

Martin Walsh Associates		Page 1
Firth Buildings 99-101 Leeds Road Dewsbury WF12 7BU	J R Paley Mapplewell Residential Rev A	
Date Aug '09 File RESIDENTIALREVA.SWS	Designed By MD Checked By	
Micro Drainage	System1 W.11.2	

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Pipe Size File C:\Program Files\Micro Drainage Ltd\winDes\STANDARD.PIP
Manhole Size File C:\Program Files\Micro Drainage Ltd\winDes\STANDARD.MHS

Location - England & Wales

Return Period (years)	1
M5-60 (mm)	19.000
Ratio R	0.358
Maximum Rainfall (mm/hr)	50
Foul Sewage (l/s/ha)	0.00
O'flow Setting (*Foul only)	0
Volumetric Runoff Coeff.	0.75
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Cover Depth for Optimisation (m)	1.200
Min Vel for Auto Design Only (m/s)	1.00
Min Slope for Optimisation (1:X)	500
Minimum Outfall Invert (m)	0.000
Ground Level at Outfall (m)	0.000
Outfall Manhole Name	
Outfall Manhole Dia/Length (mm)	0
Outfall Manhole width (mm)	0

Designed with Level soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	21.30	1.050	20.3	0.096	4.00	0.0	0.600	o	225
1.001	34.04	0.850	40.0	0.054	0.00	0.0	0.600	o	225
1.002	11.42	0.300	38.1	0.080	0.00	0.0	0.600	o	225
1.003	26.96	1.245	21.7	0.029	0.00	0.0	0.600	o	225
2.000	17.23	1.230	14.0	0.080	4.00	0.0	0.600	o	225
2.001	7.23	0.515	14.0	0.007	0.00	0.0	0.600	o	225
1.004	56.78	0.190	298.8	0.084	0.00	0.0	0.600	o	1500
1.005	25.98	0.090	288.7	0.035	0.00	0.0	0.600	o	1500
3.000	33.57	0.110	305.2	0.142	4.00	0.0	0.600	o	1500

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	50.0	4.1	99.900	0.096	0.0	0.0	0.0	2.92	116.0	13.0
1.001	50.0	4.4	98.850	0.150	0.0	0.0	0.0	2.07	82.4	20.3
1.002	50.0	4.5	98.000	0.230	0.0	0.0	0.0	2.13	84.6	31.1
1.003	50.0	4.6	97.700	0.259	0.0	0.0	0.0	2.82	112.3	35.1
2.000	50.0	4.1	98.200	0.080	0.0	0.0	0.0	3.51	139.7	10.8
2.001	50.0	4.1	96.970	0.087	0.0	0.0	0.0	3.51	139.6	11.8
1.004	49.1	5.0	95.180	0.430	0.0	0.0	0.0	2.48	4375.7	57.2
1.005	48.4	5.2	94.990	0.465	0.0	0.0	0.0	2.52	4452.6	61.0
3.000	50.0	4.2	95.010	0.142	0.0	0.0	0.0	2.45	4329.8	19.2

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Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.006	56.81	0.190	299.0	0.180	0.00	0.0	0.600	o	1500
1.007	7.28	0.024	303.3	0.000	0.00	0.0	0.600	o	1500
4.000	45.10	1.200	37.6	0.101	4.00	0.0	0.600	o	300
4.001	24.88	0.310	80.3	0.082	0.00	0.0	0.600	o	300
4.002	31.67	0.390	81.2	0.075	0.00	0.0	0.600	o	300
4.003	57.50	2.639	21.8	0.166	0.00	0.0	0.600	o	300
1.008	18.84	0.126	149.5	0.000	0.00	0.0	0.600	o	375
1.009	82.02	0.547	149.9	0.000	0.00	0.0	0.600	o	375

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.006	46.9	5.6	94.900	0.787	0.0	0.0	0.0	2.48	4374.6	100.1
1.007	46.8	5.6	94.710	0.787	0.0	0.0	0.0	2.46	4343.0	100.1
4.000	50.0	4.3	100.500	0.101	0.0	0.0	0.0	2.57	181.9	13.7
4.001	50.0	4.5	99.300	0.183	0.0	0.0	0.0	1.76	124.2	24.8
4.002	49.9	4.8	98.990	0.258	0.0	0.0	0.0	1.75	123.4	34.9
4.003	48.7	5.1	98.600	0.424	0.0	0.0	0.0	3.38	239.1	56.0
1.008	46.0	5.8	94.686	1.211	0.0	0.0	0.0	1.48	163.4	150.9
1.009	43.0	6.8	94.560	1.211	0.0	0.0	0.0	1.48	163.2	150.9

