



Photograph 21 **Description:** Trial pit TP03
 Date: 20/07/2022



Photograph 22 **Description:** Trial pit TP03; water level directly after infilling
 Date: 20/07/2022



Photograph 23

Description: Trial pit TP03; water level c. 4 hours after infilling
Date: 20/07/2022



Photograph 24

Description: Trial pit TP04
Date: 20/07/2022



Photograph 25

Description: Trial pit TP04; water level c. 4 hrs after infilling
Date: 20/07/2022



Photograph 26

Description: Trial pit TP05
Date: 20/07/2022



Photograph 27

Description: Trial pit TP06

Date: 20/07/2022

APPENDIX B

Trial pit soil descriptions

Depth: m bgl	Soil description	Comments
TP01		
0.0 – 0.3	Mid brown slightly gravelly fine sand with roots. Gravel is fine to medium and sub rounded to sub angular.	Ground is dry; no shallow groundwater observed Stable trial pit faces No odours or staining recorded
0.3 – 0.65	Tan to orange-brown slightly clayey slightly gravelly fine sand with some medium sand inclusions. Gravel is fine to coarse and sub rounded to sub angular with some sub angular to sub rounded sandstone cobbles.	
0.65 – 1.2	Mid brown to orange slightly clayey slightly gravelly fine sand. Gravel is fine to coarse and rounded to sub angular with occasional sub angular to sub rounded sandstone cobbles.	
1.2 – 2.4+	Dark brown slightly gravelly sandy silt. Sand is fine. Gravel is fine to coarse and predominantly sub angular. Some sub angular to sub rounded cobbles and occasional sub angular boulders.	
TP02		
0.0 – 0.3	Mid brown slightly gravelly fine sand with roots. Gravel is fine to coarse and sub rounded to sub angular. One ceramic fragment.	Ground is dry; no shallow groundwater observed Stable trial pit faces No odours or staining recorded
0.3 – 1.1	Grey to orange gravelly clayey fine to medium sand with pockets of fine sandy clay. Gravel is fine to coarse and rounded to sub angular with some sub angular to sub rounded sandstone cobbles.	
1.1 – 1.6	Soft to firm grey to brown slightly gravelly sandy clay. Sand is fine. Gravel is fine to coarse and rounded to sub angular with some sub rounded to rounded cobbles.	
1.6 – 2.3+	Friable dark grey mudstone.	
TP03		
0.0 – 0.3	Mid brown slightly gravelly fine sand with roots. Gravel is fine to coarse and sub rounded to sub angular.	No shallow groundwater observed; some moisture below 0.7 m Stable trial pit faces No odours or staining recorded
0.3 – 1.0	Loose orange-red gravelly fine to medium sand. Gravel is fine to coarse and rounded to sub angular with some sub angular to sub rounded sandstone cobbles and occasional sub rounded boulders.	
1.0 – 2.1+	Mid to dark brown slightly gravelly slightly clayey sandy silt. Sand is fine. Gravel is fine to coarse and sub rounded to sub angular. Some sub angular to sub rounded cobbles and occasional sub rounded to sub angular boulders.	

Depth: m bgl	Soil description	Comments
TP04		
0.0 – 0.2	Mid brown slightly gravelly fine sand with roots. Gravel is fine to coarse and sub rounded to sub angular. Occasional sub rounded cobbles.	Ground is dry; no shallow groundwater observed Stable trial pit faces No odours or staining recorded
0.2 – 1.0	Brown to orange and grey gravelly clayey fine sand with some pockets of soft grey-brown clay and fine sandy clay plus occasional pockets of medium sand. Gravel is fine to coarse and rounded to sub angular with some sub angular to sub rounded cobbles.	
1.0 – 1.9	Soft to firm grey to brown slightly gravelly sandy clay. Sand is fine. Gravel is fine to coarse and rounded to sub angular with some sub rounded to rounded cobbles.	
1.9 – 2.2	Dark brown slightly gravelly slightly clayey sandy silt. Sand is fine. Gravel is fine to coarse and sub rounded to sub angular. Some sub angular to sub rounded cobbles and occasional sub rounded to sub angular boulders.	
2.2 – 2.3+	Friable dark grey mudstone.	
TP05		
0.0 – 0.2	Mid brown slightly gravelly fine sand with roots. Gravel is fine to medium and sub rounded to sub angular.	Ground is dry; no shallow groundwater observed Stable trial pit faces No odours or staining recorded
0.2 – 0.24	Light grey gravelly fine to medium sand. Gravel is fine to coarse and sub rounded to angular.	
0.24 – 1.2	Soft to firm orange to brown slightly gravelly slightly sandy clay. Sand is fine. Gravel is fine to coarse and rounded to sub angular with some sub rounded to sub angular cobbles.	
1.2 – 2.1+	Dark brown slightly gravelly sandy silt. Sand is fine. Gravel is fine to coarse and predominantly sub angular. Some sub angular to angular cobbles and occasional sub angular boulders.	
TP06		
0.0 – 0.2	Mid brown slightly gravelly fine sand with roots. Gravel is fine to medium and sub rounded to sub angular.	Ground is dry; no shallow groundwater observed Stable trial pit faces No odours or staining recorded
0.2 – 0.3	Light grey sand and gravel. Sand is fine to medium. Gravel is fine to coarse and sub rounded to angular.	
0.3 – 1.3	Soft to firm orange to brown slightly gravelly slightly sandy clay. Sand is fine. Gravel is fine to coarse and rounded to sub angular with some sub rounded to sub angular cobbles.	
1.3 – 2.1	Dark brown to purple slightly gravelly sandy silt. Sand is fine. Gravel is fine to coarse and predominantly sub angular. Some sub angular to angular cobbles and occasional sub angular boulders.	
2.1 – 2.2+	Friable dark grey mudstone.	

APPENDIX C

Infiltration test results

Pit reference: TP01
Project: 4272
Date of infiltration test: 20/07/2022
Method: BRE365
Date of calculation: 21/07/2022
Completed by: AJS

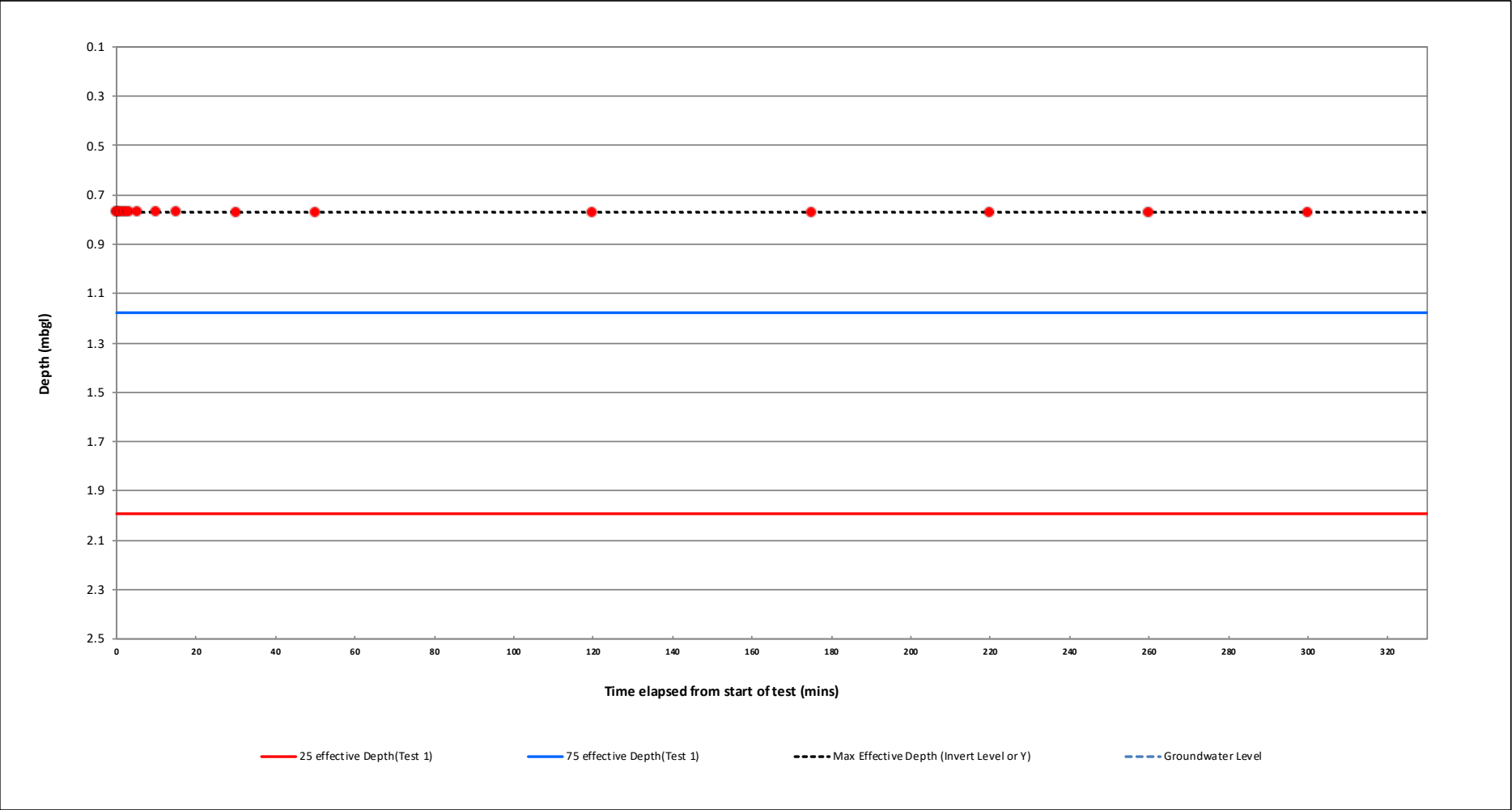
Parameters:
Trial pit length (m): 1.3 (L)
Trial pit width (m): 0.6 (W)
Trial pit depth (m): 2.4 (D)
Depth to groundwater (m): DRY
Datum (mbgl): 0 (Z)

Assumed invert level (m): c. 0.8

TEST 1			
Time	Elapsed (min)	Water dip (mbgl)	Depth of water in pit (m)
08:30:00	0.0	0.770	1.630
	0.5	0.770	1.630
	1.0	0.770	1.630
	2.0	0.770	1.630
	3.0	0.770	1.630
	5.0	0.770	1.630
	10.0	0.770	1.630
	15.0	0.770	1.630
	30.0	0.775	1.625
	50.0	0.775	1.625
	120.0	0.775	1.625
	175.0	0.775	1.625
	220.0	0.775	1.625
	260.0	0.775	1.625
	300.0	0.775	1.625

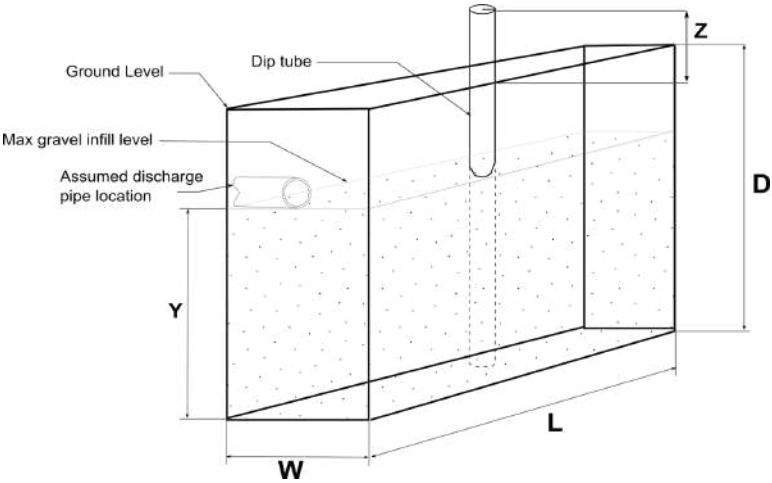
Test effective depth	1.63	m (Water depth at t=0)		
75% effective depth:	1.22	m	1.18	m bgl
50% effective depth:	0.82	m	1.59	m bgl
25% effective depth:	0.41	m	1.99	m bgl
t75	N/A	min		
t50	N/A	min		
t25	N/A	min		
Vp75-25	0.64	m3		
ap50	3.88	m2		
tp75-25	N/A	secs		
Soil infiltration rate (f):	N/A	m/s		

Test failed



Soil infiltration rate, $f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$

where:
 V_{p75-25} = the effective storage volume of water in the trial pit between 75% and 25% effective depth;
 a_{p50} = the internal surface area of the trial pit up to 50% effective depth and including the base area;
 t_{p75-25} = the time for the water level to fall from 75% to 25% effective depth.



Pit reference: TP02
Project: 4272
Date of infiltration test: 20/07/2022
Method: BRE365
Date of calculation: 21/07/2022
Completed by: AJS

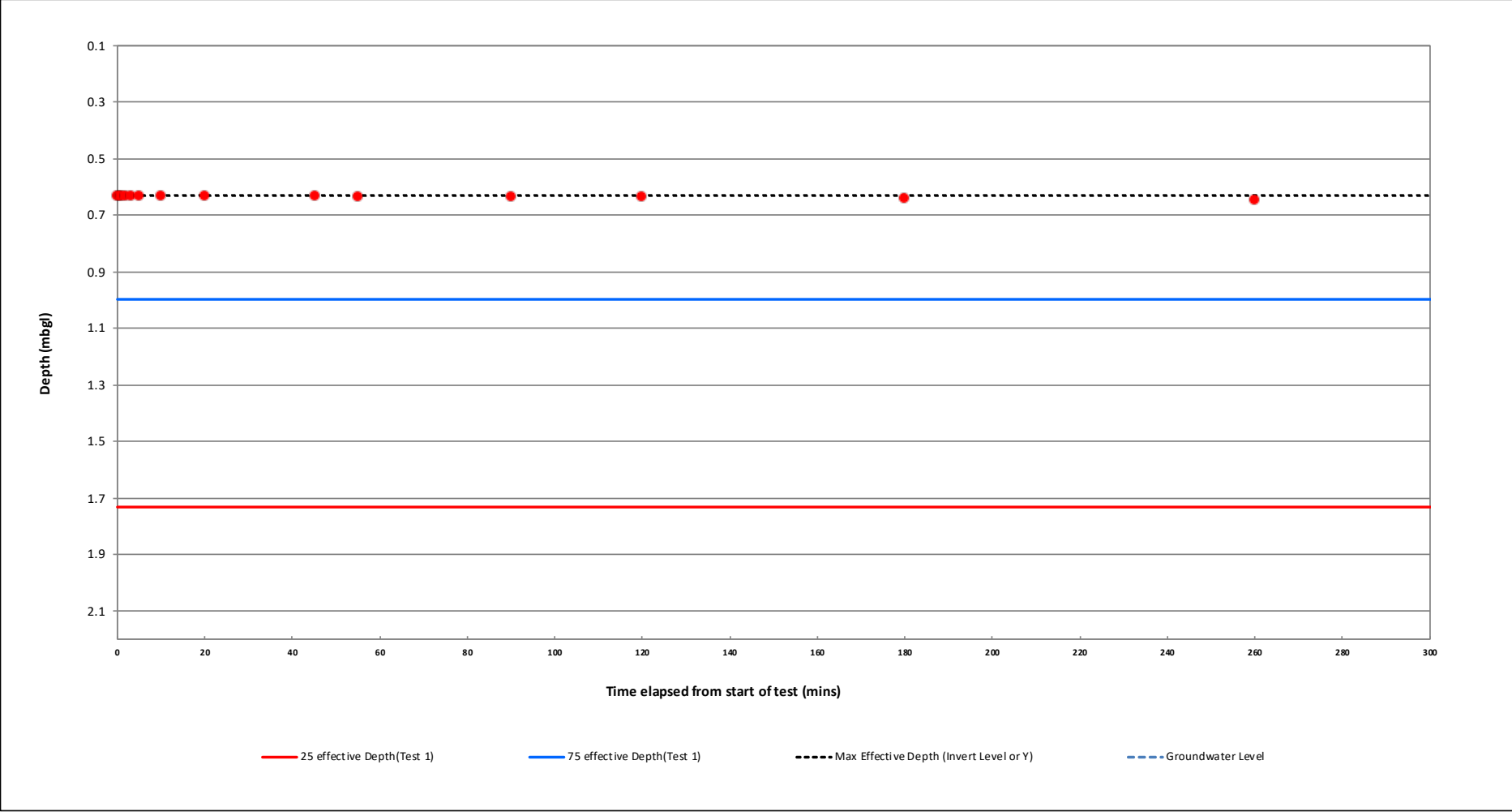
Parameters:
Trial pit length (m): 1.4 (L)
Trial pit width (m): 0.6 (W)
Trial pit depth (m): 2.1 (D)
Depth to groundwater (m): DRY
Datum (mbgl): 0 (Z)
Assumed invert level (m): c. 0.6

TEST 1			
Time	Elapsed (min)	Water dip (mbgl)	Depth of water in pit (m)
09:00:00	0.0	0.630	1.470
	0.5	0.630	1.470
	1.0	0.630	1.470
	2.0	0.630	1.470
	3.0	0.630	1.470
	5.0	0.630	1.470
	10.0	0.630	1.470
	20.0	0.630	1.470
	45.0	0.630	1.470
	55.0	0.635	1.465
	90.0	0.635	1.465
	120.0	0.635	1.465
	180.0	0.640	1.460
	260.0	0.645	1.455

Test effective depth	1.47	m	(Water depth at t=0)	
75% effective depth:	1.10	m	1.00	m bgl
50% effective depth:	0.74	m	1.37	m bgl
25% effective depth:	0.37	m	1.73	m bgl
t75	N/A	min		
t50	N/A	min		
t25	N/A	min		

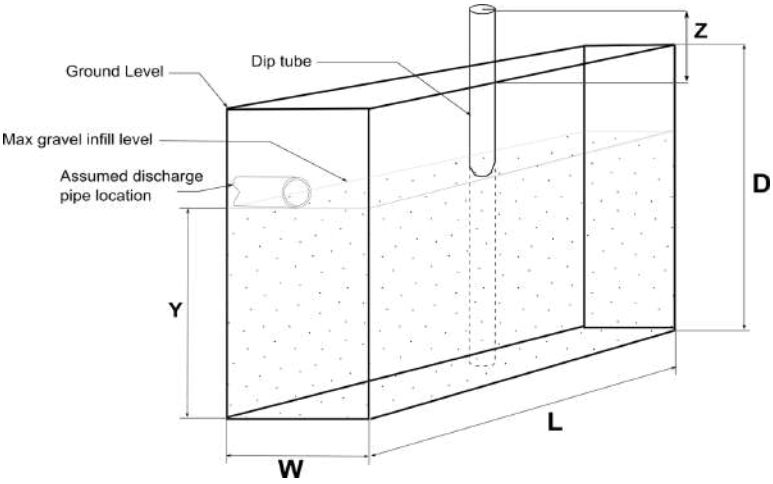
Vp75-25	0.62	m3
ap50	3.78	m2
tp75-25	N/A	secs
Soil infiltration rate (f):	N/A	m/s

Test failed



Soil infiltration rate, $f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$

where:
 V_{p75-25} = the effective storage volume of water in the trial pit between 75% and 25% effective depth;
 a_{p50} = the internal surface area of the trial pit up to 50% effective depth and including the base area;
 t_{p75-25} = the time for the water level to fall from 75% to 25% effective depth.



