Appendix D

Thames Water Asset Mapping

Asset Location Search Sewer Map - ALS/ALS Standard/2019_4026031

The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 529174,182376

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
4201	n/a	n/a
3210	27.3	23.75
2239	27.61	n/a
3233	27.3	23.01
2202	27.29	23.84
32BB	n/a	n/a
2207	27.68	23.11
32BA	n/a	n/a
2203	n/a	n/a
3202	24.09	22.39
32BC	n/a	n/a
2301	27.15	22.66
3301	27.23	22
2302	27.65	26.37
33DE	n/a	n/a
3334	27.3	24.02
3302	26.91	25.05
231A	n/a	n/a
2303	20.54	18.43
2304	20.54	n/a
2307	20.78	18.64
3303	26.27	n/a
331A	n/a	n/a
2308	20.78	18.64
2309	26.97	24.83
3304	23.78	21.81
3305	26.07	25.01
3306	23.78	21.81
3307	26.3	25.26
3308	26.13	24.55
241H	n/a	n/a
241G	n/a	n/a
341C	n/a	n/a
241J	n/a	n/a
3422	25.42	n/a
341B	n/a	n/a
3425	n/a	n/a
3426	n/a	n/a
3403	27.64	n/a
341A	n/a	n/a
241F	n/a	n/a
241I	n/a	n/a
241E	n/a	n/a
241C	n/a	n/a
241A	n/a	n/a
241B	n/a	n/a
2402	n/a	n/a
2405	26.62	n/a
3502	25.1	19.82
251B	n/a	n/a
251A	n/a	n/a
3505	25.36	20.44
3513	26.14	19.95
3601	n/a	n/a
4504	24.17	18.71
45CD	n/a	n/a
2103	n/a	n/a
2102	27.79	23.7
211A	n/a	n/a
211B	n/a	n/a
311C	n/a	n/a
3122	27.54	23.16
4145	n/a	n/a
141B	n/a	n/a
2503	n/a	n/a
151C	n/a	n/a
151D	n/a	n/a
151A	n/a	n/a
151B	n/a	n/a
16BA	n/a	n/a
9601	28.62	n/a
9602	28.25	26.76
0601	27.87	24.26
0502	27.89	23.7
0604	26.47	23.67
0605	n/a	n/a
0501	n/a	n/a
1601	26.06	n/a
151E	n/a	n/a
9417	n/a	n/a
9401	27.98	24.1
941B	n/a	n/a
0403	27.49	24.69
0205	28.04	17.64
0207	27.63	17.81
0401	n/a	n/a
0203	n/a	n/a
0202	27.66	25.77
1205	27.69	26.52
1204	27.64	26.83
1206	27.53	26.71

Manhole Reference	Manhole Cover Level	Manhole Invert Level
1302	27.54	18
141A	n/a	n/a
1207	27.44	26.62
1210	24.63	22.45
1209	24.63	22.45
1208	27.29	26.5
2204	27.22	26.17
2306	27.85	18.18
2205	27.43	26.12
2310	27.22	25.74
2401	n/a	n/a
2206	27.5	25.5
1103	27.84	24.08
9117	28.23	26.23
011A	n/a	n/a
0104	27.97	24.59
0108	n/a	25.02
011B	n/a	n/a
1105	26.99	n/a
011D	n/a	n/a
011E	n/a	n/a
0107	27.83	24.8
01FD	n/a	n/a
011F	n/a	n/a
01FE	n/a	n/a
91AE	n/a	n/a
011C	n/a	n/a
1106	26.79	25.34
1107	26.91	25.39
9103	n/a	n/a
0134	28.09	25.32
1201	n/a	n/a
9201	28.27	17.5
121A	n/a	n/a

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.

ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

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

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

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

- Trunk Surface Water
- Trunk Foul
- Storm Relief
- Trunk Combined
- Vent Pipe
- Bio-solids (Sludge)
- Proposed Thames Surface Water Sewer
- Proposed Thames Water Foul Sewer
- Gallery
- Foul Rising Main
- Surface Water Rising Main
- Combined Rising Main
- Sludge Rising Main
- Proposed Thames Water Rising Main
- Vacuum

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
- Dam Chase
- Fitting
- Meter
- Vent Column

Operational Controls

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

- Control Valve
- Drop Pipe
- Ancillary
- 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.

- Outfall
- Undefined End
- Inlet

Other Symbols

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

- Public/Private Pumping Station
- Change of characteristic indicator (C.O.C.I.)
- Invert Level
- Summit

Areas

Lines denoting areas of underground surveys, etc.

