

Blythe Valley Park  
Parcel JKM

Drainage Strategy

BLYTHE VALLEY PARK

PARCEL JKM

DRAINAGE STRATEGY

For

CREST NICHOLSON

JANUARY 2019

REV: A

P18-038

## Document History

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Date : 24<sup>th</sup> January 2019

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Position : Director  
Date : 24<sup>th</sup> January 2019

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#	18/01/19	Issued for comment.	CGD
A	24/01/19	Issued for Reserved Matters submission	CGD

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Appendix A	Land Sales Plans
Appendix B	Surface Water MicroDrainage Calculations
Appendix C	Road and Sewer General Arrangement Drawing
Appendix D	Foul Water MicroDrainage Calculations



# 1 Introduction and Brief

- 1.1.1 Rodgers Leask Ltd has been commissioned by Crest Nicholson to produce a Drainage Strategy report for the proposed development of the parcel of land in Blythe Valley Park, Parcel JKM.
- 1.1.2 The proposed development will include the construction of up to 169 residential dwellings.
- 1.1.3 In preparing this report, the existing THDA Consulting Engineers Flood Risk Assessment report for the entire Blythe Valley Park (report ref: 14-0686), along with an Engineering Layout (RACE/IMP/BVP ENG\_100 – 108) by RACE Residential and Commercial Engineering, for the main infrastructure designed to serve the parcels, has been utilised with regard to the overall drainage strategy and proposed discharge rates/connection points.
- 1.1.4 This report will consider both foul and surface water drainage and will make recommendations regarding proposed points of connection. For surface water, consideration will be given to proposed contributing impermeable areas.
- 1.1.5 This report is to be read in conjunction with Rodgers Leask Drawing 18039-RLL-18-XX-M2-C-606B Road and Sewer GA.

## 2 Site Description

- 2.1.1 The site is located off Blythe Gate to the south of Solihull, is Greenfield, and covers an area of approximately 4.67 hectares.
- 2.1.2 The site is bounded by a ditch/swales, detention basins and a footpath along the western and northern boundary, and hedgerow to the south.
- 2.1.3 Levels on the site generally slope from south to north, from a high point of approximately 138.0mAOD to a low point of 131.5mAOD.
- 2.1.4 The site is split into two sections by a main spine road which has been designed by RACE to serve the site, and comprises Parcels J, K and M of the wider IM Properties development.
- 2.1.5 The site is serviced with foul and surface water outfalls as shown in the Residential and Commercial Engineering 'Engineering Layout' (RACE/IMP/BVP ENG\_100-108).

### 3 Existing Surface Water Drainage

- 3.1.1 The site currently drains via overland flows to a ditch located along the western and northern boundary of the site.
- 3.1.2 Surface water outfalls have been constructed to serve the site through the site wide drainage strategy. The 'Land Sales Plan Parcels J & L', and 'Land Sales Plan Parcels K & M' (RACE/IM/BP ENG\_501 & 502) state the maximum contributing impermeable areas for each outfall. A copy of these drawings is contained in **Appendix A**.

### 4 Proposed Surface Water Drainage

- 4.1.1 In accordance with the Land Sales Plans, it is proposed to restrict the maximum contributing impermeable areas for each surface water outfall as stated.
- 4.1.2 Attenuation is not required for these parcels, as the parcels are serviced and sufficient attenuation has already been implemented outside of the site boundary.
- 4.1.3 It is proposed that the on-site surface water pipe network would be offered for adoption with Independent Water Networks Ltd via a Section 104 Agreement.
- 4.1.4 The exact contributing impermeable areas for each outfall should be refined at detailed design stage once an approved detailed masterplan layout has been established.
- 4.1.5 The five adoptable surface water networks, corresponding to the five of the six available outfalls have been modelled up to and including the 10 year + 40% allowance for climate change using MicroDrainage software, the results of which can be viewed in **Appendix B**. The remaining outfall will have a private surface water network connecting into it.

### 5 SuDS and Water Quality

- 5.1.1 The management of the water quality of surface water leaving a proposed development should be incorporated in any surface water drainage system. The treatment and pollution removal of surface water can be managed to a certain extent with well-designed SuDS.
- 5.1.2 SuDS have been considered as part of the drainage solution.
- 5.1.3 The overall SuDS strategy for Blythe Valley Park, serving Parcel JKM includes ponds, ditch courses and a reed bed/stilling basin for water treatment and attenuation for the site.
- 5.1.4 Water treatment will generally be provided via the ponds, ditch courses, and reed bed/stilling basin serving the site.

- 5.1.5 Table 1 below, taken from Table 4.3 in CIRIA C753, sets out the various land use and associated hazard levels along with the methods required to manage pollution risks.

Table 1: Minimum water quality management requirements for discharges to receiving surface waters and groundwater (Table 4.3 in CIRIA C753).

Land Use	Pollution hazard level	Requirements for discharge to surface waters, including coasts and estuaries	Requirements for discharge to groundwater
Residential roofs	Very Low	Removal of gross solids and sediments only	
Individual property driveways, roofs (excluding residential), residential car parks, low traffic roads (eg cul de sacs, home zones, general access roads), non-residential car parking with infrequent change (eg schools, offices)	Low	Simple index approach Note: extra measures may be required for discharges to protected resources	
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	Simple index approach Note: extra measures may be required for discharges to protected resources	Simple index approach Note: extra measures may be required for discharges to protected resources In England and Wales, Risk Screening must be undertaken first to determine whether consultation with the environmental regulator is required. In Northern Ireland, the need for risk screening should be agreed with the environmental regulator.

- 5.1.6 The simple index approach assigns indices ranging from 0-1 (where 0 is no pollution hazard for this contaminant type; 1 is high pollution hazard for contaminant type) to 3 main pollution hazards: Total suspended solids (TSS), metals; and hydrocarbons.

- 5.1.7 The proposed land use for the site falls under the 'Low' pollution hazard level, taken from Table 26.2 in CIRIA C753, whereby the following indices apply:

Total Suspended Solids: 0.5

Metals: 0.4

Hydrocarbons: 0.4

- 5.1.8 Different SuDS components are capable of providing treatment for the 3 main pollution hazards at varying levels. The SuDS component for the site should equal or exceed the pollution hazard index identified previously.

- 5.1.9 It is considered that by adhering to the SuDS strategy above, the necessary number of treatment trains could be provided to allow compliance with CIRIA C753 guidance.

5.1.10 As infiltration is not part of the surface water drainage strategy, Table 26.3 in CIRIA C753 has been used to gauge the SuDS mitigation indices.

5.1.11 Swales/ditch courses, which have been designed as part of the SuDS strategy to serve the site, have the following mitigation indices:

Total Suspended Solids: 0.5

Metals: 0.6

Hydrocarbons: 0.6

5.1.12 Ponds have also been designed as part of the SuDS strategy to serve the site, which have the following mitigation indices:

Total Suspended Solids: 0.7

Metals: 0.7

Hydrocarbons: 0.5

5.1.13 A bioretention system (reed bed) also serves the site, which has the following mitigation indices:

Total Suspended Solids: 0.8

Metals: 0.8

Hydrocarbons: 0.8

5.1.14 Therefore the total SuDS mitigation index for the site:

Total Suspended Solids: 1.25

Metals: 1.35

Hydrocarbons: 1.25

5.1.15 Rain gardens consisting of suitably planted/landscaped wet basins have also been proposed within the parcels for additional surface water treatment and source control.

5.1.16 It is therefore considered that the proposed SuDS will adequately manage the water quality of surface water leaving the development.

## 6 Existing Foul Water Drainage

- 6.1.1 The site is currently Greenfield and as such there is no current foul water discharge from the site. Adopted foul water outfalls have been designed and constructed to serve the site, as shown in the Land Sales Plans.

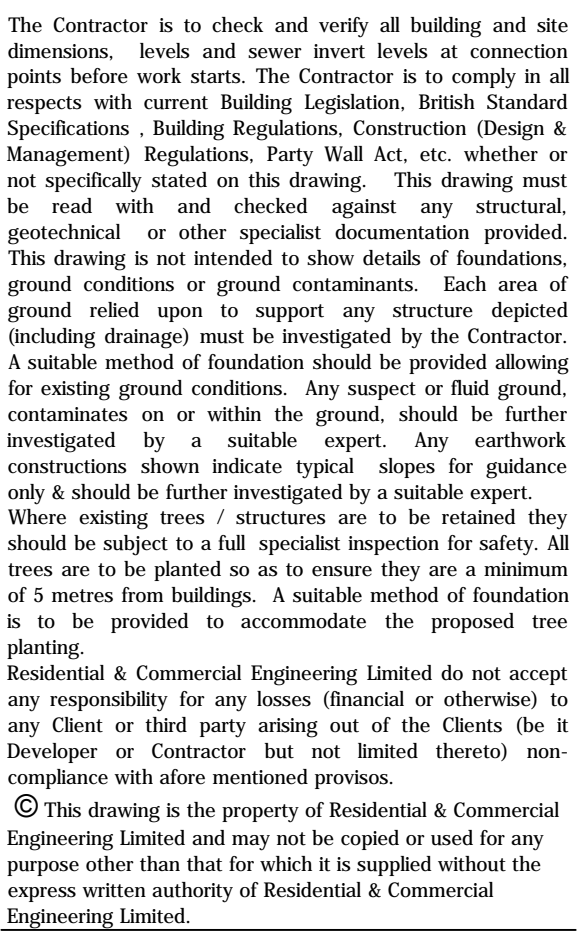
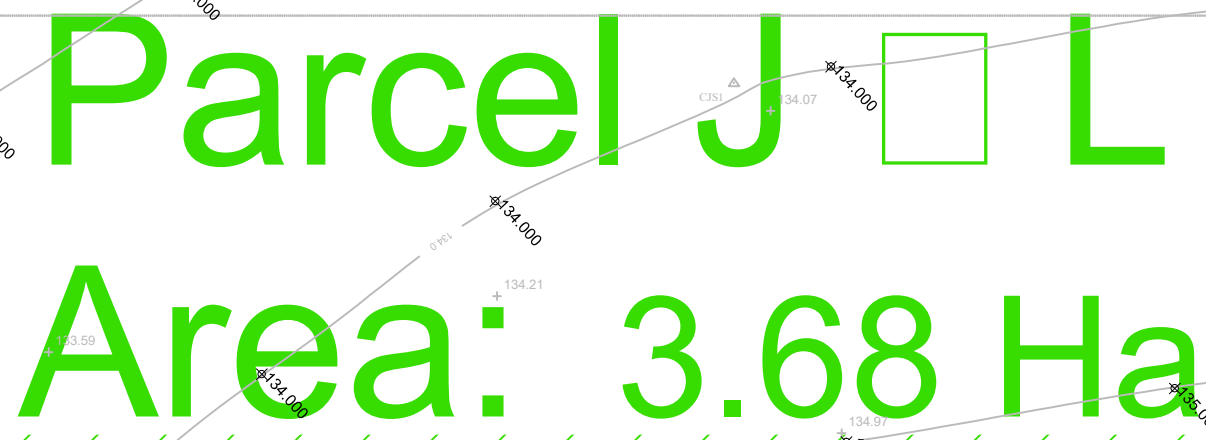
## 7 Proposed Foul Water Drainage

- 7.1.1 A foul water network has been designed to connect to the foul outfalls constructed to serve the development at various locations along the main spine road and the western and northern boundary.
- 7.1.2 It is proposed that the on-site foul water pipe network would be offered for adoption with Independent Water Networks Ltd via a Section 104 Agreement.
- 7.1.3 A copy of the road and sewer general arrangement drawing is contained within **Appendix C**. A copy of the drainage calculations is contained within **Appendix D**.

