Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	5.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	18.600	Minimum Backdrop Height (m)	0.200
Ratio-R	0.328	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
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)	Invert Level (m)
S1	0.000	1.00	30.300	1200	380655.952	390279.240	0.511	29.789
S2	0.010	1.00	30.175	1200	380673.360	390264.415	0.526	29.649
S3	0.010	1.00	30.175	1200	380663.660	390253.590	0.617	29.558
S4	0.050	1.00	30.200	1200	380659.194	390253.334	0.672	29.528
S5	0.028	1.00	30.528	1800	380651.430	390243.878	1.532	28.996
S6	0.074	1.00	30.407	2100	380618.137	390270.309	1.515	28.892
S7			29.980	1500	380626.246	390281.553	1.165	28.815
Perm Paving 2	0.002	1.00	30.250	1200	380643.760	390241.021	0.600	29.650
Perm Paving 3	0.037	1.00	30.250	1200	380643.184	390255.712	0.600	29.650
Perm Paving 4	0.004	1.00	30.250	1200	380638.155	390246.773	0.600	29.650
Perm Paving 1	0.007	1.00	30.250	1200	380637.005	390239.389	0.500	29.750
Perm Paving 5	0.002	1.00	30.250	1200	380652.542	390251.731	0.500	29.750
Perm Paving 6	0.002	1.00	30.250	1200	380655.279	390237.010	0.500	29.750

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S1	S2	20.995	0.600	29.789	29.649	0.140	150.0	150	1.43	5.0
1.001	S2	S3	13.600	0.600	29.649	29.558	0.091	150.0	150	1.70	5.0
1.002	S3	S4	4.473	0.600	29.558	29.528	0.030	150.0	150	1.80	5.0
1.003	S4	S5	12.265	0.600	29.528	29.446	0.082	150.0	150	2.05	5.0
1.004	S5	S6	41.726	0.600	28.996	28.892	0.104	400.0	600	3.00	5.0
1.005	S6	S7	12.780	0.600	28.892	28.815	0.077	165.0	225	3.22	50.0
Perm 2	Perm Paving 2	S6	8.185	0.600	29.650	29.548	0.102	80.0	150	1.12	50.0
Perm 3	Perm Paving 3	S6	7.502	0.600	29.650	29.556	0.094	80.0	150	1.11	50.0
Perm 4	Perm Paving 4	S6	13.587	0.600	29.650	29.480	0.170	80.0	150	1.20	50.0
Perm 1	Perm Paving 1	S6	36.222	0.600	29.750	29.297	0.453	80.0	100	1.70	5.0
Perm 5	Perm Paving 5	S6	39.100	0.600	29.750	29.261	0.489	80.0	100	1.76	5.0
Perm 6	Perm Paving 6	S5	7.873	0.600	29.750	29.652	0.098	80.0	100	1.15	5.0

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	0.818	14.5	0.0	0.361	0.376	0.000	0.0	0	0.000
1.001	0.818	14.5	0.1	0.376	0.467	0.010	0.0	10	0.248
1.002	0.818	14.5	0.3	0.467	0.522	0.020	0.0	14	0.313
1.003	0.818	14.5	0.9	0.522	0.932	0.070	0.0	26	0.461
1.004	1.211	342.4	1.4	0.932	0.915	0.100	0.0	27	0.300
1.005	1.015	40.4	30.6	1.290	0.940	0.226	0.0	147	1.114
Perm 2	1.125	19.9	0.3	0.450	0.709	0.002	0.0	13	0.396
Perm 3	1.125	19.9	5.0	0.450	0.701	0.037	0.0	51	0.939
Perm 4	1.125	19.9	0.5	0.450	0.777	0.004	0.0	17	0.490
Perm 1	0.861	6.8	0.1	0.400	1.010	0.007	0.0	8	0.291
Perm 5	0.861	6.8	0.0	0.400	1.046	0.002	0.0	5	0.206
Perm 6	0.861	6.8	0.0	0.400	0.776	0.002	0.0	5	0.206

