

File Note

ARUP

13 Fitzroy Street
London
W1T 4BQ
United Kingdom
www.arup.com

t +44 20 7636 1531
d +44 20 7755 2314

Project title Haverstock Hill

Job number

286265-00

cc Katherine Frost
David Fowler

File reference

HH-ARP-REP-603

Prepared by Raluca Olariu

Date

16 March 2021

Subject Clarifications on Cond 21 2020/4984/P (5 - 17 Haverstock Hill London NW3 2BP)

1 Introduction

Arup has been commissioned by OD Hotels Camden Ltd. to produce the documentation needed to meet Planning Condition 21 for the 5-17 Haverstock Hill site, NW3 2BL, London. This note is produced as supporting information for the Note submitted to address Cond 21 2020/4984/P (5 - 17 Haverstock Hill London NW3 2BP).

2 Additional clarifications

Note reference HH-ARP-REP-602 was submitted to respond to Cond 21 2020/4984/P (5 - 17 Haverstock Hill London NW3 2BP). Further information has been requested by the planning officer to clarify the following points:

1. Provides justification as to why the existing runoff rates provided are lower than those submitted in the approved submission and includes calculations to support the existing runoff rates.
2. Explains why the maintenance tasks and frequencies have changed from the approved submission and proposes maintenance tasks and frequencies for pump stations.
3. Updates the modelled site area in MicroDrainage to match the full site area (2070m²).

2.1 Existing runoff rates estimates

As explained in HH-ARP-REP-602 section 2.1 “Existing Surface Water Runoff Rate” the surface water runoff rate for the existing site was determined using the Modified Rationale Method:

$$Q=2.78C_v C_r i A$$

Where:

Q=Peak discharge (/s)

C_v=Volumetric runoff coefficient

\\GLOBAL.ARUP.COM\LONDON\BEL\JOBS\200000\268200\268265-00 HAVERSTOCK HILL\4 INTERNAL DATA\05 REPORTS\03 CIVIL\CONDITION 21\CLARIFICATIONS ON CONDITION 21.DOCX

File Note

286265-00

16 March 2021

Cr=Dimensionless routing coefficient

i=Rainfall Intensity (mm/hr)

A=Catchment area (ha)

The Wallingford Procedure recommends that when used in urban catchments the following values can be used:

Cv=0.75 (range between 0.6 to 0.9)

Cr=1.3

The existing total site area is approximately 0.21ha (value rounded up for 0.207ha was used) and is assumed 100% impermeable. Therefore, the existing site runoff rate for the 100-year storm is calculated as:

A=0.21ha

i=88.14mm/hr (for 100-year return period 6 hour duration)

The rainfall data was downloaded from the <https://fehweb.ceh.ac.uk/> website and it is the rainfall rarity/depth data (using both the FEH 2013 and legacy FEH 1999 DDF models). The rainfall data provides catchment level values for the rainfall depth-duration-frequency estimates which are used to determine the flood risk in the catchment.

Appendix A below is showing the rainfall for the catchment in which the site is located, as downloaded from the afore mentioned website.

As the catchment information does not include the rainfall depth for 1:1 return period event, the 1:2-year rainfall event was used instead. Similarly, 1:15 year return rainfall event is not included either, but the rainfall depth for the 1:20 year return rainfall event was used instead as the closest rainfall depth value.

Using the Modified Rationale Method formula and the rainfall data for 1:2, 1:20, 1:30, 1:100 and 1:100+40% Climate Change (6 hours duration) the existing runoff was determined for the site.

2.2 Pump station maintenance schedule and tasks

The HH-ARP-REP-602 note submitted in October 2020 did not include the schedule and maintenance of the pumping station. This was due to an omission from the author. Appendix B below includes the Pumping Station Maintenance Tasks and Frequency Strategy, matching the approved submission.

2.3 Updated MicroDrainage model

Appendix C includes the updated MicroDrainage model using the correct site areas matching the 0.207ha impermeable areas.

File Note

286265-00

16 March 2021

3 Appendices

3.1 Appendix A

FEH Rainfall Data

VERSION "FEH Web Version 1.0.0 exported at 10:17:11 GMT Thu 03-Sep-20

Parameters

Rainfall model FEH 2013

Calculation Design rainfall

Calculation Typical point in catchment

Calculation Catchment GB 528300 184350 TQ 28300 84350

Catchment 0.52 km**2

Fixed duration

Annual maximum: yes

														10000 year
Duration h	Duration d	2 year rain	5 year rain	10 year rain	20 year rain	30 year rain	50 year rain	75 year rain	100 year rain	150 year rain	200 year rain	500 year rain	1000 year rain	rainfall (mm)
0.25	0.010417	7.39	12.9	16.87	20.99	23.32	26.4	29.03	31	33.85	35.94	43.06	48.72	68.06
0.5	0.020833	9.5	16.42	21.59	26.89	29.97	34.16	37.63	40.21	44.14	46.99	56.43	64.2	90.68
0.75	0.03125	10.71	18.67	24.42	30.44	33.97	38.76	42.67	45.56	50.1	53.4	64.21	73.06	103.56
1	0.041667	11.62	20.15	26.44	32.96	36.87	42.02	46.31	49.5	54.25	57.78	69.66	79.23	112.36
1.25	0.052083	12.99	22.09	28.81	35.72	39.93	45.45	50.14	53.64	58.78	62.64	75.76	86.14	121.2
1.5	0.0625	14.48	24.06	31.09	38.29	42.74	48.62	53.69	57.5	63.09	67.3	81.57	92.68	129.12
1.75	0.072917	15.97	25.93	33.17	40.61	45.26	51.49	56.91	61.02	67.07	71.62	86.91	98.65	136.11
2	0.083333	17.37	27.64	35.03	42.67	47.5	54.07	59.82	64.2	70.7	75.58	91.76	104	142.25
2.25	0.09375	18.38	28.9	36.45	44.31	49.3	56.18	62.23	66.85	73.72	78.86	95.71	108.29	147.26
2.5	0.104167	19.29	30.02	37.7	45.76	50.9	58.06	64.4	69.24	76.44	81.8	99.23	112.08	151.68
2.75	0.114583	20.11	31.02	38.82	47.05	52.33	59.75	66.35	71.39	78.91	84.47	102.39	115.48	155.6
3	0.125	20.85	31.92	39.83	48.22	53.62	61.28	68.12	73.35	81.15	86.91	105.25	118.54	159.13
3.25	0.135417	21.53	32.74	40.75	49.28	54.8	62.68	69.74	75.15	83.21	89.13	107.85	121.32	162.32
3.5	0.145833	22.15	33.5	41.58	50.24	55.87	63.96	71.23	76.81	85.11	91.18	110.23	123.85	165.22
3.75	0.15625	22.72	34.19	42.36	51.13	56.86	65.14	72.61	78.34	86.87	93.08	112.41	126.18	167.88
4	0.166667	23.25	34.83	43.07	51.95	57.78	66.23	73.89	79.76	88.5	94.83	114.43	128.33	170.32
4.25	0.177083	23.73	35.42	43.73	52.69	58.62	67.23	75.06	81.07	89.99	96.44	116.25	130.29	172.55
4.5	0.1875	24.18	35.97	44.34	53.39	59.41	68.16	76.14	82.28	91.38	97.92	117.93	132.1	174.61
4.75	0.197917	24.6	36.49	44.92	54.03	60.14	69.03	77.16	83.42	92.67	99.31	119.5	133.79	176.52
5	0.208333	24.99	36.97	45.46	54.64	60.82	69.84	78.11	84.48	93.88	100.6	120.95	135.35	178.3
5.25	0.21875	25.36	37.42	45.96	55.21	61.47	70.61	79	85.48	95.01	101.81	122.31	136.81	179.96
5.5	0.229167	25.71	37.85	46.44	55.75	62.07	71.32	79.84	86.41	96.08	102.95	123.59	138.18	181.52

5.75	0.239583	26.05	38.25	46.89	56.26	62.65	72	80.64	87.3	97.08	104.02	124.79	139.46	182.97
6	0.25	26.36	38.64	47.32	56.74	63.19	72.64	81.39	88.14	98.03	105.03	125.92	140.67	184.35
6.25	0.260417	26.66	38.99	47.71	57.19	63.68	73.24	82.1	88.93	98.92	105.97	126.97	141.78	185.63
6.5	0.270833	26.94	39.32	48.08	57.61	64.16	73.81	82.77	89.69	99.76	106.86	127.97	142.84	186.84
6.75	0.28125	27.22	39.64	48.44	58.02	64.6	74.35	83.41	90.4	100.55	107.7	128.91	143.83	187.98
7	0.291667	27.48	39.95	48.78	58.41	65.03	74.86	84.02	91.08	101.31	108.5	129.8	144.77	189.06
7.25	0.302083	27.73	40.24	49.11	58.78	65.44	75.35	84.6	91.73	102.03	109.26	130.65	145.67	190.09
7.5	0.3125	27.97	40.52	49.42	59.14	65.83	75.82	85.15	92.34	102.71	109.98	131.46	146.52	191.07
7.75	0.322917	28.2	40.79	49.73	59.48	66.21	76.27	85.68	92.93	103.37	110.67	132.23	147.33	192
8	0.333333	28.42	41.05	50.02	59.81	66.57	76.71	86.19	93.5	103.99	111.33	132.97	148.1	192.89
8.25	0.34375	28.64	41.3	50.3	60.13	66.92	77.12	86.68	94.04	104.59	111.96	133.67	148.84	193.74
8.5	0.354167	28.84	41.54	50.57	60.44	67.25	77.52	87.15	94.56	105.16	112.56	134.35	149.54	194.55
8.75	0.364583	29.05	41.77	50.83	60.74	67.57	77.9	87.6	95.05	105.71	113.14	134.99	150.22	195.33
9	0.375	29.24	42	51.08	61.02	67.89	78.27	88.03	95.53	106.24	113.7	135.61	150.87	196.08
9.25	0.385417	29.43	42.22	51.33	61.3	68.19	78.63	88.45	95.99	106.74	114.23	136.21	151.5	196.8
9.5	0.395833	29.61	42.43	51.56	61.57	68.48	78.97	88.85	96.44	107.23	114.74	136.78	152.1	197.49
9.75	0.40625	29.79	42.64	51.79	61.83	68.76	79.31	89.24	96.86	107.7	115.24	137.34	152.68	198.15
10	0.416667	29.96	42.84	52.02	62.09	69.03	79.63	89.61	97.27	108.15	115.71	137.87	153.24	198.79
10.25	0.427083	30.13	43.04	52.24	62.33	69.3	79.94	89.97	97.67	108.59	116.17	138.38	153.78	199.41
10.5	0.4375	30.3	43.23	52.45	62.57	69.56	80.24	90.32	98.06	109.01	116.61	138.88	154.3	200.01
10.75	0.447917	30.46	43.41	52.65	62.81	69.81	80.54	90.66	98.43	109.42	117.04	139.36	154.8	200.58
11	0.458333	30.61	43.59	52.86	63.03	70.05	80.82	90.99	98.79	109.81	117.46	139.82	155.29	201.14
11.25	0.46875	30.76	43.77	53.05	63.25	70.29	81.1	91.31	99.14	110.19	117.86	140.27	155.76	201.68
11.5	0.479167	30.91	43.94	53.24	63.47	70.52	81.37	91.62	99.47	110.56	118.24	140.71	156.22	202.2
11.75	0.489583	31.06	44.11	53.43	63.68	70.74	81.63	91.92	99.8	110.92	118.62	141.13	156.66	202.71
12	0.5	31.2	44.28	53.61	63.89	70.96	81.89	92.21	100.12	111.27	118.98	141.54	157.09	203.2
12.25	0.510417	31.34	44.44	53.79	64.09	71.18	82.13	92.49	100.42	111.6	119.33	141.94	157.5	203.66
12.5	0.520833	31.47	44.6	53.97	64.29	71.39	82.38	92.76	100.71	111.92	119.67	142.32	157.91	204.12
12.75	0.53125	31.61	44.76	54.14	64.48	71.59	82.61	93.02	100.99	112.23	120	142.7	158.3	204.56
13	0.541667	31.74	44.91	54.31	64.67	71.8	82.84	93.28	101.27	112.53	120.32	143.06	158.69	204.99
13.25	0.552083	31.86	45.07	54.48	64.85	71.99	83.06	93.53	101.54	112.83	120.63	143.42	159.06	205.4
13.5	0.5625	31.99	45.21	54.64	65.04	72.19	83.28	93.77	101.8	113.12	120.94	143.76	159.42	205.81
13.75	0.572917	32.11	45.36	54.8	65.21	72.38	83.5	94.01	102.06	113.4	121.23	144.1	159.77	206.21

