

Job Ref: 23-211

05/09/2023

Planning/Environmental Dept,
South Dublin County Council,
County Hall,
Tallaght,
Dublin

Re: Conditions to Grant for the Planning Ref. No. SD21A/0246

Applicant: Beckett Developments Ltd.

Site Address: Palmyra, Whitechurch Road, Rathfarnham, Dublin 16

To Whom it Concerns,

This is to state that Hydrocare Environmental Ltd. has been retained by the applicant to issue a response to Item 7 of the conditions to grant planning permission for the proposed development, ref. no. SD21A/0246. The proposed development will consist of the construction of 8 houses, all associated on and off development works, landscaping, boundary treatments, removal of existing street boundary screen wall and the provision of vehicular and pedestrian access to an infill site of ca. 0.226Ha. at Grangebrook Avenue, Palmyra, Whitechurch Road, Rathfarnham, Dublin 16.

This is an update to a previously lodged response to Condition 7 for this development under the reference number SD21A/0246. The previous response to Condition 7 was deemed non-compliant for the reason outlined below.

"The applicant failed to achieve a pre-development greenfield run-off rate with proposed design in this submission. The applicant proposed 8 tree pits (which were not included in the calculation) and permeable pavement or underground attenuation tank."

In response to this it has been proposed to reduce the outfall flow rate for each individual dwelling to 0.2l/s. This will reduce the overall outfall flow rate from this development site to 1.6l/s. It has also been proposed to remove the tree-pits from the rear of the dwellings and replace them with an above ground nature-based SuDS system comprised of water butts and planter boxes with overflow connection to the gravel base attenuation blanket underlying the proposed permeable paving.

7(a) Please see appended herewith the Stormwater Drainage Report detailing surface water attenuation calculations for the proposed development. This report details the total permeable and impermeable surfaces, the SuDS features, and the attenuation volume required for each of the 8 no. dwellings.

7(b) Please see appended herewith the Stormwater Drainage Report which includes a layout drawing and long section of the proposed SUDS features for this development.

7(c) The greenfield runoff rate for this development site is 1.48l/s. It is proposed to restrict the individual outfall flow rates each dwelling to 0.2l/s. In total the outfall flow rate from this development site will be reduced to 1.6l/s.

Prior to submission of this revised stormwater drainage proposal, contact was established with Mr. Brian Harkin (Engineer) South Dublin County Council over the phone on 01/09/2023 who stated that the revised proposal seems acceptable in principle.

We hope the above is to your satisfaction.

Yours sincerely,



Daniel Nolan, BA BAI, MSc Environmental Engineering, FETAC Site Assessor, MIEI

Stormwater Drainage Proposal

Applicant: Beckett Developments Ltd.

Site Location:

Palmyra, Whitechurch Road, Rathfarnham, Co. Dublin

Date of Report: 5th September 2023

Prepared By:

HYDRO**CARE**
ENVIRONMENTAL LTD

Document Control Sheet

Project No.: 23-211

Project Title: Beckett Developments Ltd., Palmyra, Whitechurch Road, Rathfarnham,
Dublin 16

Revision: A

Status: FINAL

Prepared By: Adrian Bacaoanu, *MSc. Sust. Energy Engineering, BSc. Applied Physics*

Checked By: Daniel Nolan, *BA BAI, Msc Environmental Engineering, FETAC Site Assessor, MIEI*

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1.1 Introduction

Hydrocare Environmental Ltd, has been retained by the applicant to revise and design a new surface water drainage proposal for a development site at Palmyra, Whitechurch Road, Rathfarnham, Dublin 16 in response to Items 7(a), 7(b), & 7(c) of the Conditions to Grant, Planning Ref. No. SD21A/0246.

The proposed development will consist of the construction of 8 houses comprising of 1 three-bedroom two storey detached, Type B1 (c. 122sq.m) Site 1, 1 four bedroom 2 storey detached type B2 (c.134sq.m) Site 2, 6 four bedroom 2 storey semidetached Type A1 (c.148sq.m) Sites 3-8 inclusive, all associated on and off site development works, landscaping, boundary treatments, removal of existing street boundary screen wall and the provision of vehicular and pedestrian access to Grangebrook Avenue on infill site of circa 0.226Ha.

