



Flood Risk & Drainage Assessment

Twineham Court Farmhouse, Bob Lane

Twineham RH17 5NH

Client

Telbridge Properties Limited

Hornbrook House

Brighton Road

Horsham

RH13 6QA

Ref: 12391

Date: July 2024

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Issue	Issue date	Compiled	Checked
Preliminary Issue	24 Sept. 2025	JP / FVV	FVV / MR
First Issue	25 Sept. 2025	JP	FVV / MR

1 Introduction

- 1.1 This Flood Risk & Drainage Assessment (FRDA) report has been prepared for Telbridge Properties Limited in relation to the proposed development at Twineham Court Farmhouse, Bob Lane, Twineham RH17 5NH. No responsibility is accepted to any third party for all or part of this study in connection with this or any other development.
- 1.2 This assessment, along with the accompanying Site Drainage Strategy drawing is to support a planning application to Mid Sussex District Council at the above site – for *"Proposed removal of the modern disused and redundant agricultural buildings and creation of an events venue through the erection of an events barn and open barn. Proposed use of redundant Grade II Listed farmhouse and Curtilage Listed Building to provide ancillary accommodation to serve the events venue. Proposed erection of estate barn to assist with operation of events venue and retained agricultural land. Provision of driveway and parking area to north of proposed events venue, plus ancillary infrastructure including surface and foul water drainage strategy. Provision of ecological enhancements and hard and soft landscaping."*
- 1.3 No responsibility is accepted to any third party for all or part of this study in connection with this or any other development.
- 1.4 All the comments listed in the LLFA's standing objection (Consultation letter to the LPA dated 07 August 25) have been addressed in full.

2 Existing Site & Current Flood Conditions

- 2.1 The application site, administered by Mid Sussex District Council (MSDC), is located north of Bob Lane, equidistant between the village centres of Twineham and Wineham. The site comprises Twineham Court Farmhouse with a complex of agricultural buildings to the south and east. Access is via a drive to Bob Lane to the south. A site location map and aerial photo are shown in Appendix A.
- 2.2 Hydrology: the east branch of the River Adur rises at Ditchling Common and passes the site approximately 700m to the southeast. Approximately 400m to the north of the Farmhouse, an unnamed watercourse flows west to east, joining the eastern Adur near Twineham. There is a ditch on the eastern boundary of the site. This ditch starts within the site at the high point midway between the north and south boundary. The northern section flows northwards, past the existing power station, and into the unnamed watercourse (as surveyed). The southern section flows southward towards Bob Lane.
- 2.3 Topography: a topographical survey is shown in Appendix B. The levels fall gently from the high point in the west of the site, at around 31.15mAOD, towards both the north and the south boundary, and towards the ditch on the east boundary. The low point at the south boundary is around 25.20mAOD, and the low point at the north boundary is around 26.82mAOD.
- 2.4 Geology: online maps by BGS show the Farmhouse is located on a thin west-east band of Weald Clay Formation (clay-ironstone), while the rest of the site is situated on Weald Clay Formation (mudstone). There are no superficial deposits overlying either of these.
- 2.5 Soakage Testing: A percolation test was carried out based on BS 6297:2007 to ascertain the suitability of drainage fields on the site. The test was conducted in the north of the site and showed that the ground was heavily saturated and therefore not suitable for traditional drainage field solutions. Refer to Appendix C.
- 2.6 Public sewers: There are no public sewers nearby.
- 2.7 Existing drainage: the existing private drainage serving the site is unknown. In the absence of information, it is assumed that the existing foul drains from the farmhouse are connected to a historical cesspit on site. The existing surface water drainage is routed to an onsite pond with no flow controls in place.
- 2.8 The EA's online fluvial, pluvial and reservoir flood maps have been studied. The flood risk from these sources is Low.
- 2.9 There are no impounded water features in the vicinity.

- 2.10 The groundwater vulnerability at the site is defined as Low as the site overlies an unproductive zone, according to the EA's Groundwater Vulnerability Zones map [England] (URL ref <https://magic.defra.gov.uk/MagicMap.html>). There is minimal potential for groundwater bodies to be affected by the contaminants from the surface in this area, therefore.
- 2.11 The site is not within a groundwater source protection zone according to the EA's 'source Protection Zones merged [England] map (URL ref <https://magic.defra.gov.uk/MagicMap.html>).
- 2.12 There are no records of flooding from groundwater in this area.

In conclusion, the site's flood risk profile is **Low**.

3 Development Proposals and Drainage Strategy

3.1 The proposal is for the construction of new events facilities at this site, comprising a new car park, amended access, new estate management facilities, and the event venue itself (refer to section 1.2 above for the full description). Please refer to previous planning applications DM/23/2385 and DM/23/2386 for details covering the ancillary accommodation and annex.

Surface Water Drainage

3.2 The surface water runoff from the new facilities will be directed to two new attenuation ponds in the south of the site, working in cascade. These ponds have been designed to accommodate sufficient storage volume to attenuate all events up to and including the 1 in 100 year +45% climate change event. FEH22 hydrology and Cv values of 1 have been used in the Flow drainage calculations (refer to Appendix E). Climate change allowance has been added to the 1 in 30 years scenario.

