A CAF GROUP COMPANY

ENVIRONMENT

Wilson Bowden Developments Ltd
Plot L, Kingsway
Rochdale
Sustainable Drainage Statement

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Plot L, Kingsway
Rochdale
Sustainable Drainage Statement

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CONTENTS

1. INTRODUCTION 5
Sustainable Drainage Guidance 6
2. EXISTING CONDITIONS 7
Existing Runoff Rates 8
Existing Runoff Volume 8
3. SURFACE WATER DRAINAGE STRATEGY 9
Drainage Hierarchy 9
Peak Flow Control 9
Modelling of Proposed Drainage System 10
Runoff Volume Control 11
Residual Risk and Designing for Exceedance 12
Water Quality 12
4. MAINTENANCE 15
5. FOUL WATER DRAINAGE 16
6. SUMMARY 17

FIGURES

Figure 1.1: Site Location
Figure 3.1: FEH Website – 1 in 100-Year, 6 Hour Rainfall Depth Rational Method

TABLES

Table 1.1: Site Details
Table 2.1: Existing Runoff Rate from the Site (3.7ha)
Table 3.1: Proposed Runoff Rates
Table 3.2: Runoff Volume Comparison
Table 3.3: Pollution Hazard Indices for Different Land Use Classifications
Table 3.4: SuDS Mitigation Indices
Table 3.5: Comparison of Pollution Hazard Rating against Proposed Mitigation Index

APPENDICES

Appendix 1: North West Pro Forma
Appendix 2: Topographical Survey
Appendix 3: United Utilities Sewer Records and As-Built Records
Appendix 4: Existing Runoff Rates
Appendix 5: Existing Runoff Volumes
Appendix 6: Site Wide Surface Water Sewer Modelling Note, Catchment Plan, Flow Rates and Correspondence with United Utilities and the LLFA
Appendix 7: Proposed Drainage Strategy
Appendix 8: Network Model Results

1. INTRODUCTION

1.1 A Sustainable Drainage Statement (SDS) sets out the principles of drainage design for a development and summarises the reasoning behind the chosen design. This includes consideration of national and local guidance, justification of specific flow rates, volumes of attenuated storage, as well as the appropriate level of treatment to be provided to surface water runoff.

1.2 This SDS has been produced by BWB Consulting on behalf of Wilson Bowden Developments Ltd in respect of Plot L at Kingsway, Rochdale. The proposed development is the erection of four industrial units/warehouses (Classes E(g)(iii), B2 and B8) with ancillary office space, new access, car parking, servicing, boundary treatments, hard and soft landscaping, drainage works and other associated development. A proposed site development plan is provided on DLA drawing ref: 2022-147_KPL-DLA-LS-XX- DR-A-90002.

1.3 This SDS is intended to support a full planning application and as such the level of detail included is commensurate and subject to the nature of the proposals. A Flood Risk Assessment (FRA) has been developed for the site (reference: PLK-BWB_ZZ-XX-RP-YE-0002_FRA) and this SDS accompanies this overarching document.

1.4 It should be noted that outline planning permission existing for development of Plot L (application reference 14/00542/OUT) and the approved parameters allow for development across the site in accordance with the approved parameters plan.

1.5 A proposed site development plan is provided on DLA drawing ref: 2022-147_KPL-DLA-LS-XX- DR-A-90002.

1.6 The location of the site is illustrated within **Figure 1.1**, with contextual information provided within **Table 1.1**.

Table 1.1: Site Details

Site Name	Plot L
Location	Kingsway Business Park, Rochdale
NGR (approx.)	SD 913116
Application Site Area (ha)	3.7 (Approx.)
Proposed Impermeable Area (ha)	2.99 (Approx.)
Development Type	Industrial
Lead Local Flood Authority	Rochdale Borough Council
Local Planning Authority	Rochdale Borough Council
Environment Agency Area	Greater Manchester, Merseyside, and Cheshire (GMC)
Sewerage Undertaker	United Utilities

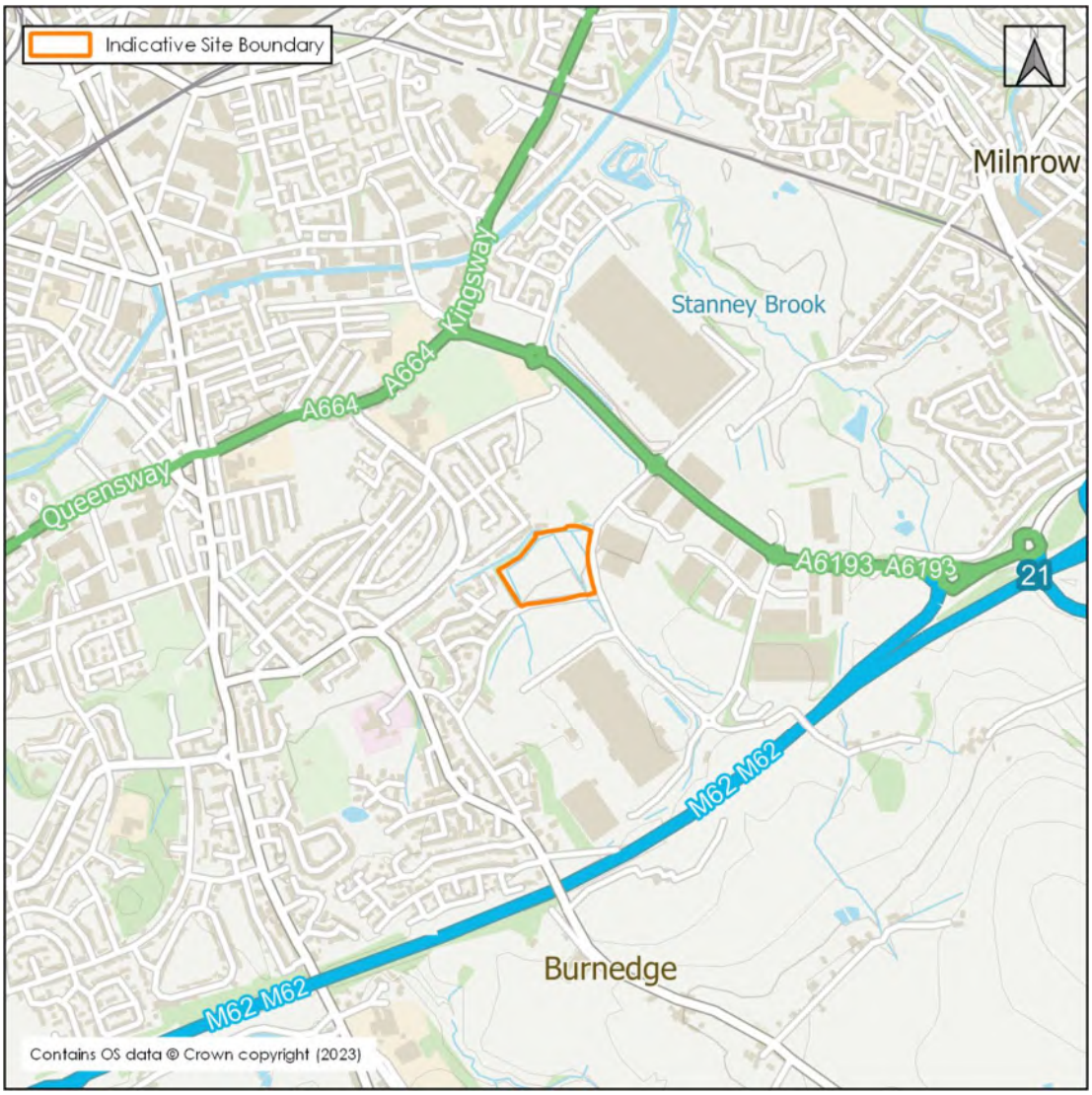


Figure 1.1: Site Location

Sustainable Drainage Guidance

1.7 Sustainable Drainage Systems (SuDS) aim to mimic a more natural runoff regime, treating and discharging water close to where it falls.

1.8 There is a North West SuDS Pro-Forma, this has been included in **Appendix 1.**

1.9 In addition to this, the Non-Statutory Technical Standards (NSTS) for Sustainable Drainage Systems[1] as published by the Department for Environment Food and Rural Affairs (DEFRA) have been utilised to inform the strategy.

[1] 2015, DEFRA. Non-statutory technical standards for sustainable drainage systems

2. EXISTING CONDITIONS

2.1 The Site is located within the Kingsway Business Park, approximately 2.2km southeast of Rochdale town centre. It is bound to the north by an Unnamed Ordinary Watercourse (UOW) and residential dwellings on Neston Road, to the east by John Milne Avenue, to the south by a cycle way and the wider Business Park and to the west by residential development on Wrenbury Drive. It is currently entirely undeveloped.

2.2 A topographical survey has been undertaken and is included as **Appendix 2**. The existing Site comprises greenfield land with levels generally falling from the south to the north. Levels range from 151.92m Above Ordnance Datum (AOD) in the southeast of the Site and fall to a low of approximately 146.45m AOD in the northwest of the Site.

2.3 The Site is considered to drain via a natural regime of infiltration and surface runoff. During extreme rainfall events where infiltration potential is exceeded, runoff is expected to flow overland towards the culvert in the north of the Site.

2.4 There is an existing ditch which flows through the Site from the southern boundary, depths vary between 0.4m to 0.9m deep. The ditch is culverted (600mm in diameter) under James Kearns Avenue and is understood to intercept overland flows from the M62 south of the development. Further details of the wider catchment and hydrology can be found within the FRA (reference: PLK-BWB-ZZ-XX-RP-YE-0002_FRA).

2.5 Much of the site wide drainage infrastructure for the business park has already been constructed, which acts to serve future plots as developments are brought forward. There are surface water and foul water sewers within John Milne Avenue and James Kearns Avenue which have been adopted by United Utilities (UU). As built records of the wider drainage infrastructure and UU sewer record plans are included as **Appendix 3.**

2.6 Within John Milne Avenue the 300mm diameter foul sewer is shown to discharge in a north-easterly direction towards an existing pumping station. The 1200mm diameter surface water sewer is shown to discharge in an north-easterly direction towards the existing attenuation pond approximately 1.1km northeast of the Site.

2.7 A Phase 2 Geo-Environment Assessment was undertaken by BWB Consulting (reference: PLK-BWB-ZZ-XX-RP-YE-0003_PH2). Findings from the investigation are summarised below:

- The ground conditions were generally recorded as topsoil overlying the soils of Hummocky Glacial Deposits. Topsoil thickness ranged from 0.30m and 0.60m, with the Hummocky Glacial Deposit thickness not proven, recorded to depths of at least 10.45m bgl (depth of borehole termination).
- Made Ground was found above natural superficial deposits in TP203, TP204, and TP206 (thicknesses ranging from 1.00m to 1.80m) and in 2018 exploratory holes TP08, TP15 and TP16 (maximum depth not proved; to 3.5m in TP16, but typically less than 0.8m depth). It is generally seen in the south and east of the site, but is not thought to be laterally consistent. Bedrock was not encountered during the investigation.
- Groundwater is perched on clay layers and at the surface, and a water table is present around 149.5mAOD in the south-east, falling to around 144.5mAOD towards the north-west.

Existing Runoff Rates

2.8 An assessment of the existing surface water runoff rates from the Site has been undertaken and is summarised within **Table 2.1**. Calculations are included within **Appendix 4**.

2.9 The runoff rates have been estimated using the IH124 method, with appropriate prorated adjustments for a site of less than 50ha, as recommended in Interim Code of Practice for Sustainable Drainage[2]. This was undertaken within Micro Drainage, which makes the necessary adjustments for small sites automatically.

Table 2.1: Existing Runoff Rate from the Site (3.7ha)

Return Period (Yrs.)	Runoff Rate (l/s)
1	2.3
Mean Annual Flow Rate (QBAR)	2.6
30	4.4
100	5.4

Existing Runoff Volume

2.10 An assessment of the existing surface water runoff rates from the Site has been made for a 1 in 100-year, 6-hour storm.

2.11 As the existing site is permeable, the runoff volume has been calculated using the Source Control module within Micro Drainage to be **891m³**, results are included within **Appendix 5**.

[2] The National SUDS Working Group (2004), Interim Code of Practice for Sustainable Drainage

3. SURFACE WATER DRAINAGE STRATEGY

3.1 The proposed development forms part of the wider Kingsway Business Park development which was granted outline planning permission in 2014 under reference 14/00542/OUT. This SDS has been progressed based on the criteria set out in the FRA (Ref: MCT/2014/FRA) for the wider site which will be referenced, as appropriate, within this report. Subsequent works by BWB have confirmed that the principles set out in the original FRA have been followed in terms of the as-built infrastructure.

Drainage Hierarchy

3.2 The Planning Policy Guidance[3] and the SuDS Manual[4] identify that surface water runoff from a development should be disposed of as high up the following hierarchy as reasonably practicable:

i. into the ground (infiltration);
ii. to a surface water body;
iii. to a surface water sewer, highway drain, or another drainage system;
iv. to a combined sewer.

3.3 The aim of this is approach is to manage surface water runoff close to where it falls and mimic natural drainage as closely as possible.

3.4 A Technical Note (TN) produced by BWB (ref: PLK-BWB-GEN-XX-TN-D-0001_Project Technical Note – Ground Solutions) states that the Site has a high groundwater level that fluctuates seasonally and thus infiltration type drainage is not viable.

3.5 As outlined previously, there is a network of existing sewers that have been designed and installed to service all future plots of Kingsway Business Park for all storm events up to the 1 in 100-year using Flood Studies Report (FSR) rainfall data and no allowance for climate change.

3.6 The existing drainage discharges east towards an existing attenuation pond with flows ultimately discharging to Stanney Brook. While the immediate discharge point doesn't follow the above hierarchical approach, the wider drainage strategy discharges flows to a watercourse and as such the approach is considered to satisfy this criterion.

Peak Flow Control

3.7 In order to comply with the Non-Statutory Technical Standards for Sustainable Drainage Systems S2-S3[5], runoff from greenfield developments should not exceed the equivalent greenfield rates for the equivalent return period events.

3.8 As previously stated, the wider infrastructure has been designed and installed to accommodate the 1 in 100-year storm event, with flows being restricted at the

[3] Planning Practice Guidance. http://planningguidance.planningportal.gov.uk/.
[4] The SuDS Manual (C753). CIRIA 2015.
[5] 2015, DEFRA. Non-statutory technical standards for sustainable drainage systems

downstream attenuation features. The proposed catchment for Plot L, amongst others, is served by the basin in 'Catchment 2' of the site wide drainage network. The restricted outflows from the attenuation features are controlled in such a way that the 1 in 10, 30, 50 and 100-year rainfall events do not exceed that of the predeveloped discharge rates.

3.9 BWB have previously undertaken three site wide drainage assessments across the business park which demonstrate the installed drainage networks and downstream attenuation has been designed and installed to accommodate the 100-year storm event for all future developments at the site. A summary note of the findings from the three assessments (ref KBP-BWB-ZZ-XX-RP-CD-0004) is included as **Appendix 6**. A subsequent drawing (ref: KBP-BWB-ZZ-XX-DR-CD-0005) has been produced by BWB Consulting Ltd, this drawing shows the allowed peak flow rate of each plot within their respective catchments. Included within **Appendix 6** is email correspondence with United Utilities and Rochdale Council showing that they both find this approach acceptable.

3.10 Surface water drainage for Catchment 2 flows in a northerly direction to an attenuation basin where the flows are restricted and then outfall to the Stanney Brook. Based on the aforementioned drainage study the existing sewers and downstream attenuation have capacity to accept a maximum allowable discharge rate from Plot L of 1,175 l/s.

3.11 Following the completion of the on plot hydraulic calculations has been found that the current proposed peak discharge rate from Plot L is lower than the maximum allowable rate of 1,175 l/s. The modelled discharge rates for various return periods are outlined within **Table 3.1**.

Table 3.1: Proposed Runoff Rates

Return Period (Yr.)	Proposed Discharge Rate (l/s)
2	288
30 + 45%	856
100	764
100 + 45%	994

3.12 It is envisaged that the drainage design will undergo future design iterations, however, the proposed peak flow rate will not exceed the maximum allowable rate of 1,175 l/s.

3.13 Considering the downstream infrastructure restricts flows to the equivalent pre-developed runoff rates and proposals do not increase flows above what was designed for and consented, the site is considered to fulfil the necessary peak runoff control criteria.

Modelling of Proposed Drainage System

3.14 A MicroDrainage network model of the proposed surface water drainage network for the main development has been produced based upon the Drainage Strategy

presented within **Appendix 7**. Results from the critical storms using both FSR and Flood Estimation Handbook (FEH) rainfall methodologies are included within **Appendix 8**.

3.15 Based upon the Micro Drainage network model outputs, there is no requirements for on plot attenuation with peak discharge rates never exceeding the maximum allowable rate of 1,175 l/s. The pipe network has been sized such that no flooding will occur up to the 1 in 30-year event. Simulations identify limited flooding during the 1 in 100-year plus climate change event, however, this will be contained within the Site.

Runoff Volume Control

3.16 The Non-Statutory Technical Standards for Sustainable Drainage Systems S4-S6[6] states that where reasonably practical the runoff volume from a development for the 1 in 100-year 6-hour rainfall event should not exceed the runoff volume prior to development or redevelopment. Additionally, if practicable on previously developed sites, the runoff volume should not exceed the equivalent greenfield runoff volume. Where it is not reasonably practicable to constrain the volume of runoff from a development at or below the existing volume, then the runoff must be discharged in a manner that does not adversely affect flood risk, i.e.:

i. The additional runoff volume resulting from the development (the 'long term storage volume') should be discharged separately from the site at a rate of 2 l/s/ha or less. Or,

ii. All the runoff volume from the development should be discharged at a rate equivalent to the mean annual flow rate (QBAR) rate under greenfield conditions or less. Or,

iii. All the runoff volume from the development should be discharged at a rate of 2 l/s/ha or less.

3.17 The rainfall data is provided in **Figure 3.1,** was used to calculate the proposed runoff volume for the impermeable area. This was taken from the FEH website.

[6] 2015, DEFRA. Non-statutory technical standards for sustainable drainage systems

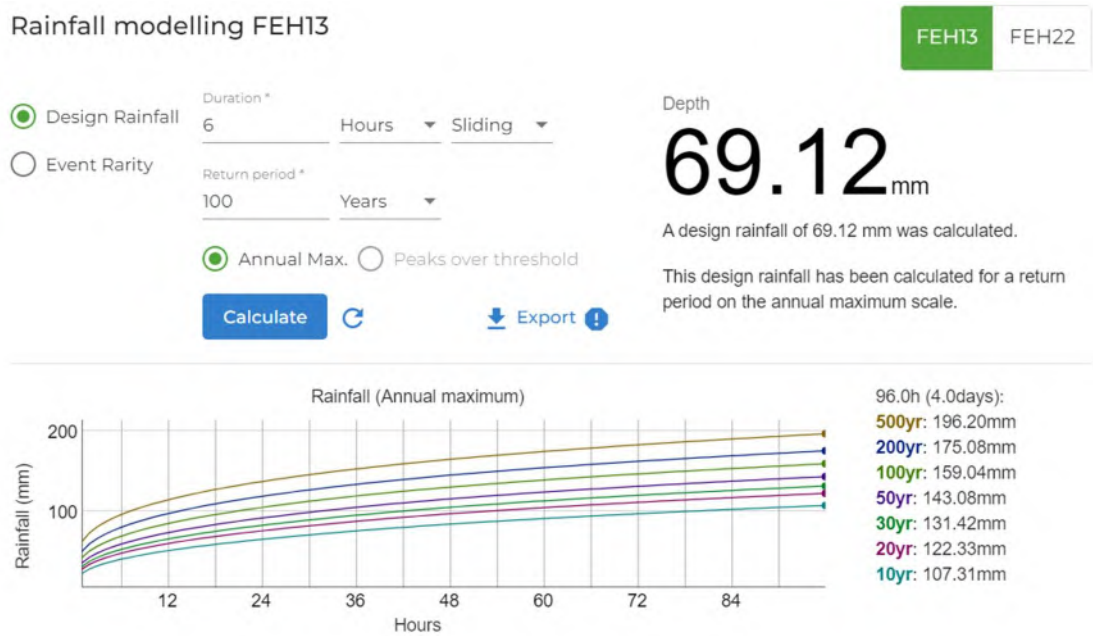


Figure 3.1: FEH Website – 1 in 100-Year, 6 Hour Rainfall Depth Rational Method

Table 3.2: Runoff Volume Comparison

Existing Volume (m^3)	Proposed Volume (m^3)	Difference (m^3)
891	2,237	1,346

3.18 The 1 in 100-year 6-hour storm runoff volume from the site has been shown to increase as a result of the proposed development. However, the runoff volume from the development will be discharged at a rate equivalent pre-developed runoff rates downstream of the site.

Residual Risk and Designing for Exceedance

3.19 The proposed system has been designed to accommodate all flows during the 1 in 30-year event, during the 1-100-year event some minor surface flooding is identified in the detailed hydraulic modelling.

3.20 Exceedance flows will generally be contained within the low-lying docking ports of the service yards.

Water Quality

3.21 In accordance with the SuDS Manual a simple index approach to water quality risk management should be undertaken for the Proposed Development. This will be compiled to provide a comprehensive account of the water quality treatment provided by the proposed surface water drainage system.

3.22 The SuDS Manual Mitigation Index will be used to assess the treatment levels proposed in relation to the pollution hazard posed from the proposed land use(s). This methodology is adopted to ensure that surface water flows receive adequate treatment through all areas of the Site prior to final outfall.

3.23 **Table 3.3** shows the pollution hazard indices for the land use classification(s) that are relevant to the Proposed Development, as described within Table 26.2 in the SuDS Manual.

Table 3.3: Pollution Hazard Indices for Different Land Use Classifications

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Commercial roofs	Low	0.3	0.2	0.05
Non-residential parking	Medium	0.7	0.6	0.7
Service yards	High	0.8	0.8	0.9

3.24 The SuDS Mitigation Indices that are relevant to the Proposed Development, as described within Table 26.3 of the SuDS Manual, are outlined in **Table 3.4**.

Table 3.4: SuDS Mitigation Indices

Type of SuDS Component	Mitigation Indices		
	TSS	Metals	Hydrocarbons
Commercial Roof			
Site Wide Attenuation Pond	0.7	0.7	0.5
Service yard			
Full Retention Separator *	0.8	0.6	0.9
Site Wide Attenuation Pond	0.7	0.7	0.5
Non-residential Parking			
Bypass Separator *	0.8	0.6	0.9
Site Wide Attenuation Pond	0.7	0.7	0.5

* The Mitigation Indices for the separator are based on a SPEL ESR Separator Range.

3.25 The pollution hazard rating and proposed SuDS Mitigation Index for the Site is compared within **Table 3.5**. Where more than one SuDS component is proposed, a factor of 0.5 should be applied to the downstream (i.e., secondary and/or tertiary) treatment stages to account for the reduced performance due to reduced inflow concentrations.

Table 3.5: Comparison of Pollution Hazard Rating against Proposed Mitigation Index

Pollution Type	Pollution Hazard Rating*	Proposed Mitigation Index	Sufficient Treatment Provided?
Commercial Roof			
TSS	0.3	0.7	✓
Metals	0.2	0.7	✓
Hydrocarbons	0.05	0.5	✓
Service Yard			
TSS	0.8	1.15	✓
Metals	0.8	0.95	✓
Hydrocarbons	0.9	1.15	✓
Non-residential Parking			
TSS	0.7	1.15	✓
Metals	0.6	0.95	✓
Hydrocarbons	0.7	1.15	✓

3.26 Based on the above assessment, the proposed drainage strategy is considered to provide an appropriate level of treatment to surface water prior to discharge from the wider site.

4. MAINTENANCE

4.1 The maintenance responsibility if the drainage and SuDS features should be undertaken by the site operator or a suitably appointed management company.

4.2 Requirements for ongoing maintenance of the drainage network should form part of the Operation and Maintenance manual for the site and should be undertaken by the site management. Any specialist or proprietary products that are specified at detailed design should have a manufacturer specific maintenance regime which should be included within the document.

4.3 It is envisaged that the Operation and Maintenance manual will be developed once the proprietary products have been specified, but some examples are included below.

i. All drainage features should be located in open areas which are readily accessible.
ii. Gullies should be inspected and de-silted at least once a year, where necessary.
iii. Pipes, manholes and silt traps should be inspected and de-silted at least once a year, where necessary.

4.4 It is understood that the site wide drainage network has been adopted by UU through a Section 104 agreement and that catchment 2 basin have been adopted by Rochdale Borough Council. Therefore, arrangements for the maintenance of the site wide drainage infrastructure are already in place.

5. FOUL WATER DRAINAGE

5.1 It is proposed to connect foul flows generated by the four industrial units into the existing 300mm diameter foul sewer within John Milne Avenue to the east. When the access road and associated drainage was built there were spur connections created to allow for a connection, this will be the point of connection from the development to the existing system.

5.2 As built records of the wider drainage infrastructure and UU sewer record plans are included as **Appendix 3.**

5.3 A foul layout drawing (ref: PLK-BWB-XX-DR-D-0500) for the development is included as **Appendix 7**.

6. SUMMARY

6.1 This statement and supporting appendices demonstrate that the drainage design for the development will comply with the relevant local and national standards, specifically the hierarchy of discharge and runoff rate. This statement and supporting appendices demonstrate that the drainage design for the development is appropriate for the surrounding infrastructure.

6.2 This SDS is intended to support a full planning application and as such the level of detail included is commensurate and subject to the nature of the proposals.

6.3 Attenuation within the wider Kingsway Business Park has been designed such that up to the 1 in 100-year event can be accommodated in the existing ponds. A detailed drainage study of this Catchment, reference KBP-BWB-ZZ-XX-RP-CD-0003 has previously been agreed with Rochdale Borough Council's drainage engineer and UU. Based on this hydraulic modelling exercise the existing sewers and downstream attenuation feature have capacity to allow a maximum discharge rate of 1,175 l/s from Plot L.

6.4 Following the completion of the on plot hydraulic calculations it was found the peak discharge rate from Plot L was lower than the allowable rate of 1,175 l/s.

6.5 The proposed development of Plot L will utilise existing attenuation basin in catchment 2 of the site wide drainage network.

6.6 The completed North West Proforma is provided as **Appendix 1.**

APPENDICES

Appendix 1: North West Pro Forma

NORTH WEST SuDS PRO-FORMA

This pro-forma is a requirement for any planning application for major development[1].

It supports applicants in summarising and confirming how surface water from a development will be managed sustainably under current and future conditions.

Your sustainable drainage system should be designed in accordance with **CIRIA The SuDS Manual C753** and any necessary adoption standards.

HOW TO COMPLETE

Blue Box	Instruction/ Question
Orange Box	Evidence Required
White Box	To be completed by Developer / Consultant

1. Complete ALL white boxes
2. Submit this pro-forma to the Local Planning Authority, along with:
- Sustainable Drainage Strategy
- Site Specific Flood Risk Assessment (if required)
- Minimum supporting evidence, as indicated in orange boxes of this pro-forma.

GUIDANCE TO SUPPORT YOU

The pro-forma should be completed in conjunction with 'Completing your SuDS Pro Forma Guide.'

The pro-forma can be completed using freely available tools such as **Tools for Sustainable Drainage Systems** or appropriate industry standard surface water management design software.

[1] *as defined in Section 2 of **Statutory Instrument 2015 No. 595** or on sites of 0.5 hectares in Critical Drainage Areas.*

SECTION 1. APPLICATION & DEVELOPMENT DETAILS

Planning Application Reference *(if available)*	
State type of planning application *i.e. Pre-application, Outline, Full, Hybrid, Reserved Matters** **Information only required if drainage is to be considered as part of reserved matters application*	Full
Developer(s) Name:	Wilson Bowden Developments Ltd
Consultant(s) Name:	BWB Consulting
Development Address *(including postcode)*	Kingsway Business Park, Rochdale, OL16 4NR
Development Grid Reference *(Eastings/Northings)*	SD 913116
Total Development Site Area (Ha)	3.7
Drained Area (Ha)* of Development	2.99
Please indicate the flood zone that your development is in. Tick all that apply. *Based on the Environment Agency Flood Map for Planning and the relevant Local Authority Strategic Flood Risk Assessment (to identify Flood Zones 3a/3b).*	Flood Zone 1 ☑ Flood Zone 2 ☐ Flood Zone 3a ☐ Flood Zone 3b ☐
What is the surface water risk of the site? Tick all that apply. *Based on the Environment Agency Surface Water Flood Map.*	High ☑ Medium ☑ Low ☑
Have you submitted a Site Specific Flood Risk Assessment (FRA)? *See separate guidance notes for clarification on when a FRA is required*	Yes ☑ No ☐
Have you submitted a Sustainable Drainage Strategy?	Yes ☑ No ☐
Does your drainage proposal provide multi-functional benefits via SuDS?	Yes ☑ No ☐
Expected Lifetime of Development *(years)* *Refer to Planning Practice Guidance "Flood Risk and Coastal Change" Paragraph 026*	60

Development Type: four industrial units/warehouses (Classes E(g)(iii), B2 and B8) with ancillary office space, new access, car parking, servicing, boundary treatments, hard and soft landscaping, drainage works and other associated development		**State Proposed Number of Residential Units / Quantum of commercial floorspace**
Greenfield Site • *Site is wholly undeveloped, and a new drainage system will be installed*	☑	12,984 sqm
Previously Developed/ Brownfield Site • *Site is already developed, and the <u>entirety</u> of the existing surface water drainage system will be used to serve the new development (evidence must be provided to prove existing surface water drainage system is reusable);* ***<u>OR</u>*** • *Where records of the previously developed system are not available so that the hydraulic characteristics of the system cannot be determined or where the drainage system is not in reasonable working order i.e. broken, blocked or no longer operational for other reasons, then one of the approaches outlined in Section 24.5 of The SuDS Manual (C753) should be adopted.*	☐	

Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 1.	PLK-BWB-ZZ-XX-RP-CD-0001-SDS PLK-BWB-ZZ-XX-RP-YE-0002-FRA

SECTION 2: IMPERMEABLE AREA AND EXISTING DRAINAGE

	Existing (E)	Proposed (P)	Change (P – E)
State Impermeable Area (Ha)	0	2.99	2.99
Evidence Required: Plans showing development layout of site with existing and proposed impermeable areas.			☑

Are there existing sewers, watercourses, water bodies, highway drains, soakaways or filter drains on the site?	Yes ☑ No ☐ Don't Know ☐
Evidence Required: Plan(s) showing existing layout to include all: • Watercourses, open and culverted • Water bodies – ponds, swales etc. • Sewers, including manholes • Highway drains, include manholes, gullies etc. • Infiltration features - soakaways, filter drains etc.	☑

Drainage Design *Outline planning applications should be able to demonstrate that a suitable drainage system is achievable.* *All other type of planning application should provide full details or reference to previous planning application where drainage details have been submitted or approved.*	
Select which design approach you are taking to manage water quantity *(refer to Section 3.3 SuDS Manual)* **Approach 1 – Volume control / Long Term Storage (Technical Standards S2/3, S4/5)** • *The attenuated runoff volume for the 1 in 100 year 6 hour event (plus climate change allowance) is limited to the greenfield runoff volume for the 1 in 100 year 6 hour event, with any additional runoff volume utilising long term storage and either infiltrated or released at 2 l/s/ha* • *The discharge rate for the critical duration 1 in 1 year event is restricted to the 1 in 1 year greenfield runoff rate* • *The discharge rate for the critical duration 1 in 100 year event (plus climate change allowance) is restricted to the 1 in 100 year greenfield runoff rate* **Approach 2 – Qbar (Technical Standards S6)** • *Justification has been provided that the provision of volume control/long term storage is not appropriate and an attenuation only approach is proposed. All events up to the critical duration 1 in 100 year event (plus climate change allowance) are limited to Qbar (1 in 2 year greenfield rate) or 2 l/s/ha, whichever is greater.*	☐ ☑
Evidence Required: Plans showing: • Existing flow routes and flood risks • Modified flow routes • Contributing and impermeable areas • Current (if any) and proposed 'source control' and 'management train' locations of sustainable drainage components (C753 Chapter 7) • Details of drainage ownership • Details of exceedance routes (Technical Standards S9) • Topographic survey • Locations and number of existing and proposed discharge points	☑

Note consideration should be given to manage surface water from both impermeable and permeable surfaces (including gardens and verges) likely to enter the drainage system.	

Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 2.	PLK-BWB-ZZ-XX-RP-CD-0001-SDS

SECTION 3: PEAK RUNOFF RATES – TECHNICAL STANDARDS S2, S3 AND S6 (UNLESS S1 APPLIES)

Rainfall Event	Existing Rate (l/s)	Greenfield Rate (l/s)	Proposed Rate (l/s) *Previously developed sites - In line with S3 should be equivalent to Greenfield runoff rates – discuss with LLFA if this is not achievable pre-application*
Qbar *(Approach 2)*	Proposed flow rates have been set to discharge at no greater than the 1 in 100yr event in line within the wider strategy. Downstream controls restrict the entire development to the equivalent greenfield rates on a catchment basis.	2.6	
1 in 1 Year Event *(Approach 1)*		2.3	288
1 in 30 Year Event		4.4	(+45% cc) 856
1 in 100 Year Event* *(Approach 1)*		5.4	(+45% cc) 994

** Total discharge at the 1 in 100 year rate should be restricted to the greenfield runoff volume for the 1 in 100 Year 6 hour event with additional volumes (long-term storage volume) released at a rate no greater than 2 l/s/ha where infiltration is not possible. The climate change allowance should only be applied to the proposed rate and not the existing or greenfield rate.*

Evidence Required: Methodology used to calculate peak runoff rate clearly stated and justified.	☑
Impermeable areas plan, supported by topographical survey confirming positive drainage.	☑
Hydraulic calculations and details of software used.	☑

State the hydraulic method used in your calculations *(Refer to Table 24.1 of The SuDS Manual)*	IH124

Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 3.	PLK-BWB-ZZ-XX-RP-CD-0001-SDS

SECTION 4: DISCHARGE VOLUME – TECHNICAL STANDARDS S4, S5 AND S6 (UNLESS S1 APPLIES)

Rainfall Event	Existing Volume (m^3)	Greenfield Volume (m^3)	Proposed Volume (m^3)
1 in 100 Year 6 Hour Event *(Approach 1)*	891	891	2237
Does the below statement apply to your development proposal? Long term storage is not achievable on this site and, in accordance with S6 of the Non Statutory Technical Standards for SuDS, the surface water discharge rates for events up to and including the 1 in 100 year critical event are limited to Qbar (Approach 2)			Yes ☑ No ☐
Evidence Required: Approach to managing the quantity of surface water leaving the site clearly stated and justified			☑
Methodology used to calculate discharge volume clearly stated and justified.			☑
Hydraulic calculations and details of software used.			☑

Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 4.	PLK-BWB-ZZ-XX-RP-CD-0001-SDS

SECTION 5: STORAGE – TECHNICAL STANDARDS S7 AND S8

State climate change allowance used (%)	45
State housing density (houses per ha)	N/A
State urban creep allowance used (%)	0
Evidence Required: State / used in appropriate industry standard surface water management design software.	☑

State storage volume required (m^3) *(excluding non-void spaces)* *Must include an allowance for climate change and urban creep*	Sufficient storage provided within the proposed sewer network/ manholes
Have you incorporated interception into your design? *(Refer to Chapter 24 of The SuDS Manual C753)* *Where possible, infiltration or other techniques are to be used to try and achieve zero discharge to receiving waters for rainfall depths up to 5mm.*	Yes ☐ No ☑
Evidence Required: Drainage plans showing location of attenuation and all flow control devices and supporting calculations.	☑

Summarise how storage will be provided for 1 in 30 year event on site. *Storage must be designed to ensure that at no flooding occurs onsite in a 1 in 30 year event except in designed areas **and** no flooding occurs offsite in a 1 in 100 year (plus climate change allowance) event.*	Sufficient storage provided within the proposed sewer network/ manholes
Summarise how storage will be provided for 1 in 100 year (plus climate change) event on site. *Where storage above the 1 in 30 year rainfall event is provided in designated areas designed to accommodate excess surface water volumes, plans showing storage locations and surface water depths and supported by calculations used in appropriate industry standard surface water management design software. It is important to run a range of duration events to ensure the worst case condition is found for each drainage element on the site*	Sufficient storage provided within the proposed sewer network/ manholes
Evidence Required: Plans showing size and location of storage and supporting calculations. Where there is controlled flooding, extents and depths must be indicated.	☑

Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 5.	PLK-BWB-ZZ-XX-RP-CD-0001-SDS

SECTION 6: WATER QUALITY PROTECTION

Contaminated surface water run-off can have negative impacts on the quality of receiving water bodies. The potential level of contamination will influence final the design of an appropriate treatment train as part of your sustainable drainage system.

Is the proposal site known to be or potentially contaminated?	Yes ☐ No☑
• *If the site is contaminated, it should be demonstrated that the sustainable drainage system will not increase the risk of pollution to controlled waters though the mobilisation of contaminants and/or creation of new pollution pathways.*	

Confirm the *Pollution Hazard Level* of the proposed development - Tick ALL that apply

Refer to Pollution Hazard Indices for different Land Use Classifications in Table 26.2 of The SuDS Manual C753 for further guidance.

Pollution Hazard Level *Tick ALL that apply*		**Surface water run-off from the proposed development will drain from:**
VERY LOW	☐	• Residential roofs
LOW	☑	• Other roofs (typically commercial/industrial roofs) • Individual property driveways, residential car parks, low traffic roads (e.g. cul de sacs, home-zones and general access roads) • Non-residential car parking with infrequent change (e.g. schools, offices) i.e. < 300 traffic movements/day
MEDIUM	☑	• Commercial yard and delivery areas • Non-residential car parking with frequent change (e.g. hospitals, retail) • All roads except low traffic roads and trunk roads/motorways[2]
HIGH	☑	• Sites with heavy pollution (e.g. haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites) • Sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured • Industrial sites • Trunk roads and motorways[1]

If the development's Pollution Hazard Level is 'Very Low' or 'Low', has the sustainable drainage design been risk assessed and appropriate mitigation measures included?	Yes ☑ No☐
• *If the proposed development has a very low or low polluting potential, you should design your sustainable drainage system to include an appropriate treatment train in accordance with The SuDS Manual (C753).*	

If the development's Pollution Hazard Level is 'Medium' or 'High', is the application supported by a detailed water quality risk assessment?	Yes ☑ No☐
• *If the proposed development has a high polluting potential, a detailed risk assessment will be required to identify an appropriate SuDS treatment train and ensure compliance with Paragraph 170 of the National Planning Policy Framework.* • *If the proposed development has a medium polluting potential, a detailed risk assessment may be required depending on the nature, scale and location of the development.*	

Has pre-application advice on water quality been obtained from the Environment Agency?	Yes ☐ No☑
If YES, provide details:	

Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 6.	PLK-BWB-ZZ-XX-RP-CD-0001-SDS

[2] Motorways and trunk roads should follow the guidance and risk assessment process set out in Highways Agency (2009).

SECTION 7: DETAILS OF YOUR SUSTAINABLE DRAINAGE SYSTEM

a) Function of your Sustainable Drainage System

Do your proposals store rainwater for later use (as a resource)?	Yes ☐ No ☑
Evidence Required: Please provide a brief sentence in the adjacent white box to describe how this function has been achieved.	

Do your proposals promote source control to manage rainfall close to where it falls? (e.g. promoting natural losses through soakage, infiltration and evapotranspiration)	Yes ☑ No ☐
Evidence Required: Please provide a brief sentence in the adjacent white box to describe how this function has been achieved.	Flows leaving the site will be lower than the allowable rate into the UU network

Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 7a.	PLK-BWB-ZZ-XX-RP-CD-0001-SDS

b) Hierarchy of Drainage Options – Planning Practice Guidance

The proposed method of discharge are set out within order of priority. Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable.

Proposed method of surface water discharge	**Is this proposed?**
Hierarchy Level 1: Into the ground (via infiltration)	Yes ☐ No ☑

	If YES - Evidence Required		**If NO – Evidence Required** **Tick ALL that apply**
☐	**A.** Completed Infiltration Checklist from The SuDS Manual (C753) Appendix B *An editable version of this form is available on SusDrain website.*	☑	A. Site investigation to demonstrate that the ground is not free draining. Test results to be provided in accordance with: • The methodology within BRE 365 (2016), ***OR*** • Falling head permeability tests BS EN ISO 22282-2: 2012
☐	**B.** British Geological Survey (BGS) Infiltration SuDS Map	☑	B. NOTE: where an applicant is unable to access a site to undertake testing, e.g. where unable to access a site for an outline application, they can submit a *SuDS GeoReport or similar.*
☐	**C.** Infiltration testing to BRE 365 (2016) or falling head permeability tests to BS EN ISO 2228-2: 2012 ***(optional for outline)***	☑	C. Evidence to confirm that infiltration to ground would result in a risk of deterioration to ground water quality.
☐	'Plan B' sustainable drainage plan and statement of approach with an alternative discharge method, in case infiltration proposals are proven not feasible upon further site specific ground investigation e.g. to consider seasonal variations to groundwater.	☑	D. Geotechnical advice from a competent person* which determines that infiltration of water to ground would pose an unacceptable risk of geohazards to the site and/or local area. **Note: Competent person may include a Chartered Engineer, Chartered Geologists, Registered Ground Engineering Professionals (RoGEP).*

Proposed method of surface water discharge	Is this proposed?
Hierarchy Level 2: To a surface water body *(select type)* ***NOTE:*** *Consent from LLFA or Permit from Environment Agency may be required – refer to guidance*	Yes No ✔ N/A ☐ Main river ☐ Canal ☐ Ordinary watercourse ☐ Other water body

	If YES - Evidence Required		If NO – Evidence Required **Tick ALL that apply**
☐	Surface water body / watercourse survey and report	☑ ☑	Plan showing nearby watercourses and waterbodies **AND** Statement providing justification in your Sustainable Drainage Strategy ***Note:*** *Where third party land is cited as a barrier, you should provide visibility of discussions held to date with the riparian landowner of the waterbody.*

Proposed method of surface water discharge	Is this proposed?
Hierarchy Level 3: To a surface water sewer. N.B. Trafford will not accept surface water drainage to a highway drain	Yes ✔ No N/A ☑ Surface water sewer

	If YES - Evidence Required		If NO – Evidence Required **Tick ALL that apply**
☑	Written correspondence from Water and Sewerage Company regarding proposed connection.	☐ ☐	Plan showing nearby sewers **AND** Statement providing justification in your Sustainable Drainage Strategy

Proposed method of surface water discharge	Is this proposed?
Hierarchy Level 4: To combined sewer	Yes ☐ No ☐ N/A ☑

	If YES - Evidence Required	If NO – Evidence Required
☐	Written correspondence from Water and Sewerage Company	N/A

Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 7b.	PLK-BWB-ZZ-XX-RP-CD-0001-SDS

c) Proposed SuDS Component Types

	Tick ALL that apply				
Within property boundary	☐ Rainwater harvesting	☐ Green/ blue roofs	☐ Pervious pavements *[**Type:** A ☐ B ☐ C ☐]*	☐ Soakaway	☐ Bio retention systems

	Tick ALL that apply				
Within development site boundary *(not property)*	☐ Infiltration system *[**Type:** ☐ Surface level ☐ Below ground]*		☐ Filter strips	☐ Filter drains	☐ Swales
	☐ Bio retention system	☑ Detention basins	☐ Ponds and wetlands	☐ Attenuation tanks/ Oversized pipes	☑ Other (state below)
	If 'Other' please state: Due to the nature of the development a number of seperators are proposed to treat flows from the higher risk areas				

Off site *(not within the boundary of the proposed development)*	***Please state:*** Further treatment, flow & volume control is provided by the downstream attenuation pond prior to discharge into the wider catchment.

