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Technical Note

Great Cauldham Park, Capel Le Ferne

18-027-009 Rev -

Technical Note in response to KCC Consultation

June 2024

Rev	Issue Purpose	Author	Checked	Reviewed	Approved	Date
-	Draft	MT	TSH	MT		June 2024

1 Introduction

1.1 Overview

1.1.1 Kent County Council (KCC) as the Lead Local Flood Authority (LLFA) have provided a consultation response, related to the Flood Risk Assessment and surface water drainage design included as part of an Outline planning application (24/00257) for the erection of up to 90 dwellings with associated parking and infrastructure following demolition of existing dwelling; with all matters reserved except access. KCC's consultation response has been provided in **3.1.1Appendix A** for completeness.

1.1.2 This Technical Note has been provided to address the comments raised in the consultation response. Each query/request for clarification within the consultation response has been outlined below with information provided beneath to enable KCC to finalise their response to the Local Planning Authority (LPA), thus ultimately allowing the holding objection to be removed for the Outline planning application at Great Cauldham Park, Capel le Ferne.

2 Consultation Response Points

2.1.1 The **first** item within KCC's consultation response states that:

"Whilst no areas are specifically mentioned within the body of the Flood Risk Assessment provided we note that various areas are quoted throughout the Ecologia report contained within appendix C - 4.03Ha on pg 54 of the FRA, 4.55Ha on pg 60, etc and that the application form details 4.55Ha. None of these areas reflect that used within the contained hydraulic calculations, given the nature of the superficial layer here (impermeable clay) we would expect for all pluvial water to have to be positively drained from site and so would request for information to be provided regarding the site areas used in the calculations and for a catchment plan denoted by receiving network to be provided."

2.1.2 With reference to the existing flood maps for the site, there is no surface water flooding on the site. There is a very small amount of low risk surface water flooding to the north of the site. It is accepted that this is likely caused, in part, by surface water falling onto our site and flowing, following the contours, and collecting in a low spot to the north.

2.1.3 However, the proposed surface water strategy has been designed to collect surface water runoff from the hard standing areas of the proposed development. This equates to an area of 1.937 Ha. The site area is 4.05 Ha therefore, the proposals will be collecting and discharging to ground 47.8% of the existing catchment. This will significantly reduce the surface water flood risk to the surrounding area.

2.1.4 It would not be appropriate to design the surface water drainage network to cater for 100% of the site area as it would result in a disproportionate drainage system that is vastly oversized and would very rarely, if ever, be utilised.

2.1.5 Full Network calculations have been provided in **3.1.1Appendix B**. The calculations show the catchments draining to each node. These catchments have been measured using the Site Layout. A catchment plan has been provided in **3.1.1Appendix C**, that can be read in conjunction with the calculations.

2.1.6 The **second** item within KCC's consultation response states that:

"Network 2 only details a swale and does not include for the infiltration trench situated there in (although understanding that this would actually be of benefit to the design)"

2.1.7 The proposed calculations have been updated with the swale and filter drain included in the hydraulic model. Refer to **Appendix B**.

2.1.8 The **third** item within KCC's consultation response states that:

"Drawing 18-027-007/B details the swales as being 1m deep yet swale 2 in the calculations would seem to be deeper than this (2m?)"

2.1.9 The swale is 1m deep with a 2m deep filter trench beneath. Refer to the updated calculations in **3.1.1Appendix B** and the Surface Water Drainage Strategy in **3.1.1Appendix D**.

2.1.10 The **fourth** item within KCC's consultation response states that:

"It has not been explained as to how the assumed infiltration rate used in the calculations has been derived. Indeed the rate of 0.3880m/hr (1.08x10-4m/s) would seem to be rather high without any supplementary information submitted to confirm this as reasonable. Without evidence to validate the assumed rate provided we would expect for the rate of infiltration for outline design purposes to be inline with those recommended within the Ciria SuDS manual of 3x10-8 to 3x10-5m/s for a chalk geology."

2.1.11 Soil logs and infiltration testing has been undertaken at the locations of the infiltrating structures, by IDOM Refer to **Appendix E**. IDOM undertook two trail pits, MTP01 and MTP02, the depths of each pit were 5.3m and 5.2m respectively. IDOM found that the chalk was encountered at 4.2m in trail pit MTP01 and 4.0m in trail pit MTP02.

