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4 BELLINGHAM ROAD, CATFORD, LONDON, SE6 2PT

SURFACE WATER MEANS OF DISPOSAL REPORT

July 2020
Project No. 20533

INDEX

Prepared by	Issued
Jeff Horwood IEng FCIPHE FRSPH MSoPHE office@axiom-structures.co.uk T: 020 3637 2751 **Axiom Structures Limited** Unit 2 127 Great Suffolk Street London SE1 1PP	P2 16th October 2020 P3 3rd November 2020

1.0 INTRODUCTION

1.1 This report has been prepared in connection with the above development and no responsibility is accepted to any third party for all or part of this study in connection with this or any other development.

1.2 The location, size, depth and identification of existing services that may be shown or referred to in this report have been assessed from non-intrusive observations, record drawings and the like. Any Contractor shall safely carry out intrusive investigations, trial holes or soundings, prior to commencing any work, to satisfy himself that it is safe to proceed and that the assessments are accurate. Any discrepancies shall be notified to the Client prior to the commencement of any works.

1.3 This report is produced to provide the evidence to satisfy London Borough of Lewisham Council's Permission for Development, reference DC/19/111789 dated 5th September 2019 – Condition No. 6

(a) *No development above ground level shall commence on site until a scheme for surface water management, including specifications of the surface treatments and sustainable urban drainage solutions, has been submitted to and approved in writing by the local planning authority.*

(b) The development shall be carried out in accordance with the approved scheme and thereafter the approved scheme is to be retained in accordance with the details approved therein.

1.4 This report has been updated to address the comments in the email dated 7th October 2020, received from Sam James, Planning Officer, Development Management, London Borough of Lewisham.

1.5 This report has been updated to incorporate the extension of both buildings towards the western boundary.

2.0 INVESTIGATION

2.1 Thames Water Utilities Ltd – Sewer Record Drawing

The Thames Water drawing below shows that there is a 305Ø combined sewer in Bellingham Road 3.2m deep. Surface water sewers are not located within Bellingham Road.

2.2 A CCTV survey was carried out, which identified that the site has a 150Ø combined sewer connection into Bellingham Road via a manhole located within the frontage of 2 Bellingham Road.

2.3 Surface Water Disposal

The surface water drainage system is to be designed in accordance with CIRIA C753 v3 The SuDS Manual. The SuDS system shall accommodate the 1:100 year return period + 40% climate change.

2.4 Surface water disposal should be directed to ground (through infiltration) as the first option; the second option directly to a watercourse (with an agreed restricted discharge) and the third option to sewer (with an agreed restricted discharge).

2.5 The Atkins Factual Desk Study dated August 2017, identified the ground conditions underlying the site's superficial deposits as being Kempton Park Gravel Formation, see extract below:-

3. Environmental Setting

3.1. Geology

The ground conditions underlying the site have been determined using information from the BGS OpenGeoscience 1:50,000 online mapping database (British Geological Survey, 2017) and Lexicon of named rock units (British Geological Survey, 2017).

The site is underlain by superficial deposits comprising the Kempton Park Gravel Formation, typically comprising sand and gravel with local lenses of silt, clay or peat; an average thickness of 6 m is reported. The London Clay Formation is present beneath the Kempton Park Gravels and typically comprises poorly laminated silty to very silty clay or clayey silt with some layers of sandy clay.

The nearest BGS borehole to the site is located 35 m west of the site which was drilled to a depth of approximately 10 m in 1923. The ground conditions were identified to comprise 1 m of Made Ground (asphalt cover) underlain by 2 m of superficial deposits (sands and gravels) with London Clay encountered at approximately 3 m below ground level (bgl) to a depth of 10 m bgl where the borehole was terminated. An abstraction borehole (reference TQ37SE151) located approximately 35 m north-west of the site indicates that the clay is approximately 25 m thick (British Geological Survey, 2017).

Therefore, Soakaways and Pervious Paving should be considered.

2.6 The first option to discharge to ground is not viable, because the existing and proposed buildings will occupy a substantial footprint of the site and there is insufficient space to construct a soakaway 5m away from the buildings. Building Regulations – H3 3.25 a - Infiltration Drainage is not Always Possible - states that infiltration devices should not be built within 5m of a building or road, or in an area of unsuitable land. The second option is also not viable, because no watercourse is adjacent to the site boundary. The final option to discharge to sewer is viable, reusing the existing 150Ø combined outfall, via No.2 Bellingham Road.

2.7 The surface water is to be attenuated into an offline cellular attenuation tank located below the grassed area within the rear gardens.

