

Design Note

Project 4 Angel Square
 Subject SuDS Verification for the Discharge of Planning Condition 11
 Project no 0047214
 Date 16 May 2023

Revision	Description	Issued by	Date	Approved (signature)
01	For Information	RB	14.03.2023	NP
02	For Information	RB	16.05.2023	NP

1 Introduction

This technical note provides an evidence-based description of the surface water drainage construction on the 4 Angel Square site and how it satisfies the criteria set out within the pack of civil engineering drawings and drainage strategy report approved for planning.

The objective of this report is to verify the sustainable drainage system installation and therefore satisfy the SuDS-related requirements of Planning Condition No. 11, as per the wording underlined below:

11. Prior to the first occupation of the development, details of the implementation, maintenance and management of the sustainable drainage scheme shall be submitted for approval in writing by the City Council, as Local Planning Authority. For the avoidance of doubt, this shall include:

- *Verification reporting providing photographic evidence of construction;*
- *Management and maintenance plan for the lifetime of the development which shall include the arrangements adoption by any public body or statutory undertaker, or any other arrangements to secure the operation of the sustainable drainage scheme throughout its lifetime.*

1.1 Surface water drainage design overview

Roof water runoff is collected and transferred to the ground via a gravity drainage system. The system has been designed by the MEP consultant (SES). The roof runoff connects into manhole MHSW-00-04A and MHSW-00-05, where the rainwater downpipes connect into the external gravity surface water drainage network.

Collection of external surface water runoff is by permeable paving, gullies, linear drains and connector pipes that connect to the external below ground drainage system.

The surface water runoff from the site is proposed to discharge into the existing United Utilities drainage network. This connection is to an existing manhole within the site. The car park entrance area of the site connects into this same manhole via a below slab network through the basement car park.

The car park entrance area and the rest of the site is attenuated separately. Attenuation Tank 1 serves the majority of the site, while Attenuation Tank 2 takes runoff from the car park entrance area. The runoff from both areas is restricted to greenfield runoff rates. This is achieved by Hydro Brakes downstream of the tanks.

No	Location	Critical Storm Return Period	1:100 YEAR	
			Run-off rate	Attenuation Volume
1	Attenuation Tank 1	1 in 100 year + 40% CC	7.5l/s	165m ³
2	Attenuation Tank 2	1 in 100 year + 40% CC	2.5l/s	32m ³
Total			10l/s	197m ³

This Design Note has been prepared for the sole benefit, use and information of Bowmer + Kirkland for the purposes set out in the Design Note or instructions commissioning it and shall be subject to the express contract terms with Bowmer + Kirkland. BH assumes no liability or responsibility for any reliance placed on this Design Note by any third party. All concepts and proposals are copyright © 1976 – 2023 Buro Happold. All rights reserved. Issued in commercial confidence.

The sustainable drainage design is described in further detail in the Drainage Strategy document (Rev 02 – May 2019) submitted for Planning. This document is intended to be read with reference to and in conjunction with the Drainage Strategy Report.

The figure below shows the proposed location of the attenuation tanks.

