

Water Neutrality Report

Development at Denver, Okehurst Lane, Billingshurst RH14 9HR

For

Denver Commercial LLP

Rev – **P3**

Reference **C2182**

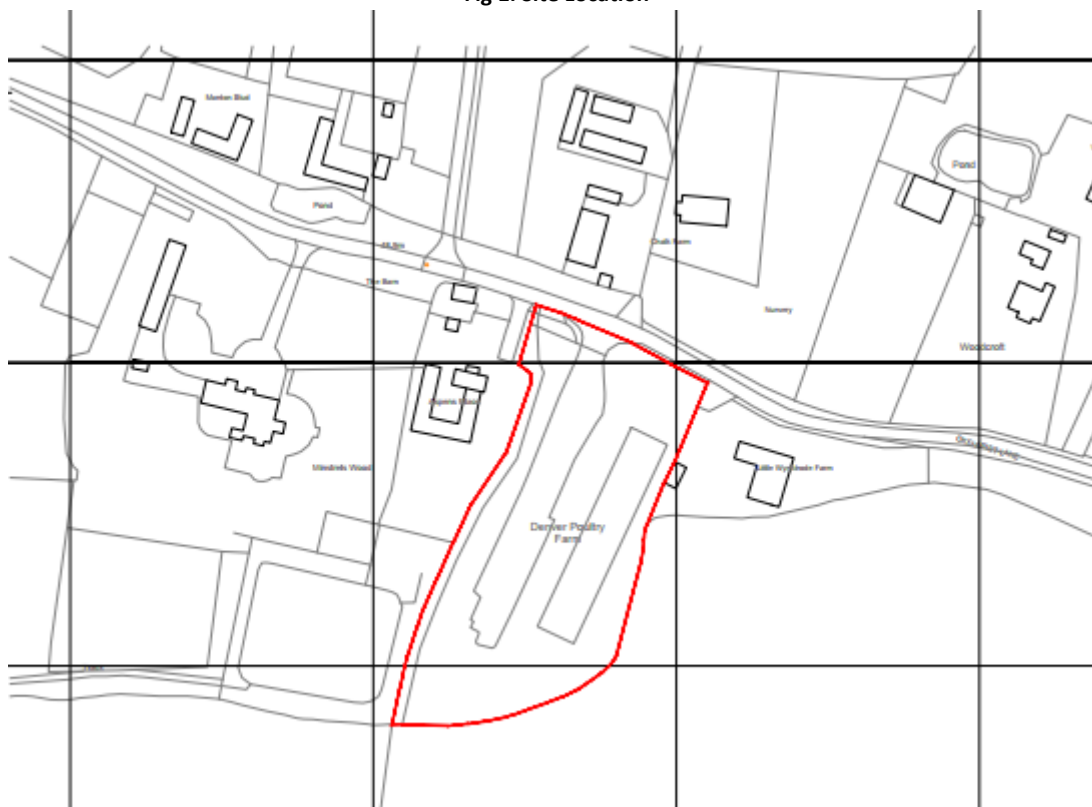
Date **22nd June 2023**

Revision	Date of Issue	Comments	Prepared By	Checked By
P	21.06.2022	Initial Issue	LH	CS
P1	09.11.2022	Revised	LH	CS
P2	17.11.2022	Revised	LH	CS
P3	22.06.23	Revised	LH	CS

1 Introduction

- 1.1.1 CGS Civils Ltd has been appointed by Denver Commercial LLP to undertake a Water Neutrality Report for a proposed development at Denver, Okehurst Lane, Billingshurst. Planning permission is sought for the demolition of a former poultry farm and the development of 3 No. Class B8 Storage Units.
- 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 TQ 09069 27464 and has the post code RH14 9HR

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.

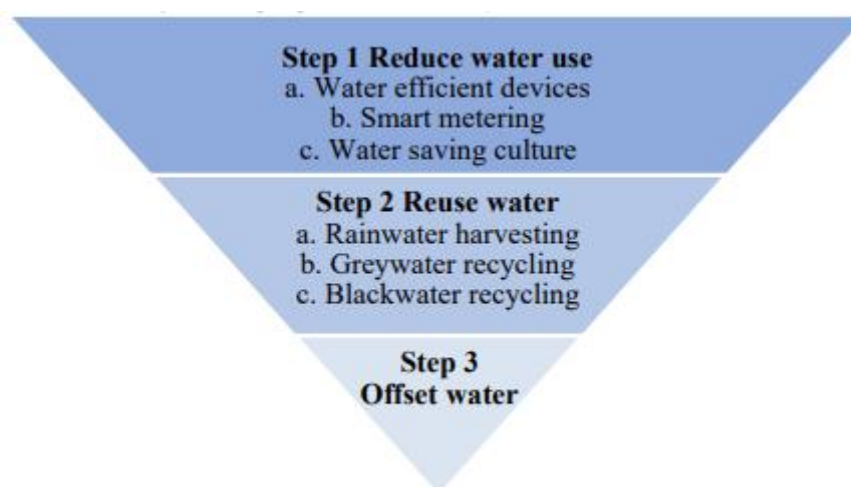
- Reduce water demand in the new development through improvement in efficiency.
- Re-use water, wherever possible.
- Offset the remaining water demand from the new development if required.

