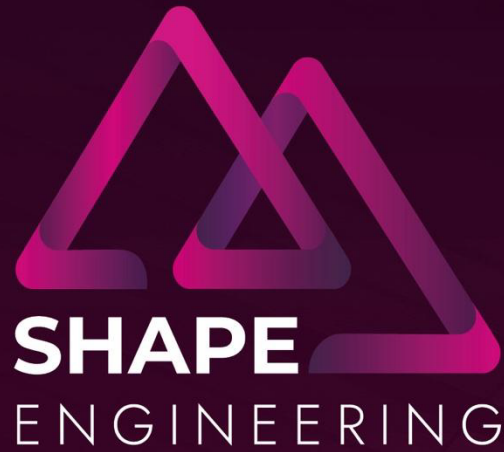




HIGHMOOR FARM, CLITHEROE

LLFA RESPONSE
REVISION A

17th June 2026

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1.0 INTRODUCTION

- 1.1 This report has been produced to provide a formal response to the drainage comments provided by the Lead Local Flood received in May 2026 relating to the planning application (3/2026/0314).
- 1.2 The comments provided by the LLFA are set out below along with a designers response, in blue, to each.

2.0 LLFA COMMENTS

Lead Local Flood Authority Position

- 2.1 The Lead Local Flood Authority cannot recommend the discharge of condition 23 on planning decision 3/2020/0601 on the basis of:
- The applicant has provided evidence within the catchment plan of a contributing area of approximately 2.444ha, however the applicant has provided evidence of the greenfield scenario being based on 3.973ha, giving a Q_{bar} of approximately 37.5l/s, although this approach was acceptable in principle, the contributing areas used to calculate the existing scenario and the proposed development are expected to be consistent. Should the applicant only intend to drain the impermeable areas (including the area for the proposed basin) then the proposed final discharge rate should also be based on the same contributing area.

A surface water catchment plan has been provided in Appendix A. The surface water catchment plan indicates the contributing areas that have been used to calculate the existing runoff rate. Likewise, the areas have been used within the surface water calculations which are provided in Appendix B.

The total developable area of the site including the basin area, but excluding permeable POS, is 2.451ha. This area provides a greenfield runoff rate Q_{bar} of 23.1l/s. The revised greenfield runoff rates are provided in Appendix C.

- The applicant has failed to provide evidence of the drainage calculations for the 1 in 1 year event.

The surface water drainage calculations, Appendix B, have been revised to include the 1 in 1 year event.

- The applicant has failed to provide evidence of details of an appropriate management and maintenance plan for the surface water drainage network over the lifetime of the development.

A Drainage Operation, Management and Maintenance schedule has been previously provided. The OMM is also provided in Appendix D.

2.2 The Lead Local Flood Authority cannot recommend the discharge of condition 25 on planning decision 3/2020/0601 on the basis of:

- The applicant has failed to provide evidence of site-specific measures of how surface water will be managed onsite during the construction phase, prior to the proposed surface water drainage system being constructed, as well as site-specific measures for pollution and siltation mitigation. The applicant should provide evidence of a construction phase layout plan that depicts the proposed location of any mitigation measures as well as evidence to demonstrate that surface water will not be discharged from the site at a rate higher than the greenfield equivalent.

A construction phase surface water management plan will be provided by Morris Homes. The plan will be submitted upon receipt.

Lead Local Flood Authority Site-Specific Advice

2.3 The following comments are provided to support the Local Planning Authority in its consideration of this application. While they do not constitute a formal objection, they highlight areas that may benefit from further attention, either at this stage or in future submissions. These comments are intended to support informed decision-making and encourage the adoption of relevant guidance, standards and best practice.

- The applicant should seek to clarify the accuracy of the modelling software in regard to the modelled surface water sustainable drainage system, as the mass balance is indicated to be a figure of 69.1%, which is lower than the expected guidance parameters.

The revised surface water calculations are provided in Appendix B. Within the revised calculations, the mass balance is no longer below the expected guidance parameters.

3.0 APPENDIX A – SURFACE WATER CATCHMENT PLAN

4.0 APPENDIX B – SURFACE WATER CALCULATIONS

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
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)	0.650
Ratio-R	0.250	Preferred Cover Depth (m)	1.200
CV	1.000	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)	Easting (m)	Northing (m)	Depth (m)
1	0.175	5.00	98.348	1350	375152.585	441486.944	1.927
2	0.000		98.430	1350	375136.780	441498.650	2.206
3	0.139	5.00	97.904	1350	375104.162	441507.340	2.018
4	0.104	5.00	96.169	1350	375068.503	441517.424	1.417
5	0.079	5.00	95.595	1350	375057.846	441526.304	1.421
6			95.250	1800	375053.313	441541.555	2.344
8	0.015	5.00	95.000	1800	375052.034	441554.621	2.119
9	0.048	5.00	95.534	1800	375061.610	441557.360	2.678
10	0.000	5.00	95.754	1800	375068.966	441564.220	2.923
11	0.000	5.00	95.769	1800	375072.018	441572.775	2.961
12	0.000		95.807	1800	375073.925	441602.403	3.073
13	0.000		95.717	1800	375077.791	441611.401	3.007
14	0.103	5.00	95.747	2100	375083.542	441616.100	3.056
15	0.174	5.00	97.652	1350	375138.538	441578.532	1.500
16	0.129	5.00	96.647	1350	375126.652	441614.270	1.700
17	0.073	5.00	96.241	1800	375119.676	441628.046	3.645
18	0.132	5.00	99.434	1500	375243.470	441619.678	2.100
19	0.109	5.00	98.991	1500	375222.886	441601.681	1.930
20	0.080	5.00	98.791	1500	375212.291	441613.181	1.886
21			98.519	1500	375204.772	441617.142	1.699
22	0.159	5.00	98.151	1500	375190.039	441618.938	2.000
23	0.141	5.00	96.700	1500	375154.321	441658.811	2.690
24	0.077	5.00	96.405	2100	375145.843	441651.283	3.896
25	0.120	5.00	95.449	1800	375103.444	441699.849	3.101
26	0.059	5.00	95.383	1800	375082.262	441724.737	3.117
27	0.069	5.00	95.040	1800	375086.728	441728.889	2.789
28	0.158	5.00	97.516	1350	375209.415	441683.185	1.500
29	0.109	5.00	96.591	1350	375192.602	441699.519	1.500
30	0.102	5.00	95.670	1350	375163.952	441724.684	1.532
31	0.063	5.00	94.800	2700	375127.586	441766.871	2.688
31_OUT			93.250	1350	375107.326	441785.438	1.320
32	0.034	5.00	93.250	1350	375100.737	441807.482	1.363
33			93.600	2100	375097.946	441817.816	1.820
33_OUT			93.000		375099.128	441840.563	2.287
35	0.000		97.300	1350	375188.122	441690.691	1.695
34	0.000	5.00	97.150	1350	375180.394	441683.011	1.500

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)	Design Flow (l/s)
1.000	1	2	19.668	0.600	96.421	96.224	0.197	100.0	300	5.21	50.0	20.0
1.001	2	3	33.756	0.600	96.224	95.886	0.338	100.0	300	5.57	50.0	
1.002	3	4	37.057	0.600	95.886	94.827	1.059	35.0	300	5.80	49.6	
1.003	4	5	13.872	0.600	94.752	94.174	0.578	24.0	375	5.86	49.4	
1.004	5	6	15.910	0.600	94.174	93.581	0.593	26.8	375	5.94	49.2	
1.005	6	8	13.128	0.600	92.906	92.881	0.025	525.0	750	6.12	48.6	
1.006	8	9	9.960	0.600	92.881	92.856	0.025	398.4	750	6.24	48.3	
1.007	9	10	10.058	0.600	92.856	92.831	0.025	402.3	750	6.36	47.9	
1.008	10	11	9.083	0.600	92.831	92.808	0.023	400.0	750	6.46	47.6	
1.009	11	12	29.689	0.600	92.808	92.734	0.074	400.0	750	6.82	46.6	
1.010	12	13	9.793	0.600	92.734	92.710	0.024	400.0	750	6.94	46.3	
1.011	13	14	7.427	0.600	92.710	92.691	0.019	400.0	750	7.03	46.0	
1.012	14	17	38.057	0.600	92.691	92.596	0.095	400.0	750	7.48	44.9	
2.000	15	16	37.663	0.600	96.152	94.947	1.205	31.2	300	5.22	50.0	
2.001	16	17	15.442	0.600	94.947	94.638	0.309	50.0	300	5.34	50.0	
1.013	17	24	34.995	0.600	92.596	92.509	0.087	400.0	750	7.90	43.8	20.0
3.000	18	19	27.342	0.600	97.334	97.061	0.273	100.0	300	5.29	50.0	
3.001	19	20	15.637	0.600	97.061	96.905	0.156	100.0	300	5.46	50.0	
3.002	20	21	8.499	0.600	96.905	96.820	0.085	100.0	300	5.55	50.0	
3.003	21	22	14.842	0.600	96.820	96.226	0.594	25.0	300	5.62	50.0	
3.004	22	23	53.532	0.600	96.151	94.010	2.141	25.0	375	5.87	49.4	
3.005	23	24	11.338	0.600	94.010	93.443	0.567	20.0	375	5.92	49.3	
1.014	24	25	64.470	0.600	92.509	92.348	0.161	400.0	750	8.67	0.0	
1.015	25	26	32.682	0.600	92.348	92.266	0.082	400.0	750	9.06	41.3	

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.572	111.1	31.6	1.627	1.906	0.175	0.0	109	1.361
1.001	1.572	111.1	31.6	1.906	1.718	0.175	0.0	109	1.361
1.002	2.666	188.5	56.3	1.718	1.042	0.314	0.0	112	2.339
1.003	3.711	409.9	74.7	1.042	1.046	0.418	0.0	107	2.843
1.004	3.509	387.6	88.4	1.046	1.294	0.497	0.0	121	2.866
1.005	1.214	536.4	87.3	1.594	1.369	0.497	0.0	203	0.904
1.006	1.396	616.5	89.3	1.369	1.928	0.512	0.0	191	1.007
1.007	1.389	613.5	97.0	1.928	2.173	0.560	0.0	200	1.027
1.008	1.393	615.3	96.3	2.173	2.211	0.560	0.0	199	1.028
1.009	1.393	615.3	94.3	2.211	2.323	0.560	0.0	197	1.022
1.010	1.393	615.3	93.6	2.323	2.257	0.560	0.0	196	1.020
1.011	1.393	615.3	93.2	2.257	2.306	0.560	0.0	195	1.018
1.012	1.393	615.3	107.5	2.306	2.895	0.663	0.0	211	1.060
2.000	2.822	199.5	31.4	1.200	1.400	0.174	0.0	80	2.077
2.001	2.229	157.6	54.8	1.400	1.303	0.303	0.0	122	2.032
1.013	1.393	615.3	164.7	2.895	3.146	1.039	0.0	263	1.188
3.000	1.572	111.1	23.9	1.800	1.630	0.132	0.0	94	1.260
3.001	1.572	111.1	43.5	1.630	1.586	0.241	0.0	130	1.480
3.002	1.572	111.1	58.0	1.586	1.399	0.321	0.0	154	1.588
3.003	3.157	223.1	58.0	1.399	1.625	0.321	0.0	104	2.668
3.004	3.636	401.6	20.0	1.625	2.315	0.480	0.0	56	1.922
3.005	4.067	449.2	110.5	2.315	2.587	0.621	0.0	126	3.392
1.014	1.393	615.3	0.0	3.146	2.351	1.737	0.0	0	0.000
1.015	1.393	615.3	277.3	2.351	2.367	1.857	0.0	353	1.358

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)	Design Flow (l/s)
1.016	26	27	6.098	0.600	92.266	92.251	0.015	400.0	750	9.14	41.2	40.0
1.017	27	31	55.785	0.600	92.251	92.112	0.139	401.3	750	9.80	0.0	
4.000	28	29	23.441	0.600	96.016	95.091	0.925	25.3	300	5.12	50.0	
4.001	29	30	38.133	0.600	95.091	94.138	0.953	40.0	300	5.48	50.0	
4.002	30	31	55.698	0.600	94.138	92.412	1.726	32.3	300	5.82	49.6	
1.018	31	31_OUT	27.481	0.600	92.112	92.000	0.112	245.4	300	10.26	39.1	
6.000	32	33	10.704	0.600	91.887	91.780	0.107	100.0	300	5.11	50.0	
6.001	33	33_OUT	16.000	0.600	91.780	90.713	1.067	15.0	300	5.18	50.0	
7.000	34	35	10.895	0.600	95.650	95.605	0.045	242.1	300	5.18	50.0	
7.001	35	29	9.900	0.600	95.605	95.091	0.514	19.3	300	5.23	50.0	

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.016	1.393	615.3	285.1	2.367	2.039	1.916	0.0	359	1.368
1.017	1.390	614.3	0.0	2.039	1.938	1.985	0.0	0	0.000
4.000	3.135	221.6	28.6	1.200	1.200	0.158	0.0	72	2.183
4.001	2.493	176.2	48.2	1.200	1.232	0.267	0.0	107	2.136
4.002	2.777	196.3	66.1	1.232	2.088	0.369	0.0	120	2.515
1.018	0.999	70.6	40.0	2.388	0.950	2.417	0.0	162	1.030
6.000	1.572	111.1	6.1	1.063	1.520	0.034	0.0	48	0.857
6.001	4.079	288.3	6.1	1.520	1.987	0.034	0.0	30	1.680
7.000	1.006	71.1	0.0	1.200	1.395	0.000	0.0	0	0.000
7.001	3.598	254.4	0.0	1.395	1.200	0.000	0.0	0	0.000

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	19.668	100.0	300	Circular_Default Sewer Type	98.348	96.421	1.627	98.430	96.224	1.906
1.001	33.756	100.0	300	Circular_Default Sewer Type	98.430	96.224	1.906	97.904	95.886	1.718
1.002	37.057	35.0	300	Circular_Default Sewer Type	97.904	95.886	1.718	96.169	94.827	1.042
1.003	13.872	24.0	375	Circular_Default Sewer Type	96.169	94.752	1.042	95.595	94.174	1.046
1.004	15.910	26.8	375	Circular_Default Sewer Type	95.595	94.174	1.046	95.250	93.581	1.294
1.005	13.128	525.0	750	Circular_Default Sewer Type	95.250	92.906	1.594	95.000	92.881	1.369
1.006	9.960	398.4	750	Circular_Default Sewer Type	95.000	92.881	1.369	95.534	92.856	1.928
1.007	10.058	402.3	750	Circular_Default Sewer Type	95.534	92.856	1.928	95.754	92.831	2.173
1.008	9.083	400.0	750	Circular_Default Sewer Type	95.754	92.831	2.173	95.769	92.808	2.211
1.009	29.689	400.0	750	Circular_Default Sewer Type	95.769	92.808	2.211	95.807	92.734	2.323

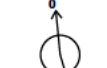
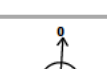
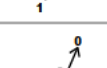
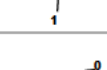
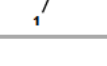
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1350	Manhole	Adoptable	2	1350	Manhole	Adoptable
1.001	2	1350	Manhole	Adoptable	3	1350	Manhole	Adoptable
1.002	3	1350	Manhole	Adoptable	4	1350	Manhole	Adoptable
1.003	4	1350	Manhole	Adoptable	5	1350	Manhole	Adoptable
1.004	5	1350	Manhole	Adoptable	6	1800	Manhole	Adoptable
1.005	6	1800	Manhole	Adoptable	8	1800	Manhole	Adoptable
1.006	8	1800	Manhole	Adoptable	9	1800	Manhole	Adoptable
1.007	9	1800	Manhole	Adoptable	10	1800	Manhole	Adoptable
1.008	10	1800	Manhole	Adoptable	11	1800	Manhole	Adoptable
1.009	11	1800	Manhole	Adoptable	12	1800	Manhole	Adoptable

Pipeline Schedule

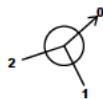
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.010	9.793	400.0	750	Circular_Default Sewer Type	95.807	92.734	2.323	95.717	92.710	2.257
1.011	7.427	400.0	750	Circular_Default Sewer Type	95.717	92.710	2.257	95.747	92.691	2.306
1.012	38.057	400.0	750	Circular_Default Sewer Type	95.747	92.691	2.306	96.241	92.596	2.895
2.000	37.663	31.2	300	Circular_Default Sewer Type	97.652	96.152	1.200	96.647	94.947	1.400
2.001	15.442	50.0	300	Circular_Default Sewer Type	96.647	94.947	1.400	96.241	94.638	1.303
1.013	34.995	400.0	750	Circular_Default Sewer Type	96.241	92.596	2.895	96.405	92.509	3.146
3.000	27.342	100.0	300	Circular_Default Sewer Type	99.434	97.334	1.800	98.991	97.061	1.630
3.001	15.637	100.0	300	Circular_Default Sewer Type	98.991	97.061	1.630	98.791	96.905	1.586
3.002	8.499	100.0	300	Circular_Default Sewer Type	98.791	96.905	1.586	98.519	96.820	1.399
3.003	14.842	25.0	300	Circular_Default Sewer Type	98.519	96.820	1.399	98.151	96.226	1.625
3.004	53.532	25.0	375	Circular_Default Sewer Type	98.151	96.151	1.625	96.700	94.010	2.315
3.005	11.338	20.0	375	Circular_Default Sewer Type	96.700	94.010	2.315	96.405	93.443	2.587
1.014	64.470	400.0	750	Circular_Default Sewer Type	96.405	92.509	3.146	95.449	92.348	2.351
1.015	32.682	400.0	750	Circular_Default Sewer Type	95.449	92.348	2.351	95.383	92.266	2.367
1.016	6.098	400.0	750	Circular_Default Sewer Type	95.383	92.266	2.367	95.040	92.251	2.039
1.017	55.785	401.3	750	Circular_Default Sewer Type	95.040	92.251	2.039	94.800	92.112	1.938
4.000	23.441	25.3	300	Circular_Default Sewer Type	97.516	96.016	1.200	96.591	95.091	1.200
4.001	38.133	40.0	300	Circular_Default Sewer Type	96.591	95.091	1.200	95.670	94.138	1.232
4.002	55.698	32.3	300	Circular_Default Sewer Type	95.670	94.138	1.232	94.800	92.412	2.088
1.018	27.481	245.4	300	Circular_Default Sewer Type	94.800	92.112	2.388	93.250	92.000	0.950
6.000	10.704	100.0	300	Circular_Default Sewer Type	93.250	91.887	1.063	93.600	91.780	1.520
6.001	16.000	15.0	300	Circular_Default Sewer Type	93.600	91.780	1.520	93.000	90.713	1.987
7.000	10.895	242.1	300	Circular_Default Sewer Type	97.150	95.650	1.200	97.300	95.605	1.395
7.001	9.900	19.3	300	Circular_Default Sewer Type	97.300	95.605	1.395	96.591	95.091	1.200

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.010	12	1800	Manhole	Adoptable	13	1800	Manhole	Adoptable
1.011	13	1800	Manhole	Adoptable	14	2100	Manhole	Adoptable
1.012	14	2100	Manhole	Adoptable	17	1800	Manhole	Adoptable
2.000	15	1350	Manhole	Adoptable	16	1350	Manhole	Adoptable
2.001	16	1350	Manhole	Adoptable	17	1800	Manhole	Adoptable
1.013	17	1800	Manhole	Adoptable	24	2100	Manhole	Adoptable
3.000	18	1500	Manhole	Adoptable	19	1500	Manhole	Adoptable
3.001	19	1500	Manhole	Adoptable	20	1500	Manhole	Adoptable
3.002	20	1500	Manhole	Adoptable	21	1500	Manhole	Adoptable
3.003	21	1500	Manhole	Adoptable	22	1500	Manhole	Adoptable
3.004	22	1500	Manhole	Adoptable	23	1500	Manhole	Adoptable
3.005	23	1500	Manhole	Adoptable	24	2100	Manhole	Adoptable
1.014	24	2100	Manhole	Adoptable	25	1800	Manhole	Adoptable
1.015	25	1800	Manhole	Adoptable	26	1800	Manhole	Adoptable
1.016	26	1800	Manhole	Adoptable	27	1800	Manhole	Adoptable
1.017	27	1800	Manhole	Adoptable	31	2700	Manhole	Adoptable
4.000	28	1350	Manhole	Adoptable	29	1350	Manhole	Adoptable
4.001	29	1350	Manhole	Adoptable	30	1350	Manhole	Adoptable
4.002	30	1350	Manhole	Adoptable	31	2700	Manhole	Adoptable
1.018	31	2700	Manhole	Adoptable	31_OUT	1350	Manhole	Adoptable
6.000	32	1350	Manhole	Adoptable	33	2100	Manhole	Adoptable
6.001	33	2100	Manhole	Adoptable	33_OUT		Junction	
7.000	34	1350	Manhole	Adoptable	35	1350	Manhole	Adoptable
7.001	35	1350	Manhole	Adoptable	29	1350	Manhole	Adoptable

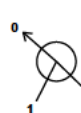
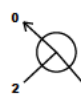
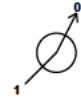
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
1	375152.585	441486.944	98.348	1.927	1350		0	1.000	96.421	300
2	375136.780	441498.650	98.430	2.206	1350		1	1.000	96.224	300
3	375104.162	441507.340	97.904	2.018	1350		1	1.001	96.224	300
4	375068.503	441517.424	96.169	1.417	1350		1	1.001	95.886	300
5	375057.846	441526.304	95.595	1.421	1350		1	1.002	95.886	300
6	375053.313	441541.555	95.250	2.344	1800		1	1.002	94.827	300
8	375052.034	441554.621	95.000	2.119	1800		1	1.003	94.752	375
9	375061.610	441557.360	95.534	2.678	1800		1	1.003	94.174	375
10	375068.966	441564.220	95.754	2.923	1800		1	1.004	94.174	375
11	375072.018	441572.775	95.769	2.961	1800		1	1.004	93.581	375
12	375073.925	441602.403	95.807	3.073	1800		1	1.005	92.906	750
13	375077.791	441611.401	95.717	3.007	1800		1	1.005	92.881	750
14	375083.542	441616.100	95.747	3.056	2100		1	1.006	92.881	750
							0	1.006	92.856	750

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
15	375138.538	441578.532	97.652	1.500	1350		0	2.000	96.152	300
16	375126.652	441614.270	96.647	1.700	1350		1	2.000	94.947	300
17	375119.676	441628.046	96.241	3.645	1800		0	2.001	94.947	300
							1	2.001	94.638	300
							2	1.012	92.596	750
							0	1.013	92.596	750
18	375243.470	441619.678	99.434	2.100	1500		0	3.000	97.334	300
19	375222.886	441601.681	98.991	1.930	1500		1	3.000	97.061	300
							0	3.001	97.061	300
20	375212.291	441613.181	98.791	1.886	1500		1	3.001	96.905	300
							0	3.002	96.905	300
21	375204.772	441617.142	98.519	1.699	1500		1	3.002	96.820	300
							0	3.003	96.820	300
22	375190.039	441618.938	98.151	2.000	1500		1	3.003	96.226	300
							0	3.004	96.151	375
23	375154.321	441658.811	96.700	2.690	1500		1	3.004	94.010	375
							0	3.005	94.010	375
24	375145.843	441651.283	96.405	3.896	2100		1	3.005	93.443	375
							2	1.013	92.509	750
							0	1.014	92.509	750
25	375103.444	441699.849	95.449	3.101	1800		1	1.014	92.348	750
							0	1.015	92.348	750
26	375082.262	441724.737	95.383	3.117	1800		1	1.015	92.266	750
							0	1.016	92.266	750
27	375086.728	441728.889	95.040	2.789	1800		1	1.016	92.251	750
							0	1.017	92.251	750

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
28	375209.415	441683.185	97.516	1.500	1350		0	4.000	96.016	300
29	375192.602	441699.519	96.591	1.500	1350		1	7.001	95.091	300
							2	4.000	95.091	300
							0	4.001	95.091	300
30	375163.952	441724.684	95.670	1.532	1350		1	4.001	94.138	300
							0	4.002	94.138	300
31	375127.586	441766.871	94.800	2.688	2700		1	4.002	92.412	300
							2	1.017	92.112	750
							0	1.018	92.112	300
31_OUT	375107.326	441785.438	93.250	1.320	1350		1	1.018	92.000	300
32	375100.737	441807.482	93.250	1.363	1350		0	6.000	91.887	300
33	375097.946	441817.816	93.600	1.820	2100		1	6.000	91.780	300
							0	6.001	91.780	300
33_OUT	375099.128	441840.563	93.000	2.287			1	6.001	90.713	300
35	375188.122	441690.691	97.300	1.695	1350		1	7.000	95.605	300
							0	7.001	95.605	300
34	375180.394	441683.011	97.150	1.500	1350		0	7.000	95.650	300

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	✓
Rainfall Events	Singular	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	0.0
M5-60 (mm)	19.000	Starting Level (m)	
Ratio-R	0.250	Check Discharge Rate(s)	x
Summer CV	1.000	Check Discharge Volume	✓
Winter CV	1.000	100 year 360 minute (m³)	
Analysis Speed	Detailed		

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	10	0
30	40	10	0
100	40	10	0

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)	2.452	Storm Duration (mins)	360
Soil Index	4	Betterment (%)	0
SPR	0.47	PR	
CWI		Runoff Volume (m³)	

Node 33 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	91.780	Product Number	CTL-SHE-0210-2310-1100-2310
Design Depth (m)	1.100	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	23.1	Min Node Diameter (mm)	1800

Node 31 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	92.112	Product Number	CTL-SHE-0205-2350-1600-2350
Design Depth (m)	1.600	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	23.5	Min Node Diameter (mm)	1800

Node 32 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	17.210
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	91.887	Main Channel Slope (1:X)	400.0
Safety Factor	2.0	Time to half empty (mins)	0	Main Channel n	0.250

Inlets

31_OUT

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	165.0	163.0	1.400	336.0	547.7

Node 31 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	92.112
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	1300.0	0.0	1.600	1300.0	0.0	1.601	0.0	0.0

Node 25 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	92.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	255

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	150.0	150.0	1.600	150.0	202.1	1.601	0.0	202.1

Node 12 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	93.300
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	135

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	274.0	215.0	0.800	274.0	277.4	0.801	0.0	277.4

Results for 1 year +10% A Critical Storm Duration. Lowest mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	96.528	0.107	27.9	0.1537	0.0000	OK
15 minute summer	2	10	96.328	0.104	27.7	0.1486	0.0000	OK
15 minute summer	3	11	95.994	0.108	49.6	0.1539	0.0000	OK
15 minute summer	4	10	94.858	0.106	65.2	0.1518	0.0000	OK
15 minute summer	5	11	94.297	0.123	77.5	0.1765	0.0000	OK
15 minute summer	6	11	93.127	0.221	77.5	0.5614	0.0000	OK
15 minute summer	8	11	93.100	0.219	79.7	0.5577	0.0000	OK
15 minute summer	9	11	93.076	0.220	86.6	0.5599	0.0000	OK
15 minute summer	10	12	93.044	0.213	86.0	0.5424	0.0000	OK
15 minute summer	11	12	93.011	0.203	85.1	0.5159	0.0000	OK
15 minute summer	12	12	92.961	0.227	84.8	0.5775	0.0000	OK
15 minute summer	13	12	92.937	0.227	83.3	0.5773	0.0000	OK
30 minute summer	14	20	92.914	0.223	93.3	0.7725	0.0000	OK
15 minute summer	15	10	96.227	0.075	27.8	0.1071	0.0000	OK
15 minute summer	16	10	95.069	0.123	48.2	0.1756	0.0000	OK
15 minute summer	17	12	92.885	0.289	143.1	0.7360	0.0000	OK
15 minute summer	18	10	97.422	0.088	21.1	0.1548	0.0000	OK
15 minute summer	19	10	97.194	0.133	38.3	0.2350	0.0000	OK
15 minute summer	20	10	97.061	0.156	50.6	0.2764	0.0000	OK
15 minute summer	21	11	96.924	0.104	50.2	0.1843	0.0000	OK
15 minute summer	22	11	96.259	0.108	75.1	0.1916	0.0000	OK
15 minute summer	23	11	94.144	0.134	96.9	0.2363	0.0000	OK
15 minute summer	24	12	92.852	0.343	237.8	1.1888	0.0000	OK
15 minute summer	25	12	92.751	0.403	249.1	1.0256	0.0000	OK
15 minute summer	26	12	92.701	0.435	254.7	1.1077	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	27.7	1.251	0.249	0.4353	
15 minute summer	2	1.001	3	27.4	1.240	0.247	0.7467	
15 minute summer	3	1.002	4	49.1	2.221	0.261	0.8201	
15 minute summer	4	1.003	5	65.1	2.287	0.159	0.3956	
15 minute summer	5	1.004	6	77.5	2.617	0.200	0.4711	
15 minute summer	6	1.005	8	77.4	0.736	0.144	1.4101	
15 minute summer	8	1.006	9	79.3	0.744	0.129	1.0679	
15 minute summer	9	1.007	10	86.0	0.821	0.140	1.0574	
15 minute summer	10	1.008	11	85.1	0.866	0.138	0.9026	
15 minute summer	11	1.009	12	84.8	0.843	0.138	3.0897	
15 minute summer	12	1.010	13	83.3	0.755	0.135	1.0989	
15 minute summer	13	1.011	14	82.3	0.751	0.134	0.8231	
30 minute summer	14	1.012	17	93.7	0.744	0.152	5.0568	
15 minute summer	15	2.000	16	27.6	1.366	0.138	0.7686	
15 minute summer	16	2.001	17	47.5	1.864	0.302	0.3942	
15 minute summer	17	1.013	24	140.3	0.832	0.228	6.1730	
15 minute summer	18	3.000	19	20.9	0.891	0.188	0.6456	
15 minute summer	19	3.001	20	37.8	1.127	0.340	0.5259	
15 minute summer	20	3.002	21	50.2	1.713	0.451	0.2498	
15 minute summer	21	3.003	22	50.4	2.446	0.226	0.3058	
15 minute summer	22	3.004	23	74.9	2.439	0.187	1.6483	
15 minute summer	23	3.005	24	97.0	3.011	0.216	0.3657	
15 minute summer	24	1.014	25	234.0	1.085	0.380	14.0972	
15 minute summer	25	1.015	26	250.1	1.029	0.406	8.2678	
15 minute summer	26	1.016	27	261.8	1.114	0.425	1.5690	

