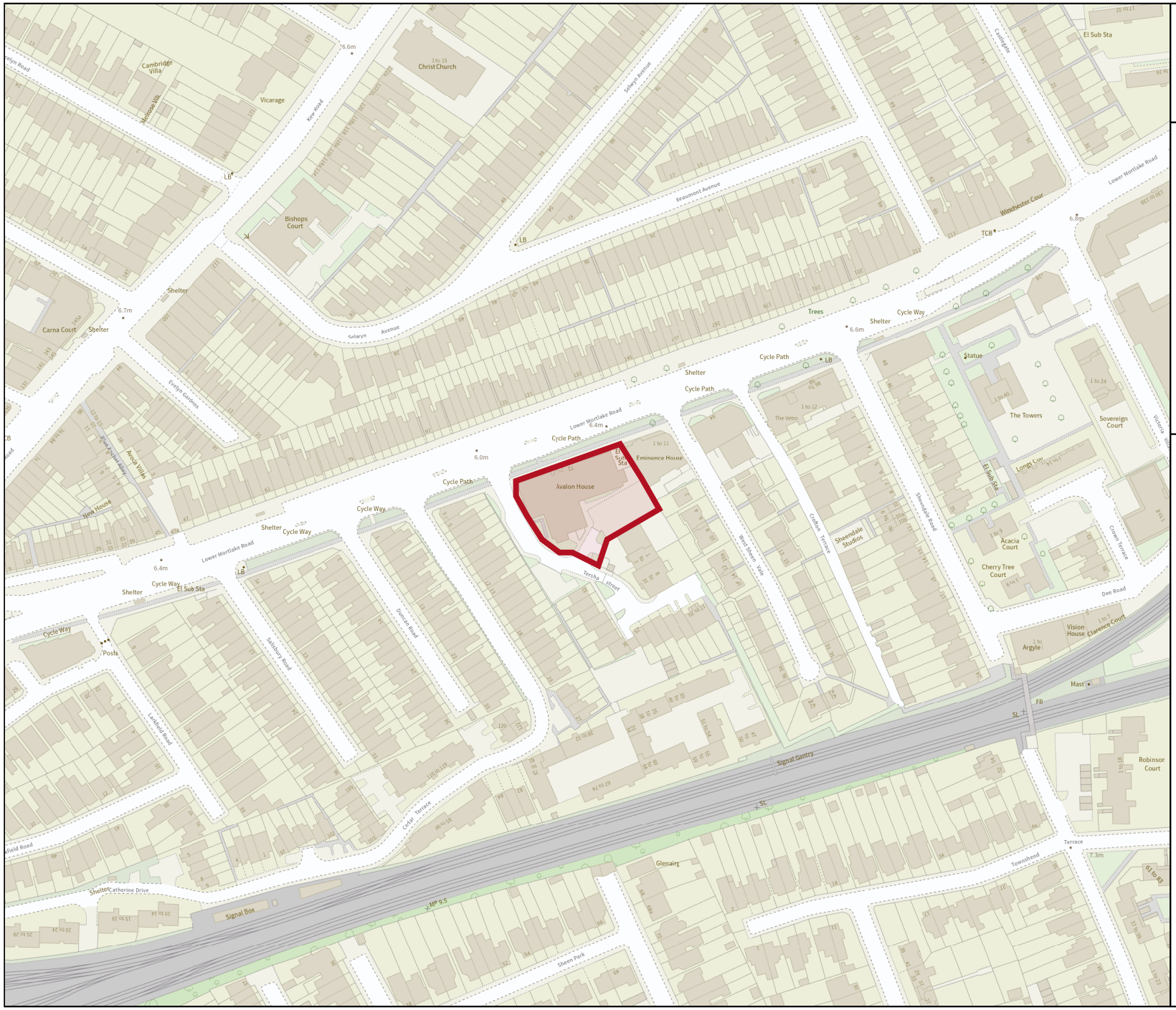


Environment Agency

Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
518535/175427

Scale
1:2500

Created
22 May 2024 18:22

- Selected area
- Flood zone 3
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 20 40 60m

Appendix G: TW Sewer Flooding History Enquiry

Sewer Flooding
History Enquiry

Property Searches

Elliott Wood Partnership

Search address supplied	Avalon House 72 Lower Mortlake Road Richmond TW9 2JY
Your reference	2230479
Our reference	SFH/SFH Standard/2024_4976094
Received date	**16 April 2024**
Search date	**16 April 2024**

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

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

0800 009 4540

Sewer Flooding
History Enquiry

Property Searches

Search address supplied: Avalon House,72,Lower Mortlake Road,Richmond,TW9 2JY

This search is recommended to check for any sewer flooding in a specific address or area

TWUL, trading as Property Searches, are responsible in respect of the following:-

(i) any negligent or incorrect entry in the records searched;

(ii) any negligent or incorrect interpretation of the records searched;

(iii) and any negligent or incorrect recording of that interpretation in the search report

(iv) compensation payments

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

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

0800 009 4540

Sewer Flooding
History Enquiry

Thames Water Property Searches

History of Sewer Flooding

Is the requested address or area at risk of flooding due to overloaded public sewers?

The flooding records held by Thames Water indicate that there have been no incidents of flooding in the requested area as a result of surcharging public sewers.

For your guidance:

- A sewer is "overloaded" when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.
- "Internal flooding" from public sewers is defined as flooding, which enters a building or passes below a suspended floor. For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.
- "At Risk" properties are those that the water company is required to include in the Regulatory Register that is presented annually to the Director General of Water Services. These are defined as properties that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the Company's reporting procedure.
- Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included on the At Risk Register.
- Properties may be at risk of flooding but not included on the Register where flooding incidents have not been reported to the Company.
- Public Sewers are defined as those for which the Company holds statutory responsibility under the Water Industry Act 1991.
- It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the Company. This report excludes flooding from private sewers and drains and the Company makes no comment upon this matter.
- For further information please contact Thames Water on Tel: 0800 316 9800 or website www.thameswater.co.uk

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

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

0800 009 4540

Appendix H: Greenfield Run-Off Rate Calculations

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Ryan Burt-Allen
Site name:	Avalon House
Site location:	Richmond-Upon-Thames

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

Site Details

Latitude:	51.46546° N
Longitude:	0.2951° W
Reference:	1823530495
Date:	May 10 2024 15:14

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 0.2011

Methodology

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

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	599	599
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	0.31	0.31
1 in 1 year (l/s):	0.26	0.26
1 in 30 years (l/s):	0.7	0.7
1 in 100 year (l/s):	0.97	0.97
1 in 200 years (l/s):	1.14	1.14

Appendix I: ACO Blue Roof Flow Rate Calculations

ACO Blue Roof Calculator Version 1.1.0.50

Project Title
Avalon House, Mortlake Rd

Design Number

Notes / Reference
Blue Roof 2 Level 3 Terrace

Design Storm Event	1:1
Climate Change	0 %
Runoff Coefficient	1.00
Location	Richmond
Roof Area m²	199.6
Additional Contributing Areas (m²)	
Total Catchment Area (m²)	**199.6**
Net Roof Area (m²)	183.4
Permitted Outflow (l/s)	0.150
Blue or Blue/Green Roof	Unknown
If B/G, Green Roof Type	Extensive
a. Permanent reservoir above or in storage void	None
b. Required Reservoir Depth (mm)	

Required Net Storm Storage Volume (m³)	1.97
Actual Depth (mm)	12
Porosity	95 %
Selected depth of storage tank (mm)	30
Provided Storage Volume (m³)	5.23
Utilisation	39.8 %

Structural Load Calculations

Item	kN/m²
Weight of Product (Tank / Cell)	0.051
Weight of Product (Tray)	0.000
Geotextile	0.005
Weight of Permanent Storage	0.000
Weight of Stormwater Storage	0.278

R: 0.40 l/s

M5-60: 20.00 mm/h

DURATION (mins)	INTENSITY (mm/h)	REQUIRED STORAGE VOLUME (m³)
5 mins	52.08	0.82
10 mins	39.23	1.21
15 mins	31.65	1.44
30 mins	20.23	1.75
1 hour	12.40	1.93
2 hours	7.64	1.97
4 hours	4.64	1.54
6 hours	3.54	0.99
10 hours	2.47	0.00
24 hours	1.29	0.00
48 hours	0.77	0.00

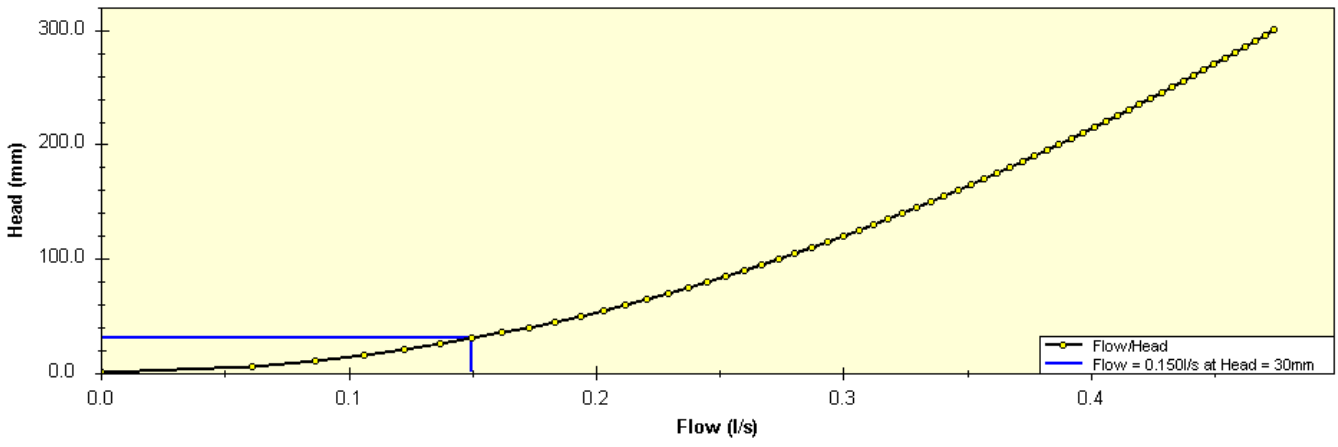
Required aperture / outlet plate size: 20 mm

Half Empty Time: 8 mins

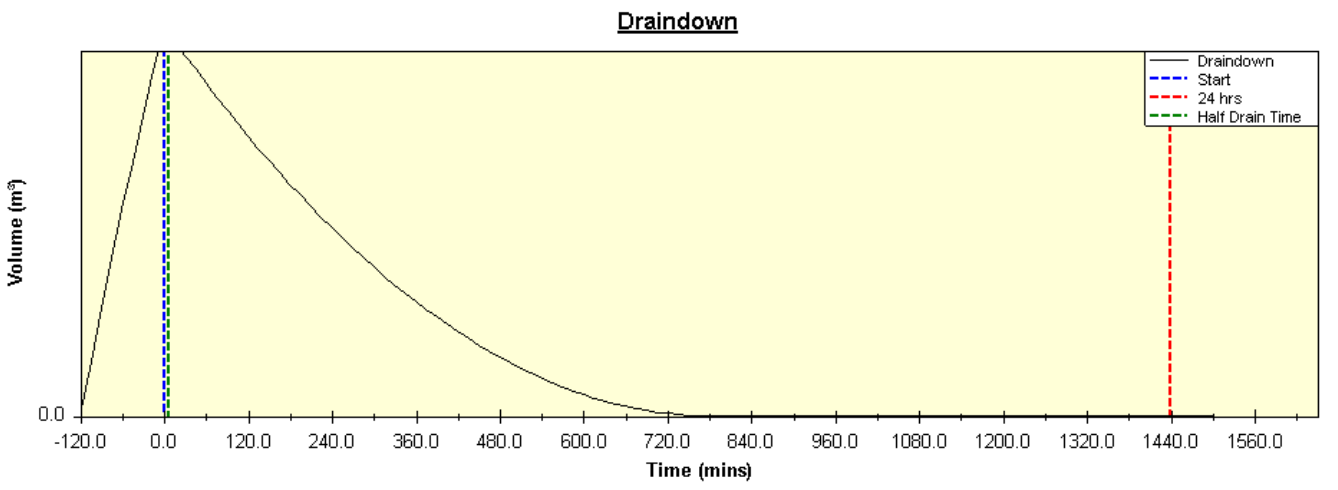
Project Status: PASS

Level & Draindown Graphs

Flow / Head



Draindown



ACO Blue Roof Calculator Version 1.1.0.50

Project Title
Avalon House, Mortlake Rd

Design Number

Notes / Reference
Blue Roof 2 Level 3 Terrace

Design Storm Event	1:30
Climate Change	0 %
Runoff Coefficient	1.00
Location	Richmond
Roof Area m²	199.6
Additional Contributing Areas (m²)	
Total Catchment Area (m²)	**199.6**
Net Roof Area (m²)	183.4
Permitted Outflow (l/s)	0.150
Blue or Blue/Green Roof	Unknown
If B/G, Green Roof Type	Extensive
a. Permanent reservoir above or in storage void	None
b. Required Reservoir Depth (mm)	

Required Net Storm Storage Volume (m³)	6.81
Actual Depth (mm)	41
Porosity	90 %
Selected depth of storage tank (mm)	85
Provided Storage Volume (m³)	14.03
Utilisation	48.5 %

Structural Load Calculations

Item	kN/m²
Weight of Product (Tank / Cell)	0.116
Weight of Product (Tray)	0.000
Geotextile	0.005
Weight of Permanent Storage	0.000
Weight of Stormwater Storage	0.788

