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Chipping Lane, Longridge
FLOOD RISK ASSESSMENT
& SUSTAINABLE DRAINAGE ASSESSMENT

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EXECUTIVE SUMMARY

This Flood Risk Assessment (FRA) & Sustainable Drainage Assessment has been prepared for a proposed **residential development** and associated infrastructure located at **Chipping Lane, Longridge**. The site is located within **Flood Zone 1** according to the Environment Agency's (EA's) online flood maps. The National Planning Policy Framework (NPPF) requires a FRA for sites greater than 1 ha. The proposals are 'residential' in nature, classified as 'more vulnerable' in Table 2 within the Technical Guidance to the NPPF. This type of development is appropriate in Flood Zone 1.

This FRA has identified the site to be at **low risk** from all sources of flooding including; fluvial, tidal, pluvial, groundwater, sewer related and flooding from artificial sources. The development is accessible during times of extreme flooding as the site is within Flood Zone 1.

The development proposal was granted outline planning application (Nº 3/2014/0764) on the 29th October 2015. This FRA has built upon the FRA submitted with the application completed by RSK (March 2015, Ref: 880500-R1). The previous FRA proposed that run-off rates will be restricted to QBar. In this report, **QBar** is calculated as **8.3 l/s/ha**. See Appendix C for Hydrological Calculations. Any discrepancy between this QBar and the previous figure is due to refined FEH catchment characteristics being utilised within the ICP SuDS method.

The existing site is classed as greenfield. Surface water runoff from the existing site flows overland in a north-westerly direction before outfalling to a land drainage ditch/ordinary watercourse situated along the northern border. This ditch flows west before outfalling via a 600mm dia pipe to contribute to the Higgin Brook catchment.

The ground investigation report carried out by Soiltechnics (Feb 2016, Ref: STN3505NM-G01) indicates that infiltration is **not viable** at this site.

Surface water will outfall via the existing pathways (i.e. to the on-site ordinary watercourse) at a maximum rate of QBar (l/s). The restriction of runoff rates on increased impermeable areas will create storm water storage volumes. These will be retained on-site for events up to and including the 1 in 100 year event plus an allowance for climate change. Sustainable Drainage Systems (SuDS) could be incorporated into the planning layout which will assist in the reduction of surface water runoff from areas of hardstanding.

The nearest public foul sewers are located within Inglewhite Road to the south-east of the site. The conveyance route of foul flows will be determined during detailed design. A pumped solution will likely be required and early liaisons with UU regarding adoptable pump design are recommended.

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Figures & Tables

Specialist Software

- Flood Estimation Handbook FEH CD-ROM (v.3.0) – Determination of Catchment Descriptors and depths of rainfall.
- MicroDrainage WinDES (v.14.1) – Calculation of Greenfield run-off rates IH124/ICP-SUDS, Greenfield run-off volumes, rates of rainfall and stormwater storage estimates.

Abbreviations & Acronyms

AEP	Annual Exceedance Probability	mAOD	Metres Above Ordnance Datum
BGL	Below Ground Level	NGR	National Grid Reference
BGS	British Geological Survey	NPPF	National Planning Policy Framework
CC	Climate Change	NSRI	National Soil Resources Institute
EA	Environment Agency	OS	Ordnance Survey
FEH	Flood Estimation Handbook	PFRA	Preliminary Flood Risk Assessment
FRA	Flood Risk Assessment	PPS	Planning Policy Statement
FZ	Flood Zone	QSE	Quick Storage Estimate
Ha	Hectare	QBAR	Mean Annual Flood
IDB	Internal Drainage Board	SFRA	Strategic Flood Risk Assessment
LLFA	Lead Local Flood Authority	SuDS	Sustainable Drainage Systems
LPA	Local Planning Authority	UU	United Utilities

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1.0 INTRODUCTION

1.1.1 The impact of flooding on the natural and built environment are material planning considerations. The NPPF sets out the Government's objectives for the planning system, how planning should facilitate and promote sustainable patterns of development, avoiding flood risk and accommodating the impacts of climate change. Government policy with respect to development in flood risk areas is contained within the NPPF and the supporting Technical Guidance.

1.1.2 The NPPF requires a FRA for sites greater than 1 ha. The proposals are 'residential' in nature, classified as 'more vulnerable' in Table 2 within the Technical Guidance to the NPPF. This type of development is appropriate in Flood Zone 1.

1.1.3 The development proposal was granted outline planning application (No 3/2014/0764) on the 29th October 2015. This FRA has built upon the FRA submitted with the application completed by RSK (March 2015, Ref: 880500-R1).

1.1.4 The NPPF advises that the LPA should consult with the EA for advice on flood issues at a strategic level and in relation to planning applications.

2.0 EXISTING SITE LOCATION

2.1 Location

2.1.1 The site is located on land off Chipping Lane, Longridge, PR3 2NA. The OS NGR is 360073E, 437980N.

2.1.2 The site is surrounded by greenfield land to the north, east and west and by residential areas to the south. Chipping Lane forms the western site boundary.

2.2 Existing and Historical Land Use

2.2.1 The site is currently classed as greenfield. No other land uses have been identified as part of this report.

2.3 Topography

2.3.1 The site slopes in a north-westerly direction with levels ranging from around 121m AOD near the eastern border to 102m AOD in the north-west.

3.0 DEVELOPMENT PROPOSALS

3.1 Nature of the development

3.1.1 The nature of the development is residential and comprises of residential units associated infrastructure. A copy of the development layout for Phase I is included in Appendix A.

4.0 SOURCES OF FLOOD RISK

4.1 Fluvial Flood Risk

4.1.1 The flood risk of the site has been assessed using EA online Flood Maps.

Flood Zone 1 – Low Risk (<0.1%)

Flood Zone 2 – Medium Risk (1% – 0.1% fluvial, 0.5% – 0.1% tidal)

Flood Zone 3 – High Risk (>1% fluvial, >0.5% tidal)

Figure 1: EA Flood Map for Planning (Rivers and Sea).

4.1.2 Figure 1 shows that the site is within Flood Zone 1, which would indicate a **low risk** from fluvial flooding.

4.2 Tidal Flooding

4.2.1 As there is no coastline or tidal river near to the site, tidal flood risk is deemed **low**.

4.3 Pluvial Flood Risk

4.3.1 Pluvial (surface water) flooding occurs when rainwater is unable to drain away through the normal drainage systems or soak into the ground, but lies on or flows over the ground instead.

4.3.2 Pluvial flood risk as indicated by the EA map (Figure 2) shows that the site is predominantly at **very low** to **low** risk.

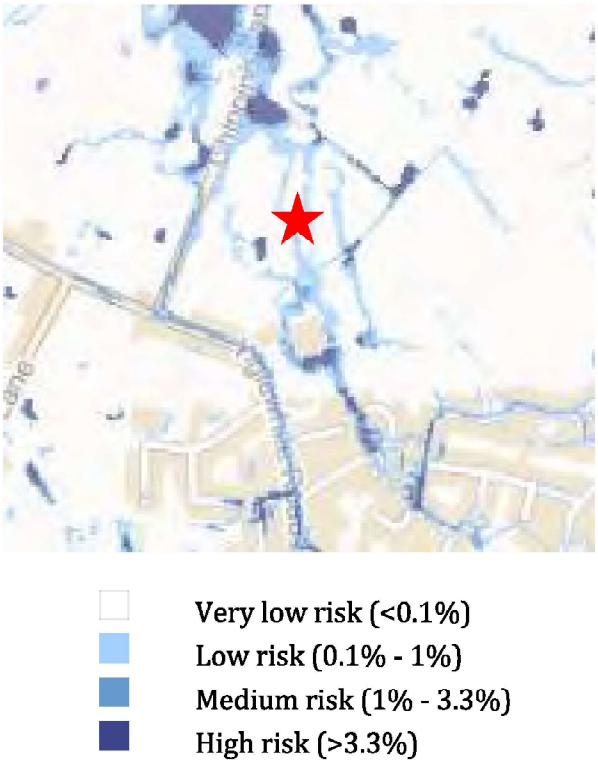

Figure 2: The EA's Indicative Surface Water Flood Risk Map.

4.3.3 There are some areas of low to medium risk that appear to follow the direction of overland flow. There is a singular area of medium to high risk located centrally to the site that is indicative of a topographic low point.

4.3.4 The development proposals, although increasing the impermeable area of the site, will provide a betterment on the pre-existing scenario in that any exceedance flows for storm events up to and including the 100 year event plus 30% climate change, will be attenuated on-site prior to a restricted outfall.

4.3.5 Finished floor levels will be raised at least 150mm above the external levels and external areas of hardstanding will comply with building regulations and divert water away from the proposed dwellings. This will further mitigate pluvial flood risk.

4.3.6 Therefore the pluvial flood risk to the development is overall considered to be **low.**

4.4 Sewer Related Flood Risk

4.4.1 Rainwater is sometimes drained into combined sewers. Foul water flooding can occur in areas prone to overland flow when the sewer is overwhelmed by heavy rainfall and will continue until the water drains away. It can also occur when the sewer becomes blocked or is of inadequate capacity, this could lead to there being a high risk of internal property flooding with contaminated water.

4.4.2 United Utilities records indicate that there is a 375mm diameter surface water pipe from the eastern site boundary which cuts through the site before outfalling to Higgin Brook near the centre of the site. A 3m easement will apply from this SWS in accordance with UU guidelines.