Results for 1 year +10% A Critical Storm Duration. Lowest mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	27	12	92.666	0.415	267.1	1.0551	0.0000	OK
15 minute summer	28	10	96.084	0.068	25.2	0.0969	0.0000	OK
15 minute summer	29	10	95.191	0.100	42.5	0.1434	0.0000	OK
15 minute summer	30	11	94.252	0.114	58.4	0.1624	0.0000	OK
960 minute summer	31	615	92.501	0.389	68.1	482.1798	0.0000	SURCHARGED
1440 minute summer	31_OUT	1020	92.120	0.189	23.2	0.2712	0.0000	OK
1440 minute summer	32	1020	92.118	0.231	23.0	0.3312	0.0000	OK
1440 minute summer	33	1020	92.114	0.334	22.8	1.1559	0.0000	SURCHARGED
15 minute summer	33_OUT	1	91.713	1.000	9.6	0.0000	0.0000	OK
15 minute summer	35	1	95.605	0.000	0.0	0.0000	0.0000	OK
15 minute summer	34	1	95.650	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	27	1.017	31	280.5	2.551	0.457	7.2351	
15 minute summer	28	4.000	29	25.1	1.557	0.113	0.3807	
15 minute summer	29	4.001	30	42.1	1.878	0.239	0.8553	
15 minute summer	30	4.002	31	57.7	2.409	0.294	1.3353	
960 minute summer	31	Hydro-Brake®	31_OUT	23.2				
1440 minute summer	31_OUT	Flow through Pond	32	22.8	0.022	0.009	37.4996	
1440 minute summer	32	6.000	33	22.8	0.485	0.205	0.6891	
1440 minute summer	33	6.001	33_OUT	22.8	0.474	0.079	0.6371	1169.4
15 minute summer	35	7.001	29	0.0	0.000	0.000	0.1020	
15 minute summer	34	7.000	35	0.0	0.000	0.000	0.0000	

Results for 30 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.90%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	96.664	0.243	95.5	0.3476	0.0000	OK
15 minute summer	2	10	96.454	0.230	94.9	0.3286	0.0000	OK
15 minute summer	3	11	96.128	0.242	169.4	0.3458	0.0000	OK
15 minute summer	4	10	94.982	0.230	223.0	0.3293	0.0000	OK
15 minute summer	5	10	94.448	0.274	265.4	0.3923	0.0000	OK
15 minute summer	6	11	93.440	0.534	265.1	1.3586	0.0000	OK
15 minute summer	8	11	93.419	0.538	267.2	1.3695	0.0000	OK
1440 minute summer	9	1050	93.416	0.560	32.5	1.4260	0.0000	OK
1440 minute summer	10	1050	93.416	0.585	32.3	1.4896	0.0000	OK
1440 minute summer	11	1050	93.416	0.608	32.3	1.5481	0.0000	OK
1440 minute summer	12	1050	93.416	0.682	32.2	32.1356	0.0000	OK
1440 minute summer	13	1050	93.416	0.706	31.8	1.7975	0.0000	OK
1440 minute summer	14	1050	93.416	0.725	37.4	2.5124	0.0000	OK
15 minute summer	15	10	96.296	0.144	94.9	0.2061	0.0000	OK
15 minute summer	16	11	95.381	0.434	164.9	0.6212	0.0000	SURCHARGED
1440 minute summer	17	1050	93.416	0.820	57.7	2.0876	0.0000	SURCHARGED
15 minute summer	18	11	97.859	0.525	72.0	0.9281	0.0000	SURCHARGED
15 minute summer	19	11	97.723	0.662	126.5	1.1691	0.0000	SURCHARGED
15 minute summer	20	11	97.426	0.521	168.9	0.9213	0.0000	SURCHARGED
15 minute summer	21	11	97.054	0.234	169.3	0.4140	0.0000	OK
15 minute summer	22	11	96.363	0.212	252.4	0.3752	0.0000	OK
15 minute summer	23	11	94.324	0.314	326.2	0.5544	0.0000	OK
1440 minute summer	24	1080	93.416	0.907	95.7	3.1428	0.0000	SURCHARGED
1440 minute summer	25	1050	93.416	1.068	99.5	90.5844	0.0000	SURCHARGED
1440 minute summer	26	1050	93.416	1.150	89.1	2.9268	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	94.9	1.594	0.854	1.1700	
15 minute summer	2	1.001	3	93.5	1.582	0.842	2.0010	
15 minute summer	3	1.002	4	168.1	2.904	0.892	2.1416	
15 minute summer	4	1.003	5	222.7	2.833	0.543	1.0907	
15 minute summer	5	1.004	6	265.1	3.413	0.684	1.2324	
15 minute summer	6	1.005	8	259.4	0.928	0.484	4.4203	
15 minute summer	8	1.006	9	260.8	0.934	0.423	3.3819	
1440 minute summer	9	1.007	10	32.3	0.657	0.053	3.6287	
1440 minute summer	10	1.008	11	32.3	0.694	0.052	3.4118	
1440 minute summer	11	1.009	12	32.2	0.659	0.052	11.9220	
1440 minute summer	12	1.010	13	31.8	0.611	0.052	4.1648	
1440 minute summer	13	1.011	14	31.4	0.628	0.051	3.2155	
1440 minute summer	14	1.012	17	36.0	0.620	0.058	16.6695	
15 minute summer	15	2.000	16	94.5	1.696	0.474	1.9554	
15 minute summer	16	2.001	17	160.7	2.282	1.020	1.0770	
1440 minute summer	17	1.013	24	55.4	0.667	0.090	15.4020	
15 minute summer	18	3.000	19	69.7	1.072	0.627	1.9254	
15 minute summer	19	3.001	20	127.2	1.806	1.145	1.1011	
15 minute summer	20	3.002	21	169.3	2.463	1.524	0.5501	
15 minute summer	21	3.003	22	169.5	3.156	0.760	0.7943	
15 minute summer	22	3.004	23	252.8	3.061	0.629	4.3590	
15 minute summer	23	3.005	24	327.1	3.798	0.728	0.9672	
1440 minute summer	24	1.014	25	92.5	0.808	0.150	28.3746	
1440 minute summer	25	1.015	26	85.7	0.708	0.139	14.3840	
1440 minute summer	26	1.016	27	88.1	0.718	0.143	2.6839	

Results for 30 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.90%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	27	1050	93.416	1.165	92.1	2.9648	0.0000	SURCHARGED
15 minute summer	28	10	96.145	0.129	86.2	0.1840	0.0000	OK
15 minute summer	29	10	95.307	0.216	145.4	0.3091	0.0000	OK
15 minute summer	30	10	94.403	0.265	199.8	0.3792	0.0000	OK
1440 minute summer	31	1080	93.416	1.304	115.9	1617.7590	0.0000	SURCHARGED
1440 minute winter	31_OUT	810	92.169	0.239	23.4	0.3416	0.0000	OK
1440 minute winter	32	810	92.168	0.281	23.7	0.4025	0.0000	OK
1440 minute winter	33	810	92.161	0.381	23.0	1.3208	0.0000	SURCHARGED
15 minute summer	33_OUT	1	91.713	1.000	22.3	0.0000	0.0000	OK
15 minute summer	35	1	95.605	0.000	0.0	0.0000	0.0000	OK
15 minute summer	34	1	95.650	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute summer	27	1.017	31	90.8	0.979	0.148	24.5521	
15 minute summer	28	4.000	29	86.0	2.054	0.388	0.9744	
15 minute summer	29	4.001	30	144.1	2.399	0.818	2.2911	
15 minute summer	30	4.002	31	198.4	3.095	1.011	3.7950	
1440 minute summer	31	Hydro-Brake®	31_OUT	23.4				
1440 minute winter	31_OUT	Flow through Pond	32	22.5	0.022	0.009	47.0945	
1440 minute winter	32	6.000	33	23.0	0.565	0.207	0.7441	
1440 minute winter	33	6.001	33_OUT	23.0	0.479	0.080	0.6377	1788.0
15 minute summer	35	7.001	29	0.0	0.000	0.000	0.2688	
15 minute summer	34	7.000	35	0.0	0.000	0.000	0.0000	

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	11	97.336	0.915	123.0	1.3089	0.0000	SURCHARGED
15 minute summer	2	11	97.045	0.821	115.6	1.1744	0.0000	SURCHARGED
15 minute summer	3	11	96.604	0.718	207.1	1.0281	0.0000	SURCHARGED
15 minute summer	4	11	95.029	0.277	276.0	0.3960	0.0000	OK
15 minute summer	5	11	94.516	0.342	328.9	0.4899	0.0000	OK
960 minute winter	6	915	93.957	1.051	32.1	2.6742	0.0000	SURCHARGED
960 minute winter	8	915	93.957	1.076	32.7	2.7378	0.0000	SURCHARGED
960 minute winter	9	915	93.957	1.101	35.1	2.8014	0.0000	SURCHARGED
960 minute winter	10	915	93.957	1.126	34.8	2.8650	0.0000	SURCHARGED
960 minute winter	11	915	93.957	1.149	34.3	2.9236	0.0000	SURCHARGED
960 minute winter	12	915	93.957	1.223	33.4	174.1917	0.0000	SURCHARGED
960 minute winter	13	915	93.957	1.247	32.5	3.1729	0.0000	SURCHARGED
960 minute winter	14	915	93.957	1.266	38.2	4.3845	0.0000	SURCHARGED
15 minute summer	15	10	96.351	0.199	122.3	0.2841	0.0000	OK
15 minute summer	16	11	95.689	0.742	210.9	1.0616	0.0000	SURCHARGED
960 minute winter	17	915	93.957	1.361	59.9	3.4630	0.0000	SURCHARGED
15 minute summer	18	11	98.489	1.155	92.7	2.0400	0.0000	SURCHARGED
15 minute summer	19	11	98.275	1.214	162.7	2.1447	0.0000	SURCHARGED
15 minute summer	20	11	97.814	0.909	212.1	1.6063	0.0000	SURCHARGED
15 minute summer	21	11	97.267	0.447	210.5	0.7906	0.0000	SURCHARGED
15 minute summer	22	11	96.408	0.257	315.2	0.4550	0.0000	OK
15 minute summer	23	11	94.614	0.604	409.3	1.0673	0.0000	SURCHARGED
960 minute winter	24	915	93.957	1.448	102.0	5.0147	0.0000	SURCHARGED
960 minute winter	25	915	93.956	1.608	106.7	168.9652	0.0000	SURCHARGED
960 minute winter	26	915	93.956	1.690	97.2	4.3020	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	115.6	1.642	1.040	1.3850	
15 minute summer	2	1.001	3	113.9	1.618	1.025	2.3771	
15 minute summer	3	1.002	4	206.1	2.928	1.094	2.6094	
15 minute summer	4	1.003	5	275.8	2.876	0.673	1.3370	
15 minute summer	5	1.004	6	328.3	3.487	0.847	1.4876	
960 minute winter	6	1.005	8	31.7	0.597	0.059	5.7779	
960 minute winter	8	1.006	9	32.1	0.608	0.052	4.3836	
960 minute winter	9	1.007	10	34.8	0.662	0.057	4.4267	
960 minute winter	10	1.008	11	34.3	0.696	0.056	3.9976	
960 minute winter	11	1.009	12	33.4	0.666	0.054	13.0667	
960 minute winter	12	1.010	13	32.5	0.628	0.053	4.3101	
960 minute winter	13	1.011	14	31.9	0.649	0.052	3.2688	
960 minute winter	14	1.012	17	36.8	0.626	0.060	16.7497	
15 minute summer	15	2.000	16	120.3	1.830	0.603	2.2578	
15 minute summer	16	2.001	17	207.6	2.948	1.317	1.0764	
960 minute winter	17	1.013	24	57.5	0.691	0.093	15.4020	
15 minute summer	18	3.000	19	86.9	1.234	0.782	1.9254	
15 minute summer	19	3.001	20	158.3	2.249	1.425	1.1011	
15 minute summer	20	3.002	21	210.5	2.990	1.895	0.5985	
15 minute summer	21	3.003	22	208.5	3.258	0.934	0.9459	
15 minute summer	22	3.004	23	314.7	3.043	0.784	5.1114	
15 minute summer	23	3.005	24	407.1	3.863	0.906	1.1142	
960 minute winter	24	1.014	25	98.9	0.831	0.161	28.3746	
960 minute winter	25	1.015	26	93.4	0.741	0.152	14.3840	
960 minute winter	26	1.016	27	97.0	0.773	0.158	2.6839	

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	27	915	93.956	1.705	101.5	4.3400	0.0000	SURCHARGED
30 minute summer	28	19	96.220	0.204	108.5	0.2925	0.0000	OK
15 minute summer	29	12	96.022	0.931	185.6	1.3321	0.0000	SURCHARGED
30 minute summer	30	19	95.089	0.951	220.3	1.3605	0.0000	SURCHARGED
960 minute winter	31	915	93.956	1.844	129.2	1987.1770	0.0000	SURCHARGED
960 minute winter	31_OUT	990	92.277	0.347	24.2	0.4959	0.0000	OK
960 minute winter	32	990	92.276	0.389	23.9	0.5572	0.0000	SURCHARGED
960 minute winter	33	990	92.269	0.489	23.1	1.6934	0.0000	SURCHARGED
15 minute summer	33_OUT	1	91.713	1.000	22.6	0.0000	0.0000	OK
15 minute summer	35	12	96.037	0.432	32.1	0.6175	0.0000	SURCHARGED
15 minute summer	34	12	96.022	0.372	5.4	0.5323	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute winter	27	1.017	31	101.2	1.081	0.165	24.5521	
30 minute summer	28	4.000	29	107.1	2.081	0.483	1.4246	
15 minute summer	29	4.001	30	163.0	2.424	0.925	2.6853	
30 minute summer	30	4.002	31	219.0	3.110	1.116	3.9211	
960 minute winter	31	Hydro-Brake®	31_OUT	24.2				
960 minute winter	31_OUT	Flow through Pond	32	23.5	0.022	0.009	69.0463	
960 minute winter	32	6.000	33	23.1	0.475	0.208	0.7538	
960 minute winter	33	6.001	33_OUT	23.1	0.480	0.080	0.6378	1391.6
15 minute summer	35	7.001	29	43.0	0.688	0.169	0.6972	
15 minute summer	34	7.000	35	15.3	0.433	0.215	0.7672	

5.0 APPENDIX C – GREENFIELD RUNOFF RATES

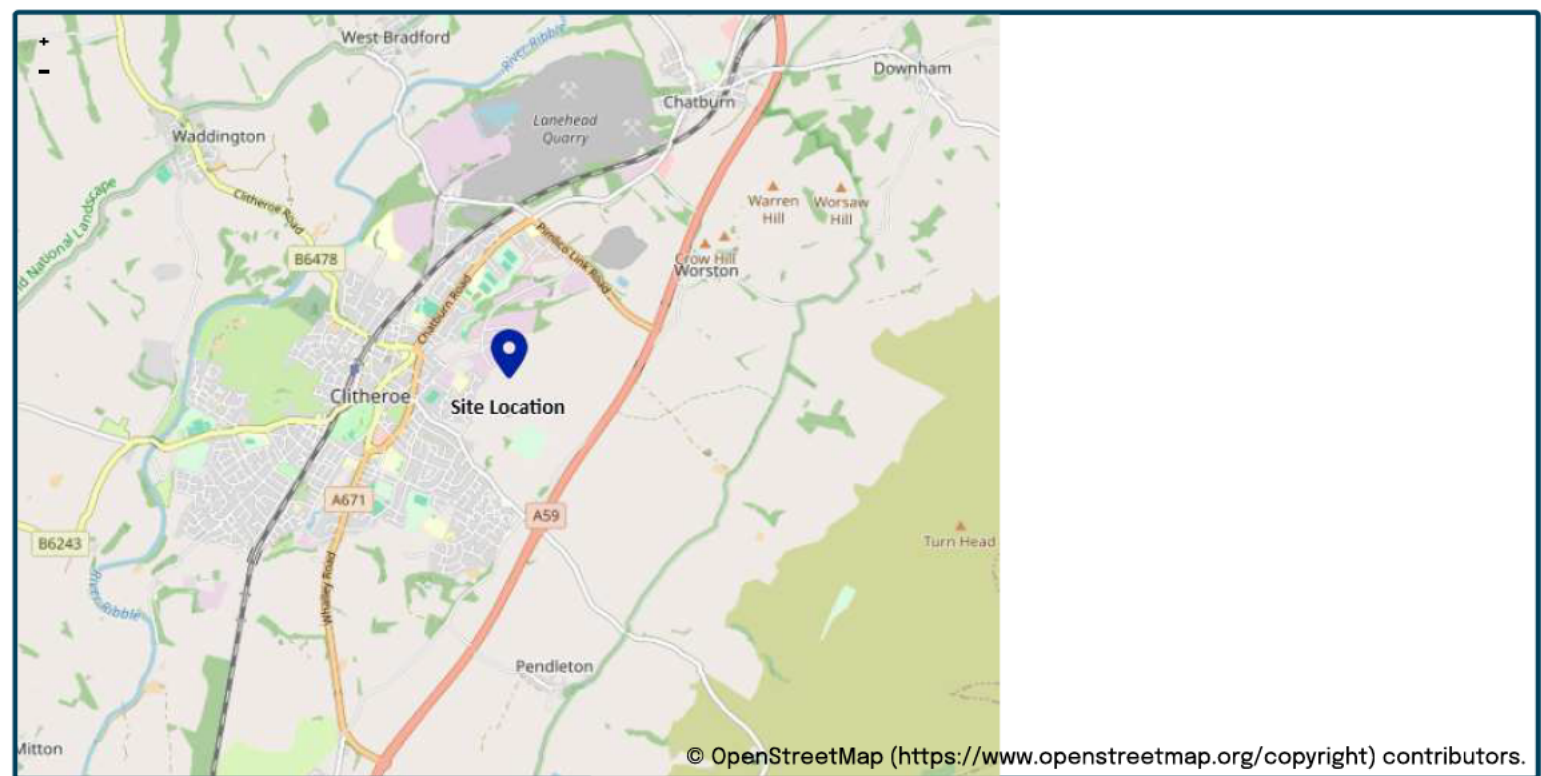
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	17/06/2026
Calculated by	PB
Reference	2936
Model version	2.2.3

Location

Site name	Highmoor Farm
Site location	Clitheroe



Site easting (British National Grid)	375332
Site northing (British National Grid)	441753

Site details

Total site area (ha)	2.451	ha
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Greenfield runoff

Method

Method	IH124	
IH124		
	<u>My value</u>	<u>Map value</u>
SAAR (mm)	1241 mm	☐ 1241
How should SPR be derived?	WRAP soil type	
WRAP soil type	4	☐ 4
SPR	0.47	
QBar (IH124) (l/s)	23.1 l/s	

Growth curve factors

	<u>My value</u>	<u>Map value</u>
Hydrological region	10	☐ 10
1 year growth factor	0.87	
2 year growth factor	0.93	
10 year growth factor	1.38	
30 year growth factor	1.7	
100 year growth factor	2.08	
200 year growth factor	2.37	

Results

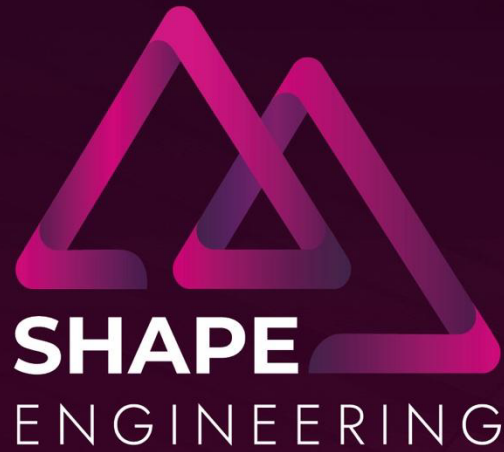
Method	IH124	
Flow rate 1 year (l/s)	20.1 l/s	
Flow rate 2 year (l/s)	21.5 l/s	
Flow rate 10 years (l/s)	31.9 l/s	
Flow rate 30 years (l/s)	39.3 l/s	
Flow rate 100 years (l/s)	48.1 l/s	
Flow rate 200 years (l/s)	54.8 l/s	

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.3) developed by HR Wallingford and available at uksuds.com (<https://www.uknuts.com/>). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at uksuds.com/terms-conditions (<https://www.uknuts.com/terms-conditions>). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

6.0 APPENDIX D – DRAINAGE OMM



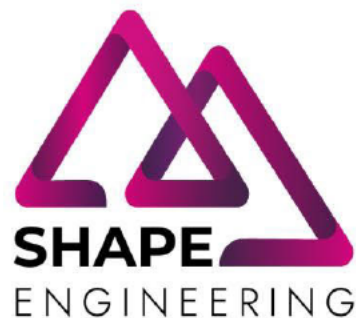
HIGHMOOR FARM, CLITHEROE

DRAINAGE OPERATION MANAGEMENT & MAINTENANCE

Revision D
17th June 2026

HEAD OFFICE

LIVERPOOL INNOVATION PARK, EDGE LANE, LIVERPOOL L7 9NJ

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REV	DATE	DESCRIPTION	PREPARED BY	CHECKED BY	APPROVED BY
A	16.01.2026	First Issue	Assistant Engineer	Director	Director
B	23.01.2026	Rain Gardens and Land Drains Added	Assistant Engineer	Director	Director
C	03.02.2026	Amended To Suit Clients Comments	Civil Engineer	Director	Director
D	17.06.2026	Drainage Revisions	Assistant Engineer	Director	Director

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1.0 INTRODUCTION

Background

- 1.1 Shape Engineering have been instructed to prepare a Drainage Operation and Maintenance Manual for a proposed residential development providing 124 units at Highmoor Farm, Clitheroe, BB7 1PN.
- 1.2 This report is based on current best practice guidance as outlined within Ciria 753 The SuDS Manual.

Scope of Report

- 1.3 This manual is intended to give an overview of the operation, maintenance and management for the range of drainage features included with the design and in relation to typical details only.
- 1.4 Where proprietary products are specified the manufacturer's instructions and recommendations should be followed in priority to this document unless specifically noted otherwise due to project constraints.
- 1.5 The recommended operations and frequencies are typical only and should be more frequent initially to ensure that there are no unforeseen issues with the operation and then adjusted to suit the site requirements.

2.0 DRAINAGE STRATEGY

- 2.1 A proposed Drainage Strategy drawing has been provided in Appendix A.
- 2.2 The surface water drainage strategy for the development will be to collect and convey the surface water runoff and mitigate flood risk to the site, surrounding areas and downstream. This will be done by restricting the discharge rate into the surface water sewer network at the northern extent of the site.
- 2.3 The surface water drainage will discharge at a limited rate of 23.1l/s to replicate the greenfield runoff rate for the developable area of the site including the basin. The discharge rate will be achieved through a flow control chamber.
- 2.4 The rate of 23.1/s is to be agreed with the Lead Local Flood Authority.
- 2.5 Attenuation will be provided within 3no. online and offline attenuation tanks located to the north of the site, oversized pipes and a detention basin located at the north of the site.
- 2.6 The basin will provide approximately 636m³ of storage for storms in excess of the 100-year plus 40% climate change flood event.
- 2.7 A series of flow control units are to be used throughout the site.
- 2.8 Ditches are proposed at the west of the site to collect and convey surface water runoff from adjacent impermeable areas and direct to the basin at the north whilst allowing for infiltration where possible.
- 2.9 A permeable tarmac surfacing is proposed for shared drive areas. Ultimately surface water from these areas will have connectivity with the surface water sewer system.
- 2.10 As the flows are being stored on site, there will be a period of time after storm events where the network is still partially or fully surcharged and is draining down. Where this surcharging is still present after 48hrs appropriate action should be taken as in Section 3.

- 2.11 Foul water from dwellings will be collected via a traditional piped network. The foul water system will be adopted under Section 104 agreement before connecting into the United Utilities sewer system to the west of the site.
- 2.12 Lateral drains will remain private and be the responsibility of the homeowner

3.0 SURFACE WATER DRAINAGE

- 3.1 This section is intended to give an overview of the operation and maintenance for the drainage features included with the drainage strategy and in relation to typical details. Where proprietary products are specified, the manufacturer's instructions and recommendations should be followed in priority to this document unless specifically noted otherwise due to project constraints.
- 3.2 The recommended operations and frequencies are typical only and should be more frequent initially to ensure that there are no unforeseen issues with the operation and then adjusted to suit the site requirements.
- 3.3 A pro-forma is provided in Appendix E for the to allow for the recording of inspection and maintenance activities.
- 3.4 Attenuation tanks have been designed to accommodate for a 1 in 100 year storm rainfall event plus an allowance for 40% climate change.
- 3.5 As the flows are to be attenuated within the onsite tanks, basin and pipe system, there will be a period of time after storm events where the network is still partially or fully surcharged and is draining down. Where this surcharging is still present after 48hrs appropriate action should be taken as noted in this section.

Components

- 3.6 The following components have been included within the drainage design for the development:
- Drainage Channels and Gullies
 - Pipes
 - Permeable paving
 - Inspection, Manhole and Catchpit Chambers
 - Cellular Storage Tanks
 - Flow Control Units
 - Ditches
 - Detention Basin
 - Rain Gardens

- 3.7 A suitable maintenance strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented.
- 3.8 The main drainage network will be maintained under Section 104 adoption subject to adoption approvals.
- 3.9 Private Rain gardens will be maintained by a private management company
- 3.10 A copy of the final drainage layout is provided in Appendix A.
- 3.11 It is recommended that the private drainage systems/ rain gardens are inspected as a minimum twice a year, with the system also being inspected after any major storm event.
- 3.12 Significant sediment deposition is likely in areas used for storage, so a post clean-up operation may be required including the removal of litter, vegetation, sewerage debris and larger objects.
- 3.13 Long-term management practices include monthly sweeping of external paved areas. The sweeping program will remove sand and contaminants directly from paved surfaces before they become mobilised during storm events and transported to the drainage system.
- 3.14 During the winter months, drainage features such as gullies and channels should be cleared of ice, snow, debris, leaves, litter etc.
- 3.15 Drainage within the adopted highway to be the responsibility of Lancashire County Council to maintain.
- 3.16 Drainage within private driveways is the responsibility of the homeowner to maintain
- 3.17 Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols.

4.0 DRAINAGE CHANNELS AND GULLIES

Location and description

- 4.1 The locations of the gullies indicated on the drainage drawing in Appendix A.
- 4.2 It is the responsibility of the individual properties to maintain private gullies within the curtilage of their property boundary.
- 4.3 It is the responsibility of the management company to maintain private gullies within parking/shared parking areas.
- 4.4 In the instance that a shared drive forms part of a homeowners property deeds, it is their responsibility to carry out maintenance
- 4.5 The features have been designed in accordance with all relevant standards, plus Statutory Bodies' and manufacturers requirements.
- 4.6 Drainage gullies should be inspected and cleaned in accordance with the manufacturer's details.
- 4.7 Locking bolts should be replaced and sufficiently tightened, taking care that the bolt heads do not stand above the top surface of the cover or grate. If covers are allowed to move within their frame, this may cause damage to the frame or seating.
- 4.8 Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols.

Drainage Gullies Schedule

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required).	Initial Inspection	Half yearly and after large storms.
Regular maintenance / inspection	Litter and debris removal	Monthly or as required.
	Check and remove large vegetation growth near channel runs.	Monthly or as required
	Inspect for evidence of poor operation and/or weed growth. If required, take remedial action. Inspect silt accumulation rates and establish appropriate brushing frequencies. Silt can also be caused by adjacent landscaping areas which should be reprofiled to provide a flat area or berm adjacent to the paving.	3-monthly, 48 hours after large storms.
Remedial Action	Inspect gullies and rod through poorly performing gullies as initial remediation.	Monthly or as required

5.0 PIPES

Location and Description

- 5.1 The locations of the pipes are indicated on the drainage drawing provided in Appendix A.
- 5.2 All branch connections for foul water will be laid at minimum gradients of 1:40 below building slabs in accordance with Building Regulations Approved Document H.
- 5.3 Above ground rodding points have been proposed to all RWP's and soil pipe connections to further mitigate the risk of blockages.
- 5.4 The features have been designed in accordance with all relevant standards, plus Statutory Bodies' and manufacturers requirements.
- 5.5 Pipes are proprietary products, and the materials can vary across the site and as such where used the manufacture's recommendations should be followed.
- 5.6 It is the responsibility of the individual properties to maintain private drainage within the curtilage of their property boundary.
- 5.7 It is the responsibility of the management company to maintain the pipes for proposed rain gardens prior to entry into the adopted system
- 5.8 It is the intention for the main sewers within the development to be adopted under a S104 agreement by a statutory body.

Operation

- 5.9 Pipes are intended to be used for conveyance and storage within the main access roads of the site. To the north of the site, prior to the outfall connection to the surface water sewer network, pipes are to be used for conveyance purposes.
- 5.10 Where the pipes are oversized, they form the attenuation volume required by the limitation of the discharge rate. They are intended to be dry except for during rainfall events.

- 5.11 Smaller diameter pipes have been designed to be self-cleansing where possible and for larger diameters the risk is reduced due to the overall pipe size.
- 5.12 Access for maintenance will be provided through access chambers, manholes and rodding eyes.

Inspection and Maintenance Regime

- 5.13 Regular inspection and maintenance are important to identify areas which may have been obstructed/clogged and may not be drain correctly thus exposing the development to a greater level of flood risk.
- 5.14 Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols.

