

**PHASE 5 DRAINAGE TECHNICAL NOTE
RESPONSE TO LLFA QUERIES
REFERENCE: DC/24/1158**

**Southwater,
Phase 5**

**Prepared for
St Edward Homes
Limited**

by

**Stuart Michael
Associates Limited**

March 2025



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1.0 INTRODUCTION

- 1.1 Stuart Michael Associates Limited, consulting engineers, has been commissioned by St Edward Homes Limited (hereafter referred to as the 'Client') to prepare this Drainage Technical Note for the residential development known as Southwater.
- 1.2 This Phase 5 Drainage Technical Note comes in response to the objection by the West Sussex County Council, which acts as the Lead Local Flood Authority (hereafter referred to as the LLFA), referenced **DC/24/1158 – Berkeley Homes Development Site Phase 4 and 5, Worthing Road, Southwater, West Sussex**, and dated 9th of October 2024. For avoidance of doubt, this letter can be found in **Appendix 1**.
- 1.3 This Phase 5 Drainage Technical Note takes into consideration and comes in to complement the information provided in the Flood Risk Assessment prepared by Patrick Parsons, Revision 4.0, dated 28.06.2024.



2.0 LLFA REQUIREMENTS

As listed in the LLFA letter, referenced in section 1.2 above, the below requirements will be addressed in the present Technical Note.

- 2.1 *An updated drainage strategy for Phase 5 is required as this has not been provided. It must be demonstrated each phase (4 and 5) can standalone if future phases are not built as planned.*
- 2.2 *A Cv value of 1 for summer and winter is required in calculations.*
- 2.3 *For the basin, cross sections are required to ensure suitable side slopes and depths are being used. 2m is very deep for a basin, as an authority we suggest 1m for safety, amenity and biodiversity reasons but we appreciate this may be difficult to achieve for this site. Additionally, the basin is in a flow path which will reduce its' capacity in storm events. The cross sections must clearly show areas proposed to always be wet compared to areas proposed to be dry except for storm events.*
- 2.4 *The proposed discharge rate means in the 2-year rainfall event the site will be discharging at the 100 year greenfield runoff rate which increases flood risk elsewhere. Rates should be restricted to Qbar in accordance with SuDS Non-Statutory Technical Standards and NPPF.*
- 2.5 *An exceedance plan showing depth, area and direction of flooding in 1 in 100 + climate change allowance event is required.*
- 2.6 *It is disappointing to see the permeable paving proposed previously is now not included in the most recent plans. The use of source control SuDS is encouraged, such as tree pits, bioretention areas/rain gardens, swales and permeable paving.*



3.0 STUART MICHAEL ASSOCIATED RESPONSE

Response to Section 2.1

- 3.1 *An updated drainage strategy for Phase 5 is required as this has not been provided. It must be demonstrated each phase (4 and 5) can standalone if future phases are not built as planned.*
- 3.2 Phases 4 and 5 are separate, with separate discharge points, therefore, they “can standalone if future phases are built as planned”. In addition, we wish to confirm that each phase of the development caters for all attenuation within its own parcel, therefore there are no common/shared infrastructure between the two. This can be reviewed in **Appendix 2**.

Response to Section 2.2

- 3.3 *A Cv value of 1 for summer and winter is required in calculations.*
- 3.4 The Cv value, has been updated in the hydraulic calculations, to reflect a value of 1 for both summer and winter. Hydraulic calculations can be reviewed in **Appendix 3**.
- 3.5 As a result of the above amendment as well as addressing requirements on section 2.4 (Qbar value), some of the pipes had to be upsized, attenuation tanks had to be provided on branches 1.002 and 6.005 internally under an estate road, however, the attenuation volume within the main ponds has remained the same, and its originally proposed size and scale can remain the same. The drainage system performs as it should in all storm events and retains a freeboard of 100mm and 200mm respectively, in the most critical storm event.

Response to Section 2.3

- 3.6 *For the basin, cross sections are required to ensure suitable side slopes and depths are being used. 2m is very deep for a basin, as an authority we suggest 1m for safety, amenity and biodiversity reasons but we appreciate this may be difficult to achieve for this site. Additionally, the basin is in a flow path which will reduce its' capacity in storm events. The cross sections must clearly show areas proposed to always be wet compared to areas proposed to be dry except for storm events.*
- 3.7 Considering requirements on sections 2.2 as well as 2.4, it would not be possible to reduce the size of the pond/basin in any way. From a design perspective, the pond is a key feature of the development, central to the open space strategy to the development, any reduction in scale would be viewed negatively in terms of landscaping and placemaking. However, a balanced view was taken by the design team in terms of upsizing the pond due to the requirements of 2.2 & 2.4 above, hence additional attenuation has been dealt with by way of surface water storage crates.
- 3.8 Cross-section have been provided in **Appendix 4** for review.

Response to Section 2.4

- 3.9 *The proposed discharge rate means in the 2-year rainfall event the site will be discharging at the 100 year greenfield runoff rate which increases flood risk elsewhere. Rates should be restricted to Qbar in accordance with SuDS Non-Statutory Technical Standards and NPPF.*
- 3.10 Stuart Michael Associated have re-run the greenfield run-off calculations and the value for Qbar, determined on UK SuDS website, was 48.3l/s for the total site area of 6.83ha. Greenfield run-off rates can be reviewed in **Appendix 5**.



- 3.11 The previous discharge rate, according to the FRA mentioned above, was 55.0l/s and that value was further used in the previous hydraulic calculations. Besides the Cv value updated to 1, Stuart Michael Associates have also updated the discharge rate at the new value of 43.8l/s.
- 3.12 We appreciate that the UK SuDS soil type value was automated to 4, however, on a closer review of the site investigation report, that can be reviewed in Appendix C of the FRA report mentioned above, it is be noted that the site is underlain by a layer of very stiff orange brown clay. In the virtue of the above, we have upgraded the soil type to 5.

Response to Section 2.5

- 3.13 *An exceedance plan showing depth, area and direction of flooding in 1 in 100 + climate change allowance event is required.*
- 3.14 An Exceedance Flow Route Plan can be reviewed in **Appendix 6**.

Response to Section 2.6

- 3.15 *It is disappointing to see the permeable paving proposed previously is now not included in the most recent plans. The use of source control SuDS is encouraged, such as tree pits, bioretention areas/rain gardens, swales and permeable paving.*
- 3.16 Given the constraints of the site layout, we believe that the SuDS system proposals is more suited to utilise swales and basins/ponds as means of source control as well as treatment, towards the lower end / discharge point of the site. If at source SuDs systems are utilised for treatment, this is negated as the surface water renters the piped network where road gullies discharge into the system and thus re-contaminating the surface runoff from roads.
- 3.17 Therefore, in virtue of the above point, we have allowed for 2 attenuation basins, at the southern end of the site. This can be reviewed the overall Phase 4 Drainage Layout, in **Appendix 7**.



4.0 CONCLUSION

- 4.1 The Technical Note has addressed each LLFA point listed the in their letter referenced **DC/24/1158 – Berkeley Homes Development Site Phase 4 and 5, Worthing Road, Southwater, West Sussex**, and dated 9th of October 2024, for Phase 5 of the development site.
- 4.2 It has been demonstrated that the proposed drainage proposals can manage run-off for up to a 1 in 100 years plus 40% climate change storm event with a Cv of 1 for both summer and winter and a discharge rate restricted at Qbar 48.3l/s.



APPENDIX 1

LLFA Objection Letter

Ground Floor
Northleigh
County Hall
Chichester
West Sussex
PO19 1RH



Lead Local Flood Authority

Date 9th October 2024

Matthew Porter
Development Control
Horsham District Council
Parkside
Chart Way
Horsham
RH14 1RL

Dear Matthew,

RE: DC/24/1158 – Berkeley Homes Development Site Phase 4 and 5, Worthing Road, Southwater, West Sussex

Thank you for your consultation on the above site, received on 3rd September 2024. We have reviewed the application as submitted and wish to make the following comments.

This is a Minor Material Amendment (Section 73) to vary condition 2 of application reference DC/24/0772 (non-material amendment to previously approved application DC/18/1246) to The development hereby approved comprises 199 no. residential dwellings including 61 affordable dwellings and vary the plans approved under condition 1 of application reference DC/18/1246.

As the current layout is significantly different from the previous permission DC/18/1246 the layout is being reviewed fresh rather than comparing differences between plans.

We **maintain our objection** to this planning application in the absence of an acceptable Flood Risk Assessment (FRA) relating to:

- The application is not in accordance with the NPPF, PPG Flood Risk and Coastal Change or Policy 38 in Horsham District Planning Framework.

Reason

To prevent flooding in accordance with National Planning Policy Framework paragraph 173, 175 and 180 by ensuring the satisfactory management of local flood risk, surface water flow paths, storage and disposal of surface water from the site in a range of rainfall events and ensuring the SuDS proposed operates as designed for the lifetime of the development.

We will consider reviewing this objection if the issues highlighted below are adequately addressed:

1. An updated drainage strategy for Phase 5 is required as this has not been provided. It must be demonstrated each phase (4 and 5) can standalone if future phases are not built as planned.
2. A Cv value of 1 for summer and winter is required in calculations.
3. For the basin, cross sections are required to ensure suitable side slopes and depths are being used. 2m is very deep for a basin, as an authority we suggest 1m for safety, amenity and biodiversity reasons but we appreciate this may be difficult to achieve for this site. Additionally the basin is in a flow path which will reduce its' capacity in storm events. The cross sections must clearly show areas proposed to always be wet compared to areas proposed to be dry except for storm events.
4. The proposed discharge rate means in the 2-year rainfall event the site will be discharging at the 100 year greenfield runoff rate which increases flood risk elsewhere. Rates should be restricted to Qbar in accordance with SuDS Non-Statutory Technical Standards and NPPF.
5. An exceedance plan showing depth, area and direction of flooding in 1 in 100 + climate change allowance event is required.
6. It is disappointing to see the permeable paving proposed previously is now not included in the most recent plans. The use of source control SuDS is encouraged, such as tree pits, bioretention areas/rain gardens, swales and permeable paving.

