

# Surface Water Drainage Calculations

Unit 7, Gateway 36

Dearne Valley Parkway, Barnsley

Prepared For

EOS Inc. Limited

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Document Revisions

Revision	Date	Written by	Checked by
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## Appendices

Appendix A Hydraulic Calculations

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## Introduction

- 1.1. This surface water calculation pack is the property of H J Consulting Engineers (HJCE) and is produced for the exclusive use of the client, EOS Inc. Limited. The contents may not be made use of by any third party without the express written consent of HJCE. Without such consent HJCE can accept no responsibility to any third party. By receiving these calculations and acting on it, the client, or any third party relying on it, accepts that no individual is personally liable in contract, tort, or breach of statutory duty (including negligence).
- 1.2. The existing site infrastructure drainage will accept an unrestricted discharge of both domestic foul water and surface water. Surface water attenuation is provided in a downstream surface water attenuation pond constructed under and earlier phase of works.
- 1.3. These calculations support the drainage design and has been prepared in accordance with the requirements set out in the National Planning Policy Framework (NPPF) 2024 and the associated Planning Practice Guidance.

## Drainage Strategy

### Surface Water Disposal

Surface water will discharge unrestricted to the infrastructure drainage tails provided to the site.

### Drainage Calculation Results

The enclosed calculations produced on Causeway Flow software demonstrate there is no flooding for both the 1:30 year event and a nominal volume of flooding (11m<sup>3</sup>) for the 1:100 year plus 40% climate change storm events. The flooded volume will be stored on the yard/car park surface



**Design Settings**

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.300	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

**Nodes**

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
SW01	2.850	8.00	146.579	1500	2.682
SW02	0.605	8.00	145.406	1800	2.250
SW03	0.156	5.00	145.283	2100	3.375
SW04	0.156	5.00	145.288	2100	3.586
SW05	1.240	5.00	145.295	2400	3.863
SW06	0.156	5.00	145.300	2100	3.975
SW10	2.140	8.00	145.100	2700	4.164
OUTFALL	0.000		142.767	1200	1.914
SW101	0.058	5.00	160.164	1200	1.429
SW102	0.083	5.00	160.164	1200	1.548
SW103	0.038	5.00	160.512	1200	1.164
SW104	0.057	5.00	159.648	1200	1.425
SW105	0.032	5.00	158.898	1200	2.320
SW106	0.005	5.00	157.665	1200	1.515
SW107	0.225	5.00	157.606	1200	1.225
SW108	0.078	5.00	157.964	1200	1.425
SW109	0.045	5.00	157.603	1200	1.808
SW110	0.073	5.00	157.636	1200	2.196
SW111	0.179	5.00	156.897	1800	1.839
SW112	0.000		156.417	1800	1.692
SW113	0.188	5.00	157.516	1500	1.425
SW114	0.376	5.00	157.518	1500	1.612
SW115	0.376	5.00	157.518	1800	1.797
SW116	0.188	5.00	156.559	1800	1.625
SW117	0.000		156.436	1800	5.001
SW118	0.000		153.756	1500	4.935
7-SW01	0.242	5.00	145.300	1200	1.575
7-SW02	0.484	5.00	145.300	1500	1.850
7-SW03	0.484	5.00	145.300	1500	2.107
7-SW04	0.242	5.00	145.407	1500	2.324
7-SW05	0.460	5.00	144.832	1350	1.825
7-SW06	0.000		144.947	1350	1.970
INT-02	0.000		145.174	600	2.317
7-SW07	0.000		145.091	1350	2.254
7-SW08	0.173	5.00	145.022	1200	1.531
7-SW09	0.275	5.00	145.065	1350	1.689
INT-01	0.000		145.065	600	1.801
DL-01	0.127	5.00	144.750	1200	1.450



Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
S1.000	SW01	SW02	32.676	0.600	143.897	143.156	0.741	44.1	1050	8.41	50.0
S1.001	SW02	SW03	28.085	0.600	143.156	142.358	0.798	35.2	1050	8.49	50.0
S1.002	SW03	SW04	51.482	0.600	141.908	141.702	0.206	249.9	1500	8.80	50.0
S1.003	SW04	SW05	67.444	0.600	141.702	141.432	0.270	249.8	1500	9.22	50.0
S1.004	SW05	SW06	26.679	0.600	141.432	141.325	0.107	249.3	1500	9.38	50.0
S1.005	SW06	SW10	97.528	0.600	141.325	140.936	0.389	250.7	1500	9.98	50.0
S1.006	SW10	OUTFALL	20.686	0.600	140.936	140.853	0.083	249.2	1500	10.11	50.0
S1.100	SW101	SW102	30.800	0.600	158.735	158.616	0.119	258.8	225	5.64	50.0
S1.101	SW102	SW104	20.000	0.600	158.616	158.223	0.393	50.9	225	5.82	50.0
S1.102	SW104	SW105	44.100	0.600	158.223	156.653	1.570	28.1	225	6.11	50.0
S1.103	SW105	SW106	27.500	0.600	156.578	156.150	0.428	64.3	300	6.35	50.0
S1.104	SW106	SW111	26.100	0.600	156.150	155.208	0.942	27.7	300	6.49	50.0
S1.105	SW111	SW112	64.600	0.600	155.058	154.800	0.258	250.4	450	7.33	50.0
S1.106	SW112	SW117	68.600	0.600	154.725	154.450	0.275	249.5	525	8.14	50.0
S1.107	SW117	SW118	25.100	0.600	151.435	148.821	2.614	9.6	525	8.20	50.0
S1.108	SW118	SW01	43.600	0.600	148.921	144.422	4.499	9.7	525	8.30	50.0
S2.100	SW103	SW104	8.500	0.600	159.348	158.298	1.050	8.1	150	5.04	50.0
S3.100	SW107	SW109	77.900	0.600	156.381	155.795	0.586	132.9	375	5.83	50.0
S3.101	SW109	SW110	24.500	0.600	155.795	155.440	0.355	69.0	375	6.01	50.0
S3.102	SW110	SW111	21.500	0.600	155.440	155.133	0.307	70.0	375	6.18	50.0
S4.100	SW108	SW109	14.300	0.600	156.539	155.945	0.594	24.1	225	5.09	50.0
S5.100	SW113	SW114	27.400	0.600	156.091	155.981	0.110	249.1	375	5.40	50.0
S5.101	SW114	SW115	27.400	0.600	155.906	155.796	0.110	249.1	450	5.76	50.0
S5.102	SW115	SW116	27.400	0.600	155.721	154.934	0.787	34.8	525	5.88	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
S1.000	5.196	4499.0	876.6	1.632	1.200	4.851	0.0	311	4.080
S1.001	5.817	5037.4	985.9	1.200	1.875	5.456	0.0	312	4.577
S1.002	2.708	4786.1	1095.0	1.875	2.086	6.060	0.0	484	2.223
S1.003	2.709	4787.3	1229.3	2.086	2.363	6.803	0.0	515	2.292
S1.004	2.712	4791.7	1453.4	2.363	2.475	8.043	0.0	564	2.396
S1.005	2.704	4778.4	1743.9	2.475	2.664	9.651	0.0	624	2.504
S1.006	2.712	4792.7	2130.6	2.664	0.414	11.791	0.0	700	2.638
S1.100	0.808	32.1	10.5	1.204	1.323	0.058	0.0	88	0.724
S1.101	1.837	73.1	25.5	1.323	1.200	0.141	0.0	92	1.680
S1.102	2.478	98.5	42.6	1.200	2.020	0.236	0.0	103	2.389
S1.103	1.964	138.8	48.4	2.020	1.215	0.268	0.0	122	1.795
S1.104	2.998	211.9	49.3	1.215	1.389	0.273	0.0	98	2.460
S1.105	1.280	203.6	157.8	1.389	1.167	0.873	0.0	298	1.407
S1.106	1.413	306.0	157.8	1.167	1.461	0.873	0.0	267	1.424
S1.107	7.257	1570.9	361.6	4.476	4.410	2.001	0.0	170	5.943
S1.108	7.223	1563.6	361.6	4.310	1.632	2.001	0.0	170	5.925
S2.100	3.563	63.0	6.9	1.014	1.200	0.038	0.0	33	2.337
S3.100	1.570	173.3	40.7	0.850	1.433	0.225	0.0	123	1.288
S3.101	2.183	241.1	62.9	1.433	1.821	0.348	0.0	130	1.846
S3.102	2.167	239.4	76.1	1.821	1.389	0.421	0.0	145	1.931
S4.100	2.677	106.5	14.1	1.200	1.433	0.078	0.0	55	1.870
S5.100	1.143	126.3	34.0	1.050	1.162	0.188	0.0	132	0.974
S5.101	1.283	204.1	101.9	1.162	1.272	0.564	0.0	225	1.282
S5.102	3.805	823.6	169.9	1.272	1.100	0.940	0.0	161	3.027



