

TECHNICAL NOTE

Date:	03/09/2020	Ref:	402.06594.00008 - TN02 v01
Subject:	Middleton Development – Discharge of Surface Water Drainage Conditions Prepared for: Frontier Estates Ltd		

1. INTRODUCTION

This Technical Note summarises the latest work on the surface water drainage strategy that has been developed for the proposed residential development by Frontier Estates Ltd at Yapton Poultry Farm, Middleton-on-Sea, PO26 6DY (Planning M/45/16/PL), in order to discharge planning conditions 11, 13 and 14 of the Planning Consent granted on 07/02/2017.

An email from Laura Gibbons c/o Arun District Council dated 28/07/2020 provided responses on the updated Drainage Strategy supporting information relating to the discharge of conditions 11, 13 and 14 relating to surface water drainage.

Laura summarised the comments by requesting "The following information is required":

1. Details of flotation calculations and flotation resistant measures.
2. Fully detailed network calculations of the proposed surface water drainage arrangement, including surcharged outfall. This is required due to the size of the site, complexity of drainage proposals, and discharge location.
3. Please provide an impermeable areas plan to facilitate review.
4. Manhole schedule makes paperless review difficult. Please detail cover and invert levels on plan at manholes.
5. Details to be reviewed in greater detail at later stage, invert level of outlet to ditch appears low, can this be raised.
6. Attenuation crates, labelled as soakaway, please amend.
7. Please provide invert levels on hydrobrake detail, as well as specific hydrobrake reference, step rungs, bypass arrangement.
8. Please provide levels on swale, confirm if sufficient cover is provided where swale overruns crates.
9. Sumps will be required at the downstream ends of the swales, before connection into crates.
10. Please include root protection zones on plan.
11. Please include a construction detail of root barrier around tank.
12. Look to utilise permeable paving more. Please provide further clarity on what elements are being relied upon to achieve mitigation indices stated.
13. Please provide flow exceedance plans, taking account of new calculation results.
14. Please provide further proposed levels.

These comments have been added to the outstanding matters detailed in Table 1 in Section 2.

2. RESPONSE AND APPROACH

In response to these comments SLR Consulting proposed a two-stage approach to resolve the outstanding matters that has now been supplemented with the additional information requested on 28/07/2020 as highlighted in Table 1 below in blue:

Table 1

Item	Arun DC requirement	Purpose	Action
Stage 1: Agreeing the Principles of the Scheme			
i. Shallow Infiltration	Provide plan showing all points	Show all points and all data	Technical Note 01 Section 2.1
	Reaffirm in a technical note the findings from the winter groundwater testing	Re-state the current facts from the winter monitoring	Technical Note 01 Section 2.1
	Confirm whether the base of the proposed crate structures is above the peak recorded water level.	Will confirm the need for shallow winter infiltration testing	Technical Note 01 Section 2.1
	Please provide detail of flotation checks and any flotation resistant measures that are required		See flotation checks shown in Section 3.2.
ii. Overland Flowpath	Provide topographical evidence that no overland/flow path exists from the field to the north	To ensure that there is no detrimental effect to the development	Plan drawing and section in Technical Note 01 Section 2.2
	Cross sections from LiDAR provided. Exceedance flow routes from development itself have been provided, it is assumed these are based on proposed levels alone. Further levels indicating proposed levels across the site are required.		See additional proposed levels on the updated SWDS plan in Appendix 01.
iii. Southern Ditches	Site visit/meeting (26/06/2020)	To agree nature and extent of proposals.	SLR attended site with Paul Cann (Arun DC). Summary of agreed comments provided in Technical Note 01 Section 2.3 and Appendix 02.
	To be reviewed further once network calculations have been supplied and as part of the land		Ditch outfall level reviewed and updated in Appendix 01.

	drainage consent application process.		
Stage 2: Providing the Details			
iv. Southern Ditches	Land Drainage Consent process	Commence Land Drainage Consent for maintenance / discharge structure. Confirm need for new culvert beneath the access.	Detailed drawings (plan and detail drawings) prepared for the outfall consent.
	Response awaited		LDC Consent process ongoing
v. Further details	Full drainage details to be provided.	Drainage design and attenuation storage crate layout justified in Section 4.2 below.	Further detailed drawings shown in Technical Note 01 Appendix 04 .
	Network calculations are required as part of the land drainage consent application process.		Network calculation provided in Appendix 02 .
	Manhole schedule makes paperless review difficult. Please detail cover and invert levels on plan at manholes. Details to be reviewed in greater detail at later stage, invert level of outlet to ditch appears low, can this be raised. Attenuation crates, labelled as soakaway, please amend. Please provide invert levels on hydrobrake detail, as well as specific hydrobrake reference, step rungs, bypass arrangement.		Manhole schedule improved with cover levels provided on plan in Appendix 01 .
	Please provide levels on swale, I note that the swale goes over the crates in some locations, is sufficient cover still provided in these areas. Sumps will be required at the downstream ends of the swales, before connection into crates.		Swale improved with sumps provided in Appendix 01 .
	Crate arrangement is still poor and represents substantial risk of conflict with tree roots. Review against root protection zones will be required, all sides in proximity to trees will require root barriers to be specified to ensure long term integrity of attenuation crates.		Crate arrangement improved with no root protection area encroachment in Appendix 01 .

	Would advise that permeable paving is used in order to reduce crate volume required and reduce conflict with trees. How are details currently meeting requirements of SuDS for treatment of surface water prior to discharge, please provide further clarity on what elements are being relied upon to achieve mitigation indices stated.		SWDS updated with further clarity as shown in Section 3.3 and in Appendix 01.
vi. Maintenance Manual	Further maintenance and operation details to be provided.	Maintenance and operation details provided for the detailed plans.	Updated and expanded Maintenance Plan shown in Technical Note 01 Appendix 05.
	Details to be reviewed at a later stage		Maintenance manual reviewed.

This Technical Note responds to each of the additional issues (shown in blue) and describes how the proposed development has mitigated the risk of surface water flooding at the site.

3. STAGE 1: AGREEING THE PRINCIPLES OF THE SCHEME

i. Shallow Infiltration

Floatation checks have been carried out on the attenuation crate storage units that have been proposed for the drainage scheme.

A minimum soil cover of 500mm is provided on top of the crate system. The site has a potentially high water table and the worst case for floatation of the attenuation system will be when the external water table is at the same level as the top of the crates.

A typical density for soil is 18 kN/m^3 , a 500mm depth of soil cover to the storage crates will therefore provide a weight of $0.5 \times 18 = 9 \text{ kN/m}^2$. A full storage crate is 660mm high and so if the attenuation crate system is empty and the external ground water is at a level equal to the top of the crates, the floatation uplift is $0.66 \times 9.81 = 6.5 \text{ kN/m}^2$; this provides a factor of safety of 1.36 which is acceptable.

Floatation therefore is not a problem.

ii. Overland Flowpath

The drainage detailed design has been supplemented with a highway design that has allowed finished formation levels to be set out for the site. These levels are now shown on 402.06594.00008.001 P1 Proposed Drainage Layout shown in **Appendix 01**.

iii. Southern Ditches

The southern ditch outfall level has been reviewed and accepted (outfall IL 4.175m AOD and ditch IL 4.100m AOD) as part of the latest drainage detailed design. The arrangement is shown on 402.06594.00008.001 P1 Proposed Drainage Layout shown in **Appendix 01**.

4 STAGE 2: PROVIDING THE DETAILS

I. Southern Ditches

A Land Drainage Consent application was submitted on 10th July 2020 and confirmed by Paul Cann (Arun DC) as having been received. The process is understood to be ongoing.