- Agreement
- Operational Site
- Chamber
- Tunnel
- Conduit Bridge

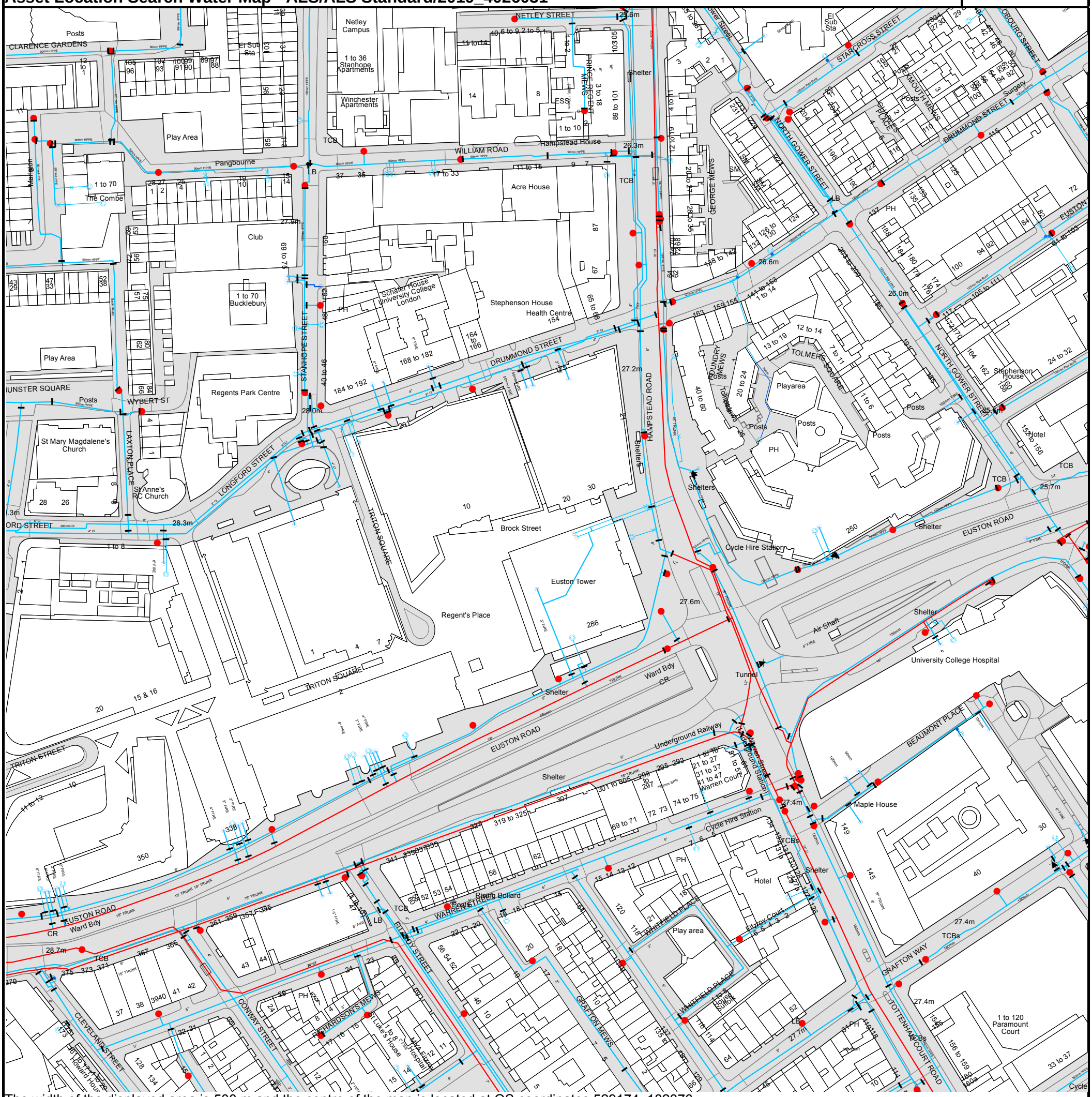
Other Sewer Types (Not Operated or Maintained by Thames Water)

- Foul Sewer
- Surface Water Sewer
- Combined Sewer
- Gulley
- Culverted Watercourse
- Proposed
- Abandoned Sewer

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plans are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate 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 level indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. 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 present on the plan, please contact a member of Property Insight on 0845 070 9148.