3.3 The drainage network shall discharge into the Ordinary Watercourse that runs along the east boundary. This lies within the Applicant's ownership: there are no issues with 3rd party owned land.

3.4 Additionally, the proposed car park shall be constructed with permeable surfacing, with 300mm of granular subbase with a 0.3 void ratio, and outfall to the proposed attenuation ponds. The drainage strategy is included in Appendix D.

3.5 Surface water runoff will be attenuated to greenfield QBAR rate of 2.1 l/s. This is based on an impermeable area of 0.370ha and greenfield QBAR of 5.64 l/s/ha (ie $5.64 \times 0.37 = 2.1$). Calculations are included in Appendix E. The attenuated runoff will discharge to the existing ditch via a new formal outfall.

3.6 Exceedance flow will follow the existing topography of the site and flow in a generally southeastern direction, towards the existing ditches and away from the proposed buildings. This is shown on the drainage drawing in Appendix D.

3.7 Water Quality: The pollution hazard level for the proposed site has been assessed as Low, based on a non-residential use with infrequent change (i.e. <300 traffic movements/day). The corresponding pollution indices are 0.5, 0.4 and 0.4 (as set out in Table 26.2 of CIRIA SuDS Manual C753.) Table 26.3 sets out the mitigation indices for discharges to surface water. The corresponding indices for permeable pavements are 0.7, 0.6 and 0.7; and for attenuation ponds are 0.7, 0.7, and 0.5. Thus, it is contended that the proposed drainage strategy will have no adverse impacts on the water quality of the receiving ditches.

- 3.8 Maintenance responsibilities for the proposed surface water network will remain the responsibility of the landowner.
- 3.9 Ordinary Watercourse Consent shall be sought during the next stage from the LLFA. There are no predicted outstanding issues in this regard, ie there is no reason to suppose that this should not be forthcoming.

Foul Water Drainage

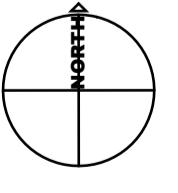
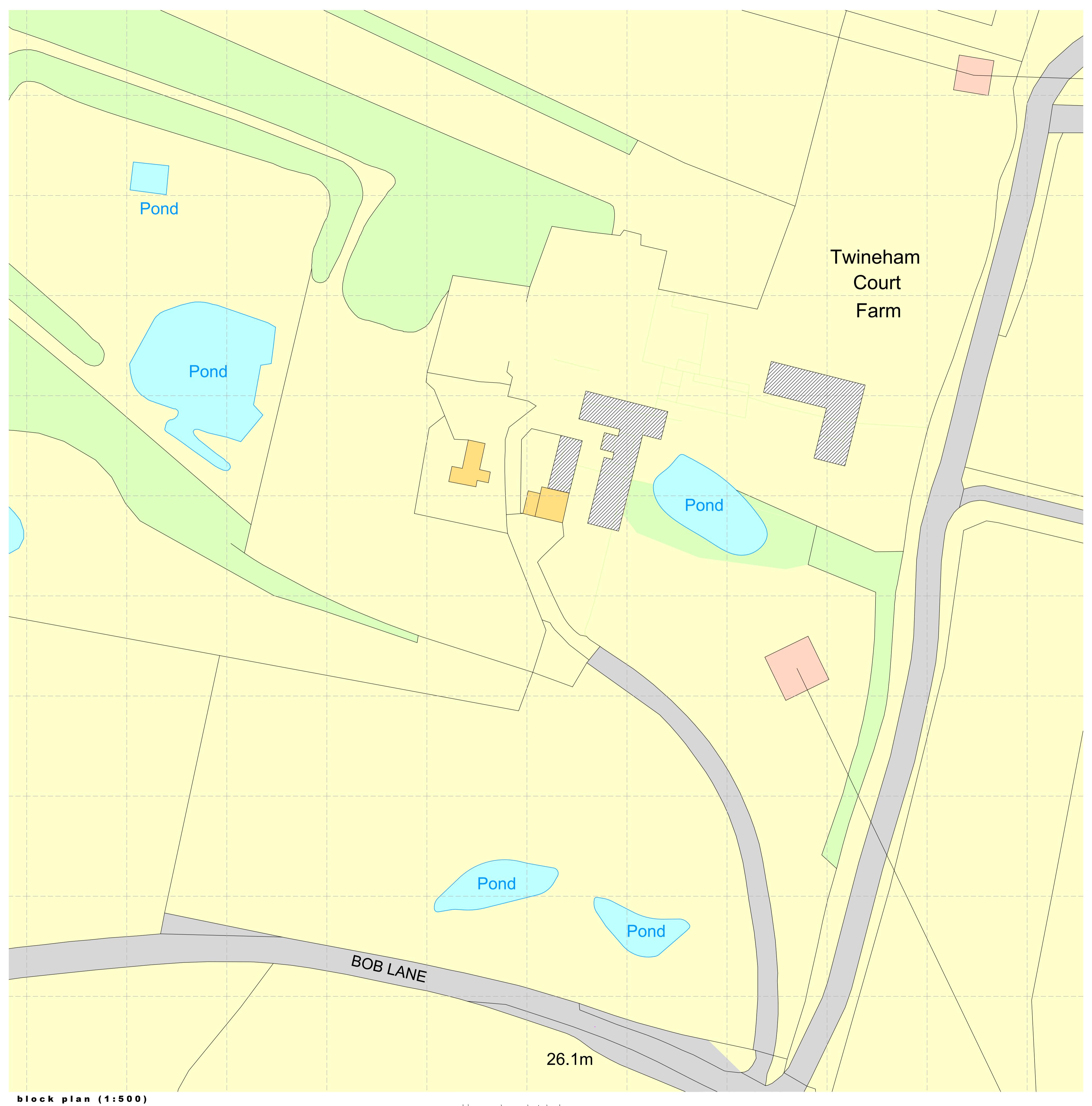
- 3.10 As discussed in Section 2, the existing ground at the site is heavily saturated with very low infiltration rate and therefore a drainage field would not be a suitable solution to manage the foul drainage from the site. For this reason, it is proposed to treat the foul effluent on site, with a new formal outfall to the existing ditch flowing northward. The drainage strategy is included in Appendix D.
- 3.11 To ensure an acceptable quality of effluent for release to the ditch, two stages of treatment will be provided upstream of the outfall. The first stage will be a packaged treatment plant. This shall be designed by a specialist to provide a sufficient level of treatment to cater for the expected flows. A sampling chamber will be located downstream of the packaged treatment plant so that its functionality can be monitored.
- 3.12 The treated effluent will then be directed through a raised drainage mound. This will act as a secondary stage of treatment, to ensure any remaining contaminants are adequately treated. The drainage mound shall be detailed to BR478 standards.
- 3.13 Maintenance responsibilities for the proposed foul network will remain the responsibility of the landowner.
- 3.14 It is contended that this development's SuDS and foul drainage design is fully compliant with the PPG/NPPF. This proposal will not increase the flood risk of this or neighbouring sites.

