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PEAK FLOW DRAINAGE CALCULATIONS & SPECIFICATION

PROPOSED NEW DWELLINGS

BLACK HORSE

PIMLICO ROAD

CLITHEROE

FOR

MR D GILES

22ND NOVEMBER 2022

Introduction

These calculations have been prepared to address condition no. 7 of planning approval 3/2022/0148 dated 30th August 2022. The proposed development is for the conversion of the original public house and construction of new cottages, to create 6 no self contained dwelling units.

Drainage calculations have been prepared for the existing rainwater run off from the car park and patio areas, and the foul water installations for the original pub.

Detailed calculations have been prepared for the proposed rainwater run off and the foul water installations.

The final results for each calculation have been compared to assess the impact of the proposals on the existing mains sewer.

Calculations based on Colebrook-White equation, BS EN 752-4 and BS EN12056-2

To be read in conjunction with drawing number 1394 - 01.

General Specification

IC1 – IC4 to be 475mm dia. Wavin PPIC with ductile iron cover.

100mm dia. clay drains from existing inspection chamber to IC1, and to ACO channel outlet to be minimum 1.2m depth below highway in accordance with L.C.C. Highways Specifications.

100mm dia. upvc foul water drain between IC1 – IC4 designed to run 75% full. Hepworth Drainage Hydraulic Design Guide Table 5 – min gradient = 1 in 208.

Osma Drainage Gutter Design Guide – 113mm DeepLine gutter system fitted at 1 in 600 fall with running outlet at one end capacity for 145m² roof area > 132.5m² actual.

Rainwater pipe to be 63mm dia. – capacity = 3.1l/s > 2.26l/s actual.

100mm dia. upvc surface water drain connected to IC4. Include for 300mm dia. Wavin mini access chambers with ductile covers AC1 & AC2.

Surface water drainage channel to be 100mm width ACO Multidrain MD composite channel with ductile slotted grid. Outlet to discharge into Wavin mini access chamber AC3 with ductile cover.

1. EXISTING FOUL DRAINAGE

Discharge Units for domestic sanitary installation in pub flat:
Frequency Factor $k = 0.5$

Wash basin	0.3×1	$= 0.3$
Shower	0.4×1	$= 0.4$
Bath	1.3×1	$= 1.3$
W.C.	1.7×1	$= 1.7$
Kitchen sink	1.3×1	$= 1.3$
Wash mach.	0.6×1	$= 0.6$
		$= 5.6$

Discharge units = 5.6 (DU)

$$Q = 0.5\sqrt{\Sigma DU}$$

$$Q = 0.5\sqrt{5.6} = 1.18 \text{ l/s}$$

Discharge Units for commercial area:
Frequency Factor $k = 0.7$

Wash basins	$0.3 \times 5 = 1.5$
Urinals	$0.2 \times 1 = 0.2$
W.C.	$1.7 \times 3 = 5.1$
Kitchen sink	$1.3 \times 1 = 1.3$
Bar sink	$1.3 \times 1 = 1.3$
Dishwasher	$0.2 \times 1 = 0.2$
Glasswasher	$0.2 \times 1 = 0.2$
	$= 9.8$

Discharge units = 9.8 (DU)

$$Q = 0.7\sqrt{\Sigma DU}$$

$$Q = 0.7\sqrt{9.8} = 2.19 \text{ l/s}$$

Total foul water discharge = $1.18 + 2.19 = 3.37 \text{ l/s}$

2. EXISTING SURFACE WATER DRAINAGE

Calculations based on a rainfall intensity of $60 \text{ mm/hr} = 0.017 \text{ l/s}$ per square metre.

a. Roof run off

$$\text{Roof area} = (11.90 \times 10) + (3.47 \times 3.70) + (8.00 \times 3.50) = 171.74 \text{ m}^2$$

$$\text{flow rate} = 171.74 \times 0.017 = 2.92 \text{ l/s}$$

b. Carpark / patio run off

$$\text{car park / patio area} = 179.34 + 181.00$$

$$\text{flow rate} = 360.34 \times 0.017 = 6.13 \text{ l/s}$$

Total surface water run off = $2.92 + 6.13 = 9.05 \text{ l/s}$

3. PROPOSED FOUL DRAINAGE

Discharge Units for domestic sanitary installation to 6no dwellings:
Frequency Factor $k = 0.5$

Wash basin	0.3×11	$= 3.3$
Shower	0.4×6	$= 2.4$
Bath	1.3×5	$= 6.5$
W.C.	1.7×10	$= 17.0$
Kitchen sink	1.3×6	$= 7.8$
Wash mach.	0.6×6	$= 3.6$
Dishwasher	0.2×6	$= 1.2$
		$= 41.8$