14	0.583333	32.23	45.5	54.96	65.39	72.56	83.71	94.24	102.3	113.67	121.52	144.42	160.12	206.6
14.25	0.59375	32.35	45.65	55.12	65.56	72.74	83.91	94.47	102.55	113.94	121.8	144.74	160.46	206.97
14.5	0.604167	32.47	45.78	55.27	65.73	72.92	84.11	94.69	102.79	114.2	122.08	145.05	160.78	207.34
14.75	0.614583	32.58	45.92	55.42	65.89	73.1	84.31	94.91	103.02	114.45	122.34	145.35	161.1	207.7
15	0.625	32.7	46.06	55.57	66.06	73.27	84.5	95.12	103.25	114.7	122.6	145.65	161.42	208.06
15.25	0.635417	32.81	46.19	55.71	66.22	73.44	84.69	95.33	103.47	114.94	122.86	145.94	161.72	208.4
15.5	0.645833	32.92	46.32	55.85	66.37	73.6	84.88	95.53	103.69	115.18	123.11	146.22	162.02	208.74
15.75	0.65625	33.02	46.45	55.99	66.53	73.77	85.06	95.73	103.9	115.41	123.35	146.5	162.31	209.07
16	0.666667	33.13	46.57	56.13	66.68	73.93	85.23	95.93	104.11	115.64	123.59	146.77	162.6	209.39
16.25	0.677083	33.23	46.7	56.27	66.83	74.08	85.41	96.12	104.31	115.86	123.83	147.03	162.88	209.71
16.5	0.6875	33.34	46.82	56.4	66.97	74.24	85.58	96.31	104.51	116.08	124.05	147.29	163.15	210.02
16.75	0.697917	33.44	46.94	56.53	67.12	74.39	85.75	96.49	104.71	116.29	124.28	147.54	163.42	210.33
17	0.708333	33.54	47.06	56.66	67.26	74.54	85.91	96.67	104.9	116.5	124.5	147.79	163.68	210.62
17.25	0.71875	33.64	47.18	56.79	67.4	74.69	86.08	96.85	105.09	116.7	124.71	148.03	163.94	210.92
17.5	0.729167	33.74	47.29	56.92	67.54	74.84	86.24	97.02	105.27	116.9	124.92	148.27	164.19	211.21
17.75	0.739583	33.83	47.41	57.05	67.67	74.98	86.39	97.19	105.46	117.1	125.13	148.5	164.44	211.49
18	0.75	33.93	47.52	57.17	67.81	75.12	86.55	97.36	105.64	117.29	125.33	148.73	164.68	211.77
18.25	0.760417	34.02	47.63	57.29	67.94	75.26	86.7	97.53	105.81	117.48	125.53	148.95	164.92	212.04
18.5	0.770833	34.11	47.74	57.41	68.07	75.4	86.85	97.69	105.99	117.67	125.72	149.17	165.15	212.31
18.75	0.78125	34.2	47.85	57.53	68.19	75.53	86.99	97.85	106.16	117.85	125.91	149.38	165.38	212.58
19	0.791667	34.29	47.95	57.65	68.32	75.66	87.13	98	106.32	118.03	126.1	149.59	165.61	212.84
19.25	0.802083	34.38	48.06	57.77	68.44	75.8	87.28	98.16	106.49	118.2	126.28	149.79	165.83	213.09
19.5	0.8125	34.47	48.16	57.88	68.57	75.93	87.42	98.31	106.65	118.38	126.47	149.99	166.05	213.35
19.75	0.822917	34.56	48.27	58	68.69	76.06	87.55	98.46	106.81	118.55	126.64	150.19	166.26	213.6
20	0.833333	34.65	48.37	58.11	68.81	76.18	87.69	98.61	106.97	118.72	126.82	150.38	166.47	213.84
20.25	0.84375	34.73	48.47	58.23	68.93	76.31	87.82	98.75	107.12	118.88	126.99	150.57	166.67	214.09
20.5	0.854167	34.82	48.57	58.34	69.05	76.43	87.96	98.9	107.28	119.04	127.16	150.76	166.88	214.32
20.75	0.864583	34.9	48.67	58.45	69.16	76.56	88.09	99.04	107.43	119.21	127.33	150.95	167.08	214.56
21	0.875	34.99	48.77	58.56	69.28	76.68	88.22	99.18	107.58	119.36	127.49	151.13	167.27	214.79
21.25	0.885417	35.07	48.87	58.67	69.39	76.8	88.35	99.32	107.72	119.52	127.66	151.31	167.47	215.02
21.5	0.895833	35.15	48.96	58.77	69.51	76.92	88.47	99.45	107.87	119.67	127.81	151.48	167.66	215.25
21.75	0.90625	35.23	49.06	58.88	69.62	77.04	88.6	99.59	108.01	119.82	127.97	151.66	167.85	215.47
22	0.916667	35.31	49.16	58.99	69.73	77.16	88.72	99.72	108.15	119.97	128.13	151.83	168.03	215.69

22.25	0.927083	35.4	49.25	59.09	69.84	77.27	88.85	99.85	108.29	120.12	128.28	152	168.21	215.9
22.5	0.9375	35.48	49.35	59.2	69.95	77.39	88.97	99.98	108.43	120.26	128.43	152.16	168.39	216.12
22.75	0.947917	35.55	49.44	59.3	70.06	77.5	89.09	100.11	108.56	120.41	128.58	152.33	168.57	216.33
23	0.958333	35.63	49.53	59.4	70.17	77.62	89.21	100.24	108.7	120.55	128.73	152.49	168.75	216.54
23.25	0.96875	35.71	49.62	59.51	70.27	77.73	89.32	100.36	108.83	120.69	128.87	152.65	168.92	216.74
23.5	0.979167	35.79	49.72	59.61	70.38	77.84	89.44	100.49	108.96	120.83	129.01	152.8	169.09	216.95
23.75	0.989583	35.87	49.81	59.71	70.48	77.95	89.55	100.61	109.09	120.96	129.15	152.96	169.26	217.15
24	1	35.94	49.9	59.81	70.59	78.06	89.67	100.73	109.22	121.1	129.29	153.11	169.42	217.35
24.25	1.010417	36.02	49.99	59.91	70.69	78.17	89.78	100.85	109.34	121.22	129.43	153.26	169.58	217.54
24.5	1.020833	36.1	50.08	60.01	70.8	78.28	89.89	100.96	109.46	121.35	129.56	153.4	169.73	217.73
24.75	1.03125	36.17	50.17	60.1	70.9	78.39	90	101.08	109.58	121.48	129.69	153.55	169.89	217.92
25	1.041667	36.25	50.26	60.2	71.01	78.5	90.11	101.19	109.69	121.6	129.82	153.69	170.04	218.11
25.25	1.052083	36.33	50.35	60.3	71.11	78.6	90.22	101.3	109.81	121.73	129.95	153.83	170.19	218.29
25.5	1.0625	36.4	50.44	60.4	71.21	78.71	90.33	101.41	109.93	121.85	130.08	153.97	170.34	218.48
25.75	1.072917	36.48	50.53	60.49	71.31	78.81	90.44	101.52	110.04	121.97	130.2	154.1	170.48	218.66
26	1.083333	36.55	50.62	60.59	71.41	78.92	90.54	101.63	110.15	122.09	130.32	154.24	170.63	218.84
26.25	1.09375	36.62	50.71	60.68	71.51	79.02	90.65	101.74	110.26	122.2	130.45	154.37	170.77	219.02
26.5	1.104167	36.7	50.79	60.78	71.61	79.12	90.76	101.85	110.37	122.32	130.57	154.51	170.91	219.19
26.75	1.114583	36.77	50.88	60.87	71.71	79.23	90.86	101.95	110.48	122.44	130.69	154.64	171.05	219.37
27	1.125	36.84	50.97	60.96	71.81	79.33	90.96	102.06	110.59	122.55	130.81	154.77	171.19	219.54
27.25	1.135417	36.92	51.05	61.06	71.91	79.43	91.07	102.16	110.7	122.66	130.92	154.89	171.33	219.71
27.5	1.145833	36.99	51.14	61.15	72	79.53	91.17	102.27	110.8	122.78	131.04	155.02	171.46	219.88
27.75	1.15625	37.06	51.23	61.24	72.1	79.63	91.27	102.37	110.91	122.89	131.15	155.15	171.6	220.04
28	1.166667	37.13	51.31	61.33	72.2	79.73	91.37	102.47	111.01	123	131.27	155.27	171.73	220.21
28.25	1.177083	37.2	51.4	61.42	72.29	79.83	91.47	102.57	111.12	123.1	131.38	155.39	171.86	220.37
28.5	1.1875	37.28	51.48	61.52	72.39	79.93	91.57	102.67	111.22	123.21	131.49	155.51	171.99	220.54
28.75	1.197917	37.35	51.57	61.61	72.49	80.03	91.67	102.77	111.32	123.32	131.6	155.64	172.12	220.7
29	1.208333	37.42	51.65	61.7	72.58	80.12	91.77	102.87	111.42	123.42	131.71	155.75	172.24	220.86
29.25	1.21875	37.49	51.73	61.79	72.67	80.22	91.86	102.97	111.52	123.53	131.82	155.87	172.37	221.01
29.5	1.229167	37.56	51.82	61.87	72.77	80.32	91.96	103.07	111.62	123.63	131.93	155.99	172.5	221.17
29.75	1.239583	37.63	51.9	61.96	72.86	80.41	92.06	103.16	111.72	123.74	132.03	156.11	172.62	221.33
30	1.25	37.7	51.98	62.05	72.95	80.51	92.15	103.26	111.81	123.84	132.14	156.22	172.74	221.48
30.25	1.260417	37.76	52.06	62.14	73.05	80.6	92.25	103.35	111.91	123.94	132.24	156.33	172.86	221.63

