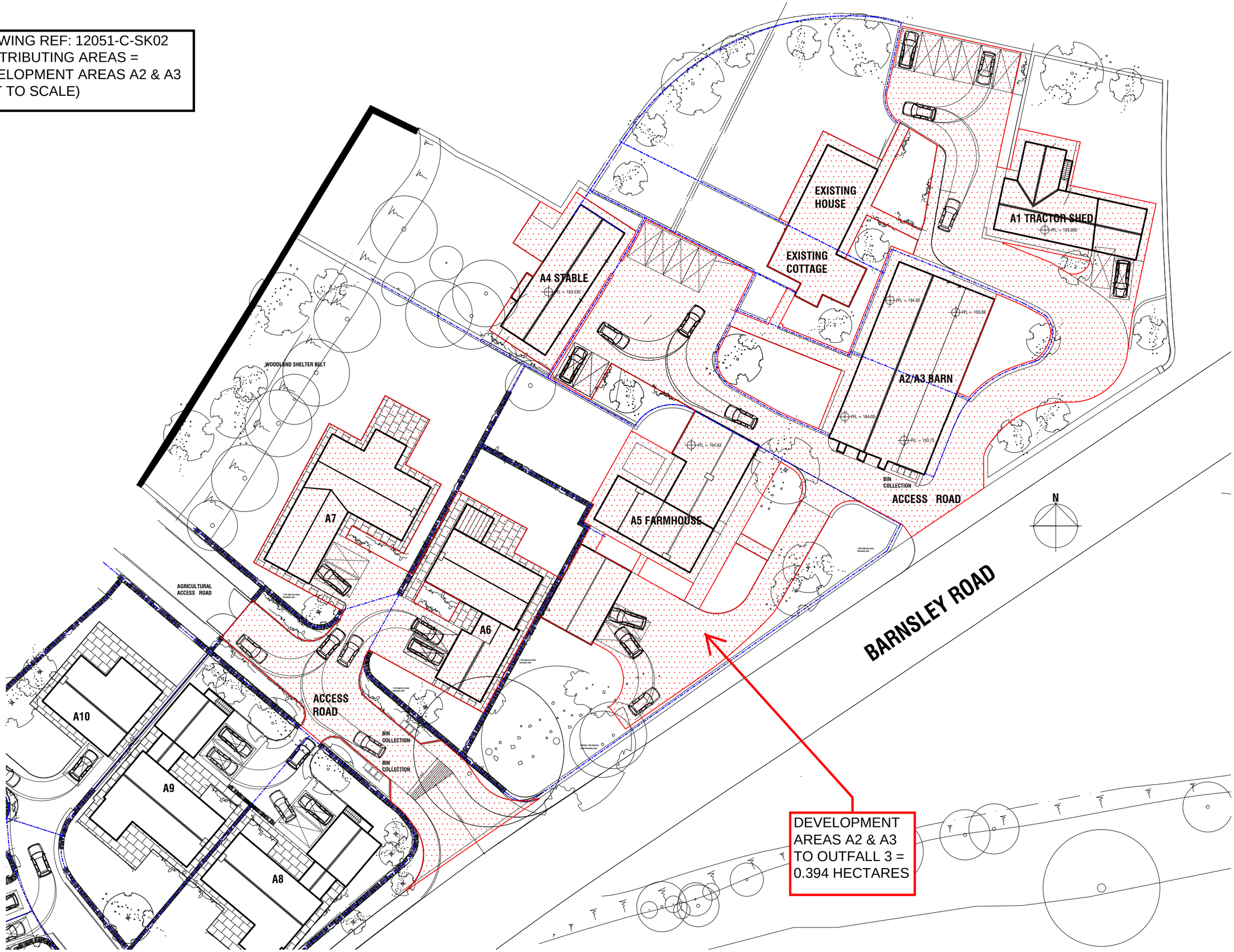
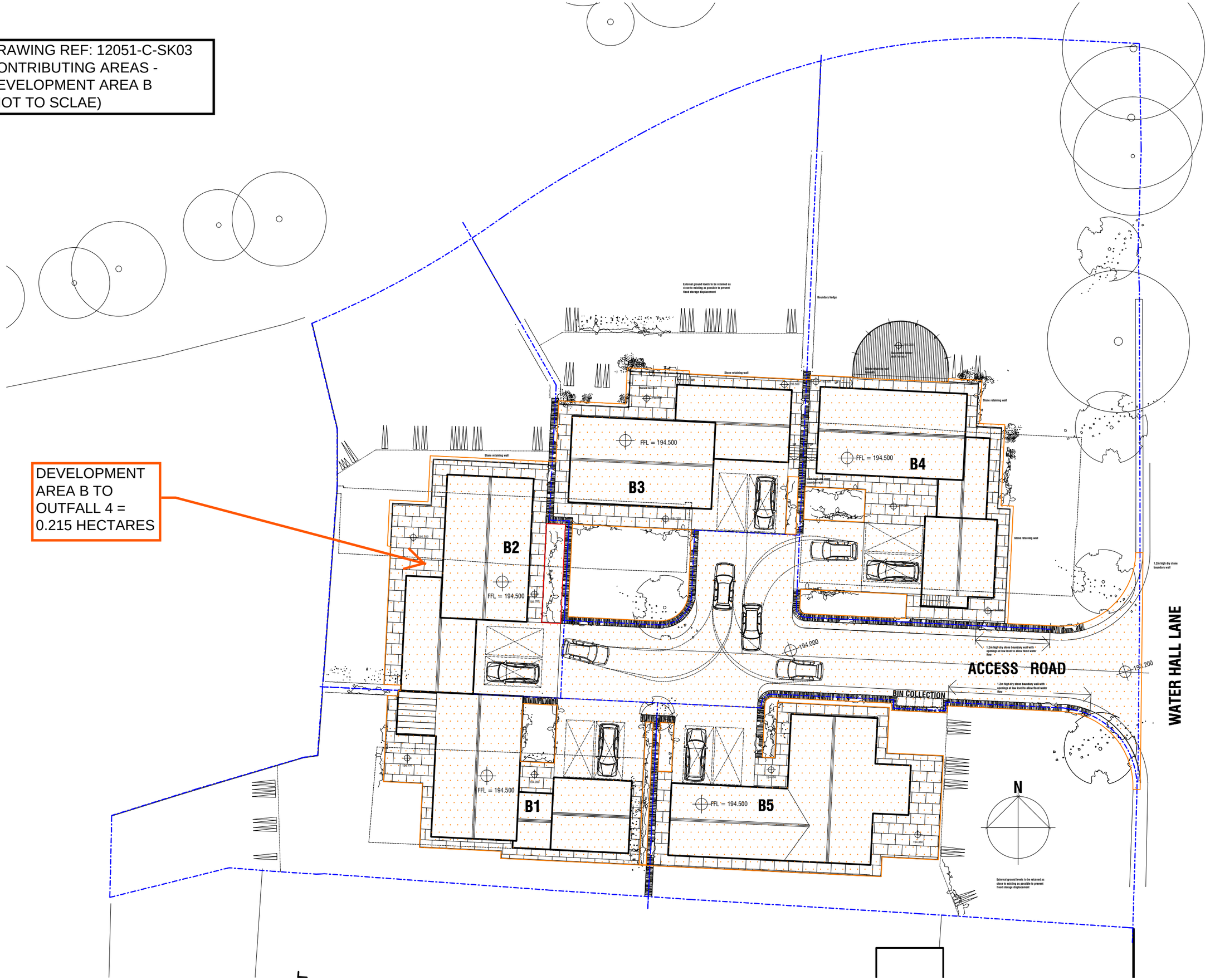
DRAWING REF: 12051-C-SK02
CONTRIBUTING AREAS =
DEVELOPMENT AREAS A2 & A3
(NOT TO SCALE)



DRAWING REF: 12051-C-SK03
CONTRIBUTING AREAS -
DEVELOPMENT AREA B
(NOT TO SCLAE)

DEVELOPMENT
AREA B TO
OUTFALL 4 =
0.215 HECTARES



APPENDIX H
Modified Rational Method: Indicative Attenuation Volume Calculations

Modified Rational Method

Length (m)	17	m
Area (ha)	0.102	Ha
Max Height	197.0	mAOD
Min Height	194.9	mAOD
DeltaH	2.1	
Slope (%)	12.35	
Te (mins)	5.45	mins
ARF	0.998	
SAAR	1181.000	mm
UCWI	127	mm
PIMP	100.0	%
SOIL	0.49	
Percentage Runoff PR	84.36	
DEEPSTOR	0.21	

Cv	0.84356	
Cr	1.3	
allowable outflow		
2 year	0.005	m^3/s

m3

Storage	RT years	Storage
	2 + 30% cc	3

Return Period flood 2 + 30% cc years

Post Development Rainfall 2 years

Development Area A1 to Outfall 1

Rainfall Duration (hours)	Rainfall Duration (days)	Rainfall Depth (mm)	30% increase	Effective Depth (mm)	Rainfall Intensity (mm/hr)	FLOW (l/s)	FLOW (l/s/ha)	RUN-OFF		Allowable Outflow (m^3)	Difference (m^3)
								FLOW (m^3)	RAIN (m^3)		
0.25	0.010	5.43	7.059	7.7	21.7	6.8	66.2	6	8	4.50	3
0.5	0.021	7.9	10.27	11.3	15.8	4.9	48.2	9	11	9.00	2
0.75	0.031	9.73	12.649	13.9	13.0	4.0	39.6	11	14	13.50	1
1	0.042	11.24	14.612	16.0	11.2	3.5	34.3	13	16	18.00	-2
1.25	0.052	12.54	16.302	17.9	10.0	3.1	30.6	14	18	22.50	-4
1.5	0.063	13.71	17.823	19.5	9.1	2.8	27.9	15	20	27.00	-7
1.75	0.073	14.76	19.188	21.0	8.4	2.6	25.7	17	21	31.50	-10
2	0.083	15.74	20.462	22.4	7.9	2.4	24.0	18	23	36.00	-13
2.25	0.094	16.65	21.645	23.7	7.4	2.3	22.6	19	24	40.50	-16
2.5	0.104	17.5	22.75	24.9	7.0	2.2	21.3	20	25	45.00	-20
2.75	0.115	18.31	23.803	26.1	6.7	2.1	20.3	20	27	49.50	-23
3	0.125	19.07	24.791	27.2	6.4	2.0	19.4	21	28	54.00	-26
3.25	0.135	19.8	25.74	28.2	6.1	1.9	18.6	22	29	58.50	-30
3.5	0.146	20.5	26.65	29.2	5.9	1.8	17.9	23	30	63.00	-33
3.75	0.156	21.17	27.521	30.2	5.6	1.8	17.2	24	31	67.50	-37
4	0.167	21.82	28.366	31.1	5.5	1.7	16.6	24	32	72.00	-40
4.25	0.177	22.44	29.172	32.0	5.3	1.6	16.1	25	33	76.50	-44
4.5	0.188	23.04	29.952	32.8	5.1	1.6	15.6	26	34	81.00	-47
4.75	0.198	23.63	30.719	33.7	5.0	1.5	15.2	26	34	85.50	-51
5	0.208	24.19	31.447	34.5	4.8	1.5	14.7	27	35	90.00	-55
5.25	0.219	24.74	32.162	35.3	4.7	1.5	14.4	28	36	94.50	-59
5.5	0.229	25.28	32.864	36.0	4.6	1.4	14.0	28	37	99.00	-62
5.75	0.240	25.8	33.54	36.8	4.5	1.4	13.7	29	38	103.50	-66
6	0.250	26.31	34.203	37.5	4.4	1.4	13.4	29	38	108.00	-70
6.25	0.260	26.81	34.853	38.2	4.3	1.3	13.1	30	39	112.50	-74
6.5	0.271	27.3	35.49	38.9	4.2	1.3	12.8	31	40	117.00	-77
6.75	0.281	27.77	36.101	39.6	4.1	1.3	12.5	31	40	121.50	-81
7	0.292	28.24	36.712	40.3	4.0	1.3	12.3	32	41	126.00	-85
7.25	0.302	28.69	37.297	40.9	4.0	1.2	12.1	32	42	130.50	-89
7.5	0.313	29.14	37.882	41.5	3.9	1.2	11.8	33	42	135.00	-93
7.75	0.323	29.58	38.454	42.2	3.8	1.2	11.6	33	43	139.50	-96
8	0.333	30.01	39.013	42.8	3.8	1.2	11.4	34	44	144.00	-100
8.25	0.344	30.44	39.572	43.4	3.7	1.1	11.2	34	44	148.50	-104
8.5	0.354	30.85	40.105	44.0	3.6	1.1	11.1	35	45	153.00	-108
8.75	0.365	31.26	40.638	44.6	3.6	1.1	10.9	35	45	157.50	-112
9	0.375	31.66	41.158	45.1	3.5	1.1	10.7	35	46	162.00	-116
9.25	0.385	32.06	41.678	45.7	3.5	1.1	10.6	36	47	166.50	-120
9.5	0.396	32.45	42.185	46.3	3.4	1.1	10.4	36	47	171.00	-124
9.75	0.406	32.84	42.692	46.8	3.4	1.0	10.3	37	48	175.50	-128
10	0.417	33.22	43.186	47.4	3.3	1.0	10.1	37	48	180.00	-132

Modified Rational Method

Length (m)	17	m
Area (ha)	0.102	Ha
Max Height	197.0	mAOD
Min Height	194.9	mAOD
DeltaH	2.1	
Slope (%)	12.35	
Te (mins)	5.45	mins
ARF	0.998	
SAAR	1181.000	mm
UCWI	127	mm
PIMP	100.0	%
SOIL	0.49	
Percentage Runoff PR	84.36	
DEEPSTOR	0.21	

Cv	0.84356	
Cr	1.3	
allowable outflow		
30 year	0.0144	m^3/s

m3

Storage	RT years	Storage
	30 + 30% cc	9

Return Period flood 30 + 30% cc years

Post Development Rainfall 30 years

Development Area A1 to Outfall 1

Rainfall Duration (hours)	Rainfall Duration (days)	Rainfall Depth (mm)	30% increase	Effective Depth (mm)	Rainfall Intensity (mm/hr)	FLOW (l/s)	FLOW (l/s/ha)	RUN-OFF		Allowable Outflow (m^3)	Difference (m^3)
								FLOW (m^3)	RAIN (m^3)		
0.25	0.010	15.29	19.877	21.8	61.2	19.0	186.5	17	22	12.96	9
0.5	0.021	21.04	27.352	30.0	42.1	13.1	128.3	24	31	25.92	5
0.75	0.031	25.08	32.604	35.8	33.4	10.4	101.9	28	36	38.88	-2
1	0.042	28.3	36.79	40.3	28.3	8.8	86.3	32	41	51.84	-11
1.25	0.052	31.03	40.339	44.2	24.8	7.7	75.7	35	45	64.80	-20
1.5	0.063	33.42	43.446	47.6	22.3	6.9	67.9	37	49	77.76	-29
1.75	0.073	35.56	46.228	50.7	20.3	6.3	61.9	40	52	90.72	-39
2	0.083	37.5	48.75	53.5	18.8	5.8	57.2	42	55	103.68	-49
2.25	0.094	39.3	51.09	56.0	17.5	5.4	53.2	44	57	116.64	-59
2.5	0.104	40.96	53.248	58.4	16.4	5.1	49.9	46	60	129.60	-70
2.75	0.115	42.52	55.276	60.6	15.5	4.8	47.1	48	62	142.56	-81
3	0.125	43.99	57.187	62.7	14.7	4.6	44.7	49	64	155.52	-92
3.25	0.135	45.38	58.994	64.7	14.0	4.3	42.6	51	66	168.48	-102
3.5	0.146	46.7	60.71	66.6	13.3	4.1	40.7	52	68	181.44	-114
3.75	0.156	47.96	62.348	68.4	12.8	4.0	39.0	54	70	194.40	-125
4	0.167	49.17	63.921	70.1	12.3	3.8	37.5	55	71	207.36	-136
4.25	0.177	50.33	65.429	71.8	11.8	3.7	36.1	56	73	220.32	-147
4.5	0.188	51.45	66.885	73.3	11.4	3.6	34.9	58	75	233.28	-158
4.75	0.198	52.52	68.276	74.9	11.1	3.4	33.7	59	76	246.24	-170
5	0.208	53.56	69.628	76.4	10.7	3.3	32.7	60	78	259.20	-181
5.25	0.219	54.57	70.941	77.8	10.4	3.2	31.7	61	79	272.16	-193
5.5	0.229	55.54	72.202	79.2	10.1	3.1	30.8	62	81	285.12	-204
5.75	0.240	56.49	73.437	80.5	9.8	3.1	30.0	63	82	298.08	-216
6	0.250	57.4	74.62	81.8	9.6	3.0	29.2	64	83	311.04	-228
6.25	0.260	58.3	75.79	83.1	9.3	2.9	28.4	65	85	324.00	-239
6.5	0.271	59.17	76.921	84.4	9.1	2.8	27.8	66	86	336.96	-251
6.75	0.281	60.02	78.026	85.6	8.9	2.8	27.1	67	87	349.92	-263
7	0.292	60.85	79.105	86.7	8.7	2.7	26.5	68	88	362.88	-274
7.25	0.302	61.66	80.158	87.9	8.5	2.6	25.9	69	90	375.84	-286
7.5	0.313	62.45	81.185	89.0	8.3	2.6	25.4	70	91	388.80	-298
7.75	0.323	63.23	82.199	90.1	8.2	2.5	24.9	71	92	401.76	-310
8	0.333	63.98	83.174	91.2	8.0	2.5	24.4	72	93	414.72	-322
8.25	0.344	64.73	84.149	92.3	7.8	2.4	23.9	72	94	427.68	-334
8.5	0.354	65.46	85.098	93.3	7.7	2.4	23.5	73	95	440.64	-345
8.75	0.365	66.17	86.021	94.3	7.6	2.4	23.1	74	96	453.60	-357
9	0.375	66.87	86.931	95.3	7.4	2.3	22.7	75	97	466.56	-369
9.25	0.385	67.56	87.828	96.3	7.3	2.3	22.3	76	98	479.52	-381
9.5	0.396	68.24	88.712	97.3	7.2	2.2	21.9	76	99	492.48	-393
9.75	0.406	68.9	89.57	98.2	7.1	2.2	21.5	77	100	505.44	-405
10	0.417	69.56	90.428	99.2	7.0	2.2	21.2	78	101	518.40	-417

