

Appendix C

15 October 2019

✉ 52 Common Lane
Titchfield, Hants,
PO14 4BU

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2 Beechworth Road
Havant
Hants
PO9 1AX

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FAO: Michael Saunders

Ref: 1828

Re: 178 West Street, Bedhampton

Dear Sirs

Further to our meeting yesterday and receipt of the updated drawings we have now been able to analyse the impact on flood storage volumes of the proposed works discussed. These are set out below in relation to the attached Figure 1.

From the EA data the design 1%AEP + Climate Change(CC) level for the rear part of the site is 6.58m AOD. A precautionary approach has been used for calculations using a greater 6.6m AOD value shown by the red line on the rear of the site in Fig 1. The current 1%AEP value is 6.34m AOD and taking a similar precautionary approach a value of 6.4m AOD has been used which is shown by the blue line on the rear of the site in Fig 1.

The flood levels for the front of the site are lower. From the EA data the design 1%AEP + Climate Change(CC) level for the front the site is 6.48m AOD. A precautionary approach has been used using a greater 6.5m AOD value shown by the red line to the front of the proposed building on the site in Fig 1. This lies outside the front of the site which lies outside the 1%AEP +CC flood risk area.

We would also draw to your attention the existing 6.2m AOD contour to the rear. This area lies below the riverbank level of some 6.25m AOD so flood from out of bank flow on the river would not mobilise until flood level reaches 6.25m AOD.

As we discussed the area shaded orange (B) will occupy some of the currently available flood storage between 6.25m AD and the design flood level of 6.6m AOD:

<u>Current GL(mAOD)</u>	<u>Av depth displaced(m)</u>	<u>Area(m²)</u>	<u>Volume displaced(m³)</u>	
				<u>cumulative</u>
6.25-6.30	0.325	31	10.1	10.1
6.30-6.40	0.25	65	16.3	26.4
6.40-6.50	0.15	59	8.9	35.3
6.50-6.60	0.05	99	<u>5.0</u>	40.3
			40.3 m³ lost	

This loss must be mitigated for in the corresponding level stages, which you propose to achieve by lowering the rear lane shaded green (A1) from 6.3-6.6m AOD to 6.3m AOD:

Current GL(mAOD)	Av depth recovered(m)	Area(m ²)	Volume displaced(m ³)	
6.30-6.40	0.05	123	16.3	
6.30-6.40	0.10	185	<u>18.5</u>	Cumulative
		Stage total	34.8	34.8
6.40-6.50	0.05	91	4.5	
6.40-6.50	0.10	94	<u>9.4</u>	
		Stage total	11.6	46.4
6.50-6.60	0.05	94	<u>3.6</u>	
		Stage total	3.6	50.0

50.0 m³ gain A1

There will be a further gain by grading off area A2:

Average existing GL 6.65m AOD, Av final GL 6.50m AOD, gain 0.15m x 71m² **10.6 m³ gain A2**

There is a small isolated high point and an adjacent small isolated low point 6.65m AOD and 6.25m AOD respectively adjacent the northeast corner of the proposed building. It is proposed to adopt a finished GL of not more than 6.3m AOD at this location. Taking a precautionary approach a value of 6.4m AOD has been used:

Area shaded purple (D) will occupy some of the currently available flood storage between 6.25m AD and the reference level of 6.4m AOD:

Current GL(mAOD)	Av depth displaced(m)	Area(m ²)	Volume displaced(m ³)	
				cumulative
6.25-6.30	0.125	16	2.0	2.0
6.30-6.40	0.05	20	<u>1.0</u>	1.0
			3.0 m³ lost	

This loss must be mitigated for in the corresponding levels stages, which you propose to achieve by lowering the rear lane shaded blue (C) from 6.4-6.65m AOD to 6.4m AOD:

Current GL(mAOD)	Av depth recovered(m)	Area(m ²)	Volume displaced(m ³)	
				Cumulative
6.40-6.50	0.05	67	3.3	
6.40-6.50	0.10	16	<u>1.6</u>	
		Stage total	4.9	4.9
6.50-6.60	0.05	13	3.6	
6.50-6.60	0.10	3	<u>0.3</u>	
		Stage total	3.9	8.8
6.60-6.65	0.025	3	<u>0.1</u>	
		Stage total	0.1	8.9

The impact on the net cumulative stage storage will therefore be (ignoring A2):

Stage	Net impact
6.25-6.30	-12.1
6.30-6.40	+5.4
6.40-6.50	+13.0
6.50-6.60	+15.5

Including for A2 the net benefit would be 26.1 m³, however there would be a stage deficit for 6.25-6.30m AOD. We would therefore recommend adopting a FGL of 6.25m AOD at the northeast corner of the building and for area A1, C & D which amounts to in excess of 400m² footprint recovering a depth of 0.05m ie >20.0m³. This will produce a positive net impact at all stages and a net increase in cumulative storage at

6.60m AOD in excess of 45m³. This will ensure there is no adverse impact on the development or elsewhere and will comply with the requirements of the NPPF.

