

**Drainage Strategy
for
Car Park
at
Styal Road
Manchester
For
Stanthorne**

Date: September 2022

Job Number 20-248



GRAVITATE CONSULTING ENGINEERS LLP

The Heath Business & Technical Park
Runcorn, Cheshire, WA7 4QX

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1. Introduction

- 1.1. This report details how the design of the drainage will meet the requirements of the Flood Risk Assessment and Surface Water management Report.
- 1.2. A topographical survey has been carried out and has noted the existing site at the boundary ranges from 69.0m in the north to 66.0 in the south.
- 1.3. The majority of the existing land is green field permeable soil with a building plot near the centre. The roof drainage currently drains to a off plot combined manhole.
- 1.4. The report basically concludes the storm water generated on the site foot print due to a 1 in 1, 1 in 30 and 1 in 100 year event plus climate change on the site will need to be stored on site and discharge at a green field run off rate into an adjacent watercourse.
- 1.5. In order to adequately store the water, the attenuation must at depth which stops any water spilling into adjacent sites and be able to gravity fall to the water course. In this case the top of the attenuation will be set at 66.0 m and the existing out fall is 65.100.
- 1.6. The car park surface will be stone filled matting over generally MOT type 3 permeable stone surface with land drains carrying the water to a buried storage attenuation cell which fills when the outfall velocity exceeds the green field run off limit set in either a hydro brake or twin orifices.
- 1.7. The site is connected to an existing drain which currently runs from the site to an existing outfall in the adjacent water course.

2. Design

- 2.1. The surface of the carpark will be generally porous stone suitable for parked cars. The water will either percolate through the stone into the ground (ignored in the calculation as assumed impermeable clay although the current site does generally soakaway) or will travel to the land drains laid to falls into a carrier drain via catchpits.
- 2.2. The catchpits will provide silt traps.
- 2.3. The carrier drain falls to the manhole containing 2 orifice plates which will restrict the flows at certain events of 1 in 1, 1 in 30 and 1 in 100 plus climate change.
- 2.4. The limits set are as follows:

Storm -	Rate	-	Volume
Q ₁ -	5.60 l/s	-	131.50m ³
Q ₃₀ -	9.70 l/s	-	376.40m ³
Q ₁₀₀ -	13.70 l/s	-	518.10m ³

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- 2.5. The lower orifice is set to the maximum velocity of 5.6 l/s as stated in the FRA and calculates to 70mm diameter at an invert of 65.400m level. The upper orifice plate is 90mm diameter. The upper orifice invert level is set at a level when the storage volume reaches the top of the 1 in 30 year storage level of 65.560 above invert.
- 2.6. An alternative solution is to use a Hydro brake which is designed to restrict the flow at various different head of water to meet the requirements of the FRA. The design is attached in the appendix of this report.
- 2.7. The storage is formed from 440mm deep cells providing 100 % volume storage. The depth has been set to allow a fall to the existing outfall without the top of the storage being above the boundary levels.
- 2.8. Reduced flow will gravity feed through a 150 dia pipe connected by a chamber over the existing storm drain, positioned under this site, and then on to the existing outfall at the adjacent water course.
- 2.9. A Kingspan Aquaoil full retention MDPE separator will be place on this line. The type is shown below:

Product Code	Flow (l/s)	Drainage Area (m2)	Silt Capacity (ltrs)	Oil Capacity (ltrs)	Length (mm)	Diameter (mm)	Manhole Cover Dimensions (mm)	Base to Inlet Invert (mm)	Base to Outlet Invert (mm)	Min. Inlet Invert (mm)	Std Pipework Diameter (mm)
NSFP003	3	170	300	30	1700	1350	600	1410	1335	550	160
NSFP006	6	335	600	60	1700	1350	600	1410	1335	550	160
NSFA010	10	555	1000	100	2610	1225	600	1050	1000	500	200
<u>NSFA015</u>	15	835	1500	150	3910	1225	600	1050	1000	500	200

- 2.10. The out fall, shown on the attached photograph, has an invert of 65.100m.



- 2.11. Refer to drawings 20-248-CIV 01,02, 03 and 04 for general arrangement and details.

GF40 Grid force Cells filled with hard
angular stone (max size 14mm)

- 2.12. The surface of the car park will be formed from:

- 2.12.1. GE40 Gridforce cells or similar over

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2.12.2. MOT type 1 Hardcore Type 3 open graded unbound clause 805 (see specification below) Over

2.12.3. Geotextile

2.13. Type 3 Unbound hardcore as stated in section 800 of the highway specification
805 (02/16) Type 3 (open graded) Unbound Mixtures

1 (02/16) Type 3 (open graded) unbound mixture shall be made from crushed rock, crushed blast furnace slag or recycled concrete aggregate. When tested in accordance with Clause 710, recycled concrete aggregate used in Type 3 (open graded) unbound mixtures shall not contain more than 5% asphalt (Class Ra) and not more than 1% other materials (Class X).

