

PROPOSED DEVELOPMENT

PADDOCK ROAD

STAINCROSS

BARNSELY

DRAINAGE REPORT

Report 753/1



07919 031289

1. INTRODUCTION

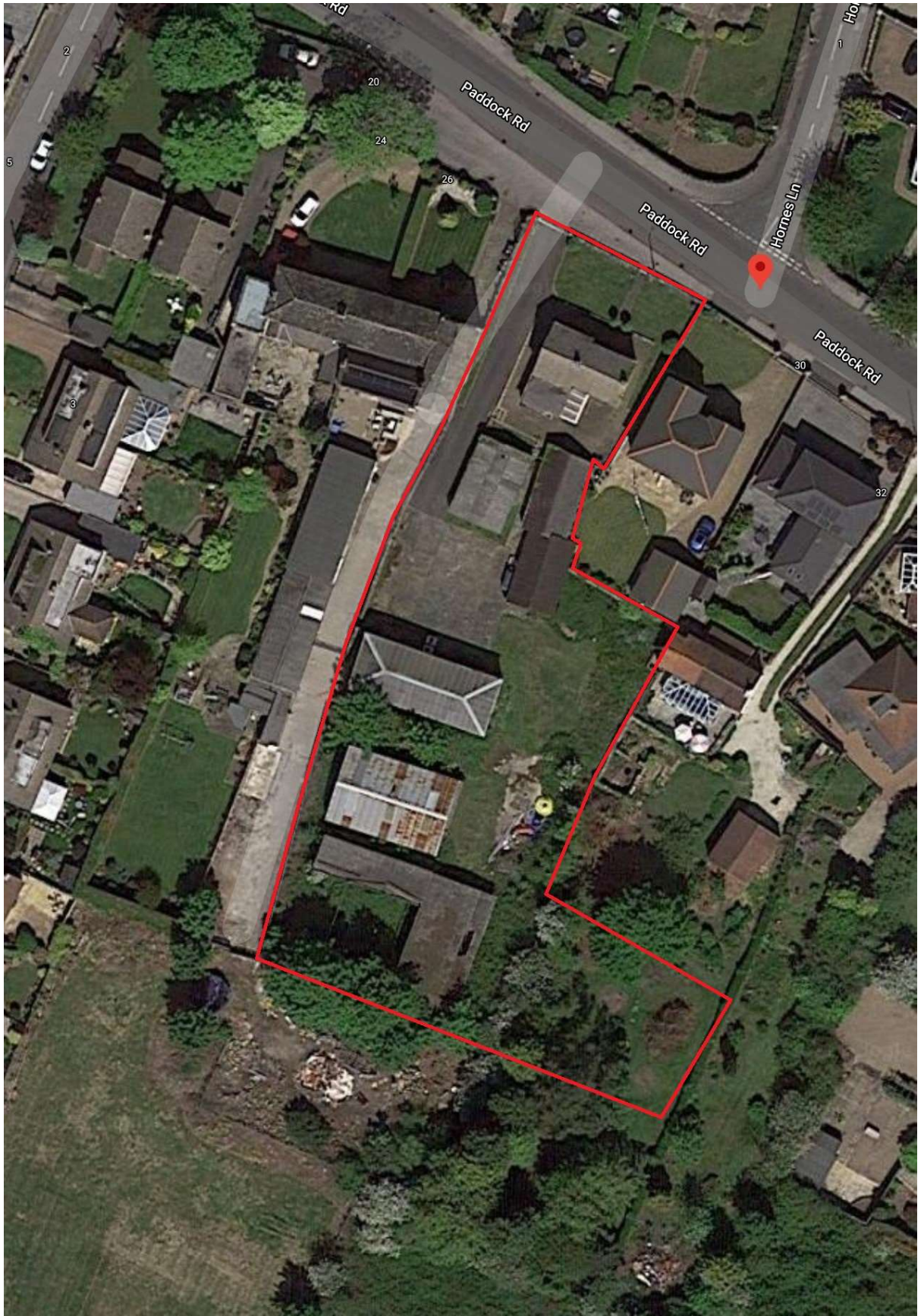
This report provides the background to the drainage design and surface water hydraulic calculations required for a development at Paddock Road, Staincross, Barnsley, S75 6LG.

It should be read in conjunction with HM Design drainage drawing YH753/13 – Drainage Plan.

It shows that climate change and urban creep has been considered and allowed for the development surface water drainage.

