THE CROWN ESTATE

East Hemel

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Water Circularity Strategy

November 2025

Contents

1. Introduction

This note describes the proposed strategy to reduce the water footprint of the East Hemel development.

Responding to regional water scarcity and the aspirations of the project for sustainable development it focuses on reducing demand through water efficiency and opportunities for harvesting of rainwater.

This document is an appendix to the Drainage Strategy submitted as part of the outline planning application for the East Hemel development. It should also be read alongside the Sustainability Strategy, which also accompanies the same planning application.

Figure 1 - Illustration of the northern part of the East Hemel development.

2. Water resources and policy context

The Environment Agency assesses that water resources are severely stressed in the South-East of England. This is predicted to worsen with climate change.

Affinity Water, the statutory water supply undertaker to the site, are required to limit abstraction to protect the ecology and the quality of chalk streams within their catchment.

Local planning policy promotes water conversation and maximising opportunities for water reuse.

Responding to this, the Sustainability Strategy sets out the following objectives:

- Reduce residential water use by 25% to 95 to 100 l/person per day (lpd) through water efficiency.
- Reduce non-residential water use by 55% through water efficiency and smart weather-controlled harvesting of rainwater.
- Rainwater harvesting for irrigation of allotments gardens, and topping-up of the natural swimming pond.

The following sections describes how it is proposed to achieve these objectives.