II. Further Details

This review of the onsite (private) drainage scheme builds and expands upon the Flood Risk Assessment (FRA) which was prepared by SLR and formed part of the Planning Application. The principles of the scheme with the proposed discharge of surface water runoff to existing drainage ditch and general methods have been retained. The scheme has been developed further and a complete drainage network has been modelled into a full MicroDrainage design (refer to network calculations in **Appendix 02**) which is presented in this Technical Note.

The proposal has been designed so that it is on a gradient sloping from the north east corner at the highest level, towards the centre of the southern boundary. This has been chosen in order to tie in with the existing levels at the site boundary and to optimise levels within the site to provide an arrangement for surface water to drain by gravity. The finished floor level for the proposed residential house in the north east corner of the site is 5.9m AOD with site drainage falling to the outlet to the ditch at 4.175m AOD. The site has a developed impermeable area of 0.41ha.

The road gradients have been set with a slope towards the swale that runs unobstructed around the centre of the site; this then enters the centrally located crate storage system via gullies. A manhole schedule has been provided on the strategy drawing in **Appendix 01** together with swale, cover and invert levels shown on the drawing.

SLR has endeavoured to provide treatment and filtration throughout the scheme, however, as the site will be used as a residential development with private car use the risk is already low. The swale will provide some treatment and filtration to the runoff from the road and driveways, and filter drains will be used to drain the footpaths.

Whilst permeable paving was considered for the scheme, the build-up required was considered too onerous to ensure gravity discharge through the crate storage. Additionally, with the potentially high water table within the site, it was concluded that it would not be a practical option.

Rainwater from the roof areas will also be collected into the drainage network. All of the runoff from the above-mentioned surfaces will flow through a network of pipes into the below ground crate attenuation storage system at the centre of the site. The storage system has been revised accordingly and split into two areas connected by a pipe in order to minimise impact to existing tree roots avoiding the root protection areas; refer to **Appendix 01**. The water flows out of the crate storage and into a manhole that contains a 75mm Hydrobrake. The size of the Hydrobrake was considered to be the smallest feasible size without risk of regular blockage. This allows a maximum discharge rate of 2.1 l/s to the existing drainage ditch that runs along the South of the site.

Although the surface water drainage will be under private ownership, it has been designed in accordance with Sewers for Adoption – 7th Edition to the following requirements: -

1. The system is designed to not surcharge any part of the network during a 1 in 1 year return period design storm.
2. The system is designed to not flood any part of the site during a 1 in 30 year return period design storm.

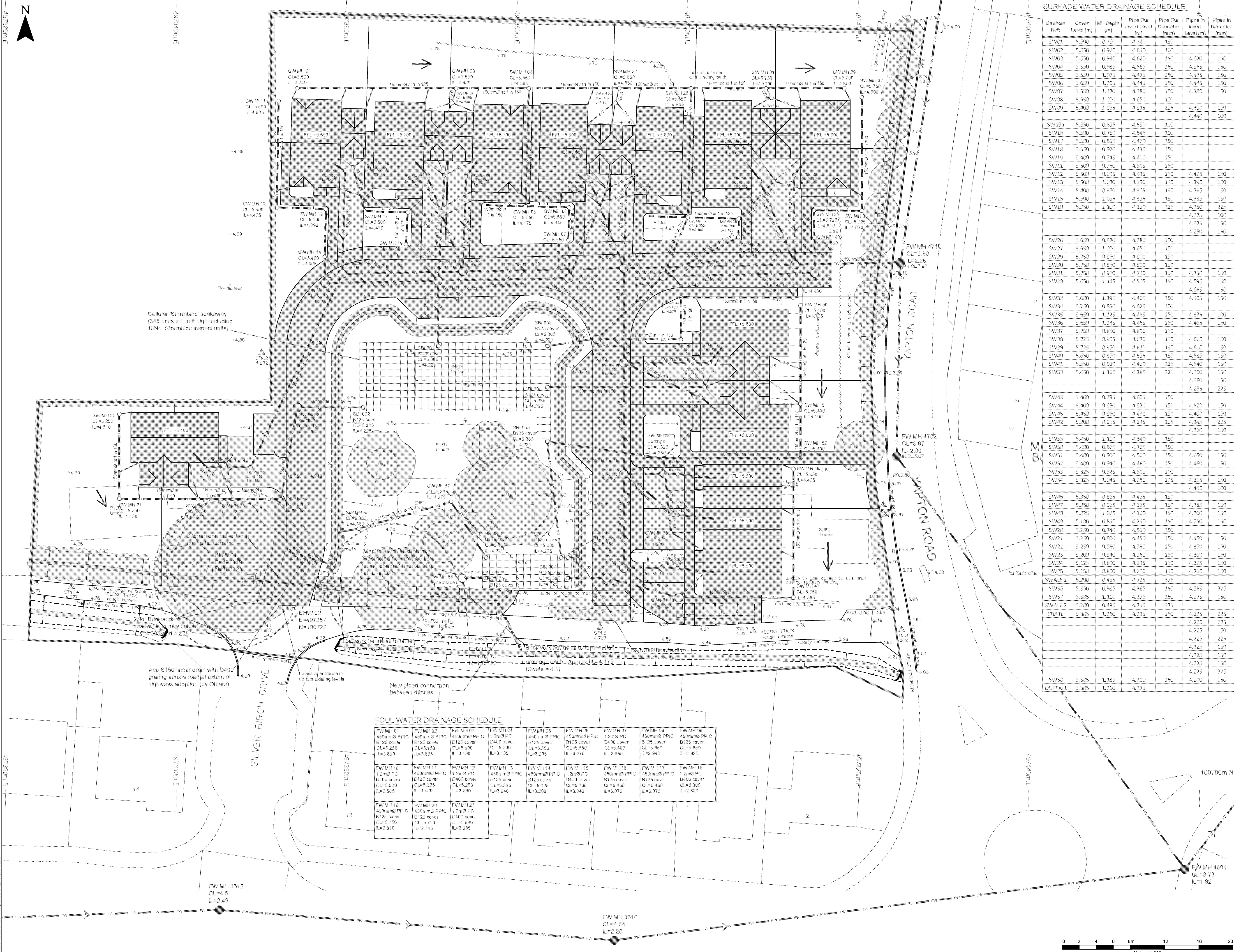
3. The system is designed to not flood any part of the site during a 1 in 100 year return period design storm, with 40% allowance for climate change.

The foul water will be discharged into a nearby existing foul sewer to the East of the site in Yapton Road.

iii. Maintenance Manual

The Maintenance Manual has been reviewed for the various SuDS components that have been detailed for the site and was found to be sufficient.

