SWAINS FARM
BRIGHTON ROAD,
HENFIELD,
HORSHAM,
WEST SUSSEX,
BN5 9RP

Removal of modern agricultural building to be replaced with 4 new buildings comprising 4 residential dwellings.

Rainwater Harvesting details

3rd July 2024

The application proposes rainwater harvesting for non potable water.

The following provides details of the system to be used, its maintenance and management for the lifetime of the development.

Rainwater Harvesting is proposed to be installed to meet 100% of the water demand for toilets and washing machines.

This will equate 23.8 litres / person / day (see Appendix A and B of the Water neutrality report)

Census data has been used to estimate the average number of people in each unit (as per HDC guidance)

This sets out that the following occupancy rates should be used.

One-bedroom dwellings: 1.32 occupants
Two-bedroom dwellings: 1.88 occupants
Three-bedroom dwellings: 2.47 occupants
Four-bedroom dwellings: 2.86 occupants
Five-bedroom dwellings: 3.09 occupants.

The units will each be two bedroom and so a figure of 1.88 people per unit should be used.

Using the figure of 23.8 litres per person per day and a population size of 1.88 it is estimated that the total water usage per day per unit is 44.74 litres per day.

Therefore, following the construction of the proposed development there will be an increase in water demand over the 4 units totalling 178.98 litres per day.

British Standard 16941-1:2018 (previously BS 8515:2009+A1:2013) provides guidance on rainwater harvesting.

The British Standard gives recommendations on the design, installation, testing and maintenance of rainwater harvesting systems and the methods of calculating the size of rainwater harvesting tanks.

The intermediate approach has been used to calculate the storage capacity.

The calculations for water demand and available yield are shown in Appendix 2

These calculations show the size of the rainwater harvesting system that would be required to meet the water demand for the development for a period of 35 days. This would allow for the recognised 35 day drought tolerance capacity

The calculations in Appendix 2 conclude that:

- The water demand for the development per unit and allowing for 35 days of drought tolerance would be 1,568 litres

- The total available rainwater yield for the development based on available roof area and allowing for 35 days of drought tolerance would be 13,549 litres

- The water demand for the development per unit and allowing for 60 days of drought tolerance would be 2,678 litres

- The total available rainwater yield for the development based on available roof area and allowing for 60 days of drought tolerance would be 23,146 litres

It is clear that the available rainwater yield is in excess of the demand and so the development can be entirely supplied by way of rainwater harvesting subject to the quality of the supply being maintained (see below)

Each unit would therefore require a rainwater harvesting tank with a minimum storage capacity of 2,678 litres in order to ensure sufficient capacity to meet the demand of the development.

It is therefore proposed to install a 3,000-litre potable rainwater harvesting tank for each unit. Details of the tank are shown in Appendix 4.

Ensuring certainty of the supply to meet the demand

Based on the above figures it is clear that the rainwater harvesting system will meet the water demand for the site and will meet the required 35 days of storage, which will provide sufficient supply during periods of drought.

Where drought periods extend beyond 35 days, the rainwater harvesting system has been designed to allow for up to 60 days of drought tolerance and so there is no need for an automatic mains backup.

This will ensure that sufficient water is available at all times, even during extended periods of drought.

Filtration and testing measures proposed to ensure water quality

BS EN 16941-1:2018 states that frequent testing should not normally be required for rainwater harvesting systems to ensure the water quality. It states that observations for water quality should be made during maintenance visits and testing should be carried out where the system is not operating satisfactorily.

Annual water samples will be tested for the following in accordance with BS EN 16941-1:2018 :

- pH
- TOC
- Colour
- Turbidity
- Suspended solids
- Conductivity
- Cl, NO3, SO4
- Na, Ca, Mg, Al
- Ni, Cr, Cu, Pb
- Total & Dissolved Fe
- Mn
- Ammonium/Ammonia
- TVC, E.Coli, Coliforms, Pseudomonas aeruginosa, Enterococci, Clostridium perfringens

The rainwater harvesting system shall incorporate suitable treatment in accordance with BS EN 16941-1:2018, to ensure that the water quality is suitable for non potable use.

