

320200159P

**SURFACE WATER AND FOUL WATER
DRAINAGE SCHEME**

for

FEAZER DEVELOPMENTS LIMITED

PROPOSED RESIDENTIAL DEVELOPMENT

**LAND OFF RIBBLESDALE VIEW
CHATBURN**

JANUARY 2020

REFORD

Consulting Engineers Limited

7 Hall Road, Fulwood, Preston, PR2 9QD

Mobile: 07970 265334 Email: r.e.ford@virginmedia.com

Company number: 09620365 VAT Reg. 215 5638 12

CONTENTS

SECTION	TITLE	PAGE
1	INTRODUCTION	3
2	BASE INFORMATION	4
3	PROPOSED DRAINAGE SCHEME	6
4	SUMMARY AND CONCLUSIONS	8

APPENDICES

A	Location plan
B	Sewer records
C	Foul and surface water drainage layout
D	Surface water drainage design

1. INTRODUCTION

1.1 This surface water and foul water drainage scheme has been produced on behalf of Feazer Developments Limited to address Condition 7 of the Planning Permission from Ribble Valley Borough Council (Reference 3/2019/0763) for the erection of four residential dwellings on land off Ribblesdale View, Chatburn. A location plan is included within Appendix A.

1.2 Condition 7 states the following:

Prior to the occupation of any dwellings a surface water drainage scheme, based on the hierarchy of drainage options in the National Planning Practice Guidance with evidence of an assessment of the site conditions shall be submitted to and approved in writing by the Local Planning Authority.

The surface water drainage scheme must be in accordance with the Non-Statutory Technical Standards for Sustainable Drainage Systems (March 2015) or any subsequent replacement national standards. In the event of surface water draining to the public surface water sewer, the pass forward flow rate to the public sewer must be restricted to 10 l/s.

1.3 This drainage scheme is to discharge Condition 7 of the planning approval. It describes the existing site conditions and proposed development. It assesses the potential impact of proposals on existing sewers and includes a proposed scheme for the provision of new drainage to serve the proposed development.

2. BASE INFORMATION

Existing site

- 2.1 The proposal relates to a roughly triangular piece of land (approx. 0.12 hectare) that lies to the south of Ribblesdale View, Chatburn.
- 2.2 The site is close to the centre of Chatburn. Along the eastern boundary lies Network Rail, which lies within a deep cut ravine hewn out of solid rock. Ribblesdale View lies along the site's northern boundary. Residential properties lie to the west and south.
- 2.3 The site is a brownfield site comprising previously erected 'lock up' garages and hardstanding areas.
- 2.4 A topographical survey has been carried out. Within the boundaries the land rises into the site from Ribblesdale View.

Site geology

- 2.5 The online Soilsmap viewer has identified the geology of this parcel of land as slowly permeable seasonally wet acid loamy and clayey soils with impeded drainage.

Understanding of existing drainage local to the site

- 2.6 The nearest watercourse to the site is Heys Brook which is located approximately 170m to the south of the site.
- 2.7 United Utilities sewer records identify a public combined water sewer in Ribblesdale View that runs to the west along Sawley Road. The sewer records are included within Appendix B.

Consultation with United Utilities

- 2.8 During the consultation period it was agreed with United Utilities that a surface water discharge from the site could be made into the public combined water sewer that lies within Ribblesdale View provided the discharge rate was attenuated to 10 l/s.

2.9 It was also agreed that an unrestricted foul discharge from the site could also be made into the public combined water sewer that lies within Ribblesdale View.

Consultation with Network Rail

2.10 Network Rail has been consulted with regards the proposed development.

2.11 Network Rail has confirmed that:

- Any soakaways for the proposal must be placed at least 30m from the railway boundary.
- Any drainage proposals that lie less than 30m from the railway boundary must ensure that surface and foul waters are carried from site in closed sealed pipe systems.

3. PROPOSED DRAINAGE SCHEME

3.1 The proposed foul and surface water drainage layout is included within Appendix C.

Surface water drainage

3.2 In accordance with the National Standards for Sustainable Drainage, the drainage scheme should incorporate the use of Sustainable Drainage (SuDS) where possible. The approach promotes the use infiltration features in the first instance. If drainage cannot be achieved solely through infiltration due to site conditions or contamination risks, the preferred options are (in order of preference):

- (i) a controlled discharge to a local waterbody or watercourse, or
- (ii) a controlled discharge into the public sewer network (depending on availability and capacity).

3.3 The rate and volume of discharge should strive to provide betterment and be restricted to the pre-development values as far as practicable.

3.4 It is not possible for soakaways to be installed within the development site as the development lies within 30m of the Network Rail boundary and Network Rail has stated that any soakaways for the proposal must be placed at least 30m from the railway boundary.

3.5 It is not feasibly possible to make a connection to the Heys Brook which is located approximately 170m to the south of the site.