2 (02/16) The mixture shall comply with BS EN 13285 and the requirements of Table 8/1. The grading requirements for the mixture are summarised in Table 8/7.

3 (02/16) The properties of aggregates used in the mixture shall be in accordance with BS EN 13242 and the requirements of Table 8/2.

4 (02/16) The size fraction of the unbound mixture passing the 0.425 mm size test sieve shall be non-plastic as defined by BS 1377-2 and tested in compliance therewith.

below 5 (02/16) The mixture shall be transported, laid and compacted without drying out or segregation.

TABLE 8/7: (02/16) Summary Grading Requirements for Type 3 (open graded) Unbound Mixtures

Sieve size, mm	Percentage by mass passing		
	Overall grading range	Supplier declared value grading range	Tolerance on the supplier declared value
80	100		
40	80 – 99		
20	50 – 78	58 – 70	± 8
10	31 – 60	39 – 51	± 8
4	18 – 46	26 – 38	± 8
2	10 – 35	17 – 28	± 7
1	6 – 26	11 – 21	± 5
0.500	0 – 20	5 – 15	± 5
0.063	0 – 5		
Grading of individual batches – differences in values passing selected sieves			
Retained sieve size, mm	Passing sieve size, mm	Percentage by mass passing	
		Not less than	Not more than
10	20	10	25
4	10	10	25
2	4	7	20
1	2	4	15

3. Management and maintenance plan

3.1. The drainage system is generally gravity led and will require little maintenance other than periodically checking and cleaning the following:

3.1.1. Check the surface is intact with no broken panels or loss of stone.

3.1.2. Check each catch pit for silt and clean as necessary

3.1.3. Check the hydraulic brake manhole for silts and clean as necessary

3.1.4. Visually check the out fall is clear of all vegetation and is functioning satisfactorily.

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3.2. All the above tasks should be carried out annually.

4. Conclusion

4.1. The new storm water drainage system allows the storm water to slowly flow through the stone surface, attenuated and clean and off site to a natural, adjacent watercourse which is fully compliant with the requirements of the Flood risk assessment.

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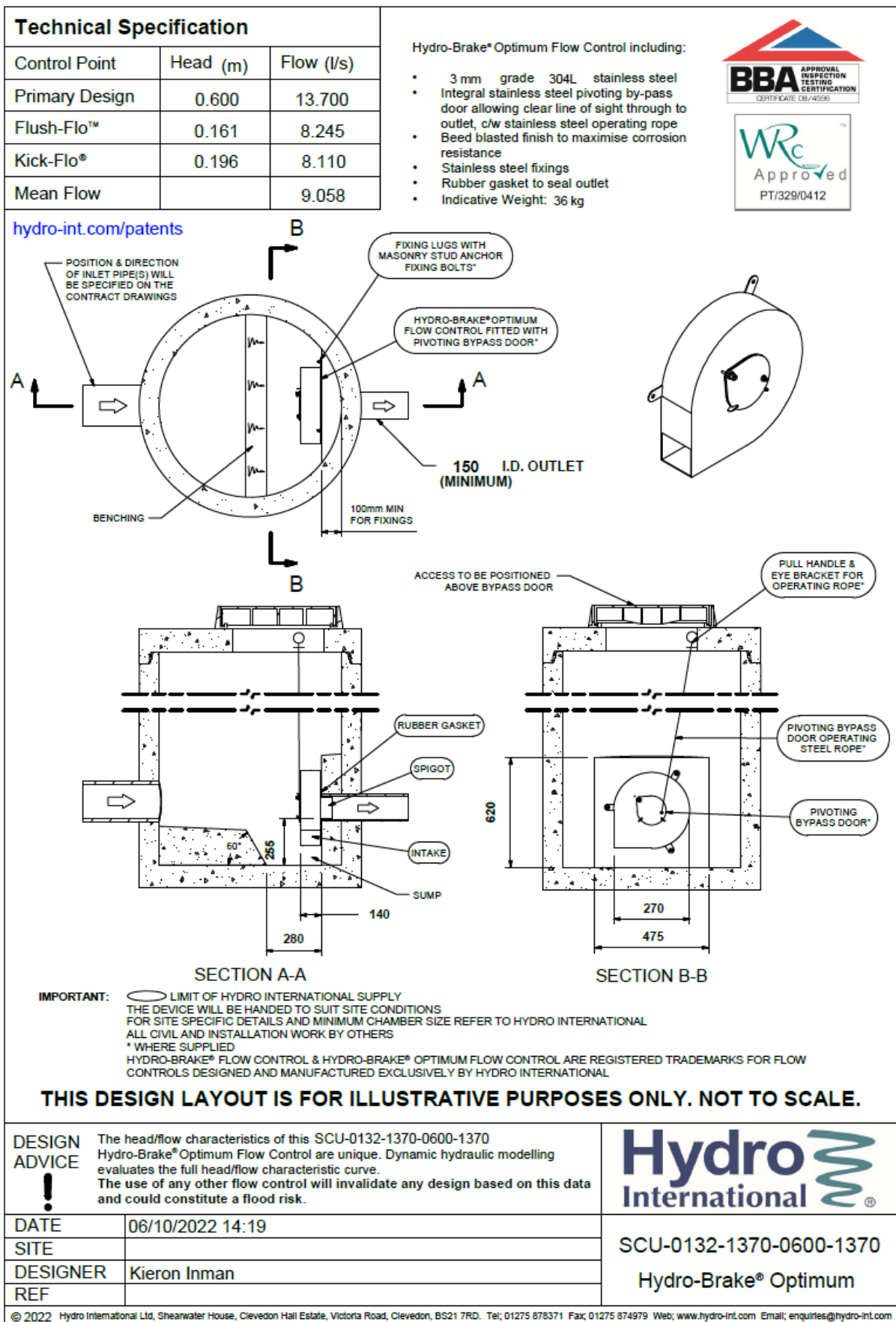
A handwritten signature in black ink, appearing to read 'R Seymour', with a long, sweeping horizontal line extending to the right.