## Appendices

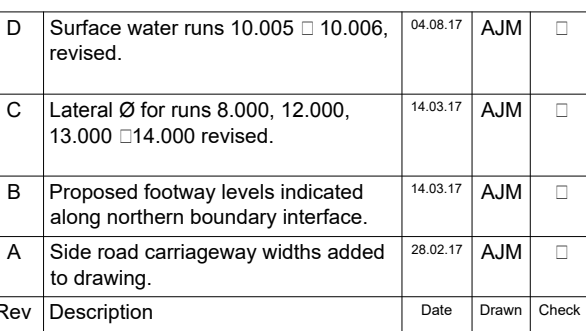
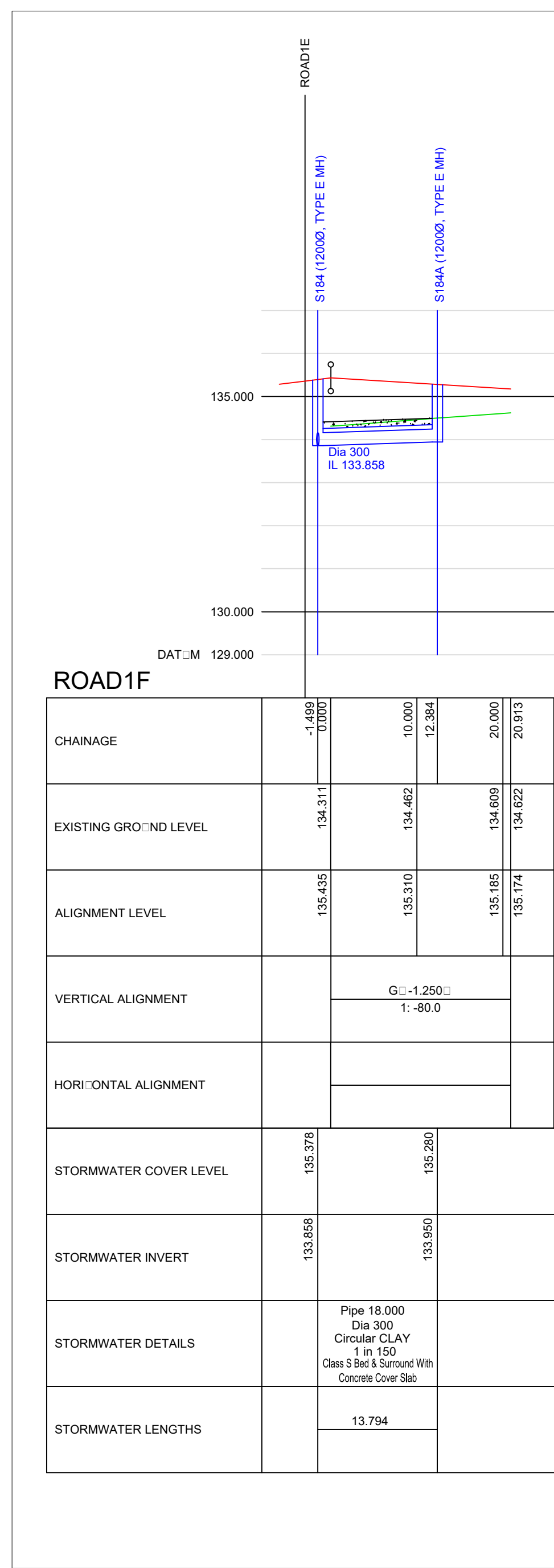
## Appendix A – Land Sales Plans





SHOULD CONTRIBUTING AREAS EXCEED THOSE SPECIFIED ON THIS DRAWING, THEN IT IS EXPECTED THAT ADDITIONAL FLOW CONTROL DEVICES, (LOCATED WITHIN PARCEL BOUNDARIES AND WITH A POTENTIAL TO EFFECT LEVELS) WILL BE REQUIRED.

SHOULD THIS OCCURRENCE BE  
ENCOUNTERED, THE ENGINEERS ADVICE  
SHOULD BE SOUGHT IMMEDIATELY.



**RACE**  
RESIDENTIAL & COMMERCIAL ENGINEERING

**Drawing Status:**  
**Subject to the following approvals:**  
 Section 38 - APPROVED - 13.10.2017 (s38/52)  
 Section 278 - APPROVED - 13.10.2017 (s38/52)  
 Section 104 - CONDITIONALLY APPROVED - 27.04.2017 (0000000258359)  
 Section 106 - Yet to be submitted to SW  
 Consent To Discharge - APPROVED - 22.05.2017 (TDV 2017/001)