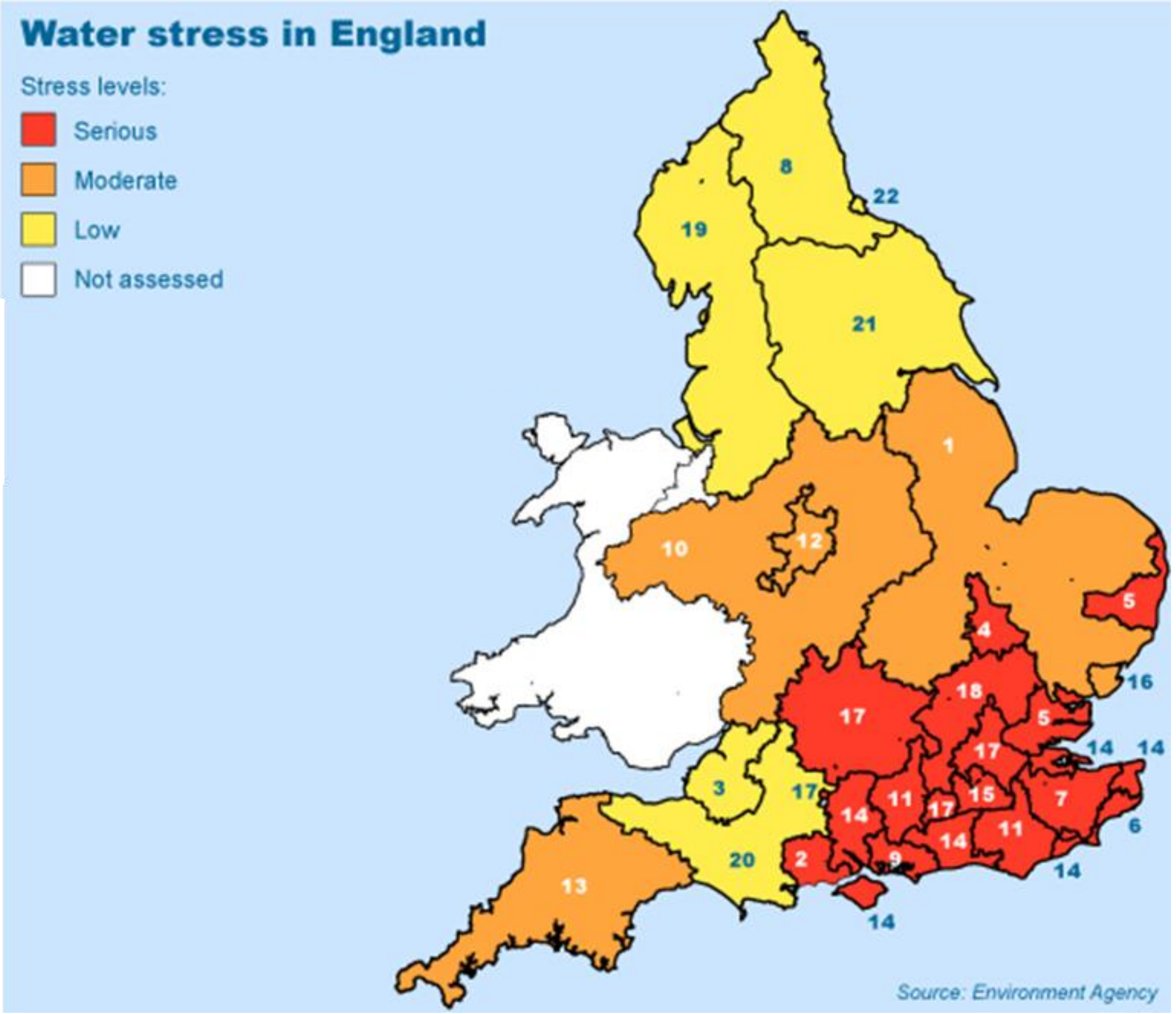


Figure 2. Water stress areas in England

3. Water efficiency

Part G of the Building Regulations sets a standard for residential water consumption of 125lpd, with an ‘optional requirement’ of 110lpd in areas of water stress.

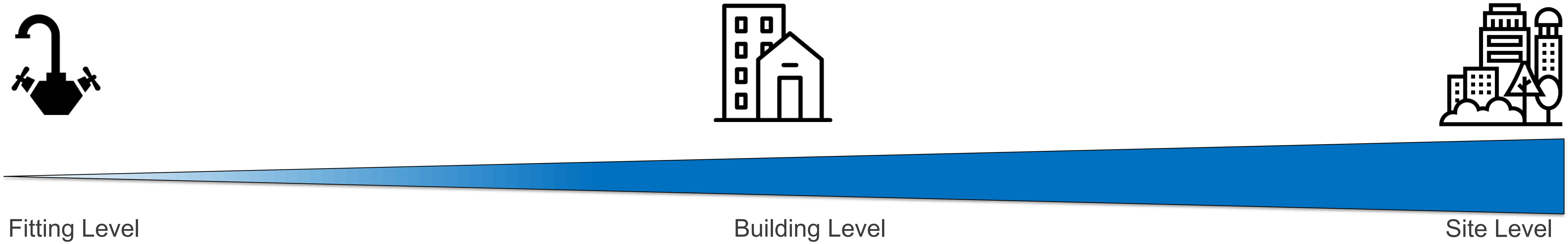
A review of best practice in the UK confirms that it is possible to achieve 95-100lpd, though efficient fittings, metering and leak detection without affecting user experience and quality.

A 40-45% reduction in demand through water efficiency is also achievable in non-residential buildings.

Native and drought resistant planting is proposed to remove permanent irrigation use.

Figure 3. Typical water efficiency measures

4. Options for reducing water footprint further



Ultra efficient fittings	Rainwater harvesting	Greywater recycling	Site wide harvesting
• Lack of real-life testing • User perception / experience • Risk of fittings being replaced • Retain flexibility once fitting performance confirmed	• Detrimental pay back and whole life carbon for conventional rainwater harvesting • Opportunity for "smart weather-controlled harvesting" with greater cost and carbon efficiencies.	• Long pay back • Detrimental whole life carbon • High maintenance requirements	• Long pay back • Would require site wide non-potable infrastructure and operator.

4. Options for reducing water footprint further

A range of options for reducing the water footprint further have been considered as summarised on the previous page.

Ultra efficient fittings show promising results but are not readily available and introduce risks with user expectations.

The whole life carbon footprint of conventional rainwater harvesting and greywater recycling systems generally significantly exceeds that of potable water supply.