1.2 Stormwater Design Parameters & Considerations

At present the proposed development is a greenfield site which consists largely of trees and open grass areas.

Soakaways could not be designed to cater for the surface water runoff from the impermeable site areas. Due to the constrained nature of this development site and the BRE Digest 365 requirement for a 5m separation distance from foundations, discharge to the ground via soakaways could not be achieved. Additionally, soil infiltration tests carried out by Ground Investigations Ireland Ltd. shows that *“At all locations the water level dropped too slowly to allow calculation of ‘f’ the soil infiltration rate. These locations are therefore not recommended as suitable for soakaway design and construction.”* The ground investigation report has been attached herewith.

To cater for the surface water runoff from this proposed development, it is proposed to install individual surface water drainage systems sized to cater for the runoff from impermeable surfaces of each of the 8 no. dwellings. Each dwelling will have surface water drainage system with a separate controlled outfall to the public surface water drain available locally. The rationale for individual controlled outfalls at each house was because there will be no common area within this development to locate a ‘shared/common’ surface

water drainage system and flow control device. This development will consist of the 8 individual private sites which will be accessed off the existing public estate road/ footpath. This is an infill site and therefore there is no other public open space or remaining common area.

The surface water drainage system of each house will outfall to the public stormwater sewer available locally. The outfall flow rate for each dwelling site will be controlled to 0.2l/s. Therefore, the total outfall flow rate from this development will be 1.6l/s. The IH124 Greenfield Runoff Rate for this entire development site is 1.48l/s.

Item 7(c) of the Condition to Grant for this development, ref. no. SD21A/0246 states: *Show in a report and drawing what the maximum surface water discharge rate will be from the overall site. The report shall demonstrate that the discharge rate will not be more than 2 litres/sec/hectare or greenfield run off rate whichever is greater from the entire site.*

This is significantly less than the outfall flow rate for each site compared to the surface water drainage system previously designed by others for this development under the ref. no. SD21A/0246. Restricting the outfall flow rate to 0.2l/s is very small and thus increases the risk of blockage of the flow control device due to debris. This requires regular inspection and maintenance as outlined in the Maintenance Schedule section of this report.

Based on the CIRIA C753 SuDS Manual 2015, the following Runoff Coefficient will be applied.

- Pitched Roof with Tiles: 0.90
- Road/Pavement: 0.75
- Permeable Pavement: 0.60

This will reduce the effective impermeable areas for the purposes of calculating the rainwater runoff from each individual site.

TABLE 11.4 Suggested initial runoff coefficients for RWH yield analysis (from BS 8515:2009+A1:2013)

Surface type	Runoff coefficient
Pitched roof with profiled metal sheeting	0.95
Pitched roof with tiles	0.90
Flat roof without gravel	0.80
Flat roof with gravel	0.60
Green roof, intensive ¹	0.30
Green roof, extensive ¹	0.60
Permeable pavement (concrete blocks) ²	0.60
Road/pavement	0.75

Note

- 1 Green roof runoff yield is particularly uncertain and varies with season. There may also be negative colouration impacts.
- 2 This reflects the proportion of rainfall that finds its way through the overlying surface to subsurface collection points for RWH.