Yours sincerely,

Eleanor Read
Flood Risk Management Team
FRM@westsussex.gov.uk

Annex

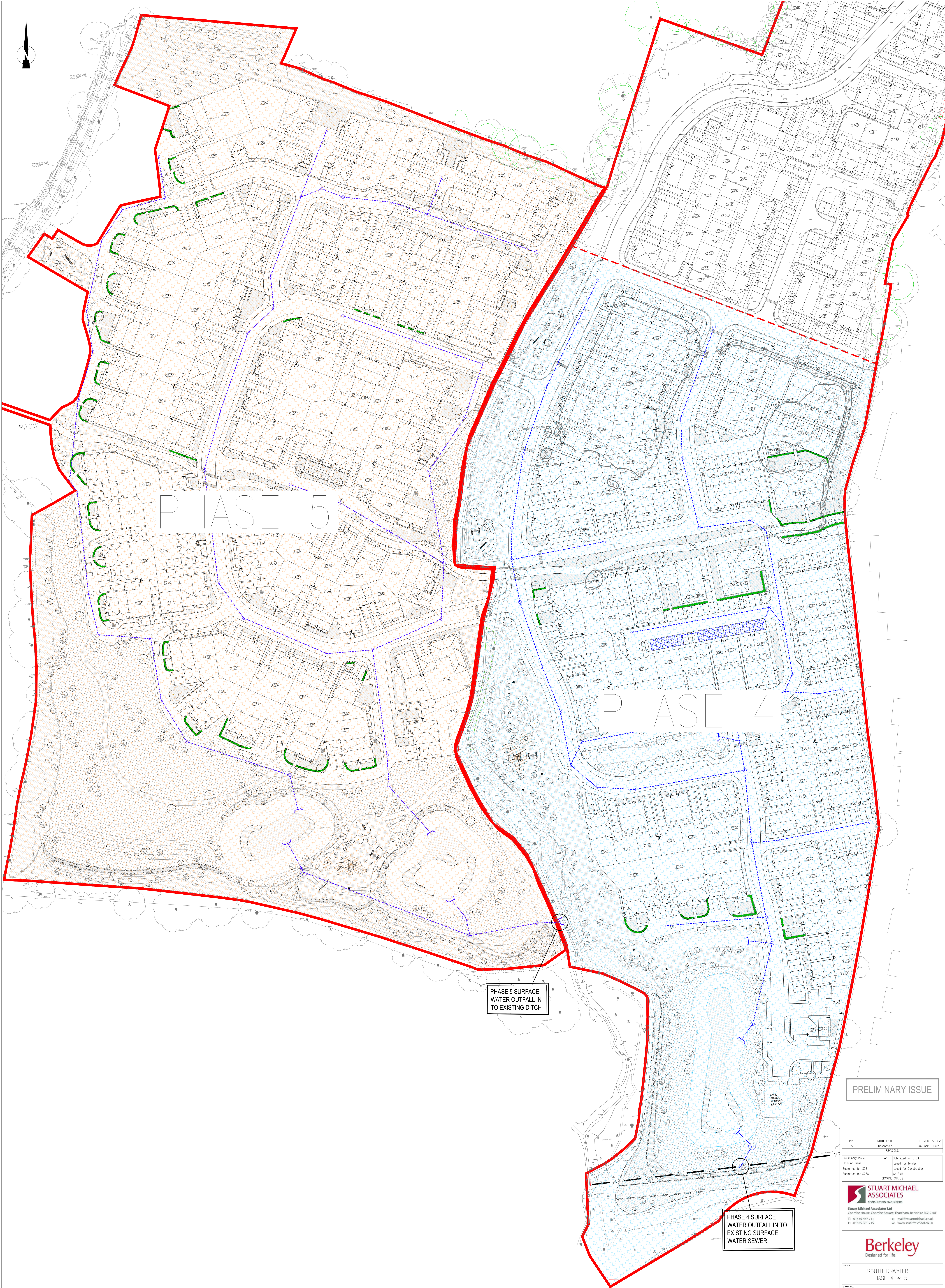
The following documents have been reviewed, which have been submitted to support the application;

- Flood Risk Assessment for Phase 4, 28.06.2024, revision 4.0



APPENDIX 2

Phase 4 and 5 General Arrangement Layout



PRELIMINARY ISSUE

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Berkeley
Designed for life

SOUTHERN WATER
PHASE 4 & 5

SURFACE WATER
GENERAL ARRANGEMENT
LAYOUT

DATE: MARCH 2025 DRAWN BY: FP CHECKED BY: MSR SCALE: 1/500 © 2025
PROJECT: S212-2105-XX-XX-DR-C-075-205_P01 SHEET: 50
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APPENDIX 3

Hydraulic Calculations

Design Settings

Rainfall Methodology	FEH-22	Maximum Time of Concentration (mins)	999.00	Preferred Cover Depth (m)	1.200
Return Period (years)	5	Maximum Rainfall (mm/hr)	50.0	Include Intermediate Ground	x
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	x
CV	1.000	Connection Type	Level Soffits		
Time of Entry (mins)	5.00	Minimum Backdrop Height (m)	1.000		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S91	0.062	5.00	60.185	Manhole	Adoptable	1350	515182.412	126177.357	0.663
S70	0.062	5.00	60.421	Manhole	Adoptable	1350	515146.126	126213.485	1.209
S71	0.062	5.00	60.042	Manhole	Adoptable	1350	515138.153	126198.964	1.032
S72	0.062	5.00	60.115	Manhole	Adoptable	1350	515124.058	126205.845	1.210
S73	0.062	5.00	60.397	Manhole	Adoptable	1350	515103.477	126210.627	1.637
S74	0.062	5.00	60.522	Manhole	Adoptable	1200	515094.995	126215.200	1.827
S39		5.00	60.797	Manhole	Adoptable	1350	515100.058	126239.734	1.447
S40	0.062	5.00	60.588	Manhole	Adoptable	1200	515085.597	126212.832	2.033
S41	0.062	5.00	60.088	Manhole	Adoptable	1350	515068.787	126181.000	1.819
S42	0.062	5.00	59.888	Manhole	Adoptable	1200	515068.586	126167.374	1.922
S43	0.062	5.00	59.833	Manhole	Adoptable	1350	515056.283	126158.244	1.969
S44	0.062	5.00	59.588	Manhole	Adoptable	1350	515040.668	126126.645	1.959
S45	0.112	5.00	59.441	Manhole	Adoptable	1350	515030.819	126102.737	1.984
S46	0.062	5.00	59.124	Manhole	Adoptable	1350	515030.819	126054.264	2.065
S47	0.062	5.00	58.913	Manhole	Adoptable	1200	515039.822	126037.910	1.979
S48	0.162	5.00	57.715	Manhole	Adoptable	1350	515073.082	126018.645	1.421
S92	0.062	5.00	59.532	Manhole	Adoptable	1350	515097.377	126160.445	1.350
S89	0.162	5.00	59.073	Manhole	Adoptable	1350	515153.786	126132.929	1.350
S93	0.062	5.00	58.709	Manhole	Adoptable	1350	515143.510	126111.282	1.350
S94	0.062	5.00	58.496	Manhole	Adoptable	1350	515125.497	126090.322	1.350
S75	0.064	5.00	58.951	Manhole	Adoptable	1350	515066.505	126091.911	1.189
S76	0.062	5.00	58.696	Manhole	Adoptable	1350	515086.535	126081.527	1.159
S77	0.062	5.00	58.316	Manhole	Adoptable	1350	515105.161	126067.392	1.013

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S78			56.831	Manhole	Adoptable	1350	515127.123	126050.720	1.150
S79	0.062	5.00	56.699	Manhole	Adoptable	1350	515123.112	126027.358	1.150
S49	0.062	5.00	57.114	Manhole	Adoptable	1350	515092.494	126017.862	1.839
S50	0.114	5.00	56.596	Manhole	Adoptable	1500	515093.089	125972.716	1.846
S51	0.062	5.00	56.486	Manhole	Adoptable	1500	515092.431	125959.297	1.786
S52			54.650	Junction			515107.284	125937.864	1.400
S84		5.00	54.650	Junction			515112.881	125907.813	1.500
S85			54.600	Manhole	Adoptable	3000	515118.000	125900.000	1.525
S55	0.062	5.00	60.243	Manhole	Adoptable	1350	515027.642	126237.296	1.033
S56	0.062	5.00	60.024	Manhole	Adoptable	1350	515028.441	126219.392	1.337
S57	0.062	5.00	59.629	Manhole	Adoptable	1350	515009.823	126216.806	1.412
S58	0.062	5.00	59.305	Manhole	Adoptable	1350	514999.321	126204.642	1.565
S59	0.062	5.00	58.778	Manhole	Adoptable	1350	514989.350	126175.891	1.281
S60	0.062	5.00	58.601	Manhole	Adoptable	1350	514989.789	126158.208	1.246
S61	0.062	5.00	58.360	Manhole	Adoptable	1350	514981.151	126138.610	1.251
S62	0.062	5.00	58.994	Manhole	Adoptable	1350	514973.457	126105.138	2.160
S63			59.042	Manhole	Adoptable	1350	514975.978	126099.415	2.258
S64	0.062	5.00	59.332	Manhole	Adoptable	1350	514975.491	126056.412	2.892
S65	0.062	5.00	59.335	Manhole	Adoptable	1350	514977.441	126038.486	3.039
S66	0.112	5.00	59.188	Manhole	Adoptable	1350	514999.453	126034.089	3.147
S67	0.062	5.00	58.818	Manhole	Adoptable	1350	515000.685	126007.708	2.988
S68	0.062	5.00	58.667	Manhole	Adoptable	1350	515009.311	125988.660	3.004
S69	0.062	5.00	57.990	Manhole	Adoptable	1350	515051.089	125969.275	2.696
S80			56.300	Junction			515052.664	125954.401	1.425
S81		5.00	56.300	Junction			515046.679	125940.622	1.500
S82			56.119	Manhole	Adoptable	3000	515051.914	125927.470	1.994
S83			53.923	Manhole	Adoptable	1350	515118.751	125892.163	1.098
S53			52.937	Manhole	Adoptable	1350	515147.813	125893.947	0.462
S54			52.964	Junction			515157.470	125893.200	0.549

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	Velocity Equation	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type	T of C (mins)	Rain (mm/hr)
1.000	S91	S71	49.251	0.600	Colebrook-White	59.522	59.086	0.436	113.0	375	Circular	5.48	50.0
2.000	S70	S71	16.566	0.600	Colebrook-White	59.212	59.101	0.111	149.2	225	Circular	5.26	50.0
1.001	S71	S72	15.685	0.600	Colebrook-White	59.010	58.905	0.105	149.4	450	Circular	5.64	50.0
1.002	S72	S73	21.129	0.600	Colebrook-White	58.905	58.760	0.145	145.7	450	Circular	5.85	50.0
1.003	S73	S74	9.637	0.600	Colebrook-White	58.760	58.695	0.065	148.3	450	Circular	5.94	50.0
1.004	S74	S40	9.692	0.600	Colebrook-White	58.695	58.630	0.065	149.1	450	Circular	6.04	50.0
3.000	S39	S40	30.543	0.600	Colebrook-White	59.350	58.780	0.570	53.6	225	Circular	5.28	50.0
1.005	S40	S41	35.998	0.600	Colebrook-White	58.555	58.269	0.286	125.9	450	Circular	6.37	50.0
1.006	S41	S42	13.627	0.600	Colebrook-White	58.269	58.037	0.232	58.7	450	Circular	6.46	50.0
1.007	S42	S43	15.321	0.600	Colebrook-White	57.966	57.864	0.102	150.2	525	Circular	6.60	50.0
1.008	S43	S44	35.247	0.600	Colebrook-White	57.864	57.629	0.235	150.0	525	Circular	6.92	50.0
1.009	S44	S45	25.858	0.600	Colebrook-White	57.629	57.457	0.172	150.3	525	Circular	7.16	50.0
1.010	S45	S46	48.473	0.600	Colebrook-White	57.457	57.059	0.398	121.8	525	Circular	7.56	50.0
1.011	S46	S47	18.668	0.600	Colebrook-White	57.059	56.934	0.125	149.3	525	Circular	7.73	50.0

Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Minimum Depth (m)	Maximum Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.000	S91	S71	1.704	188.2	11.2	0.288	0.581	0.288	0.581	0.062	0.0
2.000	S70	S71	1.068	42.5	11.2	0.984	0.716	0.716	0.984	0.062	0.0
1.001	S71	S72	1.661	264.1	33.6	0.582	0.760	0.582	0.760	0.186	0.0
1.002	S72	S73	1.682	267.5	44.8	0.760	1.187	0.760	1.187	0.248	0.0
1.003	S73	S74	1.667	265.1	56.0	1.187	1.377	1.187	1.377	0.310	0.0
1.004	S74	S40	1.662	264.4	67.2	1.377	1.508	1.377	1.508	0.372	0.0
3.000	S39	S40	1.790	71.2	0.0	1.222	1.583	1.222	1.583	0.000	0.0
1.005	S40	S41	1.810	287.9	78.4	1.583	1.369	1.369	1.583	0.434	0.0
1.006	S41	S42	2.656	422.5	89.6	1.369	1.401	1.369	1.401	0.496	0.0
1.007	S42	S43	1.825	395.1	100.8	1.397	1.444	1.397	1.444	0.558	0.0
1.008	S43	S44	1.826	395.4	112.0	1.444	1.434	1.434	1.444	0.620	0.0
1.009	S44	S45	1.824	394.9	123.2	1.434	1.459	1.434	1.459	0.682	0.0
1.010	S45	S46	2.028	439.0	143.5	1.459	1.540	1.459	1.540	0.794	0.0
1.011	S46	S47	1.830	396.2	154.7	1.540	1.454	1.454	1.540	0.856	0.0

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	Velocity Equation	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type	T of C (mins)	Rain (mm/hr)
1.012	S47	S48	38.436	0.600	Colebrook-White	56.934	56.294	0.640	60.1	525	Circular	7.95	50.0
1.013	S48	S49	19.428	0.600	Colebrook-White	56.294	55.425	0.869	22.4	525	Circular	8.01	50.0
4.000	S92	S89	62.762	0.600	Colebrook-White	58.182	57.873	0.309	203.1	225	Circular	6.15	50.0
4.001	S89	S93	23.962	0.600	Colebrook-White	57.723	57.359	0.364	65.8	375	Circular	6.32	50.0
4.002	S93	S94	27.637	0.600	Colebrook-White	57.359	57.146	0.213	129.8	375	Circular	6.61	50.0
4.003	S94	S78	39.646	0.600	Colebrook-White	57.146	55.831	1.315	30.1	375	Circular	6.81	50.0
5.000	S75	S76	22.562	0.600	Colebrook-White	57.762	57.612	0.150	150.4	225	Circular	5.35	50.0
5.001	S76	S77	23.383	0.600	Colebrook-White	57.537	57.303	0.234	99.9	300	Circular	5.60	50.0
5.002	S77	S78	27.754	0.600	Colebrook-White	57.303	55.906	1.397	19.9	300	Circular	5.73	50.0
4.004	S78	S79	23.743	0.600	Colebrook-White	55.681	55.549	0.132	179.9	600	Circular	7.03	50.0
4.005	S79	S49	32.056	0.600	Colebrook-White	55.549	55.425	0.124	258.5	600	Circular	7.39	50.0
1.014	S49	S50	45.150	0.600	Colebrook-White	55.275	54.750	0.525	86.0	750	Circular	8.26	50.0
1.015	S50	S51	13.435	0.600	Colebrook-White	54.750	54.700	0.050	268.7	750	Circular	8.40	50.0
1.016	S51	S52	26.077	0.600	Colebrook-White	54.700	53.825	0.875	29.8	750	Circular	8.48	50.0

Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Minimum Depth (m)	Maximum Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.012	S47	S48	2.894	626.4	165.9	1.454	0.896	0.896	1.454	0.918	0.0
1.013	S48	S49	4.751	1028.5	195.2	0.896	1.164	0.896	1.164	1.080	0.0
4.000	S92	S89	0.913	36.3	11.2	1.125	0.975	0.975	1.125	0.062	0.0
4.001	S89	S93	2.236	246.9	40.5	0.975	0.975	0.975	0.975	0.224	0.0
4.002	S93	S94	1.589	175.5	51.7	0.975	0.975	0.975	0.975	0.286	0.0
4.003	S94	S78	3.310	365.6	62.9	0.975	0.625	0.625	0.975	0.348	0.0
5.000	S75	S76	1.064	42.3	11.6	0.964	0.859	0.859	0.964	0.064	0.0
5.001	S76	S77	1.573	111.2	22.8	0.859	0.713	0.713	0.859	0.126	0.0
5.002	S77	S78	3.543	250.4	34.0	0.713	0.625	0.625	0.713	0.188	0.0
4.004	S78	S79	1.812	512.4	96.9	0.550	0.550	0.550	0.550	0.536	0.0
4.005	S79	S49	1.510	426.8	108.1	0.550	1.089	0.550	1.089	0.598	0.0
1.014	S49	S50	3.018	1333.5	314.4	1.089	1.096	1.089	1.096	1.740	0.0
1.015	S50	S51	1.702	751.9	335.0	1.096	1.036	1.036	1.096	1.854	0.0
1.016	S51	S52	5.137	2269.3	346.2	1.036	0.075	0.075	1.036	1.916	0.0

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	Velocity Equation	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type	T of C (mins)	Rain (mm/hr)
1.018	S84	S85	9.393	0.600	Colebrook-White	53.150	53.075	0.075	125.2	300	Circular	5.11	50.0
1.019	S85	S83	8.061	0.600	Colebrook-White	53.075	52.825	0.250	32.2	300	Circular	5.16	50.0
6.000	S55	S56	17.922	0.600	Colebrook-White	59.210	58.762	0.448	40.0	300	Circular	5.12	50.0
6.001	S56	S57	18.797	0.600	Colebrook-White	58.687	58.217	0.470	40.0	375	Circular	5.23	50.0
6.002	S57	S58	16.071	0.600	Colebrook-White	58.217	57.815	0.402	40.0	375	Circular	5.32	50.0
6.003	S58	S59	30.430	0.600	Colebrook-White	57.740	57.572	0.168	181.1	450	Circular	5.66	50.0
6.004	S59	S60	17.689	0.600	Colebrook-White	57.497	57.355	0.142	124.6	525	Circular	5.81	50.0
6.005	S60	S61	21.417	0.600	Colebrook-White	57.355	57.109	0.246	87.1	525	Circular	5.95	50.0
6.006	S61	S62	34.345	0.600	Colebrook-White	57.109	56.834	0.275	124.9	525	Circular	6.24	50.0
6.007	S62	S63	6.254	0.600	Colebrook-White	56.834	56.784	0.050	125.1	525	Circular	6.29	50.0
6.008	S63	S64	43.006	0.600	Colebrook-White	56.784	56.440	0.344	125.0	525	Circular	6.65	50.0
6.009	S64	S65	18.032	0.600	Colebrook-White	56.440	56.296	0.144	125.2	525	Circular	6.80	50.0
6.010	S65	S66	22.446	0.600	Colebrook-White	56.296	56.116	0.180	124.7	525	Circular	6.99	50.0

Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Minimum Depth (m)	Maximum Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.018	S84	S85	1.403	99.2	0.0	1.200	1.225	1.200	1.225	0.000	0.0
1.019	S85	S83	2.778	196.4	0.0	1.225	0.798	0.798	1.225	0.000	0.0
6.000	S55	S56	2.493	176.2	11.2	0.733	0.962	0.733	0.962	0.062	0.0
6.001	S56	S57	2.872	317.2	22.4	0.962	1.037	0.962	1.037	0.124	0.0
6.002	S57	S58	2.873	317.3	33.6	1.037	1.115	1.037	1.115	0.186	0.0
6.003	S58	S59	1.507	239.7	44.8	1.115	0.756	0.756	1.115	0.248	0.0
6.004	S59	S60	2.005	434.1	56.0	0.756	0.721	0.721	0.756	0.310	0.0
6.005	S60	S61	2.401	519.8	67.2	0.721	0.726	0.721	0.726	0.372	0.0
6.006	S61	S62	2.003	433.5	78.4	0.726	1.635	0.726	1.635	0.434	0.0
6.007	S62	S63	2.001	433.2	89.6	1.635	1.733	1.635	1.733	0.496	0.0
6.008	S63	S64	2.002	433.3	89.6	1.733	2.367	1.733	2.367	0.496	0.0
6.009	S64	S65	2.000	433.0	100.8	2.367	2.514	2.367	2.514	0.558	0.0
6.010	S65	S66	2.004	433.9	112.0	2.514	2.547	2.514	2.547	0.620	0.0

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	Velocity Equation	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type	T of C (mins)	Rain (mm/hr)
6.011	S66	S67	26.410	0.600	Colebrook-White	56.041	55.830	0.211	125.2	525	Circular	7.21	50.0
6.012	S67	S68	20.910	0.600	Colebrook-White	55.830	55.663	0.167	125.2	525	Circular	7.38	50.0
6.013	S68	S69	46.057	0.600	Colebrook-White	55.663	55.294	0.369	124.8	525	Circular	7.76	50.0
6.014	S69	S80	14.957	0.600	Colebrook-White	55.294	54.875	0.419	35.7	525	Circular	7.83	50.0
6.016	S81	S82	14.155	0.600	Colebrook-White	54.800	54.725	0.075	188.7	450	Circular	5.16	50.0
6.017	S82	S83	75.589	0.600	Colebrook-White	54.125	52.825	1.300	58.1	300	Circular	5.77	50.0
1.020	S83	S53	29.117	0.600	Colebrook-White	52.825	52.475	0.350	83.2	300	Circular	6.05	50.0
1.021	S53	S54	9.685	0.600	Colebrook-White	52.475	52.415	0.060	161.4	300	Circular	6.18	50.0

Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Minimum Depth (m)	Maximum Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
6.011	S66	S67	2.000	433.1	132.3	2.622	2.463	2.463	2.622	0.732	0.0
6.012	S67	S68	2.000	433.0	143.5	2.463	2.479	2.463	2.479	0.794	0.0
6.013	S68	S69	2.003	433.7	154.7	2.479	2.171	2.171	2.479	0.856	0.0
6.014	S69	S80	3.757	813.3	165.9	2.171	0.900	0.900	2.171	0.918	0.0
6.016	S81	S82	1.476	234.8	0.0	1.050	0.944	0.944	1.050	0.000	0.0
6.017	S82	S83	2.065	146.0	0.0	1.694	0.798	0.798	1.694	0.000	0.0
1.020	S83	S53	1.725	121.9	0.0	0.798	0.162	0.162	0.798	0.000	0.0
1.021	S53	S54	1.235	87.3	0.0	0.162	0.249	0.162	0.249	0.000	0.0

Simulation Settings

Rainfall Methodology	FEH-22	Winter CV	1.000	Drain Down Time (mins)	10080	Check Discharge Rate(s)	x
Rainfall Events	Singular	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0	Check Discharge Volume	x
Summer CV	1.000	Skip Steady State	x	Starting Level (m)			

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 %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	100	40	0	0
30	0	0	0				

Node S82 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	54.125	Product Number	CTL-SHE-0086-4400-2000-4400
Design Depth (m)	2.000	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	4.4	Min Node Diameter (mm)	1200

Node S85 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	53.075	Product Number	CTL-SHE-0265-4390-2000-4390
Design Depth (m)	2.000	Min Outlet Diameter (m)	0.300
Design Flow (l/s)	43.9	Min Node Diameter (mm)	2100