- End of Report -

Appendix A

Site Location Map and Aerial Photo



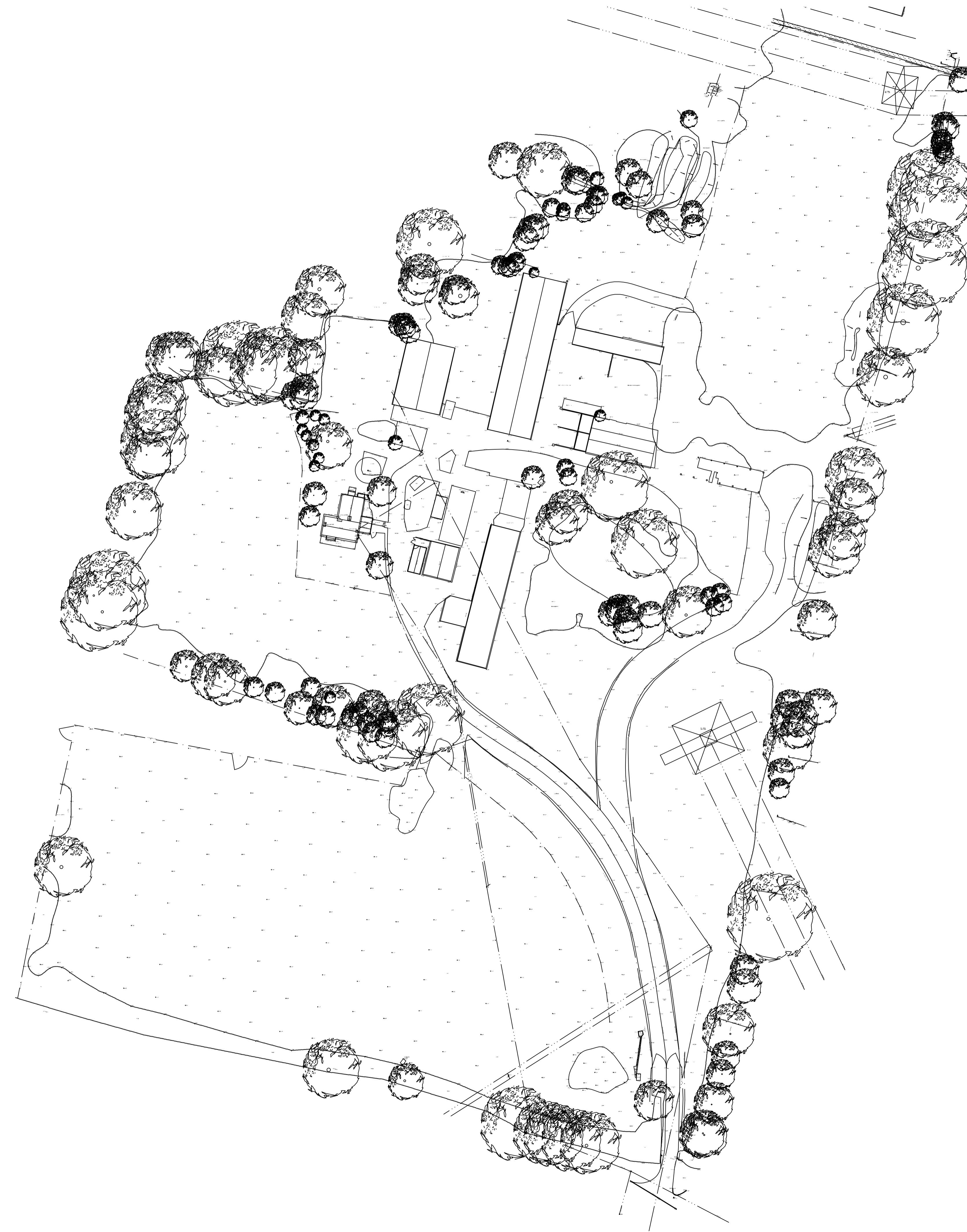




Appendix B

Topographical Survey

TOPOGRAPHICAL SURVEY
SE SURVEYING
1:500 AT A1



Appendix C

Soakage testing

Percolation Test

As instructed we have started the process of the percolation test at Twineham Court Farm for our proposed foul waste drainage field. The first test hole was dug in the proposed area of the water treatment plant and drainage field to the north of the site. As per the standard percolation trial test for foul waste effluent drainage fields we dug the hole to 1m deep and 900mm long x 500mm wide using a digger.

We filled the hole with water to a level of 730mm as the first of the potentially 3 fill/empty procedures to saturate the ground around the hole and waited for this to empty.

This first fill did not fall in its level of 730mm at all on day one.

We then went back 10 days later to find the hole had emptied by $\frac{3}{4}$ at 610mm deep.

Therefore it can be safely assumed that a conventional drainage field would be highly ineffective and cause the system to fail almost immediately.








Appendix D

Proposed Site Layout and Drainage Strategy

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twineham substation
(national grid)



Appendix E

Drainage Calculations

Calculated by:	Florence Van Vaerenbergh
Site name:	Twineham Court Farm
Site location:	Bob Lane

Site Details

Latitude:	50.97308° N
Longitude:	0.22858° W
	4094952569
Date:	Apr 12 2024 15:12

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.

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 1

Notes

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

Methodology

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

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

