

Stage 1 Letter

18.10.2022

Location: Reading

Stage 1 Blue Roof Design, 138-144 Friar Street, RG1 1EX

EPG has undertaken a review of the design at the above address and would offer the following comments:

- The contributing areas are included in Table 1 (provided by the client).
- The allowable run-off rate is “as low as practicable” based on the storage available as outlined in Table 1. This is set by the minimum orifice diameter of 20mm.
- The following calculations are based on using the Permavoid system as manufactured by Polypipe Civils Ltd. The calculations will be based on the Critical Duration Storm Event of 100-year storm event with an additional 40% allowance for climate change.
- The FEH calculation methodology has been used for rainfall modelling.
- We have assumed that the area available for the blue roof is equivalent to approximately 80% of the given storage area. This conservative estimate will account for gravel surround, access vents and other areas where Permavoid may not be positioned. This will be refined at the next design stage.
- It is noted that the proposals are for a brown roof design, we would recommend green roofs to gain the benefits of biodiversity, cooling/insulation as well as rainwater uptake and evapotranspiration.
- It is noted the intention of using the roofs for PV panels. We would recommend that photovoltaic panels are accompanied by green/blue roofs to create a BioSOLAR system. Evapotranspiration via a vegetated roof creates a microclimate that has a cooling effect which increases the efficiency of solar power generation.

The Environmental Protection Group Limited

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- The use of a wicking geotextile is recommended to provide passive irrigation to the blue/green roof, provide localised cooling, further mitigate the urban heat island effect, and reduce maintenance requirements and costs for a healthy vegetative layer. This is of particular importance as we continue to witness high temperatures in increasing frequency, caused by the ongoing climate crisis.

Table 1: Catchment Areas & Outline Design

Catchment Areas						
Roof Notes	A	B	C	D	E	F
Catchment Area,	671m ²	79m ²	122m ²	37m ²	46m ²	32m ²
Storage Area	540m ²	63m ²	101m ²	30m ²	41m ²	24m ²
Permavoid Area (80% of storage area)	432m ²	50m ²	80m ²	24m ²	32m ²	19m ²
Permavoid Tank Design						
Permavoid Depth	150mm	150mm	150mm	150mm	150mm	150mm
Orifice Diameter Ø	20mm	20mm	20mm	20mm	20mm	20mm
Rate	0.3 l/s	0.2 l/s	0.3 l/s	0.2 l/s	0.2 l/s	0.2 l/s

- The above results in a total outfall rate of **1.4 l/s**. The supporting hydraulic calculations are included in Appendix A and will be refined at the next design stage.
- The Permavoid attenuation system is a specialist system with dedicated components that have all been designed to work holistically as a structural attenuation system in conjunction with proposed waterproofing and surface finishes of roofs and podiums. The Permavoid blue roof element is made up of 85mm and 150mm interlocking geocellular units that can be combined to produce deeper attenuation systems (85mm, 150mm, 235mm, 300mm, 450mm, etc.).

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- The Permavoid incorporates high compressive strength and bending resistance within joints to create a horizontal structural ‘raft’ that is ideal for shallow attenuation of rainwater, particularly within loaded and trafficked areas. The modules have a very high void ratio (95%) to achieve highly efficient water storage capacity. The Permavoid components have been specifically designed to work with the blue roof system and includes, Outlets inspection chambers, Overflow inspection chambers, RWP diffuser catchpit chambers, treatment channels and gullies to name but a few.
- Calculations have been based on flat roof with no fall. EPG does not recommend to design green/blue roofs or podiums to a fall as it significantly compromises the storage and results in increased flow rates.
- The key principle of the Permavoid attenuation system is the SuDS treatment train. The Treatment train as set out in the SuDS Manual (co-authored by EPG Director Steve Wilson) states that silts and other contamination should be managed at source. Using the RWP catchpits, the outlet and inlet chambers/diffuser units capture silt and treat water at source. This minimises the risk of blockage and by extension the risk of surface flooding.
- The Permavoid system has undergone full hydraulic and structural testing, to allow the project engineer and architect(s) to develop the attenuation system and landscape finishes with confidence.

Trust this is of assistance.



Heather Palmer-Jones

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Appendix A – Hydraulic Calculations

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Project:	Date: 18/10/2022		
	Designed by: h.palmerjones	Checked by:	Approved By:
Report Details: Type: Inflows Storm Phase: Phase	Company Address:		



B area

Type : Catchment Area

Area (m²)	79.00
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Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	1.000
Winter Volumetric Runoff	1.000
Time of Concentration (mins)	5
Percentage Impervious (%)	100



C area

Type : Catchment Area

Area (m²)	122.00
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Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	1.000
Winter Volumetric Runoff	1.000
Time of Concentration (mins)	5
Percentage Impervious (%)	100



D area

Type : Catchment Area

Area (m²)	37.00
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Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	1.000
Winter Volumetric Runoff	1.000
Time of Concentration (mins)	5
Percentage Impervious (%)	100



E area

Type : Catchment Area

Area (m²)	46.00
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Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	1.000
Winter Volumetric Runoff	1.000
Time of Concentration (mins)	5
Percentage Impervious (%)	100

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F area

Type : Catchment Area

Area (m²)	32.00
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Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	1.000
Winter Volumetric Runoff	1.000
Time of Concentration (mins)	5
Percentage Impervious (%)	100



A area

Type : Catchment Area

Area (m²)	671.00
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Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	1.000
Winter Volumetric Runoff	1.000
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Project:	Date: 18/10/2022			
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Report Details:	Company Address:			
Type: Stormwater Controls Storm Phase: Phase				



