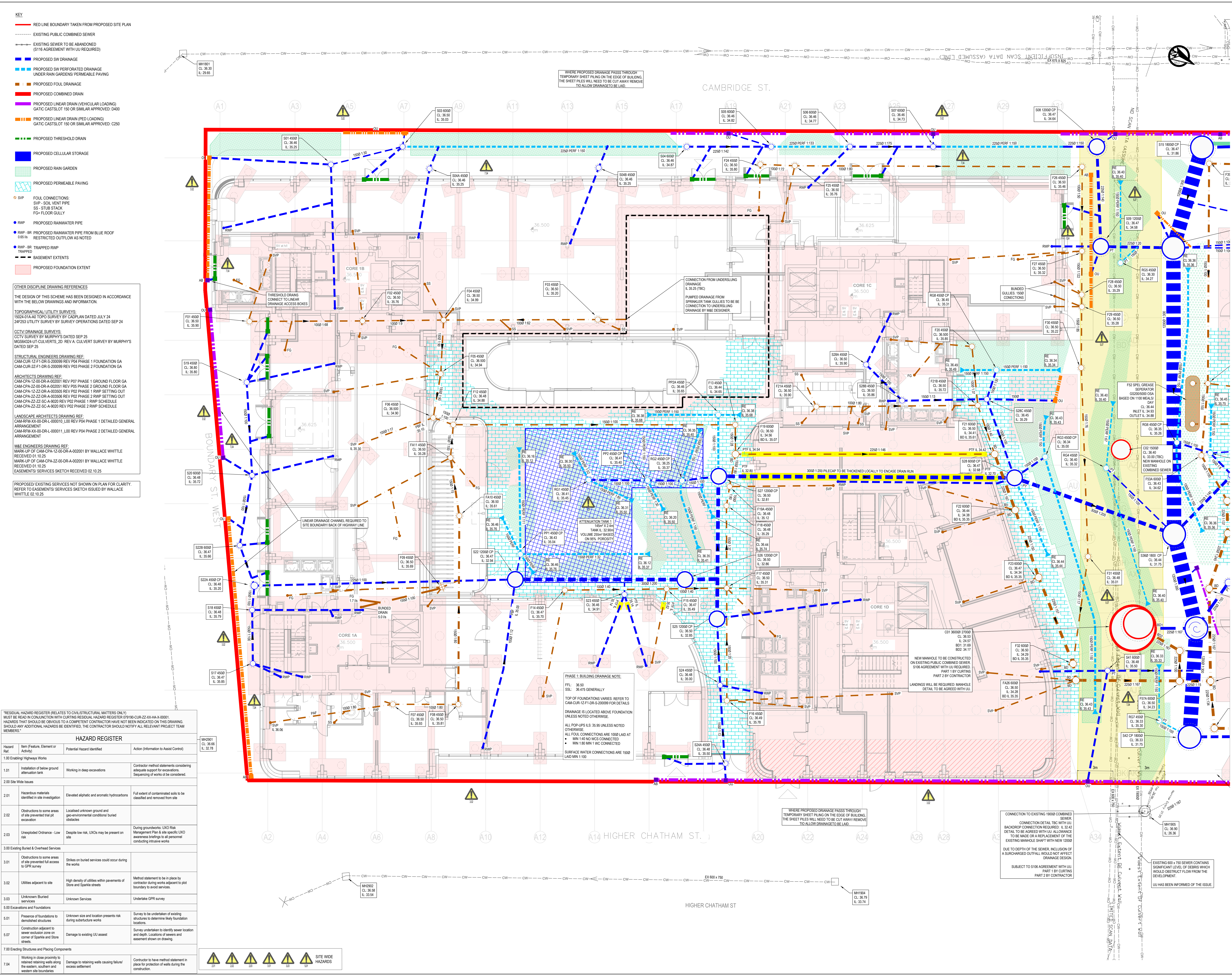




GENERAL NOTES:

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
- DESIGN BASED ON TOPOGRAPHICAL SURVEY INFORMATION AVAILABLE AT THE TIME OF DESIGN.
- DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
- ALL DIMENSIONS ARE IN METRES AND LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS OTHERWISE NOTED.
- FOR DRAINAGE NOTES, REFER TO DRAWING CAM-CUR-XX-XX-D-C-925030.
- FOR MANHOLE SCHEDULES, REFER TO DRAWING CAM-CUR-XX-XX-D-C-925011 & 925011

P04	QUILLY ADOPTED FOR BIN STORE NEAR CORE 1B	30.10.25	MM	MM
P03	STAGE 4 ISSUE	17.10.25	ATL	MM
P02	SPRINKLER TANK DRAINS ADDED	16.10.25	ATL	MM
P01	DRAFT STAGE 4 ISSUE FOR COMMENT	12.09.25	ATL	MM

Rev	Description	Date	By	Chk

Curtins

Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
0161 276 2394
manchester@curtins.com
www.curtins.com

Status: Preliminary

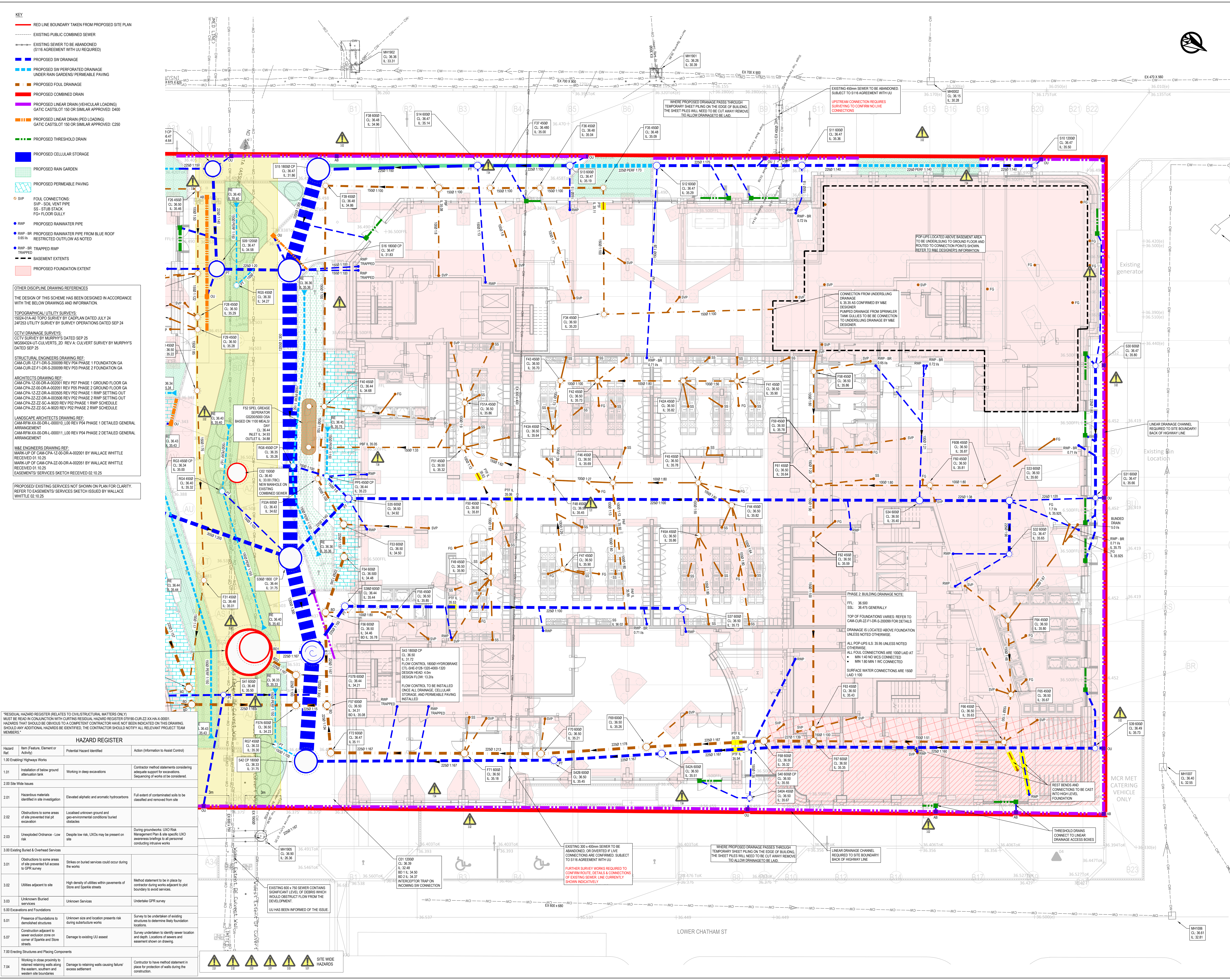
Project: Cambridge Halls Students Residences

Dwg Title: Phase 1 Proposed Drainage

Drawn By: ATL	Designed By: ATL	Checked By: MM
Project No: 087754	Date: 12.09.25	Scales @ A0: 1:100
Project Code - Originator - Function - Spatial - Form - Discipline - Number		Revision
CAM - CUR - 12 - 00 - DR - C - 925001		P04

Appendix G – Propsoed Blue Roof Plan

Proposed Drainage Strategy



GENERAL NOTES:

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
- DESIGN BASED ON TOPOGRAPHICAL SURVEY INFORMATION AVAILABLE AT THE TIME OF DESIGN.
- DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
- ALL DIMENSIONS ARE IN METRES AND LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS OTHERWISE NOTED.
- FOR DRAINAGE NOTES, REFER TO DRAWING CAM-CUR-XX-XXX-C-925030.
- FOR MANHOLE SCHEDULES, REFER TO DRAWING CAM-CUR-XX-XXX-C-925010 & 925011.

P03	STAGE 4 ISSUE	17.10.25	AL	MW
P02	SPRINKLER TANK DRAINS ADDED	16.10.25	ATL	MW
P01	DRAFT STAGE 4 ISSUE FOR COMMENT	12.09.25	ATL	MW

Rev: Description: Date: By: Chkd:

Curtins

Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
0161 275 2394
manchester@curtins.com
www.curtins.com

Status: Preliminary

Project: Cambridge Halls Students Residences

Dwg Title: Phase 2 Proposed Drainage

Drawn By	ATL	Designed By	ATL	Checked By	MW		
Project No	087754	Date	12.09.25	Scales @ A0			
Project Code	Originator	Function	Spatial	Form	Discipline	Number	Revision

CAM-CUR-22-00-DR-C-925002 P03

HAZARD REGISTER		
Hazard Ref.	Item (Feature, Element or Activity)	Potential Hazard Identified
1.01	Installation of below ground attenuation tank	Working in deep excavations
2.01	Hazardous materials identified in site investigation	Elevated aliphatic and aromatic hydrocarbons
2.02	Obstructions to some areas of site prevented trial pit excavation	Localised unknown ground and geo-environmental conditions buried obstacles
2.03	Unexcavated Ordnance - Low risk	Despite low risk, UXOs may be present on site
3.01	Obstructions to some areas of site prevented full access to GPR survey	Strikes on buried services could occur during the works
3.02	Utilities adjacent to site	High density of utilities within pavements of Store and Spinkie streets
3.03	Unknown Buried Services	Unknown Services
5.01	Excavations and Foundations	Presence of foundations to demolished structures
5.02	Construction adjacent to sewer exclusion zone on corner of Spinkie and Store streets	Damage to existing UO asset
7.04	Working in close proximity to retained retaining walls along the eastern, southern and western site boundaries	Damage to retaining walls causing failure/ excess settlement

HAZARD REGISTER		
Hazard Ref.	Item (Feature, Element or Activity)	Action (Information to Assist Control)
1.01	Installation of below ground attenuation tank	Contractor method statements considering adequate support for excavations. Sequencing of works to be considered.
2.01	Hazardous materials identified in site investigation	Full extent of contaminated soils to be classified and removed from site
2.02	Obstructions to some areas of site prevented trial pit excavation	During groundworks: UXO Risk Management Plan & site specific UXO awareness briefings to all personnel conducting intrusive works
3.01	Obstructions to some areas of site prevented full access to GPR survey	Method statement to be in place by contractor during works adjacent to plot boundary to avoid services
3.02	Utilities adjacent to site	Under take GPR survey
5.01	Excavations and Foundations	Survey to be undertaken of existing structures to determine likely foundation locations
5.02	Construction adjacent to sewer exclusion zone on corner of Spinkie and Store streets	Survey undertaken to identify sewer location and depth. Locations of sewers and easement shown on drawing.
7.04	Working in close proximity to retained retaining walls along the eastern, southern and western site boundaries	Contractor to have method statement in place for protection of walls during the construction.

Appendix H – Existing Run-off Rate calculations

Cambridge Halls: - 1 Year Brownfield Run-off Rate

Rainfall Data

Generate Rainfall

FSR DataFEH DataIDF/CRP Data

RegionEngland and Wales

Map

M5-60 (mm)18.000

Ratio R0.362

Summer Profile☒

Winter Profile☐

Return Period (years)1.0

Peak Intensity (mm/hr)43.047

Ave. Intensity (mm/hr)11.376

Storm Duration (mins)60

Generate

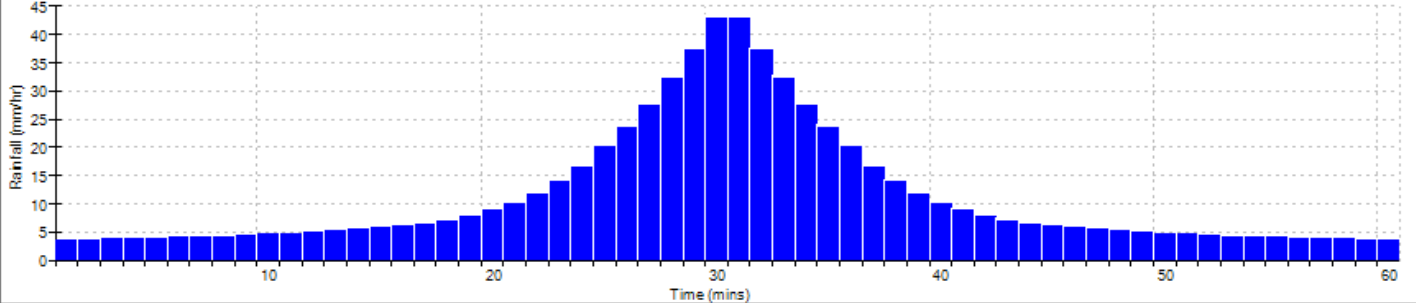
OK

Cancel

Help

Rainfall (mm/hr)

Time (mins)



Enter a Return Period between 0.5 and 1000.0

The estimated runoff rate and volume from the proposed layout has been calculated using the Modified Rational(Wallingford) Method. This method allows estimation of the amount of runoff that is likely to be generated from an urban area. Rainfall depths for the peak intensity for the 1 in 1 year return period has been calculated using the FSR Data in Micro-Drainage modelling software.

Modified
Rational
Method

Q = 2.78 Cv CR i A

Where:
CV = Volumetric Runoff Coefficient
CR = 1.3 (Routing Coefficient)
I = Rainfall Intensity (mm/h)
A = Area (ha)
2.78 = Coefficient accounting for the differences in units used for the inputs and the outputs of the equation.

The variable Cv is a co-efficient that describes the proportion of rainfall appearing in the surface water drainage system. CR is a routing co-efficient added to the Rational Method to represent runoff characteristics of a particular site or area in a more accurate manner.

2.78 x

0.9 x

1.3 x

11.4 x

0.82

=

30.4 l/s

50% Reduction

15.2 l/s

Cambridge Halls: - 30 Year Brownfield Run-off Rate

Rainfall Data

Generate Rainfall

FSR DataFEH DataIDF/CRP Data

RegionEngland and Wales

Map

M5-60 (mm)18.000

Ratio R0.362

Summer Profile☒

Winter Profile☐

Return Period (years)30.0

Peak Intensity (mm/hr)104.640

Ave. Intensity (mm/hr)27.653

Storm Duration (mins)60

Generate

OK

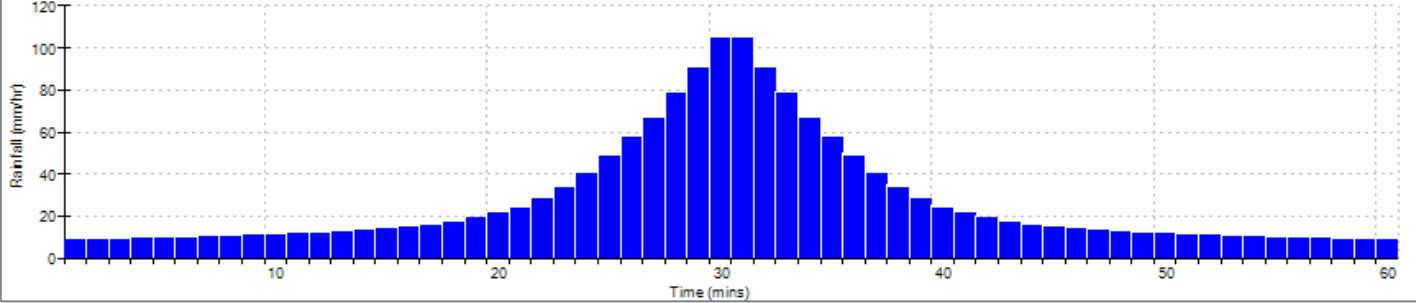
Cancel

Help

Micro Drainage

Rainfall (mm/hr)

Time (mins)



Enter a Return Period between 0.5 and 1000.0

The estimated runoff rate and volume from the proposed layout has been calculated using the Modified Rational(Wallingford) Method. This method allows estimation of the amount of runoff that is likely to be generated from an urban area. Rainfall depths for the peak intensity for the 1 in 1 year return period has been calculated using the FSR Data in Micro-Drainage modelling software.

