

Appendix H – Whole Site Area

Rennard Consulting Limited					Page 1	
Ebenezer House Ryecroft Newcastle ST5 2BE			Royal Oak Residential Whole Site Attenuation 1 in 100 30CC			
Date 21/07/2024 22:15 File 2024.07.19 WHOLE SITE A...			Designed by FEG Checked by			
Innovyze			Source Control 2020.1.3			
<u>Summary of Results for 100 year Return Period (+30%)</u>						
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	
15 min Summer	9.877	0.377	2.9	2.6	Flood	Risk
30 min Summer	9.909	0.409	2.9	2.9	Flood	Risk
60 min Summer	9.872	0.372	2.9	2.6	Flood	Risk
120 min Summer	9.739	0.239	2.9	1.7	Flood	Risk
180 min Summer	9.646	0.146	2.9	1.0	O K	
240 min Summer	9.604	0.104	2.8	0.7	O K	
360 min Summer	9.579	0.079	2.1	0.6	O K	
480 min Summer	9.568	0.068	1.8	0.5	O K	
600 min Summer	9.561	0.061	1.5	0.4	O K	
720 min Summer	9.556	0.056	1.3	0.4	O K	
960 min Summer	9.549	0.049	1.0	0.3	O K	
1440 min Summer	9.541	0.041	0.8	0.3	O K	
2160 min Summer	9.534	0.034	0.6	0.2	O K	
2880 min Summer	9.530	0.030	0.4	0.2	O K	
4320 min Summer	9.526	0.026	0.3	0.2	O K	
5760 min Summer	9.523	0.023	0.3	0.2	O K	
7200 min Summer	9.521	0.021	0.2	0.1	O K	
8640 min Summer	9.519	0.019	0.2	0.1	O K	
10080 min Summer	9.518	0.018	0.2	0.1	O K	
15 min Winter	9.932	0.432	2.9	3.0	Flood	Risk
30 min Winter	9.958	0.458	2.9	3.2	Flood	Risk
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)		
15 min Summer	109.818	0.0	4.3	14		
30 min Summer	73.629	0.0	5.8	22		
60 min Summer	47.182	0.0	7.4	40		
120 min Summer	29.263	0.0	9.2	70		
180 min Summer	21.837	0.0	10.3	98		
240 min Summer	17.632	0.0	11.1	126		
360 min Summer	12.933	0.0	12.2	186		
480 min Summer	10.386	0.0	13.1	246		
600 min Summer	8.754	0.0	13.8	306		
720 min Summer	7.609	0.0	14.4	366		
960 min Summer	6.094	0.0	15.4	488		
1440 min Summer	4.449	0.0	16.8	718		
2160 min Summer	3.241	0.0	18.4	1088		
2880 min Summer	2.585	0.0	19.5	1444		
4320 min Summer	1.877	0.0	21.3	2148		
5760 min Summer	1.493	0.0	22.6	2912		
7200 min Summer	1.250	0.0	23.6	3552		
8640 min Summer	1.080	0.0	24.5	4272		
10080 min Summer	0.955	0.0	25.3	5056		
15 min Winter	109.818	0.0	4.8	15		
30 min Winter	73.629	0.0	6.5	24		
©1982-2020 Innovyze						