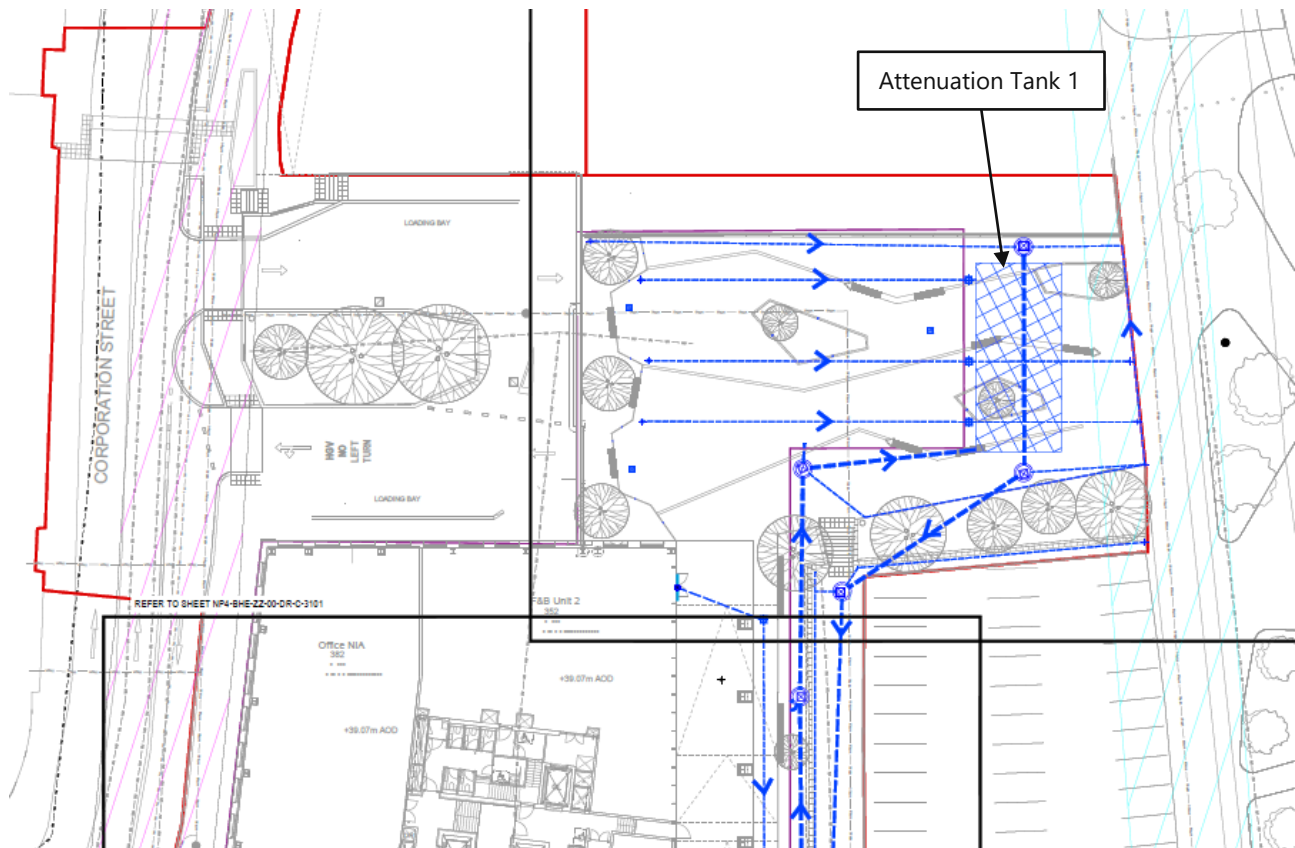


Figure 1-1 External surface water drainage layout, ground level

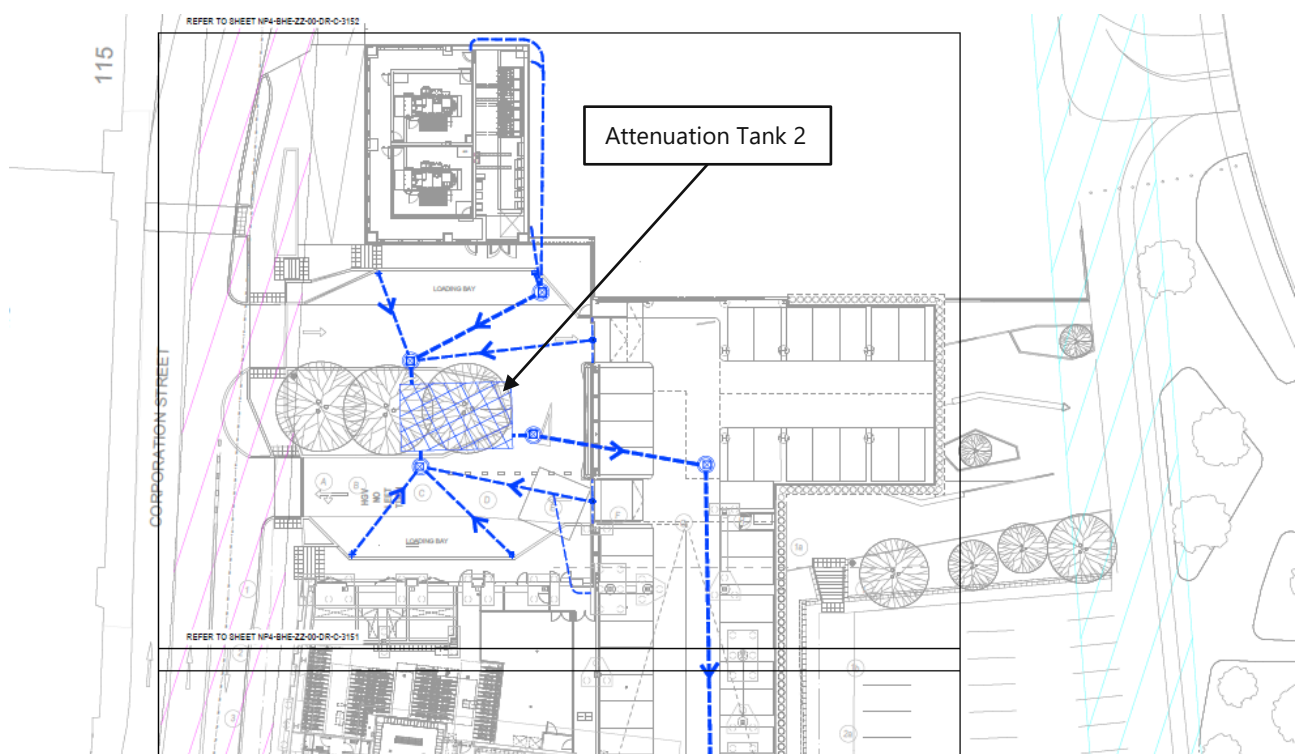


Figure 1-2 External surface water drainage layout, lower ground level

1.2 Key design criteria

The key criteria set out within the drainage strategy submitted and approved for planning are as per the below:

- 197m³ of attenuation provided, assuming a voids ratio of 96%;
- Hydro Brakes to restrict discharge to existing surface water sewer to 10 l/s in total;
- Surface water collection via permeable paving with drain joints, gullies and drainage channels.

2 Construction

Attenuation tanks

The images below show the installation of the Attenuation Tank 1 in line with the surface water drainage design submitted for planning.