APPENDIX 01 – DRAINAGE STRATEGY



SURFACE WATER DRAINAGE SCHEDULE						
Manhole Ref.	Cover Level (m)	MH Depth (m)	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipe In Invert Level (m)	Pipe In Diameter (mm)
SW01	5.500	0.760	4.740	150		
SW02	5.550	0.920	4.630	100		
SW03	5.550	0.930	4.620	150	4.620	150
SW04	5.550	0.985	4.565	150	4.565	150
SW05	5.550	1.075	4.475	150	4.475	150
SW06	5.550	1.205	4.445	150	4.445	150
SW07	5.550	1.170	4.380	150	4.380	150
SW08	5.650	1.000	4.650	100		
SW09	5.400	1.065	4.315	225	4.390	150
					4.440	100
SW19a	5.550	0.895	4.550	100		
SW16	5.500	0.760	4.545	100		
SW17	5.500	0.855	4.470	150		
SW18	5.550	0.970	4.435	150		
SW19	5.400	0.745	4.400	150		
SW11	5.500	0.750	4.505	150		
SW12	5.500	0.995	4.425	150	4.425	150
SW13	5.500	1.030	4.390	150	4.390	150
SW14	5.400	0.870	4.365	150	4.365	150
SW15	5.500	1.085	4.335	150	4.335	150
SW10	5.350	1.100	4.250	225	4.250	225
					4.375	100
					4.325	150
					4.250	150
SW26	5.650	0.870	4.780	100		
SW27	5.650	1.000	4.650	150		
SW29	5.750	0.850	4.800	150		
SW30	5.750	0.850	4.800	150		
SW31	5.750	0.910	4.730	150	4.730	150
SW28	5.650	1.145	4.505	150	4.595	150
					4.665	150
SW32	5.600	1.195	4.405	150	4.405	150
SW34	5.750	0.850	4.625	100		
SW35	5.650	1.125	4.435	150	4.535	100
SW36	5.650	1.135	4.465	150	4.465	150
SW37	5.750	0.850	4.800	150		
SW38	5.725	0.955	4.670	150	4.670	150
SW39	5.725	0.990	4.610	150	4.610	150
SW40	5.650	0.970	4.535	150	4.535	150
SW41	5.550	0.930	4.460	225	4.540	150
SW33	5.450	1.165	4.285	225	4.360	150
					4.360	150
					4.285	225
SW43	5.400	0.795	4.605	150		
SW44	5.400	0.880	4.520	150	4.520	150
SW45	5.450	0.960	4.490	150	4.490	150
SW42	5.200	0.955	4.245	225	4.245	225
					4.320	150
SW55	5.450	1.110	4.340	150		
SW50	5.400	0.675	4.725	150		
SW51	5.400	0.900	4.500	150	4.650	150
SW52	5.400	0.940	4.460	150	4.460	150
SW53	5.325	0.825	4.500	100		
SW54	5.325	1.045	4.280	225	4.355	150
					4.440	100
SW46	5.350	0.865	4.485	150		
SW47	5.350	0.965	4.385	150	4.385	150
SW48	5.325	1.025	4.300	150	4.300	150
SW49	5.100	0.850	4.250	150	4.250	150
SW20	5.250	0.740	4.510	150		
SW21	5.250	0.800	4.450	150	4.450	150
SW22	5.250	0.860	4.390	150	4.390	150
SW23	5.200	0.840	4.360	150	4.360	150
SW24	5.125	0.890	4.325	150	4.325	150
SW25	5.150	0.890	4.260	150	4.260	150
SWALE 1	5.200	0.485	4.715	375		
SW56	5.350	0.985	4.365	150	4.365	375
SW57	5.385	1.110	4.275	150	4.275	150
SWALE 2	5.200	0.485	4.715	375		
CRATE	5.385	1.160	4.225	150	4.225	225
					4.225	150
					4.225	225
					4.225	150
					4.225	150
					4.225	150
					4.225	375
SW58	5.385	1.185	4.200	150	4.200	150
OUTFALL	5.385	1.210	4.175			

FOUL WATER DRAINAGE SCHEDULE							
FWMH 01	450mmØ PPIC	FWMH 03	450mmØ PPIC	FWMH 04	1.2mØ PC	FWMH 05	450mmØ PPIC
B125 cover	CL=5.250	B125 cover	CL=5.150	D400 cover	CL=5.300	B125 cover	CL=5.650
IL=4.850	IL=3.685	IL=3.480	IL=3.185	IL=3.295	IL=5.650	IL=2.940	IL=2.950
FWMH 10	2mØ PC	FWMH 11	450mmØ PPIC	FWMH 12	1.2mØ PC	FWMH 13	450mmØ PPIC
D400 cover	CL=5.550	B125 cover	CL=5.200	D400 cover	CL=5.325	B125 cover	CL=5.200
IL=2.685	IL=3.420	IL=3.420	IL=3.280	IL=3.240	IL=3.200	IL=3.040	IL=3.075
FWMH 18	450mmØ PPIC	FWMH 20	450mmØ PPIC	FWMH 21	1.2mØ PC	FWMH 22	450mmØ PPIC
B125 cover	CL=5.750	B125 cover	CL=5.750	D400 cover	CL=5.980	B125 cover	CL=5.300
IL=2.810	IL=2.785	IL=2.385					IL=2.820

NOTES

- Do not scale this drawing. If in doubt ask.
- This drawing to be read in conjunction with all relevant Specialists and Engineers drawings and specifications.
- Topographical survey information taken from 'Offington Land Surveyors Ltd' survey ref: 13950815 dated August 2015 supplied to SLR by Client.
- Location of existing services currently unknown. Any services location and type to be confirmed prior to construction works.
- Full Building Regulation approval should be obtained prior to the commencement of works on site, and any works carried out prior to this are undertaken at the Client's/ Contractor's own risk.
- The works are to be carried out to the approval and satisfaction of the Building Control Officer, to accepted good building practice and with full compliance and in accordance with all relevant British Standards and Codes of practice.
- Method statement must be agreed before work is carried out.
- Engineered granular fill material in accordance with Specification for Highway Works. Class 6F1, 6F2 or 6N granular material in accordance with Table 6/1 Grading requirements to Table 6/2 and compaction to conform to Table 6/4.
- Concrete grades are to be in accordance with BS8500-1:2002 and BS8500-2:2002 placed, compacted and protected in accordance with the National Standard Concrete Specification.
- All drainage to be kitemark certified and installed in accordance with the latest edition of 'Sewers for Adoption'.
- The Contractor is to remain responsible for the temporary stability of the surrounding ground throughout the construction.

LEGEND

- Planning Boundary
- Foul Water Drainage
- Filter Drain
- Surface Water Drainage
- Cellular 'Stormbloc' Soakaway
- Exceedance Flow Route Above Design Flood Event
- Proposed Levels
- Shared Road/ Footpath
- Private Footpath
- Driveway Paving
- Indicative Root Protection Area

P1	DH	LN	AUG 20	Read levels and Units FFL added
P0	DH	SDE	JUL 20	Drainage information updated to suit. Surface types added.
Revision	By	Chkd By	Date	Comments

FRONTIER

SLR
global environmental solutions

Site: LAND WEST OF YAPTON ROAD, MIDDLETON-ON-SEA, BOGNOR REGIS

Project: SURFACE WATER DRAINAGE STRATEGY

Drawing Title: **PROPOSED DRAINAGE LAYOUT**

Scale: 1:200 @ A1
Drawing Number: **402.06594.00008.07.001**
Date: JULY 2020
Revision: **P1**

TreeWood House
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APPENDIX 02 – NETWORK CALCULATIONS