Node S81 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	50.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	54.800	Main Channel Slope (1:X)	500.0
Safety Factor	1.0	Time to half empty (mins)	1290	Main Channel n	0.600

Inlets

S80

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	393.9	0.0	0.300	523.5	0.0	0.600	668.0	0.0	0.900	826.6	0.0	1.200	999.3	0.0	1.490	1180.9	0.0
0.100	435.0	0.0	0.400	570.1	0.0	0.700	719.3	0.0	1.000	882.6	0.0	1.300	1060.0	0.0			
0.200	478.4	0.0	0.500	618.2	0.0	0.800	772.1	0.0	1.100	940.1	0.0	1.400	1122.3	0.0			

Node S84 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	50.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	53.150	Main Channel Slope (1:X)	500.0
Safety Factor	1.0	Time to half empty (mins)	264	Main Channel n	0.600

Inlets S52

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)	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	585.7	0.0	0.300	703.6	0.0	0.600	831.3	0.0	0.900	968.1	0.0	1.200	1113.9	0.0	1.500	1268.8	0.0
0.100	623.5	0.0	0.400	745.2	0.0	0.700	875.9	0.0	1.000	1015.7	0.0	1.300	1164.6	0.0			
0.200	663.0	0.0	0.500	787.7	0.0	0.800	921.5	0.0	1.100	1064.3	0.0	1.400	1216.2	0.0			

Node S73 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	58.760
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	8

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	50.0	0.0	0.400	50.0	0.0	0.401	0.0	0.0

Node S61 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	57.109
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	6

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	30.0	0.0	0.400	30.0	0.0	0.401	0.0	0.0

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
2 year 15 minute summer	114.182	32.310	30 year 120 minute winter	53.992	21.476
2 year 15 minute winter	80.128	32.310	30 year 180 minute summer	61.617	15.856
2 year 30 minute summer	74.054	20.955	30 year 180 minute winter	40.052	15.856
2 year 30 minute winter	51.968	20.955	30 year 240 minute summer	48.130	12.719
2 year 60 minute summer	50.242	13.277	30 year 240 minute winter	31.976	12.719
2 year 60 minute winter	33.379	13.277	30 year 360 minute summer	35.965	9.255
2 year 120 minute summer	35.064	9.266	30 year 360 minute winter	23.378	9.255
2 year 120 minute winter	23.296	9.266	30 year 480 minute summer	27.795	7.345
2 year 180 minute summer	28.161	7.247	30 year 480 minute winter	18.466	7.345
2 year 180 minute winter	18.305	7.247	30 year 600 minute summer	22.411	6.130
2 year 240 minute summer	22.715	6.003	30 year 600 minute winter	15.312	6.130
2 year 240 minute winter	15.091	6.003	30 year 720 minute summer	19.716	5.284
2 year 360 minute summer	17.551	4.516	30 year 720 minute winter	13.250	5.284
2 year 360 minute winter	11.409	4.516	30 year 960 minute summer	15.879	4.181
2 year 480 minute summer	13.830	3.655	30 year 960 minute winter	10.518	4.181
2 year 480 minute winter	9.188	3.655	30 year 1440 minute summer	11.224	3.008
2 year 600 minute summer	11.303	3.092	30 year 1440 minute winter	7.544	3.008
2 year 600 minute winter	7.723	3.092	100 year +40% CC 15 minute summer	526.631	149.018
2 year 720 minute summer	10.047	2.693	100 year +40% CC 15 minute winter	369.565	149.018
2 year 720 minute winter	6.752	2.693	100 year +40% CC 30 minute summer	351.375	99.427
2 year 960 minute summer	8.217	2.164	100 year +40% CC 30 minute winter	246.579	99.427
2 year 960 minute winter	5.443	2.164	100 year +40% CC 60 minute summer	239.797	63.371
2 year 1440 minute summer	5.942	1.593	100 year +40% CC 60 minute winter	159.315	63.371
2 year 1440 minute winter	3.993	1.593	100 year +40% CC 120 minute summer	143.032	37.799
30 year 15 minute summer	298.122	84.358	100 year +40% CC 120 minute winter	95.027	37.799
30 year 15 minute winter	209.208	84.358	100 year +40% CC 180 minute summer	107.722	27.721
30 year 30 minute summer	197.206	55.803	100 year +40% CC 180 minute winter	70.022	27.721
30 year 30 minute winter	138.390	55.803	100 year +40% CC 240 minute summer	83.924	22.179
30 year 60 minute summer	133.657	35.322	100 year +40% CC 240 minute winter	55.757	22.179
30 year 60 minute winter	88.799	35.322	100 year +40% CC 360 minute summer	62.697	16.134
30 year 120 minute summer	81.267	21.476	100 year +40% CC 360 minute winter	40.755	16.134

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +40% CC 480 minute summer	48.585	12.840	100 year +40% CC 720 minute winter	23.281	9.284
100 year +40% CC 480 minute winter	32.279	12.840	100 year +40% CC 960 minute summer	27.987	7.370
100 year +40% CC 600 minute summer	39.281	10.744	100 year +40% CC 960 minute winter	18.539	7.370
100 year +40% CC 600 minute winter	26.839	10.744	100 year +40% CC 1440 minute summer	19.862	5.323
100 year +40% CC 720 minute summer	34.641	9.284	100 year +40% CC 1440 minute winter	13.348	5.323

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S91	11	59.584	0.062	11.6	0.0891	0.0000	OK
15 minute summer	S70	10	59.295	0.083	11.6	0.1191	0.0000	OK
15 minute summer	S71	10	59.128	0.118	33.9	0.1688	0.0000	OK
15 minute summer	S72	11	59.037	0.132	45.2	0.1892	0.0000	OK
15 minute summer	S73	12	58.912	0.152	56.0	7.4538	0.0000	OK
15 minute summer	S74	12	58.853	0.158	57.8	0.1788	0.0000	OK
15 minute summer	S39	1	59.350	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S40	12	58.708	0.153	66.9	0.1735	0.0000	OK
15 minute summer	S41	12	58.412	0.143	76.1	0.2046	0.0000	OK
15 minute summer	S42	12	58.151	0.185	85.5	0.2093	0.0000	OK
15 minute summer	S43	12	58.048	0.184	94.9	0.2635	0.0000	OK
15 minute summer	S44	12	57.827	0.198	104.7	0.2838	0.0000	OK
15 minute summer	S45	12	57.651	0.194	121.6	0.2782	0.0000	OK
15 minute summer	S46	12	57.282	0.223	131.2	0.3196	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	S91	1.000	S71	11.2	0.947	0.060	0.5839	
15 minute summer	S70	2.000	S71	11.4	0.886	0.269	0.2132	
15 minute summer	S71	1.001	S72	33.6	0.941	0.127	0.5611	
15 minute summer	S72	1.002	S73	44.9	1.278	0.168	0.8773	
15 minute summer	S73	1.003	S74	48.7	1.028	0.184	0.4667	
15 minute summer	S74	1.004	S40	57.8	1.259	0.219	0.4453	
15 minute summer	S39	3.000	S40	0.0	0.000	0.000	0.0000	
15 minute summer	S40	1.005	S41	67.1	1.476	0.233	1.6362	
15 minute summer	S41	1.006	S42	76.4	1.907	0.181	0.5462	
15 minute summer	S42	1.007	S43	85.8	1.267	0.217	1.0372	
15 minute summer	S43	1.008	S44	95.6	1.347	0.242	2.5039	
15 minute summer	S44	1.009	S45	105.2	1.439	0.266	1.9039	
15 minute summer	S45	1.010	S46	122.1	1.526	0.278	3.8807	
15 minute summer	S46	1.011	S47	130.7	1.726	0.330	1.4180	

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S47	12	57.112	0.178	139.8	0.2014	0.0000	OK
15 minute summer	S48	12	56.448	0.154	163.0	0.2204	0.0000	OK
15 minute summer	S92	11	58.267	0.085	11.6	0.1222	0.0000	OK
15 minute summer	S89	10	57.826	0.103	40.3	0.1467	0.0000	OK
15 minute summer	S93	11	57.506	0.147	51.6	0.2098	0.0000	OK
15 minute summer	S94	11	57.254	0.108	62.4	0.1543	0.0000	OK
15 minute summer	S75	10	57.846	0.084	11.9	0.1196	0.0000	OK
15 minute summer	S76	10	57.635	0.098	23.3	0.1406	0.0000	OK
15 minute summer	S77	10	57.380	0.077	34.7	0.1104	0.0000	OK
15 minute summer	S78	11	55.875	0.194	97.0	0.2780	0.0000	OK
15 minute summer	S79	11	55.765	0.216	108.4	0.3087	0.0000	OK
15 minute summer	S49	12	55.516	0.241	277.3	0.3445	0.0000	OK
15 minute summer	S50	12	55.067	0.317	295.5	0.5602	0.0000	OK
15 minute summer	S51	12	54.892	0.192	305.7	0.3385	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	S47	1.012	S48	139.3	2.404	0.222	2.2518	
15 minute summer	S48	1.013	S49	162.9	3.317	0.158	0.9548	
15 minute summer	S92	4.000	S89	11.0	0.803	0.302	0.8564	
15 minute summer	S89	4.001	S93	40.0	1.254	0.162	0.7697	
15 minute summer	S93	4.002	S94	51.4	1.562	0.293	0.9126	
15 minute summer	S94	4.003	S78	62.9	2.464	0.172	1.0115	
15 minute summer	S75	5.000	S76	11.7	0.898	0.276	0.2943	
15 minute summer	S76	5.001	S77	23.1	1.348	0.208	0.4016	
15 minute summer	S77	5.002	S78	34.2	2.457	0.137	0.3870	
15 minute summer	S78	4.004	S79	97.4	1.146	0.190	2.0189	
15 minute summer	S79	4.005	S49	108.1	1.246	0.253	2.7856	
15 minute summer	S49	1.014	S50	278.8	1.871	0.209	6.7449	
15 minute summer	S50	1.015	S51	296.6	2.257	0.394	1.7834	
15 minute summer	S51	1.016	S52	306.5	3.593	0.135	2.2251	

