

Appendix D – MicroDrainage Calculations

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Eden Court Lon Parcwr Business Park Denbighshire LL15 1NJ	Mount Road Leek	
Date 29/02/2016 File	Designed by JJ Checked by JR	
XP Solutions Source Control 2015.1		

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	0.402	Urban	0.000
SAAR (mm)	900	Region Number	Region 4

Results 1/s

QBAR Rural	2.4
QBAR Urban	2.4
Q100 years	6.1
Q1 year	2.0
Q30 years	4.6
Q100 years	6.1

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Date 04/08/2016 File W10140-160804-ATTENUATI...			Designed by JJ Checked by JR			
XP Solutions			Source Control 2016.1			
Summary of Results for 100 year Return Period (+30%)						
Storm Event		Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer		9.475	0.475	5.0	38.0	0 K
30 min Summer		9.634	0.634	5.0	50.7	0 K
60 min Summer		9.772	0.772	5.0	61.7	Flood Risk
120 min Summer		9.845	0.845	5.0	67.6	Flood Risk
180 min Summer		9.848	0.848	5.0	67.9	Flood Risk
240 min Summer		9.833	0.833	5.0	66.7	Flood Risk
360 min Summer		9.787	0.787	5.0	63.0	Flood Risk
480 min Summer		9.738	0.738	5.0	59.0	Flood Risk
600 min Summer		9.686	0.686	5.0	54.9	0 K
720 min Summer		9.627	0.627	5.0	50.2	0 K
960 min Summer		9.506	0.506	5.0	40.5	0 K
1440 min Summer		9.330	0.330	5.0	26.4	0 K
2160 min Summer		9.185	0.185	4.8	14.8	0 K
2880 min Summer		9.124	0.124	4.5	9.9	0 K
4320 min Summer		9.091	0.091	3.4	7.3	0 K
5760 min Summer		9.076	0.076	2.7	6.0	0 K
7200 min Summer		9.067	0.067	2.3	5.3	0 K
8640 min Summer		9.061	0.061	2.0	4.8	0 K
10080 min Summer		9.056	0.056	1.8	4.5	0 K
15 min Winter		9.539	0.539	5.0	43.1	0 K
30 min Winter		9.720	0.720	5.0	57.6	Flood Risk
Storm Event		Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer		108.167	0.0	43.0	24	
30 min Summer		73.267	0.0	58.2	38	
60 min Summer		47.459	0.0	75.4	64	
120 min Summer		29.731	0.0	94.5	118	
180 min Summer		22.293	0.0	106.3	148	
240 min Summer		18.048	0.0	114.7	180	
360 min Summer		13.309	0.0	126.9	250	
480 min Summer		10.726	0.0	136.4	320	
600 min Summer		9.065	0.0	144.1	390	
720 min Summer		7.897	0.0	150.6	458	
960 min Summer		6.345	0.0	161.4	578	
1440 min Summer		4.652	0.0	177.5	812	
2160 min Summer		3.403	0.0	194.8	1148	
2880 min Summer		2.722	0.0	207.7	1476	
4320 min Summer		1.984	0.0	227.0	2204	
5760 min Summer		1.582	0.0	241.5	2920	
7200 min Summer		1.327	0.0	253.2	3672	
8640 min Summer		1.150	0.0	263.3	4368	
10080 min Summer		1.020	0.0	272.3	5088	
15 min Winter		108.167	0.0	48.1	24	
30 min Winter		73.267	0.0	65.2	38	
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XP Solutions		Source Control 2016.1			
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	9.879	0.879	5.0	70.3	Flood Risk
120 min Winter	9.975	0.975	5.0	78.0	Flood Risk
180 min Winter	9.976	0.976	5.0	78.0	Flood Risk
240 min Winter	9.956	0.956	5.0	76.5	Flood Risk
360 min Winter	9.889	0.889	5.0	71.1	Flood Risk
480 min Winter	9.814	0.814	5.0	65.1	Flood Risk
600 min Winter	9.734	0.734	5.0	58.7	Flood Risk
720 min Winter	9.645	0.645	5.0	51.6	0 K
960 min Winter	9.453	0.453	5.0	36.2	0 K
1440 min Winter	9.223	0.223	4.9	17.9	0 K
2160 min Winter	9.113	0.113	4.2	9.0	0 K
2880 min Winter	9.090	0.090	3.4	7.2	0 K
4320 min Winter	9.071	0.071	2.5	5.6	0 K
5760 min Winter	9.060	0.060	2.0	4.8	0 K
7200 min Winter	9.054	0.054	1.7	4.3	0 K
8640 min Winter	9.049	0.049	1.4	3.9	0 K
10080 min Winter	9.046	0.046	1.3	3.6	0 K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	47.459	0.0	84.5	64	
120 min Winter	29.731	0.0	105.8	118	
180 min Winter	22.293	0.0	119.1	158	
240 min Winter	18.048	0.0	128.5	192	
360 min Winter	13.309	0.0	142.2	270	
480 min Winter	10.726	0.0	152.8	346	
600 min Winter	9.065	0.0	161.4	422	
720 min Winter	7.897	0.0	168.7	498	
960 min Winter	6.345	0.0	180.7	610	
1440 min Winter	4.652	0.0	198.8	824	
2160 min Winter	3.403	0.0	218.1	1120	
2880 min Winter	2.722	0.0	232.7	1472	
4320 min Winter	1.984	0.0	254.3	2200	
5760 min Winter	1.582	0.0	270.5	2936	
7200 min Winter	1.327	0.0	283.5	3672	
8640 min Winter	1.150	0.0	295.0	4304	
10080 min Winter	1.020	0.0	305.0	5064	
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Source Control 2016.1

