

Coast Consulting Engineers Ltd										Page 0	
Suite 6, Vita House Fish Quay North Shields NE30 1JA					WATERS EDGE STORY HOMES						
Date 28/09/2021					Designed by RH						
File 210902 Waters Edge.MDX					Checked by PL						
Innovyze					Network 2020.1						
<u>STORM SEWER DESIGN by the Modified Rational Method</u>											
<u>Network Design Table for 210902 COAST.SWS</u>											
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
1.000	28.454	0.592	48.1	0.146	5.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	23.478	0.154	152.5	0.049	5.00	0.0	0.600	o	225	Pipe/Conduit	
3.000	27.456	0.251	109.4	0.065	5.00	0.0	0.600	o	225	Pipe/Conduit	
2.001	11.033	0.066	167.2	0.006	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.002	32.419	0.363	89.3	0.091	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	24.849	0.105	236.7	0.041	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.002	48.233	0.781	61.8	0.064	0.00	0.0	0.600	o	300	Pipe/Conduit	
4.000	17.015	0.033	515.6	0.047	5.00	0.0	0.600	o	900	Pipe/Conduit	
4.001	10.120	0.033	306.7	0.019	0.00	0.0	0.600	o	900	Pipe/Conduit	
1.003	30.214	0.045	671.4	0.052	0.00	0.0	0.600	o	900	Pipe/Conduit	
1.004	6.917	0.125	55.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.005	21.476	0.689	31.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
<u>Network Results Table</u>											
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)	
1.000	0.00	5.25	93.112	0.146	0.0	0.0	0.0	1.89	75.2	0.0	
2.000	0.00	5.37	93.103	0.049	0.0	0.0	0.0	1.06	42.0	0.0	
3.000	0.00	5.37	93.200	0.065	0.0	0.0	0.0	1.25	49.7	0.0	
2.001	0.00	5.55	92.949	0.120	0.0	0.0	0.0	1.01	40.1	0.0	
2.002	0.00	5.94	92.883	0.211	0.0	0.0	0.0	1.38	55.0	0.0	
1.001	0.00	6.35	92.445	0.398	0.0	0.0	0.0	1.02	71.9	0.0	
1.002	0.00	6.75	92.340	0.462	0.0	0.0	0.0	2.00	141.7	0.0	
4.000	0.00	5.21	91.025	0.047	0.0	0.0	0.0	1.37	873.4	0.0	
4.001	0.00	5.30	90.992	0.066	0.0	0.0	0.0	1.78	1134.9	0.0	
1.003	0.00	7.17	90.959	0.580	0.0	0.0	0.0	1.20	764.4	0.0	
1.004	0.00	7.22	90.914	0.580	0.0	0.0	0.0	2.12	149.7	0.0	
1.005	0.00	7.35	90.789	0.580	0.0	0.0	0.0	2.83	199.8	0.0	
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Suite 6, Vita House
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North Shields NE30 1JA

Date 28/09/2021
File 210902 Waters Edge.MDX

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WATERS EDGE
STORY HOMES

Designed by RH
Checked by PL

Network 2020.1

Page 1



STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for 210902 COAST.SWS

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
1.006	73.572	0.845	87.1	0.070	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.007	17.057	1.246	13.7	0.072	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.008	8.804	0.987	8.9	0.029	0.00	0.0	0.600	o	300	Pipe/Conduit	
5.000	15.717	0.692	22.7	0.192	5.00	0.0	0.600	o	150	Pipe/Conduit	
6.000	22.811	0.407	56.0	0.086	5.00	0.0	0.600	o	150	Pipe/Conduit	
6.001	25.533	0.458	55.7	0.048	0.00	0.0	0.600	o	150	Pipe/Conduit	
5.001	47.526	2.784	17.1	0.085	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.009	4.121	0.567	7.3	0.085	0.00	0.0	0.600	o	300	Pipe/Conduit	
7.000	14.555	0.391	37.2	0.063	5.00	0.0	0.600	o	150	Pipe/Conduit	
7.001	40.117	0.338	118.7	0.138	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.010	55.804	2.979	18.7	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.011	28.556	3.245	8.8	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	

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)
1.006	0.00	8.08	90.100	0.650	0.0	0.0	0.0	1.69	119.2	0.0
1.007	0.00	8.15	89.255	0.722	0.0	0.0	0.0	4.27	301.9	0.0
1.008	0.00	8.17	88.009	0.751	0.0	0.0	0.0	5.29	374.3	0.0
5.000	0.00	5.12	91.324	0.192	0.0	0.0	0.0	2.12	37.5	0.0
6.000	0.00	5.28	91.497	0.086	0.0	0.0	0.0	1.35	23.8	0.0
6.001	0.00	5.60	91.090	0.134	0.0	0.0	0.0	1.35	23.9	0.0
5.001	0.00	5.85	90.557	0.411	0.0	0.0	0.0	3.18	126.5	0.0
1.009	0.00	8.18	87.022	1.247	0.0	0.0	0.0	5.87	414.7	0.0
7.000	0.00	5.15	87.334	0.063	0.0	0.0	0.0	1.65	29.2	0.0
7.001	0.00	5.70	86.868	0.201	0.0	0.0	0.0	1.20	47.7	0.0
1.010	0.00	8.41	86.380	1.448	0.0	0.0	0.0	4.20	464.2	0.0
1.011	0.00	8.48	83.401	1.448	0.0	0.0	0.0	6.14	678.0	0.0