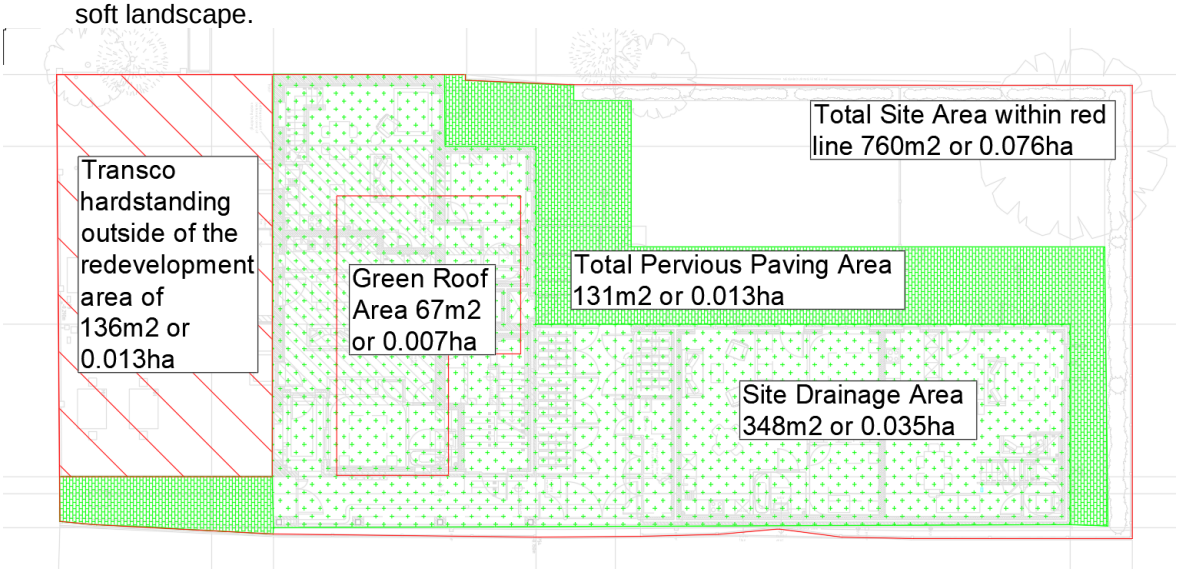
2.8 The surface water discharge from this site uses an orifice plate volumetric flow control.

2.9 Green Field Runoff

MicroDrainage source control 2020.1 software was used to calculate the QBAR (the (arithmetic) mean annual maximum flood) flow rate in litres per second for the area of green field site to be occupied by the proposed development of 0.076ha.

2.10 The drawing below shows the drainage catchment area (via attenuation) being used within the surface water calculations; the green crossed area is 0.035ha. This drawing also identified 0.013ha of pervious paving and 0.007ha of green roof. The existing Transco hardstanding at the front of the

site of 0.013ha is not included within the redevelopment. The remaining area of 0.015ha is to be soft landscape.



This drawing 20533/D/0600 P3 Site Drainage Areas and Existing Drainage, is appended to this report.

2.11 The MicroDrainage green field calculations in Section 3.0 Calculations, show that QBAR Q100 years is 0.2 litres per second.

2.12 The SuDS C753 v3 Manual recommends in Chapter 3, page 44 – 3.3.1 Water Quantity Standard 1: Control of Runoff Volume b) Volume Control For Extreme Rainfall Events - Item number 2: All the runoff from the site for the 1:100 year event should be discharged at either a rate of 2 litres per second per Hectare (ha) or the average annual peak flow rate (ie the mean annual flood QBAR) whichever is the greater. Therefore, 2 litres per ha x 0.076ha = 0.152 litres per second and is to be considered.

2.13 Thames Water currently requires that the 1:100 year event should be restricted at a rate of 5 litres per second per Hectare (ha). Therefore, 5 litres per ha x 0.076ha = 0.38 litres per second and should be used if surface water is to be connected to sewer. Thames Water's Pre-Planning Enquiry confirmed that they would have no objections to a restricted discharge up to a maximum of 3 litres per second. A volumetric discharge of up to 3 litres per second, mitigates the risk of a 13Ømm orifice blockage. At 3 litres per second this orifice increases to 44Ømm, significantly reducing the risk of blockage and the drainage system overflowing.

A copy of their letter can be seen below:-

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Jeff Horwood

Axiom Structures Limited
177 Southwark Bridge Road
London
SE1 0ED

Wastewater pre-planning
Our ref DS6076371

24th August 2020

Pre-planning enquiry: Confirmation of sufficient capacity

Site Address: 4 Bellingham Road, Catford, London, SE6 2PT

Dear Mr Horwood,

Thank you for providing information on your development for 9 houses replacing the existing 300m² commercial premises at the above address.

We have completed the assessment of the foul water flows and surface water run-off based on the information submitted in your application with the purpose of assessing sewer capacity within the existing Thames Water sewer network.

Foul Water

If your proposals progress in line with the details you've provided, we're pleased to confirm that there will be sufficient sewerage capacity in the adjacent combined sewer network to serve your development.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

Please note that you must keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient sewerage capacity.

Surface Water

Please note that discharging surface water to the public sewer network should only be considered after all other methods of disposal have been investigated and proven to not be viable. In accordance with the Building Act 2000 Clause H3.3, positive connection to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been

examined and proven to be impracticable. The disposal hierarchy being: 1st Soakaways; 2nd Watercourses; 3rd Sewers.

However, as you have proven that soakage into the ground or a connection into an adjacent watercourse is not possible, we would consider a restricted discharge into the public combined sewer network.

If the peak surface water run-off discharge is then restricted up to a maximum of 3l/s, then we would have no objections to the proposals.

We would encourage techniques such as green roofs and/or permeable paving that restricts surface water discharge from your site.

Please note that the Local Planning authority may comment on surface water discharge under the planning process.

Please Note

All connection requests are subject to a full Section 106 (Water Industry Act 1991) application before the Company can confirm approval to the connection itself. Please also note that capacity in the public sewerage system cannot be reserved. Please make sure you submit your connection application giving us at least 21 days' notice of the date you wish to make your new connection/s.

Note on trunk sewers: Connecting directly to Trunk sewers can be complex and dangerous, which means we often refuse permission. In this case, you will need to find an alternative sewer or method of discharge. Please contact the Sewer Connections team through our Helpdesk on 0800 009 39 21 for further information.

