

Ash Bank, Werrington

Sustainable Urban Drainage Systems – Water Quality and Maintenance Report.



21-081 WQ – 140122

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1.1. Sustainable Urban Drainage System

The use of a Sustainable Urban Drainage System is required to reduce the rate and volume of storm water discharged from a new development and to ensure the quality of the water in the receiving water is not compromised by pollutants washed off the surfaces that form the impermeable catchment area.

The CIRIA SuDS Manual C753 requires sufficient "treatment trains" are adopted to ensure water quality in the receiving watercourse is not detrimentally affected by the development.

Table 26.2 "Pollution hazard indices for different land use classifications" divides the potential uses of sites into risk categories from very low, low, medium and high. It is believed that the proposed end use of this site falls under the low rating under the category of "individual property driveways, residential car parks, low traffic roads (e.g., cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (e.g., schools, offices) i.e., < 300 traffic movements / day".

The table states the required level of pollution control associated with each level of hazard (very low to high) in the form of indices which are then used to ascertain the required level of mitigation in the form of the various SuDS components with each component weighted individually (table 26.3 – Indicative SuDS mitigation indices for discharge to surface waters). The use of multiple components can be required if each component, singularly, is insufficient to mitigate the pollution hazard. It should be noted that the use of multiple components in series requires successive components indices to be reduced by a factor of 0.5 due to the reduced performance of secondary and tertiary components associated with already reduced inflow concentrations.

Given the proposed sites "low" category the SuDS components employed will need to equal or exceed 0.5 for Total suspended solids (TSS), 0.4 for metals and 0.4 for Hydrocarbons.

The use of either the detention basin produces mitigation indices of 0.7 for Total suspended solids (TSS), 0.7 for metals and 0.5 for Hydrocarbons; all of which are above the required levels and therefore satisfy the requirements of CIRIA C753 as shown below:

	Requirement	Detention basin
Total suspended solids	0.5	0.7
Metals	0.4	0.7
Hydrocarbons	0.4	0.5

In respect of the potential pollution of the receiving water course the treatment of the "first flush" event is most critical. This is the beginning of any storm event which tends to have higher concentrations of pollutants and is due to higher initial rainfall intensities, greater erosion potential and to greater availability of solids and pollutants that have built up on urban surfaces during the preceding dry weather period.

To comply with Chapter 4.3.1 there should be no run-off from the site for small rainfall events classed as less than 5mm. More than half the rainfall event fall into this category and, on natural catchment rarely produce any run-off. However, on impermeable catchments run-off tends to be generated from almost all events. The adverse impact of the "first flush" can be mitigated by using infiltration system, permeable paving and vegetated SuDS.

The detention basin has been designed with an element of "wet pond" of sufficient volume (10mm over the respective catchment areas) to contain the first flush in accordance with CIRIA SuDS Manual C753 for water quality purposes and to prevent potential contamination of the receiving watercourse.

Detention basin:

In order to ensure effective operation of the detention basin it is necessary to undertake regular inspection and maintenance. Such works should be undertaken by an appropriately qualified person or body and be in accordance with CIRIA C753 Table 22.1. – (as below):

Schedule	Required action	Frequency
Regular maintenance	Litter and debris removal Grass cutting – for spillways and access routes Grass cutting – meadow grass in and around basin Manage other vegetation and remove nuisance plants Inspect inlets, outlets and overflows for blockages, and clear of necessary Inspect banksides, structures, pipework etc for evidence of physical damage Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies Check any penstocks and other mechanical devices Tidy all dead growth before start of growing season Remove sediment from inlets, outlets and forebay Manage wetland plans in outlet pool (where provided)	Monthly Monthly (during growing season), or as required Half yearly (spring (before nesting season) & autumn) Monthly at start then as required Monthly Monthly Monthly (1st year) then annually or as required Annually Annually Annually or as required Manually as set out in C753 Chapter 23
Occasional maintenance	Re-seed areas of poor vegetation growth Prune and trim trees and remove cuttings Remove sediment from inlets, outlets, forebay and main basin when required	As required 2 years or as required 3 years or as required

Remedial actions	Repair erosion or other damage by re-seeding or re-turfing	As required
	Realignment of rip-rap	As required
	Repair / rehabilitation of inlet / outlet	As required
	Re-level uneven surfaces and reinstate design levels	As required

Maintenance responsibility for a detention basin should always be placed with an appropriate organization. Adequate access should be provided for inspection and maintenance, including equipment and vehicles.