2. PRE-DEVELOPMENT SITE

The pre-development site consists of an existing dwelling with outhouses and paved areas and garden areas. A large area of the existing site is impermeable, being roof areas or hardstanding.



PRE-DEVELOPMENT SITE – AERIAL VIEW

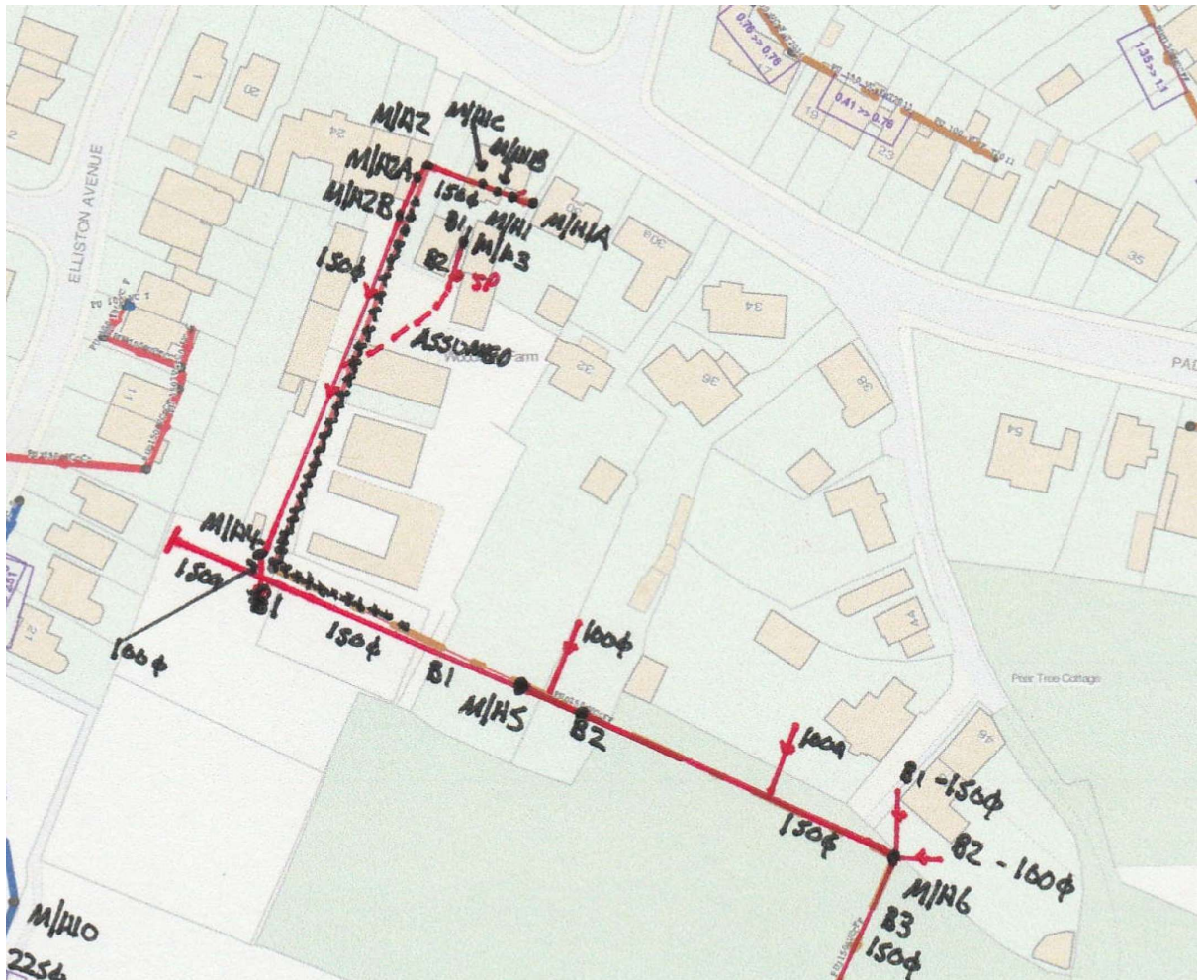


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3. DRAINAGE SURVEY

An existing drainage survey has been undertaken and this shows that the present site is served by an existing combined drain which runs in the adjacent property grounds to the west of the development.

A plan of the drainage survey is shown below. The plan shows the overall drainage linking through to the public sewer to the south of the site.



