Consulting Civil Engineers

Water Neutrality Report

Carriage House, Burton Park Road, Petworth GU28 0JS

For

Mr and Mrs Haill

Rev - **P**

Reference **C2014**

Date **13th May 2022**

Revision	Date of Issue	Comments	Prepared By	Checked By
P	13.05.2022	Initial Issue	LH	CS

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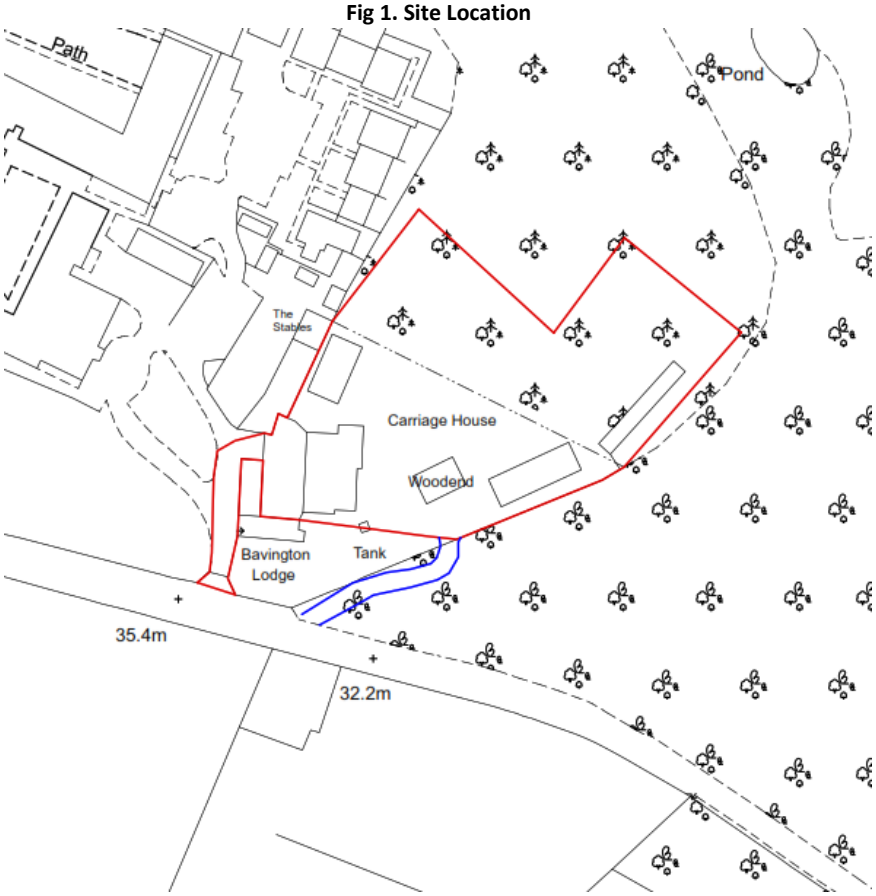
1 Introduction

1.1.1 CGS Civils Ltd has been appointed by Mr and Mrs Haill to undertake a Water Neutrality Report for a proposed development at Carriage House on Burton Park Road in Petworth. Planning permission is sought for the demolition of stables and a pole barn and the construction of a replacement building to comprise a small one bedroom holiday let and vehicle store.

1.1.2 The purpose of this report is to therefore provide an overview on the potential water usage changes on the site as a result of the proposed development, and to confirm that the site is water neutral.

1.1.3 The proposed development is located at OS Grid Reference SU 97563 18299 and has the post code GU28 0JS

Fig 1. Site Location



1.1.4 Waterwise defined Water Neutrality as:

'For every new development, total water use in the region after the development must be equal to or less than the total water uses in the region before the new development.'

1.1.5 Achieving water neutrality involves using a three-step approach. First, the demand for water from the new development must be reduced as far as is practicable, followed by the re-use of water; then the remaining demand should be offset within the region. Following this three-step approach allows the volume that requires offsetting to be reduced which ultimately reduces the cost of the overall scheme. This is noted within the Waterwise neutrality definition, which defines the three steps which should be undertaken in order to achieve water neutrality in their recent review dated January 2021.