3.6 It has been agreed with United Utilities that surface water runoff from the site can be discharged into the public combined water sewer that lies within Ribblesdale View at an attenuated discharge rate of 10 l/s.

3.7 *It is therefore intended that surface water runoff from the developed site will be attenuated to 10 l/s allowing surface water runoff generated by all rainfall events up to the 100 year critical rain storm plus 30% on stored volumes prior to discharge into the public combined water sewer that lies within Ribblesdale View. The additional 30% is to allow for climate change and has been included in the surface water volume.*

3.8 A surface water drainage design has been carried out for the proposed site development for all events up to the 100 year critical rain storm plus 30% for climate change on stored volumes. Attenuation is provided within the proposed drainage network of pipes and manholes.

3.9 The surface water drainage design is included within Appendix D.

Foul Water Drainage

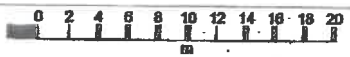
3.10 United Utilities has agreed that an unrestricted foul discharge from the site can be made into the public combined water sewer that lies within Ribblesdale View.

3.11 *It is therefore intended that foul water from the developed site will be collected by a piped system and a discharge made into the public combined water sewer manhole that lies within Ribblesdale View.*

4. SUMMARY AND CONCLUSIONS

- 4.1 This surface water and foul water drainage scheme has been produced on behalf of Feazer Developments Limited to address Condition 7 of the Planning Permission from Ribble Valley Borough Council (Reference 3/2019/0763) for the erection of four residential dwellings on land off Ribblesdale View, Chatburn.
- 4.2 As agreed with United Utilities during the consultation period, surface water runoff from the developed site will be attenuated to 10 l/s and discharged into the public combined water sewer that lies within Ribblesdale View.
- 4.3 The surface water drainage design has catered for surface water runoff generated by all rainfall events up to the 100 year critical rain storm plus 30% on stored volumes. The additional 30% is to allow for climate change and has been included in the surface water volume. Attenuation is provided within the proposed drainage network of pipes and manholes.
- 4.4 Foul water from the developed site will be collected by a piped system and a discharge made into the public combined water sewer manhole that lies within Ribblesdale View.

APPENDIX A



Location Plan

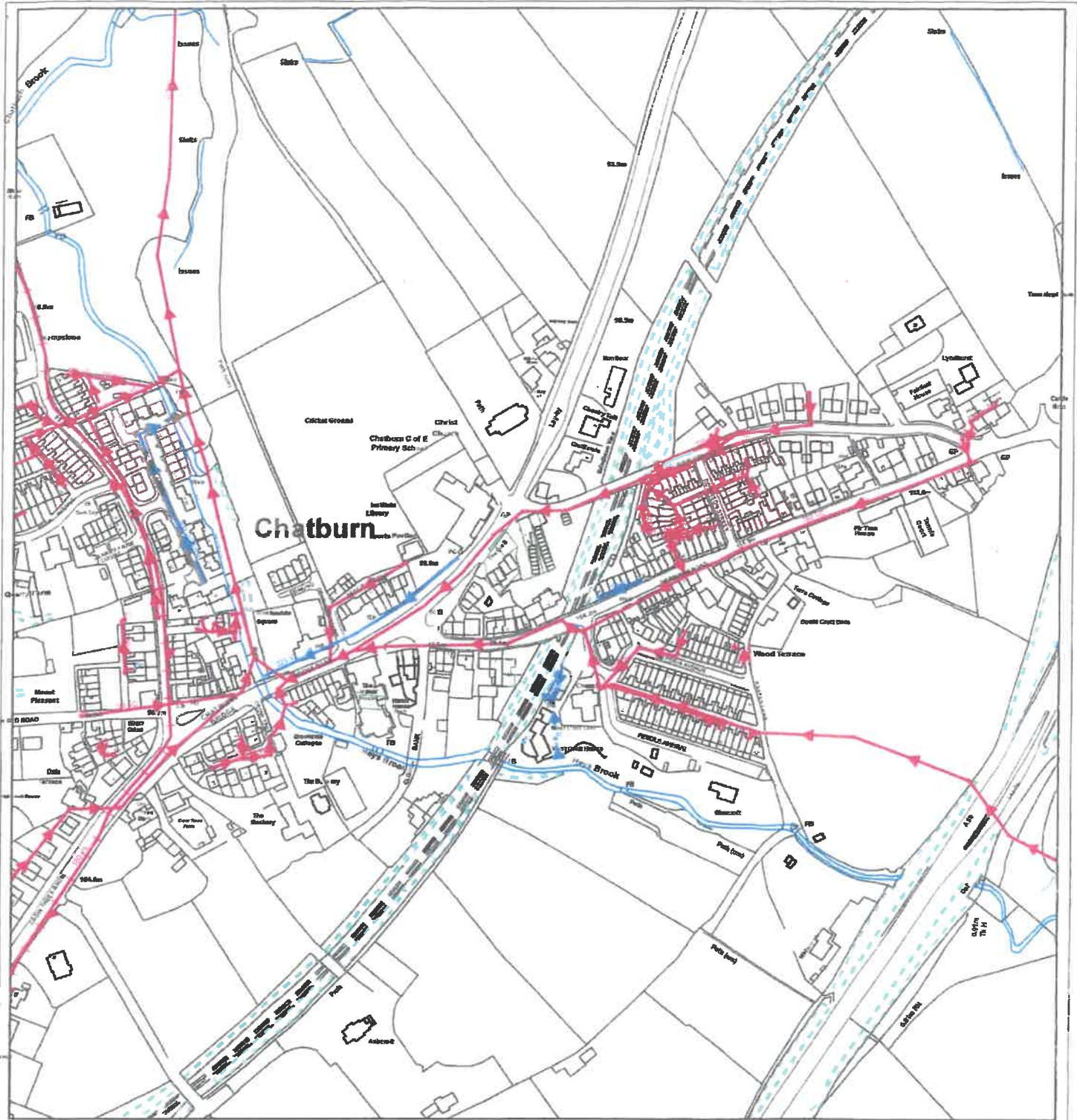
OS MasterMap 1250/2500/10000 scale
 18 April 2016, ID: BV1-00520195
www.blackwellmapping.co.uk
 1:500 scale print at A4, Centre: 377013 E, 444179 N
 ©Crown Copyright Ordnance Survey. Licence no. 100041040