SPR estimation method: Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

 (2) Are flow rates $< 5.0 \text{ l/s}$?

Hydrological characteristics

	Default	Edited
SAAR (mm):	799	799
Hydrological region:	7	7
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

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 $SPR/SPRHOST \leq 0.3$?

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):	5.64	5.64
1 in 1 year (l/s):	4.79	4.79
1 in 30 years (l/s):	12.96	12.96
1 in 100 year (l/s):	17.98	17.98
1 in 200 years (l/s):	21.08	21.08

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.eksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.eksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
PS17	0.001	5.00	29.804	180	524536.699	120813.794	0.500
PS18			29.861	450	524539.469	120825.430	0.761
PS7	0.020	5.00	29.858	450	524550.754	120831.749	0.928
PS8	0.153	5.00	29.858	450	524552.194	120837.074	1.048
PS15	0.020	5.00	29.664	450	524587.687	120828.606	1.084
PS16	0.020	5.00	29.345	450	524583.626	120807.427	0.845
PS9	0.020	5.00	28.793	450	524577.322	120791.797	0.483
PS10	0.020	5.00	28.709	450	524572.782	120781.221	1.077
PS11			28.550	450	524552.927	120766.237	1.240
PS12			27.976	450	524544.751	120737.901	1.125
PS19	0.029	5.00	29.900	450	524516.096	120826.774	0.500
PS20	0.029	5.00	29.879	450	524514.046	120817.961	0.789
PS21	0.029	5.00	29.923	450	524518.025	120813.921	0.933
PS22	0.029	5.00	29.911	450	524512.297	120790.890	1.171
PS23			28.413	450	524515.558	120745.588	0.725
PS13			27.540	1350	524512.753	120719.911	0.980
PS14			27.200		524505.774	120709.497	0.750
PS24			27.200	100	524509.218	120703.708	1.000
PS25			27.175	1350	524513.549	120701.590	1.025
PS26			26.800		524517.980	120699.722	0.700
PS27			26.800	100	524542.988	120692.420	1.000
PS28			26.800	1350	524547.862	120695.977	1.200
PS29			26.370		524571.604	120688.454	0.970