Client:  
IM PROPERTIES

Project:  
**BLYTHE VALLEY PARK**

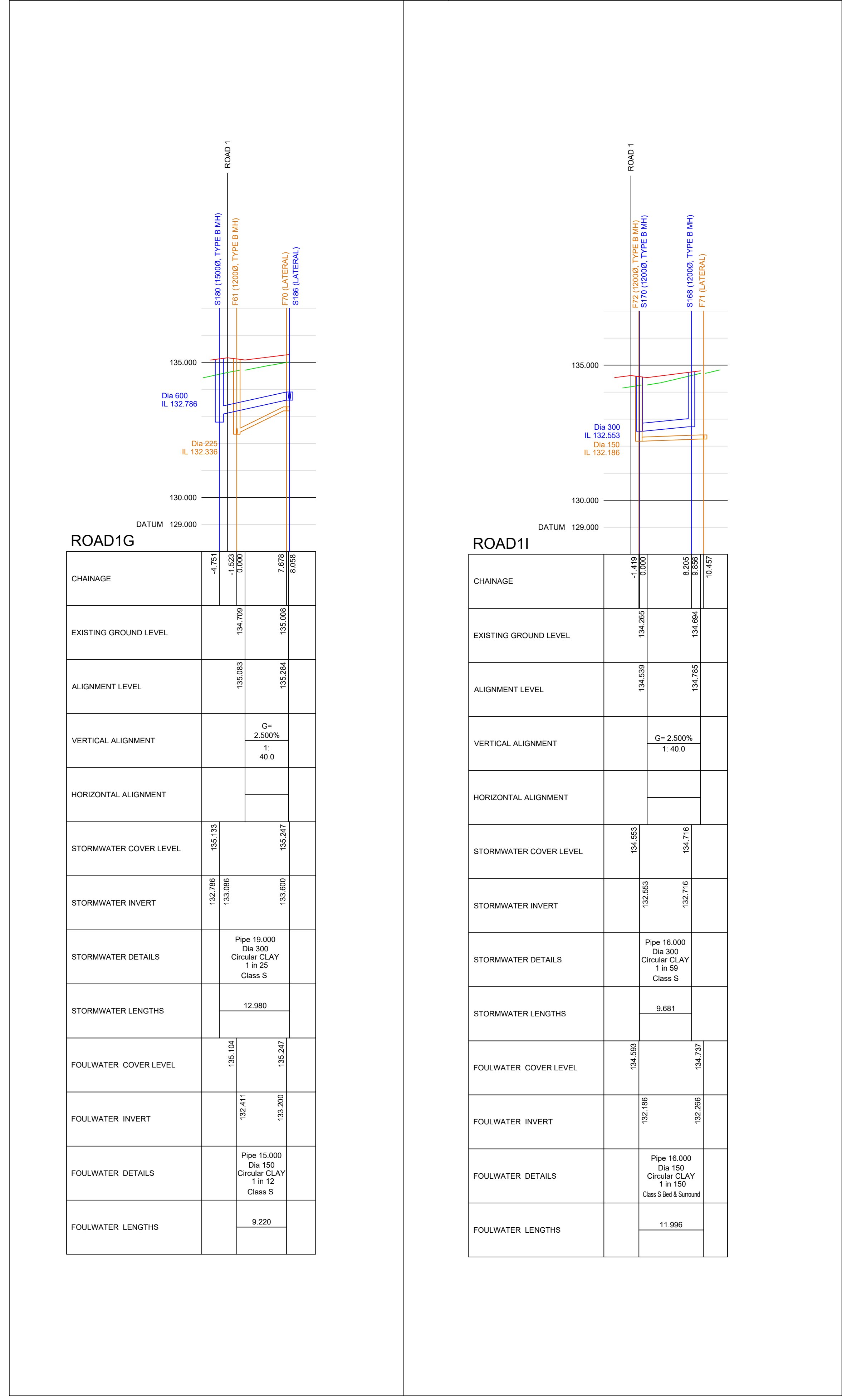
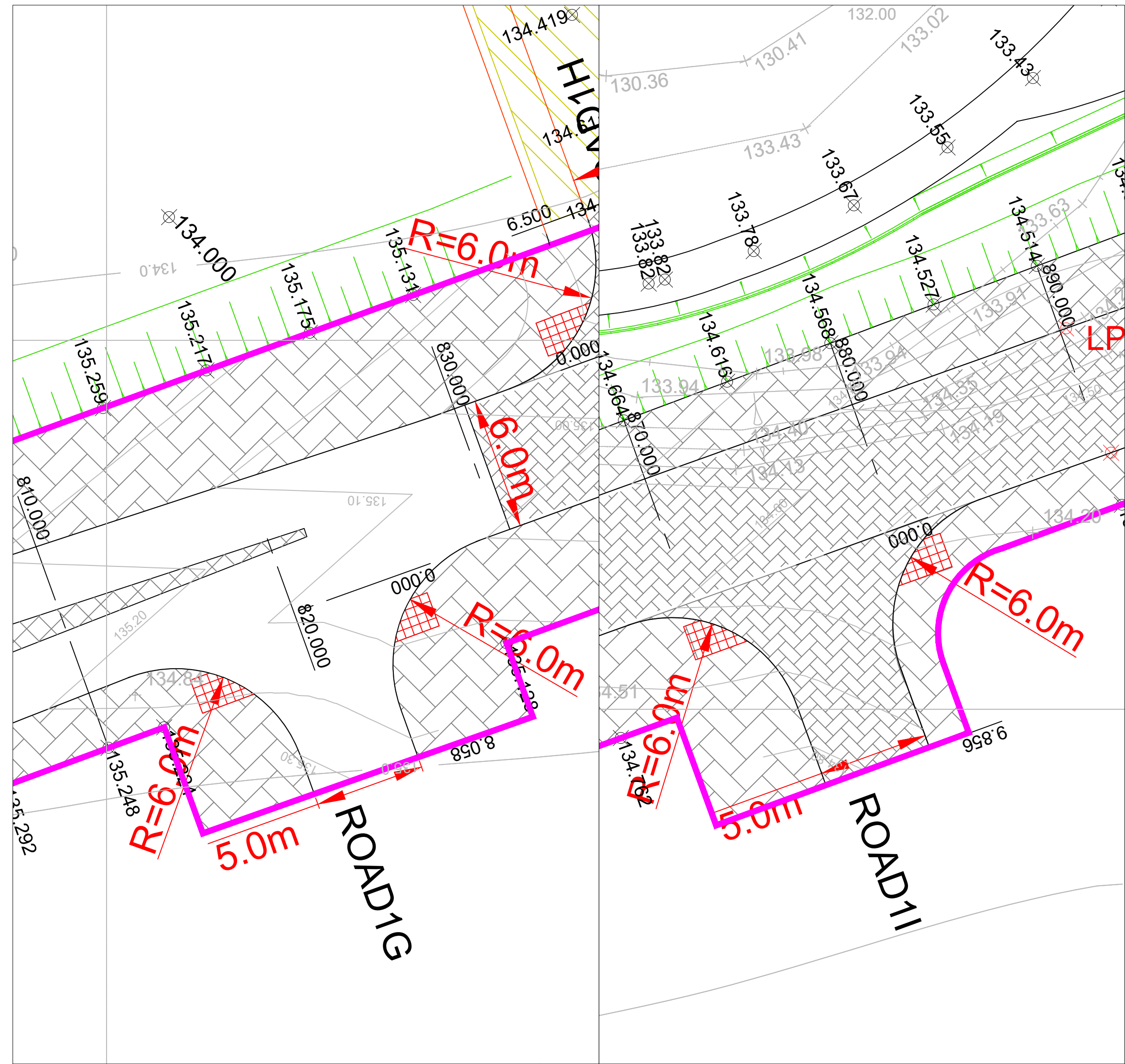
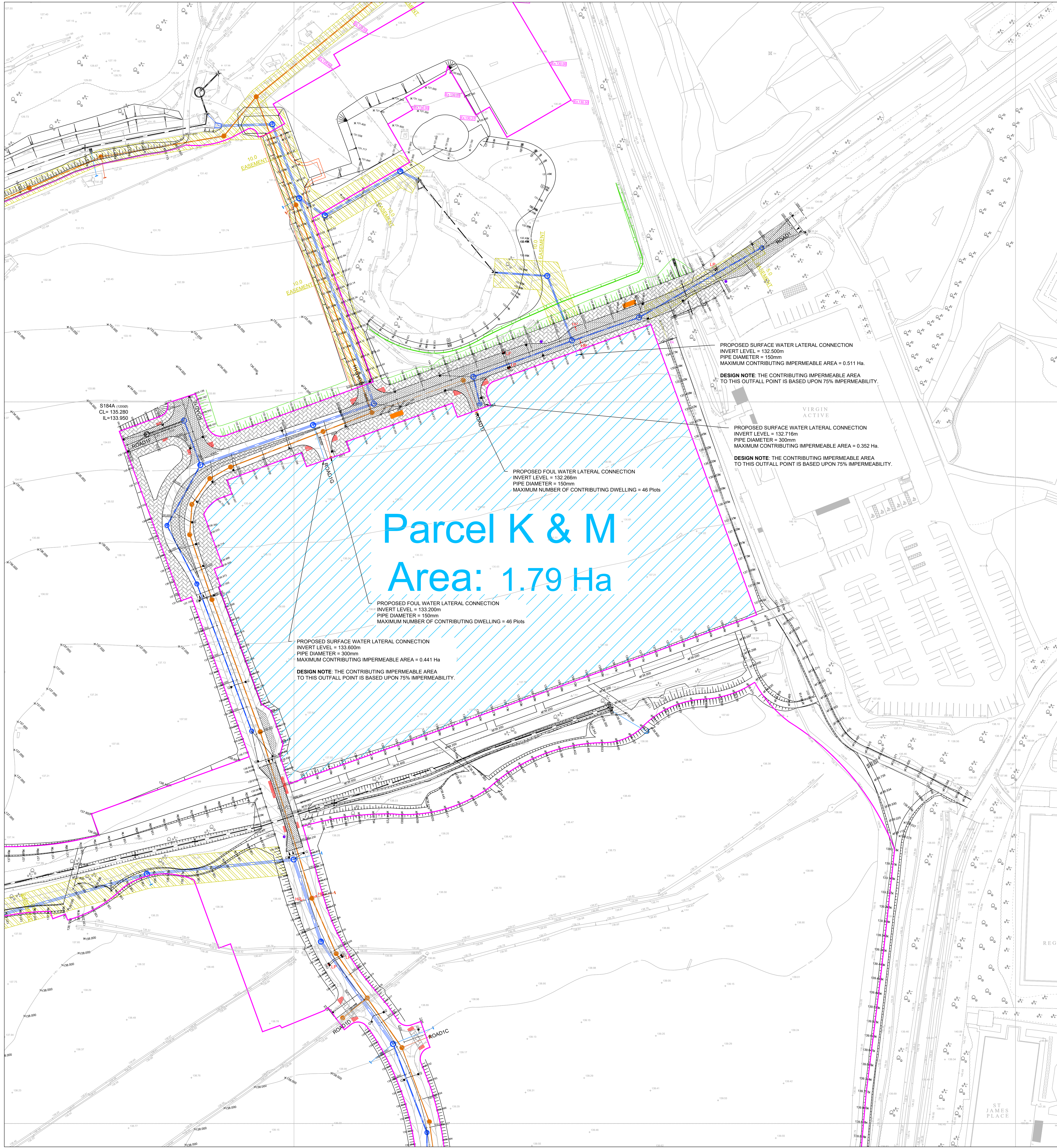
Title:  
LAND SALES PLAN PARCELS J & L

Job Number.  
RACE/IM/BVP  
Drawing No.  
ENG\_501  
Revision. D

Scale: 1:500 @ A0  
Date: JAN '17  
Drawn by: LE  
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Contact us :  
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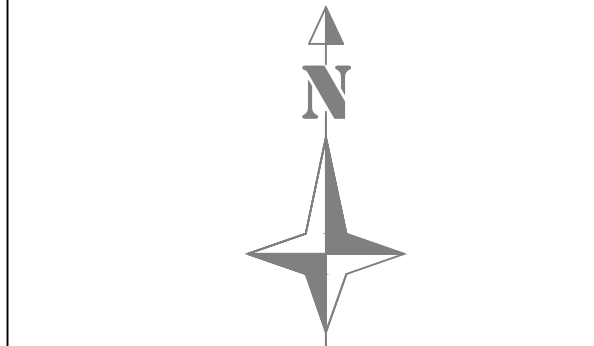




The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work starts. The Contractor is to comply in all respects with current Building Legislation, British Standard Specifications, Building Regulations, Construction (Design & Management) Regulations, Party Wall Act, etc. whether or not specifically stated on this drawing. This drawing must be read with and checked against any structural, geotechnical or other specialist documentation provided. This drawing is not intended to show details of foundations, ground conditions or ground contaminants. Each area of ground relied upon to support any structure depicted (including drainage) must be investigated by the Contractor. A suitable method of foundation should be provided allowing for existing ground conditions. Any support or fluid ground, contaminants on or within the ground, should be further investigated by a suitable expert. Any earthwork construction shown indicates typical slopes for guidance only & should be further investigated by a suitable expert. Where existing trees / structures are to be retained they should be subject to a full specialist inspection for safety. All trees are to be planted as to ensure they are a minimum of 5 metres from buildings. A suitable method of foundation is to be provided to accommodate the proposed tree planting.

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THE CONTRIBUTING AREAS SPECIFIED ON THIS DRAWING ARE IN ACCORDANCE WITH THE DESIGN STRATEGY DICTATED BY THE AREA WIDE DRAINAGE MASTER PLAN.

SHOULD CONTRIBUTING AREAS EXCEED THOSE SPECIFIED ON THIS DRAWING, THEN IT IS EXPECTED THAT ADDITIONAL FLOW CONTROL DEVICES, (LOCATED WITHIN PARCEL BOUNDARIES AND WITH A POTENTIAL TO EFFECT LEVELS) WILL BE REQUIRED.

SHOULD THIS OCCURRENCE BE ENCOUNTERED, THE ENGINEERS ADVICE SHOULD BE SOUGHT IMMEDIATELY.

D	Surface water runs 10.005 & 10.006, revised.	04/01/17	AJM	#
C	Existing 4500 culvert identified between SW 10.005 SW network 15.000 - 15.002 updated to accommodate existing feature.	20/04/17	AJM	#
B	Footpath level indicated alongside eastern boundary	19/04/17	AJM	#
A	Side road carriageway widths added to drawing	20/01/17	AJM	#
Rev	Description	Date	Drawn	Check

Revisions:



**Drawing Status:**  
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**Section 38** APPROVED - 13.02.2017 (GWS/CE)  
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**Consent to Discharge** - APPROVED - 23.05.2017 (CON 2017/0901)

**Client:**  
IM PROPERTIES

**Project:**  
BLYTHE VALLEY PARK

**Title:**  
LAND SALES PLAN PARCELS K & M


**Job Number:**  
RACE/IM/B/P  
**Drawing No.**  
ENG\_502  
**Revision:**  
D

**Scale:**  
1:500 @ A0  
**Date:**  
JAN '17  
**Drawn by:**  
LE  
**Checked by:**  
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## Appendix B – Surface Water MicroDrainage Calculations

Rodgers Leask Limited			Page 1
St James House	St Mary's Wharf	P18-038 JKM	
Mansfield Road		SW NW1	
Derby DE1 3TQ			
Date 24/01/2019		Designed by Celeste Dauncey	
File P18-038 JKM SW NW1.MDX		Checked by	
Micro Drainage		Network 2017.1.2	

### 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)	19.100	Add Flow / Climate Change (%)	40
Ratio R	0.400	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)
0-4	0.720	4-8	0.293

Total Area Contributing (ha) = 1.013


Total Pipe Volume (m³) = 18.056

#### 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	33.220	0.475	70.0	0.161	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.001	19.864	0.132	150.0	0.038	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	28.657	0.773	37.1	0.117	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	28.018	1.620	17.3	0.074	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.000	11.936	0.119	100.0	0.115	5.00	0.0	0.600	o	300	Pipe/Conduit	
S2.001	31.039	0.155	200.0	0.103	0.00	0.0	0.600	o	300	Pipe/Conduit	

#### Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.35	135.800	0.161	0.0	0.0	8.7	1.57	62.2	30.5
S1.001	50.00	5.66	135.325	0.199	0.0	0.0	10.8	1.07	42.4	37.7
S1.002	50.00	5.85	135.118	0.316	0.0	0.0	17.1	2.59	183.1	59.9
S1.003	50.00	5.97	134.345	0.390	0.0	0.0	21.1	3.80	268.5	73.9
S2.000	50.00	5.13	133.000	0.115	0.0	0.0	6.2	1.57	111.1	21.8
S2.001	50.00	5.59	132.881	0.218	0.0	0.0	11.8	1.11	78.3	41.3

Rodgers Leask Limited			Page 2
St James House	St Mary's Wharf	P18-038 JKM	
Mansfield Road		SW NW1	
Derby DE1 3TQ			
Date 24/01/2019		Designed by Celeste Dauncey	
File P18-038 JKM SW NW1.MDX		Checked by	
Micro Drainage		Network 2017.1.2	


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	29.033	0.145	200.2	0.102	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.005	30.745	0.786	39.1	0.077	0.00	0.0	0.600	o	375	Pipe/Conduit	
S3.000	11.882	0.410	29.0	0.185	5.00	0.0	0.600	o	225	Pipe/Conduit	
S4.000	5.000	0.030	166.7	0.037	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.006	10.239	0.082	124.9	0.004	0.00	0.0	0.600	o	450	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.004	50.00	6.35	132.650	0.710	0.0	0.0	38.5	1.28	141.0	134.6
S1.005	50.00	6.53	132.505	0.787	0.0	0.0	42.6	2.90	320.8	149.2
S3.000	50.00	5.08	132.235	0.185	0.0	0.0	10.0	2.44	97.0	35.1
S4.000	50.00	5.08	131.855	0.037	0.0	0.0	2.0	1.01	40.2	7.0
S1.006	50.00	6.62	131.600	1.013	0.0	0.0	54.9	1.82	289.2	192.0



Rodgers Leask Limited			Page 4
St James House Mansfield Road Derby DE1 3TQ	St Mary's Wharf	P18-038 JKM SW NW1	
Date 24/01/2019 File P18-038 JKM SW NW1.MDX		Designed by Celeste Dauncey Checked by	
Micro Drainage		Network 2017.1.2	

PIPELINE SCHEDULES for Storm

Upstream Manhole


PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	225	SNW1 S1	137.490	135.800	1.465	Open Manhole	1200
S1.001	o	225	SNW1 S2	137.085	135.325	1.535	Open Manhole	1200
S1.002	o	300	SNW1 S3	136.795	135.118	1.377	Open Manhole	1200
S1.003	o	300	SNW1 S4	135.845	134.345	1.200	Open Manhole	1200
S2.000	o	300	SNW1 S5	134.875	133.000	1.575	Open Manhole	1200
S2.001	o	300	SNW1 S6	134.860	132.881	1.679	Open Manhole	1200
S1.004	o	375	SNW1 S7	134.930	132.650	1.905	Open Manhole	1500
S1.005	o	375	SNW1 S8	134.455	132.505	1.575	Open Manhole	1500
S3.000	o	225	SNW1 S9	133.660	132.235	1.200	Open Manhole	1200
S4.000	o	225	SNW1 S10	133.280	131.855	1.200	Open Manhole	1200
S1.006	o	450	SNW1 S11	133.410	131.600	1.360	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	33.220	70.0	SNW1 S2	137.085	135.325	1.535	Open Manhole	1200
S1.001	19.864	150.0	SNW1 S3	136.795	135.193	1.377	Open Manhole	1200
S1.002	28.657	37.1	SNW1 S4	135.845	134.345	1.200	Open Manhole	1200
S1.003	28.018	17.3	SNW1 S7	134.930	132.725	1.905	Open Manhole	1500
S2.000	11.936	100.0	SNW1 S6	134.860	132.881	1.679	Open Manhole	1200
S2.001	31.039	200.0	SNW1 S7	134.930	132.725	1.905	Open Manhole	1500
S1.004	29.033	200.2	SNW1 S8	134.455	132.505	1.575	Open Manhole	1500
S1.005	30.745	39.1	SNW1 S11	133.410	131.719	1.316	Open Manhole	1500
S3.000	11.882	29.0	SNW1 S11	133.410	131.825	1.360	Open Manhole	1500
S4.000	5.000	166.7	SNW1 S11	133.410	131.825	1.360	Open Manhole	1500
S1.006	10.239	124.9	S	132.680	131.518	0.712	Open Manhole	0

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)
S1.006	S	132.680	131.518	0.000	0	0

Rodgers Leask Limited		Page 5
St James House St Mary's Wharf Mansfield Road Derby DE1 3TQ	P18-038 JKM SW NW1	
Date 24/01/2019 File P18-038 JKM SW NW1.MDX	Designed by Celeste Dauncey Checked by	
Micro Drainage Network 2017.1.2		
<p align="center"><u>Simulation Criteria for Storm</u></p> <p> Volumetric Runoff Coeff 0.750      Additional Flow - % of Total Flow 0.000  Areal Reduction Factor 1.000      MADD Factor * 10m³/ha Storage 2.500  Hot Start (mins) 0      Inlet Coefficient 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 </p> <p> 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 </p> <p align="center"><u>Synthetic Rainfall Details</u></p> <p> 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) 19.100      Storm Duration (mins) 30  Ratio R 0.400 </p>		
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St James House   St Mary's Wharf Mansfield Road Derby   DE1 3TQ		P18-038 JKM SW NW1
Date 24/01/2019 File P18-038 JKM SW NW1.MDX		Designed by Celeste Dauncey Checked by
Micro Drainage		Network 2017.1.2

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

Simulation Criteria

Areal Reduction Factor 1.000	Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0	MADD Factor * 10m³/ha Storage 2.500
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 0.400
Region England and Wales Cv (Summer)	0.750	
M5-60 (mm)	19.500 Cv (Winter)	0.840

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


  

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	SNW1 S1	15 Winter	1	+0%	30/15 Summer			
S1.001	SNW1 S2	15 Winter	1	+0%	30/15 Summer			
S1.002	SNW1 S3	15 Winter	1	+0%	100/15 Summer			
S1.003	SNW1 S4	15 Winter	1	+0%	100/15 Summer			
S2.000	SNW1 S5	15 Winter	1	+0%	30/15 Summer	100/15 Winter		
S2.001	SNW1 S6	15 Winter	1	+0%	30/15 Summer	100/15 Winter		
S1.004	SNW1 S7	15 Winter	1	+0%	30/15 Summer			
S1.005	SNW1 S8	15 Winter	1	+0%	100/15 Summer			
S3.000	SNW1 S9	15 Winter	1	+0%	100/15 Summer			
S4.000	SNW1 S10	15 Winter	1	+0%	30/15 Summer			
S1.006	SNW1 S11	15 Winter	1	+0%	30/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Overflow Cap. (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SNW1 S1	135.896	-0.129	0.000	0.37	21.4	OK	

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St James House	St Mary's Wharf	P18-038 JKM	
Mansfield Road		SW NW1	
Derby DE1 3TQ			
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Micro Drainage		Network 2017.1.2	

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.001	SNW1 S2	135.462	-0.088	0.000	0.68		26.0	OK	
S1.002	SNW1 S3	135.217	-0.201	0.000	0.24		39.2	OK	
S1.003	SNW1 S4	134.435	-0.210	0.000	0.20		47.6	OK	
S2.000	SNW1 S5	133.086	-0.214	0.000	0.18		15.5	OK	1
S2.001	SNW1 S6	133.010	-0.171	0.000	0.38		27.2	OK	1
S1.004	SNW1 S7	132.880	-0.145	0.000	0.68		84.9	OK	
S1.005	SNW1 S8	132.653	-0.227	0.000	0.33		93.4	OK	
S3.000	SNW1 S9	132.320	-0.140	0.000	0.30		25.0	OK	
S4.000	SNW1 S10	131.918	-0.162	0.000	0.17		5.0	OK	
S1.006	SNW1 S11	131.885	-0.165	0.000	0.71		120.6	OK	

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St James House St Mary's Wharf Mansfield Road Derby DE1 3TQ		P18-038 JKM SW NW1	
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Micro Drainage		Network 2017.1.2	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.500
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	0.400
Region England and Wales Cv (Summer)	0.750		
M5-60 (mm)	19.500 Cv (Winter)	0.840	

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40


  

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	SNW1 S1	15 Winter	30	+0%	30/15 Summer			
S1.001	SNW1 S2	15 Winter	30	+0%	30/15 Summer			
S1.002	SNW1 S3	15 Winter	30	+0%	100/15 Summer			
S1.003	SNW1 S4	15 Winter	30	+0%	100/15 Summer			
S2.000	SNW1 S5	15 Winter	30	+0%	30/15 Summer	100/15 Winter		
S2.001	SNW1 S6	15 Winter	30	+0%	30/15 Summer	100/15 Winter		
S1.004	SNW1 S7	15 Winter	30	+0%	30/15 Summer			
S1.005	SNW1 S8	15 Winter	30	+0%	100/15 Summer			
S3.000	SNW1 S9	15 Winter	30	+0%	100/15 Summer			
S4.000	SNW1 S10	15 Winter	30	+0%	30/15 Summer			
S1.006	SNW1 S11	15 Winter	30	+0%	30/15 Summer			

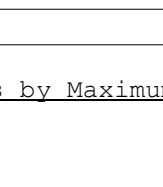
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SNW1S1	136.095	0.070	0.000	0.85		49.9	SURCHARGED	

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m <sup>3</sup> )	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.001	SNW1 S2	135.744	0.194	0.000	1.58		60.4	SURCHARGED	
S1.002	SNW1 S3	135.287	-0.131	0.000	0.59		97.2	OK	
S1.003	SNW1 S4	134.499	-0.146	0.000	0.50		122.3	OK	
S2.000	SNW1 S5	133.484	0.184	0.000	0.42		36.7	SURCHARGED	1
S2.001	SNW1 S6	133.458	0.277	0.000	0.94		66.8	SURCHARGED	1
S1.004	SNW1 S7	133.320	0.295	0.000	1.75		217.5	SURCHARGED	
S1.005	SNW1 S8	132.794	-0.086	0.000	0.83		236.9	OK	
S3.000	SNW1 S9	132.442	-0.018	0.000	0.70		58.1	OK	
S4.000	SNW1 S10	132.251	0.171	0.000	0.38		11.2	SURCHARGED	
S1.006	SNW1 S11	132.242	0.192	0.000	1.81		305.3	SURCHARGED	