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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	20.995	150.0	150	Circular	30.300	29.789	0.361	30.175	29.649	0.376
1.001	13.600	150.0	150	Circular	30.175	29.649	0.376	30.175	29.558	0.467
1.002	4.473	150.0	150	Circular	30.175	29.558	0.467	30.200	29.528	0.522
1.003	12.265	150.0	150	Circular	30.200	29.528	0.522	30.528	29.446	0.932
1.004	41.726	400.0	600	Circular	30.528	28.996	0.932	30.407	28.892	0.915
1.005	12.780	165.0	225	Circular	30.407	28.892	1.290	29.980	28.815	0.940
Perm 2	8.185	80.0	150	Circular	30.250	29.650	0.450	30.407	29.548	0.709
Perm 3	7.502	80.0	150	Circular	30.250	29.650	0.450	30.407	29.556	0.701
Perm 4	13.587	80.0	150	Circular	30.250	29.650	0.450	30.407	29.480	0.777
Perm 1	36.222	80.0	100	Circular	30.250	29.750	0.400	30.407	29.297	1.010
Perm 5	39.100	80.0	100	Circular	30.250	29.750	0.400	30.407	29.261	1.046
Perm 6	7.873	80.0	100	Circular	30.250	29.750	0.400	30.528	29.652	0.776

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	1200	Manhole	Adoptable	S2	1200	Manhole	Adoptable
1.001	S2	1200	Manhole	Adoptable	S3	1200	Manhole	Adoptable
1.002	S3	1200	Manhole	Adoptable	S4	1200	Manhole	Adoptable
1.003	S4	1200	Manhole	Adoptable	S5	1800	Manhole	Adoptable
1.004	S5	1800	Manhole	Adoptable	S6	2100	Manhole	Adoptable
1.005	S6	2100	Manhole	Adoptable	S7	1500	Manhole	Adoptable
Perm 2	Perm Paving 2	1200	Manhole	Adoptable	S6	2100	Manhole	Adoptable
Perm 3	Perm Paving 3	1200	Manhole	Adoptable	S6	2100	Manhole	Adoptable
Perm 4	Perm Paving 4	1200	Manhole	Adoptable	S6	2100	Manhole	Adoptable
Perm 1	Perm Paving 1	1200	Manhole	Adoptable	S6	2100	Manhole	Adoptable
Perm 5	Perm Paving 5	1200	Manhole	Adoptable	S6	2100	Manhole	Adoptable
Perm 6	Perm Paving 6	1200	Manhole	Adoptable	S5	1800	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1	380655.952	390279.240	30.300	0.511	1200				
						0	1.000	29.789	150
S2	380673.360	390264.415	30.175	0.526	1200				
						1	1.000	29.649	150
						0	1.001	29.649	150
S3	380663.660	390253.590	30.175	0.617	1200				
						1	1.001	29.558	150
						0	1.002	29.558	150
S4	380659.194	390253.334	30.200	0.672	1200				
						1	1.002	29.528	150
						0	1.003	29.528	150
S5	380651.430	390243.878	30.528	1.532	1800				
						1	Perm 6	29.652	100
						2	1.003	29.446	150
						0	1.004	28.996	600
S6	380618.137	390270.309	30.407	1.515	2100				
						1	Perm 3	29.556	150
						2	Perm 2	29.548	150
						3	Perm 4	29.480	150
						4	Perm 1	29.297	100
						5	Perm 5	29.261	100
						6	1.004	28.892	600
						0	1.005	28.892	225
S7	380626.246	390281.553	29.980	1.165	1500				
						1	1.005	28.815	225

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Perm Paving 2	380643.760	390241.021	30.250	0.600	1200	0	Perm 2	29.650	150
Perm Paving 3	380643.184	390255.712	30.250	0.600	1200	0	Perm 3	29.650	150
Perm Paving 4	380638.155	390246.773	30.250	0.600	1200	0	Perm 4	29.650	150
Perm Paving 1	380637.005	390239.389	30.250	0.500	1200	0	Perm 1	29.750	100
Perm Paving 5	380652.542	390251.731	30.250	0.500	1200	0	Perm 5	29.750	100
Perm Paving 6	380655.279	390237.010	30.250	0.500	1200	0	Perm 6	29.750	100

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
Rainfall Events	Singular	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	18.600	Additional Storage (m³/ha)	0.0
Ratio-R	0.200	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 %)
2	0	0	0
30	0	0	0
100	40	0	0

Node S6 Online Orifice Control

Flap Valve	x	Design Depth (m)	1.000	Discharge Coefficient	0.600
Replaces Downstream Link	x	Design Flow (l/s)	5.0		
Invert Level (m)	28.892	Diameter (m)	0.049		

Node Perm Paving 1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	29.750	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	256	Depth (m)	0.450
Safety Factor	2.0	Width (m)	16.400	Inf Depth (m)	
Porosity	1.00	Length (m)	4.800		