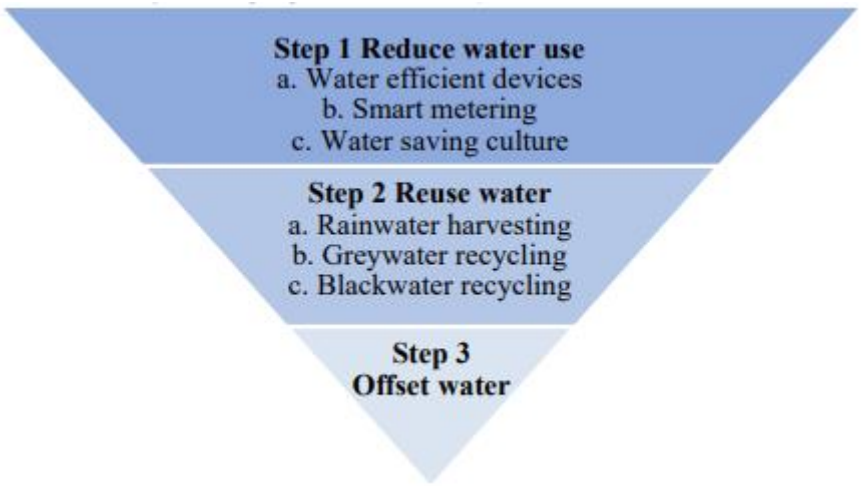
- Reduce water demand in the new development through improvement in efficiency.
- Re-use water, wherever possible.
- Offset the remaining water demand from the new development if required.

1.1.6 The report will be split into the following sections:

- A Review of Water Neutrality demand reduction
- A calculation of estimate water usage from proposed development
- Identification of measures that can be first used to reduce this demand
- Identification of measures that can be used to re-use water
- Establish solutions to offset that demand in order to achieve neutrality.

1.1.7 This report will follow the methods documented within *'A Review of Water Neutrality in the UK'* carried out by Waterwise in January 2021. The document provides details on how developments can achieve water neutrality by utilising the 3-stage approach.

Fig 2. 3-stage approach



1.1.8 Some increase in water demand within the region from planned development during the local plan period is inevitable. However, it can be minimised by making the site as water efficient as possible.

1.1.9 Per Capita Consumption (PCC) is used as a measure of water use and is the volume of water that is used by one person in one day. It is usually measures in litres per person per day (l/p/d). The average PCC within Southern Water's 'Sussex North Water Resource Zones (WRZ)' is 135 l/p/d. Homes without a water meter consume on average 160 l/p/d and for homes with a water meter, consume on average 131 l/p/d.

1.1.10 Part G of the Building regulations currently states that new build housing should achieve a minimum of 125 l/p/d. A tighter target of 110 l/p/d can be requested if the local authority can establish a clear need based on available evidence.

1.1.11 The table below indicates different demand scenarios including Southern Water's Target 100 Ambition to achieve 100 l/p/d, as well as further scenarios where water demand is cut more dramatically.

Table 1 PCC Demand Scenarios

Demand Scenario	Per Capita Consumption (l/p/d)
British Flows and Loads	150
Building Regulations Standard	125
Building Regulations Optional	110
Target 100	100
Realistic Achievable	85
Ambitious	62

1.1.12 The benefits of water neutrality are wide ranging, from financial and reputational to environment and social. For a new domestic building, they could include:

- **Saving Water** – Over 100,000 litres of water can be saved per year for each water neutral home built
- **Saving Carbon** – A significant CO2 saving can be achieved by reducing the demand for hot water for baths, showers, basins, dishwashers and washing machines
- **Saving Money** – Both water and energy bills will reduce
- **Reducing environmental impact** – Decreasing water abstracted from rivers and groundwater sources
- **Improved Resilience** – For the future by minimising the additional pressure on water resources
- **Enabling future housing growth** – In water scarce areas by reducing the impact of new homes and buildings
- **Reducing discharge to sewage** – by using less water, collecting rainwater and recycling greywater, less water is discharged to the drainage network
- **Short pay-back time** – After approximately 5 years the saving of water neutrality will outweigh the costs of doing so.