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P18-038 JKM SW NW1		
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Micro Drainage		Network 2017.1.2

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.500
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	0.400
Region England and Wales Cv (Summer)	0.750		
M5-60 (mm)	19.500 Cv (Winter)	0.840	

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40


  

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	SNW1 S1	15 Winter	100	+40%	30/15 Summer			
S1.001	SNW1 S2	15 Winter	100	+40%	30/15 Summer			
S1.002	SNW1 S3	15 Winter	100	+40%	100/15 Summer			
S1.003	SNW1 S4	15 Winter	100	+40%	100/15 Summer			
S2.000	SNW1 S5	15 Winter	100	+40%	30/15 Summer	100/15 Winter		
S2.001	SNW1 S6	15 Winter	100	+40%	30/15 Summer	100/15 Winter		
S1.004	SNW1 S7	15 Winter	100	+40%	30/15 Summer			
S1.005	SNW1 S8	15 Winter	100	+40%	100/15 Summer			
S3.000	SNW1 S9	15 Winter	100	+40%	100/15 Summer			
S4.000	SNW1 S10	15 Winter	100	+40%	30/15 Summer			
S1.006	SNW1 S11	15 Winter	100	+40%	30/15 Summer			


PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SNW1S1	137.431	1.406	0.000	1.28		74.6	FLOOD RISK	

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Micro Drainage		Network 2017.1.2	

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m <sup>3</sup> )	Flow / Cap. (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.001	SNW1 S2	136.643	1.092	0.000	2.38	91.2	SURCHARGED	
S1.002	SNW1 S3	135.932	0.514	0.000	0.85	141.2	SURCHARGED	
S1.003	SNW1 S4	135.406	0.761	0.000	0.70	169.6	SURCHARGED	
S2.000	SNW1 S5	134.877	1.577	1.569	0.80	69.3	FLOOD	1
S2.001	SNW1 S6	134.860	1.679	0.001	1.37	97.9	FLOOD	1
S1.004	SNW1 S7	134.634	1.609	0.000	2.45	304.6	FLOOD RISK	
S1.005	SNW1 S8	133.744	0.864	0.000	1.19	338.5	SURCHARGED	
S3.000	SNW1 S9	133.223	0.763	0.000	1.20	99.5	SURCHARGED	
S4.000	SNW1 S10	132.624	0.544	0.000	0.67	19.6	SURCHARGED	
S1.006	SNW1 S11	132.609	0.559	0.000	2.71	458.1	SURCHARGED	

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Mansfield Road		SW NW2	
Derby DE1 3TQ			
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File P18-038 JKM SW NW2.MDX	Checked by		
Micro Drainage	Network 2017.1.2		

### 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)	19.500	Add Flow / Climate Change (%)	40
Ratio R	0.400	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)
0-4	0.345	4-8	0.067

Total Area Contributing (ha) = 0.412


Total Pipe Volume (m³) = 5.481

#### 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	38.637	1.623	23.8	0.058	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	24.380	0.325	75.0	0.100	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	11.698	0.049	238.7	0.102	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	19.901	0.091	218.7	0.009	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.004	10.028	0.068	147.5	0.143	0.00	0.0	0.600	o	450	Pipe/Conduit	

#### Network Results Table


PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.31	132.903	0.058	0.0	0.0	3.1	2.07	36.6	11.0
S1.001	50.00	5.58	131.205	0.158	0.0	0.0	8.6	1.51	60.1	30.0
S1.002	50.00	5.77	130.805	0.260	0.0	0.0	14.1	1.01	71.6	49.3
S1.003	50.00	6.09	130.756	0.269	0.0	0.0	14.6	1.06	74.9	51.0
S1.004	50.00	6.19	130.515	0.412	0.0	0.0	22.3	1.67	265.9	78.1

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St James House	St Mary's Wharf	P18-038 JKM	
Mansfield Road		SW NW2	
Derby DE1 3TQ			
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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	134.253	1.350	Open Manhole	1200	S1.000	132.903	150				
S2	132.630	1.425	Open Manhole	1200	S1.001	131.205	225	S1.000	131.280	150	
S3	132.255	1.450	Open Manhole	1200	S1.002	130.805	300	S1.001	130.880	225	
S4	132.315	1.559	Open Manhole	1200	S1.003	130.756	300	S1.002	130.756	300	
S5	132.500	1.985	Open Manhole	1350	S1.004	130.515	450	S1.003	130.665	300	
S	131.645	1.198	Open Manhole	0		OUTFALL		S1.004	130.447	450	



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Micro Drainage	Network 2017.1.2	

### PIPELINE SCHEDULES for Storm

#### Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	S1	134.253	132.903	1.200	Open Manhole	1200
S1.001	o	225	S2	132.630	131.205	1.200	Open Manhole	1200
S1.002	o	300	S3	132.255	130.805	1.150	Open Manhole	1200
S1.003	o	300	S4	132.315	130.756	1.259	Open Manhole	1200
S1.004	o	450	S5	132.500	130.515	1.535	Open Manhole	1350

#### Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	38.637	23.8	S2	132.630	131.280	1.200	Open Manhole	1200
S1.001	24.380	75.0	S3	132.255	130.880	1.150	Open Manhole	1200
S1.002	11.698	238.7	S4	132.315	130.756	1.259	Open Manhole	1200
S1.003	19.901	218.7	S5	132.500	130.665	1.535	Open Manhole	1350
S1.004	10.028	147.5	S	131.645	130.447	0.748	Open Manhole	0

#### 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)
S1.004	S	131.645	130.447	0.000	0	0

#### Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m <sup>3</sup> /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	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)	19.500	Storm Duration (mins)	30
Ratio R	0.400		

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St James House St Mary's Wharf  
Mansfield Road  
Derby DE1 3TQ

P18-038 JKM  
SW NW2

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

Simulation Criteria

Areal Reduction Factor 1.000  
Hot Start (mins) 0  
Hot Start Level (mm) 0  
Manhole Headloss Coeff (Global) 0.500  
Foul Sewage per hectare (l/s) 0.000

Additional Flow - % of Total Flow 0.000  
MADD Factor \* 10m³/ha Storage 2.000  
Inlet Coeffiecient 0.800  
Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0  
Number of Online Controls 0  
Number of Offline Controls 0

Number of Storage Structures 0  
Number of Time/Area Diagrams 0  
Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR  
Region England and Wales Cv (Summer) 0.750  
M5-60 (mm) 19.500

Ratio R 0.400  
Cv (Winter) 0.840

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

Profile(s) Summer and Winter  
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440  
Return Period(s) (years) 1, 30, 100  
Climate Change (%) 0, 0, 40

	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water
	PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Level
								Act.	(m)
S1.000	S1	15 Winter	1	+0%	100/15 Summer				132.951
S1.001	S2	15 Winter	1	+0%	30/15 Summer				131.297
S1.002	S3	15 Winter	1	+0%	30/15 Summer				130.963
S1.003	S4	15 Winter	1	+0%	30/15 Summer				130.904
S1.004	S5	15 Winter	1	+0%	100/15 Summer				130.678

Surcharged Flooded

US/MH

Depth

Volume

Flow /

Overflow

Pipe

PN

Name

(m)

(m³)

Cap.

(l/s)

(l/s)

Status

Level

Exceeded

S1.000

S1

-0.102

0.000

0.22

7.8

OK

S1.001

S2

-0.133

0.000

0.35

19.2

OK

S1.002

S3

-0.142

0.000

0.54

31.0

OK

S1.003

S4

-0.152

0.000

0.49

31.9

OK

S1.004

S5

-0.287


0.000


0.28


47.8


OK


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Mansfield Road		SW NW2																																											
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Date 24/01/2019		Designed by Celeste Dauncey																																											
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Designed by Celeste Dauncey		
Checked by		
Micro Drainage		Network 2017.1.2

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)

for Storm

Simulation Criteria

Areal Reduction Factor 1.000	Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0	MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0	Inlet 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 0.400
Region England and Wales Cv (Summer)	0.750	
M5-60 (mm)	19.500 Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40


PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	30	+0%	100/15 Summer				132.983
S1.001	S2	15 Winter	30	+0%	30/15 Summer				131.524
S1.002	S3	15 Winter	30	+0%	30/15 Summer				131.233
S1.003	S4	15 Winter	30	+0%	30/15 Summer				131.115
S1.004	S5	15 Winter	30	+0%	100/15 Summer				130.822


  


PN	US/MH Name	Depth (m)	Surcharged Volume (m³)	Flooded Volume (m³)	Flow / Cap. (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.070	0.000	0.54	19.0	OK		
S1.001	S2	0.094	0.000	0.93	51.6	SURCHARGED		
S1.002	S3	0.128	0.000	1.46	84.2	SURCHARGED		
S1.003	S4	0.059	0.000	1.33	87.0	SURCHARGED		
S1.004	S5	-0.143	0.000	0.78	132.5	OK		

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Micro Drainage	Network 2017.1.2	

Rainfall Hyetograph for 15 minute 30 year Winter I+0%  
for Pipe S1.002 (Storm)

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
1	17.623	4	42.400	7	158.041	10	111.040	13	33.494
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Micro Drainage		Network 2017.1.2

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet 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	0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.500	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40


  

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	100	+40%	100/15 Summer				133.563
S1.001	S2	15 Winter	100	+40%	30/15 Summer				132.504
S1.002	S3	15 Winter	100	+40%	30/15 Summer				131.804
S1.003	S4	15 Winter	100	+40%	30/15 Summer				131.486
S1.004	S5	15 Winter	100	+40%	100/15 Summer				131.045


  


PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.510	0.000	0.87		30.9	SURCHARGED	
S1.001	S2	1.074	0.000	1.48		82.1	FLOOD RISK	
S1.002	S3	0.699	0.000	2.41		139.1	SURCHARGED	
S1.003	S4	0.430	0.000	2.20		143.4	SURCHARGED	
S1.004	S5	0.080	0.000	1.33		224.2	SURCHARGED	


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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)	19.500	Add Flow / Climate Change (%)	40
Ratio R	0.400	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)
0-4	0.264	4-8	0.038

Total Area Contributing (ha) = 0.302


Total Pipe Volume (m³) = 2.705

#### 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	28.445	1.100	25.9	0.085	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	30.153	0.658	45.8	0.127	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	9.083	0.202	45.0	0.090	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)
S1.000	50.00	5.24	132.550	0.085	0.0	0.0	4.6	1.99	35.1	16.1
S1.001	50.00	5.50	131.375	0.212	0.0	0.0	11.5	1.94	77.0	40.2
S1.002	50.00	5.55	130.567	0.302	0.0	0.0	16.4	2.71	299.0	57.3