Pit reference: TP03
Project: 4272
Date of infiltration test: 20/07/2022
Method: BRE365
Date of calculation: 21/07/2022
Completed by: AJS

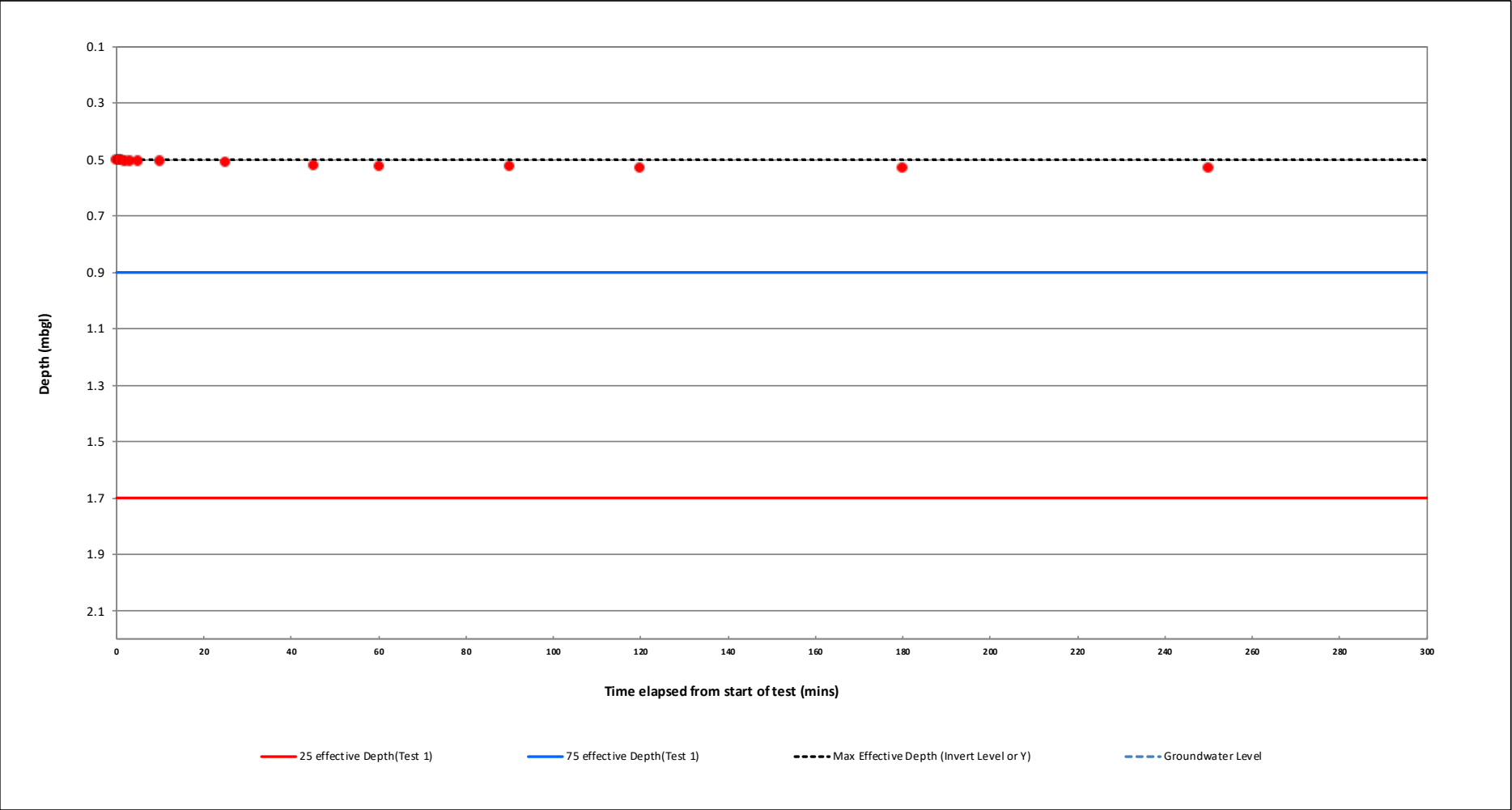
Parameters:
Trial pit length (m): 1.4 (L)
Trial pit width (m): 0.6 (W)
Trial pit depth (m): 2.1 (D)
Depth to groundwater (m): DRY
Datum (mbgl): 0 (Z)

Assumed invert level (m): c. 0.5

TEST 1			
Time	Elapsed (min)	Water dip (mbgl)	Depth of water in pit (m)
09:40:00	0.0	0.500	1.600
	0.5	0.500	1.600
	1.0	0.500	1.600
	2.0	0.505	1.595
	3.0	0.505	1.595
	5.0	0.505	1.595
	10.0	0.508	1.592
	25.0	0.510	1.590
	45.0	0.520	1.580
	60.0	0.525	1.575
	90.0	0.527	1.573
	120.0	0.528	1.572
	180.0	0.528	1.572
	250.0	0.528	1.572

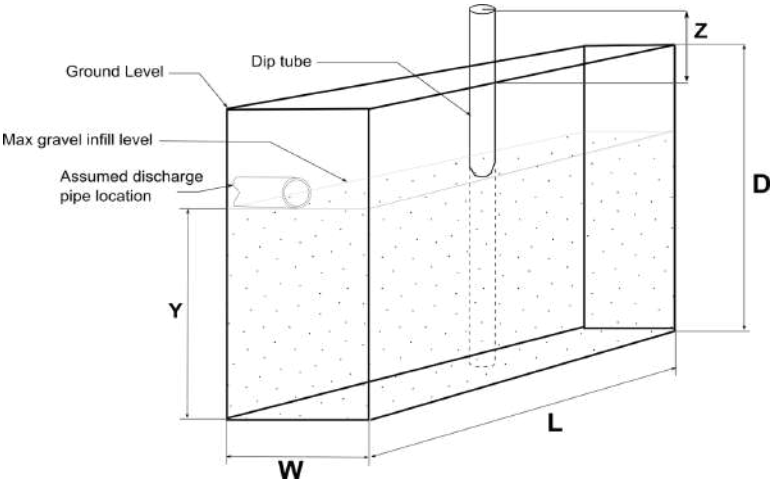
Test effective depth	1.60	m (Water depth at t=0)		
75% effective depth:	1.20	m	0.90	m bgl
50% effective depth:	0.80	m	1.30	m bgl
25% effective depth:	0.40	m	1.70	m bgl
t75	N/A	min		
t50	N/A	min		
t25	N/A	min		
Vp75-25	0.67	m3		
ap50	4.04	m2		
tp75-25	N/A	secs		
Soil infiltration rate (f):	N/A	m/s		

Test failed



Soil infiltration rate, $f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$

where:
 V_{p75-25} = the effective storage volume of water in the trial pit between 75% and 25% effective depth;
 a_{p50} = the internal surface area of the trial pit up to 50% effective depth and including the base area;
 t_{p75-25} = the time for the water level to fall from 75% to 25% effective depth.



Pit reference: TP04
Project: 4272
Date of infiltration test: 20/07/2022
Method: BRE365
Date of calculation: 21/07/2022
Completed by: AJS

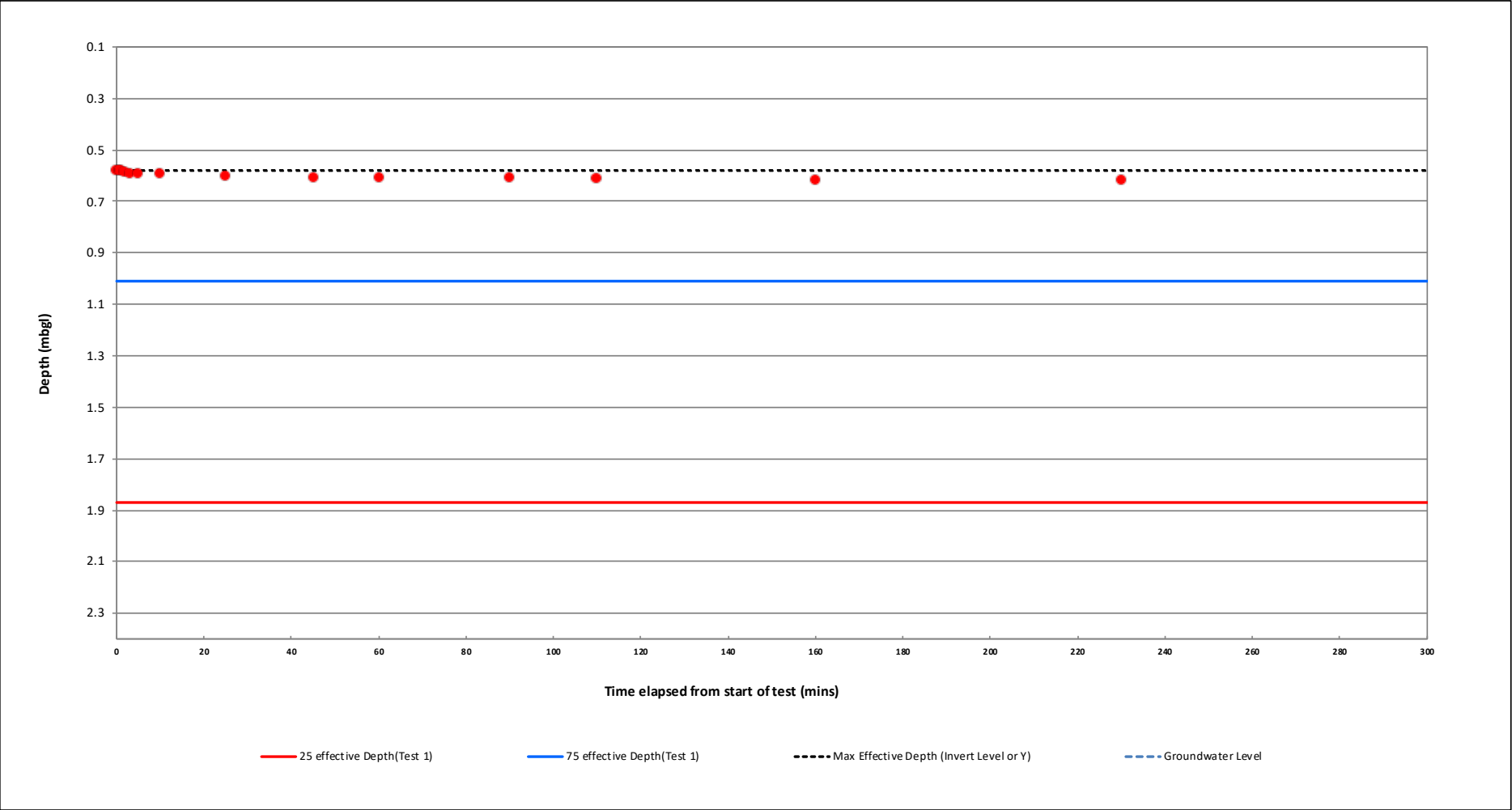
Parameters:
Trial pit length (m): 1.2 (L)
Trial pit width (m): 0.6 (W)
Trial pit depth (m): 2.3 (D)
Depth to groundwater (m): DRY
Datum (mbgl): 0 (Z)

Assumed invert level (m): c. 0.6

TEST 1			
Time	Elapsed (min)	Water dip (mbgl)	Depth of water in pit (m)
10:00:00	0.0	0.580	1.720
	0.5	0.580	1.720
	1.0	0.580	1.720
	2.0	0.585	1.715
	3.0	0.590	1.710
	5.0	0.590	1.710
	10.0	0.590	1.710
	25.0	0.600	1.700
	45.0	0.610	1.690
	60.0	0.610	1.690
	90.0	0.610	1.690
	110.0	0.615	1.685
	160.0	0.620	1.680
	230.0	0.620	1.680

Test effective depth	1.72	m (Water depth at t=0)		
75% effective depth:	1.29	m	1.01	m bgl
50% effective depth:	0.86	m	1.44	m bgl
25% effective depth:	0.43	m	1.87	m bgl
t75	N/A	min		
t50	N/A	min		
t25	N/A	min		
Vp75-25	0.62	m3		
ap50	3.82	m2		
tp75-25	N/A	secs		
Soil infiltration rate (f):	N/A	m/s		

Test failed



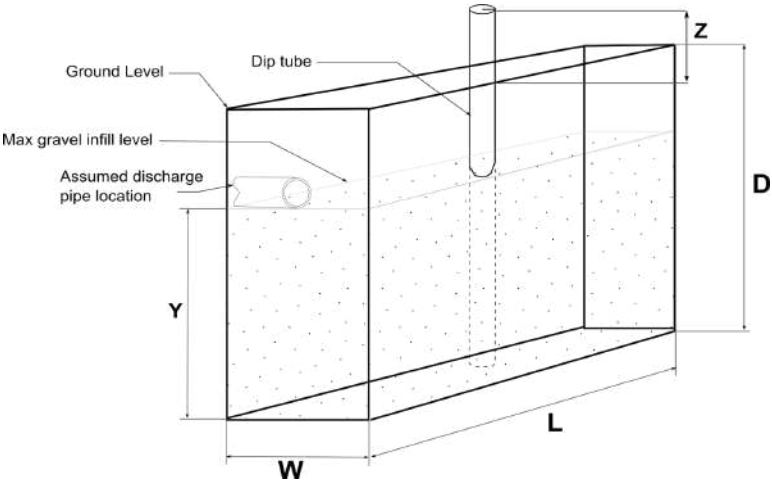
Soil infiltration rate, $f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$

where:

V_{p75-25} = the effective storage volume of water in the trial pit between 75% and 25% effective depth;

a_{p50} = the internal surface area of the trial pit up to 50% effective depth and including the base area;

t_{p75-25} = the time for the water level to fall from 75% to 25% effective depth.



APPENDIX 4 – SuDS Strategy



Notes

To be constructed in accordance with local authority drainage design guidelines or to latest version of sewers for adoption in the absence of any local authority guidelines'

Contractor is to confirm, on site, all information given relating to existing services and drainage connections etc. Prior to commencing the works and any discrepancies reported immediately to the engineer.

Allow for hand dig around existing services where necessary.

Existing flows in watercourses, sewers and land drainage shall be maintained at all times during the works or handled accordingly.

Any gradients of drains are indicative only and the contractor shall install drains to the invert levels shown for each manhole, or check with the engineer if any doubt.

All covers and gratings to be class B where in access or can be class A where away from access and any vehicle paths

Cover levels of the manholes are provisional and subject to adjustment to suit the finished ground levels.

Unless noted otherwise, all manhole invert levels are to the lowest (outgoing) pipe. All incoming pipework to be laid soffits level.

Ground levels shown are existing topographic survey and will not apply to the design but probably to much of the surrounding area. On drawing for guide purposes only

All external levels to be checked against latest architects drawings.

All drainage outlet positions, (rainwater pipes and soil stacks), to be checked against latest architects drawings.