DRAINAGE SURVEY

4. POST-DEVELOPMENT PROPOSALS

It is proposed to development the site with 3 houses and an adoptable access road. The details are shown below.

WING

4



PROPOSED DEVELOPMENT

5. SURFACE WATER DEVELOPMENT OVERVIEW

The proposed surface water on this development should be dealt with in a sustainable way. Therefore, the discharge of surface water should comply with the required hierarchy of:- by infiltration, to watercourse to surface water sewer or combined sewer.

Infiltration

Detailed soakaway testing has been carried out by G and M Consulting on this development site and this showed that the site has poor infiltration characteristics and so the use of infiltration as a means of surface water disposal has been ruled out.

Watercourses

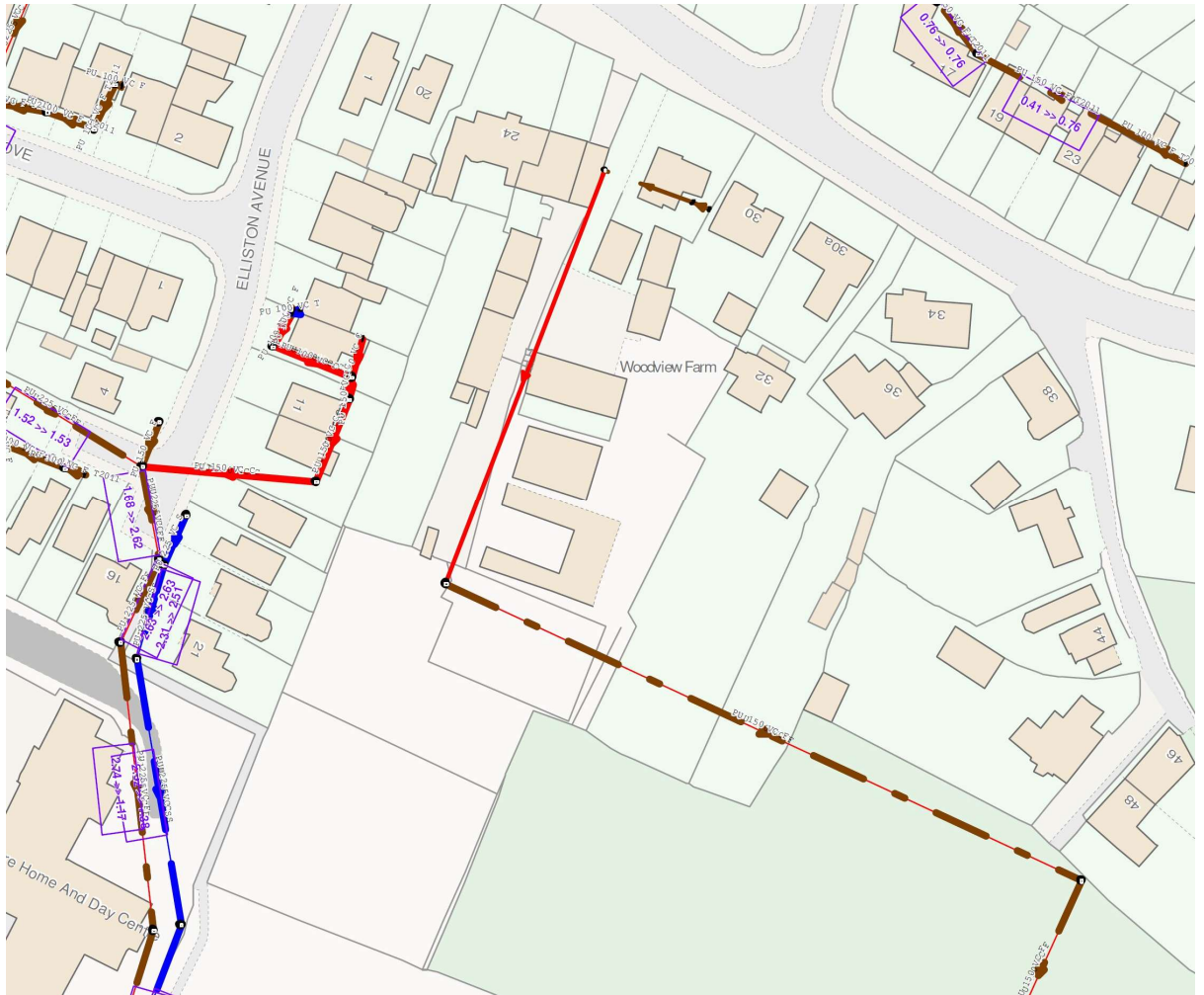
No watercourses are on or close to this development site and so a connection to watercourse for the discharge of surface water has been ruled out.