Recommended flood storage mitigation measures with respect to Fig 1:

- Reduce GL of area A1 to 6.25m AOD and grade back to 6.7mAOD over at least the footprint of area A2.
- Reduce GL of areas C&D to 6.25m AOD

Yours Sincerely,

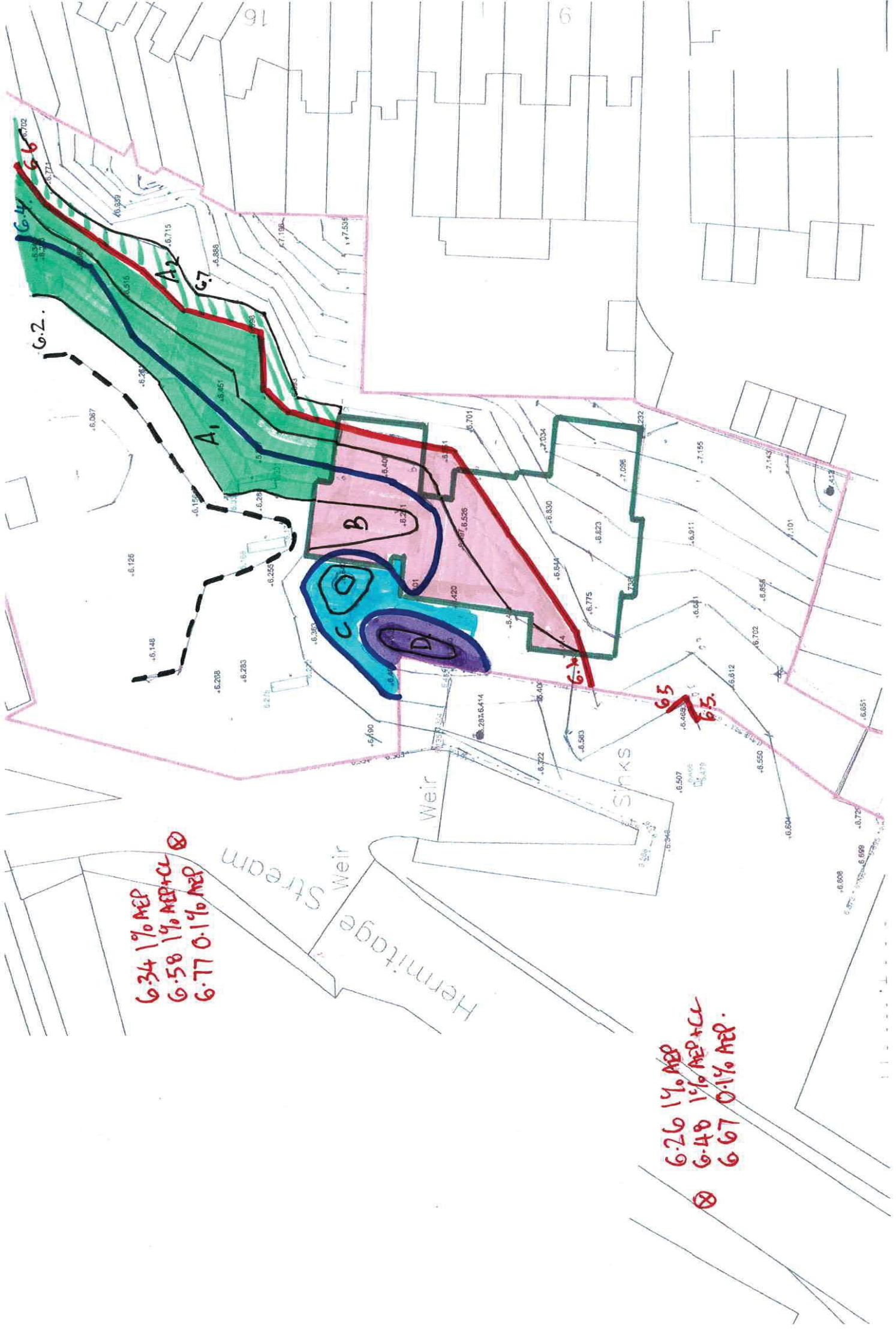
Aqua Callidus Consulting Ltd

Andy Traves

Enc. Figure 1

6.34 1% AEP
 6.58 1% AEP+CL
 6.77 0.1% AEP

6.26 1% AEP
 6.48 1% AEP+CL
 6.67 0.1% AEP



Calculated by:	Andy Traves
Site name:	West Street
Site location:	Havant

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	50.85370° N
Longitude:	0.99376° W
Reference:	2520726619
Date:	Oct 16 2019 11:16

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	0.2875
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Methodology

Q _{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	731	731
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q _{BAR} (l/s):	1.46	1.46
1 in 1 year (l/s):	1.24	1.24
1 in 30 years (l/s):	3.36	3.36
1 in 100 year (l/s):	4.66	4.66
1 in 200 years (l/s):	5.46	5.46

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Project No.: 1828
Project Title: 178A West St

Rectangular Detention Tank Assessment to CIRIA C753

No infiltration

Site Location: havant
r = 0.36 (range 0.12 to 0.45)
Drained Area = 870 m²
Design storm 1 in = 100 year
Runoff volume uplift = 50 % for climate change + urban creep

Catchment ID: gross impermeable
C_v = 1.00

Technical Assessment

Base axis Length L_x = 5.00 m
Base axis Length L_y = 80.00 m
Discharge rate = 2.0 l/s
Tank depth = 0.360 m
tank porosity = 35 %

Base area = 400.0 m²

Tank volume = 50.4 m³
Design volume = 50.4 m³
M5-60 Rainfall = 20 mm

Storm Duration	5 min	10 min	15 min	30 min	1 hr	2 hr	4 hr	6 hr	10 hr	24 hr
(secs)	300	600	900	1800	3600	7200	14400	21600	36000	86400