I confirm that the above selected components have been designed in accordance with The SuDS Manual (C753).	I confirm ☑
I confirm that the management of flows resulting from rainfall in excess of a 1 in 100 year plus climate change rainfall event, and their exceedance route(s), has been fully considered in order to minimise the risks to people, property (new and existing) and infrastructure.	I confirm ☑

Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 7c.	PLK-BWB-ZZ-XX-RP-CD-0001-SDS

SECTION 8: OPERATION AND MAINTENANCE – TECHNICAL STANDARD S12 AND NATIONAL PLANNING POLICY FRAMEWORK

The applicant is responsible for ensuring that ALL components selected in Section 7 can be maintained for the lifetime of the development. The information required below will enable the developer to demonstrate the maintenance arrangements to the Local Planning Authority and will allow the Local Planning Authority to consider how it will be secured (e.g. via planning condition or planning obligation).

	Information Provided?
Management Plan	Yes ☑ No ☐
Evidence Required: **Plan/ drawing provided to show the position of the different SuDS components with:** • Key included to identify any of the adopting bodies that you will be offering your sustainable drainage components for adoption *(relates to maintenance and management arrangements below).* • Plan/ drawing to identify any areas where certain activities are prohibited, detailing reasons why. **Action plan for accidental pollutant spillages.**	☐ ☐

	Information Provided?
Maintenance Schedule	Yes ☑ No ☐
Evidence Required: A copy of the maintenance schedule including: 1. **Proactive and preventative maintenance** Detailing regular, occasional and remedial maintenance activities including recommendations for inspection and monitoring. This should include recommended frequencies, advice on plant/ machinery required and an explanation of the objectives for the maintenance proposed and potential implications of not meeting them. 2. **Reactive and corrective maintenance** (e.g. product repair and replacement). Including advice on excavations, or similar works, in locations that could affect the SuDS components/ adjacent structures.	☐

	Information Provided?
Maintenance and Management Arrangements	Yes ☑ No ☐
Evidence Required: Evidence of formal agreement with the party responsible for undertaking maintenance. Please select any of the adopting bodies that you will be offering your sustainable drainage components for adoption. Tick all that apply. ☐ **Water and Sewerage Company** *Section 104 agreement (Water Industry Act 1991)* ☐ **Local Authority Public Open Space** *[Refer to local authority policy & check with local authority first]* Please select the arrangement(s) for all non-adopted sustainable drainage components. Tick all that apply. ☑ **Management Company** ☐ **Property Owner** *(for SuDS components within property boundary only)* ☐ **Other** (please state)	☐ Formal arrangements to be finalised prior to occupation

Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 8.	PLK-BWB-ZZ-XX-RP-CD-0001-SDS

DECLARATION AND SUBMISSION

This pro-forma has been completed using evidence from information which has been submitted with the planning application.

The information submitted in the Sustainable Drainage Strategy and site-specific Flood Risk Assessment (FRA), where submitted, is proportionate to the site conditions, flood risks and magnitude of development and I agree that this information can be used as evidence to this sustainable drainage approach.

Agent Details			
Completed by	William James	**Email Address**	william.james@bwbconsulting.com
		Telephone Number(s)	
Signed off by		**Accreditation(s) and/or Qualification(s) of Signatory**	BEng (Hons), MSc
Date *(dd/mm/yyyy)*	12/09/23	**Company**	BWB Consulting

Client Details			
Name		**Company**	Wilson Bowden Developments Ltd

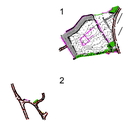
Appendix 2: Topographical Survey

Station Name	Eastings (m)	Northings (m)	Height (m)
BWB01	391454.861	411706.756	149.589
BWB02	391482.874	411592.411	152.139
BWB03	391433.218	411570.488	151.520
BWB04	391375.614	411557.371	151.956
BWB05	391290.356	411533.826	150.507
BWB06	391255.747	411533.826	149.893
BWB07	391169.266	411554.249	147.939
BWB12	391103.609	411329.423	154.302
BWB13	391056.430	411308.898	151.237
BWB14	391098.146	411243.732	154.292

Notes

1. Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
2. This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
3. All dimensions in metres unless noted otherwise. All levels in metres unless noted otherwise.
4. Any discrepancies noted on site are to be reported to the engineer immediately.
5. No scale factor has been applied to this survey, therefore the os coordinates are to be treated as arbitrary. Please refer to survey station information below for on site control establishment.
6. All coordinates and height data relate to OSGB36(15). Control stations are coordinated by means of GPS receiving real time corrections via OS smart net.
7. All manhole data is collected from ground level therefore discrepancies may occur. More accurate data is only achievable via confined space entry.
8. OS license number: 100022432

Key Plan



Legend

OS Buildings
Surveyed Buildings
Building
Wall
Kerb Channel Line
Top of Kerb
Edge of Surface
Top of Bank
Bottom of Bank
Canopy / Overhang
Line Marking
Centre Line
Watercourse Centre Line
Barrier
Fence
Gate
Overhead Powerline
Overhead Utilities
Contour Lines
Inspection Chamber
0.25 — Flow direction and pipe diameter
1 — Station and Name
BH 1 — Monitoring Borehole
Tree / Bush / Sapling
Area of Vegetation/ Extent of Tree Canopy
Hedge
Body of Water
Body of Water from OS
50.00 — Spot Level
Assumed Surface Water Drainage Line
Surface Water Drainage Line

AP	Anchor Point	FBW	Fence Barbed Wire	LB	Litter Bin
BG	Back Gully	FCB	Fence Closed Board	LP	Lamp Post
BO	Bollard	FCL	Fence Chain Link	MH	Manhole
BS	Bus Stop	FEL	Fence Electric	Mkr	Service Marker
BT	British Telecom	FMP	Fence Metal Panel	PB	Post Box
C	Crest	FMR	Fence Metal Railing	PT	Post
CL	Cover Level	FOB	Fence Open Board	RE	Rodding Eye
CMP	Cable Marker Post	FPW	Fence Post & Wire	SP	Sign Post
		FSP	Fence Steel Palisade	ST	Stop Tap
CCTV	Security Camera	FWM	Fence Wire Mesh	SV	Stop Valve
CTV	Cable TV	FFL	Finished Floor Level	TCB	Telephone Call Box
DC	Drainage Channel	FP	Flagpole	THL	Threshold Level
		Gas	Gas	TL	Traffic Light
DK	Drop Kerb	GV	Gas Valve	TP	Telegraph Post
DP	Down Pipe	GY	Gully	TS	Traffic Signal
Elec	Electric	Ht	Height	UTS	Unable to Survey
EP	Electricity Post	IC	Inspection Chamber	WL	Water Level
ER	Earth Rod	IFL	Internal Floor Level	WM	Water Meter
FH	Fire Hydrant	IL	Invert Level (as a reduced level)	WO	Wash Out
FL	Floodlight				

Rev	Date	Details of issue / revision	Drw	Rev
P1	15.05.17	First Issue	DS	SS

Issues & Revisions

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Client

Wilson Bowden Developments Ltd

Project Title

Hartle Land Kingsway

Drawing Title

Existing Site Plan Sheet 1 of 2

Drawn:	D.Smith		Reviewed:	S.Shreeves	
BWB Ref:	NTT2589	Date:	15.05.17	Scale@A1:	1:500

Drawing Status

INFORMATION

Project - Originator - Zone - Level - Type - Role - Number	Status	Rev
KPL-BWB-00-01-DR-G-0001	S2	P1

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C:\Users\Daniel.smith\Desktop\Ongoing Work Dan\NTT2589-Rochdale Plot L\KPL-BWB-00-ZZ-M2-G-0001-Existing Site 2D Model.dwg

Station Name	Eastings (m)	Northings (m)	Height (m)
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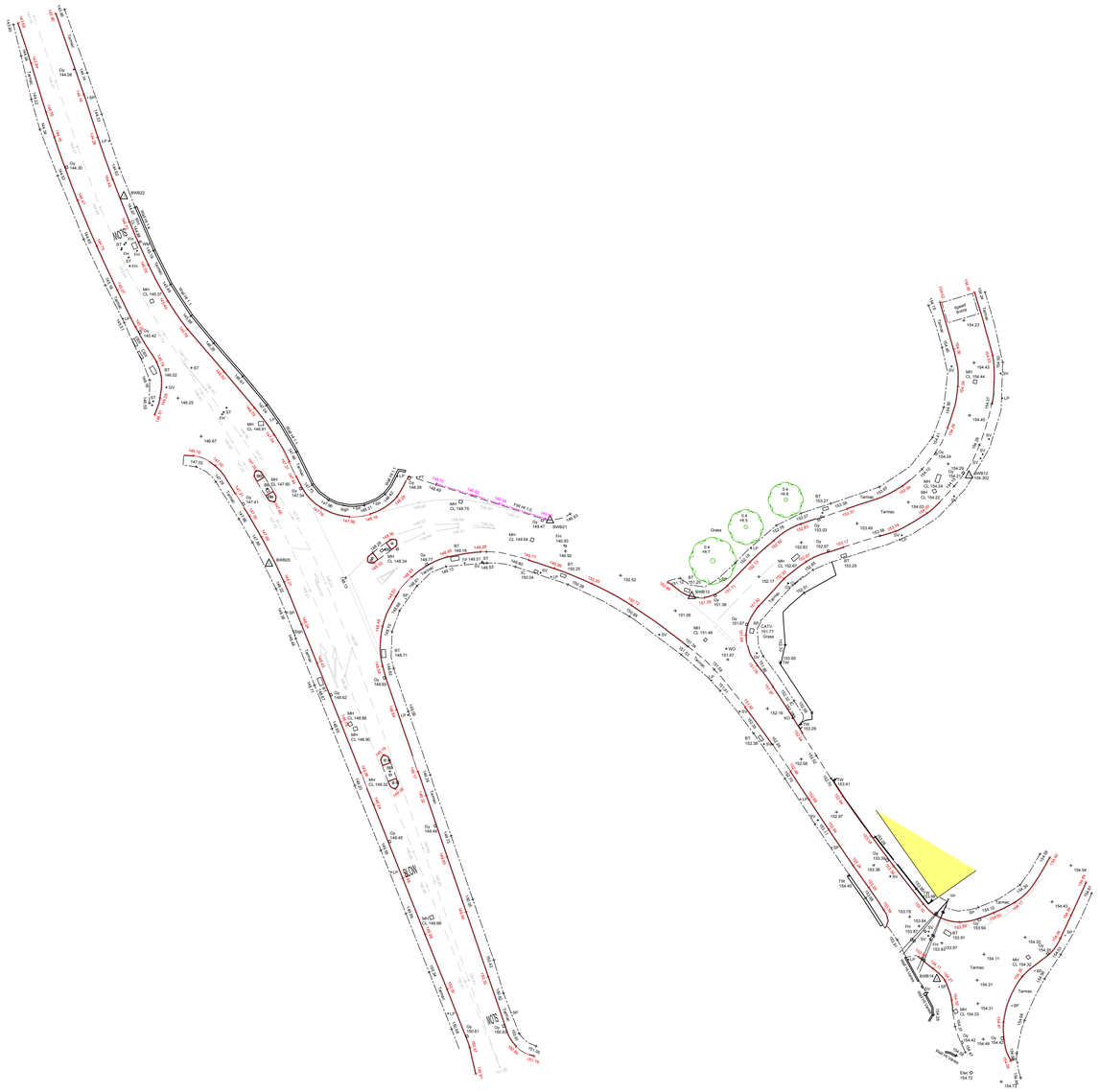

Notes

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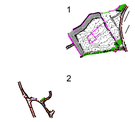

Legend

OS Buildings
Surveyed Buildings
Building
Wall
Kerb Channel Line
Top of Kerb
Edge of Surface
Top of Bank
Bottom of Bank
Canopy / Overhang
Line Marking
Centre Line
Watercourse
Centre Line
Barrier
Fence
Gate
Overhead Powerline
Overhead Utilities

Contour Lines
Inspection Chamber
0.25 — Flow direction and pipe diameter
1 — Station and Name
BH 1 — Monitoring Borehole
Tree / Bush / Sapling
Area of Vegetation/ Extent of Tree Canopy
Hedge
Body of Water
Body of Water from OS
50.00 — Spot Level
Assumed Surface Water Drainage Line
Surface Water Drainage Line

AP	Anchor Point	FBW	Fence Barbed Wire	LB	Litter Bin
BG	Back Gully	FCB	Fence Closed Board	LP	Lamp Post
BO	Bollard	FCL	Fence Chain Link	MH	Manhole
BS	Bus Stop	FEL	Fence Electric	Mkr	Service Marker
BT	British Telecom	FMP	Fence Metal Panel	PB	Post Box
C	Crest	FMR	Fence Metal Railing	PT	Post
CL	Cover Level	FOB	Fence Open Board	RE	Rodding Eye
CMP	Cable Marker Post	FPW	Fence Post & Wire	SP	Sign Post
		FSP	Fence Steel Palisade	ST	Stop Tap
CCTV	Security Camera	FWM	Fence Wire Mesh	SV	Stop Valve
CTV	Cable TV	FFL	Finished Floor Level	TCB	Telephone Call Box
DC	Drainage Channel	FP	Flagpole	THL	Threshold Level
		Gas	Gas	TL	Traffic Light
DK	Drop Kerb	GV	Gas Valve	TP	Telegraph Post
DP	Down Pipe	GY	Gully	TS	Traffic Signal
Elec	Electric	Ht	Height	UTS	Unable to Survey
EP	Electricity Post	IC	Inspection Chamber	WL	Water Level
ER	Earth Rod	IFL	Internal Floor Level	WM	Water Meter
FH	Fire Hydrant	IL	Invert Level (as a reduced level)	WO	Wash Out
FL	Floodlight				

Rev	Date	Details of issue / revision	Drw	Rev
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Client

Wilson Bowden Developments Ltd

Project Title

Hartle Land Kingsway

Drawing Title

Existing Site Plan Sheet 2 of 2

Drawn:	D.Smith	Reviewed:	S.Shreeves		
BWB Ref:	NTT2589	Date:	15.05.17	Scale@A1:	1:500

Drawing Status

INFORMATION

Project - Originator - Zone - Level - Type - Role - Number	Status	Rev
KPL-BWB-00-02-DR-G-0001	S2	P1

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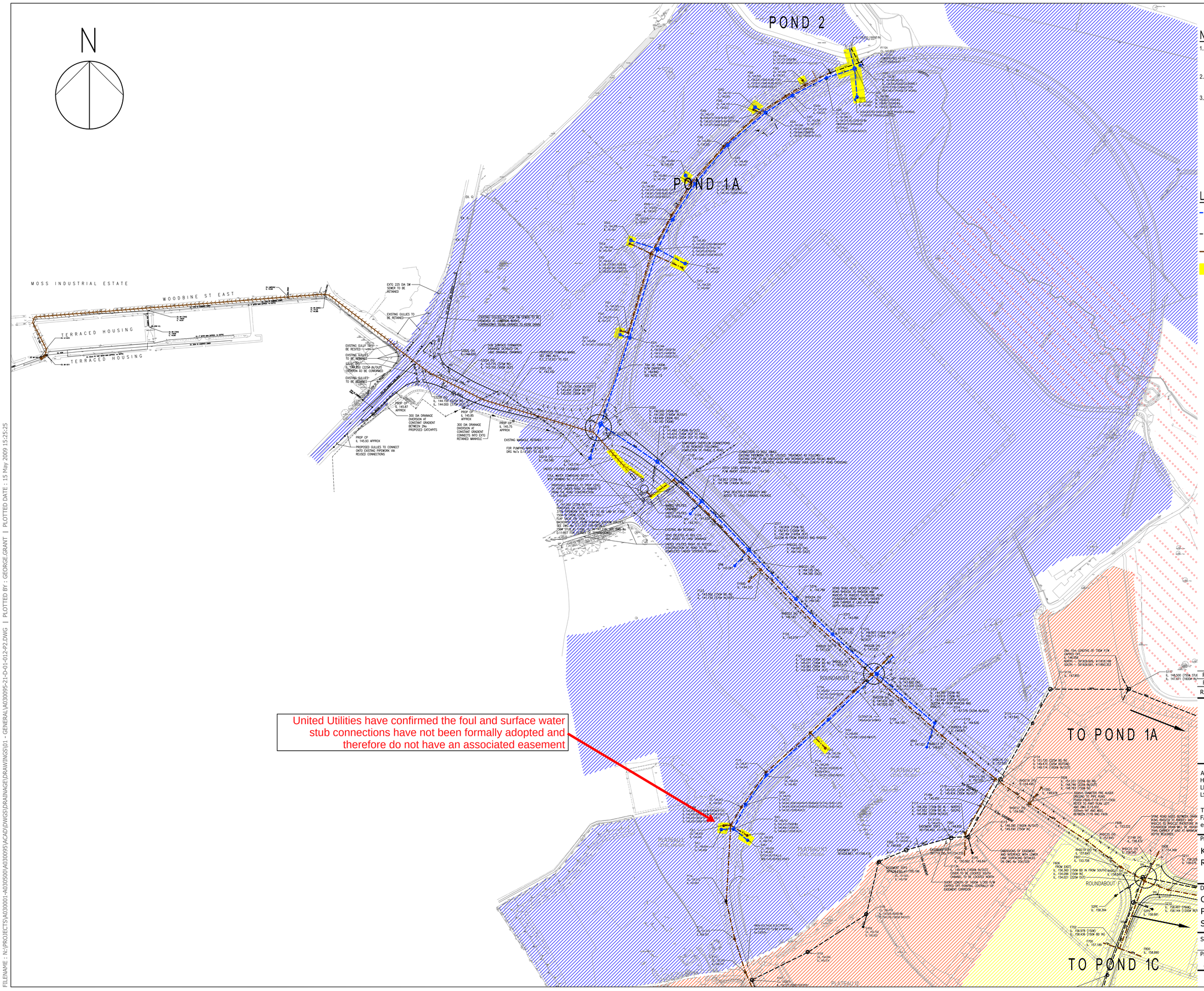
Appendix 3: United Utilities Sewer Records and As-Built Records



DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ANY OMISSIONS OR ERRORS

NOTES

1. THIS DRAWING TO BE READ IN ACCORDANCE WITH ALL OTHER RELEVANT WYG DRAWINGS, THIRD PARTY DRAWINGS, SPECIFICATIONS AND OTHER SUPPORTING DOCUMENTATION ETC.
2. THIS DRAWING ACTS AS GUIDANCE FOR FUTURE SEWER ADOPTION/VESTING DISCUSSIONS AND IS NOT FOR CONSTRUCTION.
3. INFORMATION ON THIS DRAWING IS A COMBINATION OF FORMAL PHASE 1 AS BUILT INFORMATION AND ADVANCED (BUT NOT FORMAL) PHASE 2 AS BUILT INFORMATION.

LEGEND

- ADOPTABLE SURFACE WATER DRAINAGE FLOWING TO STORAGE POND NUMBER 1A AND 1C
- ADOPTABLE SURFACE WATER DRAINAGE FLOWING TO STORAGE POND NUMBER 2
- ADOPTABLE FOUL WATER DRAINAGE
- EASEMENTS AS ORIGINALLY AGREED WITH UNITED UTILITIES

REV	DESCRIPTION	BY	CHK	APP	DATE
P2	CATCHMENT SPLIT ADDED	GSG	GSG	KAO	14.05.09
P1	PRELIMINARY ISSUE	GSG	GSG	KAO	06.05.09

Kingsway
Gateway to England's Northwest

ARNDALE COURT
HEADINGLEY
LEEDS
LS6 2UJ

TEL: +44 (0)113 278 7111
FAX: +44 (0)113 278 3487
e-mail: leeds@wyg.com

Project:
KINGSWAY
ROCHDALE

Drawing Title:
COMPOSITE S104 COLOURED DRAWING
PHASES 1 AND 2 - FLOWS TO POND 2
SHEET 3 OF 3

Scale @Custom 1:2000	Drawn GSG	Date MAY 09	Checked GSG	Date MAY 09	Approved KAO	Date MAY 09
Project No. A030095	Office 21	Type D	Drawing No. 01-012			Revision P1

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FILENAME : N:\PROJECTS\A030001-4030500\A030095\ACAD\DWGS\DRAINAGE\DRAWINGS\01 - GENERAL\A030095-21-D-01-012-P2.DWG | PLOTTED BY : GEORGE.GRANT | PLOTTED DATE : 15 May 2009 15:25:25

Water for the North West

How to contact us:

United Utilities Water Limited
Property Searches
Haweswater House
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP

Telephone: 0370 7510101

E-mail: propertysearches@uuplc.co.uk

Tom Furlong

2 Riverside Way
Whitehall Waterfront,
Leeds,
LS1 4EH

FAO:

Your Ref: 222009 - Plot L
Our Ref: UUPS-ORD-465723
Date: 21/02/2023

Dear Sirs

Location: 222009 - Plot L

I acknowledge with thanks your request dated 21/02/2023 for information on the location of our services.

Please find enclosed plans showing the approximate position of United Utilities' apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read United Utilities' access statement before you start work to check how it will affect our network. http://www.unitedutilities.com/work-near-asset.aspx .

I trust the above meets with your requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please contact us .

Yours Faithfully,

Karen McCormack
Property Searches Manager

United Utilities Water Limited
Registered In England & Wales No. 2366678
Registered Office Haweswater House, Lingley Mere Business Park,
Lingley Green Avenue, Great Sankey, Warrington, WA5 3LP

Water for the North West

TERMS AND CONDITIONS - WASTEWATER AND WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

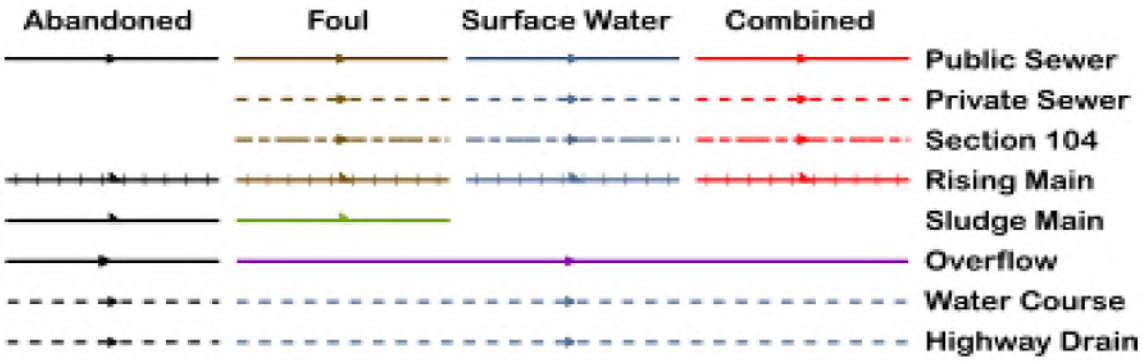
TERMS AND CONDITIONS:

- This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
- This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
- The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
- The position and depth of UUWL apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
- This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the Map and any information supplied with it.
- If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
- This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.

United Utilities Water Limited
Registered In England & Wales No. 2366678
Registered Office Haweswater House, Lingley Mere Business Park,
Lingley Green Avenue, Great Sankey, Warrington, WA5 3LP

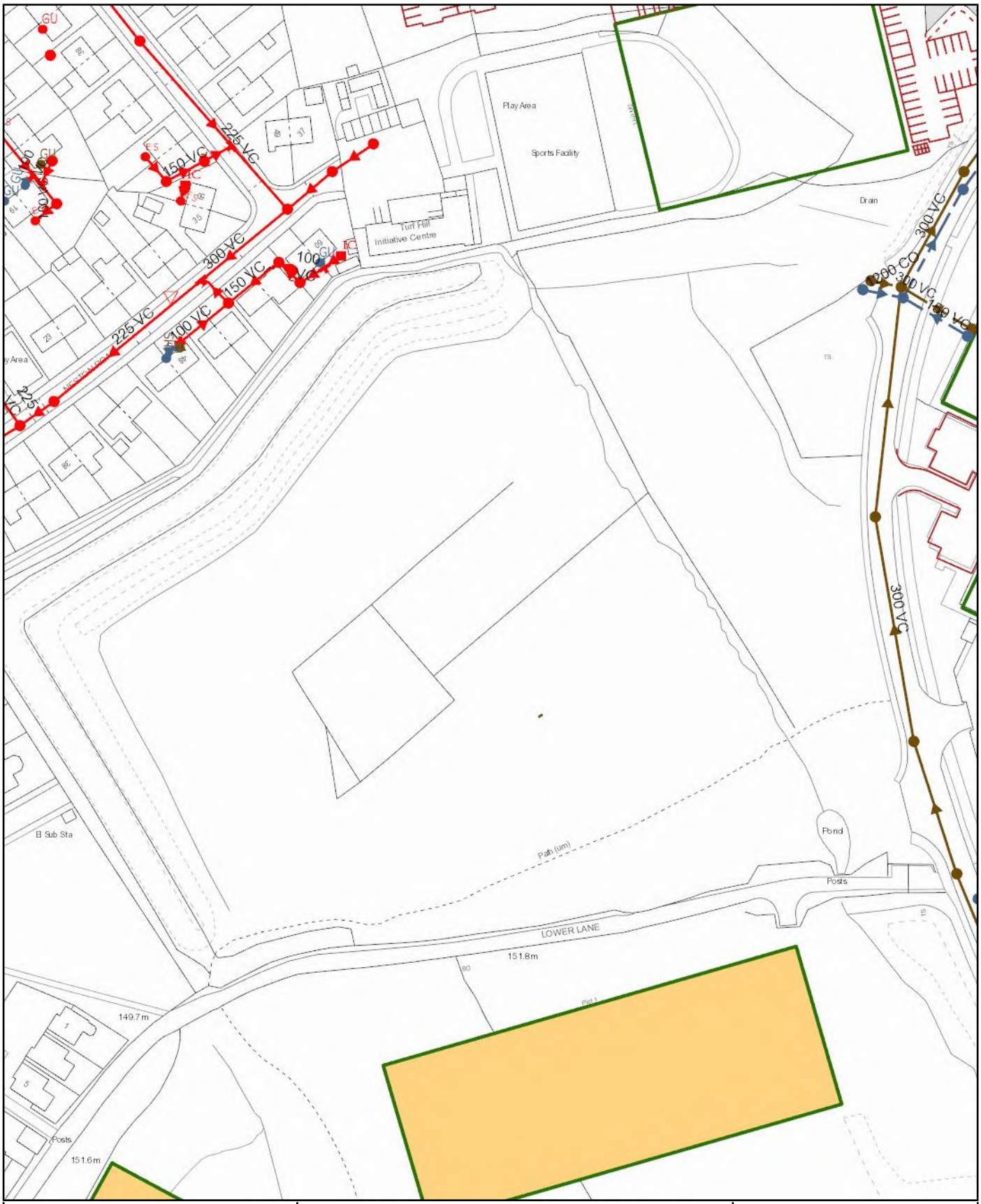
United Utilities
Water for the North West

Wastewater Symbology



All point assets follow the standard colour convention: red – combined, brown - foul, blue – surface water, purple - overflow

- Manhole
- HS Head of System
- ES Extent of Survey
- RE Rodding Eye
- IN Inlet
- DP Discharge Point
- HY Vortex
- PE Penstock
- WO Washout Chamber
- VA Valve
- AV Air Valve
- NRV Non Return Valve
- SO Soakaway
- GU Gully
- CA Cascade
- FM Flow Meter
- HA Hatch Box
- OI Oil Interceptor
- SM Summit
- DS Drop Shaft
- OP Orifice Plate
- Side Entry Manhole
- Outfall
- Screen Chamber
- IC Inspection Chamber
- Bifurcation Chamber
- LH Lamp Hole
- T Junction / Saddle
- Catchpit
- Valve Chamber
- Vent Column
- Vortex Chamber
- Penstock Chamber
- T Network Storage Tank
- V Sewer Overflow
- WwTW Ww Treatment Works
- Ww Pumping Station
- Septic Tank
- Control Kiosk
- Change of Characteristic



Scale: 1:1540 **Date:** 21/02/2023	**SEWER RECORDS**	United Utilities Water for the North West
Address or Site Reference: 222009 - Plot L **Printed by:** Property Searches		

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United Utilities
Water for the North West

Clean Water Symbology

Proposed	Abandoned	Live	
			Distribution Main
			Trunk Main
			Comms Pipe
			Private Pipe
			Concessionary Service
			Raw Water
			LDTM Raw Water
			LDTM Treated Water

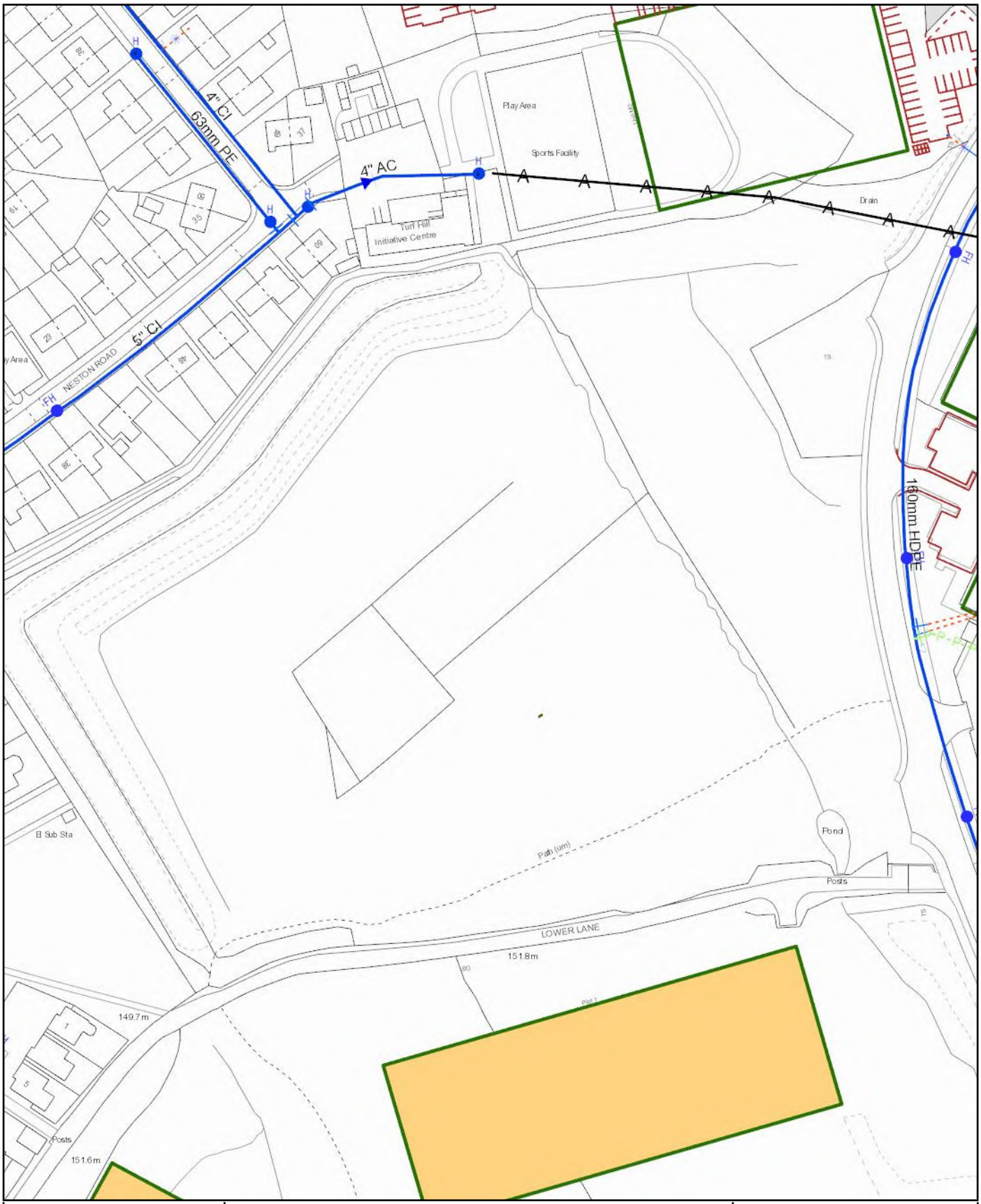
- Air Valve
- AC Valve, open
- AC Valve, closed
- CC Valve, open
- CC Valve, closed
- Non Return Valve
- Pressure Management Valve
- OMS Valve
- Stop Tap
- Flow Meter
- Domestic Meter
- Commercial Meter
- Pump
- Hydrant
- Fire Hydrant
- Anode
- Chlorination Point
- De-chlorination Point
- Strainer Point
- Access Point
- Hatch Box
- IP Point
- Sampling Station
- Logger Box

- Bore Hole
- Inlet Point
- Bulk Supply Point
- End Cap
- Site Termination
- Change of Characteristic
- Condition Report

Property Types

- Water Tower
- Valve House
- Booster Pumping Station
- Intake Pumping Station
- Water Treatment Works
- Supply Reservoir
- Service Reservoir
- Impounding Reservoir
- Pipe Bridge

Symbology for proposed assets is the same as above, but shown in green
Symbology for abandoned assets is the same as above, but shown in black



Scale: 1:1540 **Date:** 21/02/2023	**WATER MAINS RECORDS**	United Utilities Water for the North West
Address or Site Reference: 222009 - Plot L **Printed by:** Property Searches		

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Appendix 4: Existing Runoff Rates

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.150
Area (ha)	3.700	Urban	0.000
SAAR (mm)	1120	Region Number	Region 10

Results	**l/s**
QBAR Rural	2.6
QBAR Urban	2.6
Q100 years	5.4
Q1 year	2.3
Q30 years	4.4
Q100 years	5.4

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Appendix 5: Existing Runoff Volumes

Greenfield Runoff Volume

FEH Data

Return Period (years)	100
Storm Duration (mins)	360
FEH Rainfall Version	2013
Site Location	GB 391100 411550 SD 91100 11550
Data Type	Catchment
Areal Reduction Factor	1.00
Area (ha)	3.700
SAAR (mm)	1164
CWI	123.732
SPR Host	29.690
URBEXT (1990)	0.0120

Results

Percentage Runoff (%)	34.48
Greenfield Runoff Volume (m^3)	890.497

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Appendix 6: Site Wide Surface Water Sewer Modelling Note, Catchment Plan, Flow Rates and Correspondence with United Utilities and the LLFA

TECHNICAL NOTE
Kingsway Business Park
Surface Water Sewer Modelling

Project	**Kingsway Business Park**		
Document Number	KBP-BWB-ZZ-XX-RP-CD-0004	**BWB Ref**	NTW2889
Author	David Gray	**Status**	S2
Checked	Matthew Bailey	**Revision**	P1
Approved	Rowan Jobling	**Date**	15.07.2022

Summary of Surface Water Sewer Modelling

1.1. This Technical Note provides a summary of the detailed hydraulic modelling exercises undertaken to date on the surface water sewers that serve the Kingsway Business Park.

1.2. The drainage strategy across the business park is split into three distinct catchments (as shown on **Figure 1.1** below).

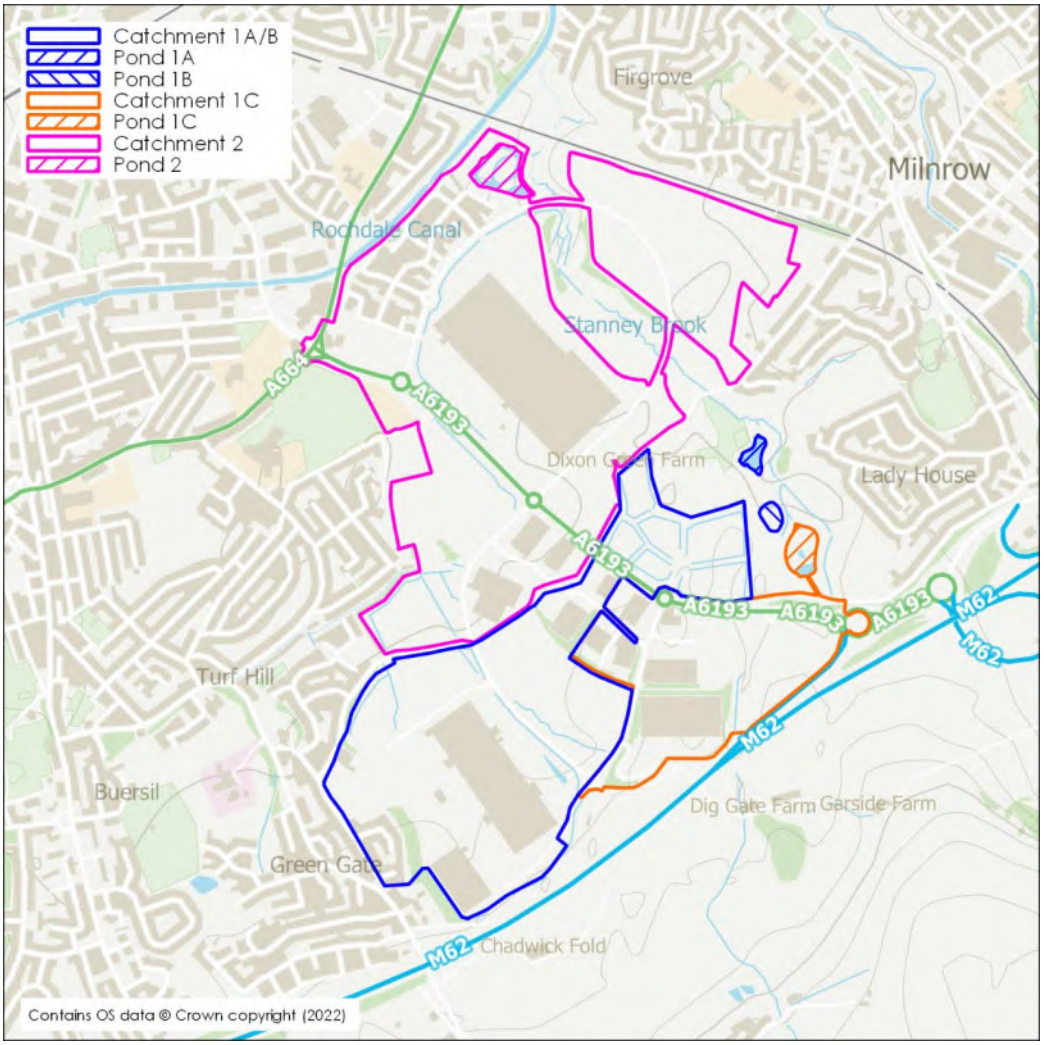

Figure 1.1: Business Park overall indicative catchments and attenuation ponds

1.3. Each drainage catchment is served by separate piped systems discharging to separate attenuation features. The existing drainage was constructed in 1999 and the hydraulic modelling exercises have shown that the surface water sewers have been designed to accommodate the 1 in 100-year storm event with no allowance for climate change for all plots across the business park.

1.4. Detailed hydraulic modelling and drawings for each drainage catchment are covered by individual reports, as listed below:

- Catchment 1A/1B – Report reference KBP-BWB-ZZ_XX-RP-CD-0001
- Catchment 1C – Report reference KBP-BWB-ZZ_XX-RP-CD-0002
- Catchment 2 – Report reference KBP-BWB-ZZ_XX-RP-CD-0003

1.5. **Table 1.1** (below) lists which Drainage catchment each development plot discharges to:

Table1.1: Drainage Catchment Split per Plot

Drainage Catchment	Development Plots
1A/B	E (West), F, G, I, J1, J2, W
1C	C1, D1, D2, D3, D4, E(East), H
2	K, L, M, N, O, P1, P2, P3, Q, R, S, T1, T2, U1, U2, V, X

Design Parameters and Assumptions

1.6. The design parameters and assumptions used for each catchment vary depending on the level of information that was available at the time of the modelling work. Catchment specific information is stated in each report and key parameters are listed below:

- Impermeable areas generally taken as 90% for industrial areas and 65% for residential areas
- Impermeable areas for roads taken as 100%
- Where plots have been constructed, a more detailed estimate of impermeable area has been used based on the detailed drainage design
- Network model simulation criteria set to default settings in MicroDrainage 2019.1.
- Simulations have been run for the network model using the 'Seasonal Return Period Wizard' for all storm durations for the 1 in 100-year event on 2.5 second increments with Dynamic Time Step turned off, Dynamic Viscous Dampening and Inertia turned on.

- Simulations have been run using both Flood Studies Report (FSR) and Flood Estimation Handbook (FEH) rainfall methodologies.
- The detention basin volumes have been checked by recreating them in AutoCAD Civils 3D Software before being input into the MicroDrainage Network Model.
- Note that the original drainage system was designed using FSR rainfall (as stated within 'Attenuation Ponds Health & Safety File'), however FEH simulations have been ran as a sensitivity test for the recreated network model.