SLR Consulting Ltd							Page 1	
4/5 Lochside View Edinburgh Park Edinburgh, EH12 9DH				Middleton-on-Sea Surface Water Drainage Network				
Date 20/08/2020				Designed by MC				
File 200819 402.06594.00008....				Checked by				
Innovyze				Network 2019.1				
<u>PIPELINE SCHEDULES for Storm</u> <u>Upstream Manhole</u>								
PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	150	SW01	5.500	4.740	0.610	Open Manhole	1200
1.001	o	150	SW03	5.550	4.619	0.781	Open Manhole	1200
1.002	o	150	SW04	5.550	4.565	0.835	Open Manhole	1200
1.003	o	150	SW05	5.550	4.476	0.924	Open Manhole	1200
1.004	o	150	SW06	5.650	4.445	1.055	Open Manhole	1200
2.000	o	100	SW08	5.650	4.652	0.898	Open Manhole	1200
1.005	o	225	SW09	5.400	4.314	0.861	Open Manhole	1200
3.000	o	100	SW19a	5.550	4.550	0.900	Open Manhole	1200
4.000	o	150	SW19	5.400	4.400	0.850	Open Manhole	1200
5.000	o	150	SW11	5.500	4.505	0.845	Open Manhole	1200
5.001	o	150	SW12	5.500	4.425	0.925	Open Manhole	1200
5.002	o	150	SW13	5.500	4.390	0.960	Open Manhole	1200
5.003	o	150	SW15	5.300	4.336	0.814	Open Manhole	1200
1.006	o	225	SW10	5.350	4.250	0.875	Open Manhole	1200
<u>Downstream Manhole</u>								
PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	18.160	150.1	SW03	5.550	4.619	0.781	Open Manhole	1200
1.001	8.080	149.6	SW04	5.550	4.565	0.835	Open Manhole	1200
1.002	13.410	150.7	SW05	5.550	4.476	0.924	Open Manhole	1200
1.003	4.630	149.4	SW06	5.650	4.445	1.055	Open Manhole	1200
1.004	8.404	150.1	SW09	5.400	4.389	0.861	Open Manhole	1200
2.000	10.657	50.0	SW09	5.400	4.439	0.861	Open Manhole	1200
1.005	13.953	225.0	SW10	5.350	4.252	0.873	Open Manhole	1200
3.000	11.653	66.6	SW10	5.350	4.375	0.875	Open Manhole	1200
4.000	5.267	70.2	SW10	5.350	4.325	0.875	Open Manhole	1200
5.000	12.064	150.0	SW12	5.500	4.425	0.925	Open Manhole	1200
5.001	5.314	151.8	SW13	5.500	4.390	0.960	Open Manhole	1200
5.002	7.967	150.0	SW15	5.300	4.336	0.814	Open Manhole	1200
5.003	12.664	150.0	SW10	5.350	4.252	0.948	Open Manhole	1200
1.006	6.143	245.7	crate	5.385	4.225	0.935	Open Manhole	10000
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4/5 Lochside View Edinburgh Park Edinburgh, EH12 9DH		Middleton-on-Sea Surface Water Drainage Network						
Date 20/08/2020 File 200819 402.06594.00008....		Designed by MC Checked by						
Innovyze		Network 2019.1						
PIPELINE SCHEDULES for Storm								
Upstream Manhole								
PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
6.000	o	150	SW27	5.650	4.650	0.850	Open Manhole	1200
7.000	o	150	SW29	5.750	4.800	0.800	Open Manhole	1200
7.001	o	150	SW31	5.750	4.730	0.870	Open Manhole	1200
6.001	o	150	SW28	5.650	4.504	0.996	Open Manhole	1200
6.002	o	150	SW32	5.600	4.406	1.044	Open Manhole	1200
8.000	o	150	SW36	5.650	4.465	1.035	Open Manhole	1200
9.000	o	150	SW37	5.750	4.800	0.800	Open Manhole	1200
9.001	o	150	SW38	5.725	4.670	0.905	Open Manhole	1200
9.002	o	150	SW39	5.725	4.612	0.963	Open Manhole	1200
9.003	o	225	SW41	5.500	4.462	0.813	Open Manhole	1200
6.003	o	225	SW33	5.450	4.286	0.939	Open Manhole	1200
10.000	o	150	SW43	5.400	4.606	0.644	Open Manhole	1200
10.001	o	150	SW44	5.400	4.521	0.729	Open Manhole	1200
10.002	o	150	SW45	5.450	4.491	0.809	Open Manhole	1200
Downstream Manhole								
PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
6.000	7.997	150.9	SW28	5.650	4.597	0.903	Open Manhole	1200
7.000	8.712	125.0	SW31	5.750	4.730	0.870	Open Manhole	1200
7.001	8.320	125.0	SW28	5.650	4.664	0.836	Open Manhole	1200
6.001	14.691	149.9	SW32	5.600	4.406	1.044	Open Manhole	1200
6.002	6.751	150.0	SW33	5.450	4.361	0.939	Open Manhole	1200
8.000	9.188	90.1	SW33	5.450	4.363	0.937	Open Manhole	1200
9.000	12.887	99.1	SW38	5.725	4.670	0.905	Open Manhole	1200
9.001	5.158	88.9	SW39	5.725	4.612	0.963	Open Manhole	1200
9.002	6.633	88.4	SW41	5.500	4.537	0.813	Open Manhole	1200
9.003	15.736	90.0	SW33	5.450	4.287	0.938	Open Manhole	1200
6.003	9.773	225.0	SW42	5.200	4.243	0.732	Open Manhole	1200
10.000	12.732	149.8	SW44	5.400	4.521	0.729	Open Manhole	1200
10.001	4.462	148.7	SW45	5.450	4.491	0.809	Open Manhole	1200
10.002	9.155	49.0	SW42	5.200	4.304	0.746	Open Manhole	1200
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4/5 Lochside View Edinburgh Park Edinburgh, EH12 9DH		Middleton-on-Sea Surface Water Drainage Network						
Date 20/08/2020 File 200819 402.06594.00008....		Designed by MC Checked by						
Innovyze		Network 2019.1						
PIPELINE SCHEDULES for Storm								
Upstream Manhole								
PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
6.004	o	225	SW42	5.200	4.229	0.746	Open Manhole	1200
11.000	o	150	SW55	5.450	4.342	0.958	Open Manhole	1200
12.000	o	150	SW50	5.400	4.725	0.525	Open Manhole	1200
12.001	o	150	SW51	5.400	4.500	0.750	Open Manhole	1200
12.002	o	150	SW52	5.400	4.461	0.789	Open Manhole	1200
13.000	o	100	SW53	5.250	4.500	0.650	Open Manhole	1200
12.003	o	225	SW54	5.325	4.256	0.844	Open Manhole	1200
14.000	o	150	SW46	5.350	4.483	0.717	Open Manhole	1200
14.001	o	150	SW47	5.350	4.385	0.815	Open Manhole	1200
14.002	o	150	SW48	5.325	4.300	0.875	Open Manhole	1200
14.003	o	150	SW49	5.100	4.248	0.702	Open Manhole	1200
15.000	o	150	SW20	5.250	4.511	0.589	Open Manhole	1200
15.001	o	150	SW21	5.250	4.448	0.652	Open Manhole	1200
15.002	o	150	SW22	5.250	4.389	0.711	Open Manhole	1200
15.003	o	150	SW24	5.125	4.327	0.648	Open Manhole	1200
Downstream Manhole								
PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
6.004	3.062	150.0	crate	5.385	4.209	0.951	Open Manhole	10000
11.000	17.610	150.5	crate	5.385	4.225	1.010	Open Manhole	10000
12.000	11.110	150.1	SW51	5.400	4.651	0.599	Open Manhole	1200
12.001	5.905	151.4	SW52	5.400	4.461	0.789	Open Manhole	1200
12.002	15.615	150.1	SW54	5.325	4.357	0.818	Open Manhole	1200
13.000	8.312	69.8	SW54	5.325	4.381	0.844	Open Manhole	1200
12.003	12.779	224.2	crate	5.385	4.199	0.961	Open Manhole	10000
14.000	14.650	149.5	SW47	5.350	4.385	0.815	Open Manhole	1200
14.001	12.699	149.4	SW48	5.325	4.300	0.875	Open Manhole	1200
14.002	7.776	149.5	SW49	5.100	4.248	0.702	Open Manhole	1200
14.003	3.443	149.7	crate	5.385	4.225	1.010	Open Manhole	10000
15.000	9.476	150.4	SW21	5.250	4.448	0.652	Open Manhole	1200
15.001	8.790	149.0	SW22	5.250	4.389	0.711	Open Manhole	1200
15.002	9.228	148.8	SW24	5.125	4.327	0.648	Open Manhole	1200
15.003	10.210	150.1	SW25	5.150	4.259	0.741	Open Manhole	1200
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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
15.004	o	150	SW25	5.150	4.259	0.741	Open Manhole	1200
16.000	3 \=/	375	swale	5.200	4.717	0.333	Junction	
16.001	o	150	SW56	5.350	4.364	0.836	Open Manhole	10000
16.002	o	150	SW57	5.385	4.277	0.958	Open Manhole	1200
17.000	3 \=/	375	swale2	5.200	4.717	0.333	Junction	
1.007	o	150	crate	5.385	4.225	1.010	Open Manhole	10000
1.008	o	150	SW58	5.385	4.112	1.103	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
15.004	5.071	149.1	crate	5.385	4.225	1.010	Open Manhole	10000
16.000	53.000	150.1	SW56	5.350	4.364	0.836	Open Manhole	10000
16.001	10.912	125.0	SW57	5.385	4.277	0.958	Open Manhole	1200
16.002	6.468	125.0	crate	5.385	4.225	1.010	Open Manhole	10000
17.000	32.000	65.0	crate	5.385	4.225	1.010	Open Manhole	10000
1.007	4.000	222.2	SW58	5.385	4.207	1.028	Open Manhole	1200
1.008	4.000	222.2		5.385	4.114	1.121	Open Manhole	225

