

APPENDIX 7

GREENFIELD RUNOFF RATE

Calculated by: Rory Harris

Site name: Site 4

Site location: wrexham industrial estate

Site coordinates

Latitude: 53.03809° N

Longitude: 2.93375° W

This is an estimation of the greenfield runoff rate limits that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Reference: 6488604

Date: 2018-11-05T16:28:14

Methodology

IH124

Site characteristics

Total site area (ha)	1.373
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Methodology

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type

	Default	Edited
SOIL type	1	4
HOST class	---	---
SPR/SPRHOST	0.1	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm)	692	692
Hydrological region	9	9
Growth curve factor: 1 year	0.88	0.88
Growth curve factor: 30 year	1.78	1.78
Growth curve factor: 100 year	2.18	2.18

Notes:

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

Normally limiting discharge rates which are less than 2.0 l/s/ha 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 consents are usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set in which case blockage work must be addressed by using appropriate drainage elements

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite may be a requirement for disposal of surface water runoff.

Greenfield runoff rates

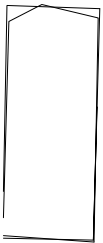
	Default	Edited
Qbar (l/s)	0.23	6.54
1 in 1 year (l/s)	0.2	5.76
1 in 30 years (l/s)	0.41	11.64
1 in 100 years (l/s)	0.5	14.26

APPENDIX 8

MICRO DRAINAGE ANALYSIS

Notes

- 1 All dimensions are in millimetres unless noted otherwise.
- 2 All levels are in metres unless noted otherwise.
- 3 This drawing is to be used in conjunction with relevant Architects and Service Engineers drawings.



PRELIMINARY		WREXHAM INDUSTRIAL ESTATE, WREXHAM	
Contract			
Drawings			
Site	AS 17/78	Issued for Preliminary	
Scale			
Details			

SITE 4 CATCHMENTS

integra
consulting
Civil & Structural Engineers

Suite 3
14-22 Inverleith Street
MURFEST
M15 4DS

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109250 @ AO	10/18
Draws RH	Charged NS
Customer No	Drawing No
3036	4.06
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Micro Drainage	Network W.12.6.1	

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)
7.000	12.045	0.030	401.5	0.000	5.00	0.0	0.600	[]	-1
1.009	2.000	0.010	200.0	0.000	0.00	0.0	0.600	o	450
1.010	2.000	0.010	200.0	0.000	0.00	0.0	0.600	o	450
1.011	3.000	0.010	300.0	0.000	0.00	0.0	0.600	o	450
1.012	25.399	0.170	149.4	0.000	0.00	0.0	0.600	o	450

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)
7.000	50.00	5.15	30.750	0.000	0.0	0.0	0.0	1.37	2340.9	0.0
1.009	50.00	8.42	30.720	0.892	0.0	0.0	0.0	1.43	228.1	120.8
1.010	50.00	8.44	30.710	0.892	0.0	0.0	0.0	1.43	228.1	120.8
1.011	50.00	8.48	30.700	0.892	0.0	0.0	0.0	1.17	185.8	120.8
1.012	50.00	8.74	30.690	0.892	0.0	0.0	0.0	1.66	264.2	120.8

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<u>PIPELINE SCHEDULES for Storm</u> <u>Upstream Manhole</u> <table><tr><th>PN</th><th>Hyd Sect</th><th>Diam (mm)</th><th>MH Name</th><th>C.Level (m)</th><th>I.Level (m)</th><th>D.Depth (m)</th><th>MH Connection</th><th>MH DIAM., L*W (mm)</th></tr><tr><td>1.000</td><td>o</td><td>150</td><td>1</td><td>33.250</td><td>32.550</td><td>0.550</td><td>Open Manhole</td><td>150</td></tr><tr><td>1.001</td><td>o</td><td>150</td><td>2</td><td>33.490</td><td>32.390</td><td>0.950</td><td>Open Manhole</td><td>1050</td></tr><tr><td>2.000</td><td>o</td><td>150</td><td>3</td><td>33.250</td><td>32.550</td><td>0.550</td><td>Open Manhole</td><td>150</td></tr><tr><td>1.002</td><td>o</td><td>225</td><td>4</td><td>33.250</td><td>32.160</td><td>0.865</td><td>Open Manhole</td><td>1050</td></tr><tr><td>1.003</td><td>o</td><td>300</td><td>5</td><td>33.100</td><td>31.730</td><td>1.070</td><td>Open Manhole</td><td>1050</td></tr><tr><td>3.000</td><td>o</td><td>225</td><td>6</td><td>32.680</td><td>31.970</td><td>0.485</td><td>Open Manhole</td><td>225</td></tr><tr><td>1.004</td><td>o</td><td>375</td><td>7</td><td>32.620</td><td>31.330</td><td>0.915</td><td>Open Manhole</td><td>1050</td></tr><tr><td>4.000</td><td>o</td><td>150</td><td>8</td><td>32.110</td><td>31.400</td><td>0.560</td><td>Open Manhole</td><td>150</td></tr><tr><td>1.005</td><td>o</td><td>450</td><td>9</td><td>32.120</td><td>30.810</td><td>0.860</td><td>Open Manhole</td><td>1200</td></tr><tr><td>1.006</td><td>[]</td><td>-1</td><td>10</td><td>31.900</td><td>30.790</td><td>0.710</td><td>Junction</td><td></td></tr><tr><td>5.000</td><td>o</td><td>150</td><td>11</td><td>31.800</td><td>31.090</td><td>0.560</td><td>Open Manhole</td><td>150</td></tr><tr><td>5.001</td><td>o</td><td>225</td><td>12</td><td>31.880</td><td>30.940</td><td>0.715</td><td>Open 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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.022	0.022	0.022
1.001	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.022	0.022	0.022
1.002	-	-	100	0.135	0.135	0.135
1.003	-	-	100	0.255	0.255	0.255
3.000	-	-	100	0.020	0.020	0.020
1.004	-	-	100	0.092	0.092	0.092
4.000	-	-	100	0.053	0.053	0.053
1.005	-	-	100	0.052	0.052	0.052
1.006	-	-	100	0.000	0.000	0.000
5.000	-	-	100	0.037	0.037	0.037
5.001	-	-	100	0.054	0.054	0.054
1.007	-	-	100	0.000	0.000	0.000
6.000	-	-	100	0.058	0.058	0.058
6.001	-	-	100	0.031	0.031	0.031
6.002	-	-	100	0.013	0.013	0.013
6.003	-	-	100	0.023	0.023	0.023
6.004	-	-	100	0.025	0.025	0.025
1.008	-	-	100	0.000	0.000	0.000
7.000	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.000	0.000	0.000
1.010	-	-	100	0.000	0.000	0.000
1.011	-	-	100	0.000	0.000	0.000
1.012	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.892	0.892	0.892

