Himley Village

Water Neutrality Statement

For *Cala Homes*

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Introduction

Hydrock's Smart Energy and Sustainability team have been appointed by Cala Homes to provide planning stage advisory services in relation to Sustainability, and water neutrality, for the proposed Himley Village development in Bicester.

The site lies in the administrative area of Cherwell District Council and in the supply zone of Thames Water. Furthermore, the site forms part of a designated Eco-Town, which requires the highest standards of sustainable design and construction.

1.1 Purpose of Report

This report has been produced to discharge planning condition 36 of the of the Outline Permission 14/02121/OUT.

The report details the need for water neutrality at the Himley Village development and outlines the varying measures to be implemented to aspire to this.

Planning Condition 36 states:

> *"Prior to the commencement of the development, details of the strategy to work towards water neutrality, in accordance with the Eco Towns PPS shall be submitted to and approved in writing by the Local Planning Authority. Each reserved matters application shall demonstrate how it contributes to and is in accordance with the approved strategy.*

Reason: The site is located in an area of water stress and to comply with Government guidance contained within the Eco Town PPS and the National Planning Policy Framework."

1.2 Project Description

The proposed Himley Village development consists of 500 dwellings and forms part of the wider Himley Village masterplan.

The wider masterplan will provide up to 1,500 homes, schools, and community facilities. The site itself is classified as an Eco Town and will seek to provide a zero-carbon and water neutral development on the outskirts of Bicester.

The site falls within the remit of Cherwell District Council (CDC).

Figure 1 - Himley Village site plan

Regulations, Policy and Guidance

This section of the report highlights the relevant regulations, policy and guidance that are applicable to the Himley Village development.

1. National Planning Policy

1.1 Water Performance of Buildings Report

The Water Performance of Buildings Report (2012, EC) has been the main policy driver for reducing water use, and improving efficiency in buildings. The Report highlights the challenges, measures and policies associated with reducing water consumption in buildings.

1.2 Building Regulations Part G

All new buildings including non-domestic buildings need to meet standards set by Building Regulations 'Approved Document Part G – Sanitation, hot water safety and water efficiency'.

These standards include a maximum level for estimated water consumption of 125 litres per person per day. Where planning authorities make it a requirement, the optional alternative maximum estimated consumption of 110 l/pp/day must be met.

Where a water efficiency methodology approach cannot be used to calculate estimated water consumption, Part G regulations dictate a maximum consumption for water fittings. These fitting consumptions can be seen in table 1.

All existing buildings need to meet standards set by Building Regulations 'Approved Document Part G – Sanitation, hot water safety and water efficiency' when applying for planning.

Table 1: Maximum consumption fittings - regular and optional requirement levels

Water Fitting	Maximum consumption 125l/pp/day	Maximum consumption 110l/pp/day
WC	6/4 l dual flush or 4.5 l single flush	4/2.6 l dual flush
Shower	10 l/min	8 l/min
Bath	185 l	170 l
Basin taps	6 l/min	5 l/min
Sink taps	8 l/min	6 l/min
Dishwasher	1.25 l/place setting	1.25 l/place setting
Washing Machine	8.17 l/kg	8.17 l/kg

1.3 Code for Sustainable Homes

The Code for Sustainable Homes provides a water consumption requirement that aims to reduce the consumption of potable water in the home from all sources through the use of water efficient fittings, appliances and water recycling systems. The water consumption requirement (litres/person/day) is level dependant and is as follows:

- Level 1 and 2 - Less than 120 l/p/d
- Level 3 and 4 - Less than 105 l/p/d
- Level 5 and 6 - less than 80 l/p/d

2. Local Planning Policy

2.1 Cherwell District Council Local Plan

Policy ESD 3: Sustainable Construction

Cherwell District is in an area of water stress and as such the Council will seek a higher level of water efficiency than required in the Building Regulations by achieving less than 110 l/p/d

Policy ESD8: Water Resources

The Council will seek to maintain water quality, ensure adequate water resources and promote sustainability in water use.

Policy Bicester 1: NW Bicester Eco-Town

Homes to be design and equipped to meet the Level 5 water consumption requirement of the Code for Sustainable Homes.

Utilities and infrastructure which allow for water neutrality on the site.