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Online Controls for Storm

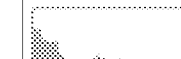
Hydro-Brake® Optimum Manhole: SW58, DS/PN: 1.008, Volume (m³): 1.4

Unit Reference	MD-SHE-0075-2100-0600-2100
Design Head (m)	0.600
Design Flow (l/s)	2.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	75
Invert Level (m)	4.207
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.600	2.1
Flush-Flo™	0.178	2.1
Kick-Flo®	0.399	1.7
Mean Flow over Head Range	–	1.8

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	2.0	1.200	2.9	3.000	4.4	7.000	6.6
0.200	2.1	1.400	3.1	3.500	4.7	7.500	6.8
0.300	2.0	1.600	3.3	4.000	5.0	8.000	7.0
0.400	1.8	1.800	3.5	4.500	5.3	8.500	7.2
0.500	1.9	2.000	3.6	5.000	5.6	9.000	7.5
0.600	2.1	2.200	3.8	5.500	5.9	9.500	7.7
0.800	2.4	2.400	4.0	6.000	6.1		
1.000	2.6	2.600	4.1	6.500	6.3		

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Storage Structures for Storm

Cellular Storage Manhole: crate, DS/PN: 1.007

Invert Level (m) 4.225 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	225.0	225.0	0.800	0.0	267.0
0.700	225.0	267.0			

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
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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 Coefficient 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 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

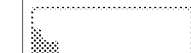
Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 0.750
Site Location GB 497381 100755 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 30, 60, 120, 180, 240, 360, 480, 600, 720,
960, 1440, 2160, 2880, 4320, 5760, 7200,
8640, 10080
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 40

									Water
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)
1.000	SW01	30 Summer	2	+0%					4.767
1.001	SW03	30 Summer	2	+0%					4.653
1.002	SW04	30 Summer	2	+0%					4.601
1.003	SW05	30 Summer	2	+0%					4.520
1.004	SW06	30 Summer	2	+0%	100/480 Winter				4.487
2.000	SW08	30 Summer	2	+0%					4.664
1.005	SW09	30 Summer	2	+0%	100/120 Winter				4.357
3.000	SW19a	30 Summer	2	+0%					4.573
4.000	SW19	30 Summer	2	+0%	100/120 Winter				4.420
5.000	SW11	30 Summer	2	+0%					4.520
5.001	SW12	30 Summer	2	+0%	100/180 Winter				4.445
5.002	SW13	30 Summer	2	+0%	100/120 Winter				4.411
5.003	SW15	30 Summer	2	+0%	100/60 Summer				4.358
1.006	SW10	360 Winter	2	+0%	100/60 Summer				4.335
6.000	SW27	30 Summer	2	+0%					4.678
7.000	SW29	30 Summer	2	+0%					4.817
7.001	SW31	30 Summer	2	+0%					4.758
6.001	SW28	30 Summer	2	+0%					4.545
6.002	SW32	30 Summer	2	+0%	100/120 Winter				4.454

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
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PN	US/MH Name	Surcharged Flooded		Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m³)					
1.000	SW01	-0.123	0.000	0.07		1.0	OK	
1.001	SW03	-0.116	0.000	0.12		1.5	OK	
1.002	SW04	-0.114	0.000	0.13		1.8	OK	
1.003	SW05	-0.106	0.000	0.19		2.1	OK	
1.004	SW06	-0.108	0.000	0.18		2.2	OK	
2.000	SW08	-0.088	0.000	0.04		0.3	OK	
1.005	SW09	-0.182	0.000	0.08		2.5	OK	
3.000	SW19a	-0.077	0.000	0.13		0.9	OK	
4.000	SW19	-0.130	0.000	0.04		0.7	OK	
5.000	SW11	-0.135	0.000	0.02		0.3	OK	
5.001	SW12	-0.130	0.000	0.05		0.5	OK	
5.002	SW13	-0.128	0.000	0.05		0.6	OK	
5.003	SW15	-0.129	0.000	0.05		0.6	OK	
1.006	SW10	-0.140	0.000	0.04		1.0	OK	
6.000	SW27	-0.122	0.000	0.08		1.0	OK	
7.000	SW29	-0.133	0.000	0.03		0.4	OK	
7.001	SW31	-0.122	0.000	0.08		1.1	OK	
6.001	SW28	-0.109	0.000	0.16		2.2	OK	
6.002	SW32	-0.102	0.000	0.23		2.8	OK	

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2 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
8.000	SW36	30 Summer	2	+0%	100/1440 Winter		
9.000	SW37	30 Summer	2	+0%			
9.001	SW38	30 Summer	2	+0%			
9.002	SW39	30 Summer	2	+0%			
9.003	SW41	30 Summer	2	+0%			
6.003	SW33	30 Summer	2	+0%	100/60 Winter		
10.000	SW43	30 Summer	2	+0%			
10.001	SW44	30 Summer	2	+0%			
10.002	SW45	30 Summer	2	+0%			
6.004	SW42	360 Winter	2	+0%	100/30 Winter		
11.000	SW55	30 Summer	2	+0%	100/60 Summer		
12.000	SW50	30 Summer	2	+0%			
12.001	SW51	30 Summer	2	+0%			
12.002	SW52	30 Summer	2	+0%	100/1440 Winter		
13.000	SW53	30 Summer	2	+0%	100/480 Winter		
12.003	SW54	360 Winter	2	+0%	100/60 Summer		
14.000	SW46	30 Summer	2	+0%			
14.001	SW47	30 Summer	2	+0%	100/120 Winter		
14.002	SW48	360 Winter	2	+0%	30/360 Winter		
14.003	SW49	360 Winter	2	+0%	30/60 Winter		
15.000	SW20	30 Summer	2	+0%			
15.001	SW21	30 Summer	2	+0%	100/480 Winter		
15.002	SW22	30 Summer	2	+0%	100/120 Winter		
15.003	SW24	30 Summer	2	+0%	100/60 Summer		
15.004	SW25	360 Winter	2	+0%	30/120 Winter		
16.000	swale	30 Summer	2	+0%			
16.001	SW56	30 Winter	2	+0%	100/60 Winter		
16.002	SW57	360 Winter	2	+0%	30/180 Winter		
17.000	swale2	30 Summer	2	+0%			
1.007	crate	360 Winter	2	+0%	30/60 Summer		
1.008	SW58	480 Winter	2	+0%	2/30 Winter	100/1440 Winter	