30.5	1.270833	37.83	52.15	62.23	73.14	80.7	92.34	103.45	112.01	124.04	132.35	156.45	172.98	221.78
30.75	1.28125	37.9	52.23	62.31	73.23	80.79	92.43	103.54	112.1	124.14	132.45	156.56	173.1	221.93
31	1.291667	37.97	52.31	62.4	73.32	80.89	92.53	103.64	112.2	124.24	132.55	156.67	173.22	222.08
31.25	1.302083	38.04	52.39	62.49	73.41	80.98	92.62	103.73	112.29	124.33	132.65	156.78	173.34	222.23
31.5	1.3125	38.11	52.47	62.57	73.5	81.07	92.71	103.82	112.38	124.43	132.75	156.89	173.45	222.37
31.75	1.322917	38.17	52.55	62.66	73.59	81.16	92.8	103.91	112.47	124.53	132.85	157	173.57	222.52
32	1.333333	38.24	52.63	62.74	73.68	81.26	92.9	104	112.57	124.62	132.95	157.1	173.68	222.66
32.25	1.34375	38.31	52.71	62.83	73.77	81.35	92.99	104.09	112.66	124.72	133.05	157.21	173.79	222.8
32.5	1.354167	38.37	52.79	62.91	73.86	81.44	93.08	104.18	112.75	124.81	133.14	157.31	173.91	222.95
32.75	1.364583	38.44	52.87	63	73.95	81.53	93.17	104.27	112.84	124.9	133.24	157.42	174.02	223.09
33	1.375	38.51	52.95	63.08	74.04	81.62	93.26	104.36	112.92	124.99	133.33	157.52	174.13	223.22
33.25	1.385417	38.57	53.03	63.17	74.13	81.71	93.34	104.45	113.01	125.09	133.43	157.62	174.24	223.36
33.5	1.395833	38.64	53.11	63.25	74.21	81.8	93.43	104.53	113.1	125.18	133.52	157.73	174.35	223.5
33.75	1.40625	38.71	53.19	63.33	74.3	81.89	93.52	104.62	113.19	125.27	133.61	157.83	174.45	223.63
34	1.416667	38.77	53.26	63.42	74.39	81.98	93.61	104.71	113.27	125.36	133.71	157.93	174.56	223.77
34.25	1.427083	38.84	53.34	63.5	74.47	82.06	93.7	104.79	113.36	125.44	133.8	158.03	174.67	223.9
34.5	1.4375	38.9	53.42	63.58	74.56	82.15	93.78	104.88	113.44	125.53	133.89	158.12	174.77	224.04
34.75	1.447917	38.97	53.5	63.66	74.65	82.24	93.87	104.96	113.53	125.62	133.98	158.22	174.88	224.17
35	1.458333	39.03	53.57	63.74	74.73	82.33	93.95	105.05	113.61	125.71	134.07	158.32	174.98	224.3
35.25	1.46875	39.1	53.65	63.83	74.82	82.41	94.04	105.13	113.7	125.79	134.16	158.42	175.08	224.43
35.5	1.479167	39.16	53.73	63.91	74.9	82.5	94.12	105.21	113.78	125.88	134.24	158.51	175.18	224.56
35.75	1.489583	39.22	53.8	63.99	74.99	82.59	94.21	105.3	113.86	125.96	134.33	158.61	175.28	224.68
36	1.5	39.29	53.88	64.07	75.07	82.67	94.29	105.38	113.94	126.05	134.42	158.7	175.38	224.81
36.25	1.510417	39.35	53.95	64.15	75.15	82.76	94.38	105.46	114.02	126.13	134.5	158.79	175.48	224.94
36.5	1.520833	39.42	54.03	64.23	75.24	82.84	94.46	105.54	114.11	126.21	134.59	158.89	175.58	225.06
36.75	1.53125	39.48	54.1	64.31	75.32	82.93	94.54	105.62	114.19	126.3	134.67	158.98	175.68	225.19
37	1.541667	39.54	54.18	64.39	75.4	83.01	94.63	105.7	114.27	126.38	134.76	159.07	175.78	225.31
37.25	1.552083	39.61	54.25	64.47	75.49	83.1	94.71	105.78	114.35	126.46	134.84	159.16	175.88	225.43
37.5	1.5625	39.67	54.33	64.55	75.57	83.18	94.79	105.86	114.42	126.54	134.93	159.25	175.97	225.55
37.75	1.572917	39.73	54.4	64.63	75.65	83.26	94.87	105.94	114.5	126.62	135.01	159.34	176.07	225.67
38	1.583333	39.79	54.48	64.7	75.74	83.35	94.95	106.02	114.58	126.7	135.09	159.43	176.16	225.79
38.25	1.59375	39.86	54.55	64.78	75.82	83.43	95.03	106.1	114.66	126.78	135.17	159.52	176.26	225.91
38.5	1.604167	39.92	54.63	64.86	75.9	83.51	95.11	106.18	114.74	126.86	135.25	159.61	176.35	226.03

38.75	1.614583	39.98	54.7	64.94	75.98	83.6	95.19	106.26	114.81	126.94	135.33	159.69	176.44	226.15
39	1.625	40.04	54.77	65.02	76.06	83.68	95.27	106.33	114.89	127.02	135.41	159.78	176.54	226.27
39.25	1.635417	40.1	54.85	65.09	76.14	83.76	95.35	106.41	114.97	127.1	135.49	159.87	176.63	226.38
39.5	1.645833	40.16	54.92	65.17	76.22	83.84	95.43	106.49	115.04	127.17	135.57	159.95	176.72	226.5
39.75	1.65625	40.23	54.99	65.25	76.3	83.92	95.51	106.56	115.12	127.25	135.65	160.04	176.81	226.61
40	1.666667	40.29	55.06	65.32	76.38	84	95.59	106.64	115.19	127.33	135.73	160.12	176.9	226.73
40.25	1.677083	40.35	55.14	65.4	76.46	84.08	95.67	106.71	115.27	127.4	135.8	160.21	176.99	226.84
40.5	1.6875	40.41	55.21	65.48	76.54	84.16	95.75	106.79	115.34	127.48	135.88	160.29	177.08	226.95
40.75	1.697917	40.47	55.28	65.55	76.62	84.24	95.83	106.86	115.41	127.55	135.96	160.37	177.17	227.06
41	1.708333	40.53	55.35	65.63	76.7	84.32	95.9	106.94	115.49	127.62	136.03	160.46	177.25	227.17
41.25	1.71875	40.59	55.43	65.7	76.78	84.4	95.98	107.01	115.56	127.7	136.11	160.54	177.34	227.28
41.5	1.729167	40.65	55.5	65.78	76.86	84.48	96.06	107.09	115.63	127.77	136.18	160.62	177.43	227.39
41.75	1.739583	40.71	55.57	65.86	76.94	84.56	96.13	107.16	115.7	127.85	136.26	160.7	177.52	227.5
42	1.75	40.77	55.64	65.93	77.02	84.64	96.21	107.23	115.77	127.92	136.33	160.78	177.6	227.61
42.25	1.760417	40.83	55.71	66.01	77.09	84.72	96.29	107.31	115.85	127.99	136.41	160.86	177.69	227.72
42.5	1.770833	40.89	55.78	66.08	77.17	84.8	96.36	107.38	115.92	128.06	136.48	160.94	177.77	227.83
42.75	1.78125	40.95	55.85	66.15	77.25	84.88	96.44	107.45	115.99	128.13	136.55	161.02	177.86	227.93
43	1.791667	41.01	55.92	66.23	77.33	84.95	96.51	107.52	116.06	128.2	136.62	161.1	177.94	228.04
43.25	1.802083	41.07	55.99	66.3	77.4	85.03	96.59	107.6	116.13	128.27	136.7	161.18	178.02	228.14
43.5	1.8125	41.13	56.06	66.38	77.48	85.11	96.66	107.67	116.2	128.35	136.77	161.25	178.11	228.25
43.75	1.822917	41.19	56.13	66.45	77.56	85.19	96.74	107.74	116.27	128.41	136.84	161.33	178.19	228.35
44	1.833333	41.25	56.2	66.52	77.63	85.26	96.81	107.81	116.34	128.48	136.91	161.41	178.27	228.46
44.25	1.84375	41.31	56.27	66.6	77.71	85.34	96.88	107.88	116.4	128.55	136.98	161.48	178.35	228.56
44.5	1.854167	41.37	56.34	66.67	77.79	85.42	96.96	107.95	116.47	128.62	137.05	161.56	178.43	228.66
44.75	1.864583	41.42	56.41	66.74	77.86	85.49	97.03	108.02	116.54	128.69	137.12	161.64	178.51	228.76
45	1.875	41.48	56.48	66.82	77.94	85.57	97.1	108.09	116.61	128.76	137.19	161.71	178.59	228.86
45.25	1.885417	41.54	56.55	66.89	78.01	85.64	97.18	108.16	116.68	128.83	137.26	161.79	178.67	228.96
45.5	1.895833	41.6	56.62	66.96	78.09	85.72	97.25	108.23	116.74	128.89	137.32	161.86	178.75	229.06
45.75	1.90625	41.66	56.69	67.04	78.16	85.8	97.32	108.3	116.81	128.96	137.39	161.93	178.83	229.16
46	1.916667	41.72	56.76	67.11	78.24	85.87	97.39	108.36	116.88	129.03	137.46	162.01	178.91	229.26
46.25	1.927083	41.77	56.82	67.18	78.32	85.95	97.47	108.43	116.94	129.09	137.53	162.08	178.99	229.36
46.5	1.9375	41.83	56.89	67.25	78.39	86.02	97.54	108.5	117.01	129.16	137.59	162.15	179.06	229.46
46.75	1.947917	41.89	56.96	67.32	78.46	86.1	97.61	108.57	117.07	129.23	137.66	162.23	179.14	229.56

