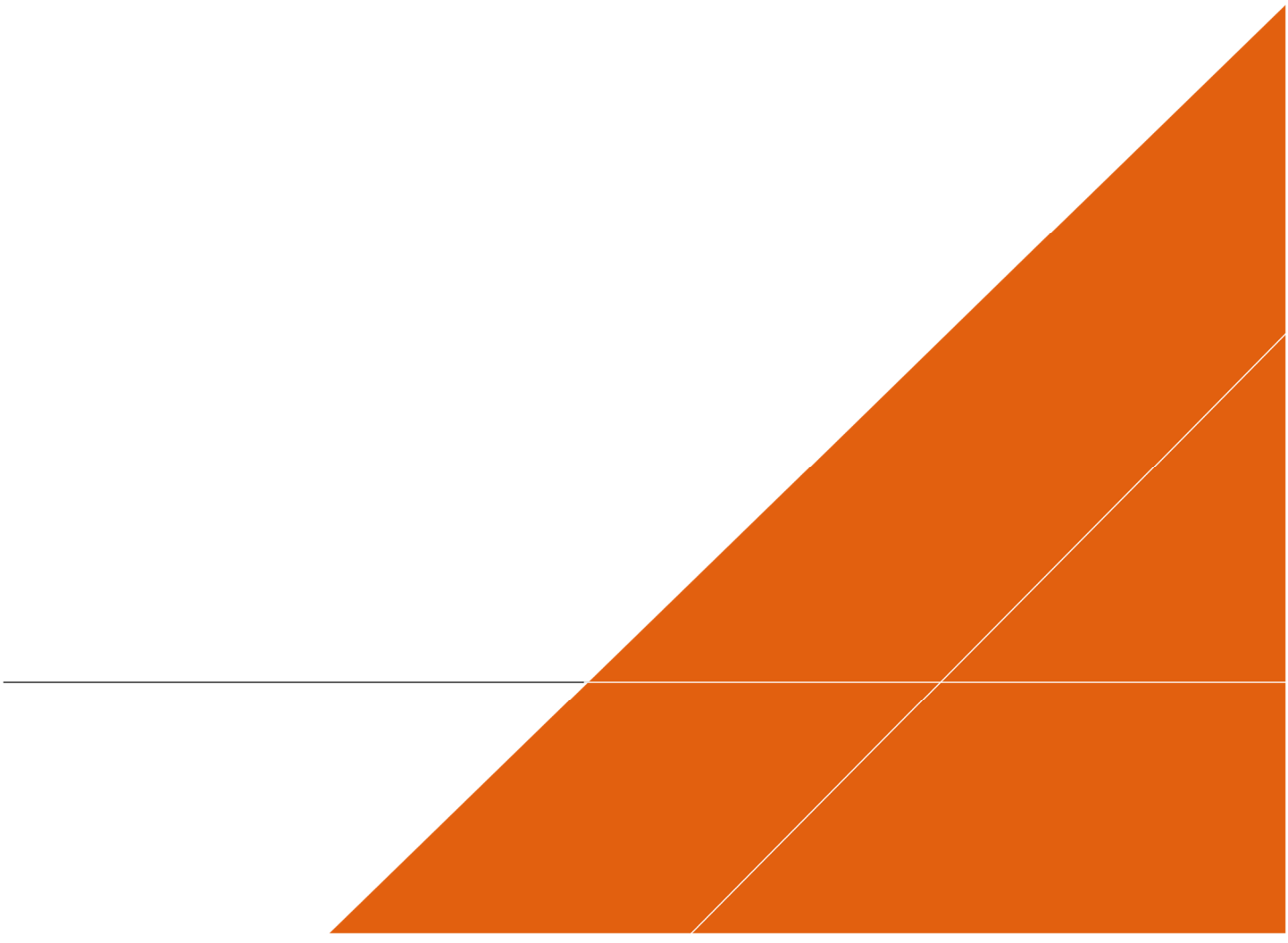
ARCADIS Design & Consultancy for natural and built assets

