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The Stables Woodbury Lane, Norton Worcester WR5 2PT	WERRINGTON STORM NETWORK 21-081 / 601 J	
Date 26/10/2022 08:59	Designed by SCH	
File Storm network - Rev L (F...	Checked by	
Micro Drainage		Network 2020.1.3

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	2
FEH Rainfall Version	2013
Site Location GB 394046 347339 SJ 94046 47339	
Data Type	Point
Maximum Rainfall (mm/hr)	0
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	40
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.801	4-8	0.367

Total Area Contributing (ha) = 1.168

Total Pipe Volume (m³) = 42.956

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
S1.000	23.000	2.000	11.5	0.035	5.00	0.0	0.600	o	150	Pipe/Conduit
S1.001	10.694	0.930	11.5	0.039	0.00	0.0	0.600	o	150	Pipe/Conduit
S1.002	10.703	0.931	11.5	0.000	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	0.00	5.13	258.750	0.035	0.0	0.0	0.0	2.99	52.8	0.0
S1.001	0.00	5.19	256.750	0.074	0.0	0.0	0.0	2.99	52.8	0.0
S1.002	0.00	5.25	255.820	0.074	0.0	0.0	0.0	2.99	52.8	0.0

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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
S1.003	47.844	2.479	19.3	0.138	0.00	0.0	0.600	o	225	Pipe/Conduit
S1.004	6.000	2.595	2.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit
S2.000	23.574	0.845	27.9	0.105	5.00	0.0	0.600	o	300	Pipe/Conduit
S1.005	11.740	0.421	27.9	0.085	0.00	0.0	0.600	o	300	Pipe/Conduit
S1.006	45.990	1.236	37.2	0.069	0.00	0.0	0.600	o	375	Pipe/Conduit
S3.000	19.066	0.114	167.2	0.084	5.00	0.0	0.600	o	225	Pipe/Conduit
S3.001	40.384	0.242	166.9	0.080	0.00	0.0	0.600	o	375	Pipe/Conduit
S3.002	11.510	0.069	166.8	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit
S3.003	23.731	0.142	167.1	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit
S1.007	15.304	0.144	106.3	0.128	0.00	0.0	0.600	o	450	Pipe/Conduit
S1.008	11.588	0.109	106.3	0.065	0.00	0.0	0.600	o	450	Pipe/Conduit
S1.009	38.133	0.806	47.3	0.078	0.00	0.0	0.600	o	450	Pipe/Conduit
S1.010	47.852	0.345	138.7	0.071	0.00	0.0	0.600	o	525	Pipe/Conduit
S1.011	10.928	0.179	61.1	0.191	0.00	0.0	0.600	o	525	Pipe/Conduit
S1.012	15.718	1.310	12.0	0.000	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)
S1.003	0.00	5.51	254.814	0.212	0.0	0.0	0.0	2.99	119.0	0.0
S1.004	0.00	5.53	252.335	0.212	0.0	0.0	0.0	8.67	344.7	0.0
S2.000	0.00	5.13	250.510	0.105	0.0	0.0	0.0	2.99	211.2	0.0
S1.005	0.00	5.59	249.665	0.402	0.0	0.0	0.0	2.99	211.3	0.0
S1.006	0.00	5.85	249.169	0.471	0.0	0.0	0.0	2.98	329.0	0.0
S3.000	0.00	5.32	248.650	0.084	0.0	0.0	0.0	1.01	40.1	0.0
S3.001	0.00	5.80	248.386	0.164	0.0	0.0	0.0	1.40	154.6	0.0
S3.002	0.00	5.93	248.144	0.164	0.0	0.0	0.0	1.40	154.6	0.0
S3.003	0.00	6.22	248.075	0.164	0.0	0.0	0.0	1.40	154.5	0.0
S1.007	0.00	6.35	247.858	0.763	0.0	0.0	0.0	1.97	313.6	0.0
S1.008	0.00	6.44	247.714	0.828	0.0	0.0	0.0	1.97	313.5	0.0
S1.009	0.00	6.66	247.605	0.906	0.0	0.0	0.0	2.96	471.0	0.0
S1.010	0.00	7.08	246.724	0.977	0.0	0.0	0.0	1.90	411.3	0.0
S1.011	0.00	7.14	246.379	1.168	0.0	0.0	0.0	2.87	621.4	0.0
S1.012	0.00	7.23	246.200	1.168	0.0	0.0	0.0	2.92	51.7	0.0

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Micro Drainage		Network 2020.1.3