Pipes Schedule

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required)	Initial inspection should be provided as post construction CCTV survey.	N/A
	Inspect for evidence of poor operation via water level in chambers. If required, take remedial action.	3-monthly, 48 hours after large storms.
Occasional maintenance	Check and remove large vegetation growth near pipe runs.	6 monthly.
Remedial actions	Rod through poorly performing runs as initial remediation.	As required.
	If continued poor performance jet and CCTV survey poorly performing runs.	As required.
	Seek advice as to remediation techniques suitable for the type of performance issue and location.	As required If above does not improve performance.

6.0 INSPECTION, MANHOLE AND CATCHPIT CHAMBERS

Location and Description

- 6.1 The locations of the inspection, manhole and catchpit chambers are as indicated on the drainage drawing within Appendix A.
- 6.2 The features have been designed in accordance with all relevant standards, plus Statutory Bodies' and manufacturers requirements.
- 6.3 Inspection, manhole and catchpit chambers are proprietary products, and the materials can vary across the site and as such where used the manufacture's recommendations should be followed.
- 6.4 The appropriate health and safety equipment must be used when accessing manholes. Confined space certificates must be held by any personnel entering a manhole.
- 6.5 It is the responsibility of the individual properties to maintain private drainage within the curtilage of their property boundary.
- 6.6 It is the responsibility of the management company to maintain the inspection chambers, manholes and catchpits prior to entering the adopted drainage system.
- 6.7 It is the responsibility of the sewerage undertaker to maintain the manholes put forwards for adoption under S104 agreement.

Inspection and Maintenance Regime

- 6.8 Regular inspection and maintenance are important for the effective operation of the features. A regular inspection regime is very important to ensure the correct functionality of the surface water drainage network.
- 6.9 Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols.

Chambers Schedule

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required)	Inspect inlets, outlets and overflows for blockages, and clear if required. If faults persist jetting and CCTV survey may be required.	Monthly and after large storms.
	Check penstocks and other mechanical devices (if present).	Half yearly.
	Inspect ventilation cowl (if present)	Monthly and after large storms.
Regular maintenance \ inspection	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly.
	Debris removal from catchment surface (where may cause risks to performance)	Monthly
	Where rainfall infiltrates into blocks from above, check surface of filter for blockage by silt, algae or other matter. Remove and replace surface infiltration medium as necessary.	Monthly (and after large storms)
	Remove sediment from pre-treatment structures	Annually (or as required after heavy rainfall events)
Remedial actions	Repair/rehabilitation of inlets, outlet, overflows and vents.	As required.

7.0 FLOW CONTROL UNITS

Location and Description

- 7.1 The location of the flow control units are as indicated on the drainage drawing within Appendix A.
- 7.2 The individual flow control unit specifications are included in Appendix B.
- 7.3 The features will be designed in accordance with all relevant standards, plus Statutory Bodies' and manufacturers requirements.
- 7.4 It is the responsibility of the management company to maintain the flow control unit.

Operation

- 7.5 The flow control units are intended for downstream flow control and to restrict the discharge rate of surface water leaving the site.
- 7.6 The flow controls are to be specified as Hydro-Brake® and is a proprietary product; therefore, manufacturer's recommendations should also be taken into consideration.

Inspection and Maintenance Regime

- 7.7 Access for maintenance will be provided by locating within a manhole chamber.
- 7.8 The appropriate health and safety equipment must be used when accessing manholes. Confined space certificates must be held by any personnel entering a manhole and the appropriate permits should be obtained from water authority prior to any access.

Flow Control Schedule

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required).	Inspect inlets for blockages, and clear if required. If faults persist jetting and CCTV survey may be required.	Monthly and after large storms.
Regular maintenance / inspection	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly.
	Debris removal from catchment surface (where may cause risks to performance).	Monthly
	Remove sediment from pre-treatment structures and flow control chambers.	Annually (or as required after heavy rainfall events)
Remedial Actions	Repair/rehabilitation of inlets.	As required.

8.0 ATTENUATION BASIN

Location and Description

- 8.1 The location of the attenuation basin is as indicated on the drainage drawing as provided in Appendix A.
- 8.2 The features will be designed in accordance with all relevant standards, plus statutory Bodies' and manufacturers requirements.
- 8.3 It is the responsibility of the sewerage undertaker to maintain the attenuation basin put forwards for adoption under S104 agreement.
- 8.4 Both features are to be finished with dense grass that will require minimal maintenance
- 8.5 The attenuation basin is to be constructed as recommended as per the guidance in CIRIA 753 The SuDS Manual.

Operation

- 8.6 The attenuation basin will provide attenuation for up to and including the 100 year + 40% climate change events.
- 8.7 Access for maintenance will be provided from the proposed access roads.

Inspection And Maintenance Regime

- 8.8 Regular inspection and maintenance are important for the effective operation of the features. As the feature is an open accessible feature of the development, a regular inspection regime is very important to ensure the correct functionality of the surface water drainage network.
- 8.9 Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols.

Attenuation Basin Schedule

Maintenance Schedule	Required Action	Frequency
Regular maintenance / inspection	Remove litter and debris	Monthly (or as required)
	Cut grass/vegetation	Monthly (during growing season)
	Inspect marginal and bankside vegetation and remove nuisance plants (for first 3 years)	Monthly (at start, then as required)
	Inspect inlets, outlets, banksides, structures, pipework etc for evidence of blockage and/or physical damage	Monthly
	Inspect water body for signs of poor water quality	Monthly (May – October)
	Inspect silt accumulation rates in any forebay and in main body of the pond and establish appropriate removal frequencies; undertake contamination testing once some build-up has occurred, to inform management and disposal options	Half Yearly
	Check any mechanical devices e.g. penstocks	Half Yearly
	Hand cut submerged and emergent aquatic plants (at minimum 0.1m above pond base, include max 25% of pond surface)	Annually
	Remove 25% of bank vegetation from water's edge to a minimum of 1m above water level	Annually
	Tidy all dead growth (scrub clearance) before start of growing season (Note: tree maintenance is usually part of overall landscape management contract)	Annually
	Remove sediment from any forebay	Every 1-5 years, or as required

	Remove sediment and planting from one quadrant of the main body of ponds without sediment forebays.	Every 5 years, or as required
Occasional Maintenance	Remove sediment from the main body of big ponds when pool volume is reduced by 20%	With effective pre-treatment, this will only be required rarely, eg every 25–50 years
Remedial Actions	Repair erosion or other damage, repair/rehabilitate inlets, outlets and overflows	As required
	Aerate pond when signs of eutrophication are detected	As required
	Realign rip-rap or repair other damage	As required

9.0 ATTENUATION TANKS

Location and Description

- 9.1 3no. online and offline attenuation tanks are proposed for the development beneath access roads.
- 9.2 The location of the cellular attenuation tanks are as indicated on the drainage drawing provided in Appendix A.
- 9.3 The manufacturer product specification for the attenuation tanks is included in Appendix C.
- 9.4 The feature will be designed in accordance with all relevant standards, plus statutory Bodies' and manufacturers requirements.
- 9.5 Attenuation tanks are proprietary products and therefore manufacturer's recommendations should also be taken into consideration. Additionally, different manufacturers may have different connection types and arrangements which will need to be taken into consideration.
- 9.6 It is the responsibility of the management company to maintain the cellular attenuation tanks.

Operation

- 9.7 Attenuation tanks are designed to assist in storing surface water storage at the site in addition to other storage features across the site. The tanks have been designed to assist in attenuating the discharge from the site up to and including the 1 in 100 year plus 40% climate change event.
- 9.8 A catchpit manhole is also positioned prior to any waters entering the cellular tanks to reduce the risk of sedimentation entering the storage units.
- 9.9 Access for maintenance will be provided from the manhole chamber downstream of the tanks.

Inspection And Maintenance Regime

- 9.10 Regular inspection and maintenance are important for the effective operation of the features. As the feature is an open accessible feature of the development, a regular inspection regime is very important to ensure the correct functionality of the surface water drainage network.
- 9.11 Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols.
- 9.12 The cellular attenuation tanks are a proprietary product and manufacturers guidance should be adhered too.

Cellular Attenuation Tank Schedule

Maintenance Schedule	Required Action	Frequency
Monitoring	Inspect/check all inlets, outlets, vents, and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter, remove and replace surface infiltration medium as necessary	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial Actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required

10.0 DITCHES

Location and Description

- 10.1 The locations of the ditches are as indicated on the drainage drawing provided in Appendix A.
- 10.2 The features have been designed in accordance with all relevant standards, plus Statutory Bodies' and manufacturers requirements.
- 10.3 Ditches are to be constructed as recommended in the CIRIA SuDS Manual.
- 10.4 It is the responsibility of the management company to maintain the private ditches.
- 10.5 The ditches are to be used for conveyance purposes.

Operation

- 10.6 The ditches are intended to collect and convey surface water runoff from adjacent to private access roads at the north-west of the development in exceedance events. Flows are to be directed to the basin at the northern extent of the development.
- 10.7 Access for maintenance will be provided from the proposed access roads, private shared driveways, footpaths and soft landscaped areas.

Inspection and Maintenance Regime

- 10.8 Ditches are proposed in areas in the north adjacent to private access roads to collect and convey surface water runoff from the highway in exceedance events. This will help to improve localised overland flow routes directing flows towards the basin.
- 10.9 Regular inspection and maintenance are important for the effective operation of ditches. As the feature is an open accessible feature of the development, a regular inspection regime is very important to ensure the correct functionality of the surface water drainage network.

10.10 Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols.

Ditch Schedule

Maintenance Schedule	Required Action	Frequency
Regular maintenance \ inspection	Remove Litter and Debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half Yearly
Occasional Maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required
Remedial Actions	Repair erosion or other damage by re-turfing or reseeded	As required
	Relevel uneven surfaces and reinstate design levels	As required

	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

11.0 PERMEABLE SURFACES

Location and Description

- 11.1 The drainage strategy utilises permeable surfaces within private access roads. The permeable surfacing is to be constructed with a permeable tarmac or block paving. The location of the permeable surfaces are indicated on the drainage drawing as provided in Appendix A.
- 11.2 Further to this, a specific construction detail is shown in Appendix D, shows the permeable surface layer.
- 11.3 The feature will be designed in accordance with all relevant standards, plus statutory Bodies' and manufacturers requirements.
- 11.4 The surface is to be constructed of a permeable tarmac or block paved surfacing and therefore manufacturer's recommendations should also be taken into consideration. Additionally, different manufacturers may have different connection types and arrangements which will need to be taken into consideration.
- 11.5 It is the responsibility of the management company to maintain the permeable tarmac or block paved surfaces.

Operation

- 11.6 The permeable tarmac or block paved surfaces will provide interception for the first 5mm of rainfall at the site.
- 11.7 Surface water enters the permeable system from directly landing on the surface level above and not indirectly from other, nearby, sources or overland flows.

Inspection And Maintenance Regime

- 11.8 Regular inspection and maintenance are important for the effective operation of the features. As the feature is an open accessible feature of the development, a regular inspection regime is very important to ensure the correct functionality of the surface water drainage network.
- 11.9 Brushing and vacuuming should be carried out on an annual basis.

11.10 Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols.

Permeable Surfacing Schedule

Maintenance Schedule	Required Action	Frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturers recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used surfaces
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving	As required.
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required.

	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 hrs after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

12.0 RAIN GARDENS

Location and Description

- 12.1 The location of the Rain Gardens are as indicated on the drainage drawing as provided in Appendix A and the detail is provided in Appendix D.
- 12.2 The rain gardens are to be constructed as recommended as per the guidance in CIRIA 753 The SuDS Manual and finished in accordance with the landscaping details.
- 12.3 It is the responsibility of the management company to maintain the rain gardens and their components.
- 12.4 These features are to be finished in accordance with the site wide landscaping plan. Finishes (planting) are to be maintained in accordance with the landscaping management and maintenance schedule.

Operation

- 12.5 The Rain Gardens are designed to collect surface water runoff from permeable land during extreme events to alleviate ponding to soft landscaping and spilling into impermeable areas.
- 12.6 Existing land drains and ditches at the site are to be utilised to convey surface water runoff from landscaped areas at the site towards proposed raingardens.
- 12.7 Surface water and land drains within rear gardens are to be directed to the 2no. rain gardens to the south of the development site.
- 12.8 Overland flow at the site is to also be directed to rain gardens.
- 12.9 Access for maintenance will be provided from the proposed access roads, private shared driveway areas and footpaths.

Inspection And Maintenance Regime

- 12.10 Regular inspection and maintenance are important for the effective operation of the features. As the feature is an open accessible feature of the development, a

regular inspection regime is very important to ensure the correct functionality of the surface water drainage network.

12.11 Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols.

Rain Garden Schedule

Maintenance Schedule	Required Action	Frequency
Regular inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary	Quarterly (3 months)
Regular maintenance		
Occasional maintenance	Check operation of underdrains by inspection of flows after rain	Annually
Remedial Actions	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly (3 months)
	Inspect inlets and outlets for blockage	Quarterly (3 months)
	Remove litter and surface debris and weeds	Quarterly (3 months) (or more frequently for tidiness or aesthetic reasons)
	Replace any plants, to maintain planting density	As required
	Remove sediment, litter and debris build-up from around inlets or from forebays	Quarterly (3 months) to biannually (6 months)
Occasional maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required

	Regular minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial Actions	Remove and replace filter medium and vegetation above.	As required but likely to be > 20 years

13.0 LAND DRAINS

Location and Description

- 13.1 The locations of the land drains are as indicated on the drainage drawing as provided in Appendix A. Details of the land drains are included in Appendix D.
- 13.2 The features have been designed in accordance with all relevant standards, plus Statutory Bodies' and manufacturers requirements.
- 13.3 Land drains are to be constructed as recommended in the CIRIA SuDS Manual.
- 13.4 It is the responsibility of the management company to maintain the private land drains.
- 13.5 The land drains are to be used for conveyance purposes.

Operation

- 13.6 The land drains are intended to collect and convey surface water runoff from the rear gardens in exceedance events.
- 13.7 Access for maintenance will be provided from the proposed access roads, private shared driveways, footpaths and soft landscaped areas.

Inspection and Maintenance Regime

- 13.8 Land drains are proposed in rear gardens to collect and convey surface water runoff from gardens in exceedance events. This will help to improve localised infiltration and route overland flows below ground to capture surface water runoff that does not infiltrate immediately, mitigating runoff onto impermeable areas of the development.
- 13.9 Regular inspection and maintenance are important for the effective operation of land drains. As the feature is an open accessible feature of the development, a regular inspection regime is very important to ensure the correct functionality of the surface water drainage network.

13.10 Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols.

Land Drain Schedule

Maintenance Schedule	Required Action	Frequency
Regular maintenance \ inspection	Remove Litter and Debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half Yearly
Occasional Maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required
Remedial Actions	Repair erosion or other damage by re-turfing or reseedling	As required
	Relevel uneven surfaces and reinstate design levels	As required

	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

14.0 APPENDIX A – DRAINAGE LAYOUT

NOTES:

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS, ARCHITECTS AND SPECIALIST DESIGN DRAWINGS AND DETAILS.
- ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE. ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM UNLESS NOTED OTHERWISE.
- ANY DISCREPANCIES NOTED ON SITE ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY.
- LOCATION AND LEVELS OF EXISTING PUBLIC SEWERS BASED ON WATER AUTHORITY SEWER RECORDS. SEWERS TO BE FULLY SURVEYED, ALL LOCATIONS TO BE CONFIRMED.
- SETTING OUT SHALL BE UNDERTAKEN USING ONLY THE INFORMATION GIVEN.
- ALL SEWERS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE DESIGN AND CONSTRUCTION GUIDANCE AND WHERE APPLICABLE UNITED UTILITIES DETAILS.
- THE MINIMUM GRAVITY PIPE DIAMETER UNDER ADOPTABLE HIGHWAYS SHALL BE 150mm.
- IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY ALL INFORMATION GIVEN WITH REGARDS TO EXISTING SERVICES AND DRAINAGE CONNECTIONS ETC. PRIOR TO COMMENCING THE WORKS. THE CONTRACTOR SHALL ADHERE TO THE CDM REGULATIONS AT ALL TIMES.
- EXISTING FLOWS IN WATERCOURSES, SEWERS AND LAND DRAINS SHALL BE MAINTAINED AT ALL TIMES.
- ALL MATERIALS TO BEAR THE RELEVANT B.S. KITEMARK AND COMPLY FULLY WITH THE SPECIFICATIONS. ALL CONCRETE & CONCRETE PRODUCTS MUST USE SULPHATE RESISTANT CEMENT (UNLESS THE SITE INVESTIGATION REPORT PROVES THAT SULPHATE ATTACK FROM SOILS AND GROUNDWATER WILL NOT OCCUR TO WITHSTAND A CLASS).
- ALL OPENING NOTICES ETC. AS REQUIRED UNDER HIGHWAYS ACTS ETC. ARE TO BE OBTAINED PRIOR TO COMMENCEMENT OF WORKS. ALL WORKS ARE TO BE INSPECTED BY L.A., NHBC OR THE NETWORK OPERATOR AS APPLICABLE.
- WHERE "ULTRA RIB" UPVC PIPES (OR SIMILAR APPROVED) ARE USED IN ADOPTABLE DRAINAGE THEY SHALL STILL BE HANDLED AND LAID IN ACCORDANCE WITH THE SPECIFICATION AND GUIDANCE ISSUED BY THE HIGH PERFORMANCE PIPE ASSOCIATION.
- A CLASS 5 BED AND SURROUND MUST BE USED FOR SUCH PIPES. TRENCH BACKFILL IN HIGHWAYS TO WITHIN 1m OF HIGHWAY SHALL, AS DIRECTED BY THE HIGHWAY AUTHORITY BE A SUITABLE GRANULAR MATERIAL ALL IN ACCORDANCE WITH SEWERS FOR ADOPTION CL. 4.3.4.
- DOMESTIC DRAINAGE SHALL BE TO BUILDING REGULATIONS APPROVED DOCUMENT H. 100mm U.P.V.C. PIPES LAID TO THE FOLLOWING MINIMUM FALLS UNLESS OTHERWISE SHOWN.

HEAD RUN	FOUL	S.W.
1 IN 40	1 IN 60	1 IN 100
ELSEWHERE	1 IN 80	1 IN 100
- ALL LATERAL CONNECTIONS FROM THE PRIVATE NETWORK TO BE 150mm U.P.V.C. PIPES UNLESS STATED OTHERWISE.
- ALL GULLY CONNECTIONS TO BE 150mm VITRIFIED UPVC UNLESS NOTED OTHERWISE.
- MINIMUM COVER TO DRAINAGE SOFFIT LEVEL:

LANDSCAPING	TRAFFICED AREAS	HIGHWAYS
0.600m	0.900m	1.200m
- CLASS 'S' BEDDING AND SURROUND TO BE USED WHERE MINIMUM COVER IS ACHIEVED.
- WHERE MINIMUM COVER IS NOT ACHIEVED CLASS 'Z' BEDDING AND SURROUND (CONCRETE ENCASMENT) IS TO BE USED.
- ANY DAMAGE TO THE EXISTING SEWER NETWORK BECAUSE OF THE DEVELOPMENT SITES ACTIVITIES WILL NEED TO BE RECTIFIED AT THE DEVELOPERS EXPENSE.

- EXISTING SURFACE WATER SEWER
- EXISTING FOUL WATER SEWER
- SURFACE WATER SEWER
- SURFACE WATER FLOW CONTROL
- FOUL WATER SEWER
- SITE BOUNDARY
- PRIVATE DITCHES TO CAPTURE DRIVEWAY SURFACE WATER RUN-OFF
- PERMEABLE PAVING TO CAPTURE DRIVEWAY SURFACE WATER RUN-OFF
- LAND DRAIN / FILTER DRAIN
- CARRIER DRAIN FOR LAND DRAINAGE CONVEYANCE

STRATEGY DRAWING TO SHOW PROPOSED OUTFALL LOCATIONS, DISCHARGE RATES AND GENERAL AREAS OF ATTENUATION FOR PLANNING PURPOSES ONLY; ALL DETAILS SUBJECT TO DETAILED DESIGN/ S104 ADOPTION PROCESSES AND THEREFORE SUBJECT TO CHANGE

P10	16.06.26	KF	SCHEME REVISED TO 20 A/L DISCHARGE
P09	13.05.25	KF	OUTFALL LOCATION AMENDED FOLLOWING TREE SURVEY
P08	07.04.25	KF	OUTFALL LOCATION AMENDED
P07	24.03.25	KF	SYSTEM REVISED TO SUIT NEW OUTFALL LOCATION
P06	18.02.25	KF	SYSTEM REVISED TO SUIT NEW OUTFALL LOCATION
P05	28.01.25	KF	MINOR AMENDMENTS
P04	28.01.25	KF	SYSTEM REVISED TO 23 A/L DISCHARGE
P03	27.01.25	NM	CLIMATE CHANGE TO 40% AS PER DECISION NOTICE
P02	22.01.25	KF	LAND DRAINAGE ADDED
P01	20.01.25	NM	FIRST ISSUE
Rev	Date	By	Description

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Client	MORRIS HOMES		
Project	HIGHMOOR FARM, CLITHEROE		
Title	Drainage Strategy Layout - Masterplan		
Status	Stability Description	Structural Stage	Date
KF	PLANNING	20	01.26
Designed By	Drawn By	Scale	Project No.
KF	KF	1:500	2955
Sheet No.	2936-SCE-00-00-DR-C-9001	Revision	
P10			

This drawing remains the copyright of Shape Consulting Engineers Ltd.

15.0 APPENDIX B – PROPOSED HYDROBRAKE® DETAILS

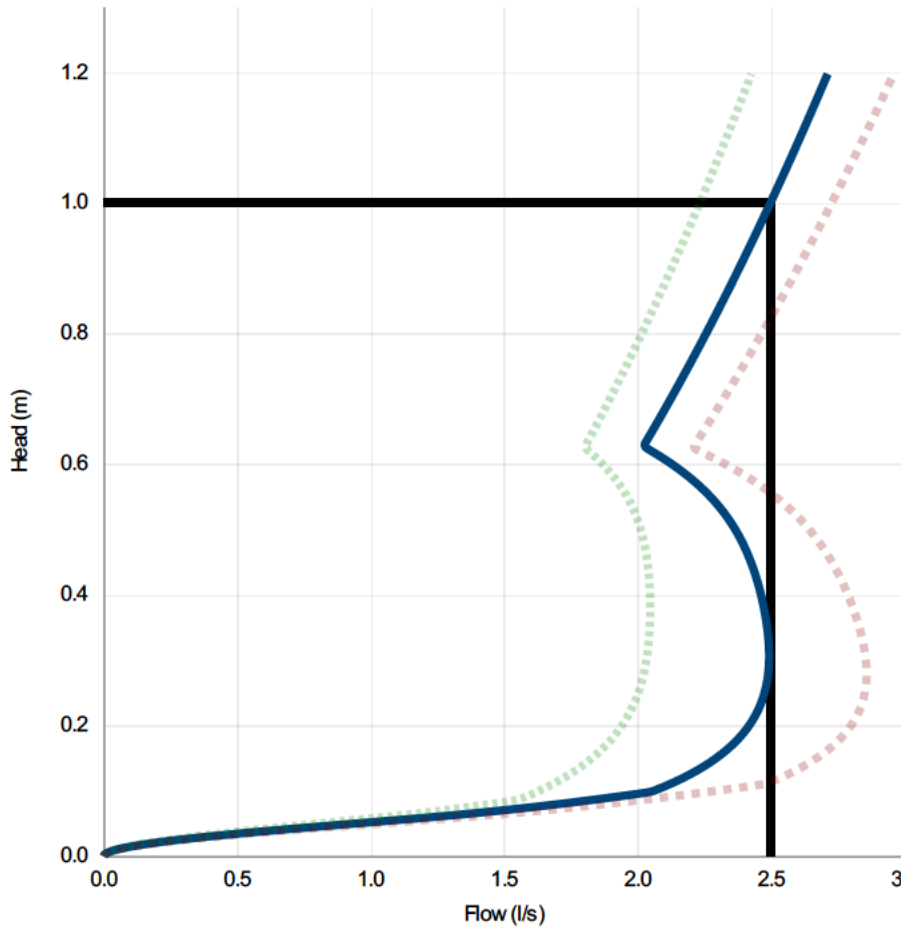
NOTE: SIMILAR APPROVED PRODUCTS MAY BE USED BY ALTERNATIVE SUPPLIERS

Technical Specification

	Original Setting		Minimum Setting		Maximum Setting	
Control Point	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)
Primary Design	1.000	2.500	1.000	2.232	1.000	2.726
Flush-Flo™	0.307	2.492	0.380	2.047	0.279	2.857
Kick-Flo®	0.627	2.020	0.625	1.800	0.624	2.205
Mean Flow		2.192		1.873		2.449



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Head (m)	Flow (l/s)
0.000	0.000
0.034	0.504
0.069	1.468
0.103	2.081
0.138	2.250
0.172	2.360
0.207	2.429
0.241	2.469
0.276	2.488
0.310	2.492
0.345	2.487
0.379	2.473
0.414	2.453
0.448	2.426
0.483	2.389
0.517	2.338
0.552	2.269
0.586	2.175
0.621	2.050
0.655	2.061
0.690	2.109
0.724	2.156
0.759	2.202
0.793	2.247
0.828	2.291
0.862	2.334
0.897	2.376
0.931	2.417
0.966	2.457
1.000	2.497

DESIGN ADVICE



The head/flow characteristics of this SHE-0075-2500-1000-2500 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.

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International

A CRH COMPANY

DATE 16/06/2026 13:20

Site Highmoor Farm

DESIGNER Paige Blundell

Ref 2936

SHE-0075-2500-1000-2500

Hydro-Brake® Optimum

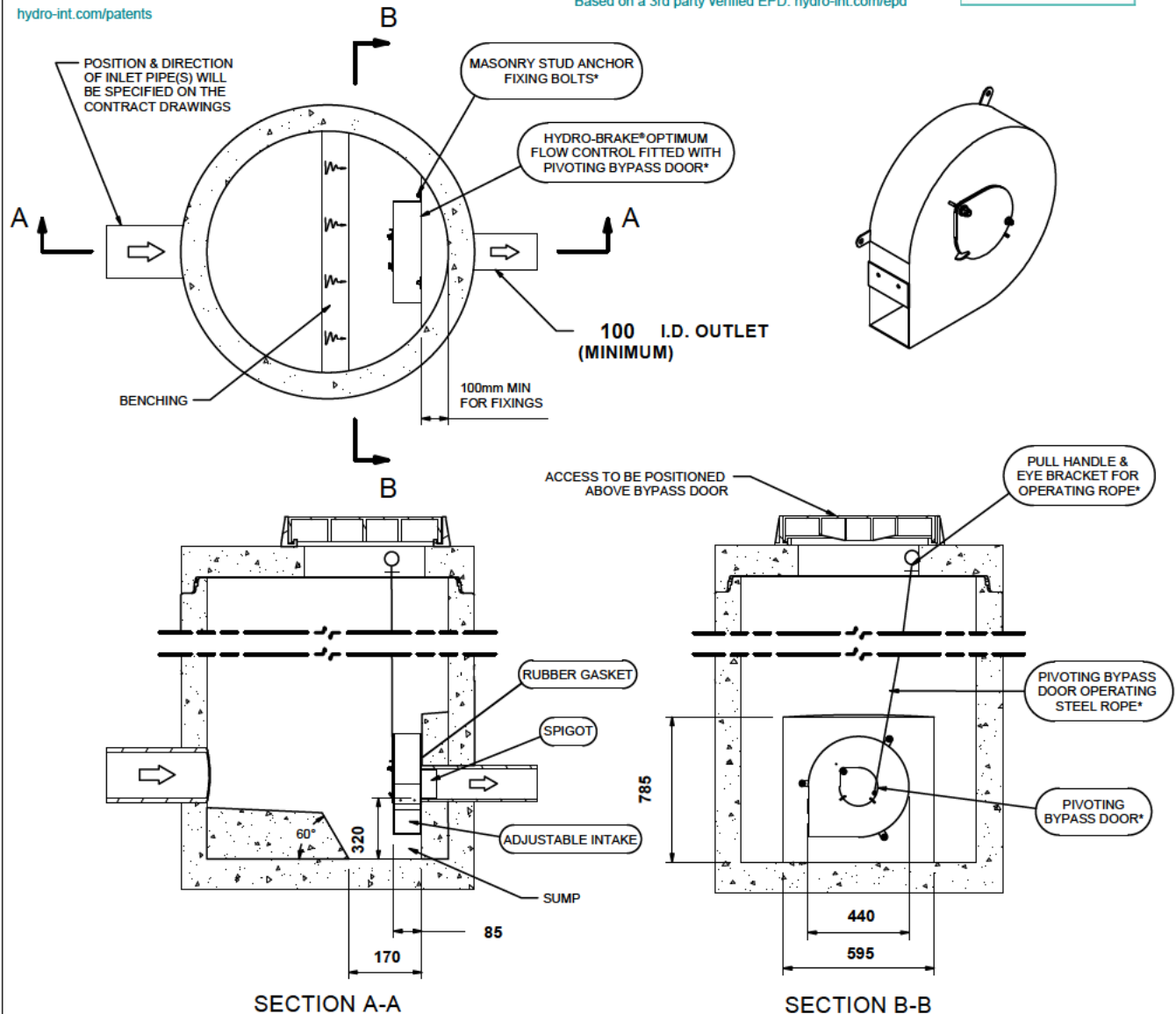
Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	1.000	2.500
Flush-Flo™	0.307	2.492
Kick-Flo®	0.627	2.020
Mean Flow		2.192

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This Hydro-Brake® Optimum includes:

- All in 3 mm Grade 304L stainless steel
 - Integral pivoting by-pass door allowing clear line of sight through to outlet, c/w operating rope
 - Media blasted for corrosion resistance
 - Variable flow rate post installation via adjustable inlet (if necessary)
 - Indicative Weight: 10 kg
 - Product Carbon Footprint: 44.35 kgCO2e
- Based on a 3rd party verified EPD: hydro-int.com/epd



IMPORTANT: ○ LIMIT OF HYDRO INTERNATIONAL SUPPLY
 THE DEVICE WILL BE HANDED TO SUIT SITE CONDITIONS
 FOR SITE SPECIFIC DETAILS AND MINIMUM CHAMBER SIZE REFER TO HYDRO INTERNATIONAL
 ALL CIVIL AND INSTALLATION WORK BY OTHERS
 * WHERE SUPPLIED
 HYDRO-BRAKE® IS A REGISTERED TRADEMARK FOR FLOW CONTROLS DESIGNED AND MANUFACTURED EXCLUSIVELY BY
 HYDRO INTERNATIONAL

THIS DESIGN LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. NOT TO SCALE.

