



Legend

Approximate Site Boundary

Historic Flood Outlines

0255075100 m

N

Figure		
Historic Flooding		
Job		
Logicor Park Reading, Rose Kiln Court		
Client		
Redwood (Light Industrial) Propco Sarl		
Appendix:	Revision	Date
H	2	28 March 2023
Drawn by	Checked by	Scale
LA	RS	1:2,000
Job No.		
91193.557191 / 22-1640.07		

Bing Maps

DeltaSimons

Site Plan Provided by Client.

C:\GIS\Templates\91193.557191_Rose Kiln Court\91193.557191.qgz

Appendix I – Site Visit Photographs

Site Photographs



Photograph 1 - Storm Water drain outlet located to the north of the Site



Photograph 2 - Weir Structure adjacent to the Site's northern boundary



Photograph 3 - Weir structure and bridge where watercourse flows beneath the A33



Photograph 4 - Holy Brook water level



Photograph 5 - Site drainage



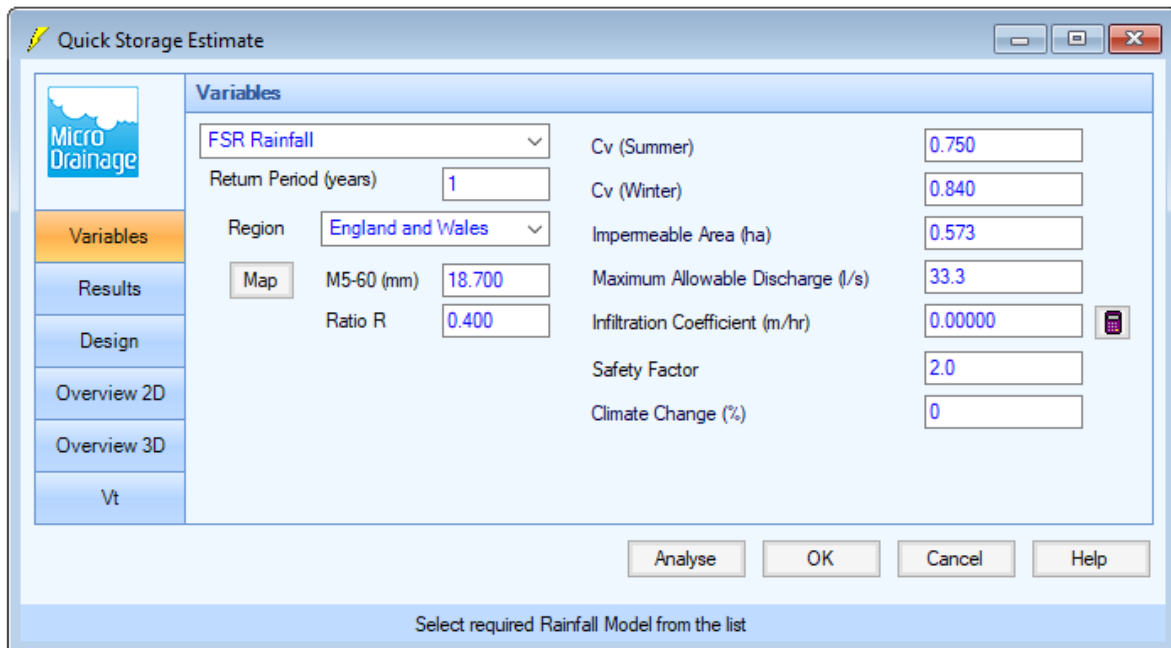
Photograph 6 - Site drainage



Photograph 7 - Site drainage

Appendix J - Quick Storage Estimates

1 in 1 year



Micro Drainage

Variables

FSR Rainfall

Return Period (years) 1

Region England and Wales

Map M5-60 (mm) 18.700

Ratio R 0.400

Cv (Summer) 0.750

Cv (Winter) 0.840

Impervious Area (ha) 0.573

Maximum Allowable Discharge (l/s) 33.3

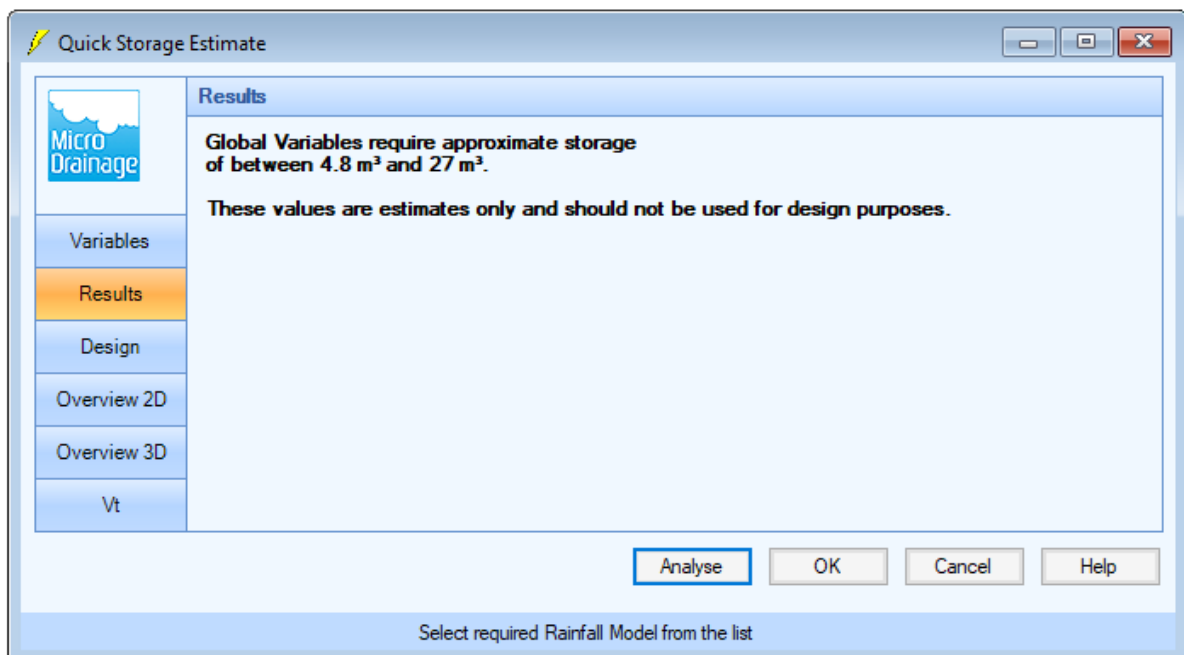
Infiltration Coefficient (m/hr) 0.00000

Safety Factor 2.0

Climate Change (%) 0

Analyse OK Cancel Help

Select required Rainfall Model from the list



Micro Drainage

Results

Global Variables require approximate storage of between 4.8 m³ and 27 m³.

These values are estimates only and should not be used for design purposes.

Analyse OK Cancel Help

Select required Rainfall Model from the list

1 in 30 year

Quick Storage Estimate

Micro Drainage

Variables

FEH Rainfall

Return Period (years) 30

Version 2013 Point

Site GB 471322 172361 SU 71322 72361

Cv (Summer) 0.750

Cv (Winter) 0.840

Impermeable Area (ha) 0.573

Maximum Allowable Discharge (l/s) 33.3

Infiltration Coefficient (m/hr) 0.00000

Safety Factor 2.0

Climate Change (%) 0

Analyse OK Cancel Help

Select required Rainfall Model from the list

Quick Storage Estimate

Micro Drainage

Results

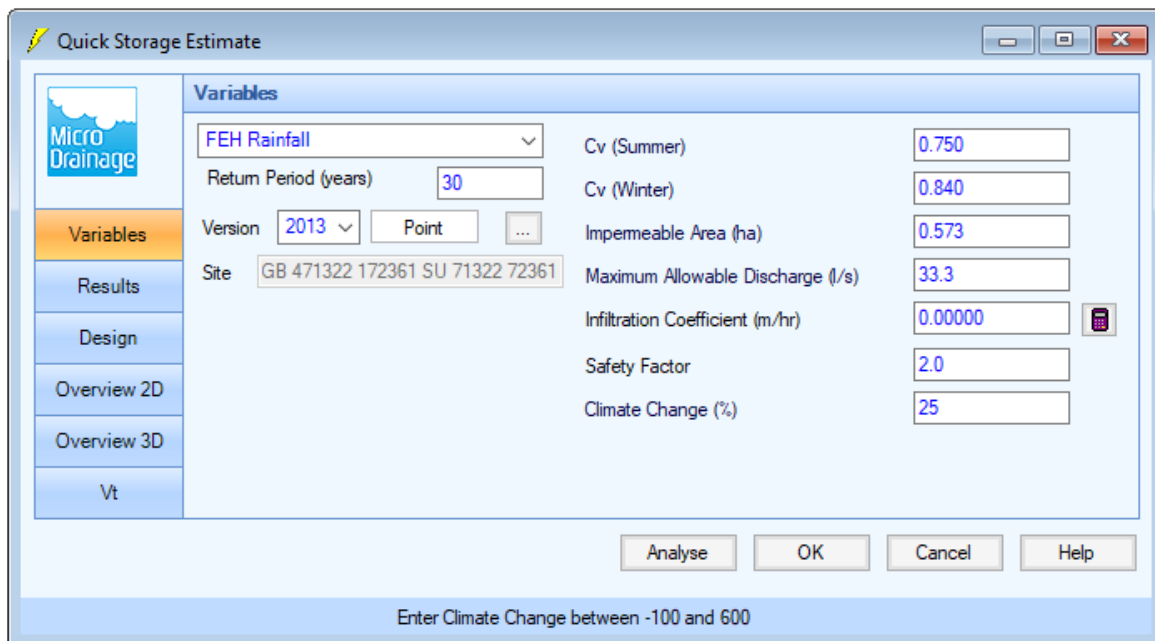
Global Variables require approximate storage of between 65 m³ and 115 m³.

These values are estimates only and should not be used for design purposes.