Summary of findings from Catchment 1A/1B

1.7. The report and modelling results were reviewed and accepted by United Utilities and Rochdale Borough Council (correspondence contained within **Appendix A**)

1.8. A summary of the findings from the as-built drainage study is below:

- The pipe network operates well for all modelled storm events up to and including the 1 in 100-year with minimal surcharging.
- The maximum water level in the pond was higher than the original Section 104 design and is predicted to overtop the weir wall once all plots within the catchment have been developed.
- The peak flow rate from Pond 1A/1B is shown to be lower than the consented flows to the Stanney Brook.
- Several options were investigated to remedy the overtopping of the weir wall. The option suggested in the drainage study report was to raise the weir wall by 200mm which solved the overtopping issue.
- In subsequent conversations and meetings with Rochdale Borough Council's drainage engineer, Stephen McCann, it was agreed that the existing orifice plate flow control would be replaced with a larger diameter orifice plate. This option lowers the anticipated maximum water level within the pond to below the weir level while maintaining peak flows below the consented flows.
- During a site visit, it was observed that the flow control could be liable to becoming blocked with vegetation and litter. To lower the risk of future blockages, it has also been agreed to install a debris screen over the flow control.

Summary of findings from Catchment 1C

1.9. The report was issued to United Utilities and Rochdale Borough Council

1.10. A summary of the findings from the as-built drainage study is below:

- The pipe network operates well for all modelled storm events up to and including the 1 in 100-year with minimal surcharging.
- The maximum modelled water level within Pond 1C is below the original design level and peak flows are shown to be below the consented flow rate.
- The drainage forming catchment 1C is considered to be operating efficiently, safely and in line with the original design.

Summary of findings from Catchment 2

1.11. The report and modelling results have been reviewed and accepted by Rochdale Borough Council (correspondence contained within **Appendix A**)

1.12. Untitled Utilities have reviewed the report and commented on some minor flooding located within Sir Isaac Newton Way. This was discussed with United Utilities who were happy with the explanation and had no further concerns (correspondence contained within **Appendix A**).

1.13. A summary of the findings from the as-built drainage study is below:

- The pipe network operates well for all modelled storm events up to and including the 1 in 100-year with one area of minimal flooding within Sir Isaac Newton Way.
- The flooding was in the short duration, high intensity rainfall event and would be expected to pond within the road corridor for a short time before draining back into the sewer network once the peak storm has passed.
- The flooding in the sewer network is unrelated to water levels in Pond 2.
- The maximum modelled water level within Pond 2 is below the original design level and peak flows are shown to be below the consented flow rate.
- The drainage forming catchment 2 is considered to be operating efficiently, safely and in line with the original design.

Appendix A

Correspondence with United Utilities and Rochdale Borough Council

David Gray

From: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Sent: 19 August 2021 20:36
To: David Gray; Rowan Jobling; Iqbal Rassool; Wastewater Developer Services
Cc: Matthew Bailey; Stephen McCann; Ward, David; John Copestake; Brennan, Adam; Walker, Jillian
Subject: GENQ 4200041062 Kingsway Business Park, Rochdale OL16 4JN

This email originated from outside of our organisation. Please exercise caution with content, links and attachments.

Good evening all and thank you for taking my call earlier David,

Firstly I would like to thank bwb for pulling together the modelling report, it has certainly helped clarify matters. Following a conversation between myself and Stephen McCann at the Lead Local Flood Authority we are now in a position to accept the proposed modelling report essentially as a drainage masterplan for the Business Park moving forward. However, we would request that this is subject to the provision of the mdx. Microdrainage model files being provided to Stephen at the Council for review against the modelling report to ensure its accuracy.

Once reviewed and the Lead Local Flood Authority are happy with the model outputs we will both be providing comments on the individual plots/below planning applications in turn:

DC/21/2987 – 21/00881/REM
DC/21/3213 – 21/01039/DOC
DC/21/3492 – 21/01041/DOC

As a point of note, we understand that there are a number of concerns the Lead Local Flood Authority have about Plot J2 which should be addressed but this sits outside United Utilities remit to comment.

I am on annual leave from tomorrow until Tuesday 24th August and for further information in my absence, I would suggest that Stephen McCann or David Gray would be best pace to answer any queries but I hope that this brings everyone together onto the same page.

Kind regards,

United Utilities
Water for the North West

Robert Brenton
Developer Engineer
Developer Services & Metering
Customer Services
M: 07880299827
unitedutilities.com

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David Gray

From: Stephen McCann <Stephen.McCann@Rochdale.Gov.UK>
Sent: 16 November 2021 17:07
To: David Gray; john.ruckledge@environment-agency.gov.uk; Darren Clark; Tracy Hibbert; Gerard Proudman; Michael Cummings
Subject: Kingsway park pond 1A - minor change of orifice plate on outlet to Stanney Brook.

This email originated from outside of our organisation. Please exercise caution with content, links and attachments.

To All

The matter of the capacity and flow discharge from the Kingsway Park Drainage Ponds to Stanney brook was raised when BWB submitted Drainage Details for Planning Applications for the latest Kingsway Plots G, I and J2. When BWB ran the drainage model with the new plots being developed it was realised that the pond would just overtop in a 1 in 100 year storm including climate change allowance of 40%. Although this is a rare event, it was deemed necessary to avoid the overtopping. David Gray looked at options and came up with a simple but effective proposal:-

- to change the low level orifice plate in the outlet weir wall (to Stanney Brook) from 200 to 226mm dia.

This does not require major works and will fulfil the original agreed discharge flow rate to Stanney Brook. It will also and keep water levels under the crest of the weir wall, and maintain a minimum of 300mm freeboard within the pond.

Therefore, I am suggesting that David Gray now organises the replacement of the orifice plate. In terms of installation, BWB will need to arrange to do this when water levels are low and obtain access through the gates. I have advised David that he can contact Michael Cummings to arrange access?

There is an email trail below.
Any comments / queries – please address them to David and myself.
I can forward the diagram of the location of the orifice plate – upon request.

regards
Stephen McCann
Drainage & Flooding Engineer
Highways, Property & Strategic Housing

ROCHDALE BOROUGH COUNCIL

01706 924606
07552 570262
stephen.mccann@rochdale.gov.uk

Rochdale Borough Council
Floor 2, Number One Riverside
Smith Street, Rochdale, OL16 1XU

From: David Gray <David.Gray@bwbconsulting.com>
Sent: 07 November 2021 16:30
To: Stephen McCann <Stephen.McCann@Rochdale.Gov.UK>
Cc: Iqbal Rassool <Iqbal.Rassool@bwbconsulting.com>; Peter Davies <Peter.Davies@bwbconsulting.com>; Darren Clark <Darren.Clark@gleeds.com>; Davies, Nick <nick.davies@wilsonbowden.co.uk>; Ellis, Dave <dave.ellis@wilsonbowden.co.uk>; Henson, Henry <henry.henson@wilsonbowden.co.uk>
Subject: RE: Kingsway - Question to EA re. Weir Wall to Stanney Brook

Hi Steve,

Following our discussion last week on the weir wall at Kingsway after reviewing John's email below, I have remodelled the outflow orifice so that the proposed flows are closer to the consented flows of 304 l/sec. The modified orifice is 226mm diameter (upsized from 200mm) with the higher orifice remaining as 250mm. This seems like an eminently sensible resolution.

This does lower water levels within the basin to just below the existing weir wall as shown in the extracts from Microdrainage below. The existing weir is set at 148.25m, the modelled water level is shown to be 148.231m and the flow is 303.4 l/sec.

From previous conversations, you suggested that you would be happy with the original situation, however John's email suggests that the outflow from the pond needs to stay within the consented discharge, which we understand to be 304 l/sec. In this situation, who makes the final decision on the acceptable flow rates? At the Outlet from Pond 1A, Stanney Brook is classed as Ordinary Watercourse so falls under the remit of the LLFA so I would think that myself as LLFA Officer can approve this modification to the orifice plate. Stanney Brook changes to 'Main River' after crossing Buckley Hill lane.

The revised hydraulic modelling shows that altering the orifice does lower the estimated water levels to just below the existing weir wall while keeping within the 304 l/sec flow rate, would this proposal be acceptable to RBC?.

I understand that RBC are responsible for maintenance of the pond, are you able to confirm if this extends to the outfall structure as well? If not, are you able to confirm who is responsible for the outfall structure? I understand that Environment received monies from the Developer and now maintain the pond and structures. The managers are Tracy Hibbert and Gerard Proudman who have been cc'd to this email.

I am happy to run through the revised modelling and discuss with yourself this week and agree the best way forward.

Kind Regards

David Gray
Principal Engineer | BWB Consulting Limited

5th Floor, Waterfront House, Station Street, Nottingham, NG2 3DQ
M 07437 015 337 **T** 0115 924 1100

David Gray

From: Stephen McCann <Stephen.McCann@Rochdale.Gov.UK>
Sent: 22 April 2022 15:52
To: David Gray
Subject: FW: Drainage Consultation Ref: 22/00373/FUL Plot M Kingsway
Attachments: Drainage Consultation 22-00373 FUL.docx

This email originated from outside of our organisation. Please exercise caution with content, links and attachments.

Hi David,

For your ref. see appended and below.
Thanks v much for sending all the extra info this morning. The complexity of the mdx models is beyond my familiarity with using MicroDrainage but your explanations filled in the gaps so I have been able to be confident in 'approving' the proposals.

regards

Stephen McCann
Drainage & Flooding Engineer
Highways, Property & Strategic Housing

ROCHDALE BOROUGH COUNCIL

01706 924606
07552 570262
stephen.mccann@rochdale.gov.uk

Rochdale Borough Council
Floor 2, Number One Riverside
Smith Street, Rochdale, OL16 1XU

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For news and social media updates go to www.rochdale.gov.uk/news

Please consider the environment before printing this email.

From: Stephen McCann
Sent: 22 April 2022 15:50
To: Michael Doyle <Michael.Doyle@Rochdale.Gov.UK>; 'Mohammed.Aljafarawi@uuplc.co.uk' <Mohammed.Aljafarawi@uuplc.co.uk>
Subject: Drainage Consultation Ref: 22/00373/FUL Plot M Kingsway

Hello Michael (Principal Planning Officer) and Mohammed (UU Engineer),

Kingsway Hydraulic Modelling, Catchment 2 - 4200045304

I have written my consultation, appended.
The two MicroDrainage Models, which Mohammed asked me to look at are pretty complex. I've talked to David Gray of BWB a couple of times about this and he's shown me the models in online Teams Screenshare and he has provided details to satisfy me that the system is well designed.

Mohammed, feel free to ring me to discuss OR you can ask David Gray. There are quite large flows coming off Plot M into the adopted Michael Faraday Ave sewer, but this was originally planned as such.
regards

Stephen McCann
Drainage & Flooding Engineer
Highways, Property & Strategic Housing

ROCHDALE
BOROUGH COUNCIL

01706 924606
07552 570262
stephen.mccann@rochdale.gov.uk

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David Gray

From: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Sent: 11 February 2022 09:49
To: David Gray; 'Stephen McCann'
Cc: Wastewater Developer Services; Francis Comyn; 'Darren.Clark@gleeds.com'
Subject: MicroDrainage- pde 4200045304 Plot M Kingsway Business Park Rochdale OL16 4UG
Attachments: Existing SW Network Model - P1.MDX

This email originated from outside of our organisation. Please exercise caution with content, links and attachments.

Good Morning David,

Thanks for the prompt response. I am happy with your explanation, I don't have any further concerns.
I would like to receive a modelling results confirmation to proceed.

Stephen,
Could you run the model as you did for catchment 1A as a sense check? Then provide confirmation of this results please.

Kind regards,

United Utilities
Water for the North West

Mohammed Aljafarawi
Developer Engineer
Developer Services & Metering
Customer Services
Email: Mohammed.Aljafarawi@uuplc.co.uk
M: 07950474499
unitedutilities.com

From: David Gray
Sent: 10 February 2022 14:38
To: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>; 'Stephen McCann' < >
Cc: Francis Comyn < >; Darren Clark < >; Davies, Nick <nick.davies@wilsonbowden.co.uk>
Subject: RE: Kingsway Hydraulic Modelling, Catchment 2 - 4200045304

EXTERNAL EMAIL This email originated outside of the organisation. Do not click links or open attachments unless you recognise the sender and know the content is safe.

Mohammed, Steve,

Please find attached the MDX for Network 2 (Plot M catchment) file as mentioned in the email below.

Mohammed, the flooding occurs in the sewers located quite some way from Pond 2 and is not affected by the water level within Pond 2 or the flow rate from Pond 2.

As shown in the extract below, the flooding occurs at MH S317 in the short duration (30 min) / high intensity rainfall event and is due to the flow rate exceeding the capacity of the pipe for a short duration. Based on

the volume shown in the hydraulic model, any flooding would be entirely contained within Sir Isaac Newton Water and drain back down into the system once the peak storm has passed. This is standard practice for designing drainage systems.

In reality, surface water drainage features (gullies, slot drains, kerb drains) are not designed generally designed a much lower storm event, typically the 5 year storm. So although the model shows flooding in the 100 year storm, the water would not have drained into the sewers in the first instance. The surface water would pond on the road surface as the capacities of the road gullies would have been exceeded before the capacity of the sewers.

1.006	S306	30 minute 100 year Winte	148.876	147.154	2.494	0.000	1.34		
1.007	S315	30 minute 100 year Winte	148.210	146.712	2.427	0.000	1.44		
1.008	S316	30 minute 100 year Winte	147.154	146.248	2.262	0.000	1.26		
9.000	SPM	30 minute 100 year Winte	148.105	145.997	1.960	0.000	0.84		
1.009	S317	30 minute 100 year Winte	145.764	145.776	2.192	13.308	1.01		
10.000	SPV	30 minute 100 year Winte	148.108	145.509	1.383	0.000	0.03		
1.010	S318	30 minute 100 year Winte	145.562	145.508	2.310	0.000	1.03		

If it would be beneficial, I would be happy to attend a Teams meeting to discuss this in more detail and answer any other queries you may have.

Kind Regards

David Gray
Principal Engineer | BWB Consulting Limited

5th Floor, Waterfront House, Station Street, Nottingham, NG2 3DQ
M 07437 015 337 **T** 0115 924 1100

From: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Sent: 10 February 2022 13:46
To: 'Stephen McCann' <Stephen.McCann@Rochdale.Gov.UK>; David Gray <David.Gray@bwbconsulting.com>
Cc: Francis Comyn <Francis.Comyn@Rochdale.Gov.UK>
Subject: RE: Kingsway Hydraulic Modelling, Catchment 2 - 4200045304

This email originated from outside of our organisation. Please exercise caution with content, links and attachments.

Good afternoon Stephen,
Thanks for your email, I had this morning a conversation with my colleague Robert, I understand that previously both of you deals with Catchment 1A/B (blue in the below picture).

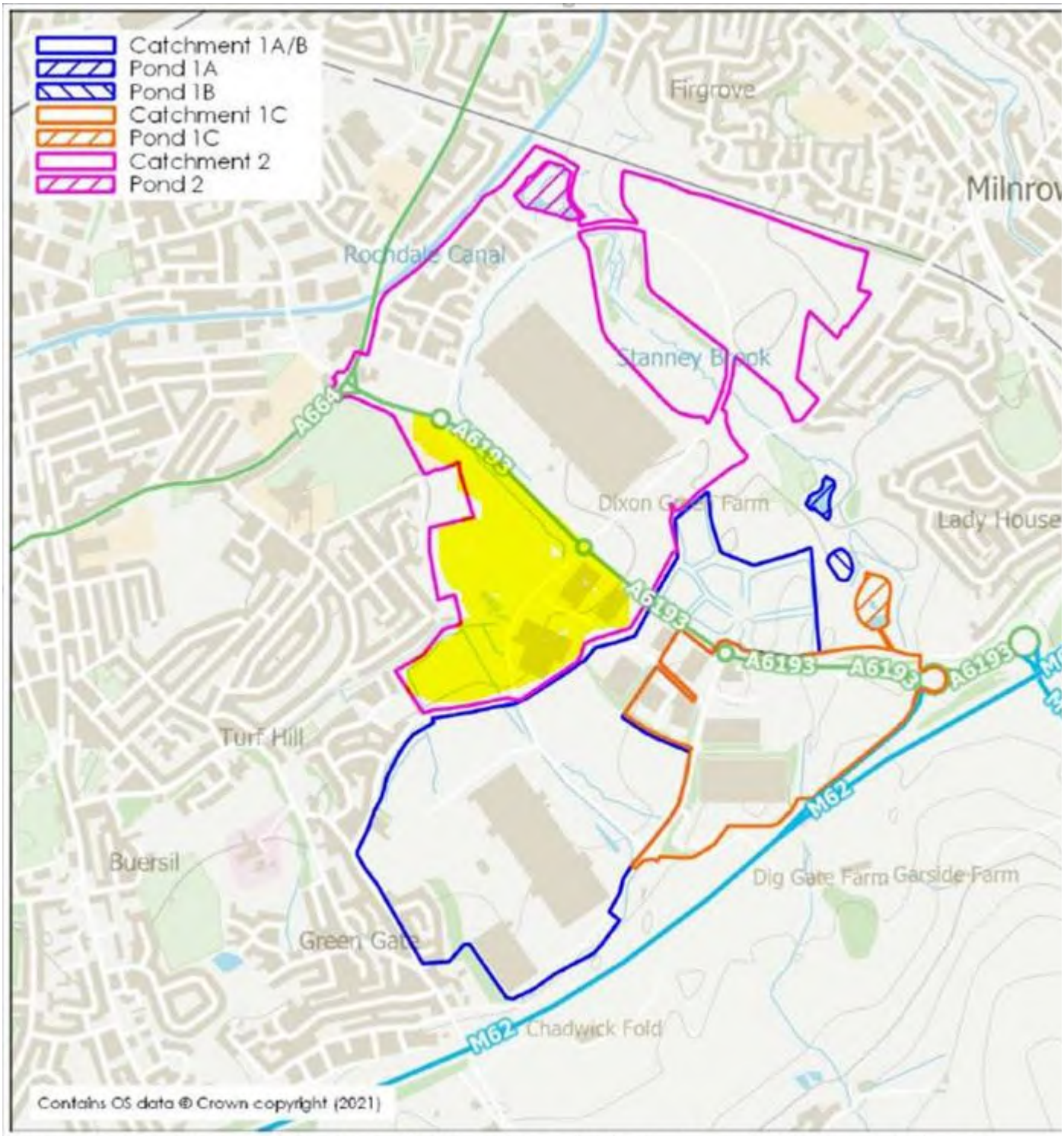

Figure 1.1: Business Park overall indicative catchments and attenuation ponds.

Currently, we are dealing with catchment 2 (pink colour), the developer contact our team regarding plot M (highlighted in yellow).

The provided modelling of catchment 2 has been done in line with previous model of catchment 1A. Previously 1A showed issues at the pond but the sewer network was fine.
Where catchment 2 model shows the pond is fine but the sewer network has a small amount of flooding (13m^3) within Sir Isaac Newton Way.

Also, the developer stated in the document no: KBP-BWB-ZZ-XX-RP-CD-0003, that the 'Pond 2' discharges surface water at a lower rate (444.5l/s) that of the original design intent (555l/s).

Could the developer provide the mdx. file to Stephen to run the model as you did for catchment 1A as a sense check.

Stephen, could you then provide confirmation of this results please.

Finally, whilst we have no problems with the proposal in principle...as there is a small amount of flooding on the sewer network, we request that this is investigated as there may be some remedial work to be done at the pond again as it does not appear to be passing forward the flow to the watercourse as it was originally designed to.

Kind regards,

Mohammed Aljafarawi
Developer Engineer
Developer Services & Metering
Customer Services
Email: Mohammed.Aljafarawi@uuplc.co.uk
M: 07950474499
unitedutilities.com

From: Stephen McCann [mailto:Stephen.McCann@Rochdale.Gov.UK]
Sent: 09 February 2022 15:30
To: Aljafarawi, Mohammed <Mohammed.Aljafarawi@uuplc.co.uk>
Cc: Francis Comyn <Francis.Comyn@Rochdale.Gov.UK>; 'David Gray' <David.Gray@bwbconsulting.com>
Subject: RE: Kingsway Hydraulic Modelling, Catchment 2 - 4200045304

EXTERNAL EMAIL This email originated outside of the organisation. Do not click links or open attachments unless you recognise the sender and know the content is safe.

Hello Mohammed,

With reference to your email below, the LLFA part of the Council, myself and Francis Comyn, are aware of the upgrade proposals to the Kingsway park pond 1A, as proposed by BWB - on behalf of the Kingsway Business park developers (Wilson Bowden, Homes England, & Rochdale Development Agency?).
I have recently done a site walkover with David Gray of BWB to discuss the options. As LLFA we agree that the upgrades, which should include a better trash screen on one of the ponds and an increased orifice plate are appropriate.

The previous UU consultee, Robert Brenton (UU) was involved in looking at the Kingsway Drainage Masterplan; he may be able to update you as he has recently dealt with several recent Kingsway Business park plot planning applications.

regards
Stephen McCann
Drainage & Flooding Engineer
Highways, Property & Strategic Housing

ROCHDALE BOROUGH COUNCIL

01706 924606

07552 570262
stephen.mccann@rochdale.gov.uk

From: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Sent: 09 February 2022 13:00
To: 'David Gray' <David.Gray@bwbconsulting.com>
Cc: Stephen McCann <Stephen.McCann@Rochdale.Gov.UK>; Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Subject: Kingsway Hydraulic Modelling, Catchment 2 - 4200045304

Good afternoon,

Thanks for providing the report.

After reviewing the site it would appear that the drainage infrastructure was installed around the year 2000 with agreement from the Rochdale council who acted as our agent at the time.

It would appear that the previously agreed drainage strategy was to freely drain the development areas through the large-diameter adopted sewers to the pond.
The pond appears to have been designed to act as storage to contain storm events up to the 1 in 100 years storm event, and the outfall to the pond was constructed to control flows into the watercourse.

Unfortunately, legislation has changed since the surface water strategy was agreed upon and the system was installed. We must therefore speak to the LLFA to ensure that the previously agreed strategy is still acceptable.

The LLFA will have to decide whether they are happy with the current arrangement where the drainage system, attenuation pond and outfall/flow control (350mm + 200mm ORIFICE plates) has already been constructed and is operational. **OR** whether they would like to restrict and attenuate flow on site in line with the latest legislation/guidance.

- Please contact the LLFA to agree on a way forward and let me know what their position is.
- If the LLFA are willing to accept the previously agreed strategy, could you please highlight the contributing area from the proposed development and the associated pipe length in the submitted Micro Drainage calculations so that the discharge rate from the proposed parcel can be confirmed?

If we can be of any further assistance please don't hesitate to contact us further.

Kind regards,

United Utilities
Water for the North West

Mohammed Aljafarawi
Developer Engineer
Developer Services & Metering
Customer Services
Email: Mohammed.Aljafarawi@uuplc.co.uk
M: 07950474499
unitedutilities.com

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Did you know we now have a live chat facility available to you Mon to Friday 8 -5pm. You just click on the orange live chat box on our webpage and one of our advisors will be ready to chat to you and help you

William James

From: seweradoptions@uuplc.co.uk
Sent: 20 July 2023 10:01
To: Rowan Jobling
Subject: RE: Kingsway Site Wide Modelled Flow Rates - UU REF: 04306456

This email originated from outside of our organisation. Please exercise caution with content, links and attachments.

Good morning Rowan,
After reviewing the provided document, drawing number: KBP-BWB-ZZ-XX-DR-CD-0005, Rev: P01, dated: 03/07/2023, prepared by BWB. I confirm that this drawing and table are acceptable to United Utilities to be used as a reference for all future plots.

- The discharge rates stated in the document are the maximum rates that can be accommodated within the adopted surface water network for each plot.
- The flow rates are for storms up to 1 in 100-year storm events without attenuation, where the 40% climate change needs to be accommodated by extra storage on each plot site.

This document is saved on ICS case number: 04306456 with all the related correspondence with LLFA for reference and guidance.

Kind regards,

United Utilities
Water for the North West

Mohammed Aljafarawi (He/Him)
Developer Engineer
Developer Services & Metering
Customer Services
M: 07950474499
unitedutilities.com

---------- Original Message ----------
From: Rowan Jobling [rowan.jobling@bwbconsulting.com]
Sent: 07/07/2023 16:19
To: seweradoptions@uuplc.co.uk
Cc: wastewaterdeveloperservices@uuplc.co.uk
Subject: FW: Kingsway Site Wide Modelled Flow Rates

Hi Mohammed,

Good to speak with you.

As discussed, we have now produced the attached drawing which is based on the modelling work that was previously submitted. The flow rates shown on the drawing are the peak rate for the 100yr storm event without climate change and hence any plot coming forward should be restricted to the rate identified on this drawing.

Please could you both review and confirm acceptance of the drawing. If it would help then we are happy to set up a call to run through any queries, please advise on availability if required.

Regards

Rowan Jobling

Senior Engineer | BWB Consulting Limited

5th Floor, Waterfront House, Station Street, Nottingham, NG2 3DQ

M 07384 810148 **W** www.bwbconsulting.com

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William James

From: Stephen McCann <Stephen.McCann@Rochdale.Gov.UK>
Sent: 19 July 2023 16:56
To: Rowan Jobling
Cc: David Gray
Subject: RE: Kingsway Site Wide Modelled Flow Rates - acceptance by LLFA Rochdale Council

This email originated from outside of our organisation. Please exercise caution with content, links and attachments.

Hello Rowan,

Thanks for sending comprehensive Drainage Model information and documentation on the Kingsway Industrial Site via large file transfer. I have downloaded them.

I have spent some time reviewing the Drainage Designs which discharge the Kingsway Plots to the ponds, both when new sites are submitted for Planning and also when looking at the overall design done by BWB. I have also looked at the Microdrainage models developed by BWB and saved them on the Rochdale Drainage dept. folder.

As such, I can confirm that, to the best of my knowledge, the plot flow rates given on BWB's Plan and Tables sheet ref. KBP-BWB-ZZ-XX-DR-CD-0005, Rev: P01, dated: 03/07/2023 are suitable for use when additional Kingsway (Milnrow) plots come forward for development. As explained in the BWB documentation:-

- the plot surface water flow rates are based upon each plot discharging all flows for storms up to 1 in 100 year storm events without attenuation, and
- only the additional 40% climate change rainwater allowance needs to be accommodated by extra storage on each plot site.

regards

Stephen McCann
Drainage & Flooding Engineer
Network Improvement/Development/Flooding

ROCHDALE BOROUGH COUNCIL

01706 924606
07552 570262
stephen.mccann@rochdale.gov.uk

Rochdale Borough Council
Floor 2, Number One Riverside
Smith Street, Rochdale, OL16 1XU

To access our services go to www.rochdale.gov.uk
For news, events and social media updates go to www.rochdale.gov.uk/newsandevents

Please consider the environment before printing this email.

From: Rowan Jobling <Rowan.Jobling@bwbconsulting.com>
Sent: 07 July 2023 16:17
To: seweradoptions@uuplc.co.uk; Stephen McCann <Stephen.McCann@Rochdale.Gov.UK>
Cc: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>; David Gray <David.Gray@bwbconsulting.com>
Subject: Kingsway Site Wide Modelled Flow Rates

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Hi Stephen, Mohammed,

Good to speak with you both.

As discussed, we have now produced the attached drawing which is based on the modelling work that was previously submitted. The flow rates shown on the drawing are the peak rate for the 100yr storm event without climate change and hence any plot coming forward should be restricted to the rate identified on this drawing.

Please could you both review and confirm acceptance of the drawing. If it would help then we are happy to set up a call to run through any queries, please advise on availability if required.

Regards

Rowan Jobling
Senior Engineer | BWB Consulting Limited

5th Floor, Waterfront House, Station Street, Nottingham, NG2 3DQ
M 07384 810148 **W** www.bwbconsulting.com

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CATCHMENT 1A/1B

For further details refer to BWB Technical Note, Ref: KBP-BWB-ZZ-XX-RP-CD-0001

Plot	Microdrainage Manhole Reference	Pipe Number	Impermeable Area (ha)	Peak Flow (l/s)	Critical Storm
E (West)	S1PE	10.000	1.530	577.7	15 min
F/G	S1PG1	11.000	5.500	1995.9	15 min
I	S1PI2	9.000	5.348	1847.4	15 min
J1	Plot J1 - Asda	2.000	13.550	513.4	240 min
J2 - Unit 1	Plot J2 - Unit 1	7.000	3.546	452.0	30 min
J2 - Unit 2	Plot J2 - Unit 2	6.000	3.546	340.0	15 min
W	PlotW	4.000	0.716	264.6	15 min

CATCHMENT 1C

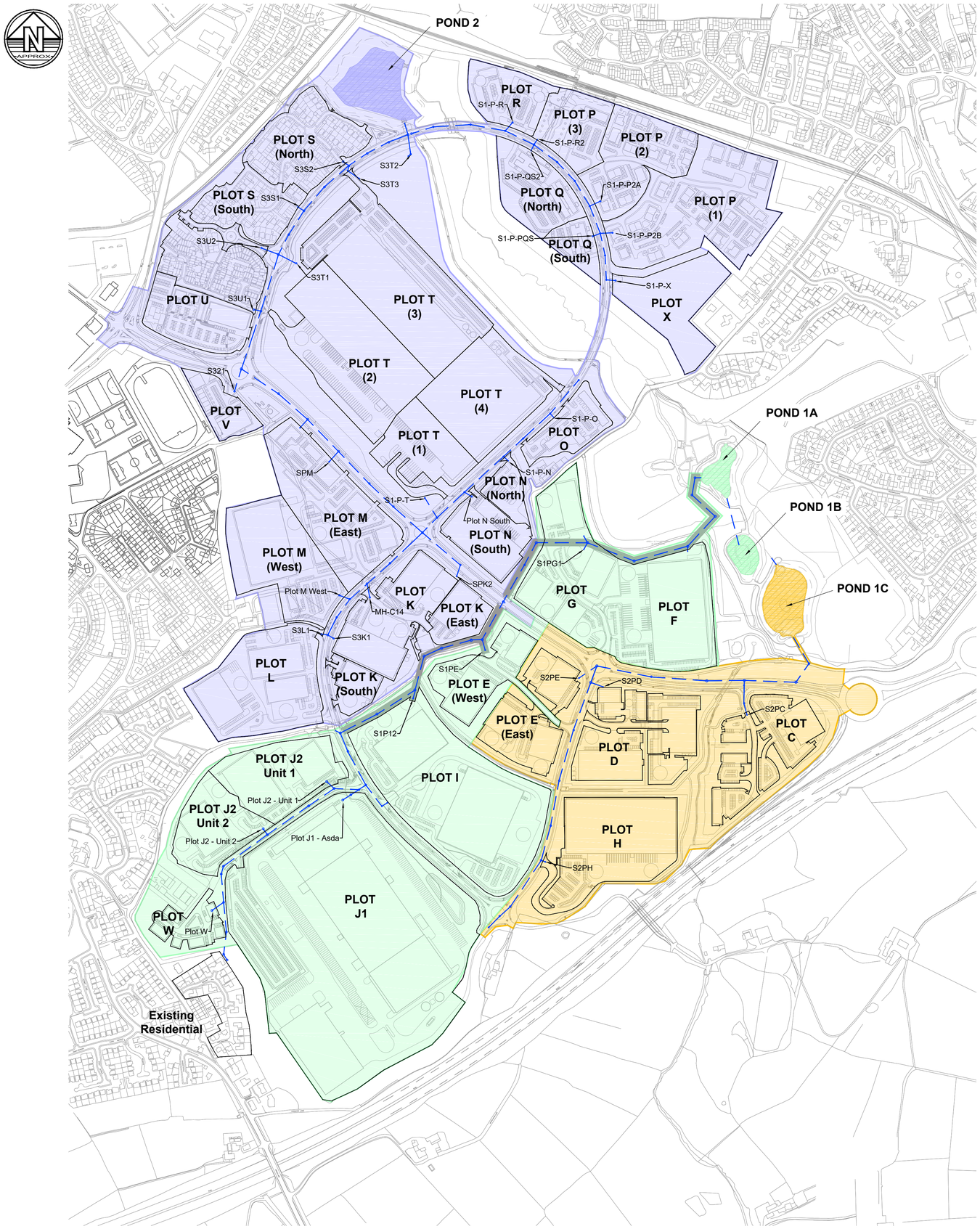
For further details refer to BWB Technical Note, Ref: KBP-BWB-ZZ-XX-RP-CD-0002

Plot	Microdrainage Manhole Reference	Pipe Number	Impermeable Area (ha)	Peak Flow (l/s)	Critical Storm
C	S2PC	7.000	2.010	662.5	15 min
D	S2PD	5.000	2.656	955.7	
E (East)	S2PE	6.000	1.790	567.8	
H	S2PH	3.000	3.196	1153.7	

CATCHMENT 2

For further details refer to BWB Technical Note, Ref: KBP-BWB-ZZ-XX-RP-CD-0003

Plot	Microdrainage Manhole Reference	Pipe Number	Impermeable Area (ha)	Peak Flow (l/s)	Critical Storm
K	MH-C14	4.000	2.251	788.6	15 min
K (South)	S3K1	2.000	0.582	211.5	
K (East)	SPK2	5.000	0.742	261.3	
L	S3L1	1.000	3.287	1175.5	
M (West)	Plot M West	3.000	2.677	947.7	
M (East)	SPM	11.000	2.900	1040.5	
N (North)	S1-P-N	8.000	0.515	187.7	
N (South)	Plot N South	9.000	1.125	368.9	
O	S1-P-O	7.000	0.988	345.7	
P (1)	S1-P-P2B	24.000	4.178	1240.5	
P (2)	S1-P-P2A	25.000	2.177	697.0	
P (3)	S1-P-R2	26.000	1.297	470.9	
Q (South)	S1-P-QS	23.000	0.581	163.0	
Q (North)	S1-P-QS2	27.000	1.543	558.4	
R	S1-P-R	28.000	1.229	441.8	
S (South)	S3S1	18.000	1.067	363.8	
S (North)	S3S2	20.000	1.560	525.4	
T (1)	S1-P-T	10.000	1.596	493.4	
T (2)	S3T1	16.000	3.959	1385.6	
T (3)	S3T3	19.000	4.559	1265.8	
T (4)	S2T2	21.000	2.826	1029.5	
U	S3U1	15.000	2.901	1055.0	
V	S321	13.000	0.751	244.4	
X	S1-P-X	22.000	1.942	589.5	



Notes

1. Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
2. This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
3. All dimensions in millimetres unless noted otherwise. All levels in metres unless noted otherwise.
4. Any discrepancies noted on site are to be reported to the engineer immediately.
5. Drawing to be read in conjunction with the BWB MicroDrainage calculations for each of the Catchments.
6. Flow rates described within the tables are the maximum modelled flow rate for each of the plots, based on the 100yr return period, FSR rainfall model. Further details regarding methodology can be found in the supporting BWB Technical Notes.
7. Proposed discharge rates for each plot to be developed are subject to agreement from United Utilities and the Lead Local Flood Authority.
8. Additional flows are present within each of the systems, associated with the highway drainage.
9. Plot boundaries based on the Masterplan at the time of production.

Legend

- Catchment 1A/B
- Catchment 1C
- Catchment 2
- Plot Boundaries

Rev	Date	Details of issue / revision	Drw	Rev
P01	03.07.23	Preliminary Issue	LR	RJ

Issues & Revisions

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Client

WILSON BOWDEN DEVELOPMENTS LTD

Project Title

KINGSWAY BUSINESS PARK

Drawing Title

SITE WIDE CATCHMENT PLAN & MODELLED FLOW RATES

Drawn:	L. Ream	Reviewed:	R. Jobling
BWB Ref: NTW 2889	Date: 03.07.23	Scale@A1:	1:4000

Drawing Status

PRELIMINARY

Project - Originator - Zone - Level - Type - Role - Number	Status	Rev
KBP-BWB-ZZ-XX-DR-CD-0005	S2	P01

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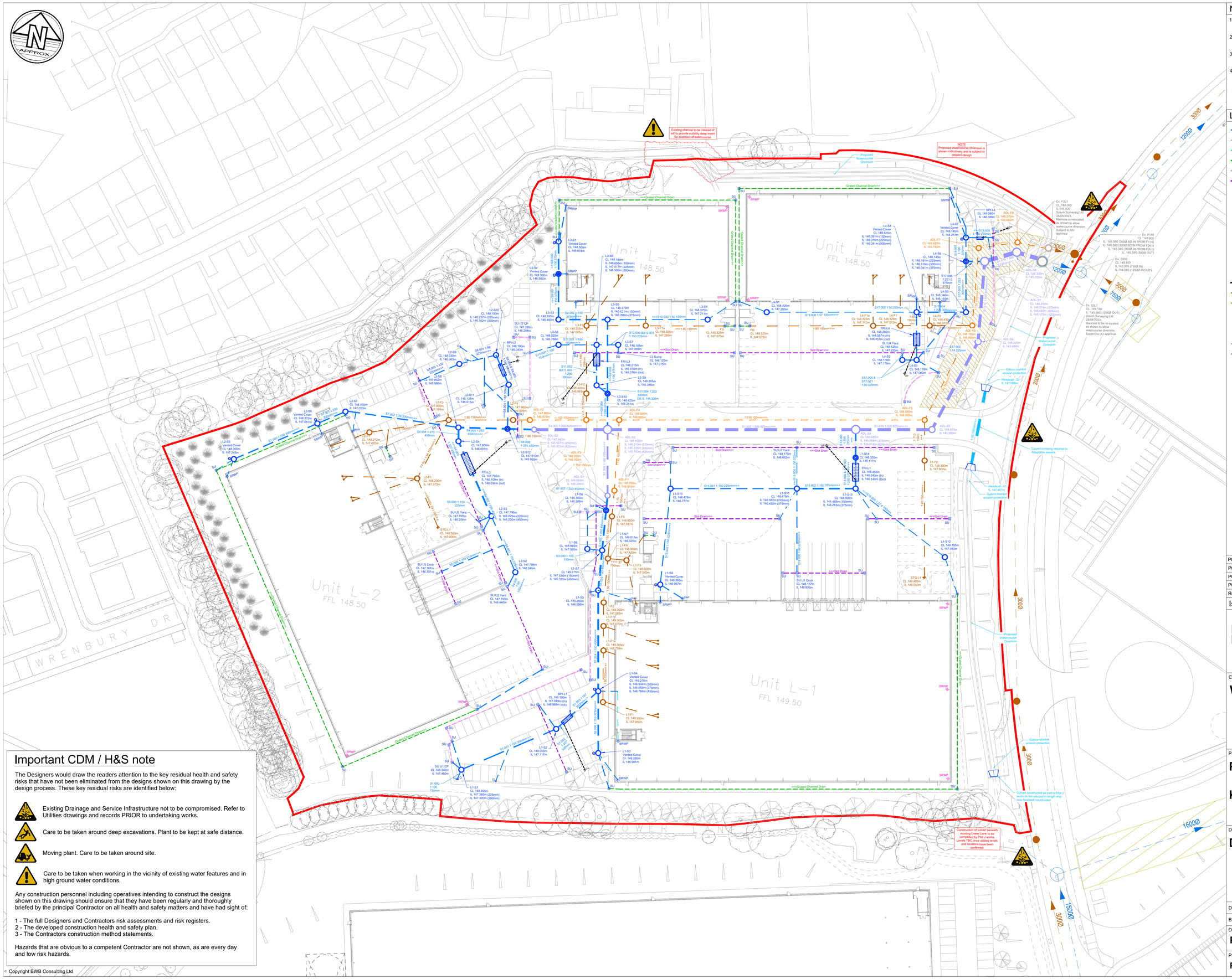
Appendix 7: Proposed Drainage Strategy



Important CDM / H&S note

The Designers would draw the readers attention to the key residual health and safety risks that have not been eliminated from the designs shown on this drawing by the design process. These key residual risks are identified below:

- Existing Drainage and Service Infrastructure not to be compromised. Refer to Utilities drawings and records PRIOR to undertaking works.
- Care to be taken around deep excavations. Plant to be kept at safe distance.
- Moving plant. Care to be taken around site.
- Care to be taken when working in the vicinity of existing water features and in high ground water conditions.

Any construction personnel including operatives intending to construct the designs shown on this drawing should ensure that they have been regularly and thoroughly briefed by the principal Contractor on all health and safety matters and have had sight of:

1 - The full Designers and Contractors risk assessments and risk registers.
2 - The developed construction health and safety plan.
3 - The Contractors construction method statements.

Hazards that are obvious to a competent Contractor are not shown, as are every day and low risk hazards.

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J:\2022\222009-Plot L, Kingsway WBD\ProjectDelivery\01-WIP\Drawings\PLK-BWB-DDG-XX-DR-D-0500_Drainage.dwg

Notes

1. Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
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4. Any discrepancies noted on site are to be reported to the engineer immediately.

Legend

- Proposed Surface Water Drainage
- Adoptable Surface Water Drainage
- Culvert and Ditch Drainage
- Channel Drain
- Kerb Drain
- Slot Drain - QMax
- Gully
- Siphonic Rain Water Pipe
- Secondary Siphonic Rain Water Pipe
- Channel Drain Sump
- Surface Water Vented Access Chamber
- Penstock Chamber
- Headwall
- Full Retention Interceptor
- Bypass Interceptor
- Petrol Interceptor Vent Pipe
- Proposed Foul Drainage
- Adoptable Foul Sewer
- Foul Pop Up
- Sprinkler Tank Drain Down
- Envisaged Sewer Easement
- Existing Surface Water Drainage
- Existing Foul Drainage
- Existing Sewer Easement

DESIGN IS SUBJECT TO APPROVAL OR THE WATER AUTHORITY, BUILDING CONTROL AND THE LEAD LOCAL FLOOD AUTHORITY.