The attenuation tank as per drawing detail and manufacturers design. Dimensions can vary if needed so long as the overall volume is not less than in the design

KEY

SITE BOUNDARY

PROPOSED SURFACE WATER DRAIN

PROPOSED FILTER DRAIN

HEADWALL

MH 1 - 33

EXCEEDANCE FLOOD FLOW PATHS

ATTENUATION TANK

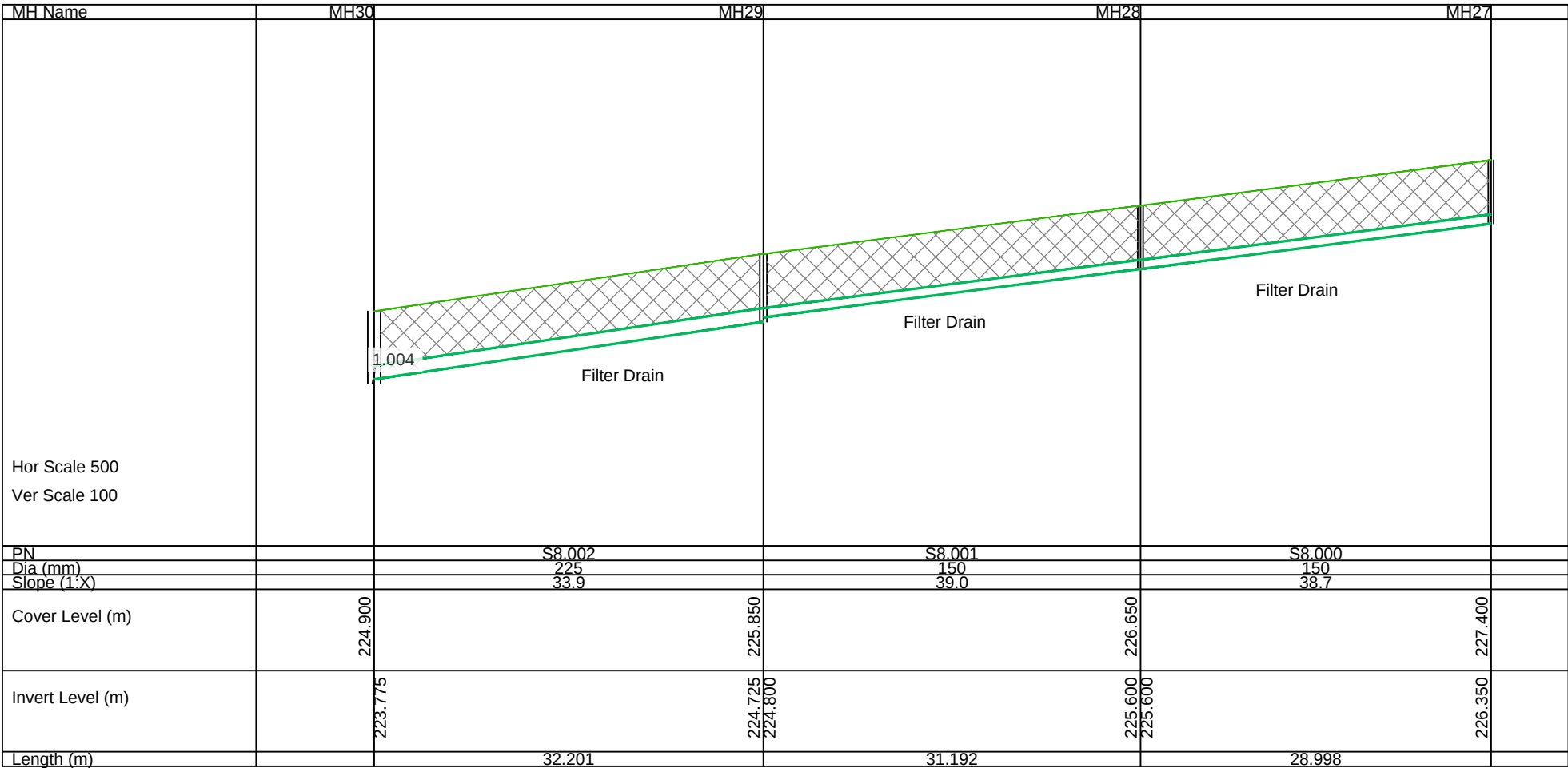
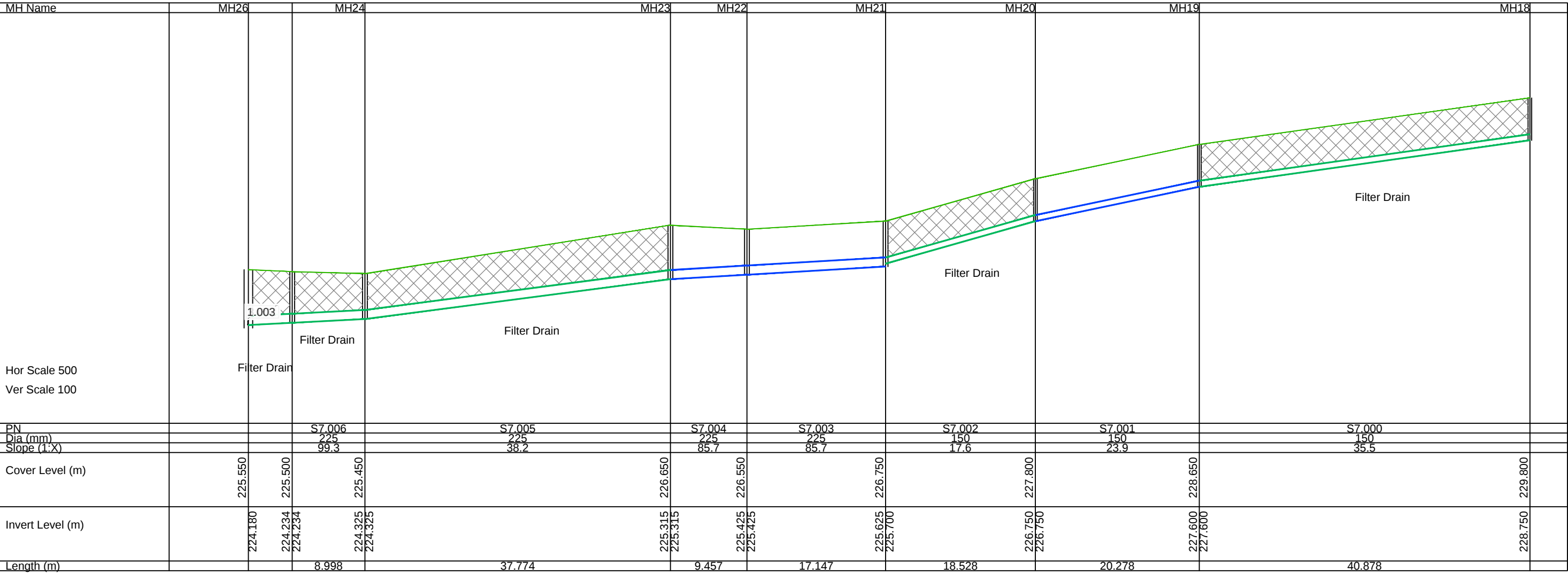
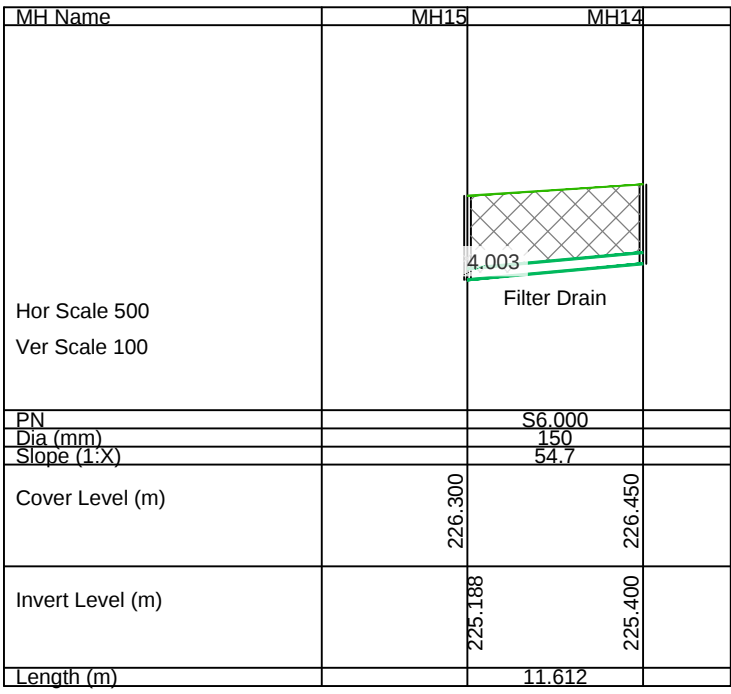
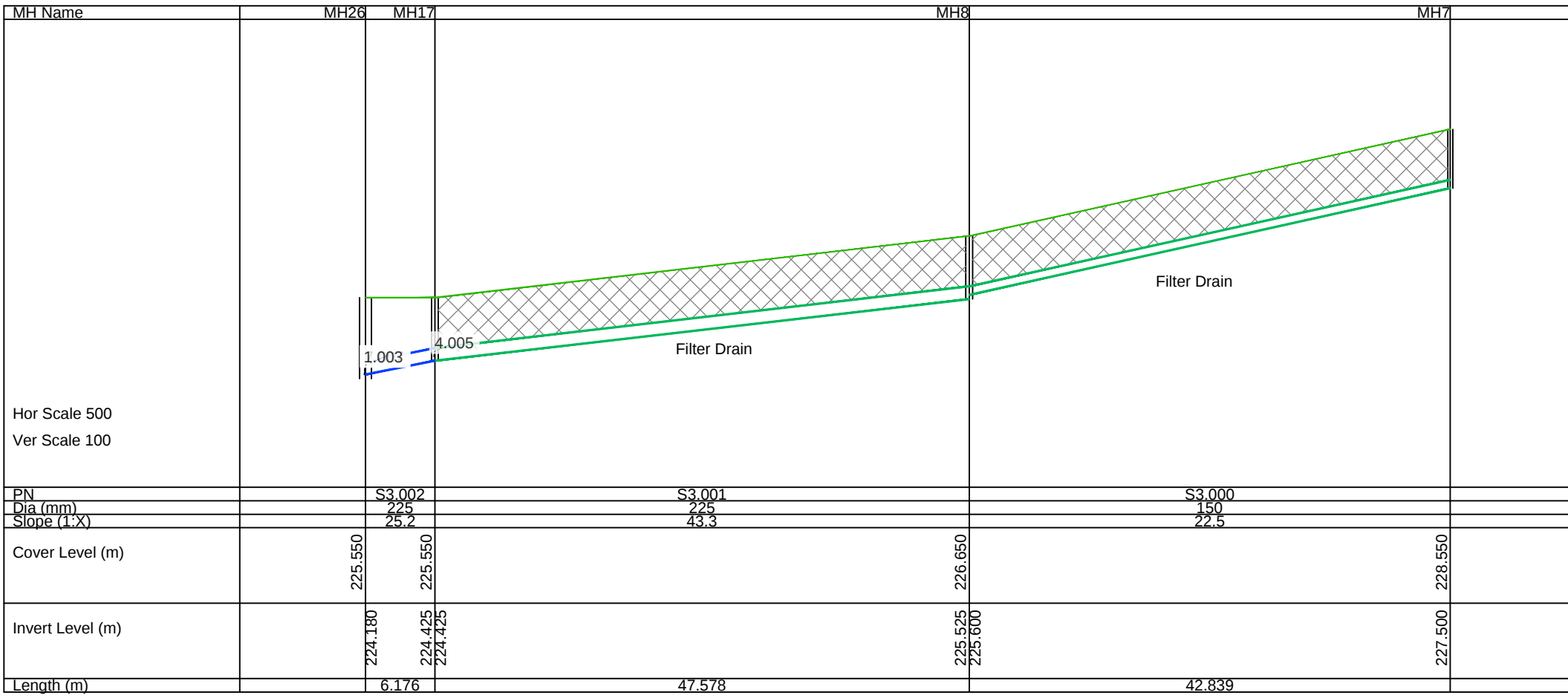
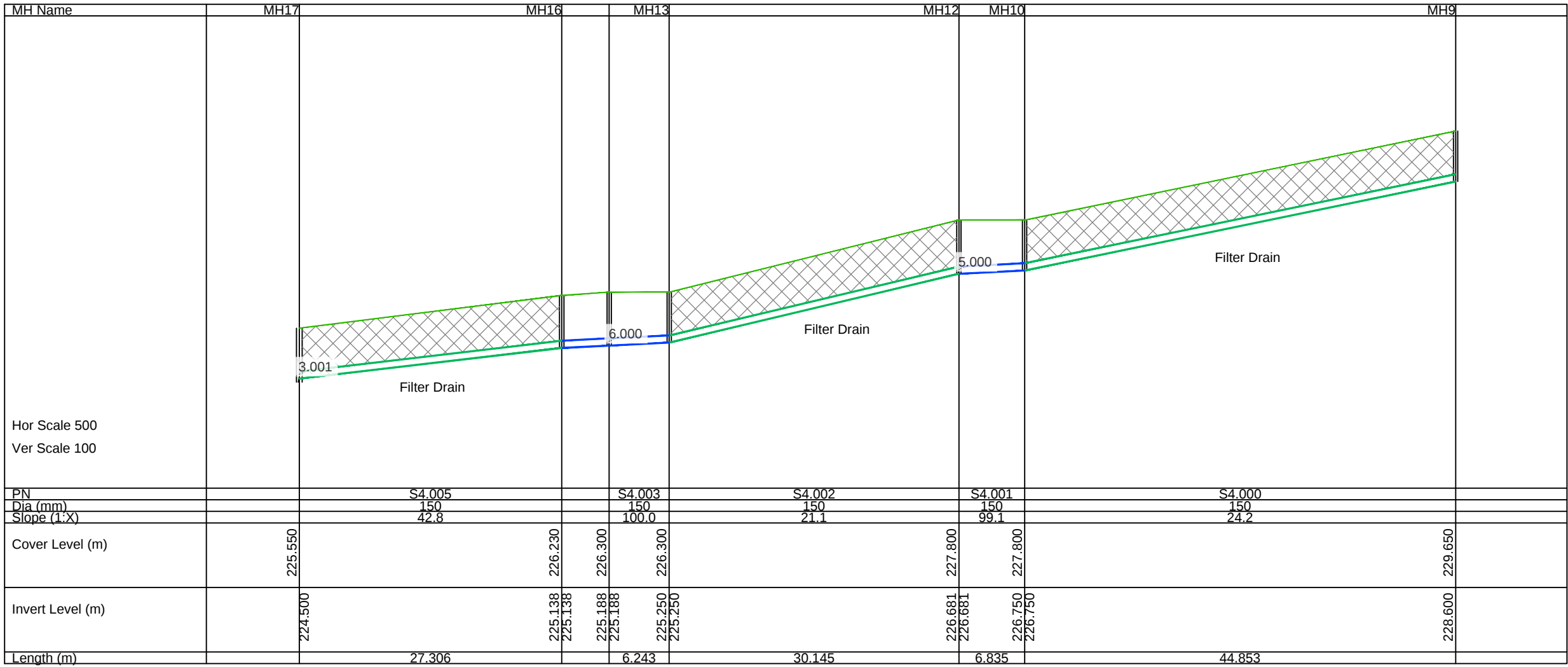
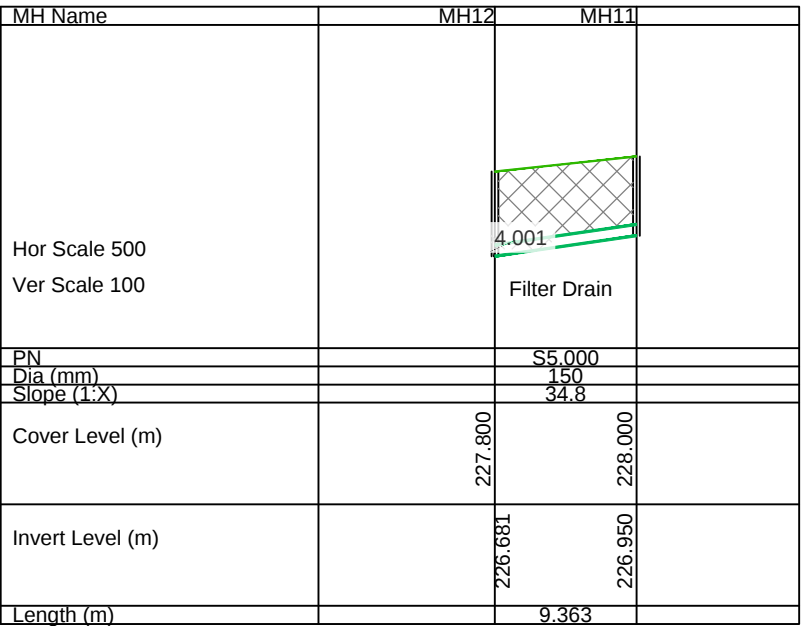
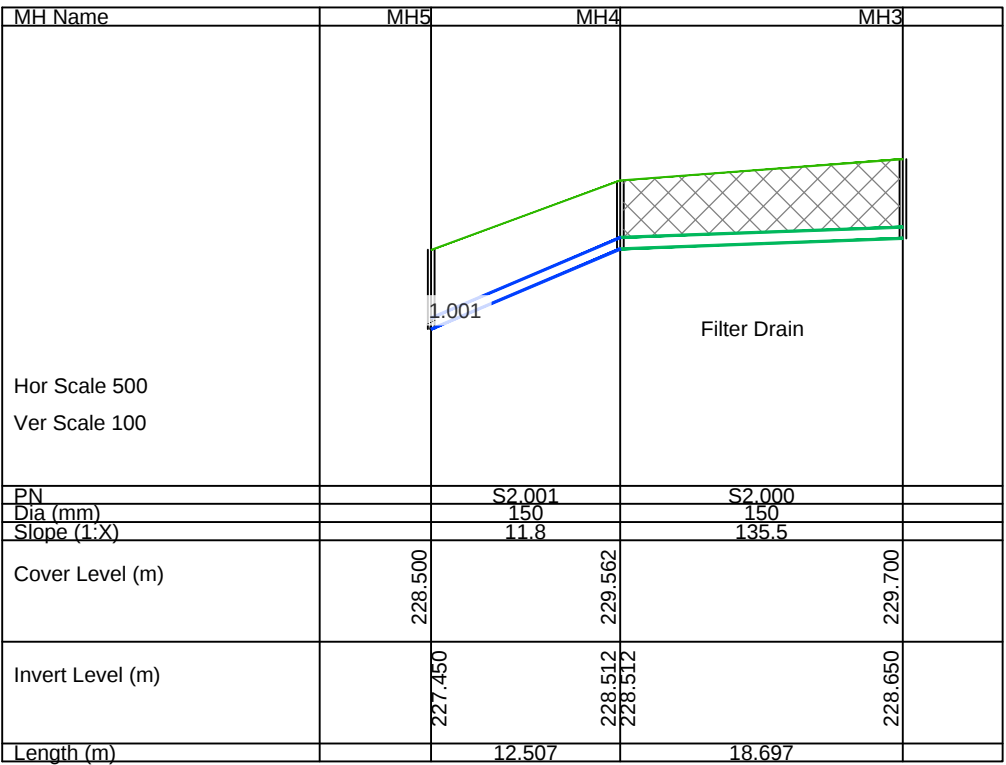
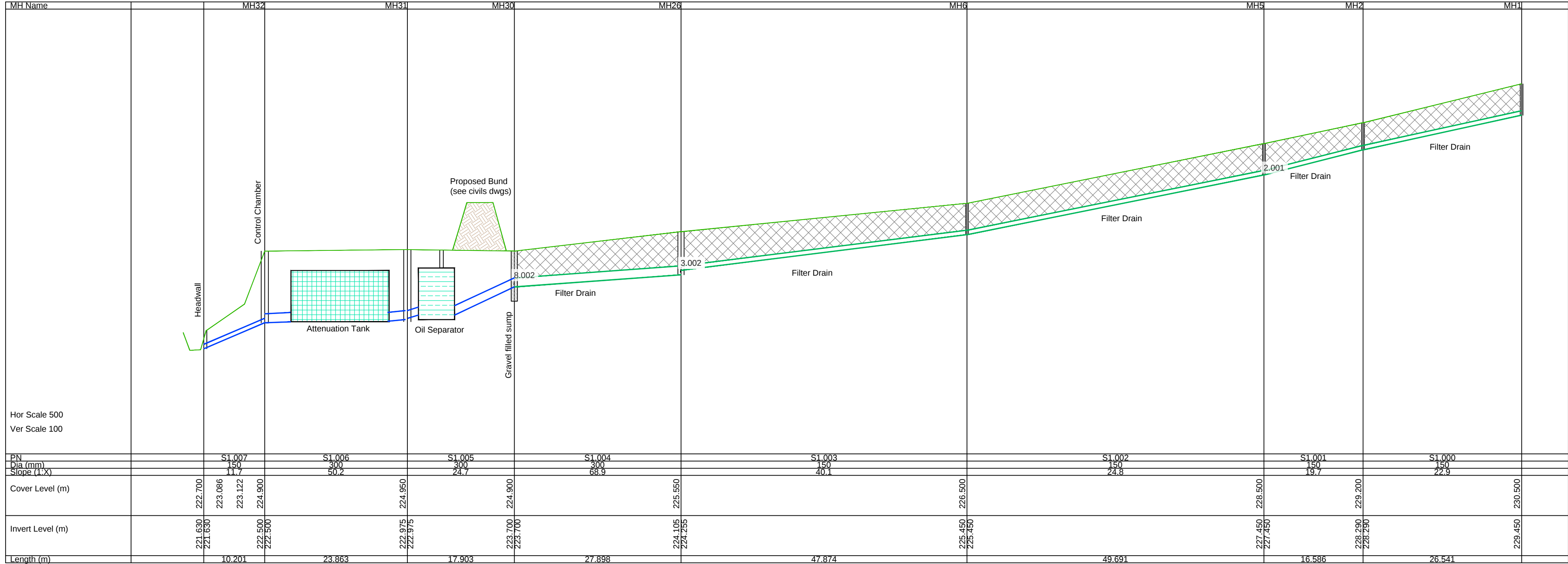
OIL SEPARATOR