Analyse OK Cancel Help

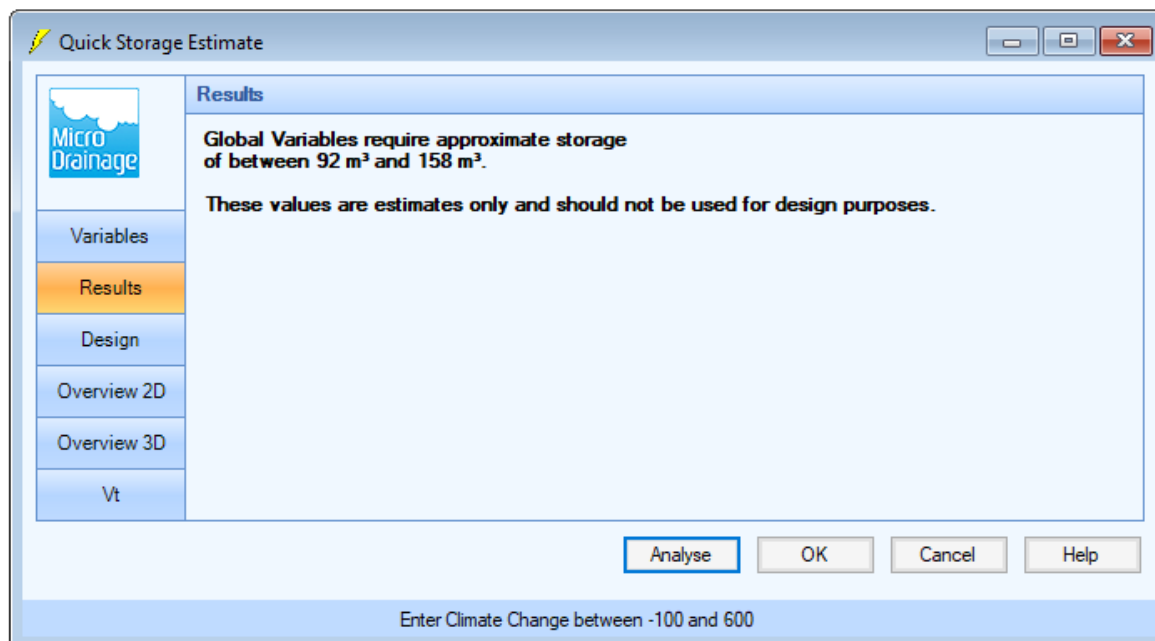
Select required Rainfall Model from the list

1 in 30 year + 25% CC



The screenshot shows the 'Variables' tab of the 'Quick Storage Estimate' window. The left sidebar contains buttons for 'Variables', 'Results', 'Design', 'Overview 2D', 'Overview 3D', and 'Vt'. The main area is divided into two columns. The left column contains input fields for 'FEH Rainfall' (a dropdown menu), 'Return Period (years)' (a text box with '30'), 'Version' (a dropdown menu with '2013'), and 'Site' (a text box with 'GB 471322 172361 SU 71322 72361'). The right column contains input fields for 'Cv (Summer)' (0.750), 'Cv (Winter)' (0.840), 'Impervious Area (ha)' (0.573), 'Maximum Allowable Discharge (l/s)' (33.3), 'Infiltration Coefficient (m/hr)' (0.00000), 'Safety Factor' (2.0), and 'Climate Change (%)' (25). At the bottom right are buttons for 'Analyse', 'OK', 'Cancel', and 'Help'. A footer note states 'Enter Climate Change between -100 and 600'.

Variable	Value
FEH Rainfall	[Dropdown]
Return Period (years)	30
Version	2013
Site	GB 471322 172361 SU 71322 72361
Cv (Summer)	0.750
Cv (Winter)	0.840
Impervious Area (ha)	0.573
Maximum Allowable Discharge (l/s)	33.3
Infiltration Coefficient (m/hr)	0.00000
Safety Factor	2.0
Climate Change (%)	25



The screenshot shows the 'Results' tab of the 'Quick Storage Estimate' window. The left sidebar is the same as the previous window, but the 'Results' button is highlighted. The main area displays the following text: 'Global Variables require approximate storage of between 92 m³ and 158 m³.' and 'These values are estimates only and should not be used for design purposes.' At the bottom right are buttons for 'Analyse', 'OK', 'Cancel', and 'Help'. A footer note states 'Enter Climate Change between -100 and 600'.

Global Variables require approximate storage of between 92 m³ and 158 m³.

These values are estimates only and should not be used for design purposes.

1 in 100 year + 35% CC

Quick Storage Estimate



Variables

FEH Rainfall

Return Period (years)

Version Point ...

Site

Cv (Summer)

Cv (Winter)

Impemeable Area (ha)

Maximum Allowable Discharge (l/s)

Infiltration Coefficient (m/hr) 

Safety Factor

Climate Change (%)

Results

Design

Overview 2D

Overview 3D

Vt

Analyse OK Cancel Help

Enter Return Period between 2 and 1000

Quick Storage Estimate



Results

Global Variables require approximate storage of between 155 m³ and 240 m³.

These values are estimates only and should not be used for design purposes.

Variables

Results

Design

Overview 2D

Overview 3D

Vt

Analyse OK Cancel Help

Enter Return Period between 2 and 1000

Appendix K - Geocellular Microdrainage Source Control Calculations

Delta-Simons

Page 1

Suite 4A
Portland Street
Manchester, M1 3BE

Rose Kiln Court
Geocellular Crates
1 in 1

Date 03/04/2023
File 1 in 1 Geocellular Crat...

Designed by AR
Checked by RS

Innovyze

Source Control 2020.1.3

Micro Drainage

Summary of Results for 1 year Return Period

Half Drain Time : 2 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	99.131	0.531	0.0	33.3	33.3	5.0	O K
30 min Summer	99.237	0.637	0.0	33.3	33.3	6.1	O K
60 min Summer	99.004	0.404	0.0	33.3	33.3	3.8	O K
120 min Summer	98.819	0.219	0.0	28.7	28.7	2.1	O K
180 min Summer	98.787	0.187	0.0	23.3	23.3	1.8	O K
240 min Summer	98.767	0.167	0.0	19.6	19.6	1.6	O K
360 min Summer	98.743	0.143	0.0	15.2	15.2	1.4	O K
480 min Summer	98.728	0.128	0.0	12.6	12.6	1.2	O K
600 min Summer	98.718	0.118	0.0	10.9	10.9	1.1	O K
720 min Summer	98.709	0.109	0.0	9.5	9.5	1.0	O K
960 min Summer	98.698	0.098	0.0	7.8	7.8	0.9	O K
1440 min Summer	98.683	0.083	0.0	5.8	5.8	0.8	O K
2160 min Summer	98.671	0.071	0.0	4.3	4.3	0.7	O K
2880 min Summer	98.664	0.064	0.0	3.5	3.5	0.6	O K
4320 min Summer	98.655	0.055	0.0	2.6	2.6	0.5	O K
5760 min Summer	98.649	0.049	0.0	2.1	2.1	0.5	O K
7200 min Summer	98.645	0.045	0.0	1.8	1.8	0.4	O K
8640 min Summer	98.642	0.042	0.0	1.6	1.6	0.4	O K
10080 min Summer	98.640	0.040	0.0	1.4	1.4	0.4	O K
15 min Winter	99.396	0.796	0.0	33.3	33.3	7.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	28.899	0.0	31.0	18
30 min Summer	18.773	0.0	40.3	26
60 min Summer	11.871	0.0	51.0	40
120 min Summer	7.355	0.0	63.2	68
180 min Summer	5.532	0.0	71.3	96
240 min Summer	4.514	0.0	77.6	126
360 min Summer	3.387	0.0	87.3	188
480 min Summer	2.746	0.0	94.4	248
600 min Summer	2.332	0.0	100.2	308
720 min Summer	2.041	0.0	105.3	368
960 min Summer	1.654	0.0	113.7	490
1440 min Summer	1.230	0.0	126.8	730
2160 min Summer	0.915	0.0	141.6	1088
2880 min Summer	0.742	0.0	153.1	1444
4320 min Summer	0.552	0.0	170.8	2192
5760 min Summer	0.447	0.0	184.5	2936
7200 min Summer	0.380	0.0	196.0	3600
8640 min Summer	0.333	0.0	206.0	4304
10080 min Summer	0.298	0.0	214.9	5096
15 min Winter	28.899	0.0	34.8	18

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Delta-Simons		Page 2																																																																																																																																																																																																																																																							
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K</td></tr><tr><td>480 min Winter</td><td>98.708</td><td>0.108</td><td>0.0</td><td>9.3</td><td>9.3</td><td>1.0</td><td>O K</td></tr><tr><td>600 min Winter</td><td>98.699</td><td>0.099</td><td>0.0</td><td>7.9</td><td>7.9</td><td>0.9</td><td>O K</td></tr><tr><td>720 min Winter</td><td>98.692</td><td>0.092</td><td>0.0</td><td>6.9</td><td>6.9</td><td>0.9</td><td>O K</td></tr><tr><td>960 min Winter</td><td>98.682</td><td>0.082</td><td>0.0</td><td>5.6</td><td>5.6</td><td>0.8</td><td>O K</td></tr><tr><td>1440 min Winter</td><td>98.670</td><td>0.070</td><td>0.0</td><td>4.2</td><td>4.2</td><td>0.7</td><td>O K</td></tr><tr><td>2160 min Winter</td><td>98.660</td><td>0.060</td><td>0.0</td><td>3.1</td><td>3.1</td><td>0.6</td><td>O K</td></tr><tr><td>2880 min Winter</td><td>98.654</td><td>0.054</td><td>0.0</td><td>2.5</td><td>2.5</td><td>0.5</td><td>O K</td></tr><tr><td>4320 min Winter</td><td>98.646</td><td>0.046</td><td>0.0</td><td>1.9</td><td>1.9</td><td>0.4</td><td>O K</td></tr><tr><td>5760 min Winter</td><td>98.642</td><td>0.042</td><td>0.0</td><td>1.6</td><td>1.6</td><td>0.4</td><td>O K</td></tr><tr><td>7200 min Winter</td><td>98.638</td><td>0.038</td><td>0.0</td><td>1.3</td><td>1.3</td><td>0.4</td><td>O K</td></tr><tr><td>8640 min Winter</td><td>98.636</td><td>0.036</td><td>0.0</td><td>1.1</td><td>1.1</td><td>0.3</td><td>O K</td></tr><tr><td>10080 min Winter</td><td>98.634</td><td>0.034</td><td>0.0</td><td>1.0</td><td>1.0</td><td>0.3</td><td>O K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>30 min Winter</td><td>18.773</td><td>0.0</td><td>45.2</td><td>26</td></tr><tr><td>60 min Winter</td><td>11.871</td><td>0.0</td><td>57.1</td><td>40</td></tr><tr><td>120 min Winter</td><td>7.355</td><td>0.0</td><td>70.8</td><td>66</td></tr><tr><td>180 min Winter</td><td>5.532</td><td>0.0</td><td>79.9</td><td>98</td></tr><tr><td>240 min Winter</td><td>4.514</td><td>0.0</td><td>86.9</td><td>126</td></tr><tr><td>360 min Winter</td><td>3.387</td><td>0.0</td><td>97.8</td><td>188</td></tr><tr><td>480 min Winter</td><td>2.746</td><td>0.0</td><td>105.7</td><td>246</td></tr><tr><td>600 min Winter</td><td>2.332</td><td>0.0</td><td>112.3</td><td>304</td></tr><tr><td>720 min Winter</td><td>2.041</td><td>0.0</td><td>117.9</td><td>368</td></tr><tr><td>960 min Winter</td><td>1.654</td><td>0.0</td><td>127.4</td><td>482</td></tr><tr><td>1440 min Winter</td><td>1.230</td><td>0.0</td><td>142.1</td><td>726</td></tr><tr><td>2160 min Winter</td><td>0.915</td><td>0.0</td><td>158.6</td><td>1068</td></tr><tr><td>2880 min Winter</td><td>0.742</td><td>0.0</td><td>171.5</td><td>1440</td></tr><tr><td>4320 min Winter</td><td>0.552</td><td>0.0</td><td>191.2</td><td>2156</td></tr><tr><td>5760 min Winter</td><td>0.447</td><td>0.0</td><td>206.7</td><td>2848</td></tr><tr><td>7200 min Winter</td><td>0.380</td><td>0.0</td><td>219.6</td><td>3592</td></tr><tr><td>8640 min Winter</td><td>0.333</td><td>0.0</td><td>230.7</td><td>4256</td></tr><tr><td>10080 min Winter</td><td>0.298</td><td>0.0</td><td>240.7</td><td>5216</td></tr></table>			Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status	30 min Winter	99.390	0.790	0.0	33.3	33.3	7.5	O K	60 min Winter	98.925	0.325	0.0	33.2	33.2	3.1	O K	120 min Winter	98.791	0.191	0.0	23.9	23.9	1.8	O K	180 min Winter	98.760	0.160	0.0	18.3	18.3	1.5	O K	240 min Winter	98.742	0.142	0.0	15.1	15.1	1.4	O K	360 min Winter	98.721	0.121	0.0	11.4	11.4	1.1	O K	480 min Winter	98.708	0.108	0.0	9.3	9.3	1.0	O K	600 min Winter	98.699	0.099	0.0	7.9	7.9	0.9	O K	720 min Winter	98.692	0.092	0.0	6.9	6.9	0.9	O K	960 min Winter	98.682	0.082	0.0	5.6	5.6	0.8	O K	1440 min Winter	98.670	0.070	0.0	4.2	4.2	0.7	O K	2160 min Winter	98.660	0.060	0.0	3.1	3.1	0.6	O K	2880 min 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480 min Winter	2.746	0.0	105.7	246																																																																																																																																																																																																																																																					
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720 min Winter	2.041	0.0	117.9	368																																																																																																																																																																																																																																																					
960 min Winter	1.654	0.0	127.4	482																																																																																																																																																																																																																																																					
1440 min Winter	1.230	0.0	142.1	726																																																																																																																																																																																																																																																					
2160 min Winter	0.915	0.0	158.6	1068																																																																																																																																																																																																																																																					
2880 min Winter	0.742	0.0	171.5	1440																																																																																																																																																																																																																																																					
4320 min Winter	0.552	0.0	191.2	2156																																																																																																																																																																																																																																																					
5760 min Winter	0.447	0.0	206.7	2848																																																																																																																																																																																																																																																					
7200 min Winter	0.380	0.0	219.6	3592																																																																																																																																																																																																																																																					
8640 min Winter	0.333	0.0	230.7	4256																																																																																																																																																																																																																																																					
10080 min Winter	0.298	0.0	240.7	5216																																																																																																																																																																																																																																																					
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Delta-Simons		Page 3
Suite 4A Portland Street Manchester, M1 3BE	Rose Kiln Court Geocellular Crates 1 in 1	
Date 03/04/2023 File 1 in 1 Geocellular Crat...	Designed by AR Checked by RS	
Innovyze Source Control 2020.1.3		