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	134.145	1.595	Open Manhole	1200	S1.000	132.550	150				
S2	132.800	1.425	Open Manhole	1200	S1.001	131.375	225	S1.000	131.450	150	
S3	132.455	1.888	Open Manhole	1350	S1.002	130.567	375	S1.001	130.717	225	
S	131.565	1.200	Open Manhole	0		OUTFALL		S1.002	130.365	375	

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### PIPELINE SCHEDULES for Storm

#### Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	S1	134.145	132.550	1.445	Open Manhole	1200
S1.001	o	225	S2	132.800	131.375	1.200	Open Manhole	1200
S1.002	o	375	S3	132.455	130.567	1.513	Open Manhole	1350

#### Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	28.445	25.9	S2	132.800	131.450	1.200	Open Manhole	1200
S1.001	30.153	45.8	S3	132.455	130.717	1.513	Open Manhole	1350
S1.002	9.083	45.0	S	131.565	130.365	0.825	Open Manhole	0

#### 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)
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S1.002	S	131.565	130.365	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 * 10m <sup>3</sup> /ha	Storage 2.000
Hot Start (mins)	0	Inlet Coefficient	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)	19.500	Storm Duration (mins)	30
Ratio R	0.400		

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Micro Drainage			Network 2017.1.2				

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m <sup>3</sup> /ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	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	0.400
Region England and Wales	Cv (Summer)	0.750	
M5-60 (mm)	19.600 Cv (Winter)	0.840	

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40


PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	1	+0%	100/15	Summer			132.611
S1.001	S2	15 Winter	1	+0%	100/15	Summer			131.469
S1.002	S3	15 Winter	1	+0%					130.683


PN	US/MH Name	Depth (m)	Volume (m <sup>3</sup> )	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.089	0.000	0.34		11.6	OK	
S1.001	S2	-0.131	0.000	0.36		26.1	OK	
S1.002	S3	-0.259	0.000	0.21		36.6	OK	


  


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Mansfield Road				SW NW3			
Derby DE1 3TQ							
Date 24/01/2019				Designed by Celeste Dauncey			
File P18-038 JKM SW NW3.MDX				Checked by			
Micro Drainage				Network 2017.1.2			

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	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	0.400
Region England and Wales	Cv (Summer)		0.750
M5-60 (mm)	19.600	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40


PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	30	+0%	100/15	Summer			132.657
S1.001	S2	15 Winter	30	+0%	100/15	Summer			131.591
S1.002	S3	15 Winter	30	+0%					130.775


  


PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.043	0.000	0.84		28.4	OK	
S1.001	S2	-0.009	0.000	1.00		71.8	OK	
S1.002	S3	-0.167	0.000	0.59		103.9	OK	


  


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Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000									
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Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440									
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Climate Change (%) 0, 0, 40									


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Micro Drainage	Network 2017.1.2	

Rainfall Hyetograph for 15 minute 100 year Winter I+40%  
for Pipe S1.001 (Storm)

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
1	32.170	4	77.400	7	288.499	10	202.700	13	61.143
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Derby DE1 3TQ			
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File P18-038 JKM SW NW4.MDX	Checked by		
Micro Drainage	Network 2017.1.2		

### 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)	19.600	Add Flow / Climate Change (%)	40
Ratio R	0.400	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)
0-4	0.288	4-8	0.071

Total Area Contributing (ha) = 0.359


Total Pipe Volume (m³) = 7.521

#### 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	11.599	0.069	167.0	0.134	5.00	0.0	0.600	o	300	Pipe/Conduit	
S1.001	50.483	1.006	50.2	0.117	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.002	21.313	0.780	27.3	0.091	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	23.000	1.129	20.4	0.017	0.00	0.0	0.600	o	300	Pipe/Conduit	


#### Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.16	135.700	0.134	0.0	0.0	7.3	1.21	85.8	25.4
S1.001	50.00	5.54	135.631	0.251	0.0	0.0	13.6	2.22	157.3	47.6
S1.002	50.00	5.66	134.625	0.342	0.0	0.0	18.5	3.02	213.4	64.8
S1.003	50.00	5.76	133.845	0.359	0.0	0.0	19.4	3.50	247.3	68.1

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St James House	St Mary's Wharf	P18-038 JKM	
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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	137.755	2.055	Open Manhole	1200	S1.000	135.700	300				
S2	137.980	2.349	Open Manhole	1200	S1.001	135.631	300	S1.000	135.631	300	
S3	136.125	1.500	Open Manhole	1200	S1.002	134.625	300	S1.001	134.625	300	
S4	135.345	1.500	Open Manhole	1200	S1.003	133.845	300	S1.002	133.845	300	
S	134.716	2.000	Open Manhole	0		OUTFALL		S1.003	132.716	300	

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Micro Drainage		Network 2017.1.2

### PIPELINE SCHEDULES for Storm

#### Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	300	S1	137.755	135.700	1.755	Open Manhole	1200
S1.001	o	300	S2	137.980	135.631	2.049	Open Manhole	1200
S1.002	o	300	S3	136.125	134.625	1.200	Open Manhole	1200
S1.003	o	300	S4	135.345	133.845	1.200	Open Manhole	1200

#### Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	11.599	167.0	S2	137.980	135.631	2.049	Open Manhole	1200
S1.001	50.483	50.2	S3	136.125	134.625	1.200	Open Manhole	1200
S1.002	21.313	27.3	S4	135.345	133.845	1.200	Open Manhole	1200
S1.003	23.000	20.4	S	134.716	132.716	1.700	Open Manhole	0

#### 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)
S1.003	S	134.716	132.716	0.000	0	0


#### 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 Coefficient	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)	19.600	Storm Duration (mins)	30
Ratio R	0.400		

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Micro Drainage			Network 2017.1.2				

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m <sup>3</sup> /ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	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	0.400
Region England and Wales Cv (Summer)			0.750
M5-60 (mm)	19.600	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40


PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	1	+0%	100/15	Summer			135.808
S1.001	S2	15 Winter	1	+0%	100/15	Summer			135.725
S1.002	S3	15 Winter	1	+0%	100/15	Summer			134.721
S1.003	S4	15 Winter	1	+0%					133.936


  

PN	US/MH Name	Depth (m)	Volume (m <sup>3</sup> )	Surcharged		Flooded		Pipe Flow (l/s)	Level Exceeded
				Flow / Cap.	Overflow (l/s)	Flow (l/s)	Overflow (l/s)		
S1.000	S1	-0.192	0.000	0.28		18.2	OK		
S1.001	S2	-0.206	0.000	0.21		31.5	OK		
S1.002	S3	-0.203	0.000	0.22		42.1	OK		
S1.003	S4	-0.209	0.000	0.20		44.1	OK		


  


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<u>Synthetic Rainfall Details</u> Rainfall Model    FSR    Ratio R 0.400 Region England and Wales Cv (Summer) 0.750 M5-60 (mm)    19.600 Cv (Winter) 0.840  Margin for Flood Risk Warning (mm)    300.0 Analysis Timestep 2.5 Second Increment (Extended) DTS Status    OFF DVD Status    OFF Inertia Status    OFF																																																									
Profile(s)    Summer and Winter Duration(s) (mins)    15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440 Return Period(s) (years)    1, 30, 100 Climate Change (%)    0, 0, 40																																																									
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Micro Drainage	Network 2017.1.2		

### 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)	19.500	Add Flow / Climate Change (%)	40
Ratio R	0.400	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)
0-4	0.389	4-8	0.064

Total Area Contributing (ha) = 0.453


Total Pipe Volume (m³) = 5.408

#### 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	41.000	1.115	36.8	0.128	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.001	31.008	0.940	33.0	0.124	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	22.292	0.670	33.3	0.079	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	13.708	0.614	22.3	0.122	0.00	0.0	0.600	o	300	Pipe/Conduit	


#### Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.32	136.500	0.128	0.0	0.0	6.9	2.16	86.1	24.3
S1.001	50.00	5.54	135.385	0.252	0.0	0.0	13.6	2.29	90.9	47.8
S1.002	50.00	5.68	134.370	0.331	0.0	0.0	17.9	2.74	193.3	62.8
S1.003	50.00	5.75	133.700	0.453	0.0	0.0	24.5	3.34	236.2	85.9

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	138.100	1.600	Open Manhole	1200	S1.000	136.500	225				
S2	136.810	1.425	Open Manhole	1200	S1.001	135.385	225	S1.000	135.385	225	
S3	135.870	1.500	Open Manhole	1200	S1.002	134.370	300	S1.001	134.445	225	
S4	135.200	1.500	Open Manhole	1200	S1.003	133.700	300	S1.002	133.700	300	
S	135.133	2.047	Open Manhole	0		OUTFALL		S1.003	133.086	300	

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### PIPELINE SCHEDULES for Storm

#### Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	225	S1	138.100	136.500	1.375	Open Manhole	1200
S1.001	o	225	S2	136.810	135.385	1.200	Open Manhole	1200
S1.002	o	300	S3	135.870	134.370	1.200	Open Manhole	1200
S1.003	o	300	S4	135.200	133.700	1.200	Open Manhole	1200

#### Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	41.000	36.8	S2	136.810	135.385	1.200	Open Manhole	1200
S1.001	31.008	33.0	S3	135.870	134.445	1.200	Open Manhole	1200
S1.002	22.292	33.3	S4	135.200	133.700	1.200	Open Manhole	1200
S1.003	13.708	22.3	S	135.133	133.086	1.747	Open Manhole	0

#### 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)
S1.003	S	135.133	133.086	0.000	0	0


#### 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 Coefficient	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)	19.500	Storm Duration (mins)	30
Ratio R	0.400		

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Micro Drainage Network 2017.1.2		

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m <sup>3</sup> /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	0.400
Region England and Wales	Cv (Summer)		0.750
M5-60 (mm)	19.500	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1	15 Winter	1	+0%	100/15 Summer			
S1.001	S2	15 Winter	1	+0%	100/15 Summer	100/15 Winter		
S1.002	S3	15 Winter	1	+0%	100/15 Summer			
S1.003	S4	15 Winter	1	+0%	100/15 Summer			


  


PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m <sup>3</sup> )	Flow / Overflow Cap. (l/s)	Pipe Flow (l/s)	Status	Level
								Exceeded
S1.000	S1	136.570	-0.155	0.000	0.21	17.1	OK	
S1.001	S2	135.480	-0.130	0.000	0.37	31.3	OK	1
S1.002	S3	134.470	-0.200	0.000	0.24	40.5	OK	
S1.003	S4	133.808	-0.192	0.000	0.28	54.5	OK	


  


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Micro Drainage		Network 2017.1.2	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000  
Hot Start (mins) 0 MADD Factor \* 10m<sup>3</sup>/ha Storage 2.000  
Hot Start Level (mm) 0 Inlet Coefficient 0.800  
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000  
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 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 0.400  
Region England and Wales Cv (Summer) 0.750  
M5-60 (mm) 19.500 Cv (Winter) 0.840