4.4.3 New sewers will be designed and constructed in accordance with Sewers for Adoption and put up for adoption by United Utilities as part of the detailed design (stc).

4.4.4 Flood Risk from sewer related sources is considered to be **low**. See Appendix B for UU sewer records.

4.5 Groundwater Flood Risk

4.5.1 In general terms groundwater flooding can occur from three main sources: - raised water tables, seepage and percolation and groundwater recovery or rebound.

- If groundwater levels are naturally close to the surface then this can present a flood risk during times of intense rainfall.
- Seepage and percolation occur where embankments above ground level hold water. In these cases water travels through the embankment material and emerges on the opposite side of the embankment.
- Groundwater recovery/rebound occurs where the water table has been artificially depressed by abstraction. When the abstraction stops the water table makes a recovery to its original level. There is the potential for groundwater flooding in low lying areas where groundwater levels have been depressed below their pre-pumping conditions, where these were at or close to ground level.

4.5.2 The online BGS maps show that the underlying geology consists of the Bowland Shale Formation, whilst the Soilscapes online Map indicates that the soil has impeded drainage. The presence of surface water flood lines in the direction of overland flow in Figure 2 is also indicative of the presence of poorly permeable underlying clay soils.

4.5.3 Groundwater flood risk is therefore considered to be **'low'**, this will be further mitigated by the increase in Finished Floor Levels by at least 150mm above existing external levels.

4.6 Artificial Sources of Flood Risk

4.6.1 The site is partially at risk of flooding from the 'Dilworth Upper' reservoir, yet the risk designation is yet 'to be determined' according to the EA online maps and information. Reservoir flooding is extremely rare, therefore the flood risk from artificial sources is deemed **low**.

4.7 Flood Risk Mitigation Measures & Residual Risks

4.7.1 Finished Floor Levels will be a minimum of 150mm above the external levels (following any re-grade). External levels within proximity will fall away from proposed dwellings in accordance with building regulations.

4.7.2 Surface water run-off rates will be restricted through the use of vortex flow control devices. The increased volume of run-off for storms greater than the 30 year event can be mitigated through the use of SuDS (evapotranspiration/bio-retention/rainwater re-use).

4.7.3 The development is considered accessible during the extreme storm events as the site is within Flood Zone 1.

5.0 SURFACE WATER MANAGEMENT

5.1 Pre-Development Surface Water Run-off

5.1.1 The previous FRA completed by RSK (March 2015, Ref: 880500-R1) proposed that run-off rates will be restricted to QBar. In this report, QBar is calculated as 8.3 l/s/ha. See Appendix C for Hydrological Calculations. Any discrepancy between this QBar and the previous figure is due to refined FEH catchment characteristics being utilised within the ICP SuDS method.

5.1.2 The pre-development (greenfield) runoff rates are shown in Table 1. The ICP SuDS method was utilised using FEH catchment characteristics.

Storm Event	Greenfield Rate (l/s/ha)
Q1 year	7.2
QBar	8.3
Q30 years	14.0
Q100 years	17.2

Table 1: Greenfield Run-off Rates (ICP SuDS)

5.2 Post-Development Surface Water Run-off

5.2.1 The impermeable area will increase as a result of the development and increased run-off rates will be restricted to QBar (l/s/ha) thereby providing **significant betterment** to the downstream catchment for all storm events greater than the average annual event.

5.2.2 Rates will be restricted through the use of a vortex flow control device. Increased run-off volumes for storms greater than the 30 year event can be reduced through the use of SuDS (evapotranspiration/bio-retention/rainwater reuse).

5.2.3 Storm-water storage volumes will be attenuated on-site prior to outfall. Table 2 indicates the estimated volumes of storm-water storage that will be required if flows are restricted to variable discharge rates.

5.2.4 The impermeable area is estimated to be 60% of the total site area. This is a conservative estimation that considers gardens, permeable driveways and landscaped areas.

Storm Event	Storage Estimate (m^3/ha)
Q1 year	32 – 73
QBar (~ 2.3 years)	45 - 96
Q30 years	141 – 249
Q100 years + cc	327 - 507

Table 2: Quick Storage Estimates

5.2.5 Hydrological Calculations are included within Appendix C. The above figures are estimates only and will be recalculated during detailed design.

5.3 Sustainable Drainage Systems (SuDS)

5.3.1 In accordance with the NPPF, SuDS should be used wherever possible to manage surface water and reduce the impact on downstream watercourses and sewers.

5.3.2 SuDS have the ability to address four core objectives; water quantity, water quality, amenity and biodiversity. With the appropriate system specified, all four core objectives can be satisfied. Where possible, peak surface water discharge rates to watercourses and sewers should be reduced.

5.3.3 Preference should always be given to practical SuDS over conventional pipe systems. Opportunities should be taken to provide soft landscaping on site to minimise surface water run-off, improve bio-diversity and increase visual enhancement.

5.3.4 The ground investigation report carried out by Soiltechnics (Feb 2016, Ref: STN3505NM-G01) indicates that infiltration is **not viable** at this site.

5.3.5 There is potential to utilise SuDS on this site, with large areas of POS provided within the layout at the lowest points of the site. Due to the level gradient of the site, shallow SuDS would be preferable to systems such as deep ponds or detention basins. Suitable SuDS would include the use of swales and bio-retention areas.

5.3.7 It is important that SuDS is seen as a multi-use commodity, and that areas that benefit from SuDS, and the additional environmental and aesthetic enhancement they can bring if designed properly, are open to the public.

5.4 Methods of Surface Water Management

5.4.1 There are three methods that have been reviewed for the management and discharge of surface water detailed below; these may be applied individually or collectively to form a complete strategy. They should be applied in the order of priority listed below.

5.4.2 **Discharge via Infiltration** - The ground investigation report carried out by Soiltechnics (Feb 2016, Ref: STN3505NM-G01) indicates that infiltration is **not viable** at this site.

5.4.3 **Discharge to Watercourse** – There are several on-site watercourses which the site currently drains to. These are designated 'ordinary watercourses' and ordinary watercourse consent should be applied for with Lancashire County Council prior to any on-site works. As the watercourses are not designated as 'Main River', a 3-5m easement is considered appropriate.

5.4.4 **Discharge to Public Sewer** – Surface water will not outfall to a public sewer.

5.5 Climate Change

5.5.1 The UK climate is changing significantly will vary greatly by region with more short duration and high intensity rainfall events as well as more periods of long duration rainfall.

5.5.2 The NPPF Technical Guidance states that the recommended national precautionary sensitivity ranges for increase of peak rainfall intensity is 30% until 2115. The impact of climate change means there is likely to be a long term increase in average sea levels.

5.5.3 An increase in flood water levels means that flooding events will occur more frequently and have a greater impact. Any increase flood risk to the site from climate change is likely to be related to the increase in rainfall intensity and duration.

5.5.4 An additional 30% to accommodate climate change will be incorporated into the design of the stormwater storage attenuation.

5.6 Foul Water Management

5.6.1 The nearest public foul sewers are located within Inglewhite Road to the south-east of the site. The conveyance route of foul flows will be determined during detailed design. A pumped solution will likely be required and early liaisons with UU regarding adoptable pump design are recommended. Sewers will be designed and constructed in accordance with Sewers for Adoption.

6.0 SUMMARY

6.1 Conclusion and Recommendations

6.1.1 This report has been prepared for a development proposal of residential dwellings and associated infrastructure. The site lies within Flood Zone 1. The residential proposals are classified as 'more vulnerable'. This type of development is considered to be appropriate in accordance with the NPPF.

6.1.2 The report has indicated that the site is at **low** risk of flooding from fluvial, tidal, sewer related and artificial sources. There is some medium indicative risk of pluvial flooding which will be reduced and mitigated by the implementation of the development proposal. Flood risk to the surrounding area as a result of the development will be significantly reduced due to the restriction of proposed run-off rates to mimic the existing rate for the average annual event (QBar).

6.1.3 Attenuation will be provided on-site for storm events up to and including the 1 in 100 year event + 30% climate change.

6.1.4 Any residual or unforeseen flood risk to the proposed development will be further mitigated by raising finished floor levels to at least 150mm above external levels. External levels will fall away from dwellings in accordance with Building Regulations.

