Client	**Elmcroft Construction**
Project	**Goring by Sea**
Job No	**2686**
Date	**26.07.24**

BUILD WARRANTY

Soakaway/Attenuation design in accordance with BRE Digest 365

Soil Infiltration Rate	Test 1	Test 2	Test 3	Units
Length				m
Width				m
Effective Depth				m
Volume of outflow between 75% & 25% effective depth	0.00	0.00	0.00	m3
Mean surface area over 50% effective depth of pit	0.00	0.00	0.00	m2
Time between 75% & 25% outflow				minutes
Soil infiltration rate, f				m/s
Minimum soil infiltration rate	**0.00E+00**	m/s	**Infiltration not possible**	
Outflow restriction if infiltration not possible	1.0	l/s	**Governs**	
	3.6	m3/h		

Soakaway Details	Dimension	Units
Length	9.00	m
Width	2.50	m
Depth of soakaway	0.80	m
Mean surface area over 50% effective depth of pit	9.20	m2
Soakaway storage volume @95% for open crate soakaway	17.10	m3

Results	Capacity	50% empty time
1:1 year storm event	Pass	Pass
1:10 year storm event	Pass	Pass
1:30 year storm event	Pass	Pass
1:100 year storm event	Fail	Pass

Note: See page 6 for additional storage capacity

Climate Change & Urban Creep	Storm Return Period (years)			
	1	10	30	100
Climate change allowance (%)	0	0	35	45
Urban Creep Allowance (%)	0	0	0	0
Total (%)	**0**	**0**	**35**	**45**

Area of impermeable surface	Area (m2)
Main building roof	391.0
Total	**391.0**

Rainfall Data	Map	Symbol	Result	Comments
Rainfall Depth	1	M5-60	19	
Rainfall ratio of 60 minute to 2 day rainfalls of 5 year return period	2	r	0.35	Governs Z1 factor

1:1 year storm return period

Storm Duration D minutes	mins/hours	Factor Z1 Table 1	Climate Change & Urban Creep %	M5-D M5-60xZ1 mm	Growth Factor Z2 Table 2	M10-D M5-DxZ2 mm	Inflow I=AxR m3	Outflow O=as50xfxd m3	Storage req S m3	Soakaway/Attenuation Capacity m3	Balance m3	Pass/fail
5	5 mins	0.36	0	6.6	0.62	4.1	1.591	0.300	1.29	17.10	15.81	Pass
10	10 mins	0.51	0	9.4	0.61	5.7	2.240	0.600	1.64	17.10	15.46	Pass
15	15 mins	0.62	0	11.4	0.61	7.0	2.734	0.900	1.83	17.10	15.27	Pass
30	30 mins	0.79	0	14.6	0.62	9.0	3.523	1.800	1.72	17.10	15.38	Pass
60	1 hour	1.00	0	18.5	0.63	11.7	4.586	3.600	0.99	17.10	16.11	Pass
120	2 hour	1.22	0	22.6	0.65	14.7	5.756	7.200	-1.44	17.10	18.54	Pass
240	4 hour	1.50	0	27.7	0.67	18.6	7.262	14.400	-7.14	17.10	24.24	Pass
360	6 hours	1.69	0	31.3	0.68	21.3	8.344	21.600	-13.26	17.10	30.36	Pass
600	10 hours	1.95	0	36.0	0.69	24.9	9.745	36.000	-26.26	17.10	43.36	Pass
1440	24 hours	2.48	0	45.9	0.71	32.7	12.768	86.400	-73.63	17.10	90.73	Pass