Firth Buildings
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Mapplewell
Residential Rev A

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Micro Drainage

System1 W.11.2



PIPELINE SCHEDULES

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
1.000	o	225	1	101.400	99.900	1.275	1050
1.001	o	225	2	100.350	98.850	1.275	1050
1.002	o	225	3	99.500	98.000	1.275	1050
1.003	o	225	4	99.200	97.700	1.275	1050
2.000	o	225	7	99.700	98.200	1.275	1050
2.001	o	225	7	98.850	96.970	1.655	1200
1.004	o	1500	7	98.500	95.180	1.820	1800
1.005	o	1500	7	97.800	94.990	1.310	1800
3.000	o	1500	9	99.150	95.010	2.640	1800
1.006	o	1500	10	97.600	94.900	1.200	1800
1.007	o	1500	11	97.750	94.710	1.540	1800
4.000	o	300	12	102.000	100.500	1.200	1050
4.001	o	300	13	100.800	99.300	1.200	1050
4.002	o	300	14	101.000	98.990	1.710	1200
4.003	o	300	15	100.400	98.600	1.500	1050
1.008	o	375	16	98.000	94.686	2.939	1800
1.009	o	375	17	98.100	94.560	3.165	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
1.000	21.30	20.3	2	100.350	98.850	1.275	1050
1.001	34.04	40.0	3	99.500	98.000	1.275	1050
1.002	11.42	38.1	4	99.200	97.700	1.275	1050
1.003	26.96	21.7	7	98.500	96.455	1.820	1800
2.000	17.23	14.0	7	98.850	96.970	1.655	1200
2.001	7.23	14.0	7	98.500	96.455	1.820	1800
1.004	56.78	298.8	7	97.800	94.990	1.310	1800
1.005	25.98	288.7	10	97.600	94.900	1.200	1800
3.000	33.57	305.2	10	97.600	94.900	1.200	1800
1.006	56.81	299.0	11	97.750	94.710	1.540	1800
1.007	7.28	303.3	16	98.000	94.686	1.814	1800
4.000	45.10	37.6	13	100.800	99.300	1.200	1050
4.001	24.88	80.3	14	101.000	98.990	1.710	1200
4.002	31.67	81.2	15	100.400	98.600	1.500	1050
4.003	57.50	21.8	16	98.000	95.961	1.739	1800
1.008	18.84	149.5	17	98.100	94.560	3.165	1350
1.009	82.02	149.9		0.000	94.013	-94.388	0

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MANHOLE SCHEDULES

M/Hole Number	Cover Level (m)	M/Hole Depth (m)	M/Hole Diam., L*W (mm)	PN	Pipes Out IL.(m)	D (mm)	PN	Pipes In IL.(m)	D (mm)
1	101.400	1.500	1050	1.000	99.900	225			
2	100.350	1.500	1050	1.001	98.850	225	1.000	98.850	225
3	99.500	1.500	1050	1.002	98.000	225	1.001	98.000	225
4	99.200	1.500	1050	1.003	97.700	225	1.002	97.700	225
7	99.700	1.500	1050	2.000	98.200	225			
7	98.850	1.880	1200	2.001	96.970	225	2.000	96.970	225
7	98.500	3.320	1800	1.004	95.180	1500	1.003 2.001	96.455 96.455	225 225
7	97.800	2.810	1800	1.005	94.990	1500	1.004	94.990	1500
9	99.150	4.140	1800	3.000	95.010	1500			
10	97.600	2.700	1800	1.006	94.900	1500	1.005 3.000	94.900 94.900	1500 1500
11	97.750	3.040	1800	1.007	94.710	1500	1.006	94.710	1500
12	102.000	1.500	1050	4.000	100.500	300			
13	100.800	1.500	1050	4.001	99.300	300	4.000	99.300	300
14	101.000	2.010	1200	4.002	98.990	300	4.001	98.990	300
15	100.400	1.800	1050	4.003	98.600	300	4.002	98.600	300
16	98.000	3.314	1800	1.008	94.686	375	1.007 4.003	94.686 95.961	1500 300
17	98.100	3.540	1350	1.009	94.560	375	1.008	94.560	375
	0.000	-94.013	0		OUTFALL		1.009	94.013	375

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Date Aug '09 File RESIDENTIALREVA.SUM	Designed By MD Checked By	
Micro Drainage	Simulation W.11.2	