DESIGN ADVICE



The head/flow characteristics of this SHE-0075-2500-1000-2500 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.

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International**
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DATE	16/06/2026 13:20
SITE	Highmoor Farm
DESIGNER	Paige Blundell
REF	2936

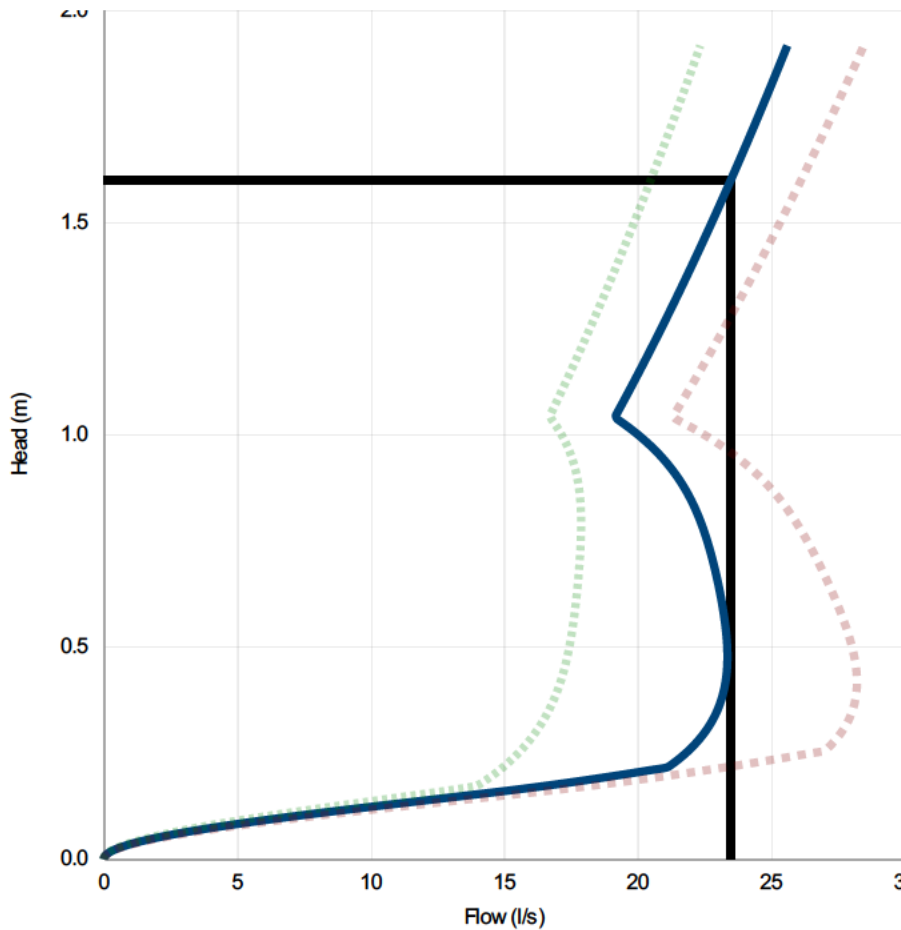
SHE-0075-2500-1000-2500
 Hydro-Brake® Optimum

Technical Specification

	Original Setting		Minimum Setting		Maximum Setting	
Control Point	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)
Primary Design	1.600	23.500	1.600	20.493	1.600	26.125
Flush-Flo™	0.477	23.362	0.790	17.883	0.417	28.214
Kick-Flo®	1.039	19.129	1.041	16.685	1.039	21.291
Mean Flow		20.224		16.424		23.257



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Head (m)	Flow (l/s)
0.000	0.000
0.055	2.355
0.110	8.318
0.166	15.679
0.221	21.227
0.276	22.220
0.331	22.837
0.386	23.184
0.441	23.338
0.497	23.356
0.552	23.282
0.607	23.147
0.662	22.970
0.717	22.754
0.772	22.487
0.828	22.141
0.883	21.672
0.938	21.027
0.993	20.141
1.048	19.208
1.103	19.682
1.159	20.143
1.214	20.594
1.269	21.034
1.324	21.464
1.379	21.886
1.434	22.298
1.490	22.703
1.545	23.100
1.600	23.490

DESIGN ADVICE



The head/flow characteristics of this SHE-0205-2350-1600-2350 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
International
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DATE 16/06/2026 13:42

Site Highmoor Farm

DESIGNER Paige Blundell

Ref 2936

SHE-0205-2350-1600-2350

Hydro-Brake® Optimum

Technical Specification

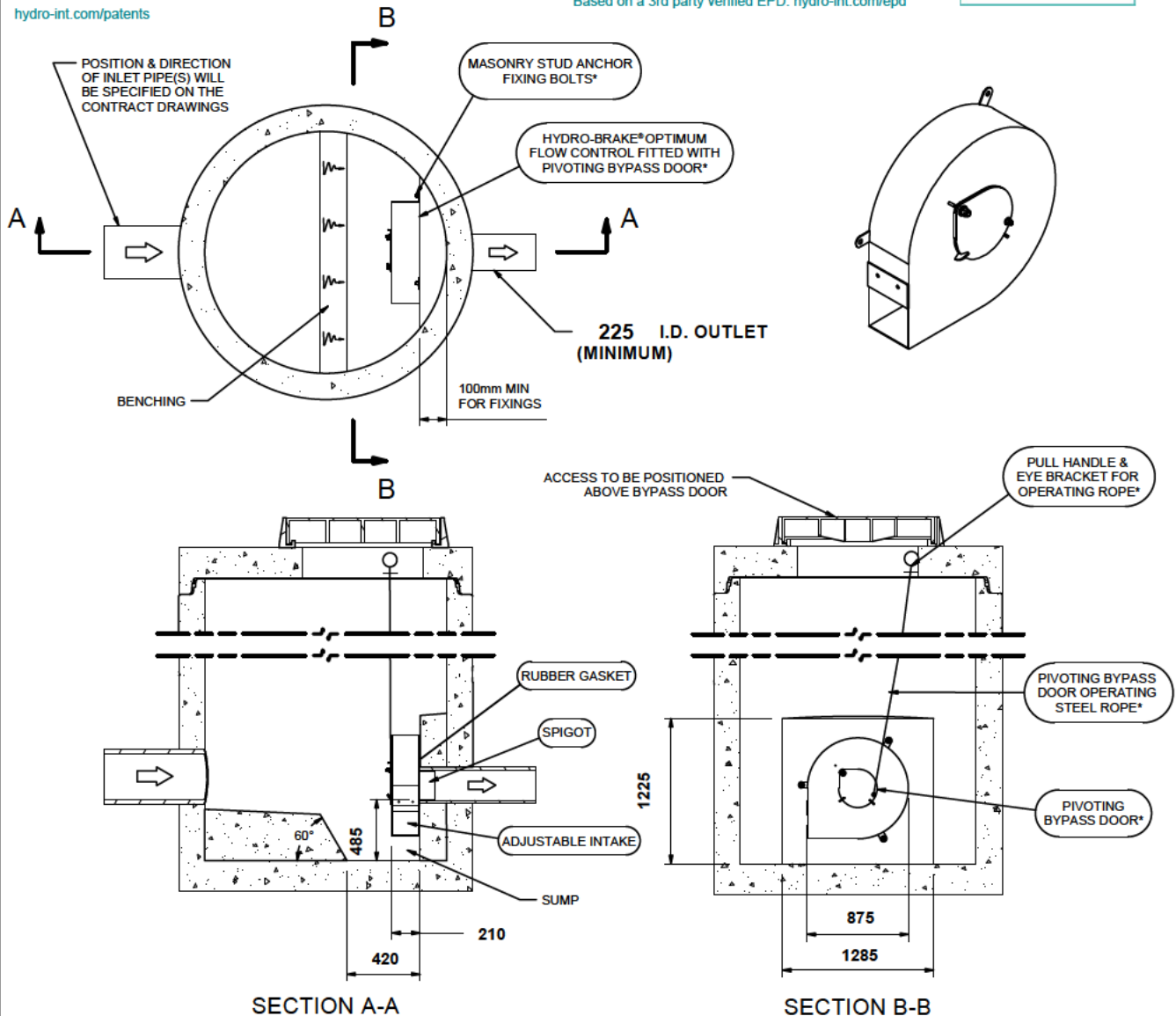
Control Point	Head (m)	Flow (l/s)
Primary Design	1.600	23.500
Flush-Flo™	0.477	23.362
Kick-Flo®	1.039	19.129
Mean Flow		20.224

hydro-int.com/patents

This Hydro-Brake® Optimum includes:

- All in 5 mm Grade 304L stainless steel
- Integral pivoting by-pass door allowing clear line of sight through to outlet, c/w operating rope
- Media blasted for corrosion resistance
- Variable flow rate post installation via adjustable inlet (if necessary)
- Indicative Weight: 75 kg
- Product Carbon Footprint: 322.22 kgCO2e

Based on a 3rd party verified EPD: hydro-int.com/epd



IMPORTANT:  LIMIT OF HYDRO INTERNATIONAL SUPPLY
 THE DEVICE WILL BE HANDED TO SUIT SITE CONDITIONS
 FOR SITE SPECIFIC DETAILS AND MINIMUM CHAMBER SIZE REFER TO HYDRO INTERNATIONAL
 ALL CIVIL AND INSTALLATION WORK BY OTHERS
 * WHERE SUPPLIED
 HYDRO-BRAKE® IS A REGISTERED TRADEMARK FOR FLOW CONTROLS DESIGNED AND MANUFACTURED EXCLUSIVELY BY
 HYDRO INTERNATIONAL

THIS DESIGN LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. NOT TO SCALE.

DESIGN ADVICE



The head/flow characteristics of this SHE-0205-2350-1600-2350 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.
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**Hydro
International**
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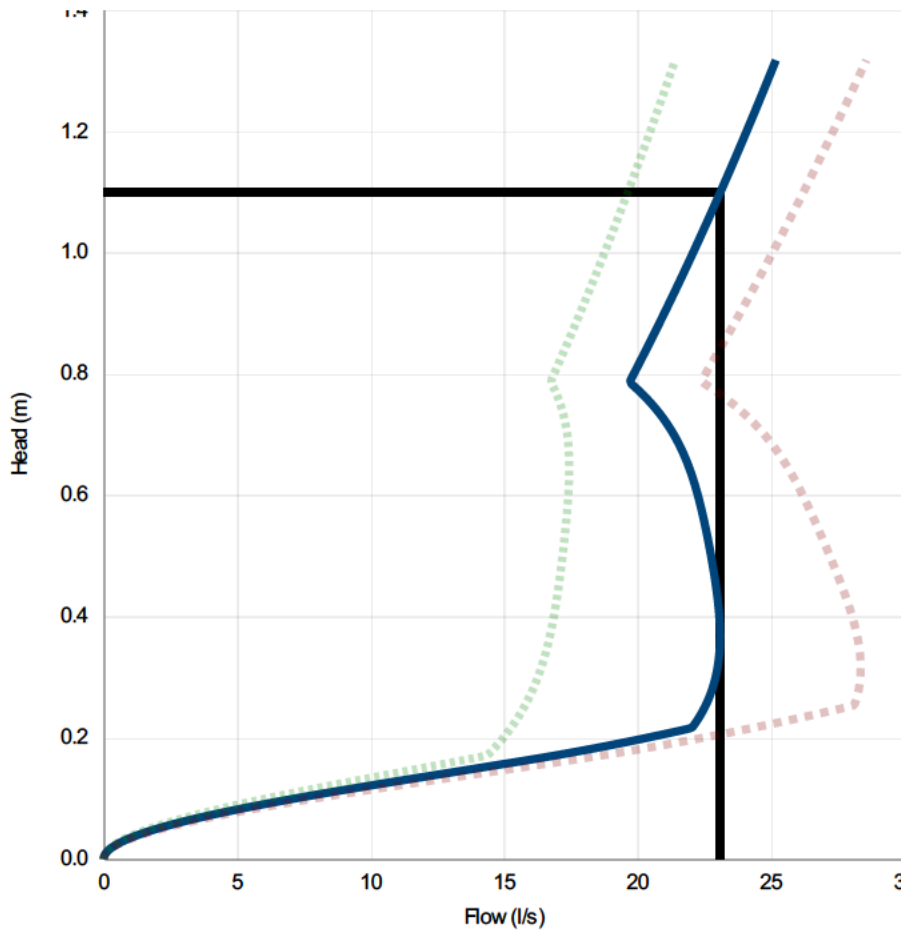
SHE-0205-2350-1600-2350
 Hydro-Brake® Optimum

Technical Specification

	Original Setting		Minimum Setting		Maximum Setting	
Control Point	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)
Primary Design	1.100	23.100	1.100	19.633	1.100	26.211
Flush-Flo™	0.368	23.085	0.646	17.438	0.315	28.354
Kick-Flo®	0.786	19.681	0.786	16.724	0.787	22.361
Mean Flow		19.497		15.440		22.736



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Head (m)	Flow (l/s)
0.000	0.000
0.038	1.168
0.076	4.349
0.114	8.965
0.152	14.259
0.190	19.189
0.228	22.212
0.266	22.669
0.303	22.938
0.341	23.063
0.379	23.082
0.417	23.025
0.455	22.918
0.493	22.778
0.531	22.616
0.569	22.431
0.607	22.211
0.645	21.934
0.683	21.564
0.721	21.057
0.759	20.359
0.797	19.812
0.834	20.254
0.872	20.686
0.910	21.109
0.948	21.523
0.986	21.929
1.024	22.326
1.062	22.716
1.100	23.099

DESIGN ADVICE



The head/flow characteristics of this SHE-0210-2310-1100-2310 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
International

A CRH COMPANY

DATE 17/06/2026 09:17

Site Highmoor Farm

DESIGNER Paige Blundell

Ref 2936

SHE-0210-2310-1100-2310

Hydro-Brake® Optimum

Technical Specification

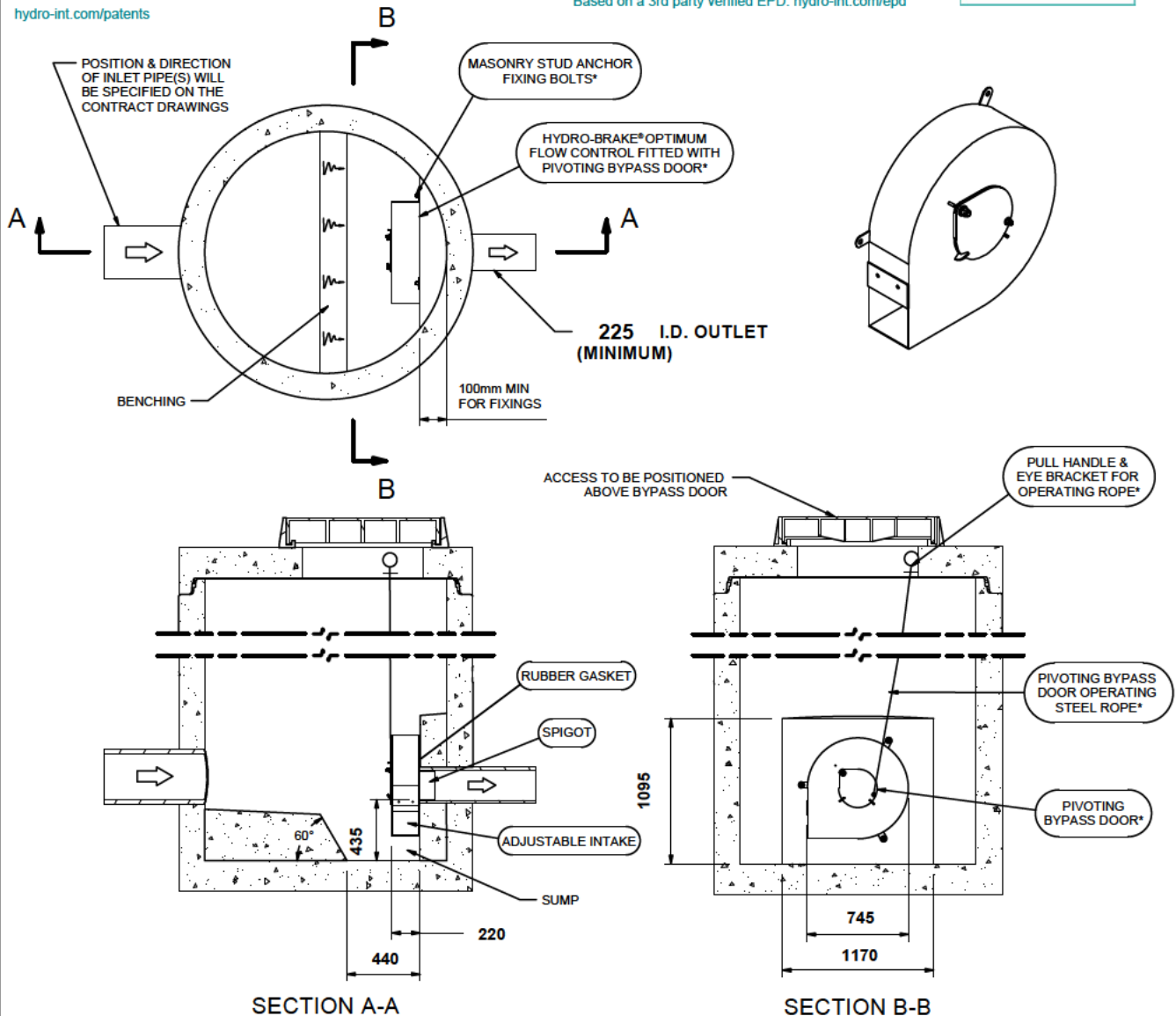
Control Point	Head (m)	Flow (l/s)
Primary Design	1.100	23.100
Flush-Flo™	0.368	23.085
Kick-Flo®	0.786	19.681
Mean Flow		19.497

hydro-int.com/patents

This Hydro-Brake® Optimum includes:

- All in 3 mm Grade 304L stainless steel
- Integral pivoting by-pass door allowing clear line of sight through to outlet, c/w operating rope
- Media blasted for corrosion resistance
- Variable flow rate post installation via adjustable inlet (if necessary)
- Indicative Weight: 35 kg
- Product Carbon Footprint: 147.16 kgCO2e

Based on a 3rd party verified EPD: hydro-int.com/epd



IMPORTANT: LIMIT OF HYDRO INTERNATIONAL SUPPLY
THE DEVICE WILL BE HANDED TO SUIT SITE CONDITIONS
FOR SITE SPECIFIC DETAILS AND MINIMUM CHAMBER SIZE REFER TO HYDRO INTERNATIONAL
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DESIGN ADVICE



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

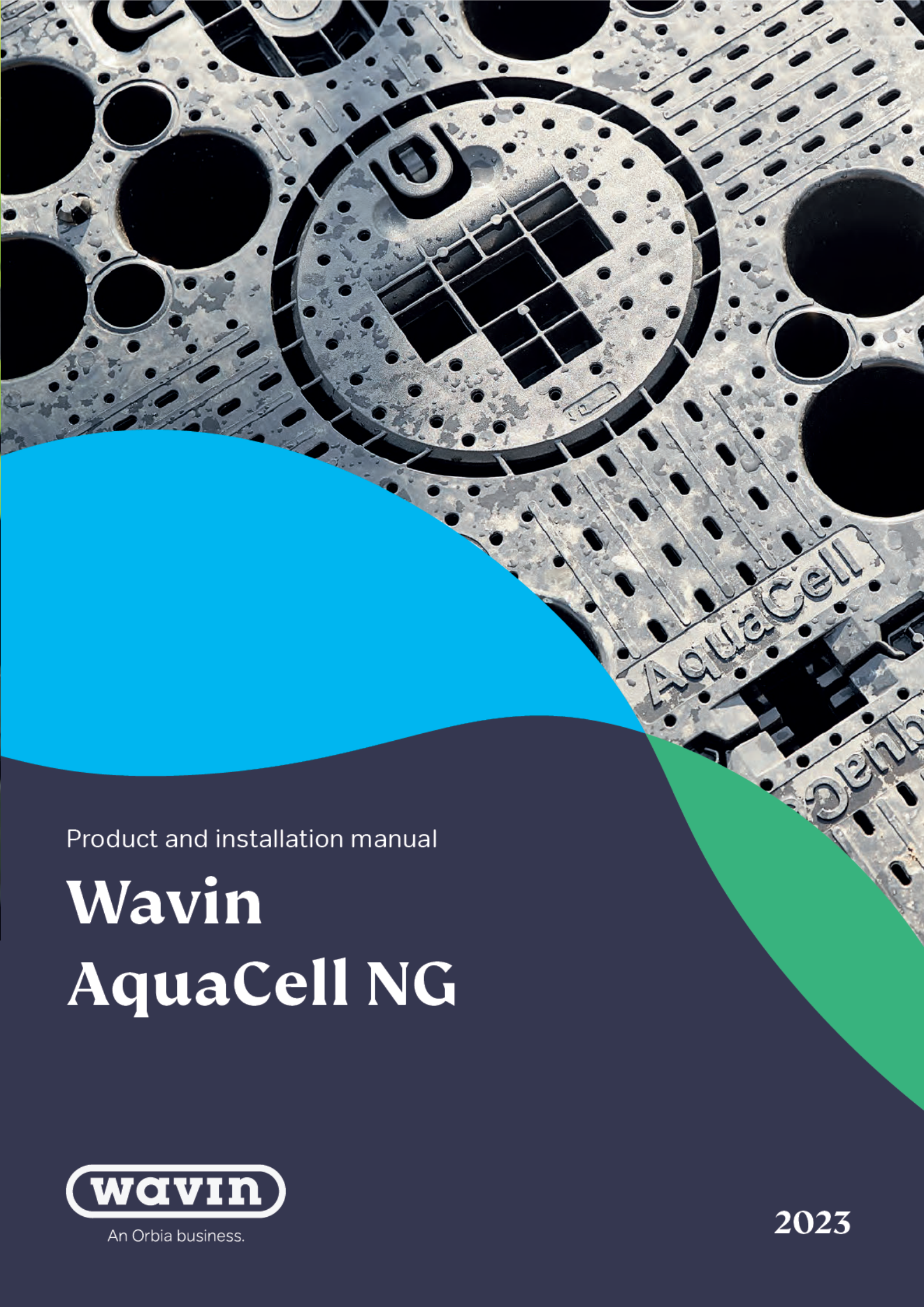
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SHE-0210-2310-1100-2310
Hydro-Brake® Optimum

16.0 APPENDIX C – CELLULAR TANK MANUFACTURER PRODUCT DATA

NOTE: SIMILAR APPROVED PRODUCTS MAY BE USED BY ALTERNATIVE SUPPLIERS



Product and installation manual

Wavin

AquaCell NG



An Orbia business.

2023

AquaCell NG – setting new standards for sustainability

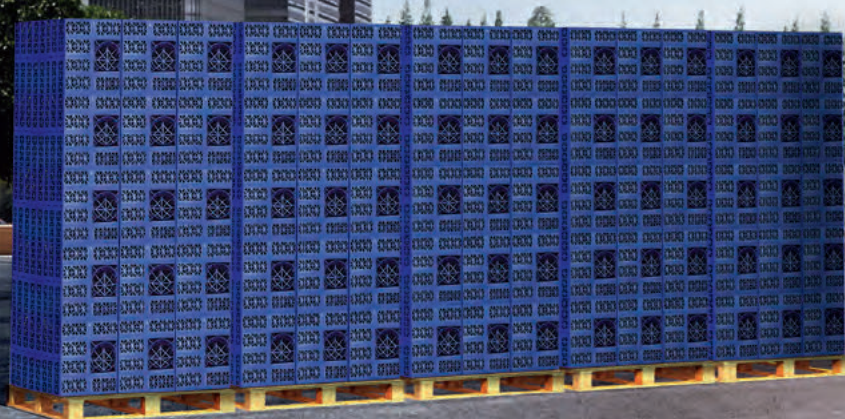
Wavin's AquaCell NG infiltration / attenuation units are made from 100% recycled and 100% recyclable polypropylene (PP).

These new generation units' stackable design means up to four times more product is delivered in every truck; This means...

- a significant reduction of CO2 emissions;
- 75% less deliveries to site

- less space required for storage on site and...
- More units per pallet mean reduced material handling on site.

The push-fit installation with integrated connectors helps to dramatically speed up installation whilst reducing the risk to your teams installing the system.



Stackable design allows up to four times more storage volume per truck when compared to AquaCell Core-R

Wavin AquaCell NG Installation

AquaCell NG		
Dimensions	Length (mm)	1200
	Width (mm)	600
	Height (mm)	400
	Gross volume (m ³)	0.288
	Void ratio %	95%
	Storage volume (m ³)	0.276
Connections	Pipe connections	OsmaDrain 110 – 160mm UltraRib 150, 225, 300mm TwinWall 150, 225, 300mm
Transportation and Handling	Weight per unit (kg)	11.4
	Units per pallet	28
	Units per truck	1,176
	m ³ per truck	338
Installation	Handling	Integrated ergonomic hand grips
	Connectors	Fully integrated
	Pipe connections	Plug and clip system
	Geotextile clips	Integrated
	Installation speed (m ³ per day)	160 – 200
Accessibility	Vertical Access	250mm Ø
	Inspection channel width	200mm
	Open floor area	54%
Material	Material	Recycled PP
	Colour	Black
Certification	BBA	BBA
	European standards	BS EN 17152-1
Loading	Vertical	44 tonnes m ²
	Lateral	11 tonnes m ²
Window of application	Pedestrian	
	Minimum Cover (m)	0.3m
	Max Depth (m)	4.48m
	Car park (9 tonnes)	
	Minimum Cover (m)	0.85m
	Max Depth (m)	3.98m

Wavin AquaCell NG

Design guidance

Infiltration or attenuation?

The AquaCell range can be used either as:

- A soakaway whereby the units will be installed in suitable pervious soils so the units can be wrapped in a geotextile to allow infiltration of the stormwater into the surrounding ground, or
- As an attenuation tank in impervious ground (e.g. clay) where infiltration is not possible, here the units are encapsulated in a geomembrane (which is in turn wrapped in a protective geotextile layer) so that the structure can hold the stormwater temporarily until local drainage flows can accept it for normal disposal at a permissible outflow rate.

Site assessment

Ground conditions may be established as part of a geotechnical assessment. This may include tests for infiltration and ground water level.

If there is no confirmation that such assessments have been conducted, or resulting conclusions are unavailable, a trial pit will be required in accordance with BRE 365.

For further information and guidance, please contact Wavin Technical Design Team.

Infiltration (soakaways)

According to the principals of SuDS, wherever possible stormwater should be drained back into the ground via a soakaway as the first priority. A site must meet BOTH of the following criteria for infiltration to be possible:

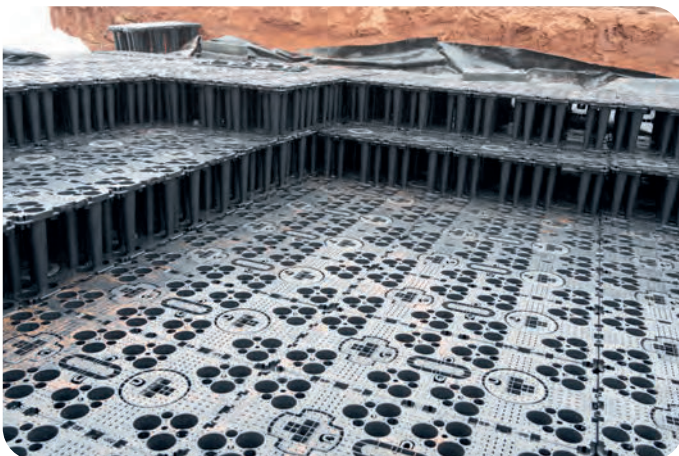
- The underlying soil surrounding the proposed installation is sufficiently permeable
- The seasonally high-water table is a minimum of 1 metre below the base of the proposed installation

If either of these criteria is not met, or cannot be confirmed for any reason, a soakaway system may not be suitable for the application, in which case a storage tank must be used.

Attenuation (storage tanks)

A storage tank may be designed to be online or offline. However, if the site is subject to groundwater or a high water table, it is important to ensure that the tank is not vulnerable to flotation. Sufficient weight from soil, or other covering placed over the AquaCell units, must be sufficient to counter any buoyancy uplift force from the rising groundwater level.

Large scale AquaCell NG storage tank installation



Wavin AquaCell NG

Design guidance

Structural Design

Structural design requires careful consideration of loading factors specific to each location – see CIRIA C680 or CIRIA C737 for further guidance (we recommend using the BPF Guide Designing Geocellular Drainage Systems to CIRIA Report C737 alongside.)

The AquaCell NG unit has been designed to have specific loading capacities that define the maximum depth parameters for which it is suitable.

The minimum depth of cover varies according to whether or not the installation will be subject to trafficking by vehicles.

However, in some situations, installations may have to be located with greater cover depths. Reasons may include:

- Deep-running drainage network
- Other buried services running above tank location
- Installation into banked/ sloping ground
- Upper layer of clay preventing infiltration

The table shows a summary of typical cover depths and installation depths as an indicative guide.