Structure should be inspected for litter and debris and the grass to the basin cut regularly. The grass to the main "treatment" surface should be retained at 75-150mm to assist in the filtering of pollutants and to retain sediment. The grass may require more frequent mowing during the growing season. Grass areas surrounding the basin managed to prevent nuisance plants from establishing.

Grass clippings should be disposed of off-site or outside of the detention basin area to remove nutrients and pollutants. If there is permanent water (eg. Near the outlet) emergent aquatic vegetation should be managed as for ponds.

Occasionally sediment will need to be removed (eg. once deposits exceed 25mm). Sediments excavated from detention basins that receive runoff from residential or standard road and roof areas are generally non-toxic or hazardous material and can be safely disposed of by either land application or land filling. However, consultation should take place with the environmental regulator to confirm appropriate protocols. Sediment testing may be required before sediment excavation to determine its classification and appropriate disposal methods.

Maintenance plans and schedules should be monitored and adjusted to suit requirements. Appropriate safety measures should always be employed when maintaining or repairing detention basins especially near to deep water.

Ponds:

In order to ensure effective operation of the detention basin it is necessary to undertake regular inspection and maintenance. Maintenance responsibility for a pond and its surrounding area should always be placed with a responsible organization.

A maintenance access way should be provided from the access road and should be a minimum of 3.5m wide. Maintenance access should be available to the inlet and outlet structure and areas of aquatic planting.

Any invasive maintenance work such as silt or vegetation removal is only required intermittently but should be planned to be sympathetic to the requirements of a wildlife pond. Care should be taken to avoid disturbance to nesting birds during the breeding season and habitats of target species at critical times. Invasive silt or vegetation removal should be staggered to limited areas at a time (25-30% of pond area) to minimize impact on biodiversity.

Such works should be undertaken by an appropriately qualified person or body and be in accordance with CIRIA C753 Table 23.1. – (as below):

Schedule	Required action	Frequency
Regular maintenance	Litter and debris removal	Monthly or as required
	Grass cutting – public areas	Monthly (during growing season)
	Grass cutting – meadow grass	Half yearly (spring, before nesting season, and autumn)
	Inspect marginal and bankside vegetation and remove nuisance plants (for first three years)	Monthly (at start, then as required)
	Inspect inlets, outlets, banksides, structures, pipework etc for evidence of blockage and / or physical damage	Monthly
	Inspect water body for signs of poor water quality	Monthly (May-Oct)
	Inspect silt accumulation rates in any forebay and in the main body of the pond and establish appropriate removal frequencies; undertake contamination testing once some build up has occurred, to inform management and disposal options	Half yearly
	Check any mechanical devices, e.g., penstocks, Hydrobrakes	Half yearly
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1m above pond base. Include max 25% of	Annually

	pond surface) Remove 25% of bank vegetation from waters edge to a minimum of 1m above water level Tidy all dead growth before start of growing season Remove sediment from any forebay Remove sediment from one quadrant of the main body of ponds without sediment forebays	Annually Annually 1-5 years or as required Every 5 years, or as required
Occasional maintenance	Remove sediment from the main body of big ponds when pond volume is reduced by 20%	With effective pre-treatment with will only be required rarely eg. Every 25-50 years
Remedial actions	Repair of erosion or other damage Replant, where necessary Aerate pond when signs of eutrophication are detected Realignment of rip-rap or other damage Repair / rehabilitation of inlets, outlets and overflows	As required As required As required As required As required

Sediments excavated from ponds or forebays that receive runoff from residential or standard road and roof areas are generally non-toxic or hazardous material and can be safely disposed of by either land application or land filling. However, consultation should take place with the environmental regulator to confirm appropriate protocols. Sediment testing may be required before sediment excavation to determine its classification and appropriate disposal methods.