Minimum storage required 1.83 m3

Time to empty 50% Ts50 0.3 hour **Pass**

1:10 year storm return period

Storm Duration D minutes	mins/hours	Factor Z1 Table 1	Climate Change & Urban Creep %	M5-D M5-60xZ1 mm	Growth Factor Z2 Table 2	M10-D M5-DxZ2 mm	Inflow I=AxR m3	Outflow O=as50xfxd m3	Storage req S m3	Soakaway/Attenuation Capacity m3	Balance m3	Pass/fail
5	5 mins	0.36	0	6.6	1.20	7.9	3.095	0.300	2.79	17.10	14.31	Pass
10	10 mins	0.51	0	9.4	1.22	11.4	4.457	0.600	3.86	17.10	13.24	Pass
15	15 mins	0.62	0	11.4	1.23	14.0	5.467	0.900	4.57	17.10	12.53	Pass
30	30 mins	0.79	0	14.6	1.24	18.0	7.046	1.800	5.25	17.10	11.85	Pass
60	1 hour	1.00	0	18.5	1.24	22.9	8.970	3.600	5.37	17.10	11.73	Pass
120	2 hour	1.22	0	22.6	1.24	28.1	10.973	7.200	3.77	17.10	13.33	Pass
240	4 hour	1.50	0	27.7	1.23	34.0	13.308	14.400	-1.09	17.10	18.19	Pass
360	6 hours	1.69	0	31.3	1.22	38.0	14.868	21.600	-6.73	17.10	23.83	Pass
600	10 hours	1.95	0	36.0	1.20	43.3	16.925	36.000	-19.07	17.10	36.17	Pass
1440	24 hours	2.48	0	45.9	1.18	54.1	21.137	86.400	-65.26	17.10	82.36	Pass

Minimum storage required 5.37 m3

Time to empty 50% Ts50 0.7 hour **Pass**

1:30 year storm return period

Storm Duration D minutes	mins/hours	Factor Z1 Table 1	Climate Change & Urban Creep %	M5-D M5-60xZ1 mm	Growth Factor Z2 Table 2	M10-D M5-DxZ2 mm	Inflow I=AxR m3	Outflow O=as50xfxd m3	Storage req S m3	Soakaway/Attenuation Capacity m3	Balance m3	Pass/fail
5	5 mins	0.36	35	8.9	1.51	13.4	5.248	0.300	4.95	17.10	12.15	Pass
10	10 mins	0.51	35	12.7	1.54	19.4	7.599	0.600	7.00	17.10	10.10	Pass
15	15 mins	0.62	35	15.4	1.55	23.9	9.344	0.900	8.44	17.10	8.66	Pass
30	30 mins	0.79	35	19.6	1.57	30.8	12.050	1.800	10.25	17.10	6.85	Pass
60	1 hour	1.00	35	25.0	1.56	39.0	15.234	3.600	11.63	17.10	5.47	Pass
120	2 hour	1.22	35	30.6	1.54	47.0	18.371	7.200	11.17	17.10	5.93	Pass
240	4 hour	1.50	35	37.4	1.51	56.5	22.076	14.400	7.68	17.10	9.42	Pass
360	6 hours	1.69	35	42.2	1.49	62.8	24.573	21.600	2.97	17.10	14.13	Pass
600	10 hours	1.95	35	48.6	1.46	70.8	27.695	36.000	-8.30	17.10	25.40	Pass
1440	24 hours	2.48	35	61.9	1.41	87.4	34.191	86.400	-52.21	17.10	69.31	Pass

Minimum storage required 11.63 m3

Time to empty 50% Ts50 1.6 hour **Pass**

1:100 year storm return period

Storm Duration D minutes	mins/hours	Factor Z1 Table 1	Climate Change & Urban Creep %	M5-D M5-60xZ1 mm	Growth Factor Z2 Table 2	M10-D M5-DxZ2 mm	Inflow I=AxR m3	Outflow O=as50xfxd m3	Storage req S m3	Soakaway/Attenuation Capacity m3	Balance m3	Pass/fail
5	5 mins	0.36	45	9.6	1.90	18.2	7.106	0.300	6.81	17.10	10.29	Pass
10	10 mins	0.51	45	13.6	1.97	26.7	10.456	0.600	9.86	17.10	7.24	Pass
15	15 mins	0.62	45	16.5	2.00	33.1	12.951	0.900	12.05	17.10	5.05	Pass
30	30 mins	0.79	45	21.1	2.03	42.7	16.713	1.800	14.91	17.10	2.19	Pass
60	1 hour	1.00	45	26.8	2.00	53.5	20.929	3.600	17.33	17.10	-0.23	Fail
120	2 hour	1.22	45	32.8	1.95	63.9	24.988	7.200	17.79	17.10	-0.69	Fail
240	4 hour	1.50	45	40.1	1.89	75.8	29.650	14.400	15.25	17.10	1.85	Pass
360	6 hours	1.69	45	45.3	1.85	83.7	32.745	21.600	11.15	17.10	5.95	Pass
600	10 hours	1.95	45	52.2	1.79	93.7	36.648	36.000	0.65	17.10	16.45	Pass
1440	24 hours	2.48	45	66.5	1.70	112.9	44.158	86.400	-42.24	17.10	59.34	Pass