R: 0.40 l/s

M5-60: 20.00 mm/h

DURATION (mins)	INTENSITY (mm/h)	REQUIRED STORAGE VOLUME (m³)
5 mins	121.63	1.98
10 mins	98.01	3.17
15 mins	79.07	3.81
30 mins	51.36	4.86
1 hour	31.48	5.74
2 hours	19.11	6.55
4 hours	11.24	6.81
6 hours	8.18	6.56
10 hours	5.57	5.71
24 hours	2.84	0.66
48 hours	1.57	0.00

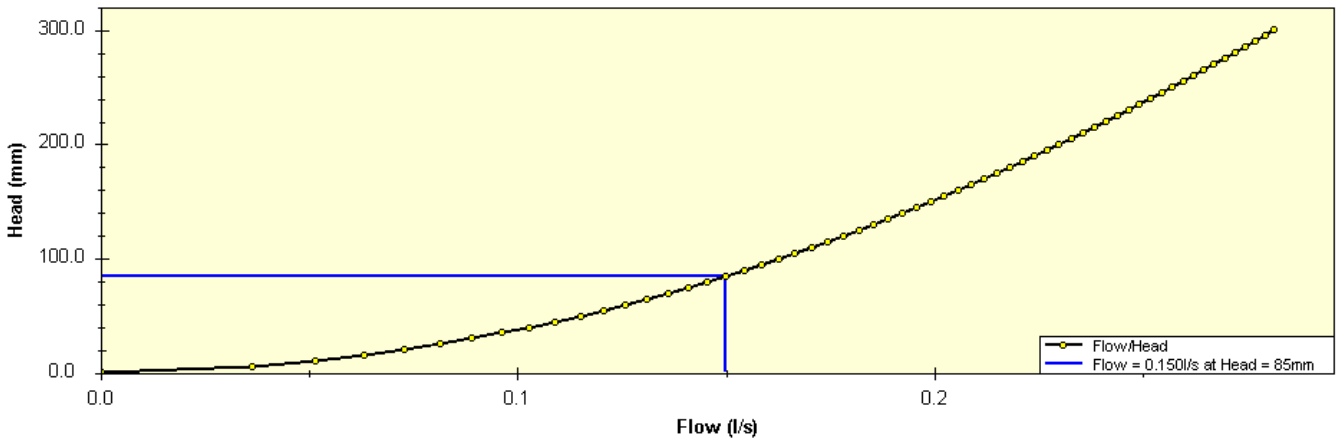
Required aperture / outlet plate size: 16 mm

Half Empty Time: 131 mins

Project Status: PASS

Level & Draindown Graphs

Flow / Head



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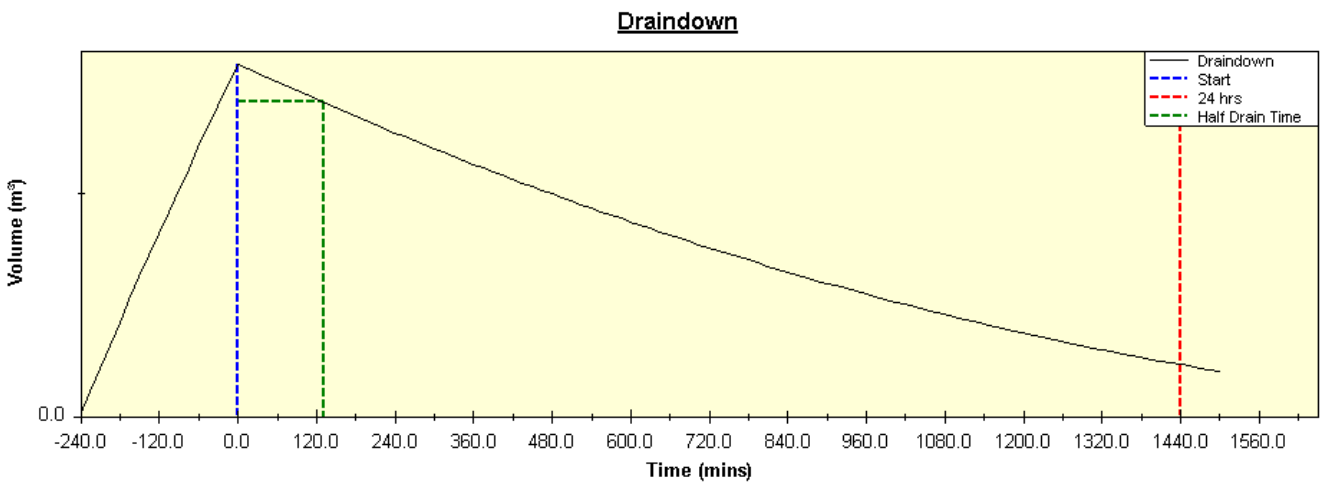


ACO Blue Roof Calculator Version 1.1.0.50

Project Title

Avalon House, Mortlake Rd

Design Number

Notes / Reference

Blue Roof 2 Level 3 Terrace

Design Storm Event	1:100
Climate Change	0 %
Runoff Coefficient	1.00
Location	Richmond
Roof Area m²	199.6
Additional Contributing Areas (m²)	
Total Catchment Area (m²)	**199.6**
Net Roof Area (m²)	183.4
Permitted Outflow (l/s)	0.150
Blue or Blue/Green Roof	Unknown
If B/G, Green Roof Type	Extensive
a. Permanent reservoir above or in storage void	None
b. Required Reservoir Depth (mm)	

Required Net Storm Storage Volume (m³)	9.11
Actual Depth (mm)	55
Porosity	90 %
Selected depth of storage tank (mm)	85
Provided Storage Volume (m³)	14.03
Utilisation	65.0 %

Structural Load Calculations

Item	kN/m²
Weight of Product (Tank / Cell)	0.116
Weight of Product (Tray)	0.000
Geotextile	0.005
Weight of Permanent Storage	0.000
Weight of Stormwater Storage	0.788

R: 0.40 l/s

M5-60: 20.00 mm/h

DURATION (mins)	INTENSITY (mm/h)	REQUIRED STORAGE VOLUME (m³)
5 mins	150.36	2.46
10 mins	122.83	4.00
15 mins	99.09	4.81
30 mins	64.94	6.21
1 hour	39.80	7.40
2 hours	24.24	8.60
4 hours	14.12	9.11
6 hours	10.24	9.03
10 hours	6.91	8.39
24 hours	3.49	3.77
48 hours	1.94	0.00

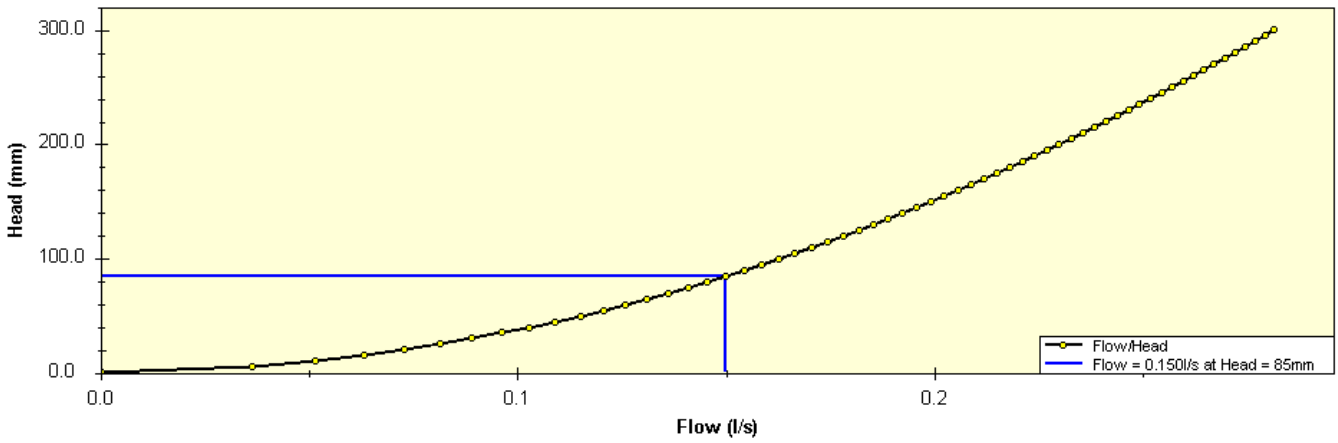
Required aperture / outlet plate size: 16 mm

Half Empty Time: 433 mins

Project Status: PASS

Level & Draindown Graphs

Flow / Head



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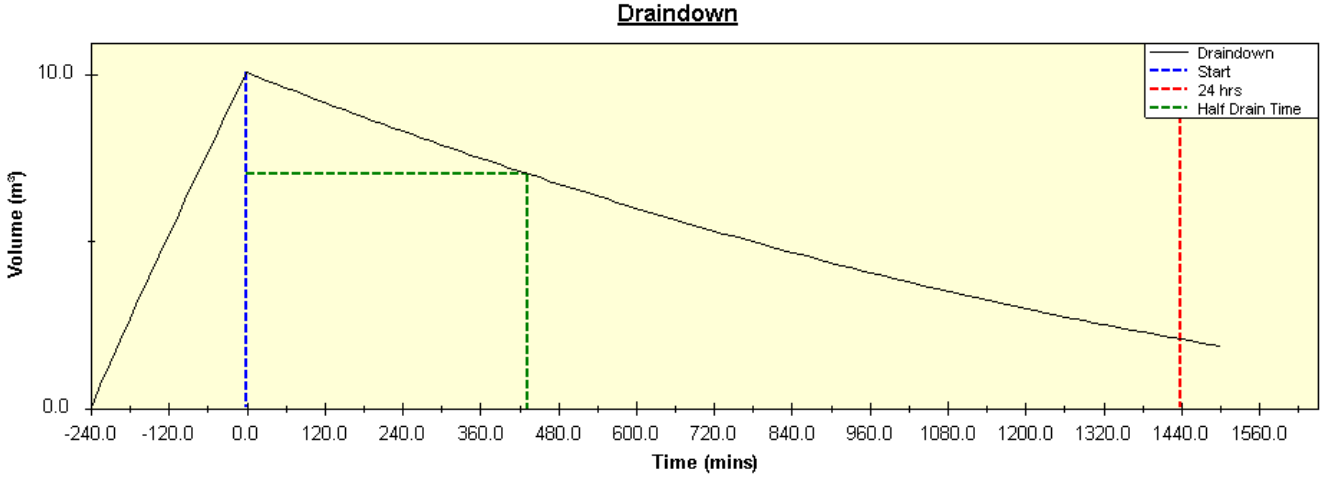


ACO Blue Roof Calculator Version 1.1.0.50

Project Title
Avalon House, Mortlake Rd

Design Number

Notes / Reference
Blue Roof 2 Level 3 Terrace

Design Storm Event	1:100
Climate Change	40 %
Runoff Coefficient	1.00
Location	Richmond
Roof Area m²	199.6
Additional Contributing Areas (m²)	
Total Catchment Area (m²)	**199.6**
Net Roof Area (m²)	183.4
Permitted Outflow (l/s)	0.150
Blue or Blue/Green Roof	Unknown
If B/G, Green Roof Type	Extensive
a. Permanent reservoir above or in storage void	None
b. Required Reservoir Depth (mm)	

Required Net Storm Storage Volume (m³)	13.93
Actual Depth (mm)	84
Porosity	90 %
Selected depth of storage tank (mm)	85
Provided Storage Volume (m³)	14.03
Utilisation	99.3 %

R: 0.40 l/s

M5-60: 20.00 mm/h

DURATION (mins)	INTENSITY (mm/h)	REQUIRED STORAGE VOLUME (m³)
5 mins	210.50	3.46
10 mins	171.97	5.63
15 mins	138.72	6.79
30 mins	90.92	8.80
1 hour	55.72	10.58
2 hours	33.94	12.47
4 hours	19.77	13.62
6 hours	14.34	13.93
10 hours	9.67	13.91
24 hours	4.89	10.47
48 hours	2.71	0.07

Required aperture / outlet plate size: 16 mm

Half Empty Time: 1009 mins

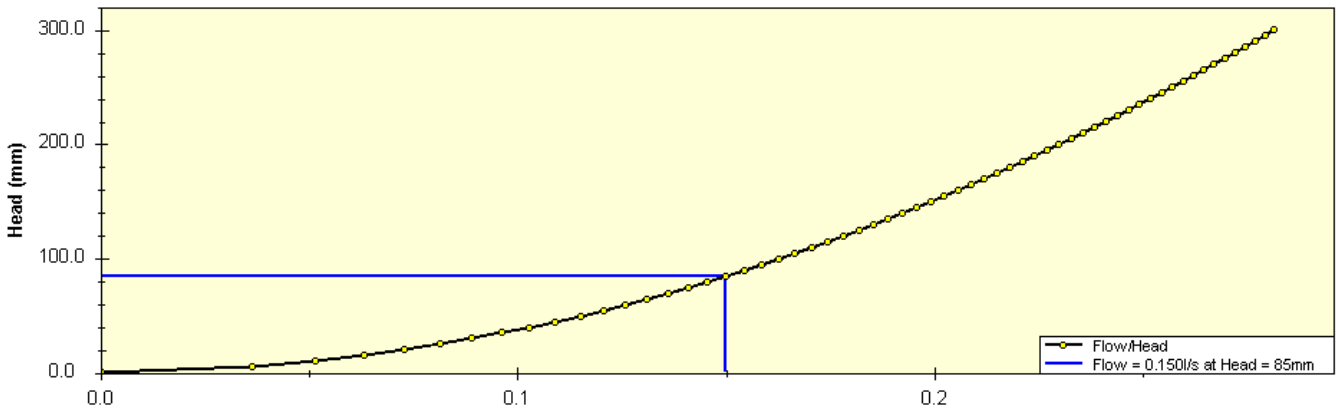
Project Status: PASS

Structural Load Calculations

Item	kN/m²
Weight of Product (Tank / Cell)	0.116
Weight of Product (Tray)	0.000
Geotextile	0.005
Weight of Permanent Storage	0.000
Weight of Stormwater Storage	0.788