6.1.5 Applications for sewer adoption will be discussed and submitted during detailed design.

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Cranfield University – www.landis.org.uk/soilscapes
Environment Agency – www.environment-agency.gov.uk
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Streetmap – www.streetmap.co.uk

Appendix F
MicroDrainage Simulations for Phase 1

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for SW1.SWS

Pipe Sizes Surface Water Network 1 Manhole Sizes Surface Water Network 1

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	18.800	Add Flow / Climate Change (%)	0
Ratio R	0.280	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for SW1.SWS

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	34.856	0.087	400.6	0.185	5.00	0.0	0.600	o	1200	Pipe/Conduit	
1.001	14.100	0.028	503.6	0.037	0.00	0.0	0.600	o	1500	Pipe/Conduit	
2.000	26.078	0.153	170.4	0.056	5.00	0.0	0.600	o	225	Pipe/Conduit	
2.001	26.997	0.429	62.9	0.018	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.002	9.582	0.056	171.1	0.055	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.003	30.639	0.361	84.9	0.127	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	12.887	0.026	495.7	0.043	0.00	0.0	0.600	o	1500	Pipe/Conduit	
3.000	37.925	0.181	209.5	0.083	5.00	0.0	0.600	o	300	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)
1.000	50.00	5.31	103.006	0.185	0.0	0.0	0.0	1.86	2106.9	25.1
1.001	50.00	5.44	102.619	0.222	0.0	0.0	0.0	1.90	3365.7	30.1
2.000	50.00	5.44	104.865	0.056	0.0	0.0	0.0	1.00	39.7	7.6
2.001	50.00	5.71	104.712	0.074	0.0	0.0	0.0	1.65	65.7	10.0
2.002	50.00	5.87	104.283	0.129	0.0	0.0	0.0	1.00	39.6	17.5
2.003	50.00	6.23	104.227	0.256	0.0	0.0	0.0	1.42	56.5	34.7
1.002	50.00	6.34	102.591	0.521	0.0	0.0	0.0	1.92	3392.6	70.5
3.000	50.00	5.58	103.977	0.083	0.0	0.0	0.0	1.08	76.5	11.2

Network Design Table for SW1.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
3.001	12.547	0.031	404.7	0.010	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.003	20.839	0.042	496.2	0.033	0.00	0.0	0.600	o	1500	Pipe/Conduit	
1.004	19.697	0.039	505.1	0.054	0.00	0.0	0.600	o	1500	Pipe/Conduit	
1.005	11.281	0.023	490.5	0.000	0.00	0.0	0.600	o	1500	Pipe/Conduit	
1.006	21.474	0.043	499.4	0.000	0.00	0.0	0.600	o	1500	Pipe/Conduit	
1.007	11.233	0.022	510.6	0.063	0.00	0.0	0.600	o	1500	Pipe/Conduit	
1.008	47.046	0.094	500.5	0.103	0.00	0.0	0.600	o	1500	Pipe/Conduit	
4.000	32.098	0.597	53.8	0.048	5.00	0.0	0.600	o	225	Pipe/Conduit	
4.001	27.069	0.068	398.1	0.092	0.00	0.0	0.600	o	525	Pipe/Conduit	
1.009	39.272	0.080	490.9	0.024	0.00	0.0	0.600	o	1500	Pipe/Conduit	
1.010	20.549	0.041	501.2	0.075	0.00	0.0	0.600	o	1500	Pipe/Conduit	
5.000	31.163	0.663	47.0	0.036	5.00	0.0	0.600	o	225	Pipe/Conduit	
5.001	24.755	0.688	36.0	0.075	0.00	0.0	0.600	o	225	Pipe/Conduit	
5.002	7.704	0.198	39.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
5.003	6.655	0.126	53.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
5.004	6.888	0.066	104.4	0.602	0.00	0.0	0.600	o	450	Pipe/Conduit	
5.005	30.420	0.317	96.0	0.024	0.00	0.0	0.600	o	450	Pipe/Conduit	
5.006	7.929	0.091	87.1	0.023	0.00	0.0	0.600	o	450	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)
3.001	50.00	5.79	103.646	0.093	0.0	0.0	0.0	1.00	159.7	12.6
1.003	49.52	6.52	102.565	0.647	0.0	0.0	0.0	1.92	3390.9	86.8
1.004	48.99	6.69	102.523	0.701	0.0	0.0	0.0	1.90	3360.7	93.0
1.005	48.69	6.79	102.484	0.701	0.0	0.0	0.0	1.93	3410.6	93.0
1.006	48.14	6.98	102.461	0.701	0.0	0.0	0.0	1.91	3379.8	93.0
1.007	47.85	7.08	102.418	0.764	0.0	0.0	0.0	1.89	3342.3	99.0
1.008	46.70	7.49	102.396	0.867	0.0	0.0	0.0	1.91	3376.1	109.7
4.000	50.00	5.30	104.242	0.048	0.0	0.0	0.0	1.79	71.1	6.5
4.001	50.00	5.70	103.345	0.140	0.0	0.0	0.0	1.12	241.7	19.0
1.009	45.81	7.83	102.302	1.031	0.0	0.0	0.0	1.93	3409.1	127.9
1.010	45.35	8.01	102.222	1.106	0.0	0.0	0.0	1.91	3373.7	135.8
5.000	50.00	5.27	108.172	0.036	0.0	0.0	0.0	1.91	76.1	4.9
5.001	50.00	5.46	107.509	0.111	0.0	0.0	0.0	2.19	87.0	15.0
5.002	50.00	5.52	106.821	0.111	0.0	0.0	0.0	2.10	83.5	15.0
5.003	50.00	5.58	106.623	0.111	0.0	0.0	0.0	1.80	71.6	15.0
5.004	50.00	5.64	106.273	0.713	0.0	0.0	0.0	1.99	316.5	96.5
5.005	50.00	5.88	106.207	0.737	0.0	0.0	0.0	2.08	330.1	99.8
5.006	50.00	5.95	105.890	0.760	0.0	0.0	0.0	2.18	346.6	102.9

Network Design Table for SW1.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
5.007	19.595	0.338	58.0	0.036	0.00	0.0	0.600	o	450	Pipe/Conduit	
5.008	12.502	0.272	46.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
5.009	9.280	0.023	403.5	0.096	0.00	0.0	0.600	o	450	Pipe/Conduit	
5.010	11.131	0.028	400.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
5.011	19.961	0.139	143.6	0.018	0.00	0.0	0.600	o	450	Pipe/Conduit	
5.012	13.450	0.157	85.7	0.055	0.00	0.0	0.600	o	450	Pipe/Conduit	
6.000	41.858	1.231	34.0	0.057	5.00	0.0	0.600	o	225	Pipe/Conduit	
6.001	39.560	1.364	29.0	0.099	0.00	0.0	0.600	o	225	Pipe/Conduit	
6.002	13.898	0.409	34.0	0.040	0.00	0.0	0.600	o	225	Pipe/Conduit	
6.003	48.787	1.203	40.6	0.291	0.00	0.0	0.600	o	375	Pipe/Conduit	
5.013	18.119	0.045	402.6	0.012	0.00	0.0	0.600	o	525	Pipe/Conduit	
5.014	27.409	0.069	397.2	0.047	0.00	0.0	0.600	o	525	Pipe/Conduit	
5.015	14.736	0.037	398.3	0.099	0.00	0.0	0.600	o	525	Pipe/Conduit	
5.016	6.640	0.017	390.6	0.012	0.00	0.0	0.600	o	525	Pipe/Conduit	
7.000	24.649	0.325	75.8	0.037	5.00	0.0	0.600	o	225	Pipe/Conduit	
5.017	17.660	0.044	401.4	0.017	0.00	0.0	0.600	o	525	Pipe/Conduit	
5.018	66.145	0.165	400.9	0.099	0.00	0.0	0.600	o	525	Pipe/Conduit	
5.019	62.798	0.157	400.0	0.131	0.00	0.0	0.600	o	525	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)
5.007	50.00	6.07	105.799	0.796	0.0	0.0	0.0	2.67	425.3	107.8
5.008	50.00	6.14	105.461	0.796	0.0	0.0	0.0	3.01	477.9	107.8
5.009	50.00	6.29	105.189	0.892	0.0	0.0	0.0	1.01	160.0	120.8
5.010	49.67	6.47	105.166	0.892	0.0	0.0	0.0	1.01	160.7	120.8
5.011	49.06	6.67	105.138	0.910	0.0	0.0	0.0	1.69	269.5	120.9
5.012	48.75	6.77	104.999	0.965	0.0	0.0	0.0	2.20	349.5	127.4
6.000	50.00	5.31	108.448	0.057	0.0	0.0	0.0	2.25	89.5	7.7
6.001	50.00	5.58	107.217	0.156	0.0	0.0	0.0	2.44	97.0	21.1
6.002	50.00	5.68	105.853	0.196	0.0	0.0	0.0	2.25	89.5	26.5
6.003	50.00	5.97	105.294	0.487	0.0	0.0	0.0	2.85	315.1	65.9
5.013	47.94	7.04	103.941	1.464	0.0	0.0	0.0	1.11	240.3	190.1
5.014	46.79	7.45	103.896	1.511	0.0	0.0	0.0	1.12	241.9	191.5
5.015	46.20	7.67	103.827	1.610	0.0	0.0	0.0	1.12	241.6	201.5
5.016	45.95	7.77	103.790	1.622	0.0	0.0	0.0	1.13	244.0	201.8
7.000	50.00	5.27	104.399	0.037	0.0	0.0	0.0	1.50	59.8	5.0
5.017	45.27	8.04	103.773	1.676	0.0	0.0	0.0	1.11	240.7	205.5
5.018	42.94	9.03	103.729	1.775	0.0	0.0	0.0	1.11	240.8	206.4
5.019	40.99	9.97	103.564	1.906	0.0	0.0	0.0	1.11	241.1	211.6

