

Marylebone Low Emission Neighbourhood (LEN), London



Image 1: Rain Gardens in Package 6 – View west towards Marylebone High Street (Aug 2019)

SuDS used

- 9 Bioretention areas “Rain gardens” retrofitted into busy public highway in Marylebone, central London

Benefits

- Attenuation of the majority of rainfall events and provides interception volumes and thus surface water quality improvements
- Improved aesthetic of public realm and streetscape to provide enhanced pedestrian safety with rain gardens acting as defensible space to footways and on approach to new and enhanced zebra crossings
- Reduced atmospheric pollution through uptake of particulates
- Biodiversity net gain

1. Location

The site is located within Marylebone in Westminster, London, UK. The site is split into 4 phased areas along Marylebone High Street, Paddington Street and New Cavendish Street. These are major thoroughfares from Marylebone Road to Wigmore Street.

2. Description

The Marylebone LEN was established in July 2016 and is set on and around Marylebone's busy shopping high street, with narrow pavements lined by boutique stores and cafes that spill out onto the pavements. The aim is to improve air quality and the public realm by reducing vehicle dominance, introducing green infrastructure.

The site had traditional gully connections draining large catchments (highway and pavements), with the worst gully draining over 1,600m². Ten times the recommended design standard.

3. Main SuDS components used

- Bioretention systems (Rain gardens)
- Trees, grasses and herbaceous perennials

4. How it works

9 Bioretention systems, rain gardens, were installed at existing gully locations with new connections to the main sewer only where needed. This was in order to minimise disruption to a live road with bus routes, cost and risks associated with deep excavations into the centre of the carriageway.

The main components include kerbs flush with footways and strategically located inlets with silt traps on carriageway sides discharging into a dished surface to allow water to pool before allowing water to infiltrate through engineered soils including an aggregate drainage layer at the base of each rain garden were placed to the depth of a perforated pipe that distributes water that is not intercepted and provides the overflow connection to the sewer.

The rain gardens, depending on their location and the below ground structures, feature a variety of trees, grasses and herbaceous perennials to provide amenity value, biodiversity and to absorb water.

As the site is located on London Clay, and mostly compacted made ground from existing construction and in some cases basement structures, infiltration was not deemed viable.

The rain gardens have the capacity to retain all 1 in 1 year storm events and due to the large catchment areas involved larger volumes of runoff overflow and feed perforated pipes at the base before flowing down overflows into the sewer. For all storm events the rain gardens are designed to capture and filter the "first flush" of the events preventing the majority of pollutants entering the sewer and possibly overflow into the River Thames.

Specific project details

The works were split into a number of phases with:

- Phase 1: 16 Marylebone High Street W1U 4NX, Phase 2: Junction between 7 Marylebone High Street W1U 4NL and 6 New Cavendish Street W1G 8UH (Package 5),
- Phase 3: Junction near 49 Paddington Street W1U 4HW (Package 6) and
- Phase 4: 79 Marylebone High Street W1U 5JZ (Packages 1 and 3).

Together they totalled 5,300m² of physical works draining an estimated catchment area of 7,000m² through a total rain garden surface area of 129m².