Figure 1 – Runoff Coefficients per CIRIA C753 SuDS Manual 2015

1.3 Site Characteristics

1.3.1 Breakdown of Impermeable Surfaces

Dwelling Site 1:

- Total Site Area: 273m²
- Total Roof Area: 79.2m²
- Impermeable Footpath Area: 29.4m²
- Permeable Paving Area: 89.1m²
- Remaining Permeable Green Area: 75.3m²
- Effective Total Impermeable Area: 146.79m²

Dwelling Site 2:

- Total Site Area: 315.8m²
- Total Roof Area: 99.3m²
- Impermeable Footpath Area: 28.1m²
- Permeable Paving Area: 62.5m²
- Remaining Permeable Green Area: 125.9m²
- Effective Total Impermeable Area: 147.95m²

Dwelling Site 3:

- Total Site Area: 261.2m²
- Total Roof Area: 92.8m²
- Impermeable Footpath Area: 23.9m²
- Permeable Paving Area: 67.4m²
- Remaining Permeable Green Area: 77.1m²
- Effective Total Impermeable Area: 141.89m²

Dwelling Site 4:

- Total Site Area: 271.3m²
- Total Roof Area: 92.8m²
- Impermeable Footpath Area: 24m²
- Permeable Paving Area: 74.1m²
- Remaining Permeable Green Area: 80.4m²
- Effective Total Impermeable Area: 145.98m²

Dwelling Site 5:

- Total Site Area: 269.8m²
- Total Roof Area: 93.3m²
- Impermeable Footpath Area: 19.9m²
- Permeable Paving Area: 56.6m²
- Remaining Permeable Green Area: 100m²
- Effective Total Impermeable Area: 132.86m²

Dwelling Site 6:

- Total Site Area: 269.7m²
- Total Roof Area: 92.2m²
- Impermeable Footpath Area: 25.5m²
- Permeable Paving Area: 53.1m²
- Remaining Permeable Green Area: 98.9m²
- Effective Total Impermeable Area: 133.97m²

Dwelling Site 7:

- Total Site Area: 303.1m²
- Total Roof Area: 80.2m²
- Impermeable Footpath Area: 27.9m²
- Permeable Paving Area: 77.7m²
- Remaining Permeable Green Area: 117.3m²
- Effective Total Impermeable Area: 139.73m²

Dwelling Site 8:

- Total Site Area: 280.2m²
- Total Roof Area: 80.6m²
- Impermeable Footpath Area: 37.1m²
- Permeable Paving Area: 60.4m²
- Remaining Permeable Green Area: 102.1m²
- Effective Total Impermeable Area: 136.61m²

1.4 Design Proposal

Soakaways could not be designed to manage the surface water runoff from this development. It is proposed to install permeable paving with an underlying gravel attenuation blanket at each proposed new dwelling house. The permeable paving will be a Kilsaran Clima-Pave System A Load Category 2 or similar approved system. This system will have a 0.65m(D) underlying gravel bed with a permeable geotextile at the base allowing some infiltration to the ground during regular rainfall events. Each permeable paving system will discharge to the public surface water drainage system at a controlled outfall flow rate restricted to 0.2l/s. The calculations for the gravel attenuation blanket underlying the permeable paving conservatively assume that no surface water will infiltrate to the ground through the base of the system.

The proposed attenuation system will manage the surface water runoff which arises from this development for the peak rainfall event during the 1 in 100-year return period. This includes a 20% allowance for climate change.

Additionally, it is proposed to install nature based above ground SuDS features in the form of rainwater harvesting systems. It is proposed that each dwelling will have two rainwater harvesting systems located at the rear of the development. The rainwater harvesting systems will be composed of water butts with an overflow to a planter box which in turn will have an overflow to the proposed gravel attenuation blanket underlying the permeable paving. This will cater for the surface water arising from the roof areas of this development during regular rainfall events, thus limiting the outfall to the public storm drain.

However, it must be assumed that the rainwater harvesting systems are full during the critical storm event and that they will have limited attenuation volume capacity. Therefore, the gravel filled attenuation blanket underlying the permeable paving will be sized to cater for the surface water runoff from all impermeable surfaces during the peak rainfall event during the 100-year return period. This includes the roof areas, footpaths, and the permeable paving. The base of the underlying attenuation gravel blanket will be permeable, allowing for some infiltration to the ground within the site boundary thus also providing additional source control and nature-based SuDS.

