

Calculation Sheet

SYSTRA

Project: Plas Coch – Glyndwr University, Wrexham

Made by:	Date:	Project No:	Checked by:	Approved by:	Page No:
T Dawe	Aug 2021	109540	G Pellegrino	D Weir	1 of 5

Item	Calculation	Output
Objective	Detailed design of new storm drainage for residential scheme at Plas Coch (Northern Quarter Glyndwr University).	
Overview	Storm drainage infiltrated on site. Use permeable-paved driveways with individual infiltration/attenuation elements, similar for communal parking areas. Run-off from roofs and main spine road directed to a series of communal soakaways spread around the site. Foul system drained to retained sewer run from eastern side of site out to DCWW sewer in Crispin Lane under S104 & S102 agreements.	
Design & adoption	Communal soakaway and supplementary storage features to be adopted by Flintshire District Council as SAB or to reside with Residents Management Company. Storm sewer network to reside with RMC. Permeable driveway elements to rest with householders. The internal road system will be maintained and owned by a RMC. All highway drainage and communal parking drainage will rest with the same body. Trunk foul sewer network to be adopted by Dwr Cymru:	
Design requirements – SW drainage	No surcharging for 2-year r.p. (SfA C5.1.2) No flooding in 30-year r.p. (SfA C5.2.1) Storage within system overall for 100-yr+40% climate-change	
Rainfall data	FSR rainfall (durations 15-60 mins): OSGR SJ327513 M5-60 = 18.0mm; 'r' = 0.324 FEH rainfall (durations 60+ mins): catchment file <i>FEH_Point_Descriptors_332792_351357.xml</i> MADD factor at zero.	
Soakaway design	Ground permeability recorded from site investigations by Smith Grant LLP, February 2020, Table 4, varies as follows (lowest for each TP) - f = 2.95×10^{-5} m/s (SA01) (0.106 m/hr) - f = 6.54×10^{-6} m/s (SA02) (0.023 m/hr) - f = 4.29×10^{-6} m/s (SA03) (0.015 m/hr) Apply closest 'f' value according to position of soakaway. Soakaway feature formed of proprietary cellular units e.g. Wavin Aquacell. Individual units 1.0 x 0.5 x 0.4m high.	
Soakaway principles of dimension	Area of base: xxxm²: Overall depth dm: Perimeter yyym. Effective infiltrating areas: - Base: 50% of xxxm² - Sides: yyy x d/2 m²	

3Calculation Sheet

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Project: Plas Coch – Glyndwr University, Wrexham

Made by:	Date:	Project No:	Checked by:	Approved by:	Page No:
T Dawe	Aug 2021	109540	G Pellegrino	D Weir	2 of 5