Surface Water Sewer

A search of the Yorkshire Water sewer records show that an existing 225mm surface water sewer is present in the recreation ground to the south of the development site.

The sewers have been surveyed as part of the site drainage survey and the survey has shown that the depth of the manhole on the surface water system is satisfactory for a connection from the development site.

A plan of the public sewers is shown below, showing the surface water sewer in the recreation ground.



It is proposed to connect to the surface water sewer with an attenuated flow rate suitable for the system, with minimal flood risk and to allow adoption of the surface water system by Yorkshire Water. As such a flow control device with a minimum orifice size of 75mm would be required. A vortex type flow control device is the most efficient in reducing flow / maximising orifice size and so a hydrobrake with a 3l/s discharge rate has been chosen. This has an orifice size of 77mm.

Removing the surface water flows from the public combined sewer and reducing flows to 3l/s will provide betterment to the overall public sewerage system.

8. SURFACE WATER DRAINAGE SYSTEM

The surface water will be a separate system on and off site. It will connect to the public surface water sewer and be attenuated to 3l/s.

Surface water storage will be provided on site by the use of a Carlow Tank and all the main surface water sewers on and off-site and the storage tank will be offered for adoption through a Section 104 agreement with Yorkshire Water.

9. SURFACE WATER DESIGN

The new surface water system serving the development has been modelled in Microdrainage to ensure that it meets the required drainage standards.

The following input data was used:-

Impermeable area = 1547 sq m (Including 10% urban creep on roofs and driveways).

Return period 1 in 1 year with no surcharging (all durations)

Return period storm event 1 in 100 year + CC with no flooding (all durations).

Climate change allowance +30%

Flow control – Hydrobrake 3l/s

Storage tank 12m x 5m x 1.2m deep.

The Micro-drainage model shows that the system works satisfactorily for all storm durations.

The 1 in 1 year critical storm is the 30 minute winter storm.

The 1 in 100 year with CC critical storm is the 180 minute storm.

The details of the microdrainage calculations are appended to this report.

10. CLIMATE CHANGE AND URBAN CREEP

The Micro-drainage model includes an allowance of +30% to include for climate change. An urban creep allowance has been provided on the roof areas and driveway areas to allow for future development.

11. FLOOD ROUTE

In the unlikely event that the on-site surface water system capacity is exceeded for any reason, a safe flood route is available on this development.

Any flood water escaping from the system would flow overland southwards onto the recreation ground, avoiding houses or other development.

12. MAINTENANCE

The surface water system provides security against flooding both on and off-site. Therefore, it requires maintenance for the lifetime of the development. The system is expected to be adopted by Yorkshire Water who will supply this continual maintenance.

13. FOUL DRAINAGE

Foul drainage on this development site will be through a separate system on and off site.

Foul flows will connect to the combined sewer adjacent to the site (shown as a foul sewer on Yorkshire Water records).

14. CONCLUSIONS

- The proposed development can be drained successfully without increasing flood risk.
- A separate surface water system will be provided on and off-site with an attenuated flow of 3l/s.
- Surface water attenuation storage will be provided as a tank.
- The new surface water system ensures no flooding in the 1 in 100 year plus 30% for climate change plus 10% urban creep.
- Future lifetime maintenance will be supplied by the Yorkshire Water.
- Foul discharge will be to the public sewer adjacent to the site.

Report by



Hugh Morris
BSc CEng MICE
17th February 2021

APPENDIX

- Micro-drainage Calculations

1 in 100 year storm with 30% climate change plus 10% urban creep – no flooding
critical storm 180 minute winter. 120 minute and 240 minute summaries.

1 in 1 year storm – no surcharging critical storm 30 minute summer.