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


Profile(s) Summer and Winter  
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,  
720, 960, 1440  
Return Period(s) (years) 1, 30, 100  
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1	15 Winter	30	+0%	100/15 Summer			
S1.001	S2	15 Winter	30	+0%	100/15 Summer	100/15 Winter		
S1.002	S3	15 Winter	30	+0%	100/15 Summer			
S1.003	S4	15 Winter	30	+0%	100/15 Summer			


PN	US/MH Name	Water		Surcharged		Flooded		Pipe		Level Exceeded
		Level (m)	Depth (m)	Volume (m <sup>3</sup> )	Flow / Cap.	Flow (l/s)	Status			
S1.000	S1	136.616	-0.109	0.000	0.51	42.0	OK			
S1.001	S2	135.582	-0.028	0.000	1.00	84.8	OK	1		
S1.002	S3	134.549	-0.121	0.000	0.66	112.7	OK			
S1.003	S4	133.904	-0.096	0.000	0.80	155.5	OK			

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<p><u>Rainfall Hyetograph for 15 minute 30 year Winter I+0%</u> <u>for Pipe S1.003 (Storm)</u></p> <table><tr><td><b>Time</b> <b>(mins)</b></td><td><b>Rain</b> <b>(mm/hr)</b></td><td><b>Time</b> <b>(mins)</b></td><td><b>Rain</b> <b>(mm/hr)</b></td><td><b>Time</b> <b>(mins)</b></td><td><b>Rain</b> <b>(mm/hr)</b></td><td><b>Time</b> <b>(mins)</b></td><td><b>Rain</b> <b>(mm/hr)</b></td><td><b>Time</b> <b>(mins)</b></td><td><b>Rain</b> <b>(mm/hr)</b></td></tr><tr><td>1</td><td>17.623</td><td>4</td><td>42.400</td><td>7</td><td>158.041</td><td>10</td><td>111.040</td><td>13</td><td>33.494</td></tr><tr><td>2</td><td>32.159</td><td>5</td><td>68.630</td><td>8</td><td>183.576</td><td>11</td><td>68.630</td><td>14</td><td>32.159</td></tr><tr><td>3</td><td>33.494</td><td>6</td><td>111.040</td><td>9</td><td>158.041</td><td>12</td><td>42.400</td><td>15</td><td>17.623</td></tr></table>				<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>	<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>	<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>	<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>	<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>	1	17.623	4	42.400	7	158.041	10	111.040	13	33.494	2	32.159	5	68.630	8	183.576	11	68.630	14	32.159	3	33.494	6	111.040	9	158.041	12	42.400	15	17.623
<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>	<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>	<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>	<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>	<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>																																		
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3	33.494	6	111.040	9	158.041	12	42.400	15	17.623																																		
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Rodgers Leask Limited		Page 15
St James House St Mary's Wharf Mansfield Road Derby DE1 3TQ	P18-038 JKM SW NW5	
Date 24/01/2019 File P18-038 JKM SW NW5.MDX	Designed by Celeste Dauncey Checked by	
Micro Drainage	Network 2017.1.2	

Rainfall Hyetograph for 15 minute 100 year Winter I+40%  
for Pipe S1.000 (Storm)

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
1	31.990	4	76.967	7	286.885	10	201.566	13	60.801
2	58.377	5	124.582	8	333.239	11	124.582	14	58.377
3	60.801	6	201.566	9	286.885	12	76.967	15	31.990

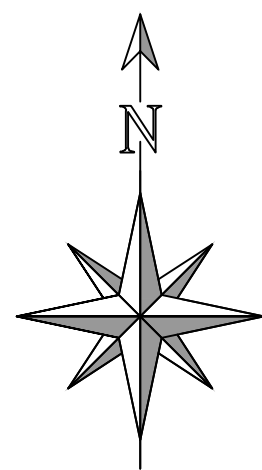
Rodgers Leask Limited				Page 16																																									
St James House St Mary's Wharf		P18-038 JKM																																											
Mansfield Road		SW NW5																																											
Derby DE1 3TQ																																													
Date 24/01/2019		Designed by Celeste Dauncey																																											
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Micro Drainage		Network 2017.1.2																																											
<p><u>Rainfall Hyetograph for 15 minute 100 year Winter I+40%</u> <u>for Pipe S1.001 (Storm)</u></p> <table><tr><td><b>Time</b> <b>(mins)</b></td><td><b>Rain</b> <b>(mm/hr)</b></td><td><b>Time</b> <b>(mins)</b></td><td><b>Rain</b> <b>(mm/hr)</b></td><td><b>Time</b> <b>(mins)</b></td><td><b>Rain</b> <b>(mm/hr)</b></td><td><b>Time</b> <b>(mins)</b></td><td><b>Rain</b> <b>(mm/hr)</b></td><td><b>Time</b> <b>(mins)</b></td><td><b>Rain</b> <b>(mm/hr)</b></td></tr><tr><td>1</td><td>31.990</td><td>4</td><td>76.967</td><td>7</td><td>286.885</td><td>10</td><td>201.566</td><td>13</td><td>60.801</td></tr><tr><td>2</td><td>58.377</td><td>5</td><td>124.582</td><td>8</td><td>333.239</td><td>11</td><td>124.582</td><td>14</td><td>58.377</td></tr><tr><td>3</td><td>60.801</td><td>6</td><td>201.566</td><td>9</td><td>286.885</td><td>12</td><td>76.967</td><td>15</td><td>31.990</td></tr></table>						<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>	<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>	<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>	<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>	<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>	1	31.990	4	76.967	7	286.885	10	201.566	13	60.801	2	58.377	5	124.582	8	333.239	11	124.582	14	58.377	3	60.801	6	201.566	9	286.885	12	76.967	15	31.990
<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>	<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>	<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>	<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>	<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>																																				
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Rodgers Leask Limited				Page 17																																									
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Derby DE1 3TQ																																													
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Micro Drainage		Network 2017.1.2																																											
<p><u>Rainfall Hyetograph for 15 minute 100 year Winter I+40%</u> <u>for Pipe S1.002 (Storm)</u></p> <table><tr><td><b>Time</b> <b>(mins)</b></td><td><b>Rain</b> <b>(mm/hr)</b></td><td><b>Time</b> <b>(mins)</b></td><td><b>Rain</b> <b>(mm/hr)</b></td><td><b>Time</b> <b>(mins)</b></td><td><b>Rain</b> <b>(mm/hr)</b></td><td><b>Time</b> <b>(mins)</b></td><td><b>Rain</b> <b>(mm/hr)</b></td><td><b>Time</b> <b>(mins)</b></td><td><b>Rain</b> <b>(mm/hr)</b></td></tr><tr><td>1</td><td>31.990</td><td>4</td><td>76.967</td><td>7</td><td>286.885</td><td>10</td><td>201.566</td><td>13</td><td>60.801</td></tr><tr><td>2</td><td>58.377</td><td>5</td><td>124.582</td><td>8</td><td>333.239</td><td>11</td><td>124.582</td><td>14</td><td>58.377</td></tr><tr><td>3</td><td>60.801</td><td>6</td><td>201.566</td><td>9</td><td>286.885</td><td>12</td><td>76.967</td><td>15</td><td>31.990</td></tr></table>						<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>	<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>	<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>	<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>	<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>	1	31.990	4	76.967	7	286.885	10	201.566	13	60.801	2	58.377	5	124.582	8	333.239	11	124.582	14	58.377	3	60.801	6	201.566	9	286.885	12	76.967	15	31.990
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St James House St Mary's Wharf		P18-038 JKM																																											
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<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>	<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>	<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>	<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>	<b>Time</b> <b>(mins)</b>	<b>Rain</b> <b>(mm/hr)</b>																																				
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## Appendix C – Road and Sewer General Arrangement Drawing





General Notes

1. Do not scale this drawing. If in doubt, ask.
2. This drawing is to be read in conjunction with all other relevant Engineers, Architects and specialist design drawings and details.
3. All dimensions are in metres unless noted otherwise. All levels are in metres unless noted otherwise.
4. This drawing is for Reserved Matters purposes and all information displayed is subject to detailed design.
5. Roads based on 1:20 max gradients.
6. Based on Topographical Survey by Greenhatch 22639 Rev 15 and 29037 PL-03 Planning Layout.
7. Only adoptable drainage shown.
8. Levels based on RACE Engineering Drawing for main spine road and ditch.

Key

- Surface Water Pipe
- Foul Water Pipe
- Indicative Surface Water Pipe (Provided by others)
- Indicative Foul Water Pipe (Provided by others)
- Highway Drainage
- Indicative Easement
- Forward Visibility (17m unless stated otherwise)
- Site Boundary
- FFL 130.00 Finished Floor Levels (±600mm)
- SSL 130.00 Solid Slab Levels (±600mm)
- Indicative Rain Garden

Rev	Date	Amendments	By	Chk
B	24.01.19	Layout updated to '29037 PL-03 Planning Layout'.	CGD	ML
A	18.01.19	Updated layout to Rev S. Drainage checked.	CGD	LP