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.100	Shortest Storm (mins)	15
Ratio R	0.336	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.212

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.071	4 8	0.071	8 12	0.071

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Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	80.0	1.000	80.0

Hydro-Brake Optimum® Outflow Control

Unit Reference	MD-SHE-0105-5000-1000-5000
Design Head (m)	1.000
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	105
Invert Level (m)	8.995
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	5.0
Flush-Flo™	0.296	5.0
Kick-Flo®	0.637	4.1
Mean Flow over Head Range	-	4.3

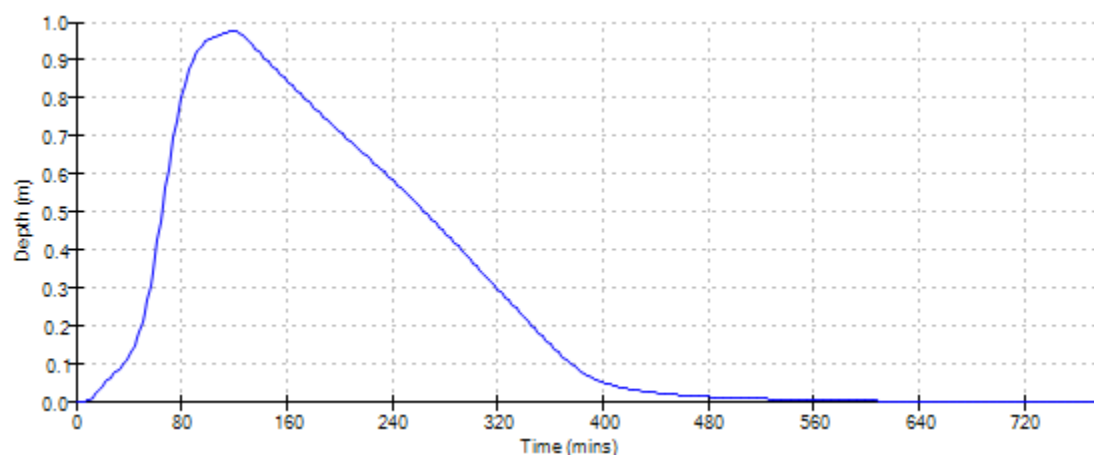
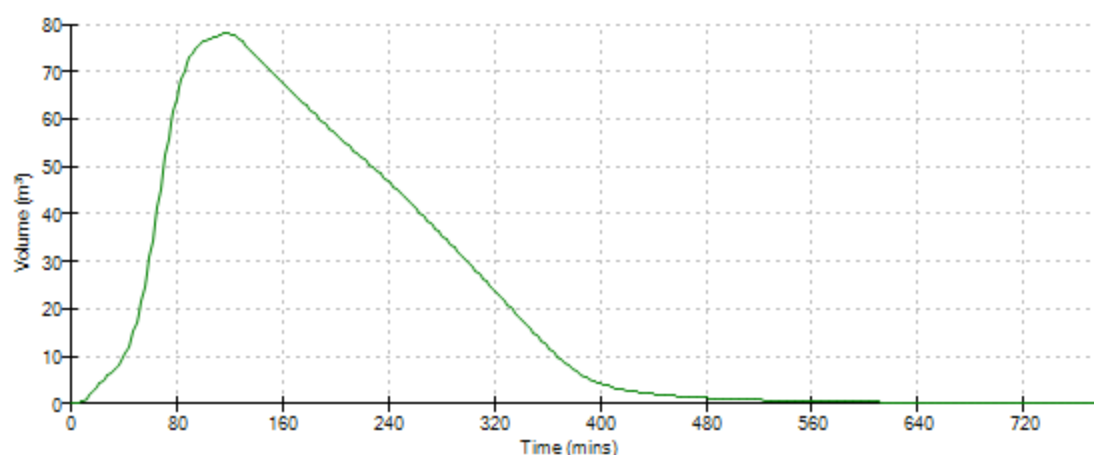
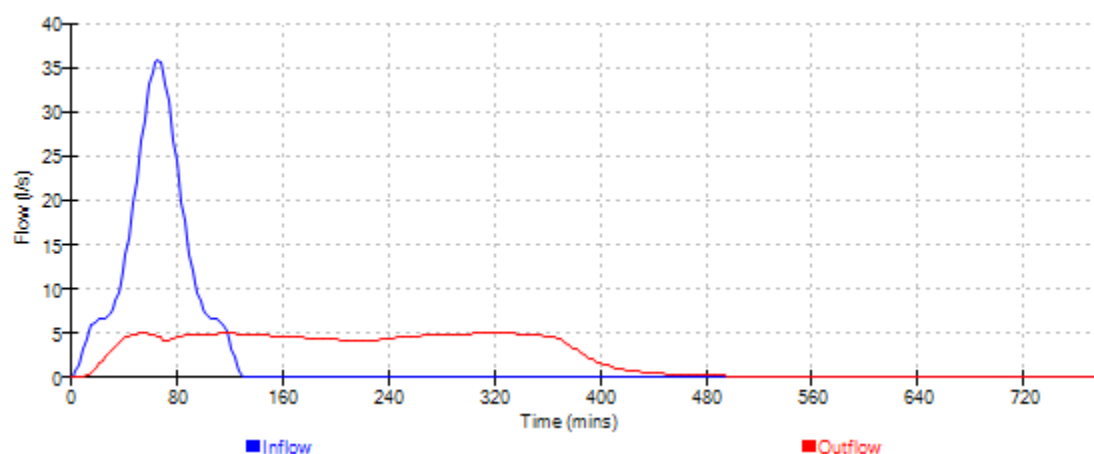
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.6	1.200	5.4	3.000	8.4	7.000	12.5
0.200	4.8	1.400	5.8	3.500	9.0	7.500	12.9
0.300	5.0	1.600	6.2	4.000	9.6	8.000	13.3
0.400	4.9	1.800	6.6	4.500	10.1	8.500	13.7
0.500	4.7	2.000	6.9	5.000	10.6	9.000	14.1
0.600	4.3	2.200	7.2	5.500	11.1	9.500	14.5
0.800	4.5	2.400	7.5	6.000	11.6		
1.000	5.0	2.600	7.8	6.500	12.1		