320181179P



BLACKWELL'S
www.blackwellmapping.co.uk
 TEL: 0113 245 2623
maps.leeds@blackwell.co.uk

APPENDIX B



Printed By: Chloe Pile

Date: 06/05/2016

Extract From Map of Public Sewers

SJB



Legend

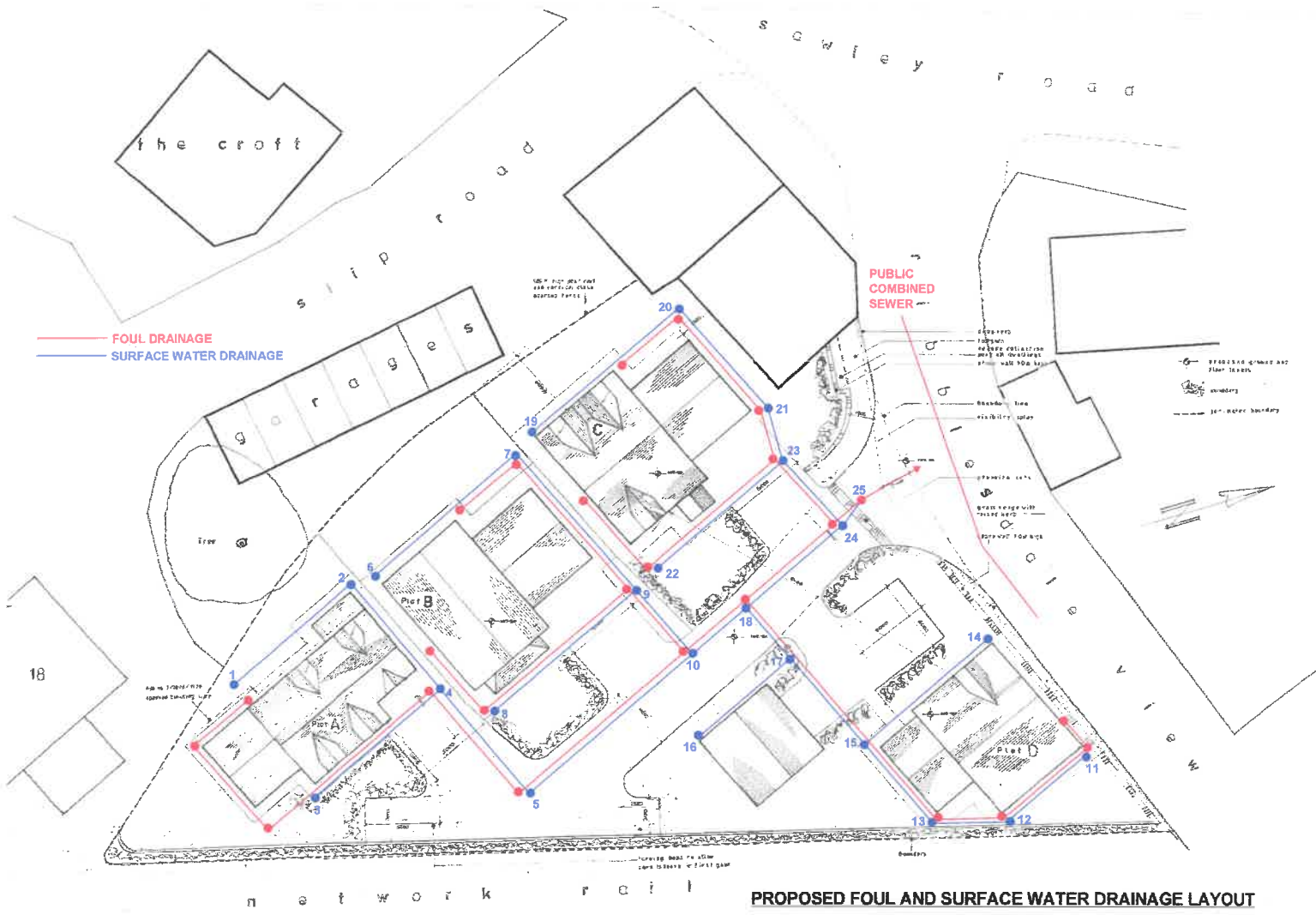
	Water Course
	Overflow Pipe
	Studge Main
	Highway Drain
	Public Sewer
	Private Sewer
	Section 104
	Rising Main
	Combined
	Surface Water
	Foul
	Abandoned