PN	US/MH Name	Overflow Act.	Water	Surcharged	Flooded	Pipe		Status
			Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	
8.000	SW36		4.489	-0.126	0.000	0.06	1.0	OK
9.000	SW37		4.806	-0.144	0.000	0.01	0.1	OK
9.001	SW38		4.686	-0.134	0.000	0.03	0.4	OK
9.002	SW39		4.630	-0.132	0.000	0.03	0.5	OK
9.003	SW41		4.490	-0.197	0.000	0.04	1.7	OK
6.003	SW33		4.352	-0.159	0.000	0.19	5.5	OK
10.000	SW43		4.614	-0.142	0.000	0.01	0.1	OK
10.001	SW44		4.542	-0.129	0.000	0.05	0.5	OK
10.002	SW45		4.506	-0.135	0.000	0.02	0.5	OK
6.004	SW42		4.335	-0.119	0.000	0.05	1.3	OK
11.000	SW55		4.364	-0.128	0.000	0.05	0.7	OK

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
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PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
12.000	SW50		4.740	-0.135	0.000	0.02		0.3	OK
12.001	SW51		4.523	-0.127	0.000	0.05		0.7	OK
12.002	SW52		4.492	-0.119	0.000	0.10		1.3	OK
13.000	SW53		4.520	-0.080	0.000	0.09		0.6	OK
12.003	SW54		4.335	-0.146	0.000	0.01		0.4	OK
14.000	SW46		4.508	-0.125	0.000	0.07		0.9	OK
14.001	SW47		4.414	-0.121	0.000	0.08		1.1	OK
14.002	SW48		4.335	-0.115	0.000	0.02		0.3	OK
14.003	SW49		4.335	-0.063	0.000	0.02		0.2	OK
15.000	SW20		4.529	-0.132	0.000	0.03		0.4	OK
15.001	SW21		4.468	-0.130	0.000	0.04		0.6	OK
15.002	SW22		4.426	-0.113	0.000	0.14		1.8	OK
15.003	SW24		4.364	-0.113	0.000	0.14		1.8	OK
15.004	SW25		4.335	-0.074	0.000	0.03		0.4	OK
16.000	swale		4.774	-0.426	0.000	0.01		7.3	OK
16.001	SW56		4.408	-0.106	0.000	0.19		2.7	OK
16.002	SW57		4.337	-0.090	0.000	0.10		1.3	OK
17.000	swale2		4.768	-0.432	0.000	0.01		8.7	OK
1.007	crate		4.335	-0.040	0.000	0.22		2.1	OK
1.008	SW58		4.408	0.126	0.000	0.21		2.0	SURCHARGED

PN	US/MH Name	Level Exceeded
8.000	SW36	
9.000	SW37	
9.001	SW38	
9.002	SW39	
9.003	SW41	
6.003	SW33	
10.000	SW43	
10.001	SW44	
10.002	SW45	
6.004	SW42	
11.000	SW55	
12.000	SW50	
12.001	SW51	
12.002	SW52	
13.000	SW53	
12.003	SW54	
14.000	SW46	
14.001	SW47	
14.002	SW48	
14.003	SW49	
15.000	SW20	
15.001	SW21	

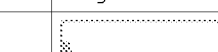
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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
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PN	US/MH Name	Level Exceeded
15.002	SW22	
15.003	SW24	
15.004	SW25	
16.000	swale	
16.001	SW56	
16.002	SW57	
17.000	swale2	
1.007	crate	
1.008	SW58	

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30 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 Coefficient 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 1						
Number of Online Controls 1		Number of Time/Area Diagrams 0						
Number of Offline Controls 0		Number of Real Time Controls 0						
Synthetic Rainfall Details								
Rainfall Model		FEH		Data Type Point				
FEH Rainfall Version		2013 Cv (Summer)		0.750				
Site Location GB 497381 100755		Cv (Winter)		0.840				
Margin for Flood Risk Warning (mm) 300.0		DVD Status OFF						
Analysis Timestep		Fine Inertia Status OFF						
DTS Status		ON						
Profile(s)		Summer and Winter						
Duration(s) (mins)		30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080						
Return Period(s) (years)		2, 30, 100						
Climate Change (%)		0, 0, 40						
Water								
US/MH	Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level	
PN Name Storm Period Change Surcharge Flood Overflow Act. (m)								
1.000 SW01 30 Summer 30 +0%								4.780
1.001 SW03 30 Summer 30 +0%								4.673
1.002 SW04 30 Summer 30 +0%								4.622
1.003 SW05 30 Summer 30 +0%								4.547
1.004 SW06 30 Summer 30 +0% 100/480 Winter								4.513
2.000 SW08 30 Summer 30 +0%								4.671
1.005 SW09 360 Winter 30 +0% 100/120 Winter								4.453
3.000 SW19a 30 Summer 30 +0%								4.585
4.000 SW19 360 Winter 30 +0% 100/120 Winter								4.453
5.000 SW11 30 Summer 30 +0%								4.526
5.001 SW12 30 Summer 30 +0% 100/180 Winter								4.458
5.002 SW13 360 Winter 30 +0% 100/120 Winter								4.453
5.003 SW15 360 Winter 30 +0% 100/60 Summer								4.453
1.006 SW10 360 Winter 30 +0% 100/60 Summer								4.453
6.000 SW27 30 Summer 30 +0%								4.692
7.000 SW29 30 Summer 30 +0%								4.825
7.001 SW31 30 Summer 30 +0%								4.774
6.001 SW28 30 Summer 30 +0%								4.568
6.002 SW32 30 Summer 30 +0% 100/120 Winter								4.485
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Surcharged		Flooded		Pipe		Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status	
1.000	SW01	-0.110	0.000	0.16		2.2	OK	
1.001	SW03	-0.096	0.000	0.28		3.5	OK	
1.002	SW04	-0.093	0.000	0.31		4.1	OK	
1.003	SW05	-0.079	0.000	0.45		5.0	OK	
1.004	SW06	-0.082	0.000	0.42		5.3	OK	
2.000	SW08	-0.081	0.000	0.08		0.6	OK	
1.005	SW09	-0.086	0.000	0.03		1.0	OK	
3.000	SW19a	-0.065	0.000	0.27		1.9	OK	
4.000	SW19	-0.097	0.000	0.02		0.3	OK	
5.000	SW11	-0.129	0.000	0.05		0.6	OK	
5.001	SW12	-0.117	0.000	0.11		1.3	OK	
5.002	SW13	-0.087	0.000	0.02		0.3	OK	
5.003	SW15	-0.033	0.000	0.02		0.2	OK	
1.006	SW10	-0.022	0.000	0.07		1.7	OK	
6.000	SW27	-0.108	0.000	0.18		2.2	OK	
7.000	SW29	-0.125	0.000	0.07		0.9	OK	
7.001	SW31	-0.106	0.000	0.19		2.6	OK	
6.001	SW28	-0.086	0.000	0.38		5.1	OK	
6.002	SW32	-0.071	0.000	0.54		6.7	OK	