Minimum storage required 17.79 m3

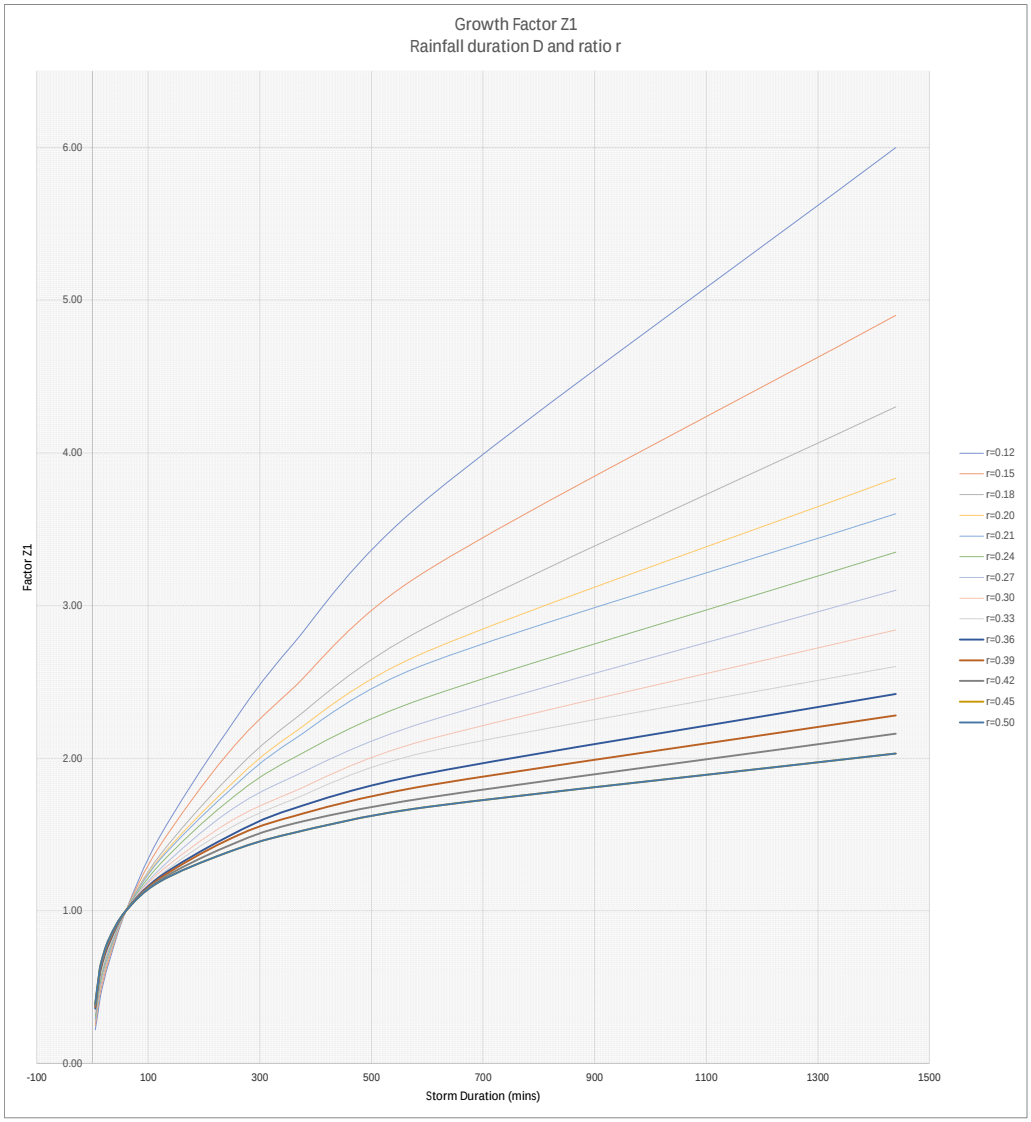
Time to empty 50% Ts50 2.5 hour **Pass**