2.1.12 IDOM undertook infiltration testing at these depths and established preliminary infiltration rates. It was noted that the infiltration rates started quickly and then slowed. C&A have calculated an average rate for each pit to base the design on. See **Table 2.1** below.

Table 2.1: Infiltration Rate Summary

Trial Pit	Initial Infiltration Rate (m/s)	Infiltration Rate (last 60minutes of test) (m/s)	Average Infiltration Rate (m/s)	Average Infiltration Rate (m/hr)
MTP01	1.8×10^{-5}	4.8×10^{-6}	1.14×10^{-5}	0.04104
MTP02	1.78×10^{-5}	2.22×10^{-6}	1.001×10^{-5}	0.03604

2.1.13 The design and calculations have been updated to suit these results. As chalk was encountered at 4.2m below the ground, the proposals have been updated to a 1.5m attenuation basin above a 2.7m deep infiltration tank. The base of the infiltration tank will be within the chalk. To provide a robust design C&A have used the slower average infiltration rate (0.03604 m/hr) within the design calculations (Appendix B).

2.1.14 The **fifth** item within KCC's consultation response states that:

"Concerns are also raised with regards to sufficient space being allowed for in order to access and maintain the swale and filter drain arrangement situated immediately adjacent to the boundary fence of the northern most properties on one side and what appears to be a hedge arrangement on the other."

2.1.15 The Site layout has been amended and now provides easy access to the entire length of the swale for maintenance purposes.

3 Conclusion

3.1.1 As has been demonstrated above and within the Appendices the information requested by KCC has been provided and should allow KCC to remove the holding objection on this outline planning application.

Appendix A KCC's Consultation Letter

Rachel Morgan
Dover District Council
White Cliffs Business Park
Dover
Kent
CT16 3PJ

Flood and Water Management
Invicta House
Maidstone
Kent
ME14 1XX
Website: www.kent.gov.uk/flooding
Email: suds@kent.gov.uk
Tel: 03000 41 41 41
Our Ref: DDC/2024/099699
Date: 3 April 2024

Application No: 24/00257

Location: Land South East Of Great Cauldham Farm, Cauldham Lane, Capel Le Ferne, CT18 7HQ

Proposal: Outline planning application for the erection of up to 90 dwellings with associated parking and infrastructure following demolition of existing dwelling; with all matters reserved except access.

Thank you for your consultation on the above referenced planning application.

Kent County Council as Lead Local Flood Authority have the following comments:

Having reviewed the information submitted we are generally accepting of the principle proposed for infiltration to be used to manage surface water however there are concerns with parts of the submission as detailed below.

Whilst no areas are specifically mentioned within the body of the Flood Risk Assessment provided we note that various areas are quoted throughout the Ecologia report contained within appendix C - 4.03Ha on pg 54 of the FRA, 4.55Ha on pg 60, etc and that the application form details 4.55Ha. None of these areas reflect that used within the contained hydraulic calculations, given the nature of the superficial layer here (impermeable clay) we would expect for all pluvial water to have to be positively drained from site and so would request for information to be provided regarding the site areas used in the calculations and for a catchment plan denoted by receiving network to be provided.

Further to this we have several concerns with the calculations submitted for the networks:

- Network 2 only details a swale and does not include for the infiltration trench situated there in (although understanding that this would actually be of benefit to the design),
- Drawing 18-027-007/B details the swales as being 1m deep yet swale 2 in the calculations would seem to be deeper than this (2m?),
- It has not been explained as to how the assumed infiltration rate used in the calculations has been derived. Indeed the rate of 0.3880m/hr (1.08x10-4m/s) would seem to be rather high without any supplementary information submitted to confirm this as reasonable. Without evidence to validate the assumed rate provided we would expect for the rate of infiltration for outline design purposes to be inline with

those recommended within the Ciria SuDS manual of 3x10-8 to 3x10-5m/s for a chalk geology.

Concerns are also raised with regards to sufficient space being allowed for in order to access and maintain the swale and filter drain arrangement situated immediately adjacent to the boundary fence of the northern most properties on one side and what appears to be a hedge arrangement on the other.

Until the above matters have been clarified we would recommend that a holding objection be put in place.

