Thames Water

Non-potable water reuse strategy

Abstract

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The Challenge

It is estimated that there are now more people living in London than at any point in its previous history. This growth trend is set to continue with the population expected to rise by 1.9 million people from 8.2million at the last census, to 10.1 million in 2036 (GLA, 2015). The increased demand for water from this population growth, coupled with supply impacts resulting from climate change and the need to leave more water in the environment, is likely to result in a supply deficit of around 414 ML/d by 2040 (Figure 1).

Figure 1. The increasing gap in supply and demand (source: Thames Water)

The London Plan (Mayor of London, 2016) identifies 38 strategic 'Opportunity Areas' which contain a significant source of brownfield land which are deemed suitable for major redevelopment. These collectively will provide a growth of over 300,000 new homes and 575,000 new jobs.

Opportunity

Thames Water is actively engaged in a number of initiatives to reduce the extent and impact of this deficit, of which non-potable water reuse (NPWR) in the Opportunity Areas is one option. Non-potable water is water that is not of drinking water quality, but that can be used for other purposes such as toilet flushing, laundry and garden watering to reduce the total demand on potable supply.

Non-potable water reuse at building or development scale can provide the following benefits:

- Reduced potable water demand by up to 40% in mixed use developments.
- More headroom in water supply and drainage networks due to reduced peak demand, in comparison to standard developments.
- Deferred or avoided infrastructure reinforcements to meet the increase in demand from new developments.
- Reduced surface water flood risk due to capture and use of rainwater and stormwater onsite.

The assessment of the non-potable potential in the Opportunity Areas identified a theoretical reduction in water demand of up to 30 Ml/d by the end of the 25 years in comparison to standard development, assuming that non-potable reuse helps developments achieve higher water efficiency targets set out in the London Plan. This means a reduction of 215 million m^3 of potable water use over the 25 year period, taking into consideration the expected phased growth.

Figure 2 highlights the location of identified sites in local plans.

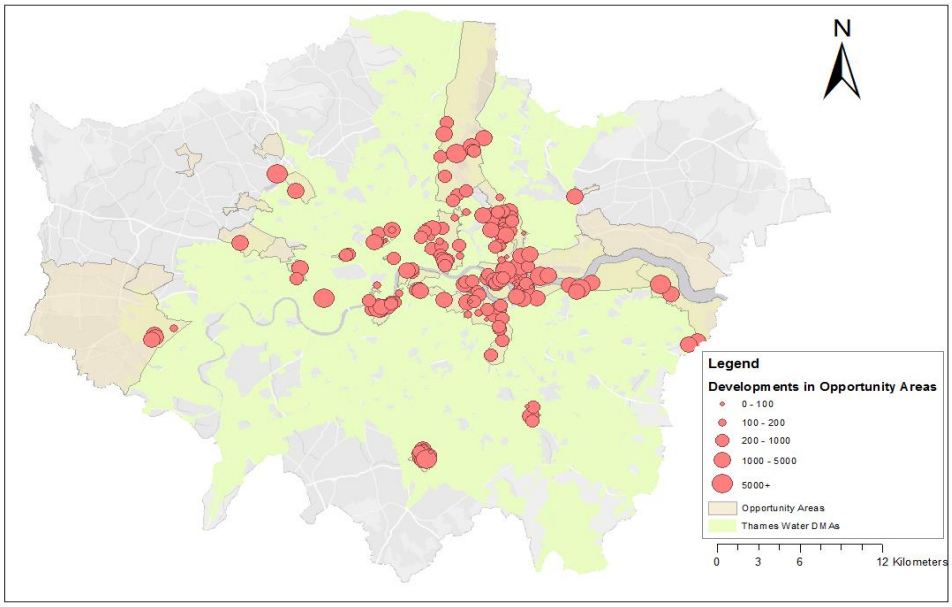

Figure 2 Major identified developments in Opportunity Areas

The volumetric reduction is significant in terms of volume delivered into supply when referenced against the preferred water resource options in the 2015 – 2040 Water Resource Management Plan (Most of the supply options in the 2014 London preferred programme had a benefit lower than 17 Ml/d).

NPWR systems included in this study are rainwater and stormwater harvesting and greywater recycling. Blackwater recycling was discarded, on the ground of being more complicated to implement and presenting higher risks.