2.2 Eco Town PPS Guidance

ET 17: Water

Eco-towns should be ambitious in terms of water efficiency across the whole development, and should contribute, where existing water quality leaves scope for further improvement, towards improving water quality in their localities.

In areas of serious water stress, Eco-towns should aspire to water neutrality, i.e., achieving development without increasing overall water use across a wider area.

2.3 North West Bicester Supplementary Planning Document (SPD)

The SPD states that developments should include where possible water neutrality measures as set out in a Water Cycle Study for the area masterplan.

Water Neutrality

This section outlines the need for water neutrality and the steps to be taken aspire to this.

3. The need for Water Neutrality

3.1 What is Water Neutrality?

The definition of water neutrality as detailed in Annex B of the Eco Town PPS Guidance Document is as follows:

> *Water Neutrality is the concept where the total water used after a new development is more than the total water used before the development. This requires meeting the demand through Improving efficiency of the use of the existing water resources. Water neutrality needs to be assessed within a defined area, normally the water company's water resource zone.*

Water neutrality is a demanding level of ambition which is only likely to be achieved through a combination of measures. A key component is to make the new development water efficient, through utilising the most water efficient products and where appropriate looking at water reuse options. Other measures involve the existing building stock and would need to be explored in partnership with the water companies.

These may include extending the extent of metering, introducing variable tariffs to encourage water efficiency, retrofitting existing buildings with water efficient products and reducing demand from non-households.

3.2 The Cherwell District

The Cherwell District is under water stress with the water resources for the area being limited and its needs having to be met from outside the Cherwell catchment area.

Cherwell's Environment Strategy for a Changing Climate (2008) highlights the need to conserve water and to be resilient to the impacts of climate change.

3.3 Thames Water

Thames Water is the statutory water supplier for the district and they have predicted the potential for supply demand deficits which will require additional resource development in the future.

To combat potential supply demand deficits and to ensure the growth in water demand is manageable in line with the growth forecasts assumed by Thames Water in their water resource management plan developments are expected to aspire to water neutrality.

3.4 Water Cycle Study

The Water Cycle study produced by Hyder Consulting Limited and submitted as part of the NW Bicester Masterplan has been used to inform the water neutrality measures for the Himley Village development.

The water cycle study considers the development location, local water environment, available resources, infrastructure and demand in order to provide a holistic view of all the potential measures that could be implemented to aid in the reduction of water consumption.

3.5 The Water Neutrality Hierarchy

The water neutrality hierarchy is a classification of water use reduction strategies, prioritised to assist progress towards a water neutral development. It is represented in Figure 2 and highlights the priority of each step within the hierarchy as you progress upwards through the strata.

Reducing a development's water consumption provides the greatest opportunity for minimising potential water consumption. Strategies typically include water efficient fixings, smart metering, and the promotion of a water saving culture. Focusing on the use of water efficient installations at an early stage in the build process is often the most cost-effective way to reduce water demand.