Modified
Rational
Method

Q = 2.78 Cv CR i A

Where:
CV = Volumetric Runoff Coefficient
CR = 1.3 (Routing Coefficient)
I = Rainfall Intensity (mm/h)
A = Area (ha)
2.78 = Coefficient accounting for the differences in units used for the inputs and the outputs of the equation.

The variable Cv is a co-efficient that describes the proportion of rainfall appearing in the surface water drainage system. CR is a routing co-efficient added to the Rational Method to represent runoff characteristics of a particular site or area in a more accurate manner.

2.78 x

0.9 x

1.3 x

27.7 x

0.82

=

73.9 l/s

50% Reduction

36.9 l/s

Cambridge Halls: - 100 Year Brownfield Run-off Rate

Rainfall Data

Generate Rainfall

FSR DataFEH DataIDF/CRP Data

RegionEngland and Wales

Map

M5-60 (mm)18.000

Ratio R0.362

Summer Profile☒

Winter Profile☐

Return Period (years)100.0

Peak Intensity (mm/hr)159.559

Ave. Intensity (mm/hr)42.167

Storm Duration (mins)60

Generate

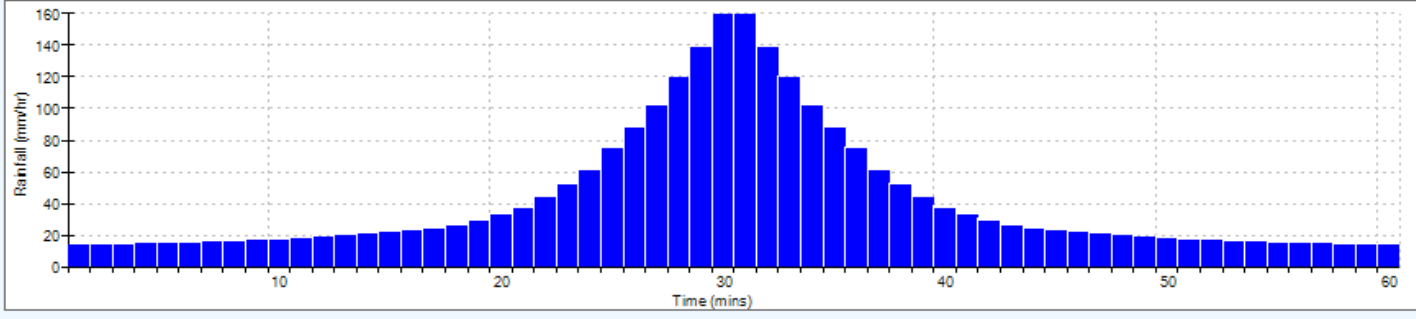
OK

Cancel

Help

Rainfall (mm/hr)

Time (mins)



Enter a Return Period between 0.5 and 1000.0

The estimated runoff rate and volume from the proposed layout has been calculated using the Modified Rational(Wallingford) Method. This method allows estimation of the amount of runoff that is likely to be generated from an urban area. Rainfall depths for the peak intensity for the 1 in 1 year return period has been calculated using the FSR Data in Micro-Drainage modelling software.

Modified
Rational
Method

Q = 2.78 Cv CR i A

Where:
Cv = Volumetric Runoff Coefficient
CR = 1.3 (Routing Coefficient)
I = Rainfall Intensity (mm/h)
A = Area (ha)
2.78 = Coefficient accounting for the differences in units used for the inputs and the outputs of the equation.

The variable Cv is a co-efficient that describes the proportion of rainfall appearing in the surface water drainage system. CR is a routing co-efficient added to the Rational Method to represent runoff characteristics of a particular site or area in a more accurate manner.

2.78 x

0.9 x

1.3 x

42.2 x

0.82

=

112.6 l/s

50% Reduction

56.3 l/s

Appendix I – Propsoed Blue Roof Calculations

Proposed Drainage Calculations

Cambridge Halls - Phase 1

Rainwater Pipe

Revision P02
Date 30/09/2025

											Bauder Calculations					CP Provision	
Level	Reference	Location	Zone	Roof Type	Finish	Roof Area (m ²)	Additional Roofs (m ²)	Adjacent Façade (m ²)	Total Area (m ²)	Roof Pitch	Required total flow rate (l/s)	Required total flow rate (l/s)	Achieved outlet flow rate (l/s)	No. Outlets	Outlet Diameter (mm)	No. Outlets	Area / Outlet (m ²)
7	1L	A2-A8 / AC-AD	Amenity	Inverted	Porous Resin Gravel	240		190	430	1:40						2	215
7	1M	A1-A9 / AA-AC	Amenity	Inverted	Porous Resin Gravel	121	55	165	341	1:40						1	341
7	1N	A9-A21 / AA-AC	Amenity	Inverted	Porous Resin Gravel	360		135	495	1:40						3	165
Total						721	55	490	1266		23.04	5.76	6.21	4	100	6	
7	1E	A27-A30 / AA-AC	Plant	Inverted	Ballast	130		130	260	1:40	4.94	4.94	6.21	1	100	1	260
8	1A	A2-A8 / AB-AC	Plant	Inverted	Ballast	80			80	1:40	1.81	1.81	6.21	1	100	1	80
10	1B	A21-A27 / AA-AB	Plant	Inverted	Ballast	85		70	155	1:40	3.05	3.05	6.21	1	100	1	155
10	1D	A21-A27 / AD-AE	Plant	Inverted	Ballast	105		70	175	1:40	3.37	3.37	6.21	1	100	1	175
10	1H	A8-A20 / AI-AK	Plant	Inverted	Ballast	340		575	915	1:40	16.91	5.64	6.21	3	100	4	229
10	1K	A2-A8 / AH-AI	Plant	Inverted	Ballast	47		68	115	1:40	2.28	2.28	6.21	1	100	1	115
11	1C	A21-A27 / AA-AC	Plant	Inverted	Ballast	95	19		114	1:40	2.08	2.08	6.21	1	100	1	114
11	1J	A2-A8 / AI-AK	Plant	Inverted	Ballast	127	19		146	1:40	3.36	3.36	6.21	1	100	2	73
23	1F	A20-A32 / AE-AK	Plant	Inverted	Ballast	442	19	405	866	1:40	16.89	5.63	6.21	3	100	3	289
24	1G	A22-A29 / AV-AJ	Plant	Inverted	Ballast	166	19		185	1:40	3.27	3.27	6.21	1	100	1	185
1	1O	A8-A10 / AE-AI	Bike Store	Warm	Sedum	65			65	1:40			6.21	2	100	2	33
																24	

Notes:

Values are taken from Bauder Calculations

BSEN12056-3:2000

Bauder Document Reference: B252515

23/05/2025

Rain fall category use - Cat 1

Rainfall Intesivity (l/(s.sqm)) 0.018

Full capacity overflow should be provided when only one outlet on roof area.

Finish by Re-Form Landscape Architect

CP Proposals

BSEN12056-3:2000 Requires overflow where 1no. Outlet provided

To ensure resilience in event of outlet blockage roof areas provided with at least 2no. Outlets

2no. Outlets provided from Greenhouse independent from flat roof for resilience

Greenhouse area factored into level 7 additional roof in event of outlet blockage

Roof areas subject to refinement following update to parapet detailing

Cambridge Halls - Phase 2

Rainwater Pipe

Revision P02
Date 01/10/2025

											Bauder Calculations					CP Provision	
Level	Reference	Location	Zone	Roof Type	Finish	Roof Area (m ²)	Additional Roofs (m ²)	Adjacent Façade (m ²)	Total Area (m ²)	Roof Pitch	Required total flow rate (l/s)	Required total flow rate (l/s)	Achieved outlet flow rate (l/s)	No. Outlets	Outlet Diameter (mm)	No. Outlets	Area / Outlet (m ²)
7	2H	B1-B4 / BC-BH	Amenity	Inverted	Porous Resin Gravel	257		275	532	1:40						2	266
7	2J	B1-B4 / BA-BB	Amenity	Inverted	Porous Resin Gravel	47	35	75	157	1:40						2	79
7	2K	B4-B10 / BA-BD	Amenity	Inverted	Porous Resin Gravel	316		265	581	1:40						2	291
						620	35	615	1270		23.62	5.91	6.21	4	100	6	
8	2A	B1-B4 / BB-BC	Plant	Inverted	Ballast	103	14		117	1:40	1.88	1.88	6.21	1	100	1	117
13	2B	B11-B18 / BB/BC	Plant	Inverted	Ballast	94	14		108	1:40	1.97	1.97	6.21	1	100	1	108
29	2C	B-10-B21 / BZ-BK	Plant	Inverted	Ballast	486		175	661	1:40	12.08	6.04	6.21	2	100	4	165
30	2D	B11-B17 / BY-BJ	Plant	Inverted	Ballast	169	14		183	1:40	3.36	3.36	6.21	1	100	2	92
12	2E	B4-B10 / BI-BK	Plant	Inverted	Ballast	290		645	935	1:40	17.06	5.69	6.21	3	100	3	312
13	2F	B1-B4 / BI-BK	Plant	Inverted	Ballast	163	14		177	1:40	3.23	3.23	6.21	1	100	1	177
12	2G	B1-B4 / BI-BH	Plant	Inverted	Ballast	55		60	115	1:40	2.28	2.28	6.21	1	100	1	115
1	2O	B4-B11 / BD-BI	Courtyard	Warm	Blue Roof Pedestal System	453		28	481	None	1.43	1.43	0.71	2	100	2	241
1	2N	B18-B22 / BC-BJ	Plant	Warm	Blue Roof Ballasted System	123		25	148	None	0.71	0.71	0.71	1	100	2	74
12	2L	B11-B22 / BA-BC	Plant	Warm	Blue Roof Ballasted System	213		18	231	None	0.72	0.72	0.72	1	100	2	116
12	2M	B11-B18 / BC-BE	Plant	Warm	Blue Roof Ballasted System	115			115	None	0.65	0.65	0.65	1	100	1	115
														19		26	

Notes:

Values are taken from Bauder Calculations

BSEN12056-3:2000

Bauder Document Reference: B252515

23/05/2025

Rain fall category use - Cat 1

Rainfall Intesity (l/(s.sqm)) 0.018

Full capacity overflow should be provided when only one outlet on roof area.

Finish by Re-Form Landscape Architect

CP Proposals

BSEN12056-3:2000 Requires overflow where 1no. Outlet provided

To ensure resilience in event of outlet blockage roof areas provided with at least 2no. Outlets

2no. Outlets provided from Greenhouse independent from flat roof for resilience

Greenhouse area factored into level 7 additional roof in event of outlet blockage

Roof areas subject to refinement following update to parapet detailing

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	18.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.356	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S19	0.022	5.00	36.480	450	384183.438	396901.986	0.680
S20	0.027	5.00	36.480	600	384190.157	396906.072	0.759
22B			36.480	450	384195.873	396907.930	0.819
S17	0.030	5.00	36.480	450	384204.167	396913.595	0.630
S18	0.019	5.00	36.480	450	384200.202	396911.420	0.686
S22A			36.480	600	384198.301	396910.622	1.280
PP1	0.015	5.00	36.430	600	384185.101	396929.055	1.130
S21	0.023	5.00	36.480	1200	384187.050	396929.592	3.545
S23	0.046	5.00	36.470	450	384183.412	396938.100	1.556
S26			36.410	1200	384180.851	396942.477	3.546
S24A	0.002	5.00	36.480	450	384192.879	396952.797	0.980
S24	0.029	5.00	36.450	450	384187.258	396949.287	1.450
S25	0.019	5.00	36.450	1200	384182.149	396946.617	3.585
JUN S27A	0.063	5.00	36.450	450	384179.346	396945.072	3.601
RG1	0.004	5.00	36.410	600	384177.162	396931.351	0.960
PP2	0.015	5.00	36.410	600	384174.861	396935.763	1.010
RG2	0.003	5.00	36.460	600	384173.514	396938.346	1.089
PP2A	0.005	5.00	36.460	450	384167.172	396938.433	0.810
S27			36.450	1200	384171.729	396940.907	3.644
S28A	0.011	5.00	36.500	450	384157.559	396947.467	0.600
S28B	0.018	5.00	36.500	450	384158.812	396951.578	0.644
RG8	0.003	5.00	36.450	450	384152.802	396957.392	1.140
S28C	0.003	5.00	36.450	450	384155.356	396957.837	1.166
RG3	0.015	5.00	36.343	600	384157.340	396964.479	1.343
S28	0.036	5.00	36.500	1200	384160.117	396963.026	3.821
S01	0.061	5.00	36.460	450	384163.864	396899.629	1.210
S03	0.046	5.00	36.460	600	384159.689	396904.262	1.435
S04			36.400	600	384148.550	396925.450	1.535
S05	0.006	5.00	36.400	600	384145.073	396931.751	1.582
S06	0.016	5.00	36.400	600	384141.952	396937.621	1.626
S07	0.007	5.00	36.500	600	384139.170	396943.303	1.768
S08	0.005	5.00	36.415	1200	384132.161	396956.035	1.780
S09	0.032	5.00	36.480	1200	384139.444	396960.280	1.901
RG5	0.005	5.00	36.300	600	384139.886	396962.406	1.030
JUN S09			36.310		384138.025	396963.038	2.114
S10	0.004	5.00	36.480	600	384099.469	397016.953	0.980
BR 2L1	0.012	5.00	38.000	450	384113.816	397001.290	0.200
S11	0.034	5.00	36.480	600	384109.157	396998.813	1.117
BR 2O1	0.024	5.00	38.000	450	384127.260	396995.073	0.200
S12	0.002	5.00	36.480	600	384114.405	396988.876	1.191
S13	0.034	5.00	36.480	600	384117.837	396982.421	1.291

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S14	0.008	5.00	36.480	600	384121.481	396975.569	1.343
S15			36.415	1800	384128.055	396963.901	4.555
S16	0.027	5.00	36.490	1800	384136.673	396965.746	4.659
BR 2N1	0.007	5.00	38.000	450	384111.613	397025.225	0.200
S30			36.480	450	384110.402	397027.437	0.680
S31	0.003	5.00	36.470	600	384122.636	397033.687	0.807
BR 2N2	0.007	5.00	38.000	450	384126.001	397034.987	0.200
S32	0.026	5.00	36.500	600	384129.325	397030.388	0.700
S33			36.500	600	384125.365	397028.300	0.973
BR 2L2 + 2M1	0.023	5.00	38.000	450	384121.454	397018.370	0.200
S34	0.027	5.00	36.500	600	384128.892	397021.611	1.097
RG6	0.019	5.00	36.350	600	384151.050	396973.723	1.090
PP5	0.030	5.00	36.440	600	384150.515	396976.643	1.210
S35	0.027	5.00	36.500	600	384151.129	396978.907	1.578
RG4	0.005	5.00	36.403	600	384155.751	396969.502	1.083
S36	0.002	5.00	36.490	1800	384158.006	396977.161	4.741
S39	0.036	5.00	36.490	600	384140.362	397044.433	0.765
S40A	0.006	5.00	36.470	450	384157.752	397020.587	0.800
S40	0.058	5.00	36.500	600	384153.950	397018.627	0.950
RG7	0.010	5.00	36.330	600	384172.437	396983.434	1.030
S42			36.420	1800	384172.498	396986.349	4.670
S41	0.017	5.00	36.500	450	384171.112	396977.064	1.000
JUN S43			36.440		384167.414	396983.998	4.709
BR 2O2	0.024	5.00	38.000	450	384151.545	397010.131	0.200
S37	0.074	5.00	36.500	450	384146.276	397008.255	0.775
S38			36.440	600	384159.442	396983.125	0.999
S43			36.440	1800	384164.133	396982.547	4.718
C01			36.500	2700	384166.385	396978.332	4.807
S42A			36.500	600	384157.347	397012.175	0.994
S42B			36.500	600	384162.257	397005.798	1.042