Item	Calculation	Output																																																																																				
	For trunk sewer layout see dwgs 109540/504-506 For private drainage layout see dwgs 109540/521-532 For trunk sewer construction details see dwgs 109540/510-511 For private drainage construction details see dwg 109540/512 For h'way drainage construction details see dwg 109540/542																																																																																					
Associated CAD files	Scheme layout (DS Jones) <i>x-Nth qtr set out model 29.07.21.dwg</i> Main drainage layout CAD file <i>x-trunk drainage layout v7.dwg</i> Road contours CAD file <i>ACAD-Plas Coch Road C3D v3.0.dwg</i> Private drain layout CAD file <i>x-private drainage layout v1.dwg</i>																																																																																					
List of soakaways	6a: adjacent to Plot 53, serving Pl. 52-57 and Pl. 40-44, 46 & 47 6b: beneath Pl. 11-13 & 14-19, also serves Pl. 1, 2 & 6-10. 6c: beneath parking behind Pl. 79-83, also serves Pl. 77 & 78. 6d: central system with soakaway beneath central open space 6e: between Pl. 54 & 72, serving Pl. 54 & 72-76 6f: beneath parking behind Pl. 84-88.																																																																																					
Soakaway 6a adj. Plot 53 MicroDrainage model 109540 SW draft design 6a.mdx	<table><tr><th>Pipe ref</th><th>Length [m]</th><th>Area [ha]</th><th>U/s CL</th><th>U/s IL (est)</th><th>Net area</th></tr><tr><td>1.000</td><td>17.38</td><td>0.020/0.008</td><td>87.30</td><td>85.80 225Ø</td><td>0.030</td></tr><tr><td>1.001</td><td>17.09</td><td>0.014/0.026</td><td>87.25</td><td>85.66 225Ø</td><td>0.042</td></tr><tr><td>1.002</td><td>3.50</td><td>0.000/0.020</td><td>87.25</td><td>85.52 225Ø</td><td>0.020</td></tr><tr><td>2.000</td><td>6.88</td><td>0.006/0.000</td><td>87.10</td><td>86.05 150Ø</td><td>0.007</td></tr><tr><td>2.001</td><td>16.92</td><td>0.006/0.000</td><td>87.10</td><td>85.93 150Ø</td><td>0.007</td></tr><tr><td>2.002</td><td>11.31</td><td>0.007/0.000</td><td>87.10</td><td>85.76 150Ø</td><td>0.008</td></tr><tr><td>3.000</td><td>7.80</td><td>0.006/0.000</td><td>87.50</td><td>86.45 150Ø</td><td>0.007</td></tr><tr><td>3.001</td><td>6.48</td><td>0.006/0.000</td><td>87.35</td><td>86.25 150Ø</td><td>0.007</td></tr><tr><td>4.000</td><td>7.48</td><td>0.006/0.000</td><td>87.20</td><td>86.10 150Ø</td><td>0.007</td></tr><tr><td>4.001</td><td>7.80</td><td>0.005/0.000</td><td>87.20</td><td>86.02 150Ø</td><td>0.006</td></tr><tr><td>4.002</td><td>3.45</td><td>0.006/0.000</td><td>87.20</td><td>85.93 150Ø</td><td>0.007</td></tr><tr><td>2.001</td><td>3.15</td><td>0.000/0.000</td><td>87.20</td><td>85.57 225Ø</td><td>0.000</td></tr><tr><td colspan="6">1.003 dummy pipe duplicating 1.003 for model structure purposes.</td></tr></table>	Pipe ref	Length [m]	Area [ha]	U/s CL	U/s IL (est)	Net area	1.000	17.38	0.020/0.008	87.30	85.80 225Ø	0.030	1.001	17.09	0.014/0.026	87.25	85.66 225Ø	0.042	1.002	3.50	0.000/0.020	87.25	85.52 225Ø	0.020	2.000	6.88	0.006/0.000	87.10	86.05 150Ø	0.007	2.001	16.92	0.006/0.000	87.10	85.93 150Ø	0.007	2.002	11.31	0.007/0.000	87.10	85.76 150Ø	0.008	3.000	7.80	0.006/0.000	87.50	86.45 150Ø	0.007	3.001	6.48	0.006/0.000	87.35	86.25 150Ø	0.007	4.000	7.48	0.006/0.000	87.20	86.10 150Ø	0.007	4.001	7.80	0.005/0.000	87.20	86.02 150Ø	0.006	4.002	3.45	0.006/0.000	87.20	85.93 150Ø	0.007	2.001	3.15	0.000/0.000	87.20	85.57 225Ø	0.000	1.003 dummy pipe duplicating 1.003 for model structure purposes.						
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Soakaway & storage	Block under parking beside plot 53. - Area 21.0 x 8.0 = 168m², perimeter 58.0m - f = 0.015m/hr (ref SA03) - IL 85.00mOD, 1.2m high, CL ~ 87.25mOD																																																																																					
Results	No flooding at 100-yrCC condition (FEH or FSR), TWL = 86.74mOD Drain-down half-time too long to be recorded for critical storm.																																																																																					

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T Dawe	Aug '21	109540	G Pellegrino	D Weir	3 of 5

Item	Calculation						Output
Soakaway 6b between Plots 11-13 & 14-19 MicroDrainage model 109540 SW draft design 5b.mdx	Pipe ref	Length [m]	Area [ha]	U/s CL	U/s IL (est)		Net area
	1.000	11.22	0.008/0.000	87.50	86.66	150Ø	0.009
	1.001	13.18	0.017/0.000	87.50	86.52	150Ø	0.019
	1.002	8.81	0.027/0.016	87.42	86.27	225Ø	0.046
	1.003	7.77	0.000/0.000	87.26	86.13	225Ø	0.000
	2.000	11.91	0.005/0.019	87.18	86.17	225Ø	0.025
	2.001	8.65	0.000/0.003	87.35	86.07	225Ø	0.003
	1.004	17.77	0.029/0.010	87.45	86.00	225Ø	0.042
	1.005	3.50	0.018/0.039	87.32	85.87	225Ø	0.059
	1.006 dummy pipe duplicating 1.003 for model structure purposes.						
Soakaway & storage	Block under parking between plots 11-13 and 14-19. - Area 14 x 12 = 168m², perimeter 52m - f = 0.106 (ref SA01) IL 85.20mOD, 1.2m high						
Results	No flooding at 100-yr+40% (FEH and FSR), TWL = 86.31mOD.						
Soakaway 6c adj. Plots 79-82 as per version 5c. MicroDrainage model 109540 SW draft design 5c.mdx	Nominal pipe system at design stage.						
	Pipe ref	Length [m]	Area [ha]	U/s CL	U/s IL (est)		Net area
	1.000	5.00	0.032/0.026	87.25	85.80	225Ø	0.061
	1.001 dummy pipe duplicating 1.001 for model structure purposes.						
Soakaway & storage	Block under parking behind plots 79-82 - Area = 19 x 4.5 = 85.5m², perimeter 47m, - f = 0.023m/hr (ref SA02) - IL 85.50mOD, 0.8m high, CL 87.25						
	No flooding at 100-yrCC condition. TWL = 86.52mOD Drain-down half-time >8,000 mins for critical storm duration (10,080)						
Soakaway 6e between Plots 54 & 72 as per version 5e MicroDrainage model 109540 SW draft design 5e.mdx	Serving Plots 72-76 & 54.						
	Pipe ref	Length [m]	Area [ha]	U/s CL	U/s IL (est)		Net area
	1.000	6.49	0.014/0.000	87.25	86.10	150Ø	0.015
	1.001	7.41	0.005/0.000	87.25	86.00	150Ø	0.006
	1.002	3.00	0.015/0.000	87.25	85.90	150Ø	0.017
	1.003 dummy pipe duplicating 1.001 for model structure purposes.						
Soakaway & storage	Block under open space beside Plot 54 - Area 12 x 3.5 = 42.0m², perimeter 31m - f = 0.015m/hr (ref SA03) IL 85.25mOD, 1.2m high, CL 87.25						

