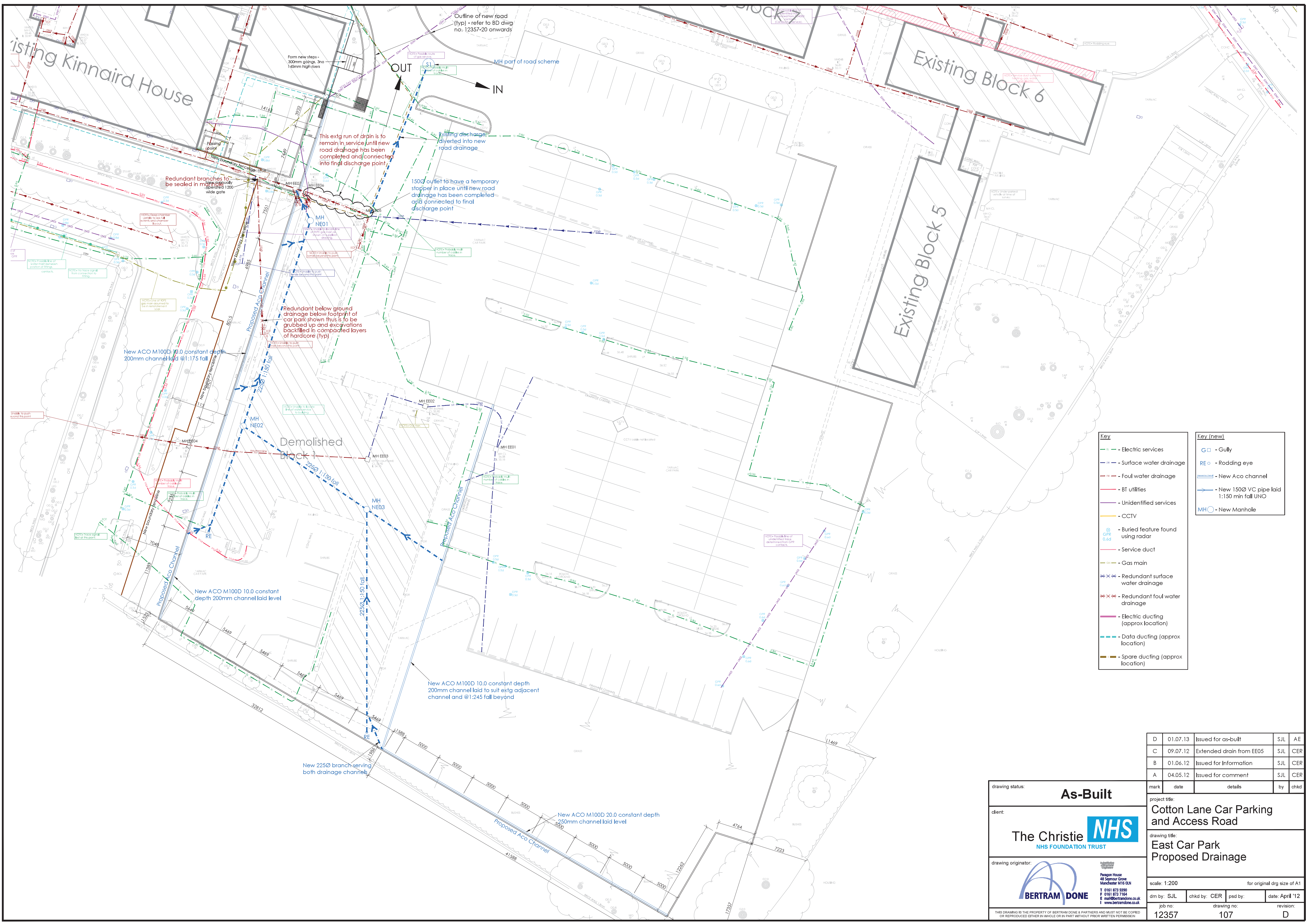




Key

- Electric services
- Surface water drainage
- Foul water drainage
- BT utilities
- Unidentified services
- CCTV
- Buried feature found using radar
- Service duct
- Gas main
- Redundant surface water drainage
- Redundant foul water drainage
- Electric ducting (approx location)
- Data ducting (approx location)
- Spare ducting (approx location)