Links (Input)

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	S19	S20	7.864	0.600	35.800	35.721	0.079	100.0	150	5.13	50.0
1.001	S20	22B	6.010	0.600	35.721	35.661	0.060	100.0	150	5.23	50.0
1.002	22B	S22A	3.625	0.600	35.661	35.625	0.036	100.0	150	5.29	50.0
2.000	S17	S18	4.522	0.600	35.850	35.805	0.045	100.0	150	5.08	50.0
2.001	S18	S22A	2.062	0.600	35.794	35.773	0.021	100.0	150	5.11	50.0
1.003	S22A	S21	22.056	0.600	35.200	34.979	0.221	100.0	225	5.57	50.0
3.000	PP1	S21	2.022	0.600	35.300	35.280	0.020	100.0	150	5.03	50.0
1.004	S21	S26	14.299	0.600	32.935	32.864	0.071	200.0	300	5.79	50.0
4.000	S23	S26	5.071	0.600	34.914	34.863	0.051	100.0	150	5.08	50.0
1.005	S26	JUN S27A	3.000	0.600	32.864	32.849	0.015	200.0	300	5.83	50.0
5.000	S24A	S24	6.627	0.600	35.500	35.000	0.500	13.3	150	5.04	50.0
5.001	S24	S25	5.765	0.600	35.000	34.942	0.058	100.0	150	5.14	50.0
5.002	S25	JUN S27A	3.201	0.600	32.865	32.849	0.016	200.0	300	5.18	50.0
1.006	JUN S27A	S27	8.681	0.600	32.849	32.806	0.043	200.0	300	5.96	50.0
6.000	RG1	PP2	4.976	0.600	35.450	35.400	0.050	100.0	150	5.08	50.0
6.001	PP2	RG2	2.913	0.600	35.400	35.371	0.029	100.0	150	5.13	50.0
6.002	RG2	S27	3.122	0.600	35.371	35.340	0.031	100.0	150	5.18	50.0

Links (Input)

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)
7.000	PP2A	S27	5.185	0.600	35.650	35.598	0.052	100.0	150	5.09	50.0
1.007	S27	S28	24.982	0.600	32.806	32.681	0.125	200.0	300	6.34	50.0
8.000	S28A	S28B	4.298	0.600	35.900	35.857	0.043	100.0	150	5.07	50.0
8.001	S28B	S28C	7.150	0.600	35.856	35.290	0.566	12.6	150	5.11	50.0
9.000	RG8	S28C	2.592	0.600	35.310	35.284	0.026	100.0	150	5.04	50.0
8.002	S28C	S28	7.042	0.600	35.290	35.220	0.070	100.0	150	5.23	50.0
10.000	RG3	S28	3.134	0.600	35.000	34.969	0.031	100.0	150	5.05	50.0
1.008	S28	S36	14.292	0.600	32.679	32.608	0.071	200.0	300	6.55	50.0
11.000	S01	S03	6.237	0.600	35.250	35.100	0.150	41.6	150	5.07	50.0
11.001	S03	S04	23.938	0.600	35.025	34.865	0.160	150.0	225	5.44	50.0
11.002	S04	S05	7.197	0.600	34.866	34.818	0.048	150.0	225	5.55	50.0
11.003	S05	S06	6.648	0.600	34.818	34.774	0.044	150.0	225	5.66	50.0
11.004	S06	S07	6.327	0.600	34.774	34.732	0.042	150.0	225	5.76	50.0
11.005	S07	S08	14.534	0.600	34.732	34.635	0.097	150.0	225	5.98	50.0
11.006	S08	S09	8.430	0.600	34.635	34.579	0.056	150.0	225	6.12	50.0
11.007	S09	JUN S09	3.102	0.600	34.579	34.234	0.345	9.0	225	6.13	50.0
12.000	RG5	JUN S09	1.965	0.600	35.270	34.271	0.999	2.0	150	5.00	50.0
11.008	JUN S09	S16	3.027	0.600	34.196	33.860	0.336	9.0	225	6.14	50.0
13.000	S10	S11	20.565	0.600	35.500	35.363	0.137	150.0	225	5.32	50.0
14.000	BR 2L1	S11	5.277	0.600	37.800	35.500	2.300	2.3	100	5.02	50.0
13.001	S11	S12	11.238	0.600	35.364	35.289	0.075	150.0	225	5.50	50.0
15.000	BR 2O1	S12	14.271	0.600	37.800	35.339	2.461	5.8	100	5.07	50.0
13.002	S12	S13	7.311	0.600	35.289	35.240	0.049	150.0	225	5.61	50.0
13.003	S13	S14	7.761	0.600	35.189	35.137	0.052	150.0	300	5.71	50.0
13.004	S14	S15	13.393	0.600	35.137	35.048	0.089	150.0	300	5.89	50.0
13.005	S15	S16	8.813	0.600	31.860	31.831	0.029	300.0	1200	5.96	50.0
11.009	S16	S36	24.195	0.600	31.831	31.750	0.081	300.0	1200	6.33	50.0
16.000	BR 2N1	S30	2.522	0.600	37.800	35.800	2.000	1.3	100	5.01	50.0
16.001	S30	S31	13.738	0.600	35.800	35.663	0.137	100.0	225	5.18	50.0
16.002	S31	S33	6.039	0.600	35.663	35.603	0.060	100.0	225	5.26	50.0
17.000	BR 2N2	S33	6.717	0.600	37.800	35.527	2.273	3.0	100	5.02	50.0
18.000	S32	S33	4.477	0.600	35.800	35.527	0.273	16.4	225	5.02	50.0
16.003	S33	S34	7.562	0.600	35.603	35.403	0.200	37.8	225	5.32	50.0
19.000	BR 2L2 + 2M1	S34	8.113	0.600	37.800	35.527	2.273	3.6	150	5.03	50.0
16.004	S34	S35	48.147	0.600	35.403	34.922	0.481	100.0	225	5.93	50.0
20.000	RG6	PP5	2.969	0.600	35.260	35.230	0.030	100.0	150	5.05	50.0
20.001	PP5	S35	2.346	0.600	35.230	34.997	0.233	10.1	150	5.06	50.0
16.005	S35	S36	7.095	0.600	34.922	34.875	0.047	150.0	225	6.04	50.0
21.000	RG4	S36	7.984	0.600	35.320	35.240	0.080	100.0	150	5.13	50.0
1.009	S36	S43	8.158	0.600	31.749	31.722	0.027	300.0	1200	6.62	50.0
22.000	S39	S40	29.165	0.600	35.725	35.550	0.175	167.0	225	5.48	50.0
23.000	S40A	S40	4.277	0.600	35.670	35.641	0.029	150.0	150	5.09	50.0
24.000	RG7	S42	2.916	0.600	35.300	35.271	0.029	100.0	150	5.05	50.0
22.004	S42	JUN S43	5.601	0.600	31.750	31.731	0.019	300.0	1200	6.14	50.0
25.000	S41	JUN S43	7.858	0.600	35.500	32.785	2.715	2.9	150	5.02	50.0
22.005	JUN S43	S43	3.588	0.600	31.735	31.723	0.012	300.0	1200	6.17	50.0
26.000	BR 2O2	S37	5.593	0.600	37.800	35.800	2.000	2.8	100	5.02	50.0
26.001	S37	S38	28.370	0.600	35.725	35.441	0.284	100.0	225	5.38	50.0
26.002	S38	S43	4.726	0.600	35.441	35.409	0.032	150.0	225	5.46	50.0
1.010	S43	C01	4.779	0.600	31.722	31.693	0.029	167.0	225	6.70	50.0
22.001	S40	S42A	7.292	0.600	35.550	35.506	0.044	167.0	225	5.60	50.0
22.002	S42A	S42B	8.048	0.600	35.506	35.458	0.048	167.0	225	5.74	50.0

Links (Input)

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)
22.003	S42B	S42	21.980	0.600	35.458	35.326	0.132	167.0	225	6.10	50.0

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Detailed
Rainfall Events	Singular	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	1440
M5-60 (mm)	18.000	Additional Storage (m³/ha)	20.0
Ratio-R	0.358	Starting Level (m)	
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

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	45	0	0

Node S43 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	31.722	Product Number	CTL-SHE-0128-1320-4000-1320
Design Depth (m)	4.000	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	13.2	Min Node Diameter (mm)	1500

Node BR 2N2 Online Depth/Flow Control

Flap Valve	x	Replaces Downstream Link	✓	Invert Level (m)	37.800
------------	---	--------------------------	---	------------------	--------

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	0.000	0.050	0.350	0.100	0.710

Node BR 2L2 + 2M1 Online Depth/Flow Control

Flap Valve	x	Replaces Downstream Link	✓	Invert Level (m)	37.800
------------	---	--------------------------	---	------------------	--------

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	0.000	0.050	0.068	0.100	0.136

Node BR 2L1 Online Depth/Flow Control

Flap Valve	x	Replaces Downstream Link	✓	Invert Level (m)	37.800
------------	---	--------------------------	---	------------------	--------

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	0.000	0.050	0.355	0.100	0.710

Node BR 2N1 Online Depth/Flow Control

Flap Valve x | Replaces Downstream Link ✓ | Invert Level (m) 37.800

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	0.000	0.050	0.355	0.100	0.710

Node BR 2O1 Online Depth/Flow Control

Flap Valve x | Replaces Downstream Link ✓ | Invert Level (m) 37.800

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	0.000	0.050	0.710	0.100	1.420

Node BR 2O2 Online Depth/Flow Control

Flap Valve x | Replaces Downstream Link ✓ | Invert Level (m) 37.800

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	0.000	0.050	0.710	0.100	1.420

Node S26 Offline Orifice Control

Flap Valve x | Invert Level (m) 32.864 | Discharge Coefficient 0.600
Loop to Node S27 | Diameter (m) 0.300

Node S26 Depth/Area Storage Structure

Base Inf Coefficient (m/hr) 0.00000 | Safety Factor 2.0 | Invert Level (m) 32.864
Side Inf Coefficient (m/hr) 0.00000 | Porosity 0.96 | Time to half empty (mins) 336

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	139.5	0.0	2.490	139.5	0.0	2.492	0.0	0.0

Node RG1 Carpark Storage Structure

Base Inf Coefficient (m/hr) 0.00000 | Invert Level (m) 35.500 | Slope (1:X) 1000.0
Side Inf Coefficient (m/hr) 0.00000 | Time to half empty (mins) 72 | Depth (m) 0.750
Safety Factor 2.0 | Width (m) 6.300 | Inf Depth (m)
Porosity 0.20 | Length (m) 10.000

Node RG3 Carpark Storage Structure

Base Inf Coefficient (m/hr) 0.00000 | Invert Level (m) 35.390 | Slope (1:X) 1000.0
Side Inf Coefficient (m/hr) 0.00000 | Time to half empty (mins) 64 | Depth (m) 0.750
Safety Factor 2.0 | Width (m) 17.500 | Inf Depth (m)
Porosity 0.20 | Length (m) 2.000

Node BR 2N2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr) 0.00000 | Safety Factor 2.0 | Invert Level (m) 37.800
Side Inf Coefficient (m/hr) 0.00000 | Porosity 1.00 | Time to half empty (mins)

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	74.0	74.0	0.200	74.0	80.1

Node BR 2L2 + 2M1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	37.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	356.0	356.0	0.200	356.0	369.4

Node BR 2L1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	37.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	74.0	74.0	0.200	74.0	80.1

Node BR 2N1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	37.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	74.0	74.0	0.200	74.0	80.1

Node BR 2O1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	37.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	241.0	241.0	0.200	241.0	252.0

Node BR 2O2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	37.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	241.0	241.0	0.200	241.0	252.0

Node RG3 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	35.000	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	64	Depth (m)	0.750
Safety Factor	2.0	Width (m)	2.000	Inf Depth (m)	
Porosity	0.20	Length (m)	10.000		

Node PP1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	36.130	Slope (1:X)	60.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.150
Safety Factor	2.0	Width (m)	2.000	Inf Depth (m)	
Porosity	0.30	Length (m)	75.000		

Node PP2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	36.110	Slope (1:X)	60.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.150
Safety Factor	2.0	Width (m)	2.000	Inf Depth (m)	
Porosity	0.30	Length (m)	75.000		

Node S28 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	36.150	Slope (1:X)	60.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	24	Depth (m)	0.150
Safety Factor	2.0	Width (m)	3.000	Inf Depth (m)	
Porosity	0.30	Length (m)	32.000		

Node PP5 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	36.140	Slope (1:X)	60.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.150
Safety Factor	2.0	Width (m)	2.500	Inf Depth (m)	
Porosity	0.30	Length (m)	20.000		

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	94.631	26.777	30 year 15 minute summer	231.479	65.500
1 year 15 minute winter	66.408	26.777	30 year 15 minute winter	162.441	65.500
1 year 30 minute summer	62.502	17.686	30 year 30 minute summer	153.602	43.464
1 year 30 minute winter	43.861	17.686	30 year 30 minute winter	107.791	43.464
1 year 60 minute summer	43.047	11.376	30 year 60 minute summer	104.640	27.653
1 year 60 minute winter	28.599	11.376	30 year 60 minute winter	69.521	27.653
1 year 120 minute summer	27.239	7.198	30 year 120 minute summer	64.725	17.105
1 year 120 minute winter	18.097	7.198	30 year 120 minute winter	43.002	17.105
1 year 180 minute summer	21.313	5.485	30 year 180 minute summer	49.672	12.782
1 year 180 minute winter	13.854	5.485	30 year 180 minute winter	32.288	12.782
1 year 240 minute summer	17.098	4.519	30 year 240 minute summer	39.164	10.350
1 year 240 minute winter	11.360	4.519	30 year 240 minute winter	26.020	10.350
1 year 360 minute summer	13.347	3.435	30 year 360 minute summer	29.696	7.642
1 year 360 minute winter	8.676	3.435	30 year 360 minute winter	19.303	7.642
1 year 480 minute summer	10.629	2.809	30 year 480 minute summer	23.318	6.162
1 year 480 minute winter	7.062	2.809	30 year 480 minute winter	15.492	6.162
1 year 600 minute summer	8.786	2.403	30 year 600 minute summer	19.053	5.212
1 year 600 minute winter	6.003	2.403	30 year 600 minute winter	13.018	5.212
1 year 720 minute summer	7.894	2.116	30 year 720 minute summer	16.951	4.543
1 year 720 minute winter	5.305	2.116	30 year 720 minute winter	11.392	4.543
1 year 960 minute summer	6.572	1.731	30 year 960 minute summer	13.883	3.656
1 year 960 minute winter	4.354	1.731	30 year 960 minute winter	9.197	3.656
1 year 1440 minute summer	4.868	1.305	30 year 1440 minute summer	10.030	2.688
1 year 1440 minute winter	3.272	1.305	30 year 1440 minute winter	6.741	2.688

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +45% CC 15 minute summer	433.303	122.610	100 year +45% CC 360 minute summer	55.995	14.410
100 year +45% CC 15 minute winter	304.072	122.610	100 year +45% CC 360 minute winter	36.399	14.410
100 year +45% CC 30 minute summer	290.377	82.167	100 year +45% CC 480 minute summer	43.781	11.570
100 year +45% CC 30 minute winter	203.773	82.167	100 year +45% CC 480 minute winter	29.087	11.570
100 year +45% CC 60 minute summer	199.139	52.627	100 year +45% CC 600 minute summer	35.650	9.751
100 year +45% CC 60 minute winter	132.303	52.627	100 year +45% CC 600 minute winter	24.358	9.751
100 year +45% CC 120 minute summer	123.447	32.623	100 year +45% CC 720 minute summer	31.621	8.475
100 year +45% CC 120 minute winter	82.015	32.623	100 year +45% CC 720 minute winter	21.251	8.475
100 year +45% CC 180 minute summer	94.580	24.339	100 year +45% CC 960 minute summer	25.771	6.786
100 year +45% CC 180 minute winter	61.480	24.339	100 year +45% CC 960 minute winter	17.071	6.786
100 year +45% CC 240 minute summer	74.355	19.650	100 year +45% CC 1440 minute summer	18.479	4.953
100 year +45% CC 240 minute winter	49.400	19.650	100 year +45% CC 1440 minute winter	12.419	4.953