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	S52	24	53.597	0.347	284.8	0.0000	0.0000	OK
180 minute summer	S84	124	53.536	0.386	116.7	0.0000	0.0000	SURCHARGED
180 minute summer	S85	124	53.516	0.441	43.4	3.1183	0.0000	SURCHARGED
15 minute summer	S55	10	59.263	0.053	11.6	0.0764	0.0000	OK
15 minute summer	S56	10	58.755	0.068	23.1	0.0968	0.0000	OK
15 minute summer	S57	10	58.305	0.088	34.5	0.1256	0.0000	OK
15 minute summer	S58	10	57.877	0.137	45.8	0.1964	0.0000	OK
15 minute summer	S59	11	57.634	0.137	56.5	0.1955	0.0000	OK
15 minute summer	S60	11	57.490	0.135	67.8	0.1929	0.0000	OK
15 minute summer	S61	11	57.264	0.155	79.2	4.6504	0.0000	OK
15 minute summer	S62	12	57.020	0.186	87.7	0.2661	0.0000	OK
15 minute summer	S63	12	56.948	0.164	87.0	0.2340	0.0000	OK
15 minute summer	S64	12	56.627	0.187	97.0	0.2680	0.0000	OK
15 minute summer	S65	12	56.487	0.191	106.9	0.2736	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)
30 minute summer	S52	Flow through pond	S84	144.5	0.049	0.108	163.9141	
180 minute summer	S84	1.018	S85	43.4	0.718	0.437	0.6614	
180 minute summer	S85	Hydro-Brake®	S83	43.0				
15 minute summer	S55	6.000	S56	11.5	1.392	0.065	0.1478	
15 minute summer	S56	6.001	S57	23.0	1.394	0.072	0.3107	
15 minute summer	S57	6.002	S58	34.2	1.828	0.108	0.3005	
15 minute summer	S58	6.003	S59	45.5	1.154	0.190	1.2003	
15 minute summer	S59	6.004	S60	56.8	1.287	0.131	0.7810	
15 minute summer	S60	6.005	S61	68.2	1.458	0.131	1.0398	
15 minute summer	S61	6.006	S62	76.7	1.271	0.177	2.0901	
15 minute summer	S62	6.007	S63	87.0	1.385	0.201	0.3930	
15 minute summer	S63	6.008	S64	87.9	1.393	0.203	2.7167	
15 minute summer	S64	6.009	S65	97.8	1.396	0.226	1.2629	
15 minute summer	S65	6.010	S66	107.2	1.606	0.247	1.4990	

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S66	12	56.249	0.208	123.6	0.2981	0.0000	OK
15 minute summer	S67	12	56.051	0.221	133.2	0.3167	0.0000	OK
15 minute summer	S68	12	55.883	0.220	142.7	0.3142	0.0000	OK
15 minute summer	S69	12	55.455	0.161	151.8	0.2307	0.0000	OK
480 minute winter	S80	464	55.236	0.361	23.7	0.0000	0.0000	OK
480 minute winter	S81	464	55.236	0.436	17.0	0.0000	0.0000	OK
480 minute winter	S82	464	55.236	1.111	13.2	7.8551	0.0000	SURCHARGED
180 minute summer	S83	128	52.957	0.132	46.2	0.1883	0.0000	OK
180 minute summer	S53	124	52.637	0.162	46.2	0.2324	0.0000	OK
180 minute summer	S54	124	52.568	0.153	46.2	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	S66	6.011	S67	124.1	1.494	0.286	2.1936	
15 minute summer	S67	6.012	S68	133.6	1.554	0.308	1.7974	
15 minute summer	S68	6.013	S69	142.7	2.033	0.329	3.2627	
15 minute summer	S69	6.014	S80	151.6	3.087	0.186	1.0225	
480 minute winter	S80	Flow through pond	S81	16.8	0.016	0.016	184.7614	
480 minute winter	S81	6.016	S82	13.2	0.654	0.056	2.2331	
480 minute winter	S82	Hydro-Brake®	S83	3.5				
180 minute summer	S83	1.020	S53	46.2	1.347	0.379	0.9991	
180 minute summer	S53	1.021	S54	46.2	1.231	0.530	0.3635	613.3

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S91	10	59.622	0.100	30.2	0.1426	0.0000	OK
15 minute summer	S70	10	59.361	0.149	30.2	0.2137	0.0000	OK
15 minute summer	S71	10	59.220	0.210	89.8	0.3008	0.0000	OK
15 minute summer	S72	11	59.146	0.241	118.2	0.3445	0.0000	OK
15 minute summer	S73	12	59.054	0.294	146.7	14.3905	0.0000	OK
15 minute summer	S74	12	58.985	0.290	160.5	0.3277	0.0000	OK
15 minute summer	S39	1	59.350	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S40	11	58.840	0.285	186.5	0.3229	0.0000	OK
15 minute summer	S41	12	58.545	0.276	212.6	0.3954	0.0000	OK
15 minute summer	S42	11	58.331	0.365	238.3	0.4129	0.0000	OK
15 minute summer	S43	11	58.221	0.357	265.5	0.5108	0.0000	OK
15 minute summer	S44	12	58.022	0.393	290.4	0.5619	0.0000	OK
15 minute summer	S45	12	57.840	0.383	336.4	0.5483	0.0000	OK
15 minute summer	S46	12	57.487	0.428	363.4	0.6124	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	S91	1.000	S71	29.8	1.067	0.158	1.4483	
15 minute summer	S70	2.000	S71	29.8	1.117	0.702	0.4420	
15 minute summer	S71	1.001	S72	88.5	1.116	0.335	1.2454	
15 minute summer	S72	1.002	S73	117.9	1.400	0.441	2.0476	
15 minute summer	S73	1.003	S74	136.9	1.270	0.516	1.0486	
15 minute summer	S74	1.004	S40	161.4	1.632	0.610	0.9577	
15 minute summer	S39	3.000	S40	0.0	0.000	0.000	0.1309	
15 minute summer	S40	1.005	S41	187.0	1.817	0.649	3.7453	
15 minute summer	S41	1.006	S42	213.1	2.132	0.504	1.4431	
15 minute summer	S42	1.007	S43	238.4	1.511	0.603	2.4258	
15 minute summer	S43	1.008	S44	265.7	1.614	0.672	5.8047	
15 minute summer	S44	1.009	S45	293.2	1.736	0.743	4.4232	
15 minute summer	S45	1.010	S46	339.8	1.898	0.774	8.6616	
15 minute summer	S46	1.011	S47	365.8	2.188	0.923	3.0996	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S47	12	57.265	0.331	389.4	0.3748	0.0000	OK
15 minute summer	S48	12	56.573	0.279	452.7	0.3992	0.0000	OK
15 minute summer	S92	11	58.338	0.156	30.2	0.2234	0.0000	OK
15 minute summer	S89	10	57.910	0.187	106.3	0.2671	0.0000	OK
15 minute summer	S93	10	57.621	0.262	135.8	0.3750	0.0000	OK
15 minute summer	S94	10	57.326	0.180	163.9	0.2581	0.0000	OK
15 minute summer	S75	10	57.913	0.151	31.2	0.2158	0.0000	OK
15 minute summer	S76	10	57.707	0.170	60.8	0.2435	0.0000	OK
15 minute summer	S77	10	57.434	0.131	90.6	0.1877	0.0000	OK
15 minute summer	S78	11	56.040	0.359	253.4	0.5137	0.0000	OK
15 minute summer	S79	11	55.937	0.388	284.5	0.5546	0.0000	OK
15 minute summer	S49	11	55.744	0.469	758.9	0.6713	0.0000	OK
15 minute summer	S50	12	55.314	0.564	806.0	0.9974	0.0000	OK
15 minute summer	S51	12	55.035	0.335	827.3	0.5917	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	S47	1.012	S48	390.9	3.021	0.624	4.9992	
15 minute summer	S48	1.013	S49	454.5	3.947	0.442	2.4536	
15 minute summer	S92	4.000	S89	29.0	1.037	0.798	1.7528	
15 minute summer	S89	4.001	S93	105.6	1.539	0.428	1.6414	
15 minute summer	S93	4.002	S94	134.5	2.002	0.767	1.8607	
15 minute summer	S94	4.003	S78	164.4	2.957	0.450	2.2827	
15 minute summer	S75	5.000	S76	30.7	1.132	0.725	0.6129	
15 minute summer	S76	5.001	S77	60.5	1.726	0.544	0.8279	
15 minute summer	S77	5.002	S78	90.5	3.111	0.361	0.8184	
15 minute summer	S78	4.004	S79	255.7	1.388	0.499	4.3737	
15 minute summer	S79	4.005	S49	284.7	1.574	0.667	5.7959	
15 minute summer	S49	1.014	S50	757.7	2.355	0.568	14.5606	
15 minute summer	S50	1.015	S51	798.5	2.910	1.062	3.6655	
15 minute summer	S51	1.016	S52	829.3	4.638	0.365	4.6702	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	S52	118	54.000	0.750	282.0	0.0000	0.0000	OK
120 minute winter	S84	118	54.000	0.850	197.3	0.0000	0.0000	SURCHARGED
120 minute winter	S85	118	53.981	0.906	46.3	6.4011	0.0000	SURCHARGED
15 minute summer	S55	10	59.298	0.088	30.2	0.1261	0.0000	OK
15 minute summer	S56	10	58.800	0.113	60.1	0.1622	0.0000	OK
15 minute summer	S57	10	58.365	0.148	90.1	0.2113	0.0000	OK
15 minute summer	S58	10	57.978	0.238	119.8	0.3412	0.0000	OK
15 minute summer	S59	10	57.738	0.241	148.4	0.3455	0.0000	OK
15 minute summer	S60	11	57.596	0.241	177.9	0.3455	0.0000	OK
15 minute summer	S61	11	57.393	0.284	206.6	8.5049	0.0000	OK
15 minute summer	S62	11	57.177	0.343	234.2	0.4910	0.0000	OK
15 minute summer	S63	11	57.085	0.301	233.0	0.4302	0.0000	OK
15 minute summer	S64	11	56.797	0.357	260.3	0.5103	0.0000	OK
15 minute summer	S65	12	56.655	0.359	283.8	0.5138	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)
120 minute winter	S52	Flow through pond	S84	197.3	0.041	0.148	598.9592	
120 minute winter	S84	1.018	S85	46.3	0.730	0.467	0.6614	
120 minute winter	S85	Hydro-Brake®	S83	43.7				
15 minute summer	S55	6.000	S56	30.0	1.811	0.170	0.2967	
15 minute summer	S56	6.001	S57	59.9	1.759	0.189	0.6422	
15 minute summer	S57	6.002	S58	89.6	2.096	0.282	0.6939	
15 minute summer	S58	6.003	S59	118.4	1.474	0.494	2.4593	
15 minute summer	S59	6.004	S60	148.0	1.534	0.341	1.7079	
15 minute summer	S60	6.005	S61	177.8	1.705	0.342	2.3142	
15 minute summer	S61	6.006	S62	205.4	1.529	0.474	4.6144	
15 minute summer	S62	6.007	S63	233.0	1.679	0.538	0.8671	
15 minute summer	S63	6.008	S64	231.5	1.643	0.534	6.1064	
15 minute summer	S64	6.009	S65	258.7	1.680	0.598	2.8258	
15 minute summer	S65	6.010	S66	285.9	1.947	0.659	3.4481	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S66	12	56.460	0.419	331.3	0.5994	0.0000	OK
15 minute summer	S67	12	56.273	0.443	355.8	0.6339	0.0000	OK
15 minute summer	S68	12	56.074	0.411	382.8	0.5885	0.0000	OK
480 minute winter	S69	480	55.617	0.323	62.0	0.4616	0.0000	OK
480 minute winter	S80	480	55.617	0.742	99.5	0.0000	0.0000	OK
480 minute winter	S81	480	55.617	0.817	61.0	0.0000	0.0000	SURCHARGED
480 minute winter	S82	480	55.617	1.492	13.2	10.5439	0.0000	SURCHARGED
360 minute summer	S83	384	52.959	0.134	47.5	0.1915	0.0000	OK
360 minute summer	S53	384	52.640	0.165	47.5	0.2364	0.0000	OK
360 minute summer	S54	384	52.571	0.156	47.5	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	S66	6.011	S67	331.8	1.757	0.766	5.0067	
15 minute summer	S67	6.012	S68	359.2	1.909	0.830	3.9300	
15 minute summer	S68	6.013	S69	386.4	2.471	0.891	7.1475	
480 minute winter	S69	6.014	S80	99.5	0.902	0.122	2.6560	
480 minute winter	S80	Flow through pond	S81	61.0	0.015	0.059	434.7938	
480 minute winter	S81	6.016	S82	13.2	0.678	0.056	2.2428	
480 minute winter	S82	Hydro-Brake®	S83	3.8				
360 minute summer	S83	1.020	S53	47.5	1.355	0.390	1.0211	
360 minute summer	S53	1.021	S54	47.5	1.240	0.545	0.3713	1573.2