Modified Rational Method

Length (m)	17	m
Area (ha)	0.102	Ha
Max Height	197.0	mAOD
Min Height	194.9	mAOD
DeltaH	2.1	
Slope (%)	12.35	
Te (mins)	5.45	mins
ARF	0.998	
SAAR	1181.000	mm
UCWI	127	mm
PIMP	100.0	%
SOIL	0.49	
Percentage Runoff PR	84.36	
DEEPSTOR	0.21	

Cv	0.84356	
Cr	1.3	
allowable outflow		
100 year	0.0222	m^3/s

Storage	RT years	Storage
	100 + 30% cc	14

Return Period: flood — 100 + 30% cc years
Post Development: Rainfall — 100 years

Development Area A1 to Outfall 1

Rainfall Duration (hours)	Rainfall Duration (days)	Rainfall Depth (mm)	30% increase	Effective Depth (mm)	Rainfall Intensity (mm/hr)	FLOW (l/s)	FLOW (l/s/ha)	RUN-OFF		Allowable Outflow (m^3)	Difference (m^3)
								FLOW (m^3)	RAIN (m^3)		
0.25	0.010	23.2	30.16	33.1	92.8	28.9	282.9	26	34	19.98	14
0.5	0.021	31.21	40.573	44.5	62.4	19.4	190.3	35	45	39.96	5
0.75	0.031	36.72	47.736	52.3	49.0	15.2	149.3	41	53	59.94	-7
1	0.042	41.06	53.378	58.5	41.1	12.8	125.2	46	60	79.92	-20
1.25	0.052	44.7	58.11	63.7	35.8	11.1	109.0	50	65	99.90	-35
1.5	0.063	47.85	62.205	68.2	31.9	9.9	97.3	54	70	119.88	-50
1.75	0.073	50.67	65.871	72.2	29.0	9.0	88.3	57	74	139.86	-66
2	0.083	53.21	69.173	75.9	26.6	8.3	81.1	60	77	159.84	-82
2.25	0.094	55.54	72.202	79.2	24.7	7.7	75.3	62	81	179.82	-99
2.5	0.104	57.7	75.01	82.3	23.1	7.2	70.4	65	84	199.80	-116
2.75	0.115	59.71	77.623	85.1	21.7	6.8	66.2	67	87	219.78	-133
3	0.125	61.6	80.08	87.8	20.5	6.4	62.6	69	90	239.76	-150
3.25	0.135	63.38	82.394	90.4	19.5	6.1	59.5	71	92	259.74	-168
3.5	0.146	65.07	84.591	92.8	18.6	5.8	56.7	73	95	279.72	-185
3.75	0.156	66.68	86.684	95.1	17.8	5.5	54.2	75	97	299.70	-203
4	0.167	68.22	88.686	97.3	17.1	5.3	52.0	76	99	319.68	-220
4.25	0.177	69.69	90.597	99.4	16.4	5.1	50.0	78	101	339.66	-238
4.5	0.188	71.1	92.43	101.4	15.8	4.9	48.2	80	103	359.64	-256
4.75	0.198	72.46	94.198	103.3	15.3	4.7	46.5	81	105	379.62	-274
5	0.208	73.77	95.901	105.2	14.8	4.6	45.0	83	107	399.60	-292
5.25	0.219	75.04	97.552	107.0	14.3	4.4	43.6	84	109	419.58	-310
5.5	0.229	76.27	99.151	108.7	13.9	4.3	42.3	85	111	439.56	-329
5.75	0.240	77.45	100.685	110.4	13.5	4.2	41.1	87	113	459.54	-347
6	0.250	78.6	102.18	112.1	13.1	4.1	39.9	88	114	479.52	-365
6.25	0.260	79.72	103.636	113.7	12.8	4.0	38.9	89	116	499.50	-384
6.5	0.271	80.81	105.053	115.2	12.4	3.9	37.9	90	118	519.48	-402
6.75	0.281	81.87	106.431	116.7	12.1	3.8	37.0	92	119	539.46	-420
7	0.292	82.91	107.783	118.2	11.8	3.7	36.1	93	121	559.44	-439
7.25	0.302	83.92	109.096	119.6	11.6	3.6	35.3	94	122	579.42	-457
7.5	0.313	84.9	110.37	121.0	11.3	3.5	34.5	95	123	599.40	-476
7.75	0.323	85.86	111.618	122.4	11.1	3.4	33.8	96	125	619.38	-495
8	0.333	86.8	112.84	123.7	10.9	3.4	33.1	97	126	639.36	-513
8.25	0.344	87.72	114.036	125.1	10.6	3.3	32.4	98	128	659.34	-532
8.5	0.354	88.63	115.219	126.4	10.4	3.2	31.8	99	129	679.32	-550
8.75	0.365	89.51	116.363	127.6	10.2	3.2	31.2	100	130	699.30	-569
9	0.375	90.38	117.494	128.8	10.0	3.1	30.6	101	131	719.28	-588
9.25	0.385	91.23	118.599	130.1	9.9	3.1	30.1	102	133	739.26	-607
9.5	0.396	92.06	119.678	131.2	9.7	3.0	29.5	103	134	759.24	-625
9.75	0.406	92.88	120.744	132.4	9.5	3.0	29.0	104	135	779.22	-644
10	0.417	93.69	121.797	133.6	9.4	2.9	28.6	105	136	799.20	-663

Modified Rational Method

Length (m)	48	m
Area (ha)	0.120	Ha
Max Height	196.3	mAOD
Min Height	194.7	mAOD
DeltaH	1.6	
Slope (%)	3.27	
Te (mins)	9.00	mins
ARF	0.999	
SAAR	1181.000	mm
UCWI	127	mm
PIMP	100.0	%
SOIL	0.49	
Percentage Runoff PR	84.36	
DEEPSTOR	0.40	

Cv	0.84356	
Cr	1.3	
allowable outflow		
2 year	0.0059	m^3/s

m3

Storage	RT years	Storage
	2 + 30% cc	4

Return Period flood 2 + 30% cc years

Post Development Rainfall 2 years

Development Area A1 to Outfall 2

Rainfall Duration (hours)	Rainfall Duration (days)	Rainfall Depth (mm)	30% increase	Effective Depth (mm)	Rainfall Intensity (mm/hr)	FLOW (l/s)	FLOW (l/s/ha)	RUN-OFF		Allowable Outflow (m^3)	Difference (m^3)
								FLOW (m^3)	RAIN (m^3)		
0.25	0.010	5.43	7.059	7.7	21.7	7.9	66.2	7	9	5.31	4
0.5	0.021	7.9	10.27	11.3	15.8	5.8	48.2	10	14	10.62	3
0.75	0.031	9.73	12.649	13.9	13.0	4.7	39.6	13	17	15.93	1
1	0.042	11.24	14.612	16.0	11.2	4.1	34.3	15	19	21.24	-2
1.25	0.052	12.54	16.302	17.9	10.0	3.7	30.6	17	21	26.55	-5
1.5	0.063	13.71	17.823	19.5	9.1	3.3	27.9	18	23	31.86	-8
1.75	0.073	14.76	19.188	21.0	8.4	3.1	25.7	19	25	37.17	-12
2	0.083	15.74	20.462	22.4	7.9	2.9	24.0	21	27	42.48	-16
2.25	0.094	16.65	21.645	23.7	7.4	2.7	22.6	22	28	47.79	-19
2.5	0.104	17.5	22.75	24.9	7.0	2.6	21.3	23	30	53.10	-23
2.75	0.115	18.31	23.803	26.1	6.7	2.4	20.3	24	31	58.41	-27
3	0.125	19.07	24.791	27.2	6.4	2.3	19.4	25	33	63.72	-31
3.25	0.135	19.8	25.74	28.2	6.1	2.2	18.6	26	34	69.03	-35
3.5	0.146	20.5	26.65	29.2	5.9	2.1	17.9	27	35	74.34	-39
3.75	0.156	21.17	27.521	30.2	5.6	2.1	17.2	28	36	79.65	-43
4	0.167	21.82	28.366	31.1	5.5	2.0	16.6	29	37	84.96	-48
4.25	0.177	22.44	29.172	32.0	5.3	1.9	16.1	30	38	90.27	-52
4.5	0.188	23.04	29.952	32.8	5.1	1.9	15.6	30	39	95.58	-56
4.75	0.198	23.63	30.719	33.7	5.0	1.8	15.2	31	40	100.89	-60
5	0.208	24.19	31.447	34.5	4.8	1.8	14.7	32	41	106.20	-65
5.25	0.219	24.74	32.162	35.3	4.7	1.7	14.4	33	42	111.51	-69
5.5	0.229	25.28	32.864	36.0	4.6	1.7	14.0	33	43	116.82	-74
5.75	0.240	25.8	33.54	36.8	4.5	1.6	13.7	34	44	122.13	-78
6	0.250	26.31	34.203	37.5	4.4	1.6	13.4	35	45	127.44	-82
6.25	0.260	26.81	34.853	38.2	4.3	1.6	13.1	35	46	132.75	-87
6.5	0.271	27.3	35.49	38.9	4.2	1.5	12.8	36	47	138.06	-91
6.75	0.281	27.77	36.101	39.6	4.1	1.5	12.5	37	48	143.37	-96
7	0.292	28.24	36.712	40.3	4.0	1.5	12.3	37	48	148.68	-100
7.25	0.302	28.69	37.297	40.9	4.0	1.4	12.1	38	49	153.99	-105
7.5	0.313	29.14	37.882	41.5	3.9	1.4	11.8	38	50	159.30	-109
7.75	0.323	29.58	38.454	42.2	3.8	1.4	11.6	39	51	164.61	-114
8	0.333	30.01	39.013	42.8	3.8	1.4	11.4	40	51	169.92	-119
8.25	0.344	30.44	39.572	43.4	3.7	1.3	11.2	40	52	175.23	-123
8.5	0.354	30.85	40.105	44.0	3.6	1.3	11.1	41	53	180.54	-128
8.75	0.365	31.26	40.638	44.6	3.6	1.3	10.9	41	53	185.85	-132
9	0.375	31.66	41.158	45.1	3.5	1.3	10.7	42	54	191.16	-137
9.25	0.385	32.06	41.678	45.7	3.5	1.3	10.6	42	55	196.47	-142
9.5	0.396	32.45	42.185	46.3	3.4	1.2	10.4	43	56	201.78	-146
9.75	0.406	32.84	42.692	46.8	3.4	1.2	10.3	43	56	207.09	-151
10	0.417	33.22	43.186	47.4	3.3	1.2	10.1	44	57	212.40	-156

Modified Rational Method

Length (m)	48	m
Area (ha)	0.120	Ha
Max Height	196.3	mAOD
Min Height	194.7	mAOD
DeltaH	1.6	
Slope (%)	3.27	
Te (mins)	9.00	mins
ARF	0.999	
SAAR	1181.000	mm
UCWI	127	mm
PIMP	100.0	%
SOIL	0.49	
Percentage Runoff PR	84.36	
DEEPSTOR	0.40	

Cv	0.84356	
Cr	1.3	
allowable outflow		
30 year	0.017	m^3/s

Storage	RT years	Storage
		m3
	30 + 30% cc	11

Return Period flood 30 + 30% cc years

Post Development Rainfall 30 years

Development Area A1 to Outfall 2

Rainfall Duration (hours)	Rainfall Duration (days)	Rainfall Depth (mm)	30% increase	Effective Depth (mm)	Rainfall Intensity (mm/hr)	FLOW (l/s)	FLOW (l/s/ha)	RUN-OFF		Allowable Outflow (m^3)	Difference (m^3)
								FLOW (m^3)	RAIN (m^3)		
0.25	0.010	15.29	19.877	21.8	61.2	22.4	186.5	20	26	15.30	11
0.5	0.021	21.04	27.352	30.0	42.1	15.4	128.3	28	36	30.60	5
0.75	0.031	25.08	32.604	35.8	33.4	12.2	101.9	33	43	45.90	-3
1	0.042	28.3	36.79	40.3	28.3	10.4	86.3	37	48	61.20	-13
1.25	0.052	31.03	40.339	44.2	24.8	9.1	75.7	41	53	76.50	-23
1.5	0.063	33.42	43.446	47.6	22.3	8.2	67.9	44	57	91.80	-35
1.75	0.073	35.56	46.228	50.7	20.3	7.4	61.9	47	61	107.10	-46
2	0.083	37.5	48.75	53.5	18.8	6.9	57.2	49	64	122.40	-58
2.25	0.094	39.3	51.09	56.0	17.5	6.4	53.2	52	67	137.70	-70
2.5	0.104	40.96	53.248	58.4	16.4	6.0	49.9	54	70	153.00	-83
2.75	0.115	42.52	55.276	60.6	15.5	5.7	47.1	56	73	168.30	-96
3	0.125	43.99	57.187	62.7	14.7	5.4	44.7	58	75	183.60	-108
3.25	0.135	45.38	58.994	64.7	14.0	5.1	42.6	60	78	198.90	-121
3.5	0.146	46.7	60.71	66.6	13.3	4.9	40.7	62	80	214.20	-134
3.75	0.156	47.96	62.348	68.4	12.8	4.7	39.0	63	82	229.50	-147
4	0.167	49.17	63.921	70.1	12.3	4.5	37.5	65	84	244.80	-161
4.25	0.177	50.33	65.429	71.8	11.8	4.3	36.1	66	86	260.10	-174
4.5	0.188	51.45	66.885	73.3	11.4	4.2	34.9	68	88	275.40	-187
4.75	0.198	52.52	68.276	74.9	11.1	4.0	33.7	69	90	290.70	-201
5	0.208	53.56	69.628	76.4	10.7	3.9	32.7	71	92	306.00	-214
5.25	0.219	54.57	70.941	77.8	10.4	3.8	31.7	72	93	321.30	-228
5.5	0.229	55.54	72.202	79.2	10.1	3.7	30.8	73	95	336.60	-242
5.75	0.240	56.49	73.437	80.5	9.8	3.6	30.0	74	97	351.90	-255
6	0.250	57.4	74.62	81.8	9.6	3.5	29.2	76	98	367.20	-269
6.25	0.260	58.3	75.79	83.1	9.3	3.4	28.4	77	100	382.50	-283
6.5	0.271	59.17	76.921	84.4	9.1	3.3	27.8	78	101	397.80	-297
6.75	0.281	60.02	78.026	85.6	8.9	3.3	27.1	79	103	413.10	-310
7	0.292	60.85	79.105	86.7	8.7	3.2	26.5	80	104	428.40	-324
7.25	0.302	61.66	80.158	87.9	8.5	3.1	25.9	81	105	443.70	-338
7.5	0.313	62.45	81.185	89.0	8.3	3.0	25.4	82	107	459.00	-352
7.75	0.323	63.23	82.199	90.1	8.2	3.0	24.9	83	108	474.30	-366
8	0.333	63.98	83.174	91.2	8.0	2.9	24.4	84	109	489.60	-380
8.25	0.344	64.73	84.149	92.3	7.8	2.9	23.9	85	111	504.90	-394
8.5	0.354	65.46	85.098	93.3	7.7	2.8	23.5	86	112	520.20	-408
8.75	0.365	66.17	86.021	94.3	7.6	2.8	23.1	87	113	535.50	-422
9	0.375	66.87	86.931	95.3	7.4	2.7	22.7	88	114	550.80	-436
9.25	0.385	67.56	87.828	96.3	7.3	2.7	22.3	89	116	566.10	-451
9.5	0.396	68.24	88.712	97.3	7.2	2.6	21.9	90	117	581.40	-465
9.75	0.406	68.9	89.57	98.2	7.1	2.6	21.5	91	118	596.70	-479
10	0.417	69.56	90.428	99.2	7.0	2.5	21.2	92	119	612.00	-493

Modified Rational Method

Length (m)	48	m
Area (ha)	0.120	Ha
Max Height	196.3	mAOD
Min Height	194.7	mAOD
DeltaH	1.6	
Slope (%)	3.27	
Te (mins)	9.00	mins
ARF	0.999	
SAAR	1181.000	mm
UCWI	127	mm
PIMP	100.0	%
SOIL	0.49	
Percentage Runoff PR	84.36	
DEEPSTOR	0.40	