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S19	10	35.839	0.039	2.7	0.0316	0.0000	OK
15 minute winter	S20	10	35.786	0.065	6.0	0.0647	0.0000	OK
15 minute winter	22B	10	35.727	0.066	5.9	0.0105	0.0000	OK
15 minute winter	S17	10	35.901	0.051	3.7	0.0569	0.0000	OK
15 minute winter	S18	10	35.862	0.068	5.9	0.0485	0.0000	OK
15 minute winter	S22A	11	35.275	0.075	11.7	0.0211	0.0000	OK
15 minute winter	PP1	10	35.335	0.035	1.8	0.0194	0.0000	OK
15 minute winter	S21	10	33.034	0.099	16.0	0.1250	0.0000	OK
15 minute winter	S23	10	34.977	0.063	5.6	0.0471	0.0000	OK
30 minute winter	S26	23	32.929	0.065	19.7	8.7921	0.0000	OK
30 minute summer	S24A	20	35.507	0.007	0.2	0.0014	0.0000	OK
15 minute winter	S24	10	35.049	0.049	3.7	0.0275	0.0000	OK
15 minute winter	S25	11	32.930	0.065	6.0	0.0799	0.0000	OK
30 minute winter	JUN S27A	22	32.927	0.078	10.8	0.0274	0.0000	OK
15 minute winter	RG1	11	35.467	0.017	0.5	0.0063	0.0000	OK
15 minute winter	PP2	10	35.441	0.041	2.3	0.0235	0.0000	OK
15 minute winter	RG2	10	35.414	0.043	2.7	0.0145	0.0000	OK
15 minute summer	PP2A	11	35.669	0.019	0.6	0.0055	0.0000	OK
120 minute winter	S27	112	32.911	0.105	12.0	0.1183	0.0000	OK
15 minute winter	S28A	11	35.929	0.029	1.3	0.0152	0.0000	OK
15 minute winter	S28B	10	35.883	0.027	3.5	0.0193	0.0000	OK
15 minute winter	RG8	10	35.343	0.033	0.4	0.0070	0.0000	OK
15 minute winter	S28C	10	35.343	0.059	4.3	0.0124	0.0000	OK
15 minute winter	RG3	11	35.034	0.034	1.8	0.1330	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 winter	S19	1.000	S20	2.7	0.490	0.150	0.0432	9.3
15 minute winter	S20	1.001	22B	5.9	0.794	0.331	0.0444	
15 minute winter	22B	1.002	S22A	5.8	0.839	0.328	0.0252	
15 minute winter	S17	2.000	S18	3.6	0.636	0.205	0.0259	
15 minute winter	S18	2.001	S22A	5.9	0.829	0.331	0.0146	
15 minute winter	S22A	1.003	S21	11.7	1.044	0.225	0.2472	
15 minute winter	PP1	3.000	S21	1.8	0.602	0.100	0.0060	
15 minute winter	S21	1.004	S26	16.3	1.393	0.208	0.1875	
15 minute winter	S23	4.000	S26	5.5	0.843	0.313	0.0334	
30 minute winter	S26	1.005	JUN S27A	5.3	0.491	0.068	0.0387	
30 minute winter	S26	Orifice	S27	5.7				
30 minute summer	S24A	5.000	S24	0.2	0.113	0.004	0.0160	
15 minute winter	S24	5.001	S25	3.7	0.761	0.206	0.0277	
15 minute winter	S25	5.002	JUN S27A	5.9	0.503	0.075	0.0392	
30 minute winter	JUN S27A	1.006	S27	10.5	0.603	0.134	0.1510	
15 minute winter	RG1	6.000	PP2	0.5	0.214	0.028	0.0123	
15 minute winter	PP2	6.001	RG2	2.3	0.574	0.128	0.0116	
15 minute winter	RG2	6.002	S27	2.6	0.680	0.149	0.0121	
15 minute summer	PP2A	7.000	S27	0.6	0.460	0.034	0.0068	
120 minute winter	S27	1.007	S28	12.0	0.719	0.154	0.9947	
15 minute winter	S28A	8.000	S28B	1.3	0.570	0.073	0.0098	
15 minute winter	S28B	8.001	S28C	3.5	0.948	0.069	0.0274	
15 minute winter	RG8	9.000	S28C	0.4	0.099	0.021	0.0120	
15 minute winter	S28C	8.002	S28	4.2	0.791	0.237	0.0374	
15 minute winter	RG3	10.000	S28	1.7	0.606	0.096	0.0089	

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	S28	110	32.910	0.231	15.3	0.3052	0.0000	OK
15 minute winter	S01	10	35.307	0.057	7.4	0.0669	0.0000	OK
15 minute winter	S03	10	35.112	0.087	12.9	0.0806	0.0000	OK
15 minute winter	S04	11	34.961	0.096	12.8	0.0272	0.0000	OK
15 minute winter	S05	11	34.918	0.100	13.4	0.0360	0.0000	OK
15 minute winter	S06	11	34.880	0.106	15.3	0.0509	0.0000	OK
15 minute winter	S07	11	34.835	0.103	16.2	0.0372	0.0000	OK
15 minute winter	S08	11	34.738	0.103	16.8	0.1224	0.0000	OK
15 minute winter	S09	11	34.635	0.056	20.5	0.0829	0.0000	OK
15 minute summer	RG5	11	35.278	0.008	0.6	0.0029	0.0000	OK
15 minute winter	JUN S09	11	34.254	0.058	21.1	0.0000	0.0000	OK
15 minute winter	S10	11	35.517	0.017	0.5	0.0063	0.0000	OK
240 minute winter	BR 2L1	168	37.816	0.016	0.3	1.2193	0.0000	OK
15 minute winter	S11	10	35.415	0.052	4.6	0.0468	0.0000	OK
480 minute winter	BR 2O1	336	37.811	0.011	0.4	2.7937	0.0000	OK
15 minute winter	S12	11	35.343	0.054	4.7	0.0169	0.0000	OK
15 minute winter	S13	10	35.256	0.067	8.8	0.0546	0.0000	OK
15 minute winter	S14	11	35.206	0.069	9.7	0.0277	0.0000	OK
120 minute winter	S15	108	32.911	1.051	3.9	2.6737	0.0000	OK
120 minute winter	S16	108	32.910	1.079	11.2	2.8724	0.0000	OK
720 minute winter	BR 2N1	465	37.810	0.010	0.1	0.7653	0.0000	OK
720 minute winter	S30	465	35.806	0.006	0.1	0.0010	0.0000	OK
15 minute winter	S31	10	35.677	0.014	0.4	0.0048	0.0000	OK
720 minute winter	BR 2N2	465	37.810	0.010	0.1	0.7698	0.0000	OK
15 minute winter	S32	10	35.824	0.024	3.2	0.0250	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)
120 minute winter	S28	1.008	S36	15.3	0.840	0.195	0.9198	
15 minute winter	S01	11.000	S03	7.3	1.253	0.265	0.0365	
15 minute winter	S03	11.001	S04	12.8	0.843	0.302	0.3629	
15 minute winter	S04	11.002	S05	12.7	0.769	0.300	0.1191	
15 minute winter	S05	11.003	S06	13.5	0.761	0.319	0.1179	
15 minute winter	S06	11.004	S07	15.4	0.854	0.363	0.1139	
15 minute winter	S07	11.005	S08	16.2	0.917	0.383	0.2569	
15 minute winter	S08	11.006	S09	16.8	1.333	0.396	0.1075	
15 minute winter	S09	11.007	JUN S09	20.5	2.791	0.117	0.0228	
15 minute summer	RG5	12.000	JUN S09	0.6	1.856	0.005	0.0006	
15 minute winter	JUN S09	11.008	S16	21.1	2.781	0.121	0.0229	
15 minute winter	S10	13.000	S11	0.5	0.129	0.012	0.0862	
240 minute winter	BR 2L1	Depth/Flow	S11	0.1				
15 minute winter	S11	13.001	S12	4.5	0.648	0.107	0.0786	
480 minute winter	BR 2O1	Depth/Flow	S12	0.2				
15 minute winter	S12	13.002	S13	4.8	0.688	0.113	0.0508	
15 minute winter	S13	13.003	S14	8.7	0.727	0.096	0.0931	
15 minute winter	S14	13.004	S15	9.7	0.822	0.107	0.1580	
120 minute winter	S15	13.005	S16	1.7	0.162	0.001	9.3178	
120 minute winter	S16	11.009	S36	5.2	0.215	0.002	26.4213	
720 minute winter	BR 2N1	Depth/Flow	S30	0.1				
720 minute winter	S30	16.001	S31	0.1	0.227	0.001	0.0040	
15 minute winter	S31	16.002	S33	0.4	0.178	0.007	0.0129	
720 minute winter	BR 2N2	Depth/Flow	S33	0.1				
15 minute winter	S32	18.000	S33	3.2	0.732	0.025	0.0469	

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S33	10	35.634	0.107	3.6	0.0303	0.0000	OK
720 minute winter	BR 2L2 + 2M1	660	37.814	0.014	0.3	4.9224	0.0000	OK
15 minute winter	S34	11	35.457	0.054	6.8	0.0419	0.0000	OK
15 minute winter	RG6	10	35.300	0.040	2.3	0.0250	0.0000	OK
15 minute winter	PP5	10	35.267	0.037	6.0	0.0292	0.0000	OK
15 minute winter	S35	11	35.025	0.103	15.8	0.0645	0.0000	OK
15 minute summer	RG4	11	35.339	0.019	0.6	0.0072	0.0000	OK
120 minute winter	S36	112	32.911	1.162	21.0	2.9661	0.0000	OK
15 minute winter	S39	10	35.774	0.049	4.4	0.0602	0.0000	OK
15 minute winter	S40A	11	35.693	0.023	0.7	0.0072	0.0000	OK
15 minute winter	S40	11	35.642	0.092	12.1	0.1383	0.0000	OK
15 minute winter	RG7	10	35.328	0.028	1.2	0.0133	0.0000	OK
120 minute winter	S42	112	32.911	1.161	4.6	2.9550	0.0000	OK
15 minute winter	S41	10	35.515	0.015	2.1	0.0074	0.0000	OK
120 minute winter	JUN S43	112	32.911	1.180	3.0	0.0000	0.0000	OK
480 minute winter	BR 2O2	336	37.811	0.011	0.4	2.7937	0.0000	OK
15 minute winter	S37	10	35.788	0.063	9.0	0.1296	0.0000	OK
15 minute winter	S38	11	35.517	0.076	8.9	0.0214	0.0000	OK
120 minute winter	S43	112	32.911	1.189	13.7	3.0260	0.0000	SURCHARGED
15 minute summer	C01	16	31.765	0.072	9.2	0.0000	0.0000	OK
15 minute winter	S42A	11	35.597	0.091	11.8	0.0257	0.0000	OK
15 minute winter	S42B	11	35.544	0.086	11.8	0.0245	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 winter	S33	16.003	S34	3.5	0.679	0.041	0.0399	
720 minute winter	BR 2L2 + 2M1	Depth/Flow	S34	0.0				
15 minute winter	S34	16.004	S35	6.6	0.540	0.128	0.6036	
15 minute winter	RG6	20.000	PP5	2.3	0.644	0.129	0.0106	
15 minute winter	PP5	20.001	S35	5.9	1.893	0.105	0.0074	
15 minute winter	S35	16.005	S36	15.6	0.935	0.369	0.1186	
15 minute summer	RG4	21.000	S36	0.6	0.463	0.034	0.0104	
120 minute winter	S36	1.009	S43	10.8	0.199	0.004	9.1442	
15 minute winter	S39	22.000	S40	4.3	0.402	0.106	0.3145	
15 minute winter	S40A	23.000	S40	0.7	0.417	0.048	0.0072	
15 minute winter	S40	22.001	S42A	11.8	0.782	0.294	0.1101	
15 minute winter	RG7	24.000	S42	1.2	0.546	0.066	0.0063	
120 minute winter	S42	22.004	JUN S43	2.3	0.065	0.001	6.2697	
15 minute winter	S41	25.000	JUN S43	2.1	2.357	0.020	0.0070	
120 minute winter	JUN S43	22.005	S43	2.3	0.126	0.001	4.0300	
480 minute winter	BR 2O2	Depth/Flow	S37	0.2				
15 minute winter	S37	26.001	S38	8.9	0.862	0.171	0.2928	
15 minute winter	S38	26.002	S43	8.8	0.801	0.208	0.0519	
120 minute winter	S43	1.010	C01	9.2	0.781	0.230	0.0564	132.9
15 minute winter	S42A	22.002	S42B	11.8	0.821	0.295	0.1167	
15 minute winter	S42B	22.003	S42	11.8	0.867	0.295	0.3003	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S19	10	35.863	0.063	6.6	0.0506	0.0000	OK
15 minute winter	S20	10	35.843	0.122	14.5	0.1214	0.0000	OK
15 minute winter	22B	10	35.779	0.118	14.3	0.0188	0.0000	OK
15 minute winter	S17	10	35.942	0.092	8.9	0.1019	0.0000	OK
15 minute winter	S18	10	35.915	0.121	14.5	0.0860	0.0000	OK
15 minute winter	S22A	10	35.325	0.125	28.6	0.0354	0.0000	OK
15 minute winter	PP1	10	35.359	0.059	4.5	0.0321	0.0000	OK
240 minute winter	S21	232	34.012	1.077	8.2	1.3576	0.0000	SURCHARGED
15 minute winter	S23	10	35.025	0.111	13.7	0.0836	0.0000	OK
240 minute winter	S26	232	34.012	1.148	47.9	154.9870	0.0000	SURCHARGED
15 minute winter	S24A	11	35.512	0.012	0.6	0.0023	0.0000	OK
15 minute winter	S24	10	35.084	0.084	9.2	0.0470	0.0000	OK
240 minute winter	S25	232	34.012	1.147	3.1	1.4182	0.0000	SURCHARGED
240 minute winter	JUN S27A	232	34.012	1.163	23.8	0.4069	0.0000	SURCHARGED
15 minute winter	RG1	10	35.476	0.026	1.2	0.0096	0.0000	OK
15 minute winter	PP2	10	35.469	0.069	5.7	0.0402	0.0000	OK
15 minute winter	RG2	10	35.442	0.071	6.5	0.0239	0.0000	OK
15 minute winter	PP2A	10	35.681	0.031	1.5	0.0086	0.0000	OK
240 minute winter	S27	228	34.011	1.205	32.1	1.3631	0.0000	SURCHARGED
15 minute winter	S28A	10	35.947	0.047	3.3	0.0248	0.0000	OK
15 minute winter	S28B	10	35.898	0.042	8.7	0.0302	0.0000	OK
15 minute winter	RG8	10	35.380	0.070	0.9	0.0148	0.0000	OK
15 minute winter	S28C	10	35.380	0.096	10.4	0.0202	0.0000	OK
15 minute winter	RG3	11	35.056	0.056	4.5	0.2324	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 winter	S19	1.000	S20	6.5	0.576	0.369	0.0878	-30.0
15 minute winter	S20	1.001	22B	14.3	0.948	0.808	0.0908	
15 minute winter	22B	1.002	S22A	14.2	1.031	0.802	0.0500	
15 minute winter	S17	2.000	S18	8.8	0.700	0.495	0.0567	
15 minute winter	S18	2.001	S22A	14.4	1.029	0.809	0.0287	
15 minute winter	S22A	1.003	S21	28.5	1.306	0.548	0.4808	
15 minute winter	PP1	3.000	S21	4.5	0.765	0.251	0.0118	
240 minute winter	S21	1.004	S26	7.7	0.726	0.098	1.0069	
15 minute winter	S23	4.000	S26	13.6	1.036	0.765	0.0663	
240 minute winter	S26	1.005	JUN S27A	-23.4	-0.730	-0.299	0.2113	
240 minute winter	S26	Orifice	S27	4.7				
15 minute winter	S24A	5.000	S24	0.6	0.128	0.012	0.0357	
15 minute winter	S24	5.001	S25	9.1	0.955	0.513	0.0549	
240 minute winter	S25	5.002	JUN S27A	2.6	0.276	0.033	0.2254	
240 minute winter	JUN S27A	1.006	S27	-17.3	0.579	-0.221	0.6113	
15 minute winter	RG1	6.000	PP2	1.2	0.245	0.067	0.0249	
15 minute winter	PP2	6.001	RG2	5.6	0.697	0.316	0.0235	
15 minute winter	RG2	6.002	S27	6.5	0.855	0.364	0.0236	
15 minute winter	PP2A	7.000	S27	1.5	0.594	0.083	0.0129	
240 minute winter	S27	1.007	S28	-30.5	0.719	-0.389	1.7592	
15 minute winter	S28A	8.000	S28B	3.3	0.730	0.184	0.0193	
15 minute winter	S28B	8.001	S28C	8.6	1.158	0.171	0.0538	
15 minute winter	RG8	9.000	S28C	0.9	0.117	0.049	0.0258	
15 minute winter	S28C	8.002	S28	10.2	0.982	0.574	0.0731	
15 minute winter	RG3	10.000	S28	4.3	0.773	0.243	0.0175	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	S28	232	34.011	1.332	30.9	1.7569	0.0000	SURCHARGED
15 minute winter	S01	10	35.352	0.102	18.2	0.1187	0.0000	OK
15 minute winter	S03	10	35.178	0.153	31.7	0.1410	0.0000	OK
15 minute winter	S04	11	35.059	0.194	31.4	0.0550	0.0000	OK
15 minute winter	S05	11	35.023	0.205	32.7	0.0735	0.0000	OK
15 minute winter	S06	11	34.983	0.209	37.3	0.1003	0.0000	OK
15 minute winter	S07	11	34.925	0.193	39.4	0.0700	0.0000	OK
15 minute winter	S08	11	34.809	0.174	40.8	0.2067	0.0000	OK
15 minute winter	S09	11	34.673	0.094	49.8	0.1379	0.0000	OK
15 minute summer	RG5	9	35.281	0.011	1.4	0.0043	0.0000	OK
15 minute winter	JUN S09	11	34.295	0.099	51.2	0.0000	0.0000	OK
15 minute winter	S10	10	35.526	0.026	1.2	0.0093	0.0000	OK
180 minute winter	BR 2L1	136	37.836	0.036	0.9	2.7179	0.0000	OK
15 minute winter	S11	10	35.448	0.085	11.3	0.0761	0.0000	OK
240 minute winter	BR 2O1	188	37.825	0.025	1.5	6.0723	0.0000	OK
15 minute winter	S12	11	35.376	0.087	11.8	0.0276	0.0000	OK
15 minute winter	S13	10	35.302	0.113	21.7	0.0910	0.0000	OK
15 minute winter	S14	11	35.249	0.112	23.9	0.0450	0.0000	OK
240 minute winter	S15	228	34.011	2.151	5.6	5.4752	0.0000	SURCHARGED
240 minute winter	S16	228	34.011	2.180	18.5	5.8011	0.0000	SURCHARGED
240 minute winter	BR 2N1	176	37.821	0.021	0.4	1.5881	0.0000	OK
240 minute winter	S30	176	35.809	0.009	0.1	0.0014	0.0000	OK
15 minute winter	S31	10	35.683	0.020	0.9	0.0073	0.0000	OK
240 minute winter	BR 2N2	176	37.821	0.021	0.4	1.5949	0.0000	OK
15 minute winter	S32	10	35.837	0.037	7.7	0.0381	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 winter	S28	1.008	S36	-25.6	0.837	-0.327	1.0064	
15 minute winter	S01	11.000	S03	18.0	1.534	0.652	0.0732	
15 minute winter	S03	11.001	S04	31.4	0.983	0.741	0.7665	
15 minute winter	S04	11.002	S05	31.0	0.853	0.731	0.2672	
15 minute winter	S05	11.003	S06	32.8	0.858	0.774	0.2540	
15 minute winter	S06	11.004	S07	37.4	0.997	0.882	0.2366	
15 minute winter	S07	11.005	S08	39.4	1.136	0.931	0.5035	
15 minute winter	S08	11.006	S09	40.8	1.657	0.964	0.2051	
15 minute winter	S09	11.007	JUN S09	49.8	3.473	0.286	0.0445	
15 minute summer	RG5	12.000	JUN S09	1.4	2.377	0.011	0.0020	
15 minute winter	JUN S09	11.008	S16	51.2	3.414	0.294	0.0455	
15 minute winter	S10	13.000	S11	1.2	0.153	0.027	0.1672	
180 minute winter	BR 2L1	Depth/Flow	S11	0.3				
15 minute winter	S11	13.001	S12	11.1	0.800	0.262	0.1558	
240 minute winter	BR 2O1	Depth/Flow	S12	0.3				
15 minute winter	S12	13.002	S13	11.8	0.874	0.278	0.0983	
15 minute winter	S13	13.003	S14	21.5	0.897	0.238	0.1863	
15 minute winter	S14	13.004	S15	23.9	1.046	0.263	0.3053	
240 minute winter	S15	13.005	S16	6.4	0.152	0.003	9.9297	
240 minute winter	S16	11.009	S36	19.2	0.162	0.008	27.2607	
240 minute winter	BR 2N1	Depth/Flow	S30	0.1				
240 minute winter	S30	16.001	S31	0.1	0.286	0.003	0.0092	
15 minute winter	S31	16.002	S33	0.9	0.275	0.017	0.0241	
240 minute winter	BR 2N2	Depth/Flow	S33	0.1				
15 minute winter	S32	18.000	S33	7.7	0.787	0.059	0.0598	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S33	10	35.651	0.124	8.6	0.0351	0.0000	OK
1440 minute winter	BR 2L2 + 2M1	1410	37.832	0.032	0.4	11.5095	0.0000	OK
15 minute winter	S34	10	35.489	0.086	16.5	0.0664	0.0000	OK
15 minute winter	RG6	10	35.326	0.066	5.7	0.0415	0.0000	OK
15 minute winter	PP5	10	35.290	0.060	14.5	0.0464	0.0000	OK
15 minute winter	S35	11	35.114	0.192	38.7	0.1197	0.0000	OK
15 minute winter	RG4	10	35.350	0.030	1.5	0.0113	0.0000	OK
240 minute winter	S36	232	34.011	2.262	28.7	5.7737	0.0000	SURCHARGED
15 minute winter	S39	10	35.803	0.078	10.7	0.0954	0.0000	OK
15 minute winter	S40A	11	35.719	0.049	1.8	0.0151	0.0000	OK
15 minute winter	S40	11	35.718	0.168	29.5	0.2524	0.0000	OK
15 minute winter	RG7	10	35.346	0.046	3.0	0.0218	0.0000	OK
240 minute winter	S42	232	34.011	2.261	6.7	5.7541	0.0000	SURCHARGED
15 minute winter	S41	10	35.523	0.023	5.1	0.0114	0.0000	OK
240 minute winter	JUN S43	232	34.011	2.280	9.5	0.0000	0.0000	SURCHARGED
240 minute winter	BR 2O2	188	37.825	0.025	1.5	6.0723	0.0000	OK
15 minute winter	S37	10	35.829	0.104	22.2	0.2150	0.0000	OK
15 minute winter	S38	10	35.568	0.127	21.9	0.0359	0.0000	OK
240 minute winter	S43	232	34.011	2.289	14.8	5.8262	0.0000	SURCHARGED
240 minute winter	C01	232	31.769	0.076	10.0	0.0000	0.0000	OK
15 minute winter	S42A	11	35.668	0.162	28.7	0.0458	0.0000	OK
15 minute winter	S42B	11	35.607	0.149	28.8	0.0423	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 winter	S33	16.003	S34	8.5	0.866	0.101	0.0758	
1440 minute winter	BR 2L2 + 2M1	Depth/Flow	S34	0.0				
15 minute winter	S34	16.004	S35	16.2	0.646	0.312	1.1999	
15 minute winter	RG6	20.000	PP5	5.6	0.811	0.318	0.0207	
15 minute winter	PP5	20.001	S35	14.5	2.024	0.257	0.0245	
15 minute winter	S35	16.005	S36	38.1	1.133	0.900	0.2376	
15 minute winter	RG4	21.000	S36	1.5	0.599	0.083	0.0197	
240 minute winter	S36	1.009	S43	10.0	0.183	0.004	9.1917	
15 minute winter	S39	22.000	S40	10.5	0.479	0.262	0.6379	
15 minute winter	S40A	23.000	S40	1.8	0.448	0.122	0.0300	
15 minute winter	S40	22.001	S42A	28.7	0.927	0.716	0.2272	
15 minute winter	RG7	24.000	S42	3.0	0.700	0.167	0.0124	
240 minute winter	S42	22.004	JUN S43	8.5	0.034	0.003	6.3107	
15 minute winter	S41	25.000	JUN S43	5.1	3.075	0.048	0.0735	
240 minute winter	JUN S43	22.005	S43	10.2	-0.033	0.004	4.0426	
240 minute winter	BR 2O2	Depth/Flow	S37	0.3				
15 minute winter	S37	26.001	S38	21.9	1.066	0.420	0.5815	
15 minute winter	S38	26.002	S43	21.6	1.008	0.510	0.1012	
240 minute winter	S43	1.010	C01	10.0	0.797	0.248	0.0597	387.7
15 minute winter	S42A	22.002	S42B	28.8	0.990	0.718	0.2355	
15 minute winter	S42B	22.003	S42	28.9	1.072	0.719	0.5914	

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	S19	344	36.243	0.443	1.9	0.3574	0.0000	FLOOD RISK
360 minute winter	S20	344	36.243	0.522	4.2	0.5193	0.0000	FLOOD RISK
360 minute winter	22B	344	36.243	0.582	4.2	0.0926	0.0000	FLOOD RISK
360 minute winter	S17	344	36.244	0.394	2.5	0.4372	0.0000	FLOOD RISK
360 minute winter	S18	344	36.243	0.449	4.1	0.3204	0.0000	FLOOD RISK
360 minute winter	S22A	344	36.243	1.043	8.3	0.2952	0.0000	FLOOD RISK
360 minute winter	PP1	344	36.243	0.943	1.3	0.5549	0.0000	FLOOD RISK
360 minute winter	S21	344	36.243	3.308	11.6	4.1711	0.0000	FLOOD RISK
360 minute winter	S23	344	36.243	1.329	3.9	0.9966	0.0000	FLOOD RISK
360 minute winter	S26	344	36.244	3.380	68.1	337.4180	0.0000	FLOOD RISK
360 minute winter	S24A	344	36.243	0.743	0.3	0.1486	0.0000	FLOOD RISK
360 minute winter	S24	344	36.243	1.243	2.7	0.6948	0.0000	FLOOD RISK
360 minute winter	S25	344	36.243	3.378	4.3	4.1783	0.0000	FLOOD RISK
360 minute winter	JUN S27A	344	36.243	3.394	34.1	1.1878	0.0000	FLOOD RISK
360 minute winter	RG1	344	36.243	0.793	5.2	9.5886	0.0000	FLOOD RISK
360 minute winter	PP2	344	36.243	0.843	5.4	0.5396	0.0000	FLOOD RISK
360 minute winter	RG2	344	36.243	0.872	5.1	0.2947	0.0000	FLOOD RISK
360 minute winter	PP2A	344	36.243	0.593	0.4	0.1672	0.0000	FLOOD RISK
360 minute winter	S27	344	36.241	3.435	44.2	3.8851	0.0000	FLOOD RISK
360 minute winter	S28A	344	36.242	0.342	0.9	0.1799	0.0000	FLOOD RISK
360 minute winter	S28B	344	36.242	0.386	2.4	0.2772	0.0000	FLOOD RISK
360 minute winter	RG8	344	36.242	0.932	0.3	0.1976	0.0000	FLOOD RISK
360 minute winter	S28C	344	36.242	0.958	3.0	0.2021	0.0000	FLOOD RISK
360 minute winter	RG3	344	36.243	1.243	3.7	8.8579	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute winter	S19	1.000	S20	1.9	0.453	0.107	0.1384	
360 minute winter	S20	1.001	22B	4.2	0.736	0.236	0.1058	
360 minute winter	22B	1.002	S22A	4.2	0.772	0.236	0.0638	
360 minute winter	S17	2.000	S18	2.5	0.608	0.141	0.0796	
360 minute winter	S18	2.001	S22A	4.1	0.757	0.231	0.0363	
360 minute winter	S22A	1.003	S21	8.3	0.949	0.159	0.8772	
360 minute winter	PP1	3.000	S21	1.3	0.553	0.073	0.0356	
360 minute winter	S21	1.004	S26	10.9	0.737	0.140	1.0069	
360 minute winter	S23	4.000	S26	3.9	0.771	0.220	0.0893	
360 minute winter	S26	1.005	JUN S27A	-33.8	-0.624	-0.432	0.2113	
360 minute winter	S26	Orifice	S27	4.2				-25.6
360 minute winter	S24A	5.000	S24	-0.2	0.113	-0.005	0.1167	
360 minute winter	S24	5.001	S25	2.7	0.703	0.152	0.1015	
360 minute winter	S25	5.002	JUN S27A	4.2	0.258	0.054	0.2254	
360 minute winter	JUN S27A	1.006	S27	-24.5	0.520	-0.312	0.6113	
360 minute winter	RG1	6.000	PP2	-5.0	-0.291	-0.284	0.0876	
360 minute winter	PP2	6.001	RG2	-4.8	0.527	-0.271	0.0513	
360 minute winter	RG2	6.002	S27	-5.0	0.623	-0.284	0.0550	
360 minute winter	PP2A	7.000	S27	0.4	0.408	0.023	0.0913	
360 minute winter	S27	1.007	S28	-41.9	0.678	-0.535	1.7592	
360 minute winter	S28A	8.000	S28B	0.9	0.514	0.051	0.0757	
360 minute winter	S28B	8.001	S28C	2.4	0.863	0.048	0.1259	
360 minute winter	RG8	9.000	S28C	0.3	0.089	0.017	0.0456	
360 minute winter	S28C	8.002	S28	3.0	0.724	0.169	0.1240	
360 minute winter	RG3	10.000	S28	-3.1	0.560	-0.176	0.0552	

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	S28	344	36.242	3.563	44.2	4.7729	0.0000	FLOOD RISK
360 minute winter	S01	344	36.244	0.994	5.2	1.1602	0.0000	FLOOD RISK
360 minute winter	S03	344	36.244	1.219	9.1	1.1261	0.0000	FLOOD RISK
360 minute winter	S04	344	36.243	1.378	9.1	0.3900	0.0000	FLOOD RISK
360 minute winter	S05	344	36.243	1.425	9.6	0.5115	0.0000	FLOOD RISK
360 minute winter	S06	344	36.243	1.469	11.0	0.7050	0.0000	FLOOD RISK
360 minute winter	S07	344	36.243	1.511	11.6	0.5469	0.0000	FLOOD RISK
360 minute winter	S08	344	36.243	1.608	12.0	1.9088	0.0000	FLOOD RISK
360 minute winter	S09	344	36.242	1.663	14.6	2.4417	0.0000	FLOOD RISK
360 minute winter	RG5	344	36.242	0.972	0.4	0.3694	0.0000	FLOOD RISK
360 minute winter	JUN S09	344	36.242	2.046	14.7	0.0000	0.0000	FLOOD RISK
360 minute winter	S10	344	36.242	0.742	0.3	0.2700	0.0000	FLOOD RISK
180 minute winter	BR 2L1	136	37.866	0.066	1.7	4.9554	0.0000	OK
360 minute winter	S11	344	36.241	0.878	3.5	0.7836	0.0000	FLOOD RISK
240 minute winter	BR 2O1	184	37.847	0.047	2.8	11.3526	0.0000	OK
360 minute winter	S12	344	36.242	0.953	4.1	0.3012	0.0000	FLOOD RISK
360 minute winter	S13	344	36.242	1.053	7.0	0.8518	0.0000	FLOOD RISK
360 minute winter	S14	344	36.241	1.104	7.7	0.4440	0.0000	FLOOD RISK
360 minute winter	S15	344	36.242	4.382	7.7	11.1511	0.0000	FLOOD RISK
360 minute winter	S16	344	36.241	4.410	42.2	11.7361	0.0000	FLOOD RISK
180 minute winter	BR 2N1	136	37.839	0.039	1.0	2.9145	0.0000	OK
360 minute winter	S30	344	36.243	0.443	0.3	0.0704	0.0000	FLOOD RISK
360 minute winter	S31	344	36.243	0.580	0.6	0.2070	0.0000	FLOOD RISK
180 minute winter	BR 2N2	136	37.839	0.039	1.0	2.9249	0.0000	OK
360 minute winter	S32	344	36.243	0.443	2.2	0.4543	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute winter	S28	1.008	S36	-36.9	0.769	-0.471	1.0064	
360 minute winter	S01	11.000	S03	5.2	1.149	0.188	0.1098	
360 minute winter	S03	11.001	S04	9.1	0.780	0.215	0.9520	
360 minute winter	S04	11.002	S05	9.1	0.722	0.214	0.2862	
360 minute winter	S05	11.003	S06	9.6	0.710	0.226	0.2644	
360 minute winter	S06	11.004	S07	11.0	0.818	0.259	0.2516	
360 minute winter	S07	11.005	S08	11.6	0.838	0.273	0.5780	
360 minute winter	S08	11.006	S09	11.9	1.248	0.281	0.3353	
360 minute winter	S09	11.007	JUN S09	14.3	2.531	0.082	0.1234	
360 minute winter	RG5	12.000	JUN S09	0.4	1.661	0.003	0.0346	
360 minute winter	JUN S09	11.008	S16	22.3	2.495	0.128	0.1204	
360 minute winter	S10	13.000	S11	0.4	0.110	0.009	0.8179	
180 minute winter	BR 2L1	Depth/Flow	S11	0.5				
360 minute winter	S11	13.001	S12	3.5	0.579	0.083	0.4469	
240 minute winter	BR 2O1	Depth/Flow	S12	0.7				
360 minute winter	S12	13.002	S13	4.1	0.660	0.097	0.2908	
360 minute winter	S13	13.003	S14	7.0	0.691	0.078	0.5465	
360 minute winter	S14	13.004	S15	7.7	0.771	0.085	0.9431	
360 minute winter	S15	13.005	S16	17.5	0.148	0.007	9.9297	
360 minute winter	S16	11.009	S36	48.0	0.198	0.020	27.2607	
180 minute winter	BR 2N1	Depth/Flow	S30	0.3				
360 minute winter	S30	16.001	S31	0.3	0.303	0.007	0.5464	
360 minute winter	S31	16.002	S33	0.6	0.277	0.011	0.2402	
180 minute winter	BR 2N2	Depth/Flow	S33	0.3				
360 minute winter	S32	18.000	S33	2.2	0.246	0.017	0.1781	

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	S33	344	36.243	0.716	2.9	0.2025	0.0000	FLOOD RISK
960 minute winter	BR 2L2 + 2M1	945	37.853	0.053	0.9	19.1398	0.0000	OK
360 minute winter	S34	344	36.242	0.839	5.2	0.6505	0.0000	FLOOD RISK
360 minute winter	RG6	344	36.242	0.982	1.6	0.6198	0.0000	FLOOD RISK
360 minute winter	PP5	344	36.242	1.012	4.1	0.9024	0.0000	FLOOD RISK
360 minute winter	S35	344	36.242	1.320	11.6	0.8247	0.0000	FLOOD RISK
360 minute winter	RG4	344	36.242	0.922	0.5	0.3457	0.0000	FLOOD RISK
360 minute winter	S36	344	36.241	4.492	60.2	11.4687	0.0000	FLOOD RISK
360 minute winter	S39	344	36.243	0.518	3.1	0.6336	0.0000	FLOOD RISK
360 minute winter	S40A	344	36.243	0.573	0.5	0.1770	0.0000	FLOOD RISK
360 minute winter	S40	344	36.243	0.693	8.5	1.0417	0.0000	FLOOD RISK
360 minute winter	RG7	344	36.242	0.942	0.8	0.4493	0.0000	FLOOD RISK
360 minute winter	S42	344	36.242	4.492	9.5	11.4328	0.0000	FLOOD RISK
360 minute winter	S41	344	36.243	0.743	1.4	0.3706	0.0000	FLOOD RISK
360 minute winter	JUN S43	344	36.243	4.512	11.6	0.0000	0.0000	FLOOD RISK
240 minute winter	BR 2O2	184	37.847	0.047	2.8	11.3526	0.0000	OK
360 minute winter	S37	344	36.242	0.517	6.7	1.0698	0.0000	FLOOD RISK
360 minute winter	S38	344	36.241	0.800	6.7	0.2264	0.0000	FLOOD RISK
360 minute winter	S43	344	36.241	4.519	22.3	11.5019	0.0000	FLOOD RISK
360 minute winter	C01	344	31.783	0.090	13.8	0.0000	0.0000	OK
360 minute winter	S42A	344	36.242	0.736	8.5	0.2084	0.0000	FLOOD RISK
360 minute winter	S42B	344	36.242	0.784	8.5	0.2218	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute winter	S33	16.003	S34	2.9	0.648	0.034	0.3007	
960 minute winter	BR 2L2 + 2M1	Depth/Flow	S34	0.1				
360 minute winter	S34	16.004	S35	5.2	0.519	0.099	1.9149	
360 minute winter	RG6	20.000	PP5	1.6	0.597	0.090	0.0523	
360 minute winter	PP5	20.001	S35	4.1	1.727	0.073	0.0413	
360 minute winter	S35	16.005	S36	11.5	0.864	0.273	0.2822	
360 minute winter	RG4	21.000	S36	0.4	0.410	0.023	0.1406	
360 minute winter	S36	1.009	S43	14.1	0.077	0.006	9.1917	
360 minute winter	S39	22.000	S40	3.1	0.374	0.077	1.1599	
360 minute winter	S40A	23.000	S40	0.5	0.379	0.035	0.0753	
360 minute winter	S40	22.001	S42A	8.5	0.726	0.212	0.2900	
360 minute winter	RG7	24.000	S42	0.8	0.491	0.045	0.0513	
360 minute winter	S42	22.004	JUN S43	10.6	0.021	0.004	6.3107	
360 minute winter	S41	25.000	JUN S43	1.4	1.610	0.013	0.1383	
360 minute winter	JUN S43	22.005	S43	12.9	0.014	0.005	4.0426	
240 minute winter	BR 2O2	Depth/Flow	S37	0.7				
360 minute winter	S37	26.001	S38	6.7	0.796	0.129	1.1283	
360 minute winter	S38	26.002	S43	6.7	0.745	0.158	0.1880	
360 minute winter	S43	1.010	C01	13.8	0.869	0.345	0.0762	809.7
360 minute winter	S42A	22.002	S42B	8.5	0.753	0.211	0.3201	
360 minute winter	S42B	22.003	S42	8.5	0.793	0.211	0.8742	

Appendix B

United Utilities Correspondence

WASTEWATER PRE-DEVELOPMENT ENQUIRY



United Utilities Grasmere House, 2nd Floor
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP

12.08.25

Dear Marta,

Pre-Development Enquiry for Cambridge Halls, Cavendish St, Manchester, M15 6TT UU Reference Number: 07888655

We have assessed your application based on the information provided. This pre-development advice on your drainage strategy will be valid for 12 months. Your strategy will need review by other authorities as part of the planning process. We advise conducting necessary site investigations to confirm viability of your proposals.

Modelled Flood Risk

[Please see the image on page 3 for details](#)

I can confirm that we do not have modelled flood risk within the vicinity of the proposed development.

Please note that our modelling data is indicative, and only representative of the 1:100year storm event.

[Please see comment 2 of the attached guidance sheet](#)

Asset Protection

2. We have significant assets crossing this site that cannot realistically be diverted.
3. According to our public sewer records, there are public sewers located within your site boundary. This requires an easement of 6m to both 600mm and 1950mm If you cannot achieve the required clearance, you may wish to consider diverting and or abandoning the public sewer.

[Please see comment 3 of the attached guidance sheet and Working Near Our Pipelines Guidance document](#)

Foul Water

Foul flow from this site will be allowed to drain into the public combined sewer system.

Our preferred point of discharge would be to the 600mm or 1950mm within your proposed development at an unrestricted rate.

WASTEWATER PRE-DEVELOPMENT ENQUIRY

Grid reference 384153, 396970

[Please see the images on **page 3** for clarification](#)

Surface Water

Follow the National Planning Policy Guidance drainage hierarchy and Provide evidence for discounting higher options before considering public sewer discharge. Consult the Lead Local Flood Authority regarding surface water concerns.

[Please see comment **4** within the guidance sheet](#)

Infiltration

[Please see comment **4** within the guidance sheet](#)

Public Sewer

United Utilities will consider a connection to the 1950mm or 600mm diameter public combined sewer within located within the proposed site at a pass forward flow to be agreed by the Lead Local Flood Authority. United Utilities requests that any agreed rate does not exceed 14 l/s.

Grid reference 384153, 396970

[Please see images on **page 3** for clarification](#)

Site Images



WASTEWATER PRE-DEVELOPMENT ENQUIRY



Marta Wolska

From: seweradoptions@uuplc.co.uk
Sent: 02 October 2025 10:40
To: Marta Wolska; Andy Losty
Cc: seamus.mcferran@graham.co.uk; james.beggan@graham.co.uk
Subject: RE: UU REF: 07888655 - Cambridge Halls Pre Development

Hello Andy

Thank you for the phone call.

Please find a link to our standard details:

[Developer Services Construction Details](#)

Use table "Manhole Access Detail" to support designing the manhole, as discussed, if a connection to the 1950mm combined sewer is being considered.

If I can be of further help do get in touch.

Kind Regards

Gulshan



Gulshan Seetulparsad, MEng (Hons)

Developer Engineer (Greater
Manchester Area)
Developer Services & Metering
Customer Services

T: 01925 429092

unitedutilities.com



If you have received a great service today why not tell us?

Visit: unitedutilities.com/wow

----- Original Message -----

From: seweradoptions@uuplc.co.uk [seweradoptions@uuplc.co.uk]

Sent: 30/09/2025 17:09

To: marta.wolska@curtins.com

Cc: seamus.mcferran@graham.co.uk; andy.losty@curtins.com; james.beggan@graham.co.uk

Subject: RE: UU REF: 07888655 - Cambridge Halls Pre Development

Good Afternoon Marta

In line with the pre-development enquiry United Utilities will consider a connection to the 600mmx750mm brick egg combined sewer at 14l/s following discounting the drainage hierarchy.

I have linked, [standard-conditions-for-works-adjacent-to-pipelines-issued-july-2015.pdf](#) please see section 8.5. c) the use of root barriers.

Further to this please see appendix 1 for plants and the distance they are allowed to protect the public sewers.

If I can be of any further support do reach out.

Kind Regards

Gulshan

 United Utilities Water for the North West	Gulshan Seetulparsad, MEng (Hons) Developer Engineer (Greater Manchester Area) Developer Services & Metering Customer Services T: 01925 429092 unitedutilities.com
---	--



If you have received a great service today why not tell us?
Visit: unitedutilities.com/wow

----- Original Message -----

From: seweradoptions@uuplc.co.uk [seweradoptions@uuplc.co.uk]

Sent: 17/09/2025 10:50

To: marta.wolska@curtins.com

Cc: seamus.mcferran@graham.co.uk; andy.losty@curtins.com; james.beggan@graham.co.uk

Subject: RE: UU REF: 07888655 - Cambridge Halls Pre Development

Good Morning,

Your enquiry has been logged and sent to our engineer Gulshan and his contact number is 01925 429092. Our service Level agreement is to respond to you within 10 working days.

Many thanks

If you feel you have received a good service from myself, please can you take two minutes to fill in the survey below. This will be much appreciated



Visit: <https://unitedutilities.thewowawards.co.uk/nominate>

----- Original Message -----

From: Marta Wolska [marta.wolska@curtins.com]

Sent: 16/09/2025 18:33

To: seweradoptions@uuplc.co.uk

Cc: seamus.mcferran@graham.co.uk; andy.losty@curtins.com; james.beggan@graham.co.uk

Subject: RE: UU REF: 07888655 - Cambridge Halls Pre Development

Dear James

1. Please find attached the survey of the 1950mm and 600x750mm public sewers, each with a total 6m easement (3m either side). As the easements overlap, the extent has been highlighted. Kindly confirm whether you have any further comments or if this is acceptable.
2. The attached CCTV survey report with access to video

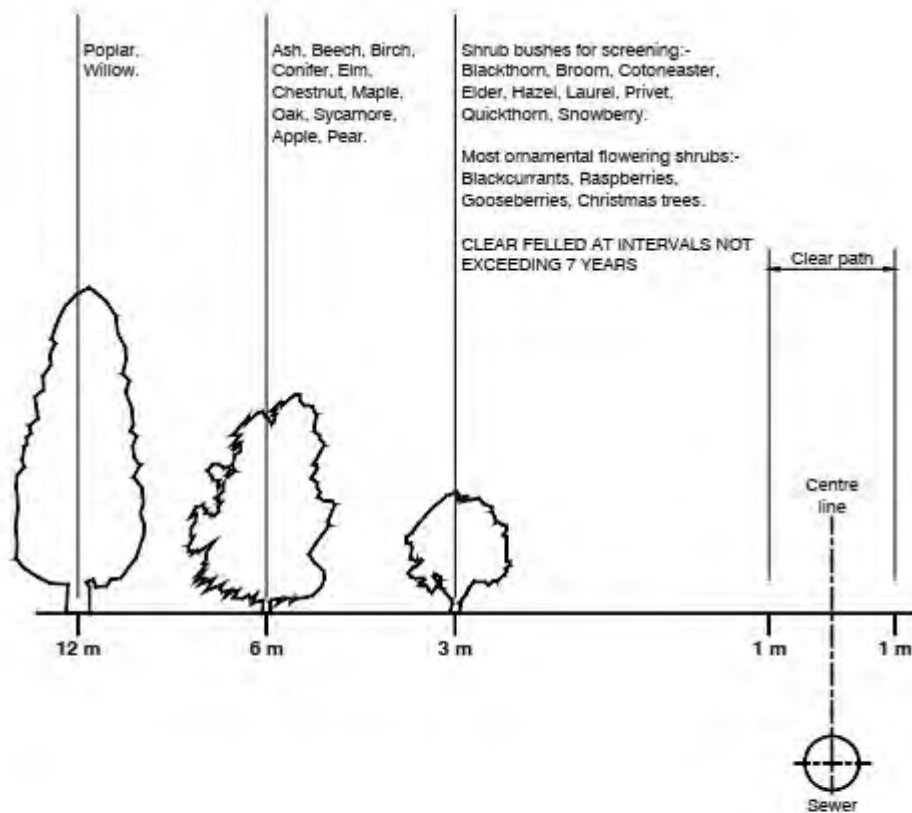


footage

indicates 600x750 has significant debris which is obstructing to carry out the full CCTV survey between 0900& 2907. The survey company was unable to clean it and complete the survey. I will notify UU of the issue; however, it is unlikely they will undertake major further cleaning as it is still flow between debris.

3. Please review the information and please confirm if UU permits us to connect development to the 600x750mm sewer in its current condition?
4. Based on the attached UU 1905 manhole card, the existing shaft is 800 mm. If connection to 600x750 is not permitted, would you accept installing only a 1200-diameter shaft above 1950 and a backdrop connection from the site?

5. Further investigation will be carried for 300x400 as there is no downstream and upstream chamber to carry out a survey; therefore, trial pit will be required.
6. The landscape plan proposes some trees outside the easement but within 4 m of the sewer. According to *Sewer for Adoption 6th Edition* (see below), specific clearance distances are required for different tree types. Does this requirement still apply if a root protection barrier is installed?



Kind regards

Marta Wolska
Principal Civil Engineer

Tel: 0161 236 2394
Mob: 07842 414 675
marta.wolska@curtins.com
curtins.com

From: seweradoptions@uuplc.co.uk <seweradoptions@uuplc.co.uk>

Sent: 12 August 2025 14:53

To: Marta Wolska <marta.wolska@curtins.com>

Cc: seamus.mcferran@graham.co.uk; james.beggan@graham.co.uk

Subject: RE: UU REF: 07888655 - Cambridge Halls Pre Development Submission

Good afternoon Marta,

Please find attached the PDE and the guidance.

Regards,



James Darlington
Developer Engineer
Developer Services & Metering
T: 01925 429095
unitedutilities.com

If you have received a great service today why not tell us?

Visit: [//unitedutilities.com/wow](http://unitedutilities.com/wow)

If you are happy with the service we have provided, please consider submitting a nomination in the following link – this only takes a moment and would be greatly appreciated: unitedutilities.com/wow

----- Original Message -----

From: seweradoptions@uuplc.co.uk [seweradoptions@uuplc.co.uk]

Sent: 06/08/2025 14:33

To: marta.wolska@curtins.com

Cc: seamus.mcferran@graham.co.uk; james.beggan@graham.co.uk

Subject: RE: UU REF: 07888655 - Cambridge Halls Pre Development Submission

Hi Marta

Thanks for your email.

The case has been passed over to our engineer however our service level agreement time is 10 days for us to respond.

Kind Regards,



Laura Owens
Customer Advisor Advanced
Developer Services & Metering
Customer Services
T: 0345 026 8989 option 4
unitedutilities.com

If you feel you have received a good service from myself, please can you take two minutes to fill in the survey below. This will be much appreciated



Visit: <https://unitedutilities.thewowawards.co.uk/nominate>

----- Original Message -----

From: Marta Wolska [marta.wolska@curtins.com]

Sent: 06/08/2025 14:16

To: seweradoptions@uuplc.co.uk

Cc: seamus.mcferran@graham.co.uk; james.beggan@graham.co.uk

Subject: RE: UU REF: 07888655 - Cambridge Halls Pre Development Submission

Dear Laura

Would you mind asking the engineer to review it at their earliest convenience?

It is essential to have the location and discharge rate confirmed as soon as possible to meet the client's deadline.

Kind regards

Marta Wolska
Principal Civil Engineer

Tel: 0161 236 2394
Mob: 07842 414 675
marta.wolska@curtins.com
curtins.com

From: seweradoptions@uuplc.co.uk <seweradoptions@uuplc.co.uk>

Sent: 06 August 2025 13:57

To: Marta Wolska <marta.wolska@curtins.com>

Subject: RE: UU REF: 07888655 - Cambridge Halls Pre Development Submission

Dear Marta,

PROPOSED PRE DEVELOPMENT AT Cambridge Halls - UU Ref – 07888655.

Thank you for your **card** payment for £565.55 received 06.08.25. Your application has now been processed and passed to our Engineer.

We will respond within the next 10 working days, please feel free to contact us if you need anything.

Kind regards



Laura Owens
Customer Advisor Advanced
Developer Services & Metering
Customer Services
T: 0345 026 8989 option 4
unitedutilities.com

If you feel you have received a good service from myself, please can you take two minutes to fill in the survey below. This will be much appreciated



Visit: <https://unitedutilities.thewowawards.co.uk/nominate>

----- Original Message -----

From: seweradoptions@uuplc.co.uk [seweradoptions@uuplc.co.uk]

Sent: 24/07/2025 16:27

To: marta.wolska@curtins.com

Subject: UU REF: 07888655 - Cambridge Halls Pre Development Submission

Dear Marta

PRE DEVELOPMENT/POC APPLICATION AT: Cambridge Halls – UU Ref 07888655.

Thank you for your application submitted on 23.07.25 for the above development. We have now logged this on our system under reference 07888655. Please use this reference in any future correspondence.

I have reviewed your application and attachments and can confirm we have received all necessary documents.

Before we can proceed with passing this to our Engineering Team, we kindly ask that you submit a payment of £565.55. This can be made via BACS to the account below, using reference 07888655.

NatWest Sort Code:

01-09-17

NatWest Account Number: 58934014
Account Name: UUW Sundry Debtors Receipts

Alternatively, please call us on 0345 026 8989 to make payment over the phone.

Please note that until payment is received your application will not be progressed.

If you have any questions, feel free to reach out.

Kind regards



Laura Owens
Customer Advisor Advanced
Developer Services & Metering
Customer Services
T: 0345 026 8989 option 4
unitedutilities.com

If you feel you have received a good service from myself, please can you take two minutes to fill in the survey below. This will be much appreciated



Visit: <https://unitedutilities.thewowawards.co.uk/nominate>

The information contained in this e-mail is intended only for the individual to whom it is addressed. It may contain legally privileged or confidential information or otherwise be exempt from disclosure. If you have received this Message in error or there are any problems, please notify the sender immediately and delete the message from your computer. You must not use, disclose, copy or alter this message for any unauthorised purpose. Neither United Utilities Group PLC nor any of its subsidiaries will be liable for any direct, special, indirect or consequential damages as a result of any virus being passed on, or arising from the alteration of the contents of this message by a third party.

United Utilities Group PLC, Haweswater House, Lingley Mere
Business Park, Lingley Green Avenue, Great Sankey,
Warrington, WA5 3LP
Registered in England and Wales. Registered No 6559020

www.unitedutilities.com
[//www.unitedutilities.com/subsidiaries](http://www.unitedutilities.com/subsidiaries)



Marta Wolska

From: wastewaterdeveloperservices@uuplc.co.uk
Sent: 23 July 2025 10:39
To: Marta Wolska; jennifer.atkinson@manchester.gov.uk
Cc: seamus.mcferran@graham.co.uk; Matthew Wright; Charlie Smith
Subject: RE: Cavendish St M15 6TT UU REF 142888/FO/2025

Good Morning Martha

Thank you for reaching out to us.

Could you please confirm whether you have any further comments or requirements? Would UU remove the objection if the exact location of 1950 and 600x750 is provided?

With regards to asset crossing the site. Following confirmation of the exact location and health of the sewer we have also requested RAMS on how the sewer will be protected during construction including. RAMS should also cover pre piling and post piling CCTV survey to confirm that no damage has been caused to the sewer as a result of piling.

As you have mentioned you will have piled foundations, therefore, loading should not be an issue, and you will be keeping 3m away from the centre line of the asset. We would still like to see drawings confirming how the load is being transferred away from the sewer (zone of influence diagram).

We also would like the opportunity to comment on the piling RAMS, to make sure that vibrations are being kept within as acceptable range.

Could you please confirm

- 1. if connection from site to 600x750mm sewer to Higher Chatham Street UU1904 (foul water 39l/s , surface water 98.7l/s) is acceptable*
- 2. What is the surcharge level for 1 in 30 and 1 in 100 in the public sewer where the connection is proposed?*
- 3. Does UU require any other sewers to be investigated to lift the objection*

1 and 2 are all covered under a Pre-Development Enquiry Application which is a chargeable service.

[Wastewater Pre-Development Enquiry | United Utilities](#)

I can advise that we will not recommend anything exceeding greenfield rates even for brownfield developments.

Concerning section 3, our objection only relates to the 1950mm, 600x700 and 300x400 combined sewers. Following this being resolved our objection will be lifted. Should you be planning any sewer closures, please apply for a S116 Sewer Closure - [Application to close a public sewer \(S116\)](#)

Thank you.

Kind Regards

Gulshan



Gulshan Seetulparsad, MEng (Hons)

Developer Engineer (Greater
Manchester Area)
Developer Services & Metering
Customer Services

T: 01925 429092

unitedutilities.com



If you have received a great service today why not tell us?

Visit: unitedutilities.com/wow

----- Original Message -----

From: Marta Wolska [marta.wolska@curtins.com]

Sent: 17/07/2025 19:51

To: wastewaterdeveloperservices@uuplc.co.uk; seweradoptions@uuplc.co.uk

Cc: seamus.mcferran@graham.co.uk; charlie.smith@curtins.com; matthew.wright@curtins.com

Subject: RE: Cavendish St M15 6TT UU REF 142888/FO/2025

Dear Gulshan

Could you please confirm you download the fields as wink will expire tomorrow

Marta Wolska

Principal Civil Engineer

Tel: 0161 236 2394

Mob: 07842 414 675

marta.wolska@curtins.com

curtins.com

From: Marta Wolska

Sent: 15 July 2025 22:00

To: wastewaterdeveloperservices@uuplc.co.uk; SewerAdoptions <seweradoptions@uuplc.co.uk>

Cc: Charlie Smith <Charlie.Smith@curtins.com>; Seamus McFerran <seamus.mcferran@graham.co.uk>; Matthew Wright <Matthew.Wright@curtins.com>

Subject: RE: Cavendish St M15 6TT UU REF 142888/FO/2025

Dear Gulshan

We kindly request your prompt attention to assist in resolving United Utilities' objections (UU Reference: 142888/FO/2025) to the submitted planning drainage strategy.

Accordingly, we provide the following response as part of the planning consultation process.

The files are too big size and bounce back when attached Please download files as link expires in 3 days
<https://we.tl/t-38t26j5pJA>

1. UU letter
2. Arups Flood Risk Assessments and Drainage Strategy
3. Existing Drainage overview
4. Site investigation report
5. Proposed Arup drainage Strategy

Based on previous correspondence between Arup and United Utilities, it was our understanding that the drainage strategy had been discussed and agreed upon in principle.

To clarify the proposed drainage approach and address the objections raised, please find below a summary and supporting documents related to the drainage strategy for the site.

The main objection relates to public sewers crossing the development site.

Regarding the public sewers within the site:

1. **1950mm and 600x750mm Sewers:** A survey is currently being arranged to accurately determine the position of these sewers on site.
2. **300x400mm Sewer:** There are no accessible upstream or downstream manholes for this sewer, making a CCTV survey currently unfeasible. A Ground Penetrating Radar (GPR) survey, along with trial pits, will be required following the demolition of the existing building.

While there are public sewers located in the adjacent roads outside the site boundary, the proposed development will not impact them, as pile foundations are being used.

Could you please confirm whether you have any further comments or requirements? Would UU remove the objection if the exact location of 1950 and 600x750 is provided?

UU comments to Drainage

3. **Section 5.3** of Arup's Flood Risk Assessment and Drainage Strategy outlines the surface water drainage hierarchy. It explains why infiltration, connection to a watercourse, and discharge to a surface water sewer are not feasible. This is supported by ground investigation results indicating the presence of clay and made ground.
4. **Section 5.1** of the report states that surface water is proposed to be discharged into the existing public combined sewer network via a new gravity connection to UU manhole MH1904. The discharge will be restricted to 98.7 l/s, reflecting a 50% reduction from the existing runoff rate calculated using the Modified Rational Method for a catchment area of 0.82 ha. Any additional surface water will be attenuated on-site using geocellular storage tanks.
5. A detailed drainage layout has been provided showing proposed cover and invert levels.
6. The plan has also been updated to include flow rates from the development.
7. We have added to the drainage plan the plan flows from the development.

Could you please confirm

1. if connection from site to 600x750mm sewer to Higher Chatham Street UU1904 (foul water 39l/s, surface water 98.7l/s) is acceptable
2. What is the surcharge level for 1 in 30 and 1 in 100 in the public sewer where the connection is proposed?
3. Does UU require any other sewers to be investigated to lift the objection

If you would like us to further clarify I am available Monday, 21.07 11-3pm or Wednesday, 11-3pm for teams meeting.

I have attached documents

Marta Wolska
Principal Civil Engineer

Tel: 0161 236 2394
Mob: 07842 414 675
marta.wolska@curtins.com
curtins.com

From: wastewaterdeveloperservices@uuplc.co.uk <wastewaterdeveloperservices@uuplc.co.uk>
Sent: 10 July 2025 16:27
To: Marta Wolska <marta.wolska@curtins.com>
Cc: Charlie Smith <Charlie.Smith@curtins.com>
Subject: RE: Cavendish St M15 6TT

Hello Marta

Jordan has now moved roles.

I am currently the engineer responsible for the Greater Manchester area.

I have no record of a predevelopment enquiry on our system for this development.

You will have to apply for [Wastewater pre-development - United Utilities](#) here.

This is a chargeable service at £471.29 (excl VAT)

I can see from our systems that Jordan responded to the planning application 01/07/2025 (the official planning letter may have gone out later).

Happy to discuss any of the points raised.

Kind Regards

Gulshan



Gulshan Seetulparsad, MEng (Hons)

Developer Engineer (Salford, Bury,
Oldham, Rochdale, Burnley)

Developer Services & Metering

Customer Services

T: 01925 429092

unitedutilities.com



If you have received a great service today why not tell us?

Visit: unitedutilities.com/wow

----- Original Message -----

From: Marta Wolska [marta.wolska@curtins.com]

Sent: 10/07/2025 08:59

To: wastewaterdeveloperservices@uuplc.co.uk

Cc: charlie.smith@curtins.com

Subject: RE: Cavendish St M15 6TT

Dear Jordan & Conor

Could you please respond as soon as possible, as I am not sure if PDE has been submitted previously or should be submitted now?

Kind regards

Marta Wolska
Principal Civil Engineer

Tel: 0161 236 2394
Mob: 07842 414 675
marta.wolska@curtins.com
curtins.com

From: Marta Wolska
Sent: 07 July 2025 13:27
To: wastewaterdeveloperservices@uuplc.co.uk
Cc: Charlie Smith <Charlie.Smith@curtins.com>
Subject: Cavendish St M15 6TT

Dear Jordan & Conor

I would like to ask please for quick review and response.

Curtins Consulting have been appointed to carry out the Stage 4 design for the site. Arup has carried out a pre-planning consultation with UU regarding the easement of the existing sewer and proposed flow rates and discharge point.

Based on below correspondence seems Flood Risk Assessment and Drainage strategy has been submitted to UU, and UU accepted surface water flows 50% reduction from the existing surface water rates to 600x750 within Higher Chatham Street.

As there is no UU reference number, we are not sure if a redevelopment enquiry has been submitted with Foul and surface water flows.

We have been informed by the client that the 600x750mm sewer, which reduces to 450mm within Higher Chatham Street, is experiencing capacity issues.

Due to limited information from Arup

I would like to confirm:

1. Has the exact predevelopment enquiry been submitted by Arup and what is reference number
2. Has UU in principle approved connection from site to 600x750mm sewer to Higher Chatham Street
3. Have the exact foul water and surface water flow rates from the development been submitted and accepted by UU
4. What is the surcharge level for 1 in 30 and 1 in 100 in the public sewer where the connection is proposed?
5. Has UU responded to the Council consultation under Planning application? would it be possible to get that advice

I have attached Arup's drawing and indicated flow rates which we understand been discussed with UU and agreed.

Kind regards

Marta Wolska
Principal Civil Engineer

Tel: 0161 236 2394
Mob: 07842 414 675
marta.wolska@curtins.com
curtins.com

From: Greg Hardie <Greg.Hardie@arup.com>

Sent: 17 June 2025 13:58

To: Ross Cuming <ross.cuming@cumming-group.com>; Laura Merrion Shaw <laura.shaw@cumming-group.com>; Hannah Walder <hannah.walder@unitestudents.com>; Seamus McFerran <seamus.mcferran@graham.co.uk>

Cc: James Thorneycroft <James.Thorneycroft@arup.com>; Daryl Ruane <Daryl.Ruane@arup.com>; Emma Cecil <Emma.Cecil@arup.com>

Subject: FW: Sewer Easement - Cavendish St M15 6TT

Hi All,

Response from UU on the sewer easement

Regards

Greg

Greg Hardie

Associate Director

My working week is Tuesday to Friday.

Arup

6th Floor 3 Piccadilly Place, Manchester, M1 3BN

United Kingdom

d +44 161 602 9324

m 07880 404 378

[arup.com](https://www.arup.com)

Follow us: [LinkedIn](#) [Instagram](#) [YouTube](#) [Facebook](#)

Ove Arup & Partners Limited | Registered in England & Wales Registered Number: 1312453 | Registered Address: 8 Fitzroy Street, London, W1T 4BJ

Electronic mail messages entering and leaving Arup business systems are scanned for viruses and acceptability of content.

From: wastewaterdeveloperservices@uuplc.co.uk <wastewaterdeveloperservices@uuplc.co.uk>

Sent: 17 June 2025 13:24

To: Daryl Ruane <daryl.ruane@arup.com>

Cc: James Thorneycroft <james.thorneycroft@arup.com>; Greg Hardie <greg.hardie@arup.com>; Emma Cecil <emma.cecil@arup.com>; Lee Jordan <lee.jordan@arup.com>; Tom Saville <tom.saville@arup.com>; Michal Ceklarz <michal.ceklarz@arup.com>

Subject: RE: Sewer Easement - Cavendish St M15 6TT

Hi Daryl,

Thank you for your email.

We're unable to accurately confirm the easement in relation to the sewer until the sonde survey has been completed.

As you can appreciate, this may impact your design and could potentially alter the footprint of certain elements.

I hope this helps, should you need anything else please do let me know.

Kind regards,



Jordan Houghton
Developer Engineer
Developer Services & Metering
Customer Services
T: 01925 429091
unitedutilities.com

If you have received a great service today why not tell us?

Visit: unitedutilities.com/wow

----- Original Message -----

From: Daryl Ruane [daryl.ruane@arup.com]

Sent: 11/06/2025 16:14

To: wastewaterdeveloperservices@uuplc.co.uk; james.thorneycroft@arup.com

Cc: greg.hardie@arup.com; tom.saville@arup.com; emma.cecil@arup.com; lee.jordan@arup.com; michal.ceklarz@arup.com

Subject: RE: Sewer Easement - Cavendish St M15 6TT

Hi Jordan,

Thank you for your response.

Following our discussions with your colleague Lewis Barr on 01/07/2024, we were advised that a 3m width would be sufficient in accordance with Building Regulations Part H4. While a greater width for the 1950mm sewer was preferred, this was noted as a preference rather than a formal requirement. This site is highly constrained on both sides of Cavendish St, and we are limited by available space.

For reference, I have attached a copy of this correspondence.

Could you please confirm whether this guidance still applies? Our designs have been developed based on this prior engagement, and we want to ensure alignment.

Please note – we are currently in the process of seeking a sonde survey to confirm an accurate position of this sewer to clarify where this corridor applies. Would confirming the location of this sewer help reduce the risk/ width?

Looking forward to your clarification.

Best regards,

Daryl

Daryl Ruane

Senior Civil Engineer

MEng CEng MICE

Arup

6th Floor 3 Piccadilly Place, Manchester, M1 3BN

United Kingdom

arup.com

Follow us: [LinkedIn](#) [Instagram](#) [YouTube](#) [Facebook](#)

Ove Arup & Partners Limited | Registered in England & Wales Registered Number: 1312453 | Registered Address: 8 Fitzroy Street, London, W1T 4BJ

Electronic mail messages entering and leaving Arup business systems are scanned for viruses and acceptability of content.

From: wastewaterdeveloperservices@uuplc.co.uk <wastewaterdeveloperservices@uuplc.co.uk>

Sent: 09 June 2025 15:34

To: James Thorneycroft <james.thorneycroft@arup.com>

Cc: Greg Hardie <greg.hardie@arup.com>; Emma Cecil <emma.cecil@arup.com>; Lee Jordan

<lee.jordan@arup.com>; Daryl Ruane <daryl.ruane@arup.com>; Michal Ceklarz <michal.ceklarz@arup.com>

Subject: RE: Sewer Easement - Cavendish St M15 6TT

Hi James,

Thank you for your email.

As Conor mentioned in his message below, the required easement from the centre line of the sewer should be 4 metres. However, the specification you've provided currently indicates only 3 metres.

Could you please review and update the specification accordingly?

Kind regards,



Jordan Houghton
Developer Engineer
Developer Services & Metering
Customer Services
T: 01925 429091
unitedutilities.com

If you have received a great service today why not tell us?

Visit: unitedutilities.com/wow

----- Original Message -----

From: James Thorneycroft [james.thorneycroft@arup.com]

Sent: 06/06/2025 12:23

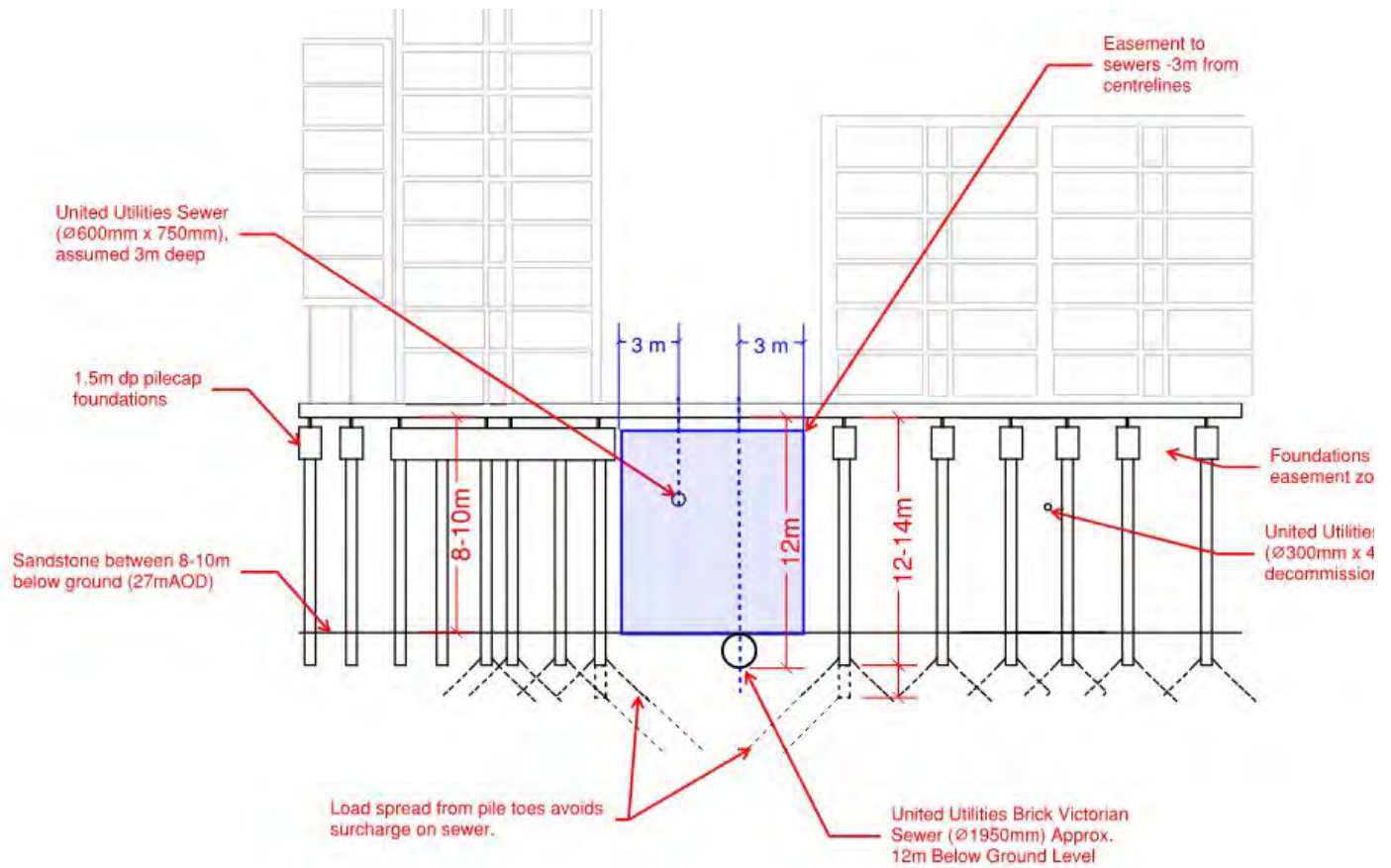
To: wastewaterdeveloperservices@uuplc.co.uk; emma.cecil@arup.com

Cc: greg.hardie@arup.com; lee.jordan@arup.com; daryl.ruane@arup.com; michal.ceklarz@arup.com

Subject: RE: Sewer Easement - Cavendish St M15 6TT

Hi Conor,

The piles will be rock socketed into the bedrock (which is generally between 8-10m below ground level) by approximately 4 metres, so we're expecting the base of the pile to be between 12-14m in length. I believe the invert level of the deeper sewer is around 12m.



Kind Regards

James

James Thorneycroft

Senior Structural Engineer

MEng(Hons) CEng MICE

Arup

6th Floor 3 Piccadilly Place, Manchester, M1 3BN

United Kingdom

d +44 161 602 9590

arup.com

Follow us: [LinkedIn](#) [Instagram](#) [YouTube](#) [Facebook](#)

From: wastewaterdeveloperservices@uuplc.co.uk <wastewaterdeveloperservices@uuplc.co.uk>
Sent: 06 June 2025 09:12
To: Emma Cecil <emma.cecil@arup.com>
Cc: James Thorneycroft <james.thorneycroft@arup.com>; Daryl Ruane <daryl.ruane@arup.com>; Michal Ceklarz <michal.ceklarz@arup.com>
Subject: RE: Sewer Easement - Cavendish St M15 6TT

Good Morning Emma

Thank you for confirming the clearance, as long as any foundations/structure is outside of the 4m easement, this could be acceptable.

If the landowner is the same one that originally entered into the build over agreement then the easement can automatically be released. However if the landowner/developer is different from the original grantee, then we could look to issue a letter that could confirm that the build over agreement is not required.

Regarding the piles, are you able to advise of the depth that these will be installed to? Whilst the structures may be outside of the 3m clearance, we still need to understand if any loading will be put onto our sewers.

Kind Regards

If you have received a great service today why not tell us?

Visit: unitedutilities.com/wow



Conor Donaghy
Developer Engineer
Developer Services & Metering
T: 01925 429097
unitedutilities.com

----- Original Message -----

From: Emma Cecil [emma.cecil@arup.com]
Sent: 05/06/2025 07:43
To: wastewaterdeveloperservices@uuplc.co.uk
Cc: james.thorneycroft@arup.com; daryl.ruane@arup.com; michal.ceklarz@arup.com
Subject: RE: Sewer Easement - Cavendish St M15 6TT

Hi Conor,

I can confirm that the proposed building footprint and foundations are outside of the 3m easement – please see attached sketch CAM-ARP-ZZ-ZZ-SK-C-000004 to visualise this.

Our WS3 design does clash with the new 4m easement, there is approximately 400mm encroachment – please see CAM-ARP-ZZ-ZZ-SK-C-000005.

If you can please keep us updated on whether the 4m easement for the buildover can be removed that would be great.

If you could please also confirm any specific monitoring that UU require during piling/construction?

Thanks,

Emma

Emma Cecil

She/her

Senior Civil Engineer | Infrastructure

MEng CEng MICE

Please note my working days are Monday, Tuesday & Wednesday

Arup

6th Floor 3 Piccadilly Place, Manchester, M1 3BN

United Kingdom

d +44 161 602 9564

[arup.com](https://www.arup.com)

Follow us: [LinkedIn](#) [Instagram](#) [YouTube](#) [Facebook](#)

Ove Arup & Partners Limited | Registered in England & Wales Registered Number: 1312453 | Registered Address: 8 Fitzroy Street, London, W1T 4BJ

Electronic mail messages entering and leaving Arup business systems are scanned for viruses and acceptability of content.

From: wastewaterdeveloperservices@uuplc.co.uk <wastewaterdeveloperservices@uuplc.co.uk>
Sent: 04 June 2025 09:43
To: Emma Cecil <emma.cecil@arup.com>
Cc: James Thorneycroft <james.thorneycroft@arup.com>; Michal Ceklarz <michal.ceklarz@arup.com>
Subject: RE: Sewer Easement - Cavendish St M15 6TT

Good Morning Emma

So I am just liaising with our legal team to understand how/if this legal easement can be removed automatically when the cantilever/cover is demolished.

Are you able to confirm if any other building footprint/foundations come within 3m of either sewer? If they do then we may request the easement remains but if you're able to confirm that would be appreciated.

Kind Regards

If you have received a great service today why not tell us?

Visit: unitedutilities.com/wow



Conor Donaghy
Developer Engineer
Developer Services & Metering
T: 01925 429097
unitedutilities.com

----- Original Message -----

From: Emma Cecil [emma.cecil@arup.com]
Sent: 02/06/2025 21:45
To: wastewaterdeveloperservices@uuplc.co.uk
Cc: james.thorneycroft@arup.com; michal.ceklarz@arup.com
Subject: RE: Sewer Easement - Cavendish St M15 6TT

Hi Conor,

Thankyou for the plan. If the buildover were to cease would the legal easement no longer be required? How come only one of the sewers has a legal easement here?

In the proposals for the new Cambridge Halls, the historic Cavendish Street is to be a public realm area and the buildings sat on the plots on either side, but no proposed building to bridge over Cavendish Street. The proposed landscaping strategy within the (3m) easement has movable raised tree planters - should access be required by UU to the 2No sewers – in addition to more generic benches and ground-level grass/flowers.

Thanks,

Emma

Emma Cecil

She/her

Senior Civil Engineer | Infrastructure

MEng CEng MICE

Please note my working days are Monday, Tuesday & Wednesday

Arup

6th Floor 3 Piccadilly Place, Manchester, M1 3BN

United Kingdom

d +44 161 602 9564

[arup.com](https://www.arup.com)

Follow us: [LinkedIn](#) [Instagram](#) [YouTube](#) [Facebook](#)

Ove Arup & Partners Limited | Registered in England & Wales Registered Number: 1312453 | Registered Address: 8 Fitzroy Street, London, W1T 4BJ

Electronic mail messages entering and leaving Arup business systems are scanned for viruses and acceptability of content.

From: wastewaterdeveloperservices@uuplc.co.uk <wastewaterdeveloperservices@uuplc.co.uk>

Sent: 02 June 2025 14:19

To: Emma Cecil <emma.cecil@arup.com>

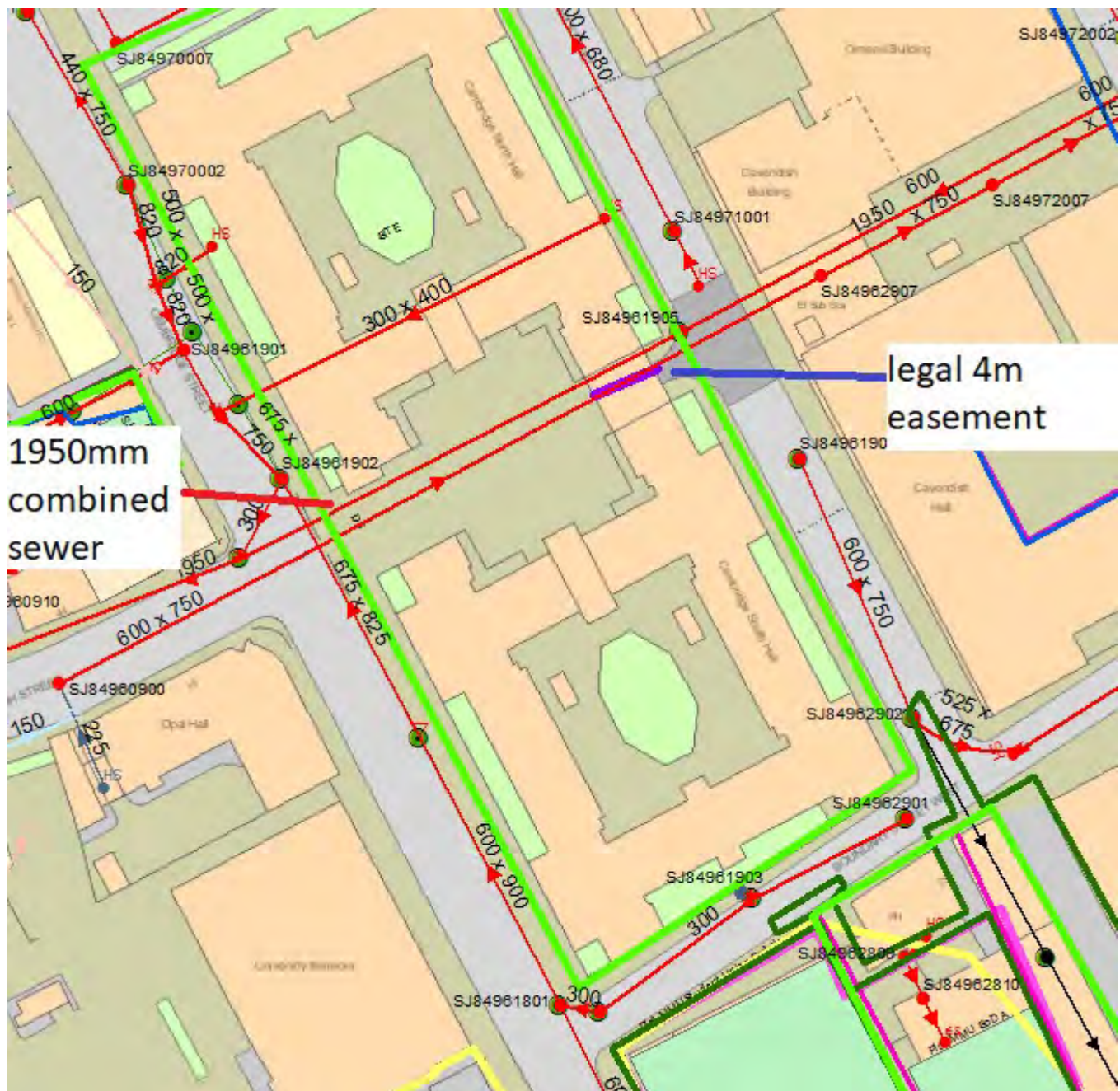
Cc: James Thorneycroft <james.thorneycroft@arup.com>; Michal Ceklarz <michal.ceklarz@arup.com>

Subject: RE: Sewer Easement - Cavendish St M15 6TT

You don't often get email from wastewaterdeveloperservices@uuplc.co.uk. [Learn why this is important](#)

Good Afternoon Emma

As per below, please see screenshot of our records. I've labelled each point however the purple section is the actual legal easement that is within the development as well as the positioning of the 1950mm combined sewer. Will this area now become open with nothing over the top of the sewers?



Kind Regards

If you have received a great service today why not tell us?

Visit: unitedutilities.com/wow



Water for the North West

Conor Donaghy
Developer Engineer
Deve



The information contained in this e-mail is intended only for the individual to whom it is addressed. It may contain legally privileged or confidential information or otherwise be exempt from disclosure. If you have received this Message in error or there are any problems, please notify the sender immediately and delete the message from your computer. You must not use, disclose, copy or alter this message for any unauthorised purpose. Neither United Utilities Group PLC nor any of its subsidiaries will be liable for any direct, special, indirect or consequential damages as a result of any virus being passed on, or arising from the alteration of the contents of this message by a third party.

United Utilities Group PLC, Haweswater House, Lingley Mere
Business Park, Lingley Green Avenue, Great Sankey,
Warrington, WA5 3LP
Registered in England and Wales. Registered No 6559020

www.unitedutilities.com

[//www.unitedutilities.com/subsidiaries](http://www.unitedutilities.com/subsidiaries)

Appendix C

Proposed Drainage Layouts

Sewer Easements Plan