Global Variables

Region	FSR - England & Wales
Return period (yrs)	100
M5-60 (mm)	19.000
Ratio R	0.358
Volumetric Runoff Coef	0.840
Profile Type	Winter
PIMP (%)	100
Areal Reduction Factor	1.000
Storm Duration (mins)	1440
Hot Start (mins)	0
Hot Start Level (mm)	0
Manhole Headloss Coefficient	0.500
MADD Factor * 10m ³ /ha Storage	2.000
Foul Sewage/Hectare (l/s)	0.00
Additional Flow - % of Total Flow	0
Number of Input Hydrographs	0
Number of Time/Area Diagrams	0
Number of Bifurcations	0
Number of Overflows	0
Number of Off-Line Controls	0
Number of On-Line Controls	2

Starting storm file name

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Freely Discharging Outfalls

Outfall Pipe Number	Outfall MH/No	C.Level (m)	I.Level (m)	D,L (mm)	B (mm)
1.009		94.688	94.013	1200	0

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On-Line Controls (Crown Vortex Valve®)

US/PN	Volume (m³)	Ctrl MH Name	Invert (m)	Type	Dia (m)	D.Head (m)	D.Flow (l/s)	Headloss (m)	Flow (l/s)
1.007	9.684	16	94.686	C1	0.177	2.800	53.0	0.2	15.5
								0.4	27.7
								0.6	24.5
								0.8	28.3
								1.0	31.7
								1.4	37.5
								1.8	42.5
								2.2	47.0
								2.6	51.1
								3.0	54.9
4.003	3.964	16	94.686	C1	0.177	2.800	53.0	3.4	58.4
								3.8	61.7
								0.2	15.5
								0.4	27.7
								0.6	24.5
								0.8	28.3
								1.0	31.7
								1.4	37.5
								1.8	42.5
								2.2	47.0
								2.6	51.1
								3.0	54.9
								3.4	58.4
								3.8	61.7

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Summary Wizard of "CRITICAL"(Rank 1 by Max Level)
Results for Design Storms

Margin for Flood Risk warning (mm) 200 Inertia Status OFF
DTS Status ON Analysis Time Step Fine
DVD Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440,
Sensitivity flow(s) (%) 2160, 2880, 4320, 5760, 7200, 8640, 10080
0, 20

PN	Storm	Sensitivity Flow (%)	Rank	Surcharge Sensitivity	Flood Sensitivity	Overflow Sensitivity	O/F Act
1.000	15 Summer	+20%	1				
1.001	15 winter	+20%	1	+20%/15 Summer			
1.002	15 winter	+20%	1	0%/15 Summer			
1.003	15 winter	+20%	1	0%/15 Summer			
2.000	15 Summer	+20%	1				
2.001	120 winter	+20%	1	+20%/120 winter			
1.004	120 winter	+20%	1	+20%/60 winter			
1.005	120 winter	+20%	1	+20%/60 winter			
3.000	120 winter	+20%	1	+20%/60 winter			
1.006	120 winter	+20%	1	+20%/60 winter			
1.007	120 winter	+20%	1	+20%/60 Summer			
4.000	15 winter	+20%	1				
4.001	15 winter	+20%	1				
4.002	15 winter	+20%	1	+20%/15 Summer			
4.003	15 Summer	+20%	1				
1.008	120 winter	+20%	1	0%/15 Summer	0%/2160 winter		
1.009	120 winter	+20%	1				

LVl Ex.	PN	Water LVl. (m)	Surcharged Depth (m)	Flooded Vol (m³)	Flow/Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
	1.000	100.008	-0.117	0.000	0.47	0.0	49.7	O K
	1.001	99.453	0.378	0.000	0.90	0.0	69.4	SURCH'ED
	1.002	98.795	0.570	0.000	1.42	0.0	102.3	SURCH'ED
	1.003	98.184	0.259	0.000	1.09	0.0	113.7	SURCH'ED
	2.000	98.289	-0.136	0.000	0.33	0.0	41.4	O K
	2.001	97.444	0.249	0.000	0.14	0.0	14.3	SURCH'ED
	1.004	97.441	0.761	0.000	0.02	0.0	68.8	SURCH'ED
	1.005	97.441	0.951	0.000	0.01	0.0	25.7	SURCH'ED
	3.000	97.441	0.931	0.000	0.01	0.0	21.3	SURCH'ED
	1.006	97.441	1.041	0.000	0.01	0.0	44.4	FLD RISK
	1.007	97.442	1.232	0.000	0.03	0.0	41.4	SURCH'ED
	4.000	100.614	-0.186	0.000	0.31	0.0	52.3	O K
	4.001	99.586	-0.014	0.000	0.81	0.0	90.2	O K
	4.002	99.374	0.084	0.000	1.11	0.0	125.2	SURCH'ED
	4.003	98.826	-0.074	0.000	0.89	0.0	201.5	O K
	1.008	97.441	2.380	0.000	0.38	0.0	52.0	SURCH'ED
	1.009	94.709	-0.226	0.000	0.33	0.0	51.9	O K