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.035	0.035	0.035
1.001	-	-	100	0.039	0.039	0.039
1.002	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.138	0.138	0.138
1.004	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.105	0.105	0.105
1.005	-	-	100	0.085	0.085	0.085
1.006	-	-	100	0.069	0.069	0.069
3.000	-	-	100	0.084	0.084	0.084
3.001	-	-	100	0.080	0.080	0.080
3.002	-	-	100	0.000	0.000	0.000
3.003	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.128	0.128	0.128
1.008	-	-	100	0.065	0.065	0.065
1.009	-	-	100	0.078	0.078	0.078
1.010	-	-	100	0.071	0.071	0.071
1.011	-	-	100	0.191	0.191	0.191
1.012	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.168	1.168	1.168

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.012	SEx MH	247.700	244.890	244.890	1200	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	0.000
Hot Start Level (mm)	0	Run Time (mins)	60
Manhole Headloss Coeff (Global)	0.500	Output Interval (mins)	1
Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0		

Synthetic Rainfall Details

Rainfall Model	FEH
Return Period (years)	2
FEH Rainfall Version	2013
Site Location GB 394046 347339 SJ 94046 47339	
Data Type	Point
Summer Storms	Yes

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<u>Synthetic Rainfall Details</u> Winter Storms No Cv (Summer) 0.750 Cv (Winter) 0.840 Storm Duration (mins) 15		
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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S16, DS/PN: S1.012, Volume (m³): 6.3

Unit Reference	MD-SHE-0059-2000-1700-2000
Design Head (m)	1.700
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	59
Invert Level (m)	246.200
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.700	2.0
Flush-Flo™	0.257	1.5
Kick-Flo®	0.527	1.2
Mean Flow over Head Range	-	1.5

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.3	1.200	1.7	3.000	2.6	7.000	3.8
0.200	1.4	1.400	1.8	3.500	2.8	7.500	4.0
0.300	1.4	1.600	1.9	4.000	3.0	8.000	4.1
0.400	1.4	1.800	2.1	4.500	3.1	8.500	4.2
0.500	1.3	2.000	2.2	5.000	3.3	9.000	4.3
0.600	1.3	2.200	2.2	5.500	3.4	9.500	4.4
0.800	1.4	2.400	2.3	6.000	3.6		
1.000	1.6	2.600	2.4	6.500	3.7		

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Storage Structures for Storm

Tank or Pond Manhole: S16, DS/PN: S1.012

Invert Level (m) 246.800

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	622.0	1.200	1189.0

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Summary of Results for 15 minute 2 year Summer (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded			Half Drain	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	
S1.000	S1	258.782	-0.118	0.000	0.10			4.9	OK
S1.001	S2	256.796	-0.104	0.000	0.20			9.6	OK
S1.002	S3	255.866	-0.104	0.000	0.20			9.5	OK
S1.003	S3	254.887	-0.152	0.000	0.23			25.9	OK
S1.004	S5	252.386	-0.174	0.000	0.11			25.7	OK
S2.000	S5	250.566	-0.244	0.000	0.08			14.8	OK
S1.005	S5	249.780	-0.185	0.000	0.31			50.2	OK
S1.006	S6	249.282	-0.262	0.000	0.19			58.3	OK
S3.000	S7	248.739	-0.136	0.000	0.32			11.7	OK
S3.001	S8	248.483	-0.278	0.000	0.15			21.0	OK
S3.002	S9	248.256	-0.263	0.000	0.20			20.9	OK
S3.003	S10	248.174	-0.276	0.000	0.16			20.9	OK
S1.007	S11	248.067	-0.241	0.000	0.44			93.5	OK
S1.008	S12	247.950	-0.214	0.000	0.54			100.6	OK
S1.009	S13	247.761	-0.294	0.000	0.26			108.8	OK
S1.010	S14	246.944	-0.305	0.000	0.32			115.4	OK
S1.011	S15	246.896	-0.008	0.000	0.40			130.0	OK
S1.012	S16	246.892	0.542	0.000	0.03			1.4	SURCHARGED