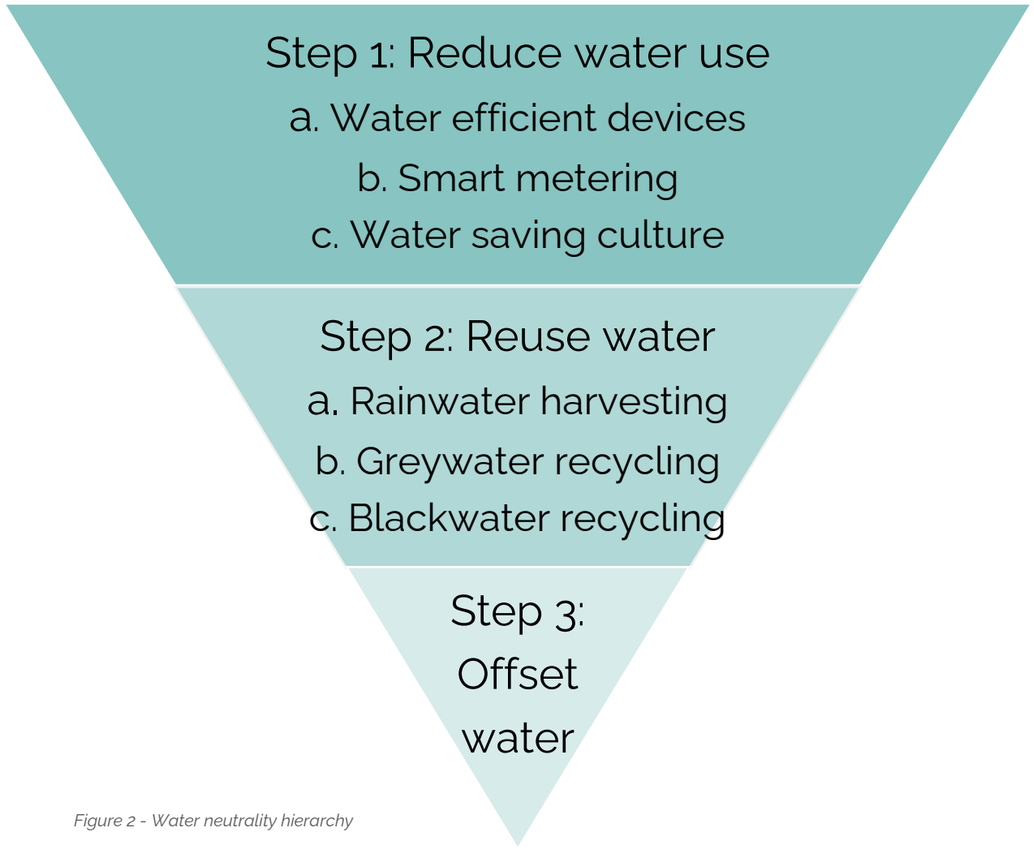

Figure 2 - Water neutrality hierarchy

Once water use has been reduced to an ambitious level, water reuse methods should be considered to decrease water demand further. Water reuse measures include rainwater harvesting, grey water and black water recycling.

4. Calculating Water Consumption

With an increasing demand for water efficiency in domestic and non-domestic buildings, a standardised framework for reporting water consumption is useful to allow designers, specifiers, building managers, water authorities and product manufacturers to estimate and report water consumption in a consistent way.

Calculating water use provides a means for estimating a building's impact on the local water supply, whether this is the impact of a new or existing development. Calculating water use also facilitates the estimation of the impact of a terminal fitting on an individual basis to inform procurement choices.

The consumption of each terminal fitting will, and should be, calculated in litres per person per day. Manufacturer's product performance data should be based upon the testing requirements set out within the relevant British Standard.

4.1 The Part G Calculator

After careful consideration, the Part G Water Calculator methodology for domestic buildings was used to calculate the proposed water consumption of the Himley Village development. The Part G Water Calculator methodology allows for precise water-use equations and coefficients to be used, which correspond to these water-use habits, producing an accurate representation of domestic water consumption. The Part G Calculator also allows detailed water fitting data to be entered, and produces an individual water consumption in litres per person per day (l/pp/d).

It should be noted that Part G is not for use as a design guide but more to inform of proposed water consumptions.

4.2 Alternative Methodologies

A number of alternative methodologies were considered for use in calculating proposed water consumption at the Himley Village development.

BREEAM is a widely-used, science-based certification system which provides measuring tools to quantify aspects of the sustainable built environment. Their 2018 UK New Construction Water Consumption WAT01 calculator and methodology was considered for use in this project due to the ability to tailor calculations for specific building types.

However, the BREEAM WAT01 methodology for was not deemed to be appropriate for use in this project due to the inability to enter specific occupancy numbers into the calculator, and the lack of quantifiable water consumption output beyond 'BREEAM credits for 'other residential institution type' buildings.

The British Standard Institute's (BSI) "Calculating domestic water consumption in non-domestic buildings – Code of practice" 8542:2011 methodology was also considered to calculate the water demand of the Himley Village development. The BSI method allows for the number of building occupants to be altered, for the calculation of common water uses in different types of building, and provides specific variations and water use factors to allow users to tailor water demand calculations. However, the BSI water use coefficients are specifically tailored for calculating water use in non-domestic buildings and would not give as accurate a representation for water consumption in a domestic building.

Water Consumption and Reduction Measures

This section of the report will set the baseline water consumption for the proposed development, and outline measures that will be implemented to reduce the proposed water consumption at the site.

