DOSA

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RESIDENTIAL DEVELOPMENT, AT CARRIGALINE ROAD & CHURCHYARD LANE, DOUGLAS, CORK

DRAINAGE IMPACT ASSESSMENT

DATE 16/01/2025

REVISION 2

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1 Introduction

Denis O'Sullivan & Associates were engaged as Consulting Engineers for the proposed development at Carrigaline Road & Churchyard Lane, Douglas, Cork. The purpose of this Drainage Impact Assessment report is to provide details of the Storm Water elements associated with the proposed development.

Following the Opinion received from Cork City Council from the Section 32(B) meeting, the report has been amended to address concerns raised.

1.1 Site Location

The subject site is located to the south-east of Douglas Village shopping centre and just off East Douglas Street on the Carrigaline Road. The subject site presents a greenfield landscape characterised by its level terrain. Bordered by the Carrigaline Roads to the east, Churchyard Lane to the west, the Telephone Exchange to the south, and a residential dwelling alongside a restaurant and bar to the north. The land is currently zoned mixed use development in the Current Development Plan

A snapshot of the site is outlined in Figure 1-1 below.

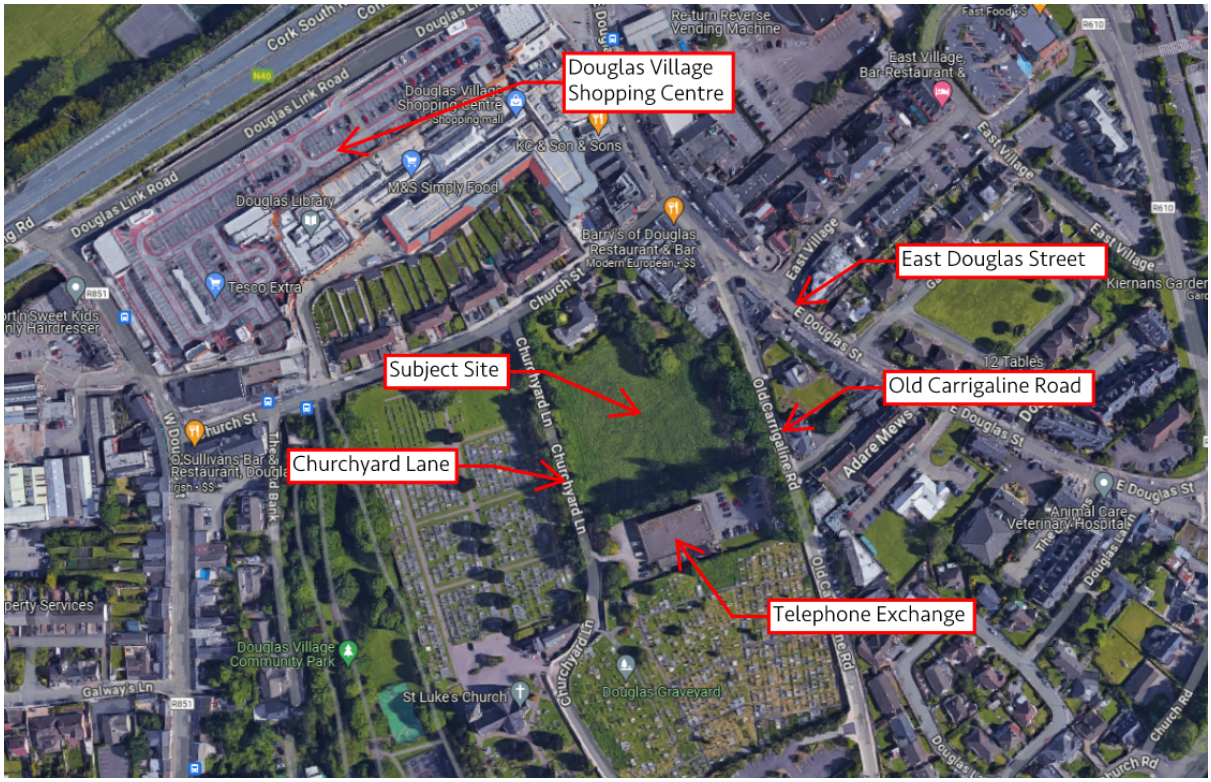


Figure 1-1 Site Location (Google Maps)

1.2 Site Topography

The subject site presents a greenfield landscape characterised by its level terrain. There is a very gentle incline from South to Northerly direction to a low point on the Northern boundary which is approximately 5.00m OD.