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PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	
8.000	SW36	30 Summer	30	+0%	100/1440 Winter			
9.000	SW37	30 Summer	30	+0%				
9.001	SW38	30 Summer	30	+0%				
9.002	SW39	30 Summer	30	+0%				
9.003	SW41	30 Summer	30	+0%				
6.003	SW33	360 Winter	30	+0%	100/60 Winter			
10.000	SW43	30 Summer	30	+0%				
10.001	SW44	30 Summer	30	+0%				
10.002	SW45	30 Summer	30	+0%				
6.004	SW42	360 Winter	30	+0%	100/30 Winter			
11.000	SW55	360 Winter	30	+0%	100/60 Summer			
12.000	SW50	30 Summer	30	+0%				
12.001	SW51	30 Summer	30	+0%				
12.002	SW52	30 Summer	30	+0%	100/1440 Winter			
13.000	SW53	30 Summer	30	+0%	100/480 Winter			
12.003	SW54	360 Winter	30	+0%	100/60 Summer			
14.000	SW46	30 Summer	30	+0%				
14.001	SW47	360 Winter	30	+0%	100/120 Winter			
14.002	SW48	360 Winter	30	+0%	30/360 Winter			
14.003	SW49	360 Winter	30	+0%	30/60 Winter			
15.000	SW20	30 Summer	30	+0%				
15.001	SW21	30 Summer	30	+0%	100/480 Winter			
15.002	SW22	480 Winter	30	+0%	100/120 Winter			
15.003	SW24	360 Winter	30	+0%	100/60 Summer			
15.004	SW25	360 Winter	30	+0%	30/120 Winter			
16.000	swale	30 Summer	30	+0%				
16.001	SW56	360 Winter	30	+0%	100/60 Winter			
16.002	SW57	360 Winter	30	+0%	30/180 Winter			
17.000	swale2	30 Summer	30	+0%				
1.007	crate	360 Winter	30	+0%	30/60 Summer			
1.008	SW58	1440 Winter	30	+0%	2/30 Winter	100/1440 Winter		
PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Pipe Flow / Overflow Cap. (l/s)	Pipe Flow (l/s)	Status
8.000	SW36		4.501	-0.114	0.000	0.13	2.2	OK
9.000	SW37		4.814	-0.136	0.000	0.02	0.3	OK
9.001	SW38		4.695	-0.125	0.000	0.06	1.0	OK
9.002	SW39		4.640	-0.122	0.000	0.08	1.3	OK
9.003	SW41		4.509	-0.178	0.000	0.09	4.5	OK
6.003	SW33		4.453	-0.058	0.000	0.07	2.1	OK
10.000	SW43		4.622	-0.134	0.000	0.02	0.3	OK
10.001	SW44		4.555	-0.116	0.000	0.12	1.3	OK
10.002	SW45		4.514	-0.127	0.000	0.06	1.3	OK
6.004	SW42		4.454	0.000	0.000	0.08	2.2	OK
11.000	SW55		4.453	-0.039	0.000	0.02	0.3	OK
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**30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
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PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
12.000	SW50		4.746	-0.129	0.000	0.05		0.6	OK
12.001	SW51		4.537	-0.113	0.000	0.13		1.6	OK
12.002	SW52		4.511	-0.100	0.000	0.24		3.3	OK
13.000	SW53		4.529	-0.071	0.000	0.19		1.3	OK
12.003	SW54		4.453	-0.028	0.000	0.02		0.7	OK
14.000	SW46		4.520	-0.113	0.000	0.14		1.9	OK
14.001	SW47		4.453	-0.082	0.000	0.03		0.4	OK
14.002	SW48		4.453	0.003	0.000	0.03		0.4	SURCHARGED
14.003	SW49		4.453	0.055	0.000	0.03		0.4	SURCHARGED
15.000	SW20		4.538	-0.123	0.000	0.07		0.9	OK
15.001	SW21		4.480	-0.118	0.000	0.10		1.3	OK
15.002	SW22		4.453	-0.086	0.000	0.04		0.6	OK
15.003	SW24		4.453	-0.024	0.000	0.05		0.7	OK
15.004	SW25		4.453	0.044	0.000	0.06		0.6	SURCHARGED
16.000	swale		4.804	-0.396	0.000	0.02		15.4	OK
16.001	SW56		4.455	-0.059	0.000	0.17		2.5	OK
16.002	SW57		4.454	0.028	0.000	0.18		2.4	SURCHARGED
17.000	swale2		4.793	-0.407	0.000	0.02		18.9	OK
1.007	crate		4.454	0.079	0.000	0.22		2.2	SURCHARGED
1.008	SW58		4.635	0.353	0.000	0.19		1.8	SURCHARGED

PN	US/MH Name	Level Exceeded
8.000	SW36	
9.000	SW37	
9.001	SW38	
9.002	SW39	
9.003	SW41	
6.003	SW33	
10.000	SW43	
10.001	SW44	
10.002	SW45	
6.004	SW42	
11.000	SW55	
12.000	SW50	
12.001	SW51	
12.002	SW52	
13.000	SW53	
12.003	SW54	
14.000	SW46	
14.001	SW47	
14.002	SW48	
14.003	SW49	
15.000	SW20	
15.001	SW21	

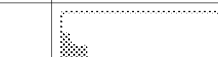
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
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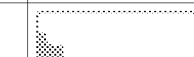
PN	US/MH Name	Level Exceeded
15.002	SW22	
15.003	SW24	
15.004	SW25	
16.000	swale	
16.001	SW56	
16.002	SW57	
17.000	swale2	
1.007	crate	
1.008	SW58	