FIDDLERS FERRY, WARRINGTON - DEVELOPMENT FRAMEWORK

Drainage Maintenance and Management Report

JANUARY 2024



Fiddlers Ferry, Warrington – Development Framework

Drainage Maintenance and Management

Author	Lara Cullen
Checker	Scott Brown
Reviewer	David Buck
Approver	Chris Sadat-Shafaee
Report No	30171032-ARC-HDG-XX-TR-DE-0003
Date	JANUARY 2024

Version control

Version	Date	Author	Changes
P01	10/11/2023	S. Brown	First issue
P02	17/11/2023	S. Brown	Updated for Peel comments
P03	03/01/2024	L. Cullen	Updated following LLFA comments

CONTENTS

1 Introduction

1.1.1 This report has been prepared by Arcadis Consulting (UK) Limited and commissioned by Peel NRE to support the development framework for the redevelopment of the former Fiddlers Ferry Power Station (FFPS) including agricultural land to the east.

1.1.2 The purpose of this document is to communicate the designer's recommendations to ensure that the maintenance body appointed by Peel NRE is assigned with a robust inspection and maintenance programme, ensuring the optimum operation of the surface water drainage network is continually maintained for the lifetime of the development (hereafter known as 'the site') and to prevent an increase in the risk of flooding both on and off site.

1.1.3 This document sets out the principles for the long-term management and maintenance of the proposed surface water Sustainable Drainage Systems (SuDS) to be installed for the Scheme and outlines who will be responsible for the maintenance and management. This plan has been comprised of and is directly referenced from the following technical SuDS guidance listed below:

- CIRIA guide C753 - The SuDS Manual
- Design Manual for Roads and Bridges CD 521, Hydraulic design of road edge surface water channels and outlets
- Warrington Borough Council highway design requirements

1.1.4 This document includes relevant SuDS types used for the Scheme and it describes:

- A description of the SuDS component and its use.
- Maintenance requirements and frequencies.
- Inspection requirements and frequencies

1.1.5 A copy of this document shall be given to those responsible for maintenance, for example, owners; occupiers; management companies and maintenance contractors for each of the units and phases within the scheme. Users should be made aware of the function of features, e.g. to inform them some areas may be designed to intentionally fill with water.

1.1.6 There are three categories of maintenance activities referred to in this report:

- Regular maintenance (including inspection) – consists of basic tasks carried out to a frequent and predictable schedule including inspection and monitoring, silt or oil removal, vegetation management, litter, and debris removal.
- Occasional maintenance – this includes the tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the regular tasks.
- Remedial maintenance – this includes intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised by good design.

1.1.7 The recommendations are not exhaustive and should be periodically reviewed as deemed necessary by those responsible for the maintenance. Any alterations made should be in the best interests of the drainage system, local wildlife and the users of the development.

1.2 Construction

1.2.1 The responsibility for successful implementation of the scheme rests with the client, Peel NRE and their contractor. Care should be taken during the installation of each component, phasing of works may need to be adjusted by the contractor/ developer undertaking the works to ensure construction debris does not adversely affect the function of the system.

1.2.2 An inspection should take place prior to final handover, with a representative from the client, contractor and the owner/ occupier of the unit/ phase present.

1.3 Limits of Responsibility

Eastern Residential Development

1.3.1 Any conventional piped drainage on plots serving more than two curtilages will be designed in accordance with Ofwat's Design and Construction Guidance and will be offered for adoption by United Utilities or a NAV (New Appointments & Variations) organisation. Maintenance of drainage assets by a NAV/ Management company is common practice and will only be awarded to competent companies with a history of maintaining similar assets.

1.3.2 The Highway Drainage on the access roads within the residential areas will be designed to adoptable standards (Design Manual for Roads and Bridges - DMRB) and are planned to be put forward for adoption by Warrington Borough Council.