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.700	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.573

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.191	4 8	0.191	8 12	0.191

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Suite 4A Portland Street Manchester, M1 3BE	Rose Kiln Court Geocellular Crates 1 in 1	
Date 03/04/2023 File 1 in 1 Geocellular Crat...	Designed by AR Checked by RS	
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Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 98.600 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	10.0	0.0	0.801	0.0	0.0
0.800	10.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0250-3330-0800-3330
Design Head (m) 0.800
Design Flow (l/s) 33.3
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 250
Invert Level (m) 98.600
Minimum Outlet Pipe Diameter (mm) 300
Suggested Manhole Diameter (mm) 1500

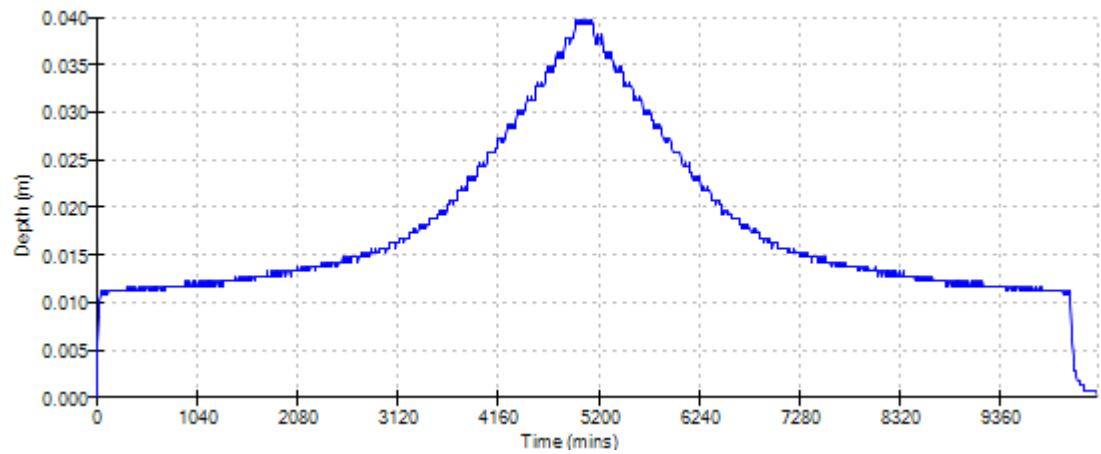
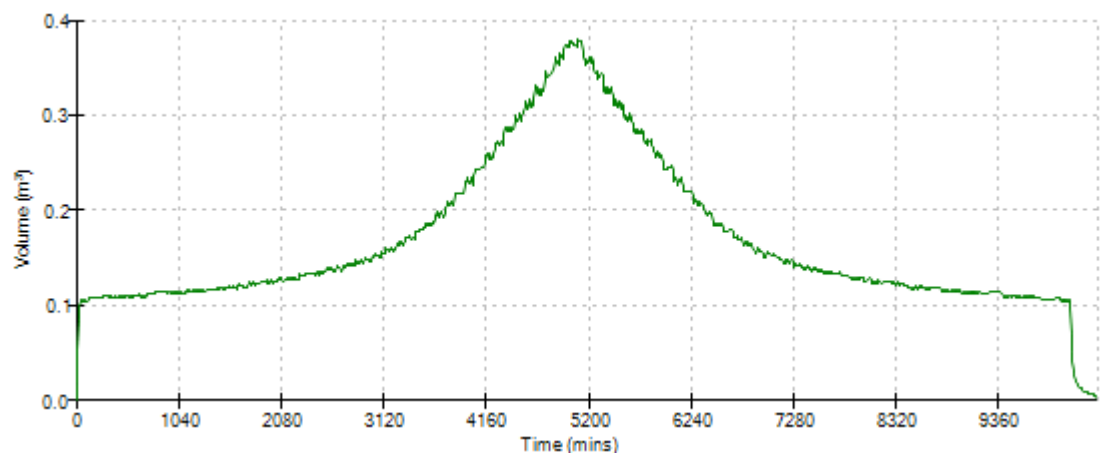
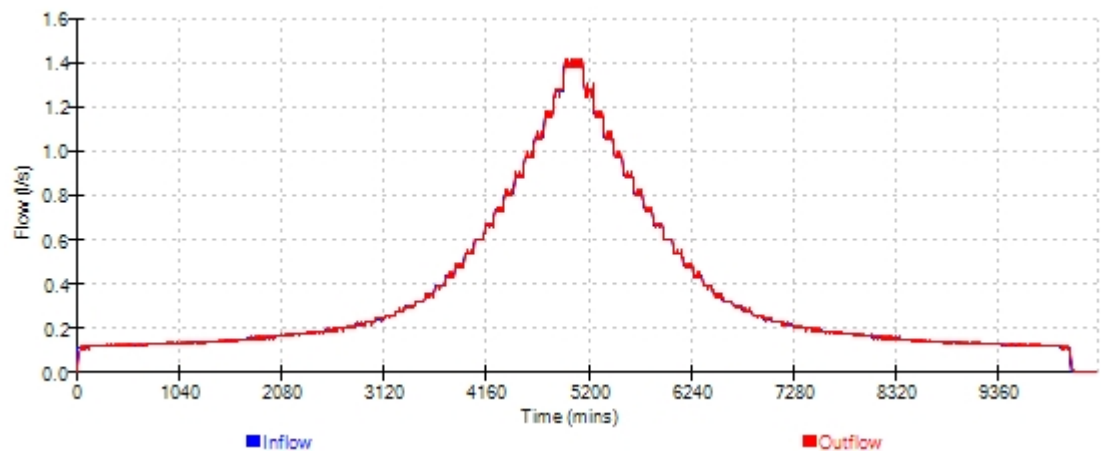
Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.800	33.3
Flush-Flo™	0.370	33.3
Kick-Flo®	0.636	29.8
Mean Flow over Head Range	-	26.4

