

Coast Consulting Engineers Ltd

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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

Micro Drainage

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	k (l/s)	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	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow	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 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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Online Controls for 210902 COAST.SWS																																																																												
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																																																																												
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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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<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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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

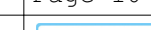
Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	0.0	0.0	1.100	108.0	0.0
0.299	0.0	0.0	1.101	0.0	0.0
0.300	108.0	0.0			

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<u>Summary of Critical Results by Maximum Level (Rank 1) for 210902 COAST.SWS</u>								
<u>Simulation Criteria</u>								
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 3 Number of Storage Structures 2 Number of Real Time Controls 0								
<u>Synthetic Rainfall Details</u>								
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) 30								
Climate Change (%) 0								

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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	-0.114	0.000	0.48		33.8	OK	
2.000	G8	-0.141	0.000	0.29		11.1	OK	
3.000	G11	-0.136	0.000	0.32		14.8	OK	
2.001	G9	-0.045	0.000	0.83		28.0	OK	
2.002	G10	-0.017	0.000	0.87		44.7	OK	
1.001	G2	0.073	0.000	1.34		85.8	SURCHARGED	
1.002	G3	-0.106	0.000	0.74		98.2	OK	
4.000	G6	0.067	0.000	0.00		1.9	SURCHARGED	
4.001	G7	0.100	0.000	0.00		2.3	SURCHARGED	
1.003	G4	0.133	0.000	0.05		24.4	SURCHARGED	
1.004	G5HB	0.778	0.000	0.05	334	4.3	SURCHARGED	
1.005	S8	-0.269	0.000	0.02		4.3	OK	
1.006	S9	-0.212	0.000	0.18		21.0	OK	
1.007	S10	-0.222	0.000	0.15		38.7	OK	
1.008	S14 HB	0.511	0.000	0.02	158	6.0	SURCHARGED	

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

									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	30	+0%	30/15 Summer				91.669
6.000	S6	15 Winter	30	+0%	30/15 Winter				91.668
6.001	S7	15 Winter	30	+0%	30/15 Summer				91.416
5.001	S2	15 Winter	30	+0%					90.697
1.009	S3	15 Winter	30	+0%					87.188
7.000	S11	15 Winter	30	+0%					87.413
7.001	S12	15 Winter	30	+0%	30/15 Summer				87.109
1.010	S4	15 Winter	30	+0%					86.535
1.011	S15	15 Winter	30	+0%					83.531
1.012	SBD	480 Winter	30	+0%					79.646
1.013	S17A	480 Winter	30	+0%	30/15 Summer				79.646
1.014	S25 H-B	480 Winter	30	+0%	30/15 Summer				79.761
1.015	S18	1440 Winter	30	+0%					77.274
1.016	S19	1440 Winter	30	+0%					74.451
1.017	S20	1440 Winter	30	+0%					69.987
1.018	35	1440 Winter	30	+0%					69.892

		Surcharged	Flooded			Half Drain	Pipe		
	US/MH	Depth	Volume	Flow /	Overflow	Time	Flow		Level
PN	Name	(m)	(m³)	Cap.	(l/s)	(mins)	(l/s)	Status	Exceeded
5.000	S1	0.195	0.000	1.13			39.1	SURCHARGED	
6.000	S6	0.021	0.000	0.81			18.2	SURCHARGED	
6.001	S7	0.176	0.000	1.18			26.7	SURCHARGED	
5.001	S2	-0.085	0.000	0.69			83.5	OK	
1.009	S3	-0.134	0.000	0.58			108.7	OK	
7.000	S11	-0.071	0.000	0.54			14.5	OK	
7.001	S12	0.016	0.000	1.03			46.5	SURCHARGED	
1.010	S4	-0.220	0.000	0.36			155.0	OK	
1.011	S15	-0.245	0.000	0.26			155.2	OK	
1.012	SBD	-1.368	0.000	0.00			32.3	OK	
1.013	S17A	0.943	0.000	0.06			18.3	SURCHARGED	
1.014	S25 H-B	1.565	0.000	0.17			11.9	SURCHARGED	
1.015	S18	-0.170	0.000	0.14			11.9	OK	
1.016	S19	-0.176	0.000	0.11			11.9	OK	
1.017	S20	-0.146	0.000	0.27			11.9	OK	
1.018	35	-0.144	0.000	0.28			11.9	OK	