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 measured 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 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

1.1.11 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 3 No. new build Class B8 storage properties. The storage units will have a maximum of 10 workers.

2.1.2 The proposed development will consist of Class B8 Storage which will have office workers within the property. Due to the limited guidance from Natural England and Horsham DC on the water usage for these properties; the water usage will be calculated using the BREAAAM Calculator – **See Appendix A.**

$$\begin{aligned} &10 \times 14.3 \text{ l/p/d} \\ &= \mathbf{143 \text{ l/day}} \end{aligned}$$

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 properties with efficient products, such as:
 - Aerated Taps
 - Low Flush Toilets, or air flush toilets
- 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 properties 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
Basin Taps	6 l/min
Sink Taps	8 l/min

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
Basin Taps	5 l/min
Sink Taps	6 l/min

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
Basin Taps	2.5 l/min
Sink Taps	5 l/min

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. It should be noted that behavioural changes 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 **143 l/day** down to **72.5 l/day**

$$10 \times 7.25 \text{ l/p/d}$$

$$= \mathbf{72.5 \text{ l/day}}$$

- 10 (confirmed occupancy over 3 Class B8 buildings) x 7.25 (Appendix B – BREEAM 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 property 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 In this instance however, rainwater harvesting is proposed to enable total self-sufficiency within the building to provide water to all fittings including drinking water. 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 rainwater harvesting tank as well as has sufficient capacity for a 60-day drought period. **See Appendix C.**

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

$$10 \times 0$$

$$= 0 \text{ l/day}$$

$$- 10 \text{ (confirmed occupancy over 3 Class B8 buildings)} \times 0$$

- 4.1.5 In addition to the rainwater harvesting tank calculator in Appendix C which proves that there is sufficient roof area to account for the water usage within the property to achieve total self-sufficiency to include drinking water. A separate calculation is to be made to ensure that the rainwater harvested is greater than the rainwater demand within the dwelling. The following is a calculation for 5% of the annual rainwater yield and has been calculated using Rainfall data from the National River Flow Archive which provides annual rainfall data as recorded by the Met office and follows the intermediate approach as detailed within BS 8515:2009. Please note, the following calculation is carried out for a quarter of the total roof area of the site, and a quarter of the total workers on site.

$$Y_R = A \times e \times h \times n \times 0.05$$

Where:

Y_R = the annual rainwater yield (l)

A = The collecting area (m²)

e = yield coefficient (%)

h = depth of rainfall (mm)

n = hydraulic filter efficiency

$$\underline{17176} = 565 \times 0.8 \times 800 \times 0.95 \times 0.05$$

- 4.1.6 In order to ensure there is sufficient roof area, another calculation from BS 8515:2009 must be carried out in order to calculate the annual demand within the property. The following is a calculation for 5% of the annual non-potable water demand. (This will take into account full water usage within the property to ensure it can be entirely self-reliant).

$$D_N = P_d \times n \times 365 \times 0.05$$

Where:

D_N = the annual non-potable water demand (l)

P_d = The daily requirement per person (l)

n = number of persons

$$330.8 = 7.25 \times 2.5 \times 365 \times 0.05$$

- 4.1.7 To ensure there is sufficient area to allow a 60-day drought storage, an extra 60 days is to be included:

$$\underline{385.2} = 7.25 \times 2.55 \times 425 \times 0.05$$

- 4.1.8 **It should be noted that a main water connection should still be made for use within an emergency. This emergency usage will not affect the water usage of the dwelling and will therefore not be included as part of the demand of the property.**

- 4.1.9 From the above water calculations, we have:

- Proposed water usage rate of 14.3 litres/person/day based on BREAAAM Calculator in Appendix A
- Which can then be reduced to a proposed water usage rate of 0 litres/person/day with water efficient devices and rainwater harvesting

- 4.1.10 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 BREAAAM Calculator in Appendix A – 14.3 l/p/d at an overall occupancy rate 10 people = **143 l/day.**
- Proposed Water Demand with water efficient devices listed in **Appendix B** and Rainwater harvesting – 0 l/p/d at an overall occupancy rate of 10 people = **0 l/day**

4.1.11 The client is willing to install 4 x 1,500 l rainwater harvesting tanks which utilised to achieve total self-sufficiency within the property, to include drinking water. The harvesting tank is to be fitted with the following equipment in order to get the rainwater to a level safe for human consumption.