Level & Draindown Graphs

Flow / Head



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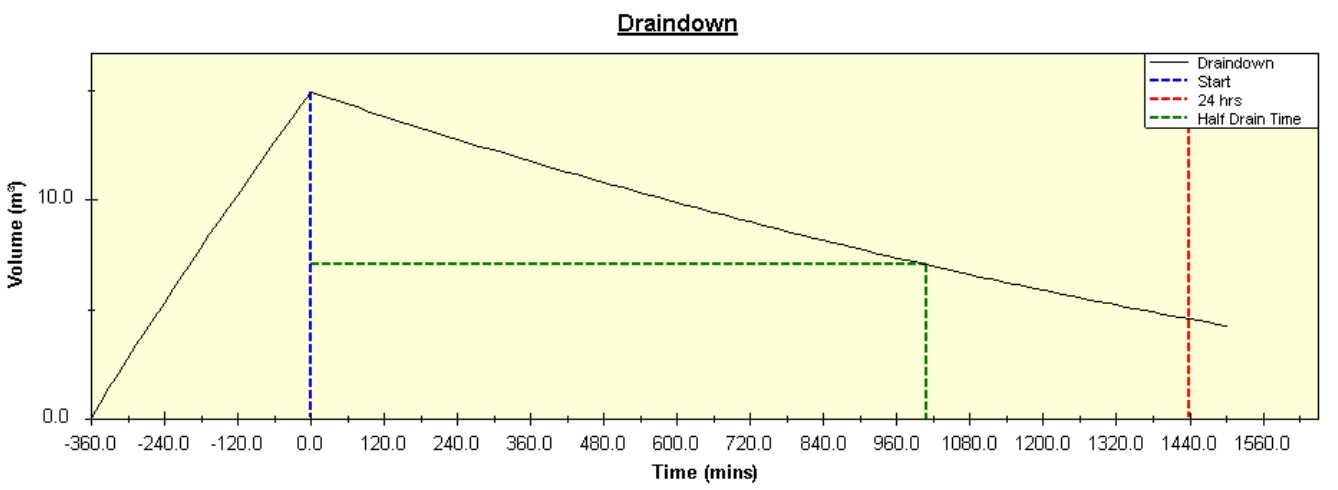


ACO Blue Roof Calculator Version 1.0.0.46

Project Title

Avalon House Mortlake Rd

Design Number

Notes / Reference

Blue Roof 1 Level 2 Terrace

Design Storm Event	1:1
Climate Change	0 %
Runoff Coefficient	1.00
Location	Richmond
Roof Area m²	60.8
Additional Contributing Areas (m²)	
Total Catchment Area (m²)	**60.8**
Net Roof Area (m²)	54.6
Permitted Outflow (l/s)	0.070
Blue or Blue/Green Roof	Unknown
If B/G, Green Roof Type	Extensive
a. Permanent reservoir above or in storage void	None
b. Required Reservoir Depth (mm)	

Required Net Storm Storage Volume (m³)	0.55
Actual Depth (mm)	11
Porosity	95 %
Selected depth of storage tank (mm)	30
Provided Storage Volume (m³)	1.55
Utilisation	37.3 %

Structural Load Calculations

Item	kN/m²
Weight of Product (Tank / Cell)	0.052
Weight of Product (Tray)	0.000
Geotextile	0.005
Weight of Permanent Storage	0.000
Weight of Stormwater Storage	0.278

R: 0.41 l/s

M5-60: 20.60 mm/h

DURATION (mins)	INTENSITY (mm/h)	REQUIRED STORAGE VOLUME (m³)
5 mins	53.64	0.25
10 mins	40.41	0.37
15 mins	32.60	0.43
30 mins	20.84	0.51
1 hour	13.18	0.55
2 hours	7.87	0.45
4 hours	4.78	0.15
6 hours	3.64	0.00
10 hours	2.54	0.00
24 hours	1.35	0.00
48 hours	0.79	0.00

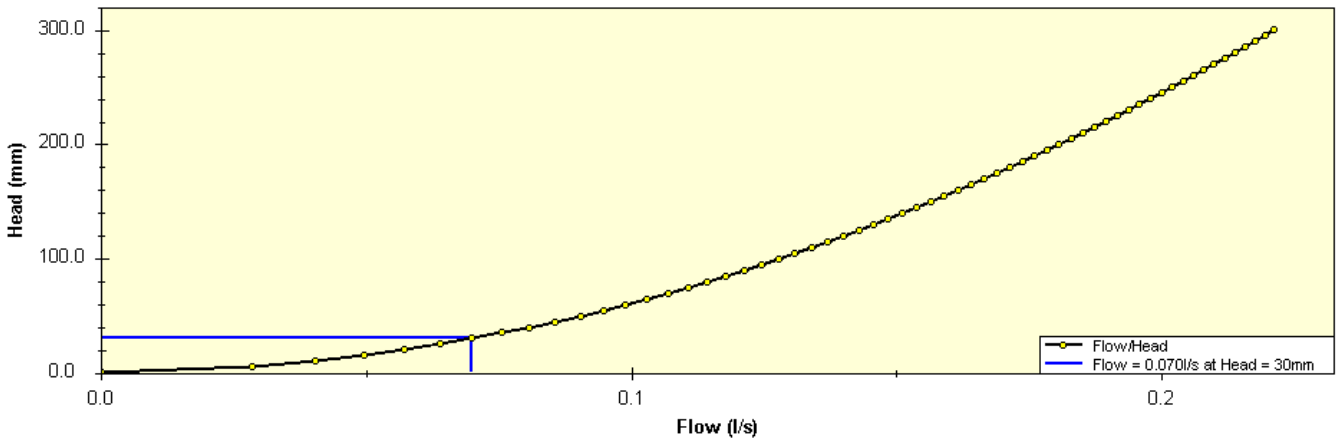
Required aperture / outlet plate size: 14 mm

Half Empty Time: 0 mins

Project Status: PASS

Level & Draindown Graphs

Flow / Head



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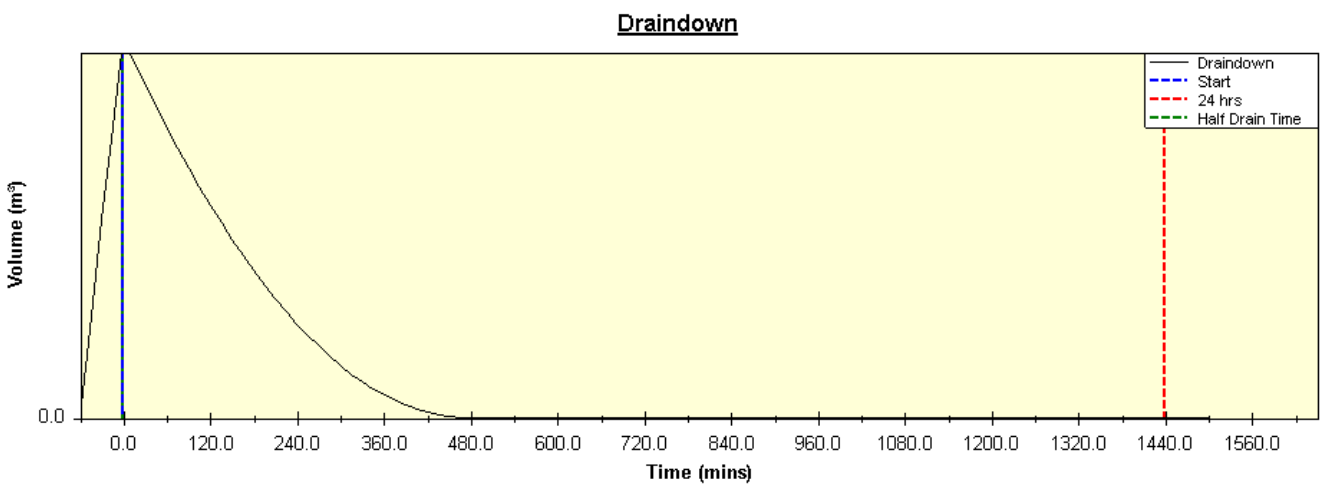


ACO Blue Roof Calculator Version 1.0.0.46

Project Title
Avalon House Mortlake Rd

Design Number

Notes / Reference
Blue Roof 1 Level 2 Terrace

Design Storm Event	1:30
Climate Change	0 %
Runoff Coefficient	1.00
Location	Richmond
Roof Area m²	60.8
Additional Contributing Areas (m²)	
Total Catchment Area (m²)	**60.8**
Net Roof Area (m²)	54.6
Permitted Outflow (l/s)	0.070
Blue or Blue/Green Roof	Unknown
If B/G, Green Roof Type	Extensive
a. Permanent reservoir above or in storage void	None
b. Required Reservoir Depth (mm)	

Required Net Storm Storage Volume (m³)	1.89
Actual Depth (mm)	38
Porosity	90 %
Selected depth of storage tank (mm)	85
Provided Storage Volume (m³)	4.17
Utilisation	45.2 %

Structural Load Calculations

Item	kN/m²
Weight of Product (Tank / Cell)	0.117
Weight of Product (Tray)	0.000
Geotextile	0.005
Weight of Permanent Storage	0.000
Weight of Stormwater Storage	0.788

R: 0.41 l/s

M5-60: 20.60 mm/h

DURATION (mins)	INTENSITY (mm/h)	REQUIRED STORAGE VOLUME (m³)
5 mins	125.28	0.61
10 mins	100.95	0.98
15 mins	81.44	1.17
30 mins	52.91	1.48
1 hour	32.96	1.75
2 hours	19.68	1.89
4 hours	11.57	1.80
6 hours	8.43	1.56
10 hours	5.73	0.96
24 hours	2.87	0.00
48 hours	1.62	0.00

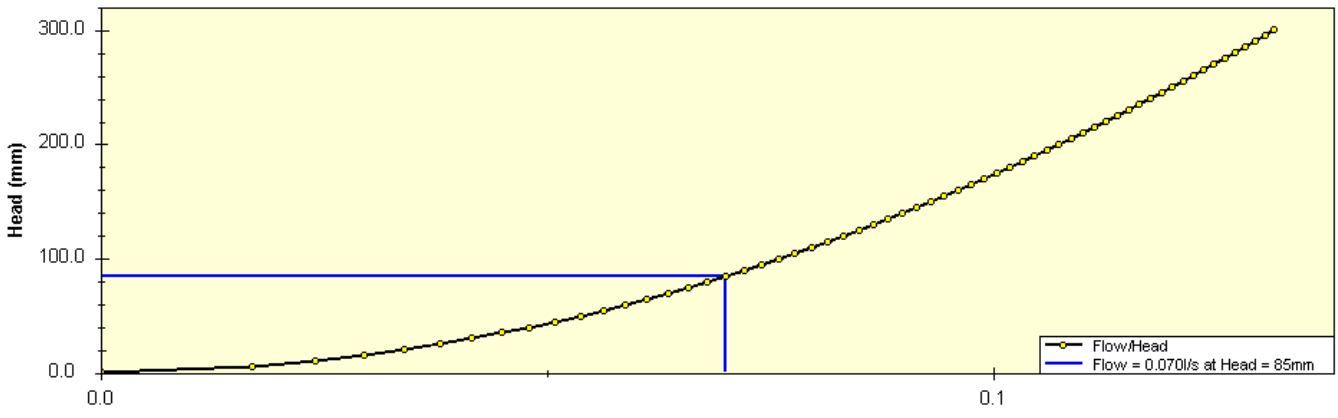
Required aperture / outlet plate size: 11 mm

Half Empty Time: 20 mins

Project Status: PASS

Level & Draindown Graphs

Flow / Head



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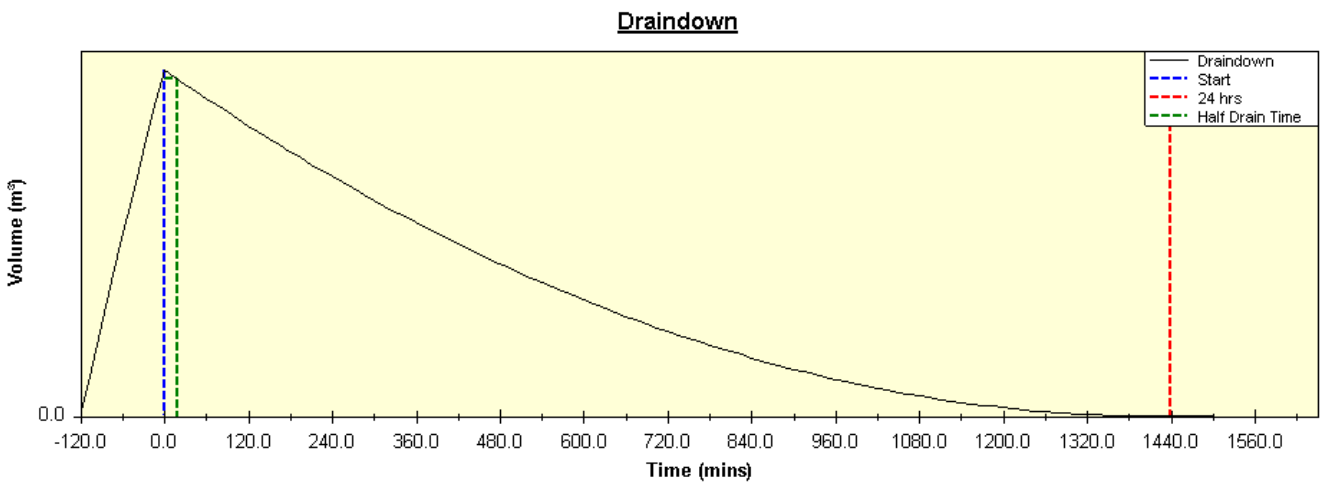