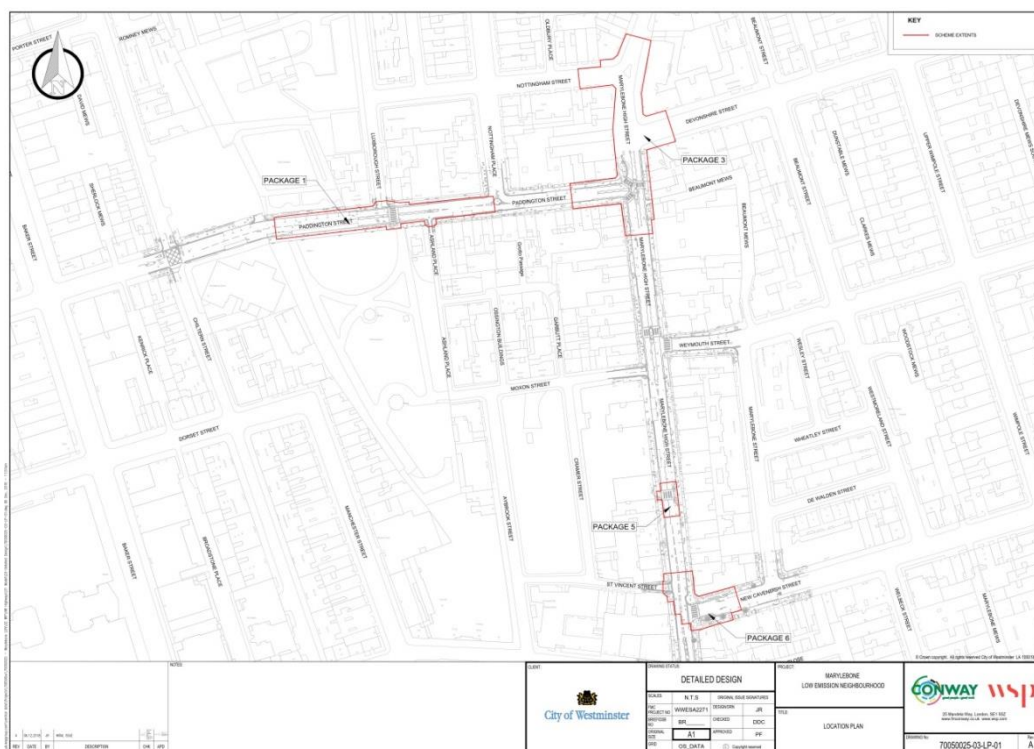


Image 2: LEN extent of works - location of Packages

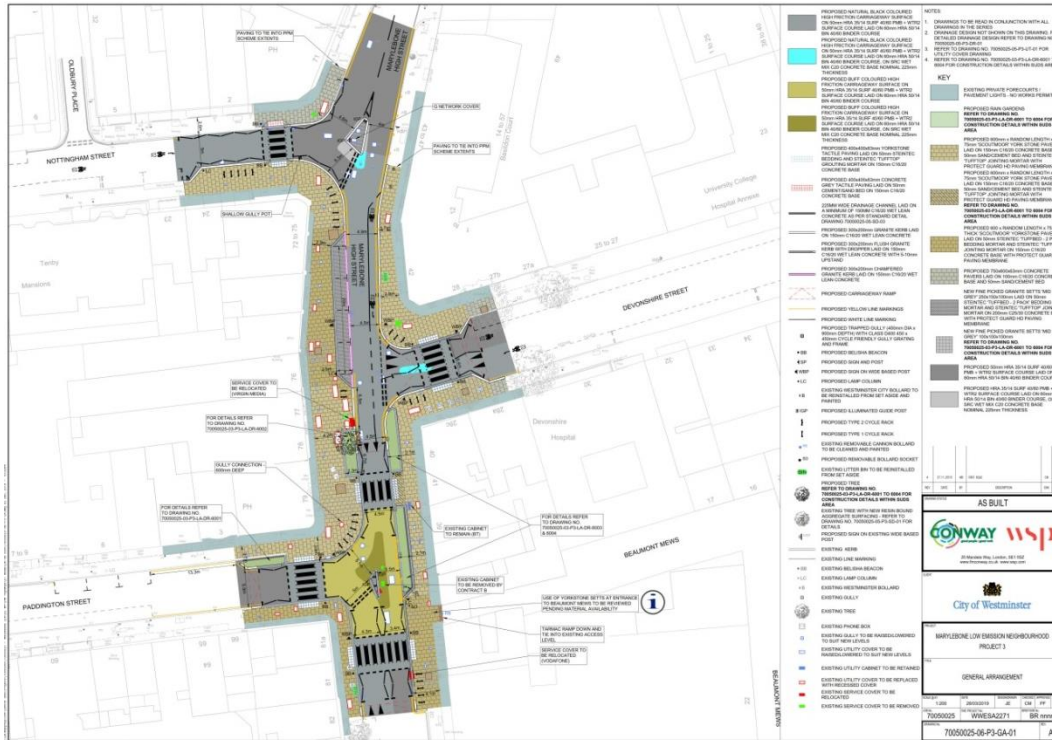


Image 3: LEN extent of works – Package 3 Detail

Physical Constraints

The site is a live high street with significant pedestrian and vehicular traffic including bus routes, there are a large number of utilities and basements within, below or close to each of the rain garden locations, some of the rain gardens had to be installed shallower than intended and lined with an impermeable membrane to protect services and basements.