Rennard Consulting Limited					Page 2	
Ebenezer House Ryecroft Newcastle ST5 2BE			Royal Oak Residential Whole Site Attenuation 1 in 100 30CC			
Date 21/07/2024 22:15 File 2024.07.19 WHOLE SITE A...			Designed by FEG Checked by			
Innovyze			Source Control 2020.1.3			
<u>Summary of Results for 100 year Return Period (+30%)</u>						
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	
60 min Winter	9.885	0.385	2.9	2.7	Flood Risk	
120 min Winter	9.672	0.172	2.9	1.2	O K	
180 min Winter	9.597	0.097	2.6	0.7	O K	
240 min Winter	9.580	0.080	2.2	0.6	O K	
360 min Winter	9.564	0.064	1.6	0.4	O K	
480 min Winter	9.555	0.055	1.3	0.4	O K	
600 min Winter	9.550	0.050	1.1	0.3	O K	
720 min Winter	9.546	0.046	1.0	0.3	O K	
960 min Winter	9.541	0.041	0.8	0.3	O K	
1440 min Winter	9.534	0.034	0.6	0.2	O K	
2160 min Winter	9.529	0.029	0.4	0.2	O K	
2880 min Winter	9.526	0.026	0.3	0.2	O K	
4320 min Winter	9.522	0.022	0.2	0.2	O K	
5760 min Winter	9.519	0.019	0.2	0.1	O K	
7200 min Winter	9.518	0.018	0.2	0.1	O K	
8640 min Winter	9.516	0.016	0.1	0.1	O K	
10080 min Winter	9.515	0.015	0.1	0.1	O K	
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)		
60 min Winter	47.182	0.0	8.3	42		
120 min Winter	29.263	0.0	10.3	72		
180 min Winter	21.837	0.0	11.6	96		
240 min Winter	17.632	0.0	12.4	124		
360 min Winter	12.933	0.0	13.7	184		
480 min Winter	10.386	0.0	14.7	246		
600 min Winter	8.754	0.0	15.4	308		
720 min Winter	7.609	0.0	16.1	362		
960 min Winter	6.094	0.0	17.2	488		
1440 min Winter	4.449	0.0	18.8	734		
2160 min Winter	3.241	0.0	20.6	1072		
2880 min Winter	2.585	0.0	21.9	1468		
4320 min Winter	1.877	0.0	23.8	2220		
5760 min Winter	1.493	0.0	25.3	2896		
7200 min Winter	1.250	0.0	26.5	3664		
8640 min Winter	1.080	0.0	27.4	4320		
10080 min Winter	0.955	0.0	28.3	4968		
©1982-2020 Innovyze						

Rennard Consulting Limited		Page 3
Ebenezer House	Royal Oak Residential	
Ryecroft	Whole Site Attenuation	
Newcastle ST5 2BE	1 in 100 30CC	
Date 21/07/2024 22:15	Designed by FEG	
File 2024.07.19 WHOLE SITE A...	Checked by	
Innovyze	Source Control 2020.1.3	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.357	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.021