1.3 Site History

There are two previous planning applications on the site for a mixed use development dated 2016 & 2018. Both planning application had been granted by Cork County Council but were appealed to An Bord Pleanála and refused.

1.4 Proposed Development

The proposed development on the site entails the construction of 124 no. residential apartments (consisting of a mix of 1, 2 and 3 bed units), 1 no. cafe unit and 2 no. office units, in a development ranging in height from 1 to 5 storeys and all associated site development works including footpaths, car and bicycle parking, drainage, bicycle and bin stores, lighting, fencing, landscaping/amenity areas, ESB substation/switchroom and plant room. Site development works include 2 no. new uncontrolled pedestrian crossings and footpath improvements on Churchyard Lane which requires the removal of 6 no. existing on-street car parking spaces. The proposed development works include a connection and construction of a new storm water and foul sewer along Carrigaline Road. Access to the site will be via a new vehicle access point and a new pedestrian connection from Carrigaline Road and 2 new pedestrian connections onto Churchyard Lane. The new vehicular access requires the removal of 4 no. existing car parking spaces. This comprehensive proposal outlines a significant residential development that aims to contribute to the local area while providing a range of housing options for potential residents.



Figure 1-2 Proposed Site Layout (O'Mahony Pike Architecture/Urban Design)

1.5 Scope of Assessment

This report deals with the following aspects associated with this development:

- Existing Site
- Storm Water Drainage Design
- Sustainable urban Drainage Systems (SuDS)
- SuDS Maintenance

1.6 Principle Design Considerations

During the design of the storm water drainage for the proposed site, including SuDS, the following key documents / standards were taken into consideration;

- Cork City Council Development Plan
- CIRIA report C753 The SuDS Manual-v6
- Greater Dublin Strategic Drainage Study (GDSDS)
- Nature-based Solutions to the Management of Rainwater and Surface Water Runoff in Urban Areas Water Sensitive Urban Design - Best Practice Interim Guidance Document, (CDP Objective 9.4) - The Department of Housing, Local Government and Heritage.
- Inland Fisheries Irelands Planning for Watercourses in the Urban Area – (CDP Para 11.221)- IFI

2 *Surface Water Design Overview*

The proposed storm water drainage system has been designed to cater for all surface water runoff from all hard surfaces within the proposed development including roadways, roofs, parking areas etc. The completed development site is a mix of soft landscaping and hard paving or roofing. The existing topography is a single catchment. There will be one no. surface water discharge points to service the developed site and it will discharge to the stormwater network at the junction between East Douglas Street and Church Street.

The diversion of runoff from the catchment will be offset by the use of infiltrating-type SuDS infrastructure. This will maintain recharge to the aquifer, which provides baseflow to the adjoining stream. Surface water runoff generated from the proposed residential development will be conveyed through a proposed surface water network including SuDS and attenuated / managed on site prior to final discharge at Qbar greenfield run-off rates. The existing stormwater network at the junction between East Douglas Street and Church Street has been chosen as the suitable surface water discharge point for the proposed development.

Surface water discharge rates from the proposed surface water drainage network will be controlled by a vortex flow control devices (Hydrobrakes or equivalent) and associated attenuation area. Surface water discharge will also pass via a full retention fuel / oil separators (sized in accordance with permitted discharge from the site). The storm sewer network was designed using Autodesk InfoDrainage modelling software. Outputs from the storm sewer design can be found in the Appendices of the Infrastructure Report.

The proposed surface water drainage network will collect surface water runoff from the site via a piped network prior to discharging off site via the attenuation basin, flow control devices and separator arrangement as noted above.

All flow velocities within the network fall within the limits of 0.75 and 3m/sec as set out in "Recommendations for Site Development Works" as published by the Department of Environment. The storm water network and detention basin are designed to accommodate the 100-year return period plus an additional 20% to account for the effects of climate change.

2.1 Proposed Sustainable Urban Drainage (SuDS) Strategy

For the proposed development a "SuDS triangle" was utilised to ensure all three functions are provided for within the SuDS strategy.