New ponds may become rapidly dominated by invasive natural plants. Where this is not desirable, for the first five years, plant growth should be controlled. After this period ponds can usually be allowed to develop naturally.

Eutrophication of SuDS ponds can occur during the summer months and is best controlled by controlling the nutrient source or providing continual base flow. Aeration can be used as a stop-gap measure to save aquatic species and reduce the risk to receiving watercourses.

Maintenance plans and schedules should be monitored and adjusted to suit requirements. Appropriate safety measures should always be employed when maintaining or repairing ponds especially near to deep water.

Attenuation tank (Cellular storage / below ground storage):

Regular inspection and maintenance are required to ensure the effective long-term operation of below ground cellular storage systems. Maintenance responsibility for a system should always be placed with a responsible organization.

Such works should be undertaken by an appropriately qualified person or body and be in accordance with CIRIA C753 Table 21.3. – (as below):

Schedule	Required action	Frequency
Regular maintenance	Inspect And identify any areas that are not operation correctly. If required, take remedial action Remove debris from the catchment surface (where may cause risks to performance) 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 Remove sediment from pre-treatment structures and internal forebays	Monthly for three months then annually Monthly Annually Annually or as required
Remedial actions	Repair / rehabilitation of inlets, outlets, 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 Survey inside of tank for sediment build-up and remove if necessary	Annually Every 5 years or as required

Maintenance plans and schedules should be monitored and adjusted to suit requirements. Appropriate safety measures should always be employed when maintaining or repairing cellular storage systems.

Soakaways & Infiltration trenches:

Regular inspection and maintenance are required to ensure the effective long-term operation of soakaways. Maintenance responsibility for a system should always be placed with a responsible organization.

Such works should be undertaken by an appropriately qualified person or body and be in accordance with CIRIA C753 Table 13.1. – (as below):

Schedule	Required action	Frequency
Regular maintenance	Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	Annually
	Cleaning of gutters and any filters on downpipes	Annually (or as required based on inspections)
	Trimming any roots that may be causing blockages	Annually or as required
Occasional maintenance	Remove sediment and debris from pre-treatment components and floor of inspection tube or chamber and inside of concrete ring manholes	As required based on inspections
Remedial actions	Reconstruct soakaway and / or replace or clean void fill, if performance deteriorates or failure occurs	As required
	Replacement of clogged geotextile (will require reconstruction of soakaway)	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year then annually
	Check soakaway to ensure emptying is occurring	Annually

Maintenance will normally be carried out manually, although a suction tanker can be used for sediment / debris removal. If maintenance is not undertaken for long periods deposits can become hard-packed and become difficult to remove.

Replacement of aggregate or geocellular units will be necessary if the system becomes blocked with silt. Effective monitoring will give information on changes in infiltration rate and provide a warning of potential failure in the long term.

Roads and / or parking areas draining to soakaways should be regularly swept to prevent silt being washed off the surface. This will minimize the need for maintenance.

Hydrobrake control chambers:

Normally, little maintenance is required as there are no moving parts within the Hydrobrake. The Hydrobrake is fitted with a pivoting bypass door, which allows the manhole chamber to be drained down should blockage occur.

Following installation of the Flow Control it is vitally important that any extraneous material i.e., building materials are removed from the unit and the chamber. After the system is made live, and assuming that the chamber design is satisfactory, it is recommended that each unit be inspected monthly for three months and thereafter at six monthly intervals with hose down if required. If problems are experienced the manufacturer should be contacted so that an investigation may be made.

All Hydrobrake units are typically manufactured from grade 304 or 316 Stainless Steel and both materials have an estimated life span in excess of the design life of drainage systems.

Schedule	Required action	Frequency
Regular maintenance	Remove any extraneous material from the unit and the chamber.	Monthly for three months then every six months
	Hose down and clean Hydrobrake unit	Monthly for three months then every six months or as required
Monitoring	Inspect / check all inlets and bypass door to ensure that they are in good condition and operating as designed	Annually
	Inspect chamber for sediment build-up and remove if necessary	Annually