If Thames Water permits a connection to the trunk sewer, we will insist on carrying out the connection ourselves under Section 107 of the Water Industry Act. We would advise for you to apply as soon as possible.

The discharge of non-domestic effluent is not permitted until a valid trade effluent consent has been issued by Thames Water. If anything other than domestic sewage is discharged into the public sewers without the above agreement an offence is committed and the applicant will be liable to the penalties contained in Section 109(1) (WIA 1991).

Applicants should contact Trade Effluent prior to seeking a connection approval, to discuss trade effluent consent and conditions of discharge. A Trade Effluent reference number should be obtained and included in the relevant box of the attached application form. The address for Trade Effluent is - Thames Water Utilities Limited, Waste Water Quality, Crossness Sewage Treatment Works, Belvedere Road, Abbeywood, London. SE2 9AQ. Alternatively you can telephone them on 020 8507 4321.

The views expressed by Thames Water in this letter are in response to this pre-planning enquiry at this time and do not represent our final views on any future planning applications made in relation to this site.

Yours sincerely,

Jonathan Shildrick BSc
Development Engineer
Developer Services

2.14 Attenuation Volume

MicroDrainage source control 2020.1 software was used to calculate the storage volume required to accommodate the 1:100 year period + 40% climate change, without the tank and drainage system overflowing.

2.15 The calculations show that the required attenuation storage is 11.1m3, peaking at 60 minutes during a winter storm.

2.16 This volume equates to an attenuation tank size of $30m^2$ (4m x 7.5m) x 0.4m internal size in depth. The tank is to have a 0.8m cover over, below the grassed area.

2.17 The MicroDrainage calculations supporting the above statements are contained within Section 3.0 Calculations, of this report.

2.18 Green Roof and Pervious Paving

The SuDS installation incorporates a green roof within the remodelling of the roof of the existing property and also incorporates pervious paving to all the hard-landscaped areas. This paving is discharging to ground and not draining through the attenuation tank.

2.19 Attenuation Tank Overflow Exceedance Route

The drainage channel located on the back edge of the Bellingham Road footpath is at the lowest level within the site. Should the design capacity of the SuDS system be exceeded, or the flow control orifice become blocked, this channel would overflow across the footpath into Bellingham Road.

3.0 CALCULATIONS

Green Field Runoff calculation page 1 of 1

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Tel: 020 3637 2751 Unit2 127 Great Suffolk Street London SE1 1PP	4 Bellingham Road Catford Greenfield Runoff	Micro Drainage
Date 15/10/2020 13:50 File 2001015 20533 Attenuati...	Designed by jdh Checked by	
Micro Drainage	Source Control 2020.1	

ICP SUDS Mean Annual Flood

Input

Return Period (years)	40	Soil	0.300
Area (ha)	0.076	Urban	0.000
SAAR (mm)	600	Region Number	Region 6

Results l/s

QBAR Rural	0.1
QBAR Urban	0.1
Q40 years	0.3
Q1 year	0.1
Q30 years	0.3
Q100 years	0.4

Summary Results for 100 year return period (+ 40%) page 1 of 5

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Tel 020 3837 2751 Unit 2 127 Great Suffolk Street London SE1 1PP	4 Bellingham Road Catford Attenuation 2 1/s	Micro Drainage
Date 02/11/2020 17:21 File 2001102 20513 Attenuati...	Designed by jdh Checked by	
Micro Drainage	Source Control 2020.1	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 56 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	21.123	0.263	0.0	1.7	1.7	7.5	O K
30 min Summer	21.178	0.318	0.0	1.8	1.8	9.1	O K
60 min Summer	21.194	0.334	0.0	1.9	1.9	9.5	O K
120 min Summer	21.178	0.310	0.0	1.8	1.8	8.8	O K
180 min Summer	21.142	0.282	0.0	1.8	1.8	8.0	O K
240 min Summer	21.115	0.255	0.0	1.7	1.7	7.3	O K
360 min Summer	21.066	0.206	0.0	1.6	1.6	5.9	O K
480 min Summer	21.025	0.165	0.0	1.5	1.5	4.7	O K
600 min Summer	20.991	0.131	0.0	1.5	1.5	3.7	O K
720 min Summer	20.962	0.102	0.0	1.4	1.4	2.9	O K
960 min Summer	20.918	0.059	0.0	1.3	1.3	1.7	O K
1440 min Summer	20.869	0.009	0.0	1.2	1.2	0.3	O K
2160 min Summer	20.860	0.000	0.0	0.9	0.9	0.0	O K
2880 min Summer	20.860	0.000	0.0	0.7	0.7	0.0	O K
4320 min Summer	20.860	0.000	0.0	0.5	0.5	0.0	O K
5760 min Summer	20.860	0.000	0.0	0.4	0.4	0.0	O K
7200 min Summer	20.860	0.000	0.0	0.3	0.3	0.0	O K
8640 min Summer	20.860	0.000	0.0	0.3	0.3	0.0	O K
10080 min Summer	20.860	0.000	0.0	0.3	0.3	0.0	O K
15 min Winter	21.168	0.308	0.0	1.8	1.8	8.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	143.842	0.0	9.4	22
30 min Summer	92.593	0.0	12.2	34
60 min Summer	56.713	0.0	14.9	56
120 min Summer	33.596	0.0	17.6	88
180 min Summer	24.437	0.0	19.2	122
240 min Summer	19.402	0.0	20.4	156
360 min Summer	13.936	0.0	22.0	222
480 min Summer	11.029	0.0	23.1	286
600 min Summer	9.192	0.0	24.1	348
720 min Summer	7.918	0.0	25.0	408
960 min Summer	6.253	0.0	26.2	526
1440 min Summer	4.478	0.0	28.2	750
2160 min Summer	3.282	0.0	30.3	0
2880 min Summer	2.622	0.0	31.8	0
4320 min Summer	1.880	0.0	34.0	0
5760 min Summer	1.416	0.0	35.7	0
7200 min Summer	1.175	0.0	37.0	0
8640 min Summer	1.038	0.0	38.1	0
10080 min Summer	0.886	0.0	39.1	0
15 min Winter	143.842	0.0	10.6	23