r= 0.36 Value Z1	0.36	0.51	0.62	0.79	1.00	1.22	1.48	1.67	1.90	2.42
Rainfall M5 (mm)	7.2	10.2	12.4	15.8	20.0	24.4	29.6	33.4	38.0	48.4
M100/M5 gf Value Z2	1.84	1.91	1.95	2.00	2.03	2.01	1.97	1.94	1.91	1.82
Rainfall M100 (mm)	13.3	19.5	24.2	31.5	40.6	49.1	58.4	64.9	72.4	88.2
with climate uplift (mm)	19.9	29.3	36.2	47.3	60.9	73.7	87.6	97.3	108.6	132.3
RUNOFF (m³)	17.3	25.5	31.5	41.2	53.0	64.1	76.2	84.7	94.5	115.1
inflow rate (l/s)	57.7	42.4	35.0	22.9	14.7	8.9	5.3	3.9	2.6	1.3
storage rate (l/s)	55.7	40.4	33.0	20.9	12.7	6.9	3.3	1.9	0.6	0.0
Discharge (m³)	0.6	1.2	1.8	3.6	7.2	14.4	28.8	43.2	72.0	115.1
Req'd STORAGE (m³)	16.7	24.3	29.7	37.6	45.8	49.7	47.4	41.5	22.5	0.0
Residual drain time (h)	2.3	3.4	4.1	5.2	6.4	6.9	6.6	5.8	3.1	0.0

Calculated by:

Site name:

Site location:

Site Details

Latitude:

Longitude:

Reference:

Date:

This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the design of the drainage scheme.

Site characteristics

Total site area (ha):	0.2875
Significant public open space (ha):	0.1135
Area positively drained (ha):	0.174
Impermeable area (ha):	0.087
Percentage of drained area that is impermeable (%):	50
Impervious area drained via infiltration (ha):	0
Return period for infiltration system design (year):	10
Impervious area drained to rainwater harvesting (ha):	0
Return period for rainwater harvesting system (year):	10
Compliance factor for rainwater harvesting system (%):	66
Net site area for storage volume design (ha):	0.17
Net impermeable area for storage volume design (ha):	0.09
Pervious area contribution to runoff (%):	0

* where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50% of the 'area positively drained', the 'net site area' and the estimates of Q_{BAR} and other flow rates will have been reduced accordingly.