This response has been provided using the best knowledge and information submitted as part of the planning application at the time of responding and is reliant on the accuracy of that information.

Yours faithfully,

Neil Clarke
Sustainable Drainage Team Leader
Flood and Water Management

Appendix B Network Calculations

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Add Inflow (l/s)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Basin	0.000	5.00	0.0	156.000	1200	624746.872	138694.074	1.500
1	0.091	5.00		162.250	1200	624704.097	138619.998	1.425
2	0.096	5.00		159.000	1200	624720.165	138665.485	1.925
3	0.000			156.500	1200	624731.640	138698.520	1.575

Node Basin Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.03604	Safety Factor	2.0	Invert Level (m)	151.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	5981

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	60.0	60.0	2.700	60.0	60.0	2.701	30.0	60.0	4.200	220.0	60.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.61%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	Basin	1350	152.558	-1.942	1.9	43.2124	0.0000	OK
15 minute winter	1	10	160.868	0.043	11.9	0.1039	0.0000	OK
15 minute winter	2	10	157.140	0.065	24.2	0.1389	0.0000	OK
15 minute winter	3	11	155.011	0.086	23.9	0.0970	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
1440 minute winter	Basin	Infiltration		0.3			
15 minute winter	1	1.000	2	11.8	1.602	0.081	0.3580
15 minute winter	2	1.001	3	23.9	2.054	0.184	0.4084
15 minute winter	3	1.002	Basin	23.8	1.784	0.279	0.2119

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.61%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2880 minute winter	Basin	2880	154.878	0.378	3.3	173.6850	0.0000	OK
15 minute winter	1	10	160.909	0.084	43.5	0.2014	0.0000	OK
15 minute winter	2	10	157.211	0.135	89.2	0.2883	0.0000	OK
15 minute winter	3	11	155.283	0.358	88.3	0.4051	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
2880 minute winter	Basin	Infiltration		0.3			
15 minute winter	1	1.000	2	43.3	2.257	0.297	0.9260
15 minute winter	2	1.001	3	88.3	2.648	0.681	1.1319
15 minute winter	3	1.002	Basin	85.7	2.257	1.004	0.6311

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

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
4320 minute winter	Basin	4260	155.697	1.197	3.5	275.4707	0.0000	OK
15 minute winter	1	10	160.923	0.097	57.5	0.2347	0.0000	OK
15 minute winter	2	11	157.272	0.197	117.9	0.4199	0.0000	OK
4320 minute winter	3	4260	155.697	0.772	3.5	0.8729	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
4320 minute winter	Basin	Infiltration		0.3			
15 minute winter	1	1.000	2	57.2	2.334	0.392	1.2733
15 minute winter	2	1.001	3	113.6	2.874	0.877	1.3411
4320 minute winter	3	1.002	Basin	3.5	1.050	0.041	0.6311

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.052	5.00	158.100	1200	624805.276	138590.006	1.800
9	0.083	5.00	154.400	1350	624771.522	138724.590	2.040
10	0.060	5.00	153.750	1350	624774.335	138735.516	2.541
2	0.120	5.00	160.250	1350	624742.738	138615.591	4.382
3	0.116	5.00	158.050	1350	624756.307	138655.214	2.601
4	0.048	5.00	155.450	1350	624765.839	138700.449	1.850
5	0.138	5.00	162.500	1200	624664.330	138635.834	1.500
7	0.143	5.00	162.200	1200	624717.258	138603.816	3.875
8	0.019	5.00	161.100	1200	624734.578	138606.857	3.775
6	0.050	5.00	162.750	1200	624698.871	138613.142	3.500
basin	0.000		151.000		624787.612	138755.377	1.500
12	0.034	5.00	161.250	1200	624647.015	138653.079	1.750
17	0.062	5.00	156.850	1200	624615.585	138740.799	2.943
11	0.164	5.00	162.000	1200	624633.919	138648.812	1.500
13	0.038	5.00	162.050	1200	624598.863	138664.057	2.050
14	0.066	5.00	161.750	1200	624592.662	138672.683	1.950
15	0.090	5.00	160.850	1200	624594.157	138681.767	1.280
16	0.137	5.00	158.200	1350	624604.871	138711.283	2.200
Swale 1	0.000	5.00	154.000		624627.207	138774.876	2.000
18	0.020	5.00	154.550	1350	624623.636	138764.256	1.470
19	0.000	5.00	153.750		624764.683	138737.370	2.050
20	0.075	5.00	159.300	1200	624655.852	138672.859	1.550
21	0.085	5.00	157.350	1200	624665.633	138695.435	1.850
22	0.024	5.00	155.050	1200	624675.197	138725.030	1.850
23	0.052	5.00	154.000	1200	624660.847	138754.376	1.500
24	0.034	5.00	154.000	1350	624683.249	138748.486	1.900
25	0.040	5.00	154.250	1200	624727.314	138736.557	1.350
J1	0.000	5.00	154.000		624687.024	138759.707	2.150

