

STATEMENT ON WATER NEUTRALITY version 3

As a result of Natural England's 'position statement' regarding water consumption and its effect on natural habitats, Horsham District Council requires that new dwellings are 'water neutral' insofar as they have no *significant* effect on water consumption in the District, and comply with Section 77 of Habitats Regulations.

Water neutrality can be achieved by designing measures to both offset consumption and also to reduce consumption.

The proposals for this development are therefore as follows:

A: OFFSET CONSUMPTION

This is achieved principally by rainwater harvesting, whereby natural rainfall is collected and used instead of mains water supplied from boreholes. An example is the rainwater system provided by RainHarvesting Systems (see: <https://rainharvesting.co.uk/> and also attached calculations) that will collect rainwater from the roofs of the development and both clean it and store it for consumption. See Appendix III.

The size of rainwater storage tanks follows a formula in BS 8515 that is based on 5% of the calculated annual water yield, which is equivalent to approximately three weeks rainfall.

The roof area for each dwelling is 110m², which indicates that the water yield might be about 57000 litres per annum, with 5% being 3000 litres. Average precipitation here is about 50mm per month (73mm in October, 40mm in February) and this equates to a minimum monthly harvest of 4.4m³ or 4400 litres (February) or maximum 8.03m³ or 8030 litres in October. However, storage is needed for dry periods and this would suggest a larger tank capacity. Additional storage to give a total of 6000 litres (in two tanks each 3000 litres) could be replenished throughout the year in an area like Horsham District, and this would give a 'reserve' of water sufficient for twenty four day supply at 125 litres per day.

Nevertheless, reducing consumption by recycling water can decrease the figure.

B: REDUCE CONSUMPTION

In order to reduce consumption, much water that is normally used for secondary purposes (such as washing machines, toilet flushing, garden, car washing) can be derived from grey water recycling, further reducing the demand from treated or mains supplies.

These systems are provided by (amongst others) Aqua-lity (see <https://www.aqua-lity.co.uk/>) who offer an installation that will make grey water available for secondary non potable water usage.

C: PROPOSED INSTALLATION

The installation for each dwelling will comprise:

- a) Roof area of 110 m² providing rain water to two 3300 litre underground tanks such as 'Rainsava' by Rainharvesting or Garden Angel, which are BS8515 compliant, situated at the front (drive) side of each property for ease of access and maintenance.
- b) A filtration and cleaning system that will provide clean drinking water to all appliances within the dwelling as required under building regulations; sinks, showers and hand

basins. This must comply with Regulation 5 from Drinking Water Inspectorate. A filtration and sterilisation system such as Silverline (see: <https://silverlineuk.co.uk/>).

- c) A grey-water recycling system, as may be provided by Aqua-lity, will provide secondary water for flushing wc's and for gardens or washing cars, ensuring that water consumption is minimised to well less than 40 litres per person per day. This water is drawn from sinks/hand basins/showers that use potable water.
- d) Sanitary provision will comprise showers only (no baths) and WCs with water saving flush.

In support of these proposals, appendices I, II, III, IV and V are given below to describe in technical detail the systems and data used.

D: CONCLUSION

Despite measures to minimise and offset water consumption, the water suppliers have a statutory duty to supply drinking water to all dwellings. It is only when development is 'off-grid' that this duty may be waived, and this report seeks only to show how water consumption may be reduced in response to Natural England's demand that new development has no *significant* effect on abstraction from aquifers and natural water sources. Appendix VI gives figures to show the potential water usage based on the proposed system.

Appendix I: Occupancy

Anticipated occupancy for each dwelling is derived from the 2011 UK Census that gives an *average* household size of 2.3 persons¹ per household.

Of 2246 households in Henfield, 26% have dependent children.²

The proposed dwellings have three bedrooms each, of which one is on the ground floor. These homes have been designed for a couple with one or two children OR a couple with one child *and* a dependent parent, giving an anticipated occupancy of four persons. Average number of rooms is 5.8 in HDC compared with 5.4 in West Sussex³

Appendix II: Water Consumption

Part G of Building Regulations controls water efficiency.

The definition of drinking water is variously given as *drinking, potable or wholesome*⁴.

Requirement G1 requires wholesome water to any place where drinking water is drawn off, to any space that contains a wash basin as well as a sanitary convenience or adjacent room with sanitary convenience and any sink where food is prepared. It follows that this dwelling must provide wholesome water to all sanitary appliances within the building.

Guidance within Part G requires that water supply is reliable and of sufficient pressure and flow rate for sanitary appliances. This must be done without waste, undue consumption or misuse.