320190763

The position of underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. The actual positions may be different from those shown on the plan and private pipes, sewers or drains may not be recorded. United Utilities will not accept any liability for any damage caused by the actual positions being different from those shown

United Utilities Water Limited 2014 The plan is based on the Ordnance Survey Map with the sanction of Controller of H.M. Stationery Office. Crown and Utilities copyrights are reserved. Unauthorised reproduction will infringe these copyrights.

APPENDIX C



APPENDIX D

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	75.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	19.000	Minimum Backdrop Height (m)	2.000
Ratio-R	0.250	Preferred Cover Depth (m)	0.450
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
1	0.003	5.00	103.350	100	0.550
2	0.002	5.00	103.350	450	0.719
3	0.003	5.00	103.350	100	0.550
4	0.002	5.00	103.350	450	0.921
5	0.011	5.00	103.000	1200	1.300
6	0.003	5.00	103.050	100	0.550
7	0.003	5.00	103.050	450	0.752
8	0.004	5.00	103.050	100	0.550
9	0.004	5.00	103.050	450	0.954
10	0.012	5.00	102.550	1200	1.350
11	0.002	5.00	102.250	100	0.550
12	0.002	5.00	102.250	450	0.668
13	0.002	5.00	102.250	450	0.753
14	0.003	5.00	102.250	100	0.550
15			102.250	450	0.888
16	0.004	5.00	102.300	100	0.550
17	0.006	5.00	102.300	450	1.056
18			102.450	1200	1.350
19	0.003	5.00	102.750	100	0.550
20	0.002	5.00	102.750	450	0.752
21	0.002	5.00	102.750	450	0.904
22	0.003	5.00	102.750	100	0.550
23	0.004	5.00	102.750	450	0.955
24			102.200	1200	1.350
25			102.100	1200	1.350

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	10.000	0.600	102.800	102.631	0.169	59.2	100	5.17	51.8
1.001	2	4	9.000	0.600	102.631	102.479	0.152	59.2	100	5.32	51.3
2.000	3	4	10.000	0.600	102.800	102.479	0.321	31.2	100	5.12	52.0
1.002	4	5	9.000	0.600	102.429	101.700	0.729	12.3	150	5.37	51.1
1.003	5	10	14.000	0.600	101.700	101.200	0.500	28.0	150	5.49	50.7
3.000	6	7	12.000	0.600	102.500	102.298	0.202	59.4	100	5.20	51.7
3.001	7	9	12.000	0.600	102.298	102.096	0.202	59.4	100	5.40	51.0
4.000	8	9	12.000	0.600	102.500	102.096	0.404	29.7	100	5.14	51.9
3.002	9	10	6.000	0.600	102.096	101.250	0.846	7.1	100	5.43	50.8
1.004	10	18	4.000	0.600	101.200	101.100	0.100	40.0	150	5.53	50.5
5.000	11	12	7.000	0.600	101.700	101.582	0.118	59.3	100	5.12	52.0
5.001	12	13	5.000	0.600	101.582	101.497	0.085	58.8	100	5.20	51.7
5.002	13	15	8.000	0.600	101.497	101.362	0.135	59.3	100	5.33	51.2
6.000	14	15	10.000	0.600	101.700	101.362	0.338	29.6	100	5.12	52.0
5.003	15	17	7.000	0.600	101.362	101.244	0.118	59.3	100	5.45	50.8
7.000	16	17	8.000	0.600	101.750	101.244	0.506	15.8	100	5.07	52.1
5.004	17	18	3.000	0.600	101.244	101.150	0.094	31.9	100	5.49	50.7
1.005	18	24	8.000	0.600	101.100	100.850	0.250	32.0	150	5.61	50.3
8.000	19	20	12.000	0.600	102.200	101.998	0.202	59.4	100	5.20	51.7
8.001	20	21	9.000	0.600	101.998	101.846	0.152	59.2	100	5.35	51.1
8.002	21	23	3.000	0.600	101.846	101.795	0.051	58.8	100	5.40	51.0
9.000	22	23	10.000	0.600	102.200	101.795	0.405	24.7	100	5.11	52.0
8.003	23	24	6.000	0.600	101.795	100.900	0.895	6.7	100	5.43	50.8
1.006	24	25	3.000	0.600	100.850	100.750	0.100	30.0	225	5.63	50.2