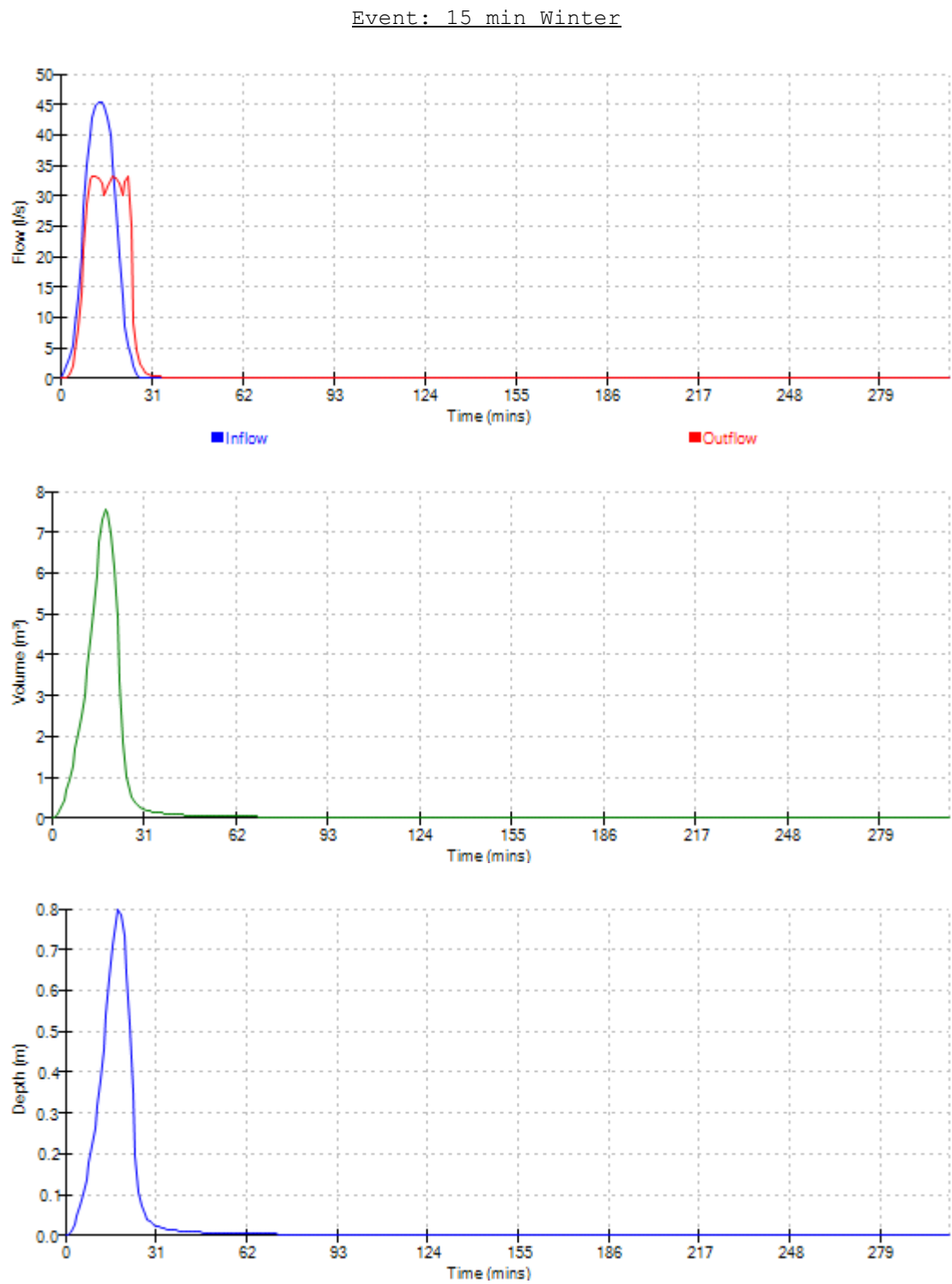
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	8.1	1.200	40.4	3.000	63.0	7.000	95.1
0.200	25.5	1.400	43.6	3.500	67.9	7.500	98.4
0.300	33.0	1.600	46.5	4.000	72.4	8.000	101.5
0.400	33.3	1.800	49.2	4.500	76.7	8.500	103.9
0.500	32.5	2.000	51.7	5.000	80.7	9.000	106.9
0.600	30.9	2.200	54.2	5.500	84.6	9.500	109.9
0.800	33.3	2.400	56.5	6.000	88.2		
1.000	37.0	2.600	58.7	6.500	91.7		

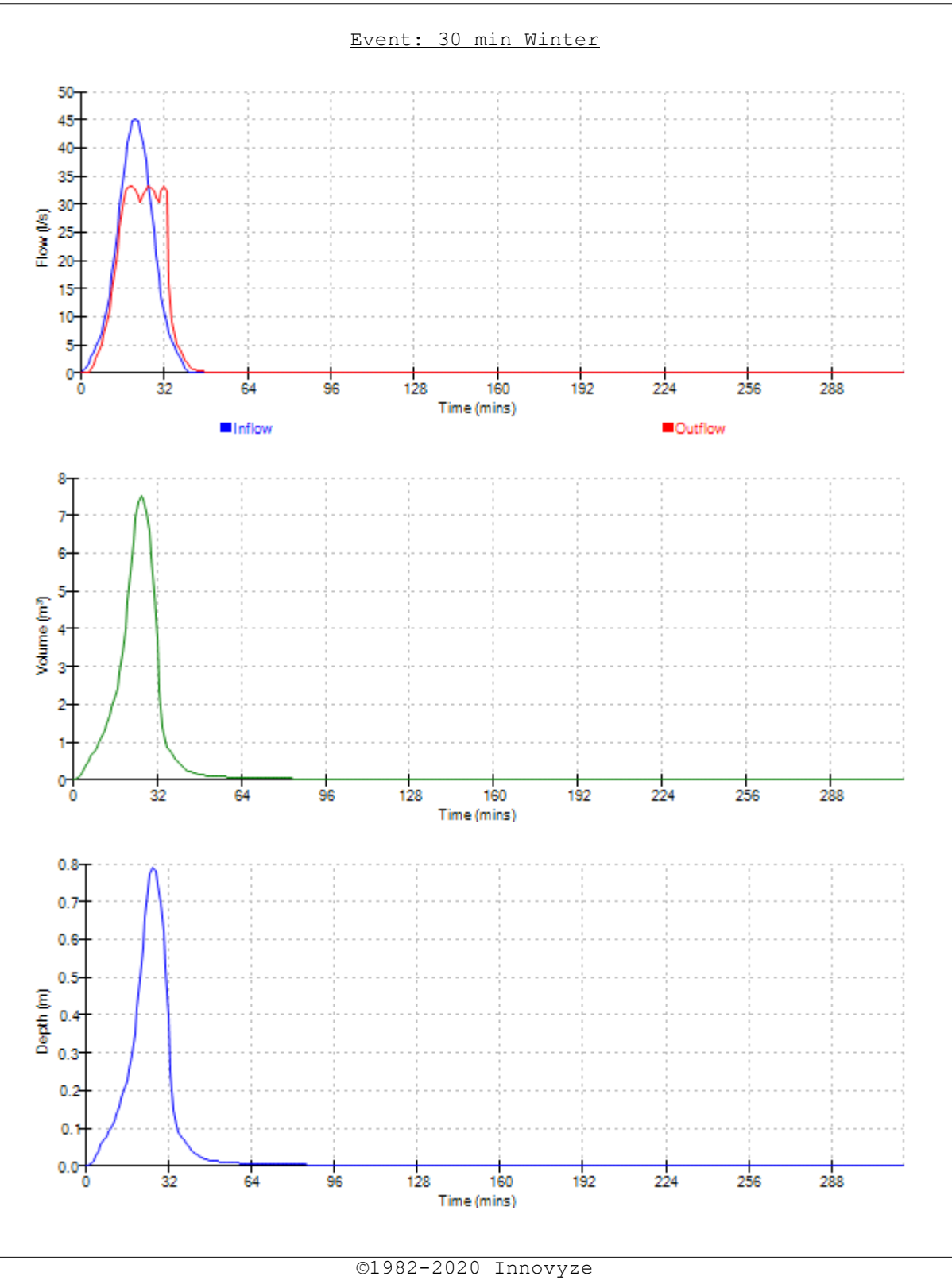
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Event: 10080 min Summer





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Suite 4A Portland Street Manchester, M1 3BE	Rose Kiln Court Geocellular Crates 1 in 1	
Date 03/04/2023 File 1 in 1 Geocellular Crat...	Designed by AR Checked by RS	
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Delta-Simons

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Suite 4A
Portland Street
Manchester, M1 3BE

Rose Kiln Court
Geocellular Crates
1 in 30

Date 03/04/2023
File 1 in 100 + 35 % Geocell...

Designed by AR
Checked by RS

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Source Control 2020.1.3

Micro
Drainage

Summary of Results for 30 year Return Period

Half Drain Time : 22 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	99.172	0.572	0.0	33.3	33.3	57.1	O K
30 min Summer	99.296	0.696	0.0	33.3	33.3	69.4	O K
60 min Summer	99.308	0.708	0.0	33.3	33.3	70.6	O K
120 min Summer	99.188	0.588	0.0	33.3	33.3	58.7	O K
180 min Summer	99.070	0.470	0.0	33.3	33.3	46.9	O K
240 min Summer	98.974	0.374	0.0	33.3	33.3	37.3	O K
360 min Summer	98.855	0.255	0.0	32.4	32.4	25.4	O K
480 min Summer	98.814	0.214	0.0	27.8	27.8	21.3	O K
600 min Summer	98.790	0.190	0.0	23.8	23.8	19.0	O K
720 min Summer	98.774	0.174	0.0	20.8	20.8	17.3	O K
960 min Summer	98.751	0.151	0.0	16.6	16.6	15.1	O K
1440 min Summer	98.725	0.125	0.0	12.0	12.0	12.4	O K
2160 min Summer	98.703	0.103	0.0	8.6	8.6	10.3	O K
2880 min Summer	98.691	0.091	0.0	6.9	6.9	9.1	O K
4320 min Summer	98.677	0.077	0.0	5.0	5.0	7.6	O K
5760 min Summer	98.669	0.069	0.0	4.0	4.0	6.8	O K
7200 min Summer	98.663	0.063	0.0	3.5	3.5	6.3	O K
8640 min Summer	98.659	0.059	0.0	3.0	3.0	5.9	O K
10080 min Summer	98.656	0.056	0.0	2.8	2.8	5.6	O K
15 min Winter	99.261	0.661	0.0	33.3	33.3	66.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	77.987	0.0	83.7	21
30 min Summer	50.893	0.0	109.2	31
60 min Summer	31.724	0.0	136.3	48
120 min Summer	18.925	0.0	162.6	80
180 min Summer	14.038	0.0	180.9	110
240 min Summer	11.301	0.0	194.2	140
360 min Summer	8.198	0.0	211.3	194
480 min Summer	6.490	0.0	223.1	254
600 min Summer	5.401	0.0	232.0	314
720 min Summer	4.643	0.0	239.3	374
960 min Summer	3.650	0.0	250.9	494
1440 min Summer	2.597	0.0	267.7	736
2160 min Summer	1.850	0.0	286.2	1100
2880 min Summer	1.461	0.0	301.4	1468
4320 min Summer	1.063	0.0	328.8	2204
5760 min Summer	0.858	0.0	353.9	2896
7200 min Summer	0.733	0.0	378.2	3648
8640 min Summer	0.650	0.0	402.0	4328
10080 min Summer	0.590	0.0	425.8	5136
15 min Winter	77.987	0.0	93.7	21