However, a new technology has relatively recently been developed allowing to harvest rainwater from attenuation storage tanks without the need for dedicated harvesting storage.

This novel approach (Figure 4), such as the Aqua Storm Control system proposed by Aquality in the UK, is based on real-time management of the drainage attenuation capacity. A valve or sluice gate, controlled by a smart algorithm connected to the weather forecast allows retention of water in the attenuation system in dry periods for re-use in buildings, and the release of water in anticipation of a larger storm to free up attenuation capacity.

Smart harvesting of rainwater

1. Water efficiency fittings to achieve 95-100l/person per day.
2. Weather-controlled retention and release of rainwater
3. Dual use on-plot storage for harvesting and stormwater attenuation.
4. Supply of harvested rainwater to building.
5. Site wide SUDS features integrated with landscape and biodiversity strategies.

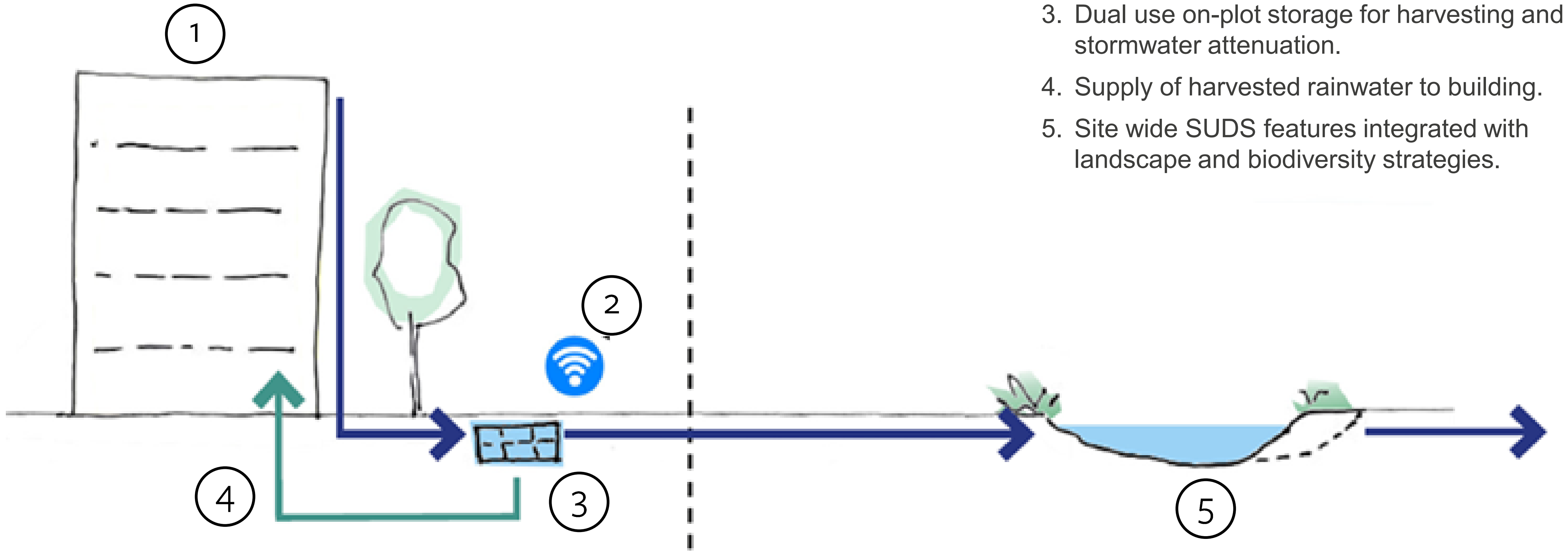


Figure 4 Schematic of smart rainwater harvesting system

4. Options for reducing water footprint further

Conventionally, a drainage attenuation system is separate from a rainwater harvesting tank (Figure 5). This is because a drainage attenuation tank wants to empty as quickly as possible to free up capacity for the next storm, whilst a rainwater harvesting tank wants to stay full to maximise supply.