47	1.958333	41.95	57.03	67.4	78.54	86.17	97.68	108.64	117.14	129.29	137.73	162.3	179.22	229.65
47.25	1.96875	42	57.1	67.47	78.61	86.24	97.75	108.7	117.2	129.36	137.79	162.37	179.29	229.75
47.5	1.979167	42.06	57.17	67.54	78.69	86.32	97.82	108.77	117.27	129.42	137.86	162.44	179.37	229.84
47.75	1.989583	42.12	57.23	67.61	78.76	86.39	97.89	108.84	117.33	129.48	137.92	162.51	179.45	229.94
48	2	42.18	57.3	67.68	78.83	86.47	97.96	108.9	117.4	129.55	137.99	162.58	179.52	230.03
48.25	2.010417	42.23	57.37	67.75	78.91	86.54	98.03	108.97	117.46	129.61	138.05	162.65	179.6	230.13
48.5	2.020833	42.29	57.44	67.82	78.98	86.61	98.1	109.04	117.53	129.67	138.11	162.72	179.67	230.22
48.75	2.03125	42.35	57.5	67.9	79.06	86.69	98.17	109.1	117.59	129.73	138.17	162.79	179.74	230.31
49	2.041667	42.41	57.57	67.97	79.13	86.76	98.24	109.17	117.65	129.79	138.24	162.86	179.82	230.4
49.25	2.052083	42.46	57.64	68.04	79.2	86.83	98.31	109.23	117.71	129.85	138.3	162.93	179.89	230.49
49.5	2.0625	42.52	57.7	68.11	79.28	86.91	98.38	109.3	117.78	129.92	138.36	162.99	179.96	230.57
49.75	2.072917	42.58	57.77	68.18	79.35	86.98	98.45	109.36	117.84	129.98	138.42	163.06	180.03	230.66
50	2.083333	42.64	57.84	68.26	79.42	87.05	98.52	109.43	117.9	130.04	138.48	163.13	180.11	230.75
50.25	2.09375	42.69	57.91	68.33	79.5	87.12	98.59	109.49	117.96	130.09	138.54	163.2	180.18	230.84
50.5	2.104167	42.75	57.97	68.4	79.57	87.2	98.66	109.56	118.02	130.15	138.6	163.26	180.25	230.93
50.75	2.114583	42.81	58.04	68.47	79.64	87.27	98.73	109.62	118.08	130.21	138.66	163.33	180.32	231.01
51	2.125	42.86	58.1	68.54	79.72	87.34	98.79	109.68	118.15	130.27	138.72	163.4	180.39	231.1
51.25	2.135417	42.92	58.17	68.61	79.79	87.41	98.86	109.75	118.21	130.33	138.78	163.46	180.46	231.19
51.5	2.145833	42.98	58.24	68.68	79.86	87.48	98.93	109.81	118.27	130.39	138.83	163.53	180.53	231.27
51.75	2.15625	43.03	58.3	68.75	79.93	87.56	99	109.87	118.33	130.45	138.89	163.59	180.6	231.36
52	2.166667	43.09	58.37	68.82	80.01	87.63	99.06	109.94	118.39	130.51	138.95	163.66	180.67	231.44
52.25	2.177083	43.15	58.43	68.89	80.08	87.7	99.13	110	118.45	130.56	139.01	163.72	180.74	231.53
52.5	2.1875	43.2	58.5	68.96	80.15	87.77	99.2	110.06	118.51	130.62	139.07	163.79	180.81	231.61
52.75	2.197917	43.26	58.57	69.03	80.22	87.84	99.27	110.13	118.57	130.68	139.12	163.85	180.88	231.7
53	2.208333	43.32	58.63	69.1	80.29	87.91	99.33	110.19	118.63	130.74	139.18	163.91	180.95	231.78
53.25	2.21875	43.37	58.7	69.17	80.36	87.98	99.4	110.25	118.69	130.79	139.24	163.98	181.02	231.86
53.5	2.229167	43.43	58.76	69.24	80.43	88.05	99.47	110.31	118.75	130.85	139.3	164.04	181.08	231.95
53.75	2.239583	43.48	58.83	69.31	80.51	88.12	99.53	110.38	118.81	130.91	139.35	164.1	181.15	232.03
54	2.25	43.54	58.89	69.38	80.58	88.19	99.6	110.44	118.86	130.96	139.41	164.17	181.22	232.11
54.25	2.260417	43.6	58.96	69.45	80.65	88.26	99.67	110.5	118.92	131.02	139.47	164.23	181.29	232.19
54.5	2.270833	43.65	59.02	69.52	80.72	88.33	99.73	110.56	118.98	131.08	139.52	164.29	181.35	232.28
54.75	2.28125	43.71	59.09	69.59	80.79	88.4	99.8	110.62	119.04	131.13	139.58	164.35	181.42	232.36
55	2.291667	43.76	59.15	69.66	80.86	88.47	99.86	110.68	119.1	131.19	139.63	164.42	181.49	232.44

55.25	2.302083	43.82	59.21	69.73	80.93	88.54	99.93	110.75	119.16	131.24	139.69	164.48	181.55	232.52
55.5	2.3125	43.87	59.28	69.79	81	88.61	100	110.81	119.21	131.3	139.74	164.54	181.62	232.6
55.75	2.322917	43.93	59.34	69.86	81.07	88.68	100.06	110.87	119.27	131.35	139.8	164.6	181.69	232.68
56	2.333333	43.98	59.41	69.93	81.14	88.75	100.13	110.93	119.33	131.41	139.85	164.66	181.75	232.76
56.25	2.34375	44.04	59.47	70	81.21	88.82	100.19	110.99	119.39	131.46	139.91	164.72	181.82	232.84
56.5	2.354167	44.09	59.54	70.07	81.28	88.89	100.26	111.05	119.44	131.52	139.96	164.78	181.88	232.92
56.75	2.364583	44.15	59.6	70.14	81.35	88.96	100.32	111.11	119.5	131.57	140.02	164.84	181.95	233
57	2.375	44.2	59.66	70.2	81.42	89.02	100.39	111.17	119.56	131.63	140.07	164.91	182.01	233.08
57.25	2.385417	44.26	59.73	70.27	81.49	89.09	100.45	111.23	119.61	131.68	140.13	164.97	182.08	233.15
57.5	2.395833	44.31	59.79	70.34	81.56	89.16	100.51	111.29	119.67	131.74	140.18	165.03	182.14	233.23
57.75	2.40625	44.37	59.85	70.41	81.63	89.23	100.58	111.35	119.73	131.79	140.23	165.08	182.2	233.31
58	2.416667	44.42	59.92	70.48	81.7	89.3	100.64	111.41	119.78	131.84	140.29	165.14	182.27	233.39
58.25	2.427083	44.48	59.98	70.54	81.76	89.36	100.71	111.47	119.84	131.9	140.34	165.2	182.33	233.46
58.5	2.4375	44.53	60.04	70.61	81.83	89.43	100.77	111.53	119.9	131.95	140.39	165.26	182.39	233.54
58.75	2.447917	44.59	60.11	70.68	81.9	89.5	100.84	111.59	119.95	132	140.45	165.32	182.46	233.62
59	2.458333	44.64	60.17	70.75	81.97	89.57	100.9	111.65	120.01	132.06	140.5	165.38	182.52	233.69
59.25	2.46875	44.7	60.23	70.81	82.04	89.64	100.96	111.7	120.06	132.11	140.55	165.44	182.58	233.77
59.5	2.479167	44.75	60.3	70.88	82.11	89.7	101.03	111.76	120.12	132.16	140.6	165.5	182.65	233.85
59.75	2.489583	44.8	60.36	70.95	82.18	89.77	101.09	111.82	120.17	132.21	140.66	165.55	182.71	233.92
60	2.5	44.86	60.42	71.01	82.24	89.84	101.15	111.88	120.23	132.27	140.71	165.61	182.77	234
60.25	2.510417	44.91	60.48	71.08	82.31	89.9	101.22	111.94	120.28	132.32	140.76	165.67	182.83	234.07
60.5	2.520833	44.97	60.55	71.15	82.38	89.97	101.28	112	120.34	132.37	140.81	165.73	182.89	234.15
60.75	2.53125	45.02	60.61	71.21	82.45	90.04	101.34	112.06	120.39	132.42	140.86	165.78	182.96	234.22
61	2.541667	45.08	60.67	71.28	82.52	90.1	101.4	112.11	120.45	132.47	140.92	165.84	183.02	234.3
61.25	2.552083	45.13	60.73	71.35	82.58	90.17	101.47	112.17	120.5	132.53	140.97	165.9	183.08	234.37
61.5	2.5625	45.18	60.8	71.41	82.65	90.24	101.53	112.23	120.56	132.58	141.02	165.96	183.14	234.44
61.75	2.572917	45.24	60.86	71.48	82.72	90.3	101.59	112.29	120.61	132.63	141.07	166.01	183.2	234.52
62	2.583333	45.29	60.92	71.55	82.79	90.37	101.65	112.34	120.67	132.68	141.12	166.07	183.26	234.59
62.25	2.59375	45.34	60.98	71.61	82.85	90.44	101.72	112.4	120.72	132.73	141.17	166.12	183.32	234.66
62.5	2.604167	45.4	61.04	71.68	82.92	90.5	101.78	112.46	120.77	132.78	141.22	166.18	183.38	234.74
62.75	2.614583	45.45	61.1	71.74	82.99	90.57	101.84	112.52	120.83	132.83	141.27	166.24	183.44	234.81
63	2.625	45.5	61.17	71.81	83.05	90.63	101.9	112.57	120.88	132.88	141.32	166.29	183.5	234.88
63.25	2.635417	45.56	61.23	71.87	83.12	90.7	101.96	112.63	120.94	132.93	141.37	166.35	183.56	234.95

