

## Proposal for Sponge Cities Technologies

### *Advanced biofiltration technology for Sponge City Application*



### Technology Background

Recent years, China is focusing on Sponge Cities development and most of technologies for Sponge Cities Design are targeting on effective drain, detention or retention, storage and reuse but lack of infiltration, the important elements of Sponge Cities Design, which refers to use best performance filter to achieve the ideally water quality requirement. Most of Sponge Cities technology nowadays utilize sand filters, however although sand filters good at nutrients and TSS removal but not good at other types of concerning contaminants including heavy metals, which need to achieve various China water quality standards. And also sand filters occurs other problems such as clogging problems, cannot provide enough nutrients for plant growth, etc.

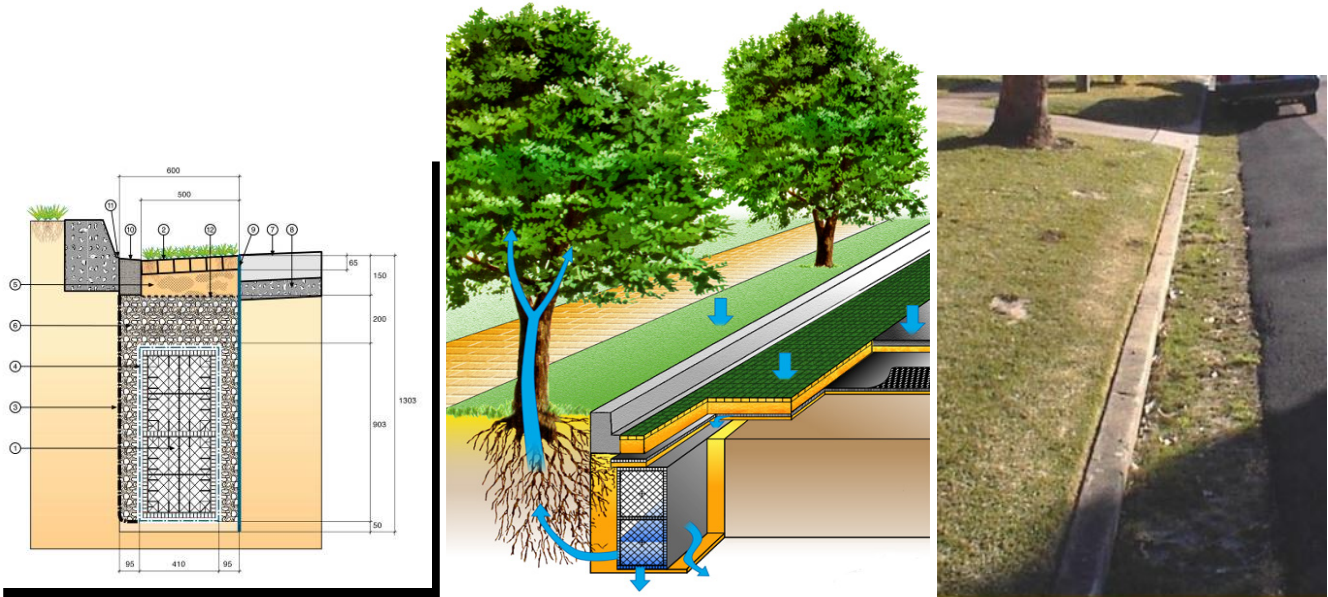
STAR Water and CORE have more than 15 years' experience in Australia and other countries for stormwater treatment with advanced biofiltration technology. The core technology is Reactive Filter Media (RFM), a patented customized bio-filter technology that enables the widespread capture, treatment and re-use of contaminated run-off by optimizing the treatment process based on filter component selection. Filter components include natural and sustainable organic, mineral and reactive materials that perform the reactions doing the treatment. This patented system enables predictable treatment, lifespan and performance results that are engineered using locally sourced materials in jurisdictions where the system is deployed. Another benefit of our technology is the ability to incorporate plants and trees in the treatment system enabling wider applications as it can be integrated in city landscapes. This improves city amenity while providing superior treatment outcomes. Treated water can then be used for a wide range on non-potable applications and flooding reduced.



## Streetscape Applications

### Road & Car Park Reuse Systems

#### Kerb gully by pass system, Concord Council, NSW, Australia



The system incorporates the extensive use of reactive media - a physically and biologically engineered filtration media. Three different engineered reactive media formulas are used to suit the specific soil and water conductivity requirements of the particular site. The bioremediating reactive media contain bio-engineered naturally occurring micro-organisms that biologically degrade and remediate toxic chemicals that are the result of daily urban and industrial activities. Through this process, toxic chemicals are transformed into natural and nontoxic elements.

The toxic chemicals treated include PCBs, PAHS, Organophosphates, coal tars, pesticides and herbicides. These toxins are carcinogenic to humans and their accumulation in soils and waterways are major health and environmental concerns. Some heavy metals can also be biologically degraded using reactive media.

#### Stormwater Treatment and Reuse Systems at Manly Beach, NSW, Australia





The Manly Stormwater Treatment and Re-Use System was constructed in 2001 and is designed to capture, treat and re-use run-off from the road and car parking areas at the popular Sydney beach. The system includes a bio-filter designed by STAR Water personnel that removes heavy metals, nutrients faecal coliforms and hydrocarbons. The water that is treated is then collected in underground tanking systems and used for irrigation. The system saves Manly Municipal Council approximately \$30,000AUD p.a in water costs and has already paid for itself. The system has cars, trucks and buses driving over the top of it constantly and has maintained its structural integrity over the 16 years since installation. The Reactive Filter Media™ bio-filter also reduces the impacts of localised flooding during heavy rainfall along the busy road.

