

MLM

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North Kiln Felaw Maltings

46 Felaw Street

Ipswich IP2 8PN

Date 30/03/2017

File 668050-CALC-SBU-C-Network_Plot_1.mdx

668050 - Kiln Court

Unit 1 - Drainage Design

Proposed Development Only

Designed by Darragh O'Connell

Checked by CB/BF

XP Solutions

Network 2016.1

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)

Site Location GB 528450 185200 TQ 28450 85200

C (1km)

D1 (1km)

D2 (1km)

D3 (1km)

E (1km)

F (1km)

Maximum Rainfall (mm/hr)

Maximum Time of Concentration (mins)

30

-0.026

0.331

0.331

0.240

0.334

2.478

50

30

Foul Sewage (l/s/ha)

Volumetric Runoff Coeff.

Add Flow / Climate Change (%)

Minimum Backdrop Height (m)

Maximum Backdrop Height (m)

Min Design Depth for Optimisation (m)

Min Vel for Auto Design only (m/s)

Min Slope for Optimisation (1:X)

0.000

0.750

0

0.000

1.500

1.200

1.00

500

Designed with Level Soffits

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN

Length

Fall

Slope

I.Area

T.E.

Base

k

HYD

DIA

Section Type

Auto

(m)

(m)

(1:X)

(ha)

(mins)

Flow (l/s)

(mm)

SECT

(mm)

Design

1.000

16.172

0.270

60.0

0.012

5.00

0.0

0.600

o

150

Pipe/Conduit



1.001

5.526

0.092

60.0

0.007

0.00

0.0

0.600

o

150

Pipe/Conduit



2.000

11.106

0.111

100.1

0.019

5.00

0.0

0.600

o

150

Pipe/Conduit



1.002

7.662

0.077

99.5

0.000

0.00

0.0

0.600

o

225

Pipe/Conduit



1.003

3.319

0.033

100.0

0.026

0.00

0.0

0.600

o

225

Pipe/Conduit



1.004

10.000

0.020

500.0

0.000

0.00

0.0

0.600

o

150

Pipe/Conduit



1.005

1.950

0.020

97.5

0.000

0.00

0.0

0.600

o

150

Pipe/Conduit



1.006

3.681

0.061

60.3

0.000

0.00

0.0

0.600

o

150

Pipe/Conduit



Network Results Table

PN

Rain

T.C.

US/IL

Σ I.Area

Σ Base

Foul

Add Flow

Vel

Cap

Flow

(mm/hr)

(mins)

(m)

(ha)

Flow (l/s)

(l/s)

(l/s)

(m/s)

(l/s)

(l/s)

1.000

50.00

5.21

41.000

0.012

0.0

0.0

0.0

1.30

23.0

1.6

1.001

50.00

5.28

40.730

0.019

0.0

0.0

0.0

1.30

23.0

2.6

2.000

50.00

5.18

39.365

0.019

0.0

0.0

0.0

1.00

17.8

2.6

1.002

50.00

5.38

39.179

0.038

0.0

0.0

0.0

1.31

52.1

5.1

1.003

50.00

5.42

39.102

0.064

0.0

0.0

0.0

1.31

52.0

8.7

1.004

50.00

5.79

38.144

0.064

0.0

0.0

0.0

0.44

7.8«

8.7

1.005

50.00

5.83

38.124

0.064

0.0

0.0

0.0

1.02

18.0

8.7

1.006

50.00

5.87

38.104

0.064

0.0

0.0

0.0

1.30

22.9

8.7

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	150	S1.0	41.860	41.000	0.710	Open Manhole	600
1.001	o	150	S1.1	41.080	40.730	0.200	Open Manhole	600
2.000	o	150	S2.0	40.065	39.365	0.550	Open Manhole	600
1.002	o	225	S.1.2	40.800	39.179	1.396	Open Manhole	1200
1.003	o	225	S1.3	41.200	39.102	1.873	Open Manhole	1200
1.004	o	150	CELLULAT STORAGE	41.200	38.144	2.906	Sealed Manhole	1200
1.005	o	150	Outlet	41.200	38.124	2.926	Open Manhole	1200
1.006	o	150	S1.4	41.000	38.104	2.746	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	16.172	60.0	S1.1	41.080	40.730	0.200	Open Manhole	600
1.001	5.526	60.0	S.1.2	40.800	40.638	0.012	Open Manhole	1200
2.000	11.106	100.1	S.1.2	40.800	39.254	1.396	Open Manhole	1200
1.002	7.662	99.5	S1.3	41.200	39.102	1.873	Open Manhole	1200
1.003	3.319	100.0	CELLULAT STORAGE	41.200	39.069	1.906	Sealed Manhole	1200
1.004	10.000	500.0	Outlet	41.200	38.124	2.926	Open Manhole	1200
1.005	1.950	97.5	S1.4	41.000	38.104	2.746	Open Manhole	1200
1.006	3.681	60.3		41.940	38.043	3.747	Open Manhole	0

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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	0.012	0.012	0.012
1.001	-	-	100	0.007	0.007	0.007
2.000	-	-	100	0.019	0.019	0.019
1.002	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.026	0.026	0.026
1.004	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.064	0.064	0.064

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)
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1.006		41.940	38.043	0.000	0	0
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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000	Run Time (mins)	60
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	2.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	E (1km)	0.334
Return Period (years)	30	F (1km)	2.478
Site Location	GB 528450 185200 TQ 28450 85200	Summer Storms	Yes
C (1km)	-0.026	Winter Storms	No
D1 (1km)	0.331	Cv (Summer)	0.750
D2 (1km)	0.331	Cv (Winter)	0.840
D3 (1km)	0.240	Storm Duration (mins)	30

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Online Controls for Storm

Hydro-Brake Optimum® Manhole: S1.4, DS/PN: 1.006, Volume (m³): 3.3

Unit Reference	MD-CHE-0098-5000-1200-5000	Sump Available	No
Design Head (m)	1.200	Diameter (mm)	98
Design Flow (l/s)	5.0	Invert Level (m)	38.104
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	Error (Contact Hydro International)
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points			Control Points		
Design Point	Head (m)	Flow (l/s)	Kick-Flo®	Head (m)	Flow (l/s)
(Calculated)	1.200	5.0		0.353	2.8
Flush-Flo™	0.241	4.9	Mean Flow over Head Range	-	3.7

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)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.6	0.600	3.6	1.600	5.8	2.600	7.3	5.000	10.1	7.500	12.3
0.200	4.5	0.800	4.1	1.800	6.1	3.000	7.8	5.500	10.5	8.000	12.7
0.300	3.2	1.000	4.6	2.000	6.4	3.500	8.5	6.000	11.0	8.500	13.1
0.400	2.9	1.200	5.0	2.200	6.7	4.000	9.0	6.500	11.4	9.000	13.4
0.500	3.3	1.400	5.4	2.400	7.0	4.500	9.6	7.000	11.9	9.500	13.8

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Storage Structures for Storm

Cellular Storage Manhole: CELLULAT STORAGE, DS/PN: 1.004

Invert Level (m) 38.144 Infiltration Coefficient Side (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Base (m/hr) 0.00000 Safety Factor 2.0

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	32.0	32.0	1.200	32.0	60.8	1.300	0.0	60.8