Summary Results for 100 year return period (+ 40%) page 2 of 5

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4 Bellingham Road
Catford
Attenuation 2 1/s

Date 02/11/2020 17:21
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Designed by jdh
Checked by

Micro Drainage

Source Control 2020.1

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	21.225	0.365	0.0	1.9	1.9	10.6	O K
60 min Winter	21.250	0.390	0.0	2.0	2.0	11.1	O K
120 min Winter	21.219	0.359	0.0	1.9	1.9	10.2	O K
180 min Winter	21.178	0.318	0.0	1.8	1.8	9.1	O K
240 min Winter	21.138	0.278	0.0	1.8	1.8	7.9	O K
360 min Winter	21.067	0.207	0.0	1.6	1.6	5.9	O K
480 min Winter	21.010	0.150	0.0	1.5	1.5	4.3	O K
600 min Winter	20.966	0.106	0.0	1.4	1.4	3.0	O K
720 min Winter	20.928	0.068	0.0	1.3	1.3	1.9	O K
960 min Winter	20.877	0.017	0.0	1.2	1.2	0.5	O K
1440 min Winter	20.860	0.000	0.0	0.9	0.9	0.0	O K
2160 min Winter	20.860	0.000	0.0	0.7	0.7	0.0	O K
2880 min Winter	20.860	0.000	0.0	0.5	0.5	0.0	O K
4320 min Winter	20.860	0.000	0.0	0.4	0.4	0.0	O K
5760 min Winter	20.860	0.000	0.0	0.3	0.3	0.0	O K
7200 min Winter	20.860	0.000	0.0	0.2	0.2	0.0	O K
8640 min Winter	20.860	0.000	0.0	0.2	0.2	0.0	O K
10080 min Winter	20.860	0.000	0.0	0.2	0.2	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	92.533	0.0	13.6	34
60 min Winter	56.713	0.0	16.7	58
120 min Winter	33.596	0.0	19.8	94
180 min Winter	24.437	0.0	21.6	132
240 min Winter	19.402	0.0	22.8	168
360 min Winter	13.336	0.0	24.5	238
480 min Winter	11.029	0.0	25.9	302
600 min Winter	9.193	0.0	27.0	364
720 min Winter	7.918	0.0	27.9	422
960 min Winter	6.253	0.0	29.4	530
1440 min Winter	4.478	0.0	31.6	0
2160 min Winter	3.202	0.0	33.9	0
2880 min Winter	2.522	0.0	35.6	0
4320 min Winter	1.608	0.0	38.1	0
5760 min Winter	1.416	0.0	40.0	0
7200 min Winter	1.175	0.0	41.6	0
8640 min Winter	1.008	0.0	42.7	0
10080 min Winter	0.886	0.0	43.7	0

Summary Results for 100 year return period (+ 40%) page 3 of 5

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Page 3

Tel: 020 3637 2751 Unit 2 127 Great Suffolk Street London SE1 1PP	4 Bellingham Road Catford Attenuation 2 l/s
Date 02/11/2020 17:21 File 2001102 20513 Attenuati...	Designed by jdh Checked by
Micro Drainage	Source Control 2020.1

Micro Drainage

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.035

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.012	4	8	0.012	8	12	0.011

Summary Results for 100 year return period (+ 40%) page 4 of 5

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Catford
Attenuation 2 1/s

Date 02/11/2020 17:21
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Checked by

Micro Drainage

Micro Drainage Source Control 2020.1

Model Details

Storage is Online Cover Level (m) 21.630

Cellular Storage Structure

Invert Level (m) 20.860 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.08400 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.08400

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.800	50.0	0.0	0.401	0.0	0.0
0.400	50.0	0.0			

