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Dear Andy

NEW DEVELOPEMNT - KNOWLE LANE, FAIROAK

Please find attached further calculations following the ecologist response on the 25th May 2023.

Yours sincerely



ELVIN GOMERY B.Eng (Hons)
For and on behalf of Cowan Consultancy Ltd.

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Timber Framed Buildings
Heritage Buildings
Structural Inspections
Subsidence
Party Wall Surveyors
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Roads & Drainage
Site Investigations
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Site Ref

Knowle Lane

SuDS Water Quality Management CIRIA C753 Ch26**Simple Index Approach****Catchment**

House roofs

Is discharge to:

SPZ1?

N

Drinking Water Protection Zone ?

Y

Is site in close proximity to an area with sensitive environmental designation?

N

if so how close?

m

Is an additional treatment component required due to sensitivity?

Y

Land Use

roofs-residential

Hazard

very low

TSS index	Metals index	HydroCar index
0.2	0.2	0.05

2 residential roofs remove gross solids and sediments*Treatments****To surface water discharge**

Y

Component

1 Pond

2 Pond

3 Swale

mitigation index

basic OK

X1 N/A

Enhanced mitigation index

stage missing

Residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0.7	0.7	0.5	1.00
0.7	0.7	0.5	0.50
0.5	0.6	0.6	0.50
1.3	1.35	1.05	
0	0	0	0.50
1.3	1.35	1.05	
0	0	0	

Land Use

roofs-residential

Hazard

very low

TSS index	Metals index	HydroCar index
0	0	0

*residual***2 residential roofs remove gross solids and sediments***Treatments****To groundwater discharge**

N

Infiltration surface

1 N/A

Final residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0	0	0	1.00
0	0	0	

Is a groundwater risk screening required?

N

Site Ref

Knowle Lane

SuDS Water Quality Management CIRIA C753 Ch26**Simple Index Approach****Catchment**

Office Roofs

Is discharge to:

SPZ1?

N

Drinking Water Protection Zone ?

Y

Is site in close proximity to an area with sensitive environmental designation?

N

if so how close?

m

Is an additional treatment component required due to sensitivity?

Y

Land Use

roofs-non-residential

Hazard

low

TSS index	Metals index	HydroCar index
0.3	0.2	0.05

Treatments

To surface water discharge

Y

Component

1 Pond

2 Pond

3 Swale

mitigation index

basic OK

X1 N/A

Enhanced mitigation index

stage missing

Residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0.7	0.7	0.5	1.00
0.7	0.7	0.5	0.50
0.5	0.6	0.6	0.50
1.3	1.35	1.05	
0	0	0	0.50
1.3	1.35	1.05	
0	0	0	

Land Use

roofs-non-residential

Hazard

low

TSS index	Metals index	HydroCar index
0	0	0

*residual***Treatments**

To groundwater discharge

N

Infiltration surface

1 N/A

Final residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0	0	0	1.00
0	0	0	

Is a groundwater risk screening required?

N

Site Ref

Knowle Lane

SuDS Water Quality Management CIRIA C753 Ch26**Simple Index Approach****Catchment**

Estate Roads

Is discharge to:

SPZ1?

N

Drinking Water Protection Zone ?

Y

Is site in close proximity to an area with sensitive environmental designation?

N

if so how close?

Is an additional treatment component required due to sensitivity?

Y

Land Use

roads-low traffic

Hazard

low

TSS index	Metals index	HydroCar index
0.5	0.4	0.4

Treatments

To surface water discharge

Y

Component

1 Pond

2 Pond

3 Swale

mitigation index

basic OK

X1 N/A

Enhanced mitigation index

stage missing

Residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0.7	0.7	0.5	1.00
0.7	0.7	0.5	0.50
0.5	0.6	0.6	0.50
1.3	1.35	1.05	
0	0	0	0.50
1.3	1.35	1.05	
0	0	0	

Land Use

roads-low traffic

Hazard

low

TSS index	Metals index	HydroCar index
0	0	0

*residual***Treatments**

To groundwater discharge

N

Infiltration surface

1 N/A

Final residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0	0	0	1.00
0	0	0	

Is a groundwater risk screening required?

N

Site Ref

Knowle Lane

SuDS Water Quality Management CIRIA C753 Ch26**Simple Index Approach****Catchment**

Car Parks

Is discharge to:

SPZ1?

N

Drinking Water Protection Zone ?

Y

Is site in close proximity to an area with sensitive environmental designation?

N

if so how close?

m

Is an additional treatment component required due to sensitivity?