1.5 Design Calculations

The surface water drainage is to include:

- Total attenuation of runoff waters will be for the critical 100-year rainfall return period with 20% allowance for climate change.
- The outfall flow control for each dwelling house will be restricted to 0.2l/s.
- Each dwelling is to include 2 rainwater harvesting systems comprised of a water butt and planter box each, for additional storage, drainage, and source control. The additional storage volume afforded by these systems is not included in the attenuation volume calculations.

1.5.1 Greenfield Runoff Rate

IH124 Greenfield Runoff Rate Calculation

Friday 10 March 2023

Client: Beckett Developments Ltd.
 Site Location: Palmyra, Whitechurch Road, Rathfarnham, Co. Dublin
 Agent: Terry & O’Flanagan Ltd., F1, Centrepoint Business Park, Oak Road, Dublin 12

The IH124 method was specifically introduced as an update to the original Flood Studies Report (1975) to address the runoff from small catchments (CIRIA C697 and IH124)

$$Q_{\text{BAR RURAL}} (\text{m}^3/\text{s}) = 0.00108 \text{ AREA}^{0.89} \times \text{SAAR}^{1.17} \times \text{SOIL}^{2.17}$$

- $Q_{\text{BAR RURAL}}$ is the mean annual flood flow from a rural catchment (43% AEP or 2.3 year return period).
- AREA is the area of the catchment (km^2)
- SAAR is the standard average annual rainfall
- SOIL is the Soil Index, $\text{SOIL} = 0.1 \text{ Soil1} + 0.3 \text{ Soil2} + 0.37 \text{ Soil3} + 0.47 \text{ Soil4} + 0.53 \text{ Soil5}$
- The soil type is selected based on the Flood Studies or the Wallingford Procedure WRAP maps.

Inputs

AREA: 0.2265 Ha Site AREA is 0.2265Ha. As site is <50Ha, use 50Ha
 SAAR: 907 mm Grid Reference E:314473 N:226367 - Met Eireann Mean Annual Rainfall Data
 Soil: 0.47 FSR SPR value for SOIL type 4 is 0.47

Outputs

$Q_{\text{BAR RURAL}}$ (l/s/Ha)- 6.54
 Site Area (Ha)- 0.2265
 $Q_{\text{BAR RURAL}}$ (l/s)- 1.48

	l/s
$Q_1 =$	1.26
$Q_{30} =$	3.11
$Q_{100} =$	3.86

Growth Curve Factors (GDSDS)	
Return Period (years)	Growth Curve Factor
1	0.85
Q_{BAR}	1
10	1.7
30	2.1
100	2.61
200	2.9

1.5.2 Dwelling Site 1 Calculations

Return Period (Years):		Dwelling Site 1									
Impermeable Area (m ²):		Required Attenuation Volume									
Controlled Outflow (l/s):		<i>Client: Beckett Developments Ltd.</i>									
Climate Change Increase Allowance:		<i>Site Location: Palmyra, Whitechurch Road, Rathfarnham, Co. Dublin</i>									
		<i>Agent: Terry & O'Flanagan Ltd., F1, Centrepoint Business Park, Oak Road, Dublin 12</i>									
Return Period (Years):	100										
Impermeable Area (m ²):	146.79										
Controlled Outflow (l/s):	0.2										
Climate Change Increase Allowance:	20%										
Duration (time)	Duration (secs)	Rainfall Depth (mm)	Rainfall Depth Incl. Climate Change (mm)	Rainfall Intensity (mm/s)	Inflow Rate (m ³ /s)	Inflow Rate (l/s)	Overflow Flow Rate (l/s)	Storage Rate (l/s)	Storage Volume (Litres)	Storage Volume (m ³)	
5 mins	300	19	22.8	0.07600	0.01116	11.16	0.2	10.96	3286.812	3.286812	
10 mins	600	26.5	31.8	0.05300	0.00778	7.78	0.2	7.58	4547.922	4.547922	
15 mins	900	31.1	37.32	0.04147	0.00609	6.09	0.2	5.89	5298.203	5.298203	
30 mins	1,800	39	46.8	0.02600	0.00382	3.82	0.2	3.62	6509.772	6.509772	
1 hours	3,600	48.9	58.68	0.01630	0.00239	2.39	0.2	2.19	7893.637	7.893637	
2 hours	7,200	61.3	73.56	0.01022	0.00150	1.50	0.2	1.30	9357.872	9.357872	
3 hours	10,800	69.9	83.88	0.00777	0.00114	1.14	0.2	0.94	10152.75	10.15275	
4 hours	14,400	76.8	92.16	0.00640	0.00094	0.94	0.2	0.74	10648.17	10.64817	
6 hours	21,600	87.6	105.12	0.00487	0.00071	0.71	0.2	0.51	11110.56	11.11056	
9 hours	32,400	100	120	0.00370	0.00054	0.54	0.2	0.34	11134.8	11.1348	
12 hours	43,200	109.8	131.76	0.00305	0.00045	0.45	0.2	0.25	10701.05	10.70105	
18 hours	64,800	125.4	150.48	0.00232	0.00034	0.34	0.2	0.14	9128.959	9.128959	
24 hours	86,400	137.7	165.24	0.00191	0.00028	0.28	0.2	0.08	6975.58	6.97558	