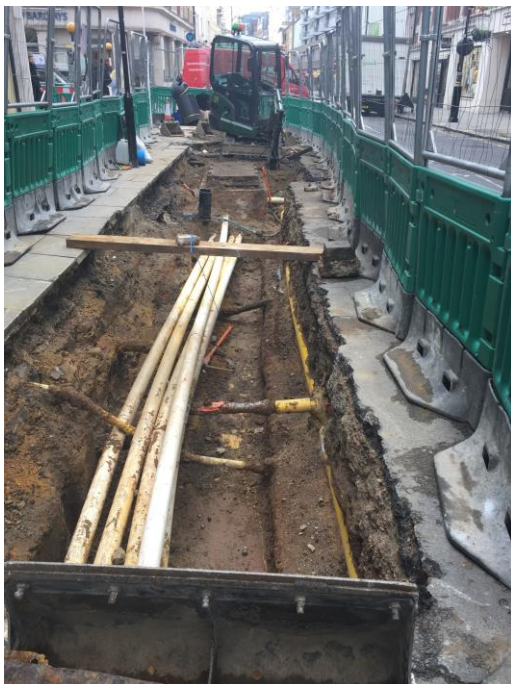


Image 4: Rain Garden Package 3.3 – Existing utilities and below ground structures (Feb 2019)

The design team was a collaborative effort from a number of key disciplines led by highways delivery team joint venture of WSP and included project management, lighting, highways, water specialism and landscape architecture. The teams collaborated extremely well. Westminster Council are the client and adopting highway authority.

Landscaper Involvement

The main design drawings, details, specifications and bills of quantity for the rain gardens were produced by the landscaping team with input from the drainage engineers. This simplified the set of construction details and prevented duplication and potential design errors and omissions.



Image 5: Rain Gardens in Package 3 – View northeast towards Devonshire Street (Aug 2019)

Drainage Engineer Involvement

The drainage team provided calculations and engineering support to the landscapers including levels, calculations of the existing and proposed catchments to assist in informing the client team of the efficiency of the installation, specifications for bespoke details to connect the new rain gardens to the existing Thames Water combined sewer network that would prevent odour emanating from the rain gardens in a very public location.

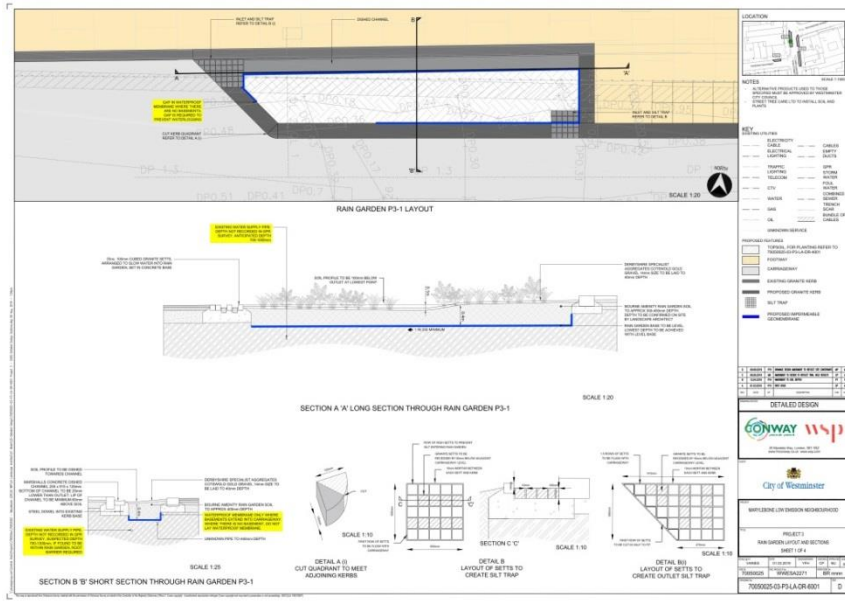


Image 6: Rain Gardens design drawings in Package 6 – with reduced construction due to utilities

