

Mucklow & Harris Ltd		Page 1
5 Ardent Court	Fole Diary	
William James Way	CB COLLIER	
Henley in Arden, B95 5GF	Network B	
Date 23/07/2025 15:09	Designed by Ben Lee	
File STORM B 22.06.22.MDX	Checked by	
Innovyze	Network 2020.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	2
FEH Rainfall Version	2013
Site Location GB 404500 337500 SK 04500 37500	
Data Type	Point
Maximum Rainfall (mm/hr)	0
Maximum Time of Concentration (mins)	60
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.000
Maximum Backdrop Height (m)	0.000
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.116	4-8	0.022

Total Area Contributing (ha) = 0.138

Total Pipe Volume (m³) = 3.029

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
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Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
20	112.550	1.000	Open Manhole	1200	1.000	111.550	225				
21	112.100	0.700	Open Manhole	475	2.000	111.400	225				
22	112.100	0.800	Open Manhole	1200	1.001	111.300	225	1.000	111.300	225	
								2.000	111.300	225	
ATT TANK	112.200	2.100	Open Manhole	1200	3.000	110.100	225				
FCC B	112.100	2.100	Open Manhole	1800	1.002	110.000	225	1.001	110.000	225	
								3.000	110.099	225	
Headwall 2	111.800	1.850	Open Manhole	0		OUTFALL		1.002	109.950	225	

No coordinates have been specified, layout information cannot be produced.

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Innovyze	Network 2020.1												
<u>Surcharged Outfall Details for Storm</u>													
Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
169	0.500	197	0.500	225	0.500	253	0.500	281	0.500	309	0.500	337	0.500
170	0.500	198	0.500	226	0.500	254	0.500	282	0.500	310	0.500	338	0.500
171	0.500	199	0.500	227	0.500	255	0.500	283	0.500	311	0.500	339	0.500
172	0.500	200	0.500	228	0.500	256	0.500	284	0.500	312	0.500	340	0.500
173	0.500	201	0.500	229	0.500	257	0.500	285	0.500	313	0.500	341	0.500
174	0.500	202	0.500	230	0.500	258	0.500	286	0.500	314	0.500	342	0.500
175	0.500	203	0.500	231	0.500	259	0.500	287	0.500	315	0.500	343	0.500
176	0.500	204	0.500	232	0.500	260	0.500	288	0.500	316	0.500	344	0.500
177	0.500	205	0.500	233	0.500	261	0.500	289	0.500	317	0.500	345	0.500
178	0.500	206	0.500	234	0.500	262	0.500	290	0.500	318	0.500	346	0.500
179	0.500	207	0.500	235	0.500	263	0.500	291	0.500	319	0.500	347	0.500
180	0.500	208	0.500	236	0.500	264	0.500	292	0.500	320	0.500	348	0.500
181	0.500	209	0.500	237	0.500	265	0.500	293	0.500	321	0.500	349	0.500
182	0.500	210	0.500	238	0.500	266	0.500	294	0.500	322	0.500	350	0.500
183	0.500	211	0.500	239	0.500	267	0.500	295	0.500	323	0.500	351	0.500
184	0.500	212	0.500	240	0.500	268	0.500	296	0.500	324	0.500	352	0.500
185	0.500	213	0.500	241	0.500	269	0.500	297	0.500	325	0.500	353	0.500
186	0.500	214	0.500	242	0.500	270	0.500	298	0.500	326	0.500	354	0.500
187	0.500	215	0.500	243	0.500	271	0.500	299	0.500	327	0.500	355	0.500
188	0.500	216	0.500	244	0.500	272	0.500	300	0.500	328	0.500	356	0.500
189	0.500	217	0.500	245	0.500	273	0.500	301	0.500	329	0.500	357	0.500
190	0.500	218	0.500	246	0.500	274	0.500	302	0.500	330	0.500	358	0.500
191	0.500	219	0.500	247	0.500	275	0.500	303	0.500	331	0.500	359	0.500
192	0.500	220	0.500	248	0.500	276	0.500	304	0.500	332	0.500	360	0.500
193	0.500	221	0.500	249	0.500	277	0.500	305	0.500	333	0.500		
194	0.500	222	0.500	250	0.500	278	0.500	306	0.500	334	0.500		
195	0.500	223	0.500	251	0.500	279	0.500	307	0.500	335	0.500		
196	0.500	224	0.500	252	0.500	280	0.500	308	0.500	336	0.500		
<u>Simulation Criteria for Storm</u>													
Volumetric Runoff Coeff 0.750		Additional Flow - % of Total Flow 0.000											
Areal Reduction Factor 1.000		MADD Factor * 10m³/ha Storage 2.000											
Hot Start (mins) 0		Inlet Coeffiecient 0.800											
Hot Start Level (mm) 0		Flow per Person per Day (l/per/day) 0.000											
Manhole Headloss Coeff (Global) 0.500		Run Time (mins) 60											
Foul Sewage per hectare (l/s) 0.000		Output Interval (mins) 1											
Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0 Number of Online Controls 1 Number of Storage Structures 2 Number of Real Time Controls 0													
<u>Synthetic Rainfall Details</u>													
Rainfall Model FSR Return Period (years) 100													
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Date 23/07/2025 15:09 File STORM B 22.06.22.MDX	Designed by Ben Lee Checked by																	
Innovyze	Network 2020.1																	
Synthetic Rainfall Details <table><tr><td>Region</td><td>England and Wales</td><td>Cv (Summer)</td><td>0.750</td></tr><tr><td>M5-60 (mm)</td><td>19.000</td><td>Cv (Winter)</td><td>0.840</td></tr><tr><td>Ratio R</td><td>0.373</td><td>Storm Duration (mins)</td><td>30</td></tr><tr><td>Profile Type</td><td>Summer</td><td></td><td></td></tr></table>			Region	England and Wales	Cv (Summer)	0.750	M5-60 (mm)	19.000	Cv (Winter)	0.840	Ratio R	0.373	Storm Duration (mins)	30	Profile Type	Summer		
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Online Controls for Storm																																																																													
Hydro-Brake® Optimum Manhole: FCC B, DS/PN: 1.002, Volume (m³): 6.9																																																																													
Unit Reference MD-SHE-0176-1500-0900-1500 Design Head (m)0.900 Design Flow (l/s)15.0 Flush-Flo™Calculated ObjectiveMinimise upstream storage ApplicationSurface Sump AvailableYes Diameter (mm)176 Invert Level (m)110.000 Minimum Outlet Pipe Diameter (mm)225 Suggested Manhole Diameter (mm)1200																																																																													
<table><tr><td>Control Points</td><td>Head (m)</td><td>Flow (l/s)</td><td>Control Points</td><td>Head (m)</td><td>Flow (l/s)</td></tr><tr><td>Design Point (Calculated)</td><td>0.900</td><td>15.0</td><td>Kick-Flo®</td><td>0.648</td><td>12.8</td></tr><tr><td>Flush-Flo™</td><td>0.303</td><td>15.0</td><td>Mean Flow over Head Range</td><td>-</td><td>12.6</td></tr></table>						Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	0.900	15.0	Kick-Flo®	0.648	12.8	Flush-Flo™	0.303	15.0	Mean Flow over Head Range	-	12.6																																																						
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The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated																																																																													
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Storage Structures for Storm