ACO Blue Roof Calculator Version 1.0.0.46

Project Title
Avalon House Mortlake Rd

Design Number

Notes / Reference
Blue Roof 1 Level 2 Terrace

Design Storm Event	1:100
Climate Change	0 %
Runoff Coefficient	1.00
Location	Richmond
Roof Area m²	60.8
Additional Contributing Areas (m²)	
Total Catchment Area (m²)	**60.8**
Net Roof Area (m²)	54.6
Permitted Outflow (l/s)	0.070
Blue or Blue/Green Roof	Unknown
If B/G, Green Roof Type	Extensive
a. Permanent reservoir above or in storage void	None
b. Required Reservoir Depth (mm)	

Required Net Storm Storage Volume (m³)	2.53
Actual Depth (mm)	52
Porosity	90 %
Selected depth of storage tank (mm)	85
Provided Storage Volume (m³)	4.17
Utilisation	60.6 %

Structural Load Calculations

Item	kN/m²
Weight of Product (Tank / Cell)	0.117
Weight of Product (Tray)	0.000
Geotextile	0.005
Weight of Permanent Storage	0.000
Weight of Stormwater Storage	0.788

R: 0.41 l/s

M5-60: 20.60 mm/h

DURATION (mins)	INTENSITY (mm/h)	REQUIRED STORAGE VOLUME (m³)
5 mins	154.87	0.76
10 mins	126.52	1.24
15 mins	102.06	1.49
30 mins	66.89	1.91
1 hour	41.82	2.29
2 hours	24.97	2.53
4 hours	14.54	2.53
6 hours	10.55	2.33
10 hours	7.12	1.80
24 hours	3.54	0.00
48 hours	2.00	0.00

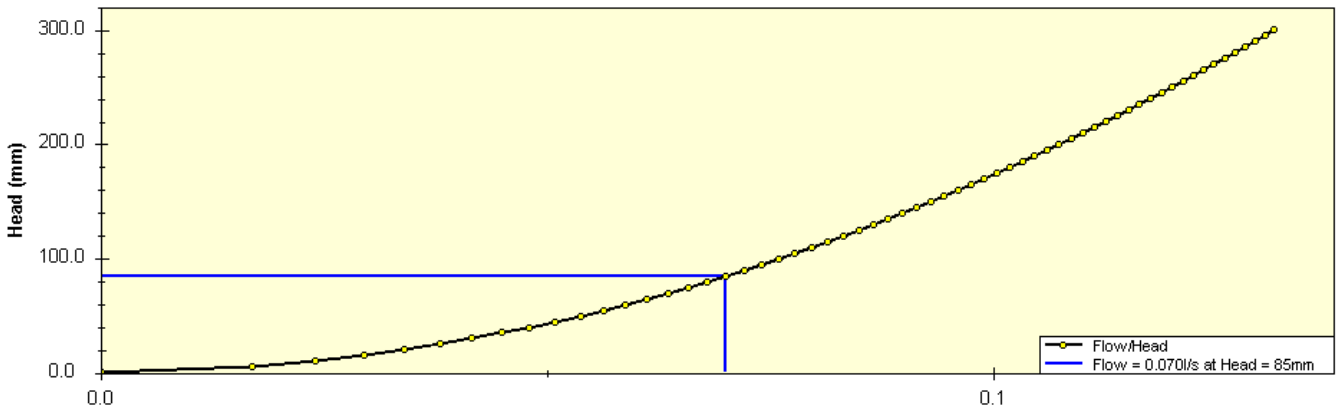
Required aperture / outlet plate size: 11 mm

Half Empty Time: 210 mins

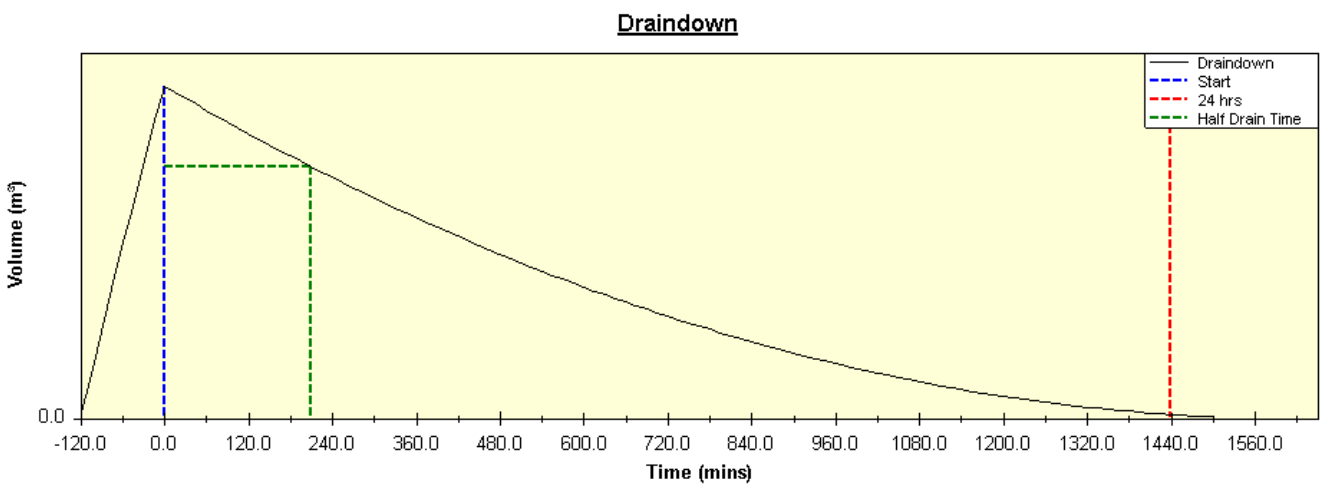
Project Status: PASS

Level & Draindown Graphs

Flow / Head



Draindown



ACO Blue Roof Calculator Version 1.0.0.46

Project Title
Avalon House Mortlake Rd

Design Number

Notes / Reference
Blue Roof 1 Level 2 Terrace

Design Storm Event	1:100
Climate Change	40 %
Runoff Coefficient	1.00
Location	Richmond
Roof Area m²	60.8
Additional Contributing Areas (m²)	
Total Catchment Area (m²)	**60.8**
Net Roof Area (m²)	54.6
Permitted Outflow (l/s)	0.070
Blue or Blue/Green Roof	Unknown
If B/G, Green Roof Type	Extensive
a. Permanent reservoir above or in storage void	None
b. Required Reservoir Depth (mm)	

Required Net Storm Storage Volume (m³)	3.94
Actual Depth (mm)	80
Porosity	90 %
Selected depth of storage tank (mm)	85
Provided Storage Volume (m³)	4.17
Utilisation	94.4 %

Structural Load Calculations

Item	kN/m²
Weight of Product (Tank / Cell)	0.117
Weight of Product (Tray)	0.000
Geotextile	0.005
Weight of Permanent Storage	0.000
Weight of Stormwater Storage	0.788

R: 0.41 l/s

M5-60: 20.60 mm/h

DURATION (mins)	INTENSITY (mm/h)	REQUIRED STORAGE VOLUME (m³)
5 mins	216.82	1.08
10 mins	177.12	1.75
15 mins	142.89	2.11
30 mins	93.64	2.72
1 hour	58.55	3.30
2 hours	34.96	3.74
4 hours	20.36	3.94
6 hours	14.77	3.87
10 hours	9.96	3.53
24 hours	4.96	1.18
48 hours	2.79	0.00

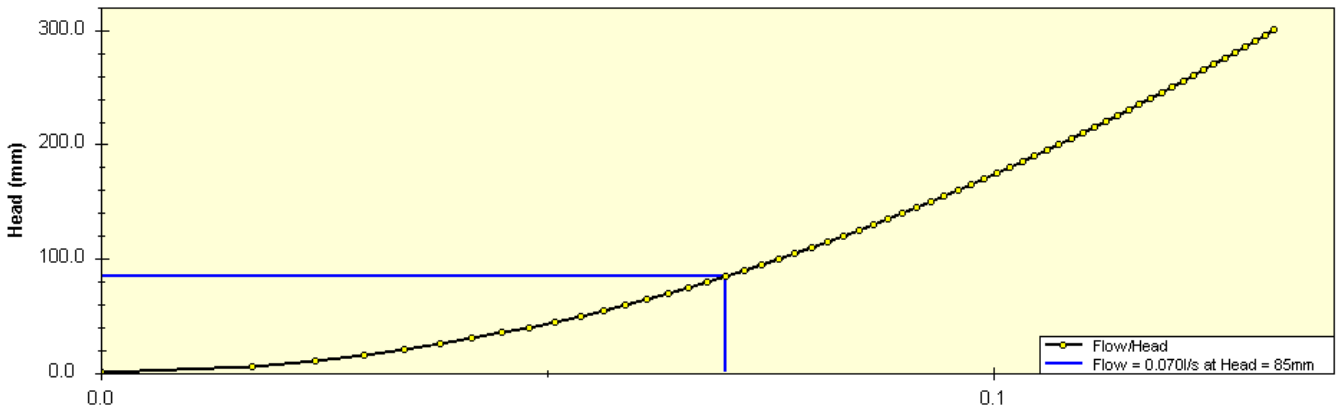
Required aperture / outlet plate size: 11 mm

Half Empty Time: 602 mins

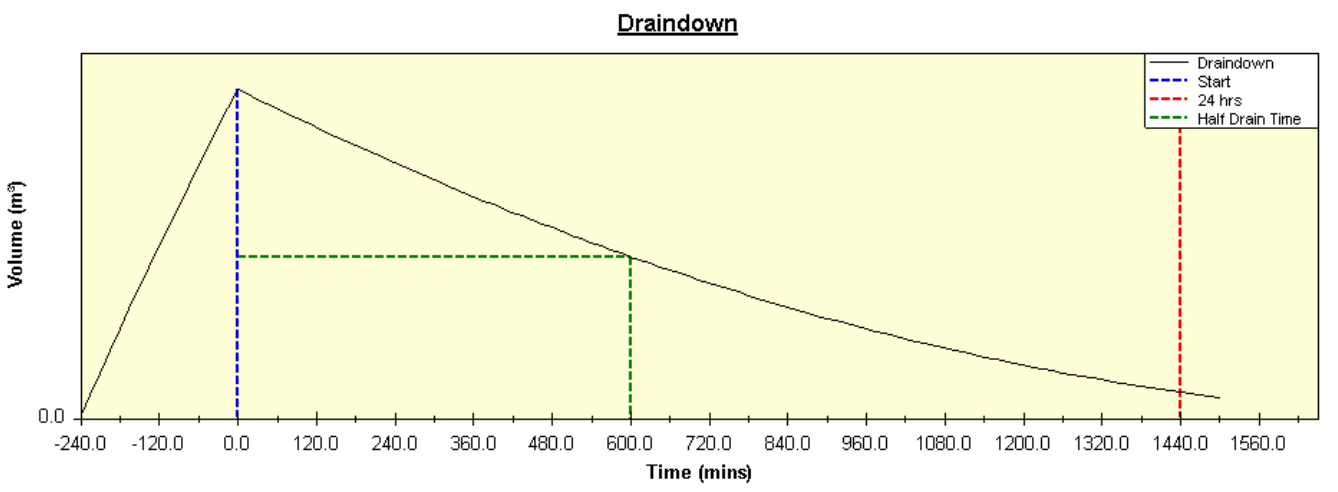
Project Status: PASS

Level & Draindown Graphs

Flow / Head



Draindown



ACO Blue Roof Calculator Version 1.0.0.46

Project Title

Avalon House Mortlake Rd

Design Number

Notes / Reference

Blue Roof 3 Solar Panels

Design Storm Event	1:1
Climate Change	0 %
Runoff Coefficient	1.00
Location	Richmond
Roof Area m²	273.1
Additional Contributing Areas (m²)	
Total Catchment Area (m²)	**273.1**
Net Roof Area (m²)	239.7
Permitted Outflow (l/s)	0.150
Blue or Blue/Green Roof	Unknown
If B/G, Green Roof Type	Extensive
a. Permanent reservoir above or in storage void	None
b. Required Reservoir Depth (mm)	

Required Net Storm Storage Volume (m³)	3.22
Actual Depth (mm)	15
Porosity	95 %
Selected depth of storage tank (mm)	30
Provided Storage Volume (m³)	6.83
Utilisation	49.8 %

Structural Load Calculations

Item	kN/m²
Weight of Product (Tank / Cell)	0.051
Weight of Product (Tray)	0.000
Geotextile	0.005
Weight of Permanent Storage	0.000
Weight of Stormwater Storage	0.278