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Made by:	Date:	Project No:	Checked by:	Approved by:	Page No:
T Dawe	Aug '21	109540	G Pellegrino	D Weir	4 of 5

Item	Calculation						Output
	No flooding at 100-yrCC condition FEH & FSR). TWL = 86.44mOD Drain-down half-time too long to register for critical storm						
Soakaway 6f by Plots 84-87 as version 5f MicroDrainage model 109540 SW draft design 5f.mdx	Serving Plots 84-87& 88						
	Pipe ref	Length [m]	Area [ha]	U/s CL	U/s IL (est)		Net area
	1.000	5.00	0.040/0.000	87.25	85.80 225Ø		0.044
	1.001 dummy pipe duplicating 1.001 for model structure purposes.						
Soakaway & storage	Block under parking bays behind houses - Area 16.0 x 4.0 = 64m², perimeter 40m - f = 0.015m/hr (ref SA03) IL 85.10mOD, 1.2m high, CL 87.25						
	Nil flooding at 100-yrCC condition (FEH & FSR) TWL = 85.99mOD. Drain-down half-time too long to register for critical storm						
Soakaway 6d central MicroDrainage model 109540 SW draft design 6d.mdx	Pipe ref	Length [m]	Area [ha]	U/s CL	U/s IL (est)		Net area
	1.000	26.23	0.013/0.010	87.29	86.21 150Ø		0.024
	1.001	32.71	0.021/0.023	87.00	86.05 225Ø		0.046
	2.000	28.08	0.024/0.015	87.60	86.60 225Ø		0.041
	2.001	59.57	0.011/0.044	87.69	86.23 225Ø		0.056
	1.002	26.70	0.009/0.003	87.27	85.77 300Ø		0.013
	1.003	13.65	0.009/0.019	87.17	85.55 375Ø		0.029
	1.004	7.48	0.005/0.000	87.11	86.48 375Ø		0.006
	3.000	10.40	0.000/0.013	87.20	85.91 225Ø		0.013
	3.001	18.32	0.011/0.010	87.18	85.84 225Ø		0.022
	3.002	20.09	0.000/0.040	87.01	85.64 300Ø		0.040
	1.005	5.74	0.000/0.000	87.15	85.42 375Ø		0.000
	4.000	10.63	0.012/0.006	87.20	85.70 225Ø		0.019
	5.000	10.29	0.024/0.000	87.60	86.15 150Ø		0.026
	4.001	30.13	0.024/0.011	87.49	85.48 300Ø		0.037
	4.002	42.47	0.040/0.046	87.20	85.33 300Ø		0.090
	4.003	18.67	0.017/0.011	87.09	85.12 300Ø		0.030
	6.000	7.97	0.006/0.002	87.21	85.23 300Ø		0.009
	4.004	31.70	0.020/0.000	87.20	84.95 375Ø		0.022
	7.000	7.45	0.010/0.000	87.10	86.15 150Ø		0.011
	4.005	4.40	0.000/0.000	87.15	84.89 375Ø		0.000
	D/s end of 1.005 & 4.005 inlet to soakaway						

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Made by:	Date:	Project No:	Checked by:	Approved by:	Page No:
T Dawe	Aug '21	109540	G Pellegrino	D Weir	5 of 5

Item	Calculation	Output
Soakaway & storage	Block under central POS. - Area $32 \times 12 + 13.5 \times 3 = 424.5\text{m}^2$, perimeter 94m $f = 0.023$ (ref SA02) IL 84.70mOD, 1.6m high, CL 87.1	
	Nil flooding @ 30-yr. Approx. 15m^3 flooding @ 100-yrCC (FEH) at 1.001, 5m^3 on 3.002, minimal elsewhere. TWL 87.04 approx.	
Garage roof soakaways	Garage roofs to be drained by individual property via chamber soakaways in the rear gardens.	
	Garages individually 16m^2 drained area. Design for no flooding at 30-year+CC Use $f = 0.021$ m/hr as worst case on site FoS = 5 Rainfall: FEH data (ref pp.1)	
	MicroDrainage file <i>109540 Garage soakaway.srcx</i> 1.35m dia manhole 1.65m deep bgl with pit size 2.03m square and stone fill of porosity = 0.3. Effective ring depth 1.25m with 0.4m allowed for cover and cover slab. Chamber base assumed to be solid: infiltration via pit sides only.	
	Peak water depth 1.38m within the chamber under 7-day storm duration (10,080 minutes) for 30-yr+40%. Drain-down is too slow to measure within modelled duration.	