**Links**

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
S5.103	SW116	SW117	37.600	0.600	154.934	154.450	0.484	77.7	525	6.12	50.0
7-S1.000	7-SW01	7-SW02	29.669	0.600	143.725	143.600	0.125	237.4	375	5.42	50.0
7-S1.001	7-SW02	7-SW03	31.980	0.600	143.450	143.343	0.107	298.9	525	5.84	50.0
7-S1.002	7-SW03	7-SW04	33.060	0.600	143.193	143.083	0.110	300.5	675	6.20	50.0
7-S1.003	7-SW04	SW06	58.787	0.600	143.083	142.150	0.933	63.0	675	6.50	50.0
7-S2.000	7-SW05	7-SW06	8.933	0.600	143.007	142.977	0.030	297.8	450	5.49	50.0
7-S2.001	7-SW06	INT-02	5.866	0.600	142.977	142.957	0.020	293.3	450	5.57	50.0
7-S2.002	INT-02	7-SW07	5.866	0.600	142.857	142.837	0.020	293.3	450	5.65	50.0
7-S2.003	7-SW07	SW04	25.606	0.600	142.837	142.752	0.085	301.2	450	6.02	50.0
7-S3.000	7-SW08	7-SW09	9.436	0.600	143.491	143.451	0.040	235.9	300	5.15	50.0
7-S3.001	7-SW09	INT-01	3.473	0.600	143.376	143.364	0.012	289.4	375	5.21	50.0
7-S3.002	INT-01	SW03	16.896	0.600	143.264	143.033	0.231	73.1	375	5.34	50.0
DOCK	DL-01	7-SW05	22.527	0.600	143.300	143.200	0.100	225.3	300	5.36	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
S5.103	2.543	550.4	203.8	1.100	1.461	1.128	0.0	221	2.361
7-S1.000	1.171	129.4	43.7	1.200	1.325	0.242	0.0	150	1.061
7-S1.001	1.290	279.3	131.2	1.325	1.432	0.726	0.0	253	1.271
7-S1.002	1.506	539.0	218.6	1.432	1.649	1.210	0.0	299	1.432
7-S1.003	3.305	1182.6	262.4	1.649	2.475	1.452	0.0	215	2.684
7-S2.000	1.173	186.5	106.1	1.375	1.520	0.587	0.0	243	1.208
7-S2.001	1.182	187.9	106.1	1.520	1.767	0.587	0.0	242	1.216
7-S2.002	1.182	187.9	106.1	1.867	1.804	0.587	0.0	242	1.216
7-S2.003	1.166	185.4	106.1	1.804	2.086	0.587	0.0	244	1.203
7-S3.000	1.019	72.0	31.3	1.231	1.314	0.173	0.0	138	0.984
7-S3.001	1.060	117.0	81.0	1.314	1.326	0.448	0.0	230	1.140
7-S3.002	2.120	234.2	81.0	1.426	1.875	0.448	0.0	152	1.934
DOCK	1.043	73.7	22.9	1.150	1.332	0.127	0.0	115	0.924

**Node DL-01 Depth/Area Storage Structure**

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	144.275
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	0

Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )
0.000	0.0	0.0	0.125	313.4	0.0	0.325	770.9	0.0	0.475	1231.6	0.0
0.025	85.1	0.0	0.225	541.9	0.0	0.425	1000.4	0.0			