2 Calculation of estimate water usage from the proposed development

2.1.1 Before any necessary steps to achieve water neutrality can be determined, the total water demand for the proposed development must first be calculated. The proposed scheme will consist of a new build dwelling to form a 1-bedroom holiday let. In accordance with the average occupancy, the population for the property will be 1.32.

Table 2 Average occupancy levels

Number of bedrooms	Average occupancy level
1	1.32
2	1.89
3	2.47
4	2.86
5	3.09

2.1.2 As the proposed property will be a new dwelling, Policy 40 of the Chichester District Council's Key Policies triggers the requirement for the optional building regulations standard of 110 litres per person per day (l/p/d), therefore:

1.32 x 110 l/p/d
= 145.2 l/day

2.1.3 The following sections within this report will cover measures that can be undertaken in order to reduce the water consumption of the proposed property and aim for the 'Ambitious' PCC of 62/l/p/d.

3 Step 1 – Identifying measures that can be used to reduce this demand

3.1.1 The first and most important step in achieving water neutrality will be to ensure that the water used by the proposed development is used as efficiently as possible; the smaller the water demand of the building due to the design and fittings, the less water is needed to be reused and offset. There are a number of ways of achieving a smaller water demand:

- Fitting homes with efficient products, such as:
  - Aerated Taps
  - Aerated Shower heads
  - Low Flush Toilets, or air flush toilets
  - Water efficient white goods
- Installing Smart Meters, this allows the consumer to see how much water they are using, and how this affects their water saving bill. This can help consumers to reduce water usage, identify leaks, and meet water saving targets, with the bonus of reduced bills.
- Designing home to encourage water saving behaviours, this can also help reduce water use and help ensure that other measures that are put in place are effective. Education and awareness are important components of achieving water neutrality.

3.1.2 Building Regulations Part G states that when the new fittings approach is used, the water consumption of the fittings must not exceed a total of 125 l/p/day/. The values are listed in the table 2 below:

Table 3 Maximum Fittings Consumption from Building Regulations Part G

Water Fitting	Maximum Rating
WC	6.4/ litres dual flush or 4.5 litres single flush
Shower	10 l/min
Bath	185 litres
Basin Taps	6 l/min
Sink Taps	8 l/min
Dishwasher	1.25 l/place setting
Washing Machine	8.17 l/kilogram

3.1.3 Should the proposed development be required to comply with the optional water efficiency as part of the conditions for planning permission, the estimated consumption of water can be calculated via the Optional requirement level of fittings consumption. This is listed within Building Regulations Part G, which also states that the water consumption must not exceed 110 l/p/day, and the maximum fittings consumption for optional requirement can be found in Table 3 below:

Table 4 Maximum fittings consumption optional requirement level from Building Regulations Part G

Water Fitting	National Base Level
WC	4/2.6 litres dual flush
Shower	8 l/min
Bath	170 litres
Basin Taps	5 l/min
Sink Taps	6 l/min
Dishwasher	1.25 l/place setting
Washing Machine	8.17 l/kilogram

3.1.4 However, to improve on the above requirements, the proposed site can implement the following measures in order to focus on becoming a water efficient development. By installing the following features, the development can achieve a water demand of around 85 l/p/d, which aligns with a 'Realistic Achievable' PCC. See Table 4 below:

Table 5 Water efficient fittings consumption

Water Fitting	Consumption Level
WC	4/2.6 litres dual flush
Shower	7 l/min
Bath	145 litres
Basin Taps	2.5 l/min
Sink Taps	5 l/min
Dishwasher	0.67 l/place setting
Washing Machine	5.5 l/kilogram

Please note that by accepting this report, you accept the low flow rates of the proposed fittings required to achieve water neutrality. CGS Civils cannot be held responsible for any reduced comfort levels that may arise from the use of these fittings.