Asset Location Search Water Map - ALS/ALS Standard/2019_4026031



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 529174, 182376.

ALS Water Map Key

Water Pipes (Operated & Maintained by Thames Water)

4" — **Distribution Main:** The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.

16" — **Trunk Main:** A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.

3" SUPPLY — **Supply Main:** A supply main indicates that the water main is used as a supply for a single property or group of properties.

3" FIRE — **Fire Main:** Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.

3" METERED — **Metered Pipe:** A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.

Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.

Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 8")
600mm and bigger (24" plus)	1200mm (4')

Valves

- General Purpose Valve
- Air Valve
- Pressure Control Valve
- Customer Valve

Hydrants

- Single Hydrant

Meters

- Meter

End Items

Symbol indicating what happens at the end of a water main.

- Blank Flange
- Capped End
- Emptying Pit
- Undefined End
- Manifold
- Customer Supply
- Fire Supply

Operational Sites

- Booster Station
- Other
- Other (Proposed)
- Pumping Station
- Service Reservoir
- Shaft Inspection
- Treatment Works
- Unknown
- Water Tower

Other Symbols

- Data Logger

Other Water Pipes (Not Operated or Maintained by Thames Water)

Other Water Company Main: Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.

Private Main: Indiates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

Appendix E

Drainage Design Plan & Calculations

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Rob Belcher
Site name:	Euston Tower
Site location:	Euston

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.

Site Details

Latitude:	51.52532° N
Longitude:	0.13919° W
Reference:	3774929550
Date:	Feb 05 2024 12:40

Runoff estimation approach

FEH Statistical

Site characteristics

Total site area (ha): 0.79

Methodology

Q_{MED} estimation method:	Calculate from BFI and SAAR
BFI and SPR method:	Specify BFI manually
HOST class:	N/A
BFI / BFIHOST:	0.629
Q_{MED} (l/s):	
Q_{BAR} / Q_{MED} factor:	1.14

Hydrological characteristics

	Default	Edited
SAAR (mm):	616	625
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):		1.22
1 in 1 year (l/s):		1.04
1 in 30 years (l/s):		2.81
1 in 100 year (l/s):		3.89
1 in 200 years (l/s):		4.56

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	99.780	0.780	53.5	34.6	Flood Risk
30 min Summer	99.839	0.839	54.4	37.2	Flood Risk
60 min Summer	99.699	0.699	52.2	31.0	O K
120 min Summer	99.510	0.510	49.1	22.6	O K
180 min Summer	99.312	0.312	45.6	13.9	O K
240 min Summer	99.159	0.159	42.7	7.1	O K
360 min Summer	99.000	0.000	39.3	0.0	O K
480 min Summer	99.000	0.000	31.6	0.0	O K
600 min Summer	99.000	0.000	26.5	0.0	O K
720 min Summer	99.000	0.000	22.7	0.0	O K
960 min Summer	99.000	0.000	17.7	0.0	O K
1440 min Summer	99.000	0.000	12.3	0.0	O K
2160 min Summer	99.000	0.000	8.6	0.0	O K
2880 min Summer	99.000	0.000	6.6	0.0	O K
4320 min Summer	99.000	0.000	4.6	0.0	O K
5760 min Summer	99.000	0.000	3.6	0.0	O K
7200 min Summer	99.000	0.000	3.0	0.0	O K
8640 min Summer	99.000	0.000	2.5	0.0	O K
10080 min Summer	99.000	0.000	2.2	0.0	O K
15 min Winter	99.927	0.927	55.8	41.2	Flood Risk
30 min Winter	99.981	0.981	56.6	43.6	Flood Risk
60 min Winter	99.741	0.741	52.9	32.9	Flood Risk
120 min Winter	99.409	0.409	47.3	18.2	O K
180 min Winter	99.142	0.142	42.4	6.3	O K
240 min Winter	99.000	0.000	39.2	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	180.320	0.0	82.1	18
30 min Summer	115.920	0.0	104.0	27
60 min Summer	70.560	0.0	127.8	42
120 min Summer	45.360	0.0	163.7	74
180 min Summer	34.391	0.0	185.6	104
240 min Summer	27.965	0.0	201.3	134
360 min Summer	20.533	0.0	221.8	0
480 min Summer	16.286	0.0	234.5	0
600 min Summer	13.526	0.0	243.5	0
720 min Summer	11.585	0.0	250.2	0
960 min Summer	9.025	0.0	259.9	0
1440 min Summer	6.294	0.0	271.9	0
2160 min Summer	4.366	0.0	282.9	0
2880 min Summer	3.369	0.0	291.1	0
4320 min Summer	2.344	0.0	303.8	0
5760 min Summer	1.821	0.0	314.7	0
7200 min Summer	1.507	0.0	325.5	0
8640 min Summer	1.297	0.0	336.1	0
10080 min Summer	1.146	0.0	346.7	0
15 min Winter	180.320	0.0	91.1	18
30 min Winter	115.920	0.0	117.5	28
60 min Winter	70.560	0.0	140.5	44
120 min Winter	45.360	0.0	184.0	76
180 min Winter	34.391	0.0	207.7	106
240 min Winter	27.965	0.0	225.5	0