63.5	2.645833	45.61	61.29	71.94	83.19	90.77	102.03	112.69	120.99	132.99	141.42	166.4	183.62	235.03
63.75	2.65625	45.66	61.35	72.01	83.26	90.83	102.09	112.74	121.04	133.04	141.47	166.46	183.68	235.1
64	2.666667	45.72	61.41	72.07	83.32	90.9	102.15	112.8	121.1	133.09	141.52	166.51	183.74	235.17
64.25	2.677083	45.77	61.47	72.14	83.39	90.96	102.21	112.86	121.15	133.14	141.57	166.57	183.8	235.24
64.5	2.6875	45.82	61.53	72.2	83.45	91.03	102.27	112.91	121.2	133.19	141.62	166.62	183.86	235.31
64.75	2.697917	45.88	61.6	72.27	83.52	91.09	102.33	112.97	121.26	133.24	141.67	166.68	183.92	235.38
65	2.708333	45.93	61.66	72.33	83.59	91.16	102.39	113.03	121.31	133.29	141.72	166.73	183.97	235.45
65.25	2.71875	45.98	61.72	72.4	83.65	91.22	102.45	113.08	121.36	133.33	141.77	166.79	184.03	235.52
65.5	2.729167	46.03	61.78	72.46	83.72	91.29	102.51	113.14	121.41	133.38	141.82	166.84	184.09	235.59
65.75	2.739583	46.09	61.84	72.53	83.79	91.35	102.58	113.19	121.47	133.43	141.87	166.89	184.15	235.66
66	2.75	46.14	61.9	72.59	83.85	91.42	102.64	113.25	121.52	133.48	141.92	166.95	184.21	235.73
66.25	2.760417	46.19	61.96	72.66	83.92	91.48	102.7	113.31	121.57	133.53	141.96	167	184.26	235.8
66.5	2.770833	46.25	62.02	72.72	83.98	91.55	102.76	113.36	121.62	133.58	142.01	167.05	184.32	235.87
66.75	2.78125	46.3	62.08	72.79	84.05	91.61	102.82	113.42	121.67	133.63	142.06	167.11	184.38	235.94
67	2.791667	46.35	62.14	72.85	84.11	91.68	102.88	113.47	121.73	133.68	142.11	167.16	184.44	236.01
67.25	2.802083	46.4	62.2	72.92	84.18	91.74	102.94	113.53	121.78	133.73	142.16	167.21	184.49	236.08
67.5	2.8125	46.46	62.26	72.98	84.25	91.8	103	113.58	121.83	133.78	142.2	167.27	184.55	236.15
67.75	2.822917	46.51	62.32	73.04	84.31	91.87	103.06	113.64	121.88	133.82	142.25	167.32	184.61	236.21
68	2.833333	46.56	62.38	73.11	84.38	91.93	103.12	113.69	121.93	133.87	142.3	167.37	184.66	236.28
68.25	2.84375	46.61	62.44	73.17	84.44	92	103.18	113.75	121.98	133.92	142.35	167.42	184.72	236.35
68.5	2.854167	46.67	62.5	73.24	84.51	92.06	103.24	113.8	122.04	133.97	142.4	167.48	184.78	236.42
68.75	2.864583	46.72	62.56	73.3	84.57	92.12	103.3	113.86	122.09	134.02	142.44	167.53	184.83	236.49
69	2.875	46.77	62.62	73.36	84.64	92.19	103.36	113.91	122.14	134.06	142.49	167.58	184.89	236.55
69.25	2.885417	46.82	62.68	73.43	84.7	92.25	103.42	113.97	122.19	134.11	142.54	167.63	184.94	236.62
69.5	2.895833	46.87	62.74	73.49	84.77	92.31	103.48	114.02	122.24	134.16	142.58	167.68	185	236.69
69.75	2.90625	46.93	62.8	73.56	84.83	92.38	103.54	114.08	122.29	134.21	142.63	167.74	185.05	236.75
70	2.916667	46.98	62.86	73.62	84.89	92.44	103.59	114.13	122.34	134.25	142.68	167.79	185.11	236.82
70.25	2.927083	47.03	62.92	73.68	84.96	92.5	103.65	114.19	122.39	134.3	142.72	167.84	185.17	236.89
70.5	2.9375	47.08	62.98	73.75	85.02	92.57	103.71	114.24	122.44	134.35	142.77	167.89	185.22	236.95
70.75	2.947917	47.13	63.04	73.81	85.09	92.63	103.77	114.29	122.49	134.4	142.82	167.94	185.28	237.02
71	2.958333	47.19	63.1	73.87	85.15	92.69	103.83	114.35	122.54	134.44	142.86	167.99	185.33	237.08
71.25	2.96875	47.24	63.16	73.94	85.22	92.76	103.89	114.4	122.59	134.49	142.91	168.04	185.38	237.15
71.5	2.979167	47.29	63.22	74	85.28	92.82	103.95	114.46	122.65	134.54	142.96	168.09	185.44	237.22

71.75	2.989583	47.34	63.28	74.06	85.34	92.88	104.01	114.51	122.7	134.58	143	168.14	185.49	237.28
72	3	47.39	63.34	74.13	85.41	92.94	104.07	114.56	122.75	134.63	143.05	168.19	185.55	237.35
72.25	3.010417	47.44	63.4	74.19	85.47	93.01	104.12	114.62	122.8	134.68	143.09	168.24	185.6	237.41
72.5	3.020833	47.49	63.46	74.25	85.54	93.07	104.18	114.67	122.85	134.72	143.14	168.3	185.66	237.48
72.75	3.03125	47.55	63.52	74.31	85.6	93.13	104.24	114.72	122.9	134.77	143.18	168.35	185.71	237.54
73	3.041667	47.6	63.57	74.38	85.66	93.19	104.3	114.78	122.94	134.82	143.23	168.39	185.76	237.61
73.25	3.052083	47.65	63.63	74.44	85.73	93.26	104.36	114.83	122.99	134.86	143.28	168.44	185.82	237.67
73.5	3.0625	47.7	63.69	74.5	85.79	93.32	104.41	114.88	123.04	134.91	143.32	168.49	185.87	237.73
73.75	3.072917	47.75	63.75	74.56	85.85	93.38	104.47	114.94	123.09	134.95	143.37	168.54	185.92	237.8
74	3.083333	47.8	63.81	74.63	85.92	93.44	104.53	114.99	123.14	135	143.41	168.59	185.98	237.86
74.25	3.09375	47.85	63.87	74.69	85.98	93.5	104.59	115.04	123.19	135.05	143.46	168.64	186.03	237.92
74.5	3.104167	47.91	63.93	74.75	86.04	93.57	104.65	115.09	123.24	135.09	143.5	168.69	186.08	237.99
74.75	3.114583	47.96	63.99	74.81	86.11	93.63	104.7	115.15	123.29	135.14	143.55	168.74	186.14	238.05
75	3.125	48.01	64.04	74.88	86.17	93.69	104.76	115.2	123.34	135.18	143.59	168.79	186.19	238.11
75.25	3.135417	48.06	64.1	74.94	86.23	93.75	104.82	115.25	123.39	135.23	143.64	168.84	186.24	238.18
75.5	3.145833	48.11	64.16	75	86.3	93.81	104.88	115.31	123.44	135.27	143.68	168.89	186.3	238.24
75.75	3.15625	48.16	64.22	75.06	86.36	93.88	104.93	115.36	123.49	135.32	143.72	168.94	186.35	238.3
76	3.166667	48.21	64.28	75.13	86.42	93.94	104.99	115.41	123.54	135.36	143.77	168.98	186.4	238.37
76.25	3.177083	48.26	64.34	75.19	86.49	94	105.05	115.46	123.58	135.41	143.81	169.03	186.45	238.43
76.5	3.1875	48.31	64.39	75.25	86.55	94.06	105.11	115.52	123.63	135.45	143.86	169.08	186.5	238.49
76.75	3.197917	48.36	64.45	75.31	86.61	94.12	105.16	115.57	123.68	135.5	143.9	169.13	186.56	238.55
77	3.208333	48.42	64.51	75.37	86.67	94.18	105.22	115.62	123.73	135.54	143.95	169.18	186.61	238.61
77.25	3.21875	48.47	64.57	75.43	86.74	94.24	105.28	115.67	123.78	135.59	143.99	169.23	186.66	238.68
77.5	3.229167	48.52	64.63	75.5	86.8	94.3	105.34	115.72	123.83	135.63	144.03	169.27	186.71	238.74
77.75	3.239583	48.57	64.68	75.56	86.86	94.37	105.39	115.78	123.87	135.68	144.08	169.32	186.76	238.8
78	3.25	48.62	64.74	75.62	86.92	94.43	105.45	115.83	123.92	135.72	144.12	169.37	186.81	238.86
78.25	3.260417	48.67	64.8	75.68	86.99	94.49	105.51	115.88	123.97	135.77	144.16	169.42	186.87	238.92
78.5	3.270833	48.72	64.86	75.74	87.05	94.55	105.56	115.93	124.02	135.81	144.21	169.46	186.92	238.98
78.75	3.28125	48.77	64.92	75.8	87.11	94.61	105.62	115.98	124.07	135.86	144.25	169.51	186.97	239.04
79	3.291667	48.82	64.97	75.87	87.17	94.67	105.68	116.03	124.12	135.9	144.29	169.56	187.02	239.1
79.25	3.302083	48.87	65.03	75.93	87.23	94.73	105.73	116.09	124.16	135.94	144.34	169.61	187.07	239.17
79.5	3.3125	48.92	65.09	75.99	87.3	94.79	105.79	116.14	124.21	135.99	144.38	169.65	187.12	239.23
79.75	3.322917	48.97	65.15	76.05	87.36	94.85	105.85	116.19	124.26	136.03	144.42	169.7	187.17	239.29