Time (mins)		Area
From:	To:	(ha)
0	4	0.021

Rennard Consulting Limited		Page 4																																																																																																																									
Ebenezer House Ryecroft Newcastle ST5 2BE	Royal Oak Residential Whole Site Attenuation 1 in 100 30CC																																																																																																																										
Date 21/07/2024 22:15 File 2024.07.19 WHOLE SITE A...	Designed by FEG Checked by																																																																																																																										
Innovyze	Source Control 2020.1.3																																																																																																																										
Model Details Storage is Online Cover Level (m) 10.000 Tank or Pond Structure Invert Level (m) 9.500 <table><tr><td>Depth (m)</td><td>Area (m²)</td><td>Depth (m)</td><td>Area (m²)</td><td>Depth (m)</td><td>Area (m²)</td></tr><tr><td>0.000</td><td>7.0</td><td>0.500</td><td>7.0</td><td>0.501</td><td>0.0</td></tr></table> Hydro-Brake® Optimum Outflow Control <table><tr><td>Unit Reference</td><td>MD-SHE-0088-2900-0500-2900</td></tr><tr><td>Design Head (m)</td><td>0.500</td></tr><tr><td>Design Flow (l/s)</td><td>2.9</td></tr><tr><td>Flush-Flo™</td><td>Calculated</td></tr><tr><td>Objective</td><td>Minimise upstream storage</td></tr><tr><td>Application</td><td>Surface</td></tr><tr><td>Sump Available</td><td>Yes</td></tr><tr><td>Diameter (mm)</td><td>88</td></tr><tr><td>Invert Level (m)</td><td>9.500</td></tr><tr><td>Minimum Outlet Pipe Diameter (mm)</td><td>150</td></tr><tr><td>Suggested Manhole Diameter (mm)</td><td>1200</td></tr></table> <table><tr><td>Control Points</td><td>Head (m)</td><td>Flow (l/s)</td></tr><tr><td>Design Point (Calculated)</td><td>0.500</td><td>2.9</td></tr><tr><td>Flush-Flo™</td><td>0.154</td><td>2.9</td></tr><tr><td>Kick-Flo®</td><td>0.352</td><td>2.5</td></tr><tr><td>Mean Flow over Head Range</td><td>-</td><td>2.4</td></tr></table> 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 <table><tr><td>Depth (m)</td><td>Flow (l/s)</td><td>Depth (m)</td><td>Flow (l/s)</td><td>Depth (m)</td><td>Flow (l/s)</td><td>Depth (m)</td><td>Flow (l/s)</td></tr><tr><td>0.100</td><td>2.7</td><td>1.200</td><td>4.3</td><td>3.000</td><td>6.7</td><td>7.000</td><td>10.0</td></tr><tr><td>0.200</td><td>2.9</td><td>1.400</td><td>4.7</td><td>3.500</td><td>7.2</td><td>7.500</td><td>10.4</td></tr><tr><td>0.300</td><td>2.7</td><td>1.600</td><td>5.0</td><td>4.000</td><td>7.6</td><td>8.000</td><td>10.7</td></tr><tr><td>0.400</td><td>2.6</td><td>1.800</td><td>5.2</td><td>4.500</td><td>8.1</td><td>8.500</td><td>11.0</td></tr><tr><td>0.500</td><td>2.9</td><td>2.000</td><td>5.5</td><td>5.000</td><td>8.5</td><td>9.000</td><td>11.3</td></tr><tr><td>0.600</td><td>3.2</td><td>2.200</td><td>5.8</td><td>5.500</td><td>8.9</td><td>9.500</td><td>11.7</td></tr><tr><td>0.800</td><td>3.6</td><td>2.400</td><td>6.0</td><td>6.000</td><td>9.3</td><td></td><td></td></tr><tr><td>1.000</td><td>4.0</td><td>2.600</td><td>6.2</td><td>6.500</td><td>9.6</td><td></td><td></td></tr></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	7.0	0.500	7.0	0.501	0.0	Unit Reference	MD-SHE-0088-2900-0500-2900	Design Head (m)	0.500	Design Flow (l/s)	2.9	Flush-Flo™	Calculated	Objective	Minimise upstream storage	Application	Surface	Sump Available	Yes	Diameter (mm)	88	Invert Level (m)	9.500	Minimum Outlet Pipe Diameter (mm)	150	Suggested Manhole Diameter (mm)	1200	Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	0.500	2.9	Flush-Flo™	0.154	2.9	Kick-Flo®	0.352	2.5	Mean Flow over Head Range	-	2.4	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	2.7	1.200	4.3	3.000	6.7	7.000	10.0	0.200	2.9	1.400	4.7	3.500	7.2	7.500	10.4	0.300	2.7	1.600	5.0	4.000	7.6	8.000	10.7	0.400	2.6	1.800	5.2	4.500	8.1	8.500	11.0	0.500	2.9	2.000	5.5	5.000	8.5	9.000	11.3	0.600	3.2	2.200	5.8	5.500	8.9	9.500	11.7	0.800	3.6	2.400	6.0	6.000	9.3			1.000	4.0	2.600	6.2	6.500	9.6		
Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)																																																																																																																						
0.000	7.0	0.500	7.0	0.501	0.0																																																																																																																						
Unit Reference	MD-SHE-0088-2900-0500-2900																																																																																																																										
Design Head (m)	0.500																																																																																																																										
Design Flow (l/s)	2.9																																																																																																																										
Flush-Flo™	Calculated																																																																																																																										
Objective	Minimise upstream storage																																																																																																																										
Application	Surface																																																																																																																										
Sump Available	Yes																																																																																																																										
Diameter (mm)	88																																																																																																																										
Invert Level (m)	9.500																																																																																																																										
Minimum Outlet Pipe Diameter (mm)	150																																																																																																																										
Suggested Manhole Diameter (mm)	1200																																																																																																																										
Control Points	Head (m)	Flow (l/s)																																																																																																																									
Design Point (Calculated)	0.500	2.9																																																																																																																									
Flush-Flo™	0.154	2.9																																																																																																																									
Kick-Flo®	0.352	2.5																																																																																																																									
Mean Flow over Head Range	-	2.4																																																																																																																									
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)																																																																																																																				
0.100	2.7	1.200	4.3	3.000	6.7	7.000	10.0																																																																																																																				
0.200	2.9	1.400	4.7	3.500	7.2	7.500	10.4																																																																																																																				
0.300	2.7	1.600	5.0	4.000	7.6	8.000	10.7																																																																																																																				
0.400	2.6	1.800	5.2	4.500	8.1	8.500	11.0																																																																																																																				
0.500	2.9	2.000	5.5	5.000	8.5	9.000	11.3																																																																																																																				
0.600	3.2	2.200	5.8	5.500	8.9	9.500	11.7																																																																																																																				
0.800	3.6	2.400	6.0	6.000	9.3																																																																																																																						
1.000	4.0	2.600	6.2	6.500	9.6																																																																																																																						
©1982-2020 Innovyze																																																																																																																											