Rev	Date	Details of issue / revision	Drw	Rev
P04	15.09.23	Minor amendments as requested by client	IB	PJL
P03	08.09.23	Updated to suit the latest site plan. Planning Issue	IB	KMJ
P02	15.05.23	Planning Issue	CKR	PJL
P01	26.04.23	Planning Issue	PJL	CKR

Issues & Revisions

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Client
Wilson Bowden

Project Title
Plot L

Kingsway Business Park

Drawing Title
Drainage

Drawn:	S. McGill	Reviewed:	P. Laidler
BWB Ref:	222009	Date: Apr '23	Scale@A1: 1:500

Drawing Status
Planning

Project - Originator - Zone - Level - Type - Role - Number	Status	Rev
PLK-BWB-DDG-XX-DR-D-0500	S8	P04

Appendix 8: Network Model Results

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.272	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
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

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	1.079	4-8	1.876	8-12	0.033

Total Area Contributing (ha) = 2.988

Total Pipe Volume (m³) = 170.607

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	3.049	0.065	46.9	0.037	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	30.414	0.203	149.8	0.031	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.002	6.342	0.028	226.5	0.051	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	10.308	0.055	187.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.000	18.230	0.122	149.4	0.145	5.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.03	147.625	0.037	0.0	0.0	0.0	1.47	26.0	5.0
S1.001	50.00	5.43	147.320	0.068	0.0	0.0	0.0	1.28	90.6	9.2
S1.002	50.00	5.53	147.117	0.119	0.0	0.0	0.0	1.04	73.6	16.1
S1.003	50.00	5.68	146.989	0.119	0.0	0.0	0.0	1.15	80.9	16.1
S2.000	50.00	5.21	146.981	0.145	0.0	0.0	0.0	1.48	163.5	19.6

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.004	29.718	0.198	150.1	0.265	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.005	11.849	0.261	45.4	0.031	0.00	0.0	0.600	o	450	Pipe/Conduit	
S3.000	4.380	0.044	99.5	0.027	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.006	11.849	0.059	200.8	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.007	4.363	0.022	198.3	0.005	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.008	19.473	0.109	178.6	0.034	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.000	4.873	0.095	51.3	0.134	5.00	0.0	0.600	o	150	Pipe/Conduit	
S4.001	17.975	0.120	149.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S5.000	4.845	0.029	167.1	0.138	5.00	0.0	0.600	o	225	Pipe/Conduit	
S6.000	3.000	0.029	103.4	0.000	5.00	0.0	0.600	CA	225	CastSlot	
S6.001	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.002	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.003	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.004	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.005	0.500	0.000	1666.7	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.006	0.945	0.000	3150.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.007	21.104	0.126	167.5	0.042	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.004	50.00	5.98	146.784	0.529	0.0	0.0	0.0	1.66	263.6	71.6
S1.005	50.00	6.05	146.586	0.560	0.0	0.0	0.0	3.02	480.9	75.8
S3.000	50.00	5.07	147.560	0.027	0.0	0.0	0.0	1.01	17.8	3.7
S1.006	50.00	6.18	146.325	0.587	0.0	0.0	0.0	1.43	227.6	79.5
S1.007	50.00	6.23	146.266	0.592	0.0	0.0	0.0	1.44	229.0	80.2
S1.008	50.00	6.45	146.244	0.626	0.0	0.0	0.0	1.52	241.4	84.8
S4.000	50.00	5.06	146.440	0.134	0.0	0.0	0.0	1.41	24.9	18.1
S4.001	50.00	5.34	146.345	0.134	0.0	0.0	0.0	1.07	42.4	18.1
S5.000	50.00	5.08	146.254	0.138	0.0	0.0	0.0	1.01	40.1	18.7
S6.000	50.00	5.04	146.351	0.000	0.0	0.0	0.0	0.82	37.9	0.0
S6.001	50.00	5.45	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.002	50.00	5.86	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.003	50.00	6.28	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.004	50.00	6.69	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.005	50.00	6.71	146.715	0.000	0.0	0.0	0.0	0.54	24.8	0.0
S6.006	50.00	6.79	146.715	0.000	0.0	0.0	0.0	0.52	24.0	0.0
S6.007	50.00	7.13	146.351	0.042	0.0	0.0	0.0	1.01	40.1	5.7

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.002	16.603	0.091	182.5	0.038	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.003	7.486	0.033	226.8	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.004	4.058	0.015	270.5	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S7.000	26.750	0.178	150.3	0.198	5.00	0.0	0.600	o	300	Pipe/Conduit	
S7.001	9.363	0.047	199.2	0.180	0.00	0.0	0.600	o	300	Pipe/Conduit	
S7.002	33.356	0.889	37.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.005	14.400	0.051	282.4	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S8.000	12.716	0.293	43.4	0.073	5.00	0.0	0.600	o	225	Pipe/Conduit	
S8.001	11.134	0.126	88.4	0.032	0.00	0.0	0.600	o	225	Pipe/Conduit	
S8.002	4.005	0.019	210.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.003	5.495	0.028	196.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.004	13.000	0.080	162.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.006	7.870	0.028	281.1	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.007	21.636	0.072	300.5	0.025	0.00	0.0	0.600	o	825	Pipe/Conduit	
S9.000	9.564	0.096	99.6	0.077	5.00	0.0	0.600	o	375	Pipe/Conduit	
S9.001	13.436	0.090	149.3	0.068	0.00	0.0	0.600	o	375	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)
S4.002	50.00	7.32	146.200	0.352	0.0	0.0	0.0	1.50	238.9	47.7
S4.003	50.00	7.41	146.034	0.352	0.0	0.0	0.0	1.35	214.0	47.7
S4.004	50.00	7.47	146.001	0.352	0.0	0.0	0.0	1.23	195.8	47.7
S7.000	50.00	5.35	147.245	0.198	0.0	0.0	0.0	1.28	90.5	26.8
S7.001	50.00	5.49	147.067	0.378	0.0	0.0	0.0	1.11	78.5	51.2
S7.002	50.00	5.70	147.020	0.378	0.0	0.0	0.0	2.57	182.0	51.2
S4.005	50.00	7.67	145.986	0.730	0.0	0.0	0.0	1.20	191.6	98.9
S8.000	50.00	5.11	146.656	0.073	0.0	0.0	0.0	1.99	79.2	9.9
S8.001	50.00	5.24	146.363	0.105	0.0	0.0	0.0	1.39	55.3	14.2
S8.002	50.00	5.30	146.162	0.105	0.0	0.0	0.0	1.08	76.3	14.2
S8.003	50.00	5.38	146.043	0.105	0.0	0.0	0.0	1.12	79.1	14.2
S8.004	50.00	5.56	146.015	0.105	0.0	0.0	0.0	1.23	87.0	14.2
S4.006	50.00	7.77	145.935	0.835	0.0	0.0	0.0	1.21	192.1	113.1
S4.007	50.00	7.99	145.832	0.860	0.0	0.0	0.0	1.71	912.7	116.5
S9.000	50.00	5.09	146.678	0.077	0.0	0.0	0.0	1.82	200.5	10.4
S9.001	50.00	5.24	146.582	0.145	0.0	0.0	0.0	1.48	163.5	19.6

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S9.002	14.455	0.096	150.6	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S10.000	29.487	0.590	50.0	0.010	5.00	0.0	0.600	o	150	Pipe/Conduit	
S9.003	21.800	0.145	150.3	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S11.000	8.764	0.188	46.6	0.050	5.00	0.0	0.600	o	150	Pipe/Conduit	
S11.001	11.226	0.112	100.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S12.000	2.351	0.016	146.9	0.145	5.00	0.0	0.600	o	225	Pipe/Conduit	
S12.001	6.353	0.042	151.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S11.002	5.969	0.030	199.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S11.003	5.969	0.030	199.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S11.004	4.029	0.020	201.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S9.004	10.627	0.041	259.2	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.009	73.129	0.146	500.9	0.077	0.00	0.0	0.600	o	825	Pipe/Conduit	
S13.000	28.448	0.190	149.7	0.133	5.00	0.0	0.600	o	225	Pipe/Conduit	
S13.001	37.223	0.195	190.9	0.014	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S9.002	50.00	5.40	146.492	0.145	0.0	0.0	0.0	1.47	162.8	19.6
S10.000	50.00	5.34	147.211	0.010	0.0	0.0	0.0	1.43	25.2	1.4
S9.003	50.00	5.65	146.396	0.155	0.0	0.0	0.0	1.48	163.0	21.0
S11.000	50.00	5.10	146.956	0.050	0.0	0.0	0.0	1.48	26.1	6.8
S11.001	50.00	5.29	146.768	0.050	0.0	0.0	0.0	1.00	17.7	6.8
S12.000	50.00	5.04	147.075	0.145	0.0	0.0	0.0	1.08	42.8	19.6
S12.001	50.00	5.14	147.059	0.145	0.0	0.0	0.0	1.06	42.2	19.6
S11.002	50.00	5.37	146.506	0.195	0.0	0.0	0.0	1.11	78.5	26.4
S11.003	50.00	5.46	146.376	0.195	0.0	0.0	0.0	1.11	78.5	26.4
S11.004	50.00	5.53	146.346	0.195	0.0	0.0	0.0	1.10	78.0	26.4
S9.004	50.00	5.81	146.251	0.350	0.0	0.0	0.0	1.12	123.8	47.4
S1.009	50.00	8.91	145.760	1.913	0.0	0.0	0.0	1.32	705.5	259.0
S13.000	50.00	5.44	146.967	0.133	0.0	0.0	0.0	1.07	42.4	18.0
S13.001	50.00	6.10	146.777	0.147	0.0	0.0	0.0	0.94	37.5	19.9

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S14.000	24.868	0.311	80.0	0.059	5.00	0.0	0.600	o	225	Pipe/Conduit	
S15.000	12.128	0.081	149.7	0.173	5.00	0.0	0.600	o	225	Pipe/Conduit	
S13.002	17.294	0.169	102.3	0.097	0.00	0.0	0.600	o	375	Pipe/Conduit	
S16.000	33.161	1.452	22.8	0.019	5.00	0.0	0.600	o	150	Pipe/Conduit	
S13.003	4.564	0.023	198.4	0.060	0.00	0.0	0.600	o	375	Pipe/Conduit	
S13.004	4.564	0.023	198.4	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S13.005	8.273	0.053	156.1	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.010	22.475	0.045	499.4	0.063	0.00	0.0	0.600	o	825	Pipe/Conduit	
S1.011	29.256	0.028	1044.9	0.000	0.00	0.0	0.600	o	825	Pipe/Conduit	
S1.012	23.744	0.061	389.2	0.000	0.00	0.0	0.600	o	825	Pipe/Conduit	
S17.000	2.464	0.049	50.3	0.159	5.00	0.0	0.600	o	225	Pipe/Conduit	
S17.001	4.217	0.114	37.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.002	5.401	0.505	10.7	0.035	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.003	8.694	0.141	61.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S14.000	50.00	5.28	146.893	0.059	0.0	0.0	0.0	1.46	58.2	8.0
S15.000	50.00	5.19	146.663	0.173	0.0	0.0	0.0	1.07	42.4	23.4
S13.002	50.00	6.26	146.432	0.476	0.0	0.0	0.0	1.79	197.8	64.5
S16.000	50.00	5.26	147.940	0.019	0.0	0.0	0.0	2.12	37.4	2.6
S13.003	50.00	6.32	146.263	0.555	0.0	0.0	0.0	1.28	141.7	75.2
S13.004	50.00	6.38	146.140	0.555	0.0	0.0	0.0	1.28	141.7	75.2
S13.005	50.00	6.48	146.117	0.555	0.0	0.0	0.0	1.45	159.9	75.2
S1.010	50.00	9.19	145.614	2.531	0.0	0.0	0.0	1.32	706.5	342.7
S1.011	50.00	9.73	145.569	2.531	0.0	0.0	0.0	0.91	486.4	342.7
S1.012	50.00	9.99	145.480	2.531	0.0	0.0	0.0	1.50	801.2	342.7
S17.000	50.00	5.02	147.225	0.159	0.0	0.0	0.0	1.85	73.5	21.5
S17.001	50.00	5.05	147.176	0.159	0.0	0.0	0.0	2.16	85.8	21.5
S17.002	50.00	5.08	147.062	0.194	0.0	0.0	0.0	4.02	160.0	26.3
S17.003	50.00	5.16	146.457	0.194	0.0	0.0	0.0	1.67	66.3	26.3

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S18.000	44.171	0.809	54.6	0.012	5.00	0.0	0.600	o	150	Pipe/Conduit	
S17.004	14.540	0.058	250.7	0.100	0.00	0.0	0.600	o	300	Pipe/Conduit	
S17.005	14.970	0.067	223.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S19.000	5.802	0.779	7.4	0.044	5.00	0.0	0.600	o	225	Pipe/Conduit	
S19.001	7.025	0.070	100.4	0.107	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.006	5.523	0.022	251.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.013	9.819	0.020	491.0	0.000	0.00	0.0	0.600	o	1200	Pipe/Conduit	
S1.014	7.993	0.095	84.1	0.000	0.00	0.0	0.600	o	1200	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)
S18.000	50.00	5.54	147.200	0.012	0.0	0.0	0.0	1.36	24.1	1.6
S17.004	50.00	5.78	146.241	0.306	0.0	0.0	0.0	0.99	69.9	41.4
S17.005	50.00	6.02	146.183	0.306	0.0	0.0	0.0	1.05	74.1	41.4
S19.000	50.00	5.02	147.040	0.044	0.0	0.0	0.0	4.82	191.8	6.0
S19.001	50.00	5.11	146.261	0.151	0.0	0.0	0.0	1.31	51.9	20.4
S17.006	50.00	6.10	146.041	0.457	0.0	0.0	0.0	1.14	125.8	61.9
S1.013	50.00	10.09	145.175	2.988	0.0	0.0	0.0	1.68	1901.9	404.6
S1.014	50.00	10.12	145.155	2.988	0.0	0.0	0.0	4.08	4614.7	404.6

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.014	Ex. S3L1	149.100	145.060	0.000	0	0

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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.272		

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 0
Number of Online Controls 0 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH
FEH Rainfall Version 2013
Site Location GB 391325 411646 SD 91325 11646
Data Type Point
Cv (Summer) 0.750
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) 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 2
Climate Change (%) 0

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S1.000	SU U1 CP	60 minute 2 year Summer I+0%	148.326	147.672	-0.103	0.000	0.21
S1.001	L1-S1	60 minute 2 year Summer I+0%	148.400	147.373	-0.247	0.000	0.07
S1.002	L1-S2	60 minute 2 year Summer I+0%	149.055	147.208	-0.209	0.000	0.20
S1.003	BPI-L1	60 minute 2 year Summer I+0%	149.100	147.071	-0.218	0.000	0.17
S2.000	L1-S3	60 minute 2 year Summer I+0%	149.380	147.059	-0.297	0.000	0.10
S1.004	L1-S4	60 minute 2 year Summer I+0%	149.270	146.921	-0.313	0.000	0.20
S1.005	L1-S5	60 minute 2 year Summer I+0%	149.260	146.709	-0.327	0.000	0.17
S3.000	L1-S6	60 minute 2 year Summer I+0%	148.985	147.604	-0.106	0.000	0.18
S1.006	L1-S7	60 minute 2 year Summer I+0%	149.015	146.501	-0.274	0.000	0.31
S1.007	L1-S8	60 minute 2 year Summer I+0%	148.760	146.466	-0.250	0.000	0.41
S1.008	ADL-S1	60 minute 2 year Summer I+0%	148.654	146.408	-0.286	0.000	0.29
S4.000	L2-S1	60 minute 2 year Summer I+0%	147.700	146.527	-0.063	0.000	0.62
S4.001	L2-S2	60 minute 2 year Summer I+0%	147.796	146.433	-0.137	0.000	0.31
S5.000	SU U2 Yard	60 minute 2 year Summer I+0%	147.700	146.358	-0.121	0.000	0.42
S6.000	15	60 minute 2 year Summer I+0%	147.167	146.351	-0.452	0.000	0.00
S6.001	15-1	60 minute 2 year Summer I+0%	147.167	146.322	-0.845	0.000	0.00
S6.002	15-2	60 minute 2 year Summer I+0%	147.167	146.715	-0.452	0.000	0.00

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

PN	US/MH Name	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S1.000	SU U1 CP		0.007	3.3	OK
S1.001	L1-S1		0.055	5.9	OK
S1.002	L1-S2		0.203	10.3	OK
S1.003	BPI-L1		0.087	10.3	OK
S2.000	L1-S3		0.105	13.0	OK
S1.004	L1-S4		0.274	45.5	OK
S1.005	L1-S5		0.444	48.2	OK
S3.000	L1-S6		0.044	2.4	OK
S1.006	L1-S7		0.421	50.6	OK
S1.007	L1-S8		0.774	50.9	OK
S1.008	ADL-S1		0.330	53.4	OK
S4.000	L2-S1		0.013	11.9	OK
S4.001	L2-S2		0.113	11.9	OK
S5.000	SU U2 Yard		0.028	12.3	OK
S6.000	15		0.000	0.0	OK
S6.001	15-1		0.000	0.0	OK
S6.002	15-2		0.000	0.0	OK

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S6.003	15-3	60 minute 2 year Summer I+0%	147.167	146.715	-0.452	0.000	0.00
S6.004	15-4	60 minute 2 year Summer I+0%	147.167	146.715	-0.452	0.000	0.00
S6.005	15-5	60 minute 2 year Summer I+0%	147.167	146.715	-0.452	0.000	0.00
S6.006	15-6	60 minute 2 year Summer I+0%	147.167	146.715	-0.452	0.000	0.00
S6.007	SU U2 Dock	60 minute 2 year Summer I+0%	147.167	146.398	-0.178	0.000	0.10
S4.002	L2-S3	60 minute 2 year Summer I+0%	147.796	146.331	-0.319	0.000	0.18
S4.003	FRI-L2	60 minute 2 year Summer I+0%	147.760	146.228	-0.256	0.000	0.22
S4.004	L2-S4	60 minute 2 year Summer I+0%	147.800	146.219	-0.232	0.000	0.26
S7.000	L2-S5	60 minute 2 year Summer I+0%	148.300	147.341	-0.204	0.000	0.22
S7.001	L2-S6	60 minute 2 year Summer I+0%	148.370	147.226	-0.141	0.000	0.54
S7.002	L2-S7	60 minute 2 year Summer I+0%	148.490	147.111	-0.209	0.000	0.20
S4.005	L2-S8	60 minute 2 year Summer I+0%	147.852	146.215	-0.221	0.000	0.44
S8.000	SU	60 minute 2 year Summer I+0%	147.656	146.703	-0.178	0.000	0.10
S8.001	L2-S9	60 minute 2 year Summer I+0%	148.030	146.431	-0.157	0.000	0.20
S8.002	L2-S10	60 minute 2 year Summer I+0%	148.163	146.251	-0.211	0.000	0.19
S8.003	BPI-L2	60 minute 2 year Summer I+0%	148.163	146.192	-0.151	0.000	0.17
S8.004	L2-S11	60 minute 2 year Summer I+0%	148.134	146.189	-0.126	0.000	0.12
S4.006	L2-S12	60 minute 2 year Summer I+0%	147.910	146.181	-0.204	0.000	0.57
S4.007	ADL-S2	60 minute 2 year Summer I+0%	147.940	146.156	-0.501	0.000	0.11
S9.000	L3-S1	60 minute 2 year Summer I+0%	148.300	146.736	-0.317	0.000	0.06
S9.001	L3-S2	60 minute 2 year Summer I+0%	148.300	146.664	-0.293	0.000	0.11
S9.002	L3-S3	60 minute 2 year Summer I+0%	148.165	146.573	-0.294	0.000	0.10
S10.000	L3-S4	60 minute 2 year Summer I+0%	148.370	147.230	-0.131	0.000	0.04
S9.003	L3-S5	60 minute 2 year Summer I+0%	148.370	146.475	-0.296	0.000	0.10
S11.000	L3 Sump	60 minute 2 year Summer I+0%	147.780	147.001	-0.105	0.000	0.20
S11.001	L3-S6	60 minute 2 year Summer I+0%	148.025	146.823	-0.095	0.000	0.28
S12.000	L3 Sump	60 minute 2 year Summer I+0%	148.125	147.184	-0.116	0.000	0.46
S12.001	L3-S7	60 minute 2 year Summer I+0%	148.185	147.164	-0.120	0.000	0.43
S11.002	L3-S8	60 minute 2 year Summer I+0%	148.184	146.624	-0.182	0.000	0.32
S11.003	FRI-L3	60 minute 2 year Summer I+0%	148.131	146.494	-0.182	0.000	0.32
S11.004	L3-S9	60 minute 2 year Summer I+0%	148.356	146.472	-0.174	0.000	0.37
S9.004	L3-S10	60 minute 2 year Summer I+0%	148.425	146.399	-0.227	0.000	0.34
S1.009	ADL-S3	60 minute 2 year Summer I+0%	148.400	146.149	-0.436	0.000	0.25
S13.000	L1-S9	60 minute 2 year Summer I+0%	149.385	147.052	-0.140	0.000	0.30
S13.001	L1-S10	60 minute 2 year Summer I+0%	148.478	146.872	-0.130	0.000	0.37
S14.000	SU U1 Dock	60 minute 2 year Summer I+0%	148.167	146.941	-0.177	0.000	0.10
S15.000	SU U1 Yard	60 minute 2 year Summer I+0%	148.175	146.767	-0.121	0.000	0.43
S13.002	L1-S11	60 minute 2 year Summer I+0%	148.478	146.563	-0.244	0.000	0.26
S16.000	L1-S12	60 minute 2 year Summer I+0%	149.185	147.961	-0.129	0.000	0.05
S13.003	L1-S13	60 minute 2 year Summer I+0%	148.500	146.469	-0.169	0.000	0.58
S13.004	FRI-L1	60 minute 2 year Summer I+0%	148.455	146.345	-0.170	0.000	0.58
S13.005	L1-S14	60 minute 2 year Summer I+0%	148.335	146.293	-0.199	0.000	0.46
S1.010	ADL-S4	60 minute 2 year Summer I+0%	148.480	146.093	-0.346	0.000	0.41
S1.011	ADL-S5	60 minute 2 year Summer I+0%	148.875	146.062	-0.332	0.000	0.67
S1.012	ADL-S6	60 minute 2 year Summer I+0%	149.225	145.809	-0.496	0.000	0.33
S17.000	SU U4 Yard	60 minute 2 year Summer I+0%	148.125	147.333	-0.117	0.000	0.45
S17.001	L4-S2	60 minute 2 year Summer I+0%	148.178	147.261	-0.140	0.000	0.30
S17.002	L4-S3	60 minute 2 year Summer I+0%	148.178	147.125	-0.162	0.000	0.17
S17.003	FRI-L4	60 minute 2 year Summer I+0%	148.260	146.546	-0.136	0.000	0.33

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

PN	US/MH Name	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S6.003	15-3		0.000	0.0	OK
S6.004	15-4		0.000	0.0	OK
S6.005	15-5		0.000	0.0	OK
S6.006	15-6		0.000	0.0	OK
S6.007	SU U2 Dock		0.017	3.6	OK
S4.002	L2-S3		0.502	31.1	OK
S4.003	FRI-L2		0.535	30.9	OK
S4.004	L2-S4		0.641	30.6	OK
S7.000	L2-S5		0.103	17.5	OK
S7.001	L2-S6		0.569	33.0	OK
S7.002	L2-S7		0.186	33.0	OK
S4.005	L2-S8		0.509	63.3	OK
S8.000	SU		0.007	6.6	OK
S8.001	L2-S9		0.090	9.1	OK
S8.002	L2-S10		0.097	9.2	OK
S8.003	BPI-L2		0.179	9.1	OK
S8.004	L2-S11		0.330	8.8	OK
S4.006	L2-S12		1.794	70.8	OK
S4.007	ADL-S2		1.239	72.1	OK
S9.000	L3-S1		0.076	6.9	OK
S9.001	L3-S2		0.175	12.6	OK
S9.002	L3-S3		0.208	12.6	OK
S10.000	L3-S4		0.016	0.9	OK
S9.003	L3-S5		0.204	13.6	OK
S11.000	L3 Sump		0.006	4.5	OK
S11.001	L3-S6		0.068	4.4	OK
S12.000	L3 Sump		0.016	12.8	OK
S12.001	L3-S7		0.132	12.9	OK
S11.002	L3-S8		0.129	17.4	OK
S11.003	FRI-L3		0.136	17.6	OK
S11.004	L3-S9		0.227	17.7	OK
S9.004	L3-S10		0.564	31.3	OK
S1.009	ADL-S3		4.506	156.6	OK
S13.000	L1-S9		0.091	11.8	OK
S13.001	L1-S10		0.196	13.2	OK
S14.000	SU U1 Dock		0.012	5.3	OK
S15.000	SU U1 Yard		0.028	15.4	OK
S13.002	L1-S11		0.194	41.9	OK
S16.000	L1-S12		0.018	1.7	OK
S13.003	L1-S13		0.774	48.9	OK
S13.004	FRI-L1		0.328	48.9	OK
S13.005	L1-S14		0.362	48.9	OK
S1.010	ADL-S4		19.095	192.4	OK
S1.011	ADL-S5		6.658	191.1	OK
S1.012	ADL-S6		3.268	190.2	OK
S17.000	SU U4 Yard		0.029	14.0	OK
S17.001	L4-S2		0.105	14.1	OK
S17.002	L4-S3		0.077	17.2	OK

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

PN	US/MH Name	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S17.003	FRI-L4		0.095	17.3	OK

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S18.000	L4-S1	60 minute 2 year Summer I+0%	148.425	147.221	-0.129	0.000	0.05
S17.004	L4-S4	60 minute 2 year Summer I+0%	148.425	146.385	-0.156	0.000	0.46
S17.005	L4-S5	60 minute 2 year Summer I+0%	148.140	146.320	-0.163	0.000	0.43
S19.000	BPI-L4	60 minute 2 year Summer I+0%	148.040	147.066	-0.199	0.000	0.03
S19.001	L4-S7	60 minute 2 year Summer I+0%	148.140	146.353	-0.133	0.000	0.35
S17.006	L4-S6	60 minute 2 year Summer I+0%	148.140	146.229	-0.187	0.000	0.50
S1.013	ADL-S7	60 minute 2 year Summer I+0%	148.232	145.624	-0.751	0.000	0.31
S1.014	ADL-S8	60 minute 2 year Summer I+0%	148.335	145.421	-0.934	0.000	0.11

PN	US/MH Name	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S18.000	L4-S1		0.018	1.1	OK
S17.004	L4-S4		0.185	26.9	OK
S17.005	L4-S5		0.440	26.9	OK
S19.000	BPI-L4		0.024	4.0	OK
S19.001	L4-S7		0.102	12.9	OK
S17.006	L4-S6		0.480	39.7	OK
S1.013	ADL-S7		2.668	216.1	OK
S1.014	ADL-S8		1.551	217.2	OK

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.272	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
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

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	1.079	4-8	1.876	8-12	0.033

Total Area Contributing (ha) = 2.988

Total Pipe Volume (m³) = 170.607

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	3.049	0.065	46.9	0.037	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	30.414	0.203	149.8	0.031	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.002	6.342	0.028	226.5	0.051	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	10.308	0.055	187.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.000	18.230	0.122	149.4	0.145	5.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.03	147.625	0.037	0.0	0.0	0.0	1.47	26.0	5.0
S1.001	50.00	5.43	147.320	0.068	0.0	0.0	0.0	1.28	90.6	9.2
S1.002	50.00	5.53	147.117	0.119	0.0	0.0	0.0	1.04	73.6	16.1
S1.003	50.00	5.68	146.989	0.119	0.0	0.0	0.0	1.15	80.9	16.1
S2.000	50.00	5.21	146.981	0.145	0.0	0.0	0.0	1.48	163.5	19.6

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.004	29.718	0.198	150.1	0.265	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.005	11.849	0.261	45.4	0.031	0.00	0.0	0.600	o	450	Pipe/Conduit	
S3.000	4.380	0.044	99.5	0.027	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.006	11.849	0.059	200.8	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.007	4.363	0.022	198.3	0.005	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.008	19.473	0.109	178.6	0.034	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.000	4.873	0.095	51.3	0.134	5.00	0.0	0.600	o	150	Pipe/Conduit	
S4.001	17.975	0.120	149.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S5.000	4.845	0.029	167.1	0.138	5.00	0.0	0.600	o	225	Pipe/Conduit	
S6.000	3.000	0.029	103.4	0.000	5.00	0.0	0.600	CA	225	CastSlot	
S6.001	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.002	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.003	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.004	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.005	0.500	0.000	1666.7	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.006	0.945	0.000	3150.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.007	21.104	0.126	167.5	0.042	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.004	50.00	5.98	146.784	0.529	0.0	0.0	0.0	1.66	263.6	71.6
S1.005	50.00	6.05	146.586	0.560	0.0	0.0	0.0	3.02	480.9	75.8
S3.000	50.00	5.07	147.560	0.027	0.0	0.0	0.0	1.01	17.8	3.7
S1.006	50.00	6.18	146.325	0.587	0.0	0.0	0.0	1.43	227.6	79.5
S1.007	50.00	6.23	146.266	0.592	0.0	0.0	0.0	1.44	229.0	80.2
S1.008	50.00	6.45	146.244	0.626	0.0	0.0	0.0	1.52	241.4	84.8
S4.000	50.00	5.06	146.440	0.134	0.0	0.0	0.0	1.41	24.9	18.1
S4.001	50.00	5.34	146.345	0.134	0.0	0.0	0.0	1.07	42.4	18.1
S5.000	50.00	5.08	146.254	0.138	0.0	0.0	0.0	1.01	40.1	18.7
S6.000	50.00	5.04	146.351	0.000	0.0	0.0	0.0	0.82	37.9	0.0
S6.001	50.00	5.45	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.002	50.00	5.86	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.003	50.00	6.28	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.004	50.00	6.69	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.005	50.00	6.71	146.715	0.000	0.0	0.0	0.0	0.54	24.8	0.0
S6.006	50.00	6.79	146.715	0.000	0.0	0.0	0.0	0.52	24.0	0.0
S6.007	50.00	7.13	146.351	0.042	0.0	0.0	0.0	1.01	40.1	5.7

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.002	16.603	0.091	182.5	0.038	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.003	7.486	0.033	226.8	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.004	4.058	0.015	270.5	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S7.000	26.750	0.178	150.3	0.198	5.00	0.0	0.600	o	300	Pipe/Conduit	
S7.001	9.363	0.047	199.2	0.180	0.00	0.0	0.600	o	300	Pipe/Conduit	
S7.002	33.356	0.889	37.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.005	14.400	0.051	282.4	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S8.000	12.716	0.293	43.4	0.073	5.00	0.0	0.600	o	225	Pipe/Conduit	
S8.001	11.134	0.126	88.4	0.032	0.00	0.0	0.600	o	225	Pipe/Conduit	
S8.002	4.005	0.019	210.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.003	5.495	0.028	196.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.004	13.000	0.080	162.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.006	7.870	0.028	281.1	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.007	21.636	0.072	300.5	0.025	0.00	0.0	0.600	o	825	Pipe/Conduit	
S9.000	9.564	0.096	99.6	0.077	5.00	0.0	0.600	o	375	Pipe/Conduit	
S9.001	13.436	0.090	149.3	0.068	0.00	0.0	0.600	o	375	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)
S4.002	50.00	7.32	146.200	0.352	0.0	0.0	0.0	1.50	238.9	47.7
S4.003	50.00	7.41	146.034	0.352	0.0	0.0	0.0	1.35	214.0	47.7
S4.004	50.00	7.47	146.001	0.352	0.0	0.0	0.0	1.23	195.8	47.7
S7.000	50.00	5.35	147.245	0.198	0.0	0.0	0.0	1.28	90.5	26.8
S7.001	50.00	5.49	147.067	0.378	0.0	0.0	0.0	1.11	78.5	51.2
S7.002	50.00	5.70	147.020	0.378	0.0	0.0	0.0	2.57	182.0	51.2
S4.005	50.00	7.67	145.986	0.730	0.0	0.0	0.0	1.20	191.6	98.9
S8.000	50.00	5.11	146.656	0.073	0.0	0.0	0.0	1.99	79.2	9.9
S8.001	50.00	5.24	146.363	0.105	0.0	0.0	0.0	1.39	55.3	14.2
S8.002	50.00	5.30	146.162	0.105	0.0	0.0	0.0	1.08	76.3	14.2
S8.003	50.00	5.38	146.043	0.105	0.0	0.0	0.0	1.12	79.1	14.2
S8.004	50.00	5.56	146.015	0.105	0.0	0.0	0.0	1.23	87.0	14.2
S4.006	50.00	7.77	145.935	0.835	0.0	0.0	0.0	1.21	192.1	113.1
S4.007	50.00	7.99	145.832	0.860	0.0	0.0	0.0	1.71	912.7	116.5
S9.000	50.00	5.09	146.678	0.077	0.0	0.0	0.0	1.82	200.5	10.4
S9.001	50.00	5.24	146.582	0.145	0.0	0.0	0.0	1.48	163.5	19.6

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S9.002	14.455	0.096	150.6	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S10.000	29.487	0.590	50.0	0.010	5.00	0.0	0.600	o	150	Pipe/Conduit	
S9.003	21.800	0.145	150.3	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S11.000	8.764	0.188	46.6	0.050	5.00	0.0	0.600	o	150	Pipe/Conduit	
S11.001	11.226	0.112	100.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S12.000	2.351	0.016	146.9	0.145	5.00	0.0	0.600	o	225	Pipe/Conduit	
S12.001	6.353	0.042	151.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S11.002	5.969	0.030	199.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S11.003	5.969	0.030	199.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S11.004	4.029	0.020	201.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S9.004	10.627	0.041	259.2	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.009	73.129	0.146	500.9	0.077	0.00	0.0	0.600	o	825	Pipe/Conduit	
S13.000	28.448	0.190	149.7	0.133	5.00	0.0	0.600	o	225	Pipe/Conduit	
S13.001	37.223	0.195	190.9	0.014	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S9.002	50.00	5.40	146.492	0.145	0.0	0.0	0.0	1.47	162.8	19.6
S10.000	50.00	5.34	147.211	0.010	0.0	0.0	0.0	1.43	25.2	1.4
S9.003	50.00	5.65	146.396	0.155	0.0	0.0	0.0	1.48	163.0	21.0
S11.000	50.00	5.10	146.956	0.050	0.0	0.0	0.0	1.48	26.1	6.8
S11.001	50.00	5.29	146.768	0.050	0.0	0.0	0.0	1.00	17.7	6.8
S12.000	50.00	5.04	147.075	0.145	0.0	0.0	0.0	1.08	42.8	19.6
S12.001	50.00	5.14	147.059	0.145	0.0	0.0	0.0	1.06	42.2	19.6
S11.002	50.00	5.37	146.506	0.195	0.0	0.0	0.0	1.11	78.5	26.4
S11.003	50.00	5.46	146.376	0.195	0.0	0.0	0.0	1.11	78.5	26.4
S11.004	50.00	5.53	146.346	0.195	0.0	0.0	0.0	1.10	78.0	26.4
S9.004	50.00	5.81	146.251	0.350	0.0	0.0	0.0	1.12	123.8	47.4
S1.009	50.00	8.91	145.760	1.913	0.0	0.0	0.0	1.32	705.5	259.0
S13.000	50.00	5.44	146.967	0.133	0.0	0.0	0.0	1.07	42.4	18.0
S13.001	50.00	6.10	146.777	0.147	0.0	0.0	0.0	0.94	37.5	19.9

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S14.000	24.868	0.311	80.0	0.059	5.00	0.0	0.600	o	225	Pipe/Conduit	
S15.000	12.128	0.081	149.7	0.173	5.00	0.0	0.600	o	225	Pipe/Conduit	
S13.002	17.294	0.169	102.3	0.097	0.00	0.0	0.600	o	375	Pipe/Conduit	
S16.000	33.161	1.452	22.8	0.019	5.00	0.0	0.600	o	150	Pipe/Conduit	
S13.003	4.564	0.023	198.4	0.060	0.00	0.0	0.600	o	375	Pipe/Conduit	
S13.004	4.564	0.023	198.4	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S13.005	8.273	0.053	156.1	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.010	22.475	0.045	499.4	0.063	0.00	0.0	0.600	o	825	Pipe/Conduit	
S1.011	29.256	0.028	1044.9	0.000	0.00	0.0	0.600	o	825	Pipe/Conduit	
S1.012	23.744	0.061	389.2	0.000	0.00	0.0	0.600	o	825	Pipe/Conduit	
S17.000	2.464	0.049	50.3	0.159	5.00	0.0	0.600	o	225	Pipe/Conduit	
S17.001	4.217	0.114	37.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.002	5.401	0.505	10.7	0.035	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.003	8.694	0.141	61.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S14.000	50.00	5.28	146.893	0.059	0.0	0.0	0.0	1.46	58.2	8.0
S15.000	50.00	5.19	146.663	0.173	0.0	0.0	0.0	1.07	42.4	23.4
S13.002	50.00	6.26	146.432	0.476	0.0	0.0	0.0	1.79	197.8	64.5
S16.000	50.00	5.26	147.940	0.019	0.0	0.0	0.0	2.12	37.4	2.6
S13.003	50.00	6.32	146.263	0.555	0.0	0.0	0.0	1.28	141.7	75.2
S13.004	50.00	6.38	146.140	0.555	0.0	0.0	0.0	1.28	141.7	75.2
S13.005	50.00	6.48	146.117	0.555	0.0	0.0	0.0	1.45	159.9	75.2
S1.010	50.00	9.19	145.614	2.531	0.0	0.0	0.0	1.32	706.5	342.7
S1.011	50.00	9.73	145.569	2.531	0.0	0.0	0.0	0.91	486.4	342.7
S1.012	50.00	9.99	145.480	2.531	0.0	0.0	0.0	1.50	801.2	342.7
S17.000	50.00	5.02	147.225	0.159	0.0	0.0	0.0	1.85	73.5	21.5
S17.001	50.00	5.05	147.176	0.159	0.0	0.0	0.0	2.16	85.8	21.5
S17.002	50.00	5.08	147.062	0.194	0.0	0.0	0.0	4.02	160.0	26.3
S17.003	50.00	5.16	146.457	0.194	0.0	0.0	0.0	1.67	66.3	26.3

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S18.000	44.171	0.809	54.6	0.012	5.00	0.0	0.600	o	150	Pipe/Conduit	
S17.004	14.540	0.058	250.7	0.100	0.00	0.0	0.600	o	300	Pipe/Conduit	
S17.005	14.970	0.067	223.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S19.000	5.802	0.779	7.4	0.044	5.00	0.0	0.600	o	225	Pipe/Conduit	
S19.001	7.025	0.070	100.4	0.107	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.006	5.523	0.022	251.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.013	9.819	0.020	491.0	0.000	0.00	0.0	0.600	o	1200	Pipe/Conduit	
S1.014	7.993	0.095	84.1	0.000	0.00	0.0	0.600	o	1200	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)
S18.000	50.00	5.54	147.200	0.012	0.0	0.0	0.0	1.36	24.1	1.6
S17.004	50.00	5.78	146.241	0.306	0.0	0.0	0.0	0.99	69.9	41.4
S17.005	50.00	6.02	146.183	0.306	0.0	0.0	0.0	1.05	74.1	41.4
S19.000	50.00	5.02	147.040	0.044	0.0	0.0	0.0	4.82	191.8	6.0
S19.001	50.00	5.11	146.261	0.151	0.0	0.0	0.0	1.31	51.9	20.4
S17.006	50.00	6.10	146.041	0.457	0.0	0.0	0.0	1.14	125.8	61.9
S1.013	50.00	10.09	145.175	2.988	0.0	0.0	0.0	1.68	1901.9	404.6
S1.014	50.00	10.12	145.155	2.988	0.0	0.0	0.0	4.08	4614.7	404.6

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.014	Ex. S3L1	149.100	145.060	0.000	0	0

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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.272		

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 391325 411646 SD 91325 11646
Data Type	Point
Cv (Summer)	0.750
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)	60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	30
Climate Change (%)	45

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	SU U1 CP	60 minute 30 year Summer I+45%	148.326	147.721	-0.054	0.000
S1.001	L1-S1	60 minute 30 year Summer I+45%	148.400	147.425	-0.195	0.000
S1.002	L1-S2	60 minute 30 year Summer I+45%	149.055	147.312	-0.105	0.000
S1.003	BPI-L1	60 minute 30 year Summer I+45%	149.100	147.163	-0.126	0.000
S2.000	L1-S3	60 minute 30 year Summer I+45%	149.380	147.135	-0.221	0.000
S1.004	L1-S4	60 minute 30 year Summer I+45%	149.270	147.080	-0.154	0.000
S1.005	L1-S5	60 minute 30 year Summer I+45%	149.260	146.961	-0.075	0.000
S3.000	L1-S6	60 minute 30 year Summer I+45%	148.985	147.648	-0.062	0.000
S1.006	L1-S7	60 minute 30 year Summer I+45%	149.015	146.904	0.129	0.000
S1.007	L1-S8	60 minute 30 year Summer I+45%	148.760	146.810	0.094	0.000
S1.008	ADL-S1	60 minute 30 year Summer I+45%	148.654	146.716	0.022	0.000
S4.000	L2-S1	60 minute 30 year Summer I+45%	147.700	147.463	0.873	0.000
S4.001	L2-S2	60 minute 30 year Summer I+45%	147.796	147.089	0.519	0.000
S5.000	SU U2 Yard	60 minute 30 year Summer I+45%	147.700	147.053	0.574	0.000
S6.000	15	60 minute 30 year Summer I+45%	147.167	146.949	0.146	0.000
S6.001	15-1	60 minute 30 year Summer I+45%	147.167	146.949	-0.218	0.000
S6.002	15-2	60 minute 30 year Summer I+45%	147.167	146.949	-0.218	0.000

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S1.000	SU U1 CP	0.72		0.014	11.5	OK
S1.001	L1-S1	0.26		0.113	21.1	OK
S1.002	L1-S2	0.71		0.798	36.7	OK
S1.003	BPI-L1	0.61		0.236	37.2	OK
S2.000	L1-S3	0.33		0.214	45.0	OK
S1.004	L1-S4	0.72		1.372	163.3	OK
S1.005	L1-S5	0.58		3.344	166.5	OK
S3.000	L1-S6	0.64		0.094	8.4	OK
S1.006	L1-S7	1.05		2.381	173.2	SURCHARGED
S1.007	L1-S8	1.41		2.434	173.3	SURCHARGED
S1.008	ADL-S1	0.98		1.120	182.2	SURCHARGED
S4.000	L2-S1	1.91		0.162	36.8	FLOOD RISK
S4.001	L2-S2	0.96		0.907	36.6	SURCHARGED
S5.000	SU U2 Yard	1.38		0.225	40.0	SURCHARGED
S6.000	15	0.02		0.593	0.8	FLOOD RISK*
S6.001	15-1	0.04		0.778	1.7	FLOOD RISK*
S6.002	15-2	0.06		0.354	3.0	FLOOD RISK*

