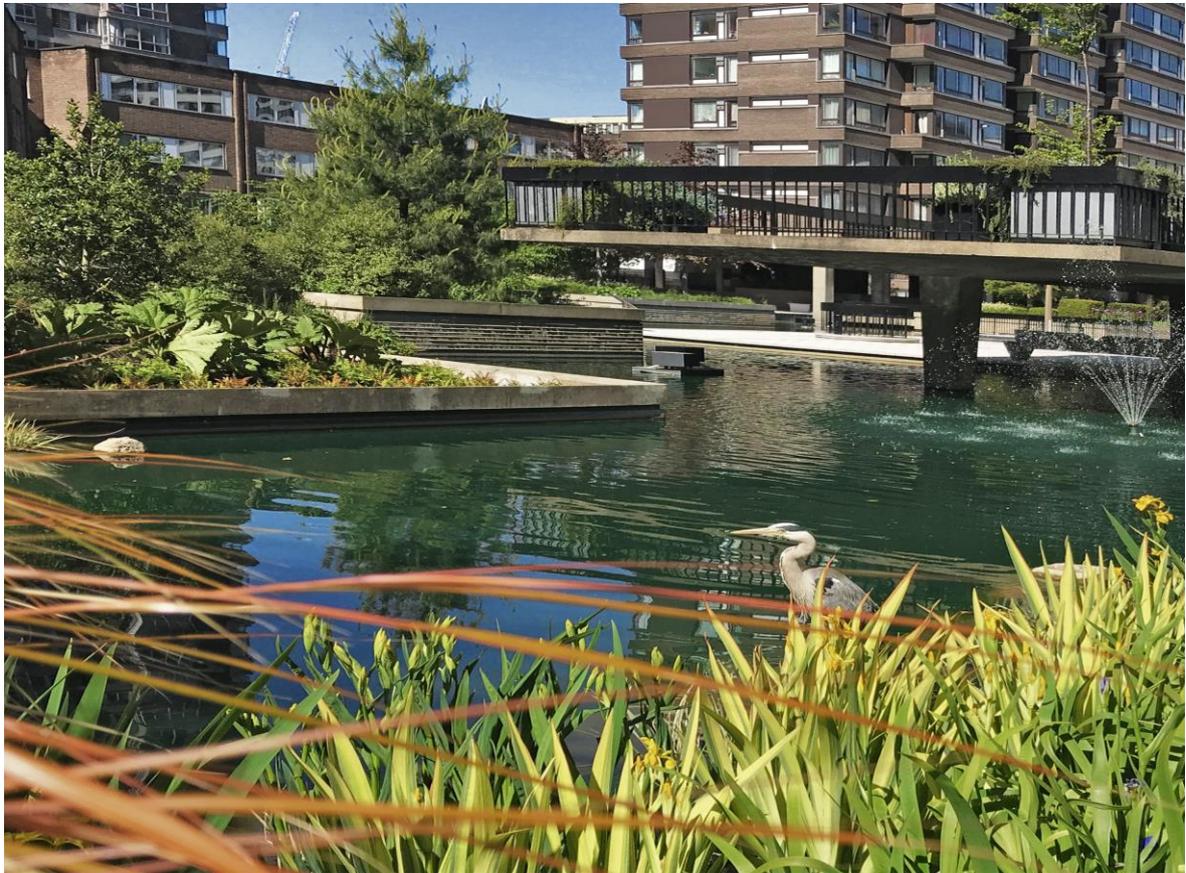


The Water Gardens



SuDS used

- *Retrofitted rainwater harvesting beneath paving*
- *Retrofitted semi-intensive Green Roofs*
- *Restored original 1960s SuDS linking ponds and planters*

Benefits

- *Use of rainwater for irrigation benefitting a multitude of biodiverse plants*
- *Reduction of heat-island effect*

- *Reinstatement of the long forgotten clogged 60s self-sufficient tree irrigation system by reconnecting the large planters with the pond. This system could be an exemplar of sustainable tree irrigation useful in contemporary schemes.*

1. Location

The Water Gardens, Tyburnia, London W2 2DB, UK

2. Description

The Water Gardens is a 5000sqm iconic Brutalist 1960s semi-public communal courtyard podium deck, covered by a large shallow concrete pond, serving over 200 apartments. The podium deck was leaking into the undercroft car park and was in urgent need of repair. R-LA's design restored the original Brutalist layout with innovative contemporary solutions. These included a dynamic new paving design; a pedestrian priority road upgrade; contemporary jet water features; diverse drought tolerant terrestrial planting providing interest, biodiversity, habitat, and food all year round; new aquatic shallow shelves containing the vegetation substrate and promoting wildlife breeding; reinstatement of the forgotten 60s self-sufficient tree irrigation system by reconnecting the large planters with the pond; a new SuDS rainwater attenuation and harvesting system.

The existing ponds (with a similar area to the surrounding pedestrian hard surfaces) were clogged and murky with 50 years of sediment and pollution. By cleaning and dredging the ponds and introducing new aquatic planting, the original Water Gardens attenuation capacity was significantly increased with improved air quality and reduced heat-island effect. The noise of the nearby busy roads was masked by the play of new water jets which have an important role in oxygenating the pond.