Network Design Table for SW1.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
5.020	26.670	0.067	398.1	0.039	0.00	0.0	0.600	o	1500	Pipe/Conduit	
5.021	39.206	0.098	400.0	0.000	0.00	0.0	0.600	o	1500	Pipe/Conduit	
5.022	34.028	0.085	400.3	0.084	0.00	0.0	0.600	o	1500	Pipe/Conduit	
1.011	44.746	0.089	500.0	0.000	0.00	0.0	0.600	o	1500	Pipe/Conduit	
1.012	8.914	0.053	168.0	0.000	0.00	0.0	0.600	o	300	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)
5.020	40.59	10.17	102.432	1.945	0.0	0.0	0.0	2.14	3788.4	213.8
5.021	40.02	10.48	102.365	1.945	0.0	0.0	0.0	2.14	3779.1	213.8
5.022	39.54	10.75	102.267	2.029	0.0	0.0	0.0	2.14	3777.5	217.3
1.011	38.86	11.14	102.182	3.135	0.0	0.0	0.0	1.91	3377.8	329.9
1.012	38.65	11.26	102.093	3.135	0.0	0.0	0.0	1.21	85.5«	329.9

Manhole Schedules for SW1.SWS

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
1	105.233	2.227	Open Manhole	2400	1.000	103.006	1200				
2	105.924	3.305	Open Manhole	2400	1.001	102.619	1500	1.000	102.919	1200	
15	106.290	1.425	Open Manhole	1350	2.000	104.865	225				
16	106.358	1.646	Open Manhole	1350	2.001	104.712	225	2.000	104.712	225	
17	105.854	1.571	Open Manhole	1350	2.002	104.283	225	2.001	104.283	225	
18	105.655	1.428	Open Manhole	1500	2.003	104.227	225	2.002	104.227	225	
3	105.961	3.370	Open Manhole	2400	1.002	102.591	1500	1.001	102.591	1500	
								2.003	103.866	225	
19	105.531	1.554	Open Manhole	1800	3.000	103.977	300				
20	105.820	2.174	Open Manhole	1500	3.001	103.646	450	3.000	103.796	300	
4	105.808	3.243	Open Manhole	2700	1.003	102.565	1500	1.002	102.565	1500	
								3.001	103.615	450	
5	105.622	3.099	Open Manhole	2400	1.004	102.523	1500	1.003	102.523	1500	
6	105.847	3.363	Open Manhole	2400	1.005	102.484	1500	1.004	102.484	1500	
7	105.909	3.448	Open Manhole	2400	1.006	102.461	1500	1.005	102.461	1500	
8	105.721	3.303	Open Manhole	2400	1.007	102.418	1500	1.006	102.418	1500	
9	105.581	3.185	Open Manhole	2400	1.008	102.396	1500	1.007	102.396	1500	
21	105.667	1.425	Open Manhole	1350	4.000	104.242	225				
22	105.259	1.914	Open Manhole	1800	4.001	103.345	525	4.000	103.645	225	
10	105.002	2.700	Open Manhole	3000	1.009	102.302	1500	1.008	102.302	1500	
								4.001	103.277	525	
11	104.922	2.700	Open Manhole	3000	1.010	102.222	1500	1.009	102.222	1500	
23	109.597	1.425	Open Manhole	1350	5.000	108.172	225				
24	108.947	1.438	Open Manhole	1500	5.001	107.509	225	5.000	107.509	225	
25	108.247	1.426	Open Manhole	1350	5.002	106.821	225	5.001	106.821	225	
26	108.049	1.426	Open Manhole	1350	5.003	106.623	225	5.002	106.623	225	
27	107.924	1.651	Open Manhole	1500	5.004	106.273	450	5.003	106.498	225	
28	107.857	1.650	Open Manhole	1500	5.005	106.207	450	5.004	106.207	450	
29	107.540	1.650	Open Manhole	1500	5.006	105.890	450	5.005	105.890	450	
30	107.449	1.650	Open Manhole	1500	5.007	105.799	450	5.006	105.799	450	
31	107.646	2.185	Open Manhole	1500	5.008	105.461	450	5.007	105.461	450	
32	107.569	2.380	Open Manhole	1500	5.009	105.189	450	5.008	105.189	450	
33	107.430	2.264	Open Manhole	1500	5.010	105.166	450	5.009	105.166	450	
34	107.241	2.103	Open Manhole	1500	5.011	105.138	450	5.010	105.138	450	
35	106.909	1.910	Open Manhole	1500	5.012	104.999	450	5.011	104.999	450	
46	109.881	1.433	Open Manhole	1350	6.000	108.448	225				
47	108.671	1.454	Open Manhole	1350	6.001	107.217	225	6.000	107.217	225	
48	107.297	1.444	Open Manhole	1350	6.002	105.853	225	6.001	105.853	225	

Manhole Schedules for SW1.SWS

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
49	106.894	1.600	Open Manhole	1350	6.003	105.294	375	6.002	105.444	225	
36	106.895	2.954	Open Manhole	1800	5.013	103.941	525	5.012	104.842	450	826
								6.003	104.091	375	
37	106.951	3.055	Open Manhole	1800	5.014	103.896	525	5.013	103.896	525	
38	106.608	2.781	Open Manhole	1800	5.015	103.827	525	5.014	103.827	525	
39	106.386	2.596	Open Manhole	1800	5.016	103.790	525	5.015	103.790	525	
50	105.824	1.425	Open Manhole	1350	7.000	104.399	225				
40	106.262	2.489	Open Manhole	1800	5.017	103.773	525	5.016	103.773	525	
								7.000	104.074	225	1
41	105.972	2.243	Open Manhole	1800	5.018	103.729	525	5.017	103.729	525	
42	105.729	2.165	Open Manhole	1800	5.019	103.564	525	5.018	103.564	525	
43	105.566	3.134	Open Manhole	2700	5.020	102.432	1500	5.019	103.407	525	
44	105.250	2.885	Open Manhole	2700	5.021	102.365	1500	5.020	102.365	1500	
45	104.968	2.701	Open Manhole	3000	5.022	102.267	1500	5.021	102.267	1500	
12	104.882	2.701	Open Manhole	3000	1.011	102.182	1500	1.010	102.181	1500	
								5.022	102.182	1500	
13	104.793	2.700	Open Manhole	3000	1.012	102.093	300	1.011	102.093	1500	
14	102.473	0.433	Open Manhole	600		OUTFALL		1.012	102.040	300	

Online Controls for SW1.SWS

Hydro-Brake Optimum® Manhole: 13, DS/PN: 1.012, Volume (m³): 92.9

Unit Reference	MD-SHE-0278-5000-2200-5000
Design Head (m)	2.200
Design Flow (l/s)	50.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	278
Invert Level (m)	102.093
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	2100

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.200	49.8	Kick-Flo®	1.423	40.4
Flush-Flo™	0.654	49.7	Mean Flow over Head Range	-	43.0

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	8.7	1.200	46.1	3.000	57.9	7.000	87.3
0.200	28.6	1.400	41.3	3.500	62.3	7.500	90.3
0.300	45.1	1.600	42.7	4.000	66.5	8.000	93.1
0.400	47.7	1.800	45.2	4.500	70.4	8.500	95.9
0.500	49.1	2.000	47.6	5.000	74.1	9.000	98.6
0.600	49.7	2.200	49.8	5.500	77.6	9.500	101.3
0.800	49.4	2.400	51.9	6.000	81.0		
1.000	48.3	2.600	54.0	6.500	84.2		

Storage Structures for SW1.SWS

Tank or Pond Manhole: 13, DS/PN: 1.012

Invert Level (m) 103.650

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	947.9	0.200	1029.2	0.400	1113.4	0.600	1200.5
0.100	988.1	0.300	1070.9	0.500	1156.6	0.750	1267.7

Summary of Critical Results by Maximum Level (Rank 1) for SW1.SWS

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	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		FSR Ratio R	0.282
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.800	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	30
Climate Change (%)	0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	180 Winter	30	+0%					103.692
1.001	2	180 Winter	30	+0%					103.692
2.000	15	15 Winter	30	+0%					104.969
2.001	16	15 Winter	30	+0%					104.804
2.002	17	15 Winter	30	+0%	30/15 Summer				104.697
2.003	18	15 Winter	30	+0%	30/15 Summer				104.639
1.002	3	180 Winter	30	+0%					103.692
3.000	19	15 Winter	30	+0%					104.097
3.001	20	15 Winter	30	+0%					103.802
1.003	4	180 Winter	30	+0%					103.692
1.004	5	180 Winter	30	+0%					103.692
1.005	6	180 Winter	30	+0%					103.693
1.006	7	180 Winter	30	+0%					103.694
1.007	8	180 Winter	30	+0%					103.693
1.008	9	180 Winter	30	+0%					103.693
4.000	21	15 Winter	30	+0%					104.311
4.001	22	180 Winter	30	+0%					103.691
1.009	10	180 Winter	30	+0%					103.691
1.010	11	180 Winter	30	+0%					103.688
5.000	23	15 Winter	30	+0%					108.229

Summary of Critical Results by Maximum Level (Rank 1) for SW1.SWS

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.514	0.000	0.01		14.6	OK	
1.001	2	-0.427	0.000	0.01		15.5	OK	
2.000	15	-0.121	0.000	0.43		15.6	OK	
2.001	16	-0.133	0.000	0.34		20.7	OK	
2.002	17	0.189	0.000	1.06		34.8	SURCHARGED	
2.003	18	0.187	0.000	1.22		64.6	SURCHARGED	
1.002	3	-0.399	0.000	0.03		33.9	OK	
3.000	19	-0.180	0.000	0.33		23.6	OK	
3.001	20	-0.294	0.000	0.26		26.4	OK	
1.003	4	-0.373	0.000	0.02		38.7	OK	
1.004	5	-0.331	0.000	0.02		36.6	OK	
1.005	6	-0.291	0.000	0.03		32.9	OK	
1.006	7	-0.267	0.000	0.02		30.4	OK	
1.007	8	-0.225	0.000	0.03		30.1	OK	
1.008	9	-0.203	0.000	0.01		33.1	OK	
4.000	21	-0.156	0.000	0.20		13.5	OK	
4.001	22	-0.179	0.000	0.06		11.7	OK	
1.009	10	-0.111	0.000	0.01		29.5	OK	
1.010	11	-0.034	0.000	0.02		27.7	OK	
5.000	23	-0.168	0.000	0.14		10.1	OK	