Node Perm Paving 2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	29.650	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	288	Depth (m)	0.450
Safety Factor	2.0	Width (m)	8.000	Inf Depth (m)	
Porosity	1.00	Length (m)	18.000		

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Node Perm Paving 3 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	29.650	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	296	Depth (m)	0.450
Safety Factor	2.0	Width (m)	7.250	Inf Depth (m)	
Porosity	1.00	Length (m)	6.000		

Node Perm Paving 4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	29.650	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	296	Depth (m)	0.450
Safety Factor	2.0	Width (m)	4.800	Inf Depth (m)	
Porosity	1.00	Length (m)	4.800		

Node Perm Paving 5 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	29.750	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	224	Depth (m)	0.450
Safety Factor	2.0	Width (m)	4.800	Inf Depth (m)	
Porosity	1.00	Length (m)	4.800		

Node Perm Paving 6 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	29.750	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	224	Depth (m)	0.450
Safety Factor	2.0	Width (m)	6.700	Inf Depth (m)	
Porosity	1.00	Length (m)	6.700		

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Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	1	29.789	0.000	0.0	0.0000	0.0000	OK
180 minute winter	S2	116	29.686	0.037	0.5	0.0421	0.0000	OK
180 minute winter	S3	116	29.686	0.128	1.0	0.1450	0.0000	OK
180 minute winter	S4	116	29.686	0.158	3.5	0.1789	0.0000	SURCHARGED
180 minute winter	S5	116	29.684	0.688	4.9	1.7517	0.0000	SURCHARGED
180 minute winter	S6	120	29.684	0.792	8.2	2.7442	0.0000	SURCHARGED
180 minute winter	S7	120	28.864	0.049	4.3	0.0000	0.0000	OK
180 minute winter	Perm Paving 2	132	29.677	0.027	2.0	2.6643	0.0000	OK
30 minute winter	Perm Paving 3	20	29.689	0.039	4.6	1.6305	0.0000	OK
180 minute winter	Perm Paving 4	120	29.684	0.034	2.0	0.7703	0.0000	OK
240 minute winter	Perm Paving 1	156	29.762	0.012	0.3	0.7426	0.0000	OK
360 minute winter	Perm Paving 5	216	29.758	0.008	0.1	0.1448	0.0000	OK
360 minute winter	Perm Paving 6	216	29.758	0.008	0.1	0.2038	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1	1.000	S2	0.0	0.000	0.000	0.0325	
180 minute winter	S2	1.001	S3	0.5	0.296	0.035	0.1321	
180 minute winter	S3	1.002	S4	1.0	0.290	0.069	0.0752	
180 minute winter	S4	1.003	S5	3.5	0.663	0.241	0.2159	
180 minute winter	S5	1.004	S6	3.4	0.150	0.010	11.7533	
180 minute winter	S6	1.005	S7	4.3	0.653	0.107	0.0845	47.6
180 minute winter	Perm Paving 2	Perm 2	S6	-1.9	0.445	-0.098	0.0756	
30 minute winter	Perm Paving 3	Perm 3	S6	2.8	0.772	0.139	0.0268	
180 minute winter	Perm Paving 4	Perm 4	S6	-1.8	0.346	-0.092	0.1401	
240 minute winter	Perm Paving 1	Perm 1	S6	0.2	0.319	0.029	0.1510	
360 minute winter	Perm Paving 5	Perm 5	S6	0.1	0.211	0.014	0.1590	
360 minute winter	Perm Paving 6	Perm 6	S5	0.1	0.286	0.012	0.0053	