Node 19 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1.009	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0057-2000-2000-2000
Invert Level (m)	151.700	Min Outlet Diameter (m)	0.075
Design Depth (m)	2.000	Min Node Diameter (mm)	1200
Design Flow (l/s)	2.0		

Node basin Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.03604	Safety Factor	2.0	Invert Level (m)	146.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	6229

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	390.0	390.0	2.700	390.0	390.0	2.701	390.0	390.0	4.200	840.0	390.0

Node Swale 1 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	4.006
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	152.700	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)		Diameter (mm)	2000

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.16%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	11	156.360	0.060	6.8	0.1018	0.0000	OK
15 minute winter	9	11	152.485	0.124	96.8	0.2794	0.0000	OK
15 minute winter	10	11	151.392	0.183	105.6	0.3487	0.0000	OK
15 minute winter	2	10	156.013	0.145	65.5	0.2862	0.0000	OK
15 minute winter	3	11	155.558	0.109	79.7	0.2529	0.0000	OK
15 minute winter	4	11	153.706	0.106	86.3	0.2064	0.0000	OK
15 minute winter	5	10	161.062	0.062	18.0	0.1832	0.0000	OK
15 minute winter	7	10	158.422	0.097	42.5	0.1810	0.0000	OK
15 minute winter	8	10	157.411	0.086	44.7	0.1062	0.0000	OK
15 minute winter	6	10	159.321	0.071	24.3	0.1004	0.0000	OK
10080 minute winter	basin	7320	147.590	-1.910	3.9	292.6646	0.0000	OK
15 minute winter	12	10	159.527	0.027	4.4	0.0403	0.0000	OK
15 minute winter	17	10	154.022	0.115	70.6	0.1790	0.0000	OK
15 minute winter	11	10	160.583	0.083	21.4	0.2762	0.0000	OK
15 minute winter	13	10	160.089	0.089	26.0	0.1336	0.0000	OK
15 minute winter	14	10	159.901	0.101	34.2	0.1832	0.0000	OK
15 minute winter	15	11	159.642	0.072	45.6	0.1836	0.0000	OK
15 minute winter	16	10	156.087	0.087	63.0	0.2330	0.0000	OK
1440 minute winter	Swale 1	1380	152.458	0.458	5.9	0.0000	0.0000	OK
15 minute winter	18	11	153.199	0.119	73.0	0.2028	0.0000	OK
1440 minute winter	19	1380	152.458	0.758	4.8	0.0000	0.0000	SURCHARGED
15 minute winter	20	10	157.795	0.045	14.2	0.0948	0.0000	OK
15 minute winter	21	10	155.566	0.066	25.1	0.1345	0.0000	OK
15 minute winter	22	10	153.269	0.069	27.8	0.0960	0.0000	OK
15 minute winter	23	10	152.544	0.043	6.8	0.0793	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	1	2.000	2	6.1	0.629	0.086	0.6586
15 minute winter	9	1.007	10	97.0	2.966	0.134	0.3693
15 minute winter	10	1.010	basin	105.5	1.752	0.341	1.2040
15 minute winter	2	1.004	3	65.5	1.792	0.202	1.5364
15 minute winter	3	1.005	4	80.4	2.778	0.124	1.3376
15 minute winter	4	1.006	9	86.6	2.711	0.119	0.7939
15 minute winter	5	1.000	6	17.8	1.824	0.165	0.4031
15 minute winter	7	1.002	8	42.2	2.785	0.338	0.2665
15 minute winter	8	1.003	2	44.4	3.357	0.268	0.1580
15 minute winter	6	1.001	7	24.0	1.779	0.216	0.2785
10080 minute winter	basin	Infiltration		2.0			
15 minute winter	12	3.000	20	4.4	1.077	0.029	0.0897
15 minute winter	17	4.005	18	70.5	2.401	0.192	0.7284
15 minute winter	11	4.000	13	21.0	1.262	0.165	0.6380
15 minute winter	13	4.001	14	25.6	1.345	0.168	0.2038
15 minute winter	14	4.002	15	34.0	2.018	0.193	0.1563
15 minute winter	15	4.003	16	45.3	3.543	0.122	0.4018
15 minute winter	16	4.004	17	62.5	2.614	0.121	0.7546
1440 minute winter	Swale 1	1.007_1	J1	5.8	0.078	0.002	70.1630
15 minute winter	18	4.006	Swale 1	73.4	2.549	0.198	0.3226
1440 minute winter	19	Hydro-Brake®	10	1.3			
15 minute winter	20	3.001	21	14.0	1.855	0.089	0.1878
15 minute winter	21	3.002	22	24.7	2.627	0.177	0.2930
15 minute winter	22	3.003	24	27.7	1.696	0.118	0.4119
15 minute winter	23	5.000	24	6.7	0.519	0.046	0.3154

