

Stanwick, Westergate, PO20 3UH

SUDS Design Report

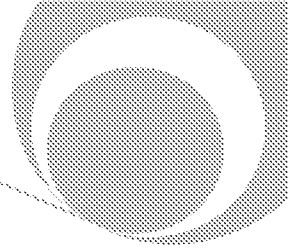
Project Number: 0137

Author: Stephen Webster | CEng MICE

February 2021

Revision B

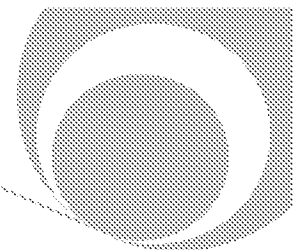




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Introduction & Project Summary

This report outlines the proposed rainwater drainage requirements for the extension of the house at Stanwick, Northfields Lane, Westergate, Chichester (PO20 3UH). The report describes the surface water drainage strategy and presents the calculations undertaken to ensure that this design is adequate for the requirements of the site.

SUDS Feasibility Analysis

In accordance with best practice, an evaluation of the feasibility of infiltration drainage systems has been undertaken. However in this case, very high groundwater up to 800mm from existing ground level have been measured. Best practice requires that there is at least 1.0m of ground between the highest groundwater level and the base of any infiltration drainage systems, in order to provide suitable filtration before the water enters the groundwater. Therefore in this case infiltration drainage systems are not feasible, so the next best option of attenuation and slow release has been proposed.

Details of infiltration testing is included in Appendix F and the results of the groundwater monitoring is included in Appendix G.

Greenfield Runoff Analysis

In accordance with the best practice a greenfield runoff analysis of the site has been undertaken in order to ensure that the proposed surface water design returns the site to its natural runoff state. This analysis was undertaken in accordance with the IH 124 method which is commonly used to assess the greenfield runoff potential of small catchments such as this.

The results of the analysis are presented in Appendix B. The results of the analysis show that for the 270m² area of the proposed development in this location the greenfield mean annual flood (Q_{BAR}) of around 0.35l/s could be expected from the catchment. This assumes a 100 year return period and a 40% climate change allowance as per current best practice. The new surface water drainage design will ensure that the output from the system will not exceed this level at any time.

Attenuation System Design

The attenuation system is required in order to reduce the maximum output of the site back to greenfield runoff levels and to store the excess rainwater produced during large rainfall events onsite. The results of the design are presented in Appendix C.

The design of the attenuation system was undertaken by modelling a large number of rainfall events of between 5 minutes and 1,440 minutes duration at this location in order to ascertain the critical design storm. The design storm is modelled at a 1 in 100 year event with a further climate change allowance of 40%, as per best practice.





In this case the critical storm duration is around 240 minutes during which 18.75m³ of rain will have fallen on the catchment while the system can only output 5.04m³ of water into the existing drainage system. Therefore the attenuation will need to accommodate a total of 13.71m³ of water.

Due to the high groundwater on the site, it is proposed to use shallow 400mm high attenuation units. Full details of the proposed system are shown in the detail drawing presented in Appendix D.

The system will include a flow control valve in order to ensure that the system never exceeds the greenfield runoff levels. It is proposed to use an Hydrobrake Optimum valve designed specifically for the needs of the site. Full details of the proposed flow control device are presented in Appendix E.

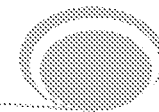
Conclusion

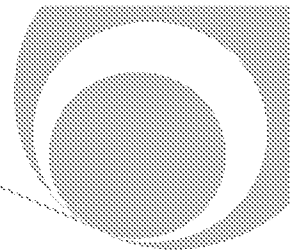
The surface water drainage scheme presented above will ensure that the site is well protected from very low frequency rainfall events. The system can accommodate a 100 year storm event plus 40% climate change allowance without flooding while releasing only a very small volume of water equivalent to the greenfield runoff of the site into the downstream drainage system.

With infiltration systems not practical due to the high groundwater at the site, this proposed attenuation system is compliant as the next best option.