Discharge units = 41.8 (DU)

$$Q = 0.5\sqrt{\Sigma DU}$$

$$Q = 0.5\sqrt{41.8} = 3.23 \text{ l/s}$$

Total foul water discharge = **3.23 l/s**

4. PROPOSED SURFACE WATER DRAINAGE

Calculations based on a rainfall intensity of 60mm/hr = 0.017l/s per square metre.

a. Roof run off

$$\text{Roof area} = 2(26.47 \times 5.00) = 264.70 \text{ m}^2$$

$$\text{flow rate} = 264.70 \times 0.017 = 4.51 \text{ l/s}$$

b. Carpark / patio run off

$$\text{car park / patio area} = 255.48$$

$$\text{flow rate} = 255.48 \times 0.017 = 4.34 \text{ l/s}$$

Total surface water run off = 4.50 + 4.34 = **8.85 l/s**

ACO HYDRAULIC DESIGN



+ SUMMARY REPORT - Page 1

Project Name: BLACK HORSE, PIMLICO ROAD, CLITHEROE

Designer: PAUL DERBYSHIRE

Project Date: 17th November 2022

Location: 26 Pimlico Rd, Clitheroe BB7 4PZ, UK

Print Date: 17th November 2022

+ INPUTS

M5-60: 19.7mm/hr

Ratio R: 0.2

RUN / OPTION	LENGTH (m)	AREA (m2)	SLOPE (%)	IMPERMEABILITY FACTOR	RETURN PERIOD (years)	CLIMATE CHANGE (%)	STORM DURATION (mins)	RAINFALL INTENSITY (mm/hr)	INFLOW CONTROL (l/s/m)	Point Inflow Interlinked from	Cumulative Point Inflows (l/s)	Discharge control (l/s)
1A	30.00	459.00	0.00	0.9	30	0	60	31.01	Free	None	0.00	None

+ OUTPUTS

M5-60: 19.7mm/hr

Ratio R: 0.2

RUN / OPTION	ACO PRODUCT	Part Number	METERAGE (m)	OUTFLOW (l/s)	CAPACITY (%)	MAX* VELOCITY (m/s)	MIN FREEBOARD (m)	EXCAVATION VOLUME (m3)	CONCRETE VOLUME (m3)
1A	MultiDrain MD M100D 10.0	23100	30.00	3.56	78.10	0.66	0.03	6.48	5.67

*ACO would typically suggest flow velocities of 0.7m/s or greater in channels to be considered self-cleansing velocities. Flow velocities in the upper reaches of linear drainage systems are not likely to achieve self-cleansing velocities.

+ SUMMARY OF PARTS

ACO PRODUCT	Cumulative Product Meterage (m)	Part Number	CUMULATIVE OUTFLOW (l/s)	EXCAVATION VOLUME (m3)	CONCRETE VOLUME (m3)
MultiDrain MD M100D 10.0	30.00	23100	3.56	6.48	5.67

ACO HYDRAULIC DESIGN



+ SUMMARY REPORT - Page 2

Project Name: BLACK HORSE, PIMLICO ROAD, CLITHEROE

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+ CUMULATIVE ATTENUATION REQUIREMENTS

Max permitted outflow (l/s): 3.56

+ CONTRIBUTING AREAS

RUN	CATCHMENT AREA (m2)
1A	459.00
Effective Catchment Area	459.00
Additional Contributing Area	0.00
TOTAL AREA	459.00

+ RAINFALL DATA

Duration	Intensity (mm/h)	Required Storage Volume (m3)
5 mins	39.57	0.45
10 mins	30.61	0.20
15 mins	24.99	0.00
30 mins	17.37	0.00
1 hour	12.21	0.00
2 hours	8.55	0.00
4 hours	5.49	0.00
6 hours	4.21	0.00
10 hours	3.06	0.00
24 hours	1.75	0.00
48 hours	1.14	0.00

+ NET STORAGE VOLUME REQUIRED

0.45 m3

+ GROSS ATTENUATION STORAGE REQUIREMENT

0.46 m3

+ EXAMPLE STORMBRIXX CONFIGURATIONS (StormBrixx SD)

DEPTH (NUMBER OF UNITS)	LENGTH (NUMBER OF UNITS)	WIDTH (NUMBER OF UNITS)	STORAGE VOLUME M3 (GROSS/NET)
½ (= 0.478m)	1 (= 1.20m)	2 (= 1.20m)	0.69 (0.67)
1 (= 0.914m)	1 (= 1.20m)	1 (= 0.60m)	0.66 (0.64)
1½ (= 1.392m)	0½ (= 0.60m)	1 (= 0.60m)	0.50 (0.49)
2 (= 1.828m)	0½ (= 0.60m)	1 (= 0.60m)	0.66 (0.64)

Please note that any changes to your design criteria are likely to affect the attenuation requirement.

Please contact ACO Design Services with the details of your tank selection, with salient details such as proposed Cover Level, Invert Level, Ground Water Level and soil conditions. We will quickly prepare a Structural Analysis to fully assess your requirements.