In trafficked applications it is recommended that the height of any tank should not exceed 2.025m (5 units). If you require a tank that exceeds this, please contact Wavin Technical Design for guidance:

T: 0800 038 0088 E: technical.design@wavin.co.uk

Soil Type	Soil Weight kN/m ³	Angle of Internal Friction ϕ (degrees)	Landscaped Areas	Vehicle Mass <9 tonnes	Vehicle Mass <44 tonnes
			Maximum depth (m)		
Consolidated Stiff Clay	20	24	3.49	3.24	2.99
Silty Sandy Clay	19	26	3.94	3.67	3.41
Loose Sand and Gravel	18	30	4.82	4.54	4.26
Medium Dense Sand and Gravel	19	34	5.36	5.10	4.83
Dense Sand and Gravel	20	38	5.21	4.96	4.71
			Minimum cover depth (m)		
			0.3	0.72	1.46

Wavin AquaCell NG

Instructions for installation

1.1. General characteristics

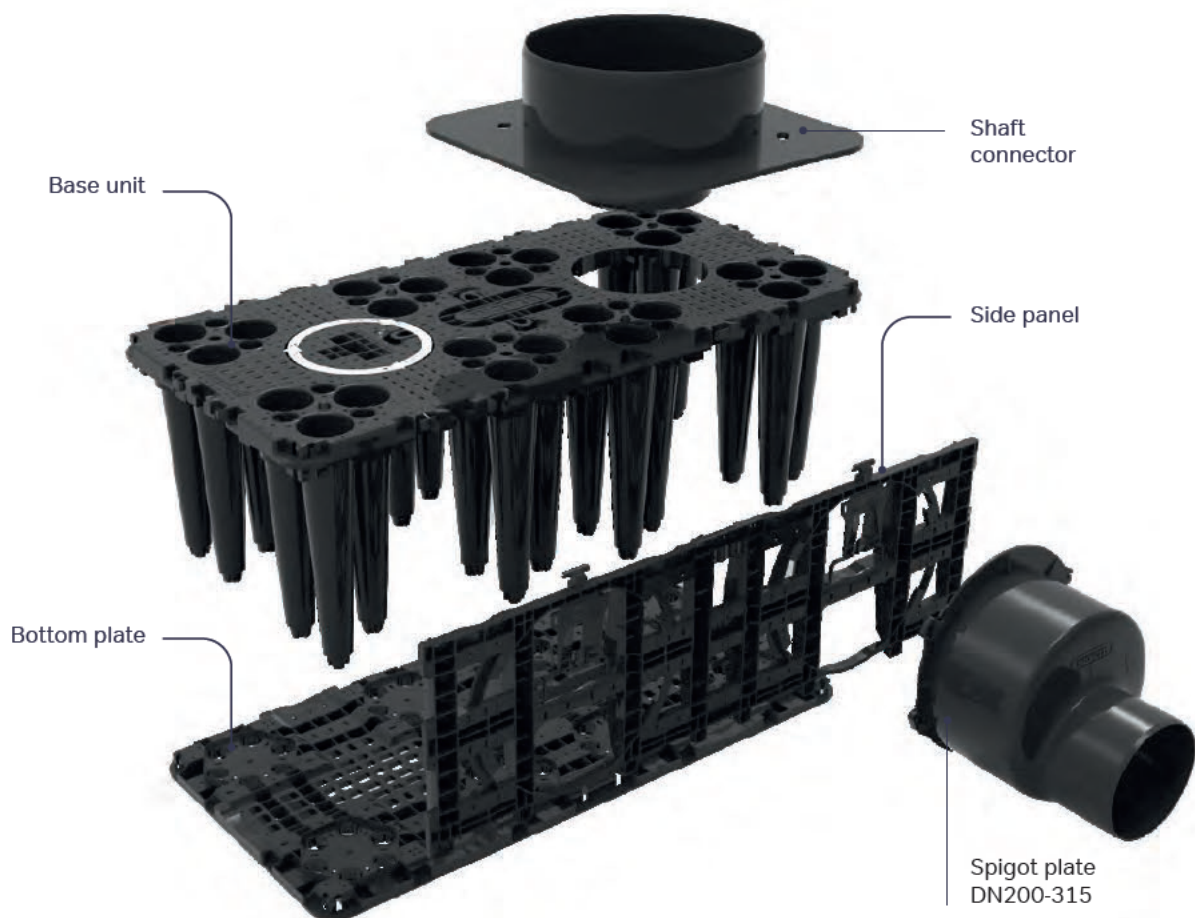
The AquaCell is a below ground (rain)water storage system which can be used in two different applications namely as an:

1. Infiltration system:

- Objective:
—temporary storage to allow the gradual infiltration of water into the soil.
- Solution:
—Wavin AquaCell system wrapped in a geotextile.

2. Attenuation system:

- Objective:
—temporary water storage and management to return the water to the existing network.
- Solution:
—Wavin AquaCell covered in a geomembrane seal, which is in protected by a geotextile around it.



1. Wavin AquaCell NG

Properties:

Base Unit	Material	Recycled PP (Polypropylene)
	Dimensions (mm)	1200x600x425 (LxWxH)
	Volume (Gross)	0.288m ³
	Volume (Net)	0.275m ³
	Void rate	96%
	Weight (kg)	11.4
	Pipe connections	110mm, 160mm, 225mm & 300mm
Bottom plate	Material	PP (Polypropylene)
	Dimensions (mm)	1200x600x35 (LxWxH)
	Weight (kg)	3.6
Side plate	Material	Recycled PP (Polypropylene)
	Dimensions (mm)	1155x373x50 (LxWxH)
	Weight	2.3
DN200-315 Spigot plate	Material	Recycled PP (Polypropylene)
	Dimensions (mm)	360x360x318 (LxWxH)
	Weight (kg)	1.3

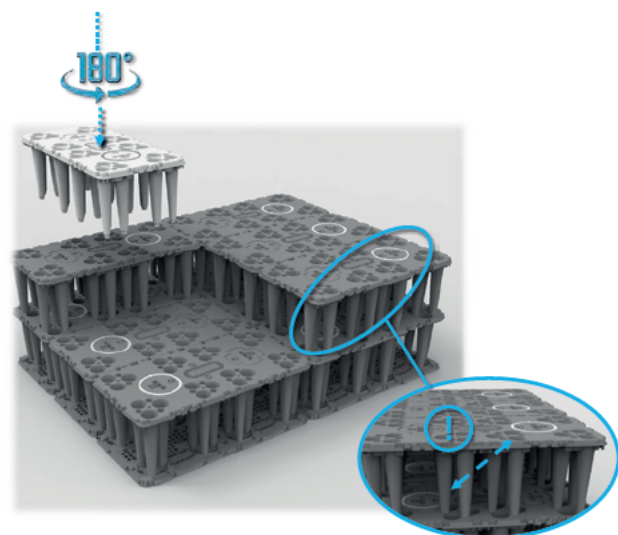
IMPORTANT

Regarding Orientation:

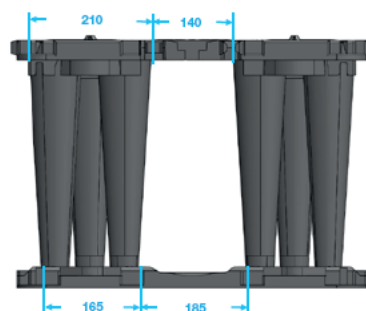
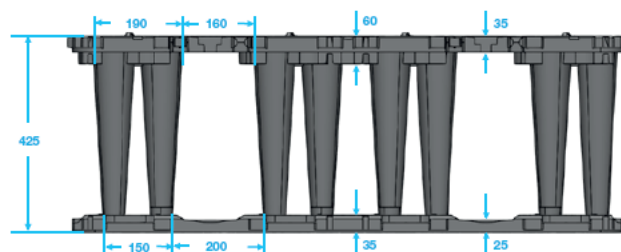
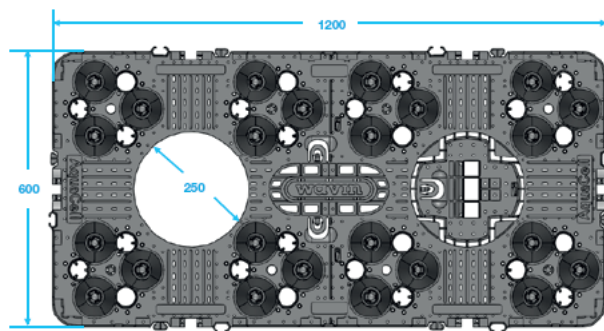
The base unit has a ring on top, which is used for the visual orientation of the product.

It is important to know that when the circle shape on the top of the unit is positioned above the circle of the unit below, the units will fall into each other, in the same way they are stacked on the pallet.

With a multi layer system it is important that all the circles are horizontally in line with each row of units. When installing the layer on top of an existing layer, the circle of the next unit should NOT be oriented directly above the circle of the base unit underneath but in the opposite direction, above the plus.



1.2. Dimensions

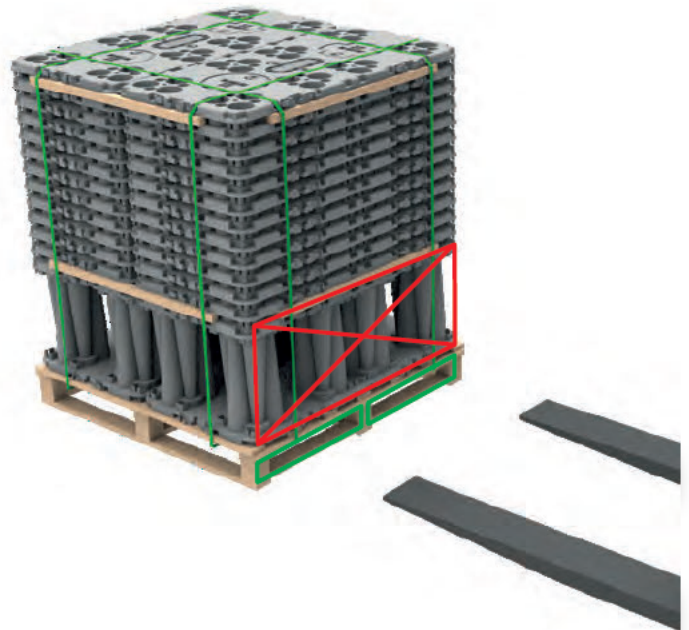


1.3. Destacking package and handling AquaCell NG

Handling by excavator or forklift:

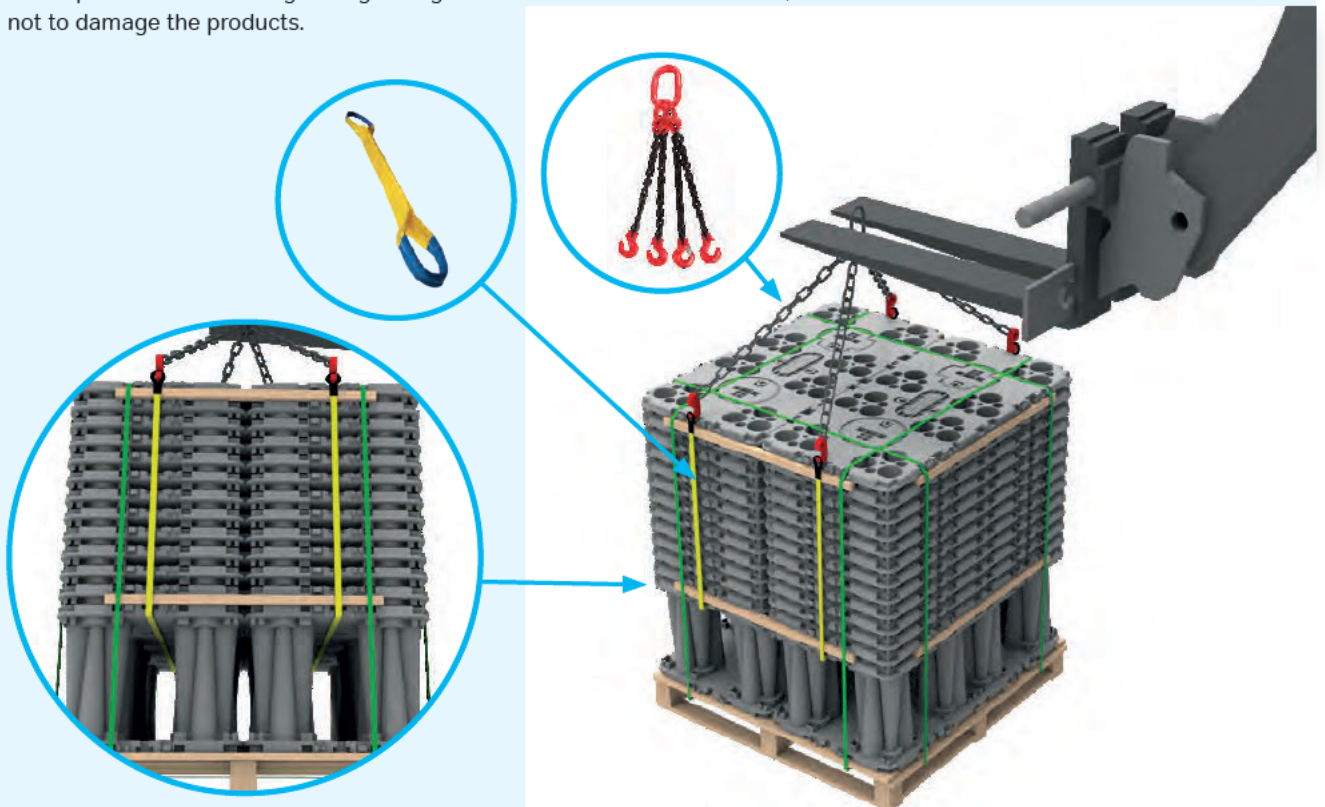
The AquaCell units are stacked 28 pieces per pallet.

The pallets can be lifted with forks on an excavator or forklift by positioning these forks in the openings of the pallets (see pictures):

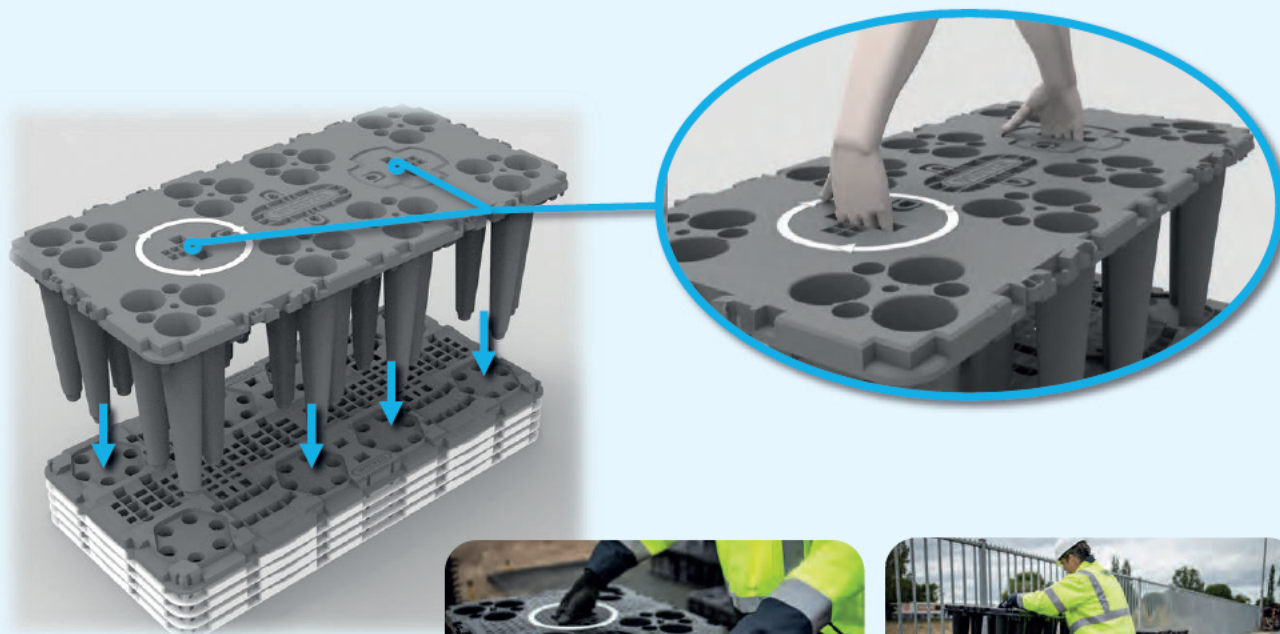


Handling with excavator or crane:

The pallets can also be lifted with slings positioned as indicated in the pictures. It is important that the sling is long enough that hooks are above the stack, not to damage the products.



The AquaCell NG Base unit has a low weight (11,4 kg) and is equipped with integrated handgrips for ergonomic handling.



For dismounting of the bottom layer of the stack pull firmly on one short side of the unit while keeping a foot on the bottom layer.



2. Installation instructions

For the total installation of the AquaCell NG the following steps have to be performed:

Step 1

Excavate the trench to the required depth ensuring that the plan area is slightly greater than that of the AquaCell NG units.

Lay 100mm of suitable bedding material.

Remove protruding (sharp) objects (e.g. stones) which can damage the geotextile/membrane).



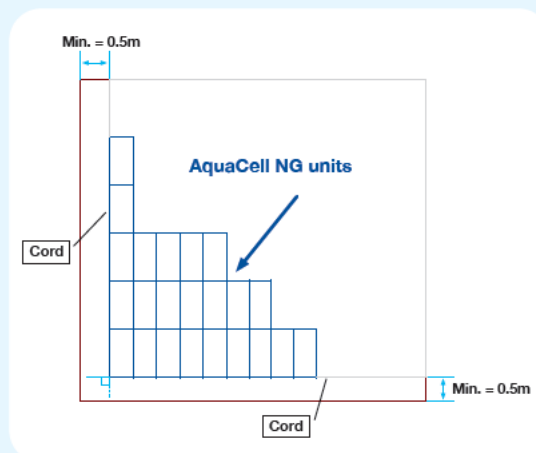
Step 3

Install the geotextile / geomembrane on the bottom of the trench. Lay the geotextile/Geomembrane over the base and the up the sides of the trench.



Step 4

Install and outline (perpendicular) a thin cord to ensure a straight system.



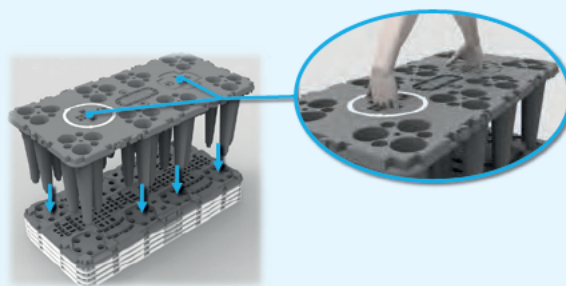
Step 2

Level and Compact.



Step 5

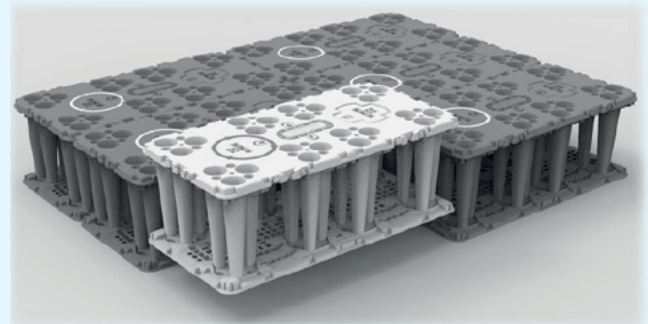
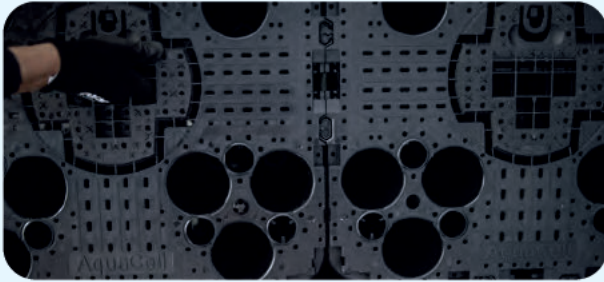
Bottom layer: Mount the bottom plate to the AquaCell unit (make sure an audible "click" is heard to ensure a proper connection) and place this unit in the outlined corner on the bottom of the trench.



Step 6a

Bottom layer: Place the next (outer) units (including a pre-mounted bottom plates) next to the installed units by sliding the integrated connectors into each other.

Note: Check the orientation of AquaCell NG (as above).



Repeat this until the full bottom layer is installed.

Step 6b

Vertical inspection: When vertical access through the unit is required, the round plate / “Circle” or “Cross” on top of the AquaCell NG unit must be cut. The cutting lines are marked by a “hand saw” logo. A saw with a blade length of a least 8cm is required.

Note: Make sure that the round “circle” plate or “cross” of each unit of each layer below the vertical access is cut.



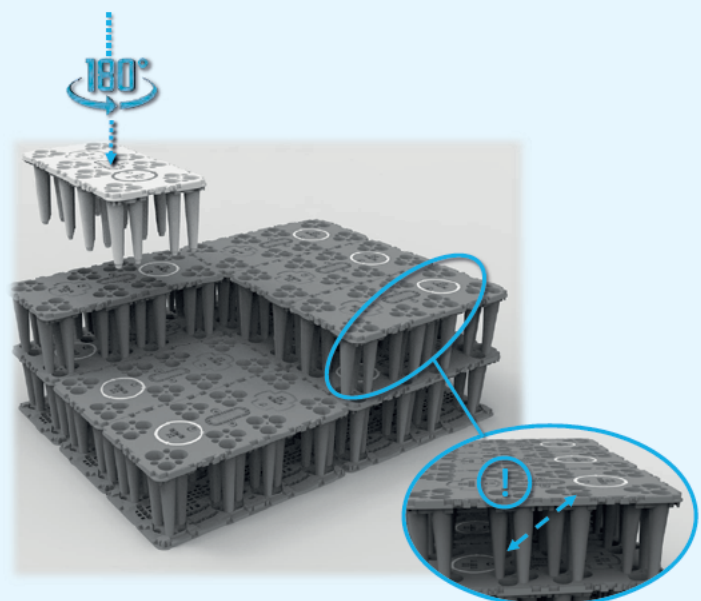
Step 7

Next layer(s): Mount the AquaCell NG (without bottom plate) directly on top of bottom layer unit(s). Each of the pillars will fall into position and click in the top directly on top of the bottom layer of the unit below.

Note 1: Keep in mind the orientation of the white circle (white circle above white circle is NOT possible!).

Note 2: The integrated connectors will slide into each other (vertically).

Note 3: It may be necessary to walk on top of previously laid AquaCell NG units. Care should be taken not to damage the edges of the units.

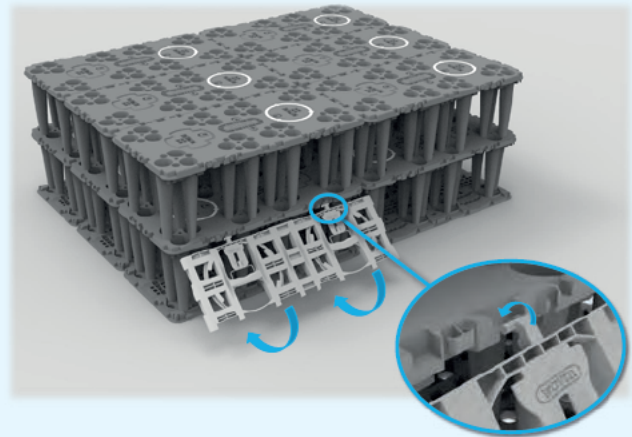


Repeat this for all the layers until all units are installed.

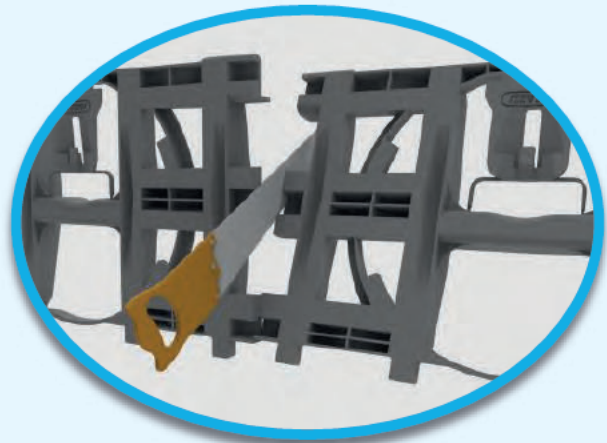
2. Installation instructions

Step 8

Side panels: The following step is to install the side panels by putting the hinge pins of the side panel into the hinge pockets the units under an angle. Next the panels can be hinged against the pillars of the AquaCell NG unit. The panel will snap to the unit.



Repeat this step until all side panels are installed and the system is fully closed except at the location where the inlet and outlet must be placed.

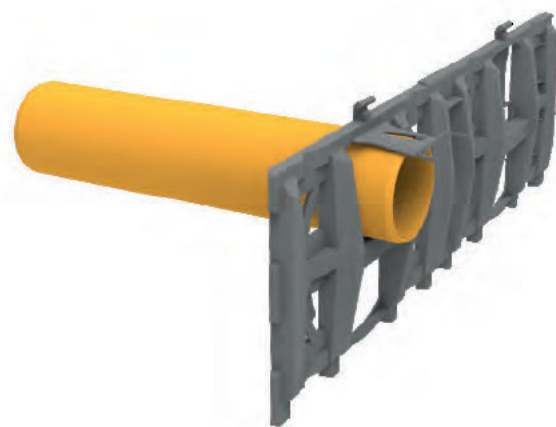
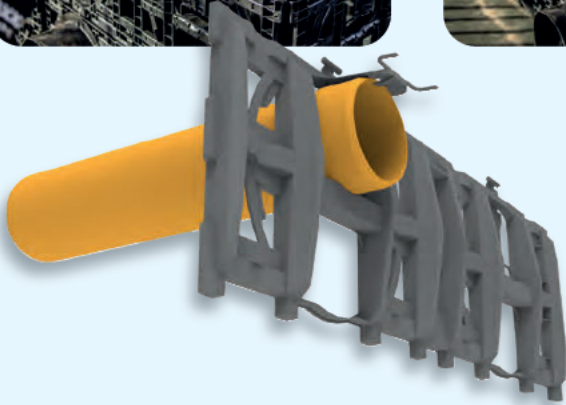


Note 1: In case of the need of a half sidepanel, the sidepanel must be cut.

Note 2: After cutting there is a left and right version. Be sure that the rounded edge of the half panel is positioned towards the corner of the system (not the cut edge!) or depending on the length of the side, put the half panel in between two uncut panels.

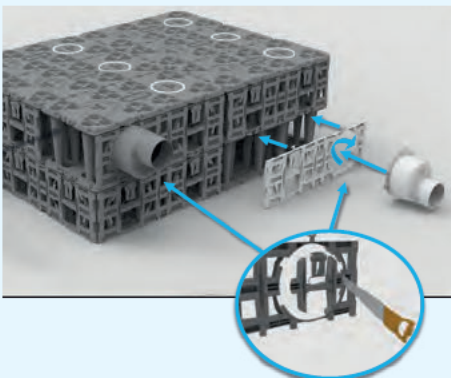
Step 9a

Connection 160mm: Each side panel has two standard DN160 Inlets with integrated pipe stopper. The two sprues of the pipe stopper can be cut/broken to activate this pipe stopper.



Step 9b

Connection 160mm: Each side panel also has two preformed openings that can be cut by a jigsaw. Next, the Inlet connector with spigot DN200 and DN315 can be connected by positioning and rotating until clicked into place. (Bayonet like).



2. Installation instructions

Step 10

Wrap the AquaCell NG Structure:
For soakaways - wrap and overlap the geotextile covering the entire AquaCell NG structure.

For attenuation tanks – wrap the geomembrane around the AquaCell NG structure and seal to manufacturer's recommendations**. Then wrap and overlay the geotextile, to protect the membrane.

**The geomembrane should be designed to survive the rigours of construction, this is typically at least 0.5mm thick. Joints should be sealed using proprietary welding techniques.



Step 11

Lay 100mm of coarse sand or non angular granular material between the trench walls and the AquaCell NG structure and compact.

Step 12

If installing integral vertical inspection shafts, directly onto the top surface of the AquaCell NG Tank structure, then ensure all pre-formed cut out sections are removed (on every level inside the structure).

Install Vertical adaptor within preformed cut out and seal to manufacturers recommendations.

Step 13

Lay 100mm of coarse sand or non angular granular material over the geotextile/geomembrane and compact. Backfill with suitable material.