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Summary of Results for 30 minute 2 year Summer (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded			Half Drain	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	
S1.000	S1	258.780	-0.120	0.000	0.09			4.5	OK
S1.001	S2	256.793	-0.107	0.000	0.19			8.8	OK
S1.002	S3	255.863	-0.107	0.000	0.19			8.8	OK
S1.003	S3	254.884	-0.155	0.000	0.21			24.1	OK
S1.004	S5	252.384	-0.176	0.000	0.11			24.0	OK
S2.000	S5	250.562	-0.248	0.000	0.07			13.4	OK
S1.005	S5	249.775	-0.190	0.000	0.29			46.7	OK
S1.006	S6	249.276	-0.268	0.000	0.18			54.2	OK
S3.000	S7	248.733	-0.142	0.000	0.30			10.7	OK
S3.001	S8	248.479	-0.282	0.000	0.14			19.3	OK
S3.002	S9	248.251	-0.268	0.000	0.18			19.4	OK
S3.003	S10	248.170	-0.280	0.000	0.14			19.2	OK
S1.007	S11	248.058	-0.250	0.000	0.41			86.8	OK
S1.008	S12	247.941	-0.223	0.000	0.51			94.0	OK
S1.009	S13	247.756	-0.299	0.000	0.25			102.2	OK
S1.010	S14	246.948	-0.301	0.000	0.30			107.7	OK
S1.011	S15	246.922	0.018	0.000	0.38			122.5	SURCHARGED
S1.012	S16	246.922	0.572	0.000	0.03			1.4	SURCHARGED

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Summary of Results for 60 minute 2 year Summer (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded			Half Drain	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	
S1.000	S1	258.775	-0.125	0.000	0.06			3.2	OK
S1.001	S2	256.787	-0.113	0.000	0.14			6.5	OK
S1.002	S3	255.857	-0.113	0.000	0.14			6.6	OK
S1.003	S3	254.875	-0.164	0.000	0.16			18.5	OK
S1.004	S5	252.378	-0.182	0.000	0.08			18.6	OK
S2.000	S5	250.554	-0.256	0.000	0.05			9.7	OK
S1.005	S5	249.760	-0.205	0.000	0.22			35.4	OK
S1.006	S6	249.262	-0.282	0.000	0.14			41.5	OK
S3.000	S7	248.721	-0.154	0.000	0.21			7.7	OK
S3.001	S8	248.467	-0.294	0.000	0.10			14.6	OK
S3.002	S9	248.236	-0.283	0.000	0.14			14.7	OK
S3.003	S10	248.158	-0.292	0.000	0.11			14.7	OK
S1.007	S11	248.031	-0.277	0.000	0.32			67.4	OK
S1.008	S12	247.909	-0.255	0.000	0.39			73.1	OK
S1.009	S13	247.737	-0.318	0.000	0.19			79.7	OK
S1.010	S14	246.956	-0.293	0.000	0.23			84.8	OK
S1.011	S15	246.953	0.049	0.000	0.30			97.2	SURCHARGED
S1.012	S16	246.953	0.603	0.000	0.03			1.4	SURCHARGED

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Summary of Results for 180 minute 2 year Summer (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded			Half Drain	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	
S1.000	S1	258.769	-0.131	0.000	0.04			1.9	OK
S1.001	S2	256.779	-0.121	0.000	0.08			4.0	OK
S1.002	S3	255.849	-0.121	0.000	0.08			4.0	OK
S1.003	S3	254.862	-0.177	0.000	0.10			11.3	OK
S1.004	S5	252.367	-0.193	0.000	0.05			11.2	OK
S2.000	S5	250.544	-0.266	0.000	0.03			5.8	OK
S1.005	S5	249.738	-0.227	0.000	0.13			21.5	OK
S1.006	S6	249.242	-0.302	0.000	0.08			25.0	OK
S3.000	S7	248.703	-0.172	0.000	0.13			4.6	OK
S3.001	S8	248.447	-0.314	0.000	0.06			8.8	OK
S3.002	S9	248.216	-0.303	0.000	0.08			8.7	OK
S3.003	S10	248.138	-0.312	0.000	0.07			8.8	OK
S1.007	S11	247.992	-0.316	0.000	0.19			40.6	OK
S1.008	S12	247.863	-0.301	0.000	0.24			44.2	OK
S1.009	S13	247.707	-0.348	0.000	0.12			48.4	OK
S1.010	S14	247.032	-0.217	0.000	0.14			51.8	OK
S1.011	S15	247.031	0.127	0.000	0.18			59.9	SURCHARGED
S1.012	S16	247.031	0.681	0.000	0.03			1.4	SURCHARGED