**Results for 1 year Critical Storm Duration. Lowest mass balance: 99.86%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
30 minute summer	SW01	19	144.190	0.292	648.5	6.7323	0.0000	OK
30 minute summer	SW02	19	143.458	0.302	722.5	2.3912	0.0000	OK
30 minute summer	SW03	19	142.371	0.463	805.0	2.0330	0.0000	OK
15 minute summer	SW04	12	142.194	0.492	914.7	2.1318	0.0000	OK
15 minute summer	SW05	12	142.024	0.592	1072.4	6.4786	0.0000	OK
15 minute summer	SW06	12	141.906	0.581	1311.8	2.4676	0.0000	OK
30 minute summer	SW10	20	141.592	0.656	1561.6	10.4983	0.0000	OK
15 minute summer	OUTFALL	13	141.414	0.561	1562.8	0.0000	0.0000	OK
15 minute summer	SW101	10	158.819	0.084	9.4	0.1626	0.0000	OK
15 minute summer	SW102	10	158.704	0.088	22.7	0.1936	0.0000	OK
15 minute summer	SW103	10	159.381	0.033	6.2	0.0589	0.0000	OK
15 minute summer	SW104	11	158.321	0.098	37.8	0.1901	0.0000	OK
15 minute summer	SW105	11	156.701	0.123	42.5	0.1724	0.0000	OK
15 minute summer	SW106	11	156.242	0.092	43.5	0.1097	0.0000	OK
15 minute summer	SW107	10	156.496	0.115	36.6	0.5538	0.0000	OK
15 minute summer	SW108	10	156.593	0.054	12.7	0.1209	0.0000	OK
15 minute summer	SW109	11	155.922	0.127	55.6	0.2065	0.0000	OK
15 minute summer	SW110	11	155.584	0.143	66.9	0.2577	0.0000	OK
15 minute summer	SW111	11	155.336	0.278	138.6	1.2471	0.0000	OK
15 minute summer	SW112	12	154.976	0.251	134.9	0.6383	0.0000	OK
15 minute summer	SW113	10	156.221	0.130	30.6	0.5712	0.0000	OK
15 minute summer	SW114	11	156.127	0.221	91.3	1.4187	0.0000	OK
15 minute summer	SW115	10	155.873	0.152	148.8	1.0213	0.0000	OK
15 minute summer	SW116	11	155.153	0.219	178.2	1.0620	0.0000	OK
15 minute summer	SW117	12	151.588	0.153	301.1	0.3893	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m <sup>3</sup> )	Discharge Vol (m <sup>3</sup> )
30 minute summer	SW01	S1.000	SW02	646.5	3.226	0.144	6.5496	
30 minute summer	SW02	S1.001	SW03	718.5	3.898	0.143	5.1981	
30 minute summer	SW03	S1.002	SW04	802.7	1.683	0.168	24.6616	
15 minute summer	SW04	S1.003	SW05	914.5	1.641	0.191	38.6997	
15 minute summer	SW05	S1.004	SW06	1074.1	1.725	0.224	17.0085	
15 minute summer	SW06	S1.005	SW10	1317.4	1.926	0.276	66.7287	
30 minute summer	SW10	S1.006	OUTFALL	1557.8	2.327	0.325	13.8553	1128.9
15 minute summer	SW101	S1.100	SW102	9.2	0.667	0.287	0.4278	
15 minute summer	SW102	S1.101	SW104	22.4	1.448	0.306	0.3091	
15 minute summer	SW103	S2.100	SW104	6.2	2.210	0.098	0.0237	
15 minute summer	SW104	S1.102	SW105	37.5	2.289	0.381	0.7226	
15 minute summer	SW105	S1.103	SW106	42.7	1.893	0.308	0.6221	
15 minute summer	SW106	S1.104	SW111	43.6	2.138	0.206	0.6101	
15 minute summer	SW107	S3.100	SW109	35.8	1.175	0.207	2.3778	
15 minute summer	SW108	S4.100	SW109	12.6	1.760	0.118	0.1023	
15 minute summer	SW109	S3.101	SW110	55.7	1.558	0.231	0.8758	
15 minute summer	SW110	S3.102	SW111	67.2	1.493	0.281	1.0696	
15 minute summer	SW111	S1.105	SW112	134.9	1.384	0.663	6.3213	
15 minute summer	SW112	S1.106	SW117	134.5	1.377	0.440	6.7471	
15 minute summer	SW113	S5.100	SW114	30.2	0.837	0.239	1.0008	
15 minute summer	SW114	S5.101	SW115	89.9	1.220	0.441	2.0193	
15 minute summer	SW115	S5.102	SW116	148.9	2.195	0.181	1.8692	
15 minute summer	SW116	S5.103	SW117	179.6	2.225	0.326	3.0368	
15 minute summer	SW117	S1.107	SW118	301.7	3.794	0.192	2.0126	



**Results for 1 year Critical Storm Duration. Lowest mass balance: 99.86%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
15 minute summer	SW118	12	149.084	0.263	301.7	0.4646	0.0000	OK
15 minute summer	7-SW01	10	143.871	0.146	39.3	0.6119	0.0000	OK
15 minute summer	7-SW02	10	143.697	0.247	116.9	1.7287	0.0000	OK
15 minute summer	7-SW03	10	143.471	0.278	192.2	1.7676	0.0000	OK
15 minute summer	7-SW04	11	143.292	0.209	229.9	0.8036	0.0000	OK
15 minute summer	7-SW05	10	143.272	0.265	95.0	1.7166	0.0000	OK
15 minute summer	7-SW06	10	143.223	0.246	93.7	0.3516	0.0000	OK
15 minute summer	INT-02	11	143.121	0.264	93.0	0.0747	0.0000	OK
15 minute summer	7-SW07	11	143.076	0.239	93.2	0.3416	0.0000	OK
15 minute summer	7-SW08	10	143.642	0.151	28.1	0.5104	0.0000	OK
15 minute summer	7-SW09	10	143.606	0.230	72.3	1.0789	0.0000	OK
15 minute summer	INT-01	10	143.419	0.155	71.5	0.0438	0.0000	OK
15 minute summer	DL-01	10	143.412	0.112	20.7	0.3223	0.0000	OK