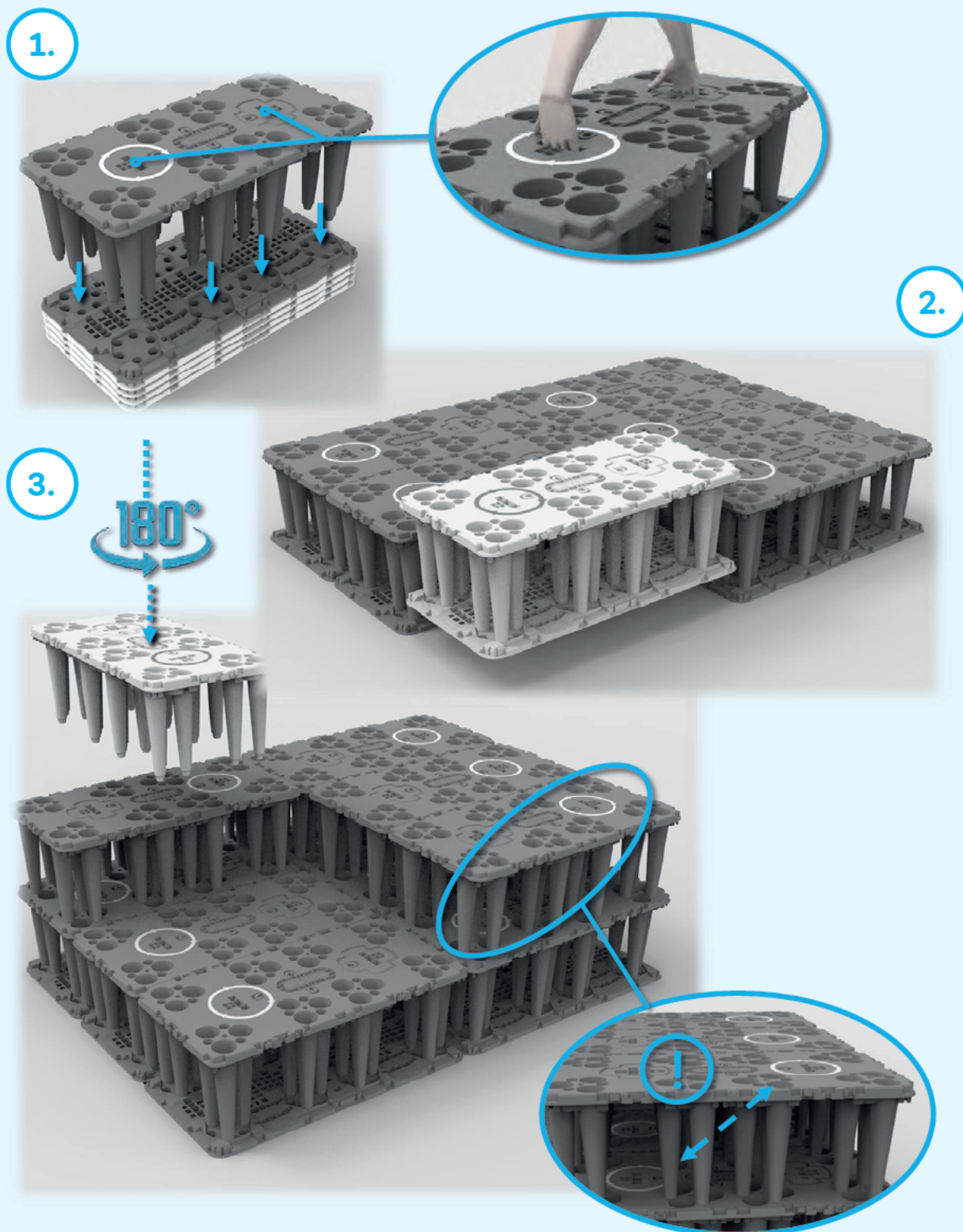
Construction Loads

Construction plant such as excavators can impose significant loads on any AquaCell NG unit. The following guidelines should be observed:

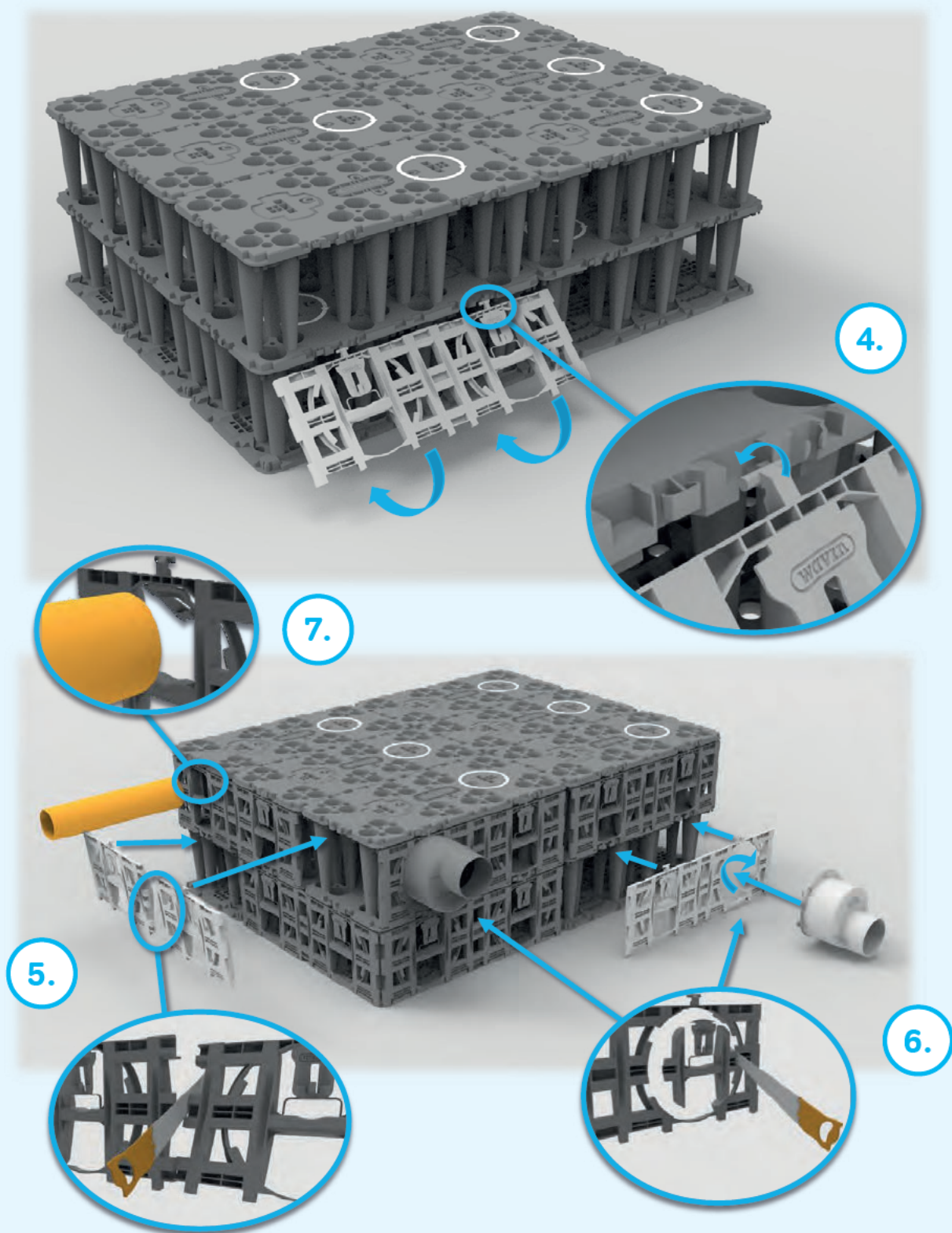
- Tracked excavators (not exceeding 21 tonnes weight) should be used to place fill over the AquaCell units when the geotextile or geomembrane wrapping has been completed
- At least 300mm of fill should be placed before the excavators or trucks delivering the backfill are allowed to traffic over the installed units
- Compaction plant used over the AquaCell NG units should not exceed 2300kg/metre width. This will allow the compaction of Type 1 sub-base in 150mm layers over the units in accordance with the Specification for Highways Works

- All other construction plant should be prevented from trafficking over the system once it is installed and surfacing completed, unless a site-specific assessment demonstrates that is acceptable
- In particular cranes should not be used over, or place their outriggers over the system

3. Schematical installation instructions



3. Schematical installation instructions





Wavin is part of Orbia, a community of companies working together to tackle some of the world's most complex challenges. We are bound by a common purpose: To Advance Life Around the World.



Orbia's Building and Infrastructure business Wavin is an innovative solutions provider for the global building and infrastructure industry. Backed by more than 60 years of product development experience, Wavin is advancing life around the world by building healthy, sustainable environments for global citizens. Whether it's to improve the distribution of clean drinking water, to make sanitation accessible for everyone, to create climate resilient cities, or to design comfortable living spaces, Wavin collaborates with municipal leaders, engineers, contractors, and installers to help future-proof communities, buildings and homes. Wavin has 12,000+ employees around 65 production sites worldwide, serving over 80 countries through a global sales and distribution network.

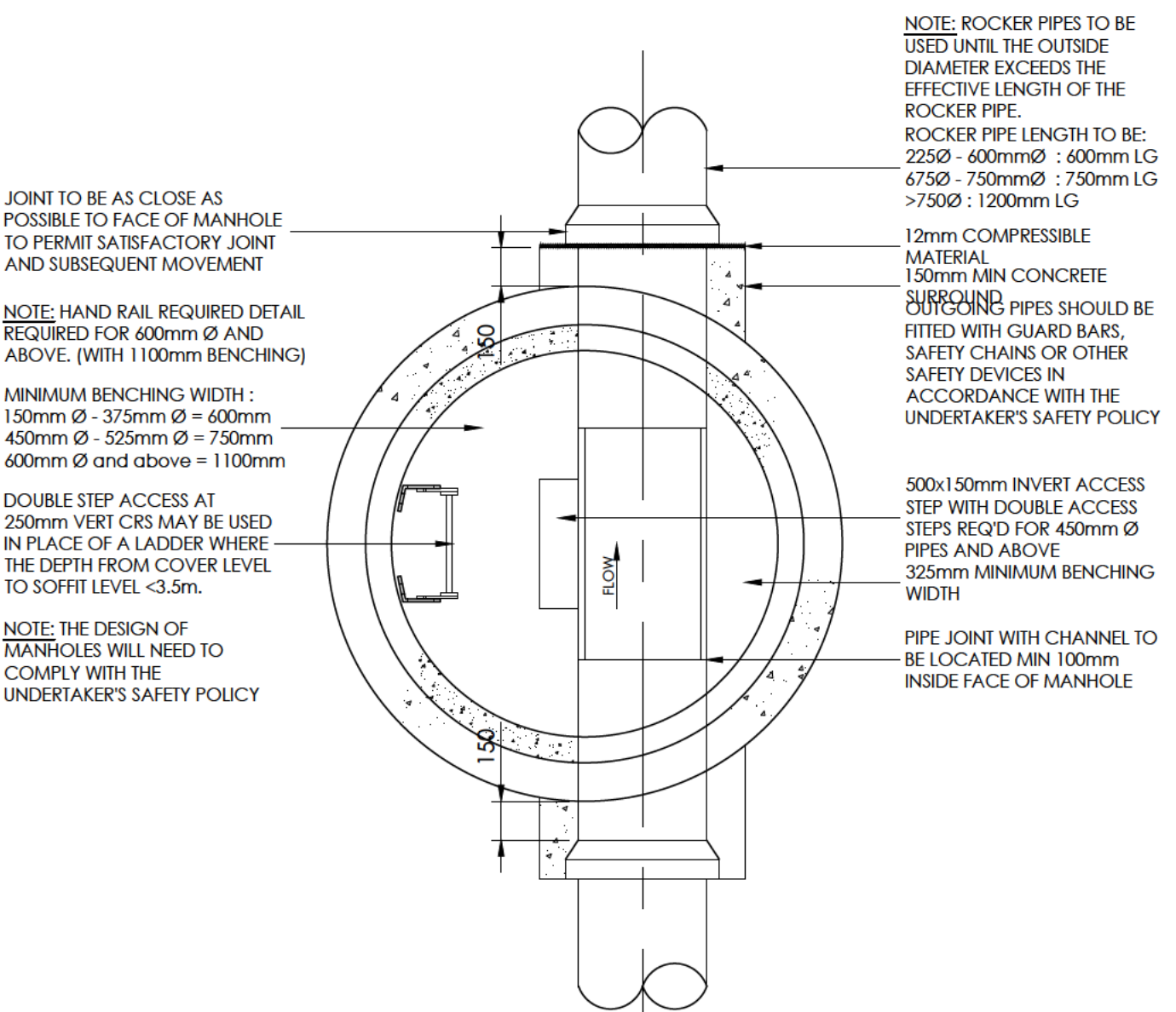
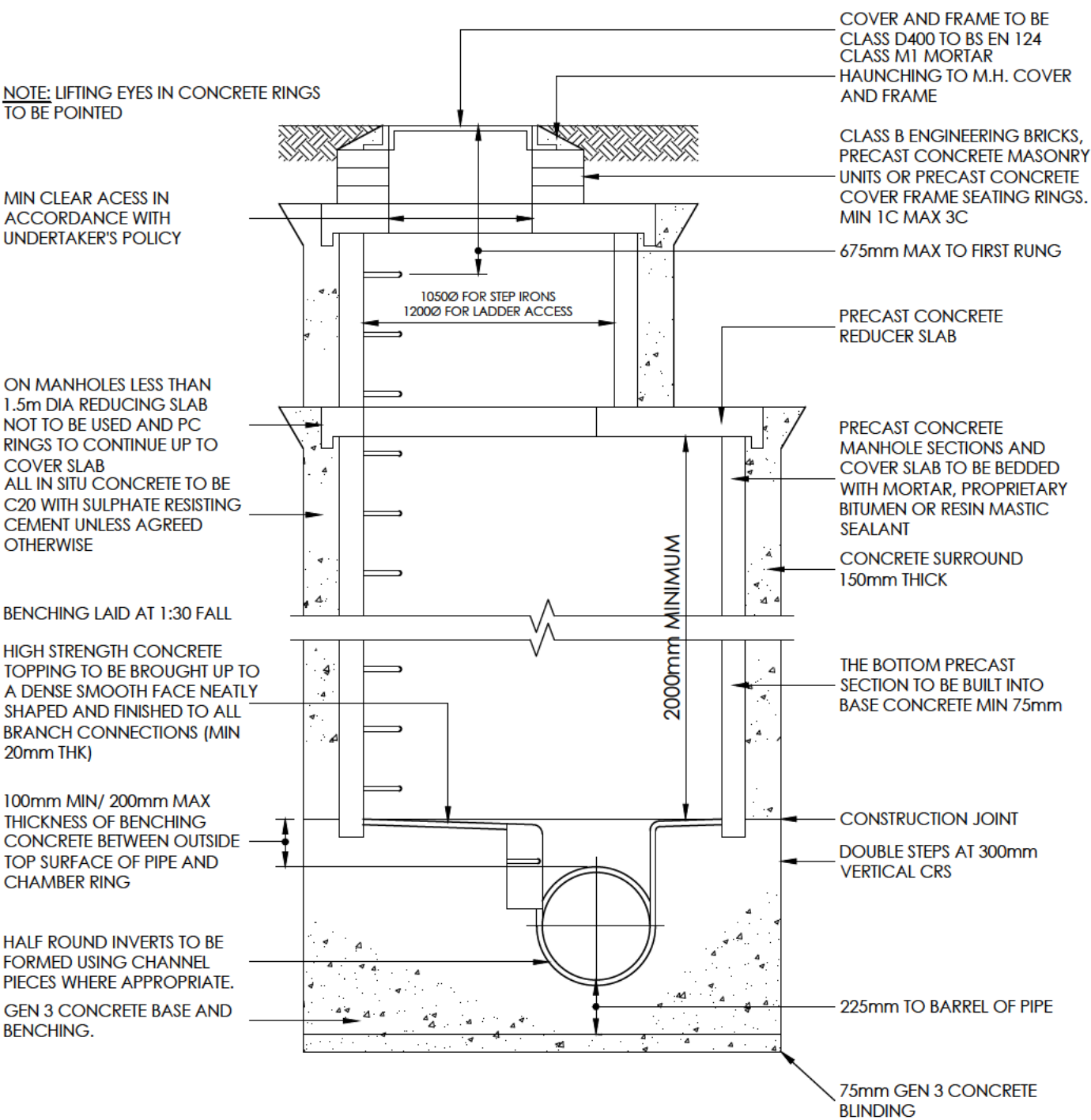
Wavin Limited | Registered Office | Edlington Lane | Doncaster | DN12 1BY
Tel. 0800 0380088 | www.wavin.co.uk | info@wavin.co.uk

© 2023 Wavin Wavin reserves the right to make alterations without prior notice. Due to continuous product development, changes in technical specifications may change. Installation must comply with the installation instructions.

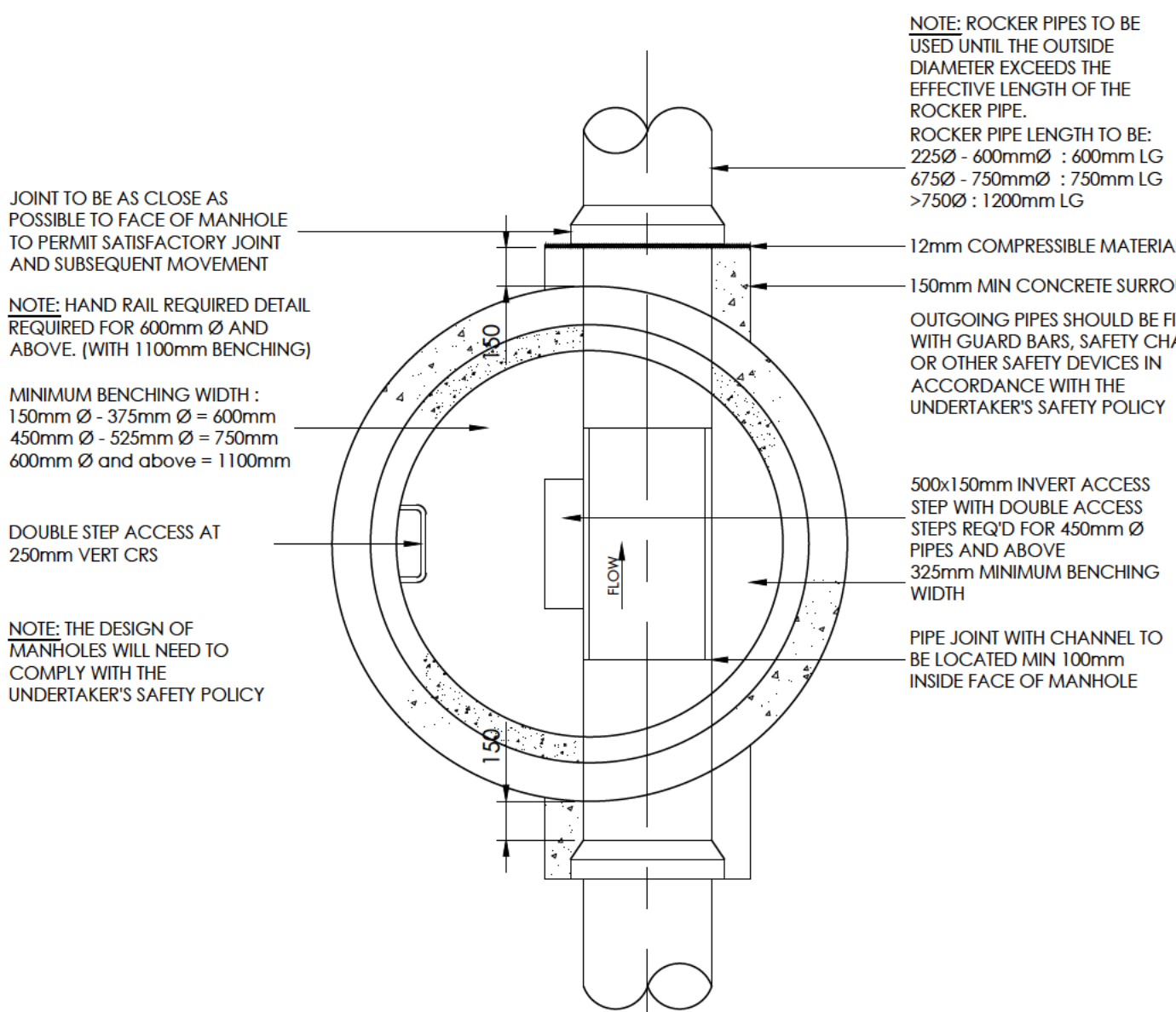
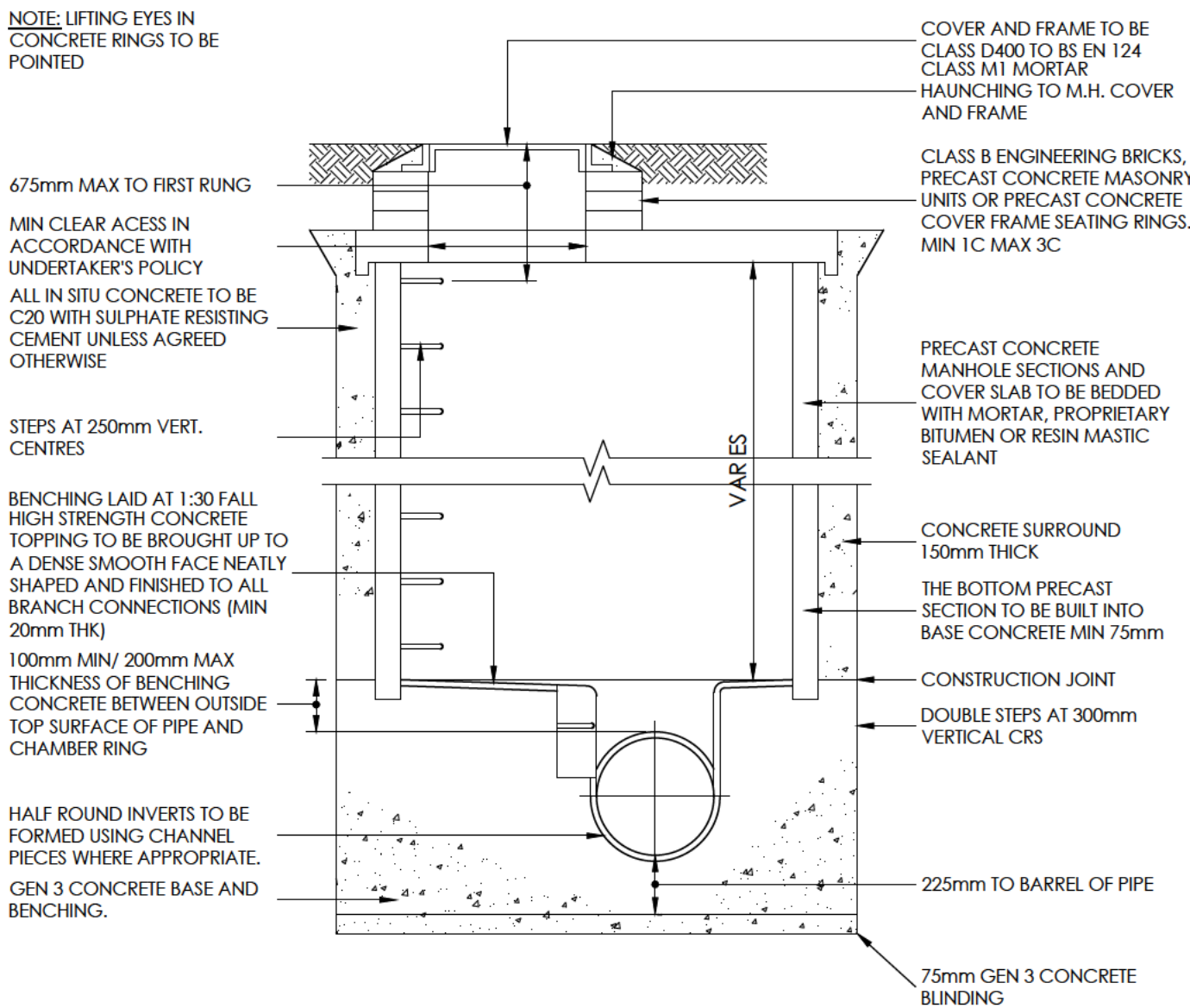
17.0 APPENDIX D – SUDS CONSTRUCTION DETAILS

NOTES:

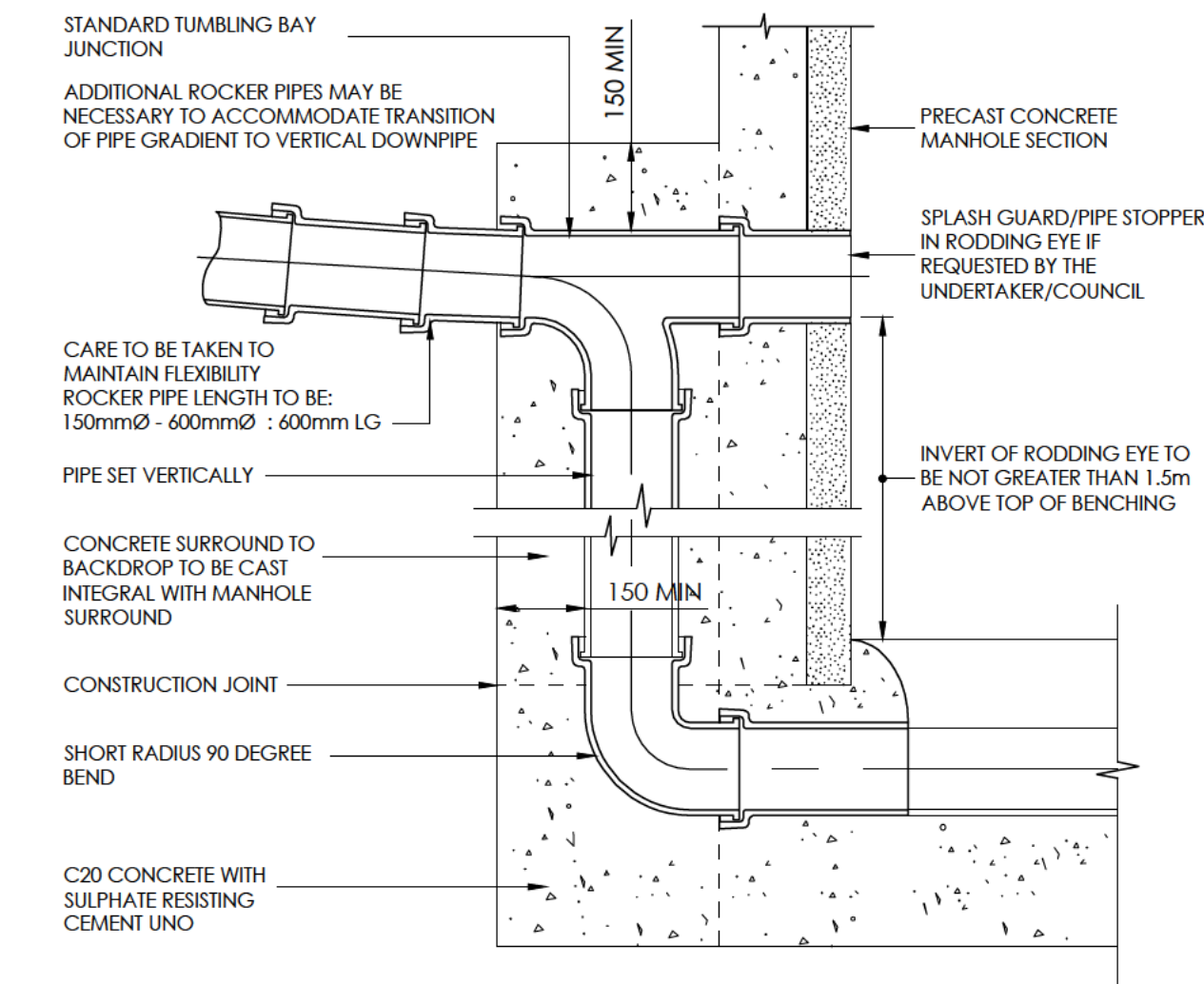
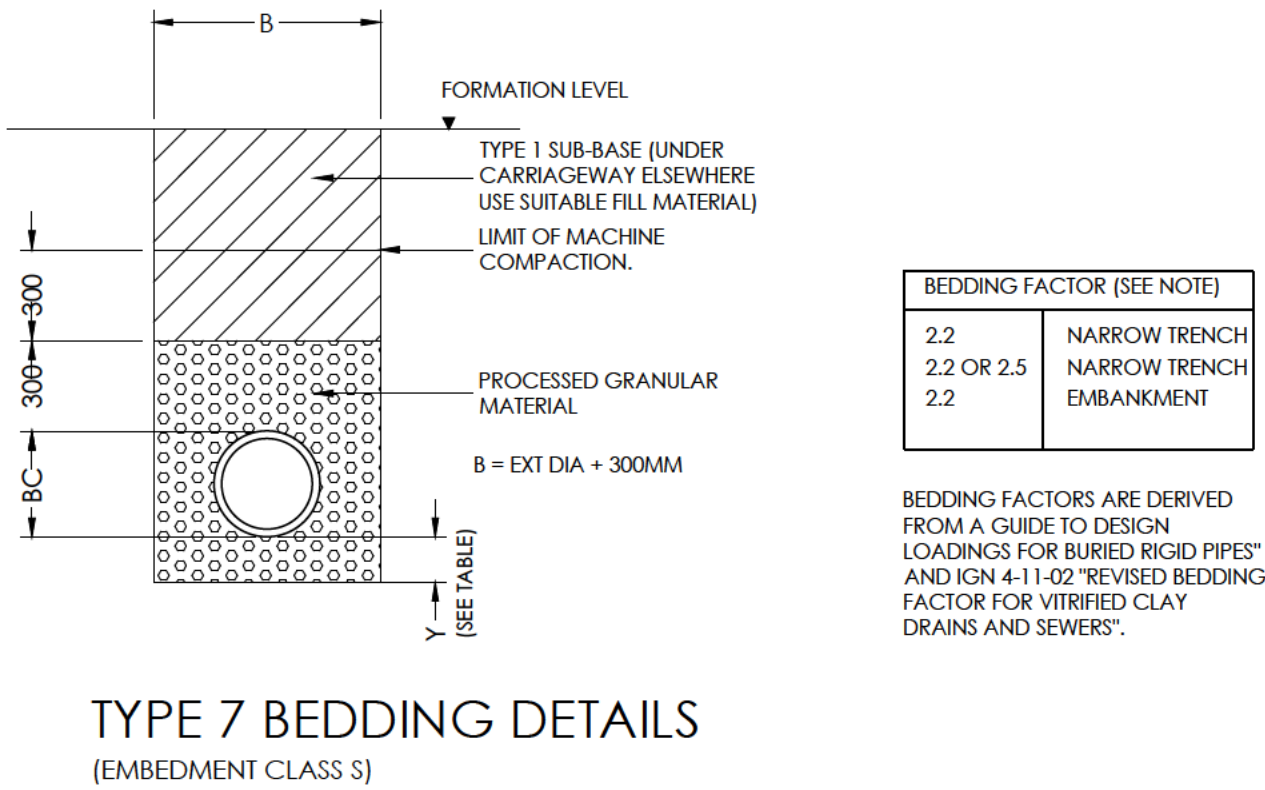
- DO NOT SCALE FROM THIS DRAWING.
- THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE DRAINAGE LAYOUT, LONG SECTIONS, MANHOLE SCHEDULES, AND ALL RELEVANT CIVIL, STRUCTURAL AND HIGHWAY DRAWINGS, AS WELL AS THE PROJECT SPECIFICATION.
- ALL WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF THE ADOPTING AUTHORITY, THE LATEST EDITION OF THE SEWERS FOR ADOPTION (OR LOCAL EQUIVALENT), THE SPECIFICATION FOR HIGHWAY WORKS, AND RELEVANT BRITISH STANDARDS.
- THE CONTRACTOR SHALL CHECK ALL DIMENSIONS, LEVELS, AND EXISTING SITE CONDITIONS PRIOR TO COMMENCING WORKS AND REPORT ANY DISCREPANCIES TO THE ENGINEER IMMEDIATELY.
- ALL SETTING OUT SHALL BE UNDERTAKEN BY A COMPETENT SURVEYOR FROM APPROVED CONTROL POINTS.
- ALL PIPES, FITTINGS, AND ANCILLARY COMPONENTS SHALL BE FROM APPROVED MANUFACTURERS AND COMPLY WITH RELEVANT BRITISH STANDARDS AND EUROPEAN STANDARDS.
- CONCRETE PIPES SHALL COMPLY WITH BS EN 1916 AND BS 5911; PLASTIC PIPES SHALL COMPLY WITH BS EN 1401 OR BS EN 13476 AS SPECIFIED.
- GRANULAR BEDDING AND SURROUND MATERIALS SHALL COMPLY WITH THE SPECIFICATION FOR HIGHWAY WORKS CLAUSE 503.
- MANHOLE RINGS, COVERS, AND FRAMES SHALL COMPLY WITH BS EN 1917 AND BS 5911-3, AND BE FROM APPROVED SOURCES.
- PIPE DIAMETERS, GRADIENTS, AND MATERIALS SHALL BE AS SHOWN ON THE DRAWINGS AND CONFIRMED IN THE SCHEDULES.
- BEDDING, SURROUND, AND BACKFILL MATERIALS SHALL BE PLACED AND COMPACTED IN ACCORDANCE WITH THE RELEVANT DETAIL AND SPECIFICATION.
- TRENCHES SHALL BE EXCAVATED TO PROVIDE THE SPECIFIED CLEARANCE AROUND THE PIPE BARREL, AND OVER-EXCAVATED AREAS SHALL BE BACKFILLED WITH SUITABLE MATERIAL AS DIRECTED BY THE ENGINEER.
- MANHOLE CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE STANDARD DETAILS, INCLUDING STEP OR LADDER PROVISION WHERE REQUIRED.
- BENCHING SHALL BE FINISHED TO A SMOOTH, DENSE SURFACE WITH A FALL TO THE CHANNEL.
- COVERS AND FRAMES SHALL BE SET TO FINISHED SURFACE LEVELS, SQUARE TO THE LINE OF THE CARRIAGEWAY OR FOOTWAY, AND BEDDED ON HIGH-STRENGTH MORTAR.
- ALL CONNECTIONS TO EXISTING DRAINAGE SYSTEMS SHALL BE MADE UNDER THE SUPERVISION OF THE ADOPTING AUTHORITY AND IN ACCORDANCE WITH THEIR REQUIREMENTS.
- SADDLES, JUNCTIONS, AND OTHER FITTINGS SHALL BE INSTALLED IN THE CORRECT ORIENTATION TO MAINTAIN HYDRAULIC EFFICIENCY.
- ALL PIPELINES SHALL BE TESTED IN ACCORDANCE WITH BS EN 1610 FOR WATER TIGHTNESS BEFORE BACKFILLING.
- ALL MANHOLES AND CHAMBERS SHALL BE INSPECTED FOR COMPLIANCE BEFORE FINAL SURFACING WORKS COMMENCE.
- THE CONTRACTOR SHALL PROTECT ALL INSTALLED DRAINAGE COMPONENTS FROM DAMAGE DURING CONSTRUCTION.
- ALL DRAINAGE RUNS SHALL BE FLUSHED AND LEFT CLEAR OF DEBRIS BEFORE HANDOVER.
- WORKS SHALL BE CARRIED OUT IN COMPLIANCE WITH CURRENT HEALTH AND SAFETY LEGISLATION, WITH SAFE ACCESS PROVIDED TO EXCAVATIONS AT ALL TIMES.
- EXCAVATIONS SHALL BE SUPPORTED WHERE NECESSARY TO PREVENT COLLAPSE.
- MEASURES SHALL BE TAKEN TO PREVENT CONTAMINATION OF WATERCOURSES DURING CONSTRUCTION, AND WASTE MATERIALS SHALL BE DISPOSED OF IN ACCORDANCE WITH CURRENT ENVIRONMENTAL LEGISLATION.