The types of NPWR systems are dependent on the type and scale of the development and to make the assessment easier, this project has developed **four typologies** of NPWR. These typologies can be used to undertake detailed assessment of the suitability of NPWR systems in all the Opportunity Areas in London.

These four typologies are:

- Individual building NPWR systems with uncoordinated implementation;
- Individual building NPWR systems with coordination (e.g. particular development scale);
- Mixed NPWR systems (building and communal) with coordination delivery;
- Central NPWR systems with coordinated delivery.

A high level estimation method based on industry best practice has been developed to undertake cost assessment of opportunity areas. The methodology for cost estimation has been developed to enable easy application to the Opportunity Areas to get greater understanding of realistic reduction in potable water demand as a result of non-potable systems.

The typologies and cost of NPWR system delivery, including capital and operational costs, have been tested for two Opportunity Areas in London: Old Oak Common and Nine Elms on South Bank.

At Nine Elms, it is estimated that the non-potable supply can reduce the potable water demand by 2800 m^3/year (or 36% of total water demand). Similarly, a 20% reduction in demand was estimated at Old Oak Common.

The cost of delivery of non-potable water supply (including additional internal building services) varies based on options selected and ranges from £1.75 to £9/m^3.

The total cost of delivery of the NPWR in all the development in all the Opportunity Areas over the next 25 years would be around £714 million, inclusive all dual plumbing and treatment system costs.

The assessment also undertook NPWR potential and impact assessment for inclusion into the WRMP19 assessment process. The assessment took into consideration the spatial location of the proposed growth and apportioned growth to each District Metering Area (DMA) based on spatial co-location. A DMA is defined as a discrete area of a water distribution network. It is usually created by closing boundary valves so that it remains flexible to changing demands. The assessment was based on phased growth over 25 years, with new developments being delivered annually.

Figure 3 below presents the potential volume of NPWR at the key DMAs and the cost per m^3 of delivery, taking into account internal plumbing. The range of costs is in concordance with the initial cost estimates generated in the case studies for Old Oak Common and Nine Elms.

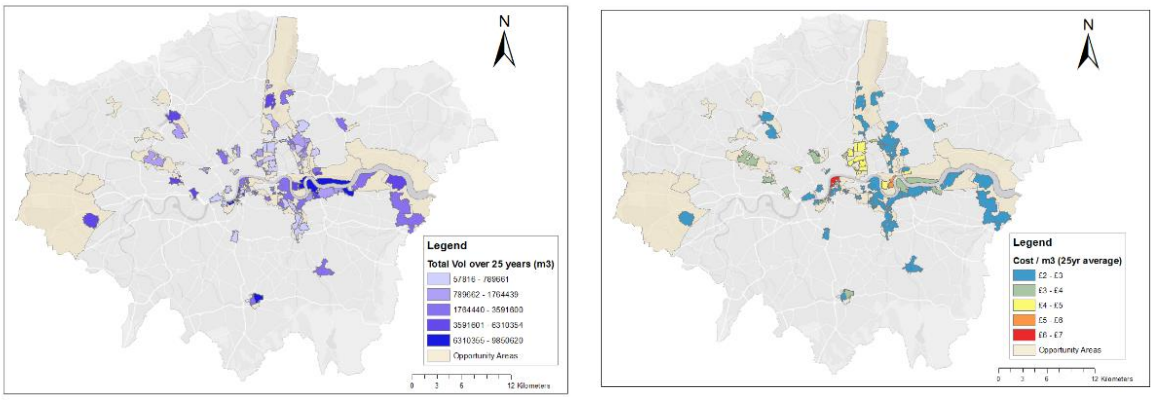

Figure 3: Potential non-potable use (left) and cost per m^3 of non-potable water (right)

Barriers identified

There are various challenges associated with implementation non-potable water reuse, such as:

- Drivers and incentives;
- Regulatory requirements;
- Installation and operational costs;
- Health and hygiene
- Public acceptance;
- Interest from developers;
- Planning requirements;
- Operation and maintenance responsibilities.

While the London Plan policies encourages the uptake on NPWR systems, there are no current requirements or incentives for developers or individuals to implement non-potable water reuse systems or networks in new or existing developments.