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.000	1.003	7.9	0.4	0.450	0.619	0.003	0.0
1.001	1.003	7.9	0.7	0.619	0.771	0.005	0.0
2.000	1.387	10.9	0.4	0.450	0.771	0.003	0.0
1.002	2.883	50.9	1.4	0.771	1.150	0.010	0.0
1.003	1.910	33.7	2.9	1.150	1.200	0.021	0.0
3.000	1.001	7.9	0.4	0.450	0.652	0.003	0.0
3.001	1.001	7.9	0.8	0.652	0.854	0.006	0.0
4.000	1.421	11.2	0.6	0.450	0.854	0.004	0.0
3.002	2.921	22.9	1.9	0.854	1.200	0.014	0.0
1.004	1.596	28.2	6.4	1.200	1.200	0.047	0.0
5.000	1.002	7.9	0.3	0.450	0.568	0.002	0.0
5.001	1.006	7.9	0.6	0.568	0.653	0.004	0.0
5.002	1.002	7.9	0.8	0.653	0.788	0.006	0.0
6.000	1.424	11.2	0.4	0.450	0.788	0.003	0.0
5.003	1.002	7.9	1.2	0.788	0.956	0.009	0.0
7.000	1.952	15.3	0.6	0.450	0.956	0.004	0.0
5.004	1.370	10.8	2.6	0.956	1.200	0.019	0.0
1.005	1.786	31.6	9.0	1.200	1.200	0.066	0.0
8.000	1.001	7.9	0.4	0.450	0.652	0.003	0.0
8.001	1.003	7.9	0.7	0.652	0.804	0.005	0.0
8.002	1.006	7.9	1.0	0.804	0.855	0.007	0.0
9.000	1.560	12.2	0.4	0.450	0.855	0.003	0.0
8.003	3.005	23.6	1.9	0.855	1.200	0.014	0.0
1.006	2.397	95.3	10.9	1.125	1.125	0.080	0.0

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.200	Additional Storage (m ³ /ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15 30 60 120 180 240 360 480 600 720 960 1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	0	0	0
100	30	0	0

Node 24 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	100.850	Product Number	CTL-SHE-0141-1000-1350-1000
Design Depth (m)	1.350	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	10.0	Min Node Diameter (mm)	1200

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute summer	1	12	102.813	0.013	0.3	0.0016	0.0000	OK
15 minute summer	2	12	102.648	0.017	0.5	0.0037	0.0000	OK
15 minute summer	3	12	102.812	0.012	0.3	0.0014	0.0000	OK
15 minute summer	4	12	102.444	0.015	1.0	0.0030	0.0000	OK
15 minute winter	5	11	101.726	0.026	2.2	0.0338	0.0000	OK
15 minute summer	6	12	102.513	0.013	0.3	0.0016	0.0000	OK
15 minute summer	7	12	102.317	0.019	0.6	0.0046	0.0000	OK
15 minute winter	8	11	102.513	0.013	0.4	0.0020	0.0000	OK
15 minute winter	9	12	102.113	0.017	1.4	0.0042	0.0000	OK
15 minute winter	10	11	101.246	0.046	4.9	0.0603	0.0000	OK
30 minute summer	11	20	101.711	0.011	0.2	0.0009	0.0000	OK
30 minute summer	12	20	101.597	0.015	0.4	0.0034	0.0000	OK
30 minute summer	13	20	101.516	0.019	0.6	0.0040	0.0000	OK
15 minute summer	14	12	101.711	0.011	0.3	0.0013	0.0000	OK
15 minute winter	15	12	101.385	0.023	0.9	0.0036	0.0000	OK
15 minute winter	16	11	101.761	0.011	0.4	0.0017	0.0000	OK
15 minute winter	17	11	101.275	0.031	2.0	0.0084	0.0000	OK
15 minute winter	18	11	101.147	0.047	6.8	0.0535	0.0000	OK
15 minute summer	19	12	102.213	0.013	0.3	0.0016	0.0000	OK
15 minute summer	20	12	102.015	0.017	0.5	0.0036	0.0000	OK
15 minute summer	21	12	101.868	0.022	0.7	0.0044	0.0000	OK
15 minute summer	22	12	102.211	0.011	0.3	0.0013	0.0000	OK
15 minute winter	23	12	101.812	0.017	1.4	0.0040	0.0000	OK
15 minute winter	24	11	100.997	0.147	8.2	0.1657	0.0000	OK
15 minute summer	25	1	100.750	0.000	7.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute summer	1	1.000	2	0.3	0.448	0.038	0.0076	
15 minute summer	2	1.001	4	0.5	0.556	0.063	0.0081	
15 minute summer	3	2.000	4	0.3	0.600	0.028	0.0050	
15 minute summer	4	1.002	5	1.0	0.742	0.020	0.0129	
15 minute winter	5	1.003	10	2.2	0.676	0.065	0.0463	
15 minute summer	6	3.000	7	0.3	0.363	0.038	0.0101	
15 minute summer	7	3.001	9	0.6	0.629	0.076	0.0117	
15 minute winter	8	4.000	9	0.4	0.557	0.036	0.0090	
15 minute winter	9	3.002	10	1.4	1.586	0.061	0.0053	
15 minute winter	10	1.004	18	4.9	1.046	0.173	0.0187	
30 minute summer	11	5.000	12	0.2	0.329	0.025	0.0043	
30 minute summer	12	5.001	13	0.4	0.454	0.051	0.0044	
30 minute summer	13	5.002	15	0.6	0.522	0.076	0.0094	
15 minute summer	14	6.000	15	0.3	0.589	0.027	0.0092	
15 minute winter	15	5.003	17	0.9	0.542	0.114	0.0119	
15 minute winter	16	7.000	17	0.4	0.412	0.026	0.0101	
15 minute winter	17	5.004	18	1.9	0.980	0.178	0.0059	
15 minute winter	18	1.005	24	6.8	0.619	0.216	0.0890	
15 minute summer	19	8.000	20	0.3	0.443	0.038	0.0091	
15 minute summer	20	8.001	21	0.5	0.472	0.063	0.0096	
15 minute summer	21	8.002	23	0.7	0.683	0.088	0.0031	
15 minute summer	22	9.000	23	0.3	0.514	0.024	0.0065	
15 minute winter	23	8.003	24	1.4	1.043	0.059	0.0258	
15 minute winter	24	Hydro-Brake®	25	8.1				4.1