Cv	0.84356	
Cr	1.3	
allowable outflow		
100 year	0.0261	m^3/s

Storage	RT years	Storage
	100 + 30% cc	16

Return Period: flood — 100 + 30% cc years

Post Development: Rainfall — 100 years

Development Area A1 to Outfall 2

Rainfall Duration (hours)	Rainfall Duration (days)	Rainfall Depth (mm)	30% increase	Effective Depth (mm)	Rainfall Intensity (mm/hr)	FLOW (l/s)	FLOW (l/s/ha)	RUN-OFF		Allowable Outflow (m^3)	Difference (m^3)
								FLOW (m^3)	RAIN (m^3)		
0.25	0.010	23.2	30.16	33.1	92.8	33.9	282.9	31	40	23.49	16
0.5	0.021	31.21	40.573	44.5	62.4	22.8	190.3	41	53	46.98	6
0.75	0.031	36.72	47.736	52.3	49.0	17.9	149.3	48	63	70.47	-8
1	0.042	41.06	53.378	58.5	41.1	15.0	125.2	54	70	93.96	-24
1.25	0.052	44.7	58.11	63.7	35.8	13.1	109.0	59	76	117.45	-41
1.5	0.063	47.85	62.205	68.2	31.9	11.7	97.3	63	82	140.94	-59
1.75	0.073	50.67	65.871	72.2	29.0	10.6	88.3	67	87	164.43	-78
2	0.083	53.21	69.173	75.9	26.6	9.7	81.1	70	91	187.92	-97
2.25	0.094	55.54	72.202	79.2	24.7	9.0	75.3	73	95	211.41	-116
2.5	0.104	57.7	75.01	82.3	23.1	8.4	70.4	76	99	234.90	-136
2.75	0.115	59.71	77.623	85.1	21.7	7.9	66.2	79	102	258.39	-156
3	0.125	61.6	80.08	87.8	20.5	7.5	62.6	81	105	281.88	-176
3.25	0.135	63.38	82.394	90.4	19.5	7.1	59.5	83	108	305.37	-197
3.5	0.146	65.07	84.591	92.8	18.6	6.8	56.7	86	111	328.86	-218
3.75	0.156	66.68	86.684	95.1	17.8	6.5	54.2	88	114	352.35	-238
4	0.167	68.22	88.686	97.3	17.1	6.2	52.0	90	117	375.84	-259
4.25	0.177	69.69	90.597	99.4	16.4	6.0	50.0	92	119	399.33	-280
4.5	0.188	71.1	92.43	101.4	15.8	5.8	48.2	94	122	422.82	-301
4.75	0.198	72.46	94.198	103.3	15.3	5.6	46.5	95	124	446.31	-322
5	0.208	73.77	95.901	105.2	14.8	5.4	45.0	97	126	469.80	-344
5.25	0.219	75.04	97.552	107.0	14.3	5.2	43.6	99	128	493.29	-365
5.5	0.229	76.27	99.151	108.7	13.9	5.1	42.3	100	130	516.78	-386
5.75	0.240	77.45	100.685	110.4	13.5	4.9	41.1	102	132	540.27	-408
6	0.250	78.6	102.18	112.1	13.1	4.8	39.9	104	134	563.76	-429
6.25	0.260	79.72	103.636	113.7	12.8	4.7	38.9	105	136	587.25	-451
6.5	0.271	80.81	105.053	115.2	12.4	4.5	37.9	106	138	610.74	-472
6.75	0.281	81.87	106.431	116.7	12.1	4.4	37.0	108	140	634.23	-494
7	0.292	82.91	107.783	118.2	11.8	4.3	36.1	109	142	657.72	-516
7.25	0.302	83.92	109.096	119.6	11.6	4.2	35.3	111	144	681.21	-538
7.5	0.313	84.9	110.37	121.0	11.3	4.1	34.5	112	145	704.70	-559
7.75	0.323	85.86	111.618	122.4	11.1	4.1	33.8	113	147	728.19	-581
8	0.333	86.8	112.84	123.7	10.9	4.0	33.1	114	148	751.68	-603
8.25	0.344	87.72	114.036	125.1	10.6	3.9	32.4	116	150	775.17	-625
8.5	0.354	88.63	115.219	126.4	10.4	3.8	31.8	117	152	798.66	-647
8.75	0.365	89.51	116.363	127.6	10.2	3.7	31.2	118	153	822.15	-669
9	0.375	90.38	117.494	128.8	10.0	3.7	30.6	119	155	845.64	-691
9.25	0.385	91.23	118.599	130.1	9.9	3.6	30.1	120	156	869.13	-713
9.5	0.396	92.06	119.678	131.2	9.7	3.5	29.5	121	157	892.62	-735
9.75	0.406	92.88	120.744	132.4	9.5	3.5	29.0	122	159	916.11	-757
10	0.417	93.69	121.797	133.6	9.4	3.4	28.6	123	160	939.60	-779

Modified Rational Method

Length (m)	48	m
Area (ha)	0.463	Ha
Max Height	196.3	mAOD
Min Height	194.7	mAOD
DeltaH	1.6	
Slope (%)	3.27	
Te (mins)	9.00	mins
ARF	0.998	
SAAR	1181.000	mm
UCWI	127	mm
PIMP	100.0	%
SOIL	0.49	
Percentage Runoff PR	84.36	
DEEPSTOR	0.40	

Cv	0.84356	
Cr	1.3	
allowable outflow		
2 year	0.0223	m^3/s

Storage	RT years	Storage
	2 + 30% cc	16

m3

Return Period flood 2 + 30% cc years — Development Area A1, A2 & A3 to Outfall 3

Post Development Rainfall 2 years

Rainfall Duration (hours)	Rainfall Duration (days)	Rainfall Depth (mm)	30% increase	Effective Depth (mm)	Rainfall Intensity (mm/hr)	FLOW (l/s)	FLOW (l/s/ha)	RUN-OFF		Allowable Outflow (m^3)	Difference (m^3)
								FLOW (m^3)	RAIN (m^3)		
0.25	0.010	5.43	7.059	7.7	21.7	30.7	66.2	28	36	20.07	16
0.5	0.021	7.9	10.27	11.3	15.8	22.3	48.2	40	52	40.14	12
0.75	0.031	9.73	12.649	13.9	13.0	18.3	39.6	49	64	60.21	4
1	0.042	11.24	14.612	16.0	11.2	15.9	34.3	57	74	80.28	-6
1.25	0.052	12.54	16.302	17.9	10.0	14.2	30.6	64	83	100.35	-18
1.5	0.063	13.71	17.823	19.5	9.1	12.9	27.9	70	90	120.42	-30
1.75	0.073	14.76	19.188	21.0	8.4	11.9	25.7	75	97	140.49	-43
2	0.083	15.74	20.462	22.4	7.9	11.1	24.0	80	104	160.56	-57
2.25	0.094	16.65	21.645	23.7	7.4	10.4	22.6	85	110	180.63	-71
2.5	0.104	17.5	22.75	24.9	7.0	9.9	21.3	89	116	200.70	-85
2.75	0.115	18.31	23.803	26.1	6.7	9.4	20.3	93	121	220.77	-100
3	0.125	19.07	24.791	27.2	6.4	9.0	19.4	97	126	240.84	-115
3.25	0.135	19.8	25.74	28.2	6.1	8.6	18.6	101	131	260.91	-130
3.5	0.146	20.5	26.65	29.2	5.9	8.3	17.9	104	135	280.98	-146
3.75	0.156	21.17	27.521	30.2	5.6	8.0	17.2	108	140	301.05	-161
4	0.167	21.82	28.366	31.1	5.5	7.7	16.6	111	144	321.12	-177
4.25	0.177	22.44	29.172	32.0	5.3	7.5	16.1	114	148	341.19	-193
4.5	0.188	23.04	29.952	32.8	5.1	7.2	15.6	117	152	361.26	-209
4.75	0.198	23.63	30.719	33.7	5.0	7.0	15.2	120	156	381.33	-225
5	0.208	24.19	31.447	34.5	4.8	6.8	14.7	123	160	401.40	-242
5.25	0.219	24.74	32.162	35.3	4.7	6.7	14.4	126	163	421.47	-258
5.5	0.229	25.28	32.864	36.0	4.6	6.5	14.0	128	167	441.54	-275
5.75	0.240	25.8	33.54	36.8	4.5	6.3	13.7	131	170	461.61	-291
6	0.250	26.31	34.203	37.5	4.4	6.2	13.4	134	174	481.68	-308
6.25	0.260	26.81	34.853	38.2	4.3	6.1	13.1	136	177	501.75	-325
6.5	0.271	27.3	35.49	38.9	4.2	5.9	12.8	139	180	521.82	-342
6.75	0.281	27.77	36.101	39.6	4.1	5.8	12.5	141	183	541.89	-359
7	0.292	28.24	36.712	40.3	4.0	5.7	12.3	144	186	561.96	-376
7.25	0.302	28.69	37.297	40.9	4.0	5.6	12.1	146	189	582.03	-393
7.5	0.313	29.14	37.882	41.5	3.9	5.5	11.8	148	192	602.10	-410
7.75	0.323	29.58	38.454	42.2	3.8	5.4	11.6	150	195	622.17	-427
8	0.333	30.01	39.013	42.8	3.8	5.3	11.4	152	198	642.24	-444
8.25	0.344	30.44	39.572	43.4	3.7	5.2	11.2	155	201	662.31	-461
8.5	0.354	30.85	40.105	44.0	3.6	5.1	11.1	157	204	682.38	-479
8.75	0.365	31.26	40.638	44.6	3.6	5.0	10.9	159	206	702.45	-496
9	0.375	31.66	41.158	45.1	3.5	5.0	10.7	161	209	722.52	-514
9.25	0.385	32.06	41.678	45.7	3.5	4.9	10.6	163	212	742.59	-531
9.5	0.396	32.45	42.185	46.3	3.4	4.8	10.4	165	214	762.66	-548
9.75	0.406	32.84	42.692	46.8	3.4	4.8	10.3	167	217	782.73	-566
10	0.417	33.22	43.186	47.4	3.3	4.7	10.1	169	219	802.80	-584

Modified Rational Method

Length (m)	48	m
Area (ha)	0.463	Ha
Max Height	196.3	mAOD
Min Height	194.7	mAOD
DeltaH	1.6	
Slope (%)	3.27	
Te (mins)	9.00	mins
ARF	0.998	
SAAR	1181.000	mm
UCWI	127	mm
PIMP	100.0	%
SOIL	0.49	
Percentage Runoff PR	84.36	
DEEPSTOR	0.40	

Cv	0.84356	
Cr	1.3	
allowable outflow		
30 year	0.0655	m^3/s

m3

Storage	RT years	Storage
	30 + 30% cc	42

Return Period flood **30 + 30% cc** years **Development Area A1, A2 & A3 to Outfall 3**

Post Development Rainfall **30** years

Rainfall Duration (hours)	Rainfall Duration (days)	Rainfall Depth (mm)	30% increase	Effective Depth (mm)	Rainfall Intensity (mm/hr)	FLOW (l/s)	FLOW (l/s/ha)	RUN-OFF		Allowable Outflow (m^3)	Difference (m^3)
								FLOW (m^3)	RAIN (m^3)		
0.25	0.010	15.29	19.877	21.8	61.2	86.3	186.5	78	101	58.95	42
0.5	0.021	21.04	27.352	30.0	42.1	59.4	128.3	107	139	117.90	21
0.75	0.031	25.08	32.604	35.8	33.4	47.2	101.9	127	166	176.85	-11
1	0.042	28.3	36.79	40.3	28.3	39.9	86.3	144	187	235.80	-49
1.25	0.052	31.03	40.339	44.2	24.8	35.0	75.7	158	205	294.75	-90
1.5	0.063	33.42	43.446	47.6	22.3	31.4	67.9	170	221	353.70	-133
1.75	0.073	35.56	46.228	50.7	20.3	28.7	61.9	181	235	412.65	-178
2	0.083	37.5	48.75	53.5	18.8	26.5	57.2	191	248	471.60	-224
2.25	0.094	39.3	51.09	56.0	17.5	24.7	53.2	200	259	530.55	-271
2.5	0.104	40.96	53.248	58.4	16.4	23.1	49.9	208	270	589.50	-319
2.75	0.115	42.52	55.276	60.6	15.5	21.8	47.1	216	281	648.45	-368
3	0.125	43.99	57.187	62.7	14.7	20.7	44.7	224	290	707.40	-417
3.25	0.135	45.38	58.994	64.7	14.0	19.7	42.6	231	300	766.35	-467
3.5	0.146	46.7	60.71	66.6	13.3	18.8	40.7	237	308	825.30	-517
3.75	0.156	47.96	62.348	68.4	12.8	18.1	39.0	244	317	884.25	-568
4	0.167	49.17	63.921	70.1	12.3	17.4	37.5	250	325	943.20	-619
4.25	0.177	50.33	65.429	71.8	11.8	16.7	36.1	256	332	1002.15	-670
4.5	0.188	51.45	66.885	73.3	11.4	16.1	34.9	261	340	1061.10	-721
4.75	0.198	52.52	68.276	74.9	11.1	15.6	33.7	267	347	1120.05	-773
5	0.208	53.56	69.628	76.4	10.7	15.1	32.7	272	354	1179.00	-825
5.25	0.219	54.57	70.941	77.8	10.4	14.7	31.7	277	360	1237.95	-878
5.5	0.229	55.54	72.202	79.2	10.1	14.3	30.8	282	367	1296.90	-930
5.75	0.240	56.49	73.437	80.5	9.8	13.9	30.0	287	373	1355.85	-983
6	0.250	57.4	74.62	81.8	9.6	13.5	29.2	292	379	1414.80	-1036
6.25	0.260	58.3	75.79	83.1	9.3	13.2	28.4	296	385	1473.75	-1089
6.5	0.271	59.17	76.921	84.4	9.1	12.8	27.8	301	391	1532.70	-1142
6.75	0.281	60.02	78.026	85.6	8.9	12.6	27.1	305	396	1591.65	-1195
7	0.292	60.85	79.105	86.7	8.7	12.3	26.5	309	402	1650.60	-1249
7.25	0.302	61.66	80.158	87.9	8.5	12.0	25.9	313	407	1709.55	-1303
7.5	0.313	62.45	81.185	89.0	8.3	11.8	25.4	317	412	1768.50	-1356
7.75	0.323	63.23	82.199	90.1	8.2	11.5	24.9	321	417	1827.45	-1410
8	0.333	63.98	83.174	91.2	8.0	11.3	24.4	325	422	1886.40	-1464
8.25	0.344	64.73	84.149	92.3	7.8	11.1	23.9	329	427	1945.35	-1518
8.5	0.354	65.46	85.098	93.3	7.7	10.9	23.5	333	432	2004.30	-1572
8.75	0.365	66.17	86.021	94.3	7.6	10.7	23.1	336	437	2063.25	-1626
9	0.375	66.87	86.931	95.3	7.4	10.5	22.7	340	441	2122.20	-1681
9.25	0.385	67.56	87.828	96.3	7.3	10.3	22.3	343	446	2181.15	-1735
9.5	0.396	68.24	88.712	97.3	7.2	10.1	21.9	347	450	2240.10	-1790
9.75	0.406	68.9	89.57	98.2	7.1	10.0	21.5	350	455	2299.05	-1844
10	0.417	69.56	90.428	99.2	7.0	9.8	21.2	353	459	2358.00	-1899

Modified Rational Method

Length (m)	48	m
Area (ha)	0.463	Ha
Max Height	196.3	mAOD
Min Height	194.7	mAOD
DeltaH	1.6	
Slope (%)	3.27	
Te (mins)	9.00	mins
ARF	0.998	
SAAR	1181.000	mm
UCWI	127	mm
PIMP	100.0	%
SOIL	0.49	
Percentage Runoff PR	84.36	
DEEPSTOR	0.40	

Cv	0.84356	
Cr	1.3	
allowable outflow		
100 year	0.1009	m^3/s

Storage	RT years	Storage
	100 + 30% cc	62

Return Period: flood 100 + 30% cc years
Post Development: Rainfall 100 years

Development Area A1, A2 & A3 to Outfall 3

Rainfall Duration (hours)	Rainfall Duration (days)	Rainfall Depth (mm)	30% increase	Effective Depth (mm)	Rainfall Intensity (mm/hr)	FLOW (l/s)	FLOW (l/s/ha)	RUN-OFF		Allowable Outflow (m^3)	Difference (m^3)
								FLOW (m^3)	RAIN (m^3)		
0.25	0.010	23.2	30.16	33.1	92.8	131.0	282.9	118	153	90.81	62
0.5	0.021	31.21	40.573	44.5	62.4	88.1	190.3	159	206	181.62	24
0.75	0.031	36.72	47.736	52.3	49.0	69.1	149.3	187	242	272.43	-30
1	0.042	41.06	53.378	58.5	41.1	58.0	125.2	209	271	363.24	-92
1.25	0.052	44.7	58.11	63.7	35.8	50.5	109.0	227	295	454.05	-159
1.5	0.063	47.85	62.205	68.2	31.9	45.0	97.3	243	316	544.86	-229
1.75	0.073	50.67	65.871	72.2	29.0	40.9	88.3	257	334	635.67	-301
2	0.083	53.21	69.173	75.9	26.6	37.6	81.1	270	351	726.48	-375
2.25	0.094	55.54	72.202	79.2	24.7	34.8	75.3	282	367	817.29	-451
2.5	0.104	57.7	75.01	82.3	23.1	32.6	70.4	293	381	908.10	-527
2.75	0.115	59.71	77.623	85.1	21.7	30.6	66.2	303	394	998.91	-605
3	0.125	61.6	80.08	87.8	20.5	29.0	62.6	313	407	1089.72	-683
3.25	0.135	63.38	82.394	90.4	19.5	27.5	59.5	322	418	1180.53	-762
3.5	0.146	65.07	84.591	92.8	18.6	26.2	56.7	331	430	1271.34	-842
3.75	0.156	66.68	86.684	95.1	17.8	25.1	54.2	339	440	1362.15	-922
4	0.167	68.22	88.686	97.3	17.1	24.1	52.0	347	450	1452.96	-1003
4.25	0.177	69.69	90.597	99.4	16.4	23.1	50.0	354	460	1543.77	-1084
4.5	0.188	71.1	92.43	101.4	15.8	22.3	48.2	361	469	1634.58	-1165
4.75	0.198	72.46	94.198	103.3	15.3	21.5	46.5	368	478	1725.39	-1247
5	0.208	73.77	95.901	105.2	14.8	20.8	45.0	375	487	1816.20	-1329
5.25	0.219	75.04	97.552	107.0	14.3	20.2	43.6	381	495	1907.01	-1412
5.5	0.229	76.27	99.151	108.7	13.9	19.6	42.3	388	503	1997.82	-1494
5.75	0.240	77.45	100.685	110.4	13.5	19.0	41.1	394	511	2088.63	-1577
6	0.250	78.6	102.18	112.1	13.1	18.5	39.9	399	519	2179.44	-1661
6.25	0.260	79.72	103.636	113.7	12.8	18.0	38.9	405	526	2270.25	-1744
6.5	0.271	80.81	105.053	115.2	12.4	17.5	37.9	411	533	2361.06	-1828
6.75	0.281	81.87	106.431	116.7	12.1	17.1	37.0	416	540	2451.87	-1911
7	0.292	82.91	107.783	118.2	11.8	16.7	36.1	421	547	2542.68	-1995
7.25	0.302	83.92	109.096	119.6	11.6	16.3	35.3	426	554	2633.49	-2080
7.5	0.313	84.9	110.37	121.0	11.3	16.0	34.5	431	560	2724.30	-2164
7.75	0.323	85.86	111.618	122.4	11.1	15.6	33.8	436	567	2815.11	-2248
8	0.333	86.8	112.84	123.7	10.9	15.3	33.1	441	573	2905.92	-2333
8.25	0.344	87.72	114.036	125.1	10.6	15.0	32.4	446	579	2996.73	-2418
8.5	0.354	88.63	115.219	126.4	10.4	14.7	31.8	450	585	3087.54	-2503
8.75	0.365	89.51	116.363	127.6	10.2	14.4	31.2	455	591	3178.35	-2588
9	0.375	90.38	117.494	128.8	10.0	14.2	30.6	459	597	3269.16	-2673
9.25	0.385	91.23	118.599	130.1	9.9	13.9	30.1	464	602	3359.97	-2758
9.5	0.396	92.06	119.678	131.2	9.7	13.7	29.5	468	608	3450.78	-2843
9.75	0.406	92.88	120.744	132.4	9.5	13.4	29.0	472	613	3541.59	-2929
10	0.417	93.69	121.797	133.6	9.4	13.2	28.6	476	618	3632.40	-3014