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	PS17	PS18	11.961	0.600	29.304	29.100	0.204	58.6	100	5.20	50.0
1.001	PS18	PS7	12.934	0.600	29.100	28.930	0.170	76.1	100	5.44	50.0
1.002	PS7	PS8	5.546	0.600	28.930	28.860	0.070	79.2	100	5.55	50.0
1.003	PS8	PS15	36.460	0.600	28.810	28.580	0.230	158.5	300	6.04	50.0
1.004	PS15	PS16	21.689	0.600	28.580	28.500	0.080	271.1	300	6.42	50.0
1.005	PS16	PS9	16.853	0.600	28.500	28.385	0.115	146.5	300	6.63	50.0
1.006	PS9	PS10	11.509	0.600	28.310	27.632	0.678	17.0	300	6.68	50.0
1.007	PS10	PS11	24.952	0.600	27.632	27.310	0.322	77.5	300	6.92	50.0
1.008	PS11	PS12	29.465	0.600	27.310	26.851	0.459	64.2	300	7.17	50.0
1.009	PS12	PS13	36.709	0.600	26.851	26.635	0.216	169.9	300	7.68	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.008	7.9	0.3	0.400	0.661	0.001	0.0	13	0.465
1.001	0.883	6.9	0.3	0.661	0.828	0.001	0.0	14	0.423
1.002	0.865	6.8	5.5	0.828	0.898	0.021	0.0	68	0.963
1.003	1.246	88.1	45.6	0.748	0.784	0.174	0.0	153	1.257
1.004	0.950	67.1	50.8	0.784	0.545	0.194	0.0	195	1.041
1.005	1.296	91.6	56.1	0.545	0.108	0.214	0.0	170	1.359
1.006	3.834	271.0	61.3	0.183	0.777	0.234	0.0	96	3.117
1.007	1.787	126.3	66.6	0.777	0.940	0.254	0.0	155	1.811
1.008	1.965	138.9	66.6	0.940	0.825	0.254	0.0	146	1.945
1.009	1.203	85.0	66.6	0.825	0.605	0.254	0.0	201	1.327

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
2.000	PS19	PS20	9.155	0.600	29.400	29.140	0.260	35.2	225	5.07	50.0
2.001	PS20	PS21	5.670	0.600	29.090	28.990	0.100	56.7	225	5.12	50.0
2.002	PS21	PS22	23.732	0.600	28.990	28.740	0.250	94.9	225	5.42	50.0
2.003	PS22	PS23	45.412	0.600	28.740	27.688	1.052	43.2	225	5.80	50.0
2.004	PS23	PS13	25.820	0.600	27.688	26.635	1.053	24.5	225	5.96	50.0
1.010	PS13	PS14	12.536	0.600	26.560	26.450	0.110	114.0	300	7.82	50.0
1.011	PS14	PS24	6.795	0.600	26.450	26.200	0.250	27.2	300	7.85	50.0
1.012	PS24	PS25	4.801	0.600	26.200	26.150	0.050	96.0	300	7.90	50.0
1.013	PS25	PS26	4.809	0.600	26.150	26.100	0.050	96.2	300	7.95	50.0
1.014	PS26	PS27	26.052	0.600	26.100	25.800	0.300	86.8	300	8.21	50.0
1.015	PS27	PS28	6.034	0.600	25.800	25.600	0.200	30.2	300	8.25	50.0
1.016	PS28	PS29	25.331	0.600	25.600	25.400	0.200	126.7	300	8.55	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
2.000	2.212	87.9	7.6	0.275	0.514	0.029	0.0	44	1.365
2.001	1.740	69.2	15.2	0.564	0.708	0.058	0.0	72	1.404
2.002	1.342	53.4	22.8	0.708	0.946	0.087	0.0	102	1.289
2.003	1.996	79.4	30.4	0.946	0.500	0.116	0.0	96	1.865
2.004	2.653	105.5	30.4	0.500	0.680	0.116	0.0	82	2.298
1.010	1.472	104.0	96.9	0.680	0.450	0.370	0.0	231	1.663
1.011	3.027	214.0	96.9	0.450	0.700	0.370	0.0	142	2.955
1.012	1.604	113.4	96.9	0.700	0.725	0.370	0.0	214	1.794
1.013	1.603	113.3	96.9	0.725	0.400	0.370	0.0	214	1.793
1.014	1.688	119.3	96.9	0.400	0.700	0.370	0.0	206	1.872
1.015	2.872	203.0	96.9	0.700	0.900	0.370	0.0	146	2.842
1.016	1.395	98.6	96.9	0.900	0.670	0.370	0.0	243	1.581

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Starting Level (m)
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s) x
Summer CV	1.000	Drain Down Time (mins)	240	Check Discharge Volume x
Winter CV	1.000	Additional Storage (m ³ /ha)	20.0	

Storm Durations									
15	60	180	360	600	960	2160	4320	7200	
30	120	240	480	720	1440	2880	5760		

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
	2	0	0
	30	40	0
	100	45	0

Node PS28 Online Hydro-Brake® Control

Flap Valve	x	Design Flow (l/s)	2.1
Downstream Link	1.016	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	25.600	Product Number	CTL-SHE-0069-2100-1000-2100
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.100