Summary of Critical Results by Maximum Level (Rank 1) for SW1.SWS

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
5.001	24	15 Winter	30	+0%					107.610
5.002	25	15 Winter	30	+0%					106.937
5.003	26	15 Winter	30	+0%					106.757
5.004	27	15 Winter	30	+0%					106.714
5.005	28	15 Summer	30	+0%					106.464
5.006	29	15 Winter	30	+0%					106.340
5.007	30	15 Winter	30	+0%					106.047
5.008	31	15 Winter	30	+0%	30/15 Winter				105.933
5.009	32	15 Winter	30	+0%	30/15 Summer				105.826
5.010	33	15 Winter	30	+0%	30/15 Summer				105.696
5.011	34	15 Winter	30	+0%					105.548
5.012	35	15 Winter	30	+0%					105.424
6.000	46	15 Winter	30	+0%					108.515
6.001	47	15 Winter	30	+0%					107.330
6.002	48	15 Winter	30	+0%					105.999
6.003	49	15 Winter	30	+0%					105.483
5.013	36	15 Winter	30	+0%	30/15 Summer				105.295
5.014	37	15 Winter	30	+0%	30/15 Summer				105.173
5.015	38	15 Winter	30	+0%	30/15 Summer				105.038
5.016	39	15 Winter	30	+0%	30/15 Summer				104.887
7.000	50	30 Winter	30	+0%	30/15 Summer				104.750
5.017	40	30 Winter	30	+0%	30/15 Summer				104.738
5.018	41	30 Winter	30	+0%	30/15 Summer				104.585
5.019	42	30 Winter	30	+0%	30/15 Summer				104.252
5.020	43	180 Winter	30	+0%					103.703
5.021	44	180 Winter	30	+0%					103.700
5.022	45	180 Winter	30	+0%					103.693
1.011	12	180 Winter	30	+0%	30/120 Winter				103.685
1.012	13	180 Winter	30	+0%	30/15 Summer				103.684

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
5.001	24	-0.124	0.000	0.41		32.8	OK	
5.002	25	-0.109	0.000	0.52		32.7	OK	
5.003	26	-0.091	0.000	0.65		32.5	OK	
5.004	27	-0.009	0.000	1.00		169.1	OK	
5.005	28	-0.193	0.000	0.62		175.0	OK	
5.006	29	0.000	0.000	1.05		178.8	OK	
5.007	30	-0.202	0.000	0.57		186.6	OK	
5.008	31	0.023	0.000	0.63		185.0	SURCHARGED	
5.009	32	0.187	0.000	2.13		201.1	SURCHARGED	
5.010	33	0.080	0.000	2.01		200.6	SURCHARGED	
5.011	34	-0.040	0.000	0.96		201.0	OK	
5.012	35	-0.025	0.000	0.93		207.7	OK	
6.000	46	-0.158	0.000	0.19		16.0	OK	
6.001	47	-0.112	0.000	0.50		45.7	OK	

Summary of Critical Results by Maximum Level (Rank 1) for SW1.SWS

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
6.002	48	-0.079	0.000	0.74		57.5	OK	
6.003	49	-0.186	0.000	0.50		144.8	OK	
5.013	36	0.829	0.000	1.74		303.2	SURCHARGED	
5.014	37	0.752	0.000	1.51		301.5	SURCHARGED	
5.015	38	0.686	0.000	2.03		310.7	SURCHARGED	
5.016	39	0.572	0.000	2.11		309.4	SURCHARGED	
7.000	50	0.126	0.000	0.15		8.5	SURCHARGED	
5.017	40	0.440	0.000	1.76		301.9	SURCHARGED	
5.018	41	0.331	0.000	1.41		311.1	SURCHARGED	
5.019	42	0.163	0.000	1.48		324.7	SURCHARGED	
5.020	43	-0.229	0.000	0.07		156.8	OK	
5.021	44	-0.165	0.000	0.06		142.1	OK	
5.022	45	-0.074	0.000	0.05		127.0	OK	
1.011	12	0.003	0.000	0.03		78.4	SURCHARGED	
1.012	13	1.291	0.000	0.81		49.9	SURCHARGED	

Surcharged Outfall Details for SW1.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.012	14	102.473	102.040	102.040	600	0

Datum (m) 102.040 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1	0.520	42	0.520	83	0.520	124	0.520	165	0.520	206	0.520
2	0.520	43	0.520	84	0.520	125	0.520	166	0.520	207	0.520
3	0.520	44	0.520	85	0.520	126	0.520	167	0.520	208	0.520
4	0.520	45	0.520	86	0.520	127	0.520	168	0.520	209	0.520
5	0.520	46	0.520	87	0.520	128	0.520	169	0.520	210	0.520
6	0.520	47	0.520	88	0.520	129	0.520	170	0.520	211	0.520
7	0.520	48	0.520	89	0.520	130	0.520	171	0.520	212	0.520
8	0.520	49	0.520	90	0.520	131	0.520	172	0.520	213	0.520
9	0.520	50	0.520	91	0.520	132	0.520	173	0.520	214	0.520
10	0.520	51	0.520	92	0.520	133	0.520	174	0.520	215	0.520
11	0.520	52	0.520	93	0.520	134	0.520	175	0.520	216	0.520
12	0.520	53	0.520	94	0.520	135	0.520	176	0.520	217	0.520
13	0.520	54	0.520	95	0.520	136	0.520	177	0.520	218	0.520
14	0.520	55	0.520	96	0.520	137	0.520	178	0.520	219	0.520
15	0.520	56	0.520	97	0.520	138	0.520	179	0.520	220	0.520
16	0.520	57	0.520	98	0.520	139	0.520	180	0.520	221	0.520
17	0.520	58	0.520	99	0.520	140	0.520	181	0.520	222	0.520
18	0.520	59	0.520	100	0.520	141	0.520	182	0.520	223	0.520
19	0.520	60	0.520	101	0.520	142	0.520	183	0.520	224	0.520
20	0.520	61	0.520	102	0.520	143	0.520	184	0.520	225	0.520
21	0.520	62	0.520	103	0.520	144	0.520	185	0.520	226	0.520
22	0.520	63	0.520	104	0.520	145	0.520	186	0.520	227	0.520
23	0.520	64	0.520	105	0.520	146	0.520	187	0.520	228	0.520
24	0.520	65	0.520	106	0.520	147	0.520	188	0.520	229	0.520
25	0.520	66	0.520	107	0.520	148	0.520	189	0.520	230	0.520
26	0.520	67	0.520	108	0.520	149	0.520	190	0.520	231	0.520
27	0.520	68	0.520	109	0.520	150	0.520	191	0.520	232	0.520
28	0.520	69	0.520	110	0.520	151	0.520	192	0.520	233	0.520
29	0.520	70	0.520	111	0.520	152	0.520	193	0.520	234	0.520
30	0.520	71	0.520	112	0.520	153	0.520	194	0.520	235	0.520
31	0.520	72	0.520	113	0.520	154	0.520	195	0.520	236	0.520
32	0.520	73	0.520	114	0.520	155	0.520	196	0.520	237	0.520
33	0.520	74	0.520	115	0.520	156	0.520	197	0.520	238	0.520
34	0.520	75	0.520	116	0.520	157	0.520	198	0.520	239	0.520
35	0.520	76	0.520	117	0.520	158	0.520	199	0.520	240	0.520
36	0.520	77	0.520	118	0.520	159	0.520	200	0.520	241	0.520
37	0.520	78	0.520	119	0.520	160	0.520	201	0.520	242	0.520
38	0.520	79	0.520	120	0.520	161	0.520	202	0.520	243	0.520
39	0.520	80	0.520	121	0.520	162	0.520	203	0.520	244	0.520
40	0.520	81	0.520	122	0.520	163	0.520	204	0.520	245	0.520
41	0.520	82	0.520	123	0.520	164	0.520	205	0.520	246	0.520

Surcharged Outfall Details for SW1.SWS

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
247	0.520	266	0.520	285	0.520	304	0.520	323	0.520	342	0.520
248	0.520	267	0.520	286	0.520	305	0.520	324	0.520	343	0.520
249	0.520	268	0.520	287	0.520	306	0.520	325	0.520	344	0.520
250	0.520	269	0.520	288	0.520	307	0.520	326	0.520	345	0.520
251	0.520	270	0.520	289	0.520	308	0.520	327	0.520	346	0.520
252	0.520	271	0.520	290	0.520	309	0.520	328	0.520	347	0.520
253	0.520	272	0.520	291	0.520	310	0.520	329	0.520	348	0.520
254	0.520	273	0.520	292	0.520	311	0.520	330	0.520	349	0.520
255	0.520	274	0.520	293	0.520	312	0.520	331	0.520	350	0.520
256	0.520	275	0.520	294	0.520	313	0.520	332	0.520	351	0.520
257	0.520	276	0.520	295	0.520	314	0.520	333	0.520	352	0.520
258	0.520	277	0.520	296	0.520	315	0.520	334	0.520	353	0.520
259	0.520	278	0.520	297	0.520	316	0.520	335	0.520	354	0.520
260	0.520	279	0.520	298	0.520	317	0.520	336	0.520	355	0.520
261	0.520	280	0.520	299	0.520	318	0.520	337	0.520	356	0.520
262	0.520	281	0.520	300	0.520	319	0.520	338	0.520	357	0.520
263	0.520	282	0.520	301	0.520	320	0.520	339	0.520	358	0.520
264	0.520	283	0.520	302	0.520	321	0.520	340	0.520	359	0.520
265	0.520	284	0.520	303	0.520	322	0.520	341	0.520	360	0.520