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	S91	20	60.046	0.524	51.2	0.7499	0.0000	FLOOD RISK
15 minute summer	S70	12	60.194	0.982	53.3	1.4056	0.0000	FLOOD RISK
15 minute summer	S71	12	60.042	1.032	158.1	1.4768	3.3292	FLOOD
15 minute summer	S72	12	60.016	1.111	211.2	1.5896	0.0000	FLOOD RISK
15 minute summer	S73	12	59.977	1.217	229.2	20.7652	0.0000	SURCHARGED
15 minute summer	S74	12	59.937	1.242	224.0	1.4046	0.0000	SURCHARGED
15 minute summer	S39	12	59.912	0.562	32.5	0.8044	0.0000	SURCHARGED
15 minute summer	S40	12	59.869	1.314	268.6	1.4861	0.0000	SURCHARGED
15 minute summer	S41	12	59.614	1.345	299.2	1.9252	0.0000	SURCHARGED
15 minute summer	S42	12	59.422	1.456	337.5	1.6473	0.0000	SURCHARGED
15 minute summer	S43	12	59.291	1.427	374.9	2.0423	0.0000	SURCHARGED
15 minute summer	S44	12	59.001	1.372	421.4	1.9632	0.0000	SURCHARGED
15 minute summer	S45	12	58.702	1.245	499.2	1.7814	0.0000	SURCHARGED
15 minute summer	S46	12	58.035	0.976	541.7	1.3971	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)
30 minute summer	S91	1.000	S71	52.7	1.037	0.280	5.4322	
15 minute summer	S70	2.000	S71	52.1	1.309	1.227	0.6588	
15 minute summer	S71	1.001	S72	157.9	1.184	0.598	2.4852	
15 minute summer	S72	1.002	S73	180.0	1.474	0.673	3.3478	
15 minute summer	S73	1.003	S74	207.9	1.451	0.784	1.5269	
15 minute summer	S74	1.004	S40	233.0	1.745	0.881	1.5356	
15 minute summer	S39	3.000	S40	-32.5	-0.864	-0.457	1.2147	
15 minute summer	S40	1.005	S41	275.2	1.897	0.956	5.7036	
15 minute summer	S41	1.006	S42	311.7	2.164	0.738	2.1591	
15 minute summer	S42	1.007	S43	346.8	1.606	0.878	3.3098	
15 minute summer	S43	1.008	S44	383.9	1.777	0.971	7.6145	
15 minute summer	S44	1.009	S45	423.8	1.962	1.073	5.5862	
15 minute summer	S45	1.010	S46	500.0	2.315	1.139	10.4718	
15 minute summer	S46	1.011	S47	543.3	2.515	1.371	4.0329	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S47	11	57.663	0.729	585.1	0.8250	0.0000	SURCHARGED
15 minute summer	S48	11	56.940	0.646	703.7	0.9243	0.0000	SURCHARGED
15 minute summer	S92	11	58.886	0.704	53.3	1.0076	0.0000	SURCHARGED
15 minute summer	S89	11	58.231	0.508	182.7	0.7270	0.0000	SURCHARGED
15 minute summer	S93	11	57.956	0.597	234.2	0.8542	0.0000	SURCHARGED
15 minute summer	S94	11	57.466	0.320	285.5	0.4573	0.0000	OK
15 minute summer	S75	10	58.085	0.323	55.0	0.4616	0.0000	SURCHARGED
15 minute summer	S76	10	57.794	0.257	107.1	0.3682	0.0000	OK
15 minute summer	S77	11	57.503	0.200	159.4	0.2858	0.0000	OK
15 minute summer	S78	11	56.656	0.975	437.6	1.3957	0.0000	FLOOD RISK
15 minute summer	S79	11	56.489	0.940	483.4	1.3456	0.0000	FLOOD RISK
15 minute summer	S49	11	56.262	0.987	1229.5	1.4120	0.0000	SURCHARGED
15 minute summer	S50	11	55.618	0.868	1320.5	1.5341	0.0000	SURCHARGED
15 minute summer	S51	11	55.163	0.463	1371.4	0.8173	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	S47	1.012	S48	587.2	3.171	0.937	8.3034	
15 minute summer	S48	1.013	S49	700.4	4.138	0.681	4.1971	
15 minute summer	S92	4.000	S89	51.1	1.286	1.406	2.4961	
15 minute summer	S89	4.001	S93	183.3	1.662	0.742	2.6429	
15 minute summer	S93	4.002	S94	234.6	2.251	1.337	2.9072	
15 minute summer	S94	4.003	S78	282.5	2.906	0.773	4.1705	
15 minute summer	S75	5.000	S76	53.8	1.361	1.272	0.8556	
15 minute summer	S76	5.001	S77	106.2	1.960	0.955	1.3256	
15 minute summer	S77	5.002	S78	156.4	3.145	0.625	1.6684	
15 minute summer	S78	4.004	S79	432.5	1.536	0.844	6.6879	
15 minute summer	S79	4.005	S49	480.0	1.704	1.125	9.0294	
15 minute summer	S49	1.014	S50	1227.1	2.788	0.920	19.8715	
15 minute summer	S50	1.015	S51	1320.6	3.283	1.756	4.8708	
15 minute summer	S51	1.016	S52	1362.8	5.186	0.601	6.8833	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	S52	180	54.589	1.339	367.7	0.0000	0.0000	OK
180 minute winter	S84	180	54.589	1.439	209.7	0.0000	0.0000	FLOOD RISK
180 minute winter	S85	180	54.574	1.499	46.0	10.5951	0.0000	FLOOD RISK
15 minute summer	S55	10	59.331	0.121	53.3	0.1737	0.0000	OK
15 minute summer	S56	10	58.846	0.159	106.2	0.2272	0.0000	OK
15 minute summer	S57	12	58.779	0.562	159.1	0.8036	0.0000	SURCHARGED
15 minute summer	S58	12	58.661	0.921	211.4	1.3182	0.0000	SURCHARGED
15 minute summer	S59	12	58.523	1.026	261.8	1.4687	0.0000	FLOOD RISK
15 minute summer	S60	12	58.457	1.102	313.7	1.5769	0.0000	FLOOD RISK
15 minute summer	S61	12	58.360	1.251	369.1	13.2044	1.4980	FLOOD
15 minute summer	S62	12	58.190	1.356	325.5	1.9401	0.0000	SURCHARGED
15 minute summer	S63	12	58.102	1.318	327.2	1.8863	0.0000	SURCHARGED
15 minute summer	S64	12	57.842	1.402	370.8	2.0068	0.0000	SURCHARGED
15 minute summer	S65	12	57.659	1.363	414.8	1.9501	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)
180 minute winter	S52	Flow through pond	S84	209.7	0.031	0.157	1225.8624	
180 minute winter	S84	1.018	S85	46.0	0.721	0.464	0.6614	
180 minute winter	S85	Hydro-Brake®	S83	43.7				
15 minute summer	S55	6.000	S56	52.9	2.093	0.300	0.4534	
15 minute summer	S56	6.001	S57	105.9	1.928	0.334	1.3685	
15 minute summer	S57	6.002	S58	158.1	2.125	0.498	1.7726	
15 minute summer	S58	6.003	S59	208.5	1.641	0.870	4.8214	
15 minute summer	S59	6.004	S60	260.4	1.633	0.600	3.8214	
15 minute summer	S60	6.005	S61	315.8	1.847	0.607	4.6268	
15 minute summer	S61	6.006	S62	303.4	1.580	0.700	7.4196	
15 minute summer	S62	6.007	S63	327.2	1.754	0.755	1.3511	
15 minute summer	S63	6.008	S64	335.9	1.633	0.775	9.2907	
15 minute summer	S64	6.009	S65	374.0	1.731	0.864	3.8955	
15 minute summer	S65	6.010	S66	417.3	1.932	0.962	4.8491	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.79%

