

Drainage Design Report



Flow

V8.1

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**Project Reference &
Site Location** **359-18 Cinders Barn Ruabon**

File Name **359-18 Surface Water Calculations 30% Reduced 01.pfd**

Network **Storm Network**

Last analysed 02/08/2019 12:08:46

Report produced on 02/08/2019 13:04:43

Flow Control **78mm Orifice Plate**

Revisions

Rainfall Methodology	FSR
Return Period (years)	100
Additional Flow (%)	0
FSR Region	England and Wales
M5-60 (mm)	17.000
Ratio-R	0.300
CV	0.750
Time of Entry (mins)	2.00
Maximum Time of Concentration (mins)	30.00
Maximum Rainfall (mm/hr)	50.0
Minimum Velocity (m/s)	1.00
Connection Type	Level Soffits
Minimum Backdrop Height (m)	0.200
Preferred Cover Depth (m)	1.200
Include Intermediate Ground	✓
Enforce best practice design rules	✓

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Width (mm)	Depth (m)	Notes
S1	0.007	2.00	98.100	Manhole	Private	450		1.000	
S2	0.009	2.00	98.200	Manhole	Private	450		1.350	
S3			97.730	Manhole	Private	750	600	1.118	
C5			97.730	Manhole	Private	450		1.160	
H1			97.730	Junction				1.179	

Flow v8.1 Design Report: Links (Input)

Name	US Node	DS Node	Length (m)	ks (mm) / n	Velocity Equation	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type	T of C (mins)	Rain (mm/hr)
S1 - S2	S1	S2	7.000	0.600	Colebrook-White	97.100	96.850	0.250	28.0	150	Circular	2.06	50.0
S2 - S3	S2	S3	19.000	0.600	Colebrook-White	96.850	96.612	0.238	80.0	150	Circular	2.34	50.0
S3 - C5	S3	C5	3.400	0.600	Colebrook-White	96.612	96.570	0.042	80.0	150	Circular	2.39	50.0
C5 - H1	C5	H1	1.500	0.600	Colebrook-White	96.570	96.551	0.019	80.0	150	Circular	2.42	50.0

Flow v8.1 Design Report: Links (Results)

Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Minimum Depth (m)	Maximum Depth (m)	Σ Area (ha)	Σ Add Inflow (ha)	Pro Depth (mm)	Pro Velocity (m/s)
S1 - S2	S1	S2	1.910	33.7	0.9	0.850	1.200	0.850	1.200	0.007	0.0	17	0.836
S2 - S3	S2	S3	1.125	19.9	2.2	1.200	0.968	0.968	1.200	0.016	0.0	34	0.743
S3 - C5	S3	C5	1.125	19.9	2.2	0.968	1.010	0.968	1.010	0.016	0.0	34	0.743
C5 - H1	C5	H1	1.125	19.9	2.2	1.010	1.029	1.010	1.029	0.016	0.0	34	0.743

Flow v8.1 Design Report: Pipeline Schedule

Link Name	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)	US Node Name	Dia (mm)	Width (mm)	Node Type	MH Type	DS Node Name	Dia (mm)	Width (mm)	Node Type	MH Type
S1 - S2	7.000	28.0	150	Circular	98.100	97.100	0.850	98.200	96.850	1.200	S1	450		Manhole	Private	S2	450		Manhole	Private
S2 - S3	19.000	80.0	150	Circular	98.200	96.850	1.200	97.730	96.612	0.968	S2	450		Manhole	Private	S3	750	600	Manhole	Private
S3 - C5	3.400	80.0	150	Circular	97.730	96.612	0.968	97.730	96.570	1.010	S3	750	600	Manhole	Private	C5	450		Manhole	Private
C5 - H1	1.500	80.0	150	Circular	97.730	96.570	1.010	97.730	96.551	1.029	C5	450		Manhole	Private	H1			Junction	

Rainfall Methodology	FSR		Return Period (years)	Climate Change (%)
FSR Region	England and Wales		100	35
M5-60 (mm)	17.000			
Ratio-R	0.300			
Summer CV	0.750			
Winter CV	0.840			
Analysis Speed	Detailed			
Skip Steady State	x			
Drain Down Time (mins)	240			
Additional Storage (m³/ha)	0.0			
Storm Durations (mins)	15			
	30			
	60			
	120			
	180			
	240			
	360			
	480			
	600			
	720			
	960			
	1440			

<u>Orifice</u>									
Node	Flap Valve	Online / Offline	Replaces Downstream Link	Loop to Node	Invert Level (m)	Design Depth (m)	Design Flow (l/s)	Diameter (m)	Discharge Coefficient
S3	x	Online	✓		96.612	0.900	6.8	0.078	0.600

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +35% 15 minute summer	355.680	100.645
100 year +35% 15 minute winter	249.600	100.645
100 year +35% 30 minute summer	245.990	69.607
100 year +35% 30 minute winter	172.625	69.607
100 year +35% 60 minute summer	174.491	46.113
100 year +35% 60 minute winter	115.928	46.113
100 year +35% 120 minute summer	111.942	29.583
100 year +35% 120 minute winter	74.372	29.583
100 year +35% 180 minute summer	87.390	22.488
100 year +35% 180 minute winter	56.806	22.488
100 year +35% 240 minute summer	69.529	18.374
100 year +35% 240 minute winter	46.193	18.374
100 year +35% 360 minute summer	53.204	13.691
100 year +35% 360 minute winter	34.584	13.691
100 year +35% 480 minute summer	42.061	11.115
100 year +35% 480 minute winter	27.944	11.115
100 year +35% 600 minute summer	34.537	9.447
100 year +35% 600 minute winter	23.598	9.447
100 year +35% 720 minute summer	30.841	8.266
100 year +35% 720 minute winter	20.727	8.266
100 year +35% 960 minute summer	25.396	6.687
100 year +35% 960 minute winter	16.823	6.687
100 year +35% 1440 minute summer	18.467	4.949
100 year +35% 1440 minute winter	12.411	4.949

Results for 100 year +35% Critical Storm Duration. Lowest mass balance: 100.00%															
Event	US Node ID	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status	Link ID	DS Node ID	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1	9	97.136	0.036	4.3	0.0058	0.0000	OK	S1 - S2	S2	4.3	0.750	0.127	0.0539	
15 minute summer	S2	10	96.954	0.104	9.8	0.0165	0.0000	OK	S2 - S3	S3	8.7	0.671	0.438	0.2911	
15 minute summer	S3	10	96.933	0.321	8.7	0.1447	0.0000	SURCHARGED	Orifice	C5	6.8				
15 minute summer	C5	10	96.636	0.066	6.8	0.0105	0.0000	OK	C5 - H1	H1	6.8	0.965	0.340	0.0105	3.0
15 minute summer	H1	10	96.611	0.060	6.8	0.0000	0.0000	OK							