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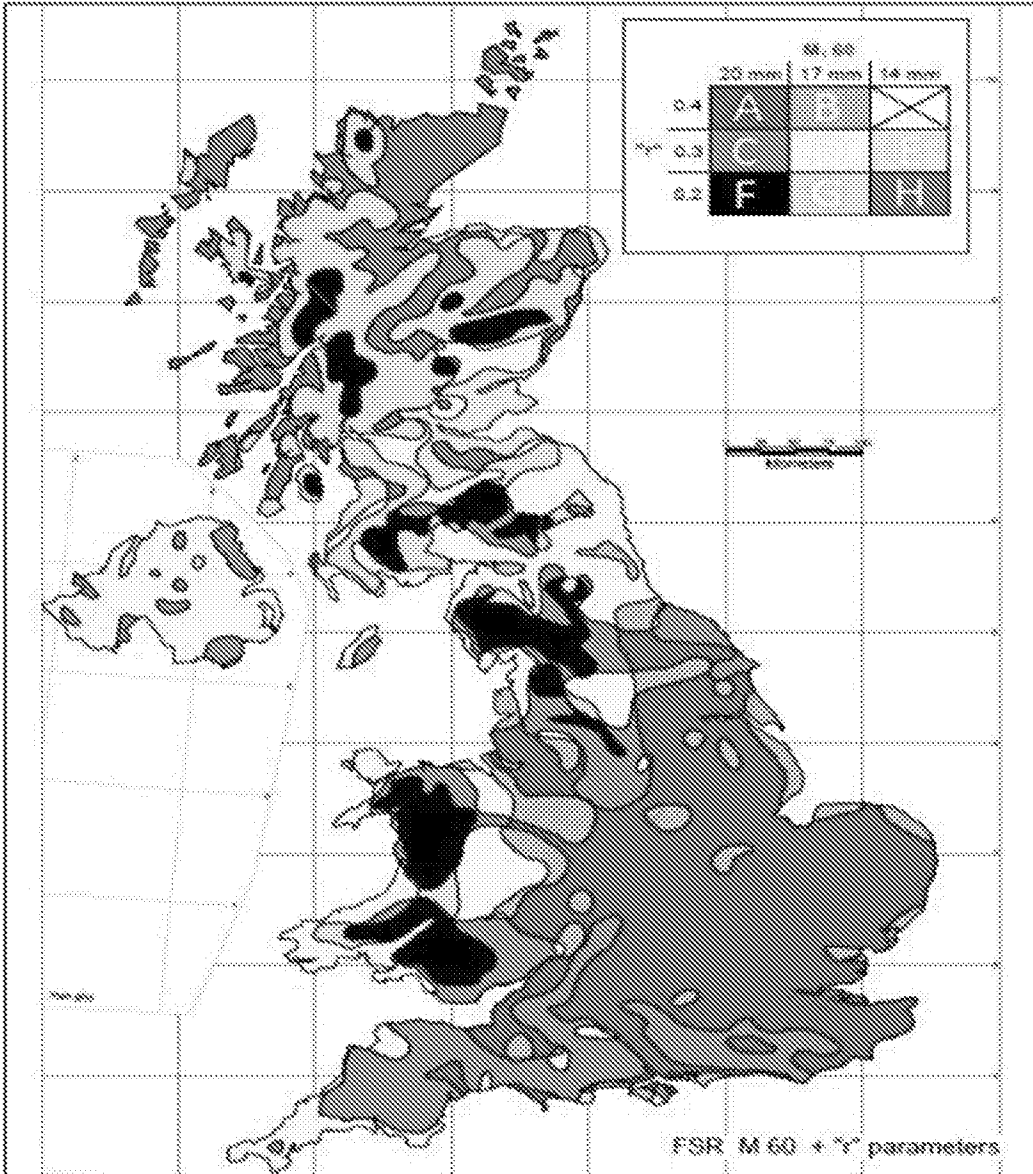


Appendix B - Greenfield Runoff Analysis

Registered User:	CivilWeb Consulting Engineers Ltd		© 2017 CivilWeb																								
Project:	Stanwick, Westergate, PO20 3UH		By:																								
Calculation:	Rainfall and Runoff Calculator		Approved:																								
	IH 124 Method																										
Sheet Number:	1	Date:																									
<table border="1"> <tr> <th colspan="4">Catchment Details</th> </tr> <tr> <td>Catchment Area</td> <td>270</td> <td>m²</td> <td></td> </tr> <tr> <td>Location</td> <td>7</td> <td></td> <td></td> </tr> <tr> <td>City/Town</td> <td>Portsmouth</td> <td></td> <td></td> </tr> <tr> <td>SAAR</td> <td>713</td> <td>Override-</td> <td></td> </tr> <tr> <td>WRAP SOIL Index</td> <td>0.37</td> <td>Override-</td> <td></td> </tr> </table>				Catchment Details				Catchment Area	270	m²		Location	7			City/Town	Portsmouth			SAAR	713	Override-		WRAP SOIL Index	0.37	Override-	
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<table border="1"> <tr> <th colspan="3">Design Storm Details</th> </tr> <tr> <td>Return Period</td> <td>100</td> <td>years</td> </tr> <tr> <td>Climate Change Allowance</td> <td>1.4</td> <td></td> </tr> </table>				Design Storm Details			Return Period	100	years	Climate Change Allowance	1.4																
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Return Period	100	years																									
Climate Change Allowance	1.4																										
Results Total Design Runoff: 0.35 l/s																											