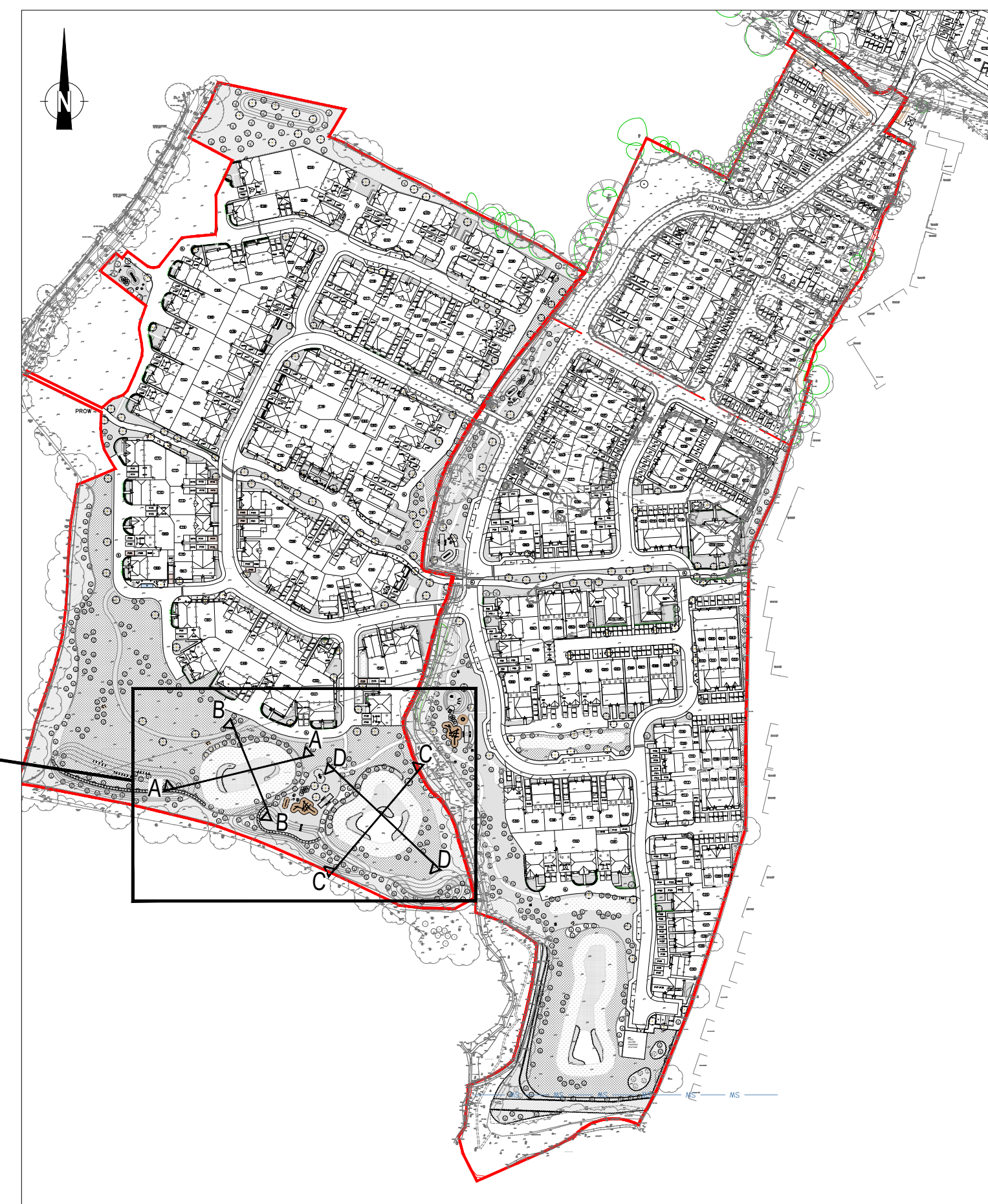
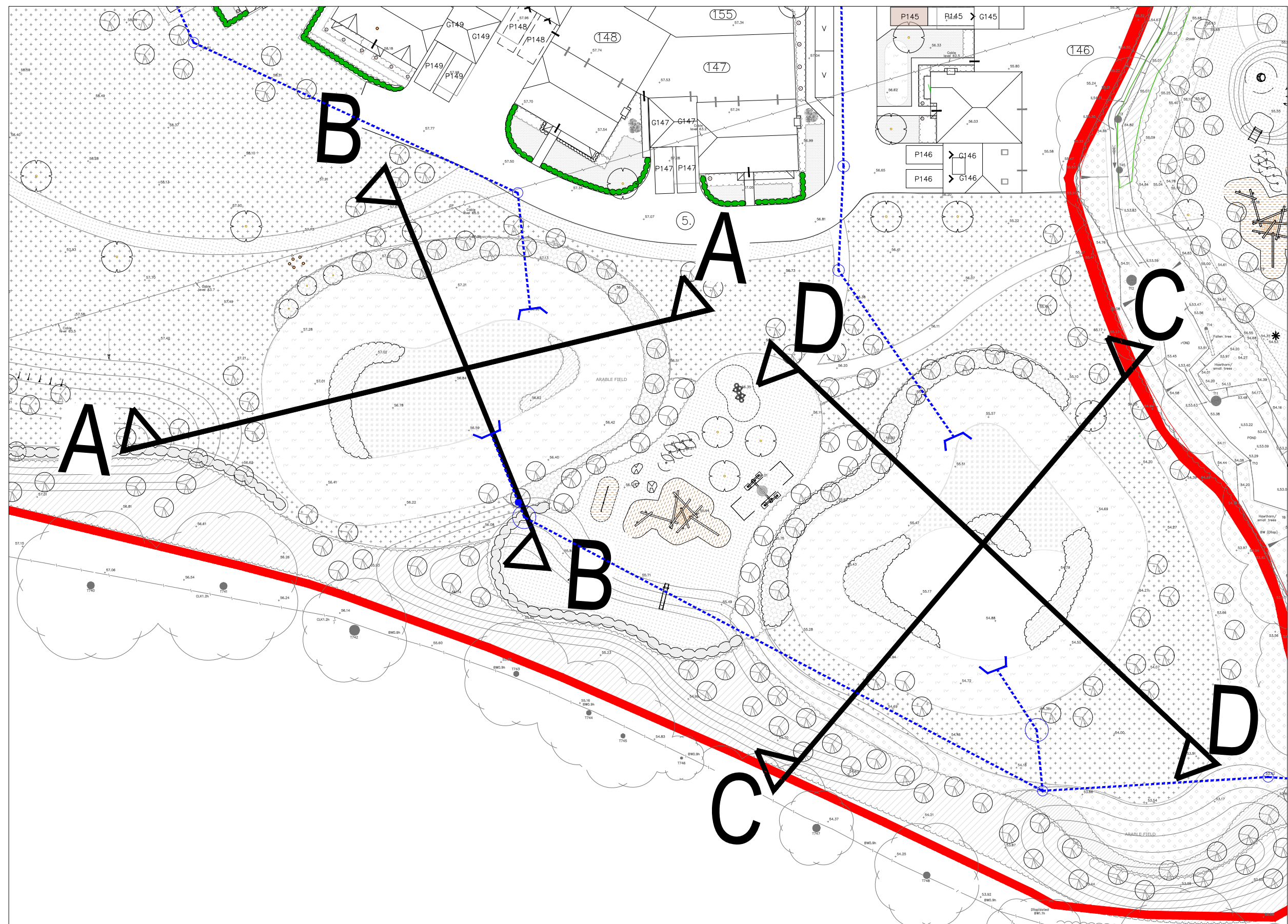
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S66	12	57.396	1.355	492.7	1.9396	0.0000	SURCHARGED
15 minute summer	S67	12	56.988	1.158	537.3	1.6564	0.0000	SURCHARGED
15 minute summer	S68	12	56.572	0.909	581.3	1.3002	0.0000	SURCHARGED
960 minute winter	S69	930	56.082	0.788	92.9	1.1274	0.0000	SURCHARGED
960 minute winter	S80	945	56.081	1.206	45.7	0.0000	0.0000	OK
960 minute winter	S81	945	56.081	1.281	72.0	0.0000	0.0000	FLOOD RISK
960 minute winter	S82	945	56.082	1.957	9.6	13.8331	0.0000	FLOOD RISK
960 minute winter	S83	975	52.960	0.135	48.1	0.1928	0.0000	OK
960 minute winter	S53	975	52.641	0.166	48.1	0.2380	0.0000	OK
960 minute winter	S54	975	52.572	0.157	48.1	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	S66	6.011	S67	495.5	2.294	1.144	5.7054	
15 minute summer	S67	6.012	S68	539.5	2.498	1.246	4.5172	
15 minute summer	S68	6.013	S69	584.5	2.720	1.348	9.5180	
960 minute winter	S69	6.014	S80	-48.0	0.778	-0.059	3.2312	
960 minute winter	S80	Flow through pond	S81	72.0	0.015	0.069	845.6802	
960 minute winter	S81	6.016	S82	9.6	0.645	0.041	2.2428	
960 minute winter	S82	Hydro-Brake®	S83	4.4				
960 minute winter	S83	1.020	S53	48.1	1.359	0.394	1.0300	
960 minute winter	S53	1.021	S54	48.1	1.243	0.551	0.3745	3338.5



APPENDIX 4

Attenuation Basin Cross-Sections



PRELIMINARY ISSUE



STUART MICHAEL
ASSOCIATES
CONSULTING ENGINEERS

Berkeley
Designed for life

PHASE 5 ATTENUATION PONDS SECTIONS

DATE	DOWN	CHECKED	SCALE
MARCH 2025	FP	MSR	NTS
DRAWING No.	REV	STATUS	
S832-STU05-XX-XX-DR-C-075-205	P01	SO	

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APPENDIX 5

Greenfield Run-off Rate

Calculated by:	Theo Epuran
Site name:	
Site location:	

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.

Site Details

Latitude:	51.02150° N
Longitude:	0.35919° W
Reference:	750266762
Date:	Mar 07 2025 07:28

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	6.83
-----------------------	------

Methodology

Q _{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

Soil characteristics

	Default	Edited
SOIL type:	4	5
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.53

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

Hydrological characteristics

	Default	Edited
SAAR (mm):	776	776
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

Default

Edited

Q_{BAR} (l/s):	37.2	48.28
1 in 1 year (l/s):	31.62	41.04
1 in 30 years (l/s):	85.56	111.05
1 in 100 year (l/s):	118.67	154.02
1 in 200 years (l/s):	139.13	180.57

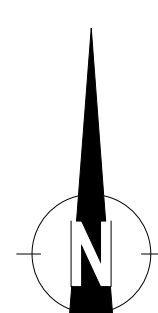
This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of 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, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.



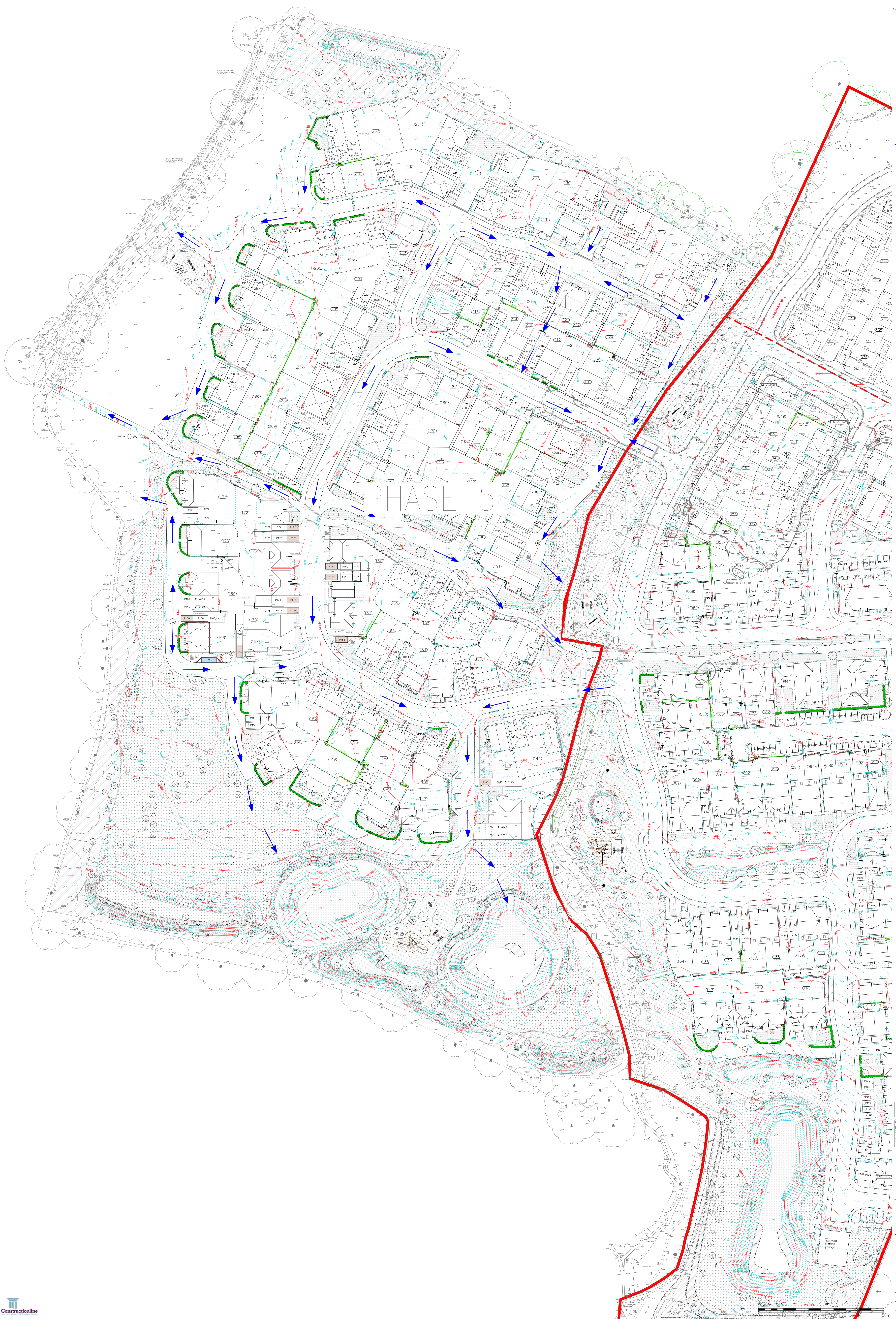
APPENDIX 6

Exceedance Flow Routes

- GENERAL NOTES:
- DO NOT SCALE FROM THIS DRAWING.
 - ALL DIMENSIONS ARE IN METRES, UNLESS STATED OTHERWISE.
 - LEVELS ARE IN METRES AND ARE RELATED TO GPS DATUM.
 - THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT SCHEME DRAWINGS AND SPECIFICATIONS.
 - ALL WORKS TO BE CARRIED OUT IN STRICT ACCORDANCE WITH THE SPECIFICATION FOR HIGHWAY WORKS - MODIFIED AND EXTENDED, INCLUDING BATH & NORTH EAST SOMERSET COUNCIL SUPPLEMENTARY CLAUSES.
 - ALL WORKS WITHIN THE PUBLIC HIGHWAY SHALL BE CARRIED OUT AND COMPLY WITH THE REQUIREMENTS OF THE DTP 'TRAFFIC SIGNS MANUAL, CHAPTER 8 - TRAFFIC SAFETY MEASURES AND SIGNS FOR ROAD WORKS AND TEMPORARY SITUATION'.
 - ALL EXISTING LEVELS TO BE CONFIRMED ON SITE PRIOR TO COMMENCEMENT OF ANY WORKS.