This approach is more cost-effective and carbon efficient on non-residential buildings proposed within the East Hemel masterplan, as non-potable demand is concentrated in toilet blocks reducing the need for an extensive internal non-potable distribution system.

On residential apartment blocks, dual water supply would be required to all apartments. On individual houses, a separate harvesting system would be required for each dwelling.

On residential buildings, we have found that the whole life cost and whole life carbon implications of such systems would outweigh their benefits.

As such, smart harvesting of rainwater is limited to non-residential buildings, as well as irrigation of allotment gardens and topping up of the natural swimming pool, as described in the following sections.

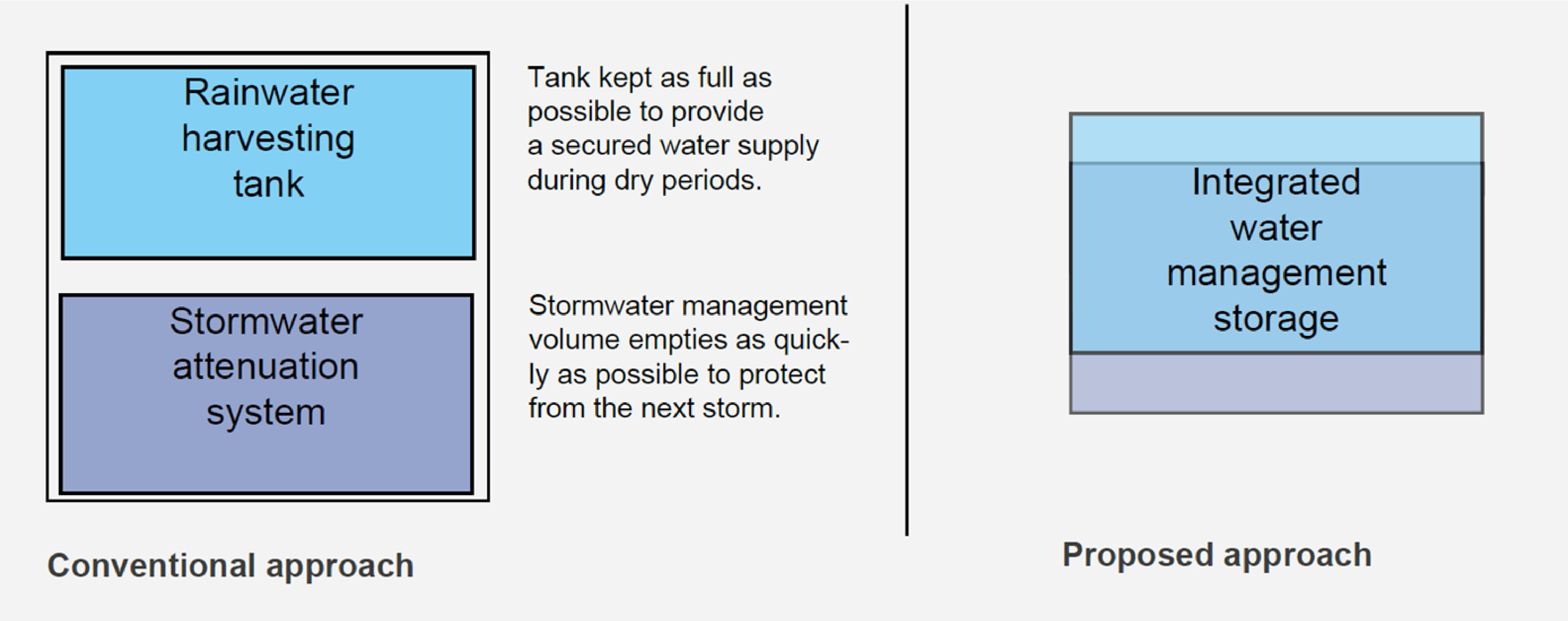


Figure 5 Benefits of smart rainwater harvesting

5. Smart harvesting of rainwater for external uses

Native and drought resistant planting is proposed to avoid permanent irrigation requirements. However, water will be required for irrigation of the allotment gardens and for topping of the natural swimming pool.