  

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m <sup>3</sup> )	Discharge Vol (m <sup>3</sup> )
15 minute summer	SW118	S1.108	SW01	303.8	5.540	0.194	2.3910	
15 minute summer	7-SW01	7-S1.000	7-SW02	38.4	1.015	0.297	1.1283	
15 minute summer	7-SW02	7-S1.001	7-SW03	115.8	1.227	0.414	3.0168	
15 minute summer	7-SW03	7-S1.002	7-SW04	192.4	1.664	0.357	3.8333	
15 minute summer	7-SW04	7-S1.003	SW06	231.5	2.564	0.196	5.3090	
15 minute summer	7-SW05	7-S2.000	7-SW06	93.7	1.009	0.502	0.8294	
15 minute summer	7-SW06	7-S2.001	INT-02	93.0	1.152	0.495	0.4742	
15 minute summer	INT-02	7-S2.002	7-SW07	93.2	1.032	0.496	0.5336	
15 minute summer	7-SW07	7-S2.003	SW04	94.1	1.182	0.508	2.0391	
15 minute summer	7-SW08	7-S3.000	7-SW09	27.7	0.809	0.384	0.3403	
15 minute summer	7-SW09	7-S3.001	INT-01	71.5	1.110	0.611	0.2237	
15 minute summer	INT-01	7-S3.002	SW03	71.1	1.777	0.303	0.6780	
15 minute summer	DL-01	DOCK	7-SW05	20.2	0.880	0.274	0.5197	



