

**STONE CONSULTING
ENGINEERS LTD.**

**CONSULTING CIVIL, STRUCTURAL AND
FOUNDATION ENGINEERS**

Hundred Acres House
Wickham
Hampshire
PO17 4ED

117 Barrack Lane
Aldwick
West Sussex
PO21 4ED

Job No. 1870

Date: July 2019

QA INFORMATION

CLIENT:	Aaron Millar
JOB ID:	37 Hill Lane. Barnham
SCOPE OF WORK:	Surface water run-off
DESIGN CODES AND REFERENCES:	BRE 365 The Building Regulations
SOFTWARE:	MS EXCEL
SUB-SOIL/ FOUNDATION DATA:	N/A

MATERIAL DATA

CONCRETE:	
REINFORCEMENT:	
STEELWORK:	
TIMBER:	
OTHER:	

OTHER INFORMATION / NOTES

Rev A	Scheme based on minimal infiltration and direct discharge to watercourse
Rev B	Attenuation and discharge scheme.

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Project:	37 Hill Lane. Barnham	Date:	July 2019	Made by:	KS	Sheet No.	1
CALCULATION SHEET		Job No.	1870	Chkd:	-	Rev.	B

Summary:

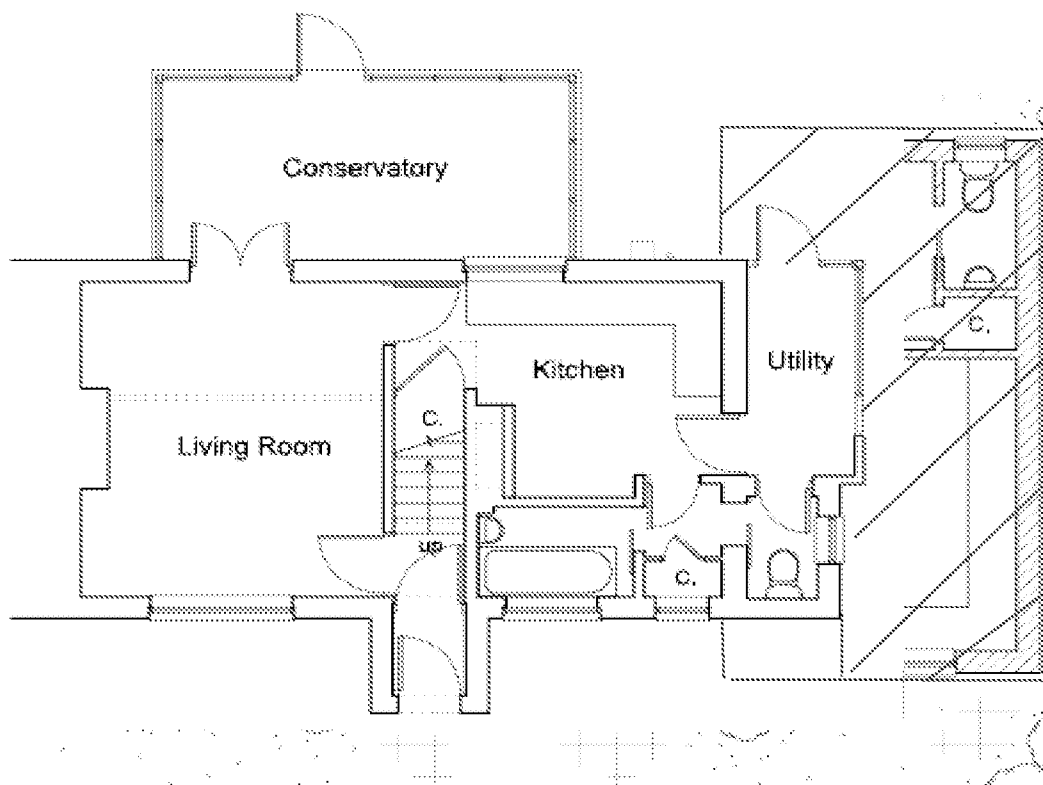
The site is underlain by 'Brickearth'. Winter groundwater monitoring recorded a maximum winter (march) water table at a depth of 3.6m bgl. Infiltration testing recorded very poor drainage with an infiltration rate into the natural ground of 3.50E-07 m/sec.

The existing property drains to soakaways.

The calculation is based on a 100 year return period with a 40% allowance for Climate Change.

The attenuation/soakaway tank is sized assuming no infiltration into the ground.