Key (new)

- Gully
- Rodding eye
- New Aco channel
- New 150Ø VC pipe laid 1:150 min fall UNO
- New Manhole

drawing status:	As-Built	project title:		Cotton Lane Car Parking and Access Road	
client:	The Christie NHS FOUNDATION TRUST	drawing title:		East Car Park Proposed Drainage	
drawing originator:	BERTRAM DONE	scale: 1:200		for original drg size of A1	
THIS DRAWING IS THE PROPERTY OF BERTRAM DONE & PARTNERS AND MUST NOT BE COPIED OR REPRODUCED EITHER IN WHOLE OR IN PART WITHOUT PRIOR WRITTEN PERMISSION.		dm by: SJL	chkd by: CER	psd by:	date: April '12
		job no: 12357	drawing no: 107	revision: D	

D	01.07.13	Issued for as-built	SJL	AE
C	09.07.12	Extended drain from EE05	SJL	CER
B	01.06.12	Issued for Information	SJL	CER
A	04.05.12	Issued for comment	SJL	CER

Appendix G GRM Soakaway Test Results



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Web: www.grm-uk.com

Our Ref: GRM/P9324/SALR.1
Date: 15th April 2021

Paul Layton
AJP
1 Dale Street
Liverpool
L2 2ET

Dear Paul,

RE: Soakaway Testing at Christie Hospital, Manchester

Further to your instruction GRM have attended the above site between 22nd March and 24th March 2021 to carry out soakaway testing in general accordance with BRE 365 methodology.

This investigation took the form of the excavation of exploratory trial pits with subsequent infiltration testing. Soakaway testing was carried out in the trial pits to assess the overall suitability of the ground for use as soakaway drainage. The test pits were positioned by the Client in the south eastern area of the site. An exploratory hole location plan and logs for the Soakaway Pits are presented in Appendix A and B, respectively.

Although only two soakaway pits were requested, due to the low permeability strata identified in soakaway pits SA01 and SA02 an additional pit, SA03 was excavated to target the deeper underlying Wilmslow Sandstone Formation.

Ground Conditions

The trial pits were advanced to depths ranging between 1.5m and 2.2m below existing ground level (begl). Tarmac was encountered in all pits from surface to 0.15m begl. Made ground comprised of loose, brown and grey sandy GRAVEL and was encountered below the tarmac to depths ranging between 0.4m and 0.55m begl.

Glacial deposits were encountered below the made ground and consisted of firm to stiff, medium to high strength, brown and light grey silty sandy slightly gravelly CLAY in SA01. A thin layer (up to 0.4m thick) of loose fine to coarse sand between the made ground and clay strata was encountered in SA02 and SA03. Medium dense sand of the Wilmslow Sandstone Formation was encountered below the Glacial Till strata in SA03 from a depth of 1.8m begl.



Land Appraisal | Environmental | Geotechnical | Design | Mining | Inspections

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The sidewalls of the trial pits were stable during excavation and were shored up with soakaway crates prior to the tests.

A summary of infiltration in the two initial pits are presented in the table below:

Soakaway Pit reference	Calculated Infiltration Rate (m/s)
	Test 1
SA01	Dropped 0.18m over 24 hours
SA02	Dropped 0.24m over 24 hours

Infiltration rates were unable to be calculated due to the poor permeability of the strata. The third test pit, SA03, recorded a drop of 0.15m in 1.5 hours. However due to time constraints was not fully completed.

Overall, the testing undertaken to date suggests that the ground and infiltration rates at the proposed locations are unlikely to be sufficient for the currently proposed soakaway drainage scheme. However, the final assessment should be undertaken by the project's drainage engineer.

I trust that the above is sufficient for your current purposes, however if you have any queries please do not hesitate to contact us.