R: 0.41 l/s

M5-60: 20.60 mm/h

DURATION (mins)	INTENSITY (mm/h)	REQUIRED STORAGE VOLUME (m³)
5 mins	53.64	1.18
10 mins	40.41	1.75
15 mins	32.60	2.09
30 mins	20.84	2.58
1 hour	13.18	3.06
2 hours	7.87	3.22
4 hours	4.78	3.06
6 hours	3.64	2.73
10 hours	2.54	1.55
24 hours	1.35	0.00
48 hours	0.79	0.00

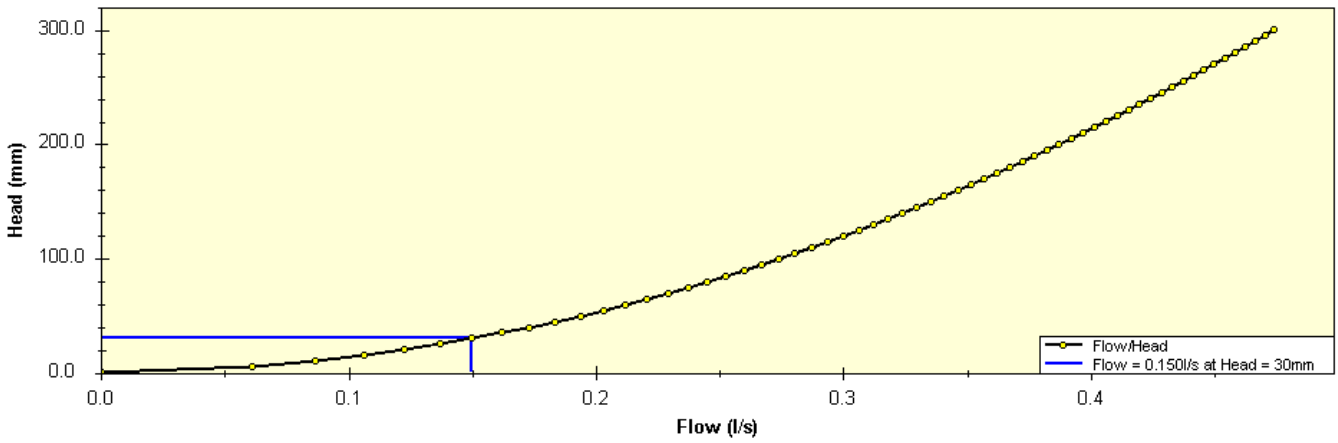
Required aperture / outlet plate size: 20 mm

Half Empty Time: 77 mins

Project Status: PASS

Level & Draindown Graphs

Flow / Head



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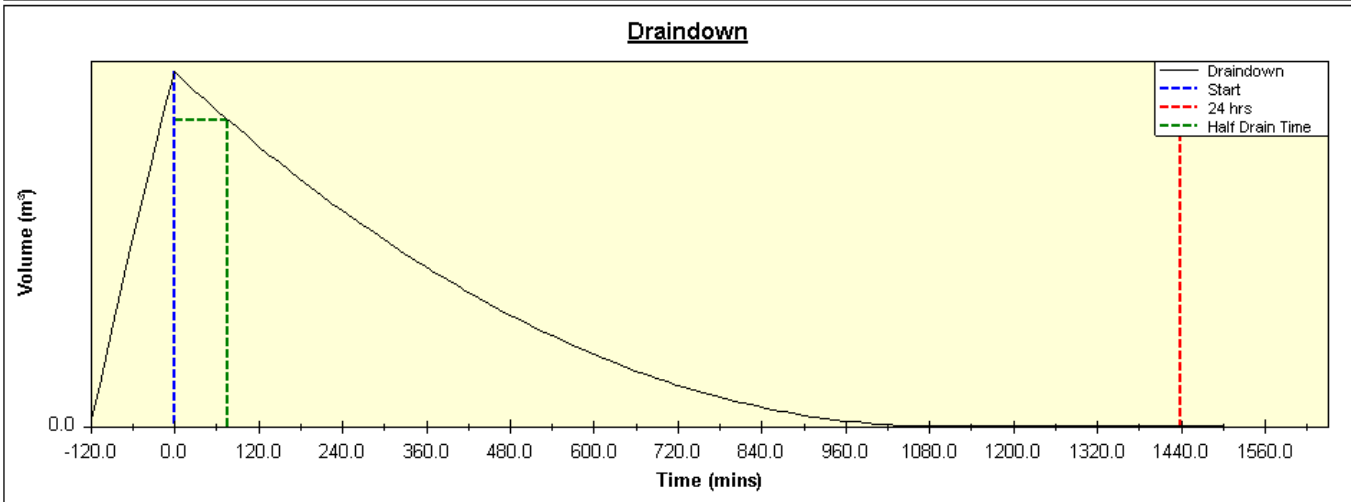


ACO Blue Roof Calculator Version 1.0.0.46

Project Title

Avalon House Mortlake Rd

Design Number

Notes / Reference

Blue Roof 3 Solar Panels

Design Storm Event	1:30
Climate Change	0 %
Runoff Coefficient	1.00
Location	Richmond
Roof Area m²	273.1
Additional Contributing Areas (m²)	
Total Catchment Area (m²)	**273.1**
Net Roof Area (m²)	239.7
Permitted Outflow (l/s)	0.150
Blue or Blue/Green Roof	Unknown
If B/G, Green Roof Type	Extensive
a. Permanent reservoir above or in storage void	None
b. Required Reservoir Depth (mm)	

Required Net Storm Storage Volume (m³)	10.58
Actual Depth (mm)	49
Porosity	90 %
Selected depth of storage tank (mm)	85
Provided Storage Volume (m³)	18.34
Utilisation	57.7 %

Structural Load Calculations

Item	kN/m²
Weight of Product (Tank / Cell)	0.116
Weight of Product (Tray)	0.000
Geotextile	0.005
Weight of Permanent Storage	0.000
Weight of Stormwater Storage	0.788

R: 0.41 l/s

M5-60: 20.60 mm/h

DURATION (mins)	INTENSITY (mm/h)	REQUIRED STORAGE VOLUME (m³)
5 mins	125.28	2.81
10 mins	100.95	4.51
15 mins	81.44	5.43
30 mins	52.91	6.96
1 hour	32.96	8.46
2 hours	19.68	9.67
4 hours	11.57	10.49
6 hours	8.43	10.58
10 hours	5.73	10.26
24 hours	2.87	5.89
48 hours	1.62	0.00

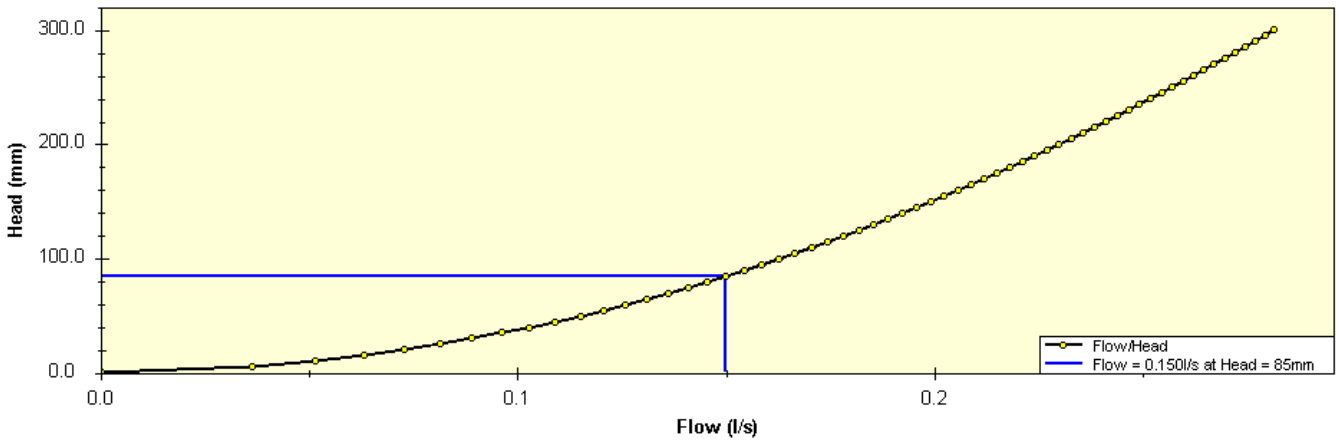
Required aperture / outlet plate size: 16 mm

Half Empty Time: 420 mins

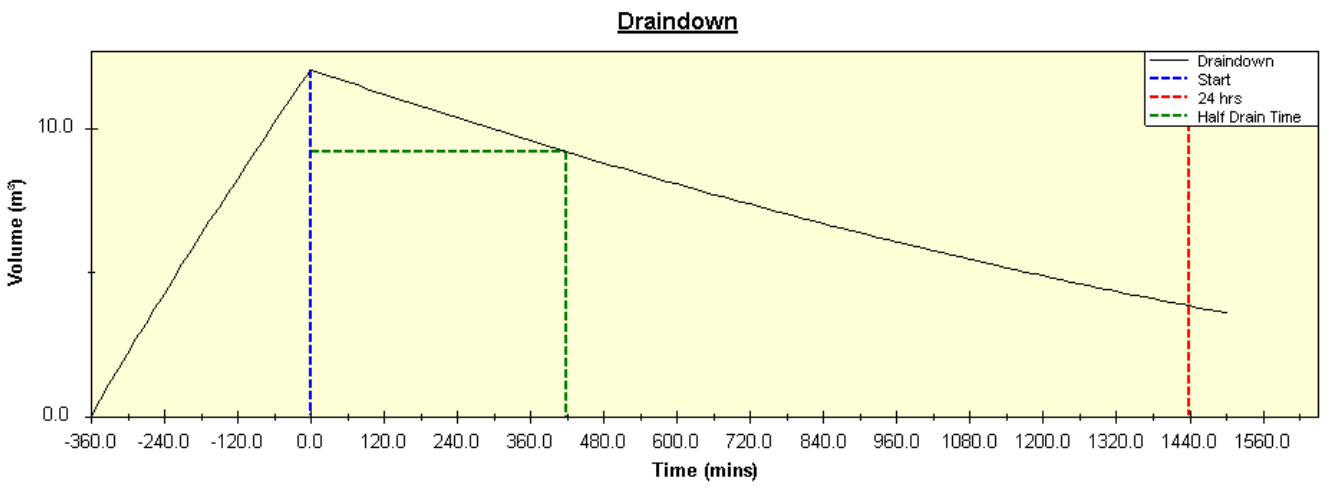
Project Status: PASS

Level & Draindown Graphs

Flow / Head



Draindown



ACO Blue Roof Calculator Version 1.0.0.46

Project Title: Avalon House Mortlake Rd

Design Number:

Notes / Reference: Blue Roof 3 Solar Panels

Design Storm Event	1:100
Climate Change	0 %
Runoff Coefficient	1.00
Location	Richmond
Roof Area m²	273.1
Additional Contributing Areas (m²)	
Total Catchment Area (m²)	**273.1**
Net Roof Area (m²)	239.7
Permitted Outflow (l/s)	0.150
Blue or Blue/Green Roof	Unknown
If B/G, Green Roof Type	Extensive
a. Permanent reservoir above or in storage void	None
b. Required Reservoir Depth (mm)	

Required Net Storm Storage Volume (m³)	14.05
Actual Depth (mm)	65
Porosity	90 %
Selected depth of storage tank (mm)	85
Provided Storage Volume (m³)	18.34
Utilisation	76.6 %

Structural Load Calculations

Item	kN/m²
Weight of Product (Tank / Cell)	0.116
Weight of Product (Tray)	0.000
Geotextile	0.005
Weight of Permanent Storage	0.000
Weight of Stormwater Storage	0.788

R: 0.41 l/s

M5-60: 20.60 mm/h

DURATION (mins)	INTENSITY (mm/h)	REQUIRED STORAGE VOLUME (m³)
5 mins	154.87	3.48
10 mins	126.52	5.67
15 mins	102.06	6.83
30 mins	66.89	8.86
1 hour	41.82	10.88
2 hours	24.97	12.56
4 hours	14.54	13.73
6 hours	10.55	14.05
10 hours	7.12	14.04
24 hours	3.54	10.25
48 hours	2.00	0.25

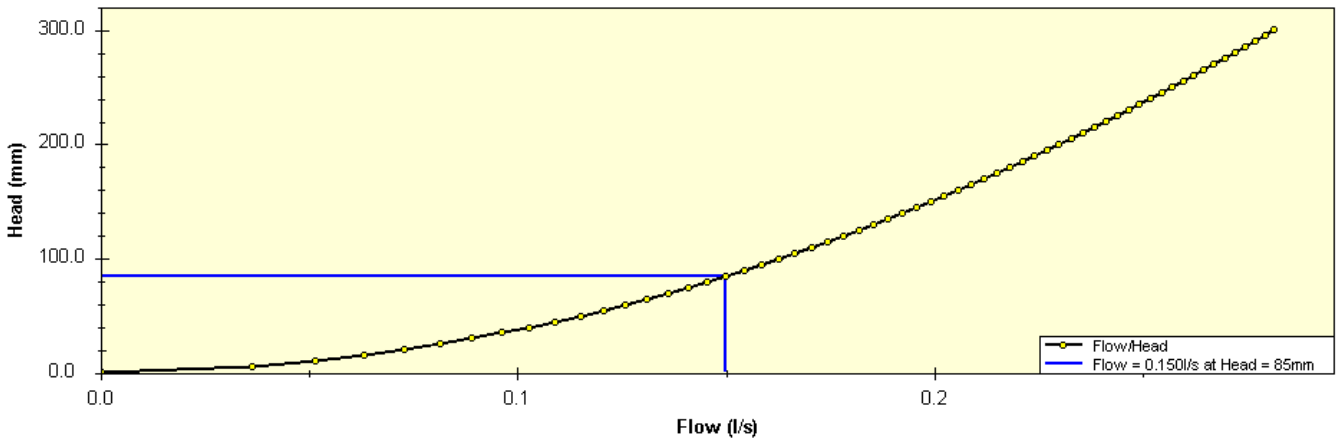
Required aperture / outlet plate size: 16 mm