3.1.5 Water demand can also be reduced through fitting metres, which help to identify leaks and track water consumption as a way to support and encourage behavioural changes such as, not leaving the tap running when brushing teeth and using eco settings on the washing machine and dishwasher. It should be noted that behavioural changed have not been used within the calculations within this report as it is impossible to enforce.

Table 6 Practical Summary of Step 1

Step 1: Reduce Water				
Toilets	Cistern displacement devices (toilet hippos)	Retrofit flush devices to dual flush	Fix leaky toilets	
Taps	Tap inserts (aerators)	Low flow restrictors	Push taps	Infrared Taps
Showers/baths	Low flow shower heads (less than 8litres/min)	Shower timers	Reduced bath frequency & volume	
Outdoors	Hosepipe flow restrictors	Hosepipe siphons	Water butts	Mulches and composting to keep soil moist
Smart Metering	Leakage information	Encourage behavioural changes	Innovative tariffs	Savings estimates

3.1.6 By installing the water efficient devices listed above, it is possible to reduce the water demand on site from **145.2 l/day** down to **117.5 l/day**

1.32 x 89.045 l/p/d

= **117.5 l/day**

- *1.32 (average occupancy level for a 1-bedroom dwelling) x 89.045 (Appendix A – Water Calculator for Proposed fittings)*

4 Step 2 – Identify measures that can be used to re-use water

4.1.1 Once the water demand has been reduced via the installation of water efficient products, water reuse should be considered. The term 'water reused' refers to the capture, treatment (if it is required) and the use of alternative water supplies for non-potable purposes. It includes:

- Rainwater and surface water harvesting
- Greywater recycling (typically the used water from baths, showers and hand basins)
- Wastewater recycling.

4.1.2 The installation of water reusing technology has the potential to save significant amounts of water; for example, 24% of water in the home is used for flushing the toilet and only 4% externally in the garden meaning a water reuse system could save at least a quarter of the demand if it was installed for these purposes. Depending on the quality and the system installed, it could also be possible to re-use water for a washing machine which accounts for 12% of total water usage.

Table 7 Practical Summary of Step 2

Step 2: Reuse Water			
Rainwater Harvesting	Small scale water butt	Rainwater Harvesting system for individual homes and buildings	Large scale surface water harvesting
Greywater Recycling		Small systems for individual homes	Largest scale systems for commercial and mixed-use sites

4.1.3 The installation of water reusing technologies will further reduce the water demand on site, depending on the harvesting tank installed. The proposed roof area is sufficient to provide the required water to the property via a below ground rainwater harvesting tank as well as has sufficient capacity for a 35-day drought period. **See Appendix D**.

4.1.4 By installing the water efficient devices listed above as well as the rainwater and greywater harvesting technologies listed above, the total demand will be reduced to:

1.32 x 66.2

= 87.4 l/day

- *1.32 (average occupancy level for 1-bedroom dwelling) x 87.4 (Appendix B – Water calculator for proposed fittings with RWH)*

4.1.5 From the above water calculations, we have:

- Proposed water usage rate of 110 litres/person/day based on Policy 40 of CDC's Key Policies
- Which can then be reduced to:
- Proposed water usage rate of 66.2 litres/person/day with water efficient devices and rainwater harvesting

4.1.6 In order to provide a cumulative consumption comparison between the existing and the proposed water usage, the occupancy rates would be for 'as existing' and 'as proposed':

- Proposed water demand from Policy 40 – 110 l/p/d at an overall occupancy rate 1.32 people = **145.2 l/day.**
- Proposed Water Demand with water efficient devices listed in **Table 4** and Rainwater harvesting – 66.2 l/p/d at an overall occupancy rate of 1.32 people = **87.4 l/day**

5 Step 3 – Offsetting remaining water demand

5.1.1 Finally, the remaining water requirements for new homes or developments which cannot be satisfied with non-potable sources must be offset. Offsetting can generally be done by investing in schemes that save water within the local region such as retrofitting existing buildings with water efficient devices or water reuse systems.