Yours sincerely

Russell Hurcombe
MGeoSci (Hons) FGS
Senior Engineering Geologist

Legend

- Site Boundary
- Proposed Structure

Exploratory Holes

- Soakaway Pit
- Rotary Openhole Borehole
- Rotary Cored Borehole



NOTES:

CLIENT: The Alan Johnston Partnership

PROJECT: Christie Car Park, Wilmslow Road, Manchester

TITLE: Exploratory Hole Location Plan

PROJECT No: P9324

DATE: April 2021

DESIGN/DRAWN: RDH

DRAWING NUMBER: 1

ISSUE: RDH

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GRM
GRM Development Solutions Ltd
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Trial Pit Log

Trial Pit No
SA02
Sheet 1 of 1

Site Name: Christie Hospital Carpark, Manchester

Ground Level (mAOD)
36.60

Client: AJP

GRM Project Ref: P9324

Coordinates
385198 E
392405 N

Water Stake	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES		0.15	36.45		Black TARIMACADAM. MADE GROUND	
	0.50	D		0.40	36.20		Loose, brownish-grey, very sandy GRAVEL with medium cobble content. Gravel is fine to coarse, angular to subangular brick and concrete. Sand is fine to coarse. Cobbles are angular to subangular brick and concrete. MADE GROUND	
	1.00	D		0.80	35.80		Medium dense, orangish-brown, slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular sandstone GLACIAL DEPOSITS	
	1.00		HVP=108					
	1.00		HVP=108					
	1.00		HVP=112					
	1.50	D		1.50	35.10		Stiff, high strength, brown and grey, slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium, angular to subangular coal, sandstone and mudstone. GLACIAL DEPOSITS	1
	1.50		HVP=122					
	1.50		HVP=125					
	1.50		HVP=126					
							End of Pit at 1.50m	2
								3
								4

Date Excavated:	22/03/2021	Groundwater Observations:	
Date Backfilled:	23/03/2021	No groundwater encountered	
Shoring:	None		
Stability:	Minor sidewall instability from 0.15m to 0.40m		
Plant Used:	JCB 3CX	Trial Pit Dimensions (m):	Reason for termination of Trial Pit:
Logged by:	JB	0.70	Target depth achieved
		1.80	

General Remarks:



Trial Pit Log

Trial Pit No
SA03
Sheet 1 of 1

Site Name: Christie Hospital Carpark, Manchester

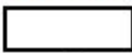
Ground Level (mAOD)
36.03

Client: AJP

GRM Project Ref: P9324

Coordinates
385166 E
392384 N

Water Stake	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.15	35.88		Black TARMACADAM. MADE GROUND	
				0.50	35.53		Loose, brown, very sandy GRAVEL with medium cobble content. Gravel is fine to coarse, angular to subangular brick and concrete. Sand is fine to coarse. Cobbles are angular to subangular brick and concrete. MADE GROUND	
				0.80	35.23		Loose to medium dense, brown and dark brown SAND. Sand is fine to coarse. GLACIAL DEPOSITS	
				1.80	34.23		Firm to stiff, medium to high strength, brown mottled grey and orangish-brown, slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium, angular to subangular sandstone and coal. GLACIAL DEPOSITS	1
				2.20	33.83		Medium dense, orangish-brown and light brown SAND. Sand is fine to coarse. WILMSLOW SANDSTONE FORMATION becoming gravelly at 2.0m. Gravel is fine to coarse, angular to subangular sandstone.	2
							End of Pit at 2.20m	3
								4

Date Excavated:	22/03/2021	Groundwater Observations:	No groundwater encountered
Date Backfilled:	23/03/2021		
Shoring:	None		
Stability:	Minor sidewall instability from 0.15m to 0.80m		
Plant Used:	JCB 3CX	Trial Pit Dimensions (m):	Reason for termination of Trial Pit:
Logged by:	JB	0.60 	Hard digging
		1.70	

General Remarks:

Appendix H Brownfield Runoff Calculations

The Alan Johnston Partnership		Page 1
1 Dale Street Liverpool L2 2ET		
Date 31/03/2020 23:27	Designed by johns	
File BROWNFIELD RUNOFF.MDX	Checked by	
XP Solutions	Network 2020.1	

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)	30	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.362	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.559	4-8	0.204

