Proposed SuDS strategy

For the proposed re-development of

26 Cecil Road, Enfield,

EN2 6TG.

Prepared by

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Innervision Design Ltd

June 2021

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design

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Scope

Note: this report can only be assessed under the scope it is intended for as set out below:

Town and Country Planning Act 1990

The scope of this report includes the provision of supplementary information in relation to a planning application set under the provision of this Act and is intended to meet the requirements for "particulars" under Section 62; (3) & (4A) of same.

Building Act 1984

Building Regulations 2010 and Statute control

This report **is not** provided in support of any application made under the Building Act 1984 or related Regulations.

Statement of conformity

While this report cannot therefore be lawfully assessed by any persons, in any capacity, for compliance with the above Building Regulations all drainage on this private site, both foul and SW will be subject to full compliance with Part H of the Building Regulations 2010 (as amended 2013).

Hence all construction details, SW runs, pipe diameters etc. as detailed in this report are designed to comply in full with the "Adequate provision" Requirement of Part H and are to be checked, inspected, tested and approved by the Building Control Body of the clients choice at the time of detailed design and construction.

SuDS design additional standards

All SuDS (Sustainable drainage system) on site will also be designed and installed in accordance with CIRIA 753 & CIRIA 768, para 163 of the NPPF, its supporting technical guidance and the DEFRA Non-Statutory Technical standards for sustainable drainage systems (2015).

1 Executive summary

The proposal is "minor development" and meets DMD 61 by:

- Seeking to reduce outfall rates as low as possible in a practicable and viable way with full consideration to the scope of the works and related site constraints.
- Provides three source control measures and hence meets the "at least one" as required under DMD 61, namely:
  - Sedum roofing
  - Rainwater harvesting
  - Permeable paving
- Provides SuDS that:
  - result in a net improvement in water quantity and quality discharging.

2 Introduction

2.1 Site location

The proposed development is at 26, Cecil Road, Enfield, EN2 6TG (see Figure 1).

Figure 1: Site location plan, outlined in red. North to top (source: Architect)

2.2 Proposed development description

This report covers a proposal for a re-development of the site to provide an apartment block consisting six flats. The proposal is "minor development".

All plans are submitted under separate cover as part of the planning application pack.

2.3 Geology

With reference to BGS data the site lays on London Clay.

2.3.1 Infiltration rates

The local, London Clay, geology is classed as "virtually impermeable"[1]. However LB Enfield acknowledge that at shallow depths "partial infiltration" may be possible.

2.4 Existing surface water disposal strategy

The existing dwelling drains roof water directly to the existing Thames Water network. The existing rear garden is set to lawn and the front driveway is permeable paving.

The curtilage of the entire site encloses an area of approximately 353m^2 of which, pre-development, 120m^2 is classed as being impermeable (120m^2 roofs, 0m^2 impermeable hard-standing and paths), with the remaining 233m^2 classed as permeable planting. The new development increases the impermeable area from 120m^2 to 197m^2 (197m^2 roof area).

2.5 Estimation of existing outfall rates

2.5.1 Variables

i_1 = 50.4[1] mm hr^{-1}

i_{100} = 153 mm hr^{-1}

A = 120 m^2

Cr = 1

Cv = 0.9

[1] 50.4mm hr^{-1}is the mean intensity of a 1 in 1yr 6min duration summer storm, calculated to be the worst case, using standard IDF formula.

2.5.2 Impermeable area run-off rate for pre-developed site

$$Q_{BF1} = \frac{0.9 * 50.4 * 120}{3600}$$
$$= 1.5 ls^{-1}$$

$$Q_{BF100} = \frac{0.9 * 153 * 120}{3600}$$
$$= 4.6 ls^{-1}$$

Existing runff rates from the impermeable areas of the site are calculated as 1.51ls^{-1} (based on 50.4mm hr^{-1}, 1 in 1 yr summer storm).

3 Policy

3.1 DMD 61

Managing Surface Water

A Drainage Strategy will be required for all developments to demonstrate how proposed measures manage surface water as close to its source as possible and follow the drainage hierarchy in the London Plan. All developments must maximise the use of and, where possible, retrofit Sustainable Drainage Systems (SuDS) which meet the following requirements:

1. Suitability
    (a) SuDS measure(s) should be appropriate having regard to the proposed use of site, site conditions/context (including proximity to Source Protection Zones and potential for contamination) and geology.
2. Quantity
    (a) All major developments must achieve greenfield run off rates (for 1 in 1 year and 1 in 100 year events).
    (b) All other development should seek to achieve greenfield run off and must maximise the use of SuDS, including at least one 'at source' SuDS measure resulting in a net improvement in water quantity or quality discharging to sewer in-line with any SuDS guidance or requirements.
3. Quality
    (a) Major developments must have regard to best practice and where appropriate follow the SuDS management train by providing a number of treatment phases corresponding to their pollution potential and the environmental sensitivities of the locality.
    (b) Measures should be incorporated to maximise opportunities for sustainable development, improve water quality, biodiversity, local amenity and recreation value.

3.2 Critical drainage area

The site falls with a defined local Critical Drainage Area (CDA).

4 SuDS Principles

In line with the SuDS management train, the following hierarchy has been considered in applying the use of SuDS into the proposed development scheme.

4.1 SuDS design philosophy

The CIRIA SuDS[2] manual provides the design philosophy:

> "SuDS design should, as much as possible, be based around the following:
>
> - using surface water runoff as a resource
> - managing rainwater close to where it falls
> - managing runoff at the surface
> - allowing rainwater to soak into the ground
> - promoting evapotranspiration
> - slowing and storing run-off to mimic natural runoff characteristics
> - reducing contamination of runoff through pollution prevention and controlling the runoff at source
> - treating runoff to reduce the risk of urban contaminants causing environmental pollution."

4.2 Source control

- Sedum roofing.
- Infiltration devices. Typically soakaways.
- Rainwater harvesting.
- Bio-retention planting, rain gardens.
- Permeable paving, porous asphalt. These provide both infiltration and short term storage volumes thus reducing overall un-mitigated run-off volumes.

4.3 "End of pipe" solutions

To be considered only after implementation of the above options.

- Retention tanks with outfall controlled by hydraulic means to limiting discharge rates and volumes to discharge to existing SW flow pathways.

Sections 5.3 to 5.7 consider the viability of a range of these SuDS devices.

5 Appraisal of SuDS options

The primary aim is to meet the requirements of the Local Plan core policy DMD 61 (as Section 3.1)and the SuDS hierarchy so as to manage SW on site by providing "at least one 'at source' SuDS measure resulting in a net improvement in water quantity or quality discharging"

5.1 Site constraints impacting on SuDS

- London clay geology.
- No access to adjacent water courses or ditches.
- Existing and functional drainage infrastructure.
- Limited external space.
- Architectural raised seam roof detailing.
- No ongoing access provision for area of main roof.

5.2 Sedum/green roofs.

With reference to Section 4.1, sedum roofs promote the following SuDS design criteria:

- manages rainwater close to where it falls
- manages run-off at the surface
- promotes evapotranspiration
- slows and stores run-off to mimic natural run-off characteristics
- treats run-off to reduce the risk of urban contaminants causing environmental pollution.

The use of Sedum roofs can significantly reduce run-off volumes from roofs [3]. These are found suitable for this development.

And also:

- Provides the DMD 61 required "at least one SuDS measure resulting in a net improvement in water quantity discharging"

5.3 Infiltration devices

Due to site constraints, these are not found suitable for this site.

5.4 Bio-retention/rain-gardens

Due to site constraints, these are not found suitable for this site.