80	3.333333	49.02	65.2	76.11	87.42	94.91	105.9	116.24	124.31	136.08	144.47	169.75	187.22	239.35
80.25	3.34375	49.07	65.26	76.17	87.48	94.97	105.96	116.29	124.35	136.12	144.51	169.79	187.27	239.41
80.5	3.354167	49.12	65.32	76.23	87.54	95.03	106.01	116.34	124.4	136.16	144.55	169.84	187.32	239.47
80.75	3.364583	49.17	65.38	76.29	87.61	95.09	106.07	116.39	124.45	136.21	144.59	169.89	187.37	239.53
81	3.375	49.22	65.43	76.35	87.67	95.15	106.13	116.45	124.5	136.25	144.64	169.93	187.42	239.59
81.25	3.385417	49.27	65.49	76.42	87.73	95.21	106.18	116.5	124.54	136.3	144.68	169.98	187.47	239.65
81.5	3.395833	49.32	65.55	76.48	87.79	95.27	106.24	116.55	124.59	136.34	144.72	170.03	187.52	239.7
81.75	3.40625	49.37	65.6	76.54	87.85	95.33	106.29	116.6	124.64	136.38	144.77	170.07	187.57	239.76
82	3.416667	49.42	65.66	76.6	87.91	95.39	106.35	116.65	124.69	136.43	144.81	170.12	187.62	239.82
82.25	3.427083	49.47	65.72	76.66	87.98	95.45	106.41	116.7	124.73	136.47	144.85	170.16	187.67	239.88
82.5	3.4375	49.52	65.78	76.72	88.04	95.51	106.46	116.75	124.78	136.51	144.89	170.21	187.72	239.94
82.75	3.447917	49.57	65.83	76.78	88.1	95.57	106.52	116.8	124.83	136.56	144.93	170.25	187.77	240
83	3.458333	49.62	65.89	76.84	88.16	95.63	106.57	116.85	124.87	136.6	144.98	170.3	187.82	240.06
83.25	3.46875	49.67	65.95	76.9	88.22	95.69	106.63	116.9	124.92	136.64	145.02	170.35	187.87	240.12
83.5	3.479167	49.72	66	76.96	88.28	95.75	106.68	116.95	124.97	136.68	145.06	170.39	187.92	240.18
83.75	3.489583	49.77	66.06	77.02	88.34	95.81	106.74	117	125.01	136.73	145.1	170.44	187.97	240.23
84	3.5	49.82	66.12	77.08	88.4	95.87	106.8	117.06	125.06	136.77	145.14	170.48	188.02	240.29
84.25	3.510417	49.87	66.17	77.14	88.46	95.93	106.85	117.11	125.11	136.81	145.19	170.53	188.07	240.35
84.5	3.520833	49.92	66.23	77.2	88.53	95.99	106.91	117.16	125.15	136.86	145.23	170.57	188.11	240.41
84.75	3.53125	49.97	66.29	77.26	88.59	96.05	106.96	117.21	125.2	136.9	145.27	170.62	188.16	240.47
85	3.541667	50.02	66.34	77.32	88.65	96.11	107.02	117.26	125.25	136.94	145.31	170.66	188.21	240.52
85.25	3.552083	50.07	66.4	77.38	88.71	96.17	107.07	117.31	125.29	136.98	145.35	170.71	188.26	240.58
85.5	3.5625	50.12	66.46	77.44	88.77	96.23	107.13	117.36	125.34	137.03	145.39	170.75	188.31	240.64
85.75	3.572917	50.17	66.51	77.5	88.83	96.29	107.18	117.41	125.39	137.07	145.43	170.8	188.36	240.7
86	3.583333	50.22	66.57	77.56	88.89	96.35	107.24	117.46	125.43	137.11	145.48	170.84	188.4	240.75
86.25	3.59375	50.27	66.63	77.62	88.95	96.41	107.29	117.51	125.48	137.15	145.52	170.89	188.45	240.81
86.5	3.604167	50.32	66.68	77.68	89.01	96.47	107.35	117.56	125.52	137.2	145.56	170.93	188.5	240.87
86.75	3.614583	50.37	66.74	77.74	89.07	96.52	107.4	117.61	125.57	137.24	145.6	170.98	188.55	240.92
87	3.625	50.42	66.8	77.8	89.13	96.58	107.46	117.66	125.62	137.28	145.64	171.02	188.6	240.98
87.25	3.635417	50.47	66.85	77.86	89.19	96.64	107.51	117.71	125.66	137.32	145.68	171.06	188.64	241.04
87.5	3.645833	50.52	66.91	77.92	89.25	96.7	107.57	117.76	125.71	137.36	145.72	171.11	188.69	241.09
87.75	3.65625	50.57	66.96	77.98	89.31	96.76	107.62	117.81	125.75	137.41	145.76	171.15	188.74	241.15
88	3.666667	50.62	67.02	78.04	89.37	96.82	107.68	117.86	125.8	137.45	145.8	171.2	188.79	241.21

88.25	3.677083	50.67	67.08	78.1	89.43	96.88	107.73	117.91	125.85	137.49	145.84	171.24	188.84	241.26
88.5	3.6875	50.72	67.13	78.16	89.49	96.94	107.79	117.95	125.89	137.53	145.88	171.28	188.88	241.32
88.75	3.697917	50.77	67.19	78.22	89.55	96.99	107.84	118	125.94	137.57	145.93	171.33	188.93	241.37
89	3.708333	50.82	67.24	78.28	89.61	97.05	107.89	118.05	125.98	137.61	145.97	171.37	188.98	241.43
89.25	3.71875	50.87	67.3	78.34	89.67	97.11	107.95	118.1	126.03	137.66	146.01	171.41	189.02	241.49
89.5	3.729167	50.92	67.36	78.4	89.73	97.17	108	118.15	126.07	137.7	146.05	171.46	189.07	241.54
89.75	3.739583	50.96	67.41	78.46	89.79	97.23	108.06	118.2	126.12	137.74	146.09	171.5	189.12	241.6
90	3.75	51.01	67.47	78.52	89.85	97.29	108.11	118.25	126.17	137.78	146.13	171.54	189.17	241.65
90.25	3.760417	51.06	67.52	78.57	89.91	97.35	108.17	118.3	126.21	137.82	146.17	171.59	189.21	241.71
90.5	3.770833	51.11	67.58	78.63	89.97	97.4	108.22	118.35	126.26	137.86	146.21	171.63	189.26	241.76
90.75	3.78125	51.16	67.63	78.69	90.03	97.46	108.27	118.4	126.3	137.9	146.25	171.67	189.31	241.82
91	3.791667	51.21	67.69	78.75	90.09	97.52	108.33	118.45	126.35	137.95	146.29	171.72	189.35	241.87
91.25	3.802083	51.26	67.75	78.81	90.15	97.58	108.38	118.5	126.39	137.99	146.33	171.76	189.4	241.93
91.5	3.8125	51.31	67.8	78.87	90.21	97.64	108.44	118.55	126.44	138.03	146.37	171.8	189.44	241.98
91.75	3.822917	51.36	67.86	78.93	90.27	97.69	108.49	118.59	126.48	138.07	146.41	171.85	189.49	242.04
92	3.833333	51.41	67.91	78.99	90.33	97.75	108.54	118.64	126.53	138.11	146.45	171.89	189.54	242.09
92.25	3.84375	51.46	67.97	79.05	90.39	97.81	108.6	118.69	126.57	138.15	146.49	171.93	189.58	242.15
92.5	3.854167	51.51	68.02	79.11	90.45	97.87	108.65	118.74	126.62	138.19	146.53	171.97	189.63	242.2
92.75	3.864583	51.55	68.08	79.16	90.51	97.93	108.71	118.79	126.66	138.23	146.57	172.02	189.68	242.26
93	3.875	51.6	68.13	79.22	90.57	97.98	108.76	118.84	126.71	138.27	146.61	172.06	189.72	242.31
93.25	3.885417	51.65	68.19	79.28	90.63	98.04	108.81	118.89	126.75	138.31	146.65	172.1	189.77	242.36
93.5	3.895833	51.7	68.25	79.34	90.69	98.1	108.87	118.94	126.8	138.36	146.68	172.14	189.81	242.42
93.75	3.90625	51.75	68.3	79.4	90.75	98.16	108.92	118.99	126.84	138.4	146.72	172.19	189.86	242.47
94	3.916667	51.8	68.36	79.46	90.81	98.22	108.97	119.03	126.89	138.44	146.76	172.23	189.91	242.53
94.25	3.927083	51.85	68.41	79.52	90.86	98.27	109.03	119.08	126.93	138.48	146.8	172.27	189.95	242.58
94.5	3.9375	51.9	68.47	79.57	90.92	98.33	109.08	119.13	126.98	138.52	146.84	172.31	190	242.63
94.75	3.947917	51.95	68.52	79.63	90.98	98.39	109.14	119.18	127.02	138.56	146.88	172.35	190.04	242.69
95	3.958333	51.99	68.58	79.69	91.04	98.45	109.19	119.23	127.07	138.6	146.92	172.4	190.09	242.74
95.25	3.96875	52.04	68.63	79.75	91.1	98.5	109.24	119.28	127.11	138.64	146.96	172.44	190.13	242.79
95.5	3.979167	52.09	68.69	79.81	91.16	98.56	109.3	119.32	127.15	138.68	147	172.48	190.18	242.85
95.75	3.989583	52.14	68.74	79.87	91.22	98.62	109.35	119.37	127.2	138.72	147.04	172.52	190.22	242.9
96	4	52.19	68.8	79.92	91.28	98.68	109.4	119.42	127.24	138.76	147.08	172.56	190.27	242.95

File Note

286265-00

16 March 2021

3.2 Appendix B

Pumping Station Maintenance Strategy

A. Inspection

Pump sets should be inspected monthly by observing at least two switching cycles and checking the operation.

B. Operation and maintenance requirements

Regular inspection and maintenance is important for the effective operation of pump sets as designed. Maintenance responsibility for a pump set should be always placed with an appropriate organisation. The time between maintenance checks shall not be greater than:

- 1/4 year for pump station in commercial premises;
- 1/2 year for plants serving multiple dwellings;
- 1 year for plants in single dwellings.

Operation and maintenance requirements for pump sets are described below.

C. Regular Maintenance shall include:

1. Checking by visual inspection all connection points for leakage;
2. Operation of valves, checking ease of operation and sealing. If necessary, reset and grease;
3. Opening and closing of non-return valves; checking seating and ball/flap; functional check;
4. Cleaning the pumping unit and the pipework directly connected to it; checking impeller and bearings;
5. Checking oil level, where necessary, refill or change oil (if oil chamber fitted);
6. Internal cleaning of tank (if required or under special circumstances);
7. Checking that vent pipe is functioning.
8. Visual inspection of the electrical part of plant;
9. Visually checking condition of collection tank;
10. Every two years rinse out plant with water.

After carrying out maintenance, the plant shall be recommissioned in accordance with the clause below. A log should be kept of all maintenance work, detailing any work carried out and the applicable information. If faults are found that cannot be corrected, these shall be notified in writing to the operator of the wastewater pump set and an acknowledgement requested.

D. Commissioning

The pump set shall be commissioned by a suitably qualified person. The supplier of the wastewater pump set is responsible for ensuring the availability of this person. Testing with water

File Note

286265-00

16 March 2021

for a minimum of two switching sequences is required for commissioning. During the test, dry running shall be avoided. The following items shall be checked before, during and after testing:

1. Electrical safety in accordance with IEC or local regulations;
2. Direction of rotation of the motor;
3. Valves (operation, opening, sealing);
4. Switching and setting of the control levels in the collection tank, where not present by the manufacturer;
5. Watertightness of pump, valves and pipes;
6. Rated voltage and frequency;
7. Functional test of the non-return valve;
8. Warning device; in combination with a second switching circuit where applicable;
9. Discharge pipework support;
10. Motor protection switch (by removing individual fuses (two-phase running));
11. Oil level (if oil chamber fitted);
12. Control lights, gauges and meters;
13. Operation of hand pump, where fitted.

Commissioning shall be recording in writing, including important data such as the setting of the motor overload switch and the reading from hours-run meters.

E. Testing

The pump sets shall be tested at the manufacturer's premises to BS 5316: Part1: Class C Annex B (ISO 2548) to demonstrate that they are capable of achieving the specified design duty. Type-test curves are acceptable for verification of performance.

Characteristic curves of pump generated head, efficiency, and pump and pump sets absorbed power versus flow rate shall be provided before the pump sets are delivered to site.

Hydraulic drop test shall be carried out by the Developer on site in the presence of the Undertaker to verify the theoretical performance of each pump set.