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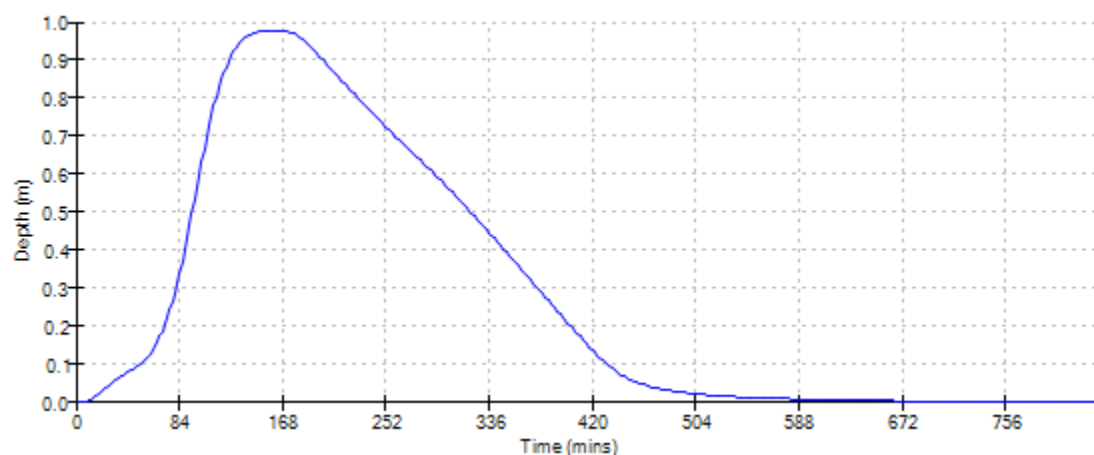
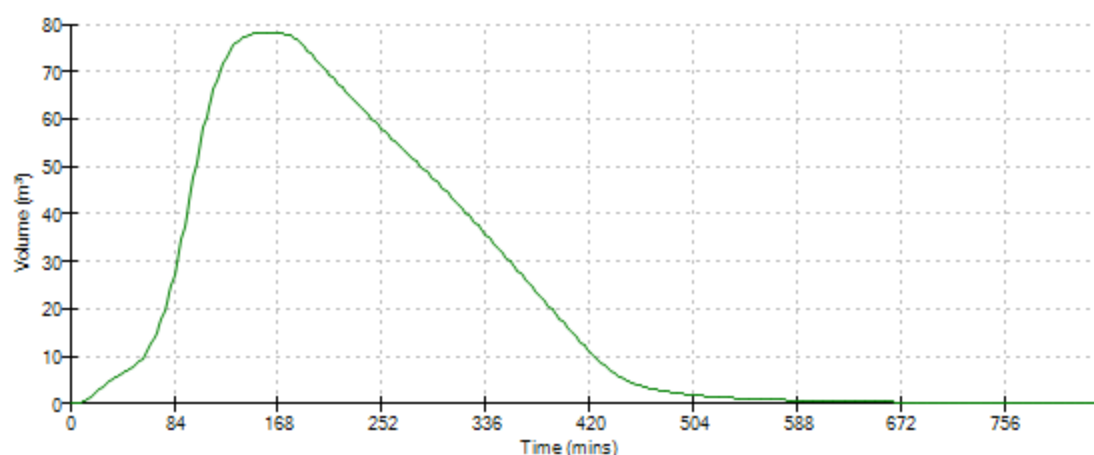
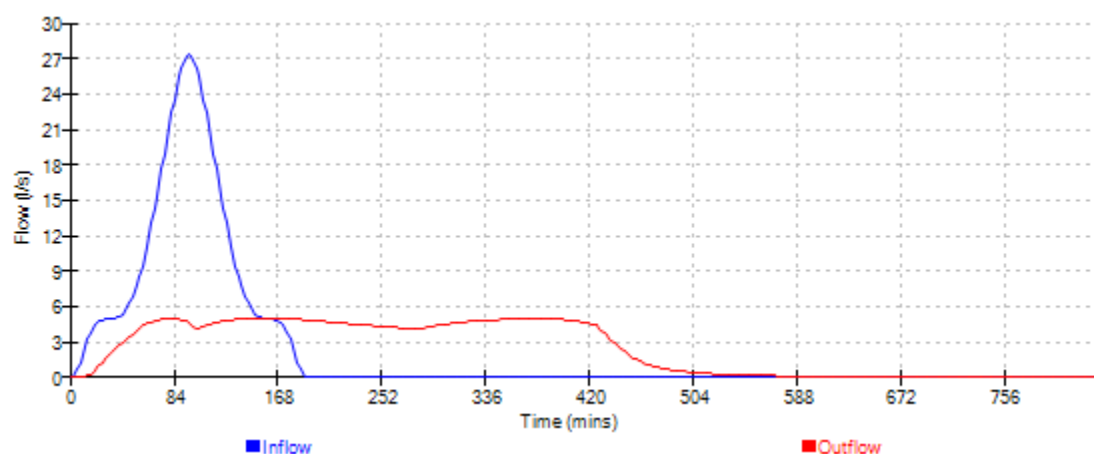
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Event: 120 min Winter