**Results for 30 year Critical Storm Duration. Lowest mass balance: 99.86%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
30 minute summer	SW01	19	144.403	0.506	1578.8	11.6369	0.0000	OK
30 minute summer	SW02	19	143.678	0.522	1762.4	4.1367	0.0000	OK
15 minute summer	SW03	12	142.760	0.852	1945.0	3.7377	0.0000	OK
15 minute summer	SW04	12	142.637	0.935	2212.0	4.0516	0.0000	OK
15 minute summer	SW05	12	142.520	1.088	2602.3	11.9053	0.0000	OK
15 minute summer	SW06	12	142.377	1.052	3182.0	4.4718	0.0000	OK
15 minute summer	SW10	12	142.072	1.135	3820.3	18.1723	0.0000	OK
15 minute summer	OUTFALL	12	141.798	0.945	3793.5	0.0000	0.0000	OK
15 minute summer	SW101	10	158.880	0.145	23.1	0.2818	0.0000	OK
15 minute summer	SW102	10	158.774	0.158	55.7	0.3474	0.0000	OK
15 minute summer	SW103	10	159.398	0.050	15.1	0.0891	0.0000	OK
15 minute summer	SW104	11	158.406	0.183	92.6	0.3530	0.0000	OK
15 minute summer	SW105	11	156.791	0.213	104.1	0.2994	0.0000	OK
15 minute summer	SW106	11	156.325	0.174	106.5	0.2089	0.0000	OK
15 minute summer	SW107	10	156.572	0.191	89.6	0.9179	0.0000	OK
15 minute summer	SW108	10	156.628	0.089	31.1	0.1976	0.0000	OK
15 minute summer	SW109	12	156.076	0.281	137.1	0.4580	0.0000	OK
15 minute summer	SW110	12	155.989	0.549	167.9	0.9858	0.0000	SURCHARGED
15 minute summer	SW111	11	155.832	0.774	316.6	3.4753	0.0000	SURCHARGED
15 minute summer	SW112	12	155.179	0.453	310.1	1.1541	0.0000	OK
15 minute summer	SW113	11	156.355	0.264	74.9	1.1643	0.0000	OK
15 minute summer	SW114	11	156.318	0.412	220.1	2.6476	0.0000	OK
15 minute summer	SW115	10	155.985	0.263	362.1	1.7730	0.0000	OK
15 minute summer	SW116	11	155.327	0.393	434.5	1.9110	0.0000	OK
15 minute summer	SW117	11	151.701	0.266	722.7	0.6768	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m <sup>3</sup> )	Discharge Vol (m <sup>3</sup> )
30 minute summer	SW01	S1.000	SW02	1575.8	3.755	0.350	13.7136	
30 minute summer	SW02	S1.001	SW03	1755.5	4.741	0.348	10.4259	
15 minute summer	SW03	S1.002	SW04	1949.3	1.844	0.407	56.2726	
15 minute summer	SW04	S1.003	SW05	2215.7	1.828	0.463	85.0553	
15 minute summer	SW05	S1.004	SW06	2606.6	1.970	0.544	35.8645	
15 minute summer	SW06	S1.005	SW10	3193.0	2.320	0.668	134.1448	
15 minute summer	SW10	S1.006	OUTFALL	3793.5	2.916	0.792	26.8808	2029.6
15 minute summer	SW101	S1.100	SW102	22.7	0.801	0.705	0.8743	
15 minute summer	SW102	S1.101	SW104	54.9	1.713	0.751	0.6392	
15 minute summer	SW103	S2.100	SW104	15.1	2.325	0.239	0.0787	
15 minute summer	SW104	S1.102	SW105	91.9	2.749	0.933	1.4733	
15 minute summer	SW105	S1.103	SW106	104.6	2.260	0.753	1.3193	
15 minute summer	SW106	S1.104	SW111	105.7	2.155	0.499	1.4737	
15 minute summer	SW107	S3.100	SW109	88.7	1.421	0.511	5.3570	
15 minute summer	SW108	S4.100	SW109	30.9	2.227	0.290	0.2522	
15 minute summer	SW109	S3.101	SW110	138.8	1.726	0.576	2.4371	
15 minute summer	SW110	S3.102	SW111	147.7	1.487	0.617	2.3714	
15 minute summer	SW111	S1.105	SW112	310.1	1.967	1.523	9.7981	
15 minute summer	SW112	S1.106	SW117	308.0	1.692	1.007	12.4880	
15 minute summer	SW113	S5.100	SW114	72.4	0.846	0.574	2.5663	
15 minute summer	SW114	S5.101	SW115	217.5	1.559	1.066	3.7835	
15 minute summer	SW115	S5.102	SW116	361.4	2.552	0.439	3.8559	
15 minute summer	SW116	S5.103	SW117	436.3	2.697	0.793	6.0709	
15 minute summer	SW117	S1.107	SW118	721.5	5.269	0.459	3.4224	



**Results for 30 year Critical Storm Duration. Lowest mass balance: 99.86%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
15 minute summer	SW118	11	149.192	0.371	721.5	0.6550	0.0000	OK
15 minute summer	7-SW01	10	143.992	0.267	96.4	1.1215	0.0000	OK
15 minute summer	7-SW02	11	143.892	0.442	286.8	3.0944	0.0000	OK
15 minute summer	7-SW03	10	143.661	0.467	471.1	2.9736	0.0000	OK
15 minute summer	7-SW04	11	143.434	0.351	562.3	1.3512	0.0000	OK
15 minute summer	7-SW05	11	143.548	0.541	227.5	3.4992	0.0000	SURCHARGED
15 minute summer	7-SW06	11	143.454	0.477	224.7	0.6823	0.0000	SURCHARGED
15 minute summer	INT-02	11	143.369	0.512	224.9	0.1448	0.0000	SURCHARGED
15 minute summer	7-SW07	11	143.290	0.453	225.0	0.6478	0.0000	SURCHARGED
15 minute summer	7-SW08	10	143.852	0.361	68.9	1.2247	0.0000	SURCHARGED
15 minute summer	7-SW09	10	143.791	0.415	177.0	1.9476	0.0000	SURCHARGED
15 minute summer	INT-01	10	143.544	0.280	175.8	0.0791	0.0000	OK
15 minute summer	DL-01	11	143.603	0.303	50.6	0.8722	0.0000	SURCHARGED

  