HM Design										Page 0	
10 The Green York YO26 5LR											
Date 01/01/0001						Designed by Hugh Morris					
File Paddock Rd-SW.MDX						Checked by					
Micro Drainage						Network 2020.1					
STORM SEWER DESIGN by the Modified Rational Method											
Network Design Table for PADDOCK RD-SW.SWS											
PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	
1.000	43.715	2.625	16.7	0.063	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	36.950	2.525	14.6	0.058	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	6.519	0.050	130.4	0.033	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.002	7.650	0.100	76.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.003	17.966	1.750	10.3	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	13.359	1.300	10.3	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.005	48.064	3.200	15.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.006	10.892	0.225	48.4	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
Network Results Table											
PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)	
1.000	50.00	5.29	118.600	0.063	0.0	0.0	0.0	2.48	43.8	8.6	
1.001	50.00	5.47	115.900	0.121	0.0	0.0	0.0	3.44	136.7	16.4	
2.000	50.00	5.08	113.350	0.033	0.0	0.0	0.0	1.38	97.2	4.5	
1.002	50.00	5.54	113.300	0.154	0.0	0.0	0.0	1.80	127.2	20.9	
1.003	50.00	5.64	113.200	0.154	0.0	0.0	0.0	3.16	55.9	20.9	
1.004	50.00	5.71	111.450	0.154	0.0	0.0	0.0	3.16	55.9	20.9	
1.005	50.00	6.02	110.150	0.154	0.0	0.0	0.0	2.61	46.2	20.9	
1.006	50.00	6.14	106.950	0.154	0.0	0.0	0.0	1.45	25.6	20.9	
Simulation Criteria for PADDOCK RD-SW.SWS											
Volumetric Runoff Coeff 0.840						Foul Sewage per hectare (l/s)			0.000		
Areal Reduction Factor 1.000						Additional Flow - % of Total Flow			30.000		
Hot Start (mins) 0						MADD Factor * 10m³/ha Storage			2.000		
Hot Start Level (mm) 0						Run Time (mins)			360		
Manhole Headloss Coeff (Global) 0.500						Output Interval (mins)			3		
Number of Input Hydrographs 0						Number of Storage Structures 1					
Number of Online Controls 1						Number of Time/Area Diagrams 0					
Number of Offline Controls 0											
Synthetic Rainfall Details											
Rainfall Model				FSR				Profile Type Winter			
Return Period (years)				100				Cv (Summer) 0.750			
Region England and Wales								Cv (Winter) 0.840			
M5-60 (mm)				19.000				Storm Duration (mins) 180			
Ratio R				0.363							
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Micro Drainage	Network 2020.1	

Online Controls for PADDOCK RD-SW.SWS

Hydro-Brake® Optimum Manhole: 4, DS/PN: 1.003, Volume (m³): 5.1

Unit Reference	MD-SHE-0077-3000-1350-3000
Design Head (m)	1.350
Design Flow (l/s)	3.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	77
Invert Level (m)	113.200
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.350	3.0
Flush-Flo™	0.338	2.7
Kick-Flo®	0.689	2.2
Mean Flow over Head Range	-	2.5

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)
0.100	2.2	1.200	2.8	3.000	4.3	7.000	6.5
0.200	2.6	1.400	3.0	3.500	4.7	7.500	6.7
0.300	2.7	1.600	3.2	4.000	5.0	8.000	6.9
0.400	2.7	1.800	3.4	4.500	5.2	8.500	7.1
0.500	2.7	2.000	3.6	5.000	5.5	9.000	7.3
0.600	2.5	2.200	3.8	5.500	5.8	9.500	7.5
0.800	2.4	2.400	3.9	6.000	6.0		
1.000	2.6	2.600	4.1	6.500	6.2		

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Date 01/01/0001 File Paddock Rd-SW.MDX	Designed by Hugh Morris Checked by													
Micro Drainage														
Network 2020.1														
<u>Storage Structures for PADDOCK RD-SW.SWS</u> <u>Tank or Pond Manhole: 9, DS/PN: 2.000</u> Invert Level (m) 113.350 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>60.0</td><td>1.200</td><td>60.0</td><td>1.201</td><td>0.0</td></tr></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	60.0	1.200	60.0	1.201	0.0
Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)									
0.000	60.0	1.200	60.0	1.201	0.0									
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Date 01/01/0001 File Paddock Rd-SW.MDX				Designed by Hugh Morris Checked by				
Micro Drainage				Network 2020.1				
<u>Summary of Results for 180 minute 100 year Winter (PADDOCK RD-SW.SWS)</u>								
Margin for Flood Risk Warning (mm)						300.0		
Analysis Timestep 2.5 Second Increment (Extended)								
DTS Status						OFF		
DVD Status						OFF		
Inertia Status						OFF		
	US/MH	Water	Surcharged	Flooded		Half Drain	Pipe	
	Name	Level	Depth	Volume	Flow / Overflow	Time	Flow	
PN		(m)	(m)	(m³)	Cap. (l/s)	(mins)	(l/s)	Status
1.000	1	118.645	-0.105	0.000	0.20		8.5	OK
1.001	2	115.953	-0.172	0.000	0.13		16.2	OK
2.000	9	114.282	0.632	0.000	0.05		3.0	SURCHARGED
1.002	3	114.282	0.682	0.000	0.04		3.4	SURCHARGED
1.003	4	114.281	0.931	0.000	0.05		2.7	SURCHARGED
1.004	5	111.472	-0.128	0.000	0.05		2.7	OK
1.005	6	110.174	-0.126	0.000	0.06		2.7	OK
1.006	7	106.984	-0.116	0.000	0.12		2.7	OK