Design criteria

Climate change allowance factor:

Urban creep allowance factor:

Volume control approach:

Interception rainfall depth (mm):

Minimum flow rate (l/s):

Methodology

esti:

Q_{BAR} estimation method:

SPR estimation method:

Soil characteristics

	Default	Edited
SOIL type:	4	4
SPR:	0.47	0.47

Hydrological characteristics

	Default	Edited
Rainfall 100 yrs 6 hrs:	--	63
Rainfall 100 yrs 12 hrs:	--	91.63
FEH / FSR conversion factor:	1.19	1.19
SAAR (mm):	731	731
M5-60 Rainfall Depth (mm):	20	20
'r' Ratio M5-60/M5-2 day:	0.4	0.4
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 10 year:	1.62	1.62
Growth curve factor 30 year:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Q_{BAR} for total site area (l/s):	1.46	1.46
Q_{BAR} for net site area (l/s):	0.88	0.88

Site discharge rates

	Default	Edited
1 in 1 year (l/s):	2	2
1 in 30 years (l/s):	2	2
1 in 100 year (l/s):	2	2

Estimated storage volumes

	Default	Edited
Attenuation storage 1/100 years (m^3):	46	46
Long term storage 1/100 years (m^3):	0	0
Total storage 1/100 years (m^3):	46	46

This report was produced using the storage estimation tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at <http://uksuds.com/terms-and-conditions.htm>. The outputs from this tool have been used to estimate storage volume requirements. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

Date: 15/12/2019

Site Ref

178A West Street

SuDS Water Quality Management CIRIA C753 Ch26

Simple Index Approach

Catchment

roof

Is discharge to: SPZ1? ☐ N Drinking Water Protection Area? ☐ N

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 Permeable pavement

2 N/A

3 N/A

mitigation index

X1 N/A

Enhanced mitigation index

Residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0.7	0.6	0.7	1.00
0	0	0	0.50
0	0	0	0.50
0.7	0.6	0.7	
0	0	0	1.00
0.7	0.6	0.7	
0	0	0	

Land Use

roofs-non-residential

Hazard

low

TSS index	Metals index	HydroCar index	residual
0	0	0	

Treatments

To groundwater discharge ☐ N

Infiltration surface

1 N/A

2 N/A

Final residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0	0	0	1.00
0	0	0	0.50
0	0	0	

Is a groundwater risk screening required?

☐ N

Notes:

SPZ1 applies to infiltration to the Chalk bedrock at depth below the site. This is separated from the surface by an intermediate stratum of clay which is an aquaclude so SPZ1 will not be impacted.

Date: 15/12/2019

Site Ref

178A West Street

SuDS Water Quality Management CIRIA C753 Ch26

Simple Index Approach

Catchment

car park

Is discharge to: SPZ1? ☐ N Drinking Water Protection Area? ☐ N

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-residential

Hazard

low

TSS index	Metals index	HydroCar index
0.5	0.4	0.4

Treatments

To surface water discharge ☐ Y

Component

1 Permeable pavement

2 N/A

3 N/A

mitigation index

X1 N/A

Enhanced mitigation index

Residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0.7	0.6	0.7	1.00
0	0	0	0.50
0	0	0	0.50
0.7	0.6	0.7	
0	0	0	1.00
0.7	0.6	0.7	
0	0	0	

Land Use

car parks-residential

Hazard

low

TSS index	Metals index	HydroCar index	residual
0	0	0	

Treatments

To groundwater discharge ☐ N

Infiltration surface

1 N/A

2 N/A

Final residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0	0	0	1.00
0	0	0	0.50
0	0	0	

Is a groundwater risk screening required?

☐ N

Notes:

SPZ1 applies to infiltration to the Chalk bedrock at depth below the site. This is separated from the surface by an intermediate stratum of clay which is an aquaclude so SPZ1 will not be impacted.

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).

Pervious pavement operation and maintenance

Maintenance schedule	Required action	Frequency
Regular maintenance	Brushing and vacuuming.	Three times/year at end of winter, mid-summer, after autumn leaf fall, or as required based on site-specific observations of clogging or manufacturers' recommendations.
Occasional maintenance	Stabilise and mow contributing and adjacent areas.	As required
	Removal of weed.	As required
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving.	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users.	As required
	Rehabilitation of surface and upper sub-structure.	As required (if infiltration performance is reduced as a result of significant clogging).
Monitoring	Initial inspection.	Monthly for 3 months after installation.
	Inspect for evidence of poor operation and/or weed growth. If required take remedial action.	3-monthly, 48 h after large storms.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually
	Monitor inspection chambers.	Annually

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