

Mate Geo-Technic Services

Report prepared by RC
Thursday 12th June 2025

#18 West View Drive Yapton BN18 0JR
Planning Application Reference Number -- Y/56/24/HH

Calculation using Rainfall Model Data as :-

The Rainfall Data is FEH with the Rainfall Model of FEH22

The Site Location is GB 497978 102433 with Ordnance Survey reference SU 97978 02433

The Data Type is Point with the following Point Descriptors from Version v5.0.1 using AppVersion 2.6.9236.11734

bfihost -- 0.675

bfihost19 -- 0.65

propwet -- 0.34

saar -- 734

The Design Parameters for the Proposed Geocellular Attenuation Tank Installation, TK #1, located in the rear garden, are as follows :-

Climate Change for 2 year Storm Event (50% AEP) is at 40% addition to Rainfall Intensity.

Climate Change for 100 year Storm Event (1% AEP) is at 45% addition to Rainfall Intensity.

The Installation consists of a sealed GeoCellular Structure of 7.000 metres Long by 1.000 metres Wide and 0.400 metres High.

With a Cover Depth of 0.400 metres.

Percentage Void Space (Porosity) of 95%.

Total Contributing Impermeable Area specified as 67.20 square metres.

Using an Urban Creep Addition of 10% on Roof Areas only.

Using a Factor-of-Safety of 1.0

Using a Volumetric Runoff Coefficient $C_v=1.0$

Wallingford Greenfield Runoff Estimation tool, using the runoff estimation approach -- IH124, produced a minimal Q_{bar} due to the small catchment area.

Arun DC agreed Runoff Flow Rate restricted to 0.50 litres / sec for all storm events.

All Levels are referenced to 'Above Ordnance Datum' (AOD).

The Peak Groundwater was recorded at the Location of the Proposed Structure at 5.715 metres AOD, at a depth of 0.685 metres Below Ground Level (BGL)

The Typical Ground Level at the Location of the Proposed Structure is 6.400 metres.

The Soffit Level of the Proposed Geocellular Storage Tank is 5.970 metres.

The Invert Level of the Incoming Pipe within the Proposed Geocellular Storage Tank is 5.848 metres.

The Base Level of the Proposed Geocellular Storage Tank is 5.570 metres.

The Base of the Geocellular Storage Tank Installation is 0.115 metres below the Peak Recorded Groundwater so Bouyancy Factors need to be considered.

The Attenuation Device is an Orifice Plate of 20mm diameter within a bespoke inspection chamber incorporating an integral filter assembly and a weir set for overflow protection.

2 YEAR STORM EVENT (50% AEP) + 40 % Climate Change Addition

Greenfield Runoff Rate Calculator

Total Greenfield Site Area (usually Red Line for Planning)	455	sq metres
Proposed Impermeable Area (Roof)	61.1	sq metres
Standard Minimum Q_{bar} for 1 hectare area	2	litres / sec / hectare
Standard Site Runoff Q_{bar} for 2 litres / second / hectare	0.09	litres / sec
Greenfield Runoff Method (for smaller catchment areas)	IH 124	
From Wallingford Estimation Tool - Q_{bar} for 1 hectare area	3	litres / sec / hectare
From Wallingford Runoff Estimation Tool - Site Q_{bar}	0.14	litres / sec
Wallingford Greenfield Site Runoff Flow Rate Estimation	0.12	litres / sec for 2 year storm event
Arun DC agreed Runoff Flow Rate (email PC 29-05-2025)	0.50	litres / sec for all storm events
Flow Rate to be Used in Calculations	0.50	litres / sec for 2 year storm event

Orifice Discharge Rate Calculator

Standard Orifice Discharge Rate Equation from SuDS Manual Page 618	$Q = C_d A_o \sqrt{2gh}$	
Coefficient of Discharge -- C_d	0.6	[metres] - incorrect
Designed Diameter of Orifice -- D_o	20	mm
Cross sectional Area of Orifice -- A_o	3.143E-04	sq metres
Maximum Hydraulic Head -- h	0.35	metres
Acceleration due to Gravity -- g	9.81	metres / sec / sec
Orifice Discharge Rate -- Q	4.942E-04	cu metres / sec
	0.494	litres / sec
Orifice Discharge Rate for ½ Hydraulic Head -- Q_{hd}	0.349	litres / sec
Runoff Rate Estimation from Wallingford or agreed Arun DC	0.500	litres / sec for 2 year storm event

Coefficient of Discharge :

0.6 if material is thinner than orifice diameter;
0.8 if material is thicker than orifice diameter;
0.92 if edges of orifice are rounded)

[C_d must be a dimensionless coefficient in order for the equation to work !!]