Half Empty Time: 840 mins

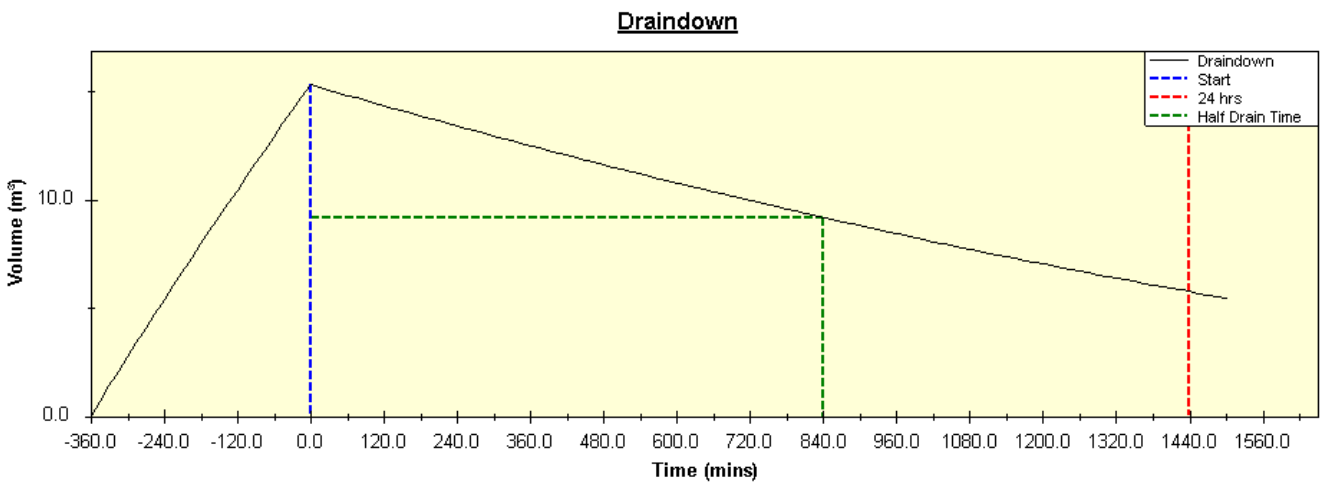
Project Status: PASS

Level & Draindown Graphs

Flow / Head



Draindown



ACO Blue Roof Calculator Version 1.0.0.46

Project Title
Avalon House Mortlake Rd

Design Number

Notes / Reference
Blue Roof 3 Solar Panels

Design Storm Event	1:100
Climate Change	40 %
Runoff Coefficient	1.00
Location	Richmond
Roof Area m²	273.1
Additional Contributing Areas (m²)	
Total Catchment Area (m²)	**273.1**
Net Roof Area (m²)	239.7
Permitted Outflow (l/s)	0.150
Blue or Blue/Green Roof	Unknown
If B/G, Green Roof Type	Extensive
a. Permanent reservoir above or in storage void	None
b. Required Reservoir Depth (mm)	

Required Net Storm Storage Volume (m³)	21.81
Actual Depth (mm)	101
Porosity	90 %
Selected depth of storage tank (mm)	125
Provided Storage Volume (m³)	26.96
Utilisation	80.9 %

Structural Load Calculations

Item	kN/m²
Weight of Product (Tank / Cell)	0.162
Weight of Product (Tray)	0.000
Geotextile	0.005
Weight of Permanent Storage	0.000
Weight of Stormwater Storage	1.158

R: 0.41 l/s

M5-60: 20.60 mm/h

DURATION (mins)	INTENSITY (mm/h)	REQUIRED STORAGE VOLUME (m³)
5 mins	216.82	4.89
10 mins	177.12	7.97
15 mins	142.89	9.62
30 mins	93.64	12.52
1 hour	58.55	15.45
2 hours	34.96	18.02
4 hours	20.36	20.09
6 hours	14.77	20.97
10 hours	9.96	21.81
24 hours	4.96	19.54
48 hours	2.79	10.71

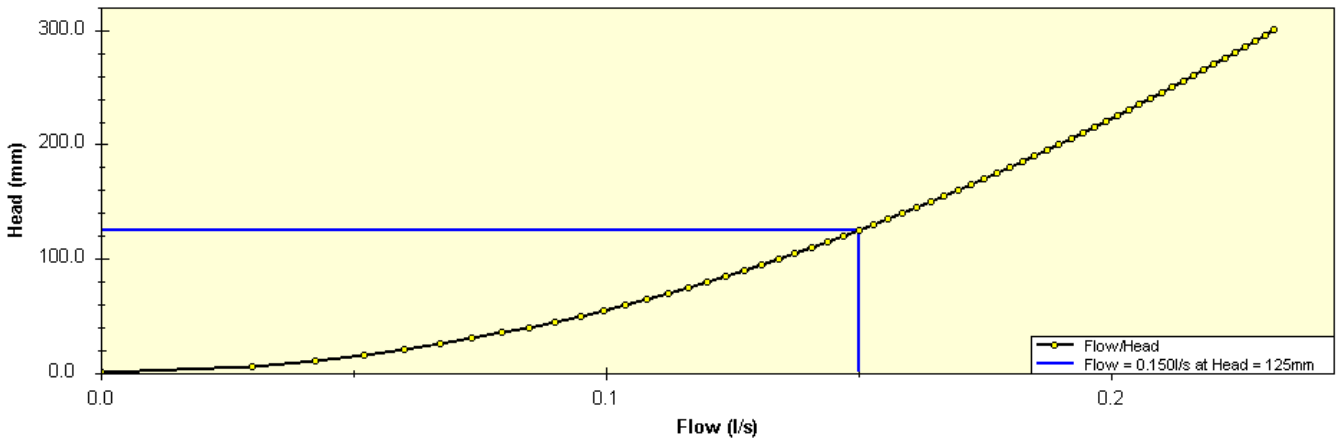
Required aperture / outlet plate size: 14 mm

Half Empty Time: 1390 mins

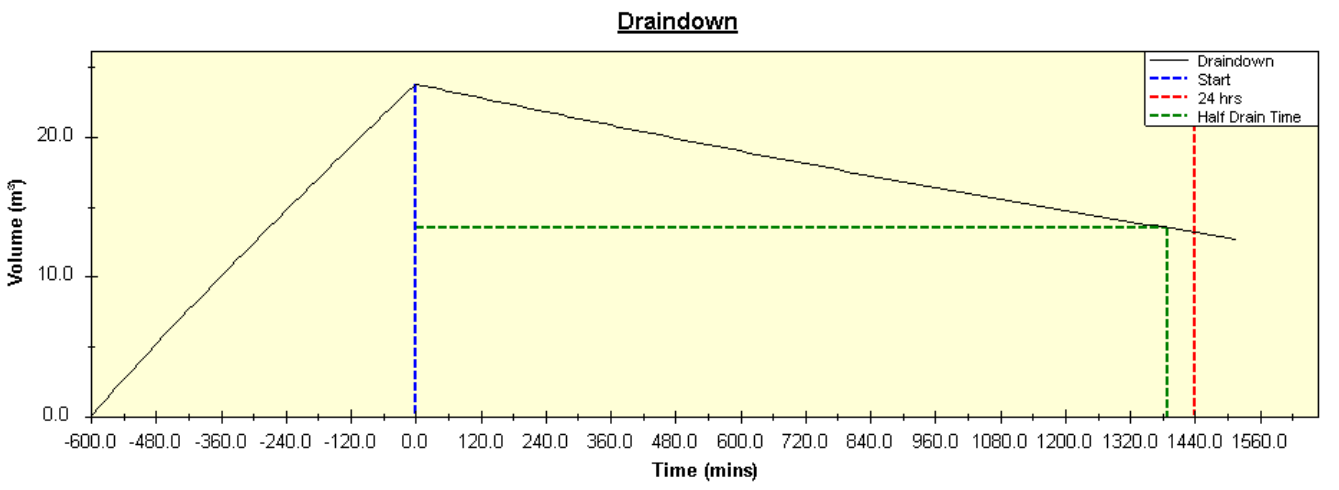
Project Status: PASS

Level & Draindown Graphs

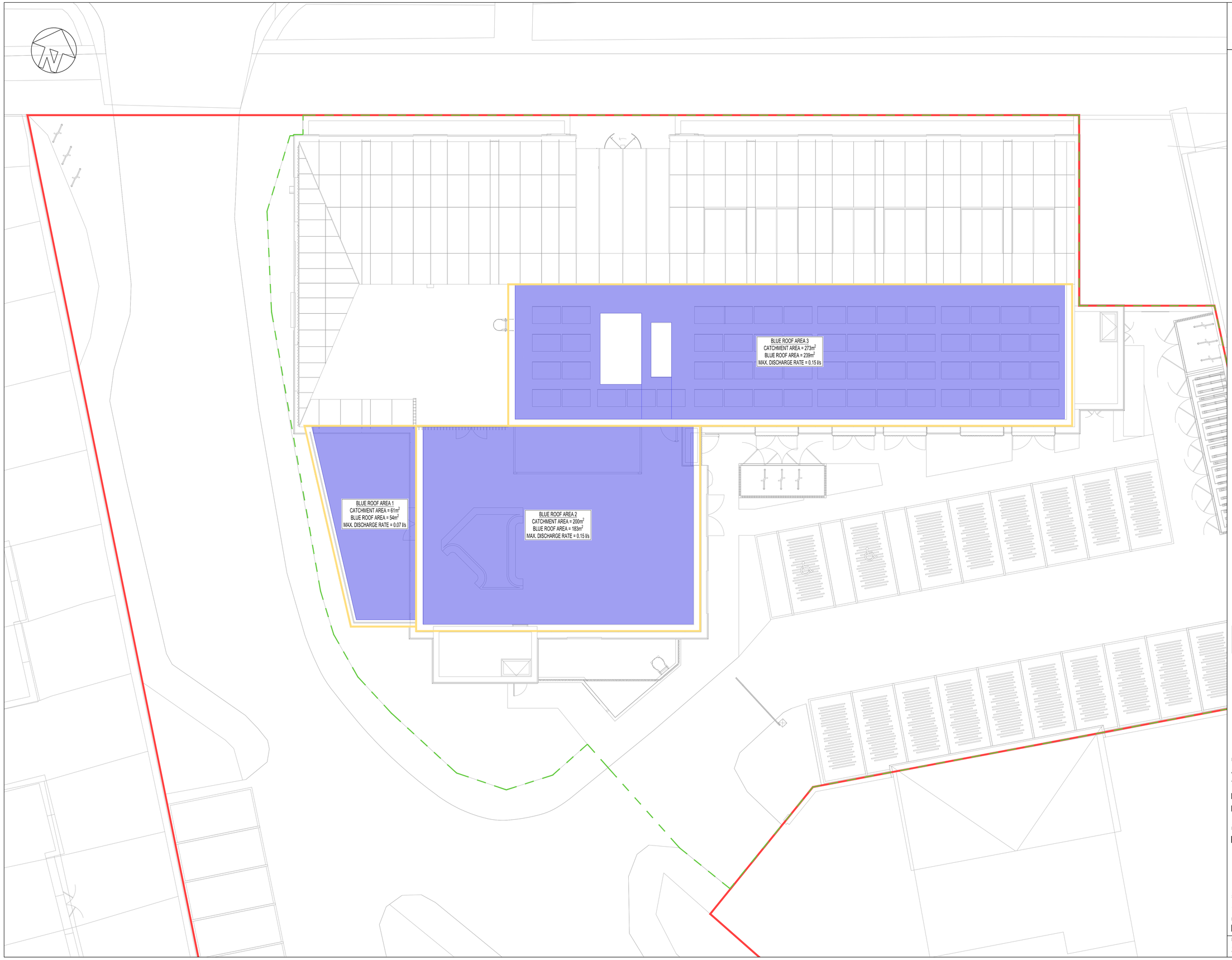
Flow / Head



Draindown



Appendix J: Proposed Below Ground Drainage Strategy



This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.

Do not scale from this drawing.