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
360 min Winter	99.000	0.000	29.0	0.0	O K
480 min Winter	99.000	0.000	23.0	0.0	O K
600 min Winter	99.000	0.000	19.2	0.0	O K
720 min Winter	99.000	0.000	16.4	0.0	O K
960 min Winter	99.000	0.000	12.8	0.0	O K
1440 min Winter	99.000	0.000	8.9	0.0	O K
2160 min Winter	99.000	0.000	6.2	0.0	O K
2880 min Winter	99.000	0.000	4.8	0.0	O K
4320 min Winter	99.000	0.000	3.3	0.0	O K
5760 min Winter	99.000	0.000	2.6	0.0	O K
7200 min Winter	99.000	0.000	2.1	0.0	O K
8640 min Winter	99.000	0.000	1.8	0.0	O K
10080 min Winter	99.000	0.000	1.6	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
360 min Winter	20.533	0.0	248.4	0
480 min Winter	16.286	0.0	262.7	0
600 min Winter	13.526	0.0	272.7	0
720 min Winter	11.585	0.0	280.3	0
960 min Winter	9.025	0.0	291.1	0
1440 min Winter	6.294	0.0	304.5	0
2160 min Winter	4.366	0.0	316.9	0
2880 min Winter	3.369	0.0	326.0	0
4320 min Winter	2.344	0.0	340.3	0
5760 min Winter	1.821	0.0	352.5	0
7200 min Winter	1.507	0.0	364.6	0
8640 min Winter	1.297	0.0	376.5	0
10080 min Winter	1.146	0.0	388.3	0

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 529750 182650 TQ 29750 82650	Shortest Storm (mins)	15
Data Type	Catchment	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.240

Time From: (mins)	To:	Area (ha)	Time From: (mins)	To:	Area (ha)	Time From: (mins)	To:	Area (ha)
0	4	0.100	4	8	0.100	8	12	0.040

Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

Invert Level (m) 99.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	44.4	1.000	44.4	1.001	0.0	1.002	0.0

Orifice Outflow Control

Diameter (m) 0.140 Discharge Coefficient 0.600 Invert Level (m) 98.000

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 37 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	27.528	0.128	0.0	12.3	12.3	175.6	O K
30 min Summer	28.000	0.600	0.0	96.8	96.8	206.7	FLOOD
60 min Summer	28.004	0.604	0.0	97.2	97.2	210.5	FLOOD
120 min Summer	28.014	0.614	0.0	98.1	98.1	219.8	FLOOD
180 min Summer	28.014	0.614	0.0	98.1	98.1	219.9	FLOOD
240 min Summer	28.008	0.608	0.0	97.5	97.5	213.9	FLOOD
360 min Summer	27.940	0.540	0.0	90.4	90.4	206.3	Flood Risk
480 min Summer	27.796	0.396	0.0	72.7	72.7	206.3	Flood Risk
600 min Summer	27.991	0.591	0.0	95.8	95.8	206.3	Flood Risk
720 min Summer	27.846	0.446	0.0	79.4	79.4	206.3	Flood Risk
960 min Summer	27.688	0.288	0.0	47.9	47.9	206.3	O K
1440 min Summer	27.639	0.239	0.0	35.6	35.6	206.3	O K
2160 min Summer	27.540	0.140	0.0	15.0	15.0	192.1	O K
2880 min Summer	27.527	0.127	0.0	12.0	12.0	174.8	O K
4320 min Summer	27.509	0.109	0.0	8.8	8.8	149.4	O K
5760 min Summer	27.497	0.097	0.0	7.2	7.2	133.2	O K
7200 min Summer	27.489	0.089	0.0	6.1	6.1	122.5	O K
8640 min Summer	27.484	0.084	0.0	5.3	5.3	114.6	O K
10080 min Summer	27.479	0.079	0.0	4.7	4.7	108.4	O K
15 min Winter	27.542	0.142	0.0	15.6	15.6	195.4	O K
30 min Winter	28.005	0.605	0.0	97.2	97.2	210.9	FLOOD
60 min Winter	28.016	0.616	0.0	98.4	98.4	222.6	FLOOD
120 min Winter	28.020	0.620	0.0	98.7	98.7	226.3	FLOOD
180 min Winter	28.006	0.606	0.0	97.4	97.4	212.7	FLOOD