Modified Rational Method

Length (m)	100	m
Area (ha)	0.215	Ha
Max Height	194.2	mAOD
Min Height	193.3	mAOD
DeltaH	0.9	
Slope (%)	0.95	
Te (mins)	13.92	mins
ARF	0.999	
SAAR	1181.000	mm
UCWI	127	mm
PIMP	100.0	%
SOIL	0.49	
Percentage Runoff PR	84.36	
DEEPSTOR	0.73	

Cv	0.84356	
Cr	1.3	
allowable outflow		
2 year	0.0059	m^3/s

m3

Storage	RT years	Storage
	2 + 30% cc	14

Return Period flood 2 + 30% cc years

Post Development Rainfall 2 years

Development Area B to Outfall 4

Rainfall Duration (hours)	Rainfall Duration (days)	Rainfall Depth (mm)	30% increase	Effective Depth (mm)	Rainfall Intensity (mm/hr)	FLOW (l/s)	FLOW (l/s/ha)	RUN-OFF		Allowable Outflow (m^3)	Difference (m^3)
								FLOW (m^3)	RAIN (m^3)		
0.25	0.010	5.43	7.059	7.7	21.7	14.2	66.2	13	17	5.31	11
0.5	0.021	7.9	10.27	11.3	15.8	10.4	48.2	19	24	10.62	14
0.75	0.031	9.73	12.649	13.9	13.0	8.5	39.6	23	30	15.93	14
1	0.042	11.24	14.612	16.0	11.2	7.4	34.3	27	34	21.24	13
1.25	0.052	12.54	16.302	17.9	10.0	6.6	30.6	30	38	26.55	12
1.5	0.063	13.71	17.823	19.5	9.1	6.0	27.9	32	42	31.86	10
1.75	0.073	14.76	19.188	21.0	8.4	5.5	25.7	35	45	37.17	8
2	0.083	15.74	20.462	22.4	7.9	5.2	24.0	37	48	42.48	6
2.25	0.094	16.65	21.645	23.7	7.4	4.9	22.6	39	51	47.79	3
2.5	0.104	17.5	22.75	24.9	7.0	4.6	21.3	41	54	53.10	1
2.75	0.115	18.31	23.803	26.1	6.7	4.4	20.3	43	56	58.41	-2
3	0.125	19.07	24.791	27.2	6.4	4.2	19.4	45	58	63.72	-5
3.25	0.135	19.8	25.74	28.2	6.1	4.0	18.6	47	61	69.03	-8
3.5	0.146	20.5	26.65	29.2	5.9	3.8	17.9	48	63	74.34	-12
3.75	0.156	21.17	27.521	30.2	5.6	3.7	17.2	50	65	79.65	-15
4	0.167	21.82	28.366	31.1	5.5	3.6	16.6	51	67	84.96	-18
4.25	0.177	22.44	29.172	32.0	5.3	3.5	16.1	53	69	90.27	-21
4.5	0.188	23.04	29.952	32.8	5.1	3.4	15.6	54	71	95.58	-25
4.75	0.198	23.63	30.719	33.7	5.0	3.3	15.2	56	72	100.89	-28
5	0.208	24.19	31.447	34.5	4.8	3.2	14.7	57	74	106.20	-32
5.25	0.219	24.74	32.162	35.3	4.7	3.1	14.4	58	76	111.51	-36
5.5	0.229	25.28	32.864	36.0	4.6	3.0	14.0	60	77	116.82	-39
5.75	0.240	25.8	33.54	36.8	4.5	2.9	13.7	61	79	122.13	-43
6	0.250	26.31	34.203	37.5	4.4	2.9	13.4	62	81	127.44	-47
6.25	0.260	26.81	34.853	38.2	4.3	2.8	13.1	63	82	132.75	-51
6.5	0.271	27.3	35.49	38.9	4.2	2.8	12.8	64	84	138.06	-54
6.75	0.281	27.77	36.101	39.6	4.1	2.7	12.5	66	85	143.37	-58
7	0.292	28.24	36.712	40.3	4.0	2.6	12.3	67	87	148.68	-62
7.25	0.302	28.69	37.297	40.9	4.0	2.6	12.1	68	88	153.99	-66
7.5	0.313	29.14	37.882	41.5	3.9	2.5	11.8	69	89	159.30	-70
7.75	0.323	29.58	38.454	42.2	3.8	2.5	11.6	70	91	164.61	-74
8	0.333	30.01	39.013	42.8	3.8	2.5	11.4	71	92	169.92	-78
8.25	0.344	30.44	39.572	43.4	3.7	2.4	11.2	72	93	175.23	-82
8.5	0.354	30.85	40.105	44.0	3.6	2.4	11.1	73	95	180.54	-86
8.75	0.365	31.26	40.638	44.6	3.6	2.3	10.9	74	96	185.85	-90
9	0.375	31.66	41.158	45.1	3.5	2.3	10.7	75	97	191.16	-94
9.25	0.385	32.06	41.678	45.7	3.5	2.3	10.6	76	98	196.47	-98
9.5	0.396	32.45	42.185	46.3	3.4	2.2	10.4	77	99	201.78	-102
9.75	0.406	32.84	42.692	46.8	3.4	2.2	10.3	77	101	207.09	-106
10	0.417	33.22	43.186	47.4	3.3	2.2	10.1	78	102	212.40	-111

Modified Rational Method

Length (m)	100	m
Area (ha)	0.215	Ha
Max Height	194.2	mAOD
Min Height	193.3	mAOD
DeltaH	0.9	
Slope (%)	0.95	
Te (mins)	13.92	mins
ARF	0.999	
SAAR	1181.000	mm
UCWI	127	mm
PIMP	100.0	%
SOIL	0.49	
Percentage Runoff PR	84.36	
DEEPSTOR	0.73	

Cv	0.84356	
Cr	1.3	
allowable outflow		
30 year	0.0172	m^3/s

m3

Storage	RT years	Storage
	30 + 30% cc	34

Return Period flood 30 + 30% cc years

Post Development Rainfall 30 years

Development Area B to Outfall 4

Rainfall Duration (hours)	Rainfall Duration (days)	Rainfall Depth (mm)	30% increase	Effective Depth (mm)	Rainfall Intensity (mm/hr)	FLOW (l/s)	FLOW (l/s/ha)	RUN-OFF		Allowable Outflow (m^3)	Difference (m^3)
								FLOW (m^3)	RAIN (m^3)		
0.25	0.010	15.29	19.877	21.8	61.2	40.1	186.5	36	47	15.48	31
0.5	0.021	21.04	27.352	30.0	42.1	27.6	128.3	50	64	30.96	34
0.75	0.031	25.08	32.604	35.8	33.4	21.9	101.9	59	77	46.44	30
1	0.042	28.3	36.79	40.3	28.3	18.5	86.3	67	87	61.92	25
1.25	0.052	31.03	40.339	44.2	24.8	16.3	75.7	73	95	77.40	18
1.5	0.063	33.42	43.446	47.6	22.3	14.6	67.9	79	102	92.88	10
1.75	0.073	35.56	46.228	50.7	20.3	13.3	61.9	84	109	108.36	1
2	0.083	37.5	48.75	53.5	18.8	12.3	57.2	88	115	123.84	-9
2.25	0.094	39.3	51.09	56.0	17.5	11.4	53.2	93	120	139.32	-19
2.5	0.104	40.96	53.248	58.4	16.4	10.7	49.9	97	126	154.80	-29
2.75	0.115	42.52	55.276	60.6	15.5	10.1	47.1	100	130	170.28	-40
3	0.125	43.99	57.187	62.7	14.7	9.6	44.7	104	135	185.76	-51
3.25	0.135	45.38	58.994	64.7	14.0	9.2	42.6	107	139	201.24	-62
3.5	0.146	46.7	60.71	66.6	13.3	8.7	40.7	110	143	216.72	-74
3.75	0.156	47.96	62.348	68.4	12.8	8.4	39.0	113	147	232.20	-85
4	0.167	49.17	63.921	70.1	12.3	8.1	37.5	116	151	247.68	-97
4.25	0.177	50.33	65.429	71.8	11.8	7.8	36.1	119	154	263.16	-109
4.5	0.188	51.45	66.885	73.3	11.4	7.5	34.9	121	158	278.64	-121
4.75	0.198	52.52	68.276	74.9	11.1	7.2	33.7	124	161	294.12	-133
5	0.208	53.56	69.628	76.4	10.7	7.0	32.7	126	164	309.60	-145
5.25	0.219	54.57	70.941	77.8	10.4	6.8	31.7	129	167	325.08	-158
5.5	0.229	55.54	72.202	79.2	10.1	6.6	30.8	131	170	340.56	-170
5.75	0.240	56.49	73.437	80.5	9.8	6.4	30.0	133	173	356.04	-183
6	0.250	57.4	74.62	81.8	9.6	6.3	29.2	135	176	371.52	-196
6.25	0.260	58.3	75.79	83.1	9.3	6.1	28.4	138	179	387.00	-208
6.5	0.271	59.17	76.921	84.4	9.1	6.0	27.8	140	181	402.48	-221
6.75	0.281	60.02	78.026	85.6	8.9	5.8	27.1	142	184	417.96	-234
7	0.292	60.85	79.105	86.7	8.7	5.7	26.5	144	187	433.44	-247
7.25	0.302	61.66	80.158	87.9	8.5	5.6	25.9	145	189	448.92	-260
7.5	0.313	62.45	81.185	89.0	8.3	5.5	25.4	147	191	464.40	-273
7.75	0.323	63.23	82.199	90.1	8.2	5.3	24.9	149	194	479.88	-286
8	0.333	63.98	83.174	91.2	8.0	5.2	24.4	151	196	495.36	-299
8.25	0.344	64.73	84.149	92.3	7.8	5.1	23.9	153	198	510.84	-312
8.5	0.354	65.46	85.098	93.3	7.7	5.0	23.5	154	201	526.32	-326
8.75	0.365	66.17	86.021	94.3	7.6	5.0	23.1	156	203	541.80	-339
9	0.375	66.87	86.931	95.3	7.4	4.9	22.7	158	205	557.28	-352
9.25	0.385	67.56	87.828	96.3	7.3	4.8	22.3	159	207	572.76	-366
9.5	0.396	68.24	88.712	97.3	7.2	4.7	21.9	161	209	588.24	-379
9.75	0.406	68.9	89.57	98.2	7.1	4.6	21.5	163	211	603.72	-393
10	0.417	69.56	90.428	99.2	7.0	4.6	21.2	164	213	619.20	-406

Modified Rational Method

Length (m)	100	m
Area (ha)	0.215	Ha
Max Height	194.2	mAOD
Min Height	193.3	mAOD
DeltaH	0.9	
Slope (%)	0.95	
Te (mins)	13.92	mins
ARF	0.999	
SAAR	1181.000	mm
UCWI	127	mm
PIMP	100.0	%
SOIL	0.49	
Percentage Runoff PR	84.36	
DEEPSTOR	0.73	

Cv	0.84356	
Cr	1.3	
allowable outflow		
100 year	0.0263	m^3/s

Storage	RT years	Storage
	100 + 30% cc	48

Return Period: flood — 100 + 30% cc years
Post Development: Rainfall — 100 years

Development Area B to Outfall 4

Rainfall Duration (hours)	Rainfall Duration (days)	Rainfall Depth (mm)	30% increase	Effective Depth (mm)	Rainfall Intensity (mm/hr)	FLOW (l/s)	FLOW (l/s/ha)	RUN-OFF FLOW (m^3)	RUN-OFF RAIN (m^3)	Allowable Outflow (m^3)	Difference (m^3)
0.25	0.010	23.2	30.16	33.1	92.8	60.8	282.9	55	71	23.67	47
0.5	0.021	31.21	40.573	44.5	62.4	40.9	190.3	74	96	47.34	48
0.75	0.031	36.72	47.736	52.3	49.0	32.1	149.3	87	113	71.01	42
1	0.042	41.06	53.378	58.5	41.1	26.9	125.2	97	126	94.68	31
1.25	0.052	44.7	58.11	63.7	35.8	23.4	109.0	105	137	118.35	19
1.5	0.063	47.85	62.205	68.2	31.9	20.9	97.3	113	147	142.02	5
1.75	0.073	50.67	65.871	72.2	29.0	19.0	88.3	120	155	165.69	-10
2	0.083	53.21	69.173	75.9	26.6	17.4	81.1	126	163	189.36	-26
2.25	0.094	55.54	72.202	79.2	24.7	16.2	75.3	131	170	213.03	-43
2.5	0.104	57.7	75.01	82.3	23.1	15.1	70.4	136	177	236.70	-60
2.75	0.115	59.71	77.623	85.1	21.7	14.2	66.2	141	183	260.37	-77
3	0.125	61.6	80.08	87.8	20.5	13.5	62.6	145	189	284.04	-95
3.25	0.135	63.38	82.394	90.4	19.5	12.8	59.5	150	194	307.71	-113
3.5	0.146	65.07	84.591	92.8	18.6	12.2	56.7	154	199	331.38	-132
3.75	0.156	66.68	86.684	95.1	17.8	11.7	54.2	157	204	355.05	-151
4	0.167	68.22	88.686	97.3	17.1	11.2	52.0	161	209	378.72	-170
4.25	0.177	69.69	90.597	99.4	16.4	10.7	50.0	164	214	402.39	-189
4.5	0.188	71.1	92.43	101.4	15.8	10.4	48.2	168	218	426.06	-208
4.75	0.198	72.46	94.198	103.3	15.3	10.0	46.5	171	222	449.73	-228
5	0.208	73.77	95.901	105.2	14.8	9.7	45.0	174	226	473.40	-247
5.25	0.219	75.04	97.552	107.0	14.3	9.4	43.6	177	230	497.07	-267
5.5	0.229	76.27	99.151	108.7	13.9	9.1	42.3	180	234	520.74	-287
5.75	0.240	77.45	100.685	110.4	13.5	8.8	41.1	183	237	544.41	-307
6	0.250	78.6	102.18	112.1	13.1	8.6	39.9	185	241	568.08	-327
6.25	0.260	79.72	103.636	113.7	12.8	8.4	38.9	188	244	591.75	-347
6.5	0.271	80.81	105.053	115.2	12.4	8.1	37.9	191	248	615.42	-368
6.75	0.281	81.87	106.431	116.7	12.1	7.9	37.0	193	251	639.09	-388
7	0.292	82.91	107.783	118.2	11.8	7.8	36.1	196	254	662.76	-409
7.25	0.302	83.92	109.096	119.6	11.6	7.6	35.3	198	257	686.43	-429
7.5	0.313	84.9	110.37	121.0	11.3	7.4	34.5	200	260	710.10	-450
7.75	0.323	85.86	111.618	122.4	11.1	7.3	33.8	203	263	733.77	-471
8	0.333	86.8	112.84	123.7	10.9	7.1	33.1	205	266	757.44	-491
8.25	0.344	87.72	114.036	125.1	10.6	7.0	32.4	207	269	781.11	-512
8.5	0.354	88.63	115.219	126.4	10.4	6.8	31.8	209	272	804.78	-533
8.75	0.365	89.51	116.363	127.6	10.2	6.7	31.2	211	274	828.45	-554
9	0.375	90.38	117.494	128.8	10.0	6.6	30.6	213	277	852.12	-575
9.25	0.385	91.23	118.599	130.1	9.9	6.5	30.1	215	280	875.79	-596
9.5	0.396	92.06	119.678	131.2	9.7	6.4	29.5	217	282	899.46	-617
9.75	0.406	92.88	120.744	132.4	9.5	6.2	29.0	219	285	923.13	-638
10	0.417	93.69	121.797	133.6	9.4	6.1	28.6	221	287	946.80	-660

APPENDIX I
Flood Hazard Calculations

Flood Evacuation Route: Barnsley Road (purple route)