1.3.3 Private drainage within each plot of residential parcels will be designed in accordance with Building Regulations Part H and will be offered for adoption by United Utilities or the same a NAV (New Appointments & Variations) organisation in section 1.3.1 above.

1.3.4 Allocation of limits of responsibility of SuDS within the Eastern Residential Development boundary is described in Table 1 below.

Table 1 – Limits Responsibility for Proposed SuDS (Eastern Residential Development)

Scheme Sections	SuDS/ Other Surface Water Drainage Components	Responsibility
Plots serving more than two curtilages	Gullies and catchpits/pipework Inlet and Outlet Headwalls Kerb Drainage Units SuDS ponds Swales/ Ditches Pervious Pavements Cellular Storage Flow control devices (hydro-brakes/orifices)	United Utilities or a NAV (New Appointments & Variations) organisation
Access Roads	Gullies and catchpits/pipework Inlet and Outlet Headwalls Kerb Drainage Units SuDS ponds Swales/ Ditches Flow control devices (hydro-brakes/orifices)	Warrington Borough Council (To be confirmed subject to further discussion between developer and Warrington Borough Council)
Residential Parcels	Gullies and catchpits/pipework Inlet and Outlet Headwalls Kerb Drainage Units SuDS ponds Swales/ Ditches Pervious Pavements Cellular Storage Flow control devices (hydro-brakes/orifices)	United Utilities or a NAV (New Appointments & Variations) organisation

Western Employment Development

1.3.5 The permeable paving and underground storage devices within the plots/units are to remain private, including drainage connecting to each unit.

1.3.6 Private drainage within each plot/unit will be designed in accordance with Building Regulations Part H and will be the responsibility of the individual property owner(s). The owner(s)/ lease holder(s) will be made aware of this maintenance responsibility by outlining this within any land sale or lease agreement to bind them to undertake these responsibilities.

1.3.7 Drainage within the existing access road will be designed to adoptable standards but are not planned to be put forward for adoption at this time, therefore this will remain the maintenance responsibility of the landowner for the lifetime of the development, unless otherwise agreed or adopted in future.

1.3.8 The SuDS attenuation pond and connection to the outfall will also remain private under the responsibility of Peel.

1.3.9 Any roads within Phases 2 & 3 will be developed and designed to adoptable standards but are not planned to be put forward for adoption at this time, therefore this will remain the maintenance responsibility of the landowner for the lifetime of the development, unless otherwise agreed or adopted in future.

1.3.10 Allocation of limits of responsibility of SuDS within the Western Employment Development boundary is described in Table 2 below.

Table 2 – Limits Responsibility for Proposed SuDS (Western Employment Development)

Scheme Sections	SuDS/ Other Surface Water Drainage Components	Responsibility
Phase 1 Unit 1, 2 3 and 4	Gullies and catchpits/pipework Inlet and Outlet Headwalls Kerb Drainage Units SuDS ponds Swales/ Ditches Pervious Pavements Cellular Storage Flow control devices (hydro-brakes/orifices)	Individual Property Owner(s)/ Lease Holder(s)
Phase 1 Access Road	Gullies and catchpits/pipework Kerb Drainage Units	Peel
Phase 1 Spine Road	Gullies and catchpits/pipework Inlet and Outlet Headwalls Kerb Drainage Units Swales	Peel
Phase 1 Attenuation	SuDS Attenuation Pond	Peel
Phase 2 Access Roads	Gullies and catchpits/pipework Inlet and Outlet Headwalls Kerb Drainage Units SuDS ponds Swales/ Ditches Flow control devices (hydro-brakes/orifices)	Peel
Phase 2 Plots	Gullies and catchpits/pipework Inlet and Outlet Headwalls Kerb Drainage Units SuDS ponds Swales/ Ditches Pervious Pavements Cellular Storage Flow control devices (hydro-brakes/orifices)	Individual Property Owner(s)/ Lease Holder(s)