This will include:

- Removal of coarse particles, upstream of the storage;
- Retention of fine particles by sedimentation and flotation in the storage tank; and
- Filtration following the storage device, depending on the intended use.

Leaf guards on gutters and a leaf filter will be provided with a first flush diverter included to divert particles contained in rainwater away from the tank and to a suitable drain.

This will avoid coarse solids and organic matter from entering the storage tank.

Finer particles will be separated either by sedimentation by settling out to the bottom of the tank, or flotation to the water surface. A calmed inlet will be incorporated in the tank to prevent turbation of the sediment at the bottom of the tank by the inflow of water.

Water will be extracted from the tank via a float switch pump, this will extract water from a level that is above any sediment collected at the bottom of the tank and below any floating particles.

Water to be used for used for laundry will pass through a UV filter to kill any microorganisms, prior to it being used in the washing machine.

Maintenance and Management Plan

Responsibilities.

The following sets out the long-term management and maintenance of the rainwater harvesting systems at the proposed development.

It is vital that the occupants have a robust inspection and maintenance plan for the lifetime of the development to ensure the quality and yield of the water being supplied ensuring that the proposed development will remain water neutral.

Industry guidance, such as that provided in BS EN 16941-1:2018 and manufacturers guidance has been used to provide the maintenance and management plan.

As the system will be considered as a private water supply it will be governed by the Water Supply (water Quality) Regulations 2016. These are regulated by the local council's Environmental Health Officer or Pollution Control Officer.

The regulations in England and Wales do not require monitoring to be undertaken where the water supply is to a single domestic dwelling unless concerns are raised by the owner or occupier.

The Drinking Water Inspectorate's Private Water Supply regulations sets out that it is the responsibility of the homeowner to ensure that all necessary maintenance activities are carried out in a timely manner.

The occupants of the property should be aware of the system but it is expected that the occupants will enter in to a maintenance agreement with a company that has specialist knowledge of the systems. It is expected that as a minimum, the maintenance work will be carried out by a competent person who must have prior knowledge of the rainwater harvesting systems onsite.

Maintenance of the system

BS EN 16941-1:2018 does not require frequent testing to be undertaken but states that observations for water quality should be made during maintenance visits and testing should be carried out where the system is not operating satisfactorily.

The annual maintenance inspection should include:

- Inspection and cleaning of the tank
- Cleaning of gutters
- Inspection of filters
- Inspection of pumps
- Inspection of overflow areas
- Testing of the water supply

The results of the annual maintenance inspection and all sample testing should be recorded and should be kept with the property for the lifetime of the development.

Filters should be changed on a 3 monthly basis.

Contingency measures for system issues.

If a water sample failed, or the system was to fail it should be investigated by a qualified engineer with experience of the system.

Drain down points for each water pipeline will be installed for ease of cleaning and sterilization.

The engineers attendance would look to address re-activation of the system after it has been out of use due to lack of rainfall/use.

Appendix 1

Part G Water Calculations

PART G - WATER EFFICIENCY CALCULATOR

Project Ref:	1597
Project Name:	Swains Farm
Date:	08.02.2023
Assessor:	Naomi Sadler
Notes:	