5. Baseline Water Consumption

5.1 Water Usage Analysis

Building regulations requires internal potable water consumption to be less than 125 l/p/d but standard practice is to typically aim for less than 105 l/p/d, which is in line with Level 3/4 of the now revoked Code for Sustainable Homes. However, to comply with the outline permission Water Cycle Study, Himley Village water consumption needs to meet Level 5 of the Code for Sustainable Homes therefore is required to use less than 80 l/p/d.

Based in the proposed accommodation schedule the following occupancy rates have been assumed. (For full details please see Appendix 1).

- 1 Bed Flat - 2 people
- 2 Bed Flat - 3 people
- 2 Bed house - 4 people
- 3 Bed house - 5 people
- 4 Bed house - 7 people
- 5 Bed house - 8 people

The baseline water use for the site has been calculated based on the Building Regulations requirement of no more than 125 l/p/d.

The baseline water use for the site is 298,900 litres per day (109,100 m^3/yr).

6. Reducing Water Use

6.1 Water Efficient Devices

Reducing the primary water consumption of a building through the use of water efficient installations is widely regarded as best practice and is therefore the first and most important step towards reducing water consumption.

Water efficient devices such as low-flow taps, showers, and toilets can be installed to reduce water use. Such devices are recommended for use within the Himley Village development.

The water savings from such devices can be significant, depending on the fitting selected.

Here we have analysed the industry leading water fittings and have categorised these as "Green Rated". These exemplary fittings may act as a guide for developments looking to reduce their water consumption via improving fitting efficiencies.

These water saving devices have been assessed in terms of cost-saving benefits and are recommended for use in the proposed development. These include shower aerators and low-flow taps. The water consumption of these industry leading 'Green Rated' fittings can be seen in table 5.

Table 5: water consumption of industry leading fittings proposed for Himley Village

Water Fitting	*Maximum consumption of Proposed Fittings*
WC	*4/2.6l dual flush*
Shower	*6 l/min*
Basin taps	*5 l/min*
Sink taps	*5 l/min*
Bath	*140l capacity*
Washing Machine	*6l/kg dry load*
Dishwasher	*0.7l/place setting*

6.2 Operation and Maintenance

It is essential that post-occupancy maintenance is conducted to ensure that the fittings are operating normally and to check for leaks which would increase water consumption.

A maintenance timetable has been included and should be adhered to (table 6).

Table 6: Neutrality Maintenance Checklist & Timetable

Water Neutrality Maintenance Checklist and Timetable		
Toilets	*Check flush operating normally*	*Monthly*
	Measure l/flush as per Appendix A methodology	*Every 6 months*
	Check plumbing for leaks	*Every 6 months*
Sinks	*Check tap operating normally*	*Monthly*
	Measure l/min using methodology laid out in Appendix A	*Every 6 months*
	Check plumbing for leaks	*Every 6 months*
Showers	*Check shower operating normally*	*Monthly*
	Measure l/min using methodology laid out in Appendix A	*Every 6 months*
	Check plumbing for leaks	*Every 6 months*
Bath	*Check bath taps and plug operating normally*	*Monthly*
	Measure tap flow l/min using methodology in Appendix A.	*Every 6 months*
	Check plumbing for leaks	*Every 6 months*
Dishwasher	*Check dishwasher operating normally*	*Monthly*
	Check plumbing for leaks	*Every 6 months*
Washing Machine	*Check washing machine operating normally*	*Monthly*
	Check plumbing for leaks	*Every 6 months*

6.3 Smart Meters

Smart meters monitor water usage, affording consumers an insight into their consumption and resulting water bill. This can help to reduce water consumption, identify leaks, and meet water saving targets set out by water companies.

Occupants should be educated on the use of smart meters and water saving culture to help reduce water consumption.

6.4 Water Saving Culture

Education and awareness are important components in achieving water neutrality. Education regarding water challenges facing the UK, and the promotion of a water saving culture and behaviours can help to ensure that other implemented measures are effective.

Encouraging local and regional water saving behaviours by promoting locally led campaigns, as well as broader initiatives such as Water Saving Week, may also be considered to help reduce water consumption within, and outside of, the proposed Himley Village development.

7. Reusing Water

Water Reuse systems provide an alternative water supply and allow the development to reduce its reliance on the grid for non-potable water demands (water to flush toilets, washing machines, outdoor use, irrigation etc).