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	180.320	0.0	163.2	34
30 min Summer	115.920	0.5	215.6	38
60 min Summer	70.560	4.3	278.8	52
120 min Summer	45.360	13.6	361.7	82
180 min Summer	34.391	13.7	412.8	112
240 min Summer	27.965	7.7	448.4	138
360 min Summer	20.533	0.0	494.7	232
480 min Summer	16.286	0.0	523.4	260
600 min Summer	13.526	0.0	543.3	320
720 min Summer	11.585	0.0	558.3	422
960 min Summer	9.025	0.0	579.1	492
1440 min Summer	6.294	0.0	603.2	772
2160 min Summer	4.366	0.0	639.6	1168
2880 min Summer	3.369	0.0	656.6	1540
4320 min Summer	2.344	0.0	679.7	2288
5760 min Summer	1.821	0.0	717.0	3008
7200 min Summer	1.507	0.0	739.9	3752
8640 min Summer	1.297	0.0	761.3	4432
10080 min Summer	1.146	0.0	780.7	5168
15 min Winter	180.320	0.0	185.2	34
30 min Winter	115.920	4.6	244.3	37
60 min Winter	70.560	16.4	313.7	54
120 min Winter	45.360	20.0	406.6	84
180 min Winter	34.391	6.4	463.8	110

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
240 min Winter	28.000	0.600	0.0	96.8	96.8	206.4	FLOOD
360 min Winter	27.791	0.391	0.0	72.1	72.1	206.3	Flood Risk
480 min Winter	27.753	0.353	0.0	64.7	64.7	206.3	Flood Risk
600 min Winter	27.751	0.351	0.0	64.0	64.0	206.3	Flood Risk
720 min Winter	27.651	0.251	0.0	38.5	38.5	206.3	O K
960 min Winter	27.627	0.227	0.0	32.8	32.8	206.3	O K
1440 min Winter	27.562	0.162	0.0	19.7	19.7	206.3	O K
2160 min Winter	27.531	0.131	0.0	12.9	12.9	179.4	O K
2880 min Winter	27.517	0.117	0.0	10.0	10.0	160.7	O K
4320 min Winter	27.497	0.097	0.0	7.2	7.2	133.6	O K
5760 min Winter	27.486	0.086	0.0	5.7	5.7	118.7	O K
7200 min Winter	27.479	0.079	0.0	4.7	4.7	108.7	O K
8640 min Winter	27.473	0.073	0.0	4.1	4.1	100.2	O K
10080 min Winter	27.468	0.068	0.0	3.6	3.6	94.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
240 min Winter	27.965	0.1	503.7	128
360 min Winter	20.533	0.0	555.6	180
480 min Winter	16.286	0.0	587.8	244
600 min Winter	13.526	0.0	610.2	342
720 min Winter	11.585	0.0	627.0	364
960 min Winter	9.025	0.0	650.5	538
1440 min Winter	6.294	0.0	677.7	800
2160 min Winter	4.366	0.0	717.4	1196
2880 min Winter	3.369	0.0	736.6	1588
4320 min Winter	2.344	0.0	763.2	2312
5760 min Winter	1.821	0.0	803.6	3064
7200 min Winter	1.507	0.0	829.4	3824
8640 min Winter	1.297	0.0	853.9	4504
10080 min Winter	1.146	0.0	876.5	5256

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 529750 182650 TQ 29750 82650	Shortest Storm (mins)	15
Data Type	Catchment	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.550

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.100	8	12	0.100	16	20	0.100
4	8	0.100	12	16	0.100	20	24	0.050

Model Details

Storage is Online Cover Level (m) 28.000

Cellular Storage Structure

Invert Level (m) 27.400 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.98
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	1400.0	0.0	0.151	0.0	0.0
0.150	1400.0	0.0	0.600	0.0	0.0