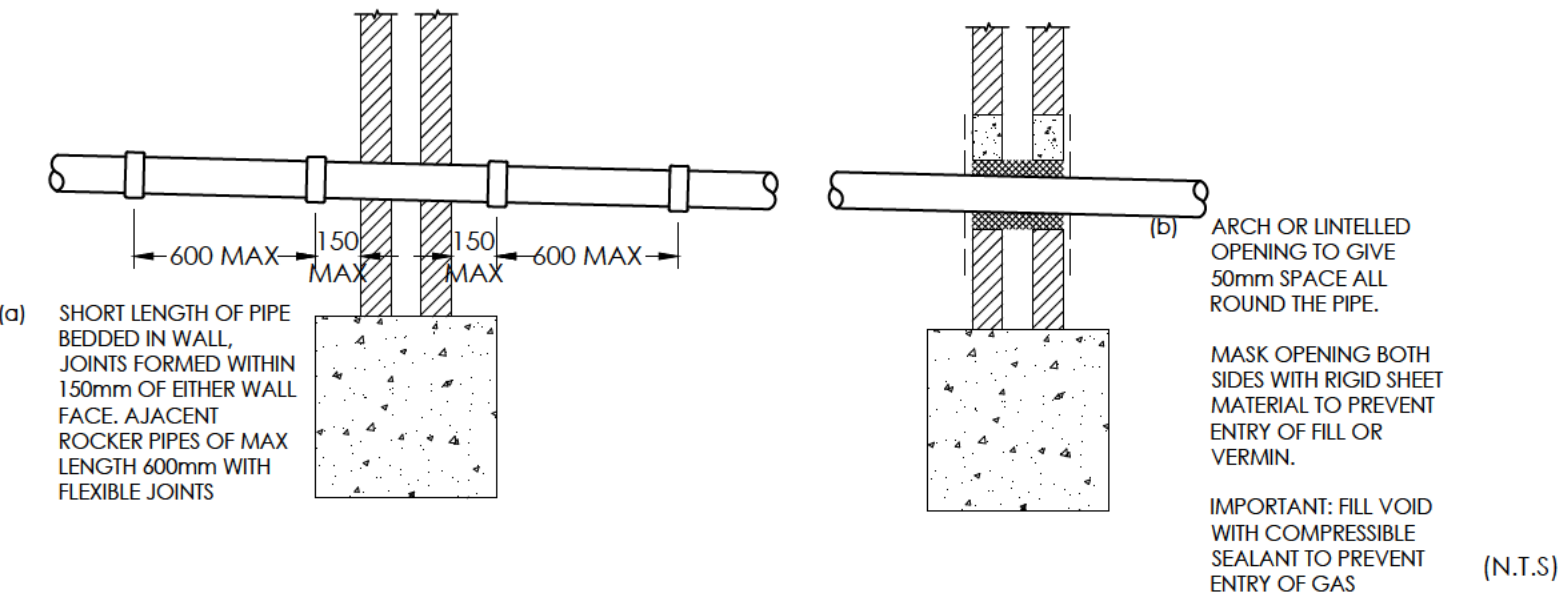
TYPICAL MANHOLE DETAIL TYPE A
DEPTH FROM GROUND LEVEL TO SOFFIT OF PIPE 3m TO 6m



TYPICAL MANHOLE DETAIL TYPE B
MAXIMUM DEPTH FROM GROUND LEVEL TO SOFFIT OF PIPE 3.0m



TYPICAL BACKDROP DETAIL



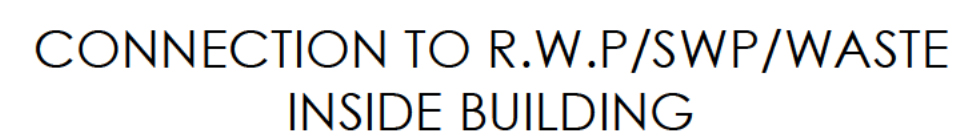
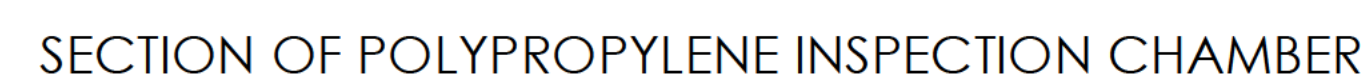
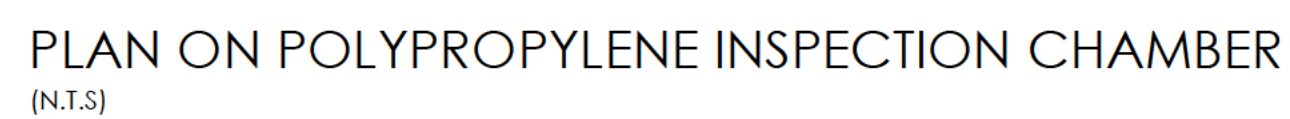
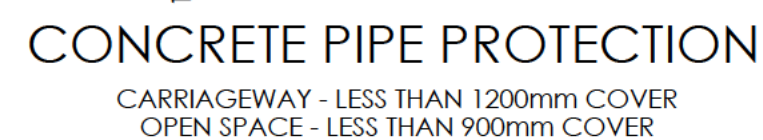
PIPES PENETRATING THROUGH WALLS

THIS DRAWING IS SUBJECT TO SECTION 104 APPROVAL AND THEREFORE SHOULD NOT BE USED FOR CONSTRUCTION.

THE PURPOSE OF THIS DRAWING IS FOR TYPICAL CONSTRUCTION DETAILS ONLY. MANHOLES / PIPE DIAMETERS / SUMP DEPTHS ETC WILL VARY ON PLAN.

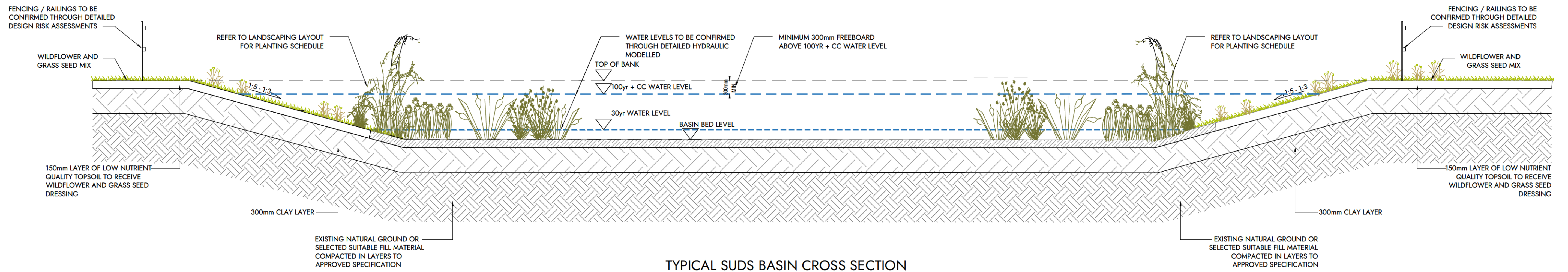
REFER TO DRAINAGE LAYOUT DRAWING FOR ALL PIPE SIZES, MANHOLE SIZES, PIPE LENGTHS, SUMP DEPTHS, STORAGE TANK CONFIGURATIONS, COVER LEVELS AND INVERT LEVELS

P01	16.01.2026	PB	FIRST ISSUE
Rev	Date	By	Description
Liverpool Office Tel 0151 305 0700 www.shapeengineering.co.uk			
Client MORRIS HOMES			
PROJECT HIGHMOOR FARM, CLITHEROE			
TITLE Drainage Construction Details - Sheet 1			
Status	Suitability Description	Structural Stage	Date
-	PLANNING	-	16.01.2026
Designed By	Drawn By	Scale @ AD	Project No.
PB	PB	VARIES	2936
Sheet No.			Revision
2936-SCE-00-00-DR-C-0070			P01

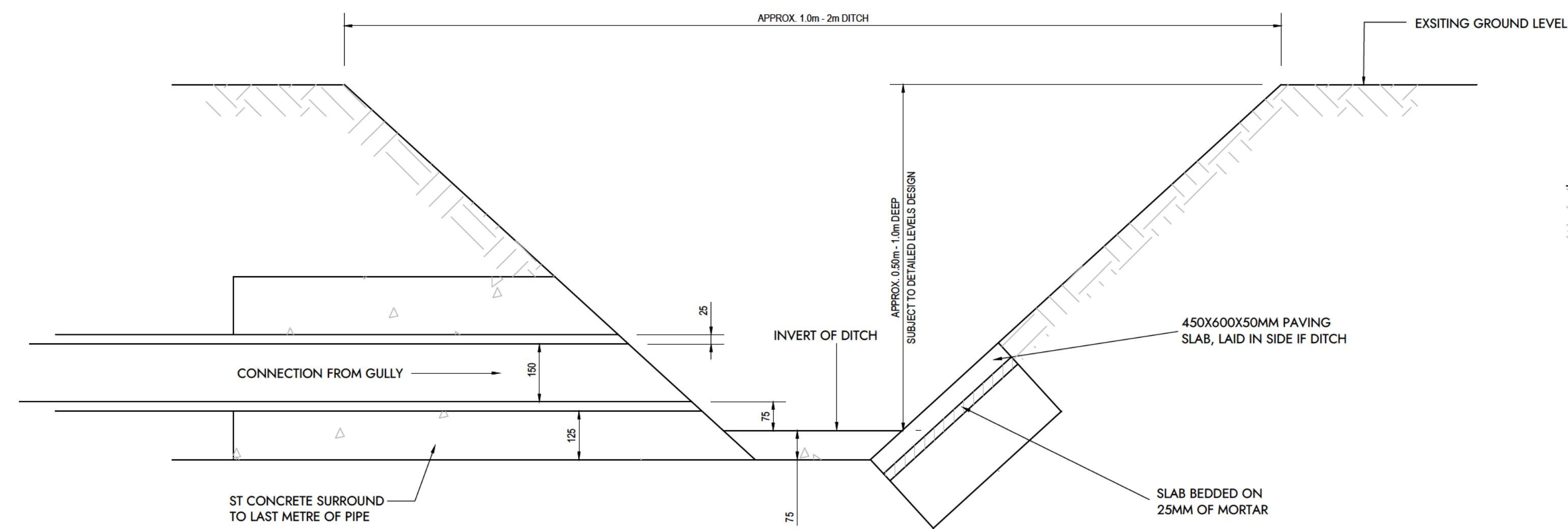


1. DO NOT SCALE FROM THIS DRAWING.
2. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE DRAINAGE LAYOUT, LONG SECTIONS, MANHOLE SCHEDULES, AND ALL RELEVANT CIVIL, STRUCTURAL AND HIGHWAY DRAWINGS, AS WELL AS THE PROJECT SPECIFICATION.
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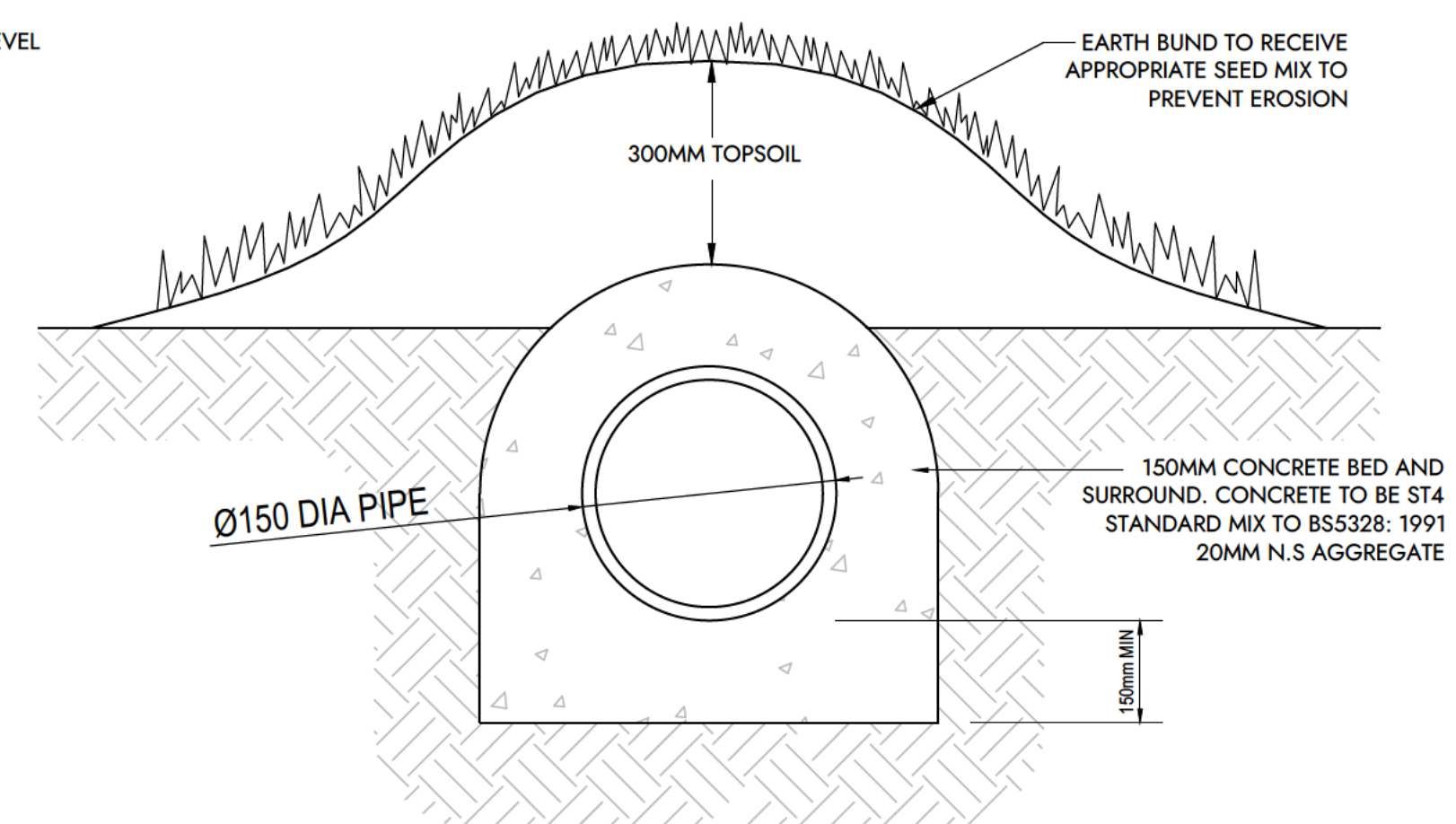
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TYPICAL SUDS BASIN CROSS SECTION

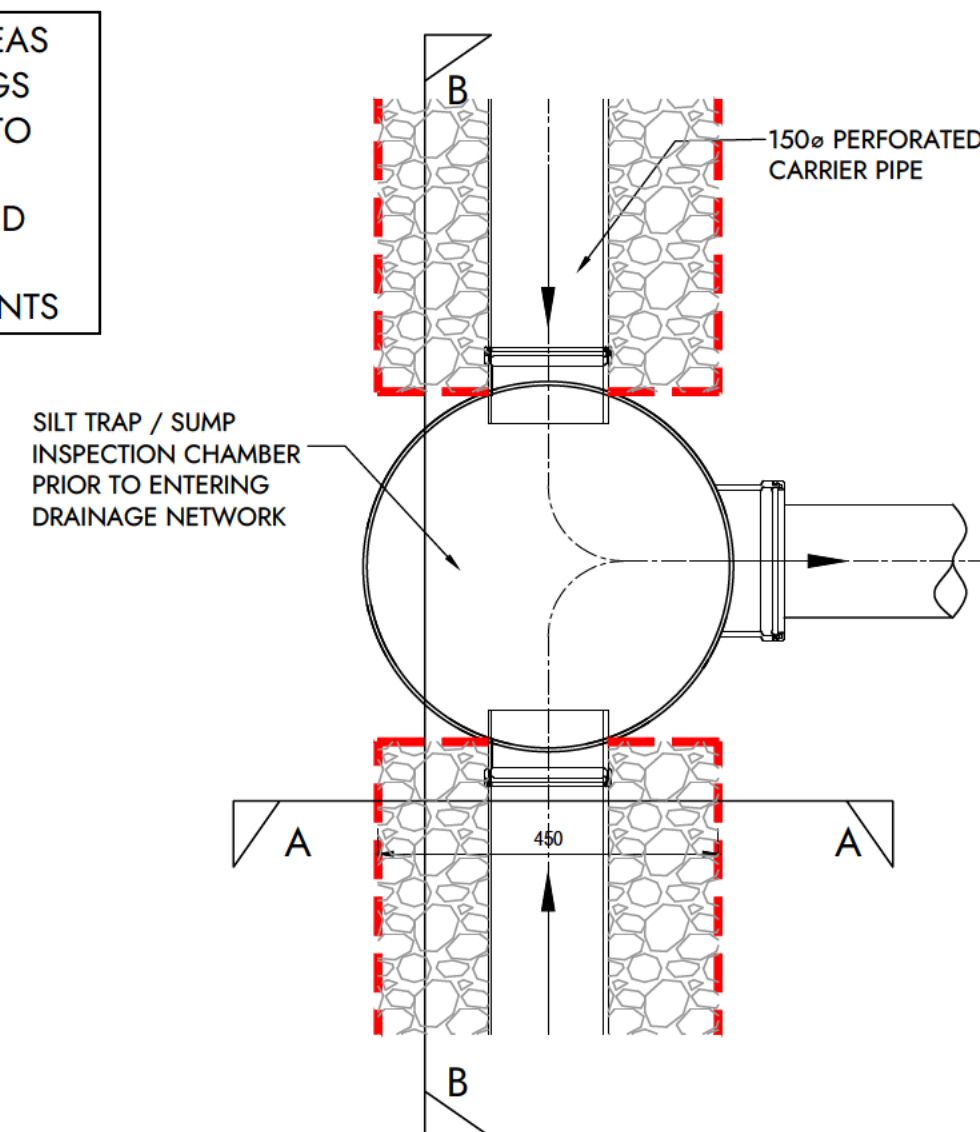


SECTION THROUGH TYPICAL DRAINAGE DITCH WITH GULLY INLET
SCALE 1:20

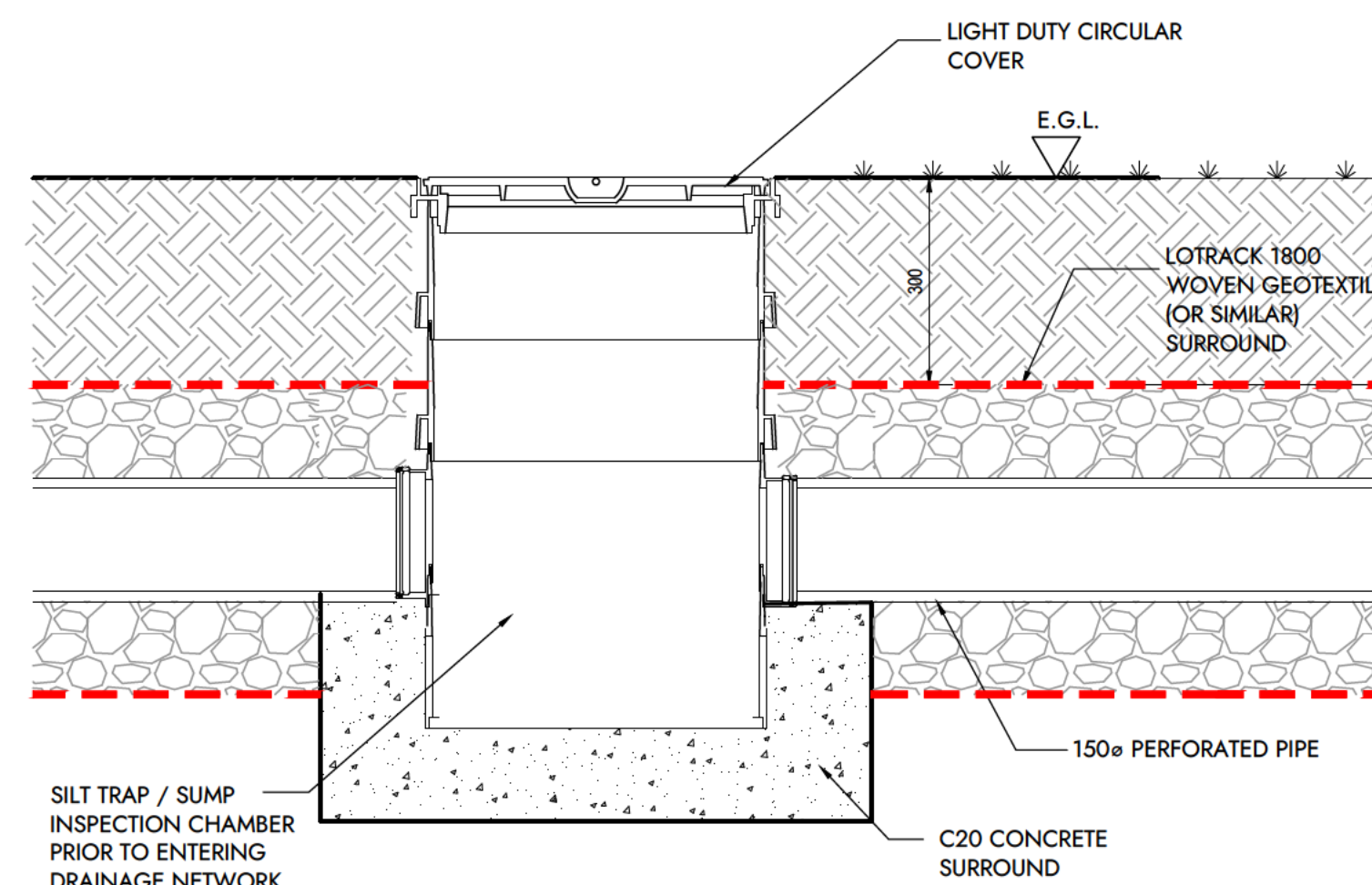


SECTION THROUGH GULLY OUTLET PIPE INTO DITCH
SCALE 1:20

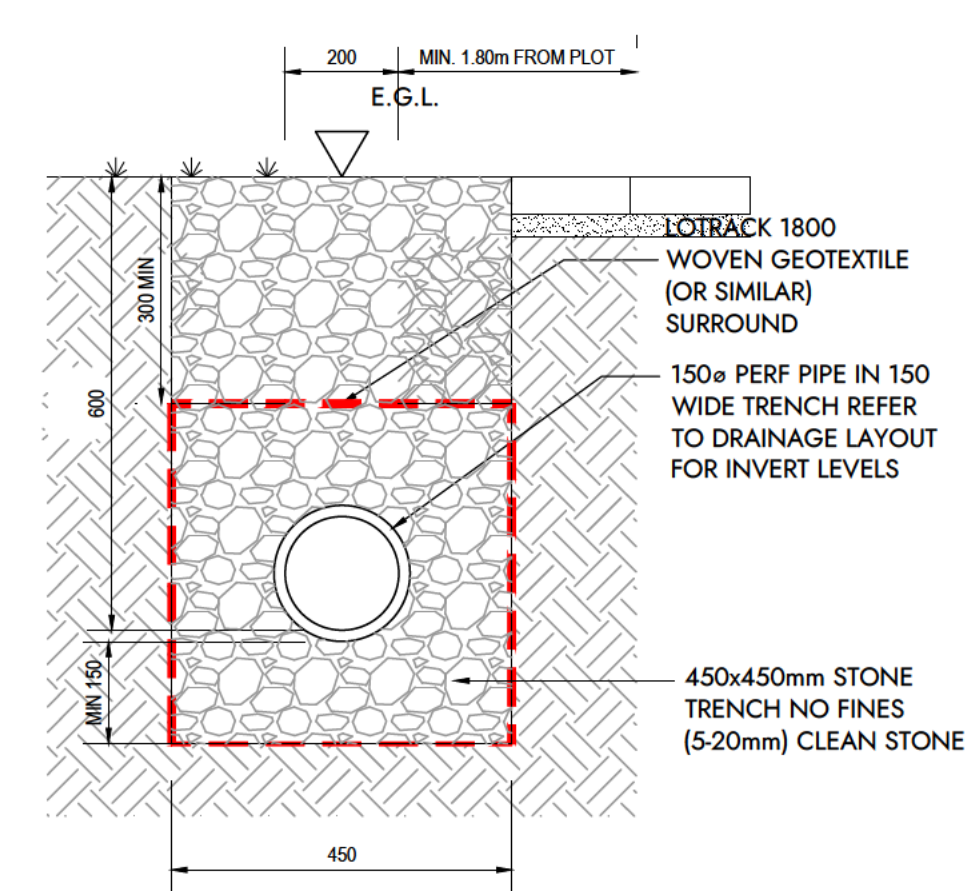
NOTE: WERE USED IN LANDSCAPING AREAS (I.E. NO COLLECTION OF HARDSTANDINGS CATCHMENTS), POSITIVE CONNECTION TO DRAINAGE NETWORK NOT REQUIRED. PERFORATED PIPE IS TO BE OMITTED, LAND DRAIN WILL ASSIST WITH NATURAL INFILTRATION DURING EXCEEDANCE EVENTS