Y

Land Use

car parks -infrequent turn over

Hazard

low

TSS index	Metals index	HydroCar index
0.5	0.4	0.4

Treatments**To surface water discharge**

Y

Component

1 Pond

2 Pond

3 Swale

mitigation index

basic OK

X1 N/A

Enhanced mitigation index

stage missing

Residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0.7	0.7	0.5	1.00
0.7	0.7	0.5	0.50
0.5	0.6	0.6	0.50
1.3	1.35	1.05	
0	0	0	0.50
1.3	1.35	1.05	
0	0	0	

Land Use

car parks -infrequent turn over

Hazard

low

TSS index	Metals index	HydroCar index
0	0	0

*residual***Treatments****To groundwater discharge**

N

Infiltration surface

1 N/A

Final residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0	0	0	1.00
0	0	0	

Is a groundwater risk screening required?

N

Site Ref

Knowle Lane

SuDS Water Quality Management CIRIA C753 Ch26**Simple Index Approach****Catchment**

Commercial delivery yards

Is discharge to:

SPZ1?

N

Drinking Water Protection Zone ?

Y

Is site in close proximity to an area with sensitive environmental designation?

N

if so how close?

m

Is an additional treatment component required due to sensitivity?

Y

Land Use

yards- commercial & delivery

Hazard

medium

TSS index	Metals index	HydroCar index
0.7	0.6	0.7

Treatments

To surface water discharge

Y

Component

1 Pond

2 Pond

3 Swale

mitigation index

basic OK

X1 N/A

Enhanced mitigation index

stage missing

Residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0.7	0.7	0.5	1.00
0.7	0.7	0.5	0.50
0.5	0.6	0.6	0.50
1.3	1.35	1.05	
0	0	0	0.50
1.3	1.35	1.05	
0	0	0	

Land Use

yards- commercial & delivery

Hazard

medium

TSS index	Metals index	HydroCar index
0	0	0

residual

Treatments

To groundwater discharge

N

Infiltration surface

1 N/A

Final residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0	0	0	1.00
0	0	0	

Is a groundwater risk screening required?

N

SUDS operation and maintenance - general

There are three categories on maintenance activities:

Regular maintenance consists of basic tasks done on a frequent and predictable schedule, including vegetation management, litter and debris removal, and inspections.

Occasional maintenance comprises tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the routine tasks (sediment removal is an example). The table below summarises the likely maintenance activities required for each SUDS component and specific maintenance activities is given in the following sections.

Remedial maintenance comprises intermittent tasks that may be required to rectify faults associated with the system. Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events, and as such timings are difficult to predict. Remedial maintenance items can comprise items such as:

- inlet/outlet repairs
- erosion repairs
- reinstatement or realignment of edgings, barriers, rip-rap or other erosion control
- infiltration surface rehabilitation
- replacement of blocked filter fabrics
- construction stage sediment removal (although this activity should have been undertaken before the maintenance contract)
- system rehabilitation immediately following a pollution event.

O&M activity	SUDS component												
	Pond	Wetland	Detention basin	Infiltration basin	Soakaway	Infiltration trench	Filter trench	Modular storage	Pervious pavements	Swale/bioretention/greenroofs	Filter strip	Sand filter	Pre-treatment systems
Regular maintenance													
Inspection	■	■	■	■	■	■	■	■	■	■	■	■	■
Litter/debris removal	■	■	■	■	□	■	■	□	■	■	■	■	■
Grass cutting	■	■	■	■	□	■	■	□	□	■	■	□	□
Wee/invasive plant control	□	□	□	□		□	□		□	□	□	□	□
Shrub management	□	□	□	□					□	□	□		□
Shoreline vegetation management	■	■	□										□
Aquatic vegetation management	■	■	□										□
Occasional maintenance													
Sediment management *	■	■	■	■	■	■	■	■	■	■	■	■	■
Vegetation/plant replacement	□	□	□	□						□	□		□
Vacuum sweeping and brushing									■				
Remedial maintenance													
Structure rehabilitation/repair	□	□	□	□	□	□	□	□	□	□	□	□	□
Infiltration surface reconditioning				□	□	□	□		□	□	□	□	

■ will be required

□ may be required

* sediment to be collected upstream of the main device

GENERAL MAINTENANCE

Litter/debris removal

This is an integral part of SUDS maintenance and reduces the risks of inlet and outlet blockages, retains amenity value and minimises pollution risks. High litter removal frequencies may be required at high profile commercial/retail parks where aesthetics are a major driver.