Phase 3 Access Roads	Gullies and catchpits/pipework Inlet and Outlet Headwalls Kerb Drainage Units SuDS ponds Swales/ Ditches Flow control devices (hydro-brakes/orifices)	Peel
Phase 3 Plots	Gullies and catchpits/pipework Inlet and Outlet Headwalls Kerb Drainage Units SuDS ponds Swales/ Ditches Pervious Pavements Cellular Storage Flow control devices (hydro-brakes/orifices)	Individual Property Owner(s)/ Lease Holder(s)
Existing Sub-Station	Gullies and catchpits/pipework Inlet and Outlet Headwalls Kerb Drainage Units SuDS ponds Swales/ Ditches Pervious Pavements Cellular Storage Flow control devices (hydro-brakes/orifices)	Individual Property Owner(s)/ Lease Holder(s)

1.4 Health and Safety

1.4.1 All those responsible for maintenance should follow relevant health and safety legislation for all activities and risk assessments should always be undertaken for the use, inspection and management of the system.

1.4.2 Any maintenance undertaken and observations should be recorded to better inform those undertaking further maintenance activities etc. and allow them to prepare appropriate risk assessments and method statements. Maintenance will be carried out in accordance with the requirements of the Health and Safety file/ Operation and Maintenance manual.

1.4.3 The drainage system has been designed with consideration to health and safety at the time of design, including for the ongoing maintenance of the system.

1.4.4 The designer's (Arcadis) responsibility to provide sufficient information to all those responsible for maintenance to conduct risk assessment and confirms that the design meets the required standard prior to adoption.

1.4.5 As the local environment will change over time it is important that due care and consideration is given to identifying and managing potential risks near SuDS, and risk assessments are carried out where required.

1.4.6 Public safety has also been considered as part of the design. Any informative signage, planting used to discourage the public approaching certain features, lifesaving equipment or fencing where it has been deemed necessary, should also be inspected and maintained periodically over the lifetime of the development to offer continued safe enjoyment of SuDS to the public.

1.5 Maintenance Provision

1.5.1 Maintenance provisions and frequency given within tables 1 to 10 of Section 3 are for guidance only.

1.5.2 Adequate access maintenance provision would be provided, with easements based on the planned maintenance activities, typically 3-4m wide access routes and up to 8m easements for maintenance of existing watercourses, subject to any habitat constraints.

1.5.3 Access chambers in the piped drainage system will be located out with the carriageway where possible, so that this doesn't cause long term surface maintenance issues and that the drainage can be easily and safely accessed for maintenance without the need to close the full road and reduce the traffic management on roadways needed during maintenance.

1.5.4 Vehicular access to the ponds and all outfall structures will be provided.

2 General Considerations

2.1.1 Sustainable drainage systems are used to convey and treat water and will often provide ecological and amenity benefits to the local area.

2.1.2 Consideration must be given to the operation of the system as a whole. This will include the hydraulic performance of SuDS components, connecting pipework, manholes and inspection chambers, ventilation pipes, safety grilles and accesses.

2.1.3 The visual appearance of planting should be maintained, the height and density of planting and grasses will also influence hydraulic performance in landscaped features designed for flowing water (e.g. swales). Refer to landscaping plans for details of plant species and locations.

2.1.4 Sites with special wildlife or habitat considerations may be subject to other site- specific management plans and maintenance may need to be planned around nesting or breeding periods.

2.1.5 Seasonal changes will also influence maintenance, for example leaf drop in autumn and rapid growth in spring. Appropriate maintenance routines should be scheduled for these key periods.

2.1.6 General considerations for inspection are included below.

Functional Problems

- Blockage
- Sedimentation
- Encrustation
- Tree root intrusion
- Infiltration or exfiltration cause by structural problems
- Failure of air entry and release valves
- Failure or obstruction of non-return valves

Structural Problems

- Collapse
- Cracking or fracturing
- Chemical attack
- Ground erosion
- Defective connections
- Pipe deformation
- Displaced joints

Other

- Dislodged or defective covers
- Access issues
- Structural issues affecting chambers, headwalls etc.