Client

CREST NICHOLSON

Project

BLYTHE VALLEY PARK  
PARCEL JKM

Drawing Title

ROAD & SEWER GA  
RM

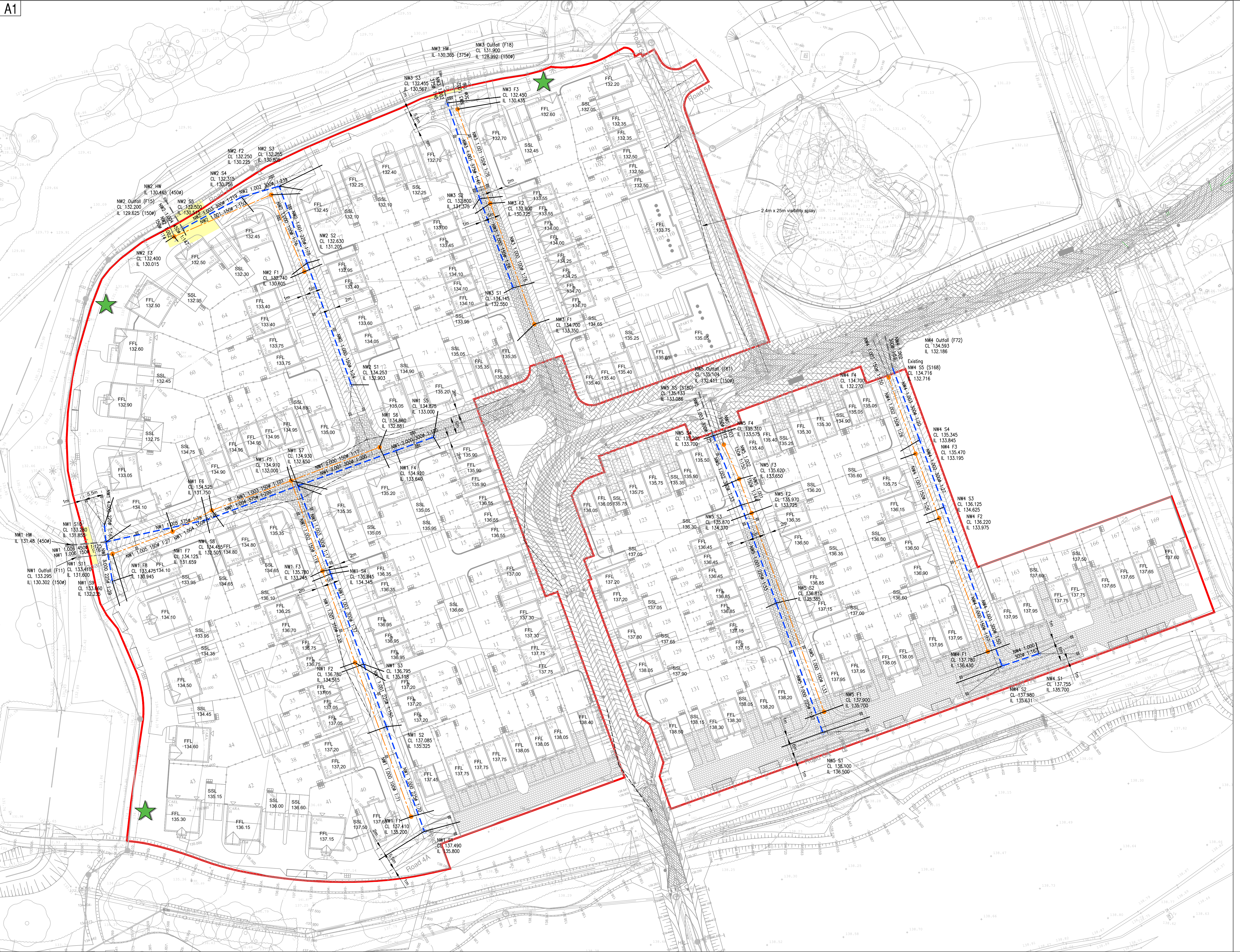
Status

FOR APPROVAL

Scale	Drawn	Checked	Date
A1@1:500	CGD	ML	17.01.19


Drawing No.	Rev.
18038-RL-18-XX-M2-C-606	B

Scale Bar:  
1:500  
0 10 20 30  
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## Appendix D – Foul Water MicroDrainage Calculations

Rodgers Leask Limited		Page 1
St James House St Mary's Wharf Mansfield Road Derby DE1 3TQ	P18-038 BVP JKM FW NW1	
Date 24/01/2019 File P18-038 JKM FW NW1.MDX	Designed by CGD Checked by	
Micro Drainage	Network 2017.1.2	

### FOUL SEWERAGE DESIGN









#### Design Criteria for Foul - Main

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	0
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.000
Flow Per Person (l/per/day)	222.00	Maximum Backdrop Height (m)	0.000
Persons per House	3.00	Min Design Depth for Optimisation (m)	1.200
Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	0.75
Domestic Peak Flow Factor	6.00	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits


#### Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.000	48.906	0.685	71.4	0.000	9	0.0	1.500	o	100	Pipe/Conduit	
F1.001	28.996	0.770	37.7	0.000	14	0.0	1.500	o	150	Pipe/Conduit	
F1.002	28.515	1.745	16.3	0.000	9	0.0	1.500	o	150	Pipe/Conduit	
F2.000	28.187	1.640	17.2	0.000	11	0.0	1.500	o	150	Pipe/Conduit	
F1.003	25.250	0.250	101.0	0.000	4	0.0	1.500	o	150	Pipe/Conduit	
F1.004	13.303	0.091	146.2	0.000	6	0.0	1.500	o	150	Pipe/Conduit	
F1.005	19.095	0.714	26.7	0.000	1	0.0	1.500	o	150	Pipe/Conduit	
F1.006	10.306	0.643	16.0	0.000	7	0.0	1.500	o	150	Pipe/Conduit	

#### Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.000	135.200	0.000	0.0	9	0.0	18	0.44	0.79	6.2	0.4
F1.001	134.465	0.000	0.0	23	0.0	21	0.70	1.43	25.3	1.1
F1.002	133.695	0.000	0.0	32	0.0	20	1.03	2.17	38.4	1.5
F2.000	133.640	0.000	0.0	11	0.0	13	0.72	2.12	37.5	0.5
F1.003	131.950	0.000	0.0	47	0.0	38	0.61	0.87	15.4	2.2
F1.004	131.700	0.000	0.0	53	0.0	45	0.56	0.72	12.8	2.5
F1.005	131.609	0.000	0.0	54	0.0	29	1.02	1.70	30.0	2.5
F1.006	130.895	0.000	0.0	61	0.0	28	1.27	2.20	38.8	2.8



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St James House Mansfield Road Derby DE1 3TQ	P18-038 BVP JKM FW NW2	
Date 24/01/2019 File P18-038 JKM FW NW2.MDX	Designed by CGD Checked by	
Micro Drainage	Network 2017.1.2	

### FOUL SEWERAGE DESIGN




#### Design Criteria for Foul - Main

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	0
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.000
Flow Per Person (l/per/day)	222.00	Maximum Backdrop Height (m)	0.000
Persons per House	3.00	Min Design Depth for Optimisation (m)	1.200
Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	0.75
Domestic Peak Flow Factor	6.00	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

#### Network Design Table for Foul - Main


PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.000	25.000	0.330	75.8	0.000	8	0.0	1.500	o	100	Pipe/Conduit	
F1.001	31.486	0.210	149.9	0.000	4	0.0	1.500	o	150	Pipe/Conduit	
F1.002	5.595	0.390	14.3	0.000	6	0.0	1.500	o	150	Pipe/Conduit	

#### Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse (l/s)	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.000	130.605	0.000	0.0	8	0.0	17	0.41	0.76	6.0	0.4
F1.001	130.225	0.000	0.0	12	0.0	22	0.35	0.71	12.6	0.6
F1.002	130.015	0.000	0.0	18	0.0	15	0.90	2.32	41.0	0.8

#### Free Flowing Outfall Details for Foul - Main

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
F1.002	F	132.200	129.625	0.000	0	0

Rodgers Leask Limited			Page 1
St James House	St Mary's Wharf	P18-038 BVP JKM	
Mansfield Road		FW NW3	
Derby DE1 3TQ			
Date 24/01/2019		Designed by CGD	
File P18-038 JKM FW NW3.MDX		Checked by	
Micro Drainage		Network 2017.1.2	

### FOUL SEWERAGE DESIGN




#### Design Criteria for Foul - Main

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	0
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.000
Flow Per Person (l/per/day)	222.00	Maximum Backdrop Height (m)	0.000
Persons per House	3.00	Min Design Depth for Optimisation (m)	1.200
Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	0.75
Domestic Peak Flow Factor	6.00	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

#### Network Design Table for Foul - Main


PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.000	38.358	2.575	14.9	0.000	6	0.0	1.500	o	100	Pipe/Conduit	
F1.001	29.735	0.290	102.5	0.000	11	0.0	1.500	o	150	Pipe/Conduit	
F1.002	8.000	1.443	5.5	0.000	3	0.0	1.500	o	150	Pipe/Conduit	

#### Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse (l/s)	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.000	133.350	0.000	0.0	6	0.0	10	0.66	1.73	13.6	0.3
F1.001	130.725	0.000	0.0	17	0.0	23	0.45	0.86	15.3	0.8
F1.002	130.435	0.000	0.0	20	0.0	13	1.29	3.74	66.0	0.9

#### Free Flowing Outfall Details for Foul - Main

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
F1.002	F	131.900	128.992	0.000	0	0

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St James House Mansfield Road Derby DE1 3TQ	P18-038 BVP JKM FW NW4	
Date 24/01/2019 File P18-038 JKM FW NW4.MDX	Designed by CGD Checked by	
Micro Drainage	Network 2017.1.2	

### FOUL SEWERAGE DESIGN





#### Design Criteria for Foul - Main

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	0
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.000
Flow Per Person (l/per/day)	222.00	Maximum Backdrop Height (m)	0.000
Persons per House	3.00	Min Design Depth for Optimisation (m)	1.200
Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	0.75
Domestic Peak Flow Factor	6.00	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

#### Network Design Table for Foul - Main


PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.000	42.400	2.455	17.3	0.000	11	0.0	1.500	o	150	Pipe/Conduit	
F1.001	20.497	0.780	26.3	0.000	2	0.0	1.500	o	150	Pipe/Conduit	
F1.002	24.126	0.925	26.1	0.000	2	0.0	1.500	o	150	Pipe/Conduit	
F1.003	12.027	0.084	143.2	0.000	0	0.0	1.500	o	150	Pipe/Conduit	

#### Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.000	136.430	0.000	0.0	11	0.0	13	0.72	2.11	37.4	0.5
F1.001	133.975	0.000	0.0	13	0.0	15	0.66	1.71	30.3	0.6
F1.002	133.195	0.000	0.0	15	0.0	16	0.69	1.72	30.4	0.7
F1.003	132.270	0.000	0.0	15	0.0	24	0.38	0.73	12.9	0.7

#### Free Flowing Outfall Details for Foul - Main

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
F1.003	F	134.593	132.186	0.000	0	0

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St James House	St Mary's Wharf	P18-038 BVP JKM	
Mansfield Road		FW NW5	
Derby DE1 3TQ			
Date 24/01/2019		Designed by CGD	
File P18-038 JKM FW NW5.MDX		Checked by	
Micro Drainage		Network 2017.1.2	

### FOUL SEWERAGE DESIGN





#### Design Criteria for Foul - Main

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	0
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.000
Flow Per Person (l/per/day)	222.00	Maximum Backdrop Height (m)	0.000
Persons per House	3.00	Min Design Depth for Optimisation (m)	1.200
Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	0.75
Domestic Peak Flow Factor	6.00	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

#### Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.000	63.096	1.925	32.8	0.000	8	0.0	1.500	o	100	Pipe/Conduit	
F1.001	10.814	0.075	144.2	0.000	15	0.0	1.500	o	150	Pipe/Conduit	
F1.002	11.238	0.075	149.8	0.000	12	0.0	1.500	o	150	Pipe/Conduit	
F1.003	14.000	1.164	12.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	

#### Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.000	135.700	0.000	0.0	8	0.0	14	0.55	1.17	9.2	0.4
F1.001	133.725	0.000	0.0	23	0.0	29	0.44	0.73	12.9	1.1
F1.002	133.650	0.000	0.0	35	0.0	36	0.49	0.71	12.6	1.6
F1.003	133.575	0.000	0.0	35	0.0	20	1.18	2.54	44.8	1.6

#### Free Flowing Outfall Details for Foul - Main

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
F1.003	F	0.000	132.411	0.000	0	0



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