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Delta-Simons		Page 2																																																																																																																																																																																																																																																							
Suite 4A Portland Street Manchester, M1 3BE	Rose Kiln Court Geocellular Crates 1 in 30																																																																																																																																																																																																																																																								
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<u>Summary of Results for 30 year Return Period</u> <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Control (l/s)</th><th>Max Σ Outflow (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>30 min Winter</td><td>99.395</td><td>0.795</td><td>0.0</td><td>33.3</td><td>33.3</td><td>79.3</td><td>O K</td></tr><tr><td>60 min Winter</td><td>99.389</td><td>0.789</td><td>0.0</td><td>33.3</td><td>33.3</td><td>78.7</td><td>O K</td></tr><tr><td>120 min Winter</td><td>99.199</td><td>0.599</td><td>0.0</td><td>33.3</td><td>33.3</td><td>59.8</td><td>O K</td></tr><tr><td>180 min Winter</td><td>99.011</td><td>0.411</td><td>0.0</td><td>33.3</td><td>33.3</td><td>41.0</td><td>O K</td></tr><tr><td>240 min Winter</td><td>98.888</td><td>0.288</td><td>0.0</td><td>32.9</td><td>32.9</td><td>28.7</td><td>O K</td></tr><tr><td>360 min Winter</td><td>98.808</td><td>0.208</td><td>0.0</td><td>26.8</td><td>26.8</td><td>20.7</td><td>O K</td></tr><tr><td>480 min Winter</td><td>98.778</td><td>0.178</td><td>0.0</td><td>21.5</td><td>21.5</td><td>17.8</td><td>O K</td></tr><tr><td>600 min Winter</td><td>98.759</td><td>0.159</td><td>0.0</td><td>18.0</td><td>18.0</td><td>15.8</td><td>O K</td></tr><tr><td>720 min Winter</td><td>98.745</td><td>0.145</td><td>0.0</td><td>15.6</td><td>15.6</td><td>14.5</td><td>O K</td></tr><tr><td>960 min Winter</td><td>98.726</td><td>0.126</td><td>0.0</td><td>12.3</td><td>12.3</td><td>12.6</td><td>O K</td></tr><tr><td>1440 min Winter</td><td>98.704</td><td>0.104</td><td>0.0</td><td>8.7</td><td>8.7</td><td>10.4</td><td>O K</td></tr><tr><td>2160 min Winter</td><td>98.687</td><td>0.087</td><td>0.0</td><td>6.2</td><td>6.2</td><td>8.7</td><td>O K</td></tr><tr><td>2880 min Winter</td><td>98.677</td><td>0.077</td><td>0.0</td><td>5.0</td><td>5.0</td><td>7.6</td><td>O K</td></tr><tr><td>4320 min Winter</td><td>98.665</td><td>0.065</td><td>0.0</td><td>3.6</td><td>3.6</td><td>6.4</td><td>O K</td></tr><tr><td>5760 min Winter</td><td>98.658</td><td>0.058</td><td>0.0</td><td>2.9</td><td>2.9</td><td>5.7</td><td>O K</td></tr><tr><td>7200 min Winter</td><td>98.653</td><td>0.053</td><td>0.0</td><td>2.5</td><td>2.5</td><td>5.3</td><td>O K</td></tr><tr><td>8640 min Winter</td><td>98.650</td><td>0.050</td><td>0.0</td><td>2.2</td><td>2.2</td><td>5.0</td><td>O K</td></tr><tr><td>10080 min Winter</td><td>98.648</td><td>0.048</td><td>0.0</td><td>2.0</td><td>2.0</td><td>4.7</td><td>O K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>30 min Winter</td><td>50.893</td><td>0.0</td><td>122.3</td><td>32</td></tr><tr><td>60 min Winter</td><td>31.724</td><td>0.0</td><td>152.6</td><td>50</td></tr><tr><td>120 min Winter</td><td>18.925</td><td>0.0</td><td>182.1</td><td>86</td></tr><tr><td>180 min Winter</td><td>14.038</td><td>0.0</td><td>202.6</td><td>116</td></tr><tr><td>240 min Winter</td><td>11.301</td><td>0.0</td><td>217.5</td><td>140</td></tr><tr><td>360 min Winter</td><td>8.198</td><td>0.0</td><td>236.7</td><td>194</td></tr><tr><td>480 min Winter</td><td>6.490</td><td>0.0</td><td>249.8</td><td>254</td></tr><tr><td>600 min Winter</td><td>5.401</td><td>0.0</td><td>259.9</td><td>314</td></tr><tr><td>720 min Winter</td><td>4.643</td><td>0.0</td><td>268.1</td><td>374</td></tr><tr><td>960 min Winter</td><td>3.650</td><td>0.0</td><td>281.0</td><td>494</td></tr><tr><td>1440 min Winter</td><td>2.597</td><td>0.0</td><td>299.9</td><td>738</td></tr><tr><td>2160 min Winter</td><td>1.850</td><td>0.0</td><td>320.5</td><td>1100</td></tr><tr><td>2880 min Winter</td><td>1.461</td><td>0.0</td><td>337.6</td><td>1472</td></tr><tr><td>4320 min Winter</td><td>1.063</td><td>0.0</td><td>368.3</td><td>2164</td></tr><tr><td>5760 min Winter</td><td>0.858</td><td>0.0</td><td>396.4</td><td>2848</td></tr><tr><td>7200 min Winter</td><td>0.733</td><td>0.0</td><td>423.6</td><td>3664</td></tr><tr><td>8640 min Winter</td><td>0.650</td><td>0.0</td><td>450.3</td><td>4328</td></tr><tr><td>10080 min Winter</td><td>0.590</td><td>0.0</td><td>476.9</td><td>5064</td></tr></table>			Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status	30 min Winter	99.395	0.795	0.0	33.3	33.3	79.3	O K	60 min Winter	99.389	0.789	0.0	33.3	33.3	78.7	O K	120 min Winter	99.199	0.599	0.0	33.3	33.3	59.8	O K	180 min Winter	99.011	0.411	0.0	33.3	33.3	41.0	O K	240 min Winter	98.888	0.288	0.0	32.9	32.9	28.7	O K	360 min Winter	98.808	0.208	0.0	26.8	26.8	20.7	O K	480 min Winter	98.778	0.178	0.0	21.5	21.5	17.8	O K	600 min Winter	98.759	0.159	0.0	18.0	18.0	15.8	O K	720 min Winter	98.745	0.145	0.0	15.6	15.6	14.5	O K	960 min Winter	98.726	0.126	0.0	12.3	12.3	12.6	O K	1440 min Winter	98.704	0.104	0.0	8.7	8.7	10.4	O K	2160 min Winter	98.687	0.087	0.0	6.2	6.2	8.7	O K	2880 min Winter	98.677	0.077	0.0	5.0	5.0	7.6	O K	4320 min Winter	98.665	0.065	0.0	3.6	3.6	6.4	O K	5760 min Winter	98.658	0.058	0.0	2.9	2.9	5.7	O K	7200 min Winter	98.653	0.053	0.0	2.5	2.5	5.3	O K	8640 min Winter	98.650	0.050	0.0	2.2	2.2	5.0	O K	10080 min Winter	98.648	0.048	0.0	2.0	2.0	4.7	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	30 min Winter	50.893	0.0	122.3	32	60 min Winter	31.724	0.0	152.6	50	120 min Winter	18.925	0.0	182.1	86	180 min Winter	14.038	0.0	202.6	116	240 min Winter	11.301	0.0	217.5	140	360 min Winter	8.198	0.0	236.7	194	480 min Winter	6.490	0.0	249.8	254	600 min Winter	5.401	0.0	259.9	314	720 min Winter	4.643	0.0	268.1	374	960 min Winter	3.650	0.0	281.0	494	1440 min Winter	2.597	0.0	299.9	738	2160 min Winter	1.850	0.0	320.5	1100	2880 min Winter	1.461	0.0	337.6	1472	4320 min Winter	1.063	0.0	368.3	2164	5760 min Winter	0.858	0.0	396.4	2848	7200 min Winter	0.733	0.0	423.6	3664	8640 min Winter	0.650	0.0	450.3	4328	10080 min Winter	0.590	0.0	476.9	5064
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																																																																		
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10080 min Winter	98.648	0.048	0.0	2.0	2.0	4.7	O K																																																																																																																																																																																																																																																		
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)																																																																																																																																																																																																																																																					
30 min Winter	50.893	0.0	122.3	32																																																																																																																																																																																																																																																					
60 min Winter	31.724	0.0	152.6	50																																																																																																																																																																																																																																																					
120 min Winter	18.925	0.0	182.1	86																																																																																																																																																																																																																																																					
180 min Winter	14.038	0.0	202.6	116																																																																																																																																																																																																																																																					
240 min Winter	11.301	0.0	217.5	140																																																																																																																																																																																																																																																					
360 min Winter	8.198	0.0	236.7	194																																																																																																																																																																																																																																																					
480 min Winter	6.490	0.0	249.8	254																																																																																																																																																																																																																																																					
600 min Winter	5.401	0.0	259.9	314																																																																																																																																																																																																																																																					
720 min Winter	4.643	0.0	268.1	374																																																																																																																																																																																																																																																					
960 min Winter	3.650	0.0	281.0	494																																																																																																																																																																																																																																																					
1440 min Winter	2.597	0.0	299.9	738																																																																																																																																																																																																																																																					
2160 min Winter	1.850	0.0	320.5	1100																																																																																																																																																																																																																																																					
2880 min Winter	1.461	0.0	337.6	1472																																																																																																																																																																																																																																																					
4320 min Winter	1.063	0.0	368.3	2164																																																																																																																																																																																																																																																					
5760 min Winter	0.858	0.0	396.4	2848																																																																																																																																																																																																																																																					
7200 min Winter	0.733	0.0	423.6	3664																																																																																																																																																																																																																																																					
8640 min Winter	0.650	0.0	450.3	4328																																																																																																																																																																																																																																																					
10080 min Winter	0.590	0.0	476.9	5064																																																																																																																																																																																																																																																					
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Delta-Simons		Page 3
Suite 4A Portland Street Manchester, M1 3BE	Rose Kiln Court Geocellular Crates 1 in 30	
Date 03/04/2023 File 1 in 100 + 35 % Geocell...	Designed by AR Checked by RS	
Innovyze Source Control 2020.1.3		

Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 471322 172361 SU 71322 72361
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.573

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:	From:	To:
0	4	4	8	8	12
	0.191		0.191		0.191

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Innovyze Source Control 2020.1.3		

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 98.600 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	105.0	0.0	0.801	0.0	0.0
0.800	105.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0250-3330-0800-3330
Design Head (m) 0.800
Design Flow (l/s) 33.3
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 250
Invert Level (m) 98.600
Minimum Outlet Pipe Diameter (mm) 300
Suggested Manhole Diameter (mm) 1500