Dwelling Site 1

Required Storage for 1 in 100 year Peak Rainfall Event:

11.13 m³ See Attenuation Volume Calculation Overleaf

Proposed Attenuation System

Gravel Filled Attenuation Blanket

Void Ratio: 30%

Permeable Paving

Surface Area 89.1 m²

Depth: 0.65 m

Total Volume: 17.37 m³

Proposed Storage Volume is Sufficient

1.5.3 Dwelling Site 2 Calculations

Return Period (Years):	100
Impermeable Area (m ²):	147.95
Controlled Outflow (l/s):	0.2
Climate Change Increase Allowance:	20%

Dwelling Site 2

Required Attenuation Volume

Client: Beckett Developments Ltd.

Site Location: Palmyra, Whitechurch Road,
Rathfarnham, Co. Dublin

Agent: Terry & O'Flanagan Ltd., F1, Centrepoint
Business Park, Oak Road, Dublin 12

Duration (time)	Duration (secs)	Rainfall Depth (mm)	Rainfall Depth Incl. Climate Change (mm)	Rainfall Intensity (mm/s)	Inflow Rate (m ³ /s)	Inflow Rate (l/s)	Overflow Flow Rate (l/s)	Storage Rate (l/s)	Storage Volume (Litres)	Storage Volume (m ³)
5 mins	300	19	22.8	0.07600	0.01124	11.24	0.2	11.04	3313.26	3.31326
10 mins	600	26.5	31.8	0.05300	0.00784	7.84	0.2	7.64	4584.81	4.58481
15 mins	900	31.1	37.32	0.04147	0.00613	6.13	0.2	5.93	5341.494	5.341494
30 mins	1,800	39	46.8	0.02600	0.00385	3.85	0.2	3.65	6564.06	6.56406
1 hours	3,600	48.9	58.68	0.01630	0.00241	2.41	0.2	2.21	7961.706	7.961706
2 hours	7,200	61.3	73.56	0.01022	0.00151	1.51	0.2	1.31	9443.202	9.443202
3 hours	10,800	69.9	83.88	0.00777	0.00115	1.15	0.2	0.95	10250.05	10.25005
4 hours	14,400	76.8	92.16	0.00640	0.00095	0.95	0.2	0.75	10755.07	10.75507
6 hours	21,600	87.6	105.12	0.00487	0.00072	0.72	0.2	0.52	11232.5	11.2325
9 hours	32,400	100	120	0.00370	0.00055	0.55	0.2	0.35	11274	11.274
12 hours	43,200	109.8	131.76	0.00305	0.00045	0.45	0.2	0.25	10853.89	10.85389
18 hours	64,800	125.4	150.48	0.00232	0.00034	0.34	0.2	0.14	9303.516	9.303516
24 hours	86,400	137.7	165.24	0.00191	0.00028	0.28	0.2	0.08	7167.258	7.167258