Figure 2-1 Ground preparation for Attenuation Tank 1

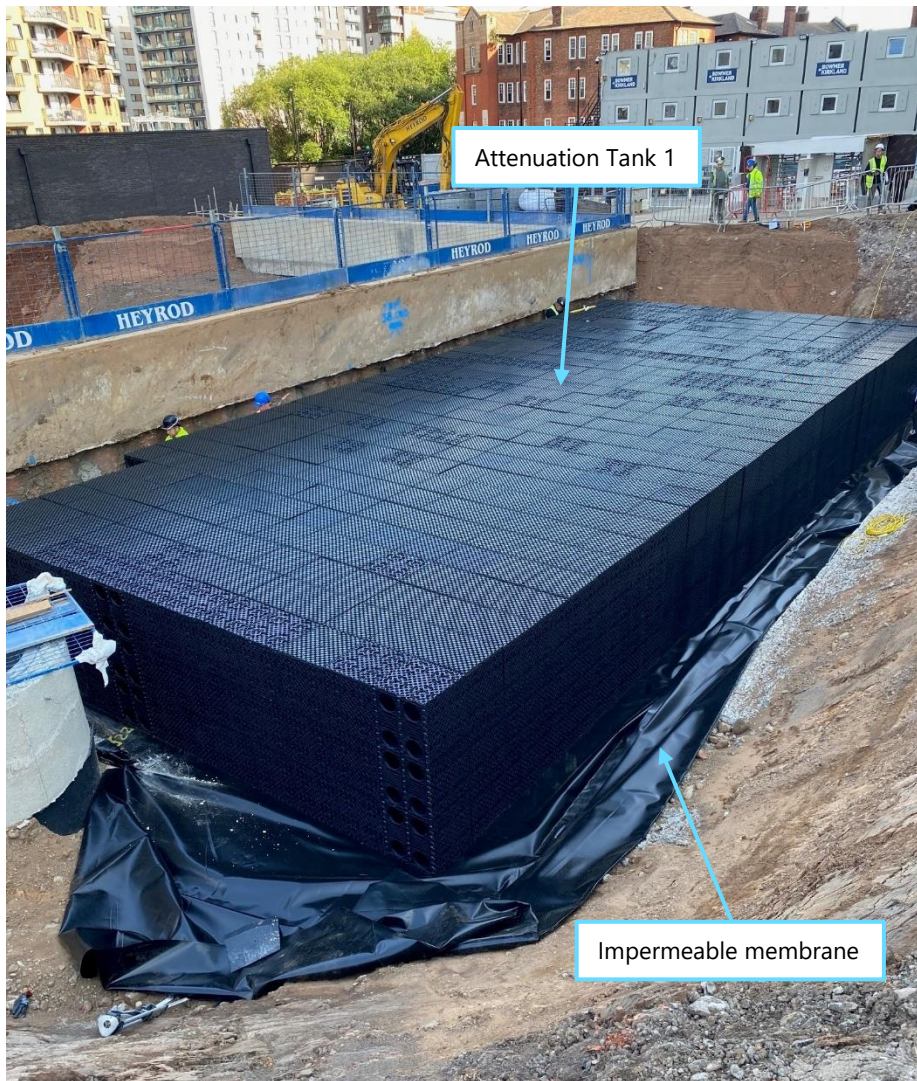


Figure 2-2 Attenuation Tank 1 construction, located East of the building



Figure 2-3 Backfilling on Attenuation Tank 1



Figure 2-4 Perforated pipe installation in permeable paving system

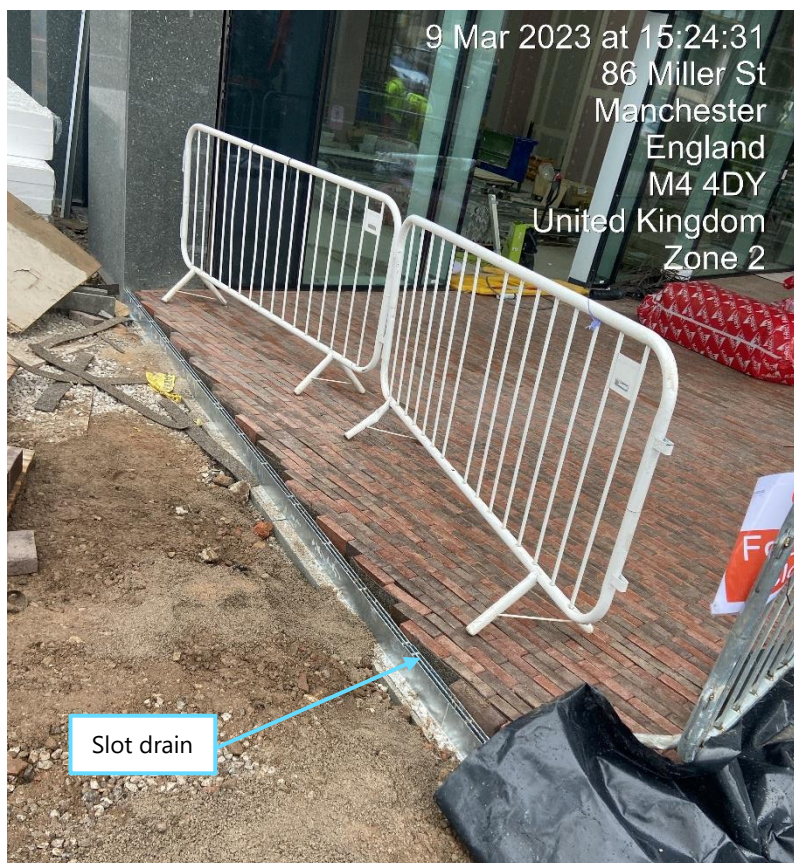


Figure 2-5 Slot drain installation at the base of the colonnade



Figure 2-6 Ground preparation for Attenuation Tank 2

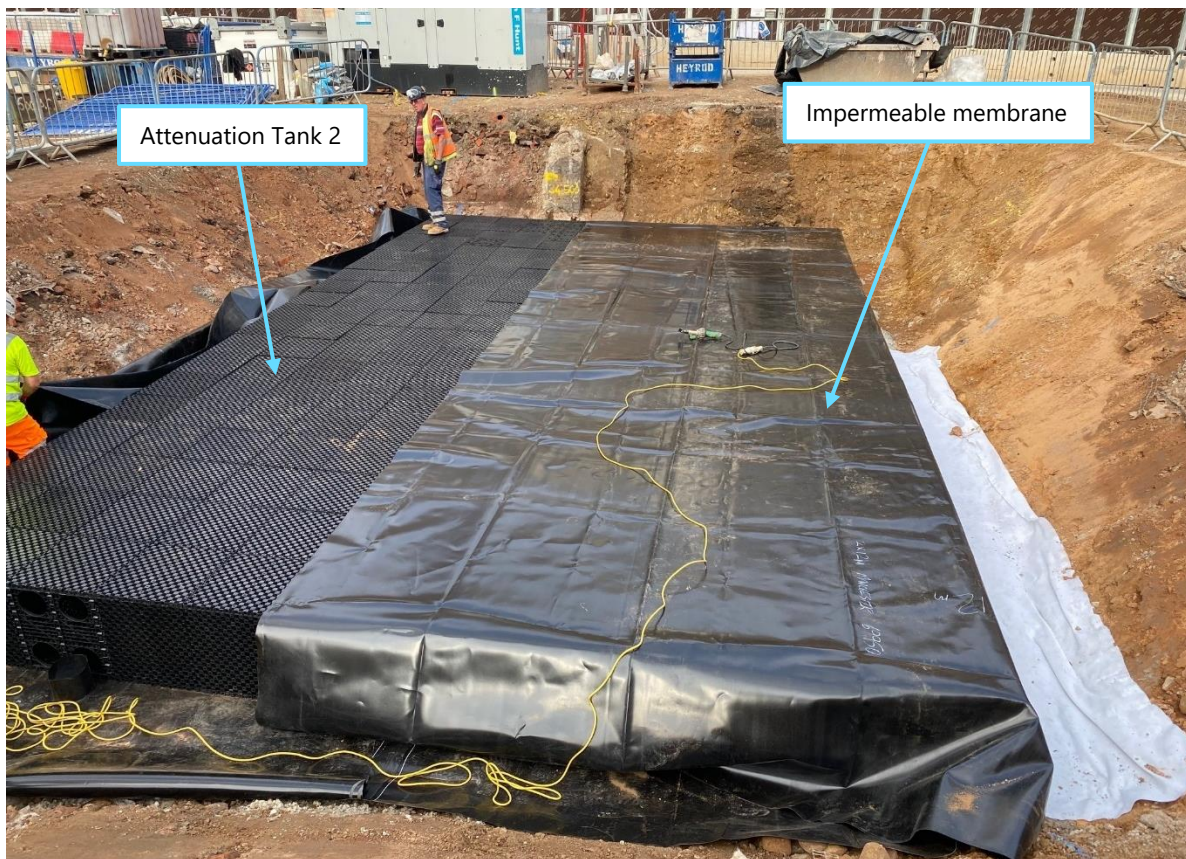


Figure 2-7 Installation of Attenuation Tank 2



Figure 2-8 Backfilling of Attenuation Tank 2



Figure 2-9 Hydro-Brake installed in MHSW-00-02

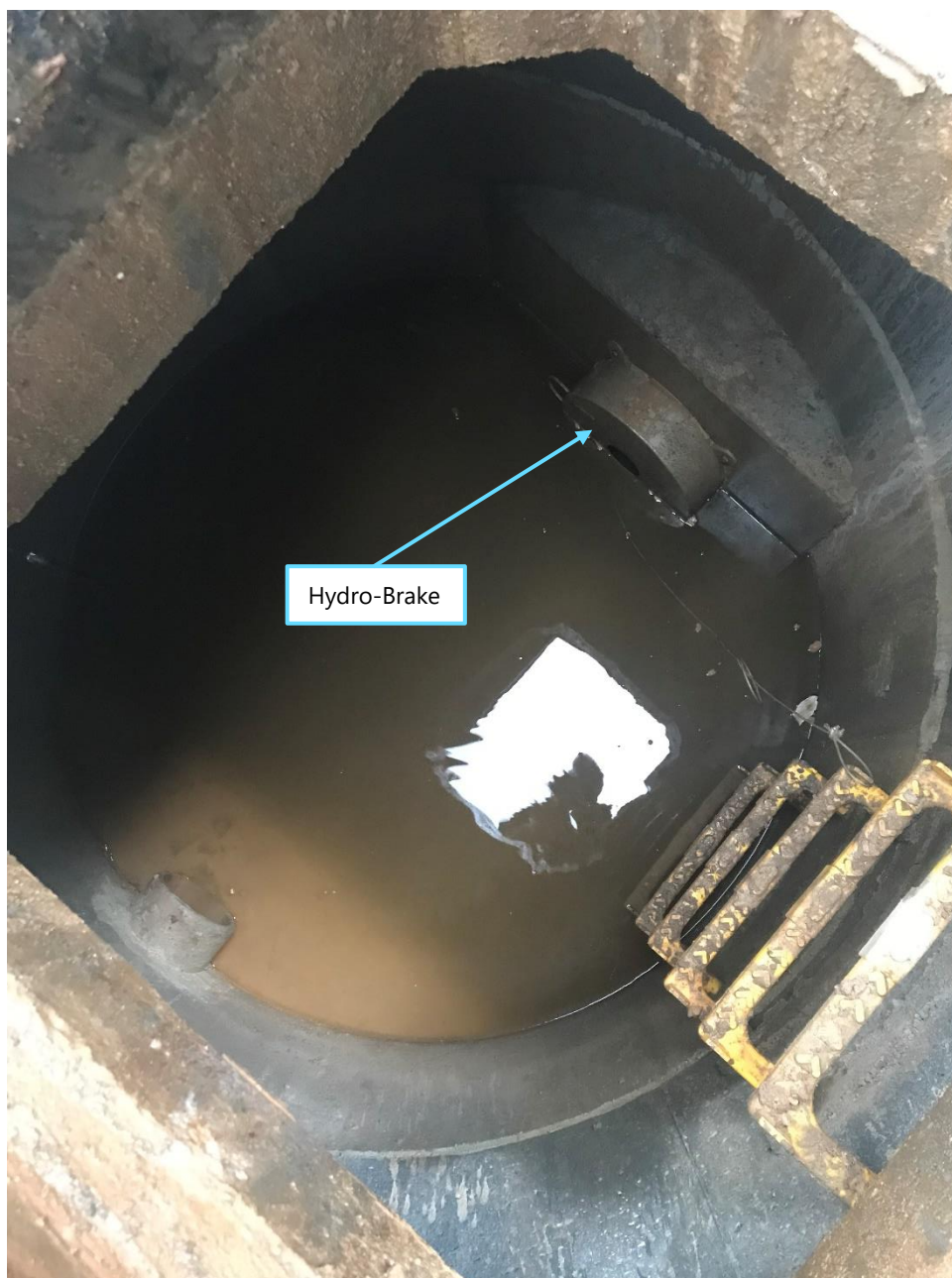


Figure 2-10 Hydro-Brake installed in MHSW-00-10

3 Maintenance Requirements