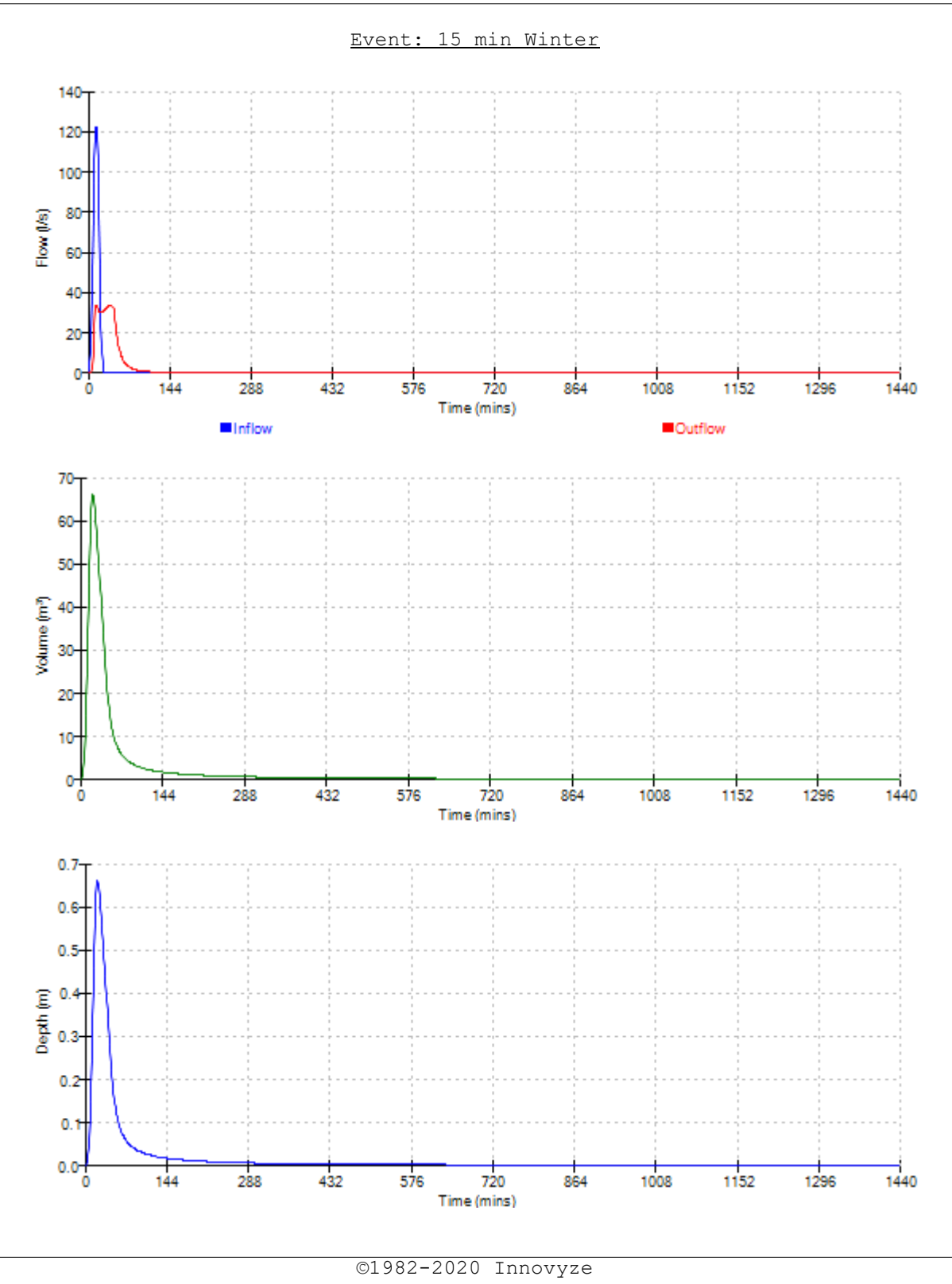
Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.800	33.3
Flush-Flo™	0.370	33.3
Kick-Flo®	0.636	29.8
Mean Flow over Head Range	-	26.4

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

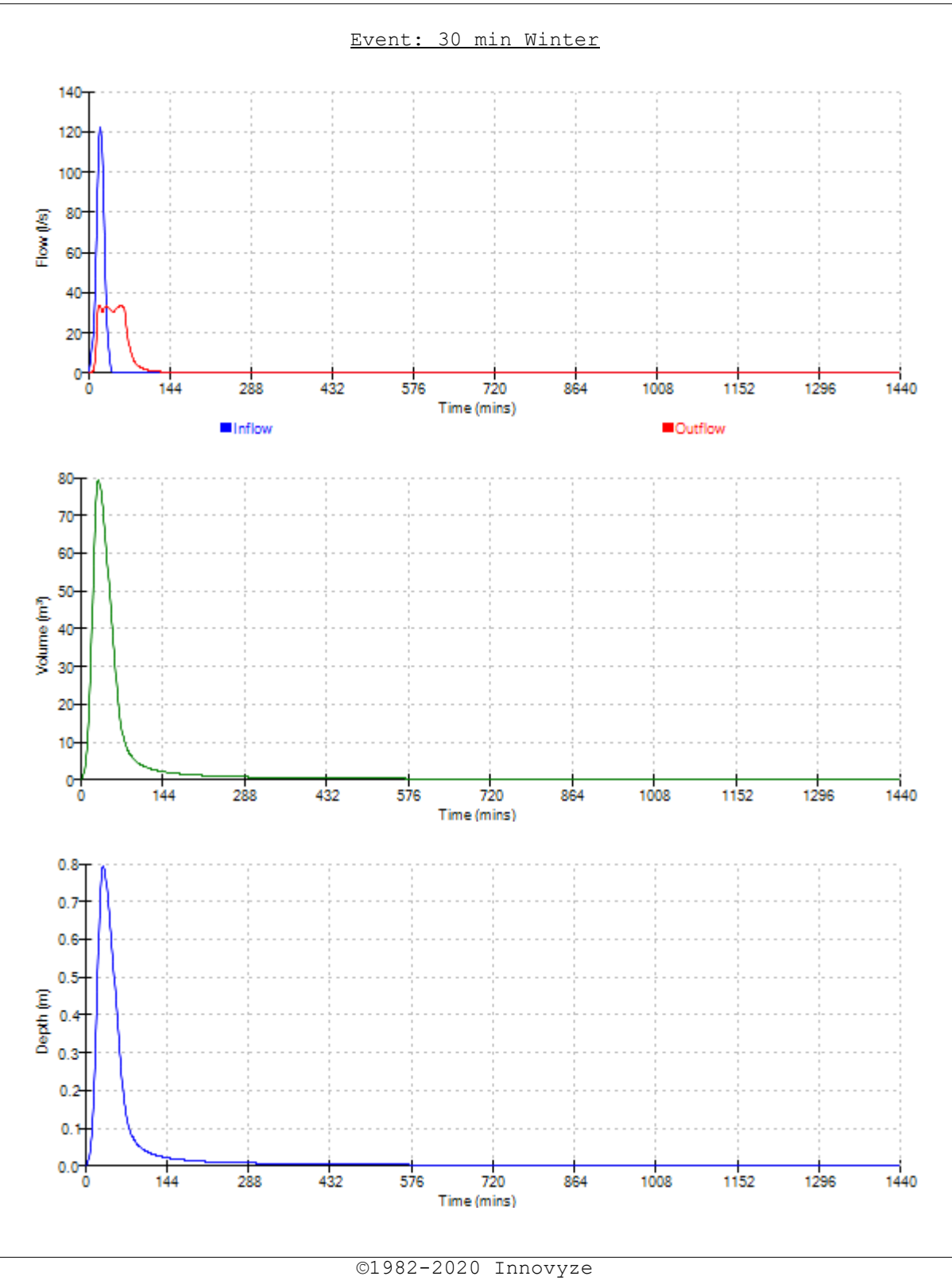
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	8.1	1.200	40.4	3.000	63.0	7.000	95.1
0.200	25.5	1.400	43.6	3.500	67.9	7.500	98.4
0.300	33.0	1.600	46.5	4.000	72.4	8.000	101.5
0.400	33.3	1.800	49.2	4.500	76.7	8.500	103.9
0.500	32.5	2.000	51.7	5.000	80.7	9.000	106.9
0.600	30.9	2.200	54.2	5.500	84.6	9.500	109.9
0.800	33.3	2.400	56.5	6.000	88.2		
1.000	37.0	2.600	58.7	6.500	91.7		

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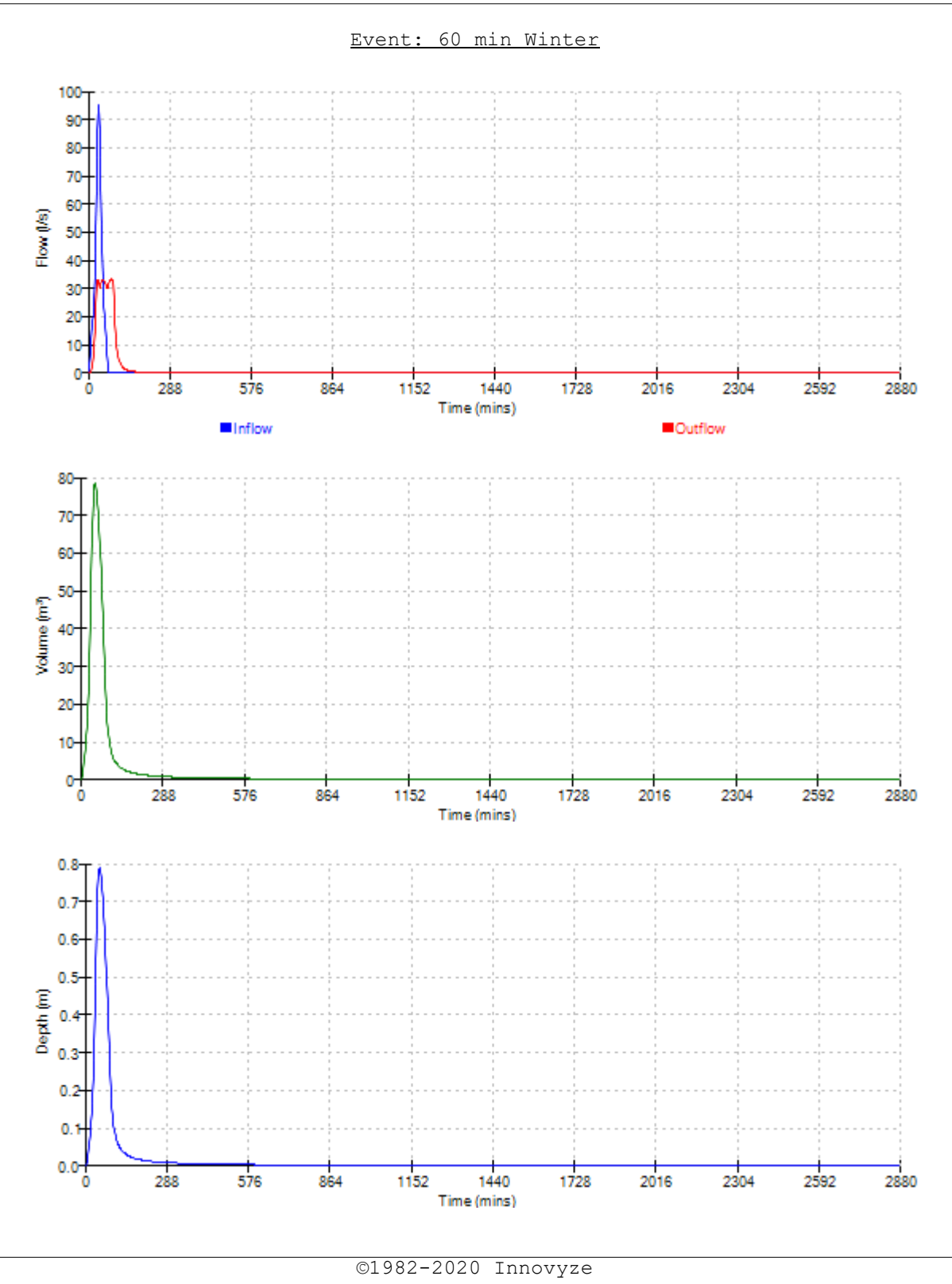
Delta-Simons		Page 5
Suite 4A	Rose Kiln Court	
Portland Street	Geocellular Crates	
Manchester, M1 3BE	1 in 30	
Date 03/04/2023	Designed by AR	
File 1 in 100 + 35 % Geocell...	Checked by RS	
Innovyze	Source Control 2020.1.3	



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Portland Street	Geocellular Crates	
Manchester, M1 3BE	1 in 30	
Date 03/04/2023	Designed by AR	
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Portland Street	Geocellular Crates	
Manchester, M1 3BE	1 in 30	
Date 03/04/2023	Designed by AR	
File 1 in 100 + 35 % Geocell...	Checked by RS	
Innovyze	Source Control 2020.1.3	



Delta-Simons

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Manchester, M1 3BE

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File 1 in 100 + 35 % Geocell...