Grass cutting

It is recommended that grass cutting be minimised around SUDS facilities, apart from swales and filter strips and structural embankments where a height of 100–150 mm is recommended to prevent the plants falling over, or “lodging”, when water flows across the surface. In general, allowing grass to grow tends to enhance water quality performance. Short grass around a wet system such as pond or wetland provides an ideal habitat for nuisance species such as geese; allowing the grass to grow is an effective means of discouraging them. Grass around wet pond or wetland systems should not be cut to the edge of the permanent water. Grass cutting is an activity undertaken primarily to enhance the perceived aesthetics of the facility. The frequency of cutting will tend to depend on surrounding land uses, and public requirements. Therefore, grass cutting should be done as infrequently as possible, recognising the aesthetic concerns of local residents. However, grass around inlet and outlet infrastructure should be trimmed closely to reduce risks to system performance. If a manicured, parkland effect is required, then cutting will need to be undertaken more regularly than for meadow type grass areas, which aim to maximise habitat and biodiversity potential.

Weed/invasive plant control

Weeds are generally defined as vegetation types that are unwanted in a particular area. For SUDS, weeds are often alien or invasive species, which do not enhance the technical performance or aesthetic value of the system, or non-native species and the spread of which is undesirable. In some places, weeding has to be done by hand to prevent the destruction of surrounding vegetation (hand weeding should generally be required only during the first year, ie during plant establishment). However, over grassed surfaces, mowing can be an effective management measure. The use of herbicides and pesticides should be prohibited since they cause water quality deterioration. The use of fertilisers should also be limited or prohibited to minimise nutrient loadings which are damaging to water bodies.

Shrub management

Shrubs tend to be densely planted and are likely to require weeding at the base, especially during the first year to ensure that they get enough water. Shrubs should be selected so they can grow to their maximum natural height without pruning.

Aquatic/shoreline vegetation management

Aquatic plant aftercare in the first 1–3 years may be required to ensure establishment of planted vegetation and control nuisance weeds/invasive plants. Once established, the build-up of dead vegetation from previous seasons should be removed at convenient intervals to reduce organic silt accumulation (eg every three years and at the end of landscape contract periods).

Emergent vegetation may need to be harvested every 5–10 years to maintain flood attenuation volumes, optimise water quality treatment potential and ensure fresh growth, although this is often not required. Care should be taken to avoid nesting birds during the breeding season and to avoid great crested newt and water vole habitats. The typical window for this activity is towards the end of the growing season (September and October). As vegetation matures, plant height may also become a safety issue in residential areas.

Where emergent vegetation is managed, up to 25 per cent can be removed by cutting at 100 mm above soil level using shearing action machinery. Up to 25 per cent of submerged vegetation can be cut and raked out at any one time, using approved rakes, grabs or other techniques, depending on whether clay or waterproof membranes are present. Aquatic vegetation arisings should be stacked close to the water's edge for 48 hours to de-water and allow wildlife to return to the SUDS feature. They should then be removed to wildlife piles, compost heaps or off site before decomposition, rotting or damage to existing vegetation can occur.

Algae removal may be undertaken for aesthetic purposes during the first 3–5 years of a pond/wetland's life. The growth of algae, which is considered by some to be visually intrusive, is encouraged by nutrients introduced into the water body. This situation should settle down once upstream construction activities are complete.

Management of green waste

Appropriate methods should be implemented to dispose of green waste, including

- The development of wildlife piles
- On- or off-site composting
- Disposal to landfill

REMEDIAL MAINTENANCE

Structure rehabilitation/repair

There will come a time with most SUDS techniques when a major overhaul of the system is required to remove clogged filters, geotextiles, gravel etc. This will typically be between 10 and 25 years, depending on the technique and factors such as the type of catchment and sediment load. For example the use of geotextiles close to the surface in pervious surfaces traps the majority of sediment in a relatively easily accessible location. Reconstruction of the surface layer and bedding layer is all that is required, rather than reconstruction of the whole pavement depth.

Major overhaul is most likely to be required on techniques that rely on filtration through soils or aggregates, such as sand filters and infiltration devices. Other SUDS techniques are unlikely to need major overhaul if routine maintenance is undertaken as required (for example ponds and wetlands).

Rehabilitation activities for each SUDS component are described on the following tables.

Infiltration surface rehabilitation

In the event that grassed surface permeability has reduced, there are a number of landscape techniques that can be used to open the surface to encourage infiltration. Such activities are not commonplace and are likely to be required only in circumstances where silt has not been effectively managed upstream.