These systems are often adaptable for a wide range of scales, from individual homes and buildings, to large scale extensions. The system selected will depend on the requirements and characteristics of the extension.

7.1 Rainwater Harvesting

There are two methods of harvesting rainwater, rooftop rainwater harvesting, and surface runoff harvesting. Both techniques collect, filter and store rainwater after a rainfall event, providing greywater which is suitable for a range of non-potable uses. Excess rainwater may also be used to recharge local aquifers.

7.1.1 Rooftop Rainwater Harvesting

Rooftop Rainwater Harvesting systems capture rain where it falls, employing roofs, terraces, courtyards etc. as catchment areas. Rooftop harvesting can utilise simple gravity fed systems with above-ground tanks, or more complex arrangements to collect and pump water to multiple buildings for non-potable use.

However, the cost of rainwater harvesting systems can be significant. On average, a rooftop rainwater harvesting system costs between £5000-12000, depending on domestic or commercial use. Therefore, the cost of installing such a system may not be cost effective when compared to the water savings achievable.

7.1.2 Surface Water Harvesting

Surface Water Harvesting systems collect rainwater that is not captured directly or absorbed by the ground, and instead flows over terrain as surface water.

Surface Water Harvesting generally involves the collection of surface runoff from the ground after rainfall events using drains and underground storage tanks. Pumps located within these submersed tanks then pump harvested water directly to WCs or other appliances. Due to the underground infrastructure required for surface water harvesting systems, they are often more costly than their rooftop rainwater harvesting counterparts.

Due to its more complex infrastructure requirements and increased costs, a surface water harvesting system is not considered appropriate for use in the proposed Himley Village development.

7.2 Greywater Recycling

Greywater Recycling systems collect and recycle water used in showers, baths and basins. Whilst regular plumbing systems direct all wastewater to the sewers, greywater recycling schemes use alternative piping to separate greywater so that it can be captured, treated and recycled.

This water reuse method is often more suitable for commercial residential buildings and leisure facilities where there is a high volume of greywater produced as well as a high demand for non-potable water. Domestic greywater recycling systems generally cost between £6000-10000.

A greywater recycling system would not be considered appropriate for the dwellings within the Himley Village development due to the relatively low yield of greywater. Given that around 50% of greywater is generally considered fit for reuse, approximately 6 l/per person/per day of greywater would be available. Due to the low non-potable water yield produced by the proposed development and the cost of installing a greywater recycling system this measure is not recommended for use at the proposed within the Himley Village site.

7.3 Blackwater Recycling

Blackwater consists of wastewater that has been contaminated with water discharged from a toilet or that has been used in industry processes.

Blackwater requires treatment before it can be reused. For this reason, blackwater recycling systems are usually significantly more complex than other water reuse schemes. Water treatments generally include;

- Aerobic screening
- Biological treatment
- Ultrafiltration
- Ultraviolet disinfection
- Total dissolved solids (TDS)
- Nutrient removal
- Chlorination

Due to the complex infrastructure and technology required for blackwater recycling systems, and its limited use for WCs, it is not considered suitable.

8. Water Consumption after Reduction Measures

The proposed sanitaryware specification at Himley Village will meet a water use rate of 100 l/p/d.

Following water reduction measures the site wide water use is 87,300m³/yr (239,100 litres/day)