Table A1: The water efficiency calculator

Installation type	Unit of measure		(1) Capacity/ flow rate	(2) Use factor	(3) Fixed use (litres/ person/ day)	(4) Litres/person/day = [(1) (2)] + (3)
WCs (multiple fittings)	Average effective flushing volume (litres)		3.06	4.42	0.00	13.53
Taps (excluding kitchen/utility room taps)	Flow rate (litres/minute)		3.00	1.58	1.58	6.32
Bath (where shower also present)	Capacity to overflow (litres)		170.00	0.11	0.00	18.70
Shower (where bath also present)	Flow rate (litres/minute)		8.00	4.37	0.00	34.96
Bath only	Capacity to overflow (litres)		0.00	0.50	0.00	0.00
Shower only	Flow rate (litres/minute)		0.00	5.60	0.00	0.00
Kitchen/utility room sink taps	Flow rate (litres/minute)		6.00	0.44	10.36	13.00
Washing machine	Litres/kg dry load	Washing machine installed? Yes	6.00	2.10	0.00	12.60
Dishwasher	Litres/place setting	Dishwasher installed? Yes	0.80	3.60	0.00	2.88
Waste disposal unit	Litres/use (If present = 1, If absent = 0)	Waste disposal installed? No	0.00	3.08	0.00	0.00
Water softener	Litres/person/day	Water softener installed? No	0.00	1.00	0.00	0.00
	(5)		Total calculated use = (Sum column 4)			101.99404
	(6)	Greywater Harvesting installed? No	Contribution from greywater (litres/person/day) from Table 4.6			0.00
	(7)	Rainwater Hervesting installed? No	Contribution from rainwater (litres/person/day) from Table 5.5			0.00
	(8)		Normalisation factor			0.91
	(9)		Total Internal Water Consumption = [(5) – (6) – (7)] = (8) (CSH)			92.8
	(10)		External water use			5
	(11)		Total water consumption (including external use) = (9) + (10) (litres/person/day) (Part G)			97.8

This calculation sheet has been developed in accordance with the methodology stated within Building Regulations Approved Document G 2015 (2016 Ammendments) Appendix A. Please refer to this document for specific guidance of how flow rates are to be derived.

09/02/2023

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01962 718870

PART G - WATER EFFICIENCY CALCULATOR

Project Ref:	1597
Project Name:	Swains Farm - Rainwater Harvesting APPENDIX B
Date:	08.02.2023
Assessor:	Naomi Sadler
Notes:	

Table A1: The water efficiency calculator

Installation type	Unit of measure		(1) Capacity/ flow rate	(2) Use factor	(3) Fixed use (litres/ person/ day)	(4) Litres/person/day = [(1) (2)] + (3)
WCs (multiple fittings)	Average effective flushing volume (litres)		3.06	4.42	0.00	13.53
Taps (excluding kitchen/utility room taps)	Flow rate (litres/minute)		3.00	1.58	1.58	6.32
Bath (where shower also present)	Capacity to overflow (litres)		170.00	0.11	0.00	18.70
Shower (where bath also present)	Flow rate (litres/minute)		8.00	4.37	0.00	34.96
Bath only	Capacity to overflow (litres)		0.00	0.50	0.00	0.00
Shower only	Flow rate (litres/minute)		0.00	5.60	0.00	0.00
Kitchen/utility room sink taps	Flow rate (litres/minute)		6.00	0.44	10.36	13.00
Washing machine	Litres/kg dry load	Washing machine installed? Yes	6.00	2.10	0.00	12.60
Dishwasher	Litres/place setting	Dishwasher installed? Yes	0.80	3.60	0.00	2.88
Waste disposal unit	Litres/use (If present = 1, If absent = 0)	Waste disposal installed? No	0.00	3.08	0.00	0.00
Water softener	Litres/person/day	Water softener installed? No	0.00	1.00	0.00	0.00
	(5)		Total calculated use = (Sum column 4)			101.99404
	(6)	Greywater Harvesting installed? No	Contribution from greywater (litres/person/day) from Table 4.6			0.00
	(7)	Rainwater Hervesting installed? Yes	Contribution from rainwater (litres/person/day) from Table 5.5			26.13
	(8)		Normalisation factor			0.91
	(9)		Total Internal Water Consumption = [(5) – (6) – (7)] = (8) (CSH)			69.0
	(10)		External water use			5
	(11)		Total water consumption (including external use) = (9) + (10) (litres/person/day) (Part G)			74.0

This calculation sheet has been developed in accordance with the methodology stated within Building Regulations Approved Document G 2015 (2016 Ammendments) Appendix A. Please refer to this document for specific guidance of how flow rates are to be derived.

Appendix 2

Water demand per unit and total available yield for rainwater harvesting calculations.