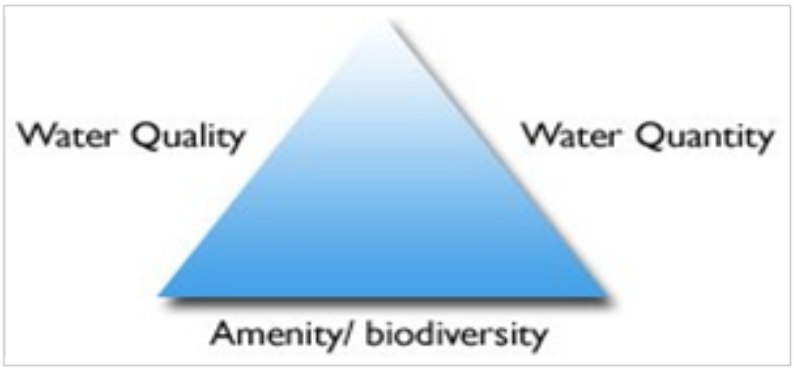


Figure 2.1– SuDS Triangle

By considering the three functions of the triangle, a SuDS system will allow for water quality treatment through natural processes by;

- Encouraging infiltration (where appropriate) and attenuating peak flows.
- Improving water quality by providing treatment to storm water prior to discharge.
- Providing habitat and function where possible for those using the area (including wildlife).

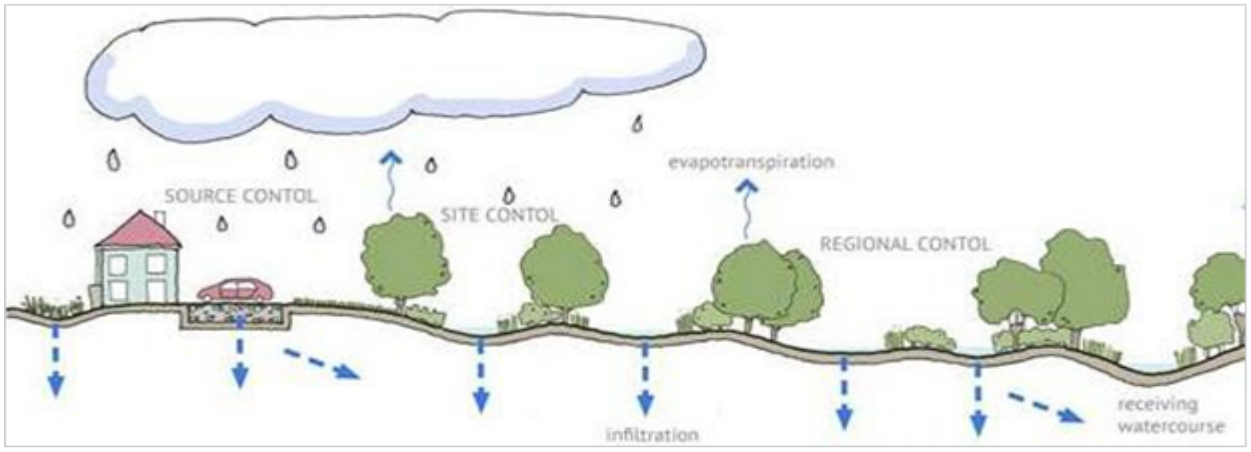


Figure 2.2– SuDS Treatment Train

The principles of a SuDS treatment train were used during the design of the surface water drainage system. The treatment train as illustrated in the image above provides an understanding of prevention and source control to reduced water run-off from a site and improve water quality.

Criterion 1: River Water Quality Protection

Satisfied by providing stormwater attenuation tanks and treatment of surface water run-off by SUDS features such full retention fuel/oil separators at surface water discharge points.

Criterion 2: River Regime Protection

Satisfied by attenuating surface water run-off in association with flow control devices prior to discharge off site at Greenfield runoff rate. Site critical duration storm used to assess attenuation volume.

Criterion 3: Level of Service (Flooding) for the Site

Satisfied by reviewing available flood hazard information relating to the site's proximity to tidal and fluvial flood plains (up to 1 in 100-year flood event).

Criterion 4: River Flood Protection

Satisfied by attenuating surface water discharge to greenfield runoff rates, addressing flood risk associated with the 1 in 100-year storm and avoiding development in flood plains.

Following a comprehensive review of the design of the storm water drainage system we considered all options under the SuDS guidance policies referred to in the Greater Dublin Drainage Strategy. A preliminary feasibility of the applicable SuDS Techniques was carried out using the facility on the website of Irishsuds.ie (Guidance and Tools). The preliminary analysis indicated that the following techniques were possibly suitable Bioretention Systems, Filter Strips/Drains and Attenuation Tanks as a last resort.