STONE ACCESS TRACK - 70% Impermeable

PLANT AREAS (mix impermeable/stone/grass) - 50% Impermeable

GRASSES AREAS- 5% Impermeable

KRS ENVIRONMENTAL TEL: 01484 437420 MOBILE: 07857264376 3 PRINCES SQUARE PRINCES STREET MONTGOMERY POWYS SY15 6PZ	
Job:	NEWFIELDS FARM BESS
Client:	RE PROJECTS DEVELOPMENT LTD
Drawing Title:	PROPOSED DRAINAGE
Date:	JANUARY 2024
Drawing No:	KRS.0612.002 revision: E
Scale:	1:350 @ A1
Drawn:	PM
Status:	



KRS ENVIRONMENTAL
TEL: 01484 437420 MOBILE: 07857264376
3 PRINCES SQUARE PRINCES STREET
MONTGOMERY POWYS SY15 6PZ



Job: NEWFIELDS FARM BESS
Client: RE PROJECTS DEVELOPMENT LTD
Drawing Title: PROPOSED SW DRAINAGE DESIGN PROFILES
Date: JANUARY 2024
Drawing No: KRS.0612.002.1 revision: E
Scale: As @ A1
Drawn: PM
Status:

Manhole Name	Cover Level (m)	MH Depth (m)	Manhole Connection	Manhole Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)
MH1	230.500	1.050	Open Manhole	450	S1.000	229.450	150			
MH2	229.200	0.910	Open Manhole	450	S1.001	228.290	150	S1.000	228.290	150
MH3	229.700	1.050	Open Manhole	450	S2.000	228.650	150			
MH4	229.050	0.538	Open Manhole	450	S2.001	228.512	150	S2.000	228.512	150
MH5	228.500	1.050	Open Manhole	450	S1.002	227.450	150	S1.001	227.450	150
								S2.001	227.450	150
MH6	226.500	1.050	Open Manhole	450	S1.003	225.450	150	S1.002	225.450	150
MH7	228.550	1.050	Open Manhole	450	S3.000	227.500	150			
MH8	226.650	1.125	Open Manhole	600	S3.001	225.525	225	S3.000	225.600	150
MH9	229.650	1.050	Open Manhole	450	S4.000	228.600	150			
MH10	227.800	1.050	Open Manhole	450	S4.001	226.750	150	S4.000	226.750	150
MH11	228.000	1.050	Open Manhole	450	S5.000	226.950	150			
MH12	227.800	1.119	Open Manhole	450	S4.002	226.681	150	S4.001	226.681	150
								S5.000	226.681	150
MH13	226.300	1.050	Open Manhole	450	S4.003	225.250	150	S4.002	225.250	150
MH14	226.450	1.050	Open Manhole	450	S6.000	225.400	150			
MH15	226.300	1.112	Open Manhole	450	S4.004	225.188	150	S4.003	225.188	150
								S6.000	225.188	150
MH16	226.230	1.092	Open Manhole	450	S4.005	225.138	150	S4.004	225.138	150
MH17	225.550	1.125	Open Manhole	600	S3.002	224.425	225	S3.001	224.425	225
								S4.005	224.500	150
MH18	229.800	1.050	Open Manhole	450	S7.000	228.750	150			
MH19	228.650	1.050	Open Manhole	450	S7.001	227.600	150	S7.000	227.600	150
MH20	227.800	1.050	Open Manhole	450	S7.002	226.750	150	S7.001	226.750	150
MH21	226.750	1.125	Open Manhole	600	S7.003	225.625	225	S7.002	225.700	150
MH22	226.550	1.125	Open Manhole	600	S7.004	225.425	225	S7.003	225.425	225
MH23	226.650	1.335	Open Manhole	600	S7.005	225.315	225	S7.004	225.315	225
MH24	225.450	1.125	Open Manhole	600	S7.006	224.325	225	S7.005	224.325	225
MH25	225.500	1.266	Open Manhole	600	S7.007	224.234	225	S7.006	224.234	225
MH26	225.550	1.445	Open Manhole	1050	S1.004	224.105	300	S1.003	224.255	150
								S3.002	224.180	225
								S7.007	224.180	225
MH27	227.400	1.050	Open Manhole	450	S8.000	226.350	150			
MH28	226.650	1.050	Open Manhole	450	S8.001	225.600	150	S8.000	225.600	150
MH29	225.850	1.125	Open Manhole	600	S8.002	224.725	225	S8.001	224.800	150
MH30	224.900	1.200	Open Manhole	1050	S1.005	223.700	300	S1.004	223.700	300
								S8.002	223.775	225
MH31	224.950	1.975	Open Manhole	1200	S1.006	222.975	300	S1.005	222.975	300
MH32	224.900	2.400	Control Chamber	1200	S1.007	222.500	150	S1.006	222.500	300
MH33 Headwall	222.700	1.070	Headwall					S1.007	221.630	150

APPENDIX 5 – MicroDrainage Calculations

INZA Design Ltd		Page 3
17 Crab Tree Hill		
Little Eaton		
Derbyshire DE21 5DL		
Date 22/12/2023 09:37	Designed by inzad	
File Newfields-SW-revD.MDX	Checked by	
Micro Drainage	Network 2020.1	

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.002	30.145	1.431	21.1	0.019	0.00	0.0	0.600	o	150	Pipe/Conduit	
S4.003	6.243	0.062	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S6.000	11.612	0.212	54.7	0.010	5.00	0.0	0.600	o	150	Pipe/Conduit	
S4.004	4.940	0.050	99.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S4.005	27.306	0.638	42.8	0.012	0.00	0.0	0.600	o	150	Pipe/Conduit	
S3.002	6.176	0.245	25.2	0.056	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.000	40.878	1.150	35.5	0.013	5.00	0.0	0.600	o	150	Pipe/Conduit	
S7.001	20.278	0.850	23.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S7.002	18.528	1.050	17.6	0.010	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S4.002	50.00	5.70	226.681	0.026	0.0	0.0	0.0	2.20	39.0	3.5
S4.003	50.00	5.81	225.250	0.026	0.0	0.0	0.0	1.00	17.8	3.5
S6.000	50.00	5.14	225.400	0.010	0.0	0.0	0.0	1.36	24.1	1.4
S4.004	50.00	5.89	225.188	0.036	0.0	0.0	0.0	1.01	17.8	4.8
S4.005	50.00	6.19	225.138	0.048	0.0	0.0	0.0	1.54	27.3	6.5
S3.002	50.00	6.22	224.425	0.175	0.0	0.0	0.0	2.62	104.1	23.7
S7.000	50.00	5.40	228.750	0.013	0.0	0.0	0.0	1.69	29.9	1.8
S7.001	50.00	5.57	227.600	0.013	0.0	0.0	0.0	2.07	36.6	1.8
S7.002	50.00	5.69	226.750	0.024	0.0	0.0	0.0	2.41	42.6	3.2

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S7.003	17.147	0.200	85.7	0.006	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.004	9.457	0.110	85.7	0.007	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.005	37.774	0.990	38.2	0.014	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.006	8.998	0.091	99.3	0.004	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.007	5.422	0.055	99.3	0.001	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.004	27.898	0.405	68.9	0.032	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.000	28.998	0.750	38.7	0.044	5.00	0.0	0.600	o	150	Pipe/Conduit	
S8.001	31.192	0.800	39.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S8.002	32.201	0.950	33.9	0.077	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.005	17.903	0.725	24.7	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S7.003	50.00	5.90	225.625	0.030	0.0	0.0	0.0	1.41	56.2	4.0
S7.004	50.00	6.01	225.425	0.036	0.0	0.0	0.0	1.41	56.2	4.9
S7.005	50.00	6.30	225.315	0.050	0.0	0.0	0.0	2.12	84.5	6.7
S7.006	50.00	6.42	224.325	0.054	0.0	0.0	0.0	1.31	52.2	7.2
S7.007	50.00	6.49	224.234	0.055	0.0	0.0	0.0	1.31	52.2	7.4
S1.004	50.00	6.73	224.105	0.302	0.0	0.0	0.0	1.90	134.1	40.9
S8.000	50.00	5.30	226.350	0.044	0.0	0.0	0.0	1.62	28.7	5.9
S8.001	50.00	5.62	225.600	0.044	0.0	0.0	0.0	1.62	28.6	5.9
S8.002	50.00	5.86	224.725	0.121	0.0	0.0	0.0	2.25	89.7	16.4
S1.005	50.00	6.83	223.700	0.423	0.0	0.0	0.0	3.18	224.6	57.2

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.006	23.863	0.475	50.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.007	10.201	0.870	11.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.008	4.871	0.100	48.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.006	50.00	7.00	222.975	0.423	0.0	0.0	0.0	2.22	157.2	57.2
S1.007	50.00	5.06	222.500	0.000	5.0	0.0	0.0	2.96	52.3	5.0
S1.008	50.00	5.11	221.630	0.000	5.0	0.0	0.0	1.45	25.5	5.0

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
MH1	230.500	1.050	Open Manhole	450	S1.000	229.450	150				
MH2	229.200	0.910	Open Manhole	450	S1.001	228.290	150	S1.000	228.290	150	
MH3	229.700	1.050	Open Manhole	450	S2.000	228.650	150				
MH4	229.050	0.538	Open Manhole	450	S2.001	228.512	150	S2.000	228.512	150	
MH5	228.500	1.050	Open Manhole	450	S1.002	227.450	150	S1.001	227.450	150	
								S2.001	227.450	150	
MH6	226.500	1.050	Open Manhole	450	S1.003	225.450	150	S1.002	225.450	150	
MH7	228.550	1.050	Open Manhole	450	S3.000	227.500	150				
MH8	226.650	1.125	Open Manhole	600	S3.001	225.525	225	S3.000	225.600	150	
MH9	229.650	1.050	Open Manhole	450	S4.000	228.600	150				
MH10	227.800	1.050	Open Manhole	450	S4.001	226.750	150	S4.000	226.750	150	
MH11	228.000	1.050	Open Manhole	450	S5.000	226.950	150				
MH12	227.800	1.119	Open Manhole	450	S4.002	226.681	150	S4.001	226.681	150	
								S5.000	226.681	150	
MH13	226.300	1.050	Open Manhole	450	S4.003	225.250	150	S4.002	225.250	150	
MH14	226.450	1.050	Open Manhole	450	S6.000	225.400	150				
MH15	226.300	1.112	Open Manhole	450	S4.004	225.188	150	S4.003	225.188	150	
								S6.000	225.188	150	
MH16	226.230	1.092	Open Manhole	450	S4.005	225.138	150	S4.004	225.138	150	
MH17	225.550	1.125	Open Manhole	600	S3.002	224.425	225	S3.001	224.425	225	
								S4.005	224.500	150	
MH18	229.800	1.050	Open Manhole	450	S7.000	228.750	150				
MH19	228.650	1.050	Open Manhole	450	S7.001	227.600	150	S7.000	227.600	150	

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
MH20	227.800	1.050	Open Manhole	450	S7.002	226.750	150	S7.001	226.750	150	
MH21	226.750	1.125	Open Manhole	600	S7.003	225.625	225	S7.002	225.700	150	
MH22	226.550	1.125	Open Manhole	600	S7.004	225.425	225	S7.003	225.425	225	
MH23	226.650	1.335	Open Manhole	600	S7.005	225.315	225	S7.004	225.315	225	
MH24	225.450	1.125	Open Manhole	600	S7.006	224.325	225	S7.005	224.325	225	
MH25	225.500	1.266	Open Manhole	600	S7.007	224.234	225	S7.006	224.234	225	
MH26	225.550	1.445	Open Manhole	1050	S1.004	224.105	300	S1.003	224.255	150	
								S3.002	224.180	225	
								S7.007	224.180	225	
MH27	227.400	1.050	Open Manhole	450	S8.000	226.350	150				
MH28	226.650	1.050	Open Manhole	450	S8.001	225.600	150	S8.000	225.600	150	
MH29	225.850	1.125	Open Manhole	600	S8.002	224.725	225	S8.001	224.800	150	
MH30	224.900	1.200	Open Manhole	1050	S1.005	223.700	300	S1.004	223.700	300	
								S8.002	223.775	225	
MH31	224.950	1.975	Open Manhole	1200	S1.006	222.975	300	S1.005	222.975	300	
MH32	224.900	2.400	Open Manhole	1200	S1.007	222.500	150	S1.006	222.500	300	
MH33 Headwall	222.700	1.070	Open Manhole	1000	S1.008	221.630	150	S1.007	221.630	150	
MHDummy	223.040	1.510	Open Manhole	1200		OUTFALL		S1.008	221.530	150	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
MH1	394401.275	349035.194	394401.275	349035.194	Required	
MH2	394382.227	349053.677	394382.227	349053.677	Required	
MH3	394412.256	349070.711	394412.256	349070.711	Required	
MH4	394393.559	349070.691	394393.559	349070.691	Required	
MH5	394381.061	349070.222	394381.061	349070.222	Required	
MH6	394381.148	349119.913	394381.148	349119.913	Required	
MH7	394386.944	349077.377	394386.944	349077.377	Required	
MH8	394387.075	349120.216	394387.075	349120.216	Required	
MH9	394414.680	349074.805	394414.680	349074.805	Required	
MH10	394414.635	349119.658	394414.635	349119.658	Required	

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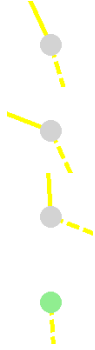
Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
MH11	394424.058	349126.363	394424.058	349126.363	Required	
MH12	394414.696	349126.492	394414.696	349126.492	Required	
MH13	394414.536	349156.637	394414.536	349156.637	Required	
MH14	394426.099	349162.951	394426.099	349162.951	Required	
MH15	394414.487	349162.880	394414.487	349162.880	Required	
MH16	394414.542	349167.820	394414.542	349167.820	Required	
MH17	394387.236	349167.793	394387.236	349167.793	Required	
MH18	394416.663	349073.483	394416.663	349073.483	Required	
MH19	394426.480	349113.164	394426.480	349113.164	Required	
MH20	394429.522	349133.213	394429.522	349133.213	Required	