5.1.2 In this instance however, the existing Carriage House is owned by the client and can undergo the 'reduce' measures that are listed in the above sections 1. The existing property is confirmed to be a 3-bedroom dwelling which has an occupancy level of 2.47. The client has provided information of the existing water demand (Appendix C), which confirms the water usage to be **176.2 l/p/d**, which equates to a total demand of **435.2 l/day**.

5.1.3 By undertaking the 'reduce' measures listed above in section 1, the water demand can be reduced down to **131.2 l/p/d** (appendix D) or **324.063 l/day** by swapping out the shower heads and basin taps. This is a reduction of **111.14 l/day** which is enough to offset the water demand for the proposed dwelling.

5.1.4 As indicated within the above calculations, it is clear that the proposed site is not only water neutral, but there will be an overall betterment over the existing site's water demand therefore reducing the impact within the region.

6 Conclusion

6.1.1 The overall water demand can be reduced by utilising methods listed in the sections above to reduce and re-used water for the proposed development. This results in the site not only being water neutral, but will also provide a degree of betterment over the existing site's water demand.

6.1.2 In order to show willing, the client can implement the 'reduce' measures listed on the above tables 3 and 4 on their own property in order to offset the remaining water demand.

6.1.3 To summarise:

- The proposed development will use on average **145.2 l/day**.
- This water demand can be reduced to **117.5 l/day** through the installation of water reducing appliances
- Re-using the water through rainwater harvesting tanks can further reduce the water demand down to **87.4 l/day**
- The existing water demand for the adjacent property can be reduced by utilising the above measures in the 'reduce' sections of this report. The existing dwelling has a total population of 2.47 which has a total water demand of **435.2 l/day**. By following the above measures, this can be reduced down to **324.063 l/day.**
- The overall water demand will be reduced, and the site will become water neutral whilst also providing betterment over the existing site's water demand.

7 Appendices

7.1 Appendix A:

Table 7 – Water Calculator from Building Regulations Part G – Information input from proposed site with water efficient devices from Table 4.

The Water Calculator for New Dwellings with Water efficient measures					
Installation Type	Unit of measure	Volume/ flow rate	Use factor	Fixed use	Litres/person/day
WC (Single Use)	Flush volume (l)	0	4.42	0	0
WC (Dual Flush)	Full Flush Vol.	4	1.46	0	5.84
	Part Flush vol.	2.6	2.96	0	7.696
WC (Multiple Fittings)	Average effective flush volume (l)	0	4.42	0	0
Taps (excl. Kitchen)	Flow rate (l/min)	2.5	1.58	1.58	5.53
Bath (shower also present)	Capactiy to overflow (l)	145	0.11	0	15.95
Shower (bath also present)	Flow rate (l/min)	7	4.37	0	30.6
Bath only	Capactiy to overflow (l)	0	0.5	0	0
Shower only	Flow rate (l/min)		5.6	0	0
Kitchen sink taps	Flow rate (l/min)	5	0.44	10.36	12.56
Washing Machine	Litres/kg dry load	5.5	2.1	0	11.55
Dishwasher	litres/place setting	0.73	3.6	0	2.62
Waste disposal unit	litres/use	0	3.08	0	0
Water softener	litres/person/day	0	1	0	0
		Total Calculated use (l/p/d)			92.358
		Contribution from greywater (l/p/d)			0
		Contribution from rainwater (l/p/d)			0
		Normalisation factor			0.91
		External water use			5
		Total water consumption (36(1)) (l/p/d)			89.045

7.2 Appendix B:

Table 7 – Water Calculator from Building Regulations Part G – Information input from proposed site with water efficient devices from Table 4 with Rainwater Harvesting.