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)
1.012		31.550	30.520	0.000	0	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 Coefficient	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 Storage Structures
Number of Online Controls		1	Number of Time/Area Diagrams
Number of Offline Controls		0	Number of Real Time Controls

Synthetic Rainfall Details

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Simulation Criteria for Storm

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.335		

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Micro Drainage	Network W.12.6.1	

Online Controls for Storm

Depth/Flow Relationship Manhole: 24, DS/PN: 1.012, Volume (m³): 1.8

Invert Level (m) 30.690

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.018	0.2070	0.257	6.4580	0.496	6.0740	0.735	5.9100
0.037	0.7840	0.276	6.4610	0.514	5.9970	0.753	5.9780
0.055	1.6500	0.294	6.4540	0.533	5.9030	0.771	6.0460
0.073	2.7040	0.312	6.4400	0.551	5.7870	0.790	6.1120
0.092	3.8210	0.331	6.4200	0.569	5.6470	0.808	6.1780
0.110	4.8230	0.349	6.3970	0.588	5.4780	0.827	6.2430
0.129	5.6530	0.367	6.3700	0.606	5.4060	0.845	6.3070
0.147	6.0810	0.386	6.3410	0.624	5.4820	0.863	6.3700
0.165	6.2070	0.404	6.3100	0.643	5.5560	0.882	6.4330
0.184	6.3010	0.422	6.2750	0.661	5.6290	0.900	6.4950
0.202	6.3700	0.441	6.2360	0.680	5.7000	0.990	6.7900
0.220	6.4160	0.459	6.1910	0.698	5.7710	1.080	7.0720
0.239	6.4450	0.478	6.1380	0.716	5.8410		

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Storage Structures for Storm

Tank or Pond Manhole: 23, DS/PN: 1.011

Invert Level (m) 30.700

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	325.6	0.900	600.4

Manhole Headloss for Storm

PN	US/MH Name	US/MH Headloss
1.000	1	0.500
1.001	2	0.500
2.000	3	0.500
1.002	4	0.500
1.003	5	0.500
3.000	6	0.500
1.004	7	0.500
4.000	8	0.500
1.005	9	0.500
1.006	10	0.000
5.000	11	0.500
5.001	12	0.500
1.007	13	0.000
6.000	14	0.500
6.001	15	0.500
6.002	16	0.500
6.003	17	0.500
6.004	18	0.500
1.008	19	0.000
7.000	20	0.000
1.009	21	0.000
1.010	22	0.500
1.011	23	0.500
1.012	24	0.500

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

Margin for Flood Risk Warning (mm)300.0

Analysis Timestep 2.5 Second Increment (Extended)

DTS StatusON

DVD StatusON

Inertia StatusON

Profile(s)Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440

Return Period(s) (years)2

Climate Change (%)0

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	2	0%					
1.001	15 Winter	2	0%					
2.000	15 Winter	2	0%					
1.002	15 Winter	2	0%					
1.003	15 Winter	2	0%					
3.000	15 Winter	2	0%					
1.004	15 Winter	2	0%					
4.000	15 Winter	2	0%					
1.005	15 Winter	2	0%					
1.006	30 Winter	2	0%					
5.000	15 Winter	2	0%					
5.001	15 Winter	2	0%					
1.007	30 Winter	2	0%					
6.000	15 Winter	2	0%					
6.001	15 Winter	2	0%					
6.002	15 Winter	2	0%					
6.003	15 Winter	2	0%					
6.004	15 Winter	2	0%					
1.008	30 Winter	2	0%					
7.000	30 Winter	2	0%					
1.009	30 Winter	2	0%					
1.010	30 Winter	2	0%					
1.011	240 Winter	2	0%					
1.012	240 Summer	2	0%					