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
MH21	394429.660	349151.740	394429.660	349151.740	Required	
MH22	394429.936	349168.884	394429.936	349168.884	Required	
MH23	394427.830	349178.104	394427.830	349178.104	Required	
MH24	394390.056	349178.226	394390.056	349178.226	Required	
MH25	394382.783	349172.927	394382.783	349172.927	Required	
MH26	394381.059	349167.786	394381.059	349167.786	Required	
MH27	394353.553	349075.442	394353.553	349075.442	Required	
MH28	394353.739	349104.440	394353.739	349104.440	Required	
MH29	394354.049	349135.630	394354.049	349135.630	Required	
MH30	394353.161	349167.819	394353.161	349167.819	Required	

Manhole Schedules for Storm						
MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
MH31	394348.049	349184.977	394348.049	349184.977	Required	
MH32	394337.941	349206.594	394337.941	349206.594	Required	
MH33 Headwall	394328.438	349210.302	394328.438	349210.302	Required	
MHDummy	394328.162	349215.165			No Entry	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd	Diam	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
Sect		(mm)	Name	(m)	(m)	(m)	Connection	(mm)
S1.000	o	150	MH1	230.500	229.450	0.900	Open Manhole	450
S1.001	o	150	MH2	229.200	228.290	0.760	Open Manhole	450
S2.000	o	150	MH3	229.700	228.650	0.900	Open Manhole	450
S2.001	o	150	MH4	229.050	228.512	0.388	Open Manhole	450
S1.002	o	150	MH5	228.500	227.450	0.900	Open Manhole	450
S1.003	o	150	MH6	226.500	225.450	0.900	Open Manhole	450
S3.000	o	150	MH7	228.550	227.500	0.900	Open Manhole	450
S3.001	o	225	MH8	226.650	225.525	0.900	Open Manhole	600

Downstream Manhole

PN	Length	Slope	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	(m)	(1:X)	Name	(m)	(m)	(m)	Connection	(mm)
S1.000	26.541	22.9	MH2	229.200	228.290	0.760	Open Manhole	450
S1.001	16.586	19.7	MH5	228.500	227.450	0.900	Open Manhole	450
S2.000	18.697	135.5	MH4	229.050	228.512	0.388	Open Manhole	450
S2.001	12.507	11.8	MH5	228.500	227.450	0.900	Open Manhole	450
S1.002	49.691	24.8	MH6	226.500	225.450	0.900	Open Manhole	450
S1.003	47.874	40.1	MH26	225.550	224.255	1.145	Open Manhole	1050
S3.000	42.839	22.5	MH8	226.650	225.600	0.900	Open Manhole	600
S3.001	47.578	43.3	MH17	225.550	224.425	0.900	Open Manhole	600

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd	Diam	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
Sect	(mm)	Name	(m)	(m)	(m)	Connection	(mm)	
S3.002	o	225	MH17	225.550	224.425	0.900	Open Manhole	600
S7.000	o	150	MH18	229.800	228.750	0.900	Open Manhole	450
S7.001	o	150	MH19	228.650	227.600	0.900	Open Manhole	450
S7.002	o	150	MH20	227.800	226.750	0.900	Open Manhole	450
S7.003	o	225	MH21	226.750	225.625	0.900	Open Manhole	600
S7.004	o	225	MH22	226.550	225.425	0.900	Open Manhole	600
S7.005	o	225	MH23	226.650	225.315	1.110	Open Manhole	600
S7.006	o	225	MH24	225.450	224.325	0.900	Open Manhole	600
S7.007	o	225	MH25	225.500	224.234	1.041	Open Manhole	600

Downstream Manhole

PN	Length	Slope	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
(m)	(1:X)	Name	(m)	(m)	(m)	Connection	(mm)	
S3.002	6.176	25.2	MH26	225.550	224.180	1.145	Open Manhole	1050
S7.000	40.878	35.5	MH19	228.650	227.600	0.900	Open Manhole	450
S7.001	20.278	23.9	MH20	227.800	226.750	0.900	Open Manhole	450
S7.002	18.528	17.6	MH21	226.750	225.700	0.900	Open Manhole	600
S7.003	17.147	85.7	MH22	226.550	225.425	0.900	Open Manhole	600
S7.004	9.457	85.7	MH23	226.650	225.315	1.110	Open Manhole	600
S7.005	37.774	38.2	MH24	225.450	224.325	0.900	Open Manhole	600
S7.006	8.998	99.3	MH25	225.500	224.234	1.041	Open Manhole	600
S7.007	5.422	99.3	MH26	225.550	224.180	1.145	Open Manhole	1050

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.004	o	300	MH26	225.550	224.105	1.145	Open Manhole	1050
S8.000	o	150	MH27	227.400	226.350	0.900	Open Manhole	450
S8.001	o	150	MH28	226.650	225.600	0.900	Open Manhole	450
S8.002	o	225	MH29	225.850	224.725	0.900	Open Manhole	600
S1.005	o	300	MH30	224.900	223.700	0.900	Open Manhole	1050
S1.006	o	300	MH31	224.950	222.975	1.675	Open Manhole	1200
S1.007	o	150	MH32	224.900	222.500	2.175	Open Manhole	1200
S1.008	o	150	MH33 Headwall	222.700	221.630	0.920	Open Manhole	1000

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.004	27.898	68.9	MH30	224.900	223.700	0.900	Open Manhole	1050
S8.000	28.998	38.7	MH28	226.650	225.600	0.900	Open Manhole	450
S8.001	31.192	39.0	MH29	225.850	224.800	0.900	Open Manhole	600
S8.002	32.201	33.9	MH30	224.900	223.775	0.900	Open Manhole	1050
S1.005	17.903	24.7	MH31	224.950	222.975	1.675	Open Manhole	1200
S1.006	23.863	50.2	MH32	224.900	222.500	2.100	Open Manhole	1200
S1.007	10.201	11.7	MH33 Headwall	222.700	221.630	0.845	Open Manhole	1000
S1.008	4.871	48.7	MHDummy	223.040	221.530	1.360	Open Manhole	1200

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
	User	-	50	0.062	0.031	0.077
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.840	0.423	0.423

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000	Run Time (mins)	60
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 1 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	18.100	Cv (Summer)	0.750
Return Period (years)	2	Ratio R	0.353	Cv (Winter)	0.840
Region	England and Wales	Profile Type	Summer Storm	Duration (mins)	30

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: MH32, DS/PN: S1.007, Volume (m³): 4.3

Unit Reference	MD-SHE-0097-5000-1600-5000	Sump Available	Yes
Design Head (m)	1.600	Diameter (mm)	97
Design Flow (l/s)	5.0	Invert Level (m)	222.500
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	150
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	5.0	Kick-Flo®	0.865	3.8
Flush-Flo™	0.425	4.7	Mean Flow over Head Range	-	4.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.1	0.600	4.6	1.600	5.0	2.600	6.3	5.000	8.5	7.500	10.3
0.200	4.3	0.800	4.1	1.800	5.3	3.000	6.7	5.500	8.9	8.000	10.7
0.300	4.6	1.000	4.0	2.000	5.5	3.500	7.2	6.000	9.3	8.500	11.0
0.400	4.7	1.200	4.4	2.200	5.8	4.000	7.7	6.500	9.7	9.000	11.3
0.500	4.7	1.400	4.7	2.400	6.0	4.500	8.1	7.000	10.0	9.500	11.6

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<u>Offline Controls for Storm</u> <u>Weir Manhole: MH32, DS/PN: S1.007, Loop to PN: S1.008</u> Discharge Coef 0.544 Width (m) 1.000 Invert Level (m) 223.600		
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Storage Structures for Storm

Cellular Storage Manhole: MH32, DS/PN: S1.007

Invert Level (m) 222.500 Infiltration Coefficient Side (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Base (m/hr) 0.00000 Safety Factor 2.0

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	216.0	216.0	1.600	216.0	312.0	1.700	0.0	312.0

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Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 0.000
 Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
 Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 1 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.100 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.350 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status OFF
 Analysis Timestep Fine DVD Status OFF

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
 Return Period(s) (years) 1
 Climate Change (%) 40

PN	US/MH	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	MH1	15 Winter	1	+40%					229.467	-0.133	0.000	0.03		1.1	OK
S1.001	MH2	15 Winter	1	+40%					228.313	-0.127	0.000	0.06		2.1	OK
S2.000	MH3	15 Winter	1	+40%					228.682	-0.118	0.000	0.10		1.4	OK
S2.001	MH4	15 Winter	1	+40%					228.529	-0.133	0.000	0.03		1.4	OK
S1.002	MH5	15 Winter	1	+40%					227.482	-0.118	0.000	0.10		3.5	OK
S1.003	MH6	15 Winter	1	+40%					225.498	-0.102	0.000	0.22		6.0	OK
S3.000	MH7	15 Winter	1	+40%					227.560	-0.090	0.000	0.33		12.0	OK
S3.001	MH8	15 Winter	1	+40%					225.585	-0.165	0.000	0.16		12.0	OK

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<u>Summary of Critical Results by Maximum Level (Rank 1) for Storm</u>																																
<table> <thead> <tr> <th></th><th>US/MH</th><th>Level</th></tr> <tr> <th>PN</th><th>Name</th><th>Exceeded</th></tr> </thead> <tbody> <tr><td>S1.000</td><td>MH1</td><td></td></tr> <tr><td>S1.001</td><td>MH2</td><td></td></tr> <tr><td>S2.000</td><td>MH3</td><td></td></tr> <tr><td>S2.001</td><td>MH4</td><td></td></tr> <tr><td>S1.002</td><td>MH5</td><td></td></tr> <tr><td>S1.003</td><td>MH6</td><td></td></tr> <tr><td>S3.000</td><td>MH7</td><td></td></tr> <tr><td>S3.001</td><td>MH8</td><td></td></tr> </tbody> </table>				US/MH	Level	PN	Name	Exceeded	S1.000	MH1		S1.001	MH2		S2.000	MH3		S2.001	MH4		S1.002	MH5		S1.003	MH6		S3.000	MH7		S3.001	MH8	
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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes SLS-1 Manhole Sizes 600mm +

FSR Rainfall Model - England and Wales

Return Period (years)	2	Foul Sewage (l/s/ha)	0.000	Maximum Backdrop Height (m)	1.500
M5-60 (mm)	18.100	Volumetric Runoff Coeff.	0.750	Min Design Depth for Optimisation (m)	0.900
Ratio R	0.353	PIMP (%)	100	Min Vel for Auto Design only (m/s)	1.00
Maximum Rainfall (mm/hr)	50	Add Flow / Climate Change (%)	0	Min Slope for Optimisation (1:X)	500
Maximum Time of Concentration (mins)	30	Minimum Backdrop Height (m)	0.500		

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	26.541	1.160	22.9	0.007	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	16.586	0.840	19.7	0.007	0.00	0.0	0.600	o	150	Pipe/Conduit	
S2.000	18.697	0.138	135.5	0.008	5.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.21	229.450	0.007	0.0	0.0	0.0	2.11	37.4	0.9
S1.001	50.00	5.33	228.290	0.013	0.0	0.0	0.0	2.28	40.2	1.8
S2.000	50.00	5.36	228.650	0.008	0.0	0.0	0.0	0.86	15.2	1.1

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.002	30.145	1.431	21.1	0.019	0.00	0.0	0.600	o	150	Pipe/Conduit	
S4.003	6.243	0.062	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S6.000	11.612	0.212	54.7	0.010	5.00	0.0	0.600	o	150	Pipe/Conduit	
S4.004	4.940	0.050	99.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S4.005	27.306	0.638	42.8	0.012	0.00	0.0	0.600	o	150	Pipe/Conduit	
S3.002	6.176	0.245	25.2	0.056	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.000	40.878	1.150	35.5	0.013	5.00	0.0	0.600	o	150	Pipe/Conduit	
S7.001	20.278	0.850	23.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S7.002	18.528	1.050	17.6	0.010	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S4.002	50.00	5.70	226.681	0.026	0.0	0.0	0.0	2.20	39.0	3.5
S4.003	50.00	5.81	225.250	0.026	0.0	0.0	0.0	1.00	17.8	3.5
S6.000	50.00	5.14	225.400	0.010	0.0	0.0	0.0	1.36	24.1	1.4
S4.004	50.00	5.89	225.188	0.036	0.0	0.0	0.0	1.01	17.8	4.8
S4.005	50.00	6.19	225.138	0.048	0.0	0.0	0.0	1.54	27.3	6.5
S3.002	50.00	6.22	224.425	0.175	0.0	0.0	0.0	2.62	104.1	23.7
S7.000	50.00	5.40	228.750	0.013	0.0	0.0	0.0	1.69	29.9	1.8
S7.001	50.00	5.57	227.600	0.013	0.0	0.0	0.0	2.07	36.6	1.8
S7.002	50.00	5.69	226.750	0.024	0.0	0.0	0.0	2.41	42.6	3.2

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S7.003	17.147	0.200	85.7	0.006	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.004	9.457	0.110	85.7	0.007	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.005	37.774	0.990	38.2	0.014	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.006	8.998	0.091	99.3	0.004	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.007	5.422	0.055	99.3	0.001	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.004	27.898	0.405	68.9	0.032	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.000	28.998	0.750	38.7	0.044	5.00	0.0	0.600	o	150	Pipe/Conduit	
S8.001	31.192	0.800	39.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S8.002	32.201	0.950	33.9	0.077	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.005	17.903	0.725	24.7	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S7.003	50.00	5.90	225.625	0.030	0.0	0.0	0.0	1.41	56.2	4.0
S7.004	50.00	6.01	225.425	0.036	0.0	0.0	0.0	1.41	56.2	4.9
S7.005	50.00	6.30	225.315	0.050	0.0	0.0	0.0	2.12	84.5	6.7
S7.006	50.00	6.42	224.325	0.054	0.0	0.0	0.0	1.31	52.2	7.2
S7.007	50.00	6.49	224.234	0.055	0.0	0.0	0.0	1.31	52.2	7.4
S1.004	50.00	6.73	224.105	0.302	0.0	0.0	0.0	1.90	134.1	40.9
S8.000	50.00	5.30	226.350	0.044	0.0	0.0	0.0	1.62	28.7	5.9
S8.001	50.00	5.62	225.600	0.044	0.0	0.0	0.0	1.62	28.6	5.9
S8.002	50.00	5.86	224.725	0.121	0.0	0.0	0.0	2.25	89.7	16.4
S1.005	50.00	6.83	223.700	0.423	0.0	0.0	0.0	3.18	224.6	57.2

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.006	23.863	0.475	50.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.007	10.201	0.870	11.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.008	4.871	0.100	48.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.006	50.00	7.00	222.975	0.423	0.0	0.0	0.0	2.22	157.2	57.2
S1.007	50.00	5.06	222.500	0.000	5.0	0.0	0.0	2.96	52.3	5.0
S1.008	50.00	5.11	221.630	0.000	5.0	0.0	0.0	1.45	25.5	5.0

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
MH1	230.500	1.050	Open Manhole	450	S1.000	229.450	150				
MH2	229.200	0.910	Open Manhole	450	S1.001	228.290	150	S1.000	228.290	150	
MH3	229.700	1.050	Open Manhole	450	S2.000	228.650	150				
MH4	229.050	0.538	Open Manhole	450	S2.001	228.512	150	S2.000	228.512	150	
MH5	228.500	1.050	Open Manhole	450	S1.002	227.450	150	S1.001	227.450	150	
								S2.001	227.450	150	
MH6	226.500	1.050	Open Manhole	450	S1.003	225.450	150	S1.002	225.450	150	
MH7	228.550	1.050	Open Manhole	450	S3.000	227.500	150				
MH8	226.650	1.125	Open Manhole	600	S3.001	225.525	225	S3.000	225.600	150	
MH9	229.650	1.050	Open Manhole	450	S4.000	228.600	150				
MH10	227.800	1.050	Open Manhole	450	S4.001	226.750	150	S4.000	226.750	150	
MH11	228.000	1.050	Open Manhole	450	S5.000	226.950	150				
MH12	227.800	1.119	Open Manhole	450	S4.002	226.681	150	S4.001	226.681	150	
								S5.000	226.681	150	
MH13	226.300	1.050	Open Manhole	450	S4.003	225.250	150	S4.002	225.250	150	
MH14	226.450	1.050	Open Manhole	450	S6.000	225.400	150				
MH15	226.300	1.112	Open Manhole	450	S4.004	225.188	150	S4.003	225.188	150	
								S6.000	225.188	150	
MH16	226.230	1.092	Open Manhole	450	S4.005	225.138	150	S4.004	225.138	150	
MH17	225.550	1.125	Open Manhole	600	S3.002	224.425	225	S3.001	224.425	225	
								S4.005	224.500	150	
MH18	229.800	1.050	Open Manhole	450	S7.000	228.750	150				
MH19	228.650	1.050	Open Manhole	450	S7.001	227.600	150	S7.000	227.600	150	