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Micro Drainage	System1 W.11.2	

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Pipe Size File C:\Program Files\Micro Drainage Ltd\winDes\STANDARD.PIP
Manhole Size File C:\Program Files\Micro Drainage Ltd\winDes\STANDARD.MHS

Location - England & Wales

Return Period (years)	1
M5-60 (mm)	19.000
Ratio R	0.358
Maximum Rainfall (mm/hr)	50
Foul Sewage (l/s/ha)	0.00
O'flow Setting (*Foul only)	0
Volumetric Runoff Coeff.	0.75
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Cover Depth for Optimisation (m)	1.200
Min Vel for Auto Design Only (m/s)	1.00
Min Slope for Optimisation (1:X)	500
Minimum Outfall Invert (m)	0.000
Ground Level at Outfall (m)	94.800
Outfall Manhole Name	
Outfall Manhole Dia/Length (mm)	0
Outfall Manhole width (mm)	0

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	28.50	0.975	29.2	0.235	4.00	0.0	0.600	o	225
1.001	48.32	0.160	302.0	0.047	0.00	0.0	0.600	o	1500
1.002	15.57	0.050	311.4	0.143	0.00	0.0	0.600	o	1500
1.003	19.77	0.070	282.4	0.314	0.00	0.0	0.600	o	1500
2.000	32.36	0.110	294.2	0.271	4.00	0.0	0.600	o	1500
1.004	55.29	0.180	307.2	0.069	0.00	0.0	0.600	o	1500
1.005	29.16	0.090	324.0	0.152	0.00	0.0	0.600	o	1500
1.006	33.60	0.420	80.0	0.000	0.00	0.0	0.600	o	375

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	50.0	4.2	96.300	0.235	0.0	0.0	0.0	2.43	96.6	31.8
1.001	50.0	4.5	94.050	0.282	0.0	0.0	0.0	2.46	4352.7	38.2
1.002	50.0	4.6	93.890	0.425	0.0	0.0	0.0	2.43	4286.1	57.6
1.003	50.0	4.8	93.840	0.739	0.0	0.0	0.0	2.55	4501.7	100.1
2.000	50.0	4.2	93.880	0.271	0.0	0.0	0.0	2.50	4410.4	36.7
1.004	48.7	5.1	93.770	1.079	0.0	0.0	0.0	2.44	4315.7	142.2
1.005	47.8	5.3	93.590	1.231	0.0	0.0	0.0	2.38	4201.5	159.5
1.006	46.8	5.6	93.500	1.231	0.0	0.0	0.0	2.03	223.9	159.5

Firth Buildings
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Industrial Rev A

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System1 W.11.2



PIPELINE SCHEDULES

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
1.000	o	225	1	97.800	96.300	1.275	1200
1.001	o	1500	2	97.500	94.050	1.950	1800
1.002	o	1500	3	97.450	93.890	2.060	1800
1.003	o	1500	4	97.400	93.840	2.060	1800
2.000	o	1500	5	96.900	93.880	1.520	1800
1.004	o	1500	6	97.100	93.770	1.830	1800
1.005	o	1500	7	96.400	93.590	1.310	2100
1.006	o	375	8	96.200	93.500	2.325	1800

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
1.000	28.50	29.2	2	97.500	95.325	1.950	1800
1.001	48.32	302.0	3	97.450	93.890	2.060	1800
1.002	15.57	311.4	4	97.400	93.840	2.060	1800
1.003	19.77	282.4	6	97.100	93.770	1.830	1800
2.000	32.36	294.2	6	97.100	93.770	1.830	1800
1.004	55.29	307.2	7	96.400	93.590	1.310	2100
1.005	29.16	324.0	8	96.200	93.500	1.200	1800
1.006	33.60	80.0		94.800	93.080	1.345	0