Node PS28 Online Hydro-Brake® Control

Min Node Diameter (mm) 1200

Node PS24 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	26.200
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	255.2	0.0	0.300	321.8	0.0	0.600	393.9	0.0	0.900	471.1	0.0
0.100	276.5	0.0	0.400	345.2	0.0	0.700	419.0	0.0	1.000	497.9	0.0
0.200	298.9	0.0	0.500	369.3	0.0	0.800	444.8	0.0			

Node PS27 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	25.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	181.0	0.0	0.300	237.6	0.0	0.600	299.7	0.0	0.900	366.9	0.0
0.100	199.1	0.0	0.400	257.8	0.0	0.700	321.5	0.0	1.000	390.4	0.0
0.200	218.1	0.0	0.500	278.4	0.0	0.800	343.9	0.0			

Node PS8 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	28.810	Slope (1:X)	80.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.300
Safety Factor	2.0			Inf Depth (m)	
Porosity	0.30			Width (m)	40.000
				Length (m)	40.000

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US	Peak	Level	Depth	Inflow	Node	Flood	Status
	Node	(mins)	(m)	(m)	(l/s)	Vol (m³)	(m³)	
15 minute summer	PS17	10	29.315	0.011	0.2	0.0007	0.0000	OK
15 minute summer	PS18	11	29.112	0.012	0.2	0.0019	0.0000	OK
15 minute summer	PS7	10	28.987	0.057	3.8	0.0336	0.0000	OK
15 minute summer	PS8	12	28.919	0.109	31.2	3.7690	0.0000	OK
15 minute summer	PS15	12	28.720	0.140	27.7	0.0738	0.0000	OK
15 minute summer	PS16	12	28.626	0.126	30.3	0.0796	0.0000	OK
15 minute summer	PS9	12	28.380	0.070	32.9	0.0692	0.0000	OK
15 minute summer	PS10	12	27.747	0.115	35.7	0.0608	0.0000	OK
15 minute summer	PS11	12	27.413	0.103	35.6	0.0164	0.0000	OK
15 minute summer	PS12	13	26.990	0.139	35.6	0.0221	0.0000	OK
15 minute summer	PS19	10	29.438	0.038	5.2	0.0507	0.0000	OK
15 minute summer	PS20	10	29.155	0.065	10.4	0.0581	0.0000	OK
15 minute summer	PS21	10	29.076	0.086	15.5	0.0670	0.0000	OK
15 minute summer	PS22	10	28.821	0.081	20.6	0.0533	0.0000	OK
15 minute summer	PS23	11	27.755	0.067	20.5	0.0107	0.0000	OK
15 minute winter	PS13	9	26.757	0.197	50.2	0.2813	0.0000	OK
15 minute winter	PS14	9	26.734	0.284	50.4	0.0000	0.0000	OK
120 minute summer	PS24	74	26.302	0.102	32.9	27.0329	0.0000	OK
120 minute summer	PS25	74	26.244	0.094	21.4	0.1344	0.0000	OK
15 minute summer	PS26	14	26.192	0.092	13.3	0.0000	0.0000	OK
360 minute summer	PS27	344	26.094	0.294	17.0	61.3153	0.0000	OK
360 minute summer	PS28	320	26.098	0.498	10.8	0.7128	0.0000	SURCHARGED
15 minute summer	PS29	1	25.400	0.000	2.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	PS17	1.000	PS18	0.2	0.459	0.025	0.0058	
15 minute summer	PS18	1.001	PS7	0.2	0.099	0.028	0.0328	
15 minute summer	PS7	1.002	PS8	3.7	0.843	0.543	0.0252	
15 minute summer	PS8	1.003	PS15	24.9	0.901	0.282	1.0074	
15 minute summer	PS15	1.004	PS16	27.5	0.918	0.410	0.6527	
15 minute summer	PS16	1.005	PS9	30.1	1.126	0.328	0.4503	
15 minute summer	PS9	1.006	PS10	32.9	1.787	0.121	0.2142	
15 minute summer	PS10	1.007	PS11	35.6	1.544	0.282	0.5765	
15 minute summer	PS11	1.008	PS12	35.6	1.347	0.256	0.7796	
15 minute summer	PS12	1.009	PS13	35.3	1.139	0.416	1.1395	
15 minute summer	PS19	2.000	PS20	5.2	1.183	0.059	0.0399	
15 minute summer	PS20	2.001	PS21	10.3	0.885	0.149	0.0663	
15 minute summer	PS21	2.002	PS22	15.4	1.147	0.289	0.3186	
15 minute summer	PS22	2.003	PS23	20.5	1.798	0.258	0.5180	
15 minute summer	PS23	2.004	PS13	20.6	1.822	0.195	0.3621	
15 minute winter	PS13	1.010	PS14	50.4	1.612	0.484	0.7388	
15 minute winter	PS14	1.011	PS24	52.6	3.014	0.246	0.2357	
120 minute summer	PS24	1.012	PS25	21.4	1.078	0.189	0.0956	
120 minute summer	PS25	1.013	PS26	21.4	1.209	0.189	0.0864	
15 minute summer	PS26	1.014	PS27	13.4	1.733	0.113	0.2402	
360 minute summer	PS27	1.015	PS28	10.8	0.300	0.053	0.4240	
360 minute summer	PS28	Hydro-Brake®	PS29	2.1				59.4