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S6.003	15-3	60 minute 30 year Summer I+45%	147.167	146.949	-0.218	0.000
S6.004	15-4	60 minute 30 year Summer I+45%	147.167	146.949	-0.218	0.000
S6.005	15-5	60 minute 30 year Summer I+45%	147.167	146.948	-0.219	0.000
S6.006	15-6	60 minute 30 year Summer I+45%	147.167	146.951	-0.216	0.000
S6.007	SU U2 Dock	60 minute 30 year Summer I+45%	147.167	146.958	0.382	0.000
S4.002	L2-S3	60 minute 30 year Summer I+45%	147.796	146.971	0.321	0.000
S4.003	FRI-L2	60 minute 30 year Summer I+45%	147.760	146.940	0.456	0.000
S4.004	L2-S4	60 minute 30 year Summer I+45%	147.800	146.922	0.471	0.000
S7.000	L2-S5	60 minute 30 year Summer I+45%	148.300	147.637	0.092	0.000
S7.001	L2-S6	60 minute 30 year Summer I+45%	148.370	147.536	0.169	0.000
S7.002	L2-S7	60 minute 30 year Summer I+45%	148.490	147.310	-0.010	0.000
S4.005	L2-S8	60 minute 30 year Summer I+45%	147.852	146.910	0.474	0.000
S8.000	SU	60 minute 30 year Summer I+45%	147.656	146.921	0.040	0.000
S8.001	L2-S9	60 minute 30 year Summer I+45%	148.030	146.886	0.298	0.000
S8.002	L2-S10	60 minute 30 year Summer I+45%	148.163	146.835	0.373	0.000
S8.003	BPI-L2	60 minute 30 year Summer I+45%	148.163	146.825	0.482	0.000
S8.004	L2-S11	60 minute 30 year Summer I+45%	148.134	146.813	0.498	0.000
S4.006	L2-S12	60 minute 30 year Summer I+45%	147.910	146.789	0.404	0.000
S4.007	ADL-S2	60 minute 30 year Summer I+45%	147.940	146.632	-0.025	0.000
S9.000	L3-S1	60 minute 30 year Summer I+45%	148.300	146.792	-0.261	0.000
S9.001	L3-S2	60 minute 30 year Summer I+45%	148.300	146.747	-0.210	0.000
S9.002	L3-S3	60 minute 30 year Summer I+45%	148.165	146.705	-0.162	0.000
S10.000	L3-S4	60 minute 30 year Summer I+45%	148.370	147.247	-0.114	0.000
S9.003	L3-S5	60 minute 30 year Summer I+45%	148.370	146.683	-0.088	0.000
S11.000	L3 Sump	60 minute 30 year Summer I+45%	147.780	147.048	-0.058	0.000
S11.001	L3-S6	60 minute 30 year Summer I+45%	148.025	146.914	-0.004	0.000
S12.000	L3 Sump	60 minute 30 year Summer I+45%	148.125	147.442	0.142	0.000
S12.001	L3-S7	60 minute 30 year Summer I+45%	148.185	147.336	0.052	0.000
S11.002	L3-S8	60 minute 30 year Summer I+45%	148.184	146.806	0.000	0.000
S11.003	FRI-L3	60 minute 30 year Summer I+45%	148.131	146.720	0.044	0.000
S11.004	L3-S9	60 minute 30 year Summer I+45%	148.356	146.686	0.040	0.000
S9.004	L3-S10	60 minute 30 year Summer I+45%	148.425	146.657	0.031	0.000
S1.009	ADL-S3	60 minute 30 year Summer I+45%	148.400	146.612	0.027	0.000
S13.000	L1-S9	60 minute 30 year Summer I+45%	149.385	147.524	0.332	0.000
S13.001	L1-S10	60 minute 30 year Summer I+45%	148.478	147.347	0.345	0.000
S14.000	SU U1 Dock	60 minute 30 year Summer I+45%	148.167	147.125	0.007	0.000
S15.000	SU U1 Yard	60 minute 30 year Summer I+45%	148.175	147.241	0.353	0.000
S13.002	L1-S11	60 minute 30 year Summer I+45%	148.478	147.087	0.280	0.000
S16.000	L1-S12	60 minute 30 year Summer I+45%	149.185	147.981	-0.109	0.000
S13.003	L1-S13	60 minute 30 year Summer I+45%	148.500	146.970	0.332	0.000
S13.004	FRI-L1	60 minute 30 year Summer I+45%	148.455	146.812	0.297	0.000
S13.005	L1-S14	60 minute 30 year Summer I+45%	148.335	146.656	0.164	0.000
S1.010	ADL-S4	60 minute 30 year Summer I+45%	148.480	146.514	0.075	0.000
S1.011	ADL-S5	60 minute 30 year Summer I+45%	148.875	146.432	0.038	0.000
S1.012	ADL-S6	60 minute 30 year Winter I+45%	149.225	146.305	0.000	0.000
S17.000	SU U4 Yard	60 minute 30 year Summer I+45%	148.125	147.529	0.079	0.000
S17.001	L4-S2	60 minute 30 year Summer I+45%	148.178	147.402	0.001	0.000
S17.002	L4-S3	60 minute 30 year Summer I+45%	148.178	147.190	-0.097	0.000
S17.003	FRI-L4	60 minute 30 year Summer I+45%	148.260	146.992	0.310	0.000

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S6.003	15-3	0.09		0.354	4.1	FLOOD RISK*
S6.004	15-4	0.11		0.354	5.1	FLOOD RISK*
S6.005	15-5	0.13		0.353	6.0	FLOOD RISK*
S6.006	15-6	0.16		0.289	7.3	FLOOD RISK*
S6.007	SU U2 Dock	0.43		0.246	15.6	FLOOD RISK
S4.002	L2-S3	0.50		2.717	84.5	SURCHARGED
S4.003	FRI-L2	0.61		3.715	83.4	SURCHARGED
S4.004	L2-S4	0.71		2.287	84.4	SURCHARGED
S7.000	L2-S5	0.75		0.438	61.0	SURCHARGED
S7.001	L2-S6	1.90		2.306	115.1	SURCHARGED
S7.002	L2-S7	0.68		0.834	114.0	OK
S4.005	L2-S8	1.33		3.339	193.2	SURCHARGED
S8.000	SU	0.31		0.041	21.1	SURCHARGED
S8.001	L2-S9	0.62		1.059	29.1	SURCHARGED
S8.002	L2-S10	0.58		1.150	28.3	SURCHARGED
S8.003	BPI-L2	0.51		1.077	27.4	SURCHARGED
S8.004	L2-S11	0.39		1.200	27.6	SURCHARGED
S4.006	L2-S12	1.75		4.120	218.7	SURCHARGED
S4.007	ADL-S2	0.35		3.025	225.3	OK
S9.000	L3-S1	0.20		0.156	23.9	OK
S9.001	L3-S2	0.39		0.469	45.6	OK
S9.002	L3-S3	0.36		0.855	43.5	OK
S10.000	L3-S4	0.13		0.035	3.1	OK
S9.003	L3-S5	0.32		1.362	44.4	OK
S11.000	L3 Sump	0.68		0.014	15.5	OK
S11.001	L3-S6	0.96		0.212	15.3	OK
S12.000	L3 Sump	1.57		0.058	44.3	SURCHARGED
S12.001	L3-S7	1.49		0.366	44.6	SURCHARGED
S11.002	L3-S8	1.10		0.442	60.1	OK
S11.003	FRI-L3	1.09		0.627	59.7	SURCHARGED
S11.004	L3-S9	1.22		0.703	59.4	SURCHARGED
S9.004	L3-S10	1.10		2.707	101.8	SURCHARGED
S1.009	ADL-S3	0.84		15.835	519.3	SURCHARGED
S13.000	L1-S9	0.94		0.624	37.2	SURCHARGED
S13.001	L1-S10	1.15		1.723	40.6	SURCHARGED
S14.000	SU U1 Dock	0.33		0.064	17.7	SURCHARGED
S15.000	SU U1 Yard	1.38		0.162	50.1	SURCHARGED
S13.002	L1-S11	0.82		3.734	131.4	SURCHARGED
S16.000	L1-S12	0.16		0.041	5.9	OK
S13.003	L1-S13	1.83		2.922	152.9	SURCHARGED
S13.004	FRI-L1	1.81		1.310	151.7	SURCHARGED
S13.005	L1-S14	1.40		1.120	150.4	SURCHARGED
S1.010	ADL-S4	1.43		40.515	679.1	SURCHARGED
S1.011	ADL-S5	2.34		12.772	669.2	SURCHARGED
S1.012	ADL-S6	1.05		14.867	601.5	OK
S17.000	SU U4 Yard	1.55		0.085	48.5	SURCHARGED
S17.001	L4-S2	1.02		0.304	48.7	SURCHARGED
S17.002	L4-S3	0.59		0.171	59.3	OK

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S17.003	FRI-L4	1.13		0.705	59.8	SURCHARGED

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S18.000	L4-S1	60 minute 30 year Summer I+45%	148.425	147.240	-0.110	0.000	0.16
S17.004	L4-S4	60 minute 30 year Summer I+45%	148.425	146.810	0.269	0.000	1.60
S17.005	L4-S5	60 minute 30 year Summer I+45%	148.140	146.657	0.174	0.000	1.51
S19.000	BPI-L4	60 minute 30 year Summer I+45%	148.040	147.090	-0.175	0.000	0.11
S19.001	L4-S7	60 minute 30 year Summer I+45%	148.140	146.628	0.142	0.000	1.26
S17.006	L4-S6	60 minute 30 year Summer I+45%	148.140	146.506	0.090	0.000	1.77
S1.013	ADL-S7	60 minute 30 year Summer I+45%	148.232	146.065	-0.310	0.000	1.14
S1.014	ADL-S8	60 minute 30 year Summer I+45%	148.335	145.684	-0.671	0.000	0.40

PN	US/MH Name	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S18.000	L4-S1		0.040	3.7	OK
S17.004	L4-S4		1.254	93.4	SURCHARGED
S17.005	L4-S5		1.473	93.5	SURCHARGED
S19.000	BPI-L4		0.051	13.7	OK
S19.001	L4-S7		0.467	47.1	SURCHARGED
S17.006	L4-S6		1.843	139.5	SURCHARGED
S1.013	ADL-S7		11.448	783.2	OK
S1.014	ADL-S8		4.411	786.8	OK

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.272	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
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

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	1.079	4-8	1.876	8-12	0.033

Total Area Contributing (ha) = 2.988

Total Pipe Volume (m³) = 170.607

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	3.049	0.065	46.9	0.037	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	30.414	0.203	149.8	0.031	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.002	6.342	0.028	226.5	0.051	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	10.308	0.055	187.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.000	18.230	0.122	149.4	0.145	5.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.03	147.625	0.037	0.0	0.0	0.0	1.47	26.0	5.0
S1.001	50.00	5.43	147.320	0.068	0.0	0.0	0.0	1.28	90.6	9.2
S1.002	50.00	5.53	147.117	0.119	0.0	0.0	0.0	1.04	73.6	16.1
S1.003	50.00	5.68	146.989	0.119	0.0	0.0	0.0	1.15	80.9	16.1
S2.000	50.00	5.21	146.981	0.145	0.0	0.0	0.0	1.48	163.5	19.6

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.004	29.718	0.198	150.1	0.265	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.005	11.849	0.261	45.4	0.031	0.00	0.0	0.600	o	450	Pipe/Conduit	
S3.000	4.380	0.044	99.5	0.027	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.006	11.849	0.059	200.8	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.007	4.363	0.022	198.3	0.005	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.008	19.473	0.109	178.6	0.034	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.000	4.873	0.095	51.3	0.134	5.00	0.0	0.600	o	150	Pipe/Conduit	
S4.001	17.975	0.120	149.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S5.000	4.845	0.029	167.1	0.138	5.00	0.0	0.600	o	225	Pipe/Conduit	
S6.000	3.000	0.029	103.4	0.000	5.00	0.0	0.600	CA	225	CastSlot	
S6.001	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.002	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.003	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.004	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.005	0.500	0.000	1666.7	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.006	0.945	0.000	3150.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.007	21.104	0.126	167.5	0.042	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.004	50.00	5.98	146.784	0.529	0.0	0.0	0.0	1.66	263.6	71.6
S1.005	50.00	6.05	146.586	0.560	0.0	0.0	0.0	3.02	480.9	75.8
S3.000	50.00	5.07	147.560	0.027	0.0	0.0	0.0	1.01	17.8	3.7
S1.006	50.00	6.18	146.325	0.587	0.0	0.0	0.0	1.43	227.6	79.5
S1.007	50.00	6.23	146.266	0.592	0.0	0.0	0.0	1.44	229.0	80.2
S1.008	50.00	6.45	146.244	0.626	0.0	0.0	0.0	1.52	241.4	84.8
S4.000	50.00	5.06	146.440	0.134	0.0	0.0	0.0	1.41	24.9	18.1
S4.001	50.00	5.34	146.345	0.134	0.0	0.0	0.0	1.07	42.4	18.1
S5.000	50.00	5.08	146.254	0.138	0.0	0.0	0.0	1.01	40.1	18.7
S6.000	50.00	5.04	146.351	0.000	0.0	0.0	0.0	0.82	37.9	0.0
S6.001	50.00	5.45	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.002	50.00	5.86	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.003	50.00	6.28	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.004	50.00	6.69	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.005	50.00	6.71	146.715	0.000	0.0	0.0	0.0	0.54	24.8	0.0
S6.006	50.00	6.79	146.715	0.000	0.0	0.0	0.0	0.52	24.0	0.0
S6.007	50.00	7.13	146.351	0.042	0.0	0.0	0.0	1.01	40.1	5.7

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.002	16.603	0.091	182.5	0.038	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.003	7.486	0.033	226.8	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.004	4.058	0.015	270.5	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S7.000	26.750	0.178	150.3	0.198	5.00	0.0	0.600	o	300	Pipe/Conduit	
S7.001	9.363	0.047	199.2	0.180	0.00	0.0	0.600	o	300	Pipe/Conduit	
S7.002	33.356	0.889	37.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.005	14.400	0.051	282.4	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S8.000	12.716	0.293	43.4	0.073	5.00	0.0	0.600	o	225	Pipe/Conduit	
S8.001	11.134	0.126	88.4	0.032	0.00	0.0	0.600	o	225	Pipe/Conduit	
S8.002	4.005	0.019	210.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.003	5.495	0.028	196.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.004	13.000	0.080	162.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.006	7.870	0.028	281.1	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.007	21.636	0.072	300.5	0.025	0.00	0.0	0.600	o	825	Pipe/Conduit	
S9.000	9.564	0.096	99.6	0.077	5.00	0.0	0.600	o	375	Pipe/Conduit	
S9.001	13.436	0.090	149.3	0.068	0.00	0.0	0.600	o	375	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)
S4.002	50.00	7.32	146.200	0.352	0.0	0.0	0.0	1.50	238.9	47.7
S4.003	50.00	7.41	146.034	0.352	0.0	0.0	0.0	1.35	214.0	47.7
S4.004	50.00	7.47	146.001	0.352	0.0	0.0	0.0	1.23	195.8	47.7
S7.000	50.00	5.35	147.245	0.198	0.0	0.0	0.0	1.28	90.5	26.8
S7.001	50.00	5.49	147.067	0.378	0.0	0.0	0.0	1.11	78.5	51.2
S7.002	50.00	5.70	147.020	0.378	0.0	0.0	0.0	2.57	182.0	51.2
S4.005	50.00	7.67	145.986	0.730	0.0	0.0	0.0	1.20	191.6	98.9
S8.000	50.00	5.11	146.656	0.073	0.0	0.0	0.0	1.99	79.2	9.9
S8.001	50.00	5.24	146.363	0.105	0.0	0.0	0.0	1.39	55.3	14.2
S8.002	50.00	5.30	146.162	0.105	0.0	0.0	0.0	1.08	76.3	14.2
S8.003	50.00	5.38	146.043	0.105	0.0	0.0	0.0	1.12	79.1	14.2
S8.004	50.00	5.56	146.015	0.105	0.0	0.0	0.0	1.23	87.0	14.2
S4.006	50.00	7.77	145.935	0.835	0.0	0.0	0.0	1.21	192.1	113.1
S4.007	50.00	7.99	145.832	0.860	0.0	0.0	0.0	1.71	912.7	116.5
S9.000	50.00	5.09	146.678	0.077	0.0	0.0	0.0	1.82	200.5	10.4
S9.001	50.00	5.24	146.582	0.145	0.0	0.0	0.0	1.48	163.5	19.6

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S9.002	14.455	0.096	150.6	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S10.000	29.487	0.590	50.0	0.010	5.00	0.0	0.600	o	150	Pipe/Conduit	
S9.003	21.800	0.145	150.3	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S11.000	8.764	0.188	46.6	0.050	5.00	0.0	0.600	o	150	Pipe/Conduit	
S11.001	11.226	0.112	100.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S12.000	2.351	0.016	146.9	0.145	5.00	0.0	0.600	o	225	Pipe/Conduit	
S12.001	6.353	0.042	151.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S11.002	5.969	0.030	199.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S11.003	5.969	0.030	199.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S11.004	4.029	0.020	201.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S9.004	10.627	0.041	259.2	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.009	73.129	0.146	500.9	0.077	0.00	0.0	0.600	o	825	Pipe/Conduit	
S13.000	28.448	0.190	149.7	0.133	5.00	0.0	0.600	o	225	Pipe/Conduit	
S13.001	37.223	0.195	190.9	0.014	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S9.002	50.00	5.40	146.492	0.145	0.0	0.0	0.0	1.47	162.8	19.6
S10.000	50.00	5.34	147.211	0.010	0.0	0.0	0.0	1.43	25.2	1.4
S9.003	50.00	5.65	146.396	0.155	0.0	0.0	0.0	1.48	163.0	21.0
S11.000	50.00	5.10	146.956	0.050	0.0	0.0	0.0	1.48	26.1	6.8
S11.001	50.00	5.29	146.768	0.050	0.0	0.0	0.0	1.00	17.7	6.8
S12.000	50.00	5.04	147.075	0.145	0.0	0.0	0.0	1.08	42.8	19.6
S12.001	50.00	5.14	147.059	0.145	0.0	0.0	0.0	1.06	42.2	19.6
S11.002	50.00	5.37	146.506	0.195	0.0	0.0	0.0	1.11	78.5	26.4
S11.003	50.00	5.46	146.376	0.195	0.0	0.0	0.0	1.11	78.5	26.4
S11.004	50.00	5.53	146.346	0.195	0.0	0.0	0.0	1.10	78.0	26.4
S9.004	50.00	5.81	146.251	0.350	0.0	0.0	0.0	1.12	123.8	47.4
S1.009	50.00	8.91	145.760	1.913	0.0	0.0	0.0	1.32	705.5	259.0
S13.000	50.00	5.44	146.967	0.133	0.0	0.0	0.0	1.07	42.4	18.0
S13.001	50.00	6.10	146.777	0.147	0.0	0.0	0.0	0.94	37.5	19.9

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S14.000	24.868	0.311	80.0	0.059	5.00	0.0	0.600	o	225	Pipe/Conduit	
S15.000	12.128	0.081	149.7	0.173	5.00	0.0	0.600	o	225	Pipe/Conduit	
S13.002	17.294	0.169	102.3	0.097	0.00	0.0	0.600	o	375	Pipe/Conduit	
S16.000	33.161	1.452	22.8	0.019	5.00	0.0	0.600	o	150	Pipe/Conduit	
S13.003	4.564	0.023	198.4	0.060	0.00	0.0	0.600	o	375	Pipe/Conduit	
S13.004	4.564	0.023	198.4	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S13.005	8.273	0.053	156.1	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.010	22.475	0.045	499.4	0.063	0.00	0.0	0.600	o	825	Pipe/Conduit	
S1.011	29.256	0.028	1044.9	0.000	0.00	0.0	0.600	o	825	Pipe/Conduit	
S1.012	23.744	0.061	389.2	0.000	0.00	0.0	0.600	o	825	Pipe/Conduit	
S17.000	2.464	0.049	50.3	0.159	5.00	0.0	0.600	o	225	Pipe/Conduit	
S17.001	4.217	0.114	37.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.002	5.401	0.505	10.7	0.035	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.003	8.694	0.141	61.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S14.000	50.00	5.28	146.893	0.059	0.0	0.0	0.0	1.46	58.2	8.0
S15.000	50.00	5.19	146.663	0.173	0.0	0.0	0.0	1.07	42.4	23.4
S13.002	50.00	6.26	146.432	0.476	0.0	0.0	0.0	1.79	197.8	64.5
S16.000	50.00	5.26	147.940	0.019	0.0	0.0	0.0	2.12	37.4	2.6
S13.003	50.00	6.32	146.263	0.555	0.0	0.0	0.0	1.28	141.7	75.2
S13.004	50.00	6.38	146.140	0.555	0.0	0.0	0.0	1.28	141.7	75.2
S13.005	50.00	6.48	146.117	0.555	0.0	0.0	0.0	1.45	159.9	75.2
S1.010	50.00	9.19	145.614	2.531	0.0	0.0	0.0	1.32	706.5	342.7
S1.011	50.00	9.73	145.569	2.531	0.0	0.0	0.0	0.91	486.4	342.7
S1.012	50.00	9.99	145.480	2.531	0.0	0.0	0.0	1.50	801.2	342.7
S17.000	50.00	5.02	147.225	0.159	0.0	0.0	0.0	1.85	73.5	21.5
S17.001	50.00	5.05	147.176	0.159	0.0	0.0	0.0	2.16	85.8	21.5
S17.002	50.00	5.08	147.062	0.194	0.0	0.0	0.0	4.02	160.0	26.3
S17.003	50.00	5.16	146.457	0.194	0.0	0.0	0.0	1.67	66.3	26.3

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S18.000	44.171	0.809	54.6	0.012	5.00	0.0	0.600	o	150	Pipe/Conduit	
S17.004	14.540	0.058	250.7	0.100	0.00	0.0	0.600	o	300	Pipe/Conduit	
S17.005	14.970	0.067	223.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S19.000	5.802	0.779	7.4	0.044	5.00	0.0	0.600	o	225	Pipe/Conduit	
S19.001	7.025	0.070	100.4	0.107	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.006	5.523	0.022	251.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.013	9.819	0.020	491.0	0.000	0.00	0.0	0.600	o	1200	Pipe/Conduit	
S1.014	7.993	0.095	84.1	0.000	0.00	0.0	0.600	o	1200	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)
S18.000	50.00	5.54	147.200	0.012	0.0	0.0	0.0	1.36	24.1	1.6
S17.004	50.00	5.78	146.241	0.306	0.0	0.0	0.0	0.99	69.9	41.4
S17.005	50.00	6.02	146.183	0.306	0.0	0.0	0.0	1.05	74.1	41.4
S19.000	50.00	5.02	147.040	0.044	0.0	0.0	0.0	4.82	191.8	6.0
S19.001	50.00	5.11	146.261	0.151	0.0	0.0	0.0	1.31	51.9	20.4
S17.006	50.00	6.10	146.041	0.457	0.0	0.0	0.0	1.14	125.8	61.9
S1.013	50.00	10.09	145.175	2.988	0.0	0.0	0.0	1.68	1901.9	404.6
S1.014	50.00	10.12	145.155	2.988	0.0	0.0	0.0	4.08	4614.7	404.6

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.014	Ex. S3L1	149.100	145.060	0.000	0	0

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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.272		

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 391325 411646 SD 91325 11646
Data Type	Point
Cv (Summer)	0.750
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)	60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	100
Climate Change (%)	0

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	SU U1 CP	60 minute 100 year Summer I+0%	148.326	147.716	-0.059	0.000
S1.001	L1-S1	60 minute 100 year Summer I+0%	148.400	147.421	-0.199	0.000
S1.002	L1-S2	60 minute 100 year Summer I+0%	149.055	147.303	-0.114	0.000
S1.003	BPI-L1	60 minute 100 year Summer I+0%	149.100	147.155	-0.134	0.000
S2.000	L1-S3	60 minute 100 year Summer I+0%	149.380	147.126	-0.230	0.000
S1.004	L1-S4	60 minute 100 year Summer I+0%	149.270	147.066	-0.168	0.000
S1.005	L1-S5	60 minute 100 year Summer I+0%	149.260	146.855	-0.181	0.000
S3.000	L1-S6	60 minute 100 year Summer I+0%	148.985	147.644	-0.066	0.000
S1.006	L1-S7	60 minute 100 year Summer I+0%	149.015	146.802	0.027	0.000
S1.007	L1-S8	60 minute 100 year Summer I+0%	148.760	146.742	0.026	0.000
S1.008	ADL-S1	60 minute 100 year Summer I+0%	148.654	146.685	-0.009	0.000
S4.000	L2-S1	60 minute 100 year Summer I+0%	147.700	147.340	0.750	0.000
S4.001	L2-S2	60 minute 100 year Summer I+0%	147.796	147.017	0.447	0.000
S5.000	SU U2 Yard	60 minute 100 year Summer I+0%	147.700	146.987	0.508	0.000
S6.000	15	60 minute 100 year Summer I+0%	147.167	146.864	0.061	0.000
S6.001	15-1	60 minute 100 year Summer I+0%	147.167	146.864	-0.303	0.000
S6.002	15-2	60 minute 100 year Summer I+0%	147.167	146.864	-0.303	0.000

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S1.000	SU U1 CP	0.67		0.014	10.7	OK
S1.001	L1-S1	0.24		0.109	19.7	OK
S1.002	L1-S2	0.66		0.739	34.2	OK
S1.003	BPI-L1	0.56		0.223	34.7	OK
S2.000	L1-S3	0.31		0.200	42.0	OK
S1.004	L1-S4	0.67		1.241	152.2	OK
S1.005	L1-S5	0.56		1.931	160.5	OK
S3.000	L1-S6	0.59		0.090	7.8	OK
S1.006	L1-S7	1.02		1.977	168.1	SURCHARGED
S1.007	L1-S8	1.37		2.257	169.1	SURCHARGED
S1.008	ADL-S1	0.96		1.054	177.7	OK
S4.000	L2-S1	1.74		0.142	33.7	SURCHARGED
S4.001	L2-S2	0.90		0.825	34.3	SURCHARGED
S5.000	SU U2 Yard	1.27		0.206	36.8	SURCHARGED
S6.000	15	0.01		0.508	0.6	SURCHARGED*
S6.001	15-1	0.03		0.671	1.2	OK
S6.002	15-2	0.04		0.209	2.1	OK

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S6.003	15-3	60 minute 100 year Summer I+0%	147.167	146.870	-0.297	0.000
S6.004	15-4	60 minute 100 year Summer I+0%	147.167	146.892	-0.275	0.000
S6.005	15-5	60 minute 100 year Summer I+0%	147.167	146.908	-0.259	0.000
S6.006	15-6	60 minute 100 year Summer I+0%	147.167	146.912	-0.255	0.000
S6.007	SU U2 Dock	60 minute 100 year Summer I+0%	147.167	146.917	0.341	0.000
S4.002	L2-S3	60 minute 100 year Summer I+0%	147.796	146.915	0.265	0.000
S4.003	FRI-L2	60 minute 100 year Summer I+0%	147.760	146.884	0.400	0.000
S4.004	L2-S4	60 minute 100 year Summer I+0%	147.800	146.867	0.416	0.000
S7.000	L2-S5	60 minute 100 year Summer I+0%	148.300	147.594	0.049	0.000
S7.001	L2-S6	60 minute 100 year Summer I+0%	148.370	147.506	0.139	0.000
S7.002	L2-S7	60 minute 100 year Summer I+0%	148.490	147.207	-0.113	0.000
S4.005	L2-S8	60 minute 100 year Summer I+0%	147.852	146.856	0.420	0.000
S8.000	SU	60 minute 100 year Summer I+0%	147.656	146.869	-0.012	0.000
S8.001	L2-S9	60 minute 100 year Summer I+0%	148.030	146.836	0.248	0.000
S8.002	L2-S10	60 minute 100 year Summer I+0%	148.163	146.790	0.328	0.000
S8.003	BPI-L2	60 minute 100 year Summer I+0%	148.163	146.781	0.438	0.000
S8.004	L2-S11	60 minute 100 year Summer I+0%	148.134	146.769	0.454	0.000
S4.006	L2-S12	60 minute 100 year Summer I+0%	147.910	146.747	0.362	0.000
S4.007	ADL-S2	60 minute 100 year Summer I+0%	147.940	146.605	-0.052	0.000
S9.000	L3-S1	60 minute 100 year Summer I+0%	148.300	146.787	-0.266	0.000
S9.001	L3-S2	60 minute 100 year Summer I+0%	148.300	146.740	-0.217	0.000
S9.002	L3-S3	60 minute 100 year Summer I+0%	148.165	146.678	-0.189	0.000
S10.000	L3-S4	60 minute 100 year Summer I+0%	148.370	147.246	-0.115	0.000
S9.003	L3-S5	60 minute 100 year Summer I+0%	148.370	146.657	-0.114	0.000
S11.000	L3 Sump	60 minute 100 year Summer I+0%	147.780	147.044	-0.062	0.000
S11.001	L3-S6	60 minute 100 year Summer I+0%	148.025	146.892	-0.026	0.000
S12.000	L3 Sump	60 minute 100 year Summer I+0%	148.125	147.415	0.115	0.000
S12.001	L3-S7	60 minute 100 year Summer I+0%	148.185	147.323	0.039	0.000
S11.002	L3-S8	60 minute 100 year Summer I+0%	148.184	146.806	0.000	0.000
S11.003	FRI-L3	60 minute 100 year Summer I+0%	148.131	146.686	0.010	0.000
S11.004	L3-S9	60 minute 100 year Summer I+0%	148.356	146.656	0.010	0.000
S9.004	L3-S10	60 minute 100 year Summer I+0%	148.425	146.630	0.004	0.000
S1.009	ADL-S3	60 minute 100 year Summer I+0%	148.400	146.585	0.000	0.000
S13.000	L1-S9	60 minute 100 year Summer I+0%	149.385	147.377	0.185	0.000
S13.001	L1-S10	60 minute 100 year Summer I+0%	148.478	147.221	0.219	0.000
S14.000	SU U1 Dock	60 minute 100 year Summer I+0%	148.167	147.027	-0.091	0.000
S15.000	SU U1 Yard	60 minute 100 year Summer I+0%	148.175	147.126	0.238	0.000
S13.002	L1-S11	60 minute 100 year Summer I+0%	148.478	146.991	0.184	0.000
S16.000	L1-S12	60 minute 100 year Summer I+0%	149.185	147.979	-0.111	0.000
S13.003	L1-S13	60 minute 100 year Summer I+0%	148.500	146.889	0.251	0.000
S13.004	FRI-L1	60 minute 100 year Summer I+0%	148.455	146.751	0.236	0.000
S13.005	L1-S14	60 minute 100 year Summer I+0%	148.335	146.615	0.123	0.000
S1.010	ADL-S4	60 minute 100 year Summer I+0%	148.480	146.495	0.056	0.000
S1.011	ADL-S5	60 minute 100 year Summer I+0%	148.875	146.422	0.028	0.000
S1.012	ADL-S6	60 minute 100 year Summer I+0%	149.225	146.305	0.000	0.000
S17.000	SU U4 Yard	60 minute 100 year Summer I+0%	148.125	147.501	0.051	0.000
S17.001	L4-S2	60 minute 100 year Summer I+0%	148.178	147.355	-0.046	0.000
S17.002	L4-S3	60 minute 100 year Summer I+0%	148.178	147.185	-0.102	0.000
S17.003	FRI-L4	60 minute 100 year Summer I+0%	148.260	146.922	0.240	0.000

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S6.003	15-3	0.06		0.220	2.9	FLOOD RISK*
S6.004	15-4	0.08		0.261	3.6	FLOOD RISK*
S6.005	15-5	0.09		0.292	4.2	FLOOD RISK*
S6.006	15-6	0.10		0.241	4.5	FLOOD RISK*
S6.007	SU U2 Dock	0.29		0.230	10.6	FLOOD RISK
S4.002	L2-S3	0.47		2.637	79.5	SURCHARGED
S4.003	FRI-L2	0.57		3.636	78.7	SURCHARGED
S4.004	L2-S4	0.67		2.208	79.6	SURCHARGED
S7.000	L2-S5	0.70		0.389	57.0	SURCHARGED
S7.001	L2-S6	1.78		2.252	107.6	SURCHARGED
S7.002	L2-S7	0.65		0.503	107.9	OK
S4.005	L2-S8	1.25		3.121	181.2	SURCHARGED
S8.000	SU	0.30		0.033	20.5	OK
S8.001	L2-S9	0.56		0.988	26.4	SURCHARGED
S8.002	L2-S10	0.52		1.100	25.5	SURCHARGED
S8.003	BPI-L2	0.48		1.027	25.9	SURCHARGED
S8.004	L2-S11	0.37		1.151	26.3	SURCHARGED
S4.006	L2-S12	1.65		4.059	207.0	SURCHARGED
S4.007	ADL-S2	0.33		2.957	213.4	OK
S9.000	L3-S1	0.18		0.149	22.3	OK
S9.001	L3-S2	0.36		0.443	42.4	OK
S9.002	L3-S3	0.34		0.708	41.1	OK
S10.000	L3-S4	0.12		0.034	2.9	OK
S9.003	L3-S5	0.30		1.192	41.0	OK
S11.000	L3 Sump	0.63		0.013	14.5	OK
S11.001	L3-S6	0.88		0.171	14.1	OK
S12.000	L3 Sump	1.46		0.053	41.3	SURCHARGED
S12.001	L3-S7	1.39		0.349	41.5	SURCHARGED
S11.002	L3-S8	1.02		0.442	55.7	OK
S11.003	FRI-L3	1.01		0.548	55.4	SURCHARGED
S11.004	L3-S9	1.13		0.663	55.0	SURCHARGED
S9.004	L3-S10	1.02		2.499	93.8	SURCHARGED
S1.009	ADL-S3	0.80		15.448	495.4	OK
S13.000	L1-S9	0.90		0.458	35.5	SURCHARGED
S13.001	L1-S10	1.08		1.580	38.2	SURCHARGED
S14.000	SU U1 Dock	0.32		0.036	17.0	OK
S15.000	SU U1 Yard	1.30		0.130	47.2	SURCHARGED
S13.002	L1-S11	0.77		3.462	123.1	SURCHARGED
S16.000	L1-S12	0.15		0.039	5.5	OK
S13.003	L1-S13	1.71		2.775	143.4	SURCHARGED
S13.004	FRI-L1	1.70		1.223	142.5	SURCHARGED
S13.005	L1-S14	1.32		1.061	141.5	SURCHARGED
S1.010	ADL-S4	1.36		39.967	642.0	SURCHARGED
S1.011	ADL-S5	2.20		12.675	630.5	SURCHARGED
S1.012	ADL-S6	1.10		14.867	631.7	OK
S17.000	SU U4 Yard	1.45		0.077	45.2	SURCHARGED
S17.001	L4-S2	0.96		0.239	45.5	OK
S17.002	L4-S3	0.55		0.163	55.4	OK

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S17.003	FRI-L4	1.06		0.602	56.1	SURCHARGED

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S18.000	L4-S1	60 minute 100 year Summer I+0%	148.425	147.239	-0.111	0.000	0.15
S17.004	L4-S4	60 minute 100 year Summer I+0%	148.425	146.759	0.218	0.000	1.50
S17.005	L4-S5	60 minute 100 year Summer I+0%	148.140	146.623	0.140	0.000	1.41
S19.000	BPI-L4	60 minute 100 year Summer I+0%	148.040	147.088	-0.177	0.000	0.10
S19.001	L4-S7	60 minute 100 year Summer I+0%	148.140	146.594	0.108	0.000	1.17
S17.006	L4-S6	60 minute 100 year Summer I+0%	148.140	146.489	0.073	0.000	1.65
S1.013	ADL-S7	60 minute 100 year Summer I+0%	148.232	146.018	-0.357	0.000	1.07
S1.014	ADL-S8	60 minute 100 year Summer I+0%	148.335	145.657	-0.698	0.000	0.37

PN	US/MH Name	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S18.000	L4-S1		0.038	3.4	OK
S17.004	L4-S4		1.148	87.6	SURCHARGED
S17.005	L4-S5		1.435	87.8	SURCHARGED
S19.000	BPI-L4		0.049	12.8	OK
S19.001	L4-S7		0.422	43.5	SURCHARGED
S17.006	L4-S6		1.814	130.5	SURCHARGED
S1.013	ADL-S7		10.460	732.4	OK
S1.014	ADL-S8		4.082	733.1	OK

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.272	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
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

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	1.079	4-8	1.876	8-12	0.033

Total Area Contributing (ha) = 2.988

Total Pipe Volume (m³) = 170.607

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	3.049	0.065	46.9	0.037	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	30.414	0.203	149.8	0.031	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.002	6.342	0.028	226.5	0.051	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	10.308	0.055	187.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.000	18.230	0.122	149.4	0.145	5.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.03	147.625	0.037	0.0	0.0	0.0	1.47	26.0	5.0
S1.001	50.00	5.43	147.320	0.068	0.0	0.0	0.0	1.28	90.6	9.2
S1.002	50.00	5.53	147.117	0.119	0.0	0.0	0.0	1.04	73.6	16.1
S1.003	50.00	5.68	146.989	0.119	0.0	0.0	0.0	1.15	80.9	16.1
S2.000	50.00	5.21	146.981	0.145	0.0	0.0	0.0	1.48	163.5	19.6

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.004	29.718	0.198	150.1	0.265	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.005	11.849	0.261	45.4	0.031	0.00	0.0	0.600	o	450	Pipe/Conduit	
S3.000	4.380	0.044	99.5	0.027	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.006	11.849	0.059	200.8	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.007	4.363	0.022	198.3	0.005	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.008	19.473	0.109	178.6	0.034	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.000	4.873	0.095	51.3	0.134	5.00	0.0	0.600	o	150	Pipe/Conduit	
S4.001	17.975	0.120	149.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S5.000	4.845	0.029	167.1	0.138	5.00	0.0	0.600	o	225	Pipe/Conduit	
S6.000	3.000	0.029	103.4	0.000	5.00	0.0	0.600	CA	225	CastSlot	
S6.001	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.002	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.003	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.004	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.005	0.500	0.000	1666.7	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.006	0.945	0.000	3150.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.007	21.104	0.126	167.5	0.042	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.004	50.00	5.98	146.784	0.529	0.0	0.0	0.0	1.66	263.6	71.6
S1.005	50.00	6.05	146.586	0.560	0.0	0.0	0.0	3.02	480.9	75.8
S3.000	50.00	5.07	147.560	0.027	0.0	0.0	0.0	1.01	17.8	3.7
S1.006	50.00	6.18	146.325	0.587	0.0	0.0	0.0	1.43	227.6	79.5
S1.007	50.00	6.23	146.266	0.592	0.0	0.0	0.0	1.44	229.0	80.2
S1.008	50.00	6.45	146.244	0.626	0.0	0.0	0.0	1.52	241.4	84.8
S4.000	50.00	5.06	146.440	0.134	0.0	0.0	0.0	1.41	24.9	18.1
S4.001	50.00	5.34	146.345	0.134	0.0	0.0	0.0	1.07	42.4	18.1
S5.000	50.00	5.08	146.254	0.138	0.0	0.0	0.0	1.01	40.1	18.7
S6.000	50.00	5.04	146.351	0.000	0.0	0.0	0.0	0.82	37.9	0.0
S6.001	50.00	5.45	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.002	50.00	5.86	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.003	50.00	6.28	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.004	50.00	6.69	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.005	50.00	6.71	146.715	0.000	0.0	0.0	0.0	0.54	24.8	0.0
S6.006	50.00	6.79	146.715	0.000	0.0	0.0	0.0	0.52	24.0	0.0
S6.007	50.00	7.13	146.351	0.042	0.0	0.0	0.0	1.01	40.1	5.7

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.002	16.603	0.091	182.5	0.038	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.003	7.486	0.033	226.8	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.004	4.058	0.015	270.5	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S7.000	26.750	0.178	150.3	0.198	5.00	0.0	0.600	o	300	Pipe/Conduit	
S7.001	9.363	0.047	199.2	0.180	0.00	0.0	0.600	o	300	Pipe/Conduit	
S7.002	33.356	0.889	37.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.005	14.400	0.051	282.4	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S8.000	12.716	0.293	43.4	0.073	5.00	0.0	0.600	o	225	Pipe/Conduit	
S8.001	11.134	0.126	88.4	0.032	0.00	0.0	0.600	o	225	Pipe/Conduit	
S8.002	4.005	0.019	210.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.003	5.495	0.028	196.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.004	13.000	0.080	162.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.006	7.870	0.028	281.1	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.007	21.636	0.072	300.5	0.025	0.00	0.0	0.600	o	825	Pipe/Conduit	
S9.000	9.564	0.096	99.6	0.077	5.00	0.0	0.600	o	375	Pipe/Conduit	
S9.001	13.436	0.090	149.3	0.068	0.00	0.0	0.600	o	375	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)
S4.002	50.00	7.32	146.200	0.352	0.0	0.0	0.0	1.50	238.9	47.7
S4.003	50.00	7.41	146.034	0.352	0.0	0.0	0.0	1.35	214.0	47.7
S4.004	50.00	7.47	146.001	0.352	0.0	0.0	0.0	1.23	195.8	47.7
S7.000	50.00	5.35	147.245	0.198	0.0	0.0	0.0	1.28	90.5	26.8
S7.001	50.00	5.49	147.067	0.378	0.0	0.0	0.0	1.11	78.5	51.2
S7.002	50.00	5.70	147.020	0.378	0.0	0.0	0.0	2.57	182.0	51.2
S4.005	50.00	7.67	145.986	0.730	0.0	0.0	0.0	1.20	191.6	98.9
S8.000	50.00	5.11	146.656	0.073	0.0	0.0	0.0	1.99	79.2	9.9
S8.001	50.00	5.24	146.363	0.105	0.0	0.0	0.0	1.39	55.3	14.2
S8.002	50.00	5.30	146.162	0.105	0.0	0.0	0.0	1.08	76.3	14.2
S8.003	50.00	5.38	146.043	0.105	0.0	0.0	0.0	1.12	79.1	14.2
S8.004	50.00	5.56	146.015	0.105	0.0	0.0	0.0	1.23	87.0	14.2
S4.006	50.00	7.77	145.935	0.835	0.0	0.0	0.0	1.21	192.1	113.1
S4.007	50.00	7.99	145.832	0.860	0.0	0.0	0.0	1.71	912.7	116.5
S9.000	50.00	5.09	146.678	0.077	0.0	0.0	0.0	1.82	200.5	10.4
S9.001	50.00	5.24	146.582	0.145	0.0	0.0	0.0	1.48	163.5	19.6