An overflow pipe connects the attenuation/soakaway tank to a drainage ditch along Hill Lane. The maximum discharge rate into the watercourse is estimated at 1.43 l/s.



New roof area (shown hatched) = **23.20** m²

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SOAKAWAY DESIGN TO BRE(1991)

SOAKAWAY DETAILS

Ring		Pit/crates	
Soakaway size, Ds =	0.00 m	Length =	2.00 m
Depth of below invert, Hs =	0.00 m	Width =	2.00 m
		Depth below invert =	0.80 m
Free volume, S =	0.00 m ³		= 3.20 m ³
Rubble filled volume, S' =	0.00 m ³		= 1.06 m ³

INITIAL SOAKAWAY SIZING

Drained area =	23.20 m ²
Climate change allowance =	40 %

INFLOW

Inflow, I = (run off area) x (design rainfall)
= A x (M10-D)

DESIGN RAINFALL

Return period = 100 yrs
Ratio of 60 min to 2-Day rainfalls of 5 year return period, r = 0.35 BRE(1991) Fig 1.

M5 rainfalls are calculated from table 1 (BRE 365) using Z1 factor

Storm duration (hrs)	Storm duration (mins)	Z1	M5-D (mm)	Z2 M10 (cor. Fac)	M10-D* rainfall	Z2 M100 Design	100 yr + 40%	
0	5	0.36	7.2	1.19	12.00	1.84	rainfall	
0	10	0.54	10.8	1.22	18.45	1.92	18.55	
0	15	0.65	13	1.23	22.39	1.96	29.03	
1	30	0.82	16.4	1.24	28.47	2.00	35.67	
1	60	1	20	1.24	34.72	2.03	45.92	
2	120	1.19	23.8	1.24	41.32	2.01	56.84	
4	240	1.39	27.8	1.23	47.87	1.97	66.97	
6	360	1.53	30.6	1.22	52.26	1.94	76.67	
10	600	1.7	34	1.21	57.60	1.90	83.11	
24	1440	2.07	41.4	1.19	68.97	1.81	90.44	
							104.91	

* including 40% for climate change

OUTFLOW

Outflow via regulator = 0.00E+00 l/sec

Outflow /sec = 0.00E+00 m3/sec (ring)

Outflow /sec = 0.00E+00 m3/sec (pit)

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STORAGE CAPACITY

$$\text{Storage capacity, } S = \text{Inflow} - \text{Outflow}$$

$$= I - O = [A \times (M10-D)] - O$$

Ring soakaway					Pit/crates soakaway			
Storm duration (hrs)	Storm duration (mins)	Inflow S(1) m ³	Outflow Max m ³	Required capacity m ³	Inflow rate l/sec	Outflow Max m ³	Outflow rate l/sec	Required capacity m ³
0	5	0.43	0.00	0.43	1.43	0.00	0.00	0.43
0	10	0.67	0.00	0.67	0.81	0.00	0.00	0.67
0	15	0.83	0.00	0.83	0.51	0.00	0.00	0.83
1	30	1.07	0.00	1.07	0.26	0.00	0.00	1.07
1	60	1.32	0.00	1.32	0.14	0.00	0.00	1.32
2	120	1.55	0.00	1.55	0.07	0.00	0.00	1.55
4	240	1.78	0.00	1.78	0.03	0.00	0.00	1.78
6	360	1.93	0.00	1.93	0.02	0.00	0.00	1.93
10	600	2.10	0.00	2.10	0.01	0.00	0.00	2.10
24	1440	2.43	0.00	2.43	0.01	0.00	0.00	2.43

Max required capacity =	2.43		=	2.43	
Max ring capacity =	0.00	FAIL	Free volume =	3.20	OK
Pubble filled volume =	0.00	FAIL			

Location of overflow outlet to be above maximum water level in tank

$$\text{Maximum depth of water in soakaway/tank, } H = (2.43/(2 \times 2)) = 0.61 \text{ m}$$

Height of soakaway =	0.80 m
Soil cover to soakaway =	0.30 m
Depth below ground to base of soakaway =	1.10 m

Locate overflow pipe invert 100mm below top of soakaway

$$\text{Invert level 75m overflow pipe} = (1.1 - 0.4) = 0.70 \text{ m above base of soakaway}$$

$$= 0.40 \text{ m below ground level}$$

Overflow pipe invert level =	7.30 mOD
Invert at discharge =	6.90 mOD

Total length of pipe ~	31.30 m
Fall to pipe ~	0.01 m
=	1:100