Point Ref	GL	1 in 5 year			1 in 10 year			1 in 25 year			1 in 50 year			1 in 75 year			1 in 100 year			1 in 200 year			1 in 100 year + 20% CC			1 in 1000 year		
		Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating
1	194.200	193.173	0	0	193.338	0	0	193.538	0	0	193.666	0	0	193.726	0	0	193.758	0	0	193.840	0	0	193.842	0	0	194.193	0	0
2	193.080	193.173	0.093	0.23	193.338	0.258	1.64	193.538	0.458	2.15	193.666	0.586	2.46	193.726	0.646	2.61	193.758	0.678	2.69	193.840	0.760	2.90	193.842	0.762	2.91	194.193	1.113	3.78
3	193.180	193.173	0	0	193.338	0.158	0.39	193.538	0.358	1.90	193.666	0.486	2.21	193.726	0.546	2.36	193.758	0.578	2.45	193.840	0.660	2.65	193.842	0.662	2.66	194.193	1.013	3.53
4	193.310	193.173	0	0	193.338	0.028	0.07	193.538	0.228	0.57	193.666	0.356	1.89	193.726	0.416	2.04	193.758	0.448	2.12	193.840	0.530	2.33	193.842	0.532	2.33	194.193	0.883	3.21
5	193.850	193.173	0	0	193.338	0	0	193.538	0	0	193.666	0	0	193.726	0	0	193.758	0	0	193.840	0	0	193.842	0	0	194.269	0.419	2.05
6	194.300	193.173	0	0	193.338	0	0	193.538	0	0	193.666	0	0	193.726	0	0	193.758	0	0	193.840	0	0	193.842	0	0	194.344	0.044	0.11
7	194.540	193.173	0	0	193.338	0	0	193.538	0	0	193.666	0	0	193.726	0	0	193.758	0	0	193.840	0	0	193.842	0	0	194.448	0	0
8	194.750	193.173	0	0	193.338	0	0	193.538	0	0	193.666	0	0	193.726	0	0	193.758	0	0	193.840	0	0	193.842	0	0	194.711	0	0
9	194.780	193.173	0	0	193.338	0	0	193.538	0	0	193.666	0	0	193.726	0	0	193.758	0	0	193.840	0	0	193.842	0	0	194.728	0	0
10	194.920	193.173	0	0	193.338	0	0	193.538	0	0	193.666	0	0	193.726	0	0	193.758	0	0	193.840	0	0	193.842	0	0	194.961	0.041	0.10
11	195.040	193.173	0	0	193.338	0	0	193.538	0	0	193.666	0	0	193.726	0	0	193.758	0	0	193.840	0	0	193.842	0	0	195.166	0.126	0.32

Flood Evacuation Route: North of Barnsley Road - Alternative (orange route)

Point Ref	GL	1 in 5 year			1 in 10 year			1 in 25 year			1 in 50 year			1 in 75 year			1 in 100 year			1 in 200 year			1 in 100 year + 20% CC			1 in 1000 year		
		Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating
1	194.000	193.173	0	0	193.338	0	0	193.538	0	0	193.666	0	0	193.726	0	0	193.758	0	0	193.840	0	0	193.842	0	0	194.193	0.19	0.48
2	195.000	193.173	0	0	193.338	0	0	193.538	0	0	193.666	0	0	193.726	0	0	193.758	0	0	193.840	0	0	193.842	0	0	194.193	0	0
3	195.170	193.173	0	0	193.338	0	0	193.538	0	0	193.666	0	0	193.726	0	0	193.758	0	0	193.840	0	0	193.842	0	0	194.193	0	0
4	195.500	193.173	0	0	193.338	0	0	193.538	0	0	193.666	0	0	193.726	0	0	193.758	0	0	193.840	0	0	193.842	0	0	194.193	0	0
5	196.400	193.173	0	0	193.338	0	0	193.538	0	0	193.666	0	0	193.726	0	0	193.758	0	0	193.840	0	0	193.842	0	0	194.269	0	0
6	195.400	193.173	0	0	193.338	0	0	193.538	0	0	193.666	0	0	193.726	0	0	193.758	0	0	193.840	0	0	193.842	0	0	194.269	0	0
7	195.500	193.173	0	0	193.338	0	0	193.538	0	0	193.666	0	0	193.726	0	0	193.758	0	0	193.840	0	0	193.842	0	0	194.269	0	0
8	195.100	193.173	0	0	193.338	0	0	193.538	0	0	193.666	0	0	193.726	0	0	193.758	0	0	193.840	0	0	193.842	0	0	194.269	0	0
9	194.360	193.173	0	0	193.338	0	0	193.538	0	0	193.666	0	0	193.726	0	0	193.758	0	0	193.840	0	0	193.842	0	0	194.269	0	0
10	194.750	193.173	0	0	193.338	0	0	193.538	0	0	193.666	0	0	193.726	0	0	193.758	0	0	193.840	0	0	193.842	0	0	194.269	0	0
11	194.700	193.173	0	0	193.338	0	0	193.538	0	0	193.666	0	0	193.726	0	0	193.758	0	0	193.840	0	0	193.842	0	0	194.344	0	0
12	194.700	193.173	0	0	193.338	0	0	193.538	0	0	193.666	0	0	193.726	0	0	193.758	0	0	193.840	0	0	193.842	0	0	194.396	0	0
13	194.390	193.173	0	0	193.338	0	0	193.538	0	0	193.666	0	0	193.726	0	0	193.758	0	0	193.840	0	0	193.842	0	0	194.396	0.01	0.02

Flood Evacuation Route: Water Hall Lane (cyan route)

Point Ref	GL	1 in 5 year			1 in 10 year			1 in 25 year			1 in 50 year			1 in 75 year			1 in 100 year			1 in 200 year			1 in 100 year + 20% CC			1 in 1000 year		
		Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating
1	194.350	193.046	0	0	193.223	0.000	0	193.440	0	0	193.576	0.0	0	193.635	0	0	193.666	0	0	193.743	0	0	193.745	0	0	194.112	0	0
2	194.000	193.012	0	0	193.184	0	0	193.403	0	0	193.542	0	0	193.599	0	0	193.627	0	0	193.692	0	0	193.693	0	0	193.982	0	0
3	193.600	192.944	0	0	193.104	0	0	193.328	0	0	193.474	0	0	193.526	0	0	193.548	0	0	193.587	0	0	193.588	0	0	193.717	0.117	0.29
4	193.200	192.912	0	0	193.067	0	0	193.292	0.092	0.23	193.442	0.242	0.61	193.492	0.292	1.73	193.511	0.311	1.78	193.538	0.338	1.85	193.539	0.339	1.85	193.592	0.392	1.98
5	193.280	192.912	0	0	193.067	0	0	193.292	0.012	0.03	193.442	0.162	0.41	193.492	0.212	0.53	193.511	0.231	0.58	193.538	0.258	1.65	193.539	0.259	1.65	193.592	0.312	1.78
6	193.590	192.912	0	0	193.067	0	0	193.292	0	0	193.442	0	0	193.492	0	0	193.511	0	0	193.538	0	0	193.539	0	0	193.592	0	0
7	194.190	192.912	0	0	193.067	0	0	193.292	0	0	193.442	0	0	193.492	0	0	193.511	0	0	193.538	0	0	193.539	0	0	193.592	0	0
8	195.560	192.912	0	0	193.067	0	0	193.292	0	0	193.442	0	0	193.492	0	0	193.511	0	0	193.538	0	0	193.539	0	0	193.592	0	0

Flood Evacuation Route: Water Hall Lane - with elevated junction at access road

Point Ref	GL	1 in 5 year			1 in 10 year			1 in 25 year			1 in 50 year			1 in 75 year			1 in 100 year			1 in 200 year			1 in 100 year + 20% CC			1 in 1000 year		
		Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating	Flood Level	Flood Depth	Flood Hazard Rating
1	194.350	193.046	0	0	193.223	0.000	0	193.440	0	0	193.576	0.0	0	193.635	0	0	193.666	0	0	193.743	0	0	193.745	0	0	194.112	0	0
2	194.000	193.012	0	0	193.184	0	0	193.403	0	0	193.542	0	0	193.599	0	0	193.627	0	0	193.692	0	0	193.693	0	0	193.982	0	0
3	193.600	192.944	0	0	193.104	0	0	193.328	0	0	193.474	0	0	193.526	0	0	193.548	0	0	193.587	0	0	193.588	0	0	193.717	0.117	0.29
4	193.342	192.912	0	0	193.067	0	0	193.292	-0.05	-0.13	193.442	0.1	0.25	193.492	0.15	0.37	193.511	0.169	0.42	193.538	0.196	0.49	193.539	0.197	0.49	193.592	0.250	0.63
5	193.342	192.912	0	0	193.067	0	0	193.292	-0.05	-0.125	193.442	0.1	0.25	193.492	0.15	0.37	193.511	0.169	0.42	193.538	0.196	0.49	193.539	0.197	0.49	193.592	0.250	0.63
6	193.590	192.912	0	0	193.067	0	0	193.292	0	0	193.442	0	0	193.492	0	0	193.511	0	0	193.538	0	0	193.539	0	0	193.592	0	0
7	194.190	192.912	0	0	193.067	0	0	193.292	0	0	193.442	0	0	193.492	0	0	193.511	0	0	193.538	0	0	193.539	0	0	193.592	0	0
8	195.560	192.912	0	0	193.067	0	0	193.292	0	0	193.442	0	0	193.492	0	0	193.511	0	0	193.538	0	0	193.539	0	0	193.592	0	0

Flood Hazard Rating = ((v + 0.5) x D) + DF

v = 2.0 m/s

DF = 0 (flood depth 0-0.25m)
DF = 1 (flood depth 0.25m+)

	<0.75	Low flood hazard (caution is required)
Class 1	0.75 – 1.25	Moderate hazard - Danger for some (children, the elderly & infirm)
Class 2	1.25 – 2.00	Significant hazard - Danger for most (the general public)
Class 3	>2.00	Extreme hazard - Danger for all (includes the emergency services)

APPENDIX J
Environment Agency Guidance:
Personal Flood Plan

Environment Agency



Prepare your property for flooding

A guide for householders and small businesses

We are the Environment Agency. It's our job to look after your environment and make it a better place – for you, and for future generations.

Your environment is the air you breathe, the water you drink and the ground you walk on. Working with business, Government and society as a whole, we are making your environment cleaner and healthier.

The Environment Agency. Out there, making your environment a better place.

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October 2009

Over 5.5 million properties in England and Wales are at risk of flooding from rivers, the sea or surface water. That's one in six, which means there's a high chance one of these properties is your home or business.

It pays to prepare for flooding.

If your home or business is flooded it can be costly, not just in terms of money and time but also inconvenience and heartache.

While it's impossible to completely flood-proof a property, there are lots of things you can do to reduce the damage flooding can cause.

The key is to act now so you're prepared if there's a flood in your area.

Am I at risk of flooding?

You need to find out. It could save you money, help you protect yourself and your property – maybe even save your life.

Even if your home or business is not directly at risk of flooding from rivers or the sea, you could still be affected by surface or groundwater flooding.

Visit our website www.environment-agency.gov.uk or call Floodline on 0845 988 1188 to see if your property or business is at risk and for other useful flood information.

Now you understand the risk, here's what you can do.

Protect your property and possessions

Whether you rent or own your home or business premises, there are many things you can do to help yourself. Some are simple and temporary while others involve permanent structural work.

You can also make improvements so that even if flood water enters your property it causes less damage, so drying-out and cleaning up is faster and easier. This means you could move back home or open for business far more quickly.

The most important thing is to prepare now by buying and installing flood products in advance.

Don't wait until flooding looks likely as you won't have time to buy or put the measures in place.

Try to keep flood water out:

• **Doors:** buy purpose-built flood boards that can be installed when flooding is imminent. You can also raise door thresholds.

• **Walls and floors:** raise damp-proof brick courses. Sealing floors ('tanking') can prevent water rising through the ground.

• **Air bricks:** buy specially designed covers that are easy to place over ventilation bricks.

• **Drains and pipes:** fit non-return valves to drains and water inlet and outlet pipes.

...but accept that flood water might get in.

In the case of bigger floods this actually needs to happen otherwise the weight of the water outside might cause the building to collapse. Here are some things you can do to reduce the damage floodwater might cause inside:

•**Shelving:** put irreplaceable or valuable items on high-mounted shelves.

• **Home entertainment:** fix your audio-visual equipment, for example your TV and hi-fi, to the wall about 1.5 metres above floor level.

• **Skirting:** fit water-resistant skirting boards, or varnish them.

• **Pump:** fit a pump in a basement or under-floor void to extract flood water.

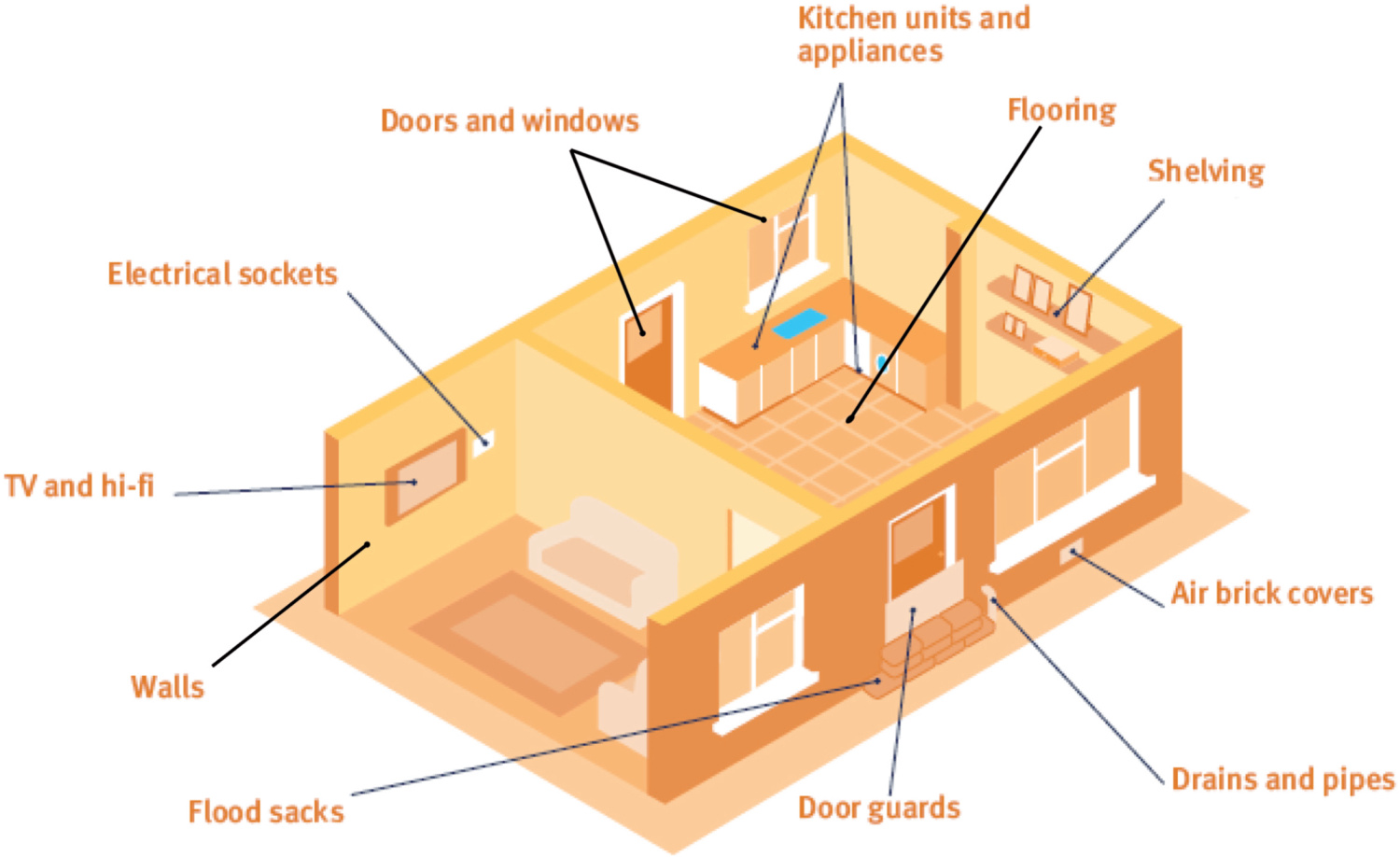
• **Walls:** dry-line. Use horizontal plasterboard, or lime-based plaster instead of gypsum. Get a special draining system for cavity walls.

• **Flooring:** lay tiles with rugs rather than fitted carpets, which often need to be replaced after a flood.

• **Doors and windows:** install synthetic or waxed windows and doors, or varnish.

• **Kitchen and bathroom:** use water-resistant materials such as stainless steel, plastic or solid wood rather than chipboard. Where possible raise fridges and appliances on plinths.

• **Electricals:** raise electrical sockets, fuse boxes, controls and wiring to at least 1.5 metres above floor level. If rewiring, bring cables down the wall to the raised socket so that cabling isn't affected.


Kitchen units and appliances
Doors and windows
Flooring
Shelving
Electrical sockets
TV and hi-fi
Air brick covers
Walls
Drains and pipes
Flood sacks
Door guards

How much will it cost?

Making your property resilient to floodwater will limit the distress and damage caused by flooding, which means less costly repairs and less time out of your home or business premises.

The cost of purchasing and installing products to keep floodwater out of your property will depend on the size of your property and the type of flood you want to protect against.

For example, according to the ABI, to protect your property against shallow flash floods could cost between £2,000 - £6,000.

To keep water out during periods of prolonged flooding will take bigger changes and could cost between £20,000 -£40,000.

Buying products

There is a variety of products that you can purchase. A comprehensive list of these can be found in 'The Blue Pages' directory on the National Flood Forum's website www.floodforum.org.uk.

The Blue Pages is an independent directory of products, builders, suppliers and insurers. It's designed to provide information on all aspects of flood protection and resilience products.

Quality check

When you buy a flood product check it's been properly tested and is up to the job – it should display the BSI Kitemark or equivalent accreditation for the national quality standard PAS 1188.

The British Standards Institution (BSI) maintains a list of all manufacturers of flood protection products that have been tested and achieved Kitemark accreditation. See www.kitemark.com

The Flood Protection Association represents manufacturers and designers of flood defence products. See www.floodprotectionassoc.co.uk

Insurance

Check your buildings and contents insurance policies to see what cover they provide for flood damage.

If you make changes to your property so it's more resilient to flooding make sure you let your insurance company know as this this might result in a reduction in excess charges or premiums depending on your insurer.