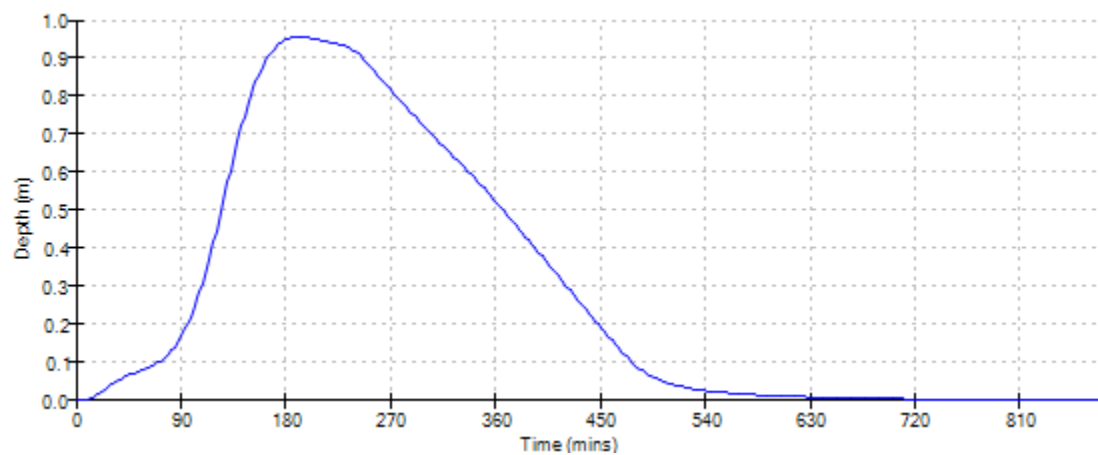
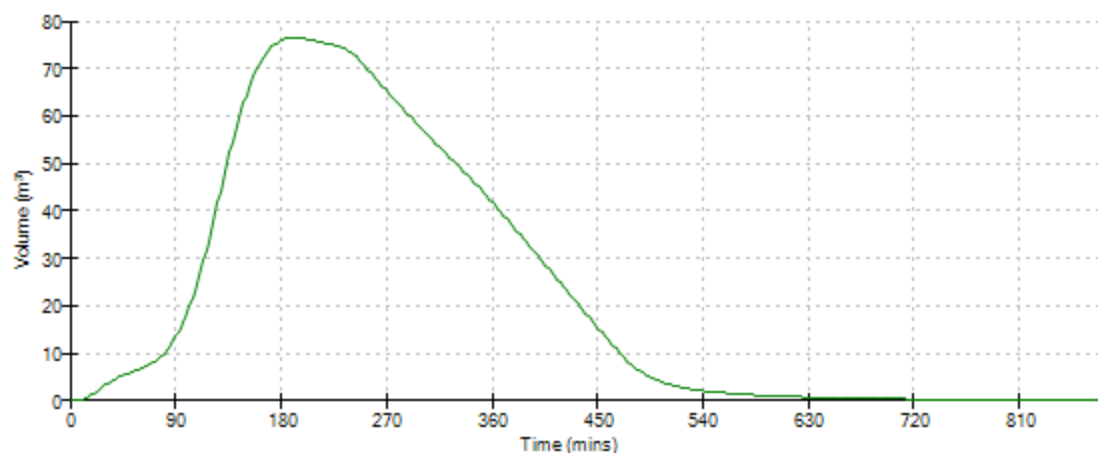
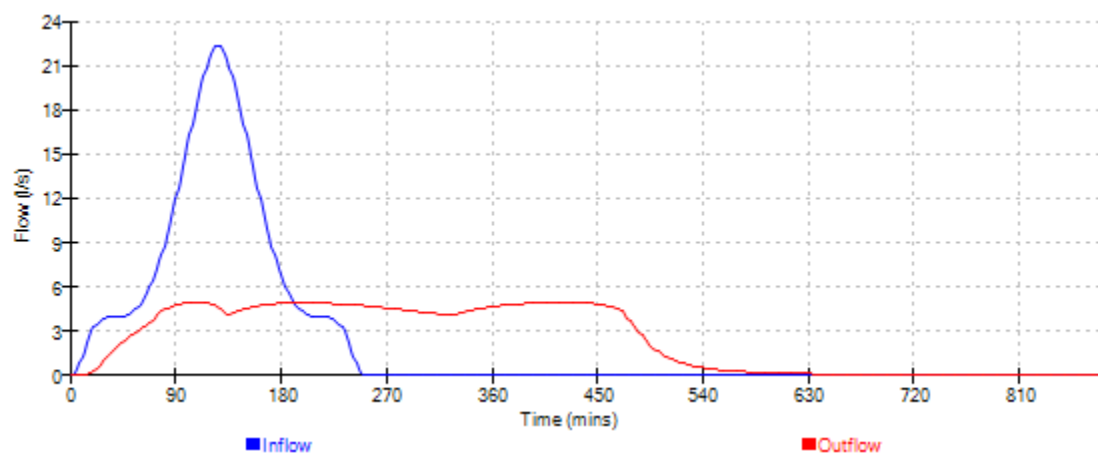
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Event: 180 min Winter