Summary of Critical Results by Maximum Level (Rank 1) for SW1.SWS

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	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		FSR Ratio R	0.282
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.800	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	30
Climate Change (%)	0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	240 Winter	30	+0%					103.736
1.001	2	240 Winter	30	+0%					103.736
2.000	15	15 Winter	30	+0%					104.969
2.001	16	15 Winter	30	+0%					104.804
2.002	17	15 Winter	30	+0%	30/15 Summer				104.697
2.003	18	15 Winter	30	+0%	30/15 Summer				104.639
1.002	3	240 Winter	30	+0%					103.736
3.000	19	15 Winter	30	+0%					104.097
3.001	20	15 Winter	30	+0%					103.802
1.003	4	240 Winter	30	+0%					103.736
1.004	5	240 Winter	30	+0%					103.736
1.005	6	240 Winter	30	+0%					103.736
1.006	7	240 Winter	30	+0%					103.736
1.007	8	240 Winter	30	+0%					103.736
1.008	9	240 Winter	30	+0%					103.736
4.000	21	15 Winter	30	+0%					104.311
4.001	22	180 Winter	30	+0%					103.735
1.009	10	240 Winter	30	+0%					103.735
1.010	11	240 Winter	30	+0%	30/180 Winter				103.732
5.000	23	15 Winter	30	+0%					108.229

Summary of Critical Results by Maximum Level (Rank 1) for SW1.SWS

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.470	0.000	0.01		10.9	OK	
1.001	2	-0.383	0.000	0.01		10.5	OK	
2.000	15	-0.121	0.000	0.43		15.6	OK	
2.001	16	-0.133	0.000	0.34		20.7	OK	
2.002	17	0.189	0.000	1.06		34.8	SURCHARGED	
2.003	18	0.187	0.000	1.22		64.6	SURCHARGED	
1.002	3	-0.355	0.000	0.02		23.7	OK	
3.000	19	-0.180	0.000	0.33		23.6	OK	
3.001	20	-0.294	0.000	0.26		26.4	OK	
1.003	4	-0.329	0.000	0.02		27.0	OK	
1.004	5	-0.287	0.000	0.02		24.6	OK	
1.005	6	-0.248	0.000	0.02		23.3	OK	
1.006	7	-0.225	0.000	0.01		23.0	OK	
1.007	8	-0.182	0.000	0.02		24.7	OK	
1.008	9	-0.160	0.000	0.01		27.7	OK	
4.000	21	-0.156	0.000	0.20		13.5	OK	
4.001	22	-0.135	0.000	0.06		11.7	OK	
1.009	10	-0.067	0.000	0.01		32.0	OK	
1.010	11	0.010	0.000	0.02		35.6	SURCHARGED	
5.000	23	-0.168	0.000	0.14		10.1	OK	

Summary of Critical Results by Maximum Level (Rank 1) for SW1.SWS

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
5.001	24	15 Winter	30	+0%					107.610
5.002	25	15 Winter	30	+0%					106.937
5.003	26	15 Winter	30	+0%					106.757
5.004	27	15 Winter	30	+0%					106.714
5.005	28	15 Summer	30	+0%					106.464
5.006	29	15 Winter	30	+0%					106.340
5.007	30	15 Winter	30	+0%					106.047
5.008	31	15 Winter	30	+0%	30/15 Winter				105.933
5.009	32	15 Winter	30	+0%	30/15 Summer				105.826
5.010	33	15 Winter	30	+0%	30/15 Summer				105.696
5.011	34	15 Winter	30	+0%					105.548
5.012	35	15 Winter	30	+0%					105.424
6.000	46	15 Winter	30	+0%					108.515
6.001	47	15 Winter	30	+0%					107.330
6.002	48	15 Winter	30	+0%					105.999
6.003	49	15 Winter	30	+0%					105.483
5.013	36	15 Winter	30	+0%	30/15 Summer				105.295
5.014	37	15 Winter	30	+0%	30/15 Summer				105.173
5.015	38	15 Winter	30	+0%	30/15 Summer				105.038
5.016	39	15 Winter	30	+0%	30/15 Summer				104.887
7.000	50	30 Winter	30	+0%	30/15 Summer				104.750
5.017	40	30 Winter	30	+0%	30/15 Summer				104.738
5.018	41	30 Winter	30	+0%	30/15 Summer				104.585
5.019	42	30 Winter	30	+0%	30/15 Summer				104.252
5.020	43	240 Winter	30	+0%					103.770
5.021	44	240 Winter	30	+0%					103.766
5.022	45	240 Winter	30	+0%					103.757
1.011	12	240 Winter	30	+0%	30/120 Winter				103.732
1.012	13	240 Winter	30	+0%	30/15 Summer				103.731

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
5.001	24	-0.124	0.000	0.41		32.8	OK	
5.002	25	-0.109	0.000	0.52		32.7	OK	
5.003	26	-0.091	0.000	0.65		32.5	OK	
5.004	27	-0.009	0.000	1.00		169.1	OK	
5.005	28	-0.193	0.000	0.62		175.0	OK	
5.006	29	0.000	0.000	1.05		178.8	OK	
5.007	30	-0.202	0.000	0.57		186.6	OK	
5.008	31	0.023	0.000	0.63		185.0	SURCHARGED	
5.009	32	0.187	0.000	2.13		201.1	SURCHARGED	
5.010	33	0.080	0.000	2.01		200.6	SURCHARGED	
5.011	34	-0.040	0.000	0.96		201.0	OK	
5.012	35	-0.025	0.000	0.93		207.7	OK	
6.000	46	-0.158	0.000	0.19		16.0	OK	
6.001	47	-0.112	0.000	0.50		45.7	OK	

Summary of Critical Results by Maximum Level (Rank 1) for SW1.SWS

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
6.002	48	-0.079	0.000	0.74		57.5	OK	
6.003	49	-0.186	0.000	0.50		144.8	OK	
5.013	36	0.829	0.000	1.74		303.2	SURCHARGED	
5.014	37	0.752	0.000	1.51		301.5	SURCHARGED	
5.015	38	0.686	0.000	2.03		310.7	SURCHARGED	
5.016	39	0.572	0.000	2.11		309.4	SURCHARGED	
7.000	50	0.126	0.000	0.15		8.5	SURCHARGED	
5.017	40	0.440	0.000	1.76		301.9	SURCHARGED	
5.018	41	0.331	0.000	1.41		311.1	SURCHARGED	
5.019	42	0.163	0.000	1.48		324.7	SURCHARGED	
5.020	43	-0.162	0.000	0.06		129.8	OK	
5.021	44	-0.099	0.000	0.05		118.9	OK	
5.022	45	-0.010	0.000	0.04		108.1	OK	
1.011	12	0.050	0.000	0.06		132.3	SURCHARGED	
1.012	13	1.338	0.000	0.81		49.9	SURCHARGED	

Summary of Critical Results by Maximum Level (Rank 1) for SW1.SWS

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	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		FSR Ratio R	0.282
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.800	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	100
Climate Change (%)	30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	240 Winter	100	+30%					104.203
1.001	2	240 Winter	100	+30%	100/120 Winter				104.202
2.000	15	15 Winter	100	+30%	100/15 Summer				105.484
2.001	16	15 Winter	100	+30%	100/15 Summer				105.433
2.002	17	15 Winter	100	+30%	100/15 Summer				105.357
2.003	18	15 Winter	100	+30%	100/15 Summer				105.249
1.002	3	240 Winter	100	+30%	100/120 Winter				104.203
3.000	19	240 Winter	100	+30%					104.204
3.001	20	240 Winter	100	+30%	100/120 Winter				104.203
1.003	4	240 Winter	100	+30%	100/120 Winter				104.203
1.004	5	240 Winter	100	+30%	100/120 Winter				104.203
1.005	6	240 Winter	100	+30%	100/60 Winter				104.203
1.006	7	240 Winter	100	+30%	100/60 Winter				104.203
1.007	8	240 Winter	100	+30%	100/60 Winter				104.203
1.008	9	240 Winter	100	+30%	100/60 Winter				104.203
4.000	21	15 Winter	100	+30%					104.333
4.001	22	240 Winter	100	+30%	100/60 Summer				104.204
1.009	10	240 Winter	100	+30%	100/30 Winter				104.203
1.010	11	240 Winter	100	+30%	100/30 Summer				104.203
5.000	23	15 Winter	100	+30%					108.247