- Sediment
- Odours
- Erosion

3 Inventory of Surface Water Drainage Components

3.1 Surface Water Runoff Storage and Attenuation/ Treatment

Eastern Residential Development

3.1.1 The surface water runoff from the Scheme is to be attenuated and treated on each individual plot/ unit by flow restriction and SuDS features.

3.1.2 Surface water systems will be designed to prevent flooding in any part of the site for the critical duration, 1:100-year return storm event, including an allowance of 45% climate change.

3.1.3 Surface water runoff will be designed to greenfield runoff rates to provide betterment for the brownfield area of the Residential Phase.

3.1.4 Each plot to manage runoff via on plot attenuation/site specific SuDS features such as permeable paving in non-adopted paved areas and roadways, storage crates (in non-adoptable areas) and, swales where feasible.

3.1.5 In the Eastern Residential Development all of the plots will either discharge directly or via swale corridors into the existing watercourse at controlled greenfield runoff rates.

Western Employment Development

3.1.6 The surface water runoff from the Scheme is to be attenuated and treated on each individual plot/ unit by flow restriction and SuDS features.

3.1.7 Surface water systems will be designed to prevent flooding in any part of the site for the critical duration, 1:100-year return storm event, including an allowance of 45% climate change.

3.1.8 Surface water runoff will be designed to greenfield runoff rates to provided betterment for the proposed site.

3.1.9 The Western Employment Development will all discharge to the proposed reinstated vegetated swale via a SuDS attenuation pond, swale and vortex separator chamber before outfalling to the River Mersey.

3.1.10 Phases 2 & 3 to discharge into Phase 1 main spine surface water sewer at controlled rates.

3.2 SuDS Components

3.2.1 The storage and attenuation SuDS components proposed within the surface water drainage strategy are listed below:

- Ponds
- Swale/ditches
- Pervious Pavement
- Geocellular Storage Tanks

3.3 Ponds

3.3.1 Ponds provide both attenuation and treatment of surface water runoff from the Scheme. Attenuation storage is provided with a use of a vortex flow control at the outfalls and controls the discharge rate during rainfall events.

3.3.2 Ponds are densely vegetated water bodies that use sedimentation and filtration to provide treatment of surface water runoff.

3.3.3 Vegetation provides amenity benefit and filtration of pollutants and is therefore as important to its function as the pond itself.

3.3.4 A schedule setting out the maintenance operations, actions and frequency is included in Table 3 below. Please also refer to the manufacturer's operation and maintenance manual for any inlet structures or valves if available.

3.3.5 The appointed maintenance body should record any deviations to the maintenance requirements in this plan.

Table 3 – SuDS Attenuation Pond Operation and Maintenance Requirements

Attenuation Pond Operation and maintenance requirements in accordance with CIRIA C753 The SuDS Manual		
Maintenance Schedule	**Required Action**	**Frequency**
Regular Maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect water body for signs of poor water quality	Monthly (May – October)
	Inspect silt accumulation rates in any forebay and in 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	Half yearly
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1m above pond base; include max 25% of pond surface)	Annually
	Remove 25% of bank vegetation from water's edge to a minimum of 1m above water level	Annually
	Tidy all dead growth (scrub clearance) before start of growing season	Annually
	Remove sediment from any forebay	Every 1-5 years, or as required
Occasional maintenance	Remove sediment and planting from one quadrant of the main body of ponds without sediment forebays	Every 5 years, or as required
	Remove sediment from main body of big ponds when pool volume is reduced by 20%	With effective pre-treatment, this will only be required rarely, e.g. every 25-50 years
	Repair erosion or other damage	As required

Remedial actions	Replant, where necessary	As required
	Aerate pond when signs of eutrophication are detected	As required
	Realign rip-rap or repair other damage	As required
	Repair/ rehabilitate inlets, outlets and overflows	As required
Attenuation pond will be maintained by the owner / occupier appointed management company		

3.4 Swales/ Ditches

3.4.1 Swales are man-made linear depressions designed to convey, treat and attenuate surface water runoff along a specified route.