5.5 Permeable hard standing

With reference to Section 4.1, permeable paving promotes the following SuDS design criteria:

- manages rainwater close to where it falls
- manages runoff at the surface
- allows rainwater to soak into the ground
- slows and stores run-off to mimic natural run-off characteristics
- treats run-off to reduce the risk of urban contaminants causing environmental pollution.

and also

- Provides the DMD 61 required "at least one SuDS measure resulting in a net improvement in water quantity discharging"

5.5.1 Permeable paving

A 30% void ratio is assumed through a 350mm sub-base. This is appropriate for a DOT Type 3 Sub-base hence the storage capacity equates to circa 105mm per $1m^2$ therefore based on a M6 100hr + cc storm of 86mm rainfall the paving offers, without any allowance for infiltration, a circa 1:1.2 drained volume:storage volume capacity. Hence there is no anticipated exceedance flow from the areas of permeable paving.

TSS 0.7, Metals 0.6, Hydrocarbons 0.7 = suitable for trafficked areas

All permeable paving offers sufficient storage volume to accommodate the 5mm event.

The areas of permeable paving are primarily disconnected from the proposed SW network, i.e. they are not primarily designed to drain to the network. Surface water

retained in the sub-base matrix is lost through evaporation and infiltration into the surrounding naturally fissured sub-soils (due to action of freeze-thaw, roots, earthworms and the proposed local re-grading following any site clearance). In doing so it mimics as close as possible the natural hydrological process of water falling onto the ground and finding natural flow paths for dispersion.

5.6 Rainwater harvesting

With reference to Section 4.1, Rainwater harvesting promotes the following SuDS design criteria:

- uses surface water run-off as a resource
- manages rainwater close to where it falls

and also

- Provides the DMD 61 required "at least one SuDS measure resulting in a net improvement in water quantity discharging"

5.6.1 For external use

Rain water harvesting / water butts: These provide additional, "off line[2]" SuDS, and are deemed a suitable SuDS component for small plots[2], extract at Figure 2. The image shows a water butt in "off-line" configuration using a standard diverter.

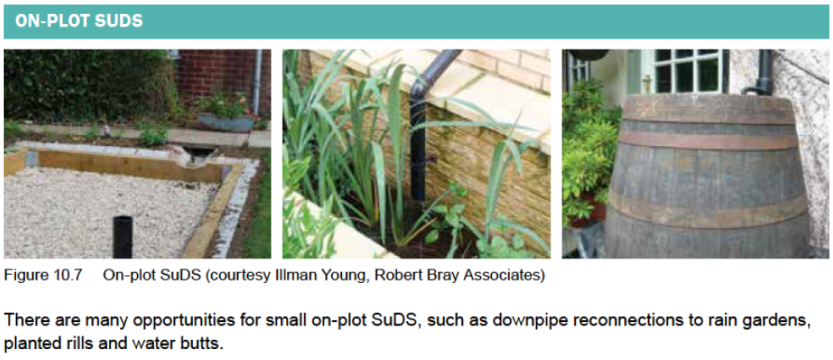


Figure 2: Use of water butts as provided in the SuDS manual

[2]The term "off-line" refers to the fact that a water butt is a harvesting device that is not "in-line" in the same manner that a pipe is in-line. Water is collected (harvested) until the water butt is full. When full, the rainwater continues down the rainwater pipe. Outflow from the tank is not "automatic" since this would negate the reason to harvest rainwater. Instead, manual drawdown occurs with the harvested water being used for external uses. Since a water butt may be full, the useful volume is not accounted for in storage and run-off calculations.

The collection and re-use of water can reduce run off volumes arising from roofs. The collected water, via readily available diverters (e.g. Web link: Standard diverter example, as per Figure 3), being used for external uses.

Figure 3: Standard rainwater diverter

Rainwater butts can, in part, accommodate the 5mm event dependent on manual drawdown and evaporation.

5.7 "End of pipe" solutions

To be considered only after implementation of the above options.

- Retention tanks with outfall controlled by hydraulic means (e.g. hydrobrakes, pipe sizing, orifice plate etc.) to limiting rates and volumes to discharge to existing flow pathways.

6 Proposed surface water disposal strategy

6.1 Source control 1 - Sedum roof

The design team have detailed a Sedum roof as the primary "green" SuDS strategy for the site, with exceedance flows taken to the existing system via attenuation and under hydraulic control to outfall to the existing TW SW asset.

6.1.1 Design parameters

"In summer green roofs can retain 70–80% of rainfall and in winter they retain 10–35%"[3] hence, it follows, will reduce run-off by these amounts.

The green roof will be designed to prevent run-off from all rainfall events up to the 5mm event which is equivalent to a 1 in 1 peak run-off summer storm for the site - generally the standard target reduction for sedum roofs. A suitable option with a max 20mm (20kg.m^{-2}) of retention capacity can be found in Appendix B.

Cv taken as 0.95 for the non-sedum part of the roof.

1 in 1yr

Maximum mean intensity storm for the site for a 1 in 1yr return period is a 50.4 mm hr^{-1} giving a total of circa 5.0mm of rainfall.

Proposed total roof area = 215m^2

Sedum roof area = 15m^2

With the accepted 100% retention of a 5mm event by the area of sedum roof, max 1:1 out fall rate from the sedum roof area is therefore 0.04 ls^{-1}

Remainder of roof = 200m^2

Run-off rate from remainder of the roof area =

$$\frac{0.9 * 50.4 * 200}{3600} = 2.5ls^{-1}$$

Total proposed mean 1 in 1yr run off rate = 2.5ls^{-1}

1 in 100yr

Maximum intensity storm for the site for a 1 in 100yr return period is a 153 mm hr^{-1} summer profile storm giving a total of circa 15.3mm of rainfall.

Proposed total roof area = 215m^2

Sedum roof area = 15m^2

Assuming a conservative 50% retention of a summer storm (refer to 6.1.1 above) by the sedum roof, max 1:100 out fall rate from the sedum roof area, in ls^{-1}, is therefore circa:

$$\frac{0.5 * 0.95 * 153.0 * 15}{3600} = 0.3ls^{-1}$$

(reducing to circa 0.15ls^{-1} when established).

Remainder of roof = 200m^2

Run-off rate from remainder of the roof area =

$$\frac{0.9 * 153 * 200}{3600} = 7.7ls^{-1}$$

Total proposed mean 1 in 100yr run off rate = 8.0ls^{-1}

This will therefore require further attenuation and hydraulic control to meet London Plan requirements of a 50% reduction for brownfield developments.

6.2 Attenuation and hydraulic control of residual SW

Surface water from the remaining roofed areas will be directed to the existing SW network under hydraulic control with outfall rates limited to a 1 in 100 yr discharge rate of 1.2 ls^{-1}.

Designed to accomodate all surface water arising from a design drained area of 200m^2 requires a minimum attenuation volume of 8 m^3. This can be achieved using an overall storage volume of 9 m^3 formed with a 0.4m overall unit depth. See Table 1.