Each proposal was examined and evaluated on its merits / suitability under site specific constraints for use in the proposed development site. Our design approach summary is as follows:

2.2 SuDS Appraisal

The SUDS selection process used for this site is in accordance with SUDS selection flow chart, Volume 3, Section 6.5, Figure 48 of the GDSDS. The characteristics of the site are utilised to select the various SUDS techniques that would be applicable.

The following methodologies are being implemented as part of a SuDS treatment train approach:

2.2.1 Filter Drain

Trenches filled with permeable material and a perforated collection pipe at the invert with an optional permeable 'sandy' topsoil at surface. These can treat, convey and attenuate runoff at source, and can infiltrate to the ground where the subgrade is suitable. These systems will allow some form of storage for small rainfall events and can result in water evaporation and adsorption in small quantities, therefore there will be less run-off from these areas in small rainfall events thus mimicking the natural response for this catchment. These will be located along the proposed internal parking and pathways and will allow groundwater to recharge to its natural state.

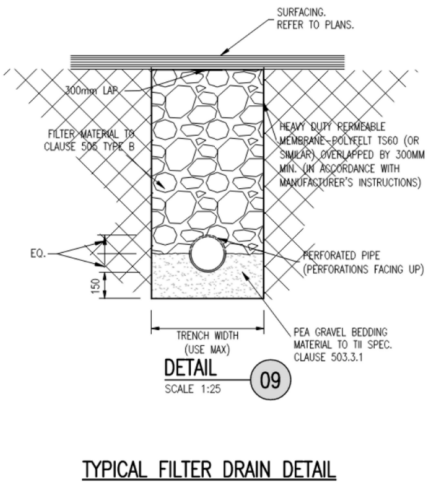


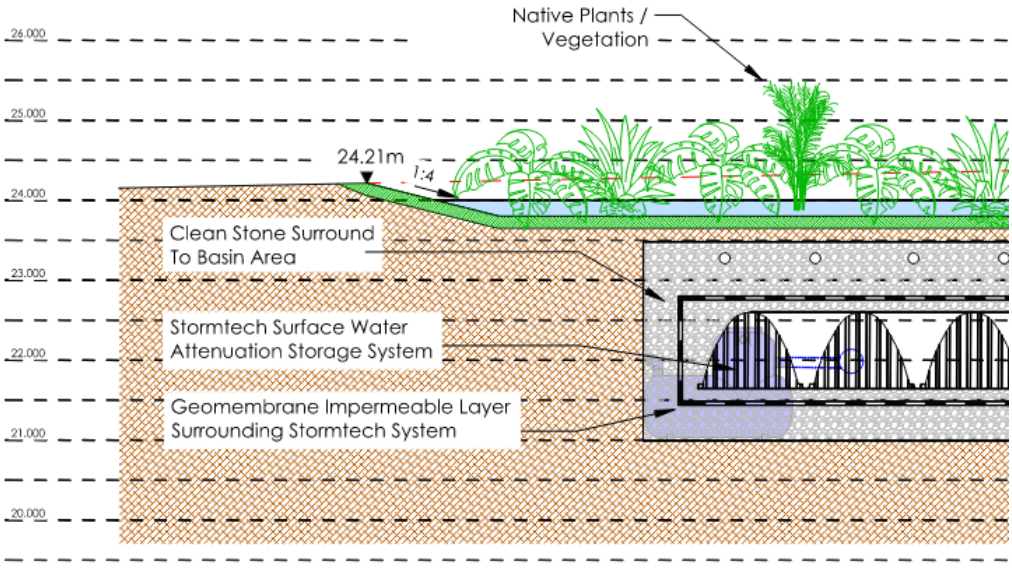
Figure 2.5– Typical Filter Drain Detail

2.2.2 Bio-retention Systems

Bio-retention systems will be constructed in green spaces to compliment the SuDs strategy. These are vegetated depressions designed to store runoff on the surface and infiltrate it gradually into the ground. They will be located at a number of locations around the site and drainage provided to the substrata to ensure runoff is directed to the attenuation system. This SuDS measure will have ecological and aesthetic benefits.

2.2.3 Attenuation Tanks

The proposed attenuation system attenuates surface water to restrict the outflow to the equivalent of the existing greenfield runoff. This ensures the development will not give rise to any impact downstream of the site. There will be a mixture of both impermeable and infiltration to the ground throughout the site. These systems will be used under the large open spaces within the development. The proposed systems will have adequate soil cover so that appropriate landscaping can be planted and play equipment installed in these open spaces.