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	1	11	102.822	0.022	0.8	0.0025	0.0000	OK
15 minute winter	2	11	102.659	0.028	1.3	0.0061	0.0000	OK
15 minute winter	3	11	102.819	0.019	0.8	0.0022	0.0000	OK
15 minute winter	4	11	102.452	0.023	2.6	0.0047	0.0000	OK
15 minute winter	5	10	101.741	0.041	5.6	0.0533	0.0000	OK
15 minute winter	6	11	102.522	0.022	0.8	0.0025	0.0000	OK
15 minute winter	7	11	102.330	0.032	1.6	0.0076	0.0000	OK
15 minute winter	8	10	102.521	0.021	1.1	0.0032	0.0000	OK
15 minute winter	9	10	102.123	0.027	3.8	0.0066	0.0000	OK
30 minute winter	10	23	101.646	0.446	11.0	0.5837	0.0000	SURCHARGED
30 minute summer	11	19	101.717	0.017	0.5	0.0014	0.0000	OK
30 minute winter	12	23	101.649	0.067	1.0	0.0147	0.0000	OK
30 minute winter	13	24	101.648	0.151	2.1	0.0321	0.0000	SURCHARGED
15 minute winter	14	11	101.718	0.018	0.8	0.0021	0.0000	OK
30 minute winter	15	23	101.648	0.286	3.0	0.0454	0.0000	SURCHARGED
15 minute winter	16	10	101.768	0.018	1.1	0.0028	0.0000	OK
30 minute winter	17	23	101.644	0.400	4.3	0.1092	0.0000	SURCHARGED
30 minute winter	18	23	101.640	0.539	11.7	0.6102	0.0000	SURCHARGED
15 minute winter	19	11	102.222	0.022	0.8	0.0025	0.0000	OK
15 minute winter	20	11	102.026	0.028	1.3	0.0058	0.0000	OK
15 minute winter	21	11	101.882	0.036	1.8	0.0072	0.0000	OK
15 minute winter	22	11	102.217	0.017	0.8	0.0020	0.0000	OK
15 minute winter	23	10	101.822	0.027	3.7	0.0065	0.0000	OK
30 minute winter	24	23	101.621	0.771	12.1	0.8716	0.0000	SURCHARGED
15 minute summer	25	1	100.750	0.000	10.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	1	1.000	2	0.8	0.529	0.102	0.0152	
15 minute winter	2	1.001	4	1.3	0.729	0.165	0.0160	
15 minute winter	3	2.000	4	0.8	0.802	0.073	0.0100	
15 minute winter	4	1.002	5	2.6	0.951	0.051	0.0252	
15 minute winter	5	1.003	10	5.5	0.787	0.163	0.1505	
15 minute winter	6	3.000	7	0.8	0.478	0.102	0.0203	
15 minute winter	7	3.001	9	1.6	0.828	0.203	0.0231	
15 minute winter	8	4.000	9	1.1	0.739	0.096	0.0175	
15 minute winter	9	3.002	10	3.7	1.983	0.162	0.0287	
30 minute winter	10	1.004	18	8.7	1.147	0.310	0.0704	
30 minute summer	11	5.000	12	0.5	0.426	0.064	0.0146	
30 minute winter	12	5.001	13	1.0	0.586	0.125	0.0335	
30 minute winter	13	5.002	15	1.5	0.642	0.188	0.0626	
15 minute winter	14	6.000	15	0.8	0.587	0.072	0.0433	
30 minute winter	15	5.003	17	2.4	0.627	0.302	0.0548	
15 minute winter	16	7.000	17	1.1	0.449	0.071	0.0351	
30 minute winter	17	5.004	18	3.8	1.119	0.354	0.0235	
30 minute winter	18	1.005	24	9.6	0.698	0.304	0.1408	
15 minute winter	19	8.000	20	0.8	0.539	0.102	0.0179	
15 minute winter	20	8.001	21	1.3	0.615	0.165	0.0191	
15 minute winter	21	8.002	23	1.8	0.869	0.227	0.0062	
15 minute winter	22	9.000	23	0.8	0.634	0.065	0.0129	
15 minute winter	23	8.003	24	3.6	1.042	0.154	0.0285	
30 minute winter	24	Hydro-Brake®	25	10.0				14.6