Orifice Outflow Control

Diameter (m) 0.260 Discharge Coefficient 0.600 Invert Level (m) 27.400

Cascade Summary of Results for 281835-ARP-XX-XX-CA-0002_Tank.SRCX

Upstream Structures	Outflow To	Overflow To
281835-ARP-XX-XX-CA-0003_Blue Roof.SRCX 281835-ARP-XX-XX-CA-0003_Permavoid.SRCX	(None)	(None)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	19.340	0.340	5.0	102.0	O K
30 min Summer	19.541	0.541	5.0	162.2	O K
60 min Summer	19.771	0.771	5.0	231.2	O K
120 min Summer	20.115	1.115	5.0	334.6	O K
180 min Summer	20.312	1.312	5.0	393.6	O K
240 min Summer	20.440	1.440	5.0	432.0	O K
360 min Summer	20.589	1.589	5.0	476.8	O K
480 min Summer	20.658	1.658	5.0	497.3	O K
600 min Summer	20.687	1.687	5.0	506.2	O K
720 min Summer	20.696	1.696	5.0	508.7	O K
960 min Summer	20.672	1.672	5.0	501.7	O K
1440 min Summer	20.540	1.540	5.0	462.0	O K
2160 min Summer	20.340	1.340	5.0	401.9	O K
2880 min Summer	20.173	1.173	5.0	352.0	O K
4320 min Summer	19.902	0.902	5.0	270.5	O K
5760 min Summer	19.686	0.686	5.0	205.7	O K
7200 min Summer	19.515	0.515	5.0	154.5	O K
8640 min Summer	19.380	0.380	5.0	114.1	O K
10080 min Summer	19.277	0.277	5.0	83.0	O K
15 min Winter	19.418	0.418	5.0	125.3	O K
30 min Winter	19.676	0.676	5.0	202.7	O K
60 min Winter	19.926	0.926	5.0	277.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	180.320	0.0	237.8	172
30 min Summer	115.920	0.0	310.1	219
60 min Summer	70.560	0.0	397.8	246
120 min Summer	45.360	0.0	513.9	304
180 min Summer	34.391	0.0	585.3	358
240 min Summer	27.965	0.0	635.0	410
360 min Summer	20.533	0.0	700.9	508
480 min Summer	16.286	0.0	741.1	604
600 min Summer	13.526	0.0	768.1	700
720 min Summer	11.585	0.0	786.0	794
960 min Summer	9.025	0.0	794.2	984
1440 min Summer	6.294	0.0	754.1	1362
2160 min Summer	4.366	0.0	903.3	1712
2880 min Summer	3.369	0.0	927.9	2080
4320 min Summer	2.344	0.0	962.4	2840
5760 min Summer	1.821	0.0	1010.5	3584
7200 min Summer	1.507	0.0	1043.4	4320
8640 min Summer	1.297	0.0	1074.7	5008
10080 min Summer	1.146	0.0	1103.7	5656
15 min Winter	180.320	0.0	267.7	196
30 min Winter	115.920	0.0	350.4	220
60 min Winter	70.560	0.0	445.0	248

Cascade Summary of Results for 281835-ARP-XX-XX-CA-0002_Tank.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
120 min Winter	20.324	1.324	5.0	397.2	O K
180 min Winter	20.548	1.548	5.0	464.5	O K
240 min Winter	20.693	1.693	5.0	508.0	O K
360 min Winter	20.861	1.861	5.0	558.3	O K
480 min Winter	20.940	1.940	5.0	582.0	O K
600 min Winter	20.975	1.975	5.0	592.4	O K
720 min Winter	20.985	1.985	5.0	595.5	O K
960 min Winter	20.964	1.964	5.0	589.2	O K
1440 min Winter	20.832	1.832	5.0	549.5	O K
2160 min Winter	20.571	1.571	5.0	471.2	O K
2880 min Winter	20.346	1.346	5.0	403.8	O K
4320 min Winter	19.952	0.952	5.0	285.7	O K
5760 min Winter	19.630	0.630	5.0	189.1	O K
7200 min Winter	19.383	0.383	5.0	115.0	O K
8640 min Winter	19.207	0.207	5.0	62.1	O K
10080 min Winter	19.107	0.107	5.0	32.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
120 min Winter	45.360	0.0	577.2	302
180 min Winter	34.391	0.0	657.6	358
240 min Winter	27.965	0.0	713.5	412
360 min Winter	20.533	0.0	785.2	514
480 min Winter	16.286	0.0	822.2	612
600 min Winter	13.526	0.0	826.6	710
720 min Winter	11.585	0.0	818.8	808
960 min Winter	9.025	0.0	802.5	1000
1440 min Winter	6.294	0.0	767.6	1408
2160 min Winter	4.366	0.0	1012.8	1832
2880 min Winter	3.369	0.0	1040.5	2224
4320 min Winter	2.344	0.0	1080.0	3036
5760 min Winter	1.821	0.0	1132.3	3800
7200 min Winter	1.507	0.0	1169.6	4472
8640 min Winter	1.297	0.0	1204.9	5048
10080 min Winter	1.146	0.0	1238.3	5440