Drained area	200m^2	
Urban Creep	1	
Designed drained area	200m^2	
Return periods considered	1yr, 30yr, 100yr	
Storm profiles used	50% Summer	75% Winter
Storm coeffs	a = 0.1, b = 0.815	a = 0.06, b = 1.026
Storm range, storm increments	From 5 minutes duration in further 2 min. intervals until critical storm reached	
M5-60	20mm	
r	0.4	
Rainfall model	FSR	
Critical design storm	117 mins, Summer	
Climate change	1.4	
FSR rainfall used		
Storm mean intensity	24.9mm.hr^{-1}	
Design mean intensity	34.9mm.hr^{-1}	
Storm peak intensity	113.0mm.hr^{-1}	
Design peak intensity	158.2mm.hr^{-1}	
Design maximum head	0.4m	
Calculated maximum head	0.37m	
Minimum attenuation volume required	8.41m^3	
Void ratio	95%	
Design attenuation volume	9.1m^3	(0.4m x 22.8m^2)
Provided attenuation volume	9.1m^3	(0.95 x 24m^2 x 0.4m)
Factor of Safety	1.00	
1 in 1yr maximum outfall rate	0.6ls^{-1}	(See Figure 4.)
1 in 30yr maximum outfall rate	1.0ls^{-1}	(See Figure 5.)
1 in 100yr maximum outfall rate	1.2ls^{-1}	(See Figure 6.)
1 in 100yr Time to peak	88 mins	
1 in 100yr Max head: Time to drop to 50%	1.16 hrs	
Outfall control method	30mm Orifice	CD = 0.62