Appendix C - Attenuation Design Calculations

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CivilWeb Consulting Engineers Limited	Project: Stanwick, Westergate, PO20 3UH	By:																		
	Calculation: Attenuation System Design	Approved:																		
	Sheet Number: 1	Date:																		
<table border="1"> <thead> <tr> <th colspan="3">Catchment Details</th> </tr> </thead> <tbody> <tr> <td>Catchment Area</td> <td>270.00</td> <td>m²</td> </tr> <tr> <td>Runoff Coefficient</td> <td>1.00</td> <td></td> </tr> <tr> <td>Location Code</td> <td>S</td> <td></td> </tr> <tr> <td>Return Period</td> <td>100</td> <td>years</td> </tr> <tr> <td>Climate Change Factor</td> <td>40</td> <td>%</td> </tr> </tbody> </table>			Catchment Details			Catchment Area	270.00	m ²	Runoff Coefficient	1.00		Location Code	S		Return Period	100	years	Climate Change Factor	40	%
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<u>UK Rainfall Map</u>  <table border="1"> <thead> <tr> <th></th> <th>20 mm</th> <th>17 mm</th> <th>14 mm</th> </tr> </thead> <tbody> <tr> <td>0.4</td> <td>A</td> <td>B</td> <td>X</td> </tr> <tr> <td>0.3</td> <td>C</td> <td></td> <td></td> </tr> <tr> <td>0.2</td> <td>F</td> <td>G</td> <td>H</td> </tr> </tbody> </table> FSR M 60 + "Y" parameters				20 mm	17 mm	14 mm	0.4	A	B	X	0.3	C			0.2	F	G	H		
	20 mm	17 mm	14 mm																	
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	Calculation:	Attenuation System Design	Approved:
	Sheet Number:	2	Date:

Attenuation Tank Outflow	0.35	l/s	Acceptable
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Results Table

Storm Duration (Mins)	Inflow (l)	Outflow (l)	Storage Required (m³)
5	4.322	105	4.22
10	6.420	210	6.21
15	7.806	315	7.49
30	10.263	630	9.63
45	11.794	945	10.85
60	12.928	1260	11.87
120	15.725	2520	13.20
240	18.749	5040	13.71
480	21.168	10080	11.09
600	22.680	12600	10.08
1440	27.216	30240	0.00

Attenuation Tank Design

Tank Shape	Rectangular	
Number of Tanks	1	
Length	10	m
Width	4	m
Effective Depth	0.4	m
Void Percentage	95	%

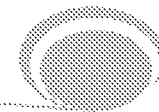
Storage Area Required	13.71 m³	
Storage Area Provided	15.20 m³	Acceptable

Time for Emptying 50%	5.4 hours	Acceptable
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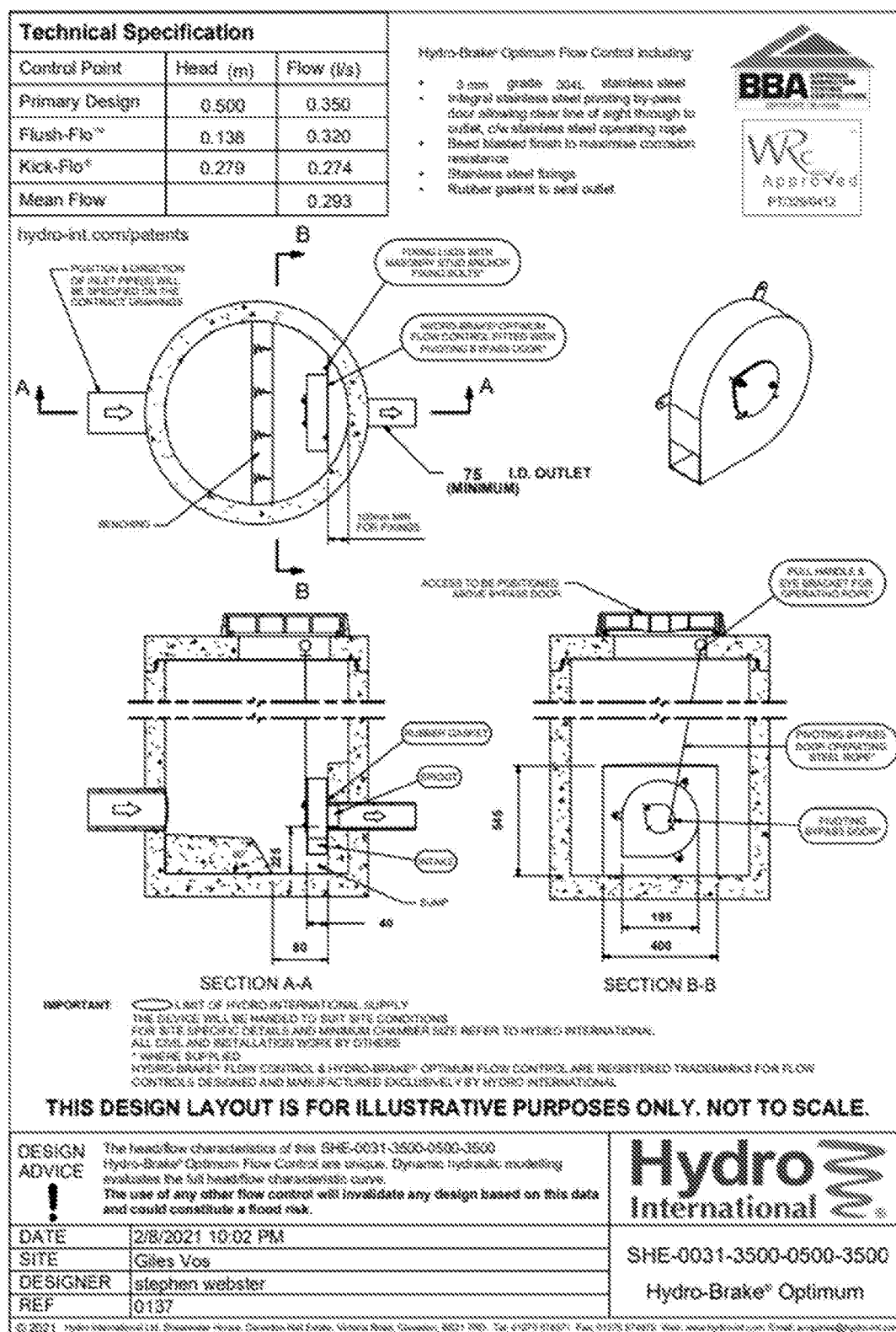
Storage Required (m³)