- Aerator
- Lowara 0.55 kW variable speed booster set
- PREFILT103/4 10" prefilter housing
- CRT10SW-05 5 micro sediment filter
- UV-CS165 ultraviolet steriliser (3 lamps to be replaced every year)
- WH1MH Whole house water filter (filter media to be replaced every 2 years)
- 10" x 54" pH correction unit (media to be replaced every 1-2 years)

4.1.12 Due to the proposed rainwater harvesting tank and filtration system, there is no requirement to install a water main to the property, however, one should be installed in case of emergency – as such this means the proposed site will not require a Water Neutrality report (based on Natural England's definition below) and will also be water neutral.

"The water neutrality approach applies to all development that uses water from the Sussex North water supply zone and specifically the Pulborough abstractions it is not restricted to new residential dwellings and may include other forms of development that use the public water supply. Whether an application is included would depend on what water supply is chosen. **Only development that uses public water supply from Sussex North water supply zone is included in the Statement. Many of the types of development that use water that the County Council permit do not use public water supply and would therefore not be covered by the Statement.** It is for the local planning authorities including the County Council to identify which types of development they believe may be captured."

5 Step 3 – Offsetting remaining water demand

5.1.1 Due to the proposed installation of a rainwater harvesting tank, which will be utilised to achieve total self-sufficiency, including drinking water; there is no requirement to offset the water demand elsewhere as the demand is **0 l/day**.

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 The client is willing to install a series of 4 x 1,500l rainwater harvesting tank with a filter system which will make the rainwater suitable for all use including drinking.

6.1.3 To summarise:

- The proposed development will use on average **143 l/day**.
- This water demand can be reduced to **72.5 l/day** through the installation of water reducing appliances
- Re-using the water through rainwater harvesting tanks to achieve total self-sufficiency can further reduce the water demand down to **0 l/day**
- The overall water demand will be reduced and the site will become water neutral.

7 Appendices

7.1 Appendix A:

BREEAM Calculator for proposed development:

Building details

Building name

Denver, Okehurst Lane, Billingshurst

BRE assessment reference no.

WCs

WC type		Specification effective flush volume (litres)	Quantity (no.)		Total per fitting type
1	Toilet	4.50	4		18.00
2					0.00
3					0.00
4					0.00
5					0.00
Total			4		18.00

Average effective flushing volume (litres)

4.50

Enter this average component consumption figure in to the rel

Urinals

Urinals - automatically operated flushing cisterns

Urinal flushing system type		Specification cistern capacity (litres)	Flushing frequency (flushes/hr)	Quantity (no.)		Total per fitting type
1					0	0.00
2					0	0.00
3					0	0.00
4					0	0.00
5					0	0.00
					0.00	0.00

Average cistern capacity (litres)

No. of cisterns

Average flushing frequency (flushes/hour)

0

Urinals - Manual or automatically operated pressure flushing valves

Urinal flushing system type		Specification flush volume (litres)	Quantity (no.)		Total per fitting type
1					0.00
2					0.00
3					0.00

4					0.00
5					0.00
Total			0		0.00

Average flush volume (litres)

Taps (excluding kitchen sink taps)

Tap type		Specification flow rate (litres/minute)	Quantity (no.)		Total per fitting type
1	Tap	6.00	4		24.00
2					0.00
3					0.00
4					0.00
5					0.00
Total			4		24.00

Average flow rate (litres/min)

6.00

Enter this average component consumption figure in to the rel

Proportionate flow rate (litres/min)

4.20

Kitchen sink taps

Tap type		Specification flow rate (litres/minute)	Quantity (no.)		Total per fitting type
1		8.00	4		32.00
2					0.00
3					0.00
4					0.00
5					0.00
Total			4		32.00

Average flow rate (litres/min)

8.00

Enter this average component consumption figure in to the rel

Proportionate flow rate (litres/min)

5.60

Showers

Shower type		Specification flow rate (litres/minute)	Quantity (no.)		Total per fitting type
1					0.00
2					0.00
3					0.00
4					0.00

5					0.00
Total			0		0.00
Average flow rate (litres/min)					
Proportionate flow rate (litres/min)					0.00

Baths

Bath type		Specification capacity to overflow (litres)	Quantity (no.)		Total per fitting type
1					0.00
2					0.00
3					0.00
4					0.00
5					0.00
Total			0		0.00
Average capacity to overflow (litres)					
Proportionate capacity to overflow (litres)					0.00

7.2 Appendix B:

BREEAM Calculator for proposed development with water efficient fittings.