B Tank

Type : Tank

Dimensions

Exceedence Level (m)	10.000
Depth (m)	0.190
Base Level (m)	9.810
Freeboard (mm)	40
Initial Depth (m)	0.000
Porosity (%)	95
Average Slope (1:x)	0.00
Total Volume (m³)	7.125

Depth (m)	Area (m²)	Volume (m³)
0.000	50.00	0.000
0.150	50.00	7.125

Inlets

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	B area
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	(None)
Outlet Type	Orifice
Diameter (m)	0.020
Coefficient of Discharge	0.600
Invert Level (m)	9.810

Advanced

Perimeter	Circular
Length (m)	9.269

Project:	Date: 18/10/2022			
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Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:			



C Tank

Type : Tank

Dimensions

Exceedence Level (m)	10.000
Depth (m)	0.190
Base Level (m)	9.810
Freeboard (mm)	40
Initial Depth (m)	0.000
Porosity (%)	95
Average Slope (1:x)	0.00
Total Volume (m³)	11.400

Depth (m)	Area (m²)	Volume (m³)
0.000	80.00	0.000
0.150	80.00	11.400

Inlets

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	C area
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	(None)
Outlet Type	Orifice
Diameter (m)	0.020
Coefficient of Discharge	0.600
Invert Level (m)	9.810

Advanced

Perimeter	Circular
Length (m)	9.269

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Report Details:	Company Address:			
Type: Stormwater Controls Storm Phase: Phase				



D Tank

Type : Tank

Dimensions

Exceedence Level (m)	10.000
Depth (m)	0.190
Base Level (m)	9.810
Freeboard (mm)	40
Initial Depth (m)	0.000
Porosity (%)	95
Average Slope (1:x)	0.00
Total Volume (m³)	3.420

Depth (m)	Area (m²)	Volume (m³)
0.000	24.00	0.000
0.150	24.00	3.420

Inlets

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	D area
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	(None)
Outlet Type	Orifice
Diameter (m)	0.020
Coefficient of Discharge	0.600
Invert Level (m)	9.810

Advanced

Perimeter	Circular
Length (m)	9.269

Project:	Date: 18/10/2022			
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Report Details:	Company Address:			
Type: Stormwater Controls Storm Phase: Phase				



E Tank

Type : Tank

Dimensions

Exceedence Level (m)	10.000
Depth (m)	0.190
Base Level (m)	9.810
Freeboard (mm)	40
Initial Depth (m)	0.000
Porosity (%)	95
Average Slope (1:x)	0.00
Total Volume (m³)	4.560

Depth (m)	Area (m²)	Volume (m³)
0.000	32.00	0.000
0.150	32.00	4.560

Inlets

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	E area
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	(None)
Outlet Type	Orifice
Diameter (m)	0.020
Coefficient of Discharge	0.600
Invert Level (m)	9.810

Advanced

Perimeter	Circular
Length (m)	9.269

Project:	Date: 18/10/2022			
	Designed by: h.palmerjones	Checked by:	Approved By:	
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:			



F Tank

Type : Tank

Dimensions

Exceedence Level (m)	10.000
Depth (m)	0.190
Base Level (m)	9.810
Freeboard (mm)	40
Initial Depth (m)	0.000
Porosity (%)	95
Average Slope (1:x)	0.00
Total Volume (m³)	2.707

Depth (m)	Area (m²)	Volume (m³)
0.000	19.00	0.000
0.150	19.00	2.708

Inlets

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	F area
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	(None)
Outlet Type	Orifice
Diameter (m)	0.020
Coefficient of Discharge	0.600
Invert Level (m)	9.810

Advanced

Perimeter	Circular
Length (m)	9.269

Project:	Date: 18/10/2022			
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Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:			



A Tank

Type : Tank

Dimensions

Exceedence Level (m)	10.000
Depth (m)	0.190
Base Level (m)	9.810
Freeboard (mm)	40
Initial Depth (m)	0.000
Porosity (%)	95
Average Slope (1:x)	0.00
Total Volume (m³)	61.560

Depth (m)	Area (m²)	Volume (m³)
0.000	432.00	0.000
0.150	432.00	61.560

Inlets

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	A area
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	(None)
Outlet Type	Orifice
Diameter (m)	0.020
Coefficient of Discharge	0.600
Invert Level (m)	9.810

Advanced

Perimeter	Circular
Length (m)	9.269

Project:	Date: 18/10/2022		
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Critical Storm

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
B Tank	FEH: 100 years: +40 %: 240 mins: Summer	9.903	9.903	0.093	0.093	1.7	4.413	0.000	0.000	0.2	4.658	38	OK
C Tank	FEH: 100 years: +40 %: 240 mins: Winter	9.910	9.910	0.100	0.100	1.7	7.600	0.000	0.000	0.3	5.235	33	OK
D Tank	FEH: 100 years: +40 %: 120 mins: Summer	9.885	9.885	0.075	0.075	1.3	1.709	0.000	0.000	0.2	1.958	50	OK
E Tank	FEH: 100 years: +40 %: 120 mins: Summer	9.885	9.885	0.075	0.075	1.6	2.265	0.000	0.000	0.2	2.080	50	OK
F Tank	FEH: 100 years: +40 %: 120 mins: Summer	9.888	9.888	0.078	0.078	1.1	1.400	0.000	0.000	0.2	1.857	48	OK
A Tank	FEH: 100 years: +40 %: 960 mins: Winter	9.951	9.951	0.141	0.141	3.0	57.704	0.000	0.000	0.3	26.303	6	OK