PN	US/MH Name	Water Level (m)	Surch'd Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	1	32.600	-0.100	0.000	0.23	0.0	3.3	OK
1.001	2	32.440	-0.100	0.000	0.24	0.0	3.3	OK
2.000	3	32.591	-0.109	0.000	0.17	0.0	3.3	OK
1.002	4	32.285	-0.100	0.000	0.57	0.0	23.0	OK
1.003	5	31.922	-0.108	0.000	0.71	0.0	53.2	OK
3.000	6	31.996	-0.199	0.000	0.03	0.0	3.1	OK
1.004	7	31.480	-0.225	0.000	0.33	0.0	66.4	OK
4.000	8	31.459	-0.091	0.000	0.33	0.0	8.0	OK
1.005	9	31.066	-0.194	0.000	0.61	0.0	79.5	OK

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

PN	US/MH Name	Water		Flooded		Pipe		Status
		Level (m)	Surch'd Depth (m)	Volume (m³)	Flow / Cap.	O'flow (l/s)	Flow (l/s)	
1.006	10	30.988	-0.202	0.000	0.04	0.0	70.3	OK*
5.000	11	31.156	-0.084	0.000	0.39	0.0	5.6	OK
5.001	12	31.011	-0.154	0.000	0.21	0.0	12.5	OK
1.007	13	30.973	-0.190	0.000	0.04	0.0	67.8	OK*
6.000	14	32.226	-0.169	0.000	0.14	0.0	8.7	OK
6.001	15	31.460	-0.135	0.000	0.33	0.0	12.6	OK
6.002	16	31.276	-0.129	0.000	0.37	0.0	14.0	OK
6.003	17	31.147	-0.118	0.000	0.45	0.0	16.8	OK
6.004	18	31.035	-0.110	0.000	0.51	0.0	19.4	OK
1.008	19	30.965	-0.184	0.000	0.05	0.0	78.2	OK*
7.000	20	30.946	-0.204	0.000	0.00	0.0	0.1	OK*
1.009	21	30.946	-0.224	0.000	0.39	0.0	65.8	OK*
1.010	22	30.946	-0.214	0.000	0.51	0.0	65.2	OK
1.011	23	30.939	-0.211	0.000	0.08	0.0	9.6	OK
1.012	24	30.992	-0.148	0.000	0.03	0.0	6.4	OK

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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)	30	Add Flow / Climate Change (%)	0
M5-60 (mm)	18.000	Minimum Backdrop Height (m)	0.200
Ratio R	0.335	Maximum Backdrop Height (m)	1.500
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	400
PIMP (%)	100		

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.476	4-8	0.412	8-12	0.004

Total Area Contributing (ha) = 0.892

Total Pipe Volume (m³) = 92.591

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)
1.000	22.759	0.160	142.2	0.022	5.00	0.0	0.600	o	150
1.001	23.010	0.155	148.5	0.000	0.00	0.0	0.600	o	150
2.000	22.493	0.315	71.4	0.022	5.00	0.0	0.600	o	150
1.002	54.302	0.355	153.0	0.135	0.00	0.0	0.600	o	225
1.003	64.234	0.325	197.6	0.255	0.00	0.0	0.600	o	300

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)
1.000	50.00	5.45	32.550	0.022	0.0	0.0	0.0	0.84	14.9	3.0
1.001	50.00	5.92	32.390	0.022	0.0	0.0	0.0	0.82	14.5	3.0
2.000	50.00	5.31	32.550	0.022	0.0	0.0	0.0	1.19	21.1	3.0
1.002	50.00	6.78	32.160	0.179	0.0	0.0	0.0	1.05	41.9	24.2
1.003	50.00	7.74	31.730	0.434	0.0	0.0	0.0	1.11	78.8	58.8

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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)
7.000	12.045	0.030	401.5	0.000	5.00	0.0	0.600	[]	-1
1.009	2.000	0.010	200.0	0.000	0.00	0.0	0.600	o	450
1.010	2.000	0.010	200.0	0.000	0.00	0.0	0.600	o	450
1.011	3.000	0.010	300.0	0.000	0.00	0.0	0.600	o	450
1.012	25.399	0.170	149.4	0.000	0.00	0.0	0.600	o	450

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)
7.000	50.00	5.15	30.750	0.000	0.0	0.0	0.0	1.37	2340.9	0.0
1.009	50.00	8.42	30.720	0.892	0.0	0.0	0.0	1.43	228.1	120.8
1.010	50.00	8.44	30.710	0.892	0.0	0.0	0.0	1.43	228.1	120.8
1.011	50.00	8.48	30.700	0.892	0.0	0.0	0.0	1.17	185.8	120.8
1.012	50.00	8.74	30.690	0.892	0.0	0.0	0.0	1.66	264.2	120.8