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.16%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	24	1350	152.459	0.359	8.1	0.6416	0.0000	OK
15 minute winter	25	10	152.941	0.041	5.2	0.0709	0.0000	OK
1440 minute winter	J1	1380	152.458	0.608	18.4	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)
1440 minute winter	24	5.002	J1	12.5	0.548	0.030	1.7398
15 minute winter	25	5.001	24	5.1	0.475	0.073	0.5108
1440 minute winter	J1	1.008	19	4.8	0.063	0.002	142.1854

Results for 30 year +45% CC Critical Storm Duration. Lowest mass balance: 99.16%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	156.421	0.121	25.8	0.2067	0.0000	OK
15 minute winter	9	11	152.647	0.287	342.0	0.6451	0.0000	OK
15 minute winter	10	11	152.277	1.068	367.4	2.0338	0.0000	SURCHARGED
15 minute winter	2	10	156.169	0.301	226.4	0.5954	0.0000	OK
15 minute winter	3	10	155.666	0.217	283.0	0.5045	0.0000	OK
15 minute winter	4	10	153.814	0.214	303.3	0.4173	0.0000	OK
15 minute winter	5	10	161.129	0.129	68.4	0.3833	0.0000	OK
15 minute winter	7	12	159.375	1.050	146.1	1.9615	0.0000	SURCHARGED
15 minute winter	8	12	157.745	0.420	148.6	0.5174	0.0000	SURCHARGED
15 minute winter	6	12	159.996	0.746	92.7	1.0569	0.0000	SURCHARGED
10080 minute winter	basin	9960	149.885	0.385	7.4	1164.0310	0.0000	OK
15 minute winter	12	10	159.551	0.051	16.9	0.0774	0.0000	OK
15 minute winter	17	10	154.176	0.269	270.8	0.4173	0.0000	OK
15 minute winter	11	10	160.680	0.180	81.3	0.5969	0.0000	OK
15 minute winter	13	10	160.217	0.217	99.2	0.3261	0.0000	OK
15 minute winter	14	10	160.039	0.239	130.4	0.4324	0.0000	OK
15 minute winter	15	10	159.723	0.153	174.2	0.3885	0.0000	OK
15 minute winter	16	10	156.178	0.178	240.8	0.4763	0.0000	OK
4320 minute winter	Swale 1	4140	153.182	1.182	7.7	1.7346	0.0000	SURCHARGED
15 minute winter	18	11	153.353	0.273	277.8	0.4657	0.0000	OK
4320 minute winter	19	4140	153.182	1.482	4.8	0.0000	0.0000	SURCHARGED
15 minute winter	20	10	157.840	0.090	54.0	0.1887	0.0000	OK
15 minute winter	21	10	155.644	0.144	95.8	0.2957	0.0000	OK
15 minute winter	22	10	153.340	0.140	106.6	0.1948	0.0000	OK
4320 minute winter	23	4140	153.182	0.682	0.7	1.2435	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	1	2.000	2	25.0	0.823	0.350	2.0964
15 minute winter	9	1.007	10	338.5	3.862	0.467	1.4965
15 minute winter	10	1.010	basin	360.4	2.276	1.164	3.0932
15 minute winter	2	1.004	3	225.6	2.417	0.698	3.9437
15 minute winter	3	1.005	4	279.5	3.749	0.431	3.4673
15 minute winter	4	1.006	9	303.2	3.430	0.418	2.2394
15 minute winter	5	1.000	6	67.9	2.401	0.632	1.3081
15 minute winter	7	1.002	8	139.7	3.513	1.121	0.6994
15 minute winter	8	1.003	2	147.5	4.181	0.891	0.4230
15 minute winter	6	1.001	7	80.3	2.097	0.726	0.8200
10080 minute winter	basin	Infiltration		2.0			
15 minute winter	12	3.000	20	16.8	1.586	0.113	0.2330
15 minute winter	17	4.005	18	268.1	3.157	0.731	2.1123
15 minute winter	11	4.000	13	80.3	1.624	0.631	1.8868
15 minute winter	13	4.001	14	97.7	1.712	0.640	0.6100
15 minute winter	14	4.002	15	129.6	2.669	0.735	0.4436
15 minute winter	15	4.003	16	172.9	5.012	0.465	1.0848
15 minute winter	16	4.004	17	240.0	3.510	0.463	2.1361
4320 minute winter	Swale 1	1.007_1	J1	5.7	0.076	0.002	332.2613
15 minute winter	18	4.006	Swale 1	278.8	3.475	0.754	0.8975
4320 minute winter	19	Hydro-Brake®	10	1.7			
15 minute winter	20	3.001	21	53.7	2.572	0.339	0.5127
15 minute winter	21	3.002	22	94.7	3.663	0.677	0.8038
15 minute winter	22	3.003	24	106.2	2.242	0.452	1.1665
4320 minute winter	23	5.000	24	0.7	0.197	0.005	1.6311