Building details

Building name

Denver, Okehurst Lane, Billingshurst

BRE assessment reference no.

WCs

WC type		Specification effective flush volume (litres)	Quantity (no.)		Total per fitting type
1	Toilet	2.00	4		8.00
2					0.00
3					0.00
4					0.00
5					0.00
Total			4		8.00

Average effective flushing volume (litres)

2.00

Enter this average component consumption figure in to the rel

Urinals

Urinals - automatically operated flushing cisterns

Urinal flushing system type		Specification cistern capacity (litres)	Flushing frequency (flushes/hr)	Quantity (no.)		Total per fitting type
1					0	0.00
2					0	0.00
3					0	0.00
4					0	0.00
5					0	0.00
					0.00	0.00

Average cistern capacity (litres)

No. of cisterns

Average flushing frequency (flushes/hour)

0

Urinals - Manual or automatically operated pressure flushing valves

Urinal flushing system type		Specification flush volume (litres)	Quantity (no.)		Total per fitting type
1					0.00
2					0.00
3					0.00

4					0.00
5					0.00
Total			0		0.00

Average flush volume (litres)

Taps (excluding kitchen sink taps)

Tap type		Specification flow rate (litres/minute)	Quantity (no.)		Total per fitting type
1	Tap	2.50	4		10.00
2					0.00
3					0.00
4					0.00
5					0.00
Total			4		10.00

Average flow rate (litres/min)

2.50

Enter this average component consumption figure in to the rel

Proportionate flow rate (litres/min)

1.75

Kitchen sink taps

Tap type		Specification flow rate (litres/minute)	Quantity (no.)		Total per fitting type
1		5.00	4		20.00
2					0.00
3					0.00
4					0.00
5					0.00
Total			4		20.00

Average flow rate (litres/min)

5.00

Enter this average component consumption figure in to the rel

Proportionate flow rate (litres/min)

3.50

Showers

Shower type		Specification flow rate (litres/minute)	Quantity (no.)		Total per fitting type
1					0.00
2					0.00
3					0.00
4					0.00

5					0.00
Total			0		0.00
Average flow rate (litres/min)					
Proportionate flow rate (litres/min)					0.00

Baths

Bath type		Specification capacity to overflow (litres)	Quantity (no.)		Total per fitting type
1					0.00
2					0.00
3					0.00
4					0.00
5					0.00
Total			0		0.00
Average capacity to overflow (litres)					
Proportionate capacity to overflow (litres)					0.00

7.3 Appendix C:

Rainwater Harvesting Calculator for a quarter of the total roof area:

COLLECTABLE ROOF AREA (M ²)					
Main Building	Width:		Length:		Rain Collection Area: 0 m ²
Extension one	Width:		Length:		Rain Collection Area: 0 m ²
Extension Two	Width:		Length:		Rain Collection Area: 0 m ²
Extension Three	Width:		Length:		Rain Collection Area: 0 m ²
Or the total roof area, if you already know it:			565	Total area of collectable roof space: 565 m ²	
Select Your Region	England SE & Central			Average rainfall per year in your region: 64 L	
Collectable rainwater per annum in litres - discounted by 20% to account for water loss					289280 L

USE OF RAINWATER IN THE BUILDING			
Number of people or bedrooms in the building -		people: 3	bedrooms: 0
☐	Number of clothes washing cycles per day (50 litres each)	0.00 Cycles	0.00 L
☐	Number of toilet flushes per day (4.42 flushes per person, average 5 litres each)	0.00 Flushes	0.00 L
Outdoor use in litres, per person per day (recommended 5 litres per person per day)		7.25	21.75 L
Amount of water you require every day			21.75 L
Amount of water you require every year		DEMAND	7938 L

FINAL FIGURES		
How many days drought protection do you need? Typically 21 (18 minimum)	60	
Capacity of water storage in litres required for drought protection	1305.00	L
The lesser of YIELD (blue) or DEMAND (green) per annum	7938	L
Therefore, volume of rainwater storage required	1304	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