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.62%

Node	Event	US	Peak	Level	Depth	Inflow	Node	Flood	Status
		Node	(mins)	(m)	(m)	(l/s)	Vol (m³)	(m³)	
15 minute winter		PS17	11	29.323	0.019	0.6	0.0012	0.0000	OK
15 minute summer		PS18	12	29.314	0.214	2.1	0.0340	0.0000	SURCHARGED
15 minute summer		PS7	12	29.310	0.380	12.9	0.2241	0.0000	SURCHARGED
15 minute summer		PS8	13	29.040	0.230	109.2	15.9725	0.0000	OK
15 minute summer		PS15	11	28.918	0.338	78.9	0.1783	0.0000	SURCHARGED
15 minute summer		PS16	11	28.776	0.276	90.3	0.1743	0.0000	OK
15 minute summer		PS9	12	28.480	0.170	101.9	0.1676	0.0000	OK
15 minute summer		PS10	12	28.241	0.609	112.4	0.3225	0.0000	SURCHARGED
15 minute summer		PS11	12	27.928	0.618	109.2	0.0983	0.0000	SURCHARGED
15 minute summer		PS12	12	27.571	0.720	108.9	0.1144	0.0000	SURCHARGED
15 minute summer		PS19	10	29.472	0.072	18.6	0.0956	0.0000	OK
15 minute summer		PS20	11	29.258	0.168	37.1	0.1503	0.0000	OK
15 minute summer		PS21	11	29.226	0.236	55.4	0.1840	0.0000	SURCHARGED
15 minute summer		PS22	10	28.924	0.184	72.7	0.1205	0.0000	OK
15 minute summer		PS23	11	27.839	0.151	72.4	0.0240	0.0000	OK
15 minute summer		PS13	12	27.140	0.580	178.4	0.8301	0.0000	SURCHARGED
15 minute winter		PS14	7	26.911	0.461	169.6	0.0000	0.0000	FLOOD RISK
720 minute winter		PS24	705	26.490	0.290	19.1	83.2055	0.0000	OK
720 minute winter		PS25	705	26.491	0.341	17.7	0.4880	0.0000	SURCHARGED
720 minute winter		PS26	720	26.491	0.391	17.7	0.0000	0.0000	SURCHARGED
720 minute winter		PS27	705	26.490	0.690	17.6	170.9559	0.0000	SURCHARGED
720 minute winter		PS28	705	26.490	0.890	9.5	1.2734	0.0000	SURCHARGED
15 minute summer		PS29	1	25.400	0.000	2.1	0.0000	0.0000	OK

Link	Event	US	Link	DS	Outflow	Velocity	Flow/Cap	Link	Discharge
(Upstream Depth)		Node		Node	(l/s)	(m/s)		Vol (m³)	Vol (m³)
15 minute winter		PS17	1.000	PS18	0.6	0.542	0.076	0.0528	
15 minute summer		PS18	1.001	PS7	2.0	0.291	0.295	0.1012	
15 minute summer		PS7	1.002	PS8	11.7	1.498	1.725	0.0434	
15 minute summer		PS8	1.003	PS15	71.6	1.104	0.813	2.3408	
15 minute summer		PS15	1.004	PS16	78.8	1.132	1.173	1.4987	
15 minute summer		PS16	1.005	PS9	89.6	1.408	0.978	1.0662	
15 minute summer		PS9	1.006	PS10	100.1	2.199	0.369	0.6419	
15 minute summer		PS10	1.007	PS11	109.2	1.839	0.865	1.7571	
15 minute summer		PS11	1.008	PS12	108.9	1.562	0.784	2.0749	
15 minute summer		PS12	1.009	PS13	110.2	1.565	1.296	2.5850	
15 minute summer		PS19	2.000	PS20	18.5	1.416	0.211	0.1449	
15 minute summer		PS20	2.001	PS21	36.8	1.070	0.532	0.2029	
15 minute summer		PS21	2.002	PS22	54.1	1.490	1.014	0.8815	
15 minute summer		PS22	2.003	PS23	72.4	2.352	0.912	1.4199	
15 minute summer		PS23	2.004	PS13	72.0	1.932	0.682	0.8793	
15 minute summer		PS13	1.010	PS14	178.7	2.540	1.718	0.8828	
15 minute winter		PS14	1.011	PS24	170.1	3.532	0.795	0.3423	
720 minute winter		PS24	1.012	PS25	17.7	1.026	0.156	0.3365	
720 minute winter		PS25	1.013	PS26	17.7	1.148	0.156	0.3386	
720 minute winter		PS26	1.014	PS27	17.5	0.927	0.146	1.8346	
720 minute winter		PS27	1.015	PS28	9.5	0.225	0.047	0.4249	
720 minute winter		PS28	Hydro-Brake®	PS29	2.1				102.4