For more information about resilient repair contact the Association of British Insurers www.abi.org.uk.

Sign up for warnings

Knowing when to put temporary flood protection measures in place is crucial. Our free Floodline Warnings Direct service can tell you when to do this by sending you a warning by phone, text and email.

Sign up for Floodline Warnings Direct online at www.environment-agency.gov.uk or call Floodline on 0845 988 1188.

Professional advice

If you're going to make permanent changes to protect your property against flooding, we strongly recommended that you seek professional advice from a building surveyor, architect or other professional. You could contact:

Royal Institution of Chartered Surveyors (RICS). See www.rics.org

Royal Institute of British Architects (RIBA). See www.architecture.com

Where can I get more information?

If you would like to get a better understanding of flooding, see our web site or call Floodline on 0845 988 1188.

Don't forget to sign up to our free 24 hour Floodline Warnings Direct service.

We have information offering you practical advice on what to do before, during and after a flood. It's available in PDF, print, CD and MP3 file. You can download them from our website or order them from Floodline.

Contact your local authority to find out if flood protection grants are available for your property.



Would you like to find out more about us, or about your environment?

Then call us on
08708 506 506 (Mon–Fri 8–6)

Approximate call costs: 8p plus 6p per minute (standard landline).
Please note charges will vary across telephone providers.

email
enquiries@environment–agency.gov.uk
or visit our website
www.environment–agency.gov.uk

incident hotline 0800 80 70 60 (24hrs)
floodline 0845 988 1188

GEHO1009BRDL-E-P

Personal flood plan

Name

Environment Agency

Are you signed up to receive flood warnings? ☐
If not call Floodline on 0845 988 1188 to see if your area receives free flood warnings.

Let us know when you've completed your flood plan by calling Floodline on **0845 988 1188.** This will help us learn more about how people are preparing for flooding.

General contact list	Company name	Contact name	Telephone
Floodline	Environment Agency		0845 988 1188
Electricity provider			
Gas provider			
Water company			
Telephone provider			
Insurance company and policy number			
Local council			
Local radio station			
Travel/weather info			

Key locations

Service cut-off	Description of location
Electricity	
Gas	
Water	

Who can help/who can you help?

Relationship	Name	Contact details	How can they/you help?
Relative			
Friend or neighbour			

Be prepared for flooding. Act now

Personal flood plan

What can I do NOW?

Environment Agency

- Put important documents out of flood risk and protect in polythene ☐
- Look at the best way of stopping floodwater entering your property ☐
- Find out where you can get sandbags ☐
- Identify what you would need to take with you if you had to leave your home ☐
- Check your insurance covers you for flooding ☐
- Make a flood plan and prepare a flood kit ☐
- Identify who can help you/ who you can help ☐
- Understand the flood warning codes ☐

What can you do if a flood is expected in your area?

Actions	Location
Home	
• Move furniture and electrical items to safety	
• Put flood boards, polythene and sandbags in place	
• Make a list now of what you can move away from the risk	
• Turn off electricity, water and gas supplies	
• Roll up carpets and rugs	
• Unless you have time to remove them hang curtains over rods	
• Move sentimental items to safety	
• Put important documents in polythene bags and move to safety	
Garden and outside	
• Move your car out of the flood risk area	
• Move any large or loose items or weigh them down	
Business	
• Move important documents, computers and stock	
• Alert staff and request their help	
• Farmers move animals and livestock to safety	
Evacuation - Prepare a flood kit in advance	
• Inform your family or friends that you may need to leave your home	
• Get your flood kit together and include a torch, warm and waterproof clothing, water, food, medication, toys for children and pets, rubber gloves and wellingtons	

There are a range of flood protection products on the market to help you protect your property from flood damage. A directory of these is available from the **National Flood Forum** at **www.bluepages.org.uk**

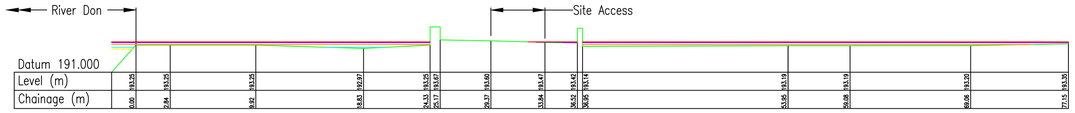
Be prepared for flooding. Act now

APPENDIX K
Flood Storage Volumes: Cross Sections & Calculations (Development Area B)

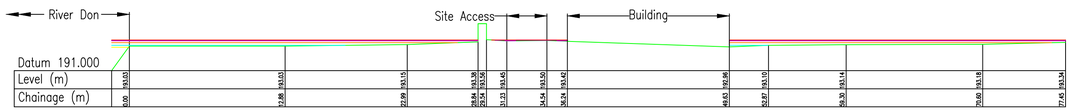
Water Hall Bridge

XS 1
XS 2
XS 3
XS 4
XS 5
XS 6
XS 7
XS 8
XS 9
XS 10
XS 11
XS 12
XS 13
XS 14
XS 15
XS 16
XS 17
XS 18
XS 19

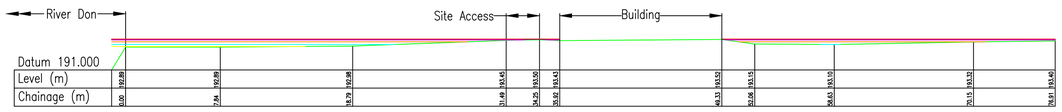
EXISTING SITE
(NTS)



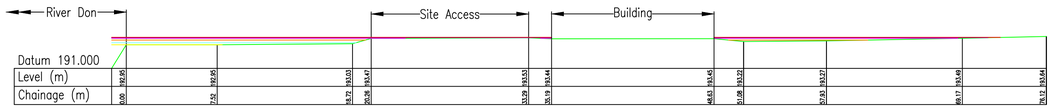
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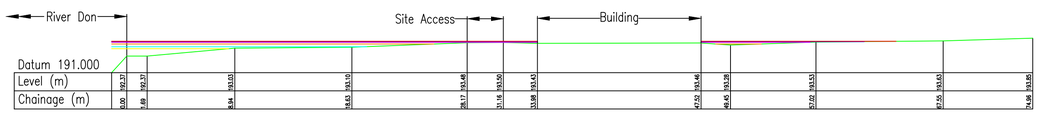
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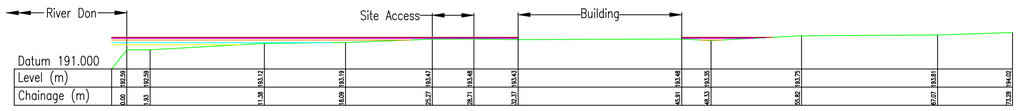
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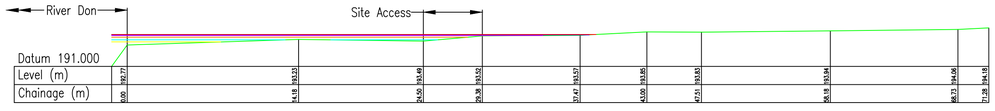
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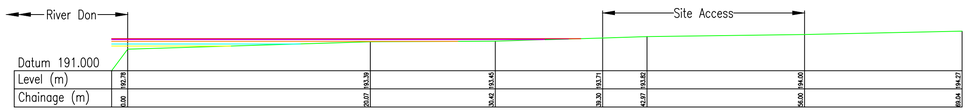
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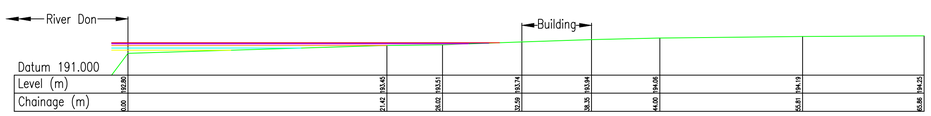
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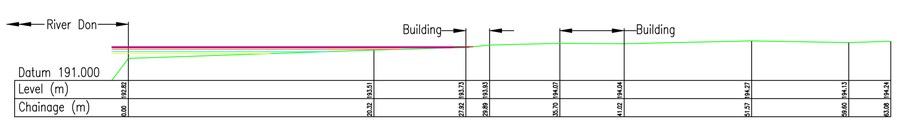
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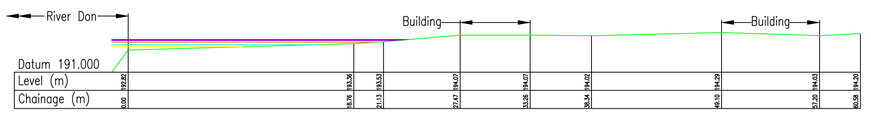
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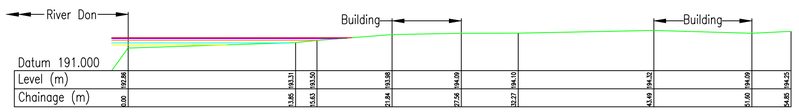
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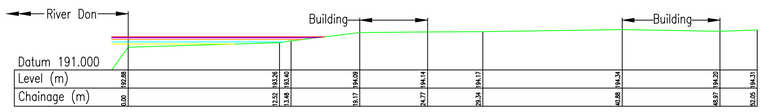
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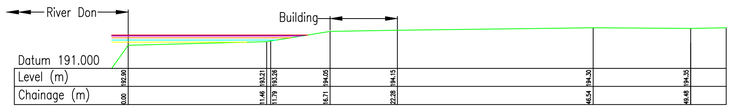
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EXISTING CROSS SECTION 12



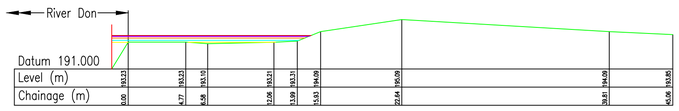
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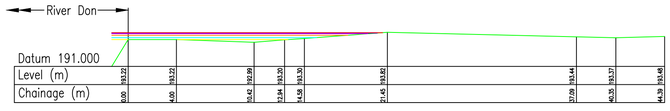
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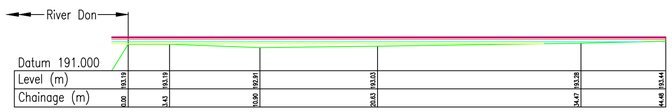
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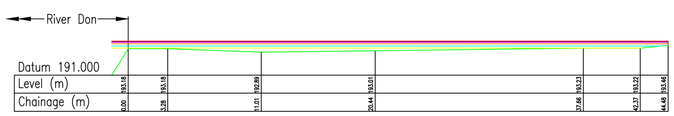
EXISTING CROSS SECTION 16



EXISTING CROSS SECTION 17



EXISTING CROSS SECTION 18



EXISTING CROSS SECTION 19

1 in 5 year

XS REF	XSA (sq.m)	XSA (sq.m)	XSA (sq.m)	XSA (sq.m)	Total XSA	Average	L (m)	Volume (cu.m)
1	0.000	0.000	0.000	0.000	0.000			
2	0.000	0.000	0.000	0.000	0.000	0.000	5.000	0.000
3	0.659	0.000	0.000	0.000	0.659	0.330	5.000	1.648
4	0.026	0.000	0.000	0.000	0.026	0.343	5.000	1.713
5	3.100	0.000	0.000	0.000	3.100	1.563	5.000	7.815
6	2.364	0.000	0.000	0.000	2.364	2.732	5.000	13.660
7	0.971	0.000	0.000	0.000	0.971	1.668	5.000	8.338
8	1.103	0.000	0.000	0.000	1.103	1.037	5.000	5.185
9	1.097	0.000	0.000	0.000	1.097	1.100	5.000	5.500
10	2.327	0.000	0.000	0.000	2.327	1.712	5.000	8.560
11	1.241	0.000	0.000	0.000	1.241	1.784	5.000	8.920
12	1.081	0.000	0.000	0.000	1.081	1.161	5.000	5.805
13	1.166	0.000	0.000	0.000	1.166	1.124	5.000	5.618
14	1.298	0.000	0.000	0.000	1.298	1.232	5.000	6.160
15	0.649	0.000	0.000	0.000	0.649	0.974	5.000	4.868
16	0.436	0.000	0.000	0.000	0.436	0.543	5.000	2.713
17	1.029	0.000	0.000	0.000	1.029	0.733	5.000	3.663
18	5.496	0.000	0.000	0.000	5.496	3.263	5.000	16.313
19	6.630	0.000	0.000	0.000	6.630	6.063	1.715	10.398
								116.873

1 in 10 year

XS REF	XSA (sq.m)	XSA (sq.m)	XSA (sq.m)	XSA (sq.m)	Total XSA	Average	L (m)	Volume (cu.m)
1	0.242	0.000	0.000	0.000	0.242			
2	0.209	0.907	0.000	0.000	1.116	0.679	5.000	3.395
3	0.007	3.188	0.000	0.000	3.195	2.156	5.000	10.778
4	2.630	0.000	0.000	0.000	2.630	2.913	5.000	14.563
5	2.316	0.000	0.000	0.000	2.316	2.473	5.000	12.365
6	2.001	0.000	0.000	0.000	2.001	2.159	5.000	10.793
7	0.458	1.800	0.000	0.000	2.258	2.130	5.000	10.648
8	1.995	0.000	0.000	0.000	1.995	2.127	5.000	10.633
9	2.007	0.000	0.000	0.000	2.007	2.001	5.000	10.005
10	2.268	0.000	0.000	0.000	2.268	2.138	5.000	10.688
11	2.155	0.000	0.000	0.000	2.155	2.212	5.000	11.058
12	1.831	0.000	0.000	0.000	1.831	1.993	5.000	9.965
13	1.899	0.000	0.000	0.000	1.899	1.865	5.000	9.325
14	1.912	0.000	0.000	0.000	1.912	1.906	5.000	9.528
15	2.704	0.000	0.000	0.000	2.704	2.308	5.000	11.540
16	1.841	0.000	0.000	0.000	1.841	2.273	5.000	11.363
17	2.319	0.000	0.000	0.000	2.319	2.080	5.000	10.400
18	6.166	0.000	0.000	0.000	6.166	4.243	5.000	21.213
19	6.880	0.000	0.000	0.000	6.880	6.523	1.715	11.187
								199.442

1 in 25 year

XS REF	XSA (sq.m)	XSA (sq.m)	XSA (sq.m)	XSA (sq.m)	Total XSA	Average	L (m)	Volume (cu.m)
1	2.797	3.879	0.000	0.000	6.676			
2	5.331	4.104	0.000	0.000	9.435	8.056	5.000	40.278
3	5.639	2.886	0.000	0.000	8.525	8.980	5.000	44.900
4	4.308	0.818	0.000	0.000	5.126	6.826	5.000	34.128
5	5.002	0.169	0.000	0.000	5.171	5.149	5.000	25.743
6	4.501	0.043	0.000	0.000	4.544	4.858	5.000	24.288
7	5.800	0.000	0.000	0.000	5.800	5.172	5.000	25.860
8	4.018	0.000	0.000	0.000	4.018	4.909	5.000	24.545
9	3.858	0.000	0.000	0.000	3.858	3.938	5.000	19.690
10	3.758	0.000	0.000	0.000	3.758	3.808	5.000	19.040
11	3.884	0.000	0.000	0.000	3.884	3.821	5.000	19.105
12	3.012	0.000	0.000	0.000	3.012	3.448	5.000	17.240
13	2.782	0.000	0.000	0.000	2.782	2.897	5.000	14.485
14	2.585	0.000	0.000	0.000	2.585	2.684	5.000	13.418
15	4.107	0.000	0.000	0.000	4.107	3.346	5.000	16.730
16	2.829	0.000	0.000	0.000	2.829	3.468	5.000	17.340
17	3.295	0.000	0.000	0.000	3.295	3.062	5.000	15.310
18	8.536	0.000	0.000	0.000	8.536	5.916	5.000	29.578
19	8.560	0.000	0.000	0.000	8.560	8.548	1.715	14.660
								416.335