Orifice Outflow Control

Diameter (m) 0.035 Discharge Coefficient 0.600 Invert Level (m) 20.847

Summary Results for 100 year return period (+ 40%) page 5 of 5

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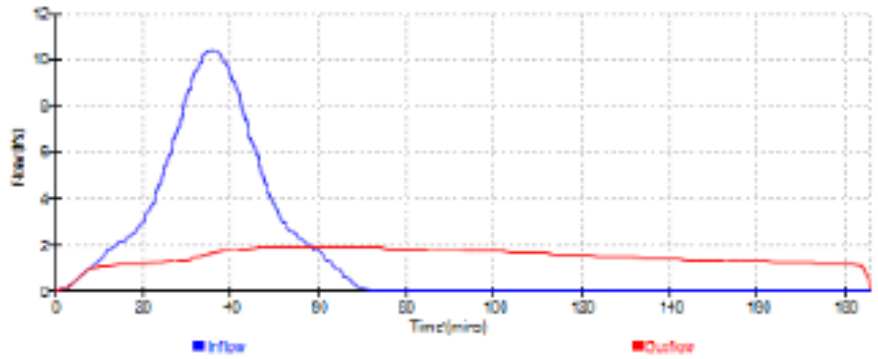
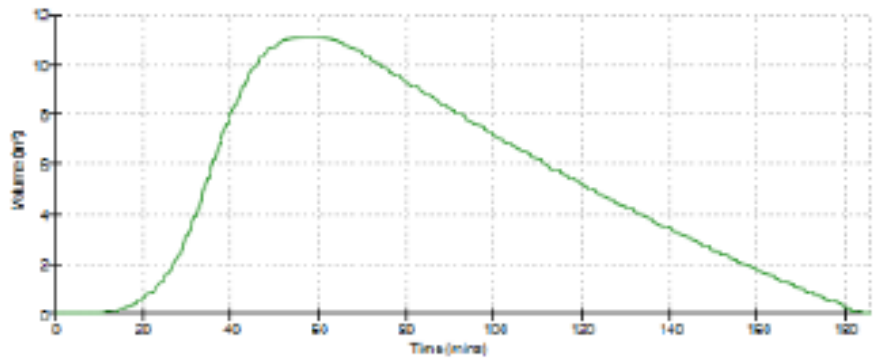
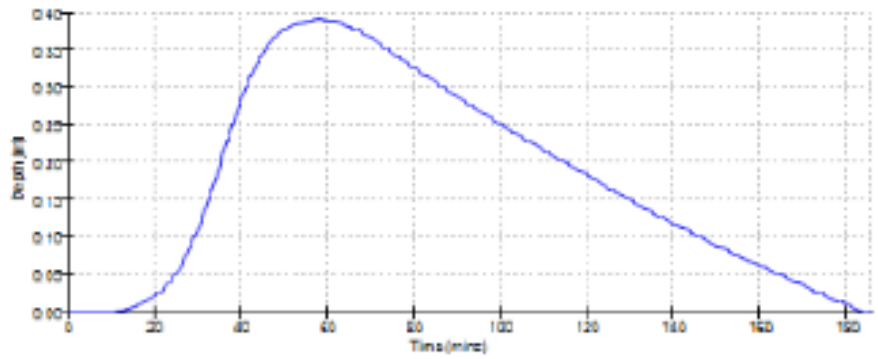
Date 02/11/2020 17:21 File 2001102 20533 Attenuati...	Designed by jdh Checked by	Micro Drainage
Micro Drainage	Source Control 2020.1	

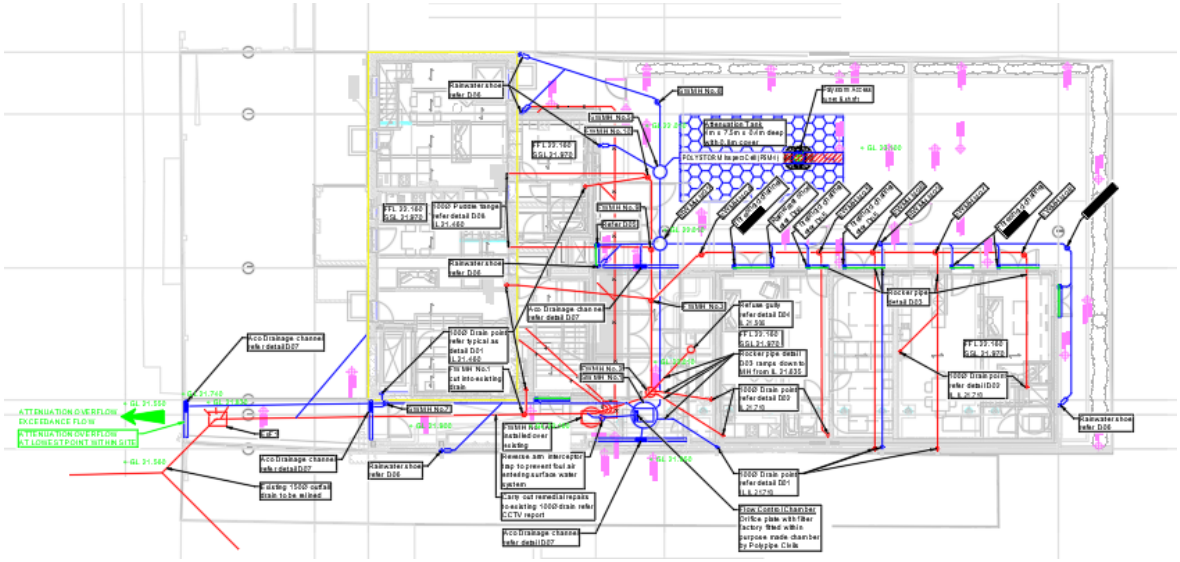
Event: 60 min Winter







4.0 PROPOSED SURFACE WATER DRAINAGE



This drawing 20533 D 0602 P3 Proposed Drainage Layout – is appended to this report.

5.0 POLLUTION CONTROL

5.1 The SuDS Manual recommends in Chapter 21.9.9 Upstream Treatment and Inlets, page 462, first paragraph – SuDS should be designed to prevent or minimise the risk of sediment ingress into the tank system. This is because there is limited access and it can be difficult to remove sediment build-up, once it enters those types of structure. It is especially important to make sure the runoff during the construction phase is prevented from entering tanks, as this has a very high sediment load, as well as other debris, which could affect the operation of the tank.

5.2 Chapter 21.9.9 page 462, the beginning of the second paragraph - As a bare minimum for any tank, a sediment sump should be included within the design.