Total Area Contributing (ha) = 0.763

Total Pipe Volume (m³) = 3.313

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
1.000	10.000	0.067	150.0	0.763	5.00	0.0	0.600	o	375	Pipe/Conduit	
1.001	10.000	0.067	150.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.002	10.000	0.067	150.0	0.000	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)
1.000	50.00	5.11	35.500	0.763	0.0	0.0	0.0	1.48	163.1	103.3
1.001	50.00	5.23	35.433	0.763	0.0	0.0	0.0	1.48	163.1	103.3
1.002	50.00	5.34	35.367	0.763	0.0	0.0	0.0	1.48	163.1	103.3

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)
1.002		37.000	35.300	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 ³ /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 Offline Controls	0
Number of Online 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	Profile Type	Summer
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.362		

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.362 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, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 0

									Water	Surcharged	Flooded	
	US/MH			Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level	Depth	Volume
PN	Name	Storm		Period	Change	Surcharge	Flood	Overflow	Act.	(m)	(m)	(m³)
1.000	SW01	15	Winter	1	+0%	2/15	Winter			35.770	-0.105	0.000
1.001	SW02	15	Winter	1	+0%	30/15	Summer			35.702	-0.107	0.000
1.002	SW03	15	Winter	1	+0%	30/15	Summer			35.632	-0.110	0.000

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.362 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, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 0

	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water	Surcharged	Flooded
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	Level	Depth	Volume
									(m)	(m)	(m³)
1.000	SW01	15 Winter	2	+0%	2/15 Winter				35.882	0.007	0.000
1.001	SW02	15 Winter	2	+0%	30/15 Summer				35.806	-0.003	0.000
1.002	SW03	15 Winter	2	+0%	30/15 Summer				35.673	-0.069	0.000

	US/MH	Flow /	Half Drain	Pipe			
PN	Name	Cap.	(l/s)	Time	Flow	Status	Level
				(mins)	(l/s)		Exceeded
1.000	SW01	1.04			111.5	SURCHARGED	
1.001	SW02	1.00			107.5	OK	
1.002	SW03	1.00			107.2	OK	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.362 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, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)
1.000	SW01	15 Winter	30	+0%	2/15 Winter			36.473	0.598	0.000
1.001	SW02	15 Winter	30	+0%	30/15 Summer			36.197	0.389	0.000
1.002	SW03	15 Winter	30	+0%	30/15 Summer			35.925	0.183	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW01	1.88			201.2	SURCHARGED	
1.001	SW02	1.87			200.9	SURCHARGED	
1.002	SW03	1.88			201.9	SURCHARGED	