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Summary of Results for 360 minute 2 year Summer (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded			Half Drain	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	
S1.000	S1	258.766	-0.134	0.000	0.02			1.2	OK
S1.001	S2	256.773	-0.127	0.000	0.06			2.6	OK
S1.002	S3	255.843	-0.127	0.000	0.06			2.6	OK
S1.003	S3	254.851	-0.188	0.000	0.07			7.5	OK
S1.004	S5	252.361	-0.199	0.000	0.03			7.5	OK
S2.000	S5	250.538	-0.272	0.000	0.02			3.7	OK
S1.005	S5	249.724	-0.241	0.000	0.09			14.1	OK
S1.006	S6	249.225	-0.319	0.000	0.05			16.5	OK
S3.000	S7	248.693	-0.182	0.000	0.08			3.0	OK
S3.001	S8	248.435	-0.326	0.000	0.04			5.8	OK
S3.002	S9	248.200	-0.319	0.000	0.05			5.8	OK
S3.003	S10	248.125	-0.325	0.000	0.04			5.8	OK
S1.007	S11	247.963	-0.345	0.000	0.13			26.8	OK
S1.008	S12	247.832	-0.332	0.000	0.16			29.0	OK
S1.009	S13	247.687	-0.368	0.000	0.08			31.7	OK
S1.010	S14	247.078	-0.171	0.000	0.09			33.9	OK
S1.011	S15	247.078	0.174	0.000	0.12			39.5	SURCHARGED
S1.012	S16	247.078	0.728	0.000	0.03			1.5	SURCHARGED

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Micro Drainage		Network 2020.1.3

Summary of Results for 600 minute 2 year Summer (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded			Half Drain	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	
S1.000	S1	258.762	-0.138	0.000	0.02			0.9	OK
S1.001	S2	256.769	-0.131	0.000	0.04			1.8	OK
S1.002	S3	255.839	-0.131	0.000	0.04			1.8	OK
S1.003	S3	254.845	-0.194	0.000	0.05			5.2	OK
S1.004	S5	252.358	-0.202	0.000	0.02			5.2	OK
S2.000	S5	250.530	-0.280	0.000	0.01			2.6	OK
S1.005	S5	249.713	-0.252	0.000	0.06			10.0	OK
S1.006	S6	249.216	-0.328	0.000	0.04			11.7	OK
S3.000	S7	248.685	-0.190	0.000	0.06			2.1	OK
S3.001	S8	248.428	-0.333	0.000	0.03			4.1	OK
S3.002	S9	248.191	-0.328	0.000	0.04			4.1	OK
S3.003	S10	248.118	-0.332	0.000	0.03			4.1	OK
S1.007	S11	247.948	-0.360	0.000	0.09			18.9	OK
S1.008	S12	247.813	-0.351	0.000	0.11			20.5	OK
S1.009	S13	247.672	-0.383	0.000	0.05			22.4	OK
S1.010	S14	247.103	-0.146	0.000	0.07			24.0	OK
S1.011	S15	247.103	0.199	0.000	0.09			27.9	SURCHARGED
S1.012	S16	247.103	0.753	0.000	0.03			1.5	SURCHARGED

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Micro Drainage	Network 2020.1.3	

Summary of Results for 1440 minute 2 year Summer (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded			Half Drain	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	
S1.000	S1	258.756	-0.144	0.000	0.01			0.5	OK
S1.001	S2	256.765	-0.135	0.000	0.02			1.0	OK
S1.002	S3	255.835	-0.135	0.000	0.02			1.0	OK
S1.003	S3	254.838	-0.201	0.000	0.02			2.8	OK
S1.004	S5	252.348	-0.212	0.000	0.01			2.8	OK
S2.000	S5	250.520	-0.290	0.000	0.01			1.4	OK
S1.005	S5	249.700	-0.265	0.000	0.03			5.3	OK
S1.006	S6	249.205	-0.339	0.000	0.02			6.2	OK
S3.000	S7	248.676	-0.199	0.000	0.03			1.1	OK
S3.001	S8	248.413	-0.348	0.000	0.02			2.1	OK
S3.002	S9	248.179	-0.340	0.000	0.02			2.1	OK
S3.003	S10	248.104	-0.346	0.000	0.02			2.1	OK
S1.007	S11	247.920	-0.388	0.000	0.05			10.0	OK
S1.008	S12	247.784	-0.380	0.000	0.06			10.8	OK
S1.009	S13	247.655	-0.400	0.000	0.03			11.9	OK
S1.010	S14	247.109	-0.140	0.000	0.03			12.7	OK
S1.011	S15	247.109	0.205	0.000	0.05			14.8	SURCHARGED
S1.012	S16	247.109	0.759	0.000	0.03			1.5	SURCHARGED

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Micro Drainage	Network 2020.1.3	