Table 1: Storage volume design summary

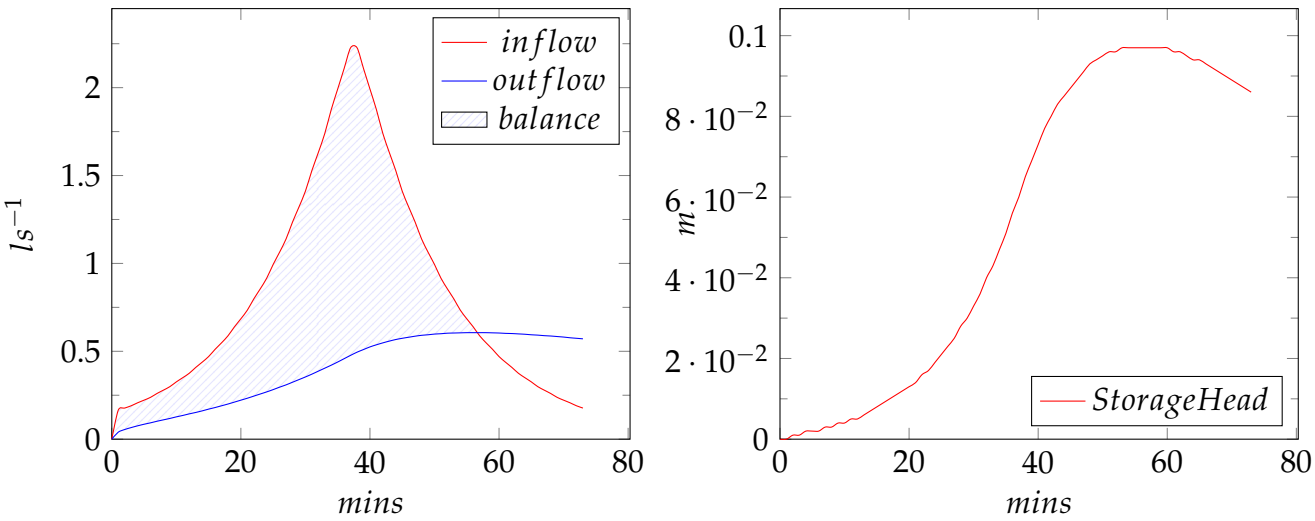


Figure 4: 1 in 1 year critical storm event

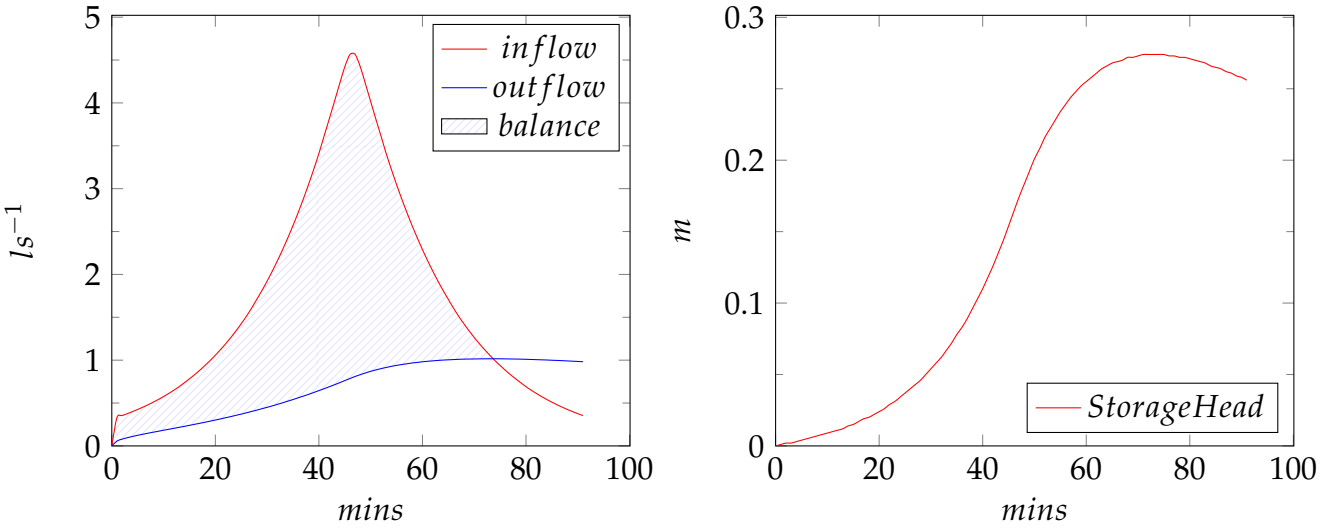


Figure 5: 1 in 30 year critical storm event

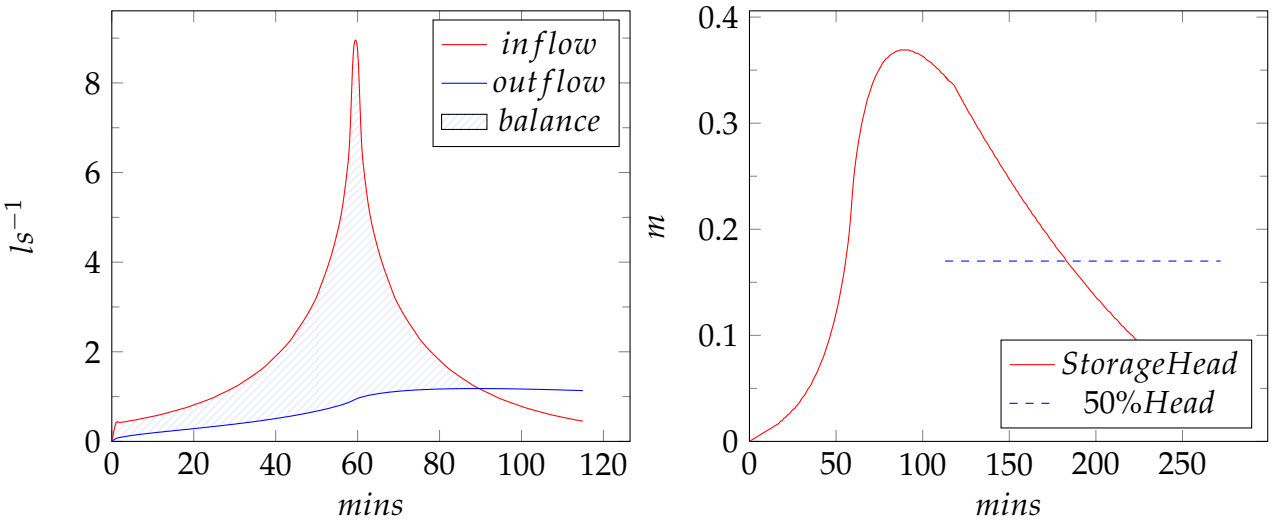


Figure 6: 1 in 100 year critical storm event

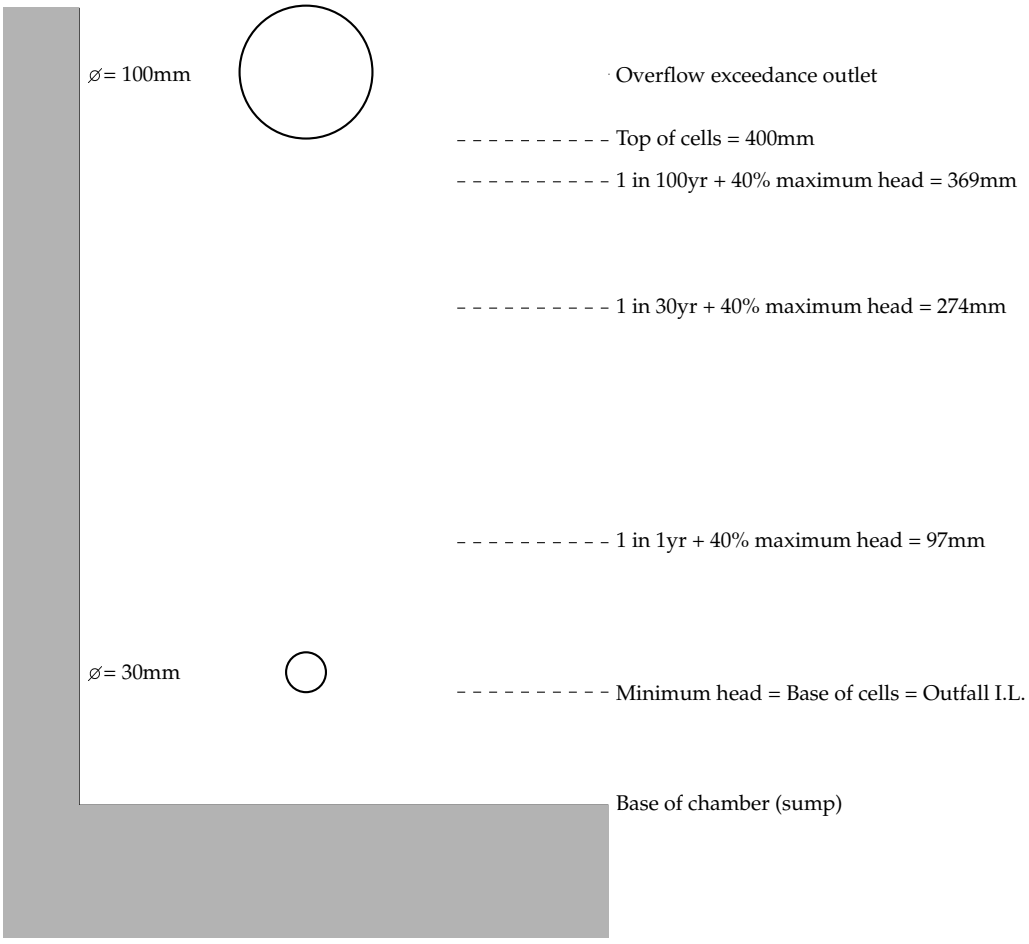


Figure 7: Orifice arrangement in control chamber

This can be achieved using a commercially available attenuation cells and protected orifice control device - see Appendix E. This unit incorporates a higher level 100mm

diameter overflow pipe to route exceedance flows under system failure events.

The attenuation cells will be fully tanked and vented and installed in on-line configuration as per the typical detail at Figure 8.

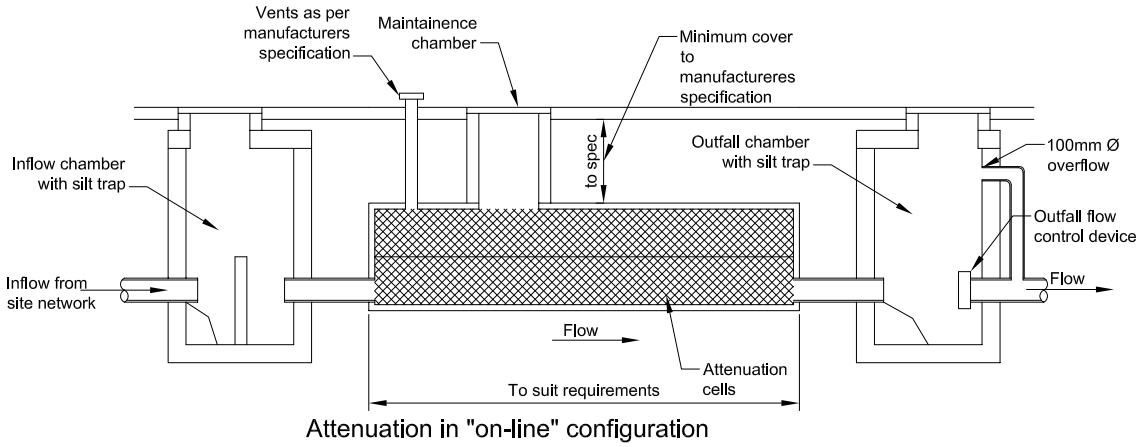


Figure 8: Typical in-line attenuation layout

6.3 Source control 2 - Rainwater harvesting

Water butts will be installed primarily to reduce potable water demand.

6.4 Source control 3 - Permeable hard standing

The front driveway area is currently formed in an permeable material.

It is proposed to retain this where practicable or, if required re-instate this using a permeable medium on a DOT/MOT 3 sub-base of 350mm depth (refer to Section 5.5).

6.5 Consent to discharge

Consent will be required. Application pack at Appendix D.2.

6.6 Indicative layout

Refer to Appendix A.1.

6.7 Reduction in run-off rate

In providing these solutions the following percentage reductions are achieved:

1 in 1 yr. Reduced from 1.51ls^{-1} to 0.61ls^{-1} which equates to a circa 60% reduction

1 in 30 yr. Reduced from 3.6ls^{-1} to 1.0ls^{-1} which equates to a circa 72% reduction

1 in 100 yr. Reduced from 4.6ls^{-1} to 1.2ls^{-1} which equates to a circa 74% reduction

6.8 Exceedance flows greater than design capacity

- Water butt(s) - when full, the water is diverted to the rain garden planter on site.

In the event that the drainage feature design parameters are exceeded only then will the following apply:

- Permeable paving - Any exceedance flows at the surface will be channelled via kerbs away from buildings towards the garden planting.
- Attenuation - The control chamber is to incorporate a 100mm high level (above design level) outfall direct to the TW network.

There are no design overland exceedance flow paths other than as noted above.

6.9 Timetable for implementation

6.9.1 Demolition phase

During the demolition phase, rainwater will be managed in line with the requirements under the CDM regulations using existing SW gullies with measures in place, such as sandbag bunding, to prevent contaminants entering the network.

6.9.2 Construction phase

The flow control device and attenuation cells will be installed early in the project under the remit of the ground-works operations - These will be provided with post construction access and cleaning points.

Permeable paving will only be installed when all construction activities are either complete, or near completion so as to minimise blockage of the surface.

Water butt(s) will be installed towards project completion.

Sedum matting will be installed prior to removal of scaffolding.

6.9.3 Post construction

Access points provided

6.10 CDM

The following must be reported to the Principal Designer and or the Principal Contractor.

- Attenuation cells are designed to depths not exceeding 1.5m.

7 Maintenance of SuDS

Ultimate responsibility for the long term maintenance with SuDS in this environment lay with the land owner/management company.

All SuDS on site will be installed with full consideration to long term maintenance. The following guidance applies:

7.1 Sedum

Refer to Appendix C.