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Suite 6, Vita House Fish Quay North Shields NE30 1JA	WATERS EDGE STORY HOMES																					
Date 28/09/2021 File 210902 Waters Edge.MDX	Designed by RH Checked by PL																					
Innovyze Network 2020.1																						
Simulation Criteria for 210902 COAST.SWS <table><tr><td>Rainfall Model</td><td>FSR</td><td>Profile Type</td><td>Summer</td></tr><tr><td>Return Period (years)</td><td>2</td><td>Cv (Summer)</td><td>0.750</td></tr><tr><td>Region</td><td>England and Wales</td><td>Cv (Winter)</td><td>0.840</td></tr><tr><td>M5-60 (mm)</td><td>16.000</td><td>Storm Duration (mins)</td><td>30</td></tr><tr><td>Ratio R</td><td>0.260</td><td></td><td></td></tr></table>			Rainfall Model	FSR	Profile Type	Summer	Return Period (years)	2	Cv (Summer)	0.750	Region	England and Wales	Cv (Winter)	0.840	M5-60 (mm)	16.000	Storm Duration (mins)	30	Ratio R	0.260		
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Coast Consulting Engineers Ltd			Page 4																																																																									
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Hydro-Brake® Optimum Manhole: G5HB, DS/PN: 1.004, Volume (m³): 25.1																																																																												
Unit Reference MD-SHE-0093-6000-2772-6000 Design Head (m)2.772 Design Flow (l/s)6.0 Flush-Flo™Calculated ObjectiveMinimise upstream storage ApplicationSurface Sump AvailableYes Diameter (mm)93 Invert Level (m)90.914 Minimum Outlet Pipe Diameter (mm)150 Suggested Manhole Diameter (mm)1200																																																																												
<table><tr><th>Control Points</th><th>Head (m)</th><th>Flow (l/s)</th><th>Control Points</th><th>Head (m)</th><th>Flow (l/s)</th></tr><tr><td>Design Point (Calculated)</td><td>2.772</td><td>6.0</td><td>Kick-Flo®</td><td>0.828</td><td>3.4</td></tr><tr><td>Flush-Flo™</td><td>0.404</td><td>4.3</td><td>Mean Flow over Head Range</td><td>-</td><td>4.5</td></tr></table>					Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	2.772	6.0	Kick-Flo®	0.828	3.4	Flush-Flo™	0.404	4.3	Mean Flow over Head Range	-	4.5																																																						
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Hydro-Brake® Optimum Manhole: S14 HB, DS/PN: 1.008, Volume (m³): 5.3																																																																												
Unit Reference MD-SHE-0107-6200-1653-6200 Design Head (m)1.653 Design Flow (l/s)6.2 Flush-Flo™Calculated ObjectiveMinimise upstream storage ApplicationSurface Sump AvailableYes Diameter (mm)107 Invert Level (m)88.009 Minimum Outlet Pipe Diameter (mm)150																																																																												
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Coast Consulting Engineers Ltd				Page 5			
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<u>Hydro-Brake® Optimum Manhole: S14 HB, DS/PN: 1.008, Volume (m³): 5.3</u>							
Suggested Manhole Diameter (mm) 1200							
Control Points		Head (m)	Flow (l/s)	Control Points		Head (m)	Flow (l/s)
Design Point (Calculated)		1.653	6.2	Kick-Flo®		0.955	4.8
Flush-Flo™		0.469	6.0	Mean Flow over Head Range		-	5.3
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							
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.7	1.200	5.3	3.000	8.2	7.000	12.2
0.200	5.3	1.400	5.7	3.500	8.8	7.500	12.7
0.300	5.8	1.600	6.1	4.000	9.4	8.000	13.1
0.400	6.0	1.800	6.4	4.500	9.9	8.500	13.4
0.500	6.0	2.000	6.8	5.000	10.4	9.000	13.8
0.600	5.9	2.200	7.1	5.500	10.9	9.500	14.2
0.800	5.6	2.400	7.4	6.000	11.4		
1.000	4.9	2.600	7.7	6.500	11.8		
<u>Hydro-Brake® Optimum Manhole: S25 H-B, DS/PN: 1.014, Volume (m³): 6.6</u>							
Unit Reference MD-SHE-0144-1580-3510-1580							
Design Head (m)				3.510			
Design Flow (l/s)				15.8			
Flush-Flo™				Calculated			
Objective				Minimise upstream storage			
Application				Surface			
Sump Available				Yes			
Diameter (mm)				144			
Invert Level (m)				77.971			
Minimum Outlet Pipe Diameter (mm)				225			
Suggested Manhole Diameter (mm)				1500			
Control Points		Head (m)	Flow (l/s)	Control Points		Head (m)	Flow (l/s)
Design Point (Calculated)		3.510	15.8	Kick-Flo®		1.287	9.8
Flush-Flo™		0.623	12.5	Mean Flow over Head Range		-	12.2
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							
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.2	0.200	10.2	0.300	11.4	0.400	12.1
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Coast Consulting Engineers Ltd		Page 7
Suite 6, Vita House Fish Quay North Shields NE30 1JA	WATERS EDGE STORY HOMES	
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File 210902 Waters Edge.MDX	Checked by PL	
Innovyze	Network 2020.1	

