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28 Castle Street Carlisle CA3 8TP	Nethertown Rd, St Bees Plot 3 soakaway	
Date 17/08/2021 14:56 File PLOT 3.MDX	Designed by SM Checked by	
Micro Drainage	Network 2020.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100
M5-60 (mm)	16.000
Ratio R	0.274
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	1.000
PIMP (%)	100
Add Flow / Climate Change (%)	40
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
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


Simulation Criteria for Storm

Volumetric Runoff Coeff	0.850	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m <sup>3</sup> /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	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 Storage Structures	1
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.850
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	16.000	Storm Duration (mins)	30
Ratio R	0.274		

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Storage Structures for Storm

Cellular Storage Manhole: S2, DS/PN: S1.001

Invert Level (m)    36.800  
 Infiltration Coefficient Base (m/hr) 0.06050  
 Infiltration Coefficient Side (m/hr) 0.06050  
 Safety Factor        2.0  
 Porosity             0.95

Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )
0.000	30.0	30.0	0.401	0.0	40.4
0.400	30.0	40.4			

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1 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 \* 10m<sup>3</sup>/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 Storage Structures 1  
Number of Online Controls 0      Number of Time/Area Diagrams 0  
Number of Offline Controls 0      Number of Real Time Controls 0

Synthetic Rainfall Details


Rainfall Model      FSR      Ratio R 0.274  
Region England and Wales Cv (Summer) 0.850  
M5-60 (mm)      16.000 Cv (Winter) 0.950

Margin for Flood Risk Warning (mm) 300.0      DVD Status OFF  
Analysis Timestep      Fine Inertia Status OFF  
DTS Status      ON

Profile(s)      Summer and Winter  
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360  
Return Period(s) (years) 1, 30, 100  
Climate Change (%) 0, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1	15 Winter	1	+0%	100/15 Winter			
S1.001	S2	240 Winter	1	+0%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m <sup>3</sup> )	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Level Status Exceeded
S1.000	S1	37.652	-0.098	0.000	0.25		2.3	OK
S1.001	S2	36.859	-0.891	0.000	0.00	108	0.0	OK

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30 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 Storage Structures 1  
Number of Online Controls 0    Number of Time/Area Diagrams 0  
Number of Offline Controls 0    Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model    FSR    Ratio R 0.274  
Region England and Wales Cv (Summer) 0.850  
M5-60 (mm)    16.000 Cv (Winter) 0.950

Margin for Flood Risk Warning (mm) 300.0    DVD Status OFF  
Analysis Timestep    Fine Inertia Status OFF  
DTS Status    ON


Profile(s)    Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360  
Return Period(s) (years) 1, 30, 100  
Climate Change (%) 0, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1	15 Winter	30	+40%	100/15 Winter			
S1.001	S2	360 Winter	30	+40%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S1	37.709	-0.041	0.000	0.86			7.7	FLOOD RISK
S1.001	S2	37.075	-0.675	0.000	0.00		300	0.0	OK

PN	US/MH Name	Level Exceeded
S1.000	S1	
S1.001	S2	

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100 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 Storage Structures 1  
Number of Online Controls 0    Number of Time/Area Diagrams 0  
Number of Offline Controls 0    Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model    FSR    Ratio R 0.274  
Region England and Wales Cv (Summer) 0.850  
M5-60 (mm)    16.000 Cv (Winter) 0.950

Margin for Flood Risk Warning (mm) 300.0    DVD Status OFF  
Analysis Timestep    Fine Inertia Status OFF  
DTS Status    ON

Profile(s)    Summer and Winter  
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360  
Return Period(s) (years) 1, 30, 100  
Climate Change (%) 0, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1	15 Winter	100	+40%	100/15 Winter			
S1.001	S2	360 Winter	100	+40%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S1	37.754	0.004	0.000	1.07			9.7	FLOOD RISK
S1.001	S2	37.185	-0.565	0.000	0.00		330	0.0	OK

PN	US/MH Name	Level Exceeded
S1.000	S1	
S1.001	S2	