5.3 Chapter 21.9.9 page 462, the beginning of the third paragraph - Off-line storage systems are less prone to sediment (ie day to day flows carrying the majority of sediment loads bypass the tank), this tank will be off-line.

5.4 The SuDS drainage design shall incorporate catch pits on the 150Ø surface water network, to intercept sediment carried through the system. Trapped gullies will also be incorporated to intercept silt and debris at source. Construction runoff will not be permitted to flow through the attenuation tank.

5.5 An access cover shall be incorporated to allow CCTV inspection access into the attenuation tank and silt removal by high pressure jetting and vacuum tanker, if required.

5.6 The incorporation of the SuDS elements into the proposed surface water system i.e. trapped gullies, catch pits and attenuation tank, will help improve the water quality from the site by: -

Water Quality Treatment Potential		
Gullies & catch pits	Total suspended solids removal	High potential
	Heavy metals removal	Medium potential
	Nutrient removal	Medium potential
Attenuation tank	Total suspended solids removal	Low potential
	Heavy metals removal	Low potential
	Nutrient removal	Low potential

6.0 OPERATION AND MAINTENANCE REQUIREMENTS FOR THE SuDS INSTALLATION

6.1 The SuDS Manual recommends the following Operation and Maintenance requirements; The Tables below are to be used in preparation for writing the Operation and Maintenance Manual for SuDS installtion.

6.2 Green Roofs

Chapter 12.12 Operation and Maintenance Requirements, page 252, Table 12.5, The design and specification of the green roofs is to be provided by others.

TABLE 12.5 Operation and maintenance requirements for green roofs

Maintenance schedule	Required action	Typical frequency
Regular inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
	Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
	Inspect underside of roof for evidence of leakage	Annually and after severe storms
Regular maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six monthly and annually or as required
	During establishment (ie year one), replace dead plants as required	Monthly (but usually responsibility of manufacturer)
	Post establishment, replace dead plants as required (where > 5% of coverage)	Annually (in autumn)
	Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
	Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
	Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate	Six monthly or as required
Remedial actions	If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material, and sources of erosion damage should be identified and controlled	As required
	If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

6.3 Proprietary Treatment

Chapter 14.12 Operation and Maintenance Requirements, page 287, Table 14.2.

TABLE 14.2 An example of operation and maintenance requirements for a proprietary treatment system

Maintenance schedule	Required action	Typical frequency
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	Six monthly
	Change the filter media	As recommended by manufacturer
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Six monthly
	Inspect filter media and establish appropriate replacement frequencies	Six monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every six months

6.4 Attenuation Storage Tank

Chapter 21.13 Operation and Maintenance Requirements, page 468, Table 21.3.

TABLE 21.3 Operation and maintenance requirements for attenuation storage tanks

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

6.5 Pervious Pavements

Chapter 20.14 Operation and Maintenance Requirements, page 430, Table 20.15, the design and specification of the pervious pavements is to be provided by others.

TABLE 20.15 Operation and maintenance requirements for pervious pavements

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any 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, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

6.6 The Management of all maintenance of the site is to be carried out by the Management Company - Freeholder Smart Environments (Freeholds) Ltd, who are to maintain and repair all common areas of the development. The works to be undertaken include drain cleaning, gully/leaf guard maintenance and gutter cleaning, landscape garden maintenance, external repairs, repairs to internal common parts and window cleaning. The Management Company will arrange all regulatory inspections and tests.

6.7 SuDS Maintenance Schedule

Maintenance Schedule	Description	Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for the first 3 months, then annually.
	Remove debris from the catchment surface ie: keep driveways and paths free from debris, such as rubbish, leaf mulch etc.	Monthly.
	Remove sediment from pre-treatment structures ie: channels, gullies, catch pits and attenuation tank.	Annually, or as required.
	Flow control orifice plate and filter	Biannually
Remedial action	Repair, rehabilitate inlets, outlets and vents.	As required.
Monitoring	Inspect/check all drainage channels, gullies, outlets and vents, to ensure that they are in good condition and operating as designed.	Annually.
	Survey inside of attenuation tank, using CCTV inspection, for structural integrity and sediment build-up and remove, using either high pressure jetting or vacuum.	Every 5 years.
	Inspect the flow control orifice and filter and high pressure clean.	As required, following poor performance or overflow.

7.0 POLYPIPE SUDS COMPONENT TECHNICAL SPECIFICATION/DETAILS

7.1 Ridgistorm Flow Control Chamber with Filter (incorporating the orifice plate)

RIDGISTORMSeparate Filter Chambers

Data Sheet

PRODUCT INFORMATION **P1** **ISSUE 1 - MAY 2016**

RIDGISTORMSeparate Filter Chambers incorporate both a sump and removable filter unit on the chamber outlet to capture silt and debris. The filter unit is easily removed for maintenance purposes and can also be incorporated into catchpits. RIDGISTORMSeparate Filter Chambers can be integrated into our range of pipe systems, such as Ridgidrain and Ridgistorm-XL, to offer a fully integrated drainage system.

Applications

RIDGISTORMSeparate Filter Chambers are pre-fabricated for use in a range of stormwater systems requiring silt and debris separation.