Equation 28.1 Page 618

Attenuation Tank Design Parameters

Proposed Impermeable Area (Roof)	61.1	sq metres
Urban Creep Addition	10	%
Total Impermeable Area Including Urban Creep	67.2	sq metres
Volumetric Runoff Coefficient C_v	1.0	
Factor of Safety (FoS)	1.0	
Climate Change Addition All Other Years Storm Events	40	%
Climate Change Addition 100 Year Storm Event	45	%
Designed Diameter of Orifice	20	mm
Maximum Attenuated Flow Limit for Hydraulic Head	0.494	litres / sec
Impermeable Area drained via Infiltration Systems	0.0	cu metres
Impermeable Area drained via Rainwater Harvesting	0.0	cu metres
Proposed Additional Storage (detailed elsewhere)	0.0	cu metres

FEH Rainfall Data using the Rainfall Model of FEH22 -- 2 Year Storm Event (50% AEP) with 40% Climate Change Addition to Rainfall Intensity.

Storm Duration (hours)	2 Year Rainfall (mm)	2 Year Rainfall + CC Addition of +40% (mm)	2 Year Rainfall Inflow Volume (cu metres)	Outflow Volume at Attenuated Limit (cu metres)	2 Year Rainfall Storage Required (cu metres)	Half Drain Time for the Critical Storm (hours)
0.25	8.16	11.42	0.768	0.445	0.323	0.13
0.50	10.60	14.84	0.998	0.889	0.108	0.04
0.75	12.20	17.08	1.148	no attenuation	none required	
1.00	13.40	18.76	1.261	no attenuation	none required	
1.50	16.15	22.61	1.520	no attenuation	none required	
2.00	18.54	25.96	1.745	no attenuation	none required	
2.50	20.26	28.36	1.907	no attenuation	none required	
3.00	21.66	30.32	2.039	no attenuation	none required	
3.50	22.83	31.96	2.149	no attenuation	none required	
4.00	23.84	33.38	2.244	no attenuation	none required	
4.50	24.71	34.59	2.326	no attenuation	none required	
5.00	25.48	35.67	2.398	no attenuation	none required	
6.00	26.79	37.51	2.522	no attenuation	none required	
7.00	27.85	38.99	2.621	no attenuation	none required	
8.00	28.77	40.28	2.708	no attenuation	none required	
9.00	29.57	41.40	2.783	no attenuation	none required	
10.00	30.29	42.41	2.851	no attenuation	none required	
11.00	30.95	43.33	2.913	no attenuation	none required	
12.00	31.55	44.17	2.970	no attenuation	none required	
14.00	32.64	45.70	3.072	no attenuation	none required	
16.00	33.61	47.05	3.164	no attenuation	none required	
18.00	34.50	48.30	3.247	no attenuation	none required	
20.00	35.34	49.48	3.326	no attenuation	none required	
22.00	36.13	50.58	3.401	no attenuation	none required	
24.00	36.90	51.66	3.473	no attenuation	none required	
30.00	39.01	54.61	3.672	no attenuation	none required	
36.00	40.97	57.36	3.856	no attenuation	none required	
42.00	42.82	59.95	4.030	no attenuation	none required	
48.00	44.60	62.44	4.198	no attenuation	none required	
54.00	46.39	64.95	4.366	no attenuation	none required	
60.00	48.13	67.38	4.530	no attenuation	none required	
72.00	51.53	72.14	4.850	no attenuation	none required	
84.00	54.85	76.79	5.163	no attenuation	none required	
96.00	58.10	81.34	5.469	no attenuation	none required	

100 YEAR STORM EVENT (1% AEP) + 45 % Climate Change Addition

Greenfield Runoff Rate Calculator

Total Greenfield Site Area (usually Red Line for Planning)	455 sq metres
Proposed Impermeable Area (Roof)	61.1 sq metres
Standard Minimum Q_{bar} for 1 hectare area	2 litres / sec / hectare
Standard Site Runoff Q_{bar} for 2 litres / second / hectare	0.09 litres / sec
Greenfield Runoff Method (for smaller catchment areas)	IH 124
From Wallingford Estimation Tool - Q_{bar} for 1 hectare area	3 litres / sec / hectare
From Wallingford Runoff Estimation Tool - Site Q_{bar}	0.14 litres / sec
Wallingford Greenfield Site Runoff Flow Rate Estimation	0.44 litres / sec for 100 year storm event
Arun DC agreed Runoff Flow Rate (email PC 29-05-2025)	0.50 litres / sec for all storm events
Flow Rate to be Used in Calculations	0.50 litres / sec for 100 year storm event