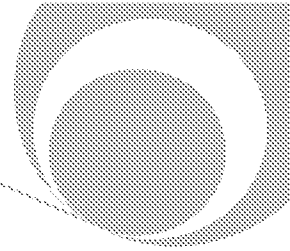
Storm Duration (Mins)

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Appendix E - Flow Control Valve Details





Appendix F - Infiltration Test Results

Front test pit

Dimensions 1370mm x 630mm x 1000mm (l x w x d)

Percolation test details.

First test 31.1.21

Time at 75% level 0733

Time at 25% level 1955

Total test time 12h 22 mins

Second test 1.2.21

Time at 75% level 0613

Time at 25% level 1717

Test complete 11h 2 mins

Third test 2.2.21

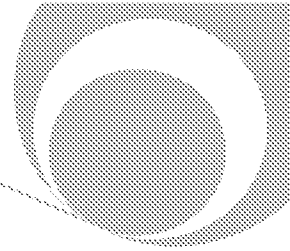
Time at 75% level 0609

Time at 25% level 1812

Test complete 12h 3 mins

Infiltration rate = 0.0122 m/hr





Back test pit

Dimensions 1550 x 660 x 1000mm (l x w x d)

Percolation test details

First test 23.1.21

Time at 75% level 1236

Time at 25% level 1857

Test complete 6h 21mins

Second test 24.1.21

Time at 75% level 0740

Time at 25% level 1752

Test complete 10h 12 mins

Third test 25.1.21

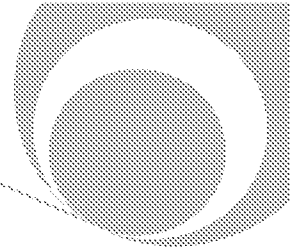
Time at 75% level 0600

Time at 25% level 1510

Test complete 9h 10 mins

Infiltration rate = 0.0155m/hr





Appendix G - Groundwater Monitoring

All measurements are in mm below ground level

DATE	FRONT TEST PIT	BACK TEST PIT
23.1.21	1000mm	Percolation test
24.1.21	1000mm	Percolation test
25.1.21	1000mm	Percolation test
26.1.21	950mm	900mm
27.1.21	950mm	800mm
28.1.21	900mm	600mm
29.1.21	800mm	500mm
30.1.21	800mm	500mm
31.1.21	Percolation test	630mm
1.2.21	Percolation test	650mm
2.2.21	Percolation test	630mm
3.2.21	830mm	550mm
4.2.21	880mm	580mm
6.2.21	890mm	630mm
7.2.21	900mm	600mm
9.2.21	930mm	630mm
10.2.21	930mm	630mm
11.2.21	930mm	640mm
13.2.21	940mm	670mm
14.2.21	960mm	690mm