Client	**Elmcroft Construction**
Project	**Goring by Sea**
Job No	**2686**
Date	**26.07.24**

BUILD WARRANTY

Table 1 Factor Z1 : rainfall duration D and ratio r

Rainfall ratio r	Storm Duration (mins/hours) 5 5	10 10	15 15	30 30	1 60	2 120	4 240	6 360	10 600	24 1440
0.12	0.22	0.34	0.45	0.67	1.00	1.48	2.17	2.75	3.70	6.00
0.15	0.25	0.38	0.48	0.69	1.00	1.42	2.02	2.46	3.23	4.90
0.18	0.27	0.41	0.51	0.71	1.00	1.36	1.86	2.25	2.86	4.30
0.20	0.28	0.42	0.53	0.72	1.00	1.34	1.80	2.16	2.70	3.83
0.21	0.29	0.43	0.54	0.73	1.00	1.33	1.77	2.12	2.62	3.60
0.24	0.31	0.46	0.56	0.75	1.00	1.30	1.71	2.00	2.40	3.35
0.27	0.33	0.48	0.58	0.76	1.00	1.27	1.64	1.88	2.24	3.10
0.30	0.34	0.49	0.59	0.77	1.00	1.25	1.57	1.78	2.12	2.84
0.33	0.35	0.50	0.61	0.78	1.00	1.23	1.53	1.73	2.04	2.60
0.36	0.36	0.51	0.62	0.79	1.00	1.22	1.48	1.67	1.90	2.42
0.39	0.37	0.52	0.63	0.80	1.00	1.21	1.46	1.62	1.82	2.28
0.42	0.38	0.53	0.64	0.81	1.00	1.20	1.42	1.57	1.74	2.16
0.45	0.39	0.54	0.65	0.82	1.00	1.19	1.38	1.51	1.68	2.03
0.50	0.39	0.54	0.65	0.82	1.00	1.19	1.38	1.51	1.68	2.03