Smart management of the stormwater attenuation pond levels and harvesting of rainwater for these uses is proposed as illustrated on Figure 6.

Stormwater runoff will be pre-treated by a full SUDs train as described in the Drainage Strategy.

Additional filtration and potentially UV disinfection will be required before using water in the allotment gardens, ensuring that the supply infrastructure is clearly labelled as non-potable.

Additional treatment will also be provided within the natural pool treatment system.

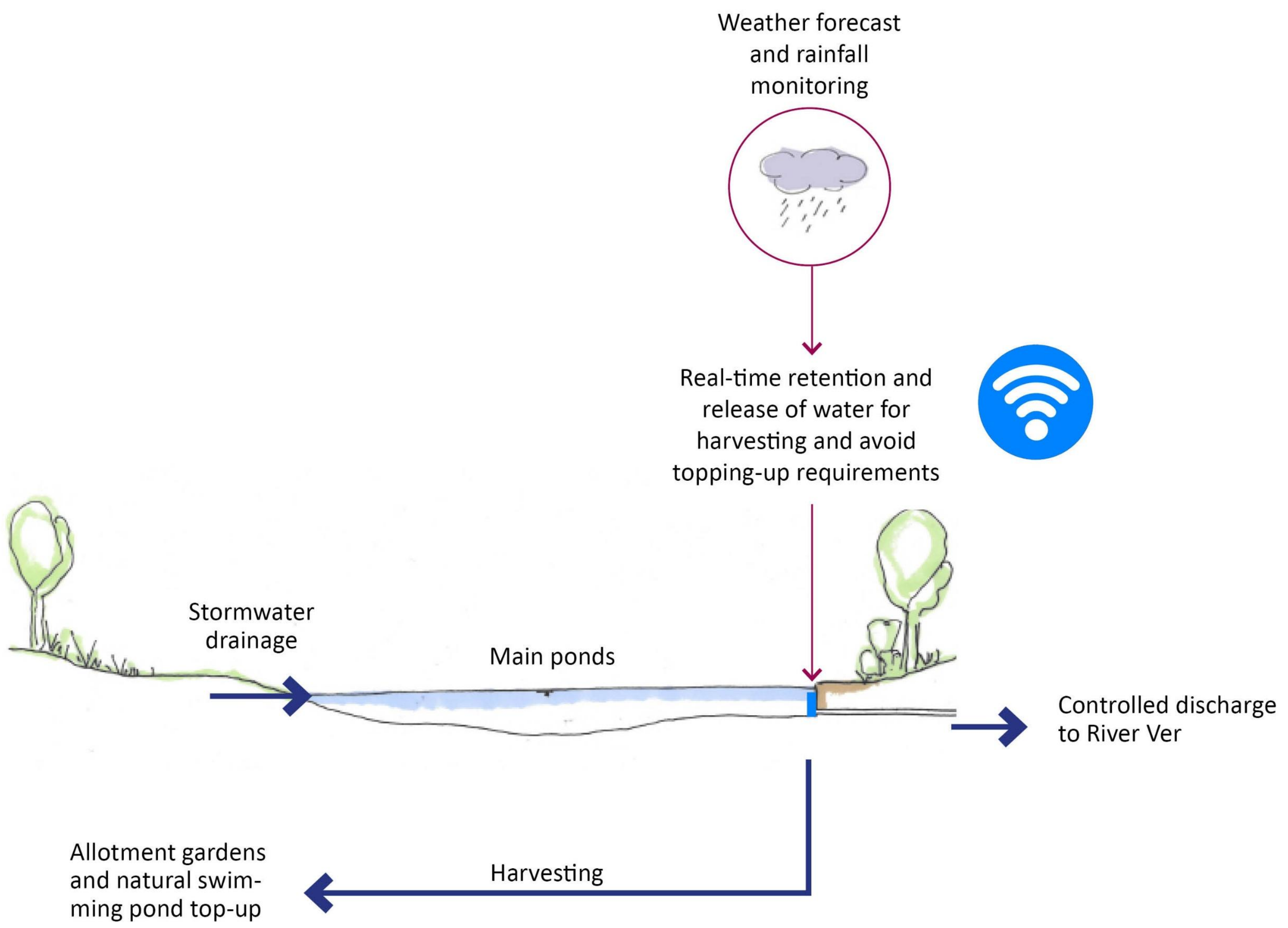


Figure 6 – Smart harvesting from stormwater attenuation ponds for allotment garden irrigation and topping up of natural swimming pond.