LEGEND

- PROPOSED BLUE ROOF AREA
- PROPOSED CATCHMENT AREA
- SITE BOUNDARY
- EXTENT OF WORKS BOUNDARY

NOT FOR CONSTRUCTION

rev	sc	date	by	chk	description
P2	S2	31.05.24	RBA	KTr	Issued For Planning
P1	S2	24.05.24	RBA	KTr	Draft Issue For Planning

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Project

Avalon House
72 Lower Mortlake Road
Richmond-upon-Thames
London, TW9 2JY

Drawing title

Proposed Blue Roof Areas

Scale (s)	Date	Drawn
1:100@ A1; 1:200@ A3	May 2024	RBA

Drawing status	Status	Revision
Preliminary	S2	P2

Project no.	Originator	Zone	Level	Type	Role	drg no.
2230479	EWP	ZZ	RF	DR	C	00001

BELOW GROUND DRAINAGE NOTES

1. THE LOCATION AND LEVEL OF EXISTING DRAINAGE CONNECTIONS AND EXISTING SERVICES IS TO BE CHECKED PRIOR TO COMMENCEMENT OF DRAINAGE WORKS. ANY VARIANCE TO THE DETAILS ON THIS DRAWING AND THE SCHEDULE IS TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
2. THE DESIGN IS BASED ON THE INFORMATION AVAILABLE ON THE DATE OF ISSUE FROM OTHER PARTIES (EG. ARCHITECT AND M & E ENGINEER), IT IS SUBJECT TO CHANGE RESULTING FROM UPDATES TO THE AVAILABLE INFORMATION FROM OTHERS.
3. THE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE NBS SPECIFICATIONS, ASSOCIATED MANHOLE SCHEDULE AND STANDARD DRAINAGE DETAIL DRAWINGS WHERE APPLICABLE.
4. THE POSITIONS OF FOUL AND SURFACE WATER DRAINAGE POINTS ARE INDICATIVE ONLY, REFER TO THE ARCHITECTS DRAWINGS FOR SETTING OUT DETAILS.
5. PRIVATE FOUL AND SURFACE WATER DRAINAGE IS TO BE CONSTRUCTED IN ACCORDANCE WITH BUILDING REGULATIONS PART H, BS EN752 AND BS EN12056.
6. DRAINS AT GROUND LEVEL ARE TO BE CONSTRUCTED USING VITRIFIED CLAY PIPES TO BS EN 295-1 SUPER STRENGTH SPECIFICATION (HEPWORTH SUPERSLEVE) OR SIMILAR APPROVED.
7. ALL SURFACE WATER CONNECTIONS TO BE 150mm DIAMETER AND TO BE LAID AT A MINIMUM GRADIENT OF 1/80 UNLESS NOTED OTHERWISE .
8. ALL SOIL CONNECTIONS AND RAINWATER PIPES SHOULD BE RODDABLE FROM GROUND LEVEL.
9. RAINWATER DOWN PIPES ARE TO CONNECT TO A DRAIN VIA A REST BEND. WHERE DRAINAGE IS COMBINED A 'P' TRAP MUST ALSO BE PROVIDED.
10. IN CASES OF IN SITU CONCRETE FLOOR SLABS, DRAINS ARE TO BE CAST INTEGRAL WITH THE SLAB WHERE PIPE COVER TO THE CROWN IS LESS THAN 300mm. • NOTE SPECIAL PROVISIONS APPLY TO BASEMENT FLOOR SLABS - SEE DETAILED DRAINAGE AND STRUCTURAL DRAWINGS. CONCRETE ENCASEMENT TO BE REINFORCED AS PER DRAINAGE DETAIL.
11. WHERE DRAINS PASS THROUGH FOUNDATIONS OR OTHER RIGID STRUCTURES A LINTEL OR SLEEVE IS TO BE USED AND PROVISION FOR FLEXIBILITY IS TO BE MADE USING ROCKER PIPES.
12. BACKFILLING OF DRAIN TRENCHES ADJACENT TO BUILDING OR OTHER STRUCTURES IS TO BE IN ACCORDANCE WITH DIAGRAM 8 OF THE BUILDING REGULATIONS.
13. ANY PIPE OR GULLY OR OTHER FITTING OR DUCT PENETRATING THE BASEMENT SLAB OR WALL IS TO BE WATERPROOFED USING HYDROPHILIC STRIPS OR PUDDLE FLANGES TO ENSURE A WATER TIGHT JOINT. CONCRETE SURROUND TO DRAINAGE PIPES AND FITTINGS MAY BE REQUIRED IN CERTAIN CASES - REFER TO DETAILED DRAINAGE DRAWINGS AND RELEVANT STRUCTURAL DETAILS.
14. EXISTING FOUNDATIONS AND RETAINING WALLS MUST NOT BE UNDERMINED BY NEW DRAINAGE RUNS UNLESS AGREED IN WRITING WITH THE STRUCTURAL ENGINEER. CONTRACTOR TO SUBMIT METHOD STATEMENTS AND TEMPORARY WORKS PROPOSALS TO THE STRUCTURAL ENGINEER FOR COMMENT PRIOR TO COMMENCEMENT OF WORKS.
15. ALL DRAINAGE EXCAVATIONS SHOULD BE RISK ASSESSED BY THE CONTRACTOR TO ENSURE TRENCH SAFETY / STABILISATION MEASURES ARE CONSIDERED DURING THE CONSTRUCTION PERIOD. ANY EXCAVATIONS LEFT EXPOSED SHOULD BE INSPECTED BY A COMPETENT PERSON ON A DAILY BASIS. GROUND CONDITIONS SHOULD BE MONITORED AND TOOL BOX TALKS SHOULD INCLUDE SITE INVESTIGATION INFORMATION TO AID THE CONTRACTORS ONGOING RISK ASSESSMENT AND METHOD OF EXCAVATION. ALL EXCAVATIONS SHOULD BE ASSESSED BY A COMPETENT PERSON FOR CONFINED SPACES REQUIREMENTS.
16. THE CONTRACTOR IS TO CONSIDER PHASING OF THE DRAINAGE INSTALLATION AND ARE TO PROVIDE TEMPORARY DRAINAGE MEASURES THEY DETERMINE ARE REQUIRED.
17. SuDS ARE TO BE INSTALLED IN ACCORDANCE WITH THE RECOMMENDATIONS MADE WITHIN THE CIRIA SUDS MANUAL C753 (WITH PARTICULAR ATTENTION DRAWN TO CHAPTER 31) AND CIRIA GUIDANCE ON THE CONSTRUCTION OF SuDS C768. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONSIDER CONSTRUCTION PROGRAMME OF SuDS.
18. DETAILED DESIGN OF GEOCELLULAR ATTENUATION CRATES IS A CDP ITEM AND SHOULD BE BASED ON LEVEL, LAYOUT AND VOLUME DETAILS SHOWN. DETAILED DESIGN INFORMATION SHOULD BE PROVIDED TO THE CIVIL ENGINEER TO PASS COMMENT.
19. ALL MANHOLE COVER LEVELS SHOWN ARE APPROXIMATE AND ARE TO SUIT THE FINAL GROUND OR BUILDING LEVELS .
20. MANHOLE COVERS IN BLOCK PAVED AREAS ARE TO BE RECESSED UNLESS NOTED OTHERWISE.
21. ALL EXTERNAL FOUL AND COMBINED WATER MANHOLE COVERS IN FOOTPATHS AND PAVED AREAS (OTHER THAN ROADS) ARE TO BE NON-VENTILATING AND SINGLE SEALED UNLESS NOTED OTHERWISE.
22. ALL EXTERNAL SURFACE WATER MANHOLE COVERS ARE TO BE NON-VENTILATING UNLESS NOTED OTHERWISE.
23. ALL MANHOLE COVERS ARE TO BE INSTALLED SQUARE TO PAVING, KERB LINES OR BUILDINGS.
24. FOR ADOPTED DRAINAGE, MANHOLE COVERS ARE TO BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE DCG OR SPECIFIC WATER AUTHORITY REQUIREMENT.
25. INSPECTION CHAMBERS ARE TO HAVE A REDUCED ACCESS PIECE WHEN THE DEPTH IS GREATER THAN 1.2m TO THE BASE OF THE CHAMBER.

This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.

Do not scale from this drawing.

LEGEND

- SURFACE WATER MANHOLE
- EXISTING SURFACE WATER
- PROPOSED SURFACE WATER
- SURFACE WATER PIPE TO BE ABANDONED
- RG TRAPPED ROAD GULLY
- RWP RAIN WATER PIPE
- GEOCELLULAR SURFACE WATER ATTENUATION (TO CONTRACTOR DESIGN)
- FC FLOW CONTROL CHAMBER
- PROPOSED PERMEABLE PAVING
- BUILDING FOOTPRINT
- GRASS LANDSCAPING
- SITE BOUNDARY
- EXTENT OF WORKS BOUNDARY

NOT FOR CONSTRUCTION

rev	sc	date	by	chk	description
P2	S2	31.05.24	RBA	KTr	Issued For Planning
P1	S2	24.05.24	RBA	KTr	Draft Issue For Planning

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Project

Avalon House
72 Lower Mortlake Road
Richmond-upon-Thames
London, TW9 2JY

Drawing title

Proposed Below Ground Drainage General Arrangement

Scale (s)	Date	Drawn
1:200@ A1; 1:400@ A3	May 2024	RBA

Drawing status: Preliminary — Status S2 — Revision P2

Project no.	Originator	Zone	Level	Type	Role	drg no.
2230479	EWP	ZZ	XX	DR	C	10000

SW MANHOLE SCHEDULE									
Manhole	Chamber Type	Cover Level (m)	Depth	Chamber Size	Eastings	Northings	Clear Opening	Cover Grade	Comments
SW01	PPIC	CL = 6.680 SUMP LEVEL OF MANHOLE = 5.720 INV IN = 5.720 INV IN = 6.175 INV OUT = 5.720	0.960	450Ø	518528.336	175411.496	450x450	B125	
SW02	PPIC	CL = 6.650 SUMP LEVEL OF MANHOLE = 5.320 INV IN = 5.720 INV OUT = 5.720	1.330	450Ø	518536.526	175417.114	450x450	B125	CATCHPIT MANHOLE WITH 400mm SUMP REDUCED ACCESS PIECE REQUIRED
SW03	PPIC	CL = 6.420 SUMP LEVEL OF MANHOLE = 5.320 INV IN = 5.720 INV IN = 5.720 INV OUT = 5.720	1.100	450Ø	518543.480	175429.077	450x450	B125	CATCHPIT MANHOLE WITH 400mm SUMP
SW04	PPIC	CL = 7.135 SUMP LEVEL OF MANHOLE = 5.320 INV IN = 5.720 INV IN = 6.630 INV OUT = 5.720	1.815	450Ø	518551.382	175425.100	450x450	D400	CATCHPIT MANHOLE WITH 400mm SUMP REDUCED ACCESS PIECE REQUIRED
SW05	PCC	CL = 6.540 SUMP LEVEL OF MANHOLE = 4.740 INV IN = 4.740 INV OUT = 4.740	1.800	1200Ø	518540.130	175417.659	600x600	D400	SURFACE WATER VORTEX FLOW CONTROL MANHOLE
SW06	PPIC	CL = 6.700 SUMP LEVEL OF MANHOLE = 6.150 INV IN = 6.150 INV OUT = 6.150	0.550	450Ø	518561.529	175428.769	450x450	D400	
SW07	PPIC	CL = 6.655 SUMP LEVEL OF MANHOLE = 6.150 INV IN = 6.150 INV OUT = 6.150	0.505	450Ø	518541.440	175417.066	450x450	D400	SURFACE WATER ORIFICE PLATE FLOW CONTROL MANHOLE CATCHPIT MANHOLE WITH 400mm SUMP
SW08	PPIC	CL = 6.095 SUMP LEVEL OF MANHOLE = 4.590 INV IN = 4.590 INV IN = 5.590 INV OUT = 4.590	1.505	450Ø	518537.597	175405.538	450x450	D400	REDUCED ACCESS PIECE REQUIRED

This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.

Do not scale from this drawing.

NOTES

1. THE MANHOLE SCHEDULE IS TO BE READ IN CONJUNCTION WITH THE BELOW GROUND DRAINAGE SPECIFICATION, BELOW GROUND TYPICAL DRAINAGE DETAIL DRAWINGS AND THE BELOW GROUND DRAINAGE GENERAL ARRANGEMENT DRAWINGS.
2. ALL COVER LEVELS SHOWN ARE APPROXIMATE AND ARE TO SUIT THE FINAL GROUND OR BUILDING LEVELS .
3. MANHOLE COVERS IN BLOCK PAVED AREAS ARE TO BE RECESSED UNLESS NOTED OTHERWISE.
4. ALL INTERNAL MANHOLE COVERS ARE TO BE NON-VENTILATING AND DOUBLE SEALED.
5. ALL EXTERNAL FOUL AND COMBINED WATER MANHOLE COVERS IN FOOTPATHS AND PAVED AREAS (OTHER THAN ROADS) ARE TO BE NON-VENTILATING AND SINGLE SEALED UNLESS NOTED OTHERWISE.
6. ALL EXTERNAL SURFACE WATER MANHOLE COVERS ARE TO BE NON-VENTILATING UNLESS NOTED OTHERWISE.
7. ALL MANHOLE COVERS ARE TO BE INSTALLED SQUARE TO PAVING, KERB LINES OR BUILDINGS.
8. ALL COVERS ARE TO BE IN ACCORDANCE WITH THE REQUIREMENTS OF BUILDING REGULATIONS.
9. FOR ADOPTED DRAINAGE, MANHOLE COVERS ARE TO BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE DCG OR SPECIFIC WATER AUTHORITY REQUIREMENT.
10. INSPECTION CHAMBERS ARE TO HAVE A REDUCED ACCESS PIECE WHEN THE DEPTH IS GREATER THAN 1.2m TO THE BASE OF THE CHAMBER.