2.2.4 Flow Control Device

It is proposed to provide a hydrobrake, or similar approved, at the outfall of the surface water catchment to restrict the outflow of water from the subject site. The hydro-brakes will be fitted with a pull cord bypass and a penstock valve installed on the inlet to the manhole for maintenance purposes. The restricted outlet will be designed to the following

Tank Ref	Restricted Outlet
1	1.5 l/s
2	1.2 l/s

2.2.5 Petrol Interceptor

It is proposed to provide a petrol interceptor upstream of the attenuation area to ensure that any remaining hydro-carbons or pollutants within the runoff from trafficked areas are treated prior to outfall to the drainage network. It is proposed to provide a Kingspan Bypass Separator Types or similar approved.

In conclusion the water quality from this catchment should be of a high quality due to the above-mentioned measures, which are applied in a treatment train to treat the water before discharge at a restricted rate to the local network.

The above measures ensure a suitable management train is provided.

2.2.6 Existing Ditches, Trees and Hedgerows Within Site

Within Site where possible, existing ditches, trees and hedgerows are to be maintained. Incorporating these existing drainage features into the proposed overall SuDS strategy would assist in the conveyance and treatment of the generated surface water runoff. The retention of existing trees and hedgerows will also assist in the reduction of surface water runoff by evapotranspiration.

2.2.7 Management Train

The management train commences with source control through the provision of filter drains and bio-retention systems. The employment of these source controls will aid to reduce the peak runoff rate, placing less stress on the facilities downstream.

The second stage of the management train, silt control, is provided by the introduction of the hydrocarbon interceptors and silt traps which provide a degree of treatment before discharging to the attenuation system.

The attenuation area offer a third stage of treatment, regional control, by slowing the storm water discharge down and removing additional silts which may remain in the storm water.

2.3 Surface Water System

The existing stormwater network at the junction between East Douglas Street and Church Street has been chosen as the suitable surface water discharge point for the proposed development.

In order to reduce the effects of the surface runoff on potential flooding, a Stormwater Management Plan will be applied to surface water discharges into adjacent network. The Stormwater Management Plan can be applied to control the rate of runoff from new development. The maximum permitted surface water outflow from the new development is to be restricted to that of the existing Greenfield site by the usage of attenuation storage.

Control of runoff by attenuation methods requires a hydraulic control to restrict the magnitude of flows passing downstream, together with an upstream storage capacity to contain the volume of runoff held back by the hydraulic control. The flows are proposed to be attenuated in the surface water system by adopting a flood storage attenuation tank along with restricted outlets as the control devise. The storage volume required has been designed using the computer aided design package InfoDrainage.

The attenuation strategy for the site is for the detention of flows in interlinked attenuation tanks.

2.4 Surface Water Drainage Network

The surface water drainage network for the proposed development was modelled using the Autodesk InfoDrainage software application. The surface water pipe lengths, slopes, contributing impermeable areas, upstream invert levels, upstream cover levels and pipe diameters were entered into the model using the drawings supplied.

2.5 Design Criteria:

The proposed surface water drains have been designed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS), the Department of the Environment's Recommendations for Site Development Works for Housing Areas, the Department of the Environment's Building Regulations "Technical Guidance Document Part H Drainage and Waste Water Disposal" and BS EN 752: 2008 Drain and Sewer Systems Outside Buildings.

- Return period for pipe work design 2 years
- Return period for attenuation design 100 years
- Soil Type 3

- Allowable Outflow varies l/second
- Time of entry 5 minutes
- M5 – 60 18.8 mm
- Ratio "r" 0.25
- Pipe Friction (Ks) 0.6 mm
- Minimum Velocity (based on pipe flowing full) 1.0 m/s
- Rainfall Runoff from Roads and Footpaths 100%
- Rainfall Runoff from Roofs 80%
- Rainfall Runoff from Driveways 80%
- Rainfall Runoff from Green Areas 20%
- Rainfall Depth Factored for Climate Change (as per GDSDS) 20%

(in accordance with GDSDS Volume 2, Chapter 6, Table 6.2 – see below)

Climate Change Category	Characteristics
River flows	20% increase in flows for all return periods up to 100 years
Sea level	400+mm rise (see Climate Change policy document for sea levels as a function of return period)
Rainfall	10% increase in depth (factor all intensities by 1.1)
	Modify time series rainfall in accordance with the GDSDS climate change policy document

Table 6.2 Climate Change Factors to be Applied to Drainage Design

2.6 Storm Water Outfall

Storm water from the proposed development shall discharge into existing stormwater network at the junction between East Douglas Street and Church Street via a hydro brake manhole, which will limit the amount of water discharging to the network. The amount of water discharged from the hydro brake manhole will be determined by using the allowable Greenfield Runoff rate for the developable area of the site. It is to be noted that all on site storm water storage facilities have been sized to cater for all storm water generated within the site boundary of the development.