7.2 Permeable pavements

The maintenance plan for permeable pavements will include:

- Monthly litter removal;
- Bi-Annual suction sweeping.
- Annual inspection and repairs as/if required.

7.3 Water butts

A maintenance plan for water butts should include:

- Regular inspection of silt traps and filters.
- Removal of sediments and debris as required.

7.4 Inspection/control chambers

The maintenance plan for areas of geocellular systems will include:

- Regular inspection of silt traps, IC's, pipework and pre-treatment devices (safe access provision required)
- Removal of sediments and debris as required.

Access points are required so as to be able to use a suction tanker on an annual basis.

8 Summary

The proposal meets DMD 61 by:

- Seeking to reduce outfall rates as low as possible in a practicable and viable way with full consideration to the scope of the works and related site constraints.
- Provides three source control measures and hence meets the "at least one" as required under DMD 61, namely:
  - Sedum roofing
  - Rainwater harvesting
  - Permeable paving
- Provides SuDS that:
  - result in a net improvement in water quantity and quality discharging.

Hence the use of SuDS techniques on site, as detailed above and when installed in line with best practice (I.e. CIRIA 753 & CIRIA 768), will mitigate and treat the run-off volumes in line with the core policies.

Signed: 

Dr Robin Saunders CEng, C. Build E, MCABE, BEng(Hons), PhD

Date: 25th June, 2021

References

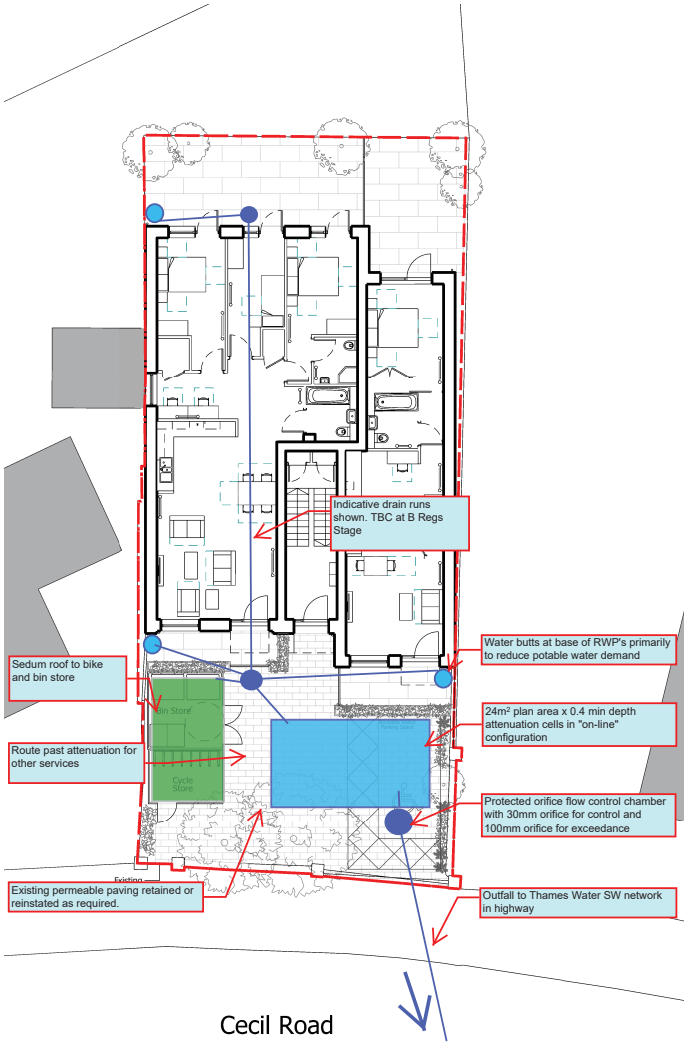
[1] Anon. Code of practice for Foundations. Technical Report BS8004:1986, BSi, 1986.

[2] CIRIA. The SUDS manual. Technical report, CIRIA, 2015.

[3] C Hassell and B Coombes. Green roofs. Technical report, CIBSE, 2007.

A Proposal plans

A.1 Indicative SuDS layout



US CODE	SUITABILITY DESCRIPTION	
	Suitable for Information	
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02	SM	AL
UMBER	SIZE	SCALE
1	A3	1:200

VERSION	DESCRIPTION
P02	Issued for Planning
P01	Issued to Client for Commen:

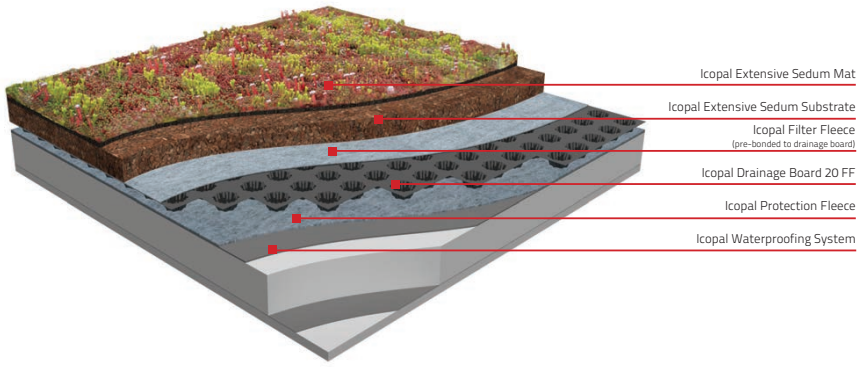
B Sedum option

Icopal ST Sedum Mat System

GREEN ROOF SYSTEMS

Code: 3101062

An extensive lightweight green roof system utilising a pre-grown vegetation mat of 8 – 12 sedum species. Provides an immediate green planting scheme for instant impact. The vegetation mat is installed on a shallow depth of specially formulated free-draining substrate and drainage board.



System Properties

The following data relates to the green roof element only.

System Dry Weight:	80 kg/m²
System Saturated Weight:	100 kg/m²
System Typical Depth:	104 mm
Growing Substrate Depth:	50 mm (settled)
Contouring:	Flat/level

Biodiversity: ●●○○○

Pollen/Nectar Richness: ●●●○○

Habitat Provision: ●●○○○

Key Features

- A lightweight system suitable for a range of roof construction types.
- System type allows for shallower substrate depths.
- Attractive mix of sedum species.
- Sedum plants are low-growing.
- Moderate range of bio-diversity.
- Moderate provision of Nectar and Pollen to attract insects.
- Suitable for flat and pitched roofs.
- Versatile system; quick and easy to install.
- Low maintenance and drought tolerant.
- Pre-grown mat provides an instant green coverage.

Icopal
ST Sedum Mat System

Flowering Period: May – August.
Typical Colours: Seasonal variation of yellows, whites, and pinks. Foliage turns from green to red in periods of plant stress.
N° of Species Sown: 8 – 12.

Typical Species: (subject to season variation) - Sedum acre, Sedum album, Sedum ellacombianum, Sedum floriferum, Sedum forsterianum, Sedum hybridum, Sedum kamtschaticum, Sedum montanum, Sedum oreganum, Sedum reflexum, Sedum rupestre, Sedum selskianum, Sedum sexangulare, Sedum spirium.

Flower Attraction
Low-moderate mixed pollen source, applicable to Bees – Mason, Honey Bombus spp; Insects – Chrysoperla (Lacewing), hoverfly (Episyrphus), Ladybird (Harmonia), Aphidius, Aphilinus, Aphidoletes (beneficial parasitic wasps).

Establishment Period: 6 – 8 months.

Plant Species
The sedum family of flowering plants are succulents and therefore have leaves which are able to store water. The majority grow naturally in arid, well drained areas, often on shallow substrate depths. Therefore they are drought tolerant, and able to survive in extremes of conditions. They generally flower from early summer to autumn.