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Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	S1	34	29.835	0.046	2.0	0.0521	0.0000	OK
60 minute summer	S2	34	29.833	0.184	7.0	0.2084	0.0000	SURCHARGED
60 minute winter	S3	34	29.826	0.268	7.2	0.3030	0.0000	SURCHARGED
60 minute summer	S4	33	29.827	0.299	14.9	0.3377	0.0000	SURCHARGED
60 minute winter	S5	40	29.792	0.796	17.9	2.0250	0.0000	SURCHARGED
60 minute winter	S6	40	29.792	0.900	26.5	3.1172	0.0000	SURCHARGED
60 minute winter	S7	40	28.866	0.051	4.6	0.0000	0.0000	OK
240 minute winter	Perm Paving 2	176	29.790	0.140	8.4	19.0215	0.0000	OK
60 minute winter	Perm Paving 3	41	29.794	0.144	13.5	6.3179	0.0000	OK
60 minute winter	Perm Paving 4	39	29.794	0.144	7.8	3.4180	0.0000	OK
240 minute winter	Perm Paving 1	184	29.790	0.040	0.8	3.0196	0.0000	OK
240 minute winter	Perm Paving 5	176	29.790	0.040	0.5	0.9044	0.0000	OK
240 minute winter	Perm Paving 6	176	29.790	0.040	0.7	1.6767	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)
60 minute summer	S1	1.000	S2	-2.0	-0.168	-0.142	0.2329	
60 minute summer	S2	1.001	S3	-5.0	0.306	-0.348	0.2394	
60 minute winter	S3	1.002	S4	-4.2	0.284	-0.294	0.0787	
60 minute summer	S4	1.003	S5	14.1	0.926	0.974	0.2159	
60 minute winter	S5	1.004	S6	14.1	0.204	0.041	11.7533	
60 minute winter	S6	1.005	S7	4.6	0.665	0.114	0.0887	54.1
240 minute winter	Perm Paving 2	Perm 2	S6	-8.3	-0.588	-0.417	0.1421	
60 minute winter	Perm Paving 3	Perm 3	S6	-7.5	0.857	-0.378	0.1313	
60 minute winter	Perm Paving 4	Perm 4	S6	-7.2	-0.525	-0.364	0.2375	
240 minute winter	Perm Paving 1	Perm 1	S6	0.7	0.306	0.105	0.1951	
240 minute winter	Perm Paving 5	Perm 5	S6	-0.4	0.221	-0.057	0.2097	
240 minute winter	Perm Paving 6	Perm 6	S5	-0.6	0.256	-0.096	0.0422	

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Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.28%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	S1	18	30.191	0.402	9.2	0.4543	0.0000	FLOOD RISK
30 minute summer	S2	17	30.175	0.526	12.3	0.5949	0.5884	FLOOD
60 minute summer	S3	31	30.175	0.617	8.6	0.6978	0.2271	FLOOD
30 minute summer	S4	17	30.181	0.653	27.2	0.7387	0.0000	FLOOD RISK
360 minute winter	S5	272	29.976	0.980	10.1	2.4937	0.0000	SURCHARGED
360 minute winter	S6	272	29.976	1.084	16.8	3.7544	0.0000	SURCHARGED
360 minute winter	S7	272	28.869	0.054	5.1	0.0000	0.0000	OK
360 minute winter	Perm Paving 2	272	29.976	0.326	9.4	45.9945	0.0000	FLOOD RISK
360 minute winter	Perm Paving 3	272	29.976	0.326	3.9	14.4253	0.0000	FLOOD RISK
360 minute winter	Perm Paving 4	272	29.976	0.326	2.5	7.8184	0.0000	FLOOD RISK
480 minute winter	Perm Paving 1	360	29.975	0.225	2.7	17.7899	0.0000	FLOOD RISK
360 minute winter	Perm Paving 5	272	29.976	0.226	1.3	5.4039	0.0000	FLOOD RISK
360 minute winter	Perm Paving 6	272	29.976	0.226	2.7	10.2374	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)
30 minute winter	S1	1.000	S2	-9.2	-0.528	-0.634	0.3696	
30 minute summer	S2	1.001	S3	-6.9	-0.394	-0.479	0.2394	
60 minute summer	S3	1.002	S4	7.0	0.398	0.485	0.0787	
30 minute summer	S4	1.003	S5	21.9	1.244	1.515	0.2159	
360 minute winter	S5	1.004	S6	7.6	0.128	0.022	11.7533	
360 minute winter	S6	1.005	S7	5.1	0.683	0.126	0.0951	154.5
360 minute winter	Perm Paving 2	Perm 2	S6	-9.2	-0.574	-0.464	0.1441	
360 minute winter	Perm Paving 3	Perm 3	S6	1.7	0.644	0.088	0.1321	
360 minute winter	Perm Paving 4	Perm 4	S6	-2.3	0.310	-0.115	0.2392	
480 minute winter	Perm Paving 1	Perm 1	S6	-2.1	0.305	-0.316	0.2834	
360 minute winter	Perm Paving 5	Perm 5	S6	-1.1	-0.145	-0.167	0.3059	
360 minute winter	Perm Paving 6	Perm 6	S5	-2.5	-0.318	-0.365	0.0616	

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