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	1	10	102.825	0.025	1.1	0.0029	0.0000	OK
15 minute winter	2	11	102.664	0.033	1.8	0.0071	0.0000	OK
15 minute winter	3	10	102.822	0.022	1.1	0.0025	0.0000	OK
15 minute winter	4	11	102.456	0.027	3.5	0.0054	0.0000	OK
30 minute winter	5	24	101.911	0.211	6.4	0.2737	0.0000	SURCHARGED
15 minute winter	6	10	102.525	0.025	1.1	0.0029	0.0000	OK
15 minute winter	7	10	102.335	0.037	2.2	0.0088	0.0000	OK
30 minute summer	8	18	102.524	0.024	1.4	0.0037	0.0000	OK
15 minute winter	9	10	102.127	0.031	4.9	0.0076	0.0000	OK
30 minute winter	10	24	101.908	0.708	14.3	0.9268	0.0000	SURCHARGED
30 minute winter	11	25	101.909	0.209	1.1	0.0169	0.0000	SURCHARGED
30 minute winter	12	25	101.909	0.327	2.0	0.0716	0.0000	SURCHARGED
30 minute winter	13	25	101.909	0.412	2.6	0.0873	0.0000	SURCHARGED
30 minute winter	14	25	101.907	0.207	1.4	0.0243	0.0000	SURCHARGED
30 minute winter	15	25	101.907	0.545	4.2	0.0867	0.0000	SURCHARGED
30 minute winter	16	24	101.905	0.155	1.3	0.0238	0.0000	SURCHARGED
30 minute winter	17	24	101.905	0.661	5.2	0.1805	0.0000	SURCHARGED
30 minute winter	18	24	101.901	0.801	12.6	0.9062	0.0000	SURCHARGED
15 minute winter	19	10	102.225	0.025	1.1	0.0029	0.0000	OK
15 minute winter	20	11	102.030	0.032	1.8	0.0068	0.0000	OK
15 minute winter	21	11	101.888	0.042	2.4	0.0086	0.0000	OK
15 minute winter	22	10	102.220	0.020	1.1	0.0024	0.0000	OK
30 minute winter	23	25	101.886	0.091	4.2	0.0221	0.0000	OK
30 minute winter	24	24	101.882	1.032	12.6	1.1668	0.0000	SURCHARGED
15 minute summer	25	1	100.750	0.000	10.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	1	1.000	2	1.1	0.572	0.136	0.0188	
15 minute winter	2	1.001	4	1.8	0.792	0.223	0.0199	
15 minute winter	3	2.000	4	1.1	0.871	0.098	0.0123	
15 minute winter	4	1.002	5	3.5	1.045	0.069	0.0817	
30 minute winter	5	1.003	10	6.4	0.763	0.190	0.2465	
15 minute winter	6	3.000	7	1.1	0.518	0.136	0.0249	
15 minute winter	7	3.001	9	2.1	0.893	0.266	0.0283	
30 minute summer	8	4.000	9	1.4	0.799	0.125	0.0211	
15 minute winter	9	3.002	10	4.8	1.948	0.210	0.0297	
30 minute winter	10	1.004	18	10.9	1.160	0.387	0.0704	
30 minute winter	11	5.000	12	0.6	0.447	0.080	0.0548	
30 minute winter	12	5.001	13	1.4	0.613	0.182	0.0391	
30 minute winter	13	5.002	15	2.4	0.638	0.305	0.0626	
30 minute winter	14	6.000	15	0.9	0.588	0.080	0.0782	
30 minute winter	15	5.003	17	3.7	0.611	0.474	0.0548	
30 minute winter	16	7.000	17	1.2	0.423	0.078	0.0626	
30 minute winter	17	5.004	18	5.0	1.083	0.460	0.0235	
30 minute winter	18	1.005	24	10.1	0.716	0.319	0.1408	
15 minute winter	19	8.000	20	1.1	0.584	0.136	0.0220	
15 minute winter	20	8.001	21	1.7	0.662	0.222	0.0239	
15 minute winter	21	8.002	23	2.5	0.918	0.312	0.0084	
15 minute winter	22	9.000	23	1.1	0.670	0.088	0.0181	
30 minute winter	23	8.003	24	4.2	1.043	0.177	0.0459	
30 minute winter	24	Hydro-Brake®	25	10.0				19.0