Cascade Rainfall Details for 281835-ARP-XX-XX-CA-0002_Tank.SRCX

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 529750 182650 TQ 29750 82650	Shortest Storm (mins)	15
Data Type	Catchment	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.000

Time (mins) From:	To:	Area (ha)
0	4	0.000

Cascade Model Details for 281835-ARP-XX-XX-CA-0002_Tank.SRCX

Storage is Online Cover Level (m) 28.000

Tank or Pond Structure

Invert Level (m) 19.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	300.0	2.000	300.0	2.001	0.0	9.000	0.0

Pump Outflow Control

Invert Level (m) 19.000

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.0000	0.700	5.0000	1.300	5.0000	1.900	5.0000	2.500	5.0000
0.200	5.0000	0.800	5.0000	1.400	5.0000	2.000	5.0000	2.600	5.0000
0.300	5.0000	0.900	5.0000	1.500	5.0000	2.100	5.0000	2.700	5.0000
0.400	5.0000	1.000	5.0000	1.600	5.0000	2.200	5.0000	2.800	5.0000
0.500	5.0000	1.100	5.0000	1.700	5.0000	2.300	5.0000	2.900	5.0000
0.600	5.0000	1.200	5.0000	1.800	5.0000	2.400	5.0000	3.000	5.0000

A1

N

Indicative location of proposed shallow attenuation tanks (varying depth between 0.15 - 0.3m) to collect water from public realm and discharge into basement attenuation tank.

Total volume = 195m³ (0.98 void ratio)
Invert level = 27.400mAOD
Contributing catchment = 0.55ha

Indicative location of proposed blue roof to collect water from roof and discharge into basement attenuation tank.

Volume = 44.4m³
Contributing catchment = 0.24ha

Indicative location of proposed urban wetland Surrounding channel drain to capture public realm surface water and drain through wetland and into shallow attenuation tank through high level overflow. Exact details to be confirmed at detailed design stage.

perforation within basement slab to allow connection from shallow attenuation above basement to drain into basement attenuation tank. Detail to be confirmed by structural engineer.

Indicative location of proposed basement attenuation tank which is proposed to discharge into existing Thames Water combined sewer within Euston Road. Flows to be restricted via hydrobrake.

Volume = 600m³
Invert level = 19.000mAOD
Contributing catchment = 0.00ha (0.79ha total across the site)

Perforation within basement slab to allow connection from shallow attenuation above basement to drain into basement attenuation tank. Detail to be confirmed by structural engineer.

Point of connection into existing TWUL combined sewer via pump (acting as a flow control).

Invert level = 19.000mAOD
100yr +CC discharge rate = 5.0 l/s

0 5 10 20 Metres
Scale 1:500

NOTES

1. Do not scale off this drawing.
2. This drawing is not for construction and is for information only to support planning.
3. This drawing has been based upon topographic survey drawing ref:42746T-01I-1 - 4 by Plowman Craven dated June 2018
4. This drawing has been based upon architectural layout drawing ref: ET-DR-A-20100 by 3XN dated September 2023.
5. This drawing has been based upon landscaper architect layout drawing ref: 364_20.001 by DSDHA dated September 2023.
6. The proposed drainage strategy is subject to detailed design and formal approval of points of connection to public sewer by Thames Water at the rates noted.
7. This drawing is to be read in conjunction with Arup Flood Risk Assessment Ref: 281835-ARP-XX-XX-RP-CD-0001 and Arup Drainage Strategy Report Ref: 281835-ARP-XX-XX-RP-CD-0002

KEY

Existing

- TWUL Combined sewer

Proposed

- Site boundary
- Indicative exceedance flow routing
- High capacity channel drain
- Surface water drainage within basement
- Blue roof attenuation
- Shallow permavoid attenuation
- Basement tank attenuation
- Pumped flow control

Issue	Date	By	Chkd	Appd
00	16/02/24	RB	NT	SD
For Information				

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Client
British Land
Property Management Ltd