The Water Calculator for New Dwellings with Water efficient measures					
Installation Type	Unit of measure	Volume/ flow rate	Use factor	Fixed use	Litres/person/day
WC (Single Use)	Flush volume (l)	0	4.42	0	0
WC (Dual Flush)	Full Flush Vol.	4	1.46	0	5.84
	Part Flush vol.	2.6	2.96	0	7.696
WC (Multiple Fittings)	Average effective flush volume (l)	0	4.42	0	0
Taps (excl. Kitchen)	Flow rate (l/min)	2.5	1.58	1.58	5.53
Bath (shower also present)	Capactiy to overflow (l)	145	0.11	0	15.95
Shower (bath also present)	Flow rate (l/min)	7	4.37	0	30.6
Bath only	Capactiy to overflow (l)	0	0.5	0	0
Shower only	Flow rate (l/min)		5.6	0	0
Kitchen sink taps	Flow rate (l/min)	5	0.44	10.36	12.56
Washing Machine	Litres/kg dry load	5.5	2.1	0	11.55
Dishwasher	litres/place setting	0.73	3.6	0	2.62
Waste disposal unit	litres/use	0	3.08	0	0
Water softener	litres/person/day	0	1	0	0
		Total Calculated use (l/p/d)			92.358
		Contribution from greywater (l/p/d)			0
		Contribution from rainwater (l/p/d)			25.086
		Normalisation factor			0.91
		External water use			5
		Total water consumption (36(1)) (l/p/d)			66.217

7.3 Appendix C:

Table 7 – Water Calculator from Building Regulations Part G – Information input from existing site

The Water Calculator for New Dwellings with Water efficient measures					
Installation Type	Unit of measure	Volume/ flow rate	Use factor	Fixed use	Litres/person/day
WC (Single Use)	Flush volume (l)	6	4.42	0	26.52
WC (Dual Flush)	Full Flush Vol.	0	1.46	0	0
	Part Flush vol.	0	2.96	0	0
WC (Multiple Fittings)	Average effective flush volume (l)	0	4.42	0	0
Taps (excl. Kitchen)	Flow rate (l/min)	9	1.58	1.58	15.8
Bath (shower also present)	Capactiy to overflow (l)	158	0.11	0	17.38
Shower (bath also present)	Flow rate (l/min)	12	4.37	0	52.44
Bath only	Capactiy to overflow (l)	0	0.5	0	0
Shower only	Flow rate (l/min)		5.6	0	0
Kitchen sink taps	Flow rate (l/min)	10	0.44	10.36	54.36
Washing Machine	Litres/kg dry load	8.2	2.1	0	17.22
Dishwasher	litres/place setting	1.25	3.6	0	4.5
Waste disposal unit	litres/use	0	3.08	0	0
Water softener	litres/person/day	0	1	0	0
		Total Calculated use (l/p/d)			188.22
		Contribution from greywater (l/p/d)			0
		Contribution from rainwater (l/p/d)			0
		Normalisation factor			0.91
		External water use			5
		Total water consumption (36(1)) (l/p/d)			176.280

7.4 Appendix D:

Table 7 – Water Calculator from Building Regulations Part G – Information input from existing site with proposed fittings

The Water Calculator for New Dwellings with Water efficient measures					
Installation Type	Unit of measure	Volume/ flow rate	Use factor	Fixed use	Litres/person/day
WC (Single Use)	Flush volume (l)	6	4.42	0	26.52
WC (Dual Flush)	Full Flush Vol.	0	1.46	0	0
	Part Flush vol.	0	2.96	0	0
WC (Multiple Fittings)	Average effective flush volume (l)	0	4.42	0	0
Taps (excl. Kitchen)	Flow rate (l/min)	2.5	1.58	1.58	5.53
Bath (shower also present)	Capactiy to overflow (l)	158	0.11	0	17.38
Shower (bath also present)	Flow rate (l/min)	7	4.37	0	30.59
Bath only	Capactiy to overflow (l)	0	0.5	0	0
Shower only	Flow rate (l/min)		5.6	0	0
Kitchen sink taps	Flow rate (l/min)	10	0.44	10.36	54.36
Washing Machine	Litres/kg dry load	8.2	2.1	0	17.22
Dishwasher	litres/place setting	1.25	3.6	0	4.5
Waste disposal unit	litres/use	0	3.08	0	0
Water softener	litres/person/day	0	1	0	0
		Total Calculated use (l/p/d)			138.72
		Contribution from greywater (l/p/d)			0
		Contribution from rainwater (l/p/d)			0
		Normalisation factor			0.91
		External water use			5
		Total water consumption (36(1)) (l/p/d)			131.235