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
MH20	227.800	1.050	Open Manhole	450	S7.002	226.750	150	S7.001	226.750	150	
MH21	226.750	1.125	Open Manhole	600	S7.003	225.625	225	S7.002	225.700	150	
MH22	226.550	1.125	Open Manhole	600	S7.004	225.425	225	S7.003	225.425	225	
MH23	226.650	1.335	Open Manhole	600	S7.005	225.315	225	S7.004	225.315	225	
MH24	225.450	1.125	Open Manhole	600	S7.006	224.325	225	S7.005	224.325	225	
MH25	225.500	1.266	Open Manhole	600	S7.007	224.234	225	S7.006	224.234	225	
MH26	225.550	1.445	Open Manhole	1050	S1.004	224.105	300	S1.003	224.255	150	
								S3.002	224.180	225	
								S7.007	224.180	225	
MH27	227.400	1.050	Open Manhole	450	S8.000	226.350	150				
MH28	226.650	1.050	Open Manhole	450	S8.001	225.600	150	S8.000	225.600	150	
MH29	225.850	1.125	Open Manhole	600	S8.002	224.725	225	S8.001	224.800	150	
MH30	224.900	1.200	Open Manhole	1050	S1.005	223.700	300	S1.004	223.700	300	
								S8.002	223.775	225	
MH31	224.950	1.975	Open Manhole	1200	S1.006	222.975	300	S1.005	222.975	300	
MH32	224.900	2.400	Open Manhole	1200	S1.007	222.500	150	S1.006	222.500	300	
MH33 Headwall	222.700	1.070	Open Manhole	1000	S1.008	221.630	150	S1.007	221.630	150	
MHDummy	223.040	1.510	Open Manhole	1200		OUTFALL		S1.008	221.530	150	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
MH1	394401.275	349035.194	394401.275	349035.194	Required	
MH2	394382.227	349053.677	394382.227	349053.677	Required	
MH3	394412.256	349070.711	394412.256	349070.711	Required	
MH4	394393.559	349070.691	394393.559	349070.691	Required	
MH5	394381.061	349070.222	394381.061	349070.222	Required	
MH6	394381.148	349119.913	394381.148	349119.913	Required	
MH7	394386.944	349077.377	394386.944	349077.377	Required	
MH8	394387.075	349120.216	394387.075	349120.216	Required	
MH9	394414.680	349074.805	394414.680	349074.805	Required	
MH10	394414.635	349119.658	394414.635	349119.658	Required	

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
MH11	394424.058	349126.363	394424.058	349126.363	Required	
MH12	394414.696	349126.492	394414.696	349126.492	Required	
MH13	394414.536	349156.637	394414.536	349156.637	Required	
MH14	394426.099	349162.951	394426.099	349162.951	Required	
MH15	394414.487	349162.880	394414.487	349162.880	Required	
MH16	394414.542	349167.820	394414.542	349167.820	Required	
MH17	394387.236	349167.793	394387.236	349167.793	Required	
MH18	394416.663	349073.483	394416.663	349073.483	Required	
MH19	394426.480	349113.164	394426.480	349113.164	Required	
MH20	394429.522	349133.213	394429.522	349133.213	Required	

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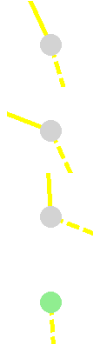
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Role Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
MH21	394429.660	349151.740	394429.660	349151.740	Required	
MH22	394429.936	349168.884	394429.936	349168.884	Required	
MH23	394427.830	349178.104	394427.830	349178.104	Required	
MH24	394390.056	349178.226	394390.056	349178.226	Required	
MH25	394382.783	349172.927	394382.783	349172.927	Required	
MH26	394381.059	349167.786	394381.059	349167.786	Required	
MH27	394353.553	349075.442	394353.553	349075.442	Required	
MH28	394353.739	349104.440	394353.739	349104.440	Required	
MH29	394354.049	349135.630	394354.049	349135.630	Required	
MH30	394353.161	349167.819	394353.161	349167.819	Required	

Manhole Schedules for Storm						
MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
MH31	394348.049	349184.977	394348.049	349184.977	Required	
MH32	394337.941	349206.594	394337.941	349206.594	Required	
MH33 Headwall	394328.438	349210.302	394328.438	349210.302	Required	
MHDummy	394328.162	349215.165			No Entry	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd	Diam	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	Sect	(mm)	Name	(m)	(m)	(m)	Connection	(mm)
S1.000	o	150	MH1	230.500	229.450	0.900	Open Manhole	450
S1.001	o	150	MH2	229.200	228.290	0.760	Open Manhole	450
S2.000	o	150	MH3	229.700	228.650	0.900	Open Manhole	450
S2.001	o	150	MH4	229.050	228.512	0.388	Open Manhole	450
S1.002	o	150	MH5	228.500	227.450	0.900	Open Manhole	450
S1.003	o	150	MH6	226.500	225.450	0.900	Open Manhole	450
S3.000	o	150	MH7	228.550	227.500	0.900	Open Manhole	450
S3.001	o	225	MH8	226.650	225.525	0.900	Open Manhole	600

Downstream Manhole

PN	Length	Slope	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	(m)	(1:X)	Name	(m)	(m)	(m)	Connection	(mm)
S1.000	26.541	22.9	MH2	229.200	228.290	0.760	Open Manhole	450
S1.001	16.586	19.7	MH5	228.500	227.450	0.900	Open Manhole	450
S2.000	18.697	135.5	MH4	229.050	228.512	0.388	Open Manhole	450
S2.001	12.507	11.8	MH5	228.500	227.450	0.900	Open Manhole	450
S1.002	49.691	24.8	MH6	226.500	225.450	0.900	Open Manhole	450
S1.003	47.874	40.1	MH26	225.550	224.255	1.145	Open Manhole	1050
S3.000	42.839	22.5	MH8	226.650	225.600	0.900	Open Manhole	600
S3.001	47.578	43.3	MH17	225.550	224.425	0.900	Open Manhole	600

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd	Diam	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
Sect	(mm)	Name	(m)	(m)	(m)	Connection	(mm)	
S3.002	o	225	MH17	225.550	224.425	0.900	Open Manhole	600
S7.000	o	150	MH18	229.800	228.750	0.900	Open Manhole	450
S7.001	o	150	MH19	228.650	227.600	0.900	Open Manhole	450
S7.002	o	150	MH20	227.800	226.750	0.900	Open Manhole	450
S7.003	o	225	MH21	226.750	225.625	0.900	Open Manhole	600
S7.004	o	225	MH22	226.550	225.425	0.900	Open Manhole	600
S7.005	o	225	MH23	226.650	225.315	1.110	Open Manhole	600
S7.006	o	225	MH24	225.450	224.325	0.900	Open Manhole	600
S7.007	o	225	MH25	225.500	224.234	1.041	Open Manhole	600

Downstream Manhole

PN	Length	Slope	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
(m)	(1:X)	Name	(m)	(m)	(m)	Connection	(mm)	
S3.002	6.176	25.2	MH26	225.550	224.180	1.145	Open Manhole	1050
S7.000	40.878	35.5	MH19	228.650	227.600	0.900	Open Manhole	450
S7.001	20.278	23.9	MH20	227.800	226.750	0.900	Open Manhole	450
S7.002	18.528	17.6	MH21	226.750	225.700	0.900	Open Manhole	600
S7.003	17.147	85.7	MH22	226.550	225.425	0.900	Open Manhole	600
S7.004	9.457	85.7	MH23	226.650	225.315	1.110	Open Manhole	600
S7.005	37.774	38.2	MH24	225.450	224.325	0.900	Open Manhole	600
S7.006	8.998	99.3	MH25	225.500	224.234	1.041	Open Manhole	600
S7.007	5.422	99.3	MH26	225.550	224.180	1.145	Open Manhole	1050

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.004	o	300	MH26	225.550	224.105	1.145	Open Manhole	1050
S8.000	o	150	MH27	227.400	226.350	0.900	Open Manhole	450
S8.001	o	150	MH28	226.650	225.600	0.900	Open Manhole	450
S8.002	o	225	MH29	225.850	224.725	0.900	Open Manhole	600
S1.005	o	300	MH30	224.900	223.700	0.900	Open Manhole	1050
S1.006	o	300	MH31	224.950	222.975	1.675	Open Manhole	1200
S1.007	o	150	MH32	224.900	222.500	2.175	Open Manhole	1200
S1.008	o	150	MH33 Headwall	222.700	221.630	0.920	Open Manhole	1000

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.004	27.898	68.9	MH30	224.900	223.700	0.900	Open Manhole	1050
S8.000	28.998	38.7	MH28	226.650	225.600	0.900	Open Manhole	450
S8.001	31.192	39.0	MH29	225.850	224.800	0.900	Open Manhole	600
S8.002	32.201	33.9	MH30	224.900	223.775	0.900	Open Manhole	1050
S1.005	17.903	24.7	MH31	224.950	222.975	1.675	Open Manhole	1200
S1.006	23.863	50.2	MH32	224.900	222.500	2.100	Open Manhole	1200
S1.007	10.201	11.7	MH33 Headwall	222.700	221.630	0.845	Open Manhole	1000
S1.008	4.871	48.7	MHDummy	223.040	221.530	1.360	Open Manhole	1200

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
	User	-	50	0.062	0.031	0.077
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.840	0.423	0.423

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000	Run Time (mins)	60
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 1 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	18.100	Cv (Summer)	0.750
Return Period (years)	2	Ratio R	0.353	Cv (Winter)	0.840
Region	England and Wales	Profile Type	Summer Storm	Duration (mins)	30

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: MH32, DS/PN: S1.007, Volume (m³): 4.3

Unit Reference	MD-SHE-0097-5000-1600-5000	Sump Available	Yes
Design Head (m)	1.600	Diameter (mm)	97
Design Flow (l/s)	5.0	Invert Level (m)	222.500
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	150
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	5.0	Kick-Flo®	0.865	3.8
Flush-Flo™	0.425	4.7	Mean Flow over Head Range	-	4.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.1	0.600	4.6	1.600	5.0	2.600	6.3	5.000	8.5	7.500	10.3
0.200	4.3	0.800	4.1	1.800	5.3	3.000	6.7	5.500	8.9	8.000	10.7
0.300	4.6	1.000	4.0	2.000	5.5	3.500	7.2	6.000	9.3	8.500	11.0
0.400	4.7	1.200	4.4	2.200	5.8	4.000	7.7	6.500	9.7	9.000	11.3
0.500	4.7	1.400	4.7	2.400	6.0	4.500	8.1	7.000	10.0	9.500	11.6

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<u>Offline Controls for Storm</u> <u>Weir Manhole: MH32, DS/PN: S1.007, Loop to PN: S1.008</u> Discharge Coef 0.544 Width (m) 1.000 Invert Level (m) 223.600		
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Storage Structures for Storm

Cellular Storage Manhole: MH32, DS/PN: S1.007

Invert Level (m) 222.500 Infiltration Coefficient Side (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Base (m/hr) 0.00000 Safety Factor 2.0

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	216.0	216.0	1.600	216.0	312.0	1.700	0.0	312.0

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Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 0.000
 Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
 Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 1 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.100 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.350 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status OFF
 Analysis Timestep Fine DVD Status OFF

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080

Return Period(s) (years) 30
 Climate Change (%) 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	MH1	15 Winter	30	+40%					229.478	-0.122	0.000	0.08		2.8	OK
S1.001	MH2	15 Winter	30	+40%					228.329	-0.111	0.000	0.15		5.7	OK
S2.000	MH3	15 Winter	30	+40%					228.700	-0.100	0.000	0.24		3.4	OK
S2.001	MH4	15 Winter	30	+40%					228.539	-0.123	0.000	0.07		3.4	OK
S1.002	MH5	15 Winter	30	+40%					227.502	-0.098	0.000	0.26		8.9	OK
S1.003	MH6	15 Winter	30	+40%					225.536	-0.064	0.000	0.59		16.3	OK
S3.000	MH7	15 Winter	30	+40%					227.603	-0.047	0.000	0.80		29.3	OK
S3.001	MH8	15 Winter	30	+40%					225.623	-0.127	0.000	0.38		29.1	OK

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<u>Summary of Critical Results by Maximum Level (Rank 1) for Storm</u>																																
<table> <thead> <tr> <th></th><th>US/MH</th><th>Level</th></tr> <tr> <th>PN</th><th>Name</th><th>Exceeded</th></tr> </thead> <tbody> <tr><td>S1.000</td><td>MH1</td><td></td></tr> <tr><td>S1.001</td><td>MH2</td><td></td></tr> <tr><td>S2.000</td><td>MH3</td><td></td></tr> <tr><td>S2.001</td><td>MH4</td><td></td></tr> <tr><td>S1.002</td><td>MH5</td><td></td></tr> <tr><td>S1.003</td><td>MH6</td><td></td></tr> <tr><td>S3.000</td><td>MH7</td><td></td></tr> <tr><td>S3.001</td><td>MH8</td><td></td></tr> </tbody> </table>				US/MH	Level	PN	Name	Exceeded	S1.000	MH1		S1.001	MH2		S2.000	MH3		S2.001	MH4		S1.002	MH5		S1.003	MH6		S3.000	MH7		S3.001	MH8	
	US/MH	Level																														
PN	Name	Exceeded																														
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Summary of Critical Results by Maximum Level (Rank 1) for Storm <table><thead><tr><th>PN</th><th>US/MH Name</th><th>Status</th><th>Level Exceeded</th></tr></thead><tbody><tr><td>S4.000</td><td>MH9</td><td>OK</td><td></td></tr><tr><td>S4.001</td><td>MH10</td><td>OK</td><td></td></tr><tr><td>S5.000</td><td>MH11</td><td>OK</td><td></td></tr><tr><td>S4.002</td><td>MH12</td><td>OK</td><td></td></tr><tr><td>S4.003</td><td>MH13</td><td>OK</td><td></td></tr><tr><td>S6.000</td><td>MH14</td><td>OK</td><td></td></tr><tr><td>S4.004</td><td>MH15</td><td>SURCHARGED</td><td></td></tr><tr><td>S4.005</td><td>MH16</td><td>OK</td><td></td></tr><tr><td>S3.002</td><td>MH17</td><td>SURCHARGED</td><td></td></tr><tr><td>S7.000</td><td>MH18</td><td>OK</td><td></td></tr><tr><td>S7.001</td><td>MH19</td><td>OK</td><td></td></tr><tr><td>S7.002</td><td>MH20</td><td>OK</td><td></td></tr><tr><td>S7.003</td><td>MH21</td><td>OK</td><td></td></tr><tr><td>S7.004</td><td>MH22</td><td>OK</td><td></td></tr><tr><td>S7.005</td><td>MH23</td><td>OK</td><td></td></tr><tr><td>S7.006</td><td>MH24</td><td>OK</td><td></td></tr><tr><td>S7.007</td><td>MH25</td><td>OK</td><td></td></tr><tr><td>S1.004</td><td>MH26</td><td>OK</td><td></td></tr><tr><td>S8.000</td><td>MH27</td><td>OK</td><td></td></tr><tr><td>S8.001</td><td>MH28</td><td>OK</td><td></td></tr><tr><td>S8.002</td><td>MH29</td><td>OK</td><td></td></tr><tr><td>S1.005</td><td>MH30</td><td>SURCHARGED</td><td></td></tr><tr><td>S1.006</td><td>MH31</td><td>SURCHARGED</td><td></td></tr><tr><td>S1.007</td><td>MH32</td><td>SURCHARGED</td><td></td></tr><tr><td>S1.008</td><td>MH33 Headwall</td><td>OK</td><td></td></tr></tbody></table>			PN	US/MH Name	Status	Level Exceeded	S4.000	MH9	OK		S4.001	MH10	OK		S5.000	MH11	OK		S4.002	MH12	OK		S4.003	MH13	OK		S6.000	MH14	OK		S4.004	MH15	SURCHARGED		S4.005	MH16	OK		S3.002	MH17	SURCHARGED		S7.000	MH18	OK		S7.001	MH19	OK		S7.002	MH20	OK		S7.003	MH21	OK		S7.004	MH22	OK		S7.005	MH23	OK		S7.006	MH24	OK		S7.007	MH25	OK		S1.004	MH26	OK		S8.000	MH27	OK		S8.001	MH28	OK		S8.002	MH29	OK		S1.005	MH30	SURCHARGED		S1.006	MH31	SURCHARGED		S1.007	MH32	SURCHARGED		S1.008	MH33 Headwall	OK	
PN	US/MH Name	Status	Level Exceeded																																																																																																							
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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S7.003	17.147	0.200	85.7	0.006	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.004	9.457	0.110	85.7	0.007	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.005	37.774	0.990	38.2	0.014	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.006	8.998	0.091	99.3	0.004	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.007	5.422	0.055	99.3	0.001	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.004	27.898	0.405	68.9	0.032	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.000	28.998	0.750	38.7	0.044	5.00	0.0	0.600	o	150	Pipe/Conduit	
S8.001	31.192	0.800	39.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S8.002	32.201	0.950	33.9	0.077	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.005	17.903	0.725	24.7	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S7.003	50.00	5.90	225.625	0.030	0.0	0.0	0.0	1.41	56.2	4.0
S7.004	50.00	6.01	225.425	0.036	0.0	0.0	0.0	1.41	56.2	4.9
S7.005	50.00	6.30	225.315	0.050	0.0	0.0	0.0	2.12	84.5	6.7
S7.006	50.00	6.42	224.325	0.054	0.0	0.0	0.0	1.31	52.2	7.2
S7.007	50.00	6.49	224.234	0.055	0.0	0.0	0.0	1.31	52.2	7.4
S1.004	50.00	6.73	224.105	0.302	0.0	0.0	0.0	1.90	134.1	40.9
S8.000	50.00	5.30	226.350	0.044	0.0	0.0	0.0	1.62	28.7	5.9
S8.001	50.00	5.62	225.600	0.044	0.0	0.0	0.0	1.62	28.6	5.9
S8.002	50.00	5.86	224.725	0.121	0.0	0.0	0.0	2.25	89.7	16.4
S1.005	50.00	6.83	223.700	0.423	0.0	0.0	0.0	3.18	224.6	57.2