General Notes
The system is suitable for both new build and refurbishment projects. Roof pitches up to 45° may be used, but for slopes over 9° a retention system is required. All slopes over 5° will require a mechanically fixed eaves edge restraint.

Detailing
A border with a recommended width of 300 – 500 mm of washed river stones (20 – 40 mm diameter) should be used around all roof penetrations, outlets, perimeters and system edges to provide a vegetation free zone.

Irrigation
Initial: Irrigation required immediately after installation for up to 8 – 12 months until fully established. Recommended irrigation period: 12 months. Pitched roofs retain less water and therefore a permanent irrigation system should be considered.
Once established: Irrigation is only generally required during prolonged periods of hot dry weather.
Water Source: A roof top source with a pressure of 2.5 – 3 bar and a flow rate of 60 L/min is recommended to connect a temporary system if required.

Maintenance:
Sedum systems are designed to be low maintenance. Species selection ensures that the roof will evolve naturally, however weeds should be removed periodically through the year to reduce the likelihood that they become dominant. It is recommended that a suitable fertiliser is applied to keep the plants healthy. This may be a spring feed of slow/controlled release fertiliser to last the growing season, or more regular granular/liquid feeds throughout the growing season.

For more information please visit
www.icopal.co.uk
TEL: 0161 865 4444 FAX: 0161 866 2616 E: info.uk@icopal.com

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M32 0YL

Issue 01 ICO3012

C Maintenance guide for sedum roofs

Extensive roof maintenance - < 100mm low nutrition substrate

- Irrigation: Post-establishment, irrigation should not be required for most extensive green roofs, although the water storage capacity of the system and the plants' water demands should be appropriately assessed.
- Fertilization: Extensive green roofs typically have low nutrient requirements and are therefore often fertilized on an annual basis, each spring, using a slow-release fertilizer.
- Plant management: Removal of undesirable plant species and fallen leaves should take place twice each year
- General: Drainage outlets (including inspection chambers) and shingle/gravel perimeters to be cleared of vegetation, twice yearly

Biodiverse – very low to low nutrition substrate

- Irrigation: Typically not required
- Fertilization: Generally not required, particularly where indigenous species are being encouraged to replicate native habitats. Whilst a low vegetative density is common, zero vegetation is generally undesirable
- Plant Management: A maintenance programme should be drawn up to follow the biodiversity hypothesis, ensuring that no materials are removed from the roof that may adversely affect the biodiversity potential of the roof
- General: Drainage outlets (with inspection chambers) and gravel/shingle perimeters should be inspected twice yearly and cleared of any living or dead vegetation

Semi intensive – 100mm to 200mm low to medium nutrition substrate

- Irrigation: Periodic irrigation is expected, depending upon the plant specification and the climatic and microclimatic conditions prevailing at roof level.
- Fertilization: With a wider range of planting, using a more fertile growing medium, more regular fertilization is required.

- Plant management: Removal of undesirable vegetation on the greened area twice yearly.
- General: Drainage outlets (including inspection chambers) and shingle/gravel perimeters to be cleared of vegetation, twice yearly

Intensive – 200mm + medium nutrition substrates and top soils

- Irrigation: Regular irrigation is often required, subject to the plant specification and the climatic and microclimatic conditions prevailing at roof level.
- Fertilization: With a wider range of planting, using a more fertile growing medium, more regular fertilization is required.
- Plant management: The intensive maintenance of lawns, hedges, borders etc. is required on a regular basis, so as to maintain the roof aesthetics. Undesirable vegetation should be removed from the green areas at least twice yearly. Failed plants in excess of 5% of the plants installed should be replaced.
- General: Drainage outlets (including inspection chambers) and shingle/gravel perimeters to be cleared of vegetation, twice yearly. Where excessive substrate settlement has occurred, this should be replenished.

D Thames Water

D.1 Asset map

Residential
The Law Society's CON29DW
Drainage & Water Enquiry

Thames Water Property Searches

Move Reports UK Ltd
16108 Cannock

Search address supplied	26, Cecil Road, Enfield, EN2 6TG
Your reference	20200901120097 - EY PP 9580/1 RIDGEMONT
Our reference	DWS/DWS Standard/2020_4246617
Received date	3 September 2020
Search date	3 September 2020

Keeping you up-to-date

Why the CON29DW?

Mitigating risk - There are potential risks for homebuyers and they need qualified drainage and water information to make an informed purchasing decision.

Expert knowledge - Specialist teams, with years of experience working directly with drainage and water data, check and review each report.

Complete and consistent - Comprising 25 standard questions answered in full, from sewerage and water asset information to sewer flooding history and connection information, fully endorsed by The Law Society.

Peace of mind - Terms & Conditions are there to support you and your client and CON29DW reports are put together using the most up to date information available.

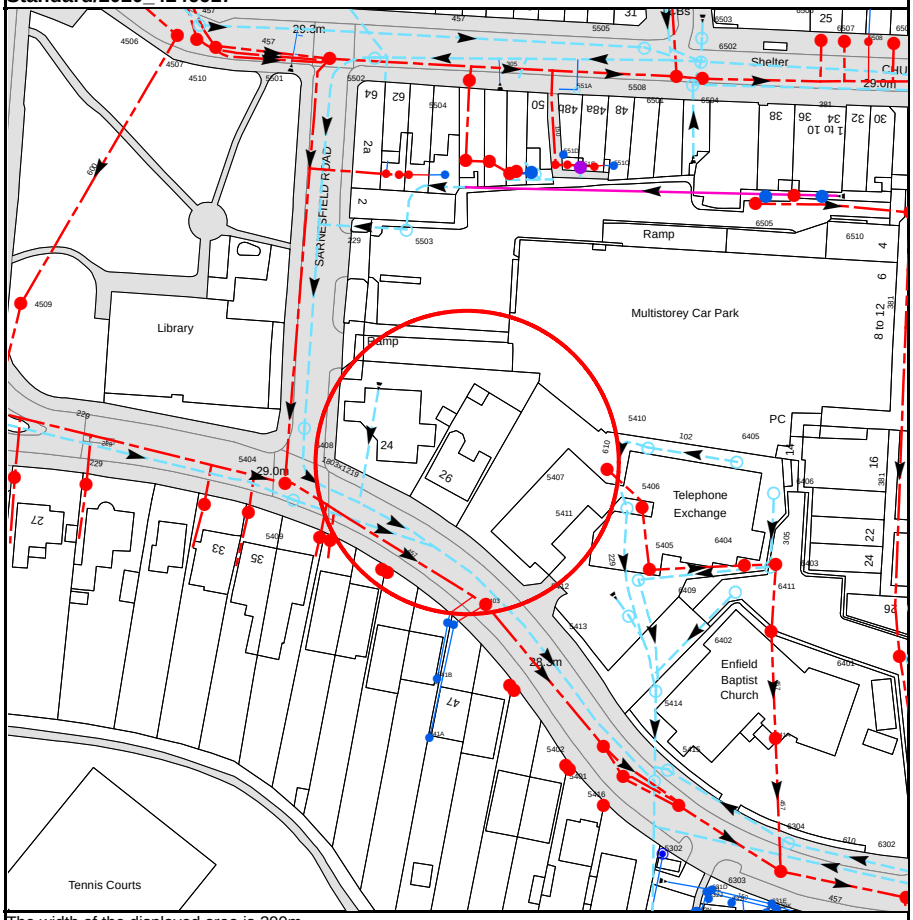
Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0845 070 9148

CON29DW
DRAINAGE AND WATER ENQUIRY

Residential CON29DW Drainage & Water Search Sewer Map-DWS/DWS Standard/2020_4246617



The width of the displayed area is 200m

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

D.2 Application pack

Application for a pre-development enquiry

Application form

You can go to our website **thameswater.co.uk/buildover** and apply online or complete this form and return to Thames Water, Developer Services, Clearwater Court, Vastern Road, Reading RG1 8DB

Guidance notes

Pre development enquiries are designed to aid developers and their consultants in understanding the impact of their proposed development on Thames Water sewerage network.