1. Scarifying to remove “thatch”. Thatch is a tightly intermingled organic layer of dead and living shoots, stems and roots, developing between the zone of green vegetation and the soil surface. Scarifying with tractor-drawn or self-propelled equipment to a depth of at least 50 mm breaks up silt deposits, removes dead grass and other organic matter and relieves compaction of the soil surface.
2. Spiking or tining the soil, using aerating equipment to encourage water percolation. This is particularly effective if followed by top dressing with a medium to fine sand, and is best undertaken when the soil is moist. Spiking or tining with tractor drawn or self-propelled equipment penetrates and perforates soil layers to a depth of at least 100 mm (at 100 mm centres) and allows the entry of air, water, nutrients and top dressing materials.
3. As a last resort, it may be necessary to remove and replace the grass and topsoil by:
 - removing accumulated silt and (subject to a toxicity test) applying to land or dispose of to landfill
 - removing damaged turf which should be composted
 - cultivating remaining topsoil to required levels
 - re turfing (using turf of a quality and appearance to match existing) or reseeded (to BS 7370: Part 3, Clause 12.6 (BSI, 1991) using seed to match existing turf) area to required levels. It may be necessary to supply and fix fully biodegradable coir blanket to protect seeded soil. Turf and seeded areas should be top dressed with fine sieved topsoil to BS 3882 (BSI, 1994) to achieve final design levels. Watering will be required to promote successful germination and/or establishment.

Water butts operation and maintenance

Maintenance schedule	Required action	Frequency
Regular maintenance	Cleaning of tank, inlets, outlets, gutters, withdrawal devices and roof drain filters of silts and other debris..	Annually (or following poor performance).
Occasional maintenance	Replacement of any filters.	As required
Remedial actions	Repair of erosion damage, or damage to tank.	As required
Monitoring	Inspection of the tank for debris and sediment build up.	Annually (or following poor performance).
	Inspection of inlets, outlets and withdrawal devices.	Annually (or following poor performance).
	Inspection of areas receiving overflow, for evidence of erosion.	After extreme storms.
	Inspection of roof drain filters	Annually (or following poor performance).

Swales operation and maintenance

Maintenance schedule	Required action	Frequency
Regular maintenance	Litter and debris removal.	Monthly (or as required).
	Grass cutting – 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).
Occasional maintenance	Check for poor vegetation growth due to lack of sunlight or dropping of leaf litter, and cut back adjacent vegetation where possible.	Annually.
	Re-seed areas of poor vegetation growth. Alter plant types to better suit conditions, if required.	Annually, or 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 reseeded.	As required
	Re-level uneven surfaces and reinstate design levels.	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt 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 or petrol residues using safe standard practices.	As required
Monitoring	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 inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Half yearly.

Sediment testing may be required before sediment excavation to determine its classification and appropriate disposal methods. For industrial site runoff sediment testing will be essential. In the majority of cases, it will be acceptable to distribute the sediment on-site if there is an appropriate safe and acceptable location to do so.

Modular systems operation and maintenance

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 six monthly
	Debris removal from catchment surface (where may cause risks to performance)	Monthly
	Where rainfall infiltrates into blocks from above, check surface of filter for blockage by silt, algae or other matter. Remove and replace surface infiltration medium as necessary.	Monthly (and after large storms)
	Remove sediment from pre-treatment structures	Annually, or as required
Occasional maintenance	-	-
Remedial actions	Repair/rehabilitation of 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 and after large storms

Pond operation and maintenance

Maintenance schedule	Required action	Frequency
Regular maintenance	Litter removal.	As required
	Grass cutting – public areas.	Monthly (during growing season)
	Grass cutting – meadow grass.	Half yearly (spring, before nesting season, and autumn)
	Inspect vegetation to pond edge and remove nuisance plants (for first 3 years).	Monthly (at start, then as required)
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1 m above pond base; include max 25% of pond surface).	Annually.
	Remove 25% of bank vegetation from waters edge to a minimum of 1 m above water level.	Annually.
	Tidy all dead growth before start of growing season.	Annually.
	Remove sediment from forebay.	1–5 years, or as required.
	Remove sediment from one quadrant of the main body of ponds without sediment forebays.	2-10 years.
Occasional maintenance	Remove sediment from the main body of big ponds when pool volume is reduced by 20%.	>25 years (usually).
Remedial actions	Repair of erosion or other damage.	As required
	Aerate pond when signs of eutrophication are detected.	As required
	Realignment of rip-rap or other damage.	As required
	Repair/rehabilitation of inlets, outlets and overflows.	As required
Monitoring	Inspect structures for evidence of poor operation.	Monthly/after large storms.
	Inspect banksides, structures, pipework etc for evidence of physical damage.	Monthly/after large storms.
	Inspect water body for signs of eutrophication.	Monthly (May–October).
	Inspect silt accumulation rates and establish appropriate removal; frequencies.	Half yearly.
	Check penstocks and other mechanical devices.	Half yearly.

Sediment testing may be required before sediment excavation to determine its classification and appropriate disposal methods. For industrial site runoff sediment testing will be essential. In the majority of cases, it will be acceptable to distribute the sediment on-site if there is an appropriate safe and acceptable location to do so.