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System1 W.11.2



MANHOLE SCHEDULES

M/Hole Number	Cover Level (m)	M/Hole Depth (m)	M/Hole Diam., L*W (mm)	PN	Pipes Out IL.(m)	D (mm)	PN	Pipes In IL.(m)	D (mm)
1	97.800	1.500	1200	1.000	96.300	225			
2	97.500	3.450	1800	1.001	94.050	1500	1.000	95.325	225
3	97.450	3.560	1800	1.002	93.890	1500	1.001	93.890	1500
4	97.400	3.560	1800	1.003	93.840	1500	1.002	93.840	1500
5	96.900	3.020	1800	2.000	93.880	1500			
6	97.100	3.330	1800	1.004	93.770	1500	1.003 2.000	93.770 93.770	1500 1500
7	96.400	2.810	2100	1.005	93.590	1500	1.004	93.590	1500
8	96.200	2.700	1800	1.006	93.500	375	1.005	93.500	1500
	94.800	1.720	0		OUTFALL		1.006	93.080	375

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Micro Drainage	Simulation W.11.2	

Global Variables

Region	FSR - England & Wales
Return Period (yrs)	100
M5-60 (mm)	19.000
Ratio R	0.358
Volumetric Runoff Coef	0.840
Profile Type	Winter
PIMP (%)	100
Areal Reduction Factor	1.000
Storm Duration (mins)	120
Hot Start (mins)	0
Hot Start Level (mm)	0
Manhole Headloss Coefficient	0.500
MADD Factor * 10m ³ /ha Storage	2.000
Foul Sewage/Hectare (l/s)	0.00
Additional Flow - % of Total Flow	0
Number of Input Hydrographs	0
Number of Time/Area Diagrams	0
Number of Bifurcations	0
Number of Overflows	0
Number of Off-Line Controls	0
Number of On-Line Controls	1

Starting Storm file name

Z:\PALEY\4794_WAKEFIELD ROAD MAPPLEWELL\PDS\INDUSTRIALREVA.SWS

Freely Discharging Outfalls

Outfall Pipe Number	Outfall MH/No	C.Level (m)	I.Level (m)	D,L (mm)	B (mm)
1.006		94.800	93.080	1200	0

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On-Line Controls (Crown Vortex Valve®)

US/PN	Volume (m³)	Ctrl MH Name	Invert (m)	Type	Dia (m)	D.Head (m)	D.Flow (l/s)	Headloss (m)	Flow (l/s)
1.005	48.084	8	93.500	C1	0.182	2.500	53.0	0.2	16.1
								0.4	29.6
								0.6	26.0
								0.8	30.0
								1.0	33.5
								1.4	39.7
								1.8	45.0
								2.2	49.7
								2.6	54.0
								3.0	58.1
								3.4	61.8

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Summary Wizard of "CRITICAL"(Rank 1 by Max Level)
Results for Design Storms

Margin for Flood Risk warning (mm) 200 Inertia Status OFF
DTS Status ON Analysis Time Step Fine
DVD Status ON

Profile(s) Summer and winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440,
Sensitivity flow(s) (%) 2160, 2880, 4320, 5760, 7200, 8640, 10080
0, 20

PN	Storm	Sensitivity Flow (%)	Rank	Surcharge Sensitivity	Flood Sensitivity	Overflow Sensitivity	O/F Act
1.000	15 winter	+20%	1	0%/15 Summer			
1.001	120 winter	+20%	1				
1.002	120 winter	+20%	1				
1.003	120 winter	+20%	1	+20%/120 winter			
2.000	120 winter	+20%	1				
1.004	120 winter	+20%	1	+20%/120 winter			
1.005	120 winter	+20%	1	+20%/60 winter			
1.006	120 winter	+20%	1	0%/15 Summer			

LVl Ex.	PN	Water Lvl. (m)	Surcharged Depth (m)	Flooded Vol (m³)	Flow/Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
	1.000	97.045	0.520	0.000	1.23	0.0	110.6	SURCH'ED
	1.001	95.408	-0.142	0.000	0.01	0.0	44.7	O K
	1.002	95.390	0.000	0.000	0.01	0.0	28.1	O K
	1.003	95.350	0.010	0.000	0.03	0.0	65.6	SURCH'ED
	2.000	95.363	-0.017	0.000	0.01	0.0	41.8	O K
	1.004	95.350	0.080	0.000	0.02	0.0	76.7	SURCH'ED
	1.005	95.350	0.260	0.000	0.02	0.0	57.0	SURCH'ED
	1.006	95.307	1.432	0.000	0.22	0.0	44.9	SURCH'ED