Summary of Results for 2880 minute 2 year Summer (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded			Half Drain	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	
S1.000	S1	258.754	-0.146	0.000	0.01			0.3	OK
S1.001	S2	256.759	-0.141	0.000	0.01			0.6	OK
S1.002	S3	255.829	-0.141	0.000	0.01			0.6	OK
S1.003	S3	254.830	-0.209	0.000	0.02			1.7	OK
S1.004	S5	252.343	-0.217	0.000	0.01			1.7	OK
S2.000	S5	250.516	-0.294	0.000	0.00			0.9	OK
S1.005	S5	249.694	-0.271	0.000	0.02			3.3	OK
S1.006	S6	249.192	-0.352	0.000	0.01			3.8	OK
S3.000	S7	248.670	-0.205	0.000	0.02			0.7	OK
S3.001	S8	248.403	-0.358	0.000	0.01			1.3	OK
S3.002	S9	248.166	-0.353	0.000	0.01			1.3	OK
S3.003	S10	248.093	-0.357	0.000	0.01			1.3	OK
S1.007	S11	247.908	-0.400	0.000	0.03			6.2	OK
S1.008	S12	247.769	-0.395	0.000	0.04			6.8	OK
S1.009	S13	247.643	-0.412	0.000	0.02			7.4	OK
S1.010	S14	247.090	-0.159	0.000	0.02			7.9	OK
S1.011	S15	247.091	0.187	0.000	0.03			9.2	SURCHARGED
S1.012	S16	247.090	0.740	0.000	0.03			1.5	SURCHARGED

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	2
FEH Rainfall Version	2013
Site Location GB 394046 347339 SJ 94046 47339	
Data Type	Point
Maximum Rainfall (mm/hr)	0
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	40
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.801	4-8	0.367

Total Area Contributing (ha) = 1.168

Total Pipe Volume (m³) = 42.956

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
S1.000	23.000	2.000	11.5	0.035	5.00	0.0	0.600	o	150	Pipe/Conduit
S1.001	10.694	0.930	11.5	0.039	0.00	0.0	0.600	o	150	Pipe/Conduit
S1.002	10.703	0.931	11.5	0.000	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	0.00	5.13	258.750	0.035	0.0	0.0	0.0	2.99	52.8	0.0
S1.001	0.00	5.19	256.750	0.074	0.0	0.0	0.0	2.99	52.8	0.0
S1.002	0.00	5.25	255.820	0.074	0.0	0.0	0.0	2.99	52.8	0.0

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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
S1.003	47.844	2.479	19.3	0.138	0.00	0.0	0.600	o	225	Pipe/Conduit
S1.004	6.000	2.595	2.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit
S2.000	23.574	0.845	27.9	0.105	5.00	0.0	0.600	o	300	Pipe/Conduit
S1.005	11.740	0.421	27.9	0.085	0.00	0.0	0.600	o	300	Pipe/Conduit
S1.006	45.990	1.236	37.2	0.069	0.00	0.0	0.600	o	375	Pipe/Conduit
S3.000	19.066	0.114	167.2	0.084	5.00	0.0	0.600	o	225	Pipe/Conduit
S3.001	40.384	0.242	166.9	0.080	0.00	0.0	0.600	o	375	Pipe/Conduit
S3.002	11.510	0.069	166.8	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit
S3.003	23.731	0.142	167.1	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit
S1.007	15.304	0.144	106.3	0.128	0.00	0.0	0.600	o	450	Pipe/Conduit
S1.008	11.588	0.109	106.3	0.065	0.00	0.0	0.600	o	450	Pipe/Conduit
S1.009	38.133	0.806	47.3	0.078	0.00	0.0	0.600	o	450	Pipe/Conduit
S1.010	47.852	0.345	138.7	0.071	0.00	0.0	0.600	o	525	Pipe/Conduit
S1.011	10.928	0.179	61.1	0.191	0.00	0.0	0.600	o	525	Pipe/Conduit
S1.012	15.718	1.310	12.0	0.000	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)
S1.003	0.00	5.51	254.814	0.212	0.0	0.0	0.0	2.99	119.0	0.0
S1.004	0.00	5.53	252.335	0.212	0.0	0.0	0.0	8.67	344.7	0.0
S2.000	0.00	5.13	250.510	0.105	0.0	0.0	0.0	2.99	211.2	0.0
S1.005	0.00	5.59	249.665	0.402	0.0	0.0	0.0	2.99	211.3	0.0
S1.006	0.00	5.85	249.169	0.471	0.0	0.0	0.0	2.98	329.0	0.0
S3.000	0.00	5.32	248.650	0.084	0.0	0.0	0.0	1.01	40.1	0.0
S3.001	0.00	5.80	248.386	0.164	0.0	0.0	0.0	1.40	154.6	0.0
S3.002	0.00	5.93	248.144	0.164	0.0	0.0	0.0	1.40	154.6	0.0
S3.003	0.00	6.22	248.075	0.164	0.0	0.0	0.0	1.40	154.5	0.0
S1.007	0.00	6.35	247.858	0.763	0.0	0.0	0.0	1.97	313.6	0.0
S1.008	0.00	6.44	247.714	0.828	0.0	0.0	0.0	1.97	313.5	0.0
S1.009	0.00	6.66	247.605	0.906	0.0	0.0	0.0	2.96	471.0	0.0
S1.010	0.00	7.08	246.724	0.977	0.0	0.0	0.0	1.90	411.3	0.0
S1.011	0.00	7.14	246.379	1.168	0.0	0.0	0.0	2.87	621.4	0.0
S1.012	0.00	7.23	246.200	1.168	0.0	0.0	0.0	2.92	51.7	0.0