Results for 30 year +45% CC Critical Storm Duration. Lowest mass balance: 99.16%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
4320 minute winter	24	4140	153.182	1.082	5.0	1.9352	0.0000	SURCHARGED
4320 minute winter	25	4140	153.182	0.282	0.5	0.4858	0.0000	SURCHARGED
4320 minute winter	J1	4140	153.182	1.332	10.0	0.0000	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
4320 minute winter	24	5.002	J1	5.7	0.548	0.014	1.8758
4320 minute winter	25	5.001	24	0.5	0.194	0.007	1.8156
4320 minute winter	J1	1.008	19	4.8	0.066	0.002	538.0098

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.16%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	156.438	0.138	32.9	0.2363	0.0000	OK
15 minute winter	9	12	153.558	1.198	403.0	2.6889	0.0000	SURCHARGED
15 minute winter	10	12	153.235	2.026	420.6	3.8579	0.0000	SURCHARGED
15 minute winter	2	11	156.214	0.346	273.9	0.6838	0.0000	OK
15 minute winter	3	10	155.689	0.240	342.1	0.5579	0.0000	OK
15 minute winter	4	12	153.946	0.345	374.2	0.6736	0.0000	OK
15 minute winter	5	12	161.966	0.966	87.4	2.8693	0.0000	SURCHARGED
15 minute winter	7	12	160.418	2.093	173.6	3.9122	0.0000	SURCHARGED
15 minute winter	8	12	158.172	0.847	173.2	1.0431	0.0000	SURCHARGED
15 minute winter	6	12	161.204	1.954	106.6	2.7691	0.0000	SURCHARGED
10080 minute winter	basin	10020	150.685	1.185	9.5	1639.2690	0.0000	OK
15 minute winter	12	10	159.558	0.057	21.5	0.0874	0.0000	OK
15 minute winter	17	11	154.265	0.358	338.3	0.5555	0.0000	OK
15 minute winter	11	10	160.715	0.215	103.9	0.7140	0.0000	OK
15 minute winter	13	11	160.372	0.372	129.7	0.5589	0.0000	SURCHARGED
15 minute winter	14	11	160.157	0.357	162.8	0.6455	0.0000	SURCHARGED
15 minute winter	15	11	159.748	0.177	217.0	0.4502	0.0000	OK
15 minute winter	16	10	156.202	0.202	299.4	0.5416	0.0000	OK
4320 minute winter	Swale 1	4200	153.505	1.505	24.8	3.7606	0.0000	SURCHARGED
4320 minute winter	18	4200	153.505	0.425	12.1	0.7233	0.0000	SURCHARGED
4320 minute winter	19	4200	153.505	1.805	6.3	0.0000	0.0000	FLOOD RISK
15 minute winter	20	10	157.853	0.103	68.9	0.2161	0.0000	OK
15 minute winter	21	10	155.675	0.175	122.3	0.3594	0.0000	OK
4320 minute winter	22	4200	153.505	0.305	4.0	0.4236	0.0000	SURCHARGED
4320 minute winter	23	4200	153.505	1.005	1.0	1.8326	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	1	2.000	2	31.8	0.843	0.445	2.7098
15 minute winter	9	1.007	10	390.9	3.744	0.539	1.7876
15 minute winter	10	1.010	basin	418.1	2.639	1.350	3.1287
15 minute winter	2	1.004	3	273.0	2.575	0.844	4.5096