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S9.002	14.455	0.096	150.6	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S10.000	29.487	0.590	50.0	0.010	5.00	0.0	0.600	o	150	Pipe/Conduit	
S9.003	21.800	0.145	150.3	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S11.000	8.764	0.188	46.6	0.050	5.00	0.0	0.600	o	150	Pipe/Conduit	
S11.001	11.226	0.112	100.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S12.000	2.351	0.016	146.9	0.145	5.00	0.0	0.600	o	225	Pipe/Conduit	
S12.001	6.353	0.042	151.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S11.002	5.969	0.030	199.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S11.003	5.969	0.030	199.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S11.004	4.029	0.020	201.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S9.004	10.627	0.041	259.2	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.009	73.129	0.146	500.9	0.077	0.00	0.0	0.600	o	825	Pipe/Conduit	
S13.000	28.448	0.190	149.7	0.133	5.00	0.0	0.600	o	225	Pipe/Conduit	
S13.001	37.223	0.195	190.9	0.014	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S9.002	50.00	5.40	146.492	0.145	0.0	0.0	0.0	1.47	162.8	19.6
S10.000	50.00	5.34	147.211	0.010	0.0	0.0	0.0	1.43	25.2	1.4
S9.003	50.00	5.65	146.396	0.155	0.0	0.0	0.0	1.48	163.0	21.0
S11.000	50.00	5.10	146.956	0.050	0.0	0.0	0.0	1.48	26.1	6.8
S11.001	50.00	5.29	146.768	0.050	0.0	0.0	0.0	1.00	17.7	6.8
S12.000	50.00	5.04	147.075	0.145	0.0	0.0	0.0	1.08	42.8	19.6
S12.001	50.00	5.14	147.059	0.145	0.0	0.0	0.0	1.06	42.2	19.6
S11.002	50.00	5.37	146.506	0.195	0.0	0.0	0.0	1.11	78.5	26.4
S11.003	50.00	5.46	146.376	0.195	0.0	0.0	0.0	1.11	78.5	26.4
S11.004	50.00	5.53	146.346	0.195	0.0	0.0	0.0	1.10	78.0	26.4
S9.004	50.00	5.81	146.251	0.350	0.0	0.0	0.0	1.12	123.8	47.4
S1.009	50.00	8.91	145.760	1.913	0.0	0.0	0.0	1.32	705.5	259.0
S13.000	50.00	5.44	146.967	0.133	0.0	0.0	0.0	1.07	42.4	18.0
S13.001	50.00	6.10	146.777	0.147	0.0	0.0	0.0	0.94	37.5	19.9

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S14.000	24.868	0.311	80.0	0.059	5.00	0.0	0.600	o	225	Pipe/Conduit	
S15.000	12.128	0.081	149.7	0.173	5.00	0.0	0.600	o	225	Pipe/Conduit	
S13.002	17.294	0.169	102.3	0.097	0.00	0.0	0.600	o	375	Pipe/Conduit	
S16.000	33.161	1.452	22.8	0.019	5.00	0.0	0.600	o	150	Pipe/Conduit	
S13.003	4.564	0.023	198.4	0.060	0.00	0.0	0.600	o	375	Pipe/Conduit	
S13.004	4.564	0.023	198.4	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S13.005	8.273	0.053	156.1	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.010	22.475	0.045	499.4	0.063	0.00	0.0	0.600	o	825	Pipe/Conduit	
S1.011	29.256	0.028	1044.9	0.000	0.00	0.0	0.600	o	825	Pipe/Conduit	
S1.012	23.744	0.061	389.2	0.000	0.00	0.0	0.600	o	825	Pipe/Conduit	
S17.000	2.464	0.049	50.3	0.159	5.00	0.0	0.600	o	225	Pipe/Conduit	
S17.001	4.217	0.114	37.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.002	5.401	0.505	10.7	0.035	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.003	8.694	0.141	61.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S14.000	50.00	5.28	146.893	0.059	0.0	0.0	0.0	1.46	58.2	8.0
S15.000	50.00	5.19	146.663	0.173	0.0	0.0	0.0	1.07	42.4	23.4
S13.002	50.00	6.26	146.432	0.476	0.0	0.0	0.0	1.79	197.8	64.5
S16.000	50.00	5.26	147.940	0.019	0.0	0.0	0.0	2.12	37.4	2.6
S13.003	50.00	6.32	146.263	0.555	0.0	0.0	0.0	1.28	141.7	75.2
S13.004	50.00	6.38	146.140	0.555	0.0	0.0	0.0	1.28	141.7	75.2
S13.005	50.00	6.48	146.117	0.555	0.0	0.0	0.0	1.45	159.9	75.2
S1.010	50.00	9.19	145.614	2.531	0.0	0.0	0.0	1.32	706.5	342.7
S1.011	50.00	9.73	145.569	2.531	0.0	0.0	0.0	0.91	486.4	342.7
S1.012	50.00	9.99	145.480	2.531	0.0	0.0	0.0	1.50	801.2	342.7
S17.000	50.00	5.02	147.225	0.159	0.0	0.0	0.0	1.85	73.5	21.5
S17.001	50.00	5.05	147.176	0.159	0.0	0.0	0.0	2.16	85.8	21.5
S17.002	50.00	5.08	147.062	0.194	0.0	0.0	0.0	4.02	160.0	26.3
S17.003	50.00	5.16	146.457	0.194	0.0	0.0	0.0	1.67	66.3	26.3

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S18.000	44.171	0.809	54.6	0.012	5.00	0.0	0.600	o	150	Pipe/Conduit	
S17.004	14.540	0.058	250.7	0.100	0.00	0.0	0.600	o	300	Pipe/Conduit	
S17.005	14.970	0.067	223.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S19.000	5.802	0.779	7.4	0.044	5.00	0.0	0.600	o	225	Pipe/Conduit	
S19.001	7.025	0.070	100.4	0.107	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.006	5.523	0.022	251.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.013	9.819	0.020	491.0	0.000	0.00	0.0	0.600	o	1200	Pipe/Conduit	
S1.014	7.993	0.095	84.1	0.000	0.00	0.0	0.600	o	1200	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)
S18.000	50.00	5.54	147.200	0.012	0.0	0.0	0.0	1.36	24.1	1.6
S17.004	50.00	5.78	146.241	0.306	0.0	0.0	0.0	0.99	69.9	41.4
S17.005	50.00	6.02	146.183	0.306	0.0	0.0	0.0	1.05	74.1	41.4
S19.000	50.00	5.02	147.040	0.044	0.0	0.0	0.0	4.82	191.8	6.0
S19.001	50.00	5.11	146.261	0.151	0.0	0.0	0.0	1.31	51.9	20.4
S17.006	50.00	6.10	146.041	0.457	0.0	0.0	0.0	1.14	125.8	61.9
S1.013	50.00	10.09	145.175	2.988	0.0	0.0	0.0	1.68	1901.9	404.6
S1.014	50.00	10.12	145.155	2.988	0.0	0.0	0.0	4.08	4614.7	404.6

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.014	Ex. S3L1	149.100	145.060	0.000	0	0

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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.272		

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 0
Number of Online Controls 0 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH
FEH Rainfall Version 2013
Site Location GB 391325 411646 SD 91325 11646
Data Type Point
Cv (Summer) 0.750
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) 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 100
Climate Change (%) 45

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	SU U1 CP	60 minute 100 year Summer I+45%	148.326	147.744	-0.031	0.000
S1.001	L1-S1	60 minute 100 year Summer I+45%	148.400	147.686	0.066	0.000
S1.002	L1-S2	60 minute 100 year Summer I+45%	149.055	147.658	0.241	0.000
S1.003	BPI-L1	60 minute 100 year Summer I+45%	149.100	147.640	0.351	0.000
S2.000	L1-S3	60 minute 100 year Summer I+45%	149.380	147.643	0.287	0.000
S1.004	L1-S4	60 minute 100 year Summer I+45%	149.270	147.614	0.380	0.000
S1.005	L1-S5	60 minute 100 year Summer I+45%	149.260	147.481	0.445	0.000
S3.000	L1-S6	60 minute 100 year Summer I+45%	148.985	147.669	-0.041	0.000
S1.006	L1-S7	60 minute 100 year Summer I+45%	149.015	147.359	0.584	0.000
S1.007	L1-S8	60 minute 100 year Summer I+45%	148.760	147.240	0.524	0.000
S1.008	ADL-S1	60 minute 100 year Summer I+45%	148.654	147.127	0.433	0.000
S4.000	L2-S1	60 minute 100 year Summer I+45%	147.700	147.705	1.115	4.517
S4.001	L2-S2	60 minute 100 year Summer I+45%	147.796	147.411	0.841	0.000
S5.000	SU U2 Yard	60 minute 100 year Summer I+45%	147.700	147.458	0.979	0.000
S6.000	15	60 minute 100 year Winter I+45%	147.167	147.167	0.364	0.000
S6.001	15-1	60 minute 100 year Summer I+45%	147.167	147.167	0.000	0.000
S6.002	15-2	60 minute 100 year Summer I+45%	147.167	147.167	0.000	0.010

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S1.000	SU U1 CP	0.97		0.018	15.5	OK
S1.001	L1-S1	0.34		0.431	28.2	SURCHARGED
S1.002	L1-S2	0.87		2.672	45.0	SURCHARGED
S1.003	BPI-L1	0.78		1.094	47.8	SURCHARGED
S2.000	L1-S3	0.40		0.941	54.7	SURCHARGED
S1.004	L1-S4	0.85		3.684	192.4	SURCHARGED
S1.005	L1-S5	0.69		5.786	199.8	SURCHARGED
S3.000	L1-S6	0.86		0.118	11.3	OK
S1.006	L1-S7	1.27		3.143	209.1	SURCHARGED
S1.007	L1-S8	1.70		3.057	209.0	SURCHARGED
S1.008	ADL-S1	1.18		1.737	219.5	SURCHARGED
S4.000	L2-S1	2.18		4.700	42.2	FLOOD
S4.001	L2-S2	1.17		1.271	44.5	SURCHARGED
S5.000	SU U2 Yard	1.84		0.339	53.2	FLOOD RISK
S6.000	15	0.05		0.811	2.4	FLOOD RISK*
S6.001	15-1	0.13		1.050	6.1	FLOOD RISK*
S6.002	15-2	0.22		0.629	10.0	FLOOD

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S6.003	15-3	60 minute 100 year Summer I+45%	147.167	147.167	0.000	0.066
S6.004	15-4	60 minute 100 year Summer I+45%	147.167	147.167	0.000	0.366
S6.005	15-5	60 minute 100 year Summer I+45%	147.167	147.169	0.002	1.631
S6.006	15-6	60 minute 100 year Summer I+45%	147.167	147.170	0.003	3.247
S6.007	SU U2 Dock	60 minute 100 year Summer I+45%	147.167	147.176	0.600	9.517
S4.002	L2-S3	60 minute 100 year Summer I+45%	147.796	147.322	0.672	0.000
S4.003	FRI-L2	60 minute 100 year Summer I+45%	147.760	147.299	0.815	0.000
S4.004	L2-S4	60 minute 100 year Summer I+45%	147.800	147.285	0.834	0.000
S7.000	L2-S5	60 minute 100 year Summer I+45%	148.300	148.294	0.749	0.000
S7.001	L2-S6	60 minute 100 year Summer I+45%	148.370	148.153	0.786	0.000
S7.002	L2-S7	60 minute 100 year Summer I+45%	148.490	147.857	0.537	0.000
S4.005	L2-S8	60 minute 100 year Summer I+45%	147.852	147.276	0.840	0.000
S8.000	SU	60 minute 100 year Summer I+45%	147.656	147.329	0.448	0.000
S8.001	L2-S9	60 minute 100 year Summer I+45%	148.030	147.290	0.702	0.000
S8.002	L2-S10	60 minute 100 year Summer I+45%	148.163	147.225	0.763	0.000
S8.003	BPI-L2	60 minute 100 year Summer I+45%	148.163	147.213	0.870	0.000
S8.004	L2-S11	60 minute 100 year Summer I+45%	148.134	147.199	0.884	0.000
S4.006	L2-S12	60 minute 100 year Summer I+45%	147.910	147.170	0.785	0.000
S4.007	ADL-S2	60 minute 100 year Summer I+45%	147.940	147.022	0.365	0.000
S9.000	L3-S1	60 minute 100 year Summer I+45%	148.300	147.172	0.119	0.000
S9.001	L3-S2	60 minute 100 year Summer I+45%	148.300	147.163	0.206	0.000
S9.002	L3-S3	60 minute 100 year Summer I+45%	148.165	147.140	0.273	0.000
S10.000	L3-S4	60 minute 100 year Summer I+45%	148.370	147.253	-0.108	0.000
S9.003	L3-S5	60 minute 100 year Summer I+45%	148.370	147.116	0.345	0.000
S11.000	L3 Sump	60 minute 100 year Summer I+45%	147.780	147.497	0.391	0.000
S11.001	L3-S6	60 minute 100 year Summer I+45%	148.025	147.402	0.484	0.000
S12.000	L3 Sump	60 minute 100 year Summer I+45%	148.125	147.611	0.311	0.000
S12.001	L3-S7	60 minute 100 year Summer I+45%	148.185	147.420	0.136	0.000
S11.002	L3-S8	60 minute 100 year Summer I+45%	148.184	147.285	0.479	0.000
S11.003	FRI-L3	60 minute 100 year Summer I+45%	148.131	147.219	0.543	0.000
S11.004	L3-S9	60 minute 100 year Summer I+45%	148.356	147.153	0.507	0.000
S9.004	L3-S10	60 minute 100 year Summer I+45%	148.425	147.086	0.460	0.000
S1.009	ADL-S3	60 minute 100 year Summer I+45%	148.400	147.001	0.416	0.000
S13.000	L1-S9	60 minute 100 year Summer I+45%	149.385	148.413	1.221	0.000
S13.001	L1-S10	60 minute 100 year Summer I+45%	148.478	148.121	1.119	0.000
S14.000	SU U1 Dock	60 minute 100 year Summer I+45%	148.167	147.760	0.642	0.000
S15.000	SU U1 Yard	60 minute 100 year Summer I+45%	148.175	147.966	1.078	0.000
S13.002	L1-S11	60 minute 100 year Summer I+45%	148.478	147.714	0.907	0.000
S16.000	L1-S12	60 minute 100 year Summer I+45%	149.185	147.988	-0.102	0.000
S13.003	L1-S13	60 minute 100 year Summer I+45%	148.500	147.530	0.892	0.000
S13.004	FRI-L1	60 minute 100 year Summer I+45%	148.455	147.315	0.800	0.000
S13.005	L1-S14	60 minute 100 year Summer I+45%	148.335	147.099	0.607	0.000
S1.010	ADL-S4	60 minute 100 year Summer I+45%	148.480	146.880	0.441	0.000
S1.011	ADL-S5	60 minute 100 year Summer I+45%	148.875	146.715	0.321	0.000
S1.012	ADL-S6	60 minute 100 year Summer I+45%	149.225	146.547	0.242	0.000
S17.000	SU U4 Yard	60 minute 100 year Summer I+45%	148.125	147.966	0.516	0.000
S17.001	L4-S2	60 minute 100 year Summer I+45%	148.178	147.774	0.373	0.000
S17.002	L4-S3	60 minute 100 year Summer I+45%	148.178	147.587	0.300	0.000
S17.003	FRI-L4	60 minute 100 year Summer I+45%	148.260	147.314	0.632	0.000

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S6.003	15-3	0.30		0.665	14.0	FLOOD
S6.004	15-4	0.38		0.928	17.6	FLOOD
S6.005	15-5	0.48		2.258	22.3	FLOOD
S6.006	15-6	0.69		3.792	32.3	FLOOD
S6.007	SU U2 Dock	1.56		9.825	57.0	FLOOD
S4.002	L2-S3	0.66		3.221	112.1	SURCHARGED
S4.003	FRI-L2	0.82		4.229	112.9	SURCHARGED
S4.004	L2-S4	0.97		2.807	115.2	SURCHARGED
S7.000	L2-S5	0.88		1.181	71.3	FLOOD RISK
S7.001	L2-S6	2.25		3.029	136.3	FLOOD RISK
S7.002	L2-S7	0.81		1.518	134.6	SURCHARGED
S4.005	L2-S8	1.50		4.502	218.5	SURCHARGED
S8.000	SU	0.40		0.106	27.1	SURCHARGED
S8.001	L2-S9	0.81		1.516	38.0	SURCHARGED
S8.002	L2-S10	0.74		1.591	35.8	SURCHARGED
S8.003	BPI-L2	0.64		1.516	34.2	SURCHARGED
S8.004	L2-S11	0.50		1.637	35.2	SURCHARGED
S4.006	L2-S12	2.00		4.665	250.3	SURCHARGED
S4.007	ADL-S2	0.40		4.016	256.0	SURCHARGED
S9.000	L3-S1	0.26		0.700	31.0	SURCHARGED
S9.001	L3-S2	0.48		1.731	56.9	SURCHARGED
S9.002	L3-S3	0.42		2.255	50.7	SURCHARGED
S10.000	L3-S4	0.17		0.042	4.1	OK
S9.003	L3-S5	0.35		2.823	48.5	SURCHARGED
S11.000	L3 Sump	0.81		0.085	18.5	FLOOD RISK
S11.001	L3-S6	1.06		0.852	17.0	SURCHARGED
S12.000	L3 Sump	2.13		0.084	59.9	SURCHARGED
S12.001	L3-S7	2.01		0.463	60.2	SURCHARGED
S11.002	L3-S8	1.34		1.247	73.1	SURCHARGED
S11.003	FRI-L3	1.31		1.285	71.3	SURCHARGED
S11.004	L3-S9	1.43		1.244	69.4	SURCHARGED
S9.004	L3-S10	1.26		3.405	116.1	SURCHARGED
S1.009	ADL-S3	0.96		17.603	594.7	SURCHARGED
S13.000	L1-S9	1.21		1.629	47.9	SURCHARGED
S13.001	L1-S10	1.44		2.598	51.0	SURCHARGED
S14.000	SU U1 Dock	0.40		0.244	21.4	SURCHARGED
S15.000	SU U1 Yard	1.79		0.367	64.9	FLOOD RISK
S13.002	L1-S11	1.05		4.650	168.8	SURCHARGED
S16.000	L1-S12	0.22		0.049	8.0	OK
S13.003	L1-S13	2.34		3.942	195.7	SURCHARGED
S13.004	FRI-L1	2.30		2.030	192.9	SURCHARGED
S13.005	L1-S14	1.77		1.753	190.0	SURCHARGED
S1.010	ADL-S4	1.67		42.080	791.4	SURCHARGED
S1.011	ADL-S5	2.77		13.955	793.7	SURCHARGED
S1.012	ADL-S6	1.37		17.347	784.9	SURCHARGED
S17.000	SU U4 Yard	1.94		0.208	60.4	FLOOD RISK
S17.001	L4-S2	1.27		0.733	60.4	SURCHARGED
S17.002	L4-S3	0.73		0.708	72.9	SURCHARGED

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S17.003	FRI-L4	1.40		1.130	74.1	SURCHARGED

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S18.000	L4-S1	60 minute 100 year Summer I+45%	148.425	147.247	-0.103	0.000	0.21
S17.004	L4-S4	60 minute 100 year Summer I+45%	148.425	147.044	0.503	0.000	1.97
S17.005	L4-S5	60 minute 100 year Summer I+45%	148.140	146.813	0.330	0.000	1.85
S19.000	BPI-L4	60 minute 100 year Summer I+45%	148.040	147.098	-0.167	0.000	0.15
S19.001	L4-S7	60 minute 100 year Summer I+45%	148.140	146.810	0.324	0.000	1.71
S17.006	L4-S6	60 minute 100 year Summer I+45%	148.140	146.586	0.170	0.000	2.24
S1.013	ADL-S7	60 minute 100 year Summer I+45%	148.232	146.375	0.000	0.000	1.37
S1.014	ADL-S8	60 minute 100 year Summer I+45%	148.335	145.742	-0.613	0.000	0.48

PN	US/MH Name	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S18.000	L4-S1		0.048	5.0	OK
S17.004	L4-S4		1.738	115.1	SURCHARGED
S17.005	L4-S5		1.650	114.9	SURCHARGED
S19.000	BPI-L4		0.060	18.5	OK
S19.001	L4-S7		0.716	63.6	SURCHARGED
S17.006	L4-S6		1.970	177.2	SURCHARGED
S1.013	ADL-S7		16.109	942.5	OK
S1.014	ADL-S8		5.129	933.9	OK

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.272	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
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

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	1.079	4-8	1.876	8-12	0.033

Total Area Contributing (ha) = 2.988

Total Pipe Volume (m³) = 170.607

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	3.049	0.065	46.9	0.037	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	30.414	0.203	149.8	0.031	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.002	6.342	0.028	226.5	0.051	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	10.308	0.055	187.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.000	18.230	0.122	149.4	0.145	5.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.03	147.625	0.037	0.0	0.0	0.0	1.47	26.0	5.0
S1.001	50.00	5.43	147.320	0.068	0.0	0.0	0.0	1.28	90.6	9.2
S1.002	50.00	5.53	147.117	0.119	0.0	0.0	0.0	1.04	73.6	16.1
S1.003	50.00	5.68	146.989	0.119	0.0	0.0	0.0	1.15	80.9	16.1
S2.000	50.00	5.21	146.981	0.145	0.0	0.0	0.0	1.48	163.5	19.6

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.004	29.718	0.198	150.1	0.265	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.005	11.849	0.261	45.4	0.031	0.00	0.0	0.600	o	450	Pipe/Conduit	
S3.000	4.380	0.044	99.5	0.027	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.006	11.849	0.059	200.8	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.007	4.363	0.022	198.3	0.005	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.008	19.473	0.109	178.6	0.034	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.000	4.873	0.095	51.3	0.134	5.00	0.0	0.600	o	150	Pipe/Conduit	
S4.001	17.975	0.120	149.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S5.000	4.845	0.029	167.1	0.138	5.00	0.0	0.600	o	225	Pipe/Conduit	
S6.000	3.000	0.029	103.4	0.000	5.00	0.0	0.600	CA	225	CastSlot	
S6.001	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.002	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.003	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.004	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.005	0.500	0.000	1666.7	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.006	0.945	0.000	3150.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.007	21.104	0.126	167.5	0.042	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.004	50.00	5.98	146.784	0.529	0.0	0.0	0.0	1.66	263.6	71.6
S1.005	50.00	6.05	146.586	0.560	0.0	0.0	0.0	3.02	480.9	75.8
S3.000	50.00	5.07	147.560	0.027	0.0	0.0	0.0	1.01	17.8	3.7
S1.006	50.00	6.18	146.325	0.587	0.0	0.0	0.0	1.43	227.6	79.5
S1.007	50.00	6.23	146.266	0.592	0.0	0.0	0.0	1.44	229.0	80.2
S1.008	50.00	6.45	146.244	0.626	0.0	0.0	0.0	1.52	241.4	84.8
S4.000	50.00	5.06	146.440	0.134	0.0	0.0	0.0	1.41	24.9	18.1
S4.001	50.00	5.34	146.345	0.134	0.0	0.0	0.0	1.07	42.4	18.1
S5.000	50.00	5.08	146.254	0.138	0.0	0.0	0.0	1.01	40.1	18.7
S6.000	50.00	5.04	146.351	0.000	0.0	0.0	0.0	0.82	37.9	0.0
S6.001	50.00	5.45	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.002	50.00	5.86	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.003	50.00	6.28	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.004	50.00	6.69	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.005	50.00	6.71	146.715	0.000	0.0	0.0	0.0	0.54	24.8	0.0
S6.006	50.00	6.79	146.715	0.000	0.0	0.0	0.0	0.52	24.0	0.0
S6.007	50.00	7.13	146.351	0.042	0.0	0.0	0.0	1.01	40.1	5.7

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.002	16.603	0.091	182.5	0.038	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.003	7.486	0.033	226.8	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.004	4.058	0.015	270.5	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S7.000	26.750	0.178	150.3	0.198	5.00	0.0	0.600	o	300	Pipe/Conduit	
S7.001	9.363	0.047	199.2	0.180	0.00	0.0	0.600	o	300	Pipe/Conduit	
S7.002	33.356	0.889	37.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.005	14.400	0.051	282.4	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S8.000	12.716	0.293	43.4	0.073	5.00	0.0	0.600	o	225	Pipe/Conduit	
S8.001	11.134	0.126	88.4	0.032	0.00	0.0	0.600	o	225	Pipe/Conduit	
S8.002	4.005	0.019	210.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.003	5.495	0.028	196.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.004	13.000	0.080	162.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.006	7.870	0.028	281.1	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.007	21.636	0.072	300.5	0.025	0.00	0.0	0.600	o	825	Pipe/Conduit	
S9.000	9.564	0.096	99.6	0.077	5.00	0.0	0.600	o	375	Pipe/Conduit	
S9.001	13.436	0.090	149.3	0.068	0.00	0.0	0.600	o	375	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)
S4.002	50.00	7.32	146.200	0.352	0.0	0.0	0.0	1.50	238.9	47.7
S4.003	50.00	7.41	146.034	0.352	0.0	0.0	0.0	1.35	214.0	47.7
S4.004	50.00	7.47	146.001	0.352	0.0	0.0	0.0	1.23	195.8	47.7
S7.000	50.00	5.35	147.245	0.198	0.0	0.0	0.0	1.28	90.5	26.8
S7.001	50.00	5.49	147.067	0.378	0.0	0.0	0.0	1.11	78.5	51.2
S7.002	50.00	5.70	147.020	0.378	0.0	0.0	0.0	2.57	182.0	51.2
S4.005	50.00	7.67	145.986	0.730	0.0	0.0	0.0	1.20	191.6	98.9
S8.000	50.00	5.11	146.656	0.073	0.0	0.0	0.0	1.99	79.2	9.9
S8.001	50.00	5.24	146.363	0.105	0.0	0.0	0.0	1.39	55.3	14.2
S8.002	50.00	5.30	146.162	0.105	0.0	0.0	0.0	1.08	76.3	14.2
S8.003	50.00	5.38	146.043	0.105	0.0	0.0	0.0	1.12	79.1	14.2
S8.004	50.00	5.56	146.015	0.105	0.0	0.0	0.0	1.23	87.0	14.2
S4.006	50.00	7.77	145.935	0.835	0.0	0.0	0.0	1.21	192.1	113.1
S4.007	50.00	7.99	145.832	0.860	0.0	0.0	0.0	1.71	912.7	116.5
S9.000	50.00	5.09	146.678	0.077	0.0	0.0	0.0	1.82	200.5	10.4
S9.001	50.00	5.24	146.582	0.145	0.0	0.0	0.0	1.48	163.5	19.6

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S9.002	14.455	0.096	150.6	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S10.000	29.487	0.590	50.0	0.010	5.00	0.0	0.600	o	150	Pipe/Conduit	
S9.003	21.800	0.145	150.3	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S11.000	8.764	0.188	46.6	0.050	5.00	0.0	0.600	o	150	Pipe/Conduit	
S11.001	11.226	0.112	100.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S12.000	2.351	0.016	146.9	0.145	5.00	0.0	0.600	o	225	Pipe/Conduit	
S12.001	6.353	0.042	151.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S11.002	5.969	0.030	199.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S11.003	5.969	0.030	199.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S11.004	4.029	0.020	201.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S9.004	10.627	0.041	259.2	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.009	73.129	0.146	500.9	0.077	0.00	0.0	0.600	o	825	Pipe/Conduit	
S13.000	28.448	0.190	149.7	0.133	5.00	0.0	0.600	o	225	Pipe/Conduit	
S13.001	37.223	0.195	190.9	0.014	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S9.002	50.00	5.40	146.492	0.145	0.0	0.0	0.0	1.47	162.8	19.6
S10.000	50.00	5.34	147.211	0.010	0.0	0.0	0.0	1.43	25.2	1.4
S9.003	50.00	5.65	146.396	0.155	0.0	0.0	0.0	1.48	163.0	21.0
S11.000	50.00	5.10	146.956	0.050	0.0	0.0	0.0	1.48	26.1	6.8
S11.001	50.00	5.29	146.768	0.050	0.0	0.0	0.0	1.00	17.7	6.8
S12.000	50.00	5.04	147.075	0.145	0.0	0.0	0.0	1.08	42.8	19.6
S12.001	50.00	5.14	147.059	0.145	0.0	0.0	0.0	1.06	42.2	19.6
S11.002	50.00	5.37	146.506	0.195	0.0	0.0	0.0	1.11	78.5	26.4
S11.003	50.00	5.46	146.376	0.195	0.0	0.0	0.0	1.11	78.5	26.4
S11.004	50.00	5.53	146.346	0.195	0.0	0.0	0.0	1.10	78.0	26.4
S9.004	50.00	5.81	146.251	0.350	0.0	0.0	0.0	1.12	123.8	47.4
S1.009	50.00	8.91	145.760	1.913	0.0	0.0	0.0	1.32	705.5	259.0
S13.000	50.00	5.44	146.967	0.133	0.0	0.0	0.0	1.07	42.4	18.0
S13.001	50.00	6.10	146.777	0.147	0.0	0.0	0.0	0.94	37.5	19.9

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S14.000	24.868	0.311	80.0	0.059	5.00	0.0	0.600	o	225	Pipe/Conduit	
S15.000	12.128	0.081	149.7	0.173	5.00	0.0	0.600	o	225	Pipe/Conduit	
S13.002	17.294	0.169	102.3	0.097	0.00	0.0	0.600	o	375	Pipe/Conduit	
S16.000	33.161	1.452	22.8	0.019	5.00	0.0	0.600	o	150	Pipe/Conduit	
S13.003	4.564	0.023	198.4	0.060	0.00	0.0	0.600	o	375	Pipe/Conduit	
S13.004	4.564	0.023	198.4	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S13.005	8.273	0.053	156.1	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.010	22.475	0.045	499.4	0.063	0.00	0.0	0.600	o	825	Pipe/Conduit	
S1.011	29.256	0.028	1044.9	0.000	0.00	0.0	0.600	o	825	Pipe/Conduit	
S1.012	23.744	0.061	389.2	0.000	0.00	0.0	0.600	o	825	Pipe/Conduit	
S17.000	2.464	0.049	50.3	0.159	5.00	0.0	0.600	o	225	Pipe/Conduit	
S17.001	4.217	0.114	37.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.002	5.401	0.505	10.7	0.035	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.003	8.694	0.141	61.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S14.000	50.00	5.28	146.893	0.059	0.0	0.0	0.0	1.46	58.2	8.0
S15.000	50.00	5.19	146.663	0.173	0.0	0.0	0.0	1.07	42.4	23.4
S13.002	50.00	6.26	146.432	0.476	0.0	0.0	0.0	1.79	197.8	64.5
S16.000	50.00	5.26	147.940	0.019	0.0	0.0	0.0	2.12	37.4	2.6
S13.003	50.00	6.32	146.263	0.555	0.0	0.0	0.0	1.28	141.7	75.2
S13.004	50.00	6.38	146.140	0.555	0.0	0.0	0.0	1.28	141.7	75.2
S13.005	50.00	6.48	146.117	0.555	0.0	0.0	0.0	1.45	159.9	75.2
S1.010	50.00	9.19	145.614	2.531	0.0	0.0	0.0	1.32	706.5	342.7
S1.011	50.00	9.73	145.569	2.531	0.0	0.0	0.0	0.91	486.4	342.7
S1.012	50.00	9.99	145.480	2.531	0.0	0.0	0.0	1.50	801.2	342.7
S17.000	50.00	5.02	147.225	0.159	0.0	0.0	0.0	1.85	73.5	21.5
S17.001	50.00	5.05	147.176	0.159	0.0	0.0	0.0	2.16	85.8	21.5
S17.002	50.00	5.08	147.062	0.194	0.0	0.0	0.0	4.02	160.0	26.3
S17.003	50.00	5.16	146.457	0.194	0.0	0.0	0.0	1.67	66.3	26.3

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S18.000	44.171	0.809	54.6	0.012	5.00	0.0	0.600	o	150	Pipe/Conduit	
S17.004	14.540	0.058	250.7	0.100	0.00	0.0	0.600	o	300	Pipe/Conduit	
S17.005	14.970	0.067	223.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S19.000	5.802	0.779	7.4	0.044	5.00	0.0	0.600	o	225	Pipe/Conduit	
S19.001	7.025	0.070	100.4	0.107	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.006	5.523	0.022	251.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.013	9.819	0.020	491.0	0.000	0.00	0.0	0.600	o	1200	Pipe/Conduit	
S1.014	7.993	0.095	84.1	0.000	0.00	0.0	0.600	o	1200	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)
S18.000	50.00	5.54	147.200	0.012	0.0	0.0	0.0	1.36	24.1	1.6
S17.004	50.00	5.78	146.241	0.306	0.0	0.0	0.0	0.99	69.9	41.4
S17.005	50.00	6.02	146.183	0.306	0.0	0.0	0.0	1.05	74.1	41.4
S19.000	50.00	5.02	147.040	0.044	0.0	0.0	0.0	4.82	191.8	6.0
S19.001	50.00	5.11	146.261	0.151	0.0	0.0	0.0	1.31	51.9	20.4
S17.006	50.00	6.10	146.041	0.457	0.0	0.0	0.0	1.14	125.8	61.9
S1.013	50.00	10.09	145.175	2.988	0.0	0.0	0.0	1.68	1901.9	404.6
S1.014	50.00	10.12	145.155	2.988	0.0	0.0	0.0	4.08	4614.7	404.6

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.014	Ex. S3L1	149.100	145.060	0.000	0	0

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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.272		

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 0
Number of Online Controls 0 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 0.276
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 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) 15, 30
Return Period(s) (years) 2
Climate Change (%) 0

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S1.000	SU U1 CP	15 minute 2 year Winter I+0%	148.326	147.687	-0.088	0.000	0.35
S1.001	L1-S1	15 minute 2 year Winter I+0%	148.400	147.388	-0.232	0.000	0.12
S1.002	L1-S2	15 minute 2 year Winter I+0%	149.055	147.231	-0.187	0.000	0.31
S1.003	BPI-L1	15 minute 2 year Winter I+0%	149.100	147.092	-0.197	0.000	0.26
S2.000	L1-S3	15 minute 2 year Winter I+0%	149.380	147.082	-0.274	0.000	0.16
S1.004	L1-S4	15 minute 2 year Winter I+0%	149.270	146.958	-0.276	0.000	0.31
S1.005	L1-S5	15 minute 2 year Winter I+0%	149.260	146.741	-0.295	0.000	0.26
S3.000	L1-S6	15 minute 2 year Winter I+0%	148.985	147.618	-0.092	0.000	0.31
S1.006	L1-S7	15 minute 2 year Winter I+0%	149.015	146.560	-0.215	0.000	0.47
S1.007	L1-S8	15 minute 2 year Winter I+0%	148.760	146.529	-0.187	0.000	0.64
S1.008	ADL-S1	15 minute 2 year Winter I+0%	148.654	146.455	-0.239	0.000	0.45
S4.000	L2-S1	15 minute 2 year Winter I+0%	147.700	146.588	-0.002	0.000	1.00
S4.001	L2-S2	15 minute 2 year Winter I+0%	147.796	146.459	-0.111	0.000	0.51
S5.000	SU U2 Yard	15 minute 2 year Winter I+0%	147.700	146.397	-0.082	0.000	0.71
S6.000	15	15 minute 2 year Summer I+0%	147.167	146.351	-0.452	0.000	0.00
S6.001	15-1	15 minute 2 year Summer I+0%	147.167	146.322	-0.845	0.000	0.00
S6.002	15-2	15 minute 2 year Summer I+0%	147.167	146.715	-0.452	0.000	0.00
S6.003	15-3	15 minute 2 year Summer I+0%	147.167	146.715	-0.452	0.000	0.00
S6.004	15-4	15 minute 2 year Summer I+0%	147.167	146.715	-0.452	0.000	0.00
S6.005	15-5	15 minute 2 year Summer I+0%	147.167	146.715	-0.452	0.000	0.00
S6.006	15-6	15 minute 2 year Summer I+0%	147.167	146.715	-0.452	0.000	0.00
S6.007	SU U2 Dock	15 minute 2 year Winter I+0%	147.167	146.410	-0.166	0.000	0.15

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

PN	US/MH Name	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S1.000	SU U1 CP		0.009	5.6	OK
S1.001	L1-S1		0.071	9.5	OK
S1.002	L1-S2		0.289	15.9	OK
S1.003	BPI-L1		0.111	15.9	OK
S2.000	L1-S3		0.138	21.8	OK
S1.004	L1-S4		0.417	70.9	OK
S1.005	L1-S5		0.705	74.9	OK
S3.000	L1-S6		0.060	4.1	OK
S1.006	L1-S7		0.669	78.0	OK
S1.007	L1-S8		1.152	78.9	OK
S1.008	ADL-S1		0.450	83.1	OK
S4.000	L2-S1		0.023	19.3	OK
S4.001	L2-S2		0.150	19.3	OK
S5.000	SU U2 Yard		0.039	20.7	OK
S6.000	15		0.000	0.0	OK
S6.001	15-1		0.000	0.0	OK
S6.002	15-2		0.000	0.0	OK
S6.003	15-3		0.000	0.0	OK
S6.004	15-4		0.000	0.0	OK
S6.005	15-5		0.000	0.0	OK
S6.006	15-6		0.000	0.0	OK
S6.007	SU U2 Dock		0.022	5.3	OK

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S4.002	L2-S3	15 minute 2 year Winter I+0%	147.796	146.367	-0.283	0.000	0.30
S4.003	FRI-L2	15 minute 2 year Winter I+0%	147.760	146.315	-0.169	0.000	0.34
S4.004	L2-S4	15 minute 2 year Winter I+0%	147.800	146.305	-0.146	0.000	0.40
S7.000	L2-S5	15 minute 2 year Winter I+0%	148.300	147.371	-0.174	0.000	0.36
S7.001	L2-S6	15 minute 2 year Winter I+0%	148.370	147.283	-0.084	0.000	0.86
S7.002	L2-S7	15 minute 2 year Winter I+0%	148.490	147.135	-0.185	0.000	0.31
S4.005	L2-S8	15 minute 2 year Winter I+0%	147.852	146.299	-0.137	0.000	0.68
S8.000	SU	15 minute 2 year Winter I+0%	147.656	146.717	-0.164	0.000	0.16
S8.001	L2-S9	15 minute 2 year Winter I+0%	148.030	146.452	-0.136	0.000	0.32
S8.002	L2-S10	15 minute 2 year Winter I+0%	148.163	146.288	-0.174	0.000	0.30
S8.003	BPI-L2	15 minute 2 year Winter I+0%	148.163	146.284	-0.059	0.000	0.26
S8.004	L2-S11	15 minute 2 year Winter I+0%	148.134	146.281	-0.034	0.000	0.19
S4.006	L2-S12	15 minute 2 year Winter I+0%	147.910	146.274	-0.111	0.000	0.89
S4.007	ADL-S2	15 minute 2 year Winter I+0%	147.940	146.258	-0.399	0.000	0.17
S9.000	L3-S1	15 minute 2 year Winter I+0%	148.300	146.756	-0.297	0.000	0.10
S9.001	L3-S2	15 minute 2 year Winter I+0%	148.300	146.687	-0.270	0.000	0.17
S9.002	L3-S3	15 minute 2 year Winter I+0%	148.165	146.595	-0.272	0.000	0.17
S10.000	L3-S4	15 minute 2 year Winter I+0%	148.370	147.235	-0.126	0.000	0.06
S9.003	L3-S5	15 minute 2 year Winter I+0%	148.370	146.504	-0.267	0.000	0.16
S11.000	L3 Sump	15 minute 2 year Winter I+0%	147.780	147.016	-0.090	0.000	0.33
S11.001	L3-S6	15 minute 2 year Winter I+0%	148.025	146.841	-0.077	0.000	0.47
S12.000	L3 Sump	15 minute 2 year Winter I+0%	148.125	147.226	-0.074	0.000	0.77
S12.001	L3-S7	15 minute 2 year Winter I+0%	148.185	147.204	-0.080	0.000	0.73
S11.002	L3-S8	15 minute 2 year Winter I+0%	148.184	146.664	-0.142	0.000	0.54
S11.003	FRI-L3	15 minute 2 year Winter I+0%	148.131	146.534	-0.142	0.000	0.54
S11.004	L3-S9	15 minute 2 year Winter I+0%	148.356	146.515	-0.131	0.000	0.60
S9.004	L3-S10	15 minute 2 year Winter I+0%	148.425	146.451	-0.175	0.000	0.55
S1.009	ADL-S3	15 minute 2 year Winter I+0%	148.400	146.251	-0.334	0.000	0.37
S13.000	L1-S9	15 minute 2 year Winter I+0%	149.385	147.082	-0.110	0.000	0.50
S13.001	L1-S10	15 minute 2 year Winter I+0%	148.478	146.904	-0.098	0.000	0.60
S14.000	SU U1 Dock	15 minute 2 year Winter I+0%	148.167	146.955	-0.163	0.000	0.16
S15.000	SU U1 Yard	15 minute 2 year Winter I+0%	148.175	146.806	-0.082	0.000	0.72
S13.002	L1-S11	15 minute 2 year Winter I+0%	148.478	146.603	-0.204	0.000	0.42
S16.000	L1-S12	15 minute 2 year Winter I+0%	149.185	147.968	-0.122	0.000	0.08
S13.003	L1-S13	15 minute 2 year Winter I+0%	148.500	146.547	-0.091	0.000	0.93
S13.004	FRI-L1	15 minute 2 year Winter I+0%	148.455	146.425	-0.090	0.000	0.92
S13.005	L1-S14	15 minute 2 year Winter I+0%	148.335	146.356	-0.136	0.000	0.73
S1.010	ADL-S4	15 minute 2 year Winter I+0%	148.480	146.209	-0.230	0.000	0.55
S1.011	ADL-S5	15 minute 2 year Winter I+0%	148.875	146.178	-0.216	0.000	0.90
S1.012	ADL-S6	15 minute 2 year Winter I+0%	149.225	145.867	-0.438	0.000	0.45
S17.000	SU U4 Yard	15 minute 2 year Winter I+0%	148.125	147.375	-0.075	0.000	0.76
S17.001	L4-S2	15 minute 2 year Winter I+0%	148.178	147.290	-0.111	0.000	0.50
S17.002	L4-S3	15 minute 2 year Winter I+0%	148.178	147.144	-0.143	0.000	0.28
S17.003	FRI-L4	15 minute 2 year Winter I+0%	148.260	146.575	-0.107	0.000	0.54
S18.000	L4-S1	15 minute 2 year Winter I+0%	148.425	147.228	-0.122	0.000	0.08
S17.004	L4-S4	15 minute 2 year Winter I+0%	148.425	146.432	-0.109	0.000	0.73
S17.005	L4-S5	15 minute 2 year Winter I+0%	148.140	146.367	-0.116	0.000	0.68
S19.000	BPI-L4	15 minute 2 year Winter I+0%	148.040	147.074	-0.191	0.000	0.05
S19.001	L4-S7	15 minute 2 year Winter I+0%	148.140	146.381	-0.105	0.000	0.54