6. Smart harvesting of rainwater on non-residential buildings

Most of stormwater attenuation for the development will be achieved in the proposed primary attenuation ponds. As discussed earlier, the option of a site wide centralised rainwater harvesting system has been discarded as this would require a site wide non-potable supply network with no operator readily available to adopt and operate the system.

Therefore, a small part of the attenuation storage needs to be provided on plot with the dual purpose of stormwater attenuation and rainwater harvesting using the smart weather-controlled system. In line with best practice this storage should be a tank to avoid water quality degradation and contamination by wildlife. This will be complemented by sustainable urban drainage features on plot including raingardens, tree pits and permeable pavement as described in the Drainage Strategy.

A water balance study has been carried out, using the 57 years of climate timeseries to assess what percentage of the rainwater harvesting demand could be achieved for an optimum tank size.

This is illustrated for commercial blocks 17 to 20. A 20m^3 tank size was identified as optimal, allowing to meet just over 40% of the non-potable water demand and achieve the target reduction in overall water demand of 55%.

A similar approach has been adopted to size the tanks for most non-residential buildings to achieve an overall demand reduction. Proposed tank sizes are summarised in the following pages.

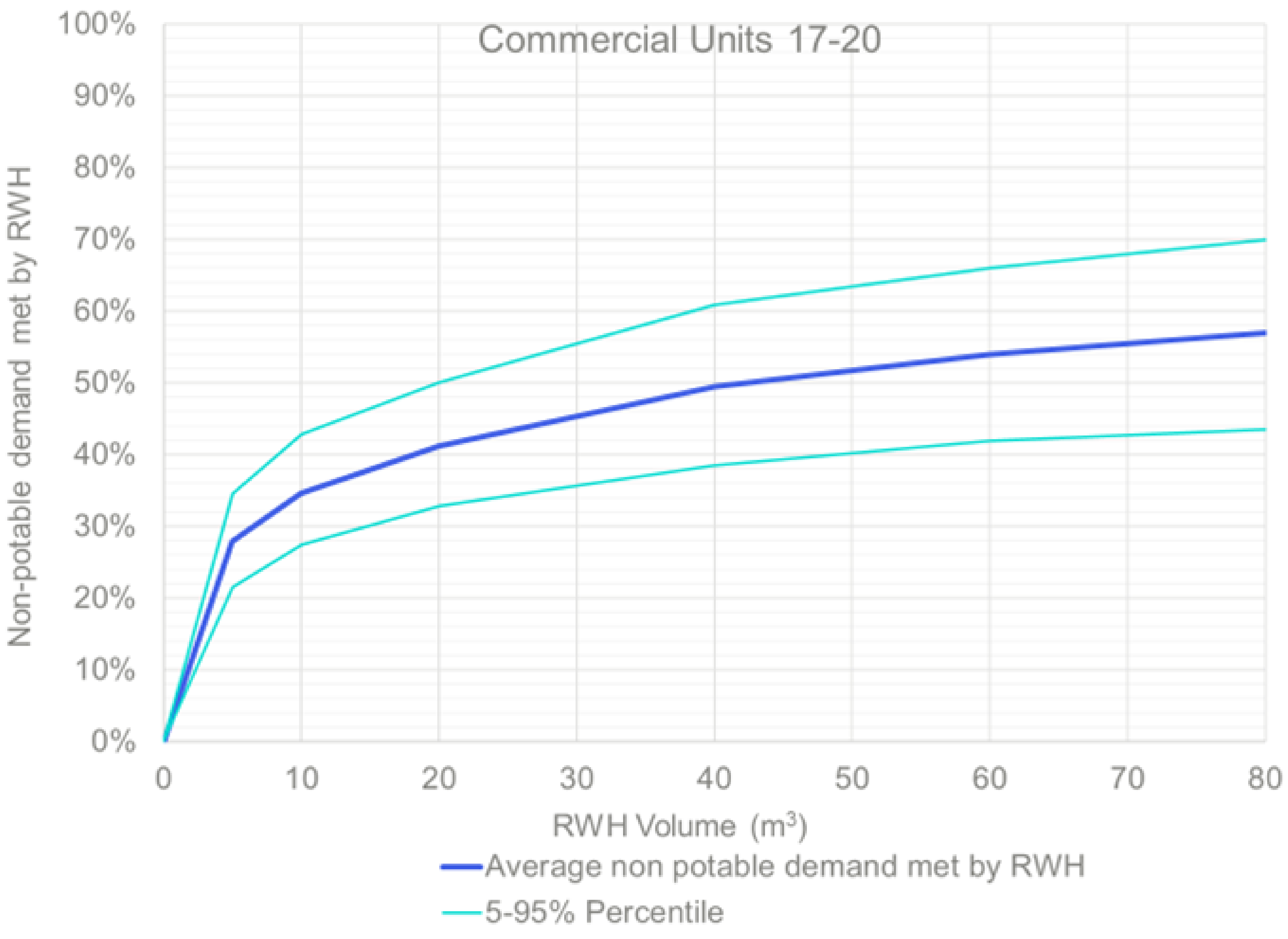


Figure 7 – Example of tank size optimisation for commercial units 17 to 20

6. Smart harvesting of rainwater on non-residential buildings

Parcels	Dual purpose harvesting /attenuation storage tanks (m^3)
Primary School	30
Secondary School	45
Community Centre	5
Total	**80**

Table 2 – Northern Residential Area: tank sizes for non –residential buildings

Figure 8 – Northern residential part of development

6. Smart harvesting of rainwater on non-residential buildings

Building clusters	Dual purpose harvesting /attenuation storage tanks (m^3)
9A-F	12
10A-D	6
11-14	31
15	6
16	6
17-20	20
21-23	42