1 in 50 year

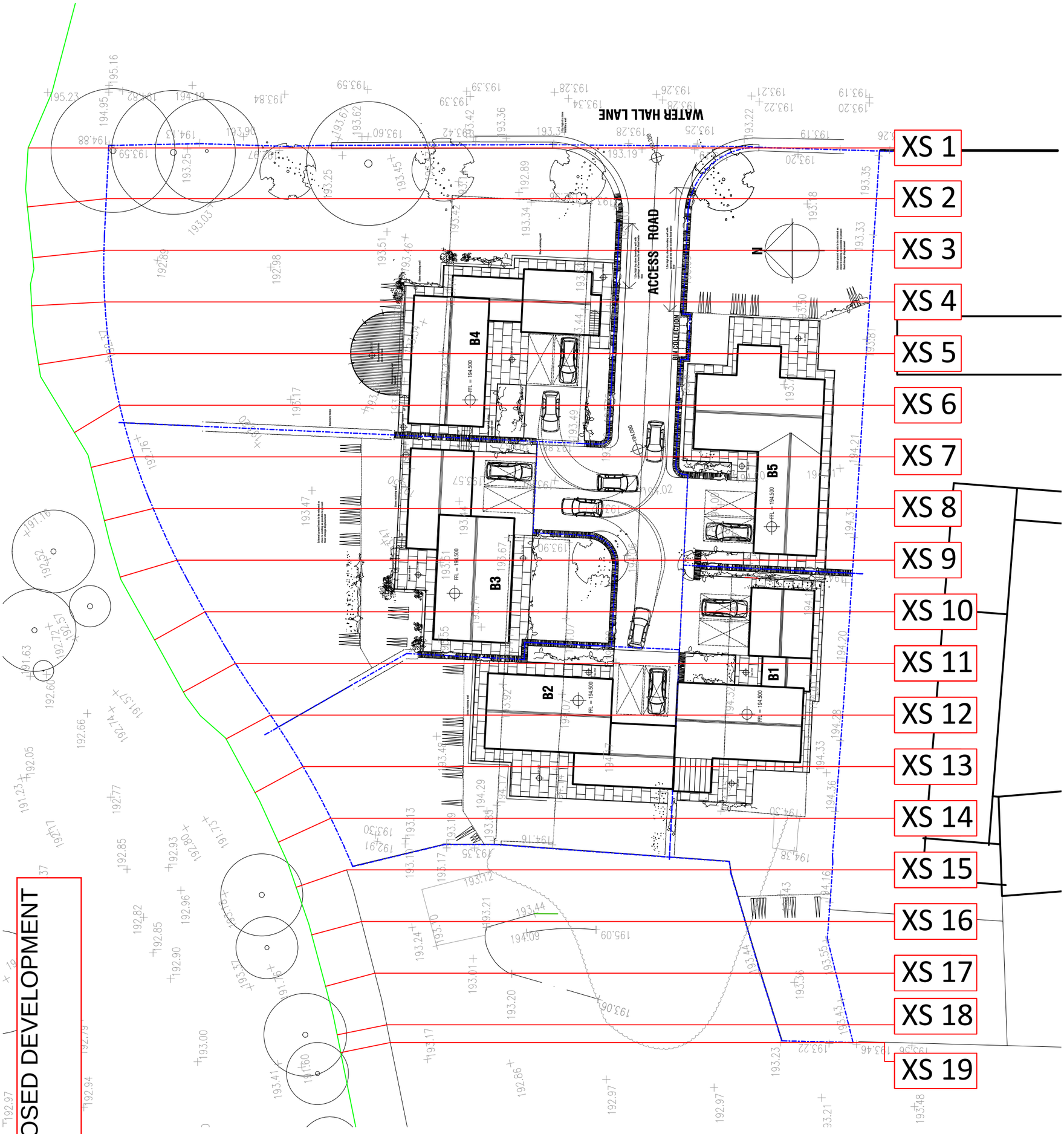
XS REF	XSA (sq.m)	XSA (sq.m)	XSA (sq.m)	XSA (sq.m)	Total XSA	Average	L (m)	Volume (cu.m)
1	3.650	5.939	0.013	0.000	9.602			
2	4.211	0.005	0.018	4.102	8.336	8.969	5.000	44.845
3	4.431	0.027	3.708	0.000	8.166	8.251	5.000	41.255
4	2.945	2.334	0.000	0.000	5.279	6.723	5.000	33.613
5	4.081	0.944	0.000	0.000	5.025	5.152	5.000	25.760
6	3.992	0.586	0.000	0.000	4.578	4.802	5.000	24.008
7	4.095	0.000	0.000	0.000	4.095	4.337	5.000	21.683
8	4.381	0.000	0.000	0.000	4.381	4.238	5.000	21.190
9	3.455	0.000	0.000	0.000	3.455	3.918	5.000	19.590
10	3.109	0.000	0.000	0.000	3.109	3.282	5.000	16.410
11	2.839	0.000	0.000	0.000	2.839	2.974	5.000	14.870
12	2.178	0.000	0.000	0.000	2.178	2.509	5.000	12.543
13	1.933	0.000	0.000	0.000	1.933	2.056	5.000	10.278
14	1.748	0.000	0.000	0.000	1.748	1.841	5.000	9.203
15	3.130	0.000	0.000	0.000	3.130	2.439	5.000	12.195
16	1.875	0.000	0.000	0.000	1.875	2.503	5.000	12.513
17	2.376	0.000	0.000	0.000	2.376	2.126	5.000	10.628
18	5.516	0.000	0.000	0.000	5.516	3.946	5.000	19.730
19	5.540	0.000	0.000	0.000	5.540	5.528	1.715	9.481
								359.791

1 in 75 year

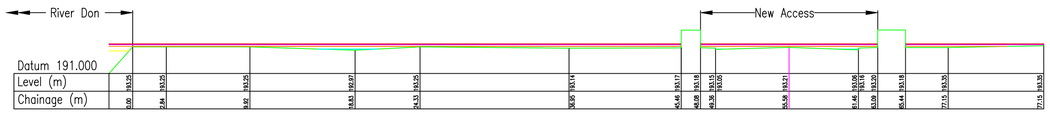
XS REF	XSA (sq.m)	XSA (sq.m)	XSA (sq.m)	XSA (sq.m)	Total XSA	Average	L (m)	Volume (cu.m)
1	1.217	0.121	2.010	0.000	3.348			
2	1.500	0.224	1.447	0.000	3.171	3.260	5.000	16.298
3	1.849	1.428	0.000	0.000	3.277	3.224	5.000	16.120
4	1.602	1.136	0.000	0.000	2.738	3.008	5.000	15.038
5	1.869	0.594	0.000	0.000	2.463	2.601	5.000	13.003
6	1.845	0.369	0.000	0.000	2.214	2.339	5.000	11.693
7	2.121	0.000	0.000	0.000	2.121	2.168	5.000	10.838
8	2.058	0.000	0.000	0.000	2.058	2.090	5.000	10.448
9	1.711	0.000	0.000	0.000	1.711	1.885	5.000	9.423
10	1.635	0.000	0.000	0.000	1.635	1.673	5.000	8.365
11	1.327	0.000	0.000	0.000	1.327	1.481	5.000	7.405
12	1.046	0.000	0.000	0.000	1.046	1.187	5.000	5.933
13	0.946	0.000	0.000	0.000	0.946	0.996	5.000	4.980
14	0.897	0.000	0.000	0.000	0.897	0.922	5.000	4.608
15	1.572	0.000	0.000	0.000	1.572	1.235	5.000	6.173
16	0.885	0.000	0.000	0.000	0.885	1.229	5.000	6.143
17	1.193	0.000	0.000	0.000	1.193	1.039	5.000	5.195
18	2.669	0.000	0.000	0.000	2.669	1.931	5.000	9.655
19	2.636	0.000	0.000	0.000	2.636	2.653	1.715	4.549
								165.862

1 in 100 year

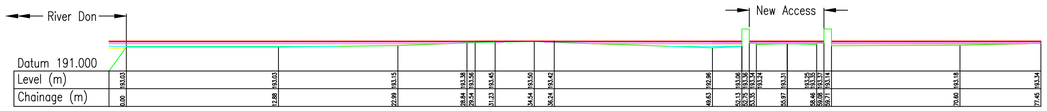
XS REF	XSA (sq.m)	XSA (sq.m)	XSA (sq.m)	XSA (sq.m)	Total XSA	Average	L (m)	Volume (cu.m)
1	0.462	0.072	0.764	0.000	1.298			
2	0.577	0.123	0.556	0.000	1.256	1.277	5.000	6.385
3	0.790	0.607	0.000	0.000	1.397	1.327	5.000	6.633
4	0.774	0.510	0.000	0.000	1.284	1.341	5.000	6.703
5	0.850	0.370	0.000	0.000	1.220	1.252	5.000	6.260
6	0.874	0.196	0.000	0.000	1.070	1.145	5.000	5.725
7	1.117	0.000	0.000	0.000	1.117	1.094	5.000	5.468
8	1.109	0.000	0.000	0.000	1.109	1.113	5.000	5.565
9	0.939	0.000	0.000	0.000	0.939	1.024	5.000	5.120
10	0.907	0.000	0.000	0.000	0.907	0.923	5.000	4.615
11	0.714	0.000	0.000	0.000	0.714	0.811	5.000	4.053
12	0.568	0.000	0.000	0.000	0.568	0.641	5.000	3.205
13	0.500	0.000	0.000	0.000	0.500	0.534	5.000	2.670
14	0.472	0.000	0.000	0.000	0.472	0.486	5.000	2.430
15	0.886	0.000	0.000	0.000	0.886	0.679	5.000	3.395
16	0.483	0.000	0.000	0.000	0.483	0.685	5.000	3.423
17	0.688	0.000	0.000	0.000	0.688	0.586	5.000	2.928
18	1.423	0.000	0.000	0.000	1.423	1.056	5.000	5.278
19	1.474	0.000	0.000	0.000	1.474	1.449	1.715	2.484
								82.337



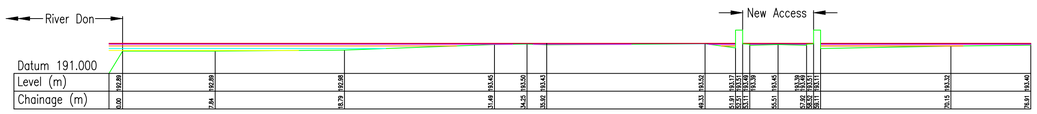
PROPOSED DEVELOPMENT
(NTS)



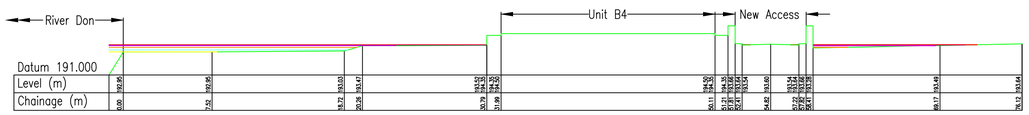
PROPOSED CROSS SECTION 1



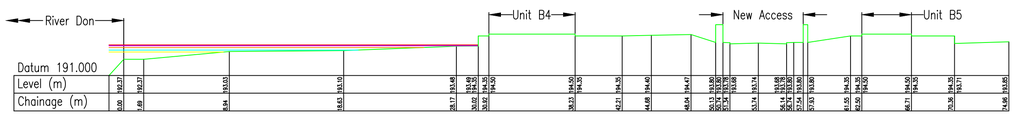
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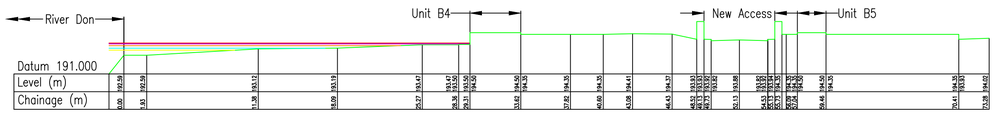
PROPOSED CROSS SECTION 3



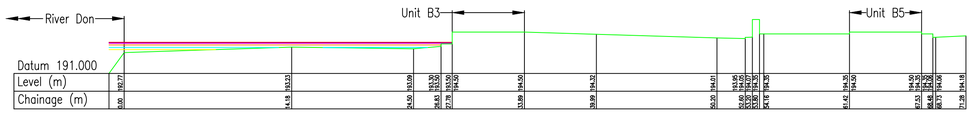
PROPOSED CROSS SECTION 4



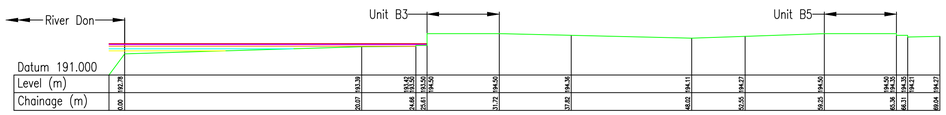
PROPOSED CROSS SECTION 5



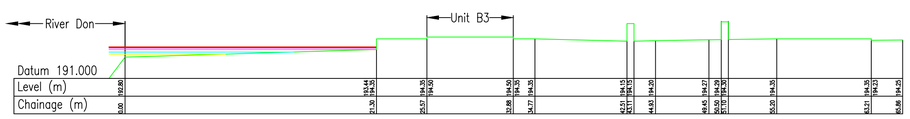
PROPOSED CROSS SECTION 6



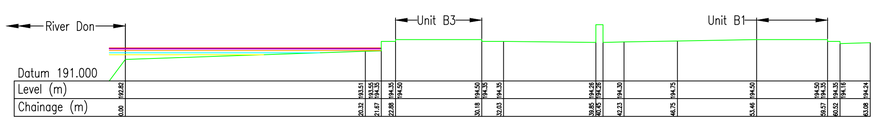
PROPOSED CROSS SECTION 7



PROPOSED CROSS SECTION 8



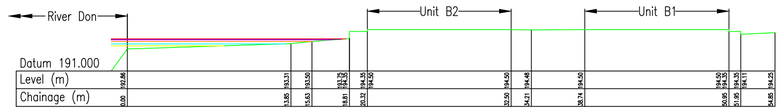
PROPOSED CROSS SECTION 9



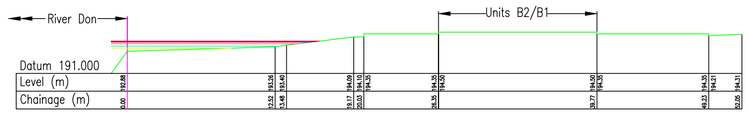
PROPOSED CROSS SECTION 10



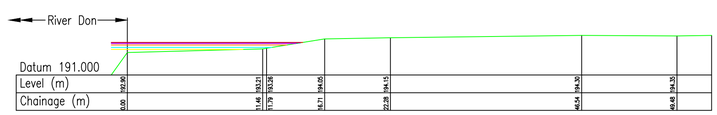
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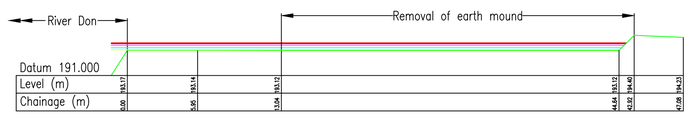
PROPOSED CROSS SECTION 12



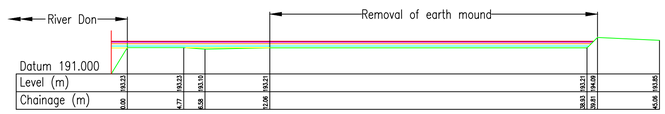
PROPOSED CROSS SECTION 13



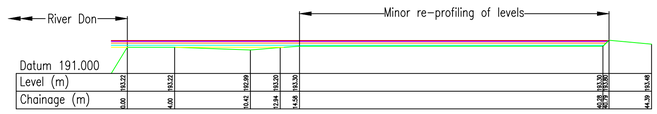
PROPOSED CROSS SECTION 14



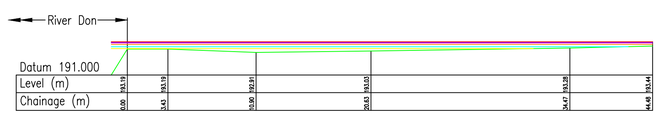
PROPOSED CROSS SECTION 15



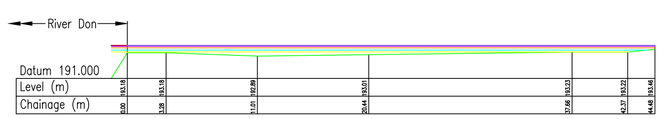
PROPOSED CROSS SECTION 16



PROPOSED CROSS SECTION 17



PROPOSED CROSS SECTION 18



PROPOSED CROSS SECTION 19

1 in 5 year

XS REF	XSA (sq.m)	XSA (sq.m)	XSA (sq.m)	XSA (sq.m)	Total XSA	Average	L (m)	Volume (cu.m)
1	0.000	0.000	0.000	0.000	0.000			
2	0.000	0.000	0.000	0.000	0.000	0.000	5.000	0.000
3	0.659	0.000	0.000	0.000	0.659	0.330	5.000	1.648
4	0.026	0.000	0.000	0.000	0.026	0.343	5.000	1.713
5	3.010	0.000	0.000	0.000	3.010	1.518	5.000	7.590
6	2.364	0.000	0.000	0.000	2.364	2.687	5.000	13.435
7	0.971	0.000	0.000	0.000	0.971	1.668	5.000	8.338
8	1.104	0.000	0.000	0.000	1.104	1.038	5.000	5.188
9	1.097	0.000	0.000	0.000	1.097	1.101	5.000	5.503
10	2.327	0.000	0.000	0.000	2.327	1.712	5.000	8.560
11	1.242	0.000	0.000	0.000	1.242	1.785	5.000	8.923
12	1.070	0.000	0.000	0.000	1.070	1.156	5.000	5.780
13	1.166	0.000	0.000	0.000	1.166	1.118	5.000	5.590
14	1.298	0.000	0.000	0.000	1.298	1.232	5.000	6.160
15	2.352	0.000	0.000	0.000	2.352	1.825	5.000	9.125
16	0.623	0.000	0.000	0.000	0.623	1.488	5.000	7.438
17	1.029	0.000	0.000	0.000	1.029	0.826	5.000	4.130
18	5.496	0.000	0.000	0.000	5.496	3.263	5.000	16.313
19	6.764	0.000	0.000	0.000	6.764	6.130	1.715	10.513
								125.943

1 in 10 year

XS REF	XSA (sq.m)	XSA (sq.m)	XSA (sq.m)	XSA (sq.m)	Total XSA	Average	L (m)	Volume (cu.m)
1	0.242	0.061	0.006	0.063	0.372			
2	0.907	0.439	0.000	0.000	1.346	0.859	5.000	4.295
3	3.188	0.000	0.000	0.000	3.188	2.267	5.000	11.335
4	2.630	0.000	0.000	0.000	2.630	2.909	5.000	14.545
5	2.316	0.000	0.000	0.000	2.316	2.473	5.000	12.365
6	2.001	0.000	0.000	0.000	2.001	2.159	5.000	10.793
7	1.800	0.458	0.000	0.000	2.258	2.130	5.000	10.648
8	1.995	0.000	0.000	0.000	1.995	2.127	5.000	10.633
9	2.007	0.000	0.000	0.000	2.007	2.001	5.000	10.005
10	2.269	0.000	0.000	0.000	2.269	2.138	5.000	10.690
11	2.155	0.000	0.000	0.000	2.155	2.212	5.000	11.060
12	1.831	0.000	0.000	0.000	1.831	1.993	5.000	9.965
13	1.899	0.000	0.000	0.000	1.899	1.865	5.000	9.325
14	1.912	0.000	0.000	0.000	1.912	1.906	5.000	9.528
15	6.894	0.000	0.000	0.000	6.894	4.403	5.000	22.015
16	5.554	0.000	0.000	0.000	5.554	6.224	5.000	31.120
17	4.286	0.000	0.000	0.000	4.286	4.920	5.000	24.600
18	6.166	0.000	0.000	0.000	6.166	5.226	5.000	26.130
19	6.880	0.000	0.000	0.000	6.880	6.523	1.715	11.187
								250.237