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Appendix A

Hydrobrake



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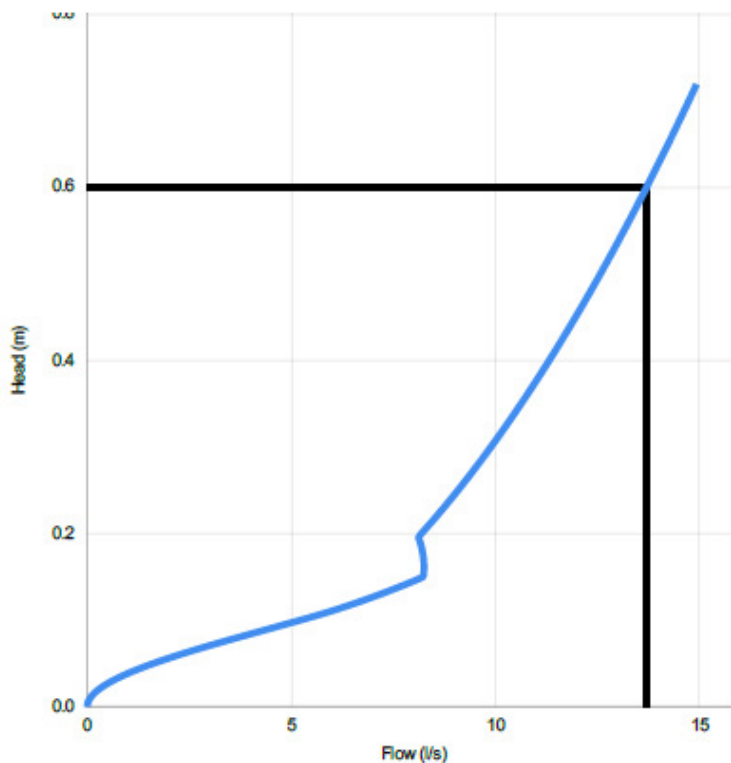
Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	0.600	13.700
Flush-Flo	0.161	8.245
Kick-Flo®	0.196	8.110
Mean Flow		9.058

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PT/329/0412



Head (m)	Flow (l/s)
0.000	0.000
0.021	0.303
0.041	1.143
0.062	2.396
0.083	3.908
0.103	5.486
0.124	6.846
0.145	7.981
0.166	8.243
0.186	8.175
0.207	8.315
0.228	8.692
0.248	9.052
0.269	9.396
0.290	9.727
0.310	10.046
0.331	10.354
0.352	10.653
0.372	10.942
0.393	11.224
0.414	11.498
0.434	11.765
0.455	12.025
0.476	12.280
0.497	12.528
0.517	12.772
0.538	13.011
0.559	13.245
0.579	13.474
0.600	13.700

DESIGN ADVICE



The head/flow characteristics of this SCU-0132-1370-0600-1370 Hydro-Brake Optimum® Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.

The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

Hydro
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DATE 06/10/2022 14:19

Site

DESIGNER Kieron Inman

Ref

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Hydro-Brake Optimum®

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