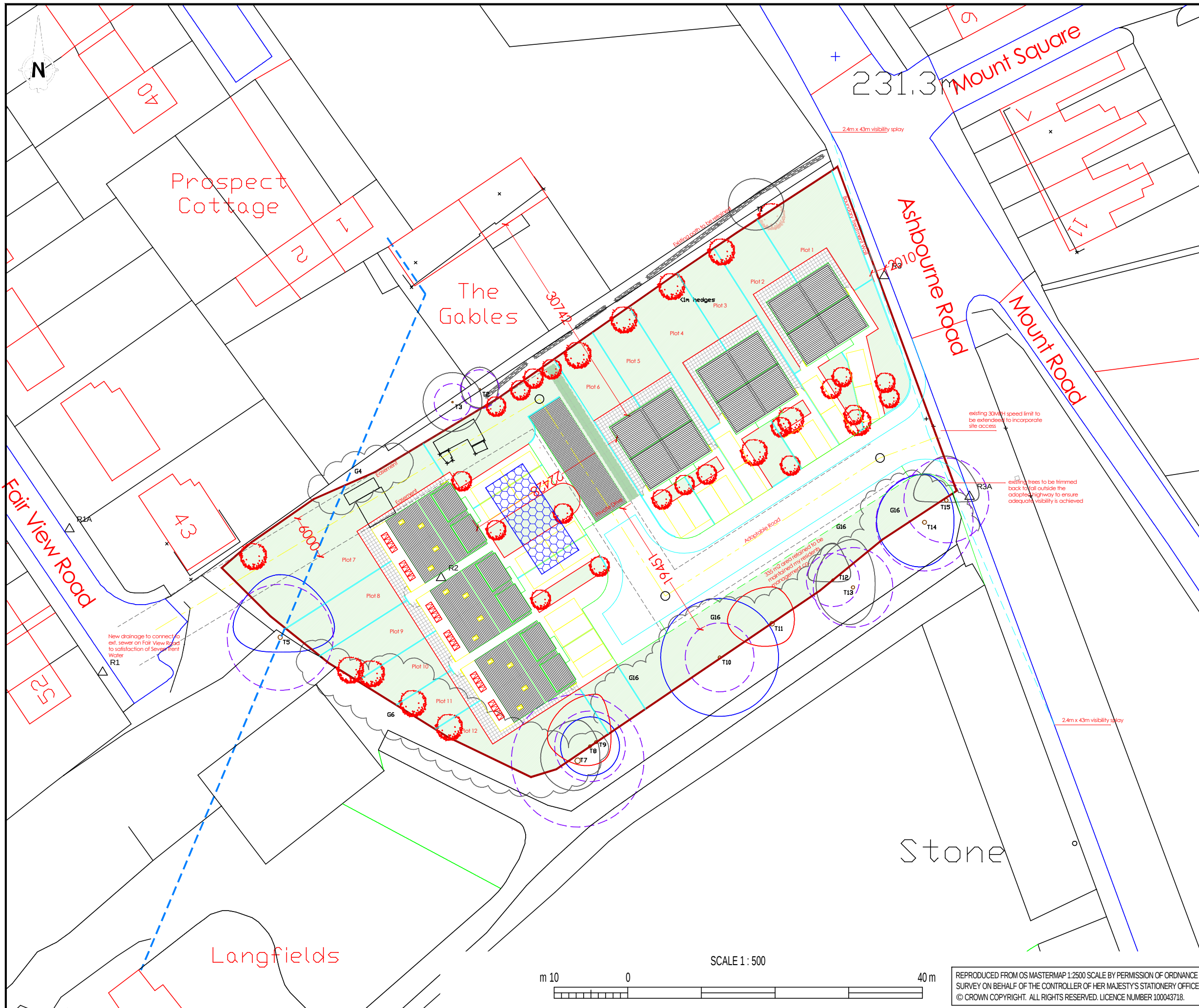


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Event: 240 min Winter



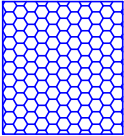
Appendix E – Concept Drainage Schematic



NOTES

- THIS DRAWING IS AN AMENDMENT OF THE ORIGINAL PROPOSED SITE LAYOUT PRODUCED BY JENNINGS DESIGN ASSOCIATES, IN DECEMBER 2015.
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH W10140-160805-DRAINAGE STRATEGY.
- THIS DRAWING PROVIDES A DRAINAGE CONCEPT ONLY AND IS NOT INTENDED FOR DETAILED DRAINAGE DESIGN.

KEY



PROPOSED MODULAR ATTENUATION STORAGE
14m x 6m WITH A DEPTH OF 1m AND VOID RATIO OF 0.95 PROVIDES 80m³ STORAGE

SITUATED WITH 5M EASEMENT FROM SITE BOUNDARY AND 3M EASEMENT FROM EXISTING SEWER.

X00	16-08-05	SECOND ISSUE	JR	JJ	AW
REV.	DATE	DESCRIPTION	DSGND	CHKD	APPD
CLIENT					
GREEN GATE HOMES (NW) LTD					
PRINCIPAL DESIGNER					
					
Waterco Ltd., Eden Court, Lon Parcwr Business Park, Ruthin LL15 1NJ					
tel (+44) 1824 702220 www.waterco.co.uk					
SCHEME					
MOUNT ROAD, LEEK					
TITLE					
CONCEPT DRAINAGE SCHEMATIC					
STATUS					
PRELIMINARY					
DESIGNED JR	CHECKED JJ	APPROVED AW	SCALE / SHEET SIZE 1 : 500 / A3		
DRAWING NO. W10140-160805-DRG CONCEPT				REV X00	

REPRODUCED FROM OS MASTERMAP 1:2500 SCALE BY PERMISSION OF ORDNANCE SURVEY ON BEHALF OF THE CONTROLLER OF HER MAJESTY'S STATIONERY OFFICE.
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