At the heart of the project was the interconnectivity of hard surfaces, water and nature. The new design had in mind the wellbeing of its users, reconnecting people to nature and water providing a safe and beautiful oasis of tranquillity in the city.

3. Main SuDS components used

- Retrofitted 96 cubic metres rainwater harvesting system for irrigation consisting of geocellular units wrapped in a geomembrane and stored at slab level beneath the paving. Rainwater irrigation promotes better plant growth and makes use of recycled water.
- Retrofitted 200sqm of semi-intensive green roofs with a 230mm deep substrate and 40mm drainage and storage element, attenuating up to 20,000L of rainwater.
- Restored original forgotten link between pond and planters which recycles rainwater through a sustainable self-irrigating system for mature trees.

4. How it works-

Up to 700mm difference in build-up depth between the paving and the slab level was revealed when the garden was stripped bare. This led to the idea of introducing approx. 500sqm sustainable rainwater harvesting system within this space to be used for irrigation (Fig.2). Rainwater is

intercepted in the long slot drains along the impermeable paving and stored in the geocellular units wrapped in a geomembrane. This is connected to a pump system with UV filters and used to irrigate the large planters filled with mature trees and a multitude of biodiverse shrubs, perennials and bulbs (total number of new plants: 33,282).

An additional 200sqm of semi-intensive green roofs cover the old car park ventilation voids. These roofs are suspended on purposely built metal frames that allow for a substrate depth of 230mm. This deeper substrate (normally less than 170mm deep) not only augments attenuation capacity but increases the choice of plants that can be implemented (Fig 4).

In addition to this, during the restoration works R-LA uncovered the original long-forgotten urban irrigation system of planters directly connected with the ponds. This connection was blocked after being buried in mud for 50 years. Reinstating this system allowed for the deep and large planters to have a constant water table giving all-weather irrigation for the tree roots. The planters are directly connected with the pond through 60mm DIA orifices spaced 1m apart at their base, allowing for the water table in the planter to be at level with the pond surface (Fig 3). This creates a constant supply of water that can be absorbed by tree roots through capillary action. To enable this mechanism to work properly, bespoke layered free-draining gravels and substrates were specified. The strata were carefully monitored and implemented on site without the need to use geotextiles to separate the layers.

5. Specific project details

Plants, paving and water are all elements intrinsically interconnected in The Water Gardens and the restoration took this closed looped cycle approach at the heart of the design. The use of rainwater is proven to be more beneficial than mains water for irrigating plants.

Whilst the new semi-mature trees will need a top-down irrigation approach in the first two years of establishment, the amount of water needed for irrigation will be significantly reduced once tree roots reach the underlying water table. Irrigation will then be monitored efficiently and mainly only used for the smaller plant species.

6. Maintenance & operation

Dedicated teams for softscape, hardscape and irrigation regularly monitor and maintain the communal courtyard.

The closed water cycle of the scheme and the presence of 400 fish in the ponds (which were reintroduced post construction), requires careful use of biological means to combat ongoing plant pests and diseases as well as a correct use of non-toxic detergents for the hardscape maintenance.

The slot drains are cleaned and checked regularly to maximise rainwater harvesting.

7. Monitoring and evaluation

The irrigation system is regularly monitored for water pressure and correct allocation according to the needs of different planters. Pond water is regularly tested for health and safety of wildlife and humans.

8. Benefits and achievements

Efficient use of rainwater and thriving biodiverse planting with reduced irrigation costs, both in terms of water use and labour. Improved air quality and reduced heat-island effects due to cleaner water. Closing the water cycle loop and attenuating water reduces pressure on London’s sewage system. The total discharge is now approx. 5l/s from a previous 33.1l/s (in the 1:1 year 15 min storm) - a reduction of 85%.

9. Lessons learnt

The connecting point between the eastern and western large water storage systems was a weak link. This was addressd at maintenance stage by the contractors so that all the water across the system would efficiently reach the pumps.

10. Interaction with local authority

Details of interaction with local authority (or client)

11. Project details

Construction completed: *Practical Completion January 2019.*

Cost: *Confidential*

Extent: The Water Gardens podium deck total area: 5000m². Area of raised podium deck pedestrian hard surface draining into rainwater storage and pond (excluding planters): 1,400m². Pond area only: 1,553m² with a water depth of approx. 500mm. Geocellular water storage area: approx.500sqm.