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<u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm</u>									
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 Coefficient		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		1			
Number of Online Controls		1		Number of Time/Area Diagrams		0			
Number of Offline Controls		0		Number of Real Time Controls		0			
Synthetic Rainfall Details									
Rainfall Model		FEH		Data Type		Point			
FEH Rainfall Version		2013		Cv (Summer)		0.750			
Site Location		GB 497381		100755		Cv (Winter)		0.840	
Margin for Flood Risk Warning (mm)		300.0		DVD Status		OFF			
Analysis Timestep		Fine		Inertia Status		OFF			
DTS Status		ON							
Profile(s)				Summer and Winter					
Duration(s) (mins)		30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080							
Return Period(s) (years)		2, 30, 100							
Climate Change (%)		0, 0, 40							
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	Level
1.000	SW01	30 Summer	100	+40%					4.795
1.001	SW03	30 Summer	100	+40%					4.694
1.002	SW04	30 Summer	100	+40%					4.645
1.003	SW05	1440 Winter	100	+40%					4.621
1.004	SW06	1440 Winter	100	+40%	100/480 Winter				4.621
2.000	SW08	30 Summer	100	+40%					4.677
1.005	SW09	1440 Winter	100	+40%	100/120 Winter				4.621
3.000	SW19a	1440 Winter	100	+40%					4.621
4.000	SW19	1440 Winter	100	+40%	100/120 Winter				4.621
5.000	SW11	1440 Winter	100	+40%					4.620
5.001	SW12	1440 Winter	100	+40%	100/180 Winter				4.620
5.002	SW13	1440 Winter	100	+40%	100/120 Winter				4.621
5.003	SW15	1440 Winter	100	+40%	100/60 Summer				4.621
1.006	SW10	1440 Winter	100	+40%	100/60 Summer				4.621
6.000	SW27	30 Summer	100	+40%					4.707
7.000	SW29	30 Summer	100	+40%					4.834
7.001	SW31	30 Summer	100	+40%					4.790
6.001	SW28	1440 Winter	100	+40%					4.621
6.002	SW32	1440 Winter	100	+40%	100/120 Winter				4.621
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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Flooded		Pipe		Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow / Overflow Cap. (l/s)	Flow (l/s)		
1.000	SW01	-0.095	0.000	0.29	3.9	OK	
1.001	SW03	-0.075	0.000	0.49	6.2	OK	
1.002	SW04	-0.070	0.000	0.55	7.3	OK	
1.003	SW05	-0.005	0.000	0.04	0.4	OK	
1.004	SW06	0.026	0.000	0.04	0.5	SURCHARGED	
2.000	SW08	-0.075	0.000	0.14	1.1	OK	
1.005	SW09	0.082	0.000	0.02	0.5	SURCHARGED	
3.000	SW19a	-0.029	0.000	0.02	0.2	OK	
4.000	SW19	0.071	0.000	0.01	0.1	SURCHARGED	
5.000	SW11	-0.035	0.000	0.00	0.1	OK	
5.001	SW12	0.046	0.000	0.01	0.1	SURCHARGED	
5.002	SW13	0.081	0.000	0.01	0.1	SURCHARGED	
5.003	SW15	0.134	0.000	0.01	0.1	SURCHARGED	
1.006	SW10	0.146	0.000	0.03	0.8	SURCHARGED	
6.000	SW27	-0.093	0.000	0.31	3.9	OK	
7.000	SW29	-0.116	0.000	0.12	1.7	OK	
7.001	SW31	-0.090	0.000	0.33	4.6	OK	
6.001	SW28	-0.033	0.000	0.03	0.4	OK	
6.002	SW32	0.065	0.000	0.05	0.6	SURCHARGED	

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100 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
8.000	SW36	1440 Winter	100	+40%	100/1440 Winter		
9.000	SW37	30 Summer	100	+40%			
9.001	SW38	30 Summer	100	+40%			
9.002	SW39	30 Summer	100	+40%			
9.003	SW41	1440 Winter	100	+40%			
6.003	SW33	1440 Winter	100	+40%	100/60 Winter		
10.000	SW43	30 Summer	100	+40%			
10.001	SW44	1440 Winter	100	+40%			
10.002	SW45	1440 Winter	100	+40%			
6.004	SW42	1440 Winter	100	+40%	100/30 Winter		
11.000	SW55	1440 Winter	100	+40%	100/60 Summer		
12.000	SW50	30 Summer	100	+40%			
12.001	SW51	1440 Winter	100	+40%			
12.002	SW52	1440 Winter	100	+40%	100/1440 Winter		
13.000	SW53	1440 Winter	100	+40%	100/480 Winter		
12.003	SW54	1440 Winter	100	+40%	100/60 Summer		
14.000	SW46	1440 Winter	100	+40%			
14.001	SW47	1440 Winter	100	+40%	100/120 Winter		
14.002	SW48	1440 Winter	100	+40%	30/360 Winter		
14.003	SW49	1440 Winter	100	+40%	30/60 Winter		
15.000	SW20	1440 Winter	100	+40%			
15.001	SW21	1440 Winter	100	+40%	100/480 Winter		
15.002	SW22	1440 Winter	100	+40%	100/120 Winter		
15.003	SW24	1440 Winter	100	+40%	100/60 Summer		
15.004	SW25	1440 Winter	100	+40%	30/120 Winter		
16.000	swale	30 Summer	100	+40%			
16.001	SW56	1440 Winter	100	+40%	100/60 Winter		
16.002	SW57	1440 Winter	100	+40%	30/180 Winter		
17.000	swale2	30 Summer	100	+40%			
1.007	crate	1440 Winter	100	+40%	30/60 Summer		
1.008	SW58	2160 Winter	100	+40%	2/30 Winter	100/1440 Winter	

PN	US/MH Name	Overflow Act.	Water Surcharged Flooded			Pipe		Status
			Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	
8.000	SW36		4.621	0.006	0.000	0.01	0.2	SURCHARGED
9.000	SW37		4.818	-0.132	0.000	0.03	0.6	OK
9.001	SW38		4.704	-0.116	0.000	0.11	1.7	OK
9.002	SW39		4.650	-0.112	0.000	0.14	2.3	OK
9.003	SW41		4.621	-0.066	0.000	0.01	0.4	OK
6.003	SW33		4.621	0.110	0.000	0.04	1.1	SURCHARGED
10.000	SW43		4.626	-0.130	0.000	0.04	0.6	OK
10.001	SW44		4.621	-0.050	0.000	0.01	0.1	OK
10.002	SW45		4.621	-0.020	0.000	0.00	0.1	OK
6.004	SW42		4.621	0.167	0.000	0.04	1.2	SURCHARGED
11.000	SW55		4.621	0.129	0.000	0.01	0.1	SURCHARGED

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

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
12.000	SW50		4.754	-0.121	0.000	0.09		1.1	OK
12.001	SW51		4.621	-0.029	0.000	0.01		0.1	OK
12.002	SW52		4.621	0.010	0.000	0.02		0.3	SURCHARGED
13.000	SW53		4.621	0.021	0.000	0.02		0.1	SURCHARGED
12.003	SW54		4.621	0.140	0.000	0.01		0.4	SURCHARGED
14.000	SW46		4.621	-0.012	0.000	0.01		0.2	OK
14.001	SW47		4.621	0.086	0.000	0.02		0.2	SURCHARGED
14.002	SW48		4.621	0.171	0.000	0.02		0.2	SURCHARGED
14.003	SW49		4.621	0.223	0.000	0.02		0.2	SURCHARGED
15.000	SW20		4.620	-0.041	0.000	0.01		0.1	OK
15.001	SW21		4.621	0.023	0.000	0.01		0.1	SURCHARGED
15.002	SW22		4.621	0.082	0.000	0.03		0.4	SURCHARGED
15.003	SW24		4.621	0.144	0.000	0.03		0.3	SURCHARGED
15.004	SW25		4.621	0.212	0.000	0.03		0.3	SURCHARGED
16.000	swale		4.832	-0.368	0.000	0.04		26.6	OK
16.001	SW56		4.621	0.107	0.000	0.07		1.0	SURCHARGED
16.002	SW57		4.621	0.194	0.000	0.08		1.0	SURCHARGED
17.000	swale2		4.820	-0.380	0.000	0.03		33.3	OK
1.007	crate		4.621	0.246	0.000	0.20		1.9	SURCHARGED
1.008	SW58		5.011	0.729	0.000	0.19		1.9	SURCHARGED

PN	US/MH Name	Level Exceeded
8.000	SW36	
9.000	SW37	
9.001	SW38	
9.002	SW39	
9.003	SW41	
6.003	SW33	
10.000	SW43	
10.001	SW44	
10.002	SW45	
6.004	SW42	
11.000	SW55	
12.000	SW50	
12.001	SW51	
12.002	SW52	
13.000	SW53	
12.003	SW54	
14.000	SW46	
14.001	SW47	
14.002	SW48	
14.003	SW49	
15.000	SW20	
15.001	SW21	

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	US/MH	Level
PN	Name	Exceeded
15.002	SW22	
15.003	SW24	
15.004	SW25	
16.000	swale	
16.001	SW56	
16.002	SW57	
17.000	swale2	
1.007	crate	
1.008	SW58	
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