Requirement G2 and regulation 36 address water efficiency. This defines *average* usage as 110 litres per person per day (pppd). With an occupancy of four persons, daily water consumption would therefore be 440 litres (0.44m³), however, when combined with recycling

¹ 2011 UK Census from ONS

² Henfield census 2011 from HDC website

³ Census bulletin West Sussex Households WSCWG

⁴ Section 67 Water Industries Act 1991, Water Supply (Water Quality) Regulations 2000 and 2001

the calculation in Appendix III suggests that only **125** litres per day is required (32 litres pppd).

The calculation of consumption is obviously fundamental to requirements for an installation that will supply all (or most) of the drinking (wholesome) water, and this figure varies between 110 litres pppd (building regulations) to 32 litres pppd. It would seem sensible to allow for the larger volume but anticipate the lower.

There is also the question of provision by water suppliers (Southern Water) who are statutorily obliged to provide water by law, and it may be that this can be provided within constraints set by the local authority that encourage efficient and minimal usage of water from abstraction of natural sources.

Appendix III: Water Harvesting

Precipitation (average) in West Sussex (Gatwick 1985 – 2015)⁵ is as follows (mm/month):

Jan 47.3 Feb 32.2 Mar 25.7 Apr 31.3 May 26 Jun 23.2 Jul 25.4 Aug 23.7 Sep 23.5 Oct 46.9 Nov 41.1 Dec 43.1

The longest period without rain was in June 2018 (driest since 1921), from 30 May to 17 June, when rainfall during that period was only 5% of the average. It follows that if Water Harvesting is to provide an average of 440 litres/day (from building regulations G2 @ 110 litres pppd), then in June this will require a storage capacity to accommodate lack of rainfall.

The calculation by Rainharvesting Systems (below) describes maximum annual water available in the region of 57000 litres giving 5% compliant with BS 8515 of 2850 litres.

STORAGE VOLUME ASSESSMENT Calculations for annual rainwater yield.

Roof area available: 110 square metres

Annual rainfall: 722 mm

Filter co-efficient: 0.9

Run-off co-efficient: 0.8

Maximum annual water available: 57182.4 litres

5% figure compliant with BS 8515: 2859.12 litres (YIELD CALC.)

Calculations for daily rainwater demand.

No. of occupants: 4

WC use

Flush volume: 6 litres

Flushes / person / day: 5

total WC use: 120 litres

Washing machine

Litres per cycle: 40 litres

Cycles per day:

total WM use: 0 litres

External use: 5 litres

Total daily demand: 125 litres

5% of annual demand: 2281 litres (DEMAND CALC.)

(daily demand x 365 ÷ 20)

RECOMMENDED STORAGE TANK VOLUME IS: 3000 Litres⁶

However, these figures permit 'topping up' using mains supply, and the intention of 'water neutrality' is that it is free from mains water use. A reduction in consumption to 125 litres per

⁵ Met Office

⁶ Calculation provided by Rainharvesting Systems Ltd Calf Way Bisley GL6 7BX

day would mean that two storage cisterns of 3000 litres would last 48 days without resupply, which in practise would permit twenty four days given that re-supply in, say, August would be slow after a drought in July.

Appendix IV: Water Storage

Storage of forty eight day supply is easily provided by two 3300 litre 'Garden Angel' rainwater tanks that are 1.2m diameter and 2.0m deep. Refer to: <https://www.tanks-direct.co.uk/3300-litre-garden-angel/p2949>

Appendix V: Specification of Equipment

Proposed rainwater harvesting *for each dwelling* will be:

STORAGE:

Two underground tanks each 3300 litres as may be supplied by Garden Angel.

RAIN HARVESTING:

Supplied from roofs via downpipes to RH Eco Pro system (see diagram) providing pumped supply to; a) UV/bacteria water treatment system by Silverline (see diagram) that supplies all sinks, hand basins and showers, and b) water to wc's for flushing.

WATER TREATMENT:

Taking into account a peak flow rate of 30 lpm and a daily use of 500 liters per day will need installation of the following:

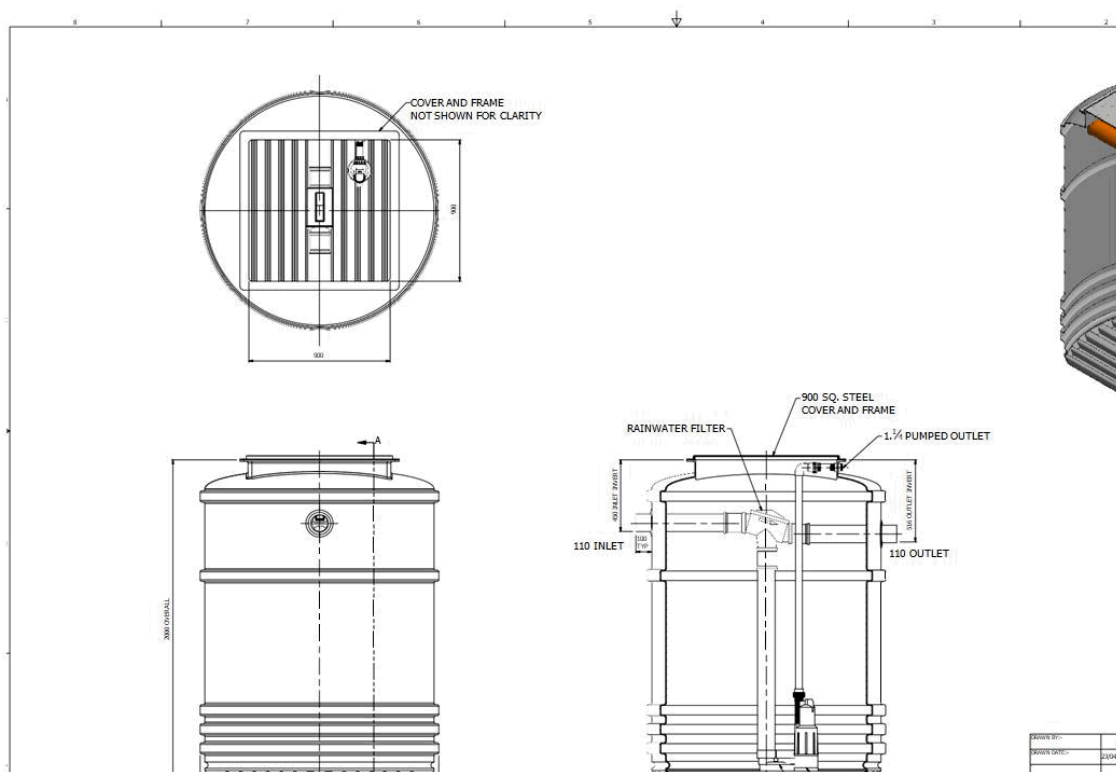
- 1 X PREFILT103/4 10" prefilter housing
<https://silverlineuk.co.uk/shop/10-quot-cartridge-filter-housing-prefilk3-4/>
- 1 X CRT10SW-05 5 micron sediment filter
This filter will need replacing every yea.
- 1 X UV-CS165 108 lpm unit
<https://silverlineuk.co.uk/wp-content/uploads/2020/02/UV-CS165.pdf>
This unit will need the flow restricting to 36 lpm to ensure a 90 mj/cm2 dose to treat the psudomonas in the water.
- 1 X 10" x 54" pH correction unit
<https://silverlineuk.co.uk/shop/standard-ph-correction-unit-with-no-backwash-head-psph/>
This unit will need the media replacing every 2 years or so

Storage of water requires aeration to prevent proliferation of bacteria, and technical advice suggests two small tanks are better than one large one.

WATER RECYCLING:

The system proposed by Aqua-lity offers a system that takes grey water from sinks, showers and washing machines, and makes it available for use either for flushing wc's or for garden/external use. It comprises; filter, buffer tank, aerator, membrane filter, clear water storage, aqua recycling control, aqua control and safety measures.

An illustration is given in appendix VII showing suppliers diagrams and technical descriptions.



3300 LITRE GARDEN ANGEL

Rain water is collected from your roof area. It is then passed through the PF1 filter system which removes any large pieces of debris, leaves, etc. and then into the underground tank through a calmed inlet designed to stop the disturbance of any sediment in the bottom of the tank. Excess water will pass through an overflow to the tank to be connected to the storm drain or soakaway.

Inside the tank sits a submersible DAB Divertron 1000 high pressure pump which works on demand, ie a tap being. The pump switches on and allows the stored to flow.

The Garden Angel Comes in five different sizes 1000L - 14000L - 2200L - 2400L and 3300L.

System Includes

- Tanks
- Pedestrian rated Cover
- Internal PF Filter System
- Calmed Inlet
- High Quality Submersible Pump
- Delivery to Site

Product Code	GA3300
Height (mm)	2000
Diameter (mm)	1200
Capacity (Litres)	3300L
Capacity (Gallons)	725
Weight (Kg)	155
Shape	Round
Material	MDPE
Potable or Non Potable	Non Potable
Tank Use	Below Ground

3300 litre GARDEN ANGEL WATER STORAGE TANK

SYSTEM COMPONENTS



- 1) **Coarse filter**
with back wash facility
- 2) **Greywater buffer tank**
collects the incoming water for treatment
- 3) **Aerator**
supplies water with oxygen and keeps membranes free from dirt deposits
- 4) **Membrane filter**
guarantees the high water quality
- 5) **Clear water storage**
keeps water available for use
- 6) **Aqua Recycling-Control**
monitors and controls the treatment process
- 7) **Aqua-Control (AC1100 shown)**
booster pump set with mains water back-up facility and controls
- 8) **Floor drain**
is needed as a safety measure

GREY WATER RECYCLING

ROGER MINOST RIBA

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