Job Title
Euston Tower New Build

Drawing Title
Drainage Strategy

Scale at A1 1:500

Discipline Drainage

Job No **281835-00**

Drawing Status **P1**

Drawing No **281835-ARP-XX-DR-CD-00001**

Issue **01**

C:\Users\Robert.Belcher\Arup\281835-00 EUSTON TOWER_NEW BUILD - Internal Data\01 Drawings\03 Civils\281835-ARP-XX-DR-CD-00001.dwg 21 Feb 2024 16:13:40 id: 5C02B5B9-03BC-4C89-AADE-69FC04E130D7 Robert Belcher

Appendix F
Camden SuDS Proforma

Camden GREATERLONDONAUTHORITY LoDEG

1. Project & Site Details	
Project / Site Name (including sub-catchment / stage / phase where appropriate)	Euston Tower
Address & post code	286 Euston Road, London, NW1 3DP
OS Grid ref. (Easting, Northing)	E 529192
	N 182362
LPA reference (if applicable)	
Brief description of proposed work	Major retrofit of Euston Tower including the partial retention (retention of existing core, foundations and basement), disassembly and re-use
Total site Area	7900 m^2
Total existing impervious area	7900 m^2
Total proposed impervious area	7900 m^2
Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	No
Existing drainage connection type and location	Connection into eixsting Thames Water combined sewer
Designer Name	Robert Belcher
Designer Position	Engineer
Designer Company	Arup

2. Proposed Discharge Arrangements			
2a. Infiltration Feasibility			
Superficial geology classification	Lynch Hill Gravel		
Bedrock geology classification	London Clay		
Site infiltration rate	0 m/s		
Depth to groundwater level	Unknown m below ground level		
Is infiltration feasible?	No		
2b. Drainage Hierarchy			
		Feasible (Y/N)	*Proposed (Y/N)*
1 store rainwater for later use		Y	Y
2 use infiltration techniques, such as porous surfaces in non-clay areas		N	N
3 attenuate rainwater in ponds or open water features for gradual release		N	N
4 attenuate rainwater by storing in tanks or sealed water features for gradual release		Y	Y
5 discharge rainwater direct to a watercourse		N	N
6 discharge rainwater to a surface water sewer/drain		N	N
7 discharge rainwater to the combined sewer.		Y	Y
2c. Proposed Discharge Details			
Proposed discharge location	Euston Road (continue to use existing)		
Has the owner/regulator of the discharge location been consulted?	Yes		

Camden GREATERLONDONAUTHORITY LoDEG

3. Drainage Strategy

3a. Discharge Rates & Required Storage				
	Greenfield (GF) runoff rate (l/s)	*Existing discharge rate (l/s)*	*Required storage for GF rate (m^3)*	*Proposed discharge rate (l/s)*
Qbar	1.2			
1 in 1	1	26.4		5
1 in 30	2.8	81.9		5
1 in 100	3.9	123		5
1 in 100 + CC				
Climate change allowance used		40%		
3b. Principal Method of Flow Control		Pump		

3c. Proposed SuDS Measures			
	Catchment area (m^2)	*Plan area (m^2)*	*Storage vol. (m^3)*
Rainwater harvesting	0		0
Infiltration systems	0		0
Green roofs	0	0	0
Blue roofs	2400	TBC	45
Filter strips	0	0	0
Filter drains	0	0	0
Bioretention / tree pits	0	0	0
Pervious pavements	0	0	0
Swales	0	0	0
Basins/ponds	0	0	0
Attenuation tanks	5500		840
Total	**7900**	**0**	**885**

4. Supporting Information

4a. Discharge & Drainage Strategy	*Page/section of drainage report*
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	Not feasible due to underlying strata and existing basement which is to be retained (page 14, table 3)
Drainage hierarchy (2b)	Page 18 & 19, table 5
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	Page 18 (Section 5.4)
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	Page 12 (Section 5.1)
Proposed SuDS measures & specifications (3b)	Page 13 (Section 5.2)
4b. Other Supporting Details	*Page/section of drainage report*
Detailed Development Layout	Appendix A
Detailed drainage design drawings, including exceedance flow routes	Appendix E
Detailed landscaping plans	NA (see landscape document)
Maintenance strategy	Page 19 & 20
Demonstration of how the proposed SuDS measures improve:	Page 13 (Section 5.2)
a) water quality of the runoff?	Page 13 (Section 5.2)
b) biodiversity?	Page 13 (Section 5.2)
c) amenity?	Page 13 (Section 5.2)