1 in 25 year

XS REF	XSA (sq.m)	XSA (sq.m)	XSA (sq.m)	XSA (sq.m)	Total XSA	Average	L (m)	Volume (cu.m)
1	2.797	1.311	2.384	0.568	7.060			
2	5.315	2.131	0.174	2.037	9.657	8.359	5.000	41.793
3	5.639	0.096	1.302	0.000	7.037	8.347	5.000	41.735
4	4.308	0.085	0.000	0.000	4.393	5.715	5.000	28.575
5	5.002	0.000	0.000	0.000	5.002	4.698	5.000	23.488
6	4.511	0.000	0.000	0.000	4.511	4.757	5.000	23.783
7	5.723	0.000	0.000	0.000	5.723	5.117	5.000	25.585
8	3.997	0.000	0.000	0.000	3.997	4.860	5.000	24.300
9	3.819	0.000	0.000	0.000	3.819	3.908	5.000	19.540
10	3.748	0.000	0.000	0.000	3.748	3.784	5.000	18.918
11	3.884	0.000	0.000	0.000	3.884	3.816	5.000	19.080
12	3.020	0.000	0.000	0.000	3.020	3.452	5.000	17.260
13	2.782	0.000	0.000	0.000	2.782	2.901	5.000	14.505
14	2.585	0.000	0.000	0.000	2.585	2.684	5.000	13.418
15	8.351	0.000	0.000	0.000	8.351	5.468	5.000	27.340
16	7.718	0.000	0.000	0.000	7.718	8.035	5.000	40.173
17	7.889	0.000	0.000	0.000	7.889	7.804	5.000	39.018
18	8.536	0.000	0.000	0.000	8.536	8.213	5.000	41.063
19	8.560	0.000	0.000	0.000	8.560	8.548	1.715	14.660
								474.230

1 in 50 year

XS REF	XSA (sq.m)	XSA (sq.m)	XSA (sq.m)	XSA (sq.m)	Total XSA	Average	L (m)	Volume (cu.m)
1	6.978	2.251	1.666	0.000	10.895			
2	4.325	2.203	0.886	2.609	10.023	10.459	5.000	52.295
3	4.431	0.199	0.531	2.403	7.564	8.794	5.000	43.968
4	2.945	0.974	0.000	0.000	3.919	5.742	5.000	28.708
5	3.926	0.000	0.000	0.000	3.926	3.923	5.000	19.613
6	3.704	0.000	0.000	0.000	3.704	3.815	5.000	19.075
7	3.778	0.000	0.000	0.000	3.778	3.741	5.000	18.705
8	3.444	0.000	0.000	0.000	3.444	3.611	5.000	18.055
9	2.876	0.000	0.000	0.000	2.876	3.160	5.000	15.800
10	2.730	0.000	0.000	0.000	2.730	2.803	5.000	14.015
11	2.839	0.000	0.000	0.000	2.839	2.785	5.000	13.923
12	2.178	0.000	0.000	0.000	2.178	2.509	5.000	12.543
13	1.933	0.000	0.000	0.000	1.933	2.056	5.000	10.278
14	1.791	0.000	0.000	0.000	1.791	1.862	5.000	9.310
15	5.392	0.000	0.000	0.000	5.392	3.592	5.000	17.958
16	4.996	0.000	0.000	0.000	4.996	5.194	5.000	25.970
17	5.077	0.000	0.000	0.000	5.077	5.037	5.000	25.183
18	5.516	0.000	0.000	0.000	5.516	5.297	5.000	26.483
19	5.403	0.000	0.000	0.000	5.403	5.460	1.715	9.363
								381.241

1 in 75 year

XS REF	XSA (sq.m)	XSA (sq.m)	XSA (sq.m)	XSA (sq.m)	Total XSA	Average	L (m)	Volume (cu.m)
1	2.323	0.750	0.586	0.000	3.659			
2	2.644	0.329	0.923	0.000	3.896	3.778	5.000	18.888
3	2.542	0.286	0.926	0.000	3.754	3.825	5.000	19.125
4	1.495	0.618	0.000	0.000	2.113	2.934	5.000	14.668
5	1.651	0.000	0.000	0.000	1.651	1.882	5.000	9.410
6	1.671	0.000	0.000	0.000	1.671	1.661	5.000	8.305
7	1.584	0.000	0.000	0.000	1.584	1.628	5.000	8.138
8	1.485	0.000	0.000	0.000	1.485	1.535	5.000	7.673
9	1.257	0.000	0.000	0.000	1.257	1.371	5.000	6.855
10	1.278	0.000	0.000	0.000	1.278	1.268	5.000	6.338
11	1.327	0.000	0.000	0.000	1.327	1.303	5.000	6.513
12	1.046	0.000	0.000	0.000	1.046	1.187	5.000	5.933
13	0.945	0.000	0.000	0.000	0.945	0.996	5.000	4.978
14	0.854	0.000	0.000	0.000	0.854	0.900	5.000	4.498
15	2.491	0.000	0.000	0.000	2.491	1.673	5.000	8.363
16	2.327	0.000	0.000	0.000	2.327	2.409	5.000	12.045
17	2.401	0.000	0.000	0.000	2.401	2.364	5.000	11.820
18	2.669	0.000	0.000	0.000	2.669	2.535	5.000	12.675
19	2.636	0.000	0.000	0.000	2.636	2.653	1.715	4.549
								170.769

1 in 100 year

XS REF	XSA (sq.m)	XSA (sq.m)	XSA (sq.m)	XSA (sq.m)	Total XSA	Average	L (m)	Volume (cu.m)
1	0.883	0.285	0.223	0.000	1.391			
2	1.042	0.127	0.355	0.000	1.524	1.458	5.000	7.288
3	1.142	0.132	0.391	0.000	1.665	1.595	5.000	7.973
4	0.677	0.295	0.000	0.000	0.972	1.319	5.000	6.593
5	0.751	0.000	0.000	0.000	0.751	0.862	5.000	4.308
6	0.791	0.000	0.000	0.000	0.791	0.771	5.000	3.855
7	0.806	0.000	0.000	0.000	0.806	0.799	5.000	3.993
8	0.768	0.000	0.000	0.000	0.768	0.787	5.000	3.935
9	0.660	0.000	0.000	0.000	0.660	0.714	5.000	3.570
10	0.693	0.000	0.000	0.000	0.693	0.677	5.000	3.383
11	0.714	0.000	0.000	0.000	0.714	0.704	5.000	3.518
12	0.568	0.000	0.000	0.000	0.568	0.641	5.000	3.205
13	0.500	0.000	0.000	0.000	0.500	0.534	5.000	2.670
14	0.472	0.000	0.000	0.000	0.472	0.486	5.000	2.430
15	1.353	0.000	0.000	0.000	1.353	0.913	5.000	4.563
16	1.263	0.000	0.000	0.000	1.263	1.308	5.000	6.540
17	1.345	0.000	0.000	0.000	1.345	1.304	5.000	6.520
18	1.423	0.000	0.000	0.000	1.423	1.384	5.000	6.920
19	1.474	0.000	0.000	0.000	1.474	1.449	1.715	2.484
								83.744

APPENDIX L
Historic Borehole Logs & Soilscape Map

SE20SW 67

HOLST & CO. LTD.

SITE INVESTIGATION DEPT

PARKSIDE LANE

LEEDS LS11 5SX.

Contract No. SI 0997/E2475 Borehole No. 3

Location Penistone Grammar School, Sports Hall. Ground Level

Client WEST RIDING COUNTY ARCHITECT Date 10/3/73 2416 0403

BOREHOLE LOG

STRATA	Legend	Depth below Ground Level	Thickness of Strata	Type of Sample	c lb/in²	ø deg	m.c %	y lb/cu. ft.	N
Topsoil with fill		1'0	1'0						
Highly weathered brown fragmented SILTSTONE with occasional clay filled fissures		4'6	3'6	3'0					50
Weathered brown fragmented SILTSTONE		8'0	3'6	5'0					62
Weathered brown SILSTONE		11'0	3'0	10'0					112 for 10"

Water Struck at None Encountered Maximum Observed Water Level

Undisturbed Sample
Disturbed Sample o
Water Sample Δ
Penetration Test I

c = Cohesion
ø = Angle of Internal Friction
m.c = Moisture Content
y = Bulk Density
N = Standard Penetration Value

Water levels are subject to seasonal or tidal variation and should not be taken as constant

HOLST & CO. LTD.

SITE INVESTIGATION DEPT

PARKSIDE LANE

LEEDS LS11 5SX.

SE 20 SW 31
2430 0289

Contract No. S10870/F2412 Borehole No. 6

Location Penistone - St. Johns C. E. School Ground Level

Client WEST RIDING COUNTY ARCHITECT Date

BOREHOLE LOG

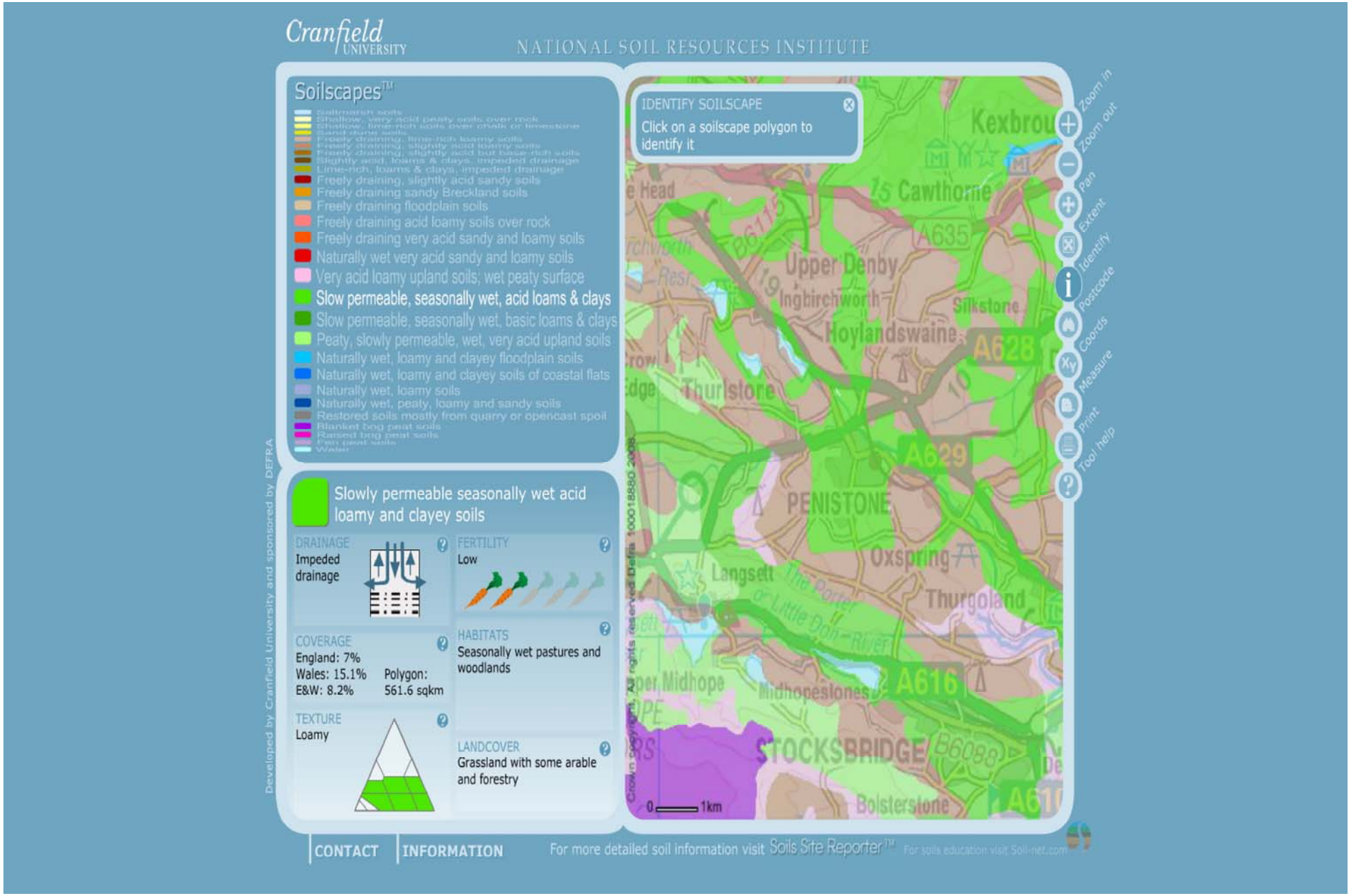
STRATA	Legend	Depth below Ground Level	Thickness of Strata	Type of Sample	c lb/in²	ø deg	m.c %	y lb/cu. ft.	N
TOPSOIL		9"	9"						
Firm brown mottled silty stoney CLAY		3'0"	2'3"	1'6"	10.0	0	22.8	130	
Stiff brown mottled shaley CLAY (weathered mudstone)		6'6"	3'6"	5'0"	16.0	19	17.7	134	
Weathered brown MUDSTONE with siltstone bands		9'6"	3'0"	8'6"					156

Water Struck at None encountered Maximum Observed Water Level

Undisturbed Sample ::
Disturbed Sample o
Water Sample Δ
Penetration Test I

c = Cohesion
ø = Angle of Internal Friction
m.c = Moisture Content
y = Bulk Density
N = Standard Penetration Value

Water levels are subject to seasonal or tidal variation and should not be taken as constant


Cranfield UNIVERSITY
NATIONAL SOIL RESOURCES INSTITUTE
Soilscapes™
Saltmarsh soils
Shallow, very acid peaty soils over rock
Shallow, lime-rich soils over chalk or limestone
Sand dune soils
Freely draining, lime-rich loamy soils
Freely draining, slightly acid loamy soils
Freely draining, slightly acid but base-rich soils
Slightly acid, loams & clays, impeded drainage
Lime-rich, loams & clays, impeded drainage
Freely draining, slightly acid sandy soils
Freely draining sandy Breckland soils
Freely draining floodplain soils
Freely draining acid loamy soils over rock
Freely draining very acid sandy and loamy soils
Naturally wet very acid sandy and loamy soils
Very acid loamy upland soils; wet peaty surface
Slow permeable, seasonally wet, acid loams & clays
Slow permeable, seasonally wet, basic loams & clays
Peaty, slowly permeable, wet, very acid upland soils
Naturally wet, loamy and clayey floodplain soils
Naturally wet, loamy and clayey soils of coastal flats
Naturally wet, loamy soils
Naturally wet, peaty, loamy and sandy soils
Restored soils mostly from quarry or opencast spoil
Blanket bog peat soils
Raised bog peat soils
Fen peat soils
Water
Slowly permeable seasonally wet acid loamy and clayey soils
DRAINAGE
Impeded drainage
FERTILITY
Low
COVERAGE
England: 7%
Wales: 15.1%
E&W: 8.2%
Polygon: 561.6 sqkm
HABITATS
Seasonally wet pastures and woodlands
TEXTURE
Loamy
LANDCOVER
Grassland with some arable and forestry
IDENTIFY SOILSCAPE
Click on a soilscape polygon to identify it
Zoom in
Zoom out
Pan
Extent
Identify
Postcode
Coords
Measure
Print
Tool help
Kexbrough
Cawthorne
Upper Denby
Ingbirchworth
Silkstone
Hoylandswaine
Thurlstone
PENISTONE
Oxspring
Langsett
Thurgoland
Midhopestones
STOCKSBRIDGE
Bolsterstone
A635
A628
A629
A616
B6088
0 1km
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INFORMATION
For more detailed soil information visit Soils Site Reporter™
For soils education visit Soil-net.com

APPENDIX M
SUDs Planner Results

SUDS Planner

Results

Ordered By Total

	Quick Rank View	Hydrological	Land Use	Site Features	Total	Community and Environment	Economics and Maintenance
Pervious Pavements	(1, 4, 5)	28 (1st)	15 (11th)	43 (4th)	86 (1st)	16 (4th)	22 (5th)
Online / Offline Storage	(1, 1, 8)	18 (10th)	23 (1st)	45 (1st)	86 (1st)	20 (1st)	20 (8th)
Green Roofs	(3, 9, 2)	26 (2nd)	9 (13th)	45 (1st)	80 (3rd)	14 (9th)	24 (2nd)
Filtration Techniques	(4, 4, 13)	16 (12th)	18 (5th)	45 (1st)	79 (4th)	16 (4th)	14 (13th)
Filter Drains	(5, 4, 11)	20 (8th)	17 (7th)	37 (6th)	74 (5th)	16 (4th)	18 (11th)
Wet Ponds	(5, 9, 1)	24 (3rd)	21 (2nd)	29 (10th)	74 (5th)	14 (9th)	26 (1st)
Stormwater Wetlands	(5, 9, 5)	22 (6th)	21 (2nd)	31 (9th)	74 (5th)	14 (9th)	22 (5th)
Grassed Swales	(5, 4, 5)	22 (6th)	17 (7th)	35 (8th)	74 (5th)	16 (4th)	22 (5th)
Bioretention Area	(9, 2, 11)	18 (10th)	18 (5th)	37 (6th)	73 (9th)	18 (2nd)	18 (11th)
Dry Detention	(10, 12, 2)	20 (8th)	21 (2nd)	29 (10th)	70 (10th)	12 (12th)	24 (2nd)
Infiltration Trench / Soakaway	(11, 4, 8)	24 (3rd)	16 (10th)	29 (10th)	69 (11th)	16 (4th)	20 (8th)
Grassed Filter Strip	(12, 2, 2)	12 (13th)	17 (7th)	39 (5th)	68 (12th)	18 (2nd)	24 (2nd)
Infiltration Basin	(13, 12, 8)	24 (3rd)	14 (12th)	21 (13th)	59 (13th)	12 (12th)	20 (8th)

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