File Note

286265-00 16 March 2021

3.3 Appendix C

Updated MicroDrainage Results

Ove Arup & Partners International Ltd		Page 1
The Arup Campus Blyth Gate Solihull B90 8AE		
Date 18/03/2021 12:35 File Connisbee MD_condition ...	Designed by Raluca.Olariu Checked by	
XP Solutions	Network 2020.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	20.700	Add Flow / Climate Change (%)	0
Ratio R	0.439	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	250	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	8.697	0.070	124.2	0.028	5.00	0.0	0.600	o	150	Pipe/Conduit	
S2.000	2.180	0.000	0.0	0.009	5.00	0.0	0.600	o	100	Pipe/Conduit	
S2.001	3.309	9.370	0.4	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
S1.001	16.922	0.169	100.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S3.000	3.281	0.000	0.0	0.009	5.00	0.0	0.600	o	100	Pipe/Conduit	
S3.001	3.806	9.539	0.4	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
S1.002	15.056	0.147	102.4	0.011	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	177.48	5.16	30.500	0.028	0.0	0.0	0.0	0.90	15.9	13.5
S2.000	172.95	5.52	39.850	0.009	0.0	0.0	0.0	0.07	0.5«	4.2
S2.001	172.89	5.53	39.850	0.009	0.0	0.0	0.0	13.14	103.2	4.2
S1.001	169.57	5.81	30.430	0.037	0.0	0.0	0.0	1.00	17.7	17.0
S3.000	169.82	5.79	39.850	0.009	0.0	0.0	0.0	0.07	0.5«	4.1
S3.001	169.76	5.79	39.850	0.009	0.0	0.0	0.0	12.36	97.1	4.1
S1.002	166.72	6.06	30.261	0.057	0.0	0.0	0.0	0.99	17.5«	25.6

Ove Arup & Partners International Ltd		Page 3
The Arup Campus Blyth Gate Solihull B90 8AE		
Date 18/03/2021 12:35 File Connisbee MD_condition ...	Designed by Raluca.Olariu Checked by	
XP Solutions	Network 2020.1	

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S8.001	4.176	8.550	0.5	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
S8.002	10.359	0.207	50.0	0.017	0.00	0.0	0.600	o	150	Pipe/Conduit	
S7.003	9.259	0.579	16.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.003	8.140	0.099	82.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.004	2.569	0.026	98.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.005	15.238	0.190	80.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S8.001	159.48	6.75	39.500	0.004	0.0	0.0	0.0	11.17	87.7	1.7
S8.002	158.29	6.87	30.900	0.021	0.0	0.0	0.0	1.43	25.2	9.1
S7.003	157.70	6.93	30.693	0.057	0.0	0.0	0.0	2.53	44.7	24.2
S1.003	155.02	7.22	30.039	0.207	0.0	0.0	0.0	1.44	57.4«	87.1
S1.004	154.72	7.25	29.940	0.207	0.0	0.0	0.0	1.32	52.3«	87.1
S1.005	153.15	7.42	29.914	0.207	0.0	0.0	0.0	1.46	58.1«	87.1

Ove Arup & Partners International Ltd

Page 4

The Arup Campus
Blyth Gate
Solihull B90 8AE

Date 18/03/2021 12:35
File Connisbee MD_condition ...

XP Solutions

Designed by Raluca.Olariu
Checked by

Network 2020.1



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

Simulation Criteria

Areal Reduction Factor 1.000

Hot Start (mins) 0

Hot Start Level (mm) 0

Manhole Headloss Coeff (Global) 0.500

Foul Sewage per hectare (l/s) 0.000

Additional Flow - % of Total Flow 0.000

MADD Factor * 10m³/ha Storage 2.000

Inlet Coeffiecient 0.800

Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0

Number of Storage Structures 7

Number of Online Controls 8

Number of Time/Area Diagrams 0

Number of Offline Controls 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model

Region England and Wales

M5-60 (mm)

FSR

Cv (Summer)

20.600 Cv (Winter)

Ratio R 0.437

0.750

0.840

Margin for Flood Risk Warning (mm)

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status

DVD Status

Inertia Status

300.0

OFF

ON

OFF

Profile(s)

Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480

Return Period(s) (years)

Climate Change (%)

Summer and Winter

1, 10, 30, 100

0, 0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	SMH01	15 Winter	1	+0%	100/15 Summer			
S2.000	SRoofBlueN.1	360 Winter	1	+0%				
S2.001	SOrificeN.1	360 Winter	1	+0%				
S1.001	SMH002	15 Winter	1	+0%	100/15 Summer			
S3.000	SRoofBlueN.2	360 Winter	1	+0%				
S3.001	SOrificeN.2	360 Winter	1	+0%				
S1.002	SMH03	15 Winter	1	+0%	30/30 Winter			
S4.000	SMH04	15 Winter	1	+0%	100/15 Summer			
S4.001	SMH05	15 Winter	1	+0%	30/15 Summer			
S5.000	SRoodBlueS.1	180 Winter	1	+0%				
S5.001	SOrificeS.1	180 Winter	1	+0%				
S5.002	SMH06	15 Winter	1	+0%	100/15 Summer			
S4.002	SPump station	15 Winter	1	+0%	10/15 Summer			
S4.003	SMH08	15 Winter	1	+0%	10/15 Summer			
S6.000	SRoofBlueS.2	180 Winter	1	+0%				
S6.001	SOrificeS.2	180 Winter	1	+0%				
S4.004	SMH09	15 Winter	1	+0%	10/15 Summer			
S4.005	SMH10	15 Winter	1	+0%	10/15 Summer			
S7.000	SRoofGreenN	120 Winter	1	+0%				

©1982-2020 Innovyze

Ove Arup & Partners International Ltd		Page 5
The Arup Campus Blyth Gate Solihull B90 8AE		
Date 18/03/2021 12:35 File Connisbee MD_condition ...	Designed by Raluca.Olariu Checked by	
XP Solutions		
Network 2020.1		

Network 2020.1

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S1.000	SMH01	30.556	-0.094	0.000	0.29		4.1
S2.000	SRoofBlueN.1	39.865	-0.085	0.000	0.02	319	0.1
S2.001	SOrificeN.1	39.864	-0.086	0.000	0.00		0.1
S1.001	SMH002	30.481	-0.099	0.000	0.25		4.1
S3.000	SRoofBlueN.2	39.865	-0.085	0.000	0.02	312	0.1
S3.001	SOrificeN.2	39.864	-0.086	0.000	0.00		0.1
S1.002	SMH03	30.321	-0.090	0.000	0.34		5.5
S4.000	SMH04	30.431	-0.194	0.000	0.04		2.2
S4.001	SMH05	30.327	-0.175	0.000	0.11		5.7
S5.000	SRoodBlueS.1	39.514	-0.086	0.000	0.02	157	0.1
S5.001	SOrificeS.1	39.513	-0.087	0.000	0.00		0.1
S5.002	SMH06	30.527	-0.123	0.000	0.08		2.8
S4.002	SPump station	30.172	-0.097	0.000	1.27		10.5
S4.003	SMH08	31.587	-0.063	0.000	0.63		10.5
S6.000	SRoofBlueS.2	39.514	-0.086	0.000	0.02	163	0.1
S6.001	SOrificeS.2	39.513	-0.087	0.000	0.00		0.1
S4.004	SMH09	31.424	-0.054	0.000	0.73		10.8
S4.005	SMH10	30.195	-0.054	0.000	0.73		10.8
S7.000	SRoofGreenN	39.517	-0.083	0.000	0.02	83	0.1

PN	US/MH Name	Status	Level Exceeded
S1.000	SMH01	OK	
S2.000	SRoofBlueN.1	FLOOD RISK	
S2.001	SOrificeN.1	FLOOD RISK	
S1.001	SMH002	OK	
S3.000	SRoofBlueN.2	FLOOD RISK	
S3.001	SOrificeN.2	FLOOD RISK	
S1.002	SMH03	OK	
S4.000	SMH04	OK	
S4.001	SMH05	OK	
S5.000	SRoodBlueS.1	OK	
S5.001	SOrificeS.1	OK	
S5.002	SMH06	OK	
S4.002	SPump station	OK	
S4.003	SMH08	OK	
S6.000	SRoofBlueS.2	OK	
S6.001	SOrificeS.2	OK	
S4.004	SMH09	OK	
S4.005	SMH10	OK	
S7.000	SRoofGreenN	OK	

Ove Arup & Partners International Ltd		Page 6
The Arup Campus Blyth Gate Solihull B90 8AE		
Date 18/03/2021 12:35 File Connisbee MD_condition ...	Designed by Raluca.Olariu Checked by	
XP Solutions	Network 2020.1	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S7.001	SOrificeGN	120 Winter	1	+0%				
S7.002	SMH11	15 Winter	1	+0%				
S8.000	SRoofGreen.2	120 Winter	1	+0%				
S8.001	SOrifice G2	120 Winter	1	+0%				
S8.002	SMH12	15 Winter	1	+0%	100/60 Winter			
S7.003	SMH13	15 Winter	1	+0%	100/60 Winter			
S1.003	SMH14	60 Winter	1	+0%	10/15 Winter			
S1.004	SMH15	60 Winter	1	+0%				
S1.005	SMH16	60 Winter	1	+0%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S7.001	SOrificeGN	39.516	-0.084	0.000	0.00			0.1	OK
S7.002	SMH11	31.533	-0.117	0.000	0.11			3.9	OK
S8.000	SRoofGreen.2	39.518	-0.082	0.000	0.03		93	0.1	OK
S8.001	SOrifice G2	39.515	-0.085	0.000	0.00			0.1	OK
S8.002	SMH12	30.931	-0.119	0.000	0.10			2.2	OK
S7.003	SMH13	30.732	-0.110	0.000	0.16			6.1	OK
S1.003	SMH14	30.175	-0.089	0.000	0.13		34	5.9	OK
S1.004	SMH15	30.008	-0.157	0.000	0.20			5.9	OK
S1.005	SMH16	29.965	-0.174	0.000	0.12			5.9	OK

PN	US/MH Name	Level Exceeded
S7.001	SOrificeGN	
S7.002	SMH11	
S8.000	SRoofGreen.2	
S8.001	SOrifice G2	
S8.002	SMH12	
S7.003	SMH13	
S1.003	SMH14	
S1.004	SMH15	
S1.005	SMH16	

Ove Arup & Partners International Ltd

Page 7

The Arup Campus
Blyth Gate
Solihull B90 8AE

Date 18/03/2021 12:35
File Connisbee MD_condition ...