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m <sup>3</sup> )	Discharge Vol (m <sup>3</sup> )
15 minute summer	SW118	S1.108	SW01	720.5	6.842	0.461	4.5922	
15 minute summer	7-SW01	7-S1.000	7-SW02	94.2	1.146	0.728	2.6103	
15 minute summer	7-SW02	7-S1.001	7-SW03	282.4	1.595	1.011	5.6303	
15 minute summer	7-SW03	7-S1.002	7-SW04	469.2	2.081	0.870	7.4334	
15 minute summer	7-SW04	7-S1.003	SW06	567.0	3.203	0.479	10.4069	
15 minute summer	7-SW05	7-S2.000	7-SW06	224.7	1.418	1.205	1.4154	
15 minute summer	7-SW06	7-S2.001	INT-02	224.9	1.423	1.197	0.9105	
15 minute summer	INT-02	7-S2.002	7-SW07	225.0	1.420	1.197	0.9293	
15 minute summer	7-SW07	7-S2.003	SW04	225.1	1.531	1.214	3.6475	
15 minute summer	7-SW08	7-S3.000	7-SW09	67.6	0.960	0.938	0.6645	
15 minute summer	7-SW09	7-S3.001	INT-01	175.8	1.616	1.502	0.3594	
15 minute summer	INT-01	7-S3.002	SW03	174.4	2.164	0.745	1.3631	
15 minute summer	DL-01	DOCK	7-SW05	48.7	0.891	0.660	1.5862	



**Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.86%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
30 minute summer	SW01	20	145.267	1.370	2754.3	31.5405	0.0000	SURCHARGED
30 minute summer	SW02	20	144.740	1.584	3095.4	12.5498	0.0000	SURCHARGED
30 minute summer	SW03	19	144.160	2.251	3448.9	9.8794	0.0000	SURCHARGED
30 minute summer	SW04	19	143.966	2.264	3766.0	9.8109	0.0000	SURCHARGED
30 minute summer	SW05	19	143.703	2.271	4402.2	24.8586	0.0000	SURCHARGED
30 minute summer	SW06	19	143.458	2.133	5371.5	9.0650	0.0000	SURCHARGED
30 minute summer	SW10	19	142.759	1.823	6576.3	29.1789	0.0000	SURCHARGED
30 minute summer	OUTFALL	19	142.164	1.311	6563.8	0.0000	0.0000	OK
15 minute summer	SW101	11	160.164	1.429	41.8	2.7765	2.0277	FLOOD
15 minute summer	SW102	11	160.158	1.542	83.5	3.3974	0.0000	FLOOD RISK
15 minute summer	SW103	12	159.844	0.496	27.4	0.8842	0.0000	SURCHARGED
15 minute summer	SW104	11	159.648	1.425	133.5	2.7517	3.1705	FLOOD
15 minute summer	SW105	12	157.721	1.143	129.5	1.6087	0.0000	SURCHARGED
15 minute summer	SW106	12	157.310	1.160	127.0	1.3889	0.0000	SURCHARGED
15 minute summer	SW107	11	157.606	1.225	162.1	5.8849	5.7322	FLOOD
30 minute summer	SW108	19	157.619	1.080	53.2	2.4038	0.0000	SURCHARGED
30 minute summer	SW109	19	157.452	1.657	203.0	2.7000	0.0000	FLOOD RISK
30 minute summer	SW110	19	157.230	1.790	217.6	3.2154	0.0000	SURCHARGED
30 minute summer	SW111	19	156.897	1.839	442.3	8.2589	0.2976	FLOOD
15 minute summer	SW112	12	155.508	0.783	435.8	1.9930	0.0000	SURCHARGED
15 minute summer	SW113	11	157.380	1.289	135.5	5.6781	0.0000	FLOOD RISK
15 minute summer	SW114	11	157.246	1.340	378.1	8.6212	0.0000	FLOOD RISK
15 minute summer	SW115	11	156.751	1.030	623.7	6.9301	0.0000	SURCHARGED
15 minute summer	SW116	11	156.101	1.167	743.6	5.6688	0.0000	SURCHARGED
15 minute summer	SW117	12	151.829	0.394	1162.1	1.0025	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m <sup>3</sup> )	Discharge Vol (m <sup>3</sup> )
30 minute summer	SW01	S1.000	SW02	2761.1	3.889	0.614	28.1875	
30 minute summer	SW02	S1.001	SW03	3113.9	4.665	0.618	24.2271	
30 minute summer	SW03	S1.002	SW04	3459.6	1.965	0.723	90.6332	
30 minute summer	SW04	S1.003	SW05	3776.6	2.145	0.789	118.7340	
30 minute summer	SW05	S1.004	SW06	4418.5	2.510	0.922	46.9679	
30 minute summer	SW06	S1.005	SW10	5368.9	3.050	1.124	171.6964	
30 minute summer	SW10	S1.006	OUTFALL	6563.8	3.738	1.370	35.0985	5061.2
15 minute summer	SW101	S1.100	SW102	28.6	0.824	0.890	1.2249	
15 minute summer	SW102	S1.101	SW104	73.1	1.839	1.001	0.7954	
15 minute summer	SW103	S2.100	SW104	24.8	2.365	0.394	0.1496	
15 minute summer	SW104	S1.102	SW105	106.4	2.675	1.080	1.7539	
15 minute summer	SW105	S1.103	SW106	123.6	2.294	0.890	1.9365	
15 minute summer	SW106	S1.104	SW111	129.2	2.094	0.610	1.8379	
15 minute summer	SW107	S3.100	SW109	130.0	1.454	0.750	8.5921	
30 minute summer	SW108	S4.100	SW109	47.8	2.320	0.449	0.5687	
30 minute summer	SW109	S3.101	SW110	170.6	1.689	0.707	2.7023	
30 minute summer	SW110	S3.102	SW111	209.5	1.900	0.875	2.3714	
30 minute summer	SW111	S1.105	SW112	437.3	2.760	2.148	10.2354	
15 minute summer	SW112	S1.106	SW117	437.0	2.039	1.428	14.0842	
15 minute summer	SW113	S5.100	SW114	126.5	1.147	1.002	3.0221	
15 minute summer	SW114	S5.101	SW115	368.3	2.325	1.804	4.3414	
15 minute summer	SW115	S5.102	SW116	614.3	2.844	0.746	5.9193	
15 minute summer	SW116	S5.103	SW117	739.6	3.424	1.344	8.0407	
15 minute summer	SW117	S1.107	SW118	1164.3	6.244	0.741	4.6645	



**Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.86%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
15 minute winter	SW118	11	149.285	0.464	1110.1	0.8206	0.0000	OK
15 minute summer	7-SW01	12	145.052	1.327	174.4	5.5792	0.0000	FLOOD RISK
15 minute summer	7-SW02	11	144.829	1.379	509.7	9.6544	0.0000	SURCHARGED
15 minute summer	7-SW03	11	144.464	1.271	840.3	8.0852	0.0000	SURCHARGED
15 minute summer	7-SW04	11	144.131	1.048	1003.3	4.0350	0.0000	SURCHARGED
15 minute summer	7-SW05	11	144.437	1.430	381.4	9.2558	0.0000	SURCHARGED
15 minute summer	7-SW06	11	144.321	1.344	355.1	1.9229	0.0000	SURCHARGED
30 minute summer	INT-02	19	144.228	1.371	351.6	0.3880	0.0000	SURCHARGED
30 minute summer	7-SW07	19	144.145	1.308	349.2	1.8713	0.0000	SURCHARGED
15 minute summer	7-SW08	12	144.936	1.445	124.6	4.8990	0.0000	FLOOD RISK
15 minute summer	7-SW09	12	144.795	1.419	314.3	6.6529	0.0000	FLOOD RISK
30 minute summer	INT-01	19	144.589	1.325	282.9	0.3749	0.0000	SURCHARGED
30 minute summer	DL-01	21	144.396	1.096	126.0	22.8330	0.0000	SURCHARGED

  

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m <sup>3</sup> )	Discharge Vol (m <sup>3</sup> )
15 minute winter	SW118	S1.108	SW01	1113.8	7.269	0.712	7.8150	
15 minute summer	7-SW01	7-S1.000	7-SW02	160.9	1.459	1.244	3.2724	
15 minute summer	7-SW02	7-S1.001	7-SW03	491.6	2.276	1.760	6.9087	
15 minute summer	7-SW03	7-S1.002	7-SW04	828.9	2.344	1.538	11.8017	
15 minute summer	7-SW04	7-S1.003	SW06	914.8	3.398	0.774	20.9857	
15 minute summer	7-SW05	7-S2.000	7-SW06	355.1	2.241	1.904	1.4154	
15 minute summer	7-SW06	7-S2.001	INT-02	334.9	2.114	1.782	0.9294	
30 minute summer	INT-02	7-S2.002	7-SW07	349.2	2.204	1.858	0.9294	
30 minute summer	7-SW07	7-S2.003	SW04	345.1	2.181	1.861	4.0571	
15 minute summer	7-SW08	7-S3.000	7-SW09	116.1	1.649	1.611	0.6645	
15 minute summer	7-SW09	7-S3.001	INT-01	304.0	2.757	2.598	0.3831	
30 minute summer	INT-01	7-S3.002	SW03	281.2	2.550	1.201	1.8636	
30 minute summer	DL-01	DOCK	7-SW05	165.8	2.355	2.249	1.5863	