Orifice Discharge Rate Calculator

Standard Orifice Discharge Rate Equation from SuDS Manual Page 618	$Q = C_d A_o \sqrt{2gh}$
Coefficient of Discharge -- C_d	0.6 [metres] - incorrect
Designed Diameter of Orifice -- D_o	20 mm
Cross sectional Area of Orifice -- A_o	3.143E-04 sq metres
Maximum Hydraulic Head -- h	0.35 metres
Acceleration due to Gravity -- g	9.81 metres / sec / sec
Orifice Discharge Rate -- Q	4.942E-04 cu metres / sec
	0.494 litres / sec
Orifice Discharge Rate for ½ Hydraulic Head -- Q_{hd}	0.349 litres / sec
Runoff Rate Estimation from Wallingford or agreed Arun DC	0.500 litres / sec for 100 year storm event

Coefficient of Discharge :

0.6 if material is thinner than orifice diameter;
0.8 if material is thicker than orifice diameter;
0.92 if edges of orifice are rounded)

[C_d must be a dimensionless coefficient in order for the equation to work !!]

Equation 28.1 Page 618

Attenuation Tank Design Parameters

Proposed Impermeable Area (Roof)	61.1 sq metres
Urban Creep Addition	10 %
Total Impermeable Area Including Urban Creep	67.2 sq metres
Volumetric Runoff Coefficient C_v	1.0
Factor of Safety (FoS)	1.0
Climate Change Addition All Other Years Storm Events	40 %
Climate Change Addition 100 Year Storm Event	45 %
Designed Diameter of Orifice	20 mm
Maximum Attenuated Flow Limit for Hydraulic Head	0.494 litres / sec
Impermeable Area drained via Infiltration Systems	0.0 cu metres
Impermeable Area drained via Rainwater Harvesting	0.0 cu metres
Proposed Additional Storage (detailed elsewhere)	0.0 cu metres

FEH Rainfall Data using the Rainfall Model of FEH22 -- 100 Year Storm Event (1% AEP) with 45% Climate Change Addition to Rainfall Intensity.

Storm Duration (hours)	100 Year Rainfall (mm)	100 Year Rainfall + CC Addition of +45% (mm)	100 Year Rainfall Inflow Volume (cu metres)	Outflow Volume at Attenuated Limit (cu metres)	100 Year Rainfall Storage Required (cu metres)	Half Drain Time for the Critical Storm (hours)
0.25	25.66	37.21	2.502	0.445	2.057	0.82
0.50	34.41	49.89	3.355	0.889	2.465	0.98
0.75	39.98	57.97	3.898	1.334	2.563	1.02
1.00	44.11	63.96	4.300	1.779	2.521	1.00
1.50	49.25	71.41	4.801	2.668	2.133	0.85
2.00	52.81	76.57	5.148	3.558	1.590	0.63
2.50	55.77	80.87	5.437	4.447	0.989	0.39
3.00	58.23	84.43	5.677	5.337	0.340	0.14
3.50	60.32	87.46	5.880	no attenuation	none required	
4.00	62.15	90.12	6.059	no attenuation	none required	
4.50	63.76	92.45	6.216	no attenuation	none required	
5.00	65.20	94.54	6.356	no attenuation	none required	
6.00	67.70	98.17	6.600	no attenuation	none required	
7.00	69.79	101.20	6.804	no attenuation	none required	
8.00	71.60	103.82	6.980	no attenuation	none required	
9.00	73.19	106.13	7.135	no attenuation	none required	
10.00	74.60	108.17	7.272	no attenuation	none required	
11.00	75.88	110.03	7.397	no attenuation	none required	
12.00	77.05	111.72	7.511	no attenuation	none required	
14.00	79.09	114.68	7.710	no attenuation	none required	
16.00	80.87	117.26	7.884	no attenuation	none required	
18.00	82.46	119.57	8.039	no attenuation	none required	
20.00	83.93	121.70	8.182	no attenuation	none required	
22.00	85.30	123.69	8.316	no attenuation	none required	
24.00	86.57	125.53	8.439	no attenuation	none required	
30.00	89.95	130.43	8.769	no attenuation	none required	
36.00	92.95	134.78	9.061	no attenuation	none required	
42.00	95.68	138.74	9.327	no attenuation	none required	
48.00	98.24	142.45	9.577	no attenuation	none required	
54.00	100.72	146.04	9.819	no attenuation	none required	
60.00	103.09	149.48	10.050	no attenuation	none required	
72.00	107.62	156.05	10.491	no attenuation	none required	
84.00	111.92	162.28	10.911	no attenuation	none required	
96.00	116.07	168.30	11.315	no attenuation	none required	