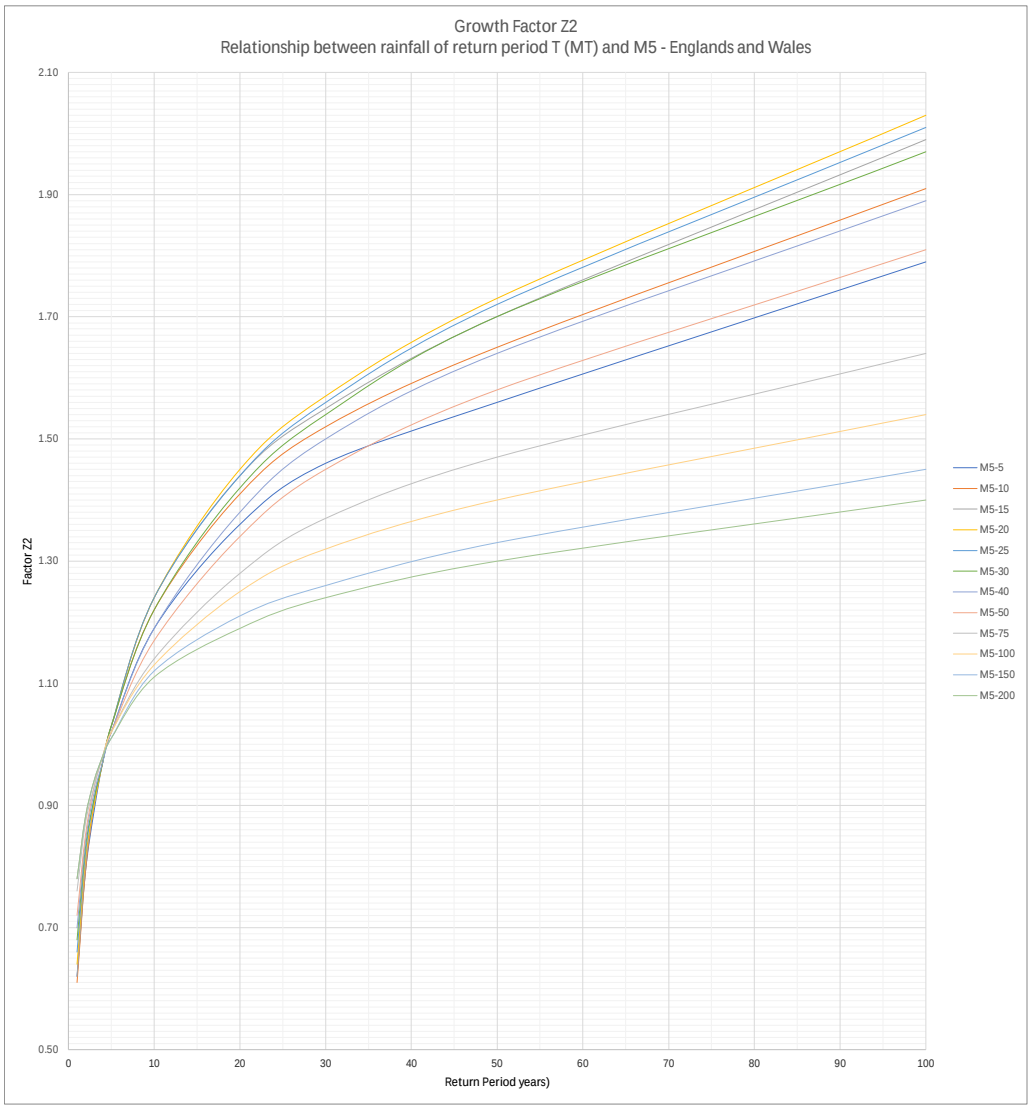


Client	**Elmcroft Construction**
Project	**Goring by Sea**
Job No	**2686**
Date	**26.07.24**

BUILD WARRANTY

Table 2 Growth Factor Z2 : relationship between rainfall of return period T (MT) and M5 - England's and Wales