Summary of Critical Results by Maximum Level (Rank 1) for SW1.SWS

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.003	0.000	0.01		20.3	OK	
1.001	2	0.083	0.000	0.02		21.9	SURCHARGED	
2.000	15	0.394	0.000	0.61		22.5	SURCHARGED	
2.001	16	0.496	0.000	0.52		31.7	SURCHARGED	
2.002	17	0.849	0.000	1.50		49.1	SURCHARGED	
2.003	18	0.797	0.000	1.78		93.9	SURCHARGED	
1.002	3	0.112	0.000	0.04		51.8	SURCHARGED	
3.000	19	-0.073	0.000	0.14		9.6	OK	
3.001	20	0.107	0.000	0.11		10.7	SURCHARGED	
1.003	4	0.138	0.000	0.04		61.1	SURCHARGED	
1.004	5	0.180	0.000	0.04		63.1	SURCHARGED	
1.005	6	0.219	0.000	0.05		62.2	SURCHARGED	
1.006	7	0.242	0.000	0.03		60.3	SURCHARGED	
1.007	8	0.285	0.000	0.06		63.5	SURCHARGED	
1.008	9	0.307	0.000	0.03		65.7	SURCHARGED	
4.000	21	-0.134	0.000	0.34		22.6	OK	
4.001	22	0.334	0.000	0.08		15.6	SURCHARGED	
1.009	10	0.401	0.000	0.03		73.1	SURCHARGED	
1.010	11	0.481	0.000	0.04		74.2	SURCHARGED	
5.000	23	-0.150	0.000	0.24		17.0	OK	

Summary of Critical Results by Maximum Level (Rank 1) for SW1.SWS

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
5.001	24	30 Winter	100	+30%	100/15 Winter			
5.002	25	30 Winter	100	+30%	100/15 Summer			
5.003	26	30 Winter	100	+30%	100/15 Summer			
5.004	27	30 Winter	100	+30%	100/15 Summer			
5.005	28	30 Winter	100	+30%	100/15 Summer			
5.006	29	30 Winter	100	+30%	100/15 Summer	100/30 Winter		
5.007	30	30 Winter	100	+30%	100/15 Summer			
5.008	31	30 Winter	100	+30%	100/15 Summer			
5.009	32	30 Winter	100	+30%	100/15 Summer			
5.010	33	30 Winter	100	+30%	100/15 Summer			
5.011	34	30 Winter	100	+30%	100/15 Summer			
5.012	35	30 Winter	100	+30%	100/15 Summer			
6.000	46	15 Winter	100	+30%				
6.001	47	15 Winter	100	+30%	100/15 Winter			
6.002	48	30 Winter	100	+30%	100/15 Summer			
6.003	49	30 Winter	100	+30%	100/15 Summer			
5.013	36	30 Winter	100	+30%	100/15 Summer			
5.014	37	30 Winter	100	+30%	100/15 Summer			
5.015	38	30 Winter	100	+30%	100/15 Summer			
5.016	39	30 Winter	100	+30%	100/15 Summer			
7.000	50	30 Winter	100	+30%	100/15 Summer			
5.017	40	30 Winter	100	+30%	100/15 Summer			
5.018	41	30 Winter	100	+30%	100/15 Summer			
5.019	42	30 Winter	100	+30%	100/15 Summer			
5.020	43	240 Winter	100	+30%	100/60 Winter			
5.021	44	240 Winter	100	+30%	100/60 Summer			
5.022	45	240 Winter	100	+30%	100/30 Winter			
1.011	12	240 Winter	100	+30%	100/30 Summer			
1.012	13	240 Winter	100	+30%	100/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
5.001	24	107.930	0.196	0.000	0.55		44.4	SURCHARGED	
5.002	25	107.870	0.824	0.000	0.64		39.8	SURCHARGED	
5.003	26	107.846	0.997	0.000	0.75		37.3	FLOOD RISK	
5.004	27	107.826	1.103	0.000	1.34		225.8	FLOOD RISK	
5.005	28	107.700	1.043	0.000	0.78		222.0	FLOOD RISK	
5.006	29	107.541	1.201	0.926	1.25		212.5	FLOOD	1
5.007	30	107.431	1.182	0.000	0.64		208.5	FLOOD RISK	
5.008	31	107.305	1.395	0.000	0.72		210.7	SURCHARGED	
5.009	32	107.177	1.539	0.000	2.42		227.9	SURCHARGED	
5.010	33	107.019	1.403	0.000	2.31		229.9	SURCHARGED	
5.011	34	106.862	1.274	0.000	1.12		234.7	SURCHARGED	
5.012	35	106.703	1.254	0.000	1.11		247.1	FLOOD RISK	
6.000	46	108.536	-0.137	0.000	0.32		26.8	OK	
6.001	47	107.472	0.030	0.000	0.82		75.8	SURCHARGED	

Summary of Critical Results by Maximum Level (Rank 1) for SW1.SWS

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
6.002	48	106.984	0.906	0.000	0.89		69.7	SURCHARGED	
6.003	49	106.768	1.099	0.000	0.55		159.0	FLOOD RISK	
5.013	36	106.528	2.062	0.000	2.11		368.5	SURCHARGED	
5.014	37	106.299	1.878	0.000	1.89		377.7	SURCHARGED	
5.015	38	106.052	1.700	0.000	2.60		399.2	SURCHARGED	
5.016	39	105.782	1.467	0.000	2.74		401.5	SURCHARGED	
7.000	50	105.529	0.905	0.000	0.18		9.9	FLOOD RISK	
5.017	40	105.510	1.212	0.000	2.40		413.1	SURCHARGED	
5.018	41	105.221	0.967	0.000	1.95		430.6	SURCHARGED	
5.019	42	104.583	0.494	0.000	2.07		454.4	SURCHARGED	
5.020	43	104.205	0.273	0.000	0.10		220.1	SURCHARGED	
5.021	44	104.205	0.340	0.000	0.09		219.0	SURCHARGED	
5.022	45	104.204	0.437	0.000	0.09		226.8	SURCHARGED	
1.011	12	104.203	0.521	0.000	0.11		265.0	SURCHARGED	
1.012	13	104.202	1.809	0.000	0.81		49.9	SURCHARGED	

FOUL SEWERAGE DESIGN

Network Design Table for FW1 - PDS Export.FWS

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
1.000	21.577	0.755	28.6	0.000	6	0.0	1.500	o	150	
1.001	10.136	0.507	20.0	0.000	0	0.0	1.500	o	150	
1.002	9.531	0.071	135.0	0.000	6	0.0	1.500	o	150	
1.003	36.247	0.324	111.9	0.000	0	0.0	1.500	o	150	
1.004	36.094	0.690	52.3	0.000	0	0.0	1.500	o	150	
1.005	9.292	0.069	135.0	0.000	3	0.0	1.500	o	150	
1.006	7.293	0.054	135.0	0.000	0	0.0	1.500	o	150	
1.007	29.244	0.491	59.6	0.000	0	0.0	1.500	o	150	
1.008	9.888	0.482	20.5	0.000	8	0.0	1.500	o	150	
2.000	46.275	1.361	34.0	0.000	200	0.0	1.500	o	150	
2.001	35.226	1.761	20.0	0.000	5	0.0	1.500	o	150	
2.002	10.901	0.081	134.6	0.000	5	0.0	1.500	o	150	
2.003	23.107	0.098	235.8	0.000	195	0.0	1.500	o	225	
2.004	25.222	1.264	20.0	0.000	0	0.0	1.500	o	225	
1.009	27.745	0.118	235.1	0.000	0	0.0	1.500	o	225	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	107.117	0.000	0.0	6	0.0	11	0.50	1.64	29.0	0.3
1.001	106.362	0.000	0.0	6	0.0	10	0.57	1.97	34.7	0.3
1.002	105.855	0.000	0.0	12	0.0	21	0.37	0.75	13.3	0.6
1.003	105.784	0.000	0.0	12	0.0	20	0.39	0.83	14.6	0.6
1.004	105.460	0.000	0.0	12	0.0	17	0.51	1.21	21.4	0.6
1.005	104.770	0.000	0.0	15	0.0	24	0.39	0.75	13.3	0.7
1.006	104.702	0.000	0.0	15	0.0	24	0.39	0.75	13.3	0.7
1.007	104.648	0.000	0.0	15	0.0	19	0.52	1.14	20.1	0.7
1.008	104.157	0.000	0.0	23	0.0	18	0.86	1.94	34.3	1.1
2.000	108.240	0.000	0.0	200	0.0	62	1.37	1.51	26.6	9.4
2.001	106.879	0.000	0.0	205	0.0	54	1.68	1.96	34.7	9.6
2.002	105.118	0.000	0.0	210	0.0	96	0.83	0.75	13.3	9.8
2.003	104.962	0.000	0.0	405	0.0	131	0.79	0.75	29.7	19.0
2.004	104.864	0.000	0.0	405	0.0	66	1.97	2.58	102.4	19.0
1.009	103.600	0.000	0.0	428	0.0	136	0.80	0.75	29.7	20.1