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.362 Cv (Winter) 0.840

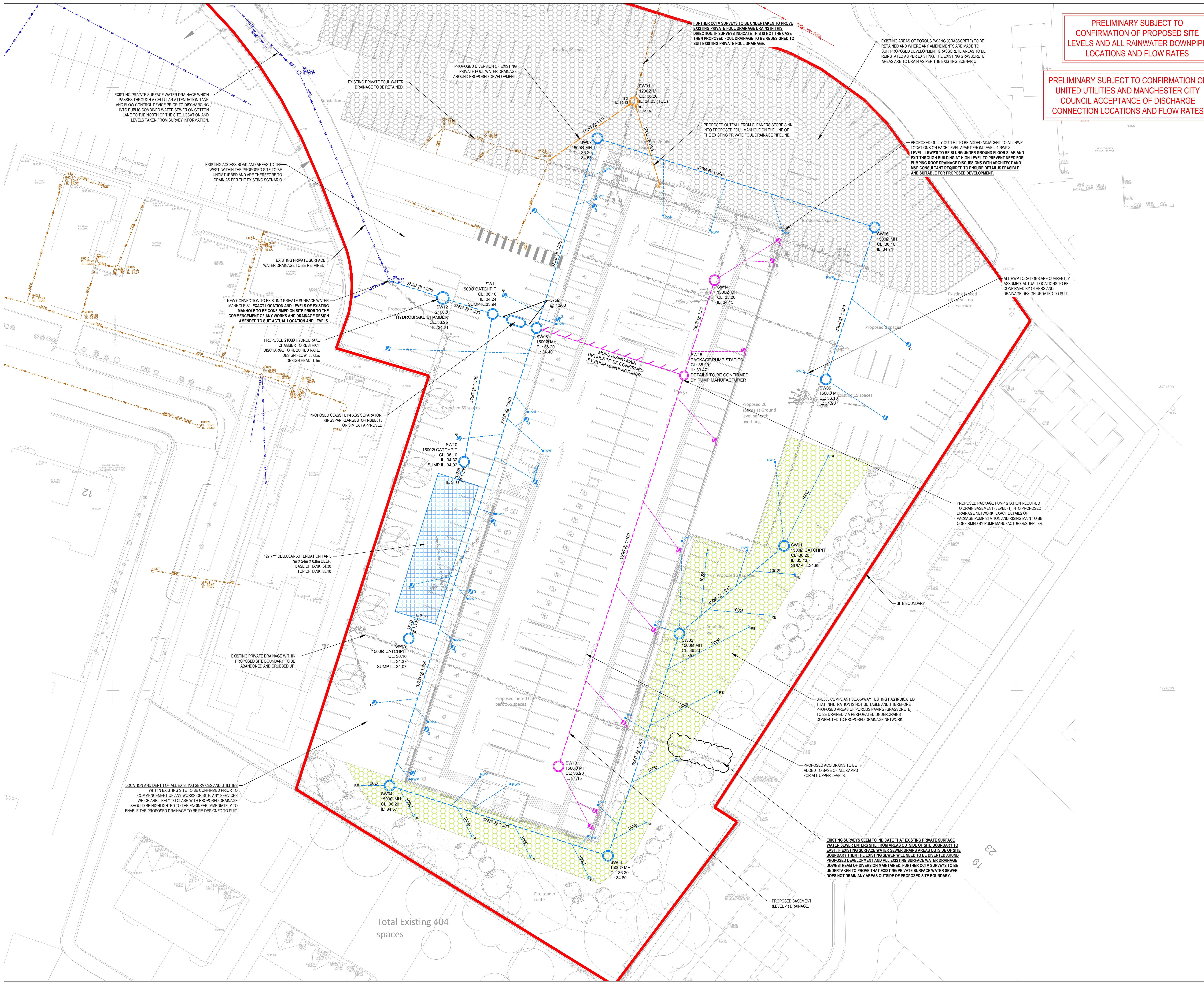
Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	SW01	15 Winter	100	+0%	2/15 Winter				36.932	1.057	0.000
1.001	SW02	15 Winter	100	+0%	30/15 Summer				36.499	0.690	0.000
1.002	SW03	15 Winter	100	+0%	30/15 Summer				36.074	0.332	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded		
1.000	SW01	2.34			250.9	FLOOD RISK			
1.001	SW02	2.36			252.5	SURCHARGED			
1.002	SW03	2.36			252.9	SURCHARGED			

Appendix I Drainage Strategy Drawing & Calculations



PRELIMINARY SUBJECT TO
CONFIRMATION OF PROPOSED SITE
LEVELS AND ALL RAINWATER DOWNPIPE
LOCATIONS AND FLOW RATES

PRELIMINARY SUBJECT TO CONFIRMATION OF
UNITED UTILITIES AND MANCHESTER CITY
COUNCIL ACCEPTANCE OF DISCHARGE
CONNECTION LOCATIONS AND FLOW RATES