15 minute winter	3	1.005	4	345.6	3.871	0.533	4.8216
15 minute winter	4	1.006	9	353.6	3.443	0.487	3.5843
15 minute winter	5	1.000	6	76.8	2.365	0.714	1.6437
15 minute winter	7	1.002	8	163.3	4.106	1.310	0.6994
15 minute winter	8	1.003	2	173.2	4.356	1.047	0.4753
15 minute winter	6	1.001	7	93.8	2.360	0.848	0.8200
10080 minute winter	basin	Infiltration		2.0			
15 minute winter	12	3.000	20	21.4	1.688	0.144	0.2781
15 minute winter	17	4.005	18	339.0	3.207	0.925	2.6634
15 minute winter	11	4.000	13	105.6	1.642	0.830	2.3798
15 minute winter	13	4.001	14	123.5	1.754	0.809	0.7481
15 minute winter	14	4.002	15	163.4	2.665	0.927	0.5238
15 minute winter	15	4.003	16	217.7	5.273	0.586	1.2965
15 minute winter	16	4.004	17	300.0	3.542	0.578	2.6497
4320 minute winter	Swale 1	1.007_1	J1	13.5	0.084	0.004	511.8413
4320 minute winter	18	4.006	Swale 1	21.0	1.388	0.057	1.2358
4320 minute winter	19	Hydro-Brake®	10	1.9			
15 minute winter	20	3.001	21	68.5	2.660	0.433	0.6261
15 minute winter	21	3.002	22	120.6	3.807	0.862	0.9851
4320 minute winter	22	3.003	24	4.0	0.560	0.017	1.7464
4320 minute winter	23	5.000	24	1.0	0.198	0.007	1.6311

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.16%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
4320 minute winter	24	4200	153.505	1.405	6.2	2.5131	0.0000	SURCHARGED
4320 minute winter	25	4200	153.505	0.605	0.7	1.0426	0.0000	SURCHARGED
4320 minute winter	J1	4200	153.505	1.655	18.5	0.0000	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
4320 minute winter	24	5.002	J1	7.3	0.548	0.017	1.8758
4320 minute winter	25	5.001	24	0.7	0.196	0.010	1.8156
4320 minute winter	J1	1.008	19	6.3	0.066	0.002	796.6645

Appendix C Surface Water Catchment Plan

N

Little
Cauldham
Farmhouse

Pump
Station

CABERFEET

151.3m

167.0m

Episode

NOTES

1. Do not scale from this drawing.
2. All measurements are in metres unless stated otherwise.
3. Topographical Survey provided by others. C&A accept no liablity for any inaccuracies.
4. C&A Consulting Engineers Ltd cannot gurantee the authenticity or reliability of any data and/or records provided by third parties.

Catchment 1
Overall Area - 0.187ha
Roads and Roofs

Catchment 2
Overall Area - 1.750ha
Roads and Roofs

Rev	Amendments	Drn	Chk	App	Date

Charles & Associates

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Job Title
Capel Le Ferne

Drawing Title
Surface Water Catchment Plan

Client
Quinn Estates

Scale	Date	Designed
1:500 @A1	Apr 24	MT
Drawn	**Checked**	**Approved**
MT	TSH	GAC
Job No	**Drawing No**	**Rev**
18-027	18-027-010	-