Porous Car Park Manhole: 20, DS/PN: 1.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	65.0
Max Percolation (l/s)	180.6	Slope (1:X)	50.0
Safety Factor	2.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	111.550	Cap Volume Depth (m)	0.350

Tank or Pond Manhole: ATT TANK, DS/PN: 3.000

Invert Level (m) 110.100

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	38.0	0.700	38.0	1.400	0.0	2.100	0.0
0.100	38.0	0.800	38.0	1.500	0.0	2.200	0.0
0.200	38.0	0.801	0.0	1.600	0.0	2.300	0.0
0.300	38.0	1.000	0.0	1.700	0.0	2.400	0.0
0.400	38.0	1.100	0.0	1.800	0.0	2.500	0.0
0.500	38.0	1.200	0.0	1.900	0.0		
0.600	38.0	1.300	0.0	2.000	0.0		

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1000 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.373
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1000
Climate Change (%) 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	20	15 Winter	1000	+0%					111.633
2.000	21	15 Winter	1000	+0%					111.478
1.001	22	15 Winter	1000	+0%					111.413
3.000	ATT TANK	30 Winter	1000	+0%	1000/15 Summer				110.886
1.002	FCC B	30 Winter	1000	+0%	1000/15 Summer				110.892

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	20	-0.142	0.000	0.29	5	15.2	OK	
2.000	21	-0.147	0.000	0.26		11.8	OK	
1.001	22	-0.112	0.000	0.48		47.3	OK	
3.000	ATT TANK	0.561	0.000	0.90		13.3	SURCHARGED	



Micro
Drainage

1000 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Surcharged	Flooded			Half Drain	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)		
1.002	FCC B	0.667	0.000	0.47			15.0	SURCHARGED	