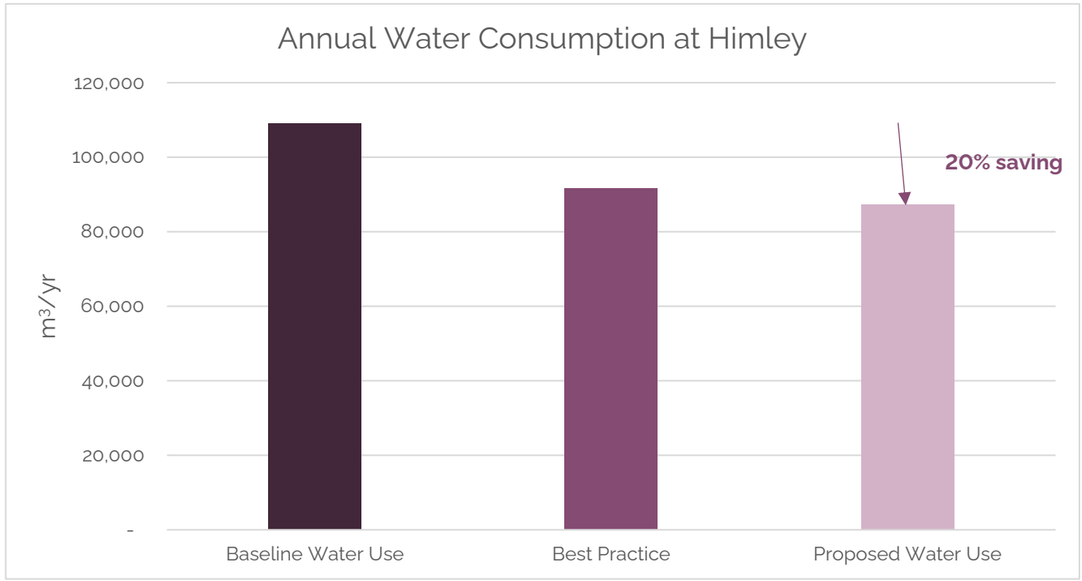

Figure 3 - Proposed water use at Himley Village compared to the baseline.

Water Offsetting

This section of the report provides a summary of water offsetting schemes which may be suitable for investment in order to minimise the impact of the extension on the regional water network further

9. Offsetting Remaining Demand

In order to achieve full water neutrality, all remaining demand should be offset via investments into retrofitting water saving technologies, such as reduction and reuse systems, in other parts of the local community. It is necessary that these technologies are located in the same water resource zone as the development.

Offsetting projects are generally conducted in partnership with other organisations, such as water companies, councils, local businesses or charities. It is vital that projects are checked against council and water company management plans to ensure that measures have not already been proposed.

Options for offsetting schemes can include;

- Retrofitting other developments with water saving installations or reuse systems to reduce water demand
- Invest in water efficiency audits and retrofits for existing homes or businesses (through water companies)
- Fund the retrofitting of a number of homes through a housing association or developer
- Fund the retrofitting of commercial properties in the water supply zone.
- Funding water companies for leak repairs in the local water network (beyond what has already been planned)

Additionally, offsetting should be supplemented with increasing awareness outside the extension via water saving campaigns and promoting water efficient behaviours. Smart meters should also be fitted in retrofitted properties where possible, to provide information on water usage and encourage water saving behaviours.

9.1 Required Offsetting

After the recommended water reduction measures have been applied to reduce consumption from the proposed development, the developments water demand has been **reduced by 25 l/p/d**, or 35,800 m^3 per annum. These figures can be seen in Table 9.

Table 2 Reduction in Himley Villages demand after reduction measures compared to Baseline scenario demands.

	Individual Water Consumption (litres/person/day)	Total Water Consumption (m^3)
Baseline	125	109,100
Proposed	100	87,300
Water Savings	25	21,800

9.2 Water Offsetting Summary

There are currently no water offsetting schemes that the Himley Village development could benefit from.

Conclusion

This report has provided a detailed overview of the proposed water efficiency measures at the Himley Village development, situated within the North West Bicester Eco Town.

The scheme has been designed to respond positively to all national regional and local water policy.

After analysis of the anticipated water demand of the proposed development, the incorporation of a number of industry leading 'green rated' water fittings with restricted maximum flows is recommended to most effectively reduce demand. The use of these measures will ensure that the development meets and exceeds the water requirements and expectations set out by Building Regulations and will meet the required **100 l/p/d target**.

Overall, the development's water demand will be significantly reduced by the use of water efficient devices, smart metering, education and the promotion of a water saving culture.

The reduction in water demand has been quantified and summarised in Table 10 and Figure 5.

Future improvements could include retrofitting WCs with 'Green Rated' devices, and incorporating a rainwater harvesting system to supply toilets throughout the scheme. The installation of rainwater harvesting is not proposed at this stage.