3.4.2 Upkeep of swales/ditches and their inlets and outlets is key to their function.

3.4.3 A schedule setting out the maintenance operations, actions and frequency is included in Table 4. Please also refer to the manufacturer's operation and maintenance manual for any inlet structures if available.

3.4.4 The appointed maintenance body should record any deviations to the maintenance requirements in this plan.

Table 4 – Swale Operation and Maintenance Requirements

Swales Operation and maintenance requirements in accordance with CIRIA C753 The SuDS Manual		
Maintenance Schedule	**Required Action**	**Frequency**
Regular Maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth; alter plant types to better suit conditions, if required	As required of if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up slit deposits and prevent compaction of the soil surface	As required

	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils and petrol residues using safe standard practices	As required
Swales will be maintained by the owner / occupier appointed management company		

3.5 Pervious Pavements

3.5.1 Pervious pavements are composed of porous material or non-porous blocks spaced so that water runoff can percolate and infiltrate through into underlying structural layers for treatment and attenuation.

3.5.2 A schedule setting out the maintenance operations, actions and frequency is included in Table 5. Please also refer to the manufacturer's operation and maintenance manual for any inlet structures if available.

3.5.3 The appointed maintenance body should record any deviations to the maintenance requirements in this plan.

Table 5 – Pervious Pavement Operation and Maintenance Requirements

Pervious pavements Operation and maintenance requirements in accordance with CIRIA C753 The SuDS Manual		
Maintenance Schedule	**Required 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	Stabilise and mow contributing and adjacent landscaped areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial actions	Remediate any adjacent soft landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving	As required
	Remedial work to any depressions, rutting or cracking, 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). Use rotating sweeper and jet wash on porous asphalt. Use

		brushing and suction sweeping on concrete block permeable paving, with replacement of top 20mm of jointing material
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
Refer to pavement manufacturer's requirements for additional detailed specification and frequencies for the required maintenance		
Pervious pavements will be maintained by the owner / occupier appointed management company		

3.6 Geocellular Storage Tanks

3.6.1 Geocelluar storage tanks are modular plastic units with high porosity and placed below ground to store the surface water runoff prior to release at a controlled discharge rate.

3.6.2 The inflow and outflow of water is critical to their function, and the tank structure itself should be kept free of debris, gradual build-up of silt, and should be inspected for defects.

3.6.3 A schedule setting out the maintenance operations, actions and frequency is included in Table 6. Please also refer to the manufacturer's operation and maintenance manual for any inlet structures if available.

3.6.4 The appointed maintenance body should record any deviations to the maintenance requirements in this plan.

Table 6 – Geocellular Storage Tanks Operation and Maintenance Requirements

Geocellular Storage Tanks Operation and maintenance requirements in accordance with CIRIA C753 The SuDS Manual		
Maintenance Schedule	**Required Action**	**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
Refer to pavement manufacturer's requirements for additional detailed specification and frequencies for the required maintenance		
Geocellular Storage Tanks will be maintained by the owner / occupier appointed management company		

3.7 Surface Water Runoff Collection and Conveyance

3.7.1 The surface water runoff from the site is collected and conveyed with the use of various collection methods prior to connection to the overall surface water discharge system.

3.7.2 The collection and conveyance SuDS components used within the surface water drainage strategy are listed below:

- Gullies/catchpit chambers and Combined Kerb Drains
- Grassed surface water channel
- Filter drain

3.8 Gullies, Combined Kerb Drains and Catchpits

3.8.1 Gullies, catchpits and combined kerb drains are constructed with a sump to collect and retain sediment, debris and light oils washed into the system from impermeable surfaces.