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Rose Kiln Court
Geocellular Crates
1 in 100 + 35% CC

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Source Control 2020.1.3

Page 1



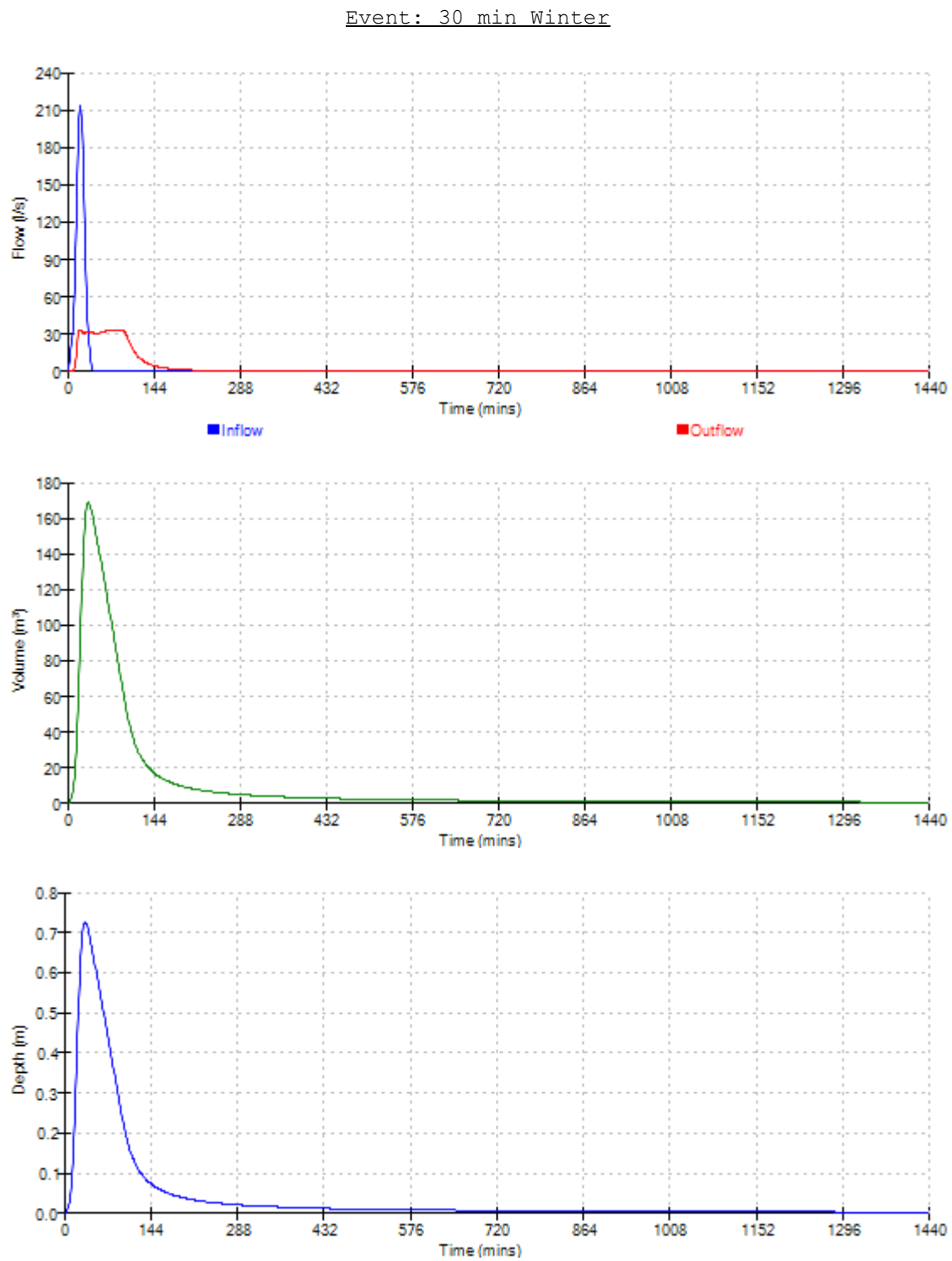
Summary of Results for 100 year Return Period (+35%)							
Half Drain Time : 47 minutes.							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	99.103	0.503	0.0	33.3	33.3	117.1	O K
30 min Summer	99.236	0.636	0.0	33.3	33.3	148.1	O K
60 min Summer	99.304	0.704	0.0	33.3	33.3	163.8	O K
120 min Summer	99.264	0.664	0.0	33.3	33.3	154.5	O K
180 min Summer	99.208	0.608	0.0	33.3	33.3	141.5	O K
240 min Summer	99.145	0.545	0.0	33.3	33.3	126.8	O K
360 min Summer	99.024	0.424	0.0	33.3	33.3	98.7	O K
480 min Summer	98.934	0.334	0.0	33.2	33.2	77.8	O K
600 min Summer	98.873	0.273	0.0	32.7	32.7	63.6	O K
720 min Summer	98.838	0.238	0.0	31.4	31.4	55.4	O K
960 min Summer	98.803	0.203	0.0	26.0	26.0	47.2	O K
1440 min Summer	98.765	0.165	0.0	19.1	19.1	38.3	O K
2160 min Summer	98.735	0.135	0.0	13.8	13.8	31.5	O K
2880 min Summer	98.718	0.118	0.0	11.0	11.0	27.5	O K
4320 min Summer	98.699	0.099	0.0	7.9	7.9	23.0	O K
5760 min Summer	98.688	0.088	0.0	6.4	6.4	20.4	O K
7200 min Summer	98.680	0.080	0.0	5.4	5.4	18.6	O K
8640 min Summer	98.675	0.075	0.0	4.7	4.7	17.4	O K
10080 min Summer	98.671	0.071	0.0	4.3	4.3	16.5	O K
15 min Winter	99.173	0.573	0.0	33.3	33.3	133.3	O K
Storm Event	Rain (mm/hr)		Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)		
15 min Summer	134.651		0.0	144.0	22		
30 min Summer	88.706		0.0	189.9	34		
60 min Summer	55.526		0.0	238.3	54		
120 min Summer	32.438		0.0	278.5	88		
180 min Summer	23.846		0.0	307.1	122		
240 min Summer	19.108		0.0	328.1	154		
360 min Summer	13.801		0.0	355.5	214		
480 min Summer	10.904		0.0	374.5	272		
600 min Summer	9.059		0.0	388.9	326		
720 min Summer	7.774		0.0	400.5	382		
960 min Summer	6.091		0.0	418.4	500		
1440 min Summer	4.296		0.0	442.5	742		
2160 min Summer	3.031		0.0	468.7	1104		
2880 min Summer	2.376		0.0	489.9	1472		
4320 min Summer	1.706		0.0	527.4	2204		
5760 min Summer	1.363		0.0	562.2	2920		
7200 min Summer	1.155		0.0	595.4	3664		
8640 min Summer	1.015		0.0	628.0	4400		
10080 min Summer	0.916		0.0	660.6	5136		
15 min Winter	134.651		0.0	161.3	23		