You may also use this application form to enable early discussion/meeting on planning issues such as Flood Risk Assessments, capacity checks, drainage strategies and pre S104 application layouts.

Once we have received your appliation Thames Water will undertake a simple desktop study to determine your sites impact on our network and identify if any detailed further analysis or modelling is required.

Please note, that all relevant sections of the application must be fully completed, as insufficient information will result in your application being returned to you, which will result in your response being delayed.

Applicant Details

Please provide the full name, address and contact details of the person or company making the Pre-development enquiry.
All applications must be paid for prior to any response being answered. Please send your cheque, with the amount (including VAT), to Thames Water Limited with the accompanying fully completed application to:
Thames Water
Developer Services
Clearwater Court
Vastern Road
Reading
Berkshire RG1 8DB

Development site details

The site must hold a comprehensive address, scaled location plan and site layout (if available) which will assist in determining the location of proposed connection points.
A 12 figure grid reference highlighting the centre point of the site will also be helpful to us if an address is difficult to determine.
The type, number of units and size of the development will assist us.

We require information on the history of the site, therefore, if the site is Brownfield ie. land identified for redevelopment, then please let us know if the site has sewerage connections and what was previously occupying the site.

Proposed development and flows

Please indicate the proposed discharge rates for surface water and foul discharge in litres per second (l/s).

Checklist and declartion

Ensure that you have fully completed all relevant sections of the application. Please print your name, sign and date the application form and enclose:

- a scaled location plan
- a scaled site layout
- payment of the required fee of £398 + VAT

What happens next?

- Once we have received your fully completed application form we will provide you with the following response to your application:
- A preliminary assessment of any restrictions and potential connection points to the existing sewerage network.
- A preliminary assessment of any reinforcement works that will be required to service the development.
- Details of any protective measures for sewerage assets which may require diversion or easements.

We will endeavor to respond to you within 15 working days of receipt of your application providing it is not necessary to carry out further investigation works.

If further analysis is required, involving detailed modelling and site investigation (depth loggers, rain gauges or flow monitors) we are able to provide you with a scope, estimated cost and timeframe for undertaking a formal impact study for the price of £400 + VAT. Once completed this study would include a full report detailing the impact and recommendations/network improvements required to alleviate any increased flood risk.

Application for a pre-development enquiry

Please complete all sections of this form in BLOCK CAPITALS

About the person applying

This is the person we'll contact about the application and will recieve all correspondence. This can be the property owner or someone acting on their behalf.

Are you applying as? An individual ☐ or A company ☐

'An individual' is a homeowner and 'A company' is an agent/architect/builder etc acting on behalf of the homeowner

Company name

Title Mr ☐ Mrs ☐ Ms ☐ Miss ☐ Dr. ☐ Other:

First name(s)

Last name

Applicant contact details

We'll use these details to get in touch with you about your application.

Preferred contact number

Alternative number

Email address

Full postal address

Address line 1:

Address line 2:

Town:

County: Postcode:

Nominated contact

Who should we contact to process your application? Applicant ☐ Someone else ☐

(Please tick one)

If someone else:

Title Mr ☐ Mrs ☐ Ms ☐ Miss ☐ Dr. ☐ Other:

First name(s)

Continued...

Last name

Preferred contact number

Alternative number

Email address

Full postal address

Address line 1:

Address line 2:

Town:

County: Postcode:

Invoices

Who should we send invoices to? Applicant ☐ Nominated contact ☐ Someone else ☐

If someone else:

Title Mr ☐ Mrs ☐ Ms ☐ Miss ☐ Dr. ☐ Other:

First name(s)

Last name

Full postal address

Address line 1:

Address line 2:

Town:

County: Postcode:

Email address

Where the work is taking place

What is the address of the property being connected? Same as applicant ☐ Same as the nominated contact ☐ Somewhere else ☐

If somewhere else:

Site name

Continued...

Full postal address

Address line 1:

Address line 2:

Town:

County: Postcode:

About the site

What is your local authority?

Ordance survey grid ref

What is the site currently used for?

Greenfield/agricultural Industry Housing Landfill Other

VAT development classification

New build house or flat Relevant residential or charitable

Commercial, existing or orther Listed Conversion Mixed

Location of existing connection

Does the site already have any of these sewerage connections?

Foul water Yes No

If yes:

Current discharge rate Litres per second

Size of existing site Number of units/hectares

Location of existing connection?

Surface water Yes No

If yes:

Current discharge rate Litres per second

Size of existing site Number of units/hectares

Location of existing connection?

Your proposed development

Type of development Greenfield/agricultural ☐ Industry ☐ Housing ☐ Landfill ☐ Mixed ☐

Preferred foul water connection point

Preferred surface water connection point

Size of proposed development Number of units/hectares

Proposed foul water discharge rate Litres per second

Proposed surface water discharge rate Litres per second

How will development flows reach the connection point? Pumped ☐ Gravity ☐

Trade effluent agreement required? Yes ☐ No ☐ Don't know ☐

If Yes, Trade effluent reference number

Planning status

Is the development identified in the local plan? Yes ☐ No ☐ Don't know ☐ If Yes, reference number

Does the development have outlined planning permission? Yes ☐ No ☐ Don't know ☐ If Yes, reference number

Does the development have full planning permission? Yes ☐ No ☐ Don't know ☐ If Yes, reference number

Does the development have building regulation permission? Yes ☐ No ☐ Don't know ☐

Enclose your documents

All drawings must be of suitable detail and have a drawing reference number on them.
What we need from you to process your application:

Site plan	This should show the site with nearby buidlings, roads and any sewers.
Development plan	This should show propsed layout of new development buildings, roads and sewers.
Site drainage plan	This should show all propsed sewers, pipe sizes and gradients.

Checklist and Declaration

I have completed the application form and enclose the following information:

- Application fee of £398 + VAT
- A scaled location plan ie. site plans showing existing and proposed layouts.
- The development site drainage plan.

Declaration

I agree, that for the purpsoses of the Water Industry Act 2003 and the Data Protection Act 1998, the information provided in this form and in any accompanying documents, may be held on a computer and processed by Thames Water Ltd and its servants and agents for all purposes connected with the Company's statutory water and sewerage undertakings.

Print name	
Position within company	
Company	
Date	
Signature	

Getting in touch with us

For enquiries regarding this application or any other questions relating to your building or development work please contact us on:

thameswater.co.uk/developerservices

developer.services@thameswater.co.uk

0800 009 3921
Monday - Friday 8.00am-5.00pm

Thames Water, Developer Services, Clearwater Court, Vastern Road, Reading, Berkshire RG1 8DB

If you have any other questions for Thames Water

thameswater.co.uk

0800 980 8800

- Queries relating to your bill
- Change of address
- Meter readings

Minicom service if you are deaf or hard of hearing 0800 316 6899

0800 316 9800

- For emergencies
- Other non-billing enquiries
- Literature

Minicom service if you are deaf or hard of hearing 0800 316 9898

To contact us from abroad +44 1793 366011

Thames Water, PO Box 286, Swindon, SN38 2RA

This leaflet can be supplied in braille or audio-tape upon request.