Table 3 - Summary of water efficiency strategy

	Individual Water Consumption (litres/person/day)	Total Water Consumption (m^3)
Baseline - Standard fittings	125	109,100
Proposed - 'Green' fittings and fixtures	100	87,300
Water Savings	25	21,800

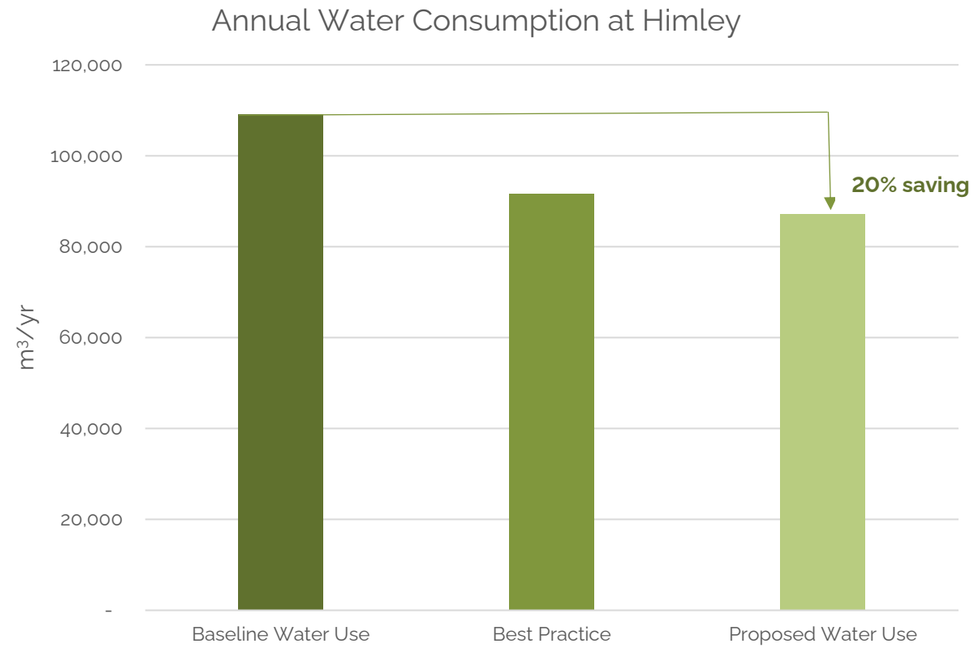

Figure 4 - Summary of water consumption

Appendix A Accommodation Schedule and Occupancy Rate

Tenure	House Type	No. of Beds	Occupancy	Storey Height	Sq Ft	Total Count On Site	Total Occupancy
Private	1 Bed Flat	1	2	3 to 4	540	12	24
	2 Bed Flat	2	4	3 to 4	760	9	36
	Aspen	2	4	2	797	23	92
	Bayberry	2	4	2	863	36	144
	Blackthorn	3	5	2	952	22	110
	Chestnut	3		2	1001	10	0
	Everglade	3	5	2	1085	35	175
	Fir	3	5	2	1089	27	135
	Fourleaf	3	5	2	1119	10	50
	Foxglove	3	5	2.5	1132	27	135
	Lancewood	3* (4B)	6	2.5	1296	23	138
	Laurel	3*	5	2	1357	14	70
	Mulberry	4	7	2.5	1444	11	77
	Pine	4	7	2.5	1547	17	119
	Poplar	4	7	2	1553	11	77
	Sycamore	4	7	2	1672	8	56
	Tulipwood	4	7	2.5	1684	10	70
	Twinberry	4	7		1696	24	168
	Walnut	4	7		1764	9	63
	Whitebeam	5	8	2	1957	12	96
Affordable Housing	1 Bed Flat	1	2	3 to 4	540	24	48
	2 Bed Flat	2	3	3 to 4	760	36	108
	Bellflower	2	4	2	850	15	60
	Bungalow	2	4	1	1001	3	12
	Clover	3	5	2	1016	19	95
	Daisy	3	5	2	1016	4	20
	Heather	4	7	2	1250	4	28
Intermediate Housing	1 Bed Flat	1	2	3 to 4	540	6	12
	2 Bed Flat	2	3	3 to 4	760	3	9
	Bellflower	2	4	2	850	19	76
	Bungalow	2	4	1	850	1	4
	Clover	3	5	2	1016	9	45
	Daisy	3	5	2	1016	5	25
	Gardenia	4	7	2	1148	2	14

Figure 5 - Accommodation schedule and occupancy pattern