Storage Structures for 210902 COAST.SWS

Cellular Storage Manhole: G5HB, DS/PN: 1.004

Invert Level (m) 90.914 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	0.0	0.0	2.221	232.0	0.0
0.620	0.0	0.0	2.222	0.0	0.0
0.621	232.0	0.0			

Cellular Storage Manhole: S14 HB, DS/PN: 1.008

Invert Level (m) 88.209 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	0.0	0.0	1.100	108.0	0.0
0.299	0.0	0.0	1.101	0.0	0.0
0.300	108.0	0.0			

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Page 8

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Micro Drainage

Summary of Critical Results by Maximum Level (Rank 1) for 210902 COAST.SWS

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 Coeffiecient 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 3

Number of Storage Structures 2

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR

Ratio R 0.259

Region England and Wales Cv (Summer) 0.750

M5-60 (mm) 16.000

Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep 2.5

Second Increment (Extended)

DTS Status OFF

DVD Status OFF

Inertia Status OFF

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440

Return Period(s) (years) 2

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

G1

15 Winter

2

+0%

93.190

2.000

G8

15 Winter

2

+0%

93.163

3.000

G11

15 Winter

2

+0%

93.264

2.001

G9

15 Winter

2

+0%

93.052

2.002

G10

15 Winter

2

+0%

92.991

1.001

G2

15 Winter

2

+0%

92.634

1.002

G3

15 Winter

2

+0%

92.470

4.000

G6

240 Winter

2

+0%

91.655

4.001

G7

240 Winter

2

+0%

91.656

1.003

G4

240 Winter

2

+0%

91.656

1.004

G5HB

240 Winter

2

+0%

2/15 Summer

91.655

1.005

S8

1440 Winter

2

+0%

90.820

1.006

S9

15 Winter

2

+0%

90.164

1.007

S10

15 Winter

2

+0%

89.309

1.008

S14 HB

120 Winter

2

+0%

2/15 Summer

88.615

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Coast Consulting Engineers Ltd		Page 9
Suite 6, Vita House Fish Quay North Shields NE30 1JA	WATERS EDGE STORY HOMES	
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Summary of Critical Results by Maximum Level (Rank 1) for 210902 COAST.SWS

PN	US/MH Name	Surcharged Flooded			Half Drain Pipe		Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Overflow Cap. (l/s)	Time (mins)	Flow (l/s)		
1.000	G1	-0.147	0.000	0.26		18.1	OK	
2.000	G8	-0.165	0.000	0.16		6.0	OK	
3.000	G11	-0.161	0.000	0.17		7.9	OK	
2.001	G9	-0.122	0.000	0.43		14.7	OK	
2.002	G10	-0.117	0.000	0.46		23.9	OK	
1.001	G2	-0.111	0.000	0.71		45.4	OK	
1.002	G3	-0.170	0.000	0.39		51.9	OK	
4.000	G6	-0.270	0.000	0.00		1.4	OK	
4.001	G7	-0.236	0.000	0.00		1.5	OK	
1.003	G4	-0.203	0.000	0.03		17.4	OK	
1.004	G5HB	0.441	0.000	0.05	147	4.3	SURCHARGED	
1.005	S8	-0.269	0.000	0.02		4.3	OK	
1.006	S9	-0.236	0.000	0.10		11.4	OK	
1.007	S10	-0.246	0.000	0.07		18.9	OK	
1.008	S14 HB	0.306	0.000	0.02	69	6.0	SURCHARGED	

									Water
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)
5.000	S1	15	Winter	2	+0%				91.417
6.000	S6	15	Winter	2	+0%				91.570
6.001	S7	15	Winter	2	+0%				91.183
5.001	S2	15	Winter	2	+0%				90.656
1.009	S3	15	Winter	2	+0%				87.142
7.000	S11	15	Winter	2	+0%				87.389
7.001	S12	15	Winter	2	+0%				86.981
1.010	S4	15	Winter	2	+0%				86.493
1.011	S15	15	Winter	2	+0%				83.495
1.012	SBD	240	Winter	2	+0%				79.040
1.013	S17A	240	Winter	2	+0%	2/15	Summer		79.040
1.014	S25 H-B	180	Winter	2	+0%	2/15	Summer		79.149
1.015	S18	960	Winter	2	+0%				77.274
1.016	S19	1440	Winter	2	+0%				74.451
1.017	S20	1440	Winter	2	+0%				69.987
1.018	35	1440	Winter	2	+0%				69.892

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