#### Rain garden at Lyne Park, Rose Bay, NSW, Australia

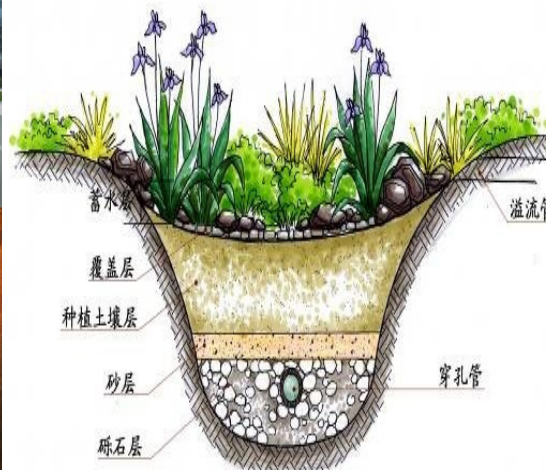


A Rain Garden installation in the car park of Lyne Park treating polluted run-off from cars and boats parked there. Lyne Park is next to Sydney Harbour and the Rain Garden removes pollutants such as heavy metals, PAH hydrocarbons and nutrients flowing into Sydney Harbour. The Rain Garden was established in 2012 and the plantings have been growing vigorously ever since.



## Highway Median Strip Application

Lougheed Highway, British Columbia, Canada



Bio-swale system on Lougheed Highway, Canada was constructed in 2009. Bio-swale system is located in the median strip of highway, which collected and treat highway road surface runoff to remove pollutants such as heavy metals, PAHs, hydrocarbons, and TSS etc. This vegetated biofiltration system also reduces flooding risk and heat from the road, and treated stormwater can be discharged to environment safely.

## High Density Urban Streetscapes

Multi-location raingarden, Sydney City, NSW, Australia

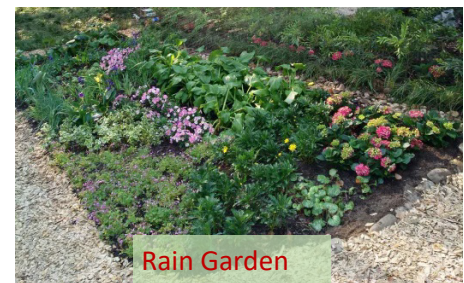




City of Sydney has been conducting a retrofit campaign of existing street rain gardens as well as establishing new rain gardens. The retrofit program is because the initial filter media used from a different specification and supplier failed causing the plants to die. STAR Water is now the recommended filter media to use in the street rain gardens and the newly established gardens. During the long dry-spell from middle 2016 to late 2017, many of the sites do not have irrigation and rely on limited rainfall to water the plants. Some sites also were establishing during very hot summer days of +35 degrees Celsius. The street rain gardens have been retrofitted into well established, highly urban developments.

## Sponge Parks in China

### Sponge Technology Demonstration Park, Shanghai, China



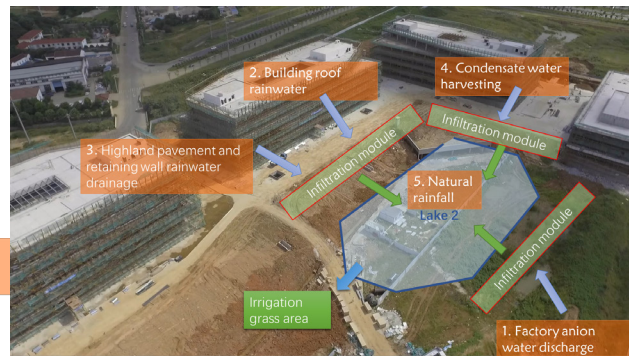
The Shanghai Sponge City Demonstration Park is a collaboration between Shanghai Botanic Gardens Green Engineering Ltd, STAR Water Solutions and The Centre for Organic Research & Education (CORE). Located within Shanghai's famous legendary Botanic Gardens, The Sponge City Demonstration Site not only features world's best practice in urban water management but is also a refinement and testing ground for new innovation for future design.

The collaboration project combines Shanghai Botanic Gardens horticultural and engineering expertise, along with their organics resource recovery & composting, with CORE's research capability and STAR Water's technological and global experience.

The technologies showcased within the Demonstration Park contain Reactive Sponge Filter media produced using materials recovered and recycled within the Botanic Garden. This is achieved using STAR Water's Kalkulus(r) sponge filter design tool that selects the most appropriate proportions of each component to optimise the treatment capability. Shanghai Botanic Gardens Engineering (SHGBE) then manufactures Reactive Sponge Filters and assembles the various devices on display in the Demonstration Site.

## Lakes, Ponds and Rivers

### Proposed Project in Nanjing



The proposed project will construct 2 artificial lakes with over 15,000 m<sup>2</sup>. STAR water will integrate the biofiltration technology for the stormwater collection, filtration and reuse for the lake water supply. Additionally, STAR Water will introduce a vegetated biofiltration system for landscaping design.