Dwelling Site 2

Required Storage for 1 in 100 year Peak Rainfall Event:

11.27 m³

See Attenuation Volume Calculation Overleaf

Proposed Attenuation System

Gravel Filled Attenuation Blanket

Void Ratio: 30%

Permeable Paving

Surface Area 62.5 m²

Depth: 0.65 m

Total Volume: 12.19 m³

Proposed Storage Volume is Sufficient

1.5.5 Dwelling Site 4 Calculations

Return Period (Years):	100
Impermeable Area (m ²):	145.98
Controlled Outflow (l/s):	0.2
Climate Change Increase Allowance:	20%

Dwelling Site 4

Required Attenuation Volume

Client: Beckett Developments Ltd.

Site Location: Palmyra, Whitechurch Road,
Rathfarnham, Co. Dublin

Agent: Terry & O'Flanagan Ltd., F1, Centrepoint
Business Park, Oak Road, Dublin 12

Duration (time)	Duration (secs)	Rainfall Depth (mm)	Rainfall Depth Incl. Climate Change (mm)	Rainfall Intensity (mm/s)	Inflow Rate (m ³ /s)	Inflow Rate (l/s)	Overflow Flow Rate (l/s)	Storage Rate (l/s)	Storage Volume (Litres)	Storage Volume (m ³)
5 mins	300	19	22.8	0.07600	0.01109	11.09	0.2	10.89	3268.344	3.268344
10 mins	600	26.5	31.8	0.05300	0.00774	7.74	0.2	7.54	4522.164	4.522164
15 mins	900	31.1	37.32	0.04147	0.00605	6.05	0.2	5.85	5267.974	5.267974
30 mins	1,800	39	46.8	0.02600	0.00380	3.80	0.2	3.60	6471.864	6.471864
1 hours	3,600	48.9	58.68	0.01630	0.00238	2.38	0.2	2.18	7846.106	7.846106
2 hours	7,200	61.3	73.56	0.01022	0.00149	1.49	0.2	1.29	9298.289	9.298289
3 hours	10,800	69.9	83.88	0.00777	0.00113	1.13	0.2	0.93	10084.8	10.0848
4 hours	14,400	76.8	92.16	0.00640	0.00093	0.93	0.2	0.73	10573.52	10.57352
6 hours	21,600	87.6	105.12	0.00487	0.00071	0.71	0.2	0.51	11025.42	11.02542
9 hours	32,400	100	120	0.00370	0.00054	0.54	0.2	0.34	11037.6	11.0376
12 hours	43,200	109.8	131.76	0.00305	0.00045	0.45	0.2	0.25	10594.32	10.59432
18 hours	64,800	125.4	150.48	0.00232	0.00034	0.34	0.2	0.14	9007.07	9.00707
24 hours	86,400	137.7	165.24	0.00191	0.00028	0.28	0.2	0.08	6841.735	6.841735

Dwelling Site 4

Required Storage for 1 in 100 year Peak Rainfall Event:

11.04 m³

See Attenuation Volume Calculation Overleaf

Proposed Attenuation System

Gravel Filled Attenuation Blanket

Void Ratio: 30%

Permeable Paving

Surface Area 74.1 m²

Depth: 0.65 m

Total Volume: 14.45 m³

Proposed Storage Volume is Sufficient

1.5.9 Dwelling Site 8 Calculations

Return Period (Years):	100
Impermeable Area (m ²):	136.61
Controlled Outflow (l/s):	0.2
Climate Change Increase Allowance:	20%

Dwelling Site 8

Required Attenuation Volume

Client: Beckett Developments Ltd.