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

PN	US/MH Name	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S4.002	L2-S3		0.814	50.3	OK
S4.003	FRI-L2		1.151	47.1	OK
S4.004	L2-S4		0.995	47.0	OK
S7.000	L2-S5		0.137	29.4	OK
S7.001	L2-S6		0.939	52.3	OK
S7.002	L2-S7		0.251	52.0	OK
S4.005	L2-S8		0.804	98.2	OK
S8.000	SU		0.009	11.0	OK
S8.001	L2-S9		0.119	15.0	OK
S8.002	L2-S10		0.159	14.8	OK
S8.003	BPI-L2		0.332	14.0	OK
S8.004	L2-S11		0.539	13.5	OK
S4.006	L2-S12		2.656	110.9	OK
S4.007	ADL-S2		1.777	108.8	OK
S9.000	L3-S1		0.105	11.6	OK
S9.001	L3-S2		0.228	20.2	OK
S9.002	L3-S3		0.267	20.4	OK
S10.000	L3-S4		0.022	1.5	OK
S9.003	L3-S5		0.291	21.6	OK
S11.000	L3 Sump		0.009	7.5	OK
S11.001	L3-S6		0.093	7.5	OK
S12.000	L3 Sump		0.023	21.6	OK
S12.001	L3-S7		0.190	21.8	OK
S11.002	L3-S8		0.178	29.5	OK
S11.003	FRI-L3		0.205	29.4	OK
S11.004	L3-S9		0.333	29.2	OK
S9.004	L3-S10		0.935	50.9	OK
S1.009	ADL-S3		6.664	226.3	OK
S13.000	L1-S9		0.124	19.7	OK
S13.001	L1-S10		0.329	21.4	OK
S14.000	SU U1 Dock		0.016	8.8	OK
S15.000	SU U1 Yard		0.039	26.0	OK
S13.002	L1-S11		0.272	67.7	OK
S16.000	L1-S12		0.026	2.8	OK
S13.003	L1-S13		1.328	77.6	OK
S13.004	FRI-L1		0.527	77.4	OK
S13.005	L1-S14		0.523	77.9	OK
S1.010	ADL-S4		26.231	262.5	OK
S1.011	ADL-S5		8.882	258.5	OK
S1.012	ADL-S6		4.547	257.5	OK
S17.000	SU U4 Yard		0.041	23.6	OK
S17.001	L4-S2		0.145	23.9	OK
S17.002	L4-S3		0.102	28.4	OK
S17.003	FRI-L4		0.128	28.5	OK
S18.000	L4-S1		0.026	1.8	OK
S17.004	L4-S4		0.272	42.5	OK
S17.005	L4-S5		0.672	42.3	OK
S19.000	BPI-L4		0.032	6.6	OK

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

PN	US/MH Name	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S19.001	L4-S7		0.137	20.2	OK

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S17.006	L4-S6	15 minute 2 year Winter I+0%	148.140	146.293	-0.123	0.000	0.78
S1.013	ADL-S7	15 minute 2 year Winter I+0%	148.232	145.681	-0.694	0.000	0.42
S1.014	ADL-S8	15 minute 2 year Winter I+0%	148.335	145.460	-0.895	0.000	0.15

PN	US/MH Name	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S17.006	L4-S6		0.856	61.9	OK
S1.013	ADL-S7		3.565	288.2	OK
S1.014	ADL-S8		1.894	287.2	OK

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.272	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
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

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	1.079	4-8	1.876	8-12	0.033

Total Area Contributing (ha) = 2.988

Total Pipe Volume (m³) = 170.607

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	3.049	0.065	46.9	0.037	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	30.414	0.203	149.8	0.031	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.002	6.342	0.028	226.5	0.051	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	10.308	0.055	187.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.000	18.230	0.122	149.4	0.145	5.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.03	147.625	0.037	0.0	0.0	0.0	1.47	26.0	5.0
S1.001	50.00	5.43	147.320	0.068	0.0	0.0	0.0	1.28	90.6	9.2
S1.002	50.00	5.53	147.117	0.119	0.0	0.0	0.0	1.04	73.6	16.1
S1.003	50.00	5.68	146.989	0.119	0.0	0.0	0.0	1.15	80.9	16.1
S2.000	50.00	5.21	146.981	0.145	0.0	0.0	0.0	1.48	163.5	19.6

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.004	29.718	0.198	150.1	0.265	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.005	11.849	0.261	45.4	0.031	0.00	0.0	0.600	o	450	Pipe/Conduit	
S3.000	4.380	0.044	99.5	0.027	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.006	11.849	0.059	200.8	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.007	4.363	0.022	198.3	0.005	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.008	19.473	0.109	178.6	0.034	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.000	4.873	0.095	51.3	0.134	5.00	0.0	0.600	o	150	Pipe/Conduit	
S4.001	17.975	0.120	149.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S5.000	4.845	0.029	167.1	0.138	5.00	0.0	0.600	o	225	Pipe/Conduit	
S6.000	3.000	0.029	103.4	0.000	5.00	0.0	0.600	CA	225	CastSlot	
S6.001	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.002	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.003	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.004	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.005	0.500	0.000	1666.7	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.006	0.945	0.000	3150.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.007	21.104	0.126	167.5	0.042	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.004	50.00	5.98	146.784	0.529	0.0	0.0	0.0	1.66	263.6	71.6
S1.005	50.00	6.05	146.586	0.560	0.0	0.0	0.0	3.02	480.9	75.8
S3.000	50.00	5.07	147.560	0.027	0.0	0.0	0.0	1.01	17.8	3.7
S1.006	50.00	6.18	146.325	0.587	0.0	0.0	0.0	1.43	227.6	79.5
S1.007	50.00	6.23	146.266	0.592	0.0	0.0	0.0	1.44	229.0	80.2
S1.008	50.00	6.45	146.244	0.626	0.0	0.0	0.0	1.52	241.4	84.8
S4.000	50.00	5.06	146.440	0.134	0.0	0.0	0.0	1.41	24.9	18.1
S4.001	50.00	5.34	146.345	0.134	0.0	0.0	0.0	1.07	42.4	18.1
S5.000	50.00	5.08	146.254	0.138	0.0	0.0	0.0	1.01	40.1	18.7
S6.000	50.00	5.04	146.351	0.000	0.0	0.0	0.0	0.82	37.9	0.0
S6.001	50.00	5.45	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.002	50.00	5.86	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.003	50.00	6.28	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.004	50.00	6.69	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.005	50.00	6.71	146.715	0.000	0.0	0.0	0.0	0.54	24.8	0.0
S6.006	50.00	6.79	146.715	0.000	0.0	0.0	0.0	0.52	24.0	0.0
S6.007	50.00	7.13	146.351	0.042	0.0	0.0	0.0	1.01	40.1	5.7

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.002	16.603	0.091	182.5	0.038	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.003	7.486	0.033	226.8	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.004	4.058	0.015	270.5	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S7.000	26.750	0.178	150.3	0.198	5.00	0.0	0.600	o	300	Pipe/Conduit	
S7.001	9.363	0.047	199.2	0.180	0.00	0.0	0.600	o	300	Pipe/Conduit	
S7.002	33.356	0.889	37.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.005	14.400	0.051	282.4	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S8.000	12.716	0.293	43.4	0.073	5.00	0.0	0.600	o	225	Pipe/Conduit	
S8.001	11.134	0.126	88.4	0.032	0.00	0.0	0.600	o	225	Pipe/Conduit	
S8.002	4.005	0.019	210.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.003	5.495	0.028	196.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.004	13.000	0.080	162.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.006	7.870	0.028	281.1	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.007	21.636	0.072	300.5	0.025	0.00	0.0	0.600	o	825	Pipe/Conduit	
S9.000	9.564	0.096	99.6	0.077	5.00	0.0	0.600	o	375	Pipe/Conduit	
S9.001	13.436	0.090	149.3	0.068	0.00	0.0	0.600	o	375	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)
S4.002	50.00	7.32	146.200	0.352	0.0	0.0	0.0	1.50	238.9	47.7
S4.003	50.00	7.41	146.034	0.352	0.0	0.0	0.0	1.35	214.0	47.7
S4.004	50.00	7.47	146.001	0.352	0.0	0.0	0.0	1.23	195.8	47.7
S7.000	50.00	5.35	147.245	0.198	0.0	0.0	0.0	1.28	90.5	26.8
S7.001	50.00	5.49	147.067	0.378	0.0	0.0	0.0	1.11	78.5	51.2
S7.002	50.00	5.70	147.020	0.378	0.0	0.0	0.0	2.57	182.0	51.2
S4.005	50.00	7.67	145.986	0.730	0.0	0.0	0.0	1.20	191.6	98.9
S8.000	50.00	5.11	146.656	0.073	0.0	0.0	0.0	1.99	79.2	9.9
S8.001	50.00	5.24	146.363	0.105	0.0	0.0	0.0	1.39	55.3	14.2
S8.002	50.00	5.30	146.162	0.105	0.0	0.0	0.0	1.08	76.3	14.2
S8.003	50.00	5.38	146.043	0.105	0.0	0.0	0.0	1.12	79.1	14.2
S8.004	50.00	5.56	146.015	0.105	0.0	0.0	0.0	1.23	87.0	14.2
S4.006	50.00	7.77	145.935	0.835	0.0	0.0	0.0	1.21	192.1	113.1
S4.007	50.00	7.99	145.832	0.860	0.0	0.0	0.0	1.71	912.7	116.5
S9.000	50.00	5.09	146.678	0.077	0.0	0.0	0.0	1.82	200.5	10.4
S9.001	50.00	5.24	146.582	0.145	0.0	0.0	0.0	1.48	163.5	19.6

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S9.002	14.455	0.096	150.6	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S10.000	29.487	0.590	50.0	0.010	5.00	0.0	0.600	o	150	Pipe/Conduit	
S9.003	21.800	0.145	150.3	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S11.000	8.764	0.188	46.6	0.050	5.00	0.0	0.600	o	150	Pipe/Conduit	
S11.001	11.226	0.112	100.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S12.000	2.351	0.016	146.9	0.145	5.00	0.0	0.600	o	225	Pipe/Conduit	
S12.001	6.353	0.042	151.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S11.002	5.969	0.030	199.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S11.003	5.969	0.030	199.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S11.004	4.029	0.020	201.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S9.004	10.627	0.041	259.2	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.009	73.129	0.146	500.9	0.077	0.00	0.0	0.600	o	825	Pipe/Conduit	
S13.000	28.448	0.190	149.7	0.133	5.00	0.0	0.600	o	225	Pipe/Conduit	
S13.001	37.223	0.195	190.9	0.014	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S9.002	50.00	5.40	146.492	0.145	0.0	0.0	0.0	1.47	162.8	19.6
S10.000	50.00	5.34	147.211	0.010	0.0	0.0	0.0	1.43	25.2	1.4
S9.003	50.00	5.65	146.396	0.155	0.0	0.0	0.0	1.48	163.0	21.0
S11.000	50.00	5.10	146.956	0.050	0.0	0.0	0.0	1.48	26.1	6.8
S11.001	50.00	5.29	146.768	0.050	0.0	0.0	0.0	1.00	17.7	6.8
S12.000	50.00	5.04	147.075	0.145	0.0	0.0	0.0	1.08	42.8	19.6
S12.001	50.00	5.14	147.059	0.145	0.0	0.0	0.0	1.06	42.2	19.6
S11.002	50.00	5.37	146.506	0.195	0.0	0.0	0.0	1.11	78.5	26.4
S11.003	50.00	5.46	146.376	0.195	0.0	0.0	0.0	1.11	78.5	26.4
S11.004	50.00	5.53	146.346	0.195	0.0	0.0	0.0	1.10	78.0	26.4
S9.004	50.00	5.81	146.251	0.350	0.0	0.0	0.0	1.12	123.8	47.4
S1.009	50.00	8.91	145.760	1.913	0.0	0.0	0.0	1.32	705.5	259.0
S13.000	50.00	5.44	146.967	0.133	0.0	0.0	0.0	1.07	42.4	18.0
S13.001	50.00	6.10	146.777	0.147	0.0	0.0	0.0	0.94	37.5	19.9

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S14.000	24.868	0.311	80.0	0.059	5.00	0.0	0.600	o	225	Pipe/Conduit	
S15.000	12.128	0.081	149.7	0.173	5.00	0.0	0.600	o	225	Pipe/Conduit	
S13.002	17.294	0.169	102.3	0.097	0.00	0.0	0.600	o	375	Pipe/Conduit	
S16.000	33.161	1.452	22.8	0.019	5.00	0.0	0.600	o	150	Pipe/Conduit	
S13.003	4.564	0.023	198.4	0.060	0.00	0.0	0.600	o	375	Pipe/Conduit	
S13.004	4.564	0.023	198.4	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S13.005	8.273	0.053	156.1	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.010	22.475	0.045	499.4	0.063	0.00	0.0	0.600	o	825	Pipe/Conduit	
S1.011	29.256	0.028	1044.9	0.000	0.00	0.0	0.600	o	825	Pipe/Conduit	
S1.012	23.744	0.061	389.2	0.000	0.00	0.0	0.600	o	825	Pipe/Conduit	
S17.000	2.464	0.049	50.3	0.159	5.00	0.0	0.600	o	225	Pipe/Conduit	
S17.001	4.217	0.114	37.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.002	5.401	0.505	10.7	0.035	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.003	8.694	0.141	61.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S14.000	50.00	5.28	146.893	0.059	0.0	0.0	0.0	1.46	58.2	8.0
S15.000	50.00	5.19	146.663	0.173	0.0	0.0	0.0	1.07	42.4	23.4
S13.002	50.00	6.26	146.432	0.476	0.0	0.0	0.0	1.79	197.8	64.5
S16.000	50.00	5.26	147.940	0.019	0.0	0.0	0.0	2.12	37.4	2.6
S13.003	50.00	6.32	146.263	0.555	0.0	0.0	0.0	1.28	141.7	75.2
S13.004	50.00	6.38	146.140	0.555	0.0	0.0	0.0	1.28	141.7	75.2
S13.005	50.00	6.48	146.117	0.555	0.0	0.0	0.0	1.45	159.9	75.2
S1.010	50.00	9.19	145.614	2.531	0.0	0.0	0.0	1.32	706.5	342.7
S1.011	50.00	9.73	145.569	2.531	0.0	0.0	0.0	0.91	486.4	342.7
S1.012	50.00	9.99	145.480	2.531	0.0	0.0	0.0	1.50	801.2	342.7
S17.000	50.00	5.02	147.225	0.159	0.0	0.0	0.0	1.85	73.5	21.5
S17.001	50.00	5.05	147.176	0.159	0.0	0.0	0.0	2.16	85.8	21.5
S17.002	50.00	5.08	147.062	0.194	0.0	0.0	0.0	4.02	160.0	26.3
S17.003	50.00	5.16	146.457	0.194	0.0	0.0	0.0	1.67	66.3	26.3

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S18.000	44.171	0.809	54.6	0.012	5.00	0.0	0.600	o	150	Pipe/Conduit	
S17.004	14.540	0.058	250.7	0.100	0.00	0.0	0.600	o	300	Pipe/Conduit	
S17.005	14.970	0.067	223.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S19.000	5.802	0.779	7.4	0.044	5.00	0.0	0.600	o	225	Pipe/Conduit	
S19.001	7.025	0.070	100.4	0.107	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.006	5.523	0.022	251.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.013	9.819	0.020	491.0	0.000	0.00	0.0	0.600	o	1200	Pipe/Conduit	
S1.014	7.993	0.095	84.1	0.000	0.00	0.0	0.600	o	1200	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)
S18.000	50.00	5.54	147.200	0.012	0.0	0.0	0.0	1.36	24.1	1.6
S17.004	50.00	5.78	146.241	0.306	0.0	0.0	0.0	0.99	69.9	41.4
S17.005	50.00	6.02	146.183	0.306	0.0	0.0	0.0	1.05	74.1	41.4
S19.000	50.00	5.02	147.040	0.044	0.0	0.0	0.0	4.82	191.8	6.0
S19.001	50.00	5.11	146.261	0.151	0.0	0.0	0.0	1.31	51.9	20.4
S17.006	50.00	6.10	146.041	0.457	0.0	0.0	0.0	1.14	125.8	61.9
S1.013	50.00	10.09	145.175	2.988	0.0	0.0	0.0	1.68	1901.9	404.6
S1.014	50.00	10.12	145.155	2.988	0.0	0.0	0.0	4.08	4614.7	404.6

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.014	Ex. S3L1	149.100	145.060	0.000	0	0

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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.272		

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 0
Number of Online Controls 0 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 0.276
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 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) 15, 30
Return Period(s) (years) 30
Climate Change (%) 45

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	SU U1 CP	15 minute 30 year Winter I+45%	148.326	147.742	-0.033	0.000
S1.001	L1-S1	15 minute 30 year Winter I+45%	148.400	147.443	-0.177	0.000
S1.002	L1-S2	15 minute 30 year Winter I+45%	149.055	147.368	-0.049	0.000
S1.003	BPI-L1	15 minute 30 year Winter I+45%	149.100	147.350	0.061	0.000
S2.000	L1-S3	15 minute 30 year Winter I+45%	149.380	147.357	0.001	0.000
S1.004	L1-S4	15 minute 30 year Winter I+45%	149.270	147.326	0.092	0.000
S1.005	L1-S5	15 minute 30 year Winter I+45%	149.260	147.186	0.150	0.000
S3.000	L1-S6	15 minute 30 year Winter I+45%	148.985	147.668	-0.042	0.000
S1.006	L1-S7	15 minute 30 year Winter I+45%	149.015	147.060	0.285	0.000
S1.007	L1-S8	15 minute 30 year Winter I+45%	148.760	146.936	0.220	0.000
S1.008	ADL-S1	15 minute 30 year Winter I+45%	148.654	146.814	0.120	0.000
S4.000	L2-S1	15 minute 30 year Winter I+45%	147.700	147.700	1.110	0.184
S4.001	L2-S2	15 minute 30 year Winter I+45%	147.796	147.242	0.672	0.000
S5.000	SU U2 Yard	15 minute 30 year Winter I+45%	147.700	147.193	0.714	0.000
S6.000	15	15 minute 30 year Winter I+45%	147.167	147.047	0.244	0.000
S6.001	15-1	15 minute 30 year Winter I+45%	147.167	147.047	-0.120	0.000
S6.002	15-2	15 minute 30 year Winter I+45%	147.167	147.047	-0.120	0.000
S6.003	15-3	15 minute 30 year Winter I+45%	147.167	147.048	-0.119	0.000
S6.004	15-4	15 minute 30 year Winter I+45%	147.167	147.050	-0.117	0.000
S6.005	15-5	15 minute 30 year Winter I+45%	147.167	147.052	-0.115	0.000
S6.006	15-6	15 minute 30 year Winter I+45%	147.167	147.053	-0.114	0.000
S6.007	SU U2 Dock	15 minute 30 year Winter I+45%	147.167	147.055	0.479	0.000

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S1.000	SU U1 CP	0.96		0.018	15.3	OK
S1.001	L1-S1	0.34		0.134	28.4	OK
S1.002	L1-S2	0.94		1.270	48.9	OK
S1.003	BPI-L1	0.74		0.688	45.4	SURCHARGED
S2.000	L1-S3	0.41		0.532	55.0	SURCHARGED
S1.004	L1-S4	0.87		3.232	197.0	SURCHARGED
S1.005	L1-S5	0.69		5.321	199.3	SURCHARGED
S3.000	L1-S6	0.85		0.116	11.1	OK
S1.006	L1-S7	1.25		2.715	207.0	SURCHARGED
S1.007	L1-S8	1.68		2.622	206.8	SURCHARGED
S1.008	ADL-S1	1.16		1.287	216.6	SURCHARGED
S4.000	L2-S1	2.25		0.384	43.4	FLOOD
S4.001	L2-S2	1.13		1.080	42.7	SURCHARGED
S5.000	SU U2 Yard	1.66		0.264	48.3	SURCHARGED
S6.000	15	0.03		0.691	1.5	FLOOD RISK*
S6.001	15-1	0.08		0.900	3.5	FLOOD RISK*
S6.002	15-2	0.14		0.484	6.6	FLOOD RISK*
S6.003	15-3	0.21		0.485	9.7	FLOOD RISK*
S6.004	15-4	0.27		0.487	12.7	FLOOD RISK*
S6.005	15-5	0.34		0.490	15.6	FLOOD RISK*
S6.006	15-6	0.38		0.416	17.5	FLOOD RISK*
S6.007	SU U2 Dock	0.61		0.286	22.0	FLOOD RISK

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S4.002	L2-S3	15 minute 30 year Winter I+45%	147.796	147.091	0.441	0.000
S4.003	FRI-L2	15 minute 30 year Winter I+45%	147.760	147.060	0.576	0.000
S4.004	L2-S4	15 minute 30 year Winter I+45%	147.800	147.041	0.590	0.000
S7.000	L2-S5	15 minute 30 year Winter I+45%	148.300	147.954	0.409	0.000
S7.001	L2-S6	15 minute 30 year Winter I+45%	148.370	147.820	0.453	0.000
S7.002	L2-S7	15 minute 30 year Winter I+45%	148.490	147.540	0.220	0.000
S4.005	L2-S8	15 minute 30 year Winter I+45%	147.852	147.029	0.593	0.000
S8.000	SU	15 minute 30 year Winter I+45%	147.656	147.030	0.149	0.000
S8.001	L2-S9	15 minute 30 year Winter I+45%	148.030	146.992	0.404	0.000
S8.002	L2-S10	15 minute 30 year Winter I+45%	148.163	146.936	0.474	0.000
S8.003	BPI-L2	15 minute 30 year Winter I+45%	148.163	146.926	0.583	0.000
S8.004	L2-S11	15 minute 30 year Winter I+45%	148.134	146.913	0.598	0.000
S4.006	L2-S12	15 minute 30 year Winter I+45%	147.910	146.888	0.503	0.000
S4.007	ADL-S2	15 minute 30 year Winter I+45%	147.940	146.702	0.045	0.000
S9.000	L3-S1	15 minute 30 year Winter I+45%	148.300	146.833	-0.220	0.000
S9.001	L3-S2	15 minute 30 year Winter I+45%	148.300	146.823	-0.134	0.000
S9.002	L3-S3	15 minute 30 year Winter I+45%	148.165	146.803	-0.064	0.000
S10.000	L3-S4	15 minute 30 year Winter I+45%	148.370	147.253	-0.108	0.000
S9.003	L3-S5	15 minute 30 year Winter I+45%	148.370	146.783	0.012	0.000
S11.000	L3 Sump	15 minute 30 year Winter I+45%	147.780	147.218	0.112	0.000
S11.001	L3-S6	15 minute 30 year Winter I+45%	148.025	147.112	0.194	0.000
S12.000	L3 Sump	15 minute 30 year Winter I+45%	148.125	147.584	0.284	0.000
S12.001	L3-S7	15 minute 30 year Winter I+45%	148.185	147.406	0.122	0.000
S11.002	L3-S8	15 minute 30 year Winter I+45%	148.184	146.989	0.183	0.000
S11.003	FRI-L3	15 minute 30 year Winter I+45%	148.131	146.915	0.239	0.000
S11.004	L3-S9	15 minute 30 year Winter I+45%	148.356	146.838	0.192	0.000
S9.004	L3-S10	15 minute 30 year Winter I+45%	148.425	146.758	0.132	0.000
S1.009	ADL-S3	15 minute 30 year Winter I+45%	148.400	146.679	0.094	0.000
S13.000	L1-S9	15 minute 30 year Winter I+45%	149.385	147.962	0.770	0.000
S13.001	L1-S10	15 minute 30 year Winter I+45%	148.478	147.700	0.698	0.000
S14.000	SU U1 Dock	15 minute 30 year Winter I+45%	148.167	147.392	0.274	0.000
S15.000	SU U1 Yard	15 minute 30 year Winter I+45%	148.175	147.589	0.701	0.000
S13.002	L1-S11	15 minute 30 year Winter I+45%	148.478	147.344	0.537	0.000
S16.000	L1-S12	15 minute 30 year Winter I+45%	149.185	147.988	-0.102	0.000
S13.003	L1-S13	15 minute 30 year Winter I+45%	148.500	147.172	0.534	0.000
S13.004	FRI-L1	15 minute 30 year Winter I+45%	148.455	146.957	0.442	0.000
S13.005	L1-S14	15 minute 30 year Winter I+45%	148.335	146.750	0.258	0.000
S1.010	ADL-S4	15 minute 30 year Winter I+45%	148.480	146.557	0.118	0.000
S1.011	ADL-S5	15 minute 30 year Winter I+45%	148.875	146.455	0.061	0.000
S1.012	ADL-S6	15 minute 30 year Winter I+45%	149.225	146.305	0.000	0.000
S17.000	SU U4 Yard	15 minute 30 year Winter I+45%	148.125	147.800	0.350	0.000
S17.001	L4-S2	15 minute 30 year Winter I+45%	148.178	147.626	0.225	0.000
S17.002	L4-S3	15 minute 30 year Winter I+45%	148.178	147.459	0.172	0.000
S17.003	FRI-L4	15 minute 30 year Winter I+45%	148.260	147.216	0.534	0.000
S18.000	L4-S1	15 minute 30 year Winter I+45%	148.425	147.247	-0.103	0.000
S17.004	L4-S4	15 minute 30 year Winter I+45%	148.425	146.977	0.436	0.000
S17.005	L4-S5	15 minute 30 year Winter I+45%	148.140	146.770	0.287	0.000
S19.000	BPI-L4	15 minute 30 year Winter I+45%	148.040	147.097	-0.168	0.000
S19.001	L4-S7	15 minute 30 year Winter I+45%	148.140	146.778	0.292	0.000

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S4.002	L2-S3	0.59		2.889	100.9	SURCHARGED
S4.003	FRI-L2	0.69		3.887	95.1	SURCHARGED
S4.004	L2-S4	0.77		2.458	90.8	SURCHARGED
S7.000	L2-S5	0.88		0.796	71.3	SURCHARGED
S7.001	L2-S6	2.33		2.652	141.2	SURCHARGED
S7.002	L2-S7	0.80		1.160	133.4	SURCHARGED
S4.005	L2-S8	1.50		3.795	217.6	SURCHARGED
S8.000	SU	0.41		0.059	27.8	SURCHARGED
S8.001	L2-S9	0.76		1.179	35.5	SURCHARGED
S8.002	L2-S10	0.65		1.265	31.6	SURCHARGED
S8.003	BPI-L2	0.57		1.191	30.7	SURCHARGED
S8.004	L2-S11	0.43		1.313	30.1	SURCHARGED
S4.006	L2-S12	1.96		4.261	245.4	SURCHARGED
S4.007	ADL-S2	0.39		3.202	248.3	SURCHARGED
S9.000	L3-S1	0.26		0.215	31.8	OK
S9.001	L3-S2	0.52		0.794	61.5	OK
S9.002	L3-S3	0.47		1.422	56.7	OK
S10.000	L3-S4	0.17		0.042	4.1	OK
S9.003	L3-S5	0.38		1.942	52.6	SURCHARGED
S11.000	L3 Sump	0.82		0.041	18.9	SURCHARGED
S11.001	L3-S6	1.08		0.522	17.3	SURCHARGED
S12.000	L3 Sump	2.07		0.080	58.5	SURCHARGED
S12.001	L3-S7	1.96		0.448	58.6	SURCHARGED
S11.002	L3-S8	1.35		0.718	73.7	SURCHARGED
S11.003	FRI-L3	1.33		0.941	72.7	SURCHARGED
S11.004	L3-S9	1.49		0.888	72.2	SURCHARGED
S9.004	L3-S10	1.29		3.032	118.9	SURCHARGED
S1.009	ADL-S3	0.93		16.656	571.2	SURCHARGED
S13.000	L1-S9	1.14		1.120	45.1	SURCHARGED
S13.001	L1-S10	1.38		2.122	48.9	SURCHARGED
S14.000	SU U1 Dock	0.39		0.140	20.7	SURCHARGED
S15.000	SU U1 Yard	1.73		0.260	62.9	SURCHARGED
S13.002	L1-S11	0.98		4.121	158.4	SURCHARGED
S16.000	L1-S12	0.22		0.048	7.8	OK
S13.003	L1-S13	2.20		3.289	184.3	SURCHARGED
S13.004	FRI-L1	2.19		1.517	183.1	SURCHARGED
S13.005	L1-S14	1.70		1.254	182.6	SURCHARGED
S1.010	ADL-S4	1.58		40.950	750.2	SURCHARGED
S1.011	ADL-S5	2.60		13.004	743.6	SURCHARGED
S1.012	ADL-S6	1.28		14.871	736.5	SURCHARGED
S17.000	SU U4 Yard	1.85		0.161	57.8	SURCHARGED
S17.001	L4-S2	1.22		0.566	58.2	SURCHARGED
S17.002	L4-S3	0.69		0.563	69.5	SURCHARGED
S17.003	FRI-L4	1.35		1.014	71.5	SURCHARGED
S18.000	L4-S1	0.21		0.047	4.9	OK
S17.004	L4-S4	1.87		1.600	108.9	SURCHARGED
S17.005	L4-S5	1.75		1.601	108.7	SURCHARGED
S19.000	BPI-L4	0.15		0.059	18.2	OK

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S19.001	L4-S7	1.70		0.673	63.2	SURCHARGED

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S17.006	L4-S6	15 minute 30 year Winter I+45%	148.140	146.566	0.150	0.000	2.15
S1.013	ADL-S7	15 minute 30 year Winter I+45%	148.232	146.121	-0.254	0.000	1.24
S1.014	ADL-S8	15 minute 30 year Winter I+45%	148.335	145.710	-0.645	0.000	0.44

PN	US/MH Name	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S17.006	L4-S6		1.941	170.0	SURCHARGED
S1.013	ADL-S7		12.552	854.5	OK
S1.014	ADL-S8		4.739	857.5	OK

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.272	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
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

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	1.079	4-8	1.876	8-12	0.033

Total Area Contributing (ha) = 2.988

Total Pipe Volume (m³) = 170.607

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	3.049	0.065	46.9	0.037	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	30.414	0.203	149.8	0.031	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.002	6.342	0.028	226.5	0.051	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	10.308	0.055	187.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.000	18.230	0.122	149.4	0.145	5.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.03	147.625	0.037	0.0	0.0	0.0	1.47	26.0	5.0
S1.001	50.00	5.43	147.320	0.068	0.0	0.0	0.0	1.28	90.6	9.2
S1.002	50.00	5.53	147.117	0.119	0.0	0.0	0.0	1.04	73.6	16.1
S1.003	50.00	5.68	146.989	0.119	0.0	0.0	0.0	1.15	80.9	16.1
S2.000	50.00	5.21	146.981	0.145	0.0	0.0	0.0	1.48	163.5	19.6

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.004	29.718	0.198	150.1	0.265	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.005	11.849	0.261	45.4	0.031	0.00	0.0	0.600	o	450	Pipe/Conduit	
S3.000	4.380	0.044	99.5	0.027	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.006	11.849	0.059	200.8	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.007	4.363	0.022	198.3	0.005	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.008	19.473	0.109	178.6	0.034	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.000	4.873	0.095	51.3	0.134	5.00	0.0	0.600	o	150	Pipe/Conduit	
S4.001	17.975	0.120	149.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S5.000	4.845	0.029	167.1	0.138	5.00	0.0	0.600	o	225	Pipe/Conduit	
S6.000	3.000	0.029	103.4	0.000	5.00	0.0	0.600	CA	225	CastSlot	
S6.001	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.002	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.003	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.004	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.005	0.500	0.000	1666.7	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.006	0.945	0.000	3150.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.007	21.104	0.126	167.5	0.042	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.004	50.00	5.98	146.784	0.529	0.0	0.0	0.0	1.66	263.6	71.6
S1.005	50.00	6.05	146.586	0.560	0.0	0.0	0.0	3.02	480.9	75.8
S3.000	50.00	5.07	147.560	0.027	0.0	0.0	0.0	1.01	17.8	3.7
S1.006	50.00	6.18	146.325	0.587	0.0	0.0	0.0	1.43	227.6	79.5
S1.007	50.00	6.23	146.266	0.592	0.0	0.0	0.0	1.44	229.0	80.2
S1.008	50.00	6.45	146.244	0.626	0.0	0.0	0.0	1.52	241.4	84.8
S4.000	50.00	5.06	146.440	0.134	0.0	0.0	0.0	1.41	24.9	18.1
S4.001	50.00	5.34	146.345	0.134	0.0	0.0	0.0	1.07	42.4	18.1
S5.000	50.00	5.08	146.254	0.138	0.0	0.0	0.0	1.01	40.1	18.7
S6.000	50.00	5.04	146.351	0.000	0.0	0.0	0.0	0.82	37.9	0.0
S6.001	50.00	5.45	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.002	50.00	5.86	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.003	50.00	6.28	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.004	50.00	6.69	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.005	50.00	6.71	146.715	0.000	0.0	0.0	0.0	0.54	24.8	0.0
S6.006	50.00	6.79	146.715	0.000	0.0	0.0	0.0	0.52	24.0	0.0
S6.007	50.00	7.13	146.351	0.042	0.0	0.0	0.0	1.01	40.1	5.7

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.002	16.603	0.091	182.5	0.038	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.003	7.486	0.033	226.8	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.004	4.058	0.015	270.5	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S7.000	26.750	0.178	150.3	0.198	5.00	0.0	0.600	o	300	Pipe/Conduit	
S7.001	9.363	0.047	199.2	0.180	0.00	0.0	0.600	o	300	Pipe/Conduit	
S7.002	33.356	0.889	37.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.005	14.400	0.051	282.4	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S8.000	12.716	0.293	43.4	0.073	5.00	0.0	0.600	o	225	Pipe/Conduit	
S8.001	11.134	0.126	88.4	0.032	0.00	0.0	0.600	o	225	Pipe/Conduit	
S8.002	4.005	0.019	210.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.003	5.495	0.028	196.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.004	13.000	0.080	162.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.006	7.870	0.028	281.1	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.007	21.636	0.072	300.5	0.025	0.00	0.0	0.600	o	825	Pipe/Conduit	
S9.000	9.564	0.096	99.6	0.077	5.00	0.0	0.600	o	375	Pipe/Conduit	
S9.001	13.436	0.090	149.3	0.068	0.00	0.0	0.600	o	375	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)
S4.002	50.00	7.32	146.200	0.352	0.0	0.0	0.0	1.50	238.9	47.7
S4.003	50.00	7.41	146.034	0.352	0.0	0.0	0.0	1.35	214.0	47.7
S4.004	50.00	7.47	146.001	0.352	0.0	0.0	0.0	1.23	195.8	47.7
S7.000	50.00	5.35	147.245	0.198	0.0	0.0	0.0	1.28	90.5	26.8
S7.001	50.00	5.49	147.067	0.378	0.0	0.0	0.0	1.11	78.5	51.2
S7.002	50.00	5.70	147.020	0.378	0.0	0.0	0.0	2.57	182.0	51.2
S4.005	50.00	7.67	145.986	0.730	0.0	0.0	0.0	1.20	191.6	98.9
S8.000	50.00	5.11	146.656	0.073	0.0	0.0	0.0	1.99	79.2	9.9
S8.001	50.00	5.24	146.363	0.105	0.0	0.0	0.0	1.39	55.3	14.2
S8.002	50.00	5.30	146.162	0.105	0.0	0.0	0.0	1.08	76.3	14.2
S8.003	50.00	5.38	146.043	0.105	0.0	0.0	0.0	1.12	79.1	14.2
S8.004	50.00	5.56	146.015	0.105	0.0	0.0	0.0	1.23	87.0	14.2
S4.006	50.00	7.77	145.935	0.835	0.0	0.0	0.0	1.21	192.1	113.1
S4.007	50.00	7.99	145.832	0.860	0.0	0.0	0.0	1.71	912.7	116.5
S9.000	50.00	5.09	146.678	0.077	0.0	0.0	0.0	1.82	200.5	10.4
S9.001	50.00	5.24	146.582	0.145	0.0	0.0	0.0	1.48	163.5	19.6

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S9.002	14.455	0.096	150.6	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S10.000	29.487	0.590	50.0	0.010	5.00	0.0	0.600	o	150	Pipe/Conduit	
S9.003	21.800	0.145	150.3	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S11.000	8.764	0.188	46.6	0.050	5.00	0.0	0.600	o	150	Pipe/Conduit	
S11.001	11.226	0.112	100.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S12.000	2.351	0.016	146.9	0.145	5.00	0.0	0.600	o	225	Pipe/Conduit	
S12.001	6.353	0.042	151.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S11.002	5.969	0.030	199.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S11.003	5.969	0.030	199.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S11.004	4.029	0.020	201.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S9.004	10.627	0.041	259.2	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.009	73.129	0.146	500.9	0.077	0.00	0.0	0.600	o	825	Pipe/Conduit	
S13.000	28.448	0.190	149.7	0.133	5.00	0.0	0.600	o	225	Pipe/Conduit	
S13.001	37.223	0.195	190.9	0.014	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S9.002	50.00	5.40	146.492	0.145	0.0	0.0	0.0	1.47	162.8	19.6
S10.000	50.00	5.34	147.211	0.010	0.0	0.0	0.0	1.43	25.2	1.4
S9.003	50.00	5.65	146.396	0.155	0.0	0.0	0.0	1.48	163.0	21.0
S11.000	50.00	5.10	146.956	0.050	0.0	0.0	0.0	1.48	26.1	6.8
S11.001	50.00	5.29	146.768	0.050	0.0	0.0	0.0	1.00	17.7	6.8
S12.000	50.00	5.04	147.075	0.145	0.0	0.0	0.0	1.08	42.8	19.6
S12.001	50.00	5.14	147.059	0.145	0.0	0.0	0.0	1.06	42.2	19.6
S11.002	50.00	5.37	146.506	0.195	0.0	0.0	0.0	1.11	78.5	26.4
S11.003	50.00	5.46	146.376	0.195	0.0	0.0	0.0	1.11	78.5	26.4
S11.004	50.00	5.53	146.346	0.195	0.0	0.0	0.0	1.10	78.0	26.4
S9.004	50.00	5.81	146.251	0.350	0.0	0.0	0.0	1.12	123.8	47.4
S1.009	50.00	8.91	145.760	1.913	0.0	0.0	0.0	1.32	705.5	259.0
S13.000	50.00	5.44	146.967	0.133	0.0	0.0	0.0	1.07	42.4	18.0
S13.001	50.00	6.10	146.777	0.147	0.0	0.0	0.0	0.94	37.5	19.9

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S14.000	24.868	0.311	80.0	0.059	5.00	0.0	0.600	o	225	Pipe/Conduit	
S15.000	12.128	0.081	149.7	0.173	5.00	0.0	0.600	o	225	Pipe/Conduit	
S13.002	17.294	0.169	102.3	0.097	0.00	0.0	0.600	o	375	Pipe/Conduit	
S16.000	33.161	1.452	22.8	0.019	5.00	0.0	0.600	o	150	Pipe/Conduit	
S13.003	4.564	0.023	198.4	0.060	0.00	0.0	0.600	o	375	Pipe/Conduit	
S13.004	4.564	0.023	198.4	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S13.005	8.273	0.053	156.1	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.010	22.475	0.045	499.4	0.063	0.00	0.0	0.600	o	825	Pipe/Conduit	
S1.011	29.256	0.028	1044.9	0.000	0.00	0.0	0.600	o	825	Pipe/Conduit	
S1.012	23.744	0.061	389.2	0.000	0.00	0.0	0.600	o	825	Pipe/Conduit	
S17.000	2.464	0.049	50.3	0.159	5.00	0.0	0.600	o	225	Pipe/Conduit	
S17.001	4.217	0.114	37.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.002	5.401	0.505	10.7	0.035	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.003	8.694	0.141	61.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S14.000	50.00	5.28	146.893	0.059	0.0	0.0	0.0	1.46	58.2	8.0
S15.000	50.00	5.19	146.663	0.173	0.0	0.0	0.0	1.07	42.4	23.4
S13.002	50.00	6.26	146.432	0.476	0.0	0.0	0.0	1.79	197.8	64.5
S16.000	50.00	5.26	147.940	0.019	0.0	0.0	0.0	2.12	37.4	2.6
S13.003	50.00	6.32	146.263	0.555	0.0	0.0	0.0	1.28	141.7	75.2
S13.004	50.00	6.38	146.140	0.555	0.0	0.0	0.0	1.28	141.7	75.2
S13.005	50.00	6.48	146.117	0.555	0.0	0.0	0.0	1.45	159.9	75.2
S1.010	50.00	9.19	145.614	2.531	0.0	0.0	0.0	1.32	706.5	342.7
S1.011	50.00	9.73	145.569	2.531	0.0	0.0	0.0	0.91	486.4	342.7
S1.012	50.00	9.99	145.480	2.531	0.0	0.0	0.0	1.50	801.2	342.7
S17.000	50.00	5.02	147.225	0.159	0.0	0.0	0.0	1.85	73.5	21.5
S17.001	50.00	5.05	147.176	0.159	0.0	0.0	0.0	2.16	85.8	21.5
S17.002	50.00	5.08	147.062	0.194	0.0	0.0	0.0	4.02	160.0	26.3
S17.003	50.00	5.16	146.457	0.194	0.0	0.0	0.0	1.67	66.3	26.3