Water Demand per unit	
Dn = Pd x n x 365 x (365/number of days of drought storage required)	
Dn is the water demand	
Pd is the daily water requirement per person (litres)	
n is the number of persons	
35 Day water demand calculations calculated at 9.6% (35/365) of the Annual water demand (litres) to account for 35 days of storage for periods of drought	
Pd (daily water requirement per person (litres))	23.8
n (number of persons)	1.88
Dn (water demand) in litres	1568

60 Day rainwater storage calculations calculated at 16.4% (60/365) of the Annual rainwater yield (litres) to account for 60 days of storage for periods of drought and provide an increased buffer	
A (collection area (m2))	209
e (yield coefficient)	0.9
AAR (site specific annual average rainfall)	833.69
h (hydraulic filter efficiency)	0.9
Yr (rainwater yield) in litres	23146

Available Yield (TOTAL)	
Yr = A x e x AAR x h x (365/number of days of drought storage required)	
Yr is the rainwater yield	
A is the collection area (m2)	
e is the yield coefficient	
AAR is the site specific annual average rainfall	
h is the hydraulic filter efficiency	
35 Day rainwater storage calculations calculated at 9.6% (35/365) of the Annual rainwater yield (litres) to account for 35 days of storage for periods of drought	
A (collection area (m2))	209
e (yield coefficient)	0.9
AAR (site specific annual average rainfall)	752.61
h (hydraulic filter efficiency)	0.9
Yr (rainwater yield) in litres	12231

60 Day water demand calculations calculated at 16.4% (60/365) of the Annual water demand (litres) to account for 60 days of storage for periods of drought and provide an increased buffer	
Pd (daily water requirement per person (litres))	23.8
n (number of persons)	1.88
Dn (water demand) in litres	2678

Available Yield (TOTAL)	
Yr = A x e x AAR x h x (365/number of days of drought storage required)	
Yr is the rainwater yield	
A is the collection area (m2)	
e is the yield coefficient	
AAR is the site specific annual average rainfall	
h is the hydraulic filter efficiency	
35 Day rainwater storage calculations calculated at 9.6% (35/365) of the Annual rainwater yield (litres) to account for 35 days of storage for periods of drought	
A (collection area (m2))	209
e (yield coefficient)	0.9
AAR (site specific annual average rainfall)	833.69
h (hydraulic filter efficiency)	0.9
Yr (rainwater yield) in litres	13549

Appendix 3

Average rainfall (mm) from nearest weather station

Month	Maximum temperature (°C)	Minimum temperature (°C)	Days of air frost (days)	Sunshine (hours)	Rainfall (mm)	Days of rainfall ≥1 mm (days)	Monthly mean wind speed at 10 m (knots)
January	7.83	1.52	10.89	53.42	90.34	13.10	6.56
February	8.49	1.44	10.47	75.42	64.46	10.86	6.56
March	11.20	2.79	7.35	119.36	53.65	9.44	6.60
April	14.50	4.24	3.87	171.48	52.49	9.73	5.80
May	17.74	7.11	0.60	206.31	54.83	8.90	5.44
June	20.80	9.92	0.03	209.70	50.67	8.79	5.12
July	23.14	11.99	0.00	215.95	54.73	8.45	4.82
August	22.70	11.86	0.00	199.09	60.42	9.29	4.64
September	19.55	9.51	0.07	156.01	64.71	9.15	4.68
October	15.35	7.10	1.66	110.62	94.33	12.51	5.18
November	11.11	3.91	6.09	65.21	97.11	13.17	5.20
December	8.25	1.74	11.89	45.87	95.95	12.82	5.94
Annual	15.09	6.12	52.92	1628.44	833.69	126.21	5.54

Table 2 – MET OFFICE Station: Charlwood (Nearest Climate Station)

Appendix 4

Details of rainwater harvesting tank

F-Line Rainwater Harvesting System (3000ltr)



Product ID: 135

in stock

Price:£3,271.27 *(£2,726.06 Exc Vat)*

Quantity: - 1 +

Optional Upgrades?

No Thanks

ADD TO CART