Key Features and Benefits

- Easily accessible removable filter
- Washable filter unit
- Eliminates wastage associated with in-situ construction
- Multiple inlet and outlet options, supplied with integral sockets as standard allowing quick and seamless connection to pipeline
- Depths can be tailored to suit project requirements
- Plastic or lockable steel covers available
- Optional step rungs to BS EN 13101 and ladders to BS EN 14396
- Integral lifting points available on request to improve Health and Safety of handling and installation
- Stub connections and rocker pipes are available

Other fabrications in our RIDGISTORMSeperate range:

- Silt Traps
- Catchpits
- Weir and Baffle Chambers

wrc approved PT/348/0614

Performance

RIDGISTORMSeparate Filter Chambers are fabricated from Ridgistorm-XL pipework, which is manufactured to meet the material requirements of BS EN 13476:2007 (Part 1-3).

RIDGISTORMSEPARATE FILTER CHAMBERS	
PHYSICAL PROPERTIES	
Diameter	900-3000mm
Depth	To suit requirements
Material	HDPE
Colour	Black with blue Interior
Loading	Determined by structural design
Chemical resistance	HDPE is naturally resistant to most chemicals naturally found in stormwater run-off and uncontaminated ground
Inlets/outlets	100-3000mm

Our Ridgistorm-XL Fabrications range

All of our Ridgistorm-XL fabrications are tailor-made, fully-welded, water-tight structured wall chambers to suit project-specific requirements. Health and Safety benefits become apparent during handling and installation, due to our fabrications' strong but light in weight nature. In addition, off-site construction ensures uncompromised, high quality products being delivered to site ready-to-install, reducing installation time and costs.

For further information please contact our Technical Team on +44 (0) 1509 615100 or download our CAD Standard Details from our website www.polypipe.com/toolbox

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7.2 Polystorm-R Modular Cell

Polystorm-R Modular Cell

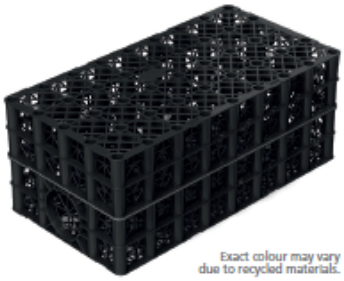
Data Sheet

PRODUCT INFORMATION **P1** **ISSUE 5 - JUNE 2018**

Product code: PSM1A

The Polystorm-R modular cell is ideally suited for loaded applications at greater depths, such as housing, commercial and infrastructure projects and has a compressive strength of up to 61 tonnes/m². It offers all the proven performance of the Polystorm cell, with the added benefits of being manufactured from over 90% recycled material content.

Wherever performance criteria and standards allow, we will always maximise the sustainability of our products by using post consumer plastics in their manufacture. By sourcing and carefully controlling the quality of the recycled material we use our precision injection moulding. Therefore we are able to guarantee consistent quality in our recycled plastic, giving you the confidence and the performance levels you expect from the market leader.



Exact colour may vary due to recycled materials.

Applications

The Polystorm-R modular cells are combined to form a structure that receives rainwater collected from roofs of surface drains. The rainwater is then either attenuated by the structure, when wrapped in an impermeable membrane, or infiltrated by the structure, when wrapped in a permeable geotextile.

Key Benefits

- Made from specially selected and controlled recycled materials
- Environmentally friendly, sustainable solution
- Has undergone stringent testing to ensure product performance
- Compressive strength of 61 tonnes/m²
- Ideal for retention, attenuation and infiltration applications with a suitable geomembrane or geotextile
- Designed for trafficked and loaded applications
- BBA approved
- Visual and maintenance access an be achieved when used in conjunction with Polystorm Access & Inspect
- Allow flexibility of shape – ideal for shallow excavation systems, narrow strips or use in restricted areas
- Can be used as part of a value engineered hybrid system with Polystorm, Polystorm Lite and Polystorm Xtra
- Integrated inlet and outlet
- 3D flow throughout the structure
- 95% void ratio
- Light in weight yet robust – excellent Health & Safety and installation benefits
- 100% recyclable
- 60 years creep limited life expectancy

ELEMENT	VALUE
PHYSICAL PROPERTIES	
Length	1m
Width	0.5m
Depth	0.4m
Total volume	0.2m³
Unit weight	9kg
Unit storage volume	0.19m³ (190 litres)
Void ratio	95%
SHORT TERM COMPRESSIVE STRENGTH	
Vertical	Maximum 610 kN/m² *
Lateral	Maximum 63 kN/m² *
SHORT TERM DEFLECTION	
Vertical	60 kN/m² per mm
Lateral	4.4 kN/m² per mm

Note: Polystorm-R is ideal for use in trafficked and pedestrian applications subject to a structural design check and suitable installation conditions

Each unit includes 4 Clips and 2 Shear Connectors.

* Compressive strength at yield, maximum recommended value for design purposes.

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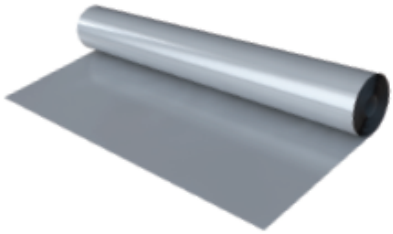
7.3 Permavoid Impermeable Geomembrane Liner

Permavoid Geomembrane

Data Sheet

PRODUCT INFORMATION P1 ISSUE 4 - NOV 2019

Geomembranes are impermeable liners used in sustainable drainage systems (SuDS) to form water tight tanks. The membrane used depends on a risk assessment of the site and the ground and groundwater conditions.



Applications

The Geomembrane is suitable for use in a range of applications including residential, industrial estates, swales, sports pitches, car parks, roofs, basements, pedestrian areas and rainwater harvesting.