PLAN ON LAND DRAIN



LAND DRAIN SECTION B-B



SECTION A-A THROUGH LAND DRAIN

P03	21.01.2026	KF	REVISED TO SUIT CLIENTS COMMENTS
P02	20.01.2026	NM	LAND DRAIN DETAIL ADDED
P01	16.01.2026	PB	FIRST ISSUE
Rev	Date	By	Description

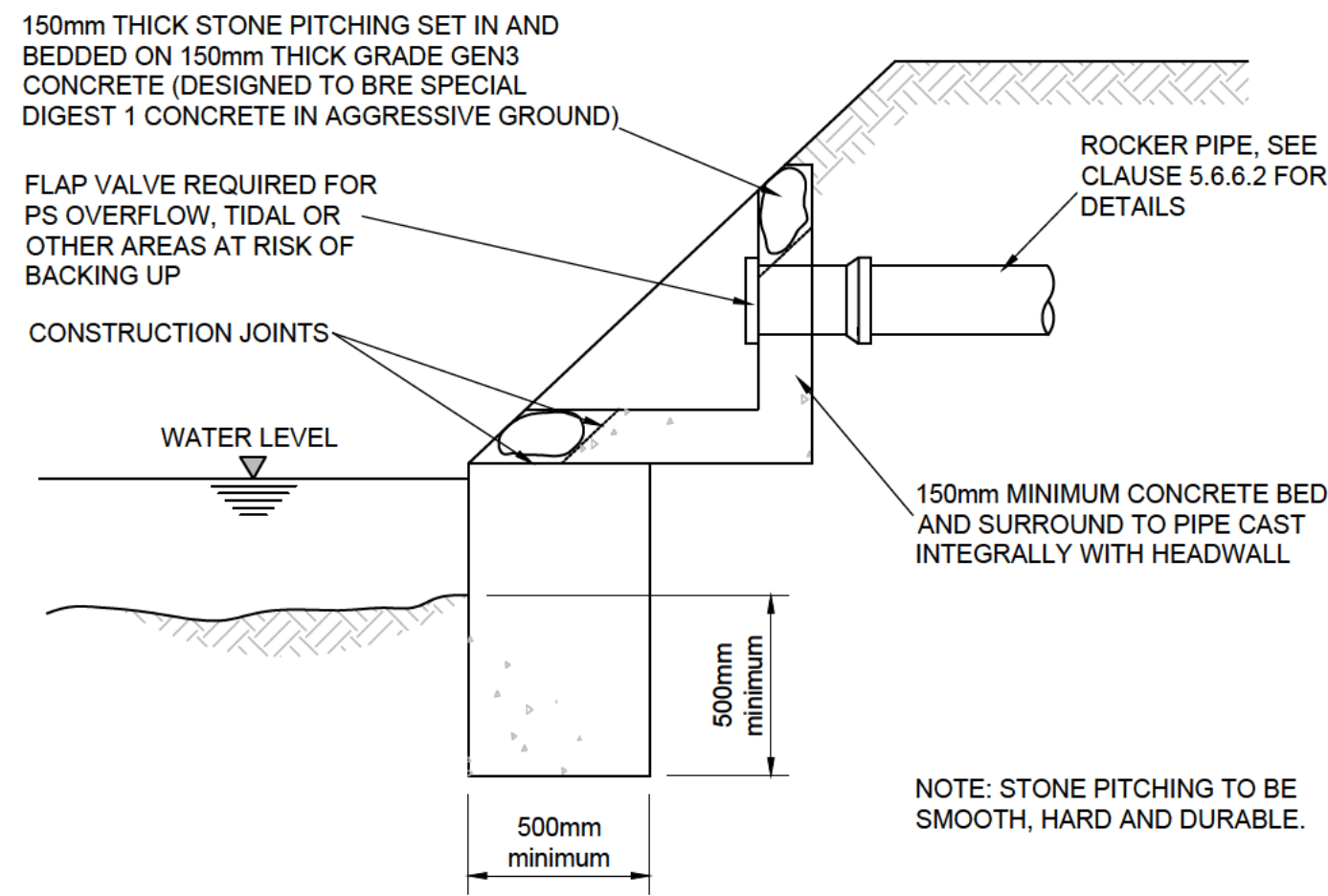
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Client
MORRIS HOMES

Project
HIGHMOOR FARM, CLITHEROE

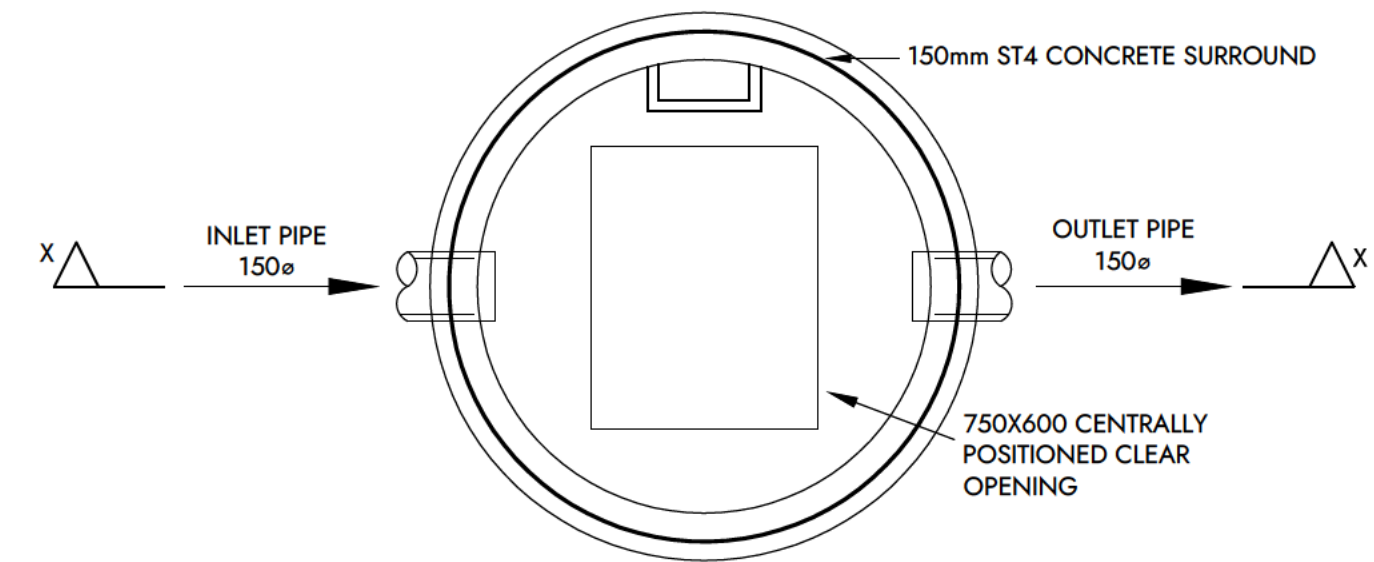
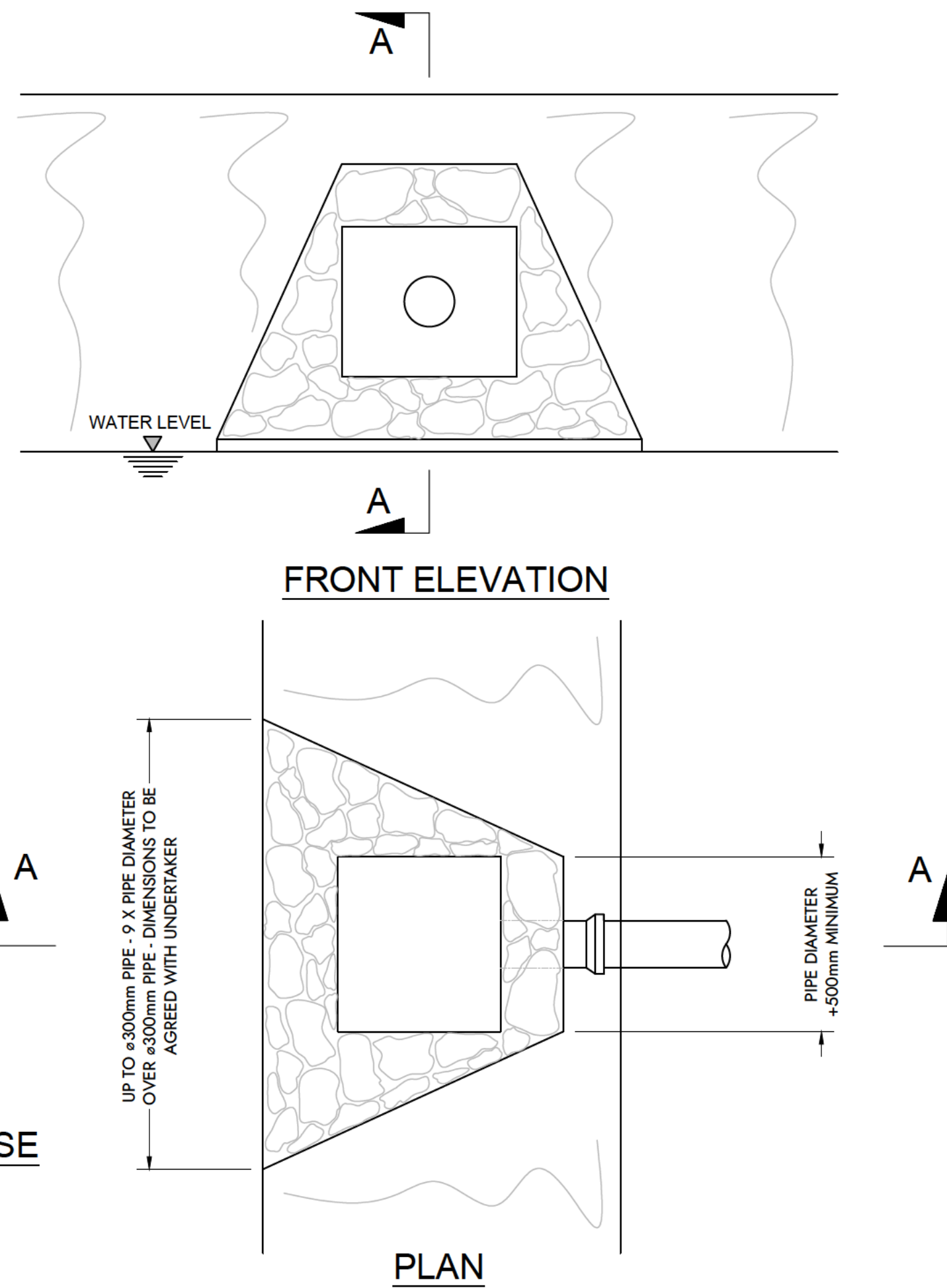
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Status	Suitability Description	Structural Stage	Date
Designed By	Drawn By	Scale @ A1	Project No.
PB	PB	AS SHOWN	2936
Sheet No.	Revision		
2936-SCE-00-00-DR-C-0072	P03		



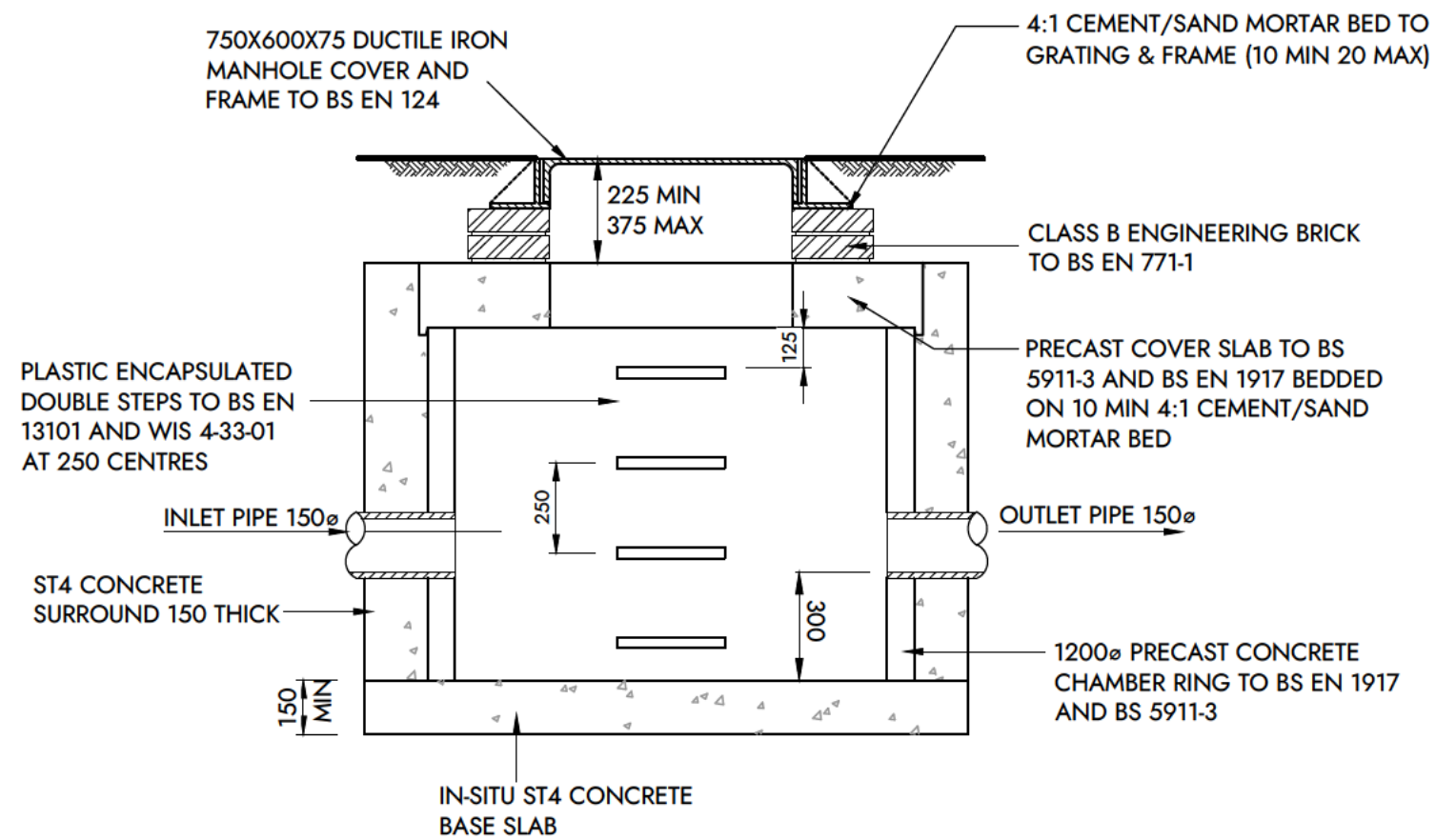
SECTION A - A

TYPICAL DETAIL OF OUTFALL TO WATERCOURSE

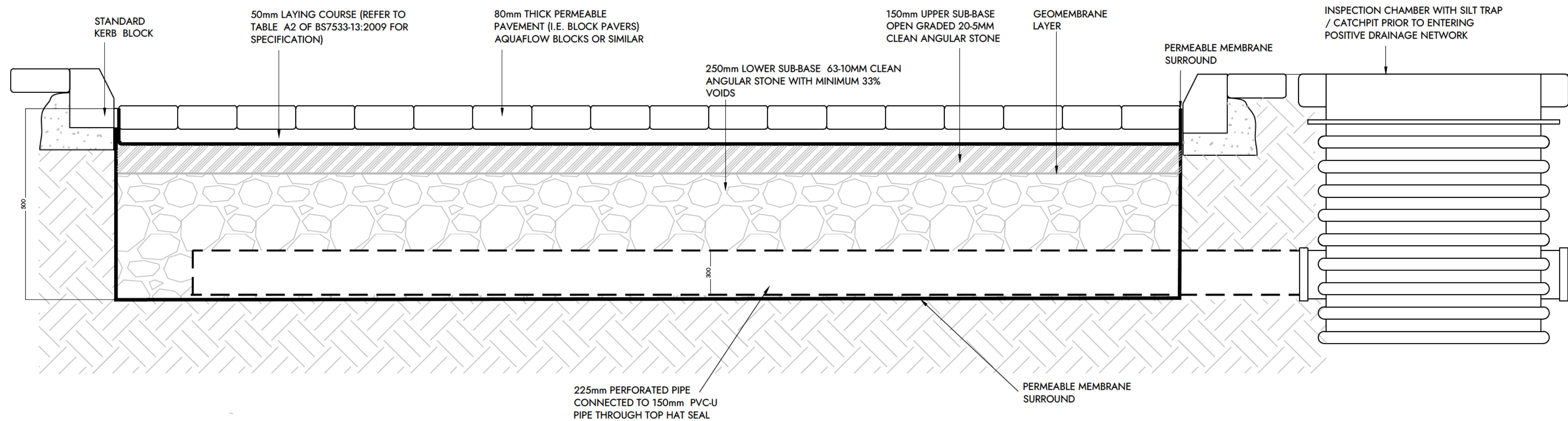
SUITABLE FOR OUTFALL PIPES OF LESS THAN 350mm
SCALE 1:20



PLAN CATCHPIT
SCALE 1:25



SECTION X-X CATCHPIT
SCALE 1:20



SECTION THROUGH PERMEABLE PAVING BENEATH CAR PARK

P03	21.01.2026	KF	REVISED TO SUIT CLIENTS COMMENTS
P02	20.01.2026	NM	OUTFALL DETAILS REVISED
P01	16.01.2026	PB	FIRST ISSUE
Rev	Date	By	Description

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Client
MORRIS HOMES

Project
HIGHMOOR FARM, CLITHEROE

Title
SUDS Details - Sheet 2

Status	Suitability Description	Structural Stage	Date
PLANNING			16.01.2026

Designed By	Drawn By	Scale @ A1	Project No.
PB	PB	AS SHOWN	2936

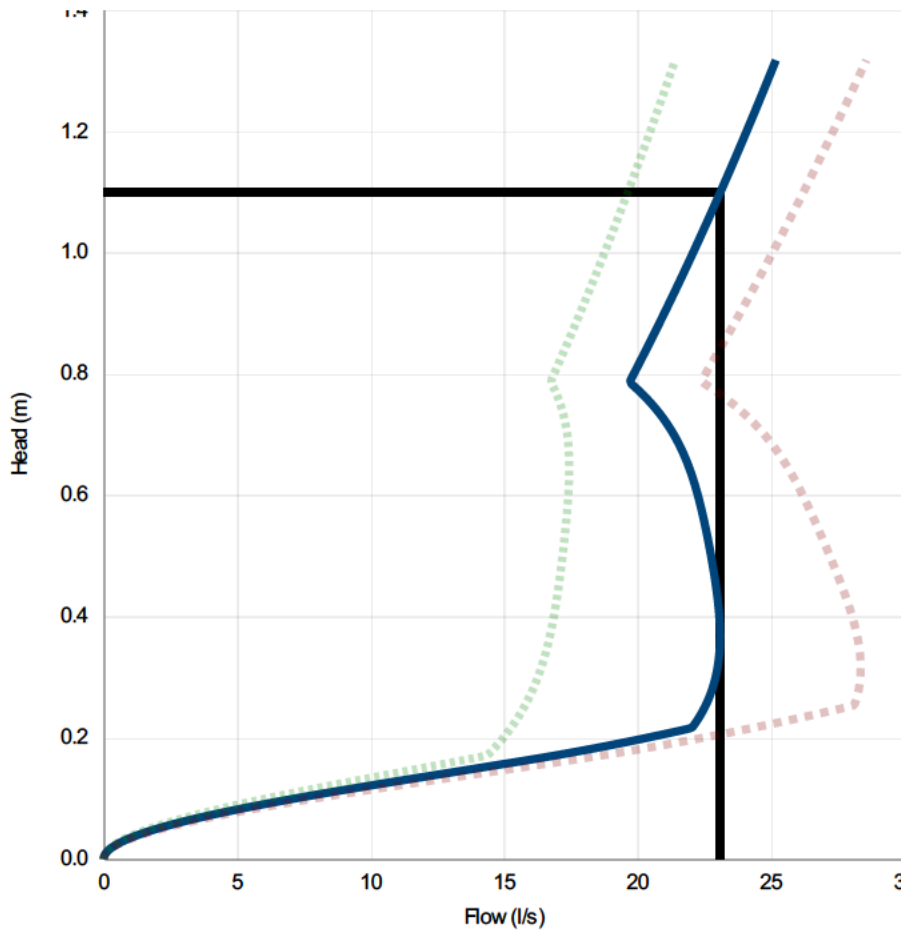
Sheet No.	Revision
2936-SCE-00-00-DR-C-0073	P03

Technical Specification

	Original Setting		Minimum Setting		Maximum Setting	
Control Point	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)
Primary Design	1.100	23.100	1.100	19.633	1.100	26.211
Flush-Flo™	0.368	23.085	0.646	17.438	0.315	28.354
Kick-Flo®	0.786	19.681	0.786	16.724	0.787	22.361
Mean Flow		19.497		15.440		22.736



hydro-int.com/patents



Head (m)	Flow (l/s)
0.000	0.000
0.038	1.168
0.076	4.349
0.114	8.965
0.152	14.259
0.190	19.189
0.228	22.212
0.266	22.669
0.303	22.938
0.341	23.063
0.379	23.082
0.417	23.025
0.455	22.918
0.493	22.778
0.531	22.616
0.569	22.431
0.607	22.211
0.645	21.934
0.683	21.564
0.721	21.057
0.759	20.359
0.797	19.812
0.834	20.254
0.872	20.686
0.910	21.109
0.948	21.523
0.986	21.929
1.024	22.326
1.062	22.716
1.100	23.099

DESIGN ADVICE



The head/flow characteristics of this SHE-0210-2310-1100-2310 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
International

A CRH COMPANY

DATE 17/06/2026 09:17

Site Highmoor Farm

DESIGNER Paige Blundell

Ref 2936

SHE-0210-2310-1100-2310

Hydro-Brake® Optimum

Technical Specification

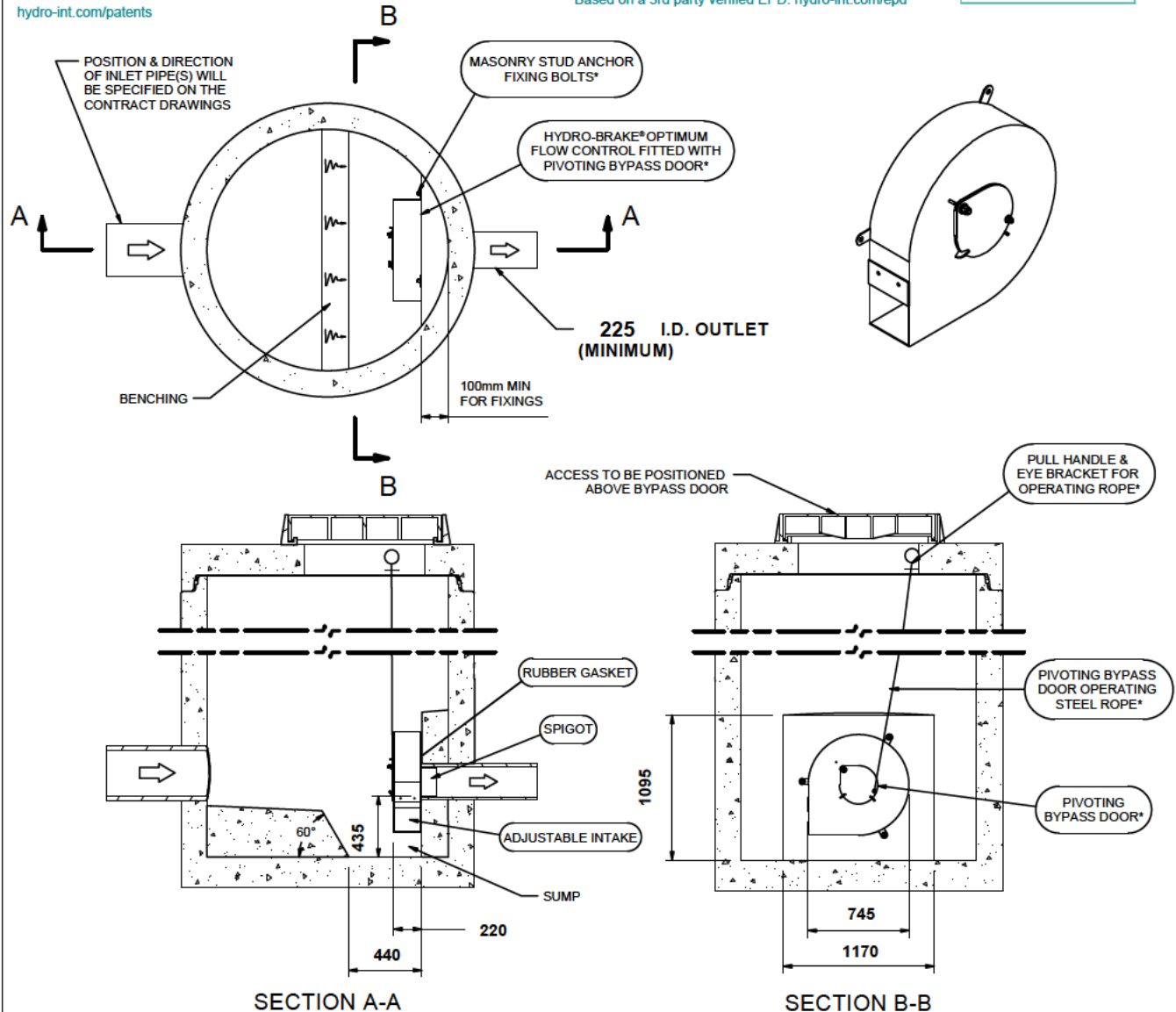
Control Point	Head (m)	Flow (l/s)
Primary Design	1.100	23.100
Flush-Flo™	0.368	23.085
Kick-Flo®	0.786	19.681
Mean Flow		19.497

hydro-int.com/patents

This Hydro-Brake® Optimum includes:

- All in 3 mm Grade 304L stainless steel
- Integral pivoting by-pass door allowing clear line of sight through to outlet, c/w operating rope
- Media blasted for corrosion resistance
- Variable flow rate post installation via adjustable inlet (if necessary)
- Indicative Weight: 35 kg
- Product Carbon Footprint: 147.16 kgCO2e

Based on a 3rd party verified EPD: hydro-int.com/epd



IMPORTANT: LIMIT OF HYDRO INTERNATIONAL SUPPLY
 THE DEVICE WILL BE HANDED TO SUIT SITE CONDITIONS
 FOR SITE SPECIFIC DETAILS AND MINIMUM CHAMBER SIZE REFER TO HYDRO INTERNATIONAL
 ALL CIVIL AND INSTALLATION WORK BY OTHERS
 * WHERE SUPPLIED
 HYDRO-BRAKE® IS A REGISTERED TRADEMARK FOR FLOW CONTROLS DESIGNED AND MANUFACTURED EXCLUSIVELY BY
 HYDRO INTERNATIONAL

THIS DESIGN LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. NOT TO SCALE.

DESIGN ADVICE



The head/flow characteristics of this SHE-0210-2310-1100-2310 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
International**
 A CRH COMPANY

DATE 17/06/2026 09:17

SITE Highmoor Farm

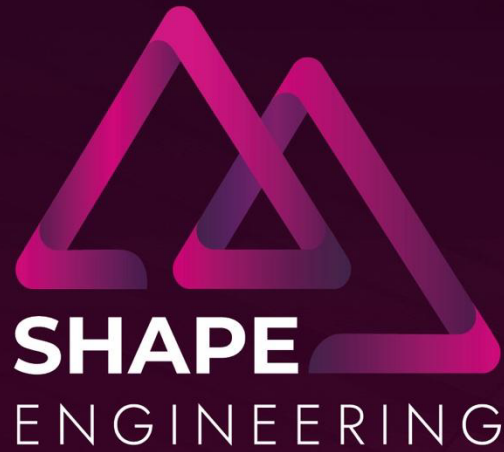
DESIGNER Paige Blundell

REF 2936

SHE-0210-2310-1100-2310

Hydro-Brake® Optimum

18.0 APPENDIX E – SUDS MAINTENANCE AND INSPECTION PRO-FORMA



HIGHMOOR FARM, CLITHEROE

SUDS INSEPTION AND MAINTENANCE PRO-FORMA
REVISION A

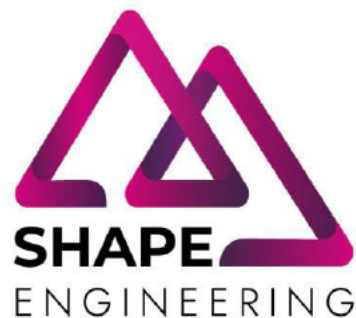
16th June 2026

HEAD OFFICE

LIVERPOOL INNOVATION PARK, EDGE LANE, LIVERPOOL L7 9NJ

T 0151 305 0700

E INFO@SHAPEENGINEERING.CO.UK



DOCUMENT HISTORY

REV	DATE	DESCRIPTION	PREPARED BY	CHECKED BY	APPROVED BY
A	16.06.2026	First Issue	██████████ Assistant Engineer	██████████ Director	██████████ Director

CONTACT LIST

NAME	DESIGNATION	ORGANISATION	TEL NUMBER	EMAIL DESCRIPTION
██████ ██████	Assistant Engineer	Shape Engineering	██████████	E ██████████
██████████	Director	Shape Engineering	██████████	██████████

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COMPANY NO. 07258371 / V.A. REGISTRATION NO. 200700005

1.0 BACKGROUND

- 1.1 A separate Drainage Operation and Maintenance Manual has been provided for the site.
- 1.2 Details of the maintenance schedule, required action and frequency for each SuDS feature/component are outlined within the report.
- 1.3 The following Pro-Forma should be completed during the inspection and maintenance of each of the features at the site in line with the Drainage Operation and Maintenance Manual.