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S18.000	44.171	0.809	54.6	0.012	5.00	0.0	0.600	o	150	Pipe/Conduit	
S17.004	14.540	0.058	250.7	0.100	0.00	0.0	0.600	o	300	Pipe/Conduit	
S17.005	14.970	0.067	223.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S19.000	5.802	0.779	7.4	0.044	5.00	0.0	0.600	o	225	Pipe/Conduit	
S19.001	7.025	0.070	100.4	0.107	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.006	5.523	0.022	251.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.013	9.819	0.020	491.0	0.000	0.00	0.0	0.600	o	1200	Pipe/Conduit	
S1.014	7.993	0.095	84.1	0.000	0.00	0.0	0.600	o	1200	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)
S18.000	50.00	5.54	147.200	0.012	0.0	0.0	0.0	1.36	24.1	1.6
S17.004	50.00	5.78	146.241	0.306	0.0	0.0	0.0	0.99	69.9	41.4
S17.005	50.00	6.02	146.183	0.306	0.0	0.0	0.0	1.05	74.1	41.4
S19.000	50.00	5.02	147.040	0.044	0.0	0.0	0.0	4.82	191.8	6.0
S19.001	50.00	5.11	146.261	0.151	0.0	0.0	0.0	1.31	51.9	20.4
S17.006	50.00	6.10	146.041	0.457	0.0	0.0	0.0	1.14	125.8	61.9
S1.013	50.00	10.09	145.175	2.988	0.0	0.0	0.0	1.68	1901.9	404.6
S1.014	50.00	10.12	145.155	2.988	0.0	0.0	0.0	4.08	4614.7	404.6

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.014	Ex. S3L1	149.100	145.060	0.000	0	0

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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.272		

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 0
Number of Online Controls 0 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 0.276
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 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) 15, 30
Return Period(s) (years) 100
Climate Change (%) 0

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	SU U1 CP	15 minute 100 year Winter I+0%	148.326	147.733	-0.042	0.000
S1.001	L1-S1	15 minute 100 year Winter I+0%	148.400	147.435	-0.185	0.000
S1.002	L1-S2	15 minute 100 year Winter I+0%	149.055	147.334	-0.083	0.000
S1.003	BPI-L1	15 minute 100 year Winter I+0%	149.100	147.208	-0.081	0.000
S2.000	L1-S3	15 minute 100 year Winter I+0%	149.380	147.208	-0.148	0.000
S1.004	L1-S4	15 minute 100 year Winter I+0%	149.270	147.179	-0.055	0.000
S1.005	L1-S5	15 minute 100 year Winter I+0%	149.260	147.059	0.023	0.000
S3.000	L1-S6	15 minute 100 year Winter I+0%	148.985	147.659	-0.051	0.000
S1.006	L1-S7	15 minute 100 year Winter I+0%	149.015	146.952	0.177	0.000
S1.007	L1-S8	15 minute 100 year Winter I+0%	148.760	146.844	0.128	0.000
S1.008	ADL-S1	15 minute 100 year Winter I+0%	148.654	146.737	0.043	0.000
S4.000	L2-S1	15 minute 100 year Winter I+0%	147.700	147.489	0.899	0.000
S4.001	L2-S2	15 minute 100 year Winter I+0%	147.796	147.107	0.537	0.000
S5.000	SU U2 Yard	15 minute 100 year Winter I+0%	147.700	147.066	0.587	0.000
S6.000	15	15 minute 100 year Winter I+0%	147.167	146.918	0.115	0.000
S6.001	15-1	15 minute 100 year Winter I+0%	147.167	146.918	-0.249	0.000
S6.002	15-2	15 minute 100 year Winter I+0%	147.167	146.918	-0.249	0.000
S6.003	15-3	15 minute 100 year Winter I+0%	147.167	146.919	-0.248	0.000
S6.004	15-4	15 minute 100 year Winter I+0%	147.167	146.928	-0.239	0.000
S6.005	15-5	15 minute 100 year Winter I+0%	147.167	146.950	-0.217	0.000
S6.006	15-6	15 minute 100 year Winter I+0%	147.167	146.957	-0.210	0.000
S6.007	SU U2 Dock	15 minute 100 year Winter I+0%	147.167	146.964	0.388	0.000

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S1.000	SU U1 CP	0.85		0.016	13.6	OK
S1.001	L1-S1	0.31		0.125	25.2	OK
S1.002	L1-S2	0.85		0.966	44.2	OK
S1.003	BPI-L1	0.71		0.327	43.5	OK
S2.000	L1-S3	0.39		0.318	52.4	OK
S1.004	L1-S4	0.84		2.369	190.0	OK
S1.005	L1-S5	0.64		4.485	183.9	SURCHARGED
S3.000	L1-S6	0.75		0.106	9.9	OK
S1.006	L1-S7	1.16		2.517	191.5	SURCHARGED
S1.007	L1-S8	1.56		2.487	192.2	SURCHARGED
S1.008	ADL-S1	1.08		1.165	200.8	SURCHARGED
S4.000	L2-S1	2.03		0.166	39.1	FLOOD RISK
S4.001	L2-S2	1.01		0.927	38.2	SURCHARGED
S5.000	SU U2 Yard	1.44		0.228	41.7	SURCHARGED
S6.000	15	0.02		0.562	1.0	FLOOD RISK*
S6.001	15-1	0.05		0.738	2.4	FLOOD RISK*
S6.002	15-2	0.10		0.311	4.5	FLOOD RISK*
S6.003	15-3	0.14		0.312	6.6	FLOOD RISK*
S6.004	15-4	0.19		0.326	8.6	FLOOD RISK*
S6.005	15-5	0.23		0.355	10.5	FLOOD RISK*
S6.006	15-6	0.25		0.297	11.6	FLOOD RISK*
S6.007	SU U2 Dock	0.41		0.249	15.0	FLOOD RISK

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S4.002	L2-S3	15 minute 100 year Winter I+0%	147.796	146.982	0.332	0.000
S4.003	FRI-L2	15 minute 100 year Winter I+0%	147.760	146.952	0.468	0.000
S4.004	L2-S4	15 minute 100 year Winter I+0%	147.800	146.935	0.484	0.000
S7.000	L2-S5	15 minute 100 year Winter I+0%	148.300	147.744	0.199	0.000
S7.001	L2-S6	15 minute 100 year Winter I+0%	148.370	147.632	0.265	0.000
S7.002	L2-S7	15 minute 100 year Winter I+0%	148.490	147.384	0.064	0.000
S4.005	L2-S8	15 minute 100 year Winter I+0%	147.852	146.923	0.487	0.000
S8.000	SU	15 minute 100 year Winter I+0%	147.656	146.920	0.039	0.000
S8.001	L2-S9	15 minute 100 year Winter I+0%	148.030	146.887	0.299	0.000
S8.002	L2-S10	15 minute 100 year Winter I+0%	148.163	146.842	0.380	0.000
S8.003	BPI-L2	15 minute 100 year Winter I+0%	148.163	146.833	0.490	0.000
S8.004	L2-S11	15 minute 100 year Winter I+0%	148.134	146.822	0.507	0.000
S4.006	L2-S12	15 minute 100 year Winter I+0%	147.910	146.800	0.415	0.000
S4.007	ADL-S2	15 minute 100 year Winter I+0%	147.940	146.640	-0.017	0.000
S9.000	L3-S1	15 minute 100 year Winter I+0%	148.300	146.801	-0.252	0.000
S9.001	L3-S2	15 minute 100 year Winter I+0%	148.300	146.764	-0.193	0.000
S9.002	L3-S3	15 minute 100 year Winter I+0%	148.165	146.732	-0.135	0.000
S10.000	L3-S4	15 minute 100 year Winter I+0%	148.370	147.250	-0.111	0.000
S9.003	L3-S5	15 minute 100 year Winter I+0%	148.370	146.711	-0.060	0.000
S11.000	L3 Sump	15 minute 100 year Winter I+0%	147.780	147.098	-0.008	0.000
S11.001	L3-S6	15 minute 100 year Winter I+0%	148.025	146.998	0.080	0.000
S12.000	L3 Sump	15 minute 100 year Winter I+0%	148.125	147.514	0.214	0.000
S12.001	L3-S7	15 minute 100 year Winter I+0%	148.185	147.371	0.087	0.000
S11.002	L3-S8	15 minute 100 year Winter I+0%	148.184	146.886	0.080	0.000
S11.003	FRI-L3	15 minute 100 year Winter I+0%	148.131	146.817	0.141	0.000
S11.004	L3-S9	15 minute 100 year Winter I+0%	148.356	146.753	0.107	0.000
S9.004	L3-S10	15 minute 100 year Winter I+0%	148.425	146.686	0.060	0.000
S1.009	ADL-S3	15 minute 100 year Winter I+0%	148.400	146.619	0.034	0.000
S13.000	L1-S9	15 minute 100 year Winter I+0%	149.385	147.677	0.485	0.000
S13.001	L1-S10	15 minute 100 year Winter I+0%	148.478	147.463	0.461	0.000
S14.000	SU U1 Dock	15 minute 100 year Winter I+0%	148.167	147.208	0.090	0.000
S15.000	SU U1 Yard	15 minute 100 year Winter I+0%	148.175	147.361	0.473	0.000
S13.002	L1-S11	15 minute 100 year Winter I+0%	148.478	147.165	0.358	0.000
S16.000	L1-S12	15 minute 100 year Winter I+0%	149.185	147.985	-0.105	0.000
S13.003	L1-S13	15 minute 100 year Winter I+0%	148.500	147.024	0.386	0.000
S13.004	FRI-L1	15 minute 100 year Winter I+0%	148.455	146.839	0.324	0.000
S13.005	L1-S14	15 minute 100 year Winter I+0%	148.335	146.670	0.178	0.000
S1.010	ADL-S4	15 minute 100 year Winter I+0%	148.480	146.512	0.073	0.000
S1.011	ADL-S5	15 minute 100 year Winter I+0%	148.875	146.431	0.037	0.000
S1.012	ADL-S6	15 minute 100 year Winter I+0%	149.225	146.305	0.000	0.000
S17.000	SU U4 Yard	15 minute 100 year Winter I+0%	148.125	147.623	0.173	0.000
S17.001	L4-S2	15 minute 100 year Winter I+0%	148.178	147.473	0.072	0.000
S17.002	L4-S3	15 minute 100 year Winter I+0%	148.178	147.325	0.038	0.000
S17.003	FRI-L4	15 minute 100 year Winter I+0%	148.260	147.108	0.426	0.000
S18.000	L4-S1	15 minute 100 year Winter I+0%	148.425	147.244	-0.106	0.000
S17.004	L4-S4	15 minute 100 year Winter I+0%	148.425	146.892	0.351	0.000
S17.005	L4-S5	15 minute 100 year Winter I+0%	148.140	146.712	0.229	0.000
S19.000	BPI-L4	15 minute 100 year Winter I+0%	148.040	147.094	-0.171	0.000
S19.001	L4-S7	15 minute 100 year Winter I+0%	148.140	146.702	0.216	0.000

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S4.002	L2-S3	0.55		2.733	92.9	SURCHARGED
S4.003	FRI-L2	0.63		3.733	86.9	SURCHARGED
S4.004	L2-S4	0.71		2.305	83.9	SURCHARGED
S7.000	L2-S5	0.85		0.559	69.4	SURCHARGED
S7.001	L2-S6	2.15		2.439	130.4	SURCHARGED
S7.002	L2-S7	0.76		0.969	126.6	SURCHARGED
S4.005	L2-S8	1.40		3.392	203.5	SURCHARGED
S8.000	SU	0.39		0.041	26.9	SURCHARGED
S8.001	L2-S9	0.73		1.059	34.0	SURCHARGED
S8.002	L2-S10	0.58		1.159	28.2	SURCHARGED
S8.003	BPI-L2	0.48		1.086	26.1	SURCHARGED
S8.004	L2-S11	0.37		1.210	26.5	SURCHARGED
S4.006	L2-S12	1.81		4.135	226.4	SURCHARGED
S4.007	ADL-S2	0.36		3.045	230.2	OK
S9.000	L3-S1	0.23		0.169	28.3	OK
S9.001	L3-S2	0.47		0.537	54.7	OK
S9.002	L3-S3	0.43		1.011	52.4	OK
S10.000	L3-S4	0.15		0.039	3.6	OK
S9.003	L3-S5	0.36		1.533	49.3	OK
S11.000	L3 Sump	0.78		0.022	17.8	OK
S11.001	L3-S6	1.04		0.360	16.7	SURCHARGED
S12.000	L3 Sump	1.85		0.069	52.1	SURCHARGED
S12.001	L3-S7	1.75		0.408	52.3	SURCHARGED
S11.002	L3-S8	1.24		0.585	67.8	SURCHARGED
S11.003	FRI-L3	1.22		0.818	66.4	SURCHARGED
S11.004	L3-S9	1.37		0.792	66.3	SURCHARGED
S9.004	L3-S10	1.21		2.800	111.7	SURCHARGED
S1.009	ADL-S3	0.85		15.940	527.0	SURCHARGED
S13.000	L1-S9	1.04		0.798	40.9	SURCHARGED
S13.001	L1-S10	1.25		1.854	44.4	SURCHARGED
S14.000	SU U1 Dock	0.36		0.088	19.5	SURCHARGED
S15.000	SU U1 Yard	1.56		0.196	56.8	SURCHARGED
S13.002	L1-S11	0.89		3.865	143.8	SURCHARGED
S16.000	L1-S12	0.19		0.045	6.9	OK
S13.003	L1-S13	2.00		3.020	167.2	SURCHARGED
S13.004	FRI-L1	1.98		1.348	166.0	SURCHARGED
S13.005	L1-S14	1.55		1.140	165.9	SURCHARGED
S1.010	ADL-S4	1.44		40.444	682.7	SURCHARGED
S1.011	ADL-S5	2.36		12.760	676.3	SURCHARGED
S1.012	ADL-S6	1.17		14.867	673.3	OK
S17.000	SU U4 Yard	1.76		0.111	55.0	SURCHARGED
S17.001	L4-S2	1.15		0.391	54.5	SURCHARGED
S17.002	L4-S3	0.65		0.393	65.4	SURCHARGED
S17.003	FRI-L4	1.26		0.872	66.6	SURCHARGED
S18.000	L4-S1	0.18		0.044	4.3	OK
S17.004	L4-S4	1.74		1.425	101.3	SURCHARGED
S17.005	L4-S5	1.63		1.536	101.1	SURCHARGED
S19.000	BPI-L4	0.13		0.055	16.2	OK

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S19.001	L4-S7	1.51		0.569	56.2	SURCHARGED

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S17.006	L4-S6	15 minute 100 year Winter I+0%	148.140	146.535	0.119	0.000	1.96
S1.013	ADL-S7	15 minute 100 year Winter I+0%	148.232	146.049	-0.326	0.000	1.12
S1.014	ADL-S8	15 minute 100 year Winter I+0%	148.335	145.672	-0.683	0.000	0.39

PN	US/MH Name	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S17.006	L4-S6		1.893	155.2	SURCHARGED
S1.013	ADL-S7		11.119	767.0	OK
S1.014	ADL-S8		4.262	764.0	OK

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.272	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
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

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	1.079	4-8	1.876	8-12	0.033

Total Area Contributing (ha) = 2.988

Total Pipe Volume (m³) = 170.607

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	3.049	0.065	46.9	0.037	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	30.414	0.203	149.8	0.031	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.002	6.342	0.028	226.5	0.051	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	10.308	0.055	187.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.000	18.230	0.122	149.4	0.145	5.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.03	147.625	0.037	0.0	0.0	0.0	1.47	26.0	5.0
S1.001	50.00	5.43	147.320	0.068	0.0	0.0	0.0	1.28	90.6	9.2
S1.002	50.00	5.53	147.117	0.119	0.0	0.0	0.0	1.04	73.6	16.1
S1.003	50.00	5.68	146.989	0.119	0.0	0.0	0.0	1.15	80.9	16.1
S2.000	50.00	5.21	146.981	0.145	0.0	0.0	0.0	1.48	163.5	19.6

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.004	29.718	0.198	150.1	0.265	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.005	11.849	0.261	45.4	0.031	0.00	0.0	0.600	o	450	Pipe/Conduit	
S3.000	4.380	0.044	99.5	0.027	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.006	11.849	0.059	200.8	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.007	4.363	0.022	198.3	0.005	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.008	19.473	0.109	178.6	0.034	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.000	4.873	0.095	51.3	0.134	5.00	0.0	0.600	o	150	Pipe/Conduit	
S4.001	17.975	0.120	149.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S5.000	4.845	0.029	167.1	0.138	5.00	0.0	0.600	o	225	Pipe/Conduit	
S6.000	3.000	0.029	103.4	0.000	5.00	0.0	0.600	CA	225	CastSlot	
S6.001	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.002	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.003	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.004	3.000	0.000	10000.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.005	0.500	0.000	1666.7	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.006	0.945	0.000	3150.0	0.000	0.00	0.0	0.600	CA	225	CastSlot	
S6.007	21.104	0.126	167.5	0.042	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.004	50.00	5.98	146.784	0.529	0.0	0.0	0.0	1.66	263.6	71.6
S1.005	50.00	6.05	146.586	0.560	0.0	0.0	0.0	3.02	480.9	75.8
S3.000	50.00	5.07	147.560	0.027	0.0	0.0	0.0	1.01	17.8	3.7
S1.006	50.00	6.18	146.325	0.587	0.0	0.0	0.0	1.43	227.6	79.5
S1.007	50.00	6.23	146.266	0.592	0.0	0.0	0.0	1.44	229.0	80.2
S1.008	50.00	6.45	146.244	0.626	0.0	0.0	0.0	1.52	241.4	84.8
S4.000	50.00	5.06	146.440	0.134	0.0	0.0	0.0	1.41	24.9	18.1
S4.001	50.00	5.34	146.345	0.134	0.0	0.0	0.0	1.07	42.4	18.1
S5.000	50.00	5.08	146.254	0.138	0.0	0.0	0.0	1.01	40.1	18.7
S6.000	50.00	5.04	146.351	0.000	0.0	0.0	0.0	0.82	37.9	0.0
S6.001	50.00	5.45	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.002	50.00	5.86	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.003	50.00	6.28	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.004	50.00	6.69	146.715	0.000	0.0	0.0	0.0	0.50	23.2	0.0
S6.005	50.00	6.71	146.715	0.000	0.0	0.0	0.0	0.54	24.8	0.0
S6.006	50.00	6.79	146.715	0.000	0.0	0.0	0.0	0.52	24.0	0.0
S6.007	50.00	7.13	146.351	0.042	0.0	0.0	0.0	1.01	40.1	5.7

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.002	16.603	0.091	182.5	0.038	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.003	7.486	0.033	226.8	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.004	4.058	0.015	270.5	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S7.000	26.750	0.178	150.3	0.198	5.00	0.0	0.600	o	300	Pipe/Conduit	
S7.001	9.363	0.047	199.2	0.180	0.00	0.0	0.600	o	300	Pipe/Conduit	
S7.002	33.356	0.889	37.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.005	14.400	0.051	282.4	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S8.000	12.716	0.293	43.4	0.073	5.00	0.0	0.600	o	225	Pipe/Conduit	
S8.001	11.134	0.126	88.4	0.032	0.00	0.0	0.600	o	225	Pipe/Conduit	
S8.002	4.005	0.019	210.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.003	5.495	0.028	196.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.004	13.000	0.080	162.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.006	7.870	0.028	281.1	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.007	21.636	0.072	300.5	0.025	0.00	0.0	0.600	o	825	Pipe/Conduit	
S9.000	9.564	0.096	99.6	0.077	5.00	0.0	0.600	o	375	Pipe/Conduit	
S9.001	13.436	0.090	149.3	0.068	0.00	0.0	0.600	o	375	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)
S4.002	50.00	7.32	146.200	0.352	0.0	0.0	0.0	1.50	238.9	47.7
S4.003	50.00	7.41	146.034	0.352	0.0	0.0	0.0	1.35	214.0	47.7
S4.004	50.00	7.47	146.001	0.352	0.0	0.0	0.0	1.23	195.8	47.7
S7.000	50.00	5.35	147.245	0.198	0.0	0.0	0.0	1.28	90.5	26.8
S7.001	50.00	5.49	147.067	0.378	0.0	0.0	0.0	1.11	78.5	51.2
S7.002	50.00	5.70	147.020	0.378	0.0	0.0	0.0	2.57	182.0	51.2
S4.005	50.00	7.67	145.986	0.730	0.0	0.0	0.0	1.20	191.6	98.9
S8.000	50.00	5.11	146.656	0.073	0.0	0.0	0.0	1.99	79.2	9.9
S8.001	50.00	5.24	146.363	0.105	0.0	0.0	0.0	1.39	55.3	14.2
S8.002	50.00	5.30	146.162	0.105	0.0	0.0	0.0	1.08	76.3	14.2
S8.003	50.00	5.38	146.043	0.105	0.0	0.0	0.0	1.12	79.1	14.2
S8.004	50.00	5.56	146.015	0.105	0.0	0.0	0.0	1.23	87.0	14.2
S4.006	50.00	7.77	145.935	0.835	0.0	0.0	0.0	1.21	192.1	113.1
S4.007	50.00	7.99	145.832	0.860	0.0	0.0	0.0	1.71	912.7	116.5
S9.000	50.00	5.09	146.678	0.077	0.0	0.0	0.0	1.82	200.5	10.4
S9.001	50.00	5.24	146.582	0.145	0.0	0.0	0.0	1.48	163.5	19.6

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S9.002	14.455	0.096	150.6	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S10.000	29.487	0.590	50.0	0.010	5.00	0.0	0.600	o	150	Pipe/Conduit	
S9.003	21.800	0.145	150.3	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S11.000	8.764	0.188	46.6	0.050	5.00	0.0	0.600	o	150	Pipe/Conduit	
S11.001	11.226	0.112	100.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S12.000	2.351	0.016	146.9	0.145	5.00	0.0	0.600	o	225	Pipe/Conduit	
S12.001	6.353	0.042	151.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S11.002	5.969	0.030	199.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S11.003	5.969	0.030	199.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S11.004	4.029	0.020	201.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S9.004	10.627	0.041	259.2	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.009	73.129	0.146	500.9	0.077	0.00	0.0	0.600	o	825	Pipe/Conduit	
S13.000	28.448	0.190	149.7	0.133	5.00	0.0	0.600	o	225	Pipe/Conduit	
S13.001	37.223	0.195	190.9	0.014	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S9.002	50.00	5.40	146.492	0.145	0.0	0.0	0.0	1.47	162.8	19.6
S10.000	50.00	5.34	147.211	0.010	0.0	0.0	0.0	1.43	25.2	1.4
S9.003	50.00	5.65	146.396	0.155	0.0	0.0	0.0	1.48	163.0	21.0
S11.000	50.00	5.10	146.956	0.050	0.0	0.0	0.0	1.48	26.1	6.8
S11.001	50.00	5.29	146.768	0.050	0.0	0.0	0.0	1.00	17.7	6.8
S12.000	50.00	5.04	147.075	0.145	0.0	0.0	0.0	1.08	42.8	19.6
S12.001	50.00	5.14	147.059	0.145	0.0	0.0	0.0	1.06	42.2	19.6
S11.002	50.00	5.37	146.506	0.195	0.0	0.0	0.0	1.11	78.5	26.4
S11.003	50.00	5.46	146.376	0.195	0.0	0.0	0.0	1.11	78.5	26.4
S11.004	50.00	5.53	146.346	0.195	0.0	0.0	0.0	1.10	78.0	26.4
S9.004	50.00	5.81	146.251	0.350	0.0	0.0	0.0	1.12	123.8	47.4
S1.009	50.00	8.91	145.760	1.913	0.0	0.0	0.0	1.32	705.5	259.0
S13.000	50.00	5.44	146.967	0.133	0.0	0.0	0.0	1.07	42.4	18.0
S13.001	50.00	6.10	146.777	0.147	0.0	0.0	0.0	0.94	37.5	19.9

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S14.000	24.868	0.311	80.0	0.059	5.00	0.0	0.600	o	225	Pipe/Conduit	
S15.000	12.128	0.081	149.7	0.173	5.00	0.0	0.600	o	225	Pipe/Conduit	
S13.002	17.294	0.169	102.3	0.097	0.00	0.0	0.600	o	375	Pipe/Conduit	
S16.000	33.161	1.452	22.8	0.019	5.00	0.0	0.600	o	150	Pipe/Conduit	
S13.003	4.564	0.023	198.4	0.060	0.00	0.0	0.600	o	375	Pipe/Conduit	
S13.004	4.564	0.023	198.4	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S13.005	8.273	0.053	156.1	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.010	22.475	0.045	499.4	0.063	0.00	0.0	0.600	o	825	Pipe/Conduit	
S1.011	29.256	0.028	1044.9	0.000	0.00	0.0	0.600	o	825	Pipe/Conduit	
S1.012	23.744	0.061	389.2	0.000	0.00	0.0	0.600	o	825	Pipe/Conduit	
S17.000	2.464	0.049	50.3	0.159	5.00	0.0	0.600	o	225	Pipe/Conduit	
S17.001	4.217	0.114	37.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.002	5.401	0.505	10.7	0.035	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.003	8.694	0.141	61.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S14.000	50.00	5.28	146.893	0.059	0.0	0.0	0.0	1.46	58.2	8.0
S15.000	50.00	5.19	146.663	0.173	0.0	0.0	0.0	1.07	42.4	23.4
S13.002	50.00	6.26	146.432	0.476	0.0	0.0	0.0	1.79	197.8	64.5
S16.000	50.00	5.26	147.940	0.019	0.0	0.0	0.0	2.12	37.4	2.6
S13.003	50.00	6.32	146.263	0.555	0.0	0.0	0.0	1.28	141.7	75.2
S13.004	50.00	6.38	146.140	0.555	0.0	0.0	0.0	1.28	141.7	75.2
S13.005	50.00	6.48	146.117	0.555	0.0	0.0	0.0	1.45	159.9	75.2
S1.010	50.00	9.19	145.614	2.531	0.0	0.0	0.0	1.32	706.5	342.7
S1.011	50.00	9.73	145.569	2.531	0.0	0.0	0.0	0.91	486.4	342.7
S1.012	50.00	9.99	145.480	2.531	0.0	0.0	0.0	1.50	801.2	342.7
S17.000	50.00	5.02	147.225	0.159	0.0	0.0	0.0	1.85	73.5	21.5
S17.001	50.00	5.05	147.176	0.159	0.0	0.0	0.0	2.16	85.8	21.5
S17.002	50.00	5.08	147.062	0.194	0.0	0.0	0.0	4.02	160.0	26.3
S17.003	50.00	5.16	146.457	0.194	0.0	0.0	0.0	1.67	66.3	26.3

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S18.000	44.171	0.809	54.6	0.012	5.00	0.0	0.600	o	150	Pipe/Conduit	
S17.004	14.540	0.058	250.7	0.100	0.00	0.0	0.600	o	300	Pipe/Conduit	
S17.005	14.970	0.067	223.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S19.000	5.802	0.779	7.4	0.044	5.00	0.0	0.600	o	225	Pipe/Conduit	
S19.001	7.025	0.070	100.4	0.107	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.006	5.523	0.022	251.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.013	9.819	0.020	491.0	0.000	0.00	0.0	0.600	o	1200	Pipe/Conduit	
S1.014	7.993	0.095	84.1	0.000	0.00	0.0	0.600	o	1200	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)
S18.000	50.00	5.54	147.200	0.012	0.0	0.0	0.0	1.36	24.1	1.6
S17.004	50.00	5.78	146.241	0.306	0.0	0.0	0.0	0.99	69.9	41.4
S17.005	50.00	6.02	146.183	0.306	0.0	0.0	0.0	1.05	74.1	41.4
S19.000	50.00	5.02	147.040	0.044	0.0	0.0	0.0	4.82	191.8	6.0
S19.001	50.00	5.11	146.261	0.151	0.0	0.0	0.0	1.31	51.9	20.4
S17.006	50.00	6.10	146.041	0.457	0.0	0.0	0.0	1.14	125.8	61.9
S1.013	50.00	10.09	145.175	2.988	0.0	0.0	0.0	1.68	1901.9	404.6
S1.014	50.00	10.12	145.155	2.988	0.0	0.0	0.0	4.08	4614.7	404.6

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.014	Ex. S3L1	149.100	145.060	0.000	0	0

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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.272		

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 0
Number of Online Controls 0 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 0.276
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 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) 15, 30
Return Period(s) (years) 100
Climate Change (%) 45

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	SU U1 CP	15 minute 100 year Winter I+45%	148.326	147.999	0.224	0.000
S1.001	L1-S1	15 minute 100 year Winter I+45%	148.400	147.944	0.324	0.000
S1.002	L1-S2	15 minute 100 year Winter I+45%	149.055	147.913	0.496	0.000
S1.003	BPI-L1	15 minute 100 year Winter I+45%	149.100	147.891	0.602	0.000
S2.000	L1-S3	15 minute 100 year Winter I+45%	149.380	147.901	0.545	0.000
S1.004	L1-S4	15 minute 100 year Winter I+45%	149.270	147.862	0.628	0.000
S1.005	L1-S5	15 minute 100 year Winter I+45%	149.260	147.662	0.626	0.000
S3.000	L1-S6	15 minute 100 year Winter I+45%	148.985	147.713	0.003	0.000
S1.006	L1-S7	15 minute 100 year Winter I+45%	149.015	147.503	0.728	0.000
S1.007	L1-S8	15 minute 100 year Winter I+45%	148.760	147.361	0.645	0.000
S1.008	ADL-S1	15 minute 100 year Winter I+45%	148.654	147.236	0.542	0.000
S4.000	L2-S1	15 minute 100 year Winter I+45%	147.700	147.706	1.116	5.767
S4.001	L2-S2	30 minute 100 year Winter I+45%	147.796	147.460	0.890	0.000
S5.000	SU U2 Yard	15 minute 100 year Winter I+45%	147.700	147.561	1.082	0.000
S6.000	15	30 minute 100 year Winter I+45%	147.167	147.167	0.364	0.000
S6.001	15-1	30 minute 100 year Winter I+45%	147.167	147.167	0.000	0.001
S6.002	15-2	30 minute 100 year Winter I+45%	147.167	147.167	0.000	0.009
S6.003	15-3	30 minute 100 year Winter I+45%	147.167	147.167	0.000	0.072
S6.004	15-4	30 minute 100 year Winter I+45%	147.167	147.167	0.000	0.399
S6.005	15-5	30 minute 100 year Winter I+45%	147.167	147.169	0.002	1.765
S6.006	15-6	30 minute 100 year Winter I+45%	147.167	147.170	0.003	3.522
S6.007	SU U2 Dock	30 minute 100 year Winter I+45%	147.167	147.178	0.602	10.525

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S1.000	SU U1 CP	1.20		0.059	19.1	SURCHARGED
S1.001	L1-S1	0.39		0.739	32.2	SURCHARGED
S1.002	L1-S2	0.98		2.960	50.7	SURCHARGED
S1.003	BPI-L1	0.92		1.378	56.3	SURCHARGED
S2.000	L1-S3	0.49		1.310	66.0	SURCHARGED
S1.004	L1-S4	1.02		4.039	230.7	SURCHARGED
S1.005	L1-S5	0.84		6.045	241.1	SURCHARGED
S3.000	L1-S6	1.07		0.168	14.1	SURCHARGED
S1.006	L1-S7	1.52		3.349	250.4	SURCHARGED
S1.007	L1-S8	2.01		3.230	247.5	SURCHARGED
S1.008	ADL-S1	1.39		1.892	257.8	SURCHARGED
S4.000	L2-S1	2.30		5.958	44.3	FLOOD
S4.001	L2-S2	1.23		1.327	46.6	SURCHARGED
S5.000	SU U2 Yard	2.22		0.368	64.3	FLOOD RISK
S6.000	15	0.09		0.811	4.1	FLOOD RISK*
S6.001	15-1	0.19		1.050	8.9	FLOOD
S6.002	15-2	0.29		0.636	13.5	FLOOD
S6.003	15-3	0.39		0.699	18.3	FLOOD
S6.004	15-4	0.58		1.006	27.1	FLOOD
S6.005	15-5	0.68		2.378	31.5	FLOOD
S6.006	15-6	0.80		4.057	37.1	FLOOD
S6.007	SU U2 Dock	1.73		10.857	63.2	FLOOD

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S4.002	L2-S3	30 minute 100 year Winter I+45%	147.796	147.373	0.723	0.000
S4.003	FRI-L2	30 minute 100 year Winter I+45%	147.760	147.355	0.871	0.000
S4.004	L2-S4	30 minute 100 year Winter I+45%	147.800	147.344	0.893	0.000
S7.000	L2-S5	15 minute 100 year Winter I+45%	148.300	148.305	0.760	4.504
S7.001	L2-S6	15 minute 100 year Winter I+45%	148.370	148.235	0.868	0.000
S7.002	L2-S7	15 minute 100 year Winter I+45%	148.490	147.910	0.590	0.000
S4.005	L2-S8	30 minute 100 year Winter I+45%	147.852	147.336	0.900	0.000
S8.000	SU	30 minute 100 year Winter I+45%	147.656	147.388	0.507	0.000
S8.001	L2-S9	30 minute 100 year Winter I+45%	148.030	147.346	0.758	0.000
S8.002	L2-S10	15 minute 100 year Winter I+45%	148.163	147.289	0.827	0.000
S8.003	BPI-L2	15 minute 100 year Winter I+45%	148.163	147.279	0.936	0.000
S8.004	L2-S11	15 minute 100 year Winter I+45%	148.134	147.266	0.951	0.000
S4.006	L2-S12	15 minute 100 year Winter I+45%	147.910	147.241	0.856	0.000
S4.007	ADL-S2	15 minute 100 year Winter I+45%	147.940	147.111	0.454	0.000
S9.000	L3-S1	15 minute 100 year Winter I+45%	148.300	147.238	0.185	0.000
S9.001	L3-S2	15 minute 100 year Winter I+45%	148.300	147.229	0.272	0.000
S9.002	L3-S3	15 minute 100 year Winter I+45%	148.165	147.210	0.343	0.000
S10.000	L3-S4	15 minute 100 year Winter I+45%	148.370	147.259	-0.102	0.000
S9.003	L3-S5	15 minute 100 year Winter I+45%	148.370	147.191	0.420	0.000
S11.000	L3 Sump	15 minute 100 year Winter I+45%	147.780	147.671	0.565	0.000
S11.001	L3-S6	15 minute 100 year Winter I+45%	148.025	147.533	0.615	0.000
S12.000	L3 Sump	15 minute 100 year Winter I+45%	148.125	147.800	0.500	0.000
S12.001	L3-S7	15 minute 100 year Winter I+45%	148.185	147.569	0.285	0.000
S11.002	L3-S8	15 minute 100 year Winter I+45%	148.184	147.400	0.594	0.000
S11.003	FRI-L3	15 minute 100 year Winter I+45%	148.131	147.328	0.652	0.000
S11.004	L3-S9	15 minute 100 year Winter I+45%	148.356	147.250	0.604	0.000
S9.004	L3-S10	15 minute 100 year Winter I+45%	148.425	147.167	0.541	0.000
S1.009	ADL-S3	15 minute 100 year Winter I+45%	148.400	147.090	0.505	0.000
S13.000	L1-S9	15 minute 100 year Winter I+45%	149.385	148.812	1.620	0.000
S13.001	L1-S10	15 minute 100 year Winter I+45%	148.478	148.442	1.440	0.000
S14.000	SU U1 Dock	15 minute 100 year Winter I+45%	148.167	147.960	0.842	0.000
S15.000	SU U1 Yard	15 minute 100 year Winter I+45%	148.175	148.176	1.288	0.622
S13.002	L1-S11	15 minute 100 year Winter I+45%	148.478	147.894	1.087	0.000
S16.000	L1-S12	15 minute 100 year Winter I+45%	149.185	147.994	-0.096	0.000
S13.003	L1-S13	15 minute 100 year Winter I+45%	148.500	147.686	1.048	0.000
S13.004	FRI-L1	15 minute 100 year Winter I+45%	148.455	147.446	0.931	0.000
S13.005	L1-S14	15 minute 100 year Winter I+45%	148.335	147.207	0.715	0.000
S1.010	ADL-S4	15 minute 100 year Winter I+45%	148.480	146.966	0.527	0.000
S1.011	ADL-S5	15 minute 100 year Winter I+45%	148.875	146.775	0.381	0.000
S1.012	ADL-S6	15 minute 100 year Winter I+45%	149.225	146.576	0.271	0.000
S17.000	SU U4 Yard	15 minute 100 year Winter I+45%	148.125	148.127	0.677	1.984
S17.001	L4-S2	15 minute 100 year Winter I+45%	148.178	147.959	0.558	0.000
S17.002	L4-S3	15 minute 100 year Winter I+45%	148.178	147.791	0.504	0.000
S17.003	FRI-L4	15 minute 100 year Winter I+45%	148.260	147.507	0.825	0.000
S18.000	L4-S1	15 minute 100 year Winter I+45%	148.425	147.271	-0.079	0.000
S17.004	L4-S4	15 minute 100 year Winter I+45%	148.425	147.222	0.681	0.000
S17.005	L4-S5	15 minute 100 year Winter I+45%	148.140	146.936	0.453	0.000
S19.000	BPI-L4	15 minute 100 year Winter I+45%	148.040	147.106	-0.159	0.000
S19.001	L4-S7	15 minute 100 year Winter I+45%	148.140	147.004	0.518	0.000

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S4.002	L2-S3	0.68		3.293	115.8	SURCHARGED
S4.003	FRI-L2	0.86		4.309	118.5	SURCHARGED
S4.004	L2-S4	1.02		2.891	121.0	SURCHARGED
S7.000	L2-S5	1.11		5.692	90.4	FLOOD
S7.001	L2-S6	2.51		3.121	152.3	FLOOD RISK
S7.002	L2-S7	0.88		1.578	147.2	SURCHARGED
S4.005	L2-S8	1.56		4.608	226.3	SURCHARGED
S8.000	SU	0.42		0.116	28.8	FLOOD RISK
S8.001	L2-S9	0.85		1.579	40.0	SURCHARGED
S8.002	L2-S10	0.82		1.664	39.8	SURCHARGED
S8.003	BPI-L2	0.72		1.591	38.5	SURCHARGED
S8.004	L2-S11	0.52		1.713	36.8	SURCHARGED
S4.006	L2-S12	2.13		4.767	266.8	SURCHARGED
S4.007	ADL-S2	0.42		4.243	267.8	SURCHARGED
S9.000	L3-S1	0.32		0.795	38.5	SURCHARGED
S9.001	L3-S2	0.62		1.827	72.5	SURCHARGED
S9.002	L3-S3	0.54		2.356	64.9	SURCHARGED
S10.000	L3-S4	0.22		0.049	5.2	OK
S9.003	L3-S5	0.44		2.991	60.7	SURCHARGED
S11.000	L3 Sump	0.94		0.113	21.5	FLOOD RISK
S11.001	L3-S6	1.14		1.000	18.2	SURCHARGED
S12.000	L3 Sump	2.63		0.115	74.2	SURCHARGED
S12.001	L3-S7	2.47		0.632	73.8	SURCHARGED
S11.002	L3-S8	1.58		1.388	86.4	SURCHARGED
S11.003	FRI-L3	1.51		1.408	82.7	SURCHARGED
S11.004	L3-S9	1.66		1.354	80.8	SURCHARGED
S9.004	L3-S10	1.39		3.498	128.7	SURCHARGED
S1.009	ADL-S3	1.04		17.831	643.4	SURCHARGED
S13.000	L1-S9	1.40		2.081	55.1	SURCHARGED
S13.001	L1-S10	1.65		2.961	58.5	FLOOD RISK
S14.000	SU U1 Dock	0.47		0.300	25.3	FLOOD RISK
S15.000	SU U1 Yard	2.12		1.048	77.1	FLOOD
S13.002	L1-S11	1.19		4.908	191.9	SURCHARGED
S16.000	L1-S12	0.28		0.056	10.1	OK
S13.003	L1-S13	2.66		4.228	222.8	SURCHARGED
S13.004	FRI-L1	2.60		2.218	217.5	SURCHARGED
S13.005	L1-S14	2.00		1.908	214.9	SURCHARGED
S1.010	ADL-S4	1.82		42.297	861.6	SURCHARGED
S1.011	ADL-S5	2.95		14.108	844.9	SURCHARGED
S1.012	ADL-S6	1.47		17.428	841.3	SURCHARGED
S17.000	SU U4 Yard	2.19		2.237	68.3	FLOOD
S17.001	L4-S2	1.50		0.942	71.2	FLOOD RISK
S17.002	L4-S3	0.80		0.939	79.8	SURCHARGED
S17.003	FRI-L4	1.54		1.349	81.2	SURCHARGED
S18.000	L4-S1	0.26		0.075	6.2	OK
S17.004	L4-S4	2.18		2.105	127.2	SURCHARGED
S17.005	L4-S5	2.05		1.789	127.4	SURCHARGED
S19.000	BPI-L4	0.19		0.069	23.5	OK

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S19.001	L4-S7	2.18		0.981	81.2	SURCHARGED

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S17.006	L4-S6	15 minute 100 year Winter I+45%	148.140	146.654	0.238	0.000	2.61
S1.013	ADL-S7	15 minute 100 year Summer I+45%	148.232	146.375	0.000	0.000	1.32
S1.014	ADL-S8	15 minute 100 year Winter I+45%	148.335	145.765	-0.590	0.000	0.51

PN	US/MH Name	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S17.006	L4-S6		2.067	205.9	SURCHARGED
S1.013	ADL-S7		16.110	907.4	OK
S1.014	ADL-S8		5.411	994.0	OK

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