3.8.2 To continue to provide a benefit to the system they should regularly be inspected and emptied.

3.8.3 A schedule setting out the maintenance operations, actions and frequency is included in Table 7 below.

Table 7 – Gullies, Combined Kerb Drains and Catchpits Operation and Maintenance Requirements

Gullies, Combined Kerb Drains and Catchpits Operation and maintenance requirements in accordance with BS EN 752		
Maintenance Schedule	**Required Action**	**Frequency**
Regular Maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	Six monthly
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Six monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every six months

3.9 Filter Drains

3.9.1 Filter drains or trenches are shallow excavations filled with rubble or stone that create temporary subsurface storage of stormwater runoff. These trenches can be used to filter and convey storm water to downstream SuDS components. They can be used independently or as part of a swale or other channel.

3.9.2 A schedule setting out the maintenance operations, actions and frequency is included in Table 8 below.

Table 8 – Filter Drains Operation and Maintenance Requirements

Filter Drains Operation and maintenance requirements in accordance with BS EN 752		
Maintenance schedule	**Required action**	**Frequency**
Regular maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly (or as required)
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly
	Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six monthly
	Remove sediment from pre-treatment devices	Six monthly, or as required
Occasional maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (e.g. NJUG; 2007 or BS 3998:2010)	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly, or as required
	Clear perforated pipework of blockages	As required

3.10 Proprietary Systems

3.10.1 Proprietary Systems used on the scheme include the following:

- Flow control devices (hydro-brakes)
- Hydrodynamic vortex separators

3.11 Flow Control Devices

3.11.1 Outlets of the SuDS components generally comprises a flow control device fitted prior to connection to a surface water discharge system. These are custom made and its primary function is to throttle the discharge conveyed downstream and hence enable the attenuation storage volume to fill.

3.11.2 Flow control devices used for the scheme will include hydro-brake flow controls or orifice plates, or orifice plates fitted to headwalls or weir walls.

3.11.3 Reducing the flow leaving storage areas such as ponds, swales or tanks to a set rate is important to ensure the storage area is not overwhelmed, it is therefore important to ensure the flow control is allowed to operate as intended.

3.11.4 A schedule setting out the maintenance operations, actions and frequency is included in Table 9 below.

Table 9 – Flow Control Devices Operation and Maintenance Requirements

Filter Drains Operation and maintenance requirements		
Maintenance schedule	**Required action**	**Typical frequency**
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	As required – indicated by system inspections
	Remove sediment, oil, grease and floatables	As required – indicated by system inspections
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Six monthly
	Check the operation of bypass doors	Six monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every six months

3.12 Hydrodynamic Vortex Separators

3.12.1 Proprietary Treatment Systems used for the Scheme include Hydrodynamic vortex separators.

3.12.2 Hydrodynamic vortex separators are designed to perform important cleansing functions and protect downstream systems from pollution and regular inspection and maintenance is critical.

3.12.3 Hydrodynamic vortex separators may include telemetry systems or alarms to warn of inoperability or a need for maintenance.

3.12.4 A schedule setting out the maintenance operations, actions and frequency is included in Table 10 below.

Table 10 – Hydrodynamic Vortex Separator Operation and Maintenance Requirements

Hydrodynamic Vortex Separator Operation and maintenance requirements		
Maintenance schedule	**Required action**	**Typical frequency**
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	Six monthly
	Change the filter media	As recommended by manufacturer
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Occasional maintenance	Oil and Floatables Removal	Once per year, with sediment removal - Following a spill in the drainage area

	Sediment Removal	Once per year or as needed - Following a spill in the drainage area
Monitoring	Inspect for evidence of poor operation	Six monthly
	Inspect filter media and establish appropriate replacement frequencies	Six monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every six months

Arcadis Consulting (UK) Limited

The Athenaeum Building
8 Nelson Mandela Place
Glasgow
G2 1BT
UK

arcadis.com