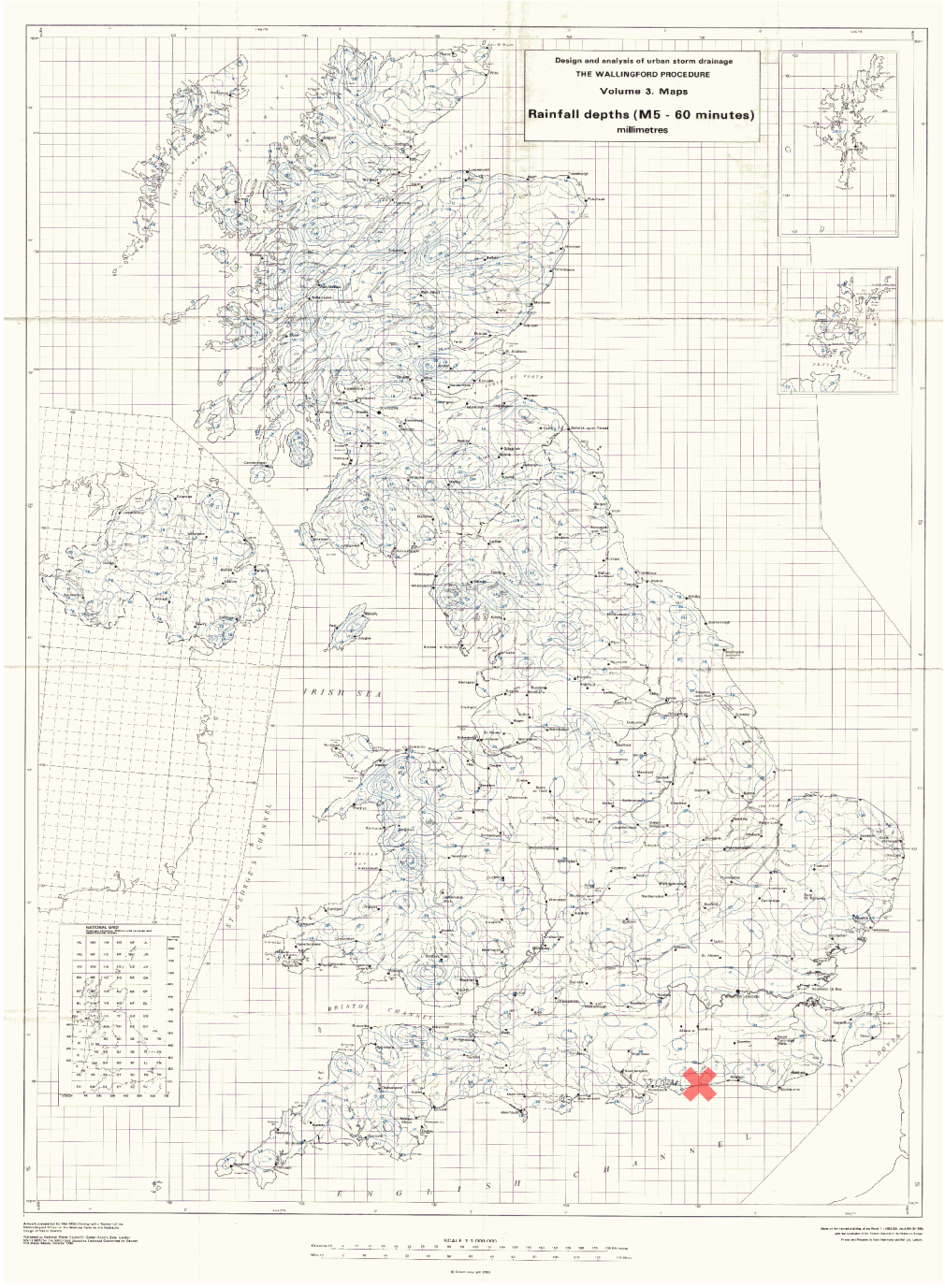
M5 Rainfall	Storm Return Period (Years)									
mm	1	2	3	4	5	10	20	30	50	100
5	0.62	0.79	0.89	0.97	1.02	1.19	1.36	1.46	1.56	1.79
10	0.61	0.79	0.90	0.97	1.03	1.22	1.41	1.52	1.65	1.91
15	0.62	0.80	0.90	0.97	1.03	1.24	1.44	1.55	1.70	1.99
20	0.64	0.81	0.90	0.97	1.03	1.24	1.45	1.57	1.73	2.03
25	0.66	0.82	0.91	0.97	1.03	1.24	1.44	1.56	1.72	2.01
30	0.68	0.83	0.91	0.97	1.03	1.22	1.42	1.54	1.70	1.97
40	0.70	0.84	0.92	0.97	1.02	1.19	1.38	1.50	1.64	1.89
50	0.72	0.85	0.93	0.98	1.02	1.17	1.34	1.45	1.58	1.81
75	0.76	0.87	0.93	0.98	1.02	1.14	1.28	1.37	1.47	1.64
100	0.78	0.88	0.94	0.98	1.02	1.13	1.25	1.32	1.40	1.54
150	0.78	0.88	0.94	0.98	1.01	1.12	1.21	1.26	1.33	1.45
200	0.78	0.88	0.94	0.98	1.01	1.11	1.19	1.24	1.30	1.40



Client	**Elmcroft Construction**
Project	**Goring by Sea**
Job No	**2686**
Date	**26.07.24**

BUILD WARRANTY

Map 1 - Rainfall Depths (M5-60 minutes)



Client	**Elmcroft Construction**
Project	**Goring by Sea**
Job No	**2686**
Date	**26.07.24**

BUILD WARRANTY

Map 2 - Ratio of M5-60 to M5-2 day rainfalls



Client	**Elmcroft Construction**
Project	**Goring by Sea**
Job No	**2686**
Date	**26.07.24**

There is a deficit of 0.69m3 for the 1:100 year storm 2 hour event which will be accommodated within the manhole and pipes as follows

Assume max water level is 9.20m giving 100mm freeboard before surface water flooding occurs on site.

Element	**IL**	**WL**	**Diameter**	**Capacity**	
SWMH01	8.85	9.20	0.45	0.06	
SWMH02	8.60	9.20	0.45	0.10	
SWMH03	8.85	9.20	0.45	0.06	
SWMH04	8.60	9.20	0.45	0.10	
Total available storage in manholes				**0.30**	**m3**

Pipe between	**Length**	**Diameter**	**Capacity**	
SWMH01-SWMH02	19.00	0.10	0.15	
SWMH02-Attenuation tank	5.00	0.10	0.04	
SWMH01-SWMH02	20.00	0.10	0.16	
SWMH02-Attenuation tank	12.00	0.10	0.09	
Total available storage in pipes			**0.44**	**m3**

Total available storage = 0.74m3 which is sufficient for the 1:100 year storm events.