Key Benefits

- Heavy duty polypropylene membrane
- Used to create a water-tight construction and minimise risk of subgrade softening
- 100% recyclable

Performance

A robust, heavy duty geomembrane resistant to puncture. Geomembrane combines excellent chemical resistance with low flexural modulus to provide a malleable, flexible membrane suitable for non-smooth surfaces and factory pre-fabrication to optimise on-site installation. Jointing shall be formed using fusion or extrusion bead welding in accordance with manufacturing recommendations. Double-sided tape may be used when specifically requested by the contractor.

Installation

For retention and attenuation applications the units need a sealed geomembrane to prevent the release of water and prevent the ingress of groundwater. All joints should be sealed, using proprietary techniques recommended by the manufacturer. Advice on seam testing procedures as given in CIRIA SP 124:1996. Barriers, lines and cover systems for containment and control of land contamination.

Technical Support

Detailed guidance and assistance is available.
For further information, please contact our Technical Team on +44 (0) 1509 615 100 or email civils@polypipe.com or visit www.polypipe.com/civils-technical-hub

ELEMENT	VALUE	TEST METHOD
PHYSICAL PROPERTIES		
Thickness mm ±10%	1.0	ASTN D-751
Density g/cm³ minimum	0.9	ASTM D-792
Tensile stress at break minimum N/mm²	18	ASTM D-638
Elongation at break %	>700	ASTM D-638
Puncture resistance minimum N	150	FTMS 101C method 2065
Tear resistance minimum N	60	ASTM D-104
Dimensional stability % change max	±2.0	ASTM D-1204 1hr at 100°C
Stress crack resistance	100%	ASTM 5397
Volatile loss 5% loss max	0.2	ASTM D-1203 method A
Ozone resistance	No cracks	ASTM D-1149
Carbon black content	2-3%	ASTM 1603
Moisture vapour g/m²/day	<0.1	ASTM E96
Friction angle (non woven Geotextile)	21°	Shear box
Methane permeability	0.11 g/m²/day/atm	European standard
Methane transmission rate	1.8×10^{-9} m³/m²/s/atm	BRE
Permeability coefficient	1.8×10^{-12}	
Core material	Polypropylene	

ROLL OPTIONS	
CODE & DESCRIPTION	DIMENSIONS
PV1301201 Geomembrane Roll	1m x 105m
PV1301202 Geomembrane Roll	2m x 105m
PV1301203 Geomembrane Roll	3m x 105m
PV1301204 Geomembrane Roll	4m x 105m
PV1301205 Geomembrane Roll	5m x 105m
PV13011 Double Sided Tape	100mm x 15m

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7.4 Permavoid Permatex 300 Geotextile

Permavoid Permatex 300

Data Sheet

PRODUCT INFORMATION **P1** **ISSUE 4 - OCT 2018**

Product code: PV23010, PV23011

A heavy duty, non-woven, needle punched, polypropylene geotextile designed to protect and separate Permavoid geocellular layers. Comprising of a three-layer composite scrim reinforced with low elongation. 300mm lap-jointing is required.

Key Benefits

- Separation
- Protection

Installation

Permatex protection geotextile shall be laid around the attenuation/ infiltration layer to suit site specific requirements. Overlaps shall be a minimum of 300mm or heat sealed. Ensure geotextile is clean and debris free before installing Permavoid.

Technical Support

Detailed guidance and assistance is available.
For further information, please contact our Technical Team on **+44 (0) 1509 615 100** or email **civils@polypipe.com** or visit **www.polypipe.com/civils-technical-hub**

ELEMENT	VALUE	TEST METHOD
PHYSICAL PROPERTIES		
Roll length	100m	
Roll width	3m / 6m	
Mass per unit area	285g/sq.m	EN ISO 9864
Thickness under load 2kPa	2.6mm	EN ISO 9863-1
CBR puncture resistance	3300N	EN ISO 12236
Dynamic cone drop	16mm	EN ISO 13433
Tensile strength (min) at max. load	22kN/m	EN ISO 10319
Tensile extension (max) at max. load	80%	EN ISO 10319
Coefficient of permeability	65 x 10-3m/s	EN ISO 11058
Characteristic opening size	90 microns	EN ISO 12956

Permavoid Permatex 300 can be utilised in these SuDS techniques

TECHNIQUES												
Blue-Green roofs	Podium Decks	Trees	Sports Pitches	Cycle Paths	Permeable Paving (sub base & podium)	Bioretention & Rain Gardens	Attenuation Storage Tanks	Infiltration	Swales	Filter Drains	Detention Basins	Ponds & Wetlands	Filter Strips
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				

Visit **www.polypipe.com/greeninfrastructure**

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8.0 SUMMARY

8.1 The surface water system is designed in accordance with CIRIA C753 v3 The SuDS Manual. The SuDS system shall accommodate the 1:100 year return period + 40% climate change.

8.2 The above calculations demonstrate that 11.1m3 of storm water storage is required when the surface water runoff is restricted to 2.0 litres per second. This storage is contained within a 4m x 7.5m x 0.4m deep attenuation tank.

8.3 The surface water discharge from the site is to be restricted to 2.0 litres per second, through a 35Ømm orifice, which is protected by a filter to prevent blockage.

8.4 It is our recommendation that the maximum discharge from this site should be increased to 3.0 litres per second, as agreed with Thames Water (refer section 2.13 above). The orifice size would be 44Ømm; this larger size is less likely to block.