- IMPORTANT NOTES**
- SETTING OUT SHALL BE UNDERTAKEN USING ONLY THE INFORMATION GIVEN DISTANCES SHOULD NOT BE SCALED FROM THIS DRAWING.
 - ALL SEWERS SHALL BE CONSTRUCTED IN ACCORDANCE WITH SEWERS FOR ADOPTION 7TH EDITION AND UNITED UTILITIES DETAILS & GUIDELINES.
 - THE MINIMUM GRAVITY PIPE DIAMETER UNDER ADOPTABLE HIGHWAYS SHALL BE 150mm.
 - IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY ALL INFORMATION GIVEN WITH REGARDS TO EXISTING SERVICES AND DRAINAGE CONNECTIONS ETC. PRIOR TO COMMENCING THE WORKS. THE RATES SHALL INCLUDE FOR HAND OIL AND ROADS SERVICES WHERE NECESSARY. THE CONTRACTOR SHALL ADHERE TO THE CON REGULATIONS AT ALL TIMES.
 - THE OUTSIDES OF ALL SEWERS SHALL BE A MINIMUM OF 1.0m FROM KERB LINES AND THE OUTSIDE OF MANHOLES SHALL BE A MINIMUM OF 0.5m FROM KERB LINES.
 - EXISTING FLOWS IN WATERCOURSES, SEWERS AND LAND DRAINS SHALL BE MAINTAINED AT ALL TIMES.
 - ONLY TRAINED PERSONNEL SHALL BE PERMITTED TO ENTER CONFINED SPACES.
 - ALL MATERIALS TO BEAR THE RELEVANT B.S. HYPERMARK AND COMPLY FULLY WITH THE SPECIFICATIONS. ALL CONCRETE & CONCRETE PRODUCTS MUST USE SULPHATE RESISTANT CEMENT (UNLESS THE SITE INVESTIGATION REPORT PROVES THAT SULPHATE ATTACK FROM SOILS AND GROUNDWATER WILL NOT OCCUR TO WITHSTAND A CLASS 3).
 - ALL OPENINGS ETC. AS REQUIRED UNDER HIGHWAYS ACTS ETC. ARE TO BE OBTAINED PRIOR TO COMMENCEMENT OF WORKS. ALL WORKS ARE TO BE INSPECTED BY I.A. INHS OR THE NETWORK OPERATOR AS APPLICABLE.
 - WHERE 'ULTRA RIF' UPVC PIPES (OR SIMILAR APPROVED) ARE USED IN ADOPTABLE DRAINAGE THEY SHALL STILL BE HANDLED AND LAD IN ACCORDANCE WITH THE SPECIFICATION AND GUIDANCE ISSUED BY THE HIGH PERFORMANCE PIPE ASSOCIATION.
 - A CLASS 3 BED AND SURROUND MUST BE USED FOR SUCH PIPES. TRENCH BACKFILL IN HIGHWAYS TO WITHIN 1M OF HIGHWAY SHALL AS DIRECTED BY THE HIGHWAY AUTHORITY BE A SUITABLE GRANULAR MATERIAL ALL IN ACCORDANCE WITH SEWERS FOR ADOPTION CL. 4.4.
 - SLAB LEVELS SHALL NOT BE VARIED WITHOUT REFERENCE TO THE ENGINEER FOR GUIDANCE.
 - DOMESTIC DRAINAGE SHALL BE TO BUILDING REGULATIONS APPROVED DOCUMENT H. 115mm U.P.V.C. PIPES LAD TO THE FOLLOWING MINIMUM FALLS UNLESS OTHERWISE SHOWN.

	FOUL	S.W.
HEAD RUN	1 IN 40	1 IN 60
ELSEWHERE	1 IN 80	1 IN 100
 - ALL GULLY CONNECTIONS TO BE 150mm VITRIFIED CLAY UNLESS NOTED OTHERWISE.
 - ALL MANHOLE COVERS TO BE RECESSED TO ACCEPT FINISH AS DETAILED BY LANDSCAPE ARCHITECT.
 - SLOW REST BENDS TO BE USED IN ALL LOCATIONS MADE UP FROM 2m. 45 DEG BENDS (800mm TO INVERT FROM FFL) EXTERNAL TRENCHES.
 - MANHOLE POSITIONS AND ACCESS COVERS TO BE ACCURATELY SET OUT BY LANDSCAPE ARCHITECT TO SUIT EXTERNAL TRENCHES.
 - ALL DRAINS CAST THROUGH FOUNDATIONS TO HAVE ROCKER PIPES ON BOTH SIDES OF FOUNDATION.
 - ALL POP UP POSITIONS TO BE CONFIRMED SET OUT DIMENSIONS TO BE AGREED & PROVIDED BY OTHERS.
 - ALL DