

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	40	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Inverts
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	0.500
CV	1.000	Include Intermediate Ground	x
Time of Entry (mins)	1.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
22	0.007	1.00	7.504	450	213.057	62.086	0.654
23	0.017	1.00	7.504	450	220.452	63.423	0.682
24			7.500		223.788	56.783	0.920
25			7.200		237.070	49.510	0.630
26			7.200		237.070	39.077	0.630
27			7.220	1200	234.393	35.530	0.650
29	0.022	1.00	7.200	450	238.880	65.629	0.300
33			7.100	450	256.003	39.068	0.689
34			7.000	1200	287.464	48.064	0.805
1	0.014	1.00	7.350		254.420	65.718	0.600
2	0.008	1.00	7.225	450	256.849	49.007	0.500
3	0.004	1.00	7.100	450	256.059	39.916	0.462
4	0.011	1.00	7.200		242.000	49.724	0.600
28		1.00	7.200	1200	234.658	34.300	0.630

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	15.613	0.600	6.750	6.725	0.025	624.5	100	1.39	50.0
1.001	2	3	1.057	0.600	6.725	6.638	0.087	12.1	100	1.00	50.0
1.014	33	34	32.722	0.600	6.411	6.195	0.216	151.5	150	2.12	50.0
1.015	27	33	21.898	0.600	6.570	6.411	0.159	137.7	150	1.45	50.0
1.018	23	24	2.723	0.600	6.822	6.725	0.097	28.1	150	1.61	50.0
1.019	22	23	9.584	0.600	6.850	6.822	0.028	342.3	150	1.57	50.0
1.020	29	23	7.139	0.600	6.900	6.822	0.078	91.5	150	1.50	50.0
1.033	3	26	19.008	0.600	6.638	6.570	0.068	279.5	150	1.53	50.0
1.034	4	25	4.935	0.600	6.600	6.570	0.030	164.5	100	1.14	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.301	2.4	3.5	0.500	0.400	0.014	0.0	100	0.309
1.001	2.229	17.5	5.6	0.400	0.362	0.022	0.0	39	1.979
1.014	0.814	14.4	0.0	0.539	0.655	0.000	0.0	0	0.000
1.015	0.854	15.1	0.0	0.500	0.539	0.000	0.0	0	0.000
1.018	1.907	33.7	11.6	0.532	0.625	0.046	0.0	61	1.733
1.019	0.538	9.5	1.8	0.504	0.532	0.007	0.0	44	0.410
1.020	1.051	18.6	5.6	0.150	0.532	0.022	0.0	56	0.917
1.033	0.596	10.5	6.6	0.312	0.480	0.026	0.0	86	0.628
1.034	0.597	4.7	2.8	0.500	0.530	0.011	0.0	55	0.621

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.035	28	27	1.258	0.600	6.570	6.570	0.000	0.0	100	1.02	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.035	1.000	7.9	0.0	0.530	0.550	0.000	0.0	0	0.000

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	15.613	624.5	100	Circular_Default Sewer Type	7.350	6.750	0.500	7.225	6.725	0.400
1.001	1.057	12.1	100	Circular_Default Sewer Type	7.225	6.725	0.400	7.100	6.638	0.362
1.014	32.722	151.5	150	Circular_Default Sewer Type	7.100	6.411	0.539	7.000	6.195	0.655
1.015	21.898	137.7	150	Circular_Default Sewer Type	7.220	6.570	0.500	7.100	6.411	0.539
1.018	2.723	28.1	150	Circular_Default Sewer Type	7.504	6.822	0.532	7.500	6.725	0.625
1.019	9.584	342.3	150	Circular_Default Sewer Type	7.504	6.850	0.504	7.504	6.822	0.532
1.020	7.139	91.5	150	Circular_Default Sewer Type	7.200	6.900	0.150	7.504	6.822	0.532
1.033	19.008	279.5	150	Circular_Default Sewer Type	7.100	6.638	0.312	7.200	6.570	0.480
1.034	4.935	164.5	100	Circular_Default Sewer Type	7.200	6.600	0.500	7.200	6.570	0.530
1.035	1.258	0.0	100	Circular_Default Sewer Type	7.200	6.570	0.530	7.220	6.570	0.550

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1		Junction		2	450	Manhole	Adoptable
1.001	2	450	Manhole	Adoptable	3	450	Manhole	Adoptable
1.014	33	450	Manhole	Adoptable	34	1200	Manhole	Adoptable
1.015	27	1200	Manhole	Adoptable	33	450	Manhole	Adoptable
1.018	23	450	Manhole	Adoptable	24		Junction	
1.019	22	450	Manhole	Adoptable	23	450	Manhole	Adoptable
1.020	29	450	Manhole	Adoptable	23	450	Manhole	Adoptable
1.033	3	450	Manhole	Adoptable	26		Junction	
1.034	4		Junction		25		Junction	
1.035	28	1200	Manhole	Adoptable	27	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
22	213.057	62.086	7.504	0.654	450		0	1.019	6.850	150
23	220.452	63.423	7.504	0.682	450		1 2 0	1.020 1.019	6.822 6.822	150 150
							0	1.018	6.822	150
24	223.788	56.783	7.500	0.920			1	1.018	6.725	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
25	237.070	49.510	7.200	0.630		1 	1.034	6.570	100
26	237.070	39.077	7.200	0.630		1 	1.033	6.570	150
27	234.393	35.530	7.220	0.650	1200	1 	1.035	6.570	100
29	238.880	65.629	7.200	0.300	450	0 	1.015	6.570	150
33	256.003	39.068	7.100	0.689	450	0 	1.020	6.900	150
34	287.464	48.064	7.000	0.805	1200	1 	1.015	6.411	150
1	254.420	65.718	7.350	0.600		0 	1.014	6.411	150
2	256.849	49.007	7.225	0.500	450	1 	1.000	6.750	100
3	256.059	39.916	7.100	0.462	450	0 	1.000	6.725	100
4	242.000	49.724	7.200	0.600		0 	1.001	6.638	100
28	234.658	34.300	7.200	0.630	1200	0 	1.033	6.638	150
						0 	1.034	6.600	100
						0 	1.035	6.570	100

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	✓
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.500	Check Discharge Rate(s)	✓
Winter CV	0.840	30 year (l/s)	1.6

Simulation Settings

100 year (l/s)	2.1	100 year 360 minute (m³)	48
Check Discharge Volume	✓		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440
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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
30	0	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	2.40
Greenfield Method	IH124	Growth Factor 100 year	3.19
Positively Drained Area (ha)	0.196	Betterment (%)	0
SAAR (mm)	703	QBar	0.7
Soil Index	3	Q 30 year (l/s)	1.6
SPR	0.40	Q 100 year (l/s)	2.1
Region	7		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)	0.196	Storm Duration (mins)	360
Soil Index	3	Betterment (%)	0
SPR	0.40	PR	0.391
CWI	105.630	Runoff Volume (m³)	48

Node 27 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	6.570	Product Number	CTL-SHE-0125-6900-0865-6900
Design Depth (m)	0.865	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	6.9	Min Node Diameter (mm)	1200

Node 28 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Main Channel Length (m)	10.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	6.570	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)	0	Main Channel n	0.025

Inlets

24	25	26
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Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	437.0	0.0	0.500	437.0	0.0	0.510	0.0	0.0	0.600	0.0	0.0

Results for 30 year Critical Storm Duration. Lowest mass balance: -35.15%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	22	8	6.921	0.071	3.1	0.0266	0.0000	OK
15 minute winter	23	8	6.914	0.092	19.7	0.0608	0.0000	OK
60 minute winter	24	55	6.756	0.176	8.4	0.0000	0.0000	OK
60 minute winter	25	53	6.709	0.139	1.9	0.0000	0.0000	OK
15 minute winter	26	10	6.710	0.140	10.0	0.0000	0.0000	OK
60 minute winter	27	57	6.699	0.129	3.3	0.1462	0.0000	OK
15 minute winter	29	8	6.985	0.085	9.7	0.1387	0.0000	OK
60 minute winter	33	58	6.460	0.049	3.3	0.0078	0.0000	OK
60 minute winter	34	58	6.243	0.048	3.3	0.0000	0.0000	OK
15 minute winter	1	9	6.938	0.188	6.2	0.0878	0.0000	SURCHARGED
15 minute winter	2	9	6.810	0.085	8.8	0.0408	0.0000	OK
15 minute winter	3	9	6.765	0.127	10.2	0.0423	0.0000	OK
60 minute winter	4	50	6.708	0.108	2.0	0.0398	0.0000	SURCHARGED
60 minute winter	28	56	6.708	0.138	28.8	0.1564	0.0000	SURCHARGED

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	22	1.019	23	3.0	0.319	0.311	0.0940	
15 minute winter	23	1.018	24	19.3	1.826	0.573	0.0288	
60 minute winter	24	Flow through pond	28	28.8	0.106	0.009	17.4900	
60 minute winter	25	Flow through pond	28	28.8	0.106	0.009	17.4900	
15 minute winter	26	Flow through pond	28	16.9	0.072	0.005	11.5395	
60 minute winter	27	1.015	33	3.3	0.662	0.217	0.1083	
15 minute winter	29	1.020	23	9.4	0.864	0.505	0.0775	
60 minute winter	33	1.014	34	3.3	0.658	0.228	0.1627	22.3
15 minute winter	1	1.000	2	5.5	0.713	2.345	0.1165	
15 minute winter	2	1.001	3	8.6	1.104	0.490	0.0079	
15 minute winter	3	1.033	26	10.0	0.618	0.952	0.3141	
60 minute winter	4	1.034	25	1.9	0.336	0.404	0.0386	
60 minute winter	28	1.035	27	3.3	0.425	0.420	0.0098	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: -35.15%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	22	9	7.010	0.160	5.6	0.0599	0.0000	SURCHARGED
15 minute winter	23	9	7.000	0.178	32.6	0.1169	0.0000	SURCHARGED
60 minute winter	24	66	6.848	0.268	17.9	0.0000	0.0000	OK
120 minute winter	25	84	6.800	0.230	2.1	0.0000	0.0000	OK
15 minute winter	26	10	6.812	0.242	15.0	0.0000	0.0000	OK
120 minute winter	27	84	6.770	0.200	6.1	0.2257	0.0000	SURCHARGED
15 minute winter	29	9	7.080	0.180	17.6	0.2930	0.0000	SURCHARGED
120 minute winter	33	88	6.480	0.069	6.1	0.0110	0.0000	OK
120 minute winter	34	88	6.263	0.068	6.1	0.0000	0.0000	OK
15 minute winter	1	9	7.350	0.600	11.2	0.3062	0.0000	FLOOD RISK
15 minute winter	2	10	7.075	0.350	14.0	0.1675	0.0000	SURCHARGED
15 minute winter	3	10	6.959	0.321	15.8	0.1066	0.0000	SURCHARGED
15 minute winter	4	9	6.839	0.239	8.8	0.0878	0.0000	SURCHARGED
120 minute winter	28	84	6.799	0.229	19.1	0.2588	0.0000	SURCHARGED

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	22	1.019	23	5.1	0.351	0.542	0.1687	
15 minute winter	23	1.018	24	33.5	1.983	0.994	0.0478	
60 minute winter	24	Flow through pond	28	14.9	0.062	0.005	28.2139	
120 minute winter	25	Flow through pond	28	19.1	0.084	0.006	29.3490	
15 minute winter	26	Flow through pond	28	28.8	0.075	0.009	20.6033	
120 minute winter	27	1.015	33	6.1	0.776	0.403	0.1718	
15 minute winter	29	1.020	23	15.8	0.927	0.849	0.1257	
120 minute winter	33	1.014	34	6.1	0.776	0.423	0.2566	89.2
15 minute winter	1	1.000	2	8.4	1.070	3.542	0.1222	
15 minute winter	2	1.001	3	13.0	1.660	0.742	0.0083	
15 minute winter	3	1.033	26	15.0	0.852	1.424	0.3346	
15 minute winter	4	1.034	25	7.7	0.982	1.640	0.0386	
120 minute winter	28	1.035	27	6.1	0.779	0.776	0.0098	