Notes

1. This drawing is produced for use in this project only and may not be used for any other purpose. The consulting Engineers accept no liability for the use of this drawing other than the purpose for which it was intended in connection with this project as recorded on the title block fields 'Purpose for Issue' and 'File Status Code'.
2. This drawing may not be reproduced in any form without prior written agreement.
3. Do not scale from the drawing, use written dimensions only.
4. All dimensions are in millimetres unless otherwise specified.
5. Discrepancies must be reported back to the engineer prior to construction.

Key

FLOOD EXCEEDANCE EVENT

FLOOD FLOW PATH

REV.	DESCRIPTION	DWN	CHK	DATE
C	LAYOUT UPDATED	MJM	JD	25.04.25
B	FOUL UPDATED TO NEW OUTFALL	MJM	JD	14.02.25
A	INITIAL ISSUE	MJM	JD	30.01.25

CLIENT
DESIGN ENDEAVOURS

PROJECT
LAND ADJACENT
43A WOODSTOCK GARDENS
LONDON, UB4 8BA

TITLE
FLOOD EXCEEDANCE
LAYOUT PLAN

DWN	DATE	CHK	DATE	APP.	DATE	SCALE
MM	FEB '25					1:100

John Davies Associates
1 St John's Rd.
Queen's Park
Chester. CH4 7AL
Tel/Fax: 01244 677991

Drawing Number
JDA/566/3/1
A1
REV.
C

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	1	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Adoptable Manhole Type

Max Width (mm)	Diameter (mm)	Max Width (mm)	Diameter (mm)
374	1200	749	1500
499	1350	900	1800

>900 Link+900 mm

Max Depth (m)	Diameter (mm)	Max Depth (m)	Diameter (mm)
1.500	1050	99.999	1200

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100	150

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1	0.010	5.00	40.500	600	-902.862	6652.485	0.550
S2			40.500	600	-898.346	6665.878	1.000
S3	0.016	5.00	40.500	600	-903.654	6668.533	1.200
S4			40.500	900	-910.784	6679.589	1.500
5806			40.310	1200	-917.993	6687.593	1.520

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S1	S2	14.134	0.600	39.950	39.500	0.450	31.4	150	5.13	50.0
1.001	S2	S3	5.935	0.600	39.500	39.300	0.200	29.7	150	5.18	50.0
1.002	S3	S4	13.156	0.600	39.300	39.050	0.250	52.6	150	5.34	50.0
1.003	S4	5806	10.772	0.600	39.000	38.790	0.210	51.3	150	5.47	50.0

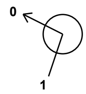
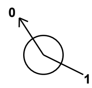
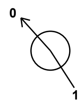
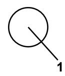
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.802	31.9	1.8	0.400	0.850	0.010	0.0	24	0.980
1.001	1.855	32.8	1.8	0.850	1.050	0.010	0.0	24	0.993
1.002	1.390	24.6	4.7	1.050	1.300	0.026	0.0	44	1.072
1.003	1.408	24.9	4.7	1.350	1.370	0.026	0.0	44	1.086

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	14.134	31.4	150	Circular	40.500	39.950	0.400	40.500	39.500	0.850
1.001	5.935	29.7	150	Circular	40.500	39.500	0.850	40.500	39.300	1.050
1.002	13.156	52.6	150	Circular	40.500	39.300	1.050	40.500	39.050	1.300
1.003	10.772	51.3	150	Circular	40.500	39.000	1.350	40.310	38.790	1.370

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	600	Manhole	Adoptable	S2	600	Manhole	Adoptable
1.001	S2	600	Manhole	Adoptable	S3	600	Manhole	Adoptable
1.002	S3	600	Manhole	Adoptable	S4	900	Manhole	Adoptable
1.003	S4	900	Manhole	Adoptable	5806	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
S1	-902.862	6652.485	40.500	0.550	600		0	1.000	39.950	150
S2	-898.346	6665.878	40.500	1.000	600		1	1.000	39.500	150
							0	1.001	39.500	150
S3	-903.654	6668.533	40.500	1.200	600		1	1.001	39.300	150
							0	1.002	39.300	150
S4	-910.784	6679.589	40.500	1.500	900		1	1.002	39.050	150
							0	1.003	39.000	150
5806	-917.993	6687.593	40.310	1.520	1200		1	1.003	38.790	150

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	1.000	Drain Down Time (mins)	240	Check Discharge Volume	x
Winter CV	1.000	Additional Storage (m³/ha)	0.0		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
600	0	0	0

Node S4 Online Orifice Control

Flap Valve	x	Design Depth (m)	1.500	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	1.0		
Invert Level (m)	39.000	Diameter (m)	0.019		

Node S3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	39.300
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.33	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	133.0	0.0	0.300	133.0	0.0	0.301	0.0	0.0

Other (defaults)

Entry Loss (manhole)	0.250	Entry Loss (junction)	0.000	Apply Recommended Losses	x
Exit Loss (manhole)	0.250	Exit Loss (junction)	0.000	Flood Risk (m)	0.300

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
600 year 15 minute summer	564.700	159.790	600 year 360 minute summer	72.052	18.542
600 year 15 minute winter	396.280	159.790	600 year 360 minute winter	46.836	18.542
600 year 30 minute summer	371.450	105.108	600 year 480 minute summer	55.457	14.656
600 year 30 minute winter	260.667	105.108	600 year 480 minute winter	36.844	14.656
600 year 60 minute summer	247.650	65.447	600 year 600 minute summer	44.376	12.138
600 year 60 minute winter	164.533	65.447	600 year 600 minute winter	30.320	12.138
600 year 120 minute summer	156.600	41.385	600 year 720 minute summer	38.693	10.370
600 year 120 minute winter	104.041	41.385	600 year 720 minute winter	26.004	10.370
600 year 180 minute summer	121.597	31.291	600 year 960 minute summer	30.531	8.040
600 year 180 minute winter	79.041	31.291	600 year 960 minute winter	20.224	8.040
600 year 240 minute summer	96.093	25.395	600 year 1440 minute summer	20.878	5.595
600 year 240 minute winter	63.842	25.395	600 year 1440 minute winter	14.031	5.595

Results for 600 year Critical Storm Duration. Lowest mass balance: 98.08%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute summer	S1	168	40.500	0.550	2.7	0.1557	0.2157	FLOOD
240 minute winter	S2	176	40.500	1.000	1.8	0.2830	0.0467	FLOOD
240 minute winter	S3	176	40.500	1.200	4.6	13.5286	0.0860	FLOOD
240 minute summer	S4	168	40.500	1.500	2.3	0.9539	0.0000	FLOOD RISK
15 minute summer	5806	1	38.790	0.000	0.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute summer	S1	1.000	S2	2.7	1.096	0.084	0.2488	
240 minute winter	S2	1.001	S3	1.8	0.759	0.055	0.1045	
240 minute winter	S3	1.002	S4	1.6	0.451	0.064	0.2316	
240 minute summer	S4	Orifice	5806	0.9				17.2