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.006	23.863	0.475	50.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.007	10.201	0.870	11.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.008	4.871	0.100	48.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.006	50.00	7.00	222.975	0.423	0.0	0.0	0.0	2.22	157.2	57.2
S1.007	50.00	5.06	222.500	0.000	5.0	0.0	0.0	2.96	52.3	5.0
S1.008	50.00	5.11	221.630	0.000	5.0	0.0	0.0	1.45	25.5	5.0

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Manhole Schedules for Storm

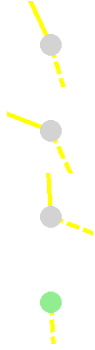
MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
MH1	230.500	1.050	Open Manhole	450	S1.000	229.450	150				
MH2	229.200	0.910	Open Manhole	450	S1.001	228.290	150	S1.000	228.290	150	
MH3	229.700	1.050	Open Manhole	450	S2.000	228.650	150				
MH4	229.050	0.538	Open Manhole	450	S2.001	228.512	150	S2.000	228.512	150	
MH5	228.500	1.050	Open Manhole	450	S1.002	227.450	150	S1.001	227.450	150	
								S2.001	227.450	150	
MH6	226.500	1.050	Open Manhole	450	S1.003	225.450	150	S1.002	225.450	150	
MH7	228.550	1.050	Open Manhole	450	S3.000	227.500	150				
MH8	226.650	1.125	Open Manhole	600	S3.001	225.525	225	S3.000	225.600	150	
MH9	229.650	1.050	Open Manhole	450	S4.000	228.600	150				
MH10	227.800	1.050	Open Manhole	450	S4.001	226.750	150	S4.000	226.750	150	
MH11	228.000	1.050	Open Manhole	450	S5.000	226.950	150				
MH12	227.800	1.119	Open Manhole	450	S4.002	226.681	150	S4.001	226.681	150	
								S5.000	226.681	150	
MH13	226.300	1.050	Open Manhole	450	S4.003	225.250	150	S4.002	225.250	150	
MH14	226.450	1.050	Open Manhole	450	S6.000	225.400	150				
MH15	226.300	1.112	Open Manhole	450	S4.004	225.188	150	S4.003	225.188	150	
								S6.000	225.188	150	
MH16	226.230	1.092	Open Manhole	450	S4.005	225.138	150	S4.004	225.138	150	
MH17	225.550	1.125	Open Manhole	600	S3.002	224.425	225	S3.001	224.425	225	
								S4.005	224.500	150	
MH18	229.800	1.050	Open Manhole	450	S7.000	228.750	150				
MH19	228.650	1.050	Open Manhole	450	S7.001	227.600	150	S7.000	227.600	150	

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
MH20	227.800	1.050	Open Manhole	450	S7.002	226.750	150	S7.001	226.750	150	
MH21	226.750	1.125	Open Manhole	600	S7.003	225.625	225	S7.002	225.700	150	
MH22	226.550	1.125	Open Manhole	600	S7.004	225.425	225	S7.003	225.425	225	
MH23	226.650	1.335	Open Manhole	600	S7.005	225.315	225	S7.004	225.315	225	
MH24	225.450	1.125	Open Manhole	600	S7.006	224.325	225	S7.005	224.325	225	
MH25	225.500	1.266	Open Manhole	600	S7.007	224.234	225	S7.006	224.234	225	
MH26	225.550	1.445	Open Manhole	1050	S1.004	224.105	300	S1.003	224.255	150	
								S3.002	224.180	225	
								S7.007	224.180	225	
MH27	227.400	1.050	Open Manhole	450	S8.000	226.350	150				
MH28	226.650	1.050	Open Manhole	450	S8.001	225.600	150	S8.000	225.600	150	
MH29	225.850	1.125	Open Manhole	600	S8.002	224.725	225	S8.001	224.800	150	
MH30	224.900	1.200	Open Manhole	1050	S1.005	223.700	300	S1.004	223.700	300	
								S8.002	223.775	225	
MH31	224.950	1.975	Open Manhole	1200	S1.006	222.975	300	S1.005	222.975	300	
MH32	224.900	2.400	Open Manhole	1200	S1.007	222.500	150	S1.006	222.500	300	
MH33 Headwall	222.700	1.070	Open Manhole	1000	S1.008	221.630	150	S1.007	221.630	150	
MHDummy	223.040	1.510	Open Manhole	1200		OUTFALL		S1.008	221.530	150	

Manhole Schedules for Storm						
MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
MH21	394429.660	349151.740	394429.660	349151.740	Required	
MH22	394429.936	349168.884	394429.936	349168.884	Required	
MH23	394427.830	349178.104	394427.830	349178.104	Required	
MH24	394390.056	349178.226	394390.056	349178.226	Required	
MH25	394382.783	349172.927	394382.783	349172.927	Required	
MH26	394381.059	349167.786	394381.059	349167.786	Required	
MH27	394353.553	349075.442	394353.553	349075.442	Required	
MH28	394353.739	349104.440	394353.739	349104.440	Required	
MH29	394354.049	349135.630	394354.049	349135.630	Required	
MH30	394353.161	349167.819	394353.161	349167.819	Required	

Manhole Schedules for Storm						
MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
MH31	394348.049	349184.977	394348.049	349184.977	Required	
MH32	394337.941	349206.594	394337.941	349206.594	Required	
MH33 Headwall	394328.438	349210.302	394328.438	349210.302	Required	
MHDummy	394328.162	349215.165			No Entry	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd	Diam	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	Sect	(mm)	Name	(m)	(m)	(m)	Connection	(mm)
S1.000	o	150	MH1	230.500	229.450	0.900	Open Manhole	450
S1.001	o	150	MH2	229.200	228.290	0.760	Open Manhole	450
S2.000	o	150	MH3	229.700	228.650	0.900	Open Manhole	450
S2.001	o	150	MH4	229.050	228.512	0.388	Open Manhole	450
S1.002	o	150	MH5	228.500	227.450	0.900	Open Manhole	450
S1.003	o	150	MH6	226.500	225.450	0.900	Open Manhole	450
S3.000	o	150	MH7	228.550	227.500	0.900	Open Manhole	450
S3.001	o	225	MH8	226.650	225.525	0.900	Open Manhole	600

Downstream Manhole

PN	Length	Slope	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	(m)	(1:X)	Name	(m)	(m)	(m)	Connection	(mm)
S1.000	26.541	22.9	MH2	229.200	228.290	0.760	Open Manhole	450
S1.001	16.586	19.7	MH5	228.500	227.450	0.900	Open Manhole	450
S2.000	18.697	135.5	MH4	229.050	228.512	0.388	Open Manhole	450
S2.001	12.507	11.8	MH5	228.500	227.450	0.900	Open Manhole	450
S1.002	49.691	24.8	MH6	226.500	225.450	0.900	Open Manhole	450
S1.003	47.874	40.1	MH26	225.550	224.255	1.145	Open Manhole	1050
S3.000	42.839	22.5	MH8	226.650	225.600	0.900	Open Manhole	600
S3.001	47.578	43.3	MH17	225.550	224.425	0.900	Open Manhole	600

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd	Diam	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	Sect	(mm)	Name	(m)	(m)	(m)	Connection	(mm)
S4.000	o	150	MH9	229.650	228.600	0.900	Open Manhole	450
S4.001	o	150	MH10	227.800	226.750	0.900	Open Manhole	450
S5.000	o	150	MH11	228.000	226.950	0.900	Open Manhole	450
S4.002	o	150	MH12	227.800	226.681	0.969	Open Manhole	450
S4.003	o	150	MH13	226.300	225.250	0.900	Open Manhole	450
S6.000	o	150	MH14	226.450	225.400	0.900	Open Manhole	450
S4.004	o	150	MH15	226.300	225.188	0.962	Open Manhole	450
S4.005	o	150	MH16	226.230	225.138	0.942	Open Manhole	450

Downstream Manhole

PN	Length	Slope	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	(m)	(1:X)	Name	(m)	(m)	(m)	Connection	(mm)
S4.000	44.853	24.2	MH10	227.800	226.750	0.900	Open Manhole	450
S4.001	6.835	99.1	MH12	227.800	226.681	0.969	Open Manhole	450
S5.000	9.363	34.8	MH12	227.800	226.681	0.969	Open Manhole	450
S4.002	30.145	21.1	MH13	226.300	225.250	0.900	Open Manhole	450
S4.003	6.243	100.0	MH15	226.300	225.188	0.962	Open Manhole	450
S6.000	11.612	54.7	MH15	226.300	225.188	0.962	Open Manhole	450
S4.004	4.940	99.7	MH16	226.230	225.138	0.942	Open Manhole	450
S4.005	27.306	42.8	MH17	225.550	224.500	0.900	Open Manhole	600

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd	Diam	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
Sect	(mm)	Name	(m)	(m)	(m)	Connection	(mm)	
S3.002	o	225	MH17	225.550	224.425	0.900	Open Manhole	600
S7.000	o	150	MH18	229.800	228.750	0.900	Open Manhole	450
S7.001	o	150	MH19	228.650	227.600	0.900	Open Manhole	450
S7.002	o	150	MH20	227.800	226.750	0.900	Open Manhole	450
S7.003	o	225	MH21	226.750	225.625	0.900	Open Manhole	600
S7.004	o	225	MH22	226.550	225.425	0.900	Open Manhole	600
S7.005	o	225	MH23	226.650	225.315	1.110	Open Manhole	600
S7.006	o	225	MH24	225.450	224.325	0.900	Open Manhole	600
S7.007	o	225	MH25	225.500	224.234	1.041	Open Manhole	600

Downstream Manhole

PN	Length	Slope	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
(m)	(1:X)	Name	(m)	(m)	(m)	Connection	(mm)	
S3.002	6.176	25.2	MH26	225.550	224.180	1.145	Open Manhole	1050
S7.000	40.878	35.5	MH19	228.650	227.600	0.900	Open Manhole	450
S7.001	20.278	23.9	MH20	227.800	226.750	0.900	Open Manhole	450
S7.002	18.528	17.6	MH21	226.750	225.700	0.900	Open Manhole	600
S7.003	17.147	85.7	MH22	226.550	225.425	0.900	Open Manhole	600
S7.004	9.457	85.7	MH23	226.650	225.315	1.110	Open Manhole	600
S7.005	37.774	38.2	MH24	225.450	224.325	0.900	Open Manhole	600
S7.006	8.998	99.3	MH25	225.500	224.234	1.041	Open Manhole	600
S7.007	5.422	99.3	MH26	225.550	224.180	1.145	Open Manhole	1050

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.004	o	300	MH26	225.550	224.105	1.145	Open Manhole	1050
S8.000	o	150	MH27	227.400	226.350	0.900	Open Manhole	450
S8.001	o	150	MH28	226.650	225.600	0.900	Open Manhole	450
S8.002	o	225	MH29	225.850	224.725	0.900	Open Manhole	600
S1.005	o	300	MH30	224.900	223.700	0.900	Open Manhole	1050
S1.006	o	300	MH31	224.950	222.975	1.675	Open Manhole	1200
S1.007	o	150	MH32	224.900	222.500	2.175	Open Manhole	1200
S1.008	o	150	MH33 Headwall	222.700	221.630	0.920	Open Manhole	1000

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.004	27.898	68.9	MH30	224.900	223.700	0.900	Open Manhole	1050
S8.000	28.998	38.7	MH28	226.650	225.600	0.900	Open Manhole	450
S8.001	31.192	39.0	MH29	225.850	224.800	0.900	Open Manhole	600
S8.002	32.201	33.9	MH30	224.900	223.775	0.900	Open Manhole	1050
S1.005	17.903	24.7	MH31	224.950	222.975	1.675	Open Manhole	1200
S1.006	23.863	50.2	MH32	224.900	222.500	2.100	Open Manhole	1200
S1.007	10.201	11.7	MH33 Headwall	222.700	221.630	0.845	Open Manhole	1000
S1.008	4.871	48.7	MHDummy	223.040	221.530	1.360	Open Manhole	1200

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
	User	-	50	0.062	0.031	0.077
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.840	0.423	0.423

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000	Run Time (mins)	60
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	0.000	Output Interval (mins)	1

Number of Input Hydrographs

0

Number of Offline Controls

1

Number of Time/Area Diagrams

0

Number of Online Controls

1

Number of Storage Structures

1

Number of Real Time Controls

0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	18.100	Cv (Summer)	0.750
Return Period (years)	2	Ratio R	0.353	Cv (Winter)	0.840
Region	England and Wales	Profile Type	Summer Storm	Duration (mins)	30

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: MH32, DS/PN: S1.007, Volume (m³): 4.3

Unit Reference	MD-SHE-0097-5000-1600-5000	Sump Available	Yes
Design Head (m)	1.600	Diameter (mm)	97
Design Flow (l/s)	5.0	Invert Level (m)	222.500
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	150
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	5.0	Kick-Flo®	0.865	3.8
Flush-Flo™	0.425	4.7	Mean Flow over Head Range	-	4.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.1	0.600	4.6	1.600	5.0	2.600	6.3	5.000	8.5	7.500	10.3
0.200	4.3	0.800	4.1	1.800	5.3	3.000	6.7	5.500	8.9	8.000	10.7
0.300	4.6	1.000	4.0	2.000	5.5	3.500	7.2	6.000	9.3	8.500	11.0
0.400	4.7	1.200	4.4	2.200	5.8	4.000	7.7	6.500	9.7	9.000	11.3
0.500	4.7	1.400	4.7	2.400	6.0	4.500	8.1	7.000	10.0	9.500	11.6

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<u>Offline Controls for Storm</u> <u>Weir Manhole: MH32, DS/PN: S1.007, Loop to PN: S1.008</u> Discharge Coef 0.544 Width (m) 1.000 Invert Level (m) 223.600		
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Storage Structures for Storm

Cellular Storage Manhole: MH32, DS/PN: S1.007

Invert Level (m) 222.500 Infiltration Coefficient Side (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Base (m/hr) 0.00000 Safety Factor 2.0

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	216.0	216.0	1.600	216.0	312.0	1.700	0.0	312.0

Summary of Critical Results by Maximum Level (Rank 1) for Storm

Areal Reduction Factor	1.000	Manhole Headloss Coeff (Global)	0.500	MADD Factor * 10m ³ /ha Storage	0.000
Hot Start (mins)	0	Foul Sewage per hectare (l/s)	0.000	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Additional Flow - % of Total Flow	0.000	Flow per Person per Day (l/per/day)	0.000

Synthetic Rainfall Details

```
Margin for Flood Risk Warning (mm) 300.0 DTS Status   ON Inertia Status OFF
Analysis Timestep      Fine DVD Status OFF
```

									Water	Surcharged	Flooded			Half Drain	Pipe
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level	Depth	Volume	Flow /	Overflow	Time	Flow
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)	(m)	(m³)	Cap.	(1/s)	(mins)	(1/s)
S1.000	MH1	15 Winter	100	+40%					229.482	-0.118	0.000	0.10			3.6
S1.001	MH2	15 Winter	100	+40%					228.335	-0.105	0.000	0.20			7.4
S2.000	MH3	15 Winter	100	+40%					228.708	-0.092	0.000	0.31			4.4
S2.001	MH4	15 Winter	100	+40%					228.543	-0.119	0.000	0.09			4.4
S1.002	MH5	15 Winter	100	+40%					227.510	-0.090	0.000	0.33			11.5
S1.003	MH6	15 Winter	100	+40%					225.552	-0.048	0.000	0.77			21.0
S3.000	MH7	15 Winter	100	+40%	100/15 Winter				227.780	0.130	0.000	1.02			37.4
S3.001	MH8	15 Winter	100	+40%					225.637	-0.113	0.000	0.49			37.3

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Summary of Critical Results by Maximum Level (Rank 1) for Storm

US/MH		Level	
PN	Name	Status	Exceeded
S1.000	MH1	OK	
S1.001	MH2	OK	
S2.000	MH3	OK	
S2.001	MH4	OK	
S1.002	MH5	OK	
S1.003	MH6	OK	
S3.000	MH7	SURCHARGED	
S3.001	MH8	OK	