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<u>Synthetic Rainfall Details</u> Winter Storms Yes Cv (Summer) 0.750 Cv (Winter) 0.840 Storm Duration (mins) 15		
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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S16, DS/PN: S1.012, Volume (m³): 6.3

Unit Reference	MD-SHE-0059-2000-1700-2000
Design Head (m)	1.700
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	59
Invert Level (m)	246.200
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.700	2.0
Flush-Flo™	0.257	1.5
Kick-Flo®	0.527	1.2
Mean Flow over Head Range	-	1.5

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.3	1.200	1.7	3.000	2.6	7.000	3.8
0.200	1.4	1.400	1.8	3.500	2.8	7.500	4.0
0.300	1.4	1.600	1.9	4.000	3.0	8.000	4.1
0.400	1.4	1.800	2.1	4.500	3.1	8.500	4.2
0.500	1.3	2.000	2.2	5.000	3.3	9.000	4.3
0.600	1.3	2.200	2.2	5.500	3.4	9.500	4.4
0.800	1.4	2.400	2.3	6.000	3.6		
1.000	1.6	2.600	2.4	6.500	3.7		

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Storage Structures for Storm

Tank or Pond Manhole: S16, DS/PN: S1.012

Invert Level (m) 246.800

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	622.0	1.200	1189.0

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Micro Drainage		Network 2020.1.3

Summary of Results for 15 minute 2 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded			Half Drain	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	
S1.000	S1	258.782	-0.118	0.000	0.10			5.2	OK
S1.001	S2	256.797	-0.103	0.000	0.21			10.0	OK
S1.002	S3	255.867	-0.103	0.000	0.21			10.0	OK
S1.003	S3	254.889	-0.150	0.000	0.24			27.1	OK
S1.004	S5	252.387	-0.173	0.000	0.12			27.2	OK
S2.000	S5	250.568	-0.242	0.000	0.08			15.5	OK
S1.005	S5	249.784	-0.181	0.000	0.33			53.0	OK
S1.006	S6	249.284	-0.260	0.000	0.20			61.8	OK
S3.000	S7	248.741	-0.134	0.000	0.34			12.3	OK
S3.001	S8	248.486	-0.275	0.000	0.16			22.2	OK
S3.002	S9	248.259	-0.260	0.000	0.21			22.1	OK
S3.003	S10	248.177	-0.273	0.000	0.17			22.0	OK
S1.007	S11	248.072	-0.236	0.000	0.46			98.6	OK
S1.008	S12	247.959	-0.205	0.000	0.57			105.7	OK
S1.009	S13	247.767	-0.288	0.000	0.28			115.1	OK
S1.010	S14	246.954	-0.295	0.000	0.34			122.9	OK
S1.011	S15	246.905	0.001	0.000	0.43			139.2	SURCHARGED
S1.012	S16	246.904	0.554	0.000	0.03			1.4	SURCHARGED

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Micro Drainage		Network 2020.1.3