12. Project team

Clients	<ul style="list-style-type: none"> The Church Commissioners for England 	
Designers	<ul style="list-style-type: none"> Landscape Architect and lead designer: Refolo Landscape Architects Drainage engineers: Cundall 	
Project manager	<ul style="list-style-type: none"> Colliers International 	
Contractors	<ul style="list-style-type: none"> Makers Construction Ltd 	

Landscape Contractor	<ul style="list-style-type: none"> • Bartholomew Landscaping 	
Large planters Soil Specification	<ul style="list-style-type: none"> • Tim O’Hare Associates 	

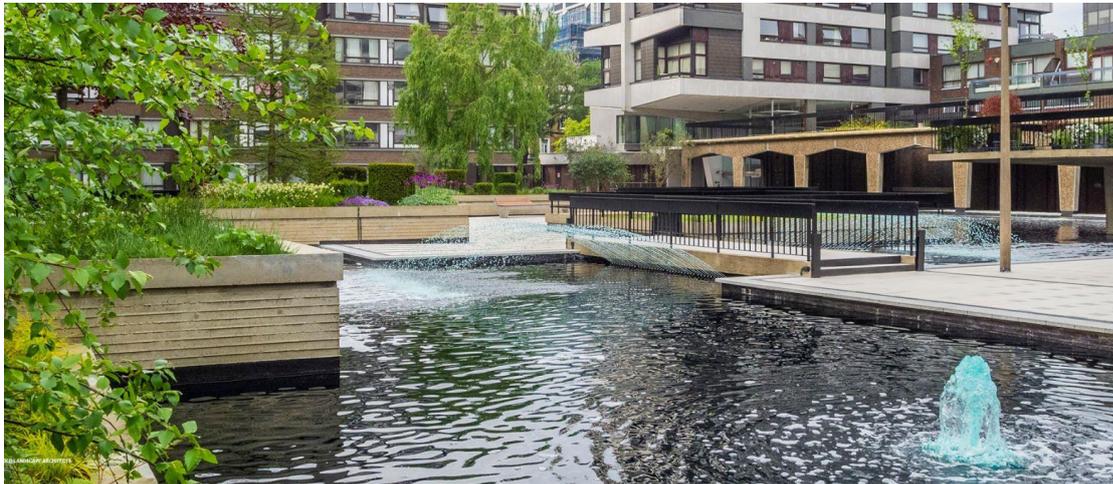


Fig 1. View from within The Water Gardens. Credit: Refolo Landscape Architects



Fig 2. Rainwater geocellular storage and attenuation system on the podium deck.

Credit: Refolo Landscape Architects

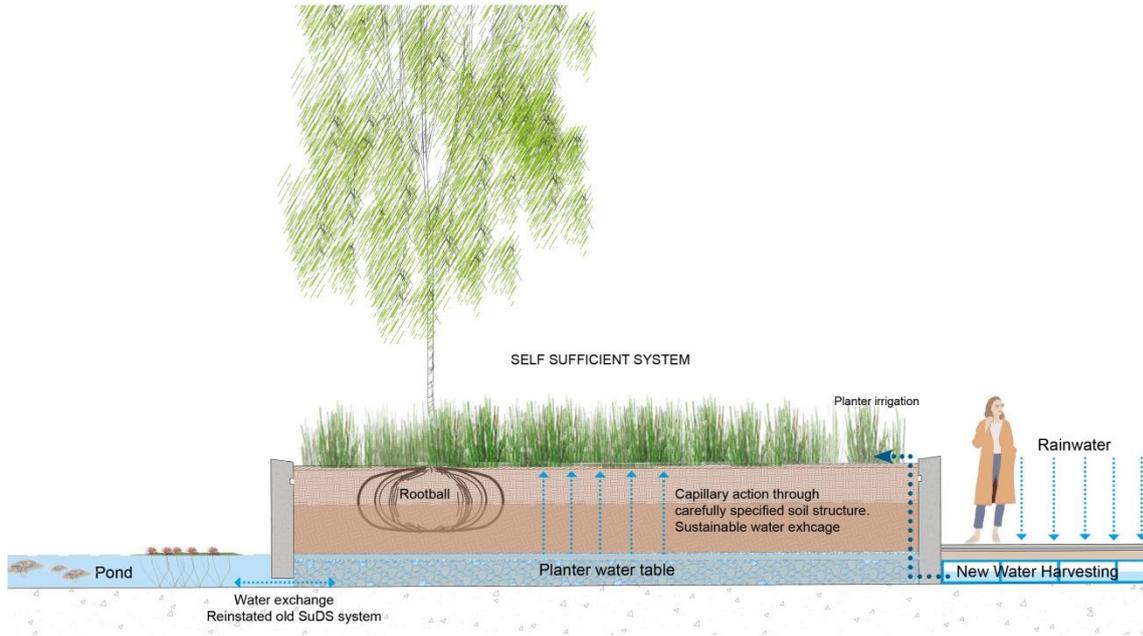


Fig 3. Pond-planter SuDS system and rainwater storage for irrigation loop.

Credit: Refolo Landscape Architects



Fig 4. Semi intensive green roofs over old and polluting car park voids.

Credit: Refolo Landscape Architects



Fig 5. View of part of The Water Gardens from above. Credit: Refolo Landscape Architects



Fig 6. View of part of The Water Gardens from within. Credit: Refolo Landscape Architects



Fig 7. One of the deep concrete planters connected with the pond.

Credit: Refolo Landscape Architects



Fig 8. View towards water jets oxygenating the water and dampening noise. Credit: Refolo Landscape Architects