Summary of Critical Results by Maximum Level (Rank 1) for Storm

									Water	Surcharged	Flooded				Half Drain	Pipe
PN	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level	Depth	Volume	Flow /	Overflow	Time	Flow	
	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)	(m)	(m³)	Cap.	(l/s)	(mins)	(l/s)	
S4.000	MH9	15 Winter	100	+40%					228.617	-0.133	0.000	0.03			1.1	
S4.001	MH10	15 Winter	100	+40%					226.776	-0.124	0.000	0.07			1.0	
S5.000	MH11	15 Winter	100	+40%					226.981	-0.119	0.000	0.09			2.5	
S4.002	MH12	15 Winter	100	+40%					226.745	-0.086	0.000	0.38			14.2	
S4.003	MH13	15 Winter	100	+40%	100/15 Summer				225.740	0.340	0.000	0.86			12.9	
S6.000	MH14	15 Winter	100	+40%	100/15 Summer				225.720	0.170	0.000	0.23			5.0	
S4.004	MH15	15 Winter	100	+40%	100/15 Summer				225.703	0.365	0.000	1.17			16.4	
S4.005	MH16	15 Winter	100	+40%	100/15 Summer				225.639	0.351	0.000	0.86			22.3	
S3.002	MH17	15 Winter	100	+40%	100/15 Summer				225.206	0.556	0.000	1.13			79.1	
S7.000	MH18	15 Winter	100	+40%					228.800	-0.100	0.000	0.24			7.0	
S7.001	MH19	15 Winter	100	+40%					227.646	-0.104	0.000	0.20			7.0	
S7.002	MH20	15 Winter	100	+40%					226.809	-0.091	0.000	0.32			12.7	
S7.003	MH21	15 Winter	100	+40%					225.713	-0.137	0.000	0.32			16.0	
S7.004	MH22	15 Winter	100	+40%					225.528	-0.122	0.000	0.42			19.5	
S7.005	MH23	15 Winter	100	+40%					225.406	-0.134	0.000	0.34			26.9	
S7.006	MH24	15 Winter	100	+40%	100/15 Summer				224.934	0.384	0.000	0.59			24.8	
S7.007	MH25	15 Winter	100	+40%	100/15 Summer				224.905	0.446	0.000	0.79			26.2	
S1.004	MH26	15 Winter	100	+40%	100/15 Summer				224.885	0.480	0.000	1.12			135.4	
S8.000	MH27	15 Winter	100	+40%					226.457	-0.043	0.000	0.84			23.2	
S8.001	MH28	15 Winter	100	+40%					225.707	-0.043	0.000	0.84			23.0	
S8.002	MH29	15 Winter	100	+40%					224.878	-0.072	0.000	0.78			65.8	
S1.005	MH30	15 Winter	100	+40%	100/15 Summer				224.374	0.374	0.000	0.99			190.0	
S1.006	MH31	15 Winter	100	+40%	100/15 Summer				223.664	0.389	0.000	1.36			189.4	
S1.007	MH32	360 Winter	100	+40%	100/15 Summer			0	223.585	0.936	0.000	0.10	0.0	468	4.7	
S1.008	MH33 Headwall	240 Summer	100	+40%					221.679	-0.101	0.000	0.24			4.7	

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Summary of Critical Results by Maximum Level (Rank 1) for Storm		



KRS Environmental Ltd

Mob: 07857 264 376

Tel: 01686 668957

Tel: 01484 437420

Email: keelan@krsenvironmental.com

Web: www.krsenvironmental.com

Appendix B – LLFA Response

Lead Local Flood Authority Planning Application Response

Lead SCC Officer	Henry Wood
Local Planning Authority	Staffordshire Moorlands District Council (SMDC)
Planning application name	Development of a Battery Energy Storage System (BESS) with ancillary infrastructure, security fence, access, landscaping, and biodiversity enhancements, to provide balancing services to the local electricity grid. Land at Newfields Farm Rownall Road Wetley Rocks
Planning application reference	SMD/2024/0019
Type of application	Full
Date consulted	25/01/2024
Date of response	13/02/2024

Disclaimer

This response is made by the County Council in its capacity as a Lead Local Flood Authority as a statutory consultee. As a Lead Local Flood Authority, we respond to Planning Applications where resources allow and considering where development has the greatest ability to affect flood risk.

These comments should be taken as general comments on flood risk and drainage only. A detailed review of any technical methodology and results has not been undertaken by the Council. Liability for such technical work therefore rests with organisation(s) who have undertaken the said work.



General observations/ local flooding information

Flood Zone	The site is within FZ1
Surface water risk	Yes, the updated Flood Map for Surface Water (uFMfSW) does affect the proposed site area. The northern portion of the site is affected by surface water flooding during the 1 in 30-year event. Small areas of localised flooding are shown along the length of the unnamed watercourse flowing adjacent to the site's western boundary. In addition, there is localised surface water flooding shown in the vicinity of an existing land drain which heads towards the sites north-western boundary. During the 100-year rainfall period, there is the start of a route for surface water to flow through the northern end of the development site. Surface water is shown to pool on the access road to the east of the site before heading west through the development site toward the unnamed watercourse along the site western site boundary. This flow path becomes more evident during the 1000-year rainfall event with the extent of surface water flooding also affecting a greater area within the northern areas of the development site.
Past flooding within 20m of site	None known. Our information about past flooding is based on data that the Flood Risk Management team holds. Where other authorities (such as LPAs) have been made aware of issues, we cannot guarantee they have passed this information on to us.
Watercourse within 5m of site	Yes. A drainage ditch runs through the northern portion of the site. In addition, an unnamed watercourse is present along the length of the site's western boundary. Should any works to develop the site affect the flows within these channels, watercourse consent shall be required from the LLFA.
Other observations	None.

RESPONSE

Thank you for consulting us on this full planning application. Our response is detailed below.

Staffordshire County Council Flood Risk Management position

We have reviewed the Flood Risk and Surface Water Drainage Assessment Document (KRS.0612.002.R.001.G January 2024).

At this time, we have no objections to the application subject to the following condition being attached to any decision notice to ensure that the final detailed drainage design along with a management and maintenance plan are provided to the Local Planning Authority and reviewed by the LLFA.

We ask to be consulted on the details submitted for approval to your Authority to discharge this condition and on any subsequent amendments/alterations.

Please also consult us again on any future major changes to the proposed development or drainage scheme.

Condition

No development shall begin until the final detailed surface water drainage design has been submitted to and approved by the Local Planning Authority in consultation with the Lead Local Flood Authority.

The design must be in accordance with the principles outlined in the approved Flood Risk and Surface Water Drainage Assessment Document (KRS.0612.002.R.001.G January 2024) and must further demonstrate:

- Final detailed design (plans, network details and full hydraulic calculations) of the surface water drainage scheme, the attenuation features (attenuation tank), petrol interceptor and Hydrobrake.

Calculations shall demonstrate the performance of the drainage system for the 1-year, 2-year, 30-year and 100-year return periods including an allowance for climate change.

- Final management and maintenance plan for surface water drainage to ensure that surface water drainage systems shall be maintained and managed for the lifetime of the development.

To include the named body responsible for management and maintenance of the system. The development shall thereafter proceed in accordance with the approved details.

Reason

To reduce the risk of surface water flooding to the development and properties downstream for the lifetime of the development.

Advisory

Ordinary Watercourse Consent

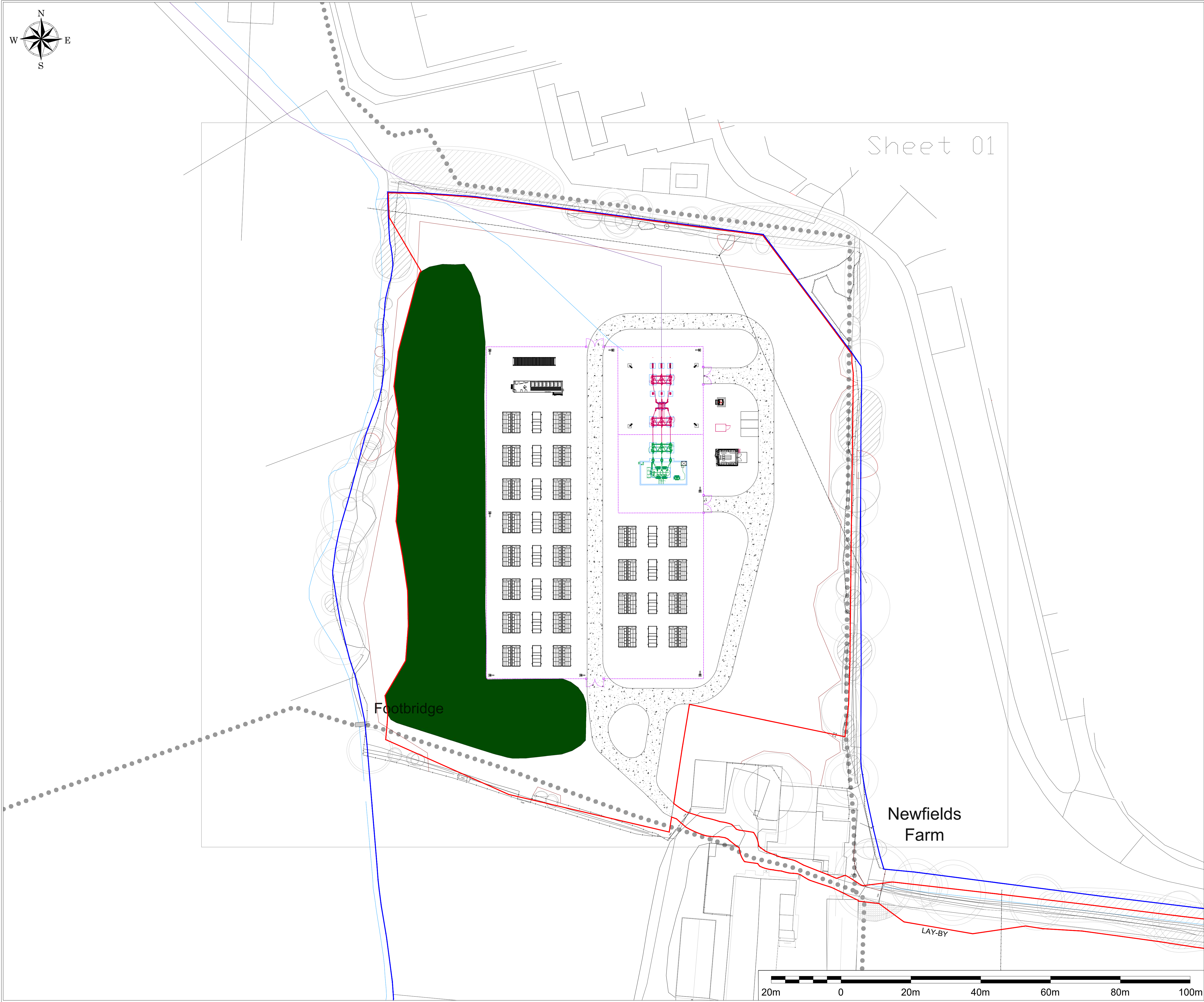


The proposals are in an area where existing land drains are present. Should any works to develop the site affect the flows within these channels, watercourse consent shall be required from the LLFA.

Please contact us on flood.team@staffordshire.gov.uk if you have any queries about this response.



Appendix C – Proposed Layout

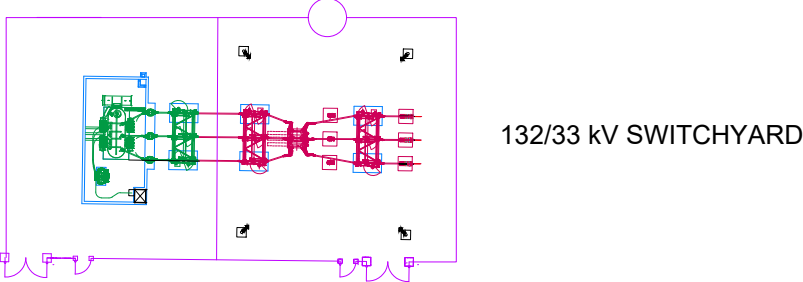


Sheet 01

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS AND SPECIALISTS DRAWINGS & SPECIFICATIONS.
2. ANY DISCREPANCIES BETWEEN THIS DRAWING AND ANY OTHER TO BE REPORTED TO THE ENGINEER IMMEDIATELY.
3. ALL WORKS TO COMPLY WITH THE MOST CURRENT BRITISH STANDARDS.
4. ALL DIMENSIONS IN MILLIMETERS UNLESS STATED OTHERWISE. USE FIGURED DIMENSIONS ONLY.
5. ALL DIMENSIONS TO BE ±3mm UNLESS SPECIFIED OTHERWISE.
6. A RECESSIVE COLOUR SUCH AS GREY IS PROPOSED, BUT CAN BE AGREED WITH OFFICERS.

Legend:

- LAND UNDER OWNERSHIP OF THE APPLICANT
- SITE BOUNDARY
- FENCE
- OVERHEAD LINE
- HV UNDERGROUND CABLE ROUTE
- CULVERTED DRAINAGE DITCH
- FOOTPATH (PROW)
- ACCESS ROAD
- ACCESS ROAD
- INTERNAL STONE ROAD
- PROPOSED BUND - APPROX. 3m HEIGHT
- ENTRANCE GATE
- CAR PARKING SPACES
- 5.0m CCTV CAMERA COLUMN
- TREES WITH ROOT PROTECTION AREA



- DNO CONTROL BUILDING
- DNO STORE BUILDING
- BATTERY ENERGY STORAGE CONTAINERS
- TRANSFORMER STATION
- CUSTOMER SWITCHROOM
- CUSTOMER CONTROL BUILDING
- CUSTOMER STORE BUILDING
- AUXILIARY TRANSFORMER

3	UPDATED SUNGROW EQUIPMENT	JK	MB	05/2/25
2	UPDATED LOCATION PLAN	JK	MB	04/2/25
1	INITIAL ISSUE	JK	MB	14/2/24
Issue	Description	Drawn	Checked	Date

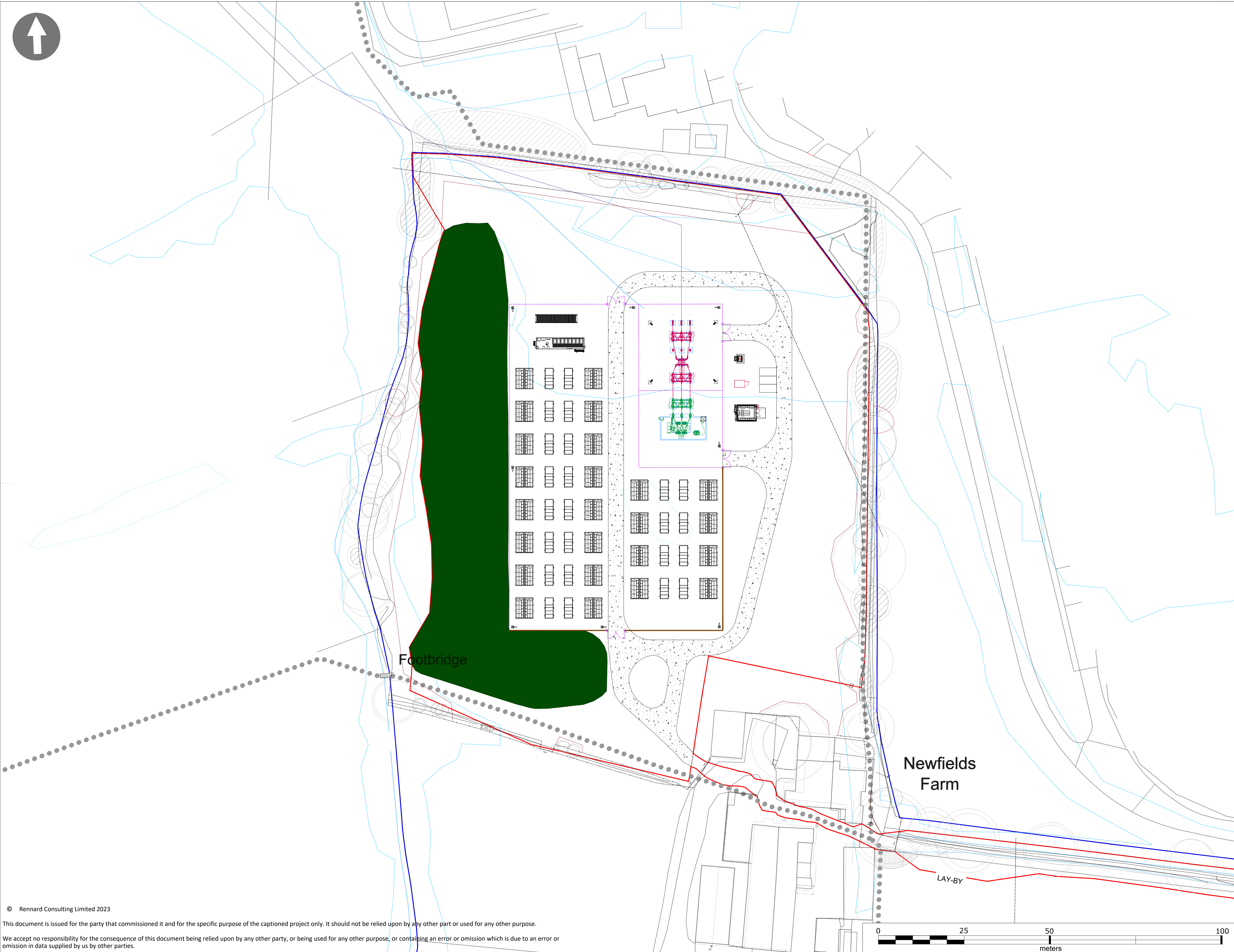
Project Title	
Newfields Farm BESS	
Drawing Title	
SITE LAYOUT PLAN	
Scale 1:500	Original Size A1
Sheet 1 of 1	
Drawing Number 1105-01-04-NF-SL-05022025	Revision 4.0



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7th Floor, Regal House
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Appendix D – Surface Water Flood Map



NOTES
1. Dimensions are in mm unless otherwise stated.
2. Levels are in m AOD unless otherwise stated.
3. This drawing has been produced to support a planning application for the named scheme. It should not be relied upon for any other purpose.

Key

Extent of Surface Water Flooding

Reference Drawings

A	28.02.2025	For Discussion	FEG
Rev	Date	Revision notes	By

NOT FOR CONSTRUCTION
Status For Planning

Project Newfields Farm BESS Facility

Title Surface Water Flooding

Client

RE Project Development Ltd
7th Floor, Regal House
70 London Road
Twickenham
TW1 3QS

Rennard Consulting Limited
Ebenezer House
Ryecroft
Newcastle
ST5 2BE
W: www.rennardconsulting.co.uk

Drawn By	Publish Date	Scale(s)
FEG	28.02.2025	1:200
Drawing no. 00123/NEW/SK/01		Revision A

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0

25

50

100

meters

Appendix E – Equipment Foundation Drawing