NOT FOR CONSTRUCTION

rev	sc	date	by	chk	description
P2	S2	31.05.24	RBA	KTr	Issued For Planning
P1	S2	24.05.24	RBA	KTr	Draft Issue For Planning

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Project

Avalon House
72 Lower Mortlake Road
Richmond-upon-Thames
London, TW9 2JY

Drawing title

Proposed Below Ground Drainage Manhole Schedule

Scale (s)	Date	Drawn
NTS	May 2024	RBA

Drawing status: Preliminary — Status S2 — Revision P2

Project no.	Originator	Zone	Level	Type	Role	drg no.
2230479	EWP	ZZ	XX	DR	C	11000

Appendix K: MicroDrainage Hydraulic Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.413	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	100	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	21.313	0.670	31.8	0.063	4.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	5.718	0.075	76.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S2.000	23.923	0.000	0.0	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	
S2.001	8.009	0.990	8.1	0.067	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.002	5.718	0.075	76.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	59.88	4.20	5.410	0.063	0.0	0.0	0.0	1.79	31.7	10.2
S1.001	59.40	4.28	4.740	0.063	0.0	0.0	0.0	1.15	20.4	10.2
S2.000	43.39	8.30	5.655	0.000	0.0	0.0	0.0	0.09	1.6	0.0
S2.001	43.29	8.34	5.655	0.067	0.0	0.0	0.0	3.56	63.0	7.9
S1.002	43.06	8.42	4.665	0.130	0.0	0.0	0.0	1.15	20.4	15.2

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
SSW04	6.610	1.200	Open Manhole	1200	S1.000	5.410	150				
SSW05	6.540	1.800	Open Manhole	1200	S1.001	4.740	150	S1.000	4.740	150	
SJunction 2	6.655	1.000	Junction		S2.000	5.655	150				
SPerm Paving	6.655	1.000	Open Manhole	450	S2.001	5.655	150	S2.000	5.655	150	
SJunction	6.600	1.935	Junction		S1.002	4.665	150	S1.001	4.665	150	
								S2.001	4.665	150	
SSW09	6.700	2.110	Open Manhole	450		OUTFALL		S1.002	4.590	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SSW04	518558.166	175429.065	518558.166	175429.065	Required	
SSW05	518540.164	175417.656	518540.164	175417.656	Required	
SJunction 2	518565.516	175427.672			No Entry	
SPerm Paving	518544.991	175415.383	518544.991	175415.383	Required	
SJunction	518537.478	175412.608			No Entry	
SSW09	518534.793	175407.560			No Entry	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	SSW04	6.610	5.410	1.050	Open Manhole	1200
S1.001	o	150	SSW05	6.540	4.740	1.650	Open Manhole	1200
S2.000	o	150	SJunction 2	6.655	5.655	0.850	Junction	
S2.001	o	150	SPerm Paving	6.655	5.655	0.850	Open Manhole	450
S1.002	o	150	SJunction	6.600	4.665	1.785	Junction	

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	21.313	31.8	SSW05	6.540	4.740	1.650	Open Manhole	1200
S1.001	5.718	76.2	SJunction	6.600	4.665	1.785	Junction	
S2.000	23.923	0.0	SPerm Paving	6.655	5.655	0.850	Open Manhole	450
S2.001	8.009	8.1	SJunction	6.600	4.665	1.785	Junction	
S1.002	5.718	76.2	SSW09	6.700	4.590	1.960	Open Manhole	450

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.063	0.063	0.063
1.001	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.000	0.000	0.000
2.001	-	-	100	0.067	0.067	0.067
1.002	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.130	0.130	0.130

Network Classifications for Storm

PN	USMH Name	Pipe Dia (mm)	Min Cover Depth (m)	Max Cover Depth (m)	Pipe Type	MH Dia (mm)	MH Width (mm)	MH Ring Depth (m)	MH Type
S1.000	SSW04	150	1.050	1.650	Unclassified	1200	0	1.050	Unclassified
S1.001	SSW05	150	1.650	1.785	Unclassified	1200	0	1.650	Unclassified
S2.000	SJunction 2	150	0.850	0.850	Unclassified				Junction
S2.001	SPerm Paving	150	0.850	1.785	Unclassified	450	0	0.850	Unclassified
S1.002	SJunction	150	1.785	1.960	Unclassified				Junction

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.002	SSW09	6.700	4.590	0.000	450	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.413		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: SSW05, DS/PN: S1.001, Volume (m³): 2.4

Unit Reference	MD-SHE-0095-4000-1000-4000
Design Head (m)	1.000
Design Flow (l/s)	4.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	95
Invert Level (m)	4.740
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	4.0	Kick-Flo®	0.629	3.2
Flush-Flo™	0.294	4.0	Mean Flow over Head Range	-	3.5

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.0	0.800	3.6	2.000	5.5	4.000	7.6	7.000	10.0
0.200	3.9	1.000	4.0	2.200	5.8	4.500	8.1	7.500	10.3
0.300	4.0	1.200	4.3	2.400	6.0	5.000	8.5	8.000	10.6
0.400	3.9	1.400	4.7	2.600	6.2	5.500	8.9	8.500	10.9
0.500	3.8	1.600	5.0	3.000	6.7	6.000	9.3	9.000	11.2
0.600	3.4	1.800	5.3	3.500	7.2	6.500	9.6	9.500	11.5

Orifice Manhole: SPerm Paving, DS/PN: S2.001, Volume (m³): 0.6

Diameter (m) 0.050 Discharge Coefficient 0.600 Invert Level (m) 5.655

Storage Structures for Storm

Cellular Storage Manhole: SSW05, DS/PN: S1.001

Invert Level (m) 4.740 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	30.0	0.0	1.000	30.0	0.0	1.001	0.0	0.0

Porous Car Park Manhole: SPerm Paving, DS/PN: S2.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	52.3
Max Percolation (l/s)	145.3	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	6.155	Cap Volume Depth (m)	0.350

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model		FSR M5-60 (mm) 20.000	Cv (Summer) 0.750
Region England and Wales		Ratio R 0.414	Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	SSW04	15 Summer	1	+0%	100/15 Summer				5.468	-0.092
S1.001	SSW05	30 Winter	1	+0%	30/15 Summer				4.845	-0.045
S2.000	SJunction 2	15 Summer	1	+0%					5.805	0.000
S2.001	SPerm Paving	60 Winter	1	+0%	1/15 Summer				6.024	0.219
S1.002	SJunction	30 Winter	1	+0%					4.727	-0.088

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SSW04	0.000	0.32			9.5	OK	
S1.001	SSW05	0.000	0.19		19	3.2	OK	
S2.000	SJunction 2	0.000	0.05			0.2	SURCHARGED*	
S2.001	SPerm Paving	0.000	0.06		22	3.0	SURCHARGED	
S1.002	SJunction	0.000	0.35			6.1	OK*	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model		FSR M5-60 (mm) 20.000	Cv (Summer) 0.750
Region	England and Wales	Ratio R 0.414	Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	SSW04	15 Winter	30	+0%	100/15 Summer				5.510	-0.050
S1.001	SSW05	30 Winter	30	+0%	30/15 Summer				5.033	0.143
S2.000	SJunction 2	15 Summer	30	+0%					5.805	0.000
S2.001	SPerm Paving	60 Winter	30	+0%	1/15 Summer				6.192	0.387
S1.002	SJunction	30 Winter	30	+0%					4.735	-0.080

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SSW04	0.000	0.78			23.3	OK	
S1.001	SSW05	0.000	0.24		25	4.0	SURCHARGED	
S2.000	SJunction 2	0.000	0.24			1.1	SURCHARGED*	
S2.001	SPerm Paving	0.000	0.07		28	3.7	SURCHARGED	
S1.002	SJunction	0.000	0.45			7.7	OK*	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	20.000
Region	England and Wales	Ratio R	0.414
Cv (Summer)	0.750		
Cv (Winter)	0.840		

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	SSW04	15 Winter	100	+40%	100/15 Summer				6.054
S1.001	SSW05	60 Winter	100	+40%	30/15 Summer				5.411
S2.000	SJunction 2	15 Summer	100	+40%					5.805
S2.001	SPerm Paving	60 Winter	100	+40%	1/15 Summer				6.266
S1.002	SJunction	240 Winter	100	+40%					4.736

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SSW04	0.494	0.000	1.22			36.3	SURCHARGED	
S1.001	SSW05	0.521	0.000	0.24		50	4.0	SURCHARGED	
S2.000	SJunction 2	0.000	0.000	0.01			0.0	SURCHARGED*	
S2.001	SPerm Paving	0.461	0.000	0.07		50	4.0	SURCHARGED	
S1.002	SJunction	-0.079	0.000	0.45			7.8	OK*	

Appendix L: TW Confirmation of Sufficient Capacity

Keri Trimmer

Elliott Wood
The Building Society, 55 Whitfield Street
London
W1T 4AH

Wastewater pre-planning
Our ref DS6117165

26 April 2024

Pre-planning enquiry: Confirmation of sufficient capacity

Site address: Avalon House, 72 Lower Mortlake Rd, Richmond TW9 2JY (Foul Water)

Dear Keri

Thank you for providing information on your development *Top floors of existing office building to be demolished and replaced. Footprint of the building increased from 33,104m2 GIA to 43,512m2 GIA. Proposed foul water strategy is to reuse existing connection into a foul water sewer in Tersha Street by gravity. No surface water strategy provided at this stage.*

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 sewerage 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 foul water 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.

You'll need to 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 capacity.

What happens next?

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.

If you've any further questions, please contact me on number below.

Yours sincerely

Natalya Bacon
Adoption & Pre-planning Engineer
Service Delivery
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T: +44 800 009 3921
E: developer.services@thameswater.co.uk
W: https://www.thameswater.co.uk/developers

Get advice – make your sewer connection correctly - Plumbing and drainage misconnections | Water UK

Clearwater Court, Vastern Road, Reading, RG1 8DB

Appendix M: LBRUT SuDS Proforma

LONDON BOROUGH OF RICHMOND UPON THAMES

LoDEG

1. Project & Site Details

Project / Site Name (including sub-catchment / stage / phase where appropriate)	Avalon House
Address & post code	Avalon House 72 Lower Mortlake Road Richmond upon Thames London TW9 2JY
OS Grid ref. (Easting, Northing)	E 518521
	N 175440
LPA reference (if applicable)	
Brief description of proposed work	Refer to report ref: 2230479-EWP-ZZ-XX-RP-C-0001
Total site Area	2011 m^2
Total existing impervious area	2011 m^2
Total proposed impervious area	1836 m^2
Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	Yes. The site is located within a CDA as defined by the LBRUT - SFRA Interactive Maps.
Existing drainage connection type and location	FW and SW connection to Thames Water FW and SW sewers beneath Tersha
Designer Name	Ryan Burt-Allen
Designer Position	Civil Engineer
Designer Company	Elliott Wood Partnership Ltd.

2. Proposed Discharge Arrangements

2a. Infiltration Feasibility

Superficial geology classification	Kempton Park Gravel Members
Bedrock geology classification	London Clay Formation
Site infiltration rate	Unknown m/s
Depth to groundwater level	5.2 m below ground level
Is infiltration feasible?	No

2b. Drainage Hierarchy

	Feasible (Y/N)	*Proposed (Y/N)*
1 store rainwater for later use	N	N
2 use infiltration techniques, such as porous surfaces in non-clay areas	N	N
3 attenuate rainwater in ponds or open water features for gradual release	N	N
4 attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Y
5 discharge rainwater direct to a watercourse	N	N
6 discharge rainwater to a surface water sewer/drain	Y	Y
7 discharge rainwater to the combined sewer.	N	N

2c. Proposed Discharge Details

Proposed discharge location	Beneath Tersha Street
Has the owner/regulator of the discharge location been consulted?	Yes. Capacity confirmed from Thames Water

LONDON BOROUGH OF RICHMOND UPON THAMES

LoDEG

3. Drainage Strategy

3a. Discharge Rates & Required Storage

	Greenfield (GF) runoff rate (l/s)	*Existing discharge rate (l/s)*	*Required storage for GF rate (m^3)*	*Proposed discharge rate (l/s)*
Qbar	0.32			
1 in 1	0.27	18.1		6.57
1 in 30	0.73	45.5		8.07
1 in 100	1.02	58		8.17
1 in 100 + CC				8.37
Climate change allowance used		40%		
3b. Principal Method of Flow Control		Blue Roof Flow Restrictor. Hydro-brake Flow Control & Orifice Plate		

3c. Proposed SuDS Measures

	Catchment area (m^2)	*Plan area (m^2)*	*Storage vol. (m^3)*
Rainwater harvesting	0		0
Infiltration systems	0		0
Green roofs	0	0	0
Blue roofs	534	476	50.02
Filter strips	0	0	0
Filter drains	0	0	0
Bioretention / tree pits	0	0	0
Pervious pavements	668	523	156.9
Swales	0	0	0
Basins/ponds	0	0	0
Attenuation tanks	0		30
Total	**1202**	**999**	**236.92**

4. Supporting Information

4a. Discharge & Drainage Strategy	*Page/section of drainage report*
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	Refer to report ref: 2230479-EWP-ZZ-XX-RP-C-0001
Drainage hierarchy (2b)	
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	
Proposed SuDS measures & specifications (3b)	
4b. Other Supporting Details	*Page/section of drainage report*
Detailed Development Layout	
Detailed drainage design drawings, including exceedance flow routes	
Detailed landscaping plans	
Maintenance strategy	
Demonstration of how the proposed SuDS measures improve:	
a) water quality of the runoff?	
b) biodiversity?	
c) amenity?	

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Engineering a Better Society

Certified B Corporation