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Date 01/01/0001				Designed by Hugh Morris				
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Micro Drainage				Network 2020.1				
<u>Summary of Results for 120 minute 100 year Winter (PADDOCK RD-SW.SWS)</u>								
Margin for Flood Risk Warning (mm)						300.0		
Analysis Timestep 2.5 Second Increment (Extended)								
DTS Status						OFF		
DVD Status						OFF		
Inertia Status						OFF		
	US/MH	Water	Surcharged	Flooded		Half Drain	Pipe	
	Name	Level	Depth	Volume	Flow /	Time	Flow	
PN		(m)	(m)	(m³)	Cap.	(l/s)	(mins)	(l/s)
								Status
1.000	1	118.652	-0.098	0.000	0.26		11.3	OK
1.001	2	115.961	-0.164	0.000	0.17		21.6	OK
2.000	9	114.274	0.624	0.000	0.05		2.9	SURCHARGED
1.002	3	114.274	0.674	0.000	0.04		3.6	SURCHARGED
1.003	4	114.273	0.923	0.000	0.05		2.7	SURCHARGED
1.004	5	111.472	-0.128	0.000	0.05		2.7	OK
1.005	6	110.174	-0.126	0.000	0.06		2.7	OK
1.006	7	106.984	-0.116	0.000	0.12		2.7	OK

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Date 01/01/0001								Designed by Hugh Morris	
File Paddock Rd-SW.MDX								Checked by	
Micro Drainage					Network 2020.1				
<u>Summary of Results for 240 minute 100 year Winter (PADDOCK RD-SW.SWS)</u>									
Margin for Flood Risk Warning (mm)							300.0		
Analysis Timestep 2.5 Second Increment (Extended)									
DTS Status							OFF		
DVD Status							OFF		
Inertia Status							OFF		
	US/MH	Water Level	Surcharged Depth	Flooded Volume	Flow /	Overflow	Half Drain Time	Pipe Flow	
PN	Name	(m)	(m)	(m³)	Cap.	(l/s)	(mins)	(l/s)	Status
1.000	1	118.640	-0.110	0.000	0.16			6.8	OK
1.001	2	115.948	-0.177	0.000	0.10			13.1	OK
2.000	9	114.258	0.608	0.000	0.04			2.7	SURCHARGED
1.002	3	114.260	0.660	0.000	0.04			3.2	SURCHARGED
1.003	4	114.260	0.910	0.000	0.05			2.7	SURCHARGED
1.004	5	111.472	-0.128	0.000	0.05			2.7	OK
1.005	6	110.174	-0.126	0.000	0.06			2.7	OK
1.006	7	106.984	-0.116	0.000	0.12			2.7	OK

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Micro Drainage		Network 2020.1
<u>Simulation Criteria for PADDOCK RD-SW.SWS</u> Volumetric Runoff Coeff 0.750 Foul Sewage per hectare (l/s) 0.000 Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000 Hot Start Level (mm) 0 Run Time (mins) 120 Manhole Headloss Coeff (Global) 0.500 Output Interval (mins) 2 Number of Input Hydrographs 0 Number of Storage Structures 1 Number of Online Controls 1 Number of Time/Area Diagrams 0 Number of Offline Controls 0 <u>Synthetic Rainfall Details</u> Rainfall Model FSR Profile Type Summer Return Period (years) 1 Cv (Summer) 0.750 Region England and Wales Cv (Winter) 0.840 M5-60 (mm) 19.000 Storm Duration (mins) 60 Ratio R 0.363		
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