The table below summarises the maintenance requirements for different elements of the proposed drainage network. The requirements are based on the CIRIA C753 SuDS Manual.

Note that none of the sustainable drainage network is being adopted. Maintenance work is to be undertaken by Workman LLP as part of the wider NOMA estate management.

SUDS COMPONENTS MAINTENANCE REQUIREMENTS		
SUDS COMPONENT	GEOCELLULAR TANK (TABLE 21.3)	
Maintenance	Action	Frequency
Regular maintenance	Inspect and identify areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance).	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface or filter for blockage by sediment,	Annually

	algae or other matter; remove and replace surface infiltration medium as necessary.	
	Remove sediment from pre-treatment structures and/or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, outflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required
SUDS COMPONENT	PAVING WITH DRAIN JOINTS (TABLE 20.15)	
Maintenance	Action	Frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial action	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually
SUDS COMPONENT	Key design standards for adoption inlets, outlets and connections	
Maintenance	Action	Frequency
Regular maintenance	Litter and debris removal	Monthly
	Grass cut 1m around structure at 50mm where necessary	Monthly

	Remove silt from forebays, aprons or other structures if present	Monthly or as required
	Inspect and clear inlets, outlets, control structures and overflows	Monthly or as required
Occasional tasks	Removal of tree or shrub growth within 5m	As required