Total	**123**

Table 3 – Central commercial part of development – tank sizes

Smart harvesting of rainwater is not proposed for the large logistic buildings where the relatively small water demand does not justify the additional system.

Figure 9– Central Commercial part of development

6. Smart harvesting of rainwater on non-residential buildings

Parcels	Dual purpose harvesting /attenuation storage tanks (m^3)
Primary School (N)	30
Primary School (S)	30
Community Centre	5
Total	**65**

Table 4 – Southern residential part of development – tank sizes

Figure 10 – Southern residential part of development

7. Conclusion

Water resources are scare in the South-east of England. This is predicted to worsen with climate change.

Responding to this, it is proposed to reduce residential water use by 25% to 95 to 100 l/person per day (lpd) through water efficiency. A review of best practice in the UK confirms that this can be achieved without affecting user experience and quality

Demand in non residential buildings will be reduced by 55% through water efficiency and smart weather-controlled harvesting of rainwater. This new technology allows harvest rainwater from attenuation storage tanks without the need for dedicated harvesting storage. Tanks have been optimised for all non-residential buildings based on water balance study using the 57 years of climate timeseries to assess the performance of the system under different climatic condition.

Smart harvesting of rainwater is not proposed for the larger footprint Storage and Distribution (use class B8) buildings where the relatively small water demand does not justify the additional system.

Rainwater will also be harvested from the main attenuation ponds for irrigation of allotments gardens, and topping-up of the natural swimming pond. Stormwater runoff will be pre-treated by a full SUDS train. Additional filtration and potentially UV disinfection will be required before using water in the allotment gardens, ensuring that the supply infrastructure is clearly labelled as non-potable. Additional treatment will also be provided within the natural pool treatment system.