Results for 100 year +30% CC Critical Storm Duration. Lowest mass balance: 99.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	1	10	102.828	0.028	1.4	0.0033	0.0000	OK
15 minute winter	2	11	102.669	0.038	2.3	0.0082	0.0000	OK
15 minute winter	3	10	102.825	0.025	1.4	0.0029	0.0000	OK
15 minute winter	4	11	102.459	0.030	4.5	0.0061	0.0000	OK
60 minute winter	5	44	102.209	0.509	6.3	0.6613	0.0000	SURCHARGED
15 minute winter	6	10	102.528	0.028	1.4	0.0033	0.0000	OK
15 minute winter	7	10	102.341	0.043	2.8	0.0102	0.0000	OK
30 minute summer	8	18	102.527	0.027	1.8	0.0042	0.0000	OK
60 minute winter	9	44	102.213	0.117	4.2	0.0284	0.0000	SURCHARGED
60 minute winter	10	44	102.205	1.005	13.1	1.3157	0.0000	SURCHARGED
60 minute winter	11	45	102.207	0.507	1.5	0.0410	0.0000	FLOOD RISK
60 minute winter	12	45	102.206	0.624	1.9	0.1368	0.0000	FLOOD RISK
60 minute winter	13	44	102.206	0.709	2.4	0.1503	0.0000	FLOOD RISK
60 minute winter	14	44	102.206	0.506	1.8	0.0592	0.0000	FLOOD RISK
60 minute winter	15	44	102.205	0.843	3.9	0.1341	0.0000	FLOOD RISK
60 minute winter	16	44	102.204	0.454	1.3	0.0694	0.0000	FLOOD RISK
60 minute winter	17	44	102.203	0.959	5.1	0.2618	0.0000	FLOOD RISK
60 minute winter	18	44	102.197	1.097	13.0	1.2408	0.0000	FLOOD RISK
15 minute winter	19	10	102.228	0.028	1.4	0.0033	0.0000	OK
60 minute winter	20	44	102.181	0.183	1.6	0.0389	0.0000	SURCHARGED
60 minute winter	21	44	102.180	0.334	2.1	0.0679	0.0000	SURCHARGED
15 minute winter	22	10	102.223	0.023	1.4	0.0027	0.0000	OK
60 minute winter	23	44	102.180	0.385	4.2	0.0934	0.0000	SURCHARGED
60 minute winter	24	44	102.173	1.323	11.9	1.4966	0.0000	FLOOD RISK
15 minute summer	25	1	100.750	0.000	10.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	1	1.000	2	1.4	0.609	0.174	0.0227	
15 minute winter	2	1.001	4	2.3	0.847	0.286	0.0239	
15 minute winter	3	2.000	4	1.4	0.934	0.126	0.0147	
15 minute winter	4	1.002	5	4.5	1.074	0.088	0.0906	
60 minute winter	5	1.003	10	5.9	0.794	0.173	0.2465	
15 minute winter	6	3.000	7	1.4	0.552	0.175	0.0300	
15 minute winter	7	3.001	9	2.7	0.936	0.345	0.0373	
30 minute summer	8	4.000	9	1.8	0.855	0.161	0.0309	
60 minute winter	9	3.002	10	4.2	1.887	0.183	0.0469	
60 minute winter	10	1.004	18	10.9	1.140	0.387	0.0704	
60 minute winter	11	5.000	12	-0.9	0.428	-0.110	0.0548	
60 minute winter	12	5.001	13	1.6	0.587	0.199	0.0391	
60 minute winter	13	5.002	15	2.5	0.648	0.315	0.0626	
60 minute winter	14	6.000	15	-0.9	0.588	-0.082	0.0782	
60 minute winter	15	5.003	17	3.8	0.609	0.484	0.0548	
60 minute winter	16	7.000	17	1.2	0.432	0.077	0.0626	
60 minute winter	17	5.004	18	5.0	1.092	0.467	0.0235	
60 minute winter	18	1.005	24	9.4	0.679	0.299	0.1408	
15 minute winter	19	8.000	20	1.4	0.624	0.175	0.0265	
60 minute winter	20	8.001	21	1.5	0.638	0.190	0.0704	
60 minute winter	21	8.002	23	2.1	0.885	0.265	0.0235	
15 minute winter	22	9.000	23	1.4	0.700	0.113	0.0450	
60 minute winter	23	8.003	24	4.0	1.043	0.168	0.0469	
60 minute winter	24	Hydro-Brake®	25	10.0				35.2