Summary of Results for 30 minute 2 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded			Half Drain	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	
S1.000	S1	258.778	-0.122	0.000	0.08			4.0	OK
S1.001	S2	256.792	-0.108	0.000	0.17			8.2	OK
S1.002	S3	255.862	-0.108	0.000	0.17			8.2	OK
S1.003	S3	254.882	-0.157	0.000	0.20			22.8	OK
S1.004	S5	252.383	-0.177	0.000	0.10			22.8	OK
S2.000	S5	250.559	-0.251	0.000	0.06			12.1	OK
S1.005	S5	249.771	-0.194	0.000	0.27			43.7	OK
S1.006	S6	249.272	-0.272	0.000	0.17			51.0	OK
S3.000	S7	248.729	-0.146	0.000	0.27			9.7	OK
S3.001	S8	248.475	-0.286	0.000	0.13			18.0	OK
S3.002	S9	248.247	-0.272	0.000	0.17			18.1	OK
S3.003	S10	248.166	-0.284	0.000	0.14			18.0	OK
S1.007	S11	248.052	-0.256	0.000	0.39			82.6	OK
S1.008	S12	247.933	-0.231	0.000	0.48			89.3	OK
S1.009	S13	247.752	-0.303	0.000	0.23			97.2	OK
S1.010	S14	246.952	-0.297	0.000	0.28			103.9	OK
S1.011	S15	246.939	0.035	0.000	0.37			119.1	SURCHARGED
S1.012	S16	246.938	0.588	0.000	0.03			1.4	SURCHARGED

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Micro Drainage		Network 2020.1.3

Summary of Results for 180 minute 2 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded			Half Drain	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	
S1.000	S1	258.767	-0.133	0.000	0.03			1.4	OK
S1.001	S2	256.775	-0.125	0.000	0.06			3.0	OK
S1.002	S3	255.845	-0.125	0.000	0.06			3.0	OK
S1.003	S3	254.855	-0.184	0.000	0.08			8.7	OK
S1.004	S5	252.363	-0.197	0.000	0.04			8.6	OK
S2.000	S5	250.541	-0.269	0.000	0.02			4.3	OK
S1.005	S5	249.729	-0.236	0.000	0.10			16.4	OK
S1.006	S6	249.230	-0.314	0.000	0.06			19.2	OK
S3.000	S7	248.696	-0.179	0.000	0.10			3.5	OK
S3.001	S8	248.438	-0.323	0.000	0.05			6.7	OK
S3.002	S9	248.205	-0.314	0.000	0.06			6.7	OK
S3.003	S10	248.129	-0.321	0.000	0.05			6.7	OK
S1.007	S11	247.972	-0.336	0.000	0.15			31.1	OK
S1.008	S12	247.843	-0.321	0.000	0.18			33.8	OK
S1.009	S13	247.695	-0.360	0.000	0.09			37.0	OK
S1.010	S14	247.063	-0.186	0.000	0.11			39.6	OK
S1.011	S15	247.061	0.157	0.000	0.14			46.0	SURCHARGED
S1.012	S16	247.061	0.711	0.000	0.03			1.5	SURCHARGED

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Micro Drainage		Network 2020.1.3

Summary of Results for 360 minute 2 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded			Half Drain	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	
S1.000	S1	258.763	-0.137	0.000	0.02			0.9	OK
S1.001	S2	256.769	-0.131	0.000	0.04			1.9	OK
S1.002	S3	255.839	-0.131	0.000	0.04			1.9	OK
S1.003	S3	254.846	-0.193	0.000	0.05			5.6	OK
S1.004	S5	252.359	-0.201	0.000	0.02			5.6	OK
S2.000	S5	250.531	-0.279	0.000	0.01			2.8	OK
S1.005	S5	249.714	-0.251	0.000	0.06			10.5	OK
S1.006	S6	249.217	-0.327	0.000	0.04			12.3	OK
S3.000	S7	248.686	-0.189	0.000	0.06			2.2	OK
S3.001	S8	248.429	-0.332	0.000	0.03			4.3	OK
S3.002	S9	248.192	-0.327	0.000	0.04			4.3	OK
S3.003	S10	248.119	-0.331	0.000	0.03			4.3	OK
S1.007	S11	247.950	-0.358	0.000	0.09			20.0	OK
S1.008	S12	247.816	-0.348	0.000	0.12			21.7	OK
S1.009	S13	247.674	-0.381	0.000	0.06			23.7	OK
S1.010	S14	247.116	-0.133	0.000	0.07			25.4	OK
S1.011	S15	247.115	0.211	0.000	0.09			29.5	SURCHARGED
S1.012	S16	247.115	0.765	0.000	0.03			1.5	SURCHARGED

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Micro Drainage		Network 2020.1.3