12961I 04/15

2.2 Polystorm Lite

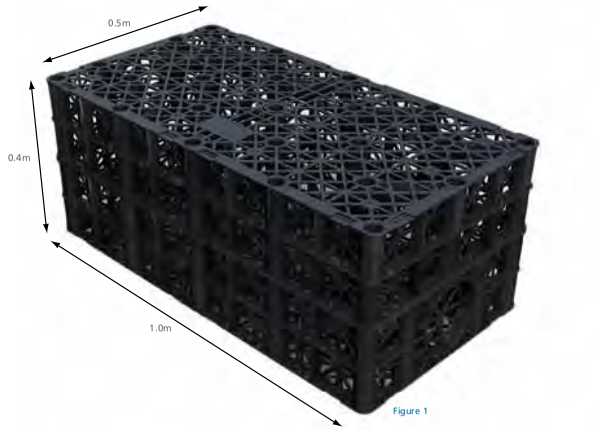


Figure 1

Designed for use in landscaped, pedestrian or other non-loaded applications with a load bearing capacity of:

20 tonnes

Technical specification overview	
Unit type	**Polystorm Lite**
Product code	PSM2*
Dimensions	1m x 0.5m x 0.4m high
Total volume	0.2m per cube
Unit weight	7kgs**
Cube storage volume	0.19m³ (190 litres)
Surface area	55% perforated
Compressive strength	Maximum 20 tonnes per sq metre
Maximum burial depth	2.5m***

* Each unit includes 4 clips and 2 shear connectors. Please note that brick bond connector may be required at additional cost.

** Pallet weight dependent upon order quantity and transport type.

*** In weak clay soil conditions the maximum burial depth is 1.5 metres. Polystorm Lite should not be installed below the water table.

Table 1

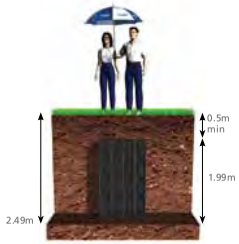


Figure 2

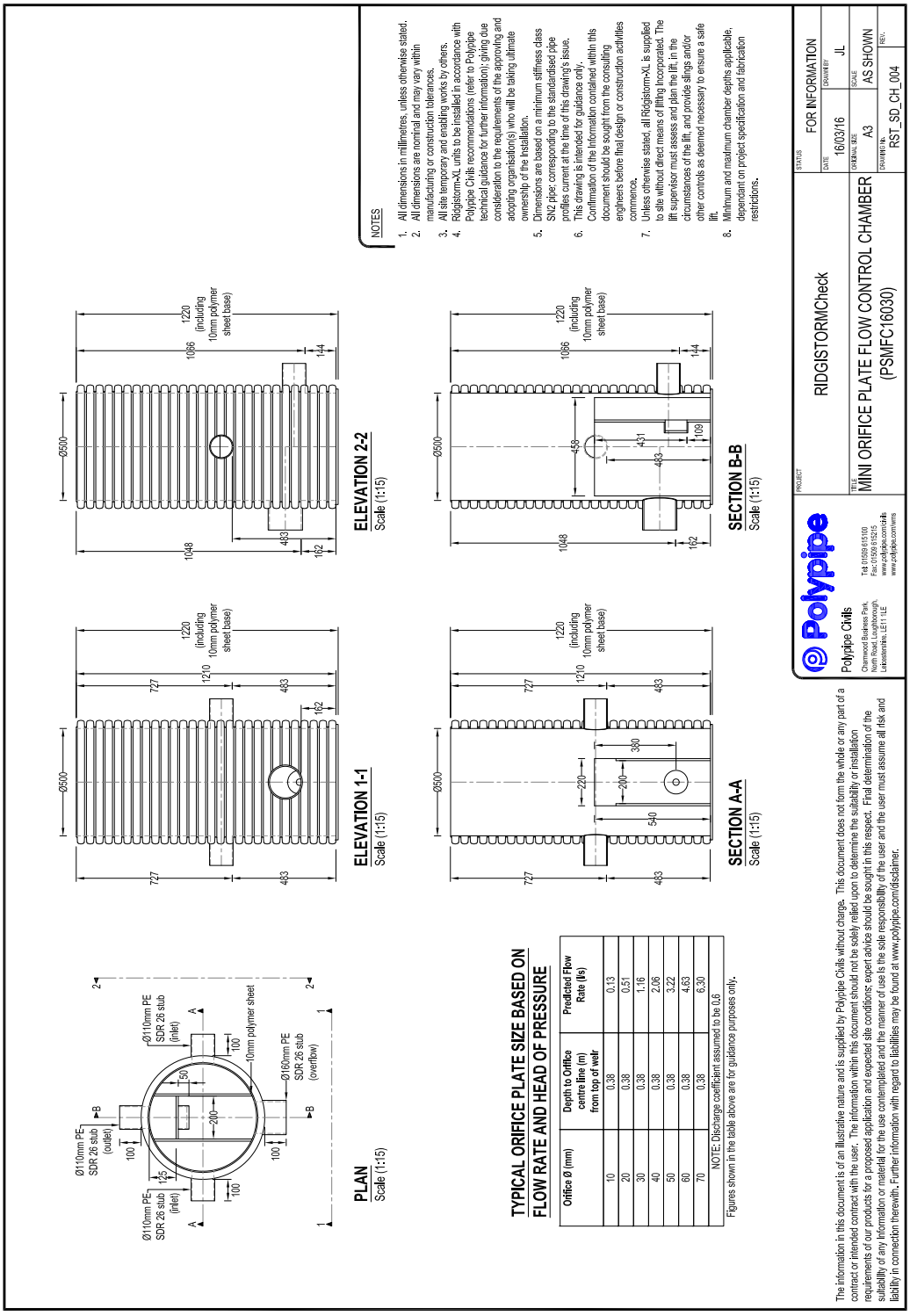
Polystorm Lite has been specifically designed for non-trafficked applications. With a 20 tonne per square metre compressive strength it will however take general maintenance vehicles such as grass cutters. Polystorm Lite can be used for both attenuation and soakaway applications. The modular structure receives rainwater collected from roofs or surface drains ready to release within a set drainage limit. Polystorm Lite can be used typically for landscaped areas, pedestrian or public open spaces such as underneath playgrounds.

Polystorm Lite		
Description	**Code**	**Pack quantity**
Polystorm Lite cell 1000 x 500 x 400mm	PSM2	15
Polystorm Lite flow control unit	PSMFC160/30	1
Brick bond shear connector	PSMBBSC	30
Clips	PSMCLIP	60
Shear connector	PSMSC	30
EN1401 flange adaptor - 110mm	PSMFA110	1
Ridgidrain flange adaptor - 150mm	PSMFA150	1
EN1401 flange adaptor - 160mm	PSMFA160	1
Basic silt trap	PSMST160	1
Advanced silt trap - 15 litres/sec	PSMSTA160/15	1
Mini silt trap for Polystorm Lite	PSMST110	1
Cover & frame (round)	UG501	1
Cover & frame (square)	UG502	1
450mm silt trap lid & frame	UG512	1
460mm lockable plastic cover & frame	UG511	1
Polypropylene cover & frame	ICDC1	1
Chamber riser section	ICDR1	1
Silt trap sealing ring	UG488	1

Table 2

Note: Minimum cover and burial depths may vary depending on load and ground conditions. Please contact Polypipe WMS for further information. All grades of Polystorm units may be used in situations outside of those recommended above, through the use of the appropriate protective measures designed to reduce the imposed loading on the proposed Polystorm structures.

E.2 Orifice chamber




Polyethylene wall chamber complying with BS 7158
Integral polypropylene 2.5kN lockable cover and frame, individually labelled with a unique reference number and orifice size for whole-life relevance