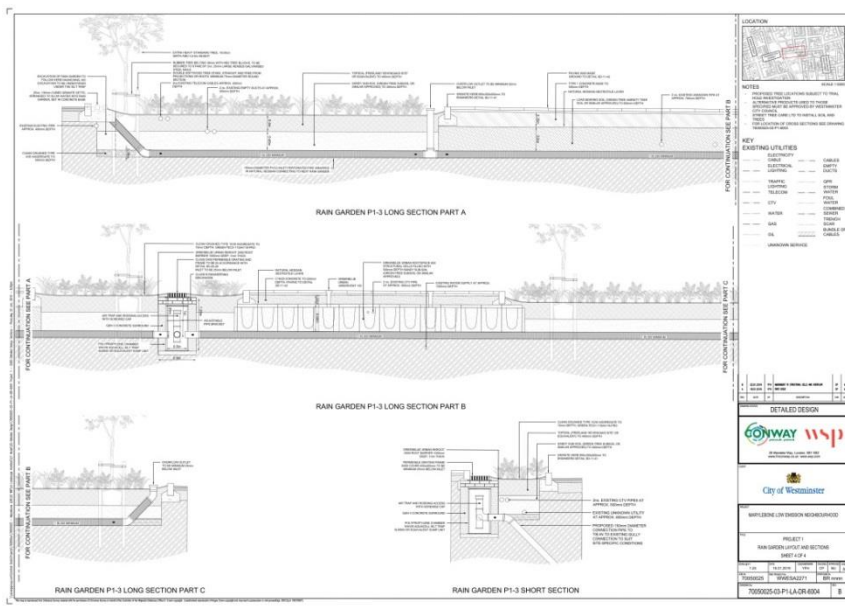


Image 7: Rain Gardens design drawings in Package 3 – with extended root zone and storage beneath pavement

Consultation:

As part of the communication strategy, one of the main tasks was to identify key stakeholders in the scheme. These included **Ward Members**, **The Howard De Walden Estate** (as a major property owner in the area), **Business associations/ independent shops**, there are two hospitals in the vicinity of the scheme who use Marylebone High Street as a strategic route for ambulances and other **Developers** with construction sites under development in the vicinity.

An information document was sent to all residents and businesses within a 300m radius. A project website was also set up (<https://www.marylebone.org/MA-News-Features/6922318>) to provide updates.

5. Maintenance & operation

Maintenance was undertaken by the installing soft landscape contractor for a year commencing with completion of the first phase. Following this, the rain gardens have been adopted by WCC and maintenance and operational tasks are undertaken by the council's Term Contractor.

General maintenance tasks involve clearing silt from inlets and removing litter including autumn leaves. Following establishment, evergreen plants require pruning with long term tree maintenance. Manholes were installed with a vertical rodding pipe so the sewer connection can be maintained, a rodding eye was installed at each drainage run for cleaning and access to the perforated pipe.

6. Monitoring and evaluation

WCC have monitored this scheme closely from conception to beyond completion as it is the first use of rain gardens within the council area. Many of the rain gardens have been completed for at least a year and WCC has monitored them to ensure that they are working well and to determine whether further rain gardens can be retrofitted successfully within the extremely tricky environment of central London. WCC has since expressed interest in retrofitting further rain gardens elsewhere.

7. Benefits and achievements

- No flooding during storm events late 2019 and early 2020
- Silt trap and plants improve the water quality entering the sewer compared with the traditional gully system as well as capture pollutant particles improve air quality
- Community education on urban flooding and water management as an issue by information boards adjacent to rain gardens
- Enhanced amenity value and pedestrian safety through replacement of carriageway used for temporary parking replaced with large rain gardens displaying flowering plants thus providing biodiversity net gain with high quality materials including yorkstone paving flags and granite kerbs
- Additional cycle parking facilities promote sustainable transport methods

8. Lessons learnt

- Implementation of site investigations including ground penetration surveys, basements surveys and archeological survey at an early stage can minimise construction delays.
- On site challenges require quick decisions to be made by the design team.
- Design must be robust and flexible to be able to adapt to site conditions.
- Maintenance funding is paramount to guarantee the establishment and maintenance of the plants
- Knowing and regularly engaging with stakeholders is critical. Clear and concise consultation documents, an appointed public liaison officer and weekly updates minimised objections

and complaints allowing for fast construction. Client expectations should be understood and set in advance to reduce amendments.

9. Project details

Construction completed: Phased completion from: May - December 2019

Cost: £65k SuDS/public realm design fees (design, site supervision and monitoring), total design fees £729k, construction costs £1.7m

Extent: 2.1 Ha

10. Project team

Funders	<ul style="list-style-type: none"> Westminster City Council The London Mayor’s Air Quality Fund 	 <p>SUPPORTED BY City of Westminster MAYOR OF LONDON</p>
Clients	<ul style="list-style-type: none"> Westminster City Council 	 <p>City of Westminster</p>
Designers	<ul style="list-style-type: none"> WSP 	
Contractors	<ul style="list-style-type: none"> FM Conway (Principle Contractor) Street Tree Care 	



Image 8: Marylebone High Street view north following completion (May 2020)