Summary of Results for 600 minute 2 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded			Half Drain	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	
S1.000	S1	258.759	-0.141	0.000	0.01			0.6	OK
S1.001	S2	256.767	-0.133	0.000	0.03			1.4	OK
S1.002	S3	255.837	-0.133	0.000	0.03			1.4	OK
S1.003	S3	254.841	-0.198	0.000	0.03			3.9	OK
S1.004	S5	252.353	-0.207	0.000	0.02			3.9	OK
S2.000	S5	250.525	-0.285	0.000	0.01			1.9	OK
S1.005	S5	249.706	-0.259	0.000	0.05			7.4	OK
S1.006	S6	249.211	-0.333	0.000	0.03			8.7	OK
S3.000	S7	248.680	-0.195	0.000	0.04			1.5	OK
S3.001	S8	248.424	-0.337	0.000	0.02			3.0	OK
S3.002	S9	248.185	-0.334	0.000	0.03			3.0	OK
S3.003	S10	248.113	-0.337	0.000	0.02			3.0	OK
S1.007	S11	247.933	-0.375	0.000	0.07			14.1	OK
S1.008	S12	247.800	-0.364	0.000	0.08			15.3	OK
S1.009	S13	247.663	-0.392	0.000	0.04			16.7	OK
S1.010	S14	247.147	-0.102	0.000	0.05			17.9	OK
S1.011	S15	247.148	0.244	0.000	0.06			20.9	SURCHARGED
S1.012	S16	247.147	0.797	0.000	0.03			1.5	SURCHARGED

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Summary of Results for 1440 minute 2 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded			Half Drain	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	
S1.000	S1	258.755	-0.145	0.000	0.01			0.3	OK
S1.001	S2	256.761	-0.139	0.000	0.02			0.7	OK
S1.002	S3	255.831	-0.139	0.000	0.02			0.7	OK
S1.003	S3	254.833	-0.206	0.000	0.02			2.1	OK
S1.004	S5	252.345	-0.215	0.000	0.01			2.1	OK
S2.000	S5	250.518	-0.292	0.000	0.01			1.0	OK
S1.005	S5	249.696	-0.269	0.000	0.02			3.9	OK
S1.006	S6	249.196	-0.348	0.000	0.02			4.6	OK
S3.000	S7	248.673	-0.202	0.000	0.02			0.8	OK
S3.001	S8	248.406	-0.355	0.000	0.01			1.6	OK
S3.002	S9	248.170	-0.349	0.000	0.01			1.6	OK
S3.003	S10	248.096	-0.354	0.000	0.01			1.6	OK
S1.007	S11	247.912	-0.396	0.000	0.03			7.4	OK
S1.008	S12	247.774	-0.390	0.000	0.04			8.1	OK
S1.009	S13	247.650	-0.405	0.000	0.02			8.8	OK
S1.010	S14	247.166	-0.083	0.000	0.03			9.5	OK
S1.011	S15	247.166	0.262	0.000	0.03			11.1	SURCHARGED
S1.012	S16	247.166	0.816	0.000	0.03			1.5	SURCHARGED

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Date 26/10/2022 09:04	Designed by SCH	
File Storm network - Rev L (F...	Checked by	
Micro Drainage		Network 2020.1.3

Summary of Results for 2880 minute 2 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded			Half Drain	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	
S1.000	S1	258.753	-0.147	0.000	0.00			0.2	OK
S1.001	S2	256.757	-0.143	0.000	0.01			0.4	OK
S1.002	S3	255.827	-0.143	0.000	0.01			0.4	OK
S1.003	S3	254.826	-0.213	0.000	0.01			1.2	OK
S1.004	S5	252.341	-0.219	0.000	0.01			1.2	OK
S2.000	S5	250.515	-0.295	0.000	0.00			0.6	OK
S1.005	S5	249.686	-0.279	0.000	0.01			2.4	OK
S1.006	S6	249.185	-0.359	0.000	0.01			2.8	OK
S3.000	S7	248.665	-0.210	0.000	0.01			0.5	OK
S3.001	S8	248.398	-0.363	0.000	0.01			1.0	OK
S3.002	S9	248.160	-0.359	0.000	0.01			1.0	OK
S3.003	S10	248.088	-0.362	0.000	0.01			1.0	OK
S1.007	S11	247.903	-0.405	0.000	0.02			4.5	OK
S1.008	S12	247.762	-0.402	0.000	0.03			4.9	OK
S1.009	S13	247.632	-0.423	0.000	0.01			5.3	OK
S1.010	S14	247.138	-0.111	0.000	0.02			5.7	OK
S1.011	S15	247.138	0.234	0.000	0.02			6.7	SURCHARGED
S1.012	S16	247.138	0.788	0.000	0.03			1.5	SURCHARGED