3 Soil Infiltration Rate

DOSA undertook site investigation works, in the form of trial hole excavations, in September 2024. Three pits were excavated on site.

Each of the pits were 3.0m long and 1.0m wide. As the invert level of the proposed stormwater was assumed to be 0.8m, the pits were filled to a depth below this of 1.1-1.4m and allowed to drain to near empty. The water level from filling was recorded at intervals sufficiently close to clearly define water level versus time. The soil infiltration rate was calculated from the time taken for the water level to fall from 75% to 25% of the effective depth of the pits.

	1	2	3
Vp75-25	1.63m3	1.00m3	1.20m3
Ap75-25	7.10m2	5.10m2	5.51m2
Tp75-25	140min	30min	36min
Infiltration	$2.7x10^{-5}$m/s	$1.1 x10^{-4}$m/s	$9.6 x10^{-5}$m/s
Average	$7.7 x10^{-5}$m/s		

4 *Maintenance Regime for SuDS Devices*

The SuDS features proposed above for the site will require the following maintenance:

4.1 Underground attenuation systems

Gullies, pipework and silt traps within the development boundary are to be maintained by the Management Company upon completion of the works. It is suggested that the gullies and associated pipework and silt traps are inspected monthly for the first six months post-handover, with a maintenance plan being compiled based on the findings of these observations. The Management Company will commit to ensuring regular checks of the network to ensure any siltation is noted and removed by vacuum tanker or other method.

The Attenuation Tank is to be maintained by the Management Company upon completion of the works. A maintenance schedule is to be developed based on Table 21.3 of CIRIA C753 SUDS Manual, 2015, transcribed below. Additionally, the operation and maintenance shall be undertaken following the guidelines present on Chapter 21 of the CIRIA SUDS Manual 2015. Routine attenuation tank maintenance will only be carried out during dry periods. Maintenance for the attenuation tank will be conducted using a vacuum/JetVac vehicle. The JetVac process involves using a high-pressure water nozzle to flush sediment back into the manhole for vacuum extraction. Prior to the arrival of the JetVac vehicle, the tank will be jetted in preparation for the jetvac vehicle. To ensure efficient workflow, a traffic management plan will be implemented to allow the tanker to be stationed adjacent to the development for vacuum extraction.

The maintenance process will involve pre-jetting the tank with the assistance of bank men while the JetVac vehicle is on-site. This approach, along with scheduling the works during off-peak traffic hours, will ensure that the maintenance is carried out safely and effectively to minimize disruption.

TABLE 21.3 Operation and maintenance requirements for attenuation storage tanks

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any 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 of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows 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

Figure 3 Extract from CIRIA C753 SuDs Manual 2015

4.2 Bio-retention Systems

Maintenance of the planting will be greatest in the first few years, which will include regular inspection of plant condition including inlets and outlets, removal of invasive vegetation and possibly irrigation during long dry periods.

4.3 Filter Drains

Inspection of the system should be carried out monthly on the inlet / outlet pipework and any control systems for blockages. Inspection of pre-treatment systems should be carried out every 6 months for catch pits manholes prior to the filter drain with removal of silt or other build-ups. Removal of silt build-up may be required more frequent. Perforated pipework should be cleared of blockage if required.

4.4 Flow Control Manhole:

Normally little maintenance is required as there are no moving parts within a vortex control, however, after installation, flow controls should be inspected to ensure the orifice is not blocked on a monthly basis for three months and thereafter at six monthly intervals and hosed down if required. Remove rubbish or debris from flow control if present. Typically flow controls are fitted with a pivoting by-pass door, which allows the manhole chamber to be drained down should blockages occur.

4.5 Petrol Interceptor:

Systems should be visually inspected for every rainfall event for 30 days after installation and the amount of sediment measured to give the operator an idea of the expected rate of deposition. Systems should then be inspected every 6 months to verify the appropriate level of maintenance. Floating debris and solids should be removed and the sump cleaned with a conventional sump vacuum cleaner. Filter media should be replaced and sediments, oils and grease should be removed where required.