Designed by Raluca.Olariu
Checked by

XP Solutions

Network 2020.1

Micro Drainage

10 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

Simulation Criteria

Areal Reduction Factor 1.000

Additional Flow - % of Total Flow 0.000

Hot Start (mins) 0

MADD Factor * 10m³/ha Storage 2.000

Hot Start Level (mm) 0

Inlet Coeffiecient 0.800

Manhole Headloss Coeff (Global) 0.500

Flow per Person per Day (l/per/day) 0.000

Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0

Number of Storage Structures 7

Number of Online Controls 8

Number of Time/Area Diagrams 0

Number of Offline Controls 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model

FSR

Ratio R 0.437

Region England and Wales Cv (Summer) 0.750

M5-60 (mm)

20.600 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm)

300.0

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status

OFF

DVD Status

ON

Inertia Status

OFF

Profile(s)

Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480

Return Period(s) (years) 1, 10, 30, 100

Climate Change (%) 0, 0, 0, 30

PN

US/MH Name

Storm

Return Period

Climate Change

First (X) Surge

First (Y) Flood

First (Z) Overflow

Overflow Act.

S1.000

SMH01

15 Winter

10

+0%

100/15 Summer

S2.000

SRoofBlueN.1

180 Winter

10

+0%

S2.001

SOrificeN.1

180 Winter

10

+0%

S1.001

SMH002

15 Winter

10

+0%

100/15 Summer

S3.000

SRoofBlueN.2

180 Winter

10

+0%

S3.001

SOrificeN.2

180 Winter

10

+0%

S1.002

SMH03

15 Winter

10

+0%

30/30 Winter

S4.000

SMH04

15 Winter

10

+0%

100/15 Summer

S4.001

SMH05

15 Winter

10

+0%

30/15 Summer

S5.000

SRoodBlueS.1

120 Winter

10

+0%

S5.001

SOrificeS.1

120 Winter

10

+0%

S5.002

SMH06

15 Winter

10

+0%

100/15 Summer

S4.002

SPump station

15 Winter

10

+0%

10/15 Summer

S4.003

SMH08

15 Winter

10

+0%

10/15 Summer

S6.000

SRoofBlueS.2

120 Winter

10

+0%

S6.001

SOrificeS.2

120 Winter

10

+0%

S4.004

SMH09

15 Winter

10

+0%

10/15 Summer

S4.005

SMH10

15 Winter

10

+0%

10/15 Summer

S7.000

SRoofGreenN

60 Winter

10

+0%

©1982-2020 Innovyze

Ove Arup & Partners International Ltd		Page 8
The Arup Campus Blyth Gate Solihull B90 8AE		
Date 18/03/2021 12:35 File Connisbee MD_condition ...	Designed by Raluca.Olariu Checked by	
XP Solutions	Network 2020.1	

10 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S1.000	SMH01	30.582	-0.068	0.000	0.57		8.0
S2.000	SRoofBlueN.1	39.873	-0.077	0.000	0.05	194	0.2
S2.001	SOrificeN.1	39.872	-0.078	0.000	0.00		0.2
S1.001	SMH002	30.504	-0.076	0.000	0.48		8.0
S3.000	SRoofBlueN.2	39.874	-0.076	0.000	0.05	187	0.2
S3.001	SOrificeN.2	39.873	-0.077	0.000	0.00		0.2
S1.002	SMH03	30.353	-0.058	0.000	0.68		11.0
S4.000	SMH04	30.445	-0.180	0.000	0.09		4.2
S4.001	SMH05	30.375	-0.127	0.000	0.24		12.7
S5.000	SRoodBlueS.1	39.522	-0.078	0.000	0.04	104	0.2
S5.001	SOrificeS.1	39.521	-0.079	0.000	0.00		0.2
S5.002	SMH06	30.543	-0.107	0.000	0.18		6.9
S4.002	SPump station	30.354	0.085	0.000	2.41		20.0
S4.003	SMH08	31.821	0.171	0.000	1.20		19.9
S6.000	SRoofBlueS.2	39.522	-0.078	0.000	0.04	107	0.2
S6.001	SOrificeS.2	39.521	-0.079	0.000	0.00		0.2
S4.004	SMH09	31.571	0.093	0.000	1.38		20.4
S4.005	SMH10	30.409	0.160	0.000	1.34		20.0
S7.000	SRoofGreenN	39.528	-0.072	0.000	0.07	49	0.2

PN	US/MH Name	Status	Level Exceeded
S1.000	SMH01	OK	
S2.000	SRoofBlueN.1	FLOOD RISK	
S2.001	SOrificeN.1	FLOOD RISK	
S1.001	SMH002	OK	
S3.000	SRoofBlueN.2	FLOOD RISK	
S3.001	SOrificeN.2	FLOOD RISK	
S1.002	SMH03	OK	
S4.000	SMH04	OK	
S4.001	SMH05	OK	
S5.000	SRoodBlueS.1	OK	
S5.001	SOrificeS.1	OK	
S5.002	SMH06	OK	
S4.002	SPump station	SURCHARGED	
S4.003	SMH08	FLOOD RISK	
S6.000	SRoofBlueS.2	OK	
S6.001	SOrificeS.2	OK	
S4.004	SMH09	SURCHARGED	
S4.005	SMH10	SURCHARGED	
S7.000	SRoofGreenN	OK	

Ove Arup & Partners International Ltd		Page 11
The Arup Campus Blyth Gate Solihull B90 8AE		
Date 18/03/2021 12:35 File Connisbee MD_condition ...	Designed by Raluca.Olariu Checked by	
XP Solutions	Network 2020.1	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S1.000	SMH01	30.596	-0.054	0.000	0.72		10.1
S2.000	SRoofBlueN.1	39.878	-0.072	0.000	0.07		0.3
S2.001	SOrificeN.1	39.877	-0.073	0.000	0.00		0.3
S1.001	SMH002	30.516	-0.064	0.000	0.61		10.1
S3.000	SRoofBlueN.2	39.880	-0.070	0.000	0.07	148	0.3
S3.001	SOrificeN.2	39.878	-0.072	0.000	0.00		0.3
S1.002	SMH03	30.427	0.016	0.000	0.44		7.2
S4.000	SMH04	30.613	-0.012	0.000	0.10		4.9
S4.001	SMH05	30.608	0.106	0.000	0.25		13.0
S5.000	SRoodBlueS.1	39.527	-0.073	0.000	0.06		0.2
S5.001	SOrificeS.1	39.526	-0.074	0.000	0.00		0.2
S5.002	SMH06	30.599	-0.051	0.000	0.24		8.8
S4.002	SPump station	30.586	0.317	0.000	2.41		20.0
S4.003	SMH08	31.828	0.178	0.000	1.21		20.0
S6.000	SRoofBlueS.2	39.527	-0.073	0.000	0.06		0.2
S6.001	SOrificeS.2	39.526	-0.074	0.000	0.00		0.2
S4.004	SMH09	31.578	0.100	0.000	1.40		20.7
S4.005	SMH10	30.513	0.264	0.000	1.36		20.2
S7.000	SRoofGreenN	39.533	-0.067	0.000	0.10	43	0.4

PN	US/MH Name	Status	Level Exceeded
S1.000	SMH01	OK	
S2.000	SRoofBlueN.1	FLOOD RISK	
S2.001	SOrificeN.1	FLOOD RISK	
S1.001	SMH002	OK	
S3.000	SRoofBlueN.2	FLOOD RISK	
S3.001	SOrificeN.2	FLOOD RISK	
S1.002	SMH03	SURCHARGED	
S4.000	SMH04	OK	
S4.001	SMH05	SURCHARGED	
S5.000	SRoodBlueS.1	OK	
S5.001	SOrificeS.1	OK	
S5.002	SMH06	OK	
S4.002	SPump station	SURCHARGED	
S4.003	SMH08	FLOOD RISK	
S6.000	SRoofBlueS.2	OK	
S6.001	SOrificeS.2	OK	
S4.004	SMH09	SURCHARGED	
S4.005	SMH10	SURCHARGED	
S7.000	SRoofGreenN	OK	

Ove Arup & Partners International Ltd		Page 14
The Arup Campus Blyth Gate Solihull B90 8AE		
Date 18/03/2021 12:35 File Connisbee MD_condition ...	Designed by Raluca.Olariu Checked by	
XP Solutions	Network 2020.1	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S1.000	SMH01	31.093	0.443	0.000	0.62		8.7
S2.000	SRoofBlueN.1	39.894	-0.056	0.000	0.15	106	0.6
S2.001	SOrificeN.1	39.892	-0.058	0.000	0.01		0.6
S1.001	SMH002	31.087	0.507	0.000	0.52		8.6
S3.000	SRoofBlueN.2	39.895	-0.055	0.000	0.16	102	0.6
S3.001	SOrificeN.2	39.893	-0.057	0.000	0.01		0.6
S1.002	SMH03	31.077	0.666	0.000	0.67		10.8
S4.000	SMH04	31.752	1.127	0.000	0.10		4.8
S4.001	SMH05	31.746	1.244	0.000	0.28		14.7
S5.000	SRoodBlueS.1	39.541	-0.059	0.000	0.14	56	0.6
S5.001	SOrificeS.1	39.540	-0.060	0.000	0.01		0.6
S5.002	SMH06	31.737	1.087	0.000	0.29		10.9
S4.002	SPump station	31.724	1.455	0.000	2.41		20.0
S4.003	SMH08	31.849	0.199	0.000	1.21		20.1
S6.000	SRoofBlueS.2	39.541	-0.059	0.000	0.14	56	0.6
S6.001	SOrificeS.2	39.540	-0.060	0.000	0.01		0.6
S4.004	SMH09	31.600	0.122	0.000	1.47		21.7
S4.005	SMH10	31.095	0.846	0.000	1.39		20.7
S7.000	SRoofGreenN	39.551	-0.049	0.000	0.19	26	0.7

PN	US/MH Name	Status	Level Exceeded
S1.000	SMH01	SURCHARGED	
S2.000	SRoofBlueN.1	FLOOD RISK	
S2.001	SOrificeN.1	FLOOD RISK	
S1.001	SMH002	SURCHARGED	
S3.000	SRoofBlueN.2	FLOOD RISK	
S3.001	SOrificeN.2	FLOOD RISK	
S1.002	SMH03	SURCHARGED	
S4.000	SMH04	FLOOD RISK	
S4.001	SMH05	FLOOD RISK	
S5.000	SRoodBlueS.1	OK	
S5.001	SOrificeS.1	OK	
S5.002	SMH06	FLOOD RISK	
S4.002	SPump station	FLOOD RISK	
S4.003	SMH08	FLOOD RISK	
S6.000	SRoofBlueS.2	OK	
S6.001	SOrificeS.2	OK	
S4.004	SMH09	SURCHARGED	
S4.005	SMH10	SURCHARGED	
S7.000	SRoofGreenN	OK	

File Note

286265-00

16 March 2021

DOCUMENT CHECKING (not mandatory for File Note)

	Prepared by	Checked by	Approved by
Name	Raluca Olariu	Tristan McDonnell	Tristan McDonnell
Signature			