KEY:
→ FLOW EXCEEDANCE ROUTE



PRELIMINARY ISSUE

ST	Rev	DESCRIPTION	DATE
P101	1	NETAL ISSUE	FP 11.03.25
P102	1	DESCRIPTION	FP 11.03.25
P103	1	DESCRIPTION	FP 11.03.25
P104	1	DESCRIPTION	FP 11.03.25
P105	1	DESCRIPTION	FP 11.03.25
P106	1	DESCRIPTION	FP 11.03.25
P107	1	DESCRIPTION	FP 11.03.25
P108	1	DESCRIPTION	FP 11.03.25
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Berkeley
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SOUTHERNWATER
PHASE 4 & 5

PHASE 5
EXCEEDANCE FLOW
ROUTES LAYOUT

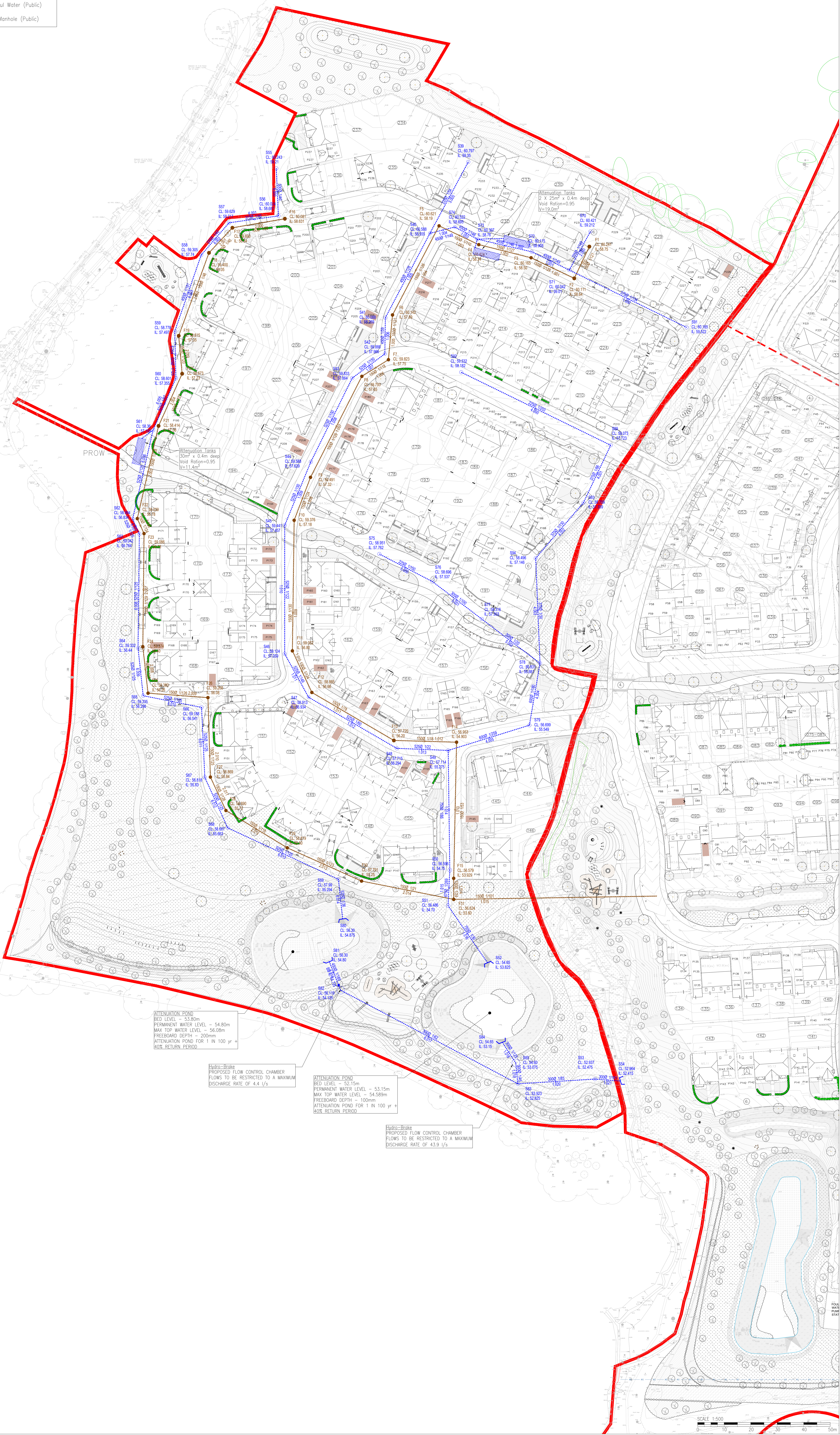
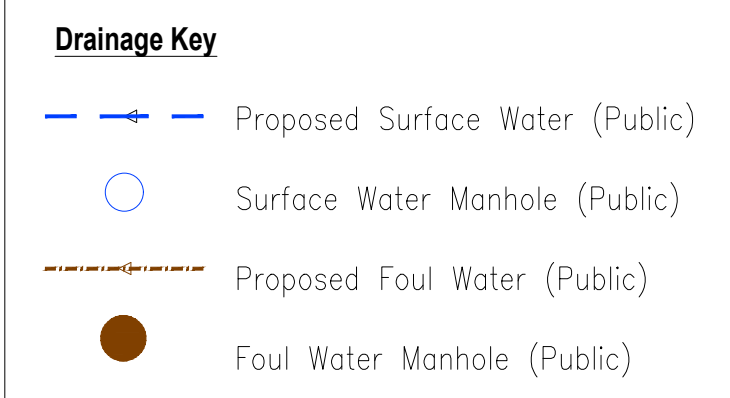
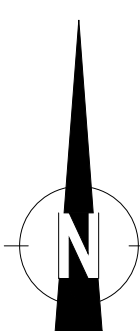


APPENDIX 7

Phase 5 Drainage Layout

GENERAL NOTES

- 1.1. THIS DRAWING IS COPYRIGHT AND SHOULD NOT BE REPRODUCED IN WHOLE OR PART WITHOUT THE WRITTEN CONSENT OF PMCC GROUP LTD.
 - 1.2. ALL DIMENSIONS TO BE CHECKED ON SITE AND CO-ORDINATE WITH RELEVANT ARCHITECT'S DRAWINGS. ANY DISCREPANCIES TO BE REPORTED TO THE ENGINEER PRIOR TO CONSTRUCTION.
 - 1.3. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
 - 1.4. ALL LEVELS IN METRES.
 - 1.5. SIZES HEREON SHALL NOT BE MODIFIED WITHOUT THE WRITTEN APPROVAL OF THE ENGINEER.
 - 1.6. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS DRAWINGS & SPECIFICATIONS.
- Drainage Construction Notes**
1. All materials and workmanship related to private sewers shall be in accordance with Part H of the Building Regulations and BS EN1252 and best practice.
 2. All materials and workmanship related to adoptable sewers shall be in accordance with the Design and Construction Guidance 2020 as published by the Water Services Association and any subsequent revisions shown by the water authority.
 3. All sustainable drainage systems to be designed and maintained in accordance with CIRA C753 The SuDS Manual and best practice guidance.
 4. All paths and external surfaces to drain away from building thresholds unless explicitly noted on the plan.
 5. All downpipes with pathways falling towards them to be fitted with treated drains to be connected to nearest SW inspection chamber or pipe.
 6. All parking areas to be porous paving.
 7. Where practicable rainwater pipes to discharge onto parking areas or into diffuser.
 8. Land drainage to be provided in gardens where the gradient falls towards a property.



ATTENUATION POND
BED LEVEL - 53.80m
PERMANENT WATER LEVEL - 54.80m
MAX TOP WATER LEVEL - 56.08m
FREEBOARD DEPTH - 200mm
ATTENUATION POND FOR 1 IN 100 yr +
40% RETURN PERIOD

Hydro-Boiler
PROPOSED FLOW CONTROL CHAMBER
FLOWS TO BE RESTRICTED TO A MAXIMUM
DISCHARGE RATE OF 4.4 l/s

ATTENUATION POND
BED LEVEL - 52.15m
PERMANENT WATER LEVEL - 53.15m
MAX TOP WATER LEVEL - 54.589m
FREEBOARD DEPTH - 100mm
ATTENUATION POND FOR 1 IN 100 yr +
50% RETURN PERIOD

Hydro-Boiler
PROPOSED FLOW CONTROL CHAMBER
FLOWS TO BE RESTRICTED TO A MAXIMUM
DISCHARGE RATE OF 43.9 l/s

PH4	Door UPDATING SOME PIPES UPDATING	TL MGR11.03.25
PH5	ATTENUATION TANKS ADDED ON 1.02.25 AND 6.02.25	
PH6	MAJOR AMENDMENTS	AM 08 26.06.24
PH7	PH7 DISCHARGE RATE AT FUTURE-BANK UPDATED	AM 08 14.06.24
PH8	INITIAL ISSUE	AM 08 15.06.24
PH9	REVISION	DM 08 15.06.24
PH10	REVISION	DM 08 15.06.24

Preparation Issue	Submitted for S104
Planning Issue	Issued for Tender
Submitted for S28	Issued for Construction
Submitted for S278	As Built
DRAWING STATUS	

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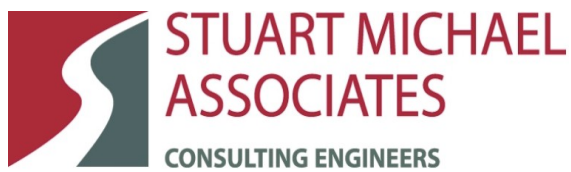
Berkeley
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SOUTHWATER
PHASE 4 & 5

STRATEGY SURFACE WATER LAYOUT
OVERVIEW - PHASE 5
SHEET 1

JUNE 2024
SQU-PPC-00-XX-DR-C-0202
P04
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