7.5 Appendix E:

Measured water demand – Carriage House

Part G Water Calculation Data Collection

Date 3rd March 2022

Property Address:
Carriage House
Burton Park Road
Petworth
West Sussex GU28 0JS

Filled in By: Mr and Mrs Stuart Haill

Number: 07779113343 or 07969666603

Email: pepperandspot@gmail.com

	Installation Type	Unit of Measure	Capacity/Flow rate -1	Make/model
3	WC (single flush)	Flush Volume (litres)	eg 6	AD10 England ES2109 x3
1	WC (dual flush)	Full flush Volume (litres)	eg 6	Gerberit
		Part flush Volume (litres)	eg 4	
	WC (multiple fittings)	Average effective flushing Volume (litres)	eg 5.49	N/A
2	Taps (excluding kitchen/utility room taps)	Flow rate (litres/min)	13 eg 9	Ensuite basin
1	Bath (where shower also present)	Capacity to overflow(litres)	eg 158	bath measures 600 wide 300 high to over flow 1500 long
1	Shower (where bath also present)	Flow Rate(litres / minute)	eg 9 8	En Suite shower
	Bath Only	Capacity to overflow(litres)	eg 158	bath measures 600 wide 300 to overflow 1500 long
1	Shower Only	Flow rate (litres/minute)	8 eg 12	
	Kitchen/Utility room sink taps	Flow rate (litres/minute)	10 kitchen 8 utility eg 10	
	Washing Machine	(Litres/kg dry load)	eg 8.2	bosch 1400 express
	Dishwasher	(Litres/place setting)	eg 1.25	Lamona 8606
	Waste disposal unit	(Litres/use)		n/a
	Water Softener	(Litres/person/day)		Monarch SXP 22

Please complete and return by Fax, post or email:

01223 577278

27 Fairway Girton Cambridge, CB3 0QF

robin@sapratings.com

We're Raising money for WaterAid this year: Pay it forward with us!

http://www.justgiving.com/GreenHeatWaterAid

7.6 Appendix F:

Rainwater Harvesting Tank size calculator

COLLECTABLE ROOF AREA (M²)

Main Building	Width:		Length:		Rain Collection Area:	0 m²
Extension one	Width:		Length:		Rain Collection Area:	0 m²
Extension Two	Width:		Length:		Rain Collection Area:	0 m²
Extension Three	Width:		Length:		Rain Collection Area:	0 m²
Or the total roof area, if you already know it:				221	Total area of collectable roof space:	221 m²
Select Your Region		England SE & Central S			Average rainfall per year in your region:	64 L
Collectable rainwater per annum in litres - discounted by 20% to account for water loss						**113152 L**

USE OF RAINWATER IN THE BUILDING

	people:	*bedrooms:*	
Number of people or bedrooms in the building -	1.32	0	
☑ Number of clothes washing cycles per day (*50 litres each*)	0.25 Cycles	12.50	L
☑ Number of toilet flushes per day (*4.42 flushes per person, average 5 litres each*)	4.42 Flushes	22.10	L
Outdoor use in litres, per person per day (*recommended 5 litres per person per day*)	0	0.00	L
Amount of water you require every day		34.6	L
Amount of water you require every year	**DEMAND**	**12629**	**L**

FINAL FIGURES

How many days drought protection do you need? Typically 21 (18 minimum)	35	
Capacity of water storage in litres required for drought protection	1211.00	L
The lesser of YIELD (blue) or DEMAND (green) per annum	12629	L
Therefore, volume of rainwater storage required	**1211**	**L**

CONCLUSION

Is there sufficient roof water available:		YES
Recommended tank size from our shallow dig range:	F-Line Range:	1500 LITRE F-LINE TANK