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.61%

Node	Event	US	Peak	Level	Depth	Inflow	Node	Flood	Status
		Node	(mins)	(m)	(m)	(l/s)	Vol (m³)	(m³)	
15 minute summer		PS17	12	29.496	0.192	2.0	0.0125	0.0000	SURCHARGED
15 minute summer		PS18	12	29.492	0.392	2.4	0.0623	0.0000	SURCHARGED
15 minute summer		PS7	12	29.485	0.555	16.7	0.3272	0.0000	SURCHARGED
15 minute summer		PS8	13	29.107	0.297	141.2	26.3360	0.0000	OK
15 minute summer		PS15	11	28.992	0.412	80.5	0.2177	0.0000	SURCHARGED
15 minute summer		PS16	11	28.874	0.374	94.6	0.2366	0.0000	SURCHARGED
15 minute summer		PS9	11	28.724	0.414	111.2	0.4086	0.0000	FLOOD RISK
15 minute summer		PS10	11	28.568	0.936	122.3	0.4959	0.0000	FLOOD RISK
15 minute summer		PS11	11	28.205	0.895	117.4	0.1424	0.0000	SURCHARGED
15 minute summer		PS12	12	27.803	0.952	116.2	0.1513	0.0000	FLOOD RISK
15 minute summer		PS19	12	29.818	0.418	24.3	0.5512	0.0000	FLOOD RISK
15 minute summer		PS20	12	29.796	0.706	46.0	0.6312	0.0000	FLOOD RISK
15 minute summer		PS21	12	29.733	0.743	63.2	0.5804	0.0000	FLOOD RISK
15 minute summer		PS22	12	29.335	0.595	83.6	0.3889	0.0000	SURCHARGED
15 minute summer		PS23	12	28.082	0.394	80.8	0.0626	0.0000	SURCHARGED
15 minute summer		PS13	12	27.316	0.756	197.3	1.0815	0.0000	FLOOD RISK
15 minute winter		PS14	7	26.962	0.512	194.6	0.0000	0.0000	FLOOD RISK
960 minute winter		PS24	930	26.640	0.440	25.5	133.5807	0.0000	SURCHARGED
960 minute winter		PS25	945	26.640	0.490	16.0	0.7008	0.0000	SURCHARGED
960 minute winter		PS26	960	26.639	0.539	16.0	0.0000	0.0000	FLOOD RISK
960 minute winter		PS27	945	26.639	0.839	15.8	221.2005	0.0000	FLOOD RISK
960 minute winter		PS28	945	26.639	1.039	10.8	1.4873	0.0000	FLOOD RISK
15 minute summer		PS29	1	25.400	0.000	2.1	0.0000	0.0000	OK

Link	Event	US	Link	DS	Outflow	Velocity	Flow/Cap	Link	Discharge
(Upstream Depth)		Node		Node	(l/s)	(m/s)		Vol (m³)	Vol (m³)
15 minute summer		PS17	1.000	PS18	1.9	0.509	0.241	0.0936	
15 minute summer		PS18	1.001	PS7	3.5	0.443	0.500	0.1012	
15 minute summer		PS7	1.002	PS8	13.8	1.763	2.030	0.0434	
15 minute summer		PS8	1.003	PS15	77.8	1.129	0.883	2.5657	
15 minute summer		PS15	1.004	PS16	80.5	1.165	1.199	1.5273	
15 minute summer		PS16	1.005	PS9	94.5	1.412	1.031	1.1868	
15 minute summer		PS9	1.006	PS10	105.6	2.233	0.390	0.8105	
15 minute summer		PS10	1.007	PS11	117.4	1.906	0.929	1.7571	
15 minute summer		PS11	1.008	PS12	116.2	1.651	0.837	2.0749	
15 minute summer		PS12	1.009	PS13	116.1	1.649	1.366	2.5850	
15 minute summer		PS19	2.000	PS20	22.9	1.408	0.260	0.3641	
15 minute summer		PS20	2.001	PS21	40.6	1.078	0.586	0.2255	
15 minute summer		PS21	2.002	PS22	60.7	1.527	1.138	0.9438	
15 minute summer		PS22	2.003	PS23	80.8	2.322	1.018	1.8061	
15 minute summer		PS23	2.004	PS13	81.1	2.055	0.769	1.0269	
15 minute summer		PS13	1.010	PS14	197.9	2.811	1.903	0.8828	
15 minute winter		PS14	1.011	PS24	195.0	3.320	0.911	0.4279	
960 minute winter		PS24	1.012	PS25	16.0	0.984	0.141	0.3381	
960 minute winter		PS25	1.013	PS26	16.0	1.095	0.141	0.3386	
960 minute winter		PS26	1.014	PS27	15.7	0.937	0.132	1.8346	
960 minute winter		PS27	1.015	PS28	10.8	0.263	0.053	0.4249	
960 minute winter		PS28	Hydro-Brake®	PS29	2.1				135.8



Civil Engineering - Transport Planning - Flood Risk

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