+ DISCLAIMER

This simplified estimate of storage determines the largest volume required using the rainfall intensities for a range of different rainfall durations, for the location and return period specified by the designer. The type of flow control device is not known, so the calculation assumes a constant rate of outfall from the storage volume for the whole duration of the storm. Please contact ACO Design Services for further advice and details of the ACO Q-Brake Vortex Flow Control and the ACO StormBrixx Cellular Storage tank.

ACO HYDRAULIC DESIGN



+ DETAILED RUN REPORT - Page 1

Project Name: BLACK HORSE, PIMLICO ROAD, CLITHEROE

Designer: PAUL DERBYSHIRE

Project Date: 17th November 2022

Location: 26 Pimlico Rd, Clitheroe BB7 4PZ, UK

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Project Notes:

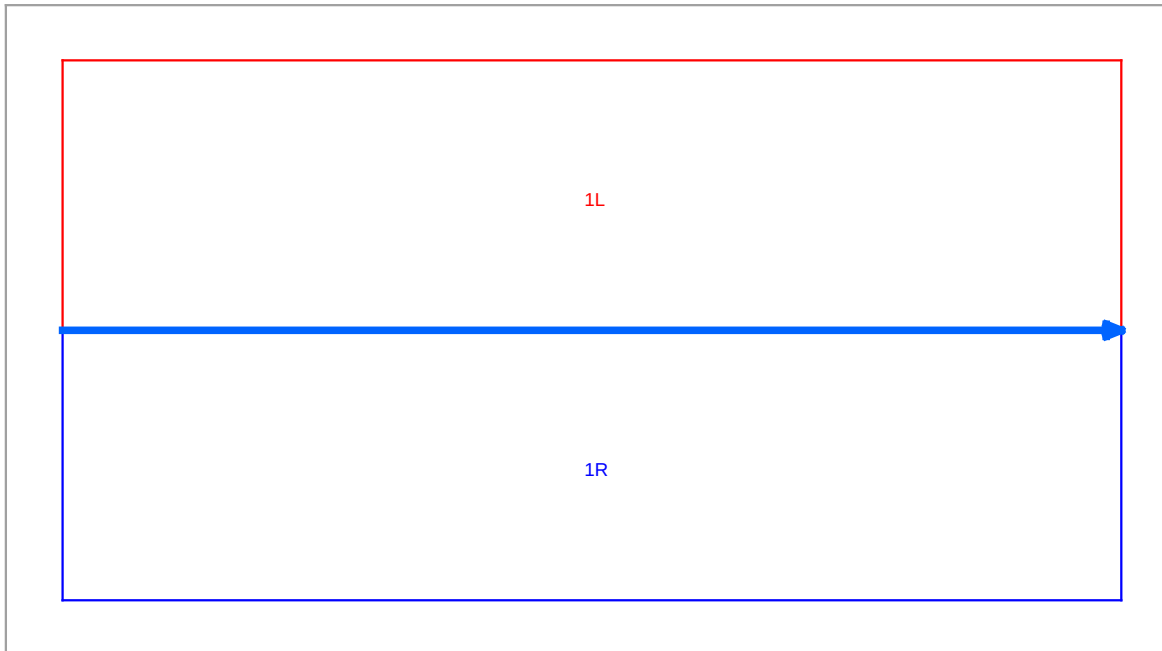
+ INPUT DATA:- Run 1: 'CAR PARK', Option A 'New Option'

M5-60: 19.7mm/hr

Ratio R: 0.2

LENGTH (m)	AREA (m2)	SLOPE (%)	IMPERMEABILITY FACTOR	RETURN PERIOD (years)	CLIMATE CHANGE (%)	STORM DURATION (mins)	RAINFALL INTENSITY (mm/hr)	INFLOW CONTROL (l/s/m)	Point Inflow Interlinked from	Cumulative Point Inflows l/s
30.00	459.00	0.00	0.90	30	0.00	1 hour	31.01	None	None	0.00

+ CHANNEL LAYOUT



+ RAINFALL DATA

Duration	Intensity (mm/h)
5 mins	92.42
10 mins	71.50
15 mins	62.43
30 mins	43.39
1 hour	31.01
2 hours	20.72
4 hours	12.71
6 hours	9.50
10 hours	6.72
24 hours	3.51
48 hours	2.11



ACO HYDRAULIC DESIGN



+ DETAILED RUN REPORT - Page 2

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Print Date: 17th November 2022

+ OUTPUTS:- Run 1: 'CAR PARK', Option A 'New Option'

OUTFLOW (l/s)	CAPACITY (%)	MAX* VELOCITY (m/s)	MIN FREEBOARD (m)	EXCAVATION VOLUME (m3)	CONCRETE VOLUME (m3)
3.56	78.10	0.66	0.03	6.48	5.67

MultiDrain MD

1	
System	M100D 10.0
W - Width (mm)	100
H - Invert (mm)	180
Length (m)	30.00