Site Location: Palmyra, Whitechurch Road,
Rathfarnham, Co. Dublin

Agent: Terry & O'Flanagan Ltd., F1, Centrepoint
Business Park, Oak Road, Dublin 12

Duration (time)	Duration (secs)	Rainfall Depth (mm)	Rainfall Depth Incl. Climate Change (mm)	Rainfall Intensity (mm/s)	Inflow Rate (m ³ /s)	Inflow Rate (l/s)	Overflow Flow Rate (l/s)	Storage Rate (l/s)	Storage Volume (Litres)	Storage Volume (m ³)
5 mins	300	19	22.8	0.07600	0.01038	10.38	0.2	10.18	3054.708	3.054708
10 mins	600	26.5	31.8	0.05300	0.00724	7.24	0.2	7.04	4224.198	4.224198
15 mins	900	31.1	37.32	0.04147	0.00566	5.66	0.2	5.46	4918.285	4.918285
30 mins	1,800	39	46.8	0.02600	0.00355	3.55	0.2	3.35	6033.348	6.033348
1 hours	3,600	48.9	58.68	0.01630	0.00223	2.23	0.2	2.03	7296.275	7.296275
2 hours	7,200	61.3	73.56	0.01022	0.00140	1.40	0.2	1.20	8609.032	8.609032
3 hours	10,800	69.9	83.88	0.00777	0.00106	1.06	0.2	0.86	9298.847	9.298847
4 hours	14,400	76.8	92.16	0.00640	0.00087	0.87	0.2	0.67	9709.978	9.709978
6 hours	21,600	87.6	105.12	0.00487	0.00066	0.66	0.2	0.46	10040.44	10.04044
9 hours	32,400	100	120	0.00370	0.00051	0.51	0.2	0.31	9913.2	9.9132
12 hours	43,200	109.8	131.76	0.00305	0.00042	0.42	0.2	0.22	9359.734	9.359734
18 hours	64,800	125.4	150.48	0.00232	0.00032	0.32	0.2	0.12	7597.073	7.597073
24 hours	86,400	137.7	165.24	0.00191	0.00026	0.26	0.2	0.06	5293.436	5.293436

Dwelling Site 8

Required Storage for 1 in 100 year Peak Rainfall Event:

10.04 m³

See Attenuation Volume Calculation Overleaf

Proposed Attenuation System

Gravel Filled Attenuation Blanket

Void Ratio: 30%

Permeable Paving

Surface Area: 60.4 m²

Depth: 0.65 m

Total Volume: 11.78 m³

Proposed Storage Volume is Sufficient

- Regular inspection and day to day care – collecting leaves and vegetation from inlets and outlets and visually inspecting the permeable paving to ensure there is no ponding.
- Occasional maintenance – the gullies, downpipes and flow control device must occasionally be inspected to ensure they are not silted up or blocked and must be cleared as needed. The permeable paving must also be inspected and maintained as set out in the maintenance schedule below.

1.8 Maintenance Schedule

Schedule	Action	Frequency
Paving Visual Inspection	Visually inspect the permeable paving for ponding during or following a heavy rainfall event.	Once a Year
Paving Maintenance	Brush, vacuum, or power wash the joints of the permeable paving if ponding is observed.	As Required
Paving Weed Control	Treat with weedkiller or manually remove weeds.	As Required
Paving Structural Maintenance	Remove and replace damaged blocks.	As Required
Flow Control Device Inspection	Flow control chamber and unit should be visually inspected, and any debris or silt should be removed.	Once a Year
Flow Control Device Maintenance	The flow control device does not require routine maintenance. In the event of a suspected blockage the system shall be inspected, and the source of blockage removed until unit becomes operational.	As Required
Gullies and Downpipes	Visually inspect and remove any debris and check there is no physical damage.	Monthly
High Level Overflow Maintenance	Jet pipes from the tree-pit high level overflow and check by running water through the overflow.	Once a Year
Water Butts	Regularly empty the water butts by watering the garden etc. Inspect the tanks and clean of sludge, stains, and grime.	As Required
Planter Boxes	Check for damage and repair if needed. Ensure soil is not compacted and is free draining to the gravels. Ensure that leaves and dead plants are removed and replaced.	Once a Year