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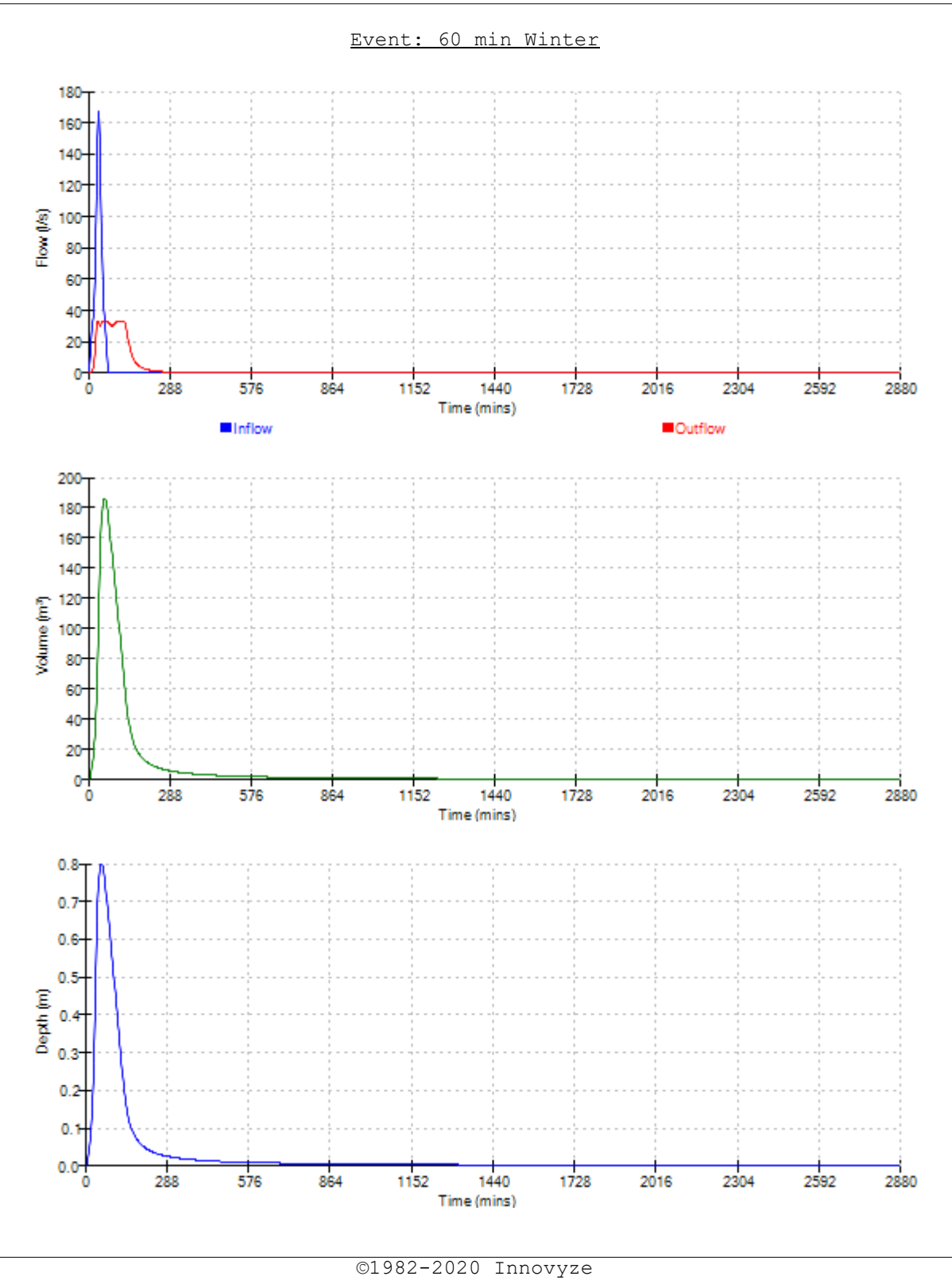
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Suite 4A Portland Street Manchester, M1 3BE	Rose Kiln Court Geocellular Crates 1 in 100 + 35% CC	
Date 03/04/2023 File 1 in 100 + 35 % Geocell...	Designed by AR Checked by RS	
Innovyze Source Control 2020.1.3		
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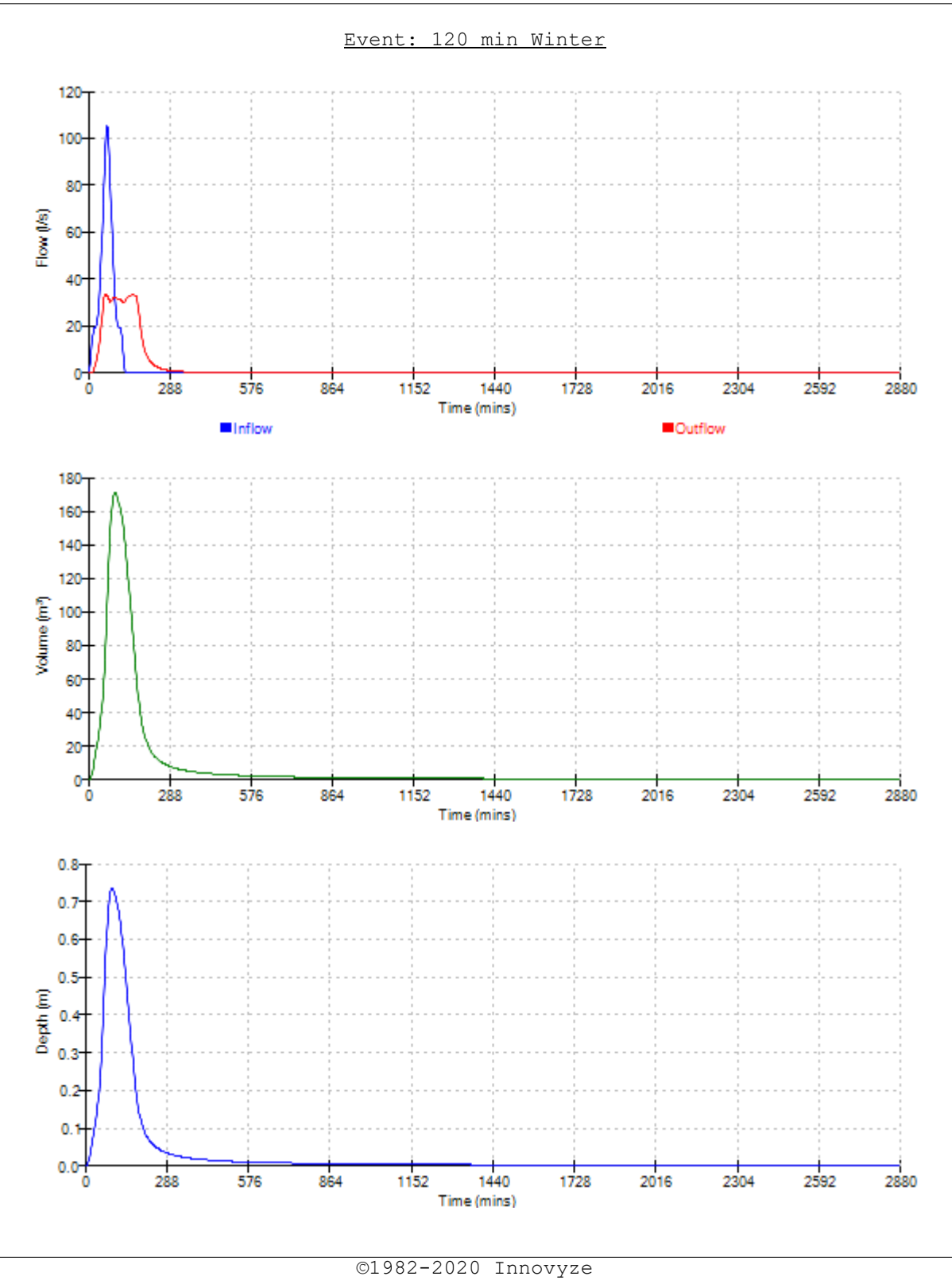
Delta-Simons		Page 4																																																																																																									
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<u>Model Details</u> Storage is Online Cover Level (m) 100.000 <u>Cellular Storage Structure</u> Invert Level (m) 98.600 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr><tr><td>0.000</td><td>245.0</td><td>0.0</td><td>0.801</td><td>0.0</td><td>0.0</td></tr><tr><td>0.800</td><td>245.0</td><td>0.0</td><td></td><td></td><td></td></tr></table> <u>Hydro-Brake® Optimum Outflow Control</u> Unit Reference MD-SHE-0250-3330-0800-3330 Design Head (m) 0.800 Design Flow (l/s) 33.3 Flush-Flo™ Calculated Objective Minimise upstream storage Application Surface Sump Available Yes Diameter (mm) 250 Invert Level (m) 98.600 Minimum Outlet Pipe Diameter (mm) 300 Suggested Manhole Diameter (mm) 1500 <table><tr><th>Control Points</th><th>Head (m)</th><th>Flow (l/s)</th></tr><tr><td>Design Point (Calculated)</td><td>0.800</td><td>33.3</td></tr><tr><td>Flush-Flo™</td><td>0.370</td><td>33.3</td></tr><tr><td>Kick-Flo®</td><td>0.636</td><td>29.8</td></tr><tr><td>Mean Flow over Head Range</td><td>-</td><td>26.4</td></tr></table> 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 <table><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr><tr><td>0.100</td><td>8.1</td><td>1.200</td><td>40.4</td><td>3.000</td><td>63.0</td><td>7.000</td><td>95.1</td></tr><tr><td>0.200</td><td>25.5</td><td>1.400</td><td>43.6</td><td>3.500</td><td>67.9</td><td>7.500</td><td>98.4</td></tr><tr><td>0.300</td><td>33.0</td><td>1.600</td><td>46.5</td><td>4.000</td><td>72.4</td><td>8.000</td><td>101.5</td></tr><tr><td>0.400</td><td>33.3</td><td>1.800</td><td>49.2</td><td>4.500</td><td>76.7</td><td>8.500</td><td>103.9</td></tr><tr><td>0.500</td><td>32.5</td><td>2.000</td><td>51.7</td><td>5.000</td><td>80.7</td><td>9.000</td><td>106.9</td></tr><tr><td>0.600</td><td>30.9</td><td>2.200</td><td>54.2</td><td>5.500</td><td>84.6</td><td>9.500</td><td>109.9</td></tr><tr><td>0.800</td><td>33.3</td><td>2.400</td><td>56.5</td><td>6.000</td><td>88.2</td><td></td><td></td></tr><tr><td>1.000</td><td>37.0</td><td>2.600</td><td>58.7</td><td>6.500</td><td>91.7</td><td></td><td></td></tr></table>			Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	245.0	0.0	0.801	0.0	0.0	0.800	245.0	0.0				Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	0.800	33.3	Flush-Flo™	0.370	33.3	Kick-Flo®	0.636	29.8	Mean Flow over Head Range	-	26.4	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	8.1	1.200	40.4	3.000	63.0	7.000	95.1	0.200	25.5	1.400	43.6	3.500	67.9	7.500	98.4	0.300	33.0	1.600	46.5	4.000	72.4	8.000	101.5	0.400	33.3	1.800	49.2	4.500	76.7	8.500	103.9	0.500	32.5	2.000	51.7	5.000	80.7	9.000	106.9	0.600	30.9	2.200	54.2	5.500	84.6	9.500	109.9	0.800	33.3	2.400	56.5	6.000	88.2			1.000	37.0	2.600	58.7	6.500	91.7		
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Innovyze	Source Control 2020.1.3	



Appendix L - Conceptual Drainage Sketch



122400N

+

Surface water runoff to discharge to Holy Brook via existing outfall.

Hydrobrake (or similar) flow control device to restrict surface water discharge to 33.28 l/s.

Planning application site area+ 0.69 ha / 1.7 acres

Proposed Geocellular Storage Crate measuring 17.5 m (L) x 14 m (W) x 0.8 m (D), with a 95% void ratio thereby providing up to 186.2 m³ of attenuation.

Rose Kiln Lane

T22

T1

T2

Existing site entrance retained

LEGEND



Proposed Geocellular Tank
17.5 m (L) 14 m (W) 0.8 m (D) tank with a void ratio of 95% provides 186.2 m³ of attenuation



Approximate Route of Existing Private Surface Water Sewer



Indicative Proposed Indicative Surface Water Drainage Route



Approximate Existing Public Foul Water Sewer



Proposed Flow Control Device (Hydrobrake or similar)

NOTES

1. All dimensions in millimetres and all levels in metres above ordnance datum unless shown otherwise.
2. This drawing provides a Concept Drainage Sketch and is not intended for detailed design. Detailed drainage design will be required at the detailed design stage.
3. The Concept Drainage Sketch is based on the Proposed Development Plan (drawing ref - 8758-WGA-EX-XX-DR-A-002) and the Landscape Plan (ref- D342.L.001-EXT-A) provided by the Client.
4. Route of existing public sewers are indicative and based on plans provided by Thames Water. The location of existing public sewers should be verified on-Site.
5. Attenuation to be provided in the form of underground geocellular storage crates. Dimensions of proposed geocellular storage crates are to be confirmed at the detailed design stage.
6. Routes and dimensions of proposed surface water drainage to be confirmed at the detailed design stage. Where appropriate, it may be possible to utilise existing drainage runs, subject to further investigation at the detailed design stage.
7. Surface water runoff to discharge into Holy Brook via a Hydrobrake or similar flow control device, subject to agreement with the EA.
8. Proprietary treatment to be specified at the detailed design stage and installed and maintained as per relevant supplier's instructions.
9. Existing sewers may need to be diverted to facilitate the proposed development.
10. Further consideration of proposed ground levels will be required at the detailed design stage.

Site Plan Provided by Client

Appendix M – Maintenance Schedules

Attenuation Storage Tank Maintenance Schedule

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

Ref. Table 21.3, CIRIA C753 'The SuDS Manual'