FOUL SEWERAGE DESIGN

Network Design Table for FW1 - PDS Export.FWS

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
1.010	21.277	0.091	235.0	0.000	3	0.0	1.500	o	225	
1.011	9.211	0.039	235.0	0.000	7	0.0	1.500	o	225	
1.012	16.634	0.071	235.0	0.000	0	0.0	1.500	o	225	
1.013	34.291	1.593	21.5	0.000	2	0.0	1.500	o	225	
3.000	28.025	0.208	135.0	0.000	2	0.0	1.500	o	150	
3.001	23.238	0.332	70.0	0.000	0	0.0	1.500	o	150	
3.002	12.851	0.643	20.0	0.000	4	0.0	1.500	o	150	
3.003	28.939	1.453	19.9	0.000	7	0.0	1.500	o	150	
4.000	35.578	0.404	88.1	0.000	7	0.0	1.500	o	150	
4.001	13.249	0.103	128.9	0.000	4	0.0	1.500	o	150	
3.004	13.280	0.099	134.0	0.000	4	0.0	1.500	o	150	
5.000	32.509	1.086	29.9	0.000	4	0.0	1.500	o	150	
5.001	13.165	0.663	19.9	0.000	0	0.0	1.500	o	150	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.010	103.482	0.000	0.0	431	0.0	136	0.80	0.75	29.7	20.2
1.011	103.391	0.000	0.0	438	0.0	138	0.81	0.75	29.7	20.5
1.012	103.352	0.000	0.0	438	0.0	138	0.81	0.75	29.7	20.5
1.013	103.281	0.000	0.0	440	0.0	70	1.96	2.48	98.6	20.6
3.000	104.652	0.000	0.0	2	0.0	9	0.21	0.75	13.3	0.1
3.001	104.444	0.000	0.0	2	0.0	8	0.26	1.05	18.5	0.1
3.002	104.112	0.000	0.0	6	0.0	10	0.57	1.96	34.7	0.3
3.003	103.470	0.000	0.0	13	0.0	14	0.73	1.97	34.8	0.6
4.000	102.524	0.000	0.0	7	0.0	15	0.36	0.93	16.5	0.3
4.001	102.120	0.000	0.0	11	0.0	20	0.36	0.77	13.6	0.5
3.004	102.017	0.000	0.0	28	0.0	32	0.48	0.76	13.4	1.3
5.000	103.667	0.000	0.0	4	0.0	9	0.43	1.61	28.4	0.2
5.001	102.581	0.000	0.0	4	0.0	8	0.49	1.97	34.8	0.2

FOUL SEWERAGE DESIGN

Network Design Table for FW1 - PDS Export.FWS

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
3.005	20.894	0.155	134.8	0.000	0	0.0	1.500	o	150	
1.014	17.155	0.073	235.0	0.000	0	0.0	1.500	o	225	
1.015	13.743	0.058	235.0	0.000	2	0.0	1.500	o	225	
1.016	21.770	0.093	235.0	0.000	0	0.0	1.500	o	225	
1.017	11.274	0.162	69.6	0.000	8	0.0	1.500	o	225	
6.000	34.974	0.259	135.0	0.000	5	0.0	1.500	o	150	
7.000	13.792	0.521	26.5	0.000	8	0.0	1.500	o	150	
6.001	51.228	0.379	135.0	0.000	0	0.0	1.500	o	150	
6.002	27.732	0.590	47.0	0.000	13	0.0	1.500	o	150	
6.003	10.422	0.077	135.0	0.000	5	0.0	1.500	o	150	
6.004	56.806	0.421	135.0	0.000	0	0.0	1.500	o	750	
1.018	3.254	0.024	135.0	0.000	0	0.0	1.500	o	150	
1.019	185.986	-4.482	-41.5	0.000	0	0.0	1.500	o	300	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
3.005	101.918	0.000	0.0	32	0.0	34	0.50	0.75	13.3	1.5
1.014	101.688	0.000	0.0	472	0.0	145	0.82	0.75	29.7	22.1
1.015	101.615	0.000	0.0	474	0.0	145	0.82	0.75	29.7	22.2
1.016	101.557	0.000	0.0	474	0.0	145	0.82	0.75	29.7	22.2
1.017	101.464	0.000	0.0	482	0.0	101	1.31	1.38	54.8	22.6
6.000	103.029	0.000	0.0	5	0.0	14	0.28	0.75	13.3	0.2
7.000	103.291	0.000	0.0	8	0.0	12	0.56	1.71	30.2	0.4
6.001	102.770	0.000	0.0	13	0.0	22	0.38	0.75	13.3	0.6
6.002	102.390	0.000	0.0	26	0.0	24	0.67	1.28	22.6	1.2
6.003	101.800	0.000	0.0	31	0.0	34	0.49	0.75	13.3	1.5
6.004	101.723	0.000	0.0	31	0.0	22	0.39	2.15	950.7	1.5
1.018	101.302	0.000	0.0	513	0.0	150	0.75	0.75	13.3«	24.0
1.019	101.278	0.000	0.0	513	0.0	300	0.14	0.14	9.6«	24.0

FOUL SEWERAGE DESIGN

Network Design Table for FW1 - PDS Export.FWS

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
1.020	7.073	0.021	340.0	0.000	0	0.0	1.500	o	300	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.020	105.760	0.000	0.0	513	0.0	142	0.73	0.75	53.0	24.0

Manhole Schedules for FW1 - PDS Export.FWS

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
1	108.762	1.645	Open Manhole	1350	1.000	107.117	150				
2	108.164	1.802	Open Manhole	1200	1.001	106.362	150	1.000	106.362	150	
3	107.960	2.105	Open Manhole	1350	1.002	105.855	150	1.001	105.855	150	
4	107.858	2.074	Open Manhole	1200	1.003	105.784	150	1.002	105.784	150	
5	107.505	2.045	Open Manhole	1200	1.004	105.460	150	1.003	105.460	150	
6	107.578	2.808	Open Manhole	1200	1.005	104.770	150	1.004	104.770	150	
7	107.447	2.745	Open Manhole	1200	1.006	104.702	150	1.005	104.702	150	
8	107.337	2.689	Open Manhole	1200	1.007	104.648	150	1.006	104.648	150	
9	106.880	2.723	Open Manhole	1200	1.008	104.157	150	1.007	104.157	150	
20	109.898	1.658	Open Manhole	1200	2.000	108.240	150				
21	108.550	1.671	Open Manhole	1200	2.001	106.879	150	2.000	106.879	150	
22	107.328	2.210	Open Manhole	1350	2.002	105.118	150	2.001	105.118	150	
23	106.952	1.990	Open Manhole	1200	2.003	104.962	225	2.002	105.037	150	
24	106.615	1.751	Open Manhole	1200	2.004	104.864	225	2.003	104.864	225	
10	106.852	3.252	Open Manhole	1200	1.009	103.600	225	1.008	103.675	150	
								2.004	103.600	225	
11	106.898	3.416	Open Manhole	1200	1.010	103.482	225	1.009	103.482	225	
12	106.549	3.158	Open Manhole	1200	1.011	103.391	225	1.010	103.391	225	
13	106.397	3.045	Open Manhole	1200	1.012	103.352	225	1.011	103.352	225	
14	106.160	2.879	Open Manhole	1350	1.013	103.281	225	1.012	103.281	225	
25	106.302	1.650	Open Manhole	1200	3.000	104.652	150				
26	106.321	1.877	Open Manhole	1200	3.001	104.444	150	3.000	104.444	150	
27	105.875	1.763	Open Manhole	1200	3.002	104.112	150	3.001	104.112	150	
28	105.655	2.185	Open Manhole	1200	3.003	103.470	150	3.002	103.470	150	
31	105.283	2.759	Open Manhole	1200	4.000	102.524	150				
32	105.918	3.798	Open Manhole	1200	4.001	102.120	150	4.000	102.120	150	
29	105.942	3.925	Open Manhole	1200	3.004	102.017	150	3.003	102.017	150	
								4.001	102.017	150	
33	105.617	1.950	Open Manhole	1200	5.000	103.667	150				
34	105.795	3.214	Open Manhole	1200	5.001	102.581	150	5.000	102.581	150	
30	105.781	3.863	Open Manhole	1200	3.005	101.918	150	3.004	101.918	150	
								5.001	101.918	150	
15	105.682	3.994	Open Manhole	1350	1.014	101.688	225	1.013	101.688	225	
								3.005	101.763	150	

Manhole Schedules for FW1 - PDS Export.FWS

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
16	105.764	4.149	Open Manhole	1350	1.015	101.615	225	1.014	101.615	225	
17	105.885	4.328	Open Manhole	1200	1.016	101.557	225	1.015	101.557	225	
18	105.724	4.260	Open Manhole	1500	1.017	101.464	225	1.016	101.464	225	
36	105.595	2.566	Open Manhole	1200	6.000	103.029	150				
41	105.841	2.550	Open Manhole	1200	7.000	103.291	150				
37	106.021	3.251	Open Manhole	1200	6.001	102.770	150	6.000	102.770	150	
								7.000	102.770	150	
38	105.301	2.911	Open Manhole	1350	6.002	102.390	150	6.001	102.390	150	
39	104.996	3.196	Open Manhole	1200	6.003	101.800	150	6.002	101.800	150	
43	105.000	3.277	Open Manhole	2100	6.004	101.723	750	6.003	101.723	150	
19	105.800	4.498	Open Manhole	2400	1.018	101.302	150	1.017	101.302	225	
								6.004	101.302	750	
42	105.800	4.522	Open Manhole	1200	1.019	101.278	300	1.018	101.278	150	
44	108.350	2.590	Open Manhole	1200	1.020	105.760	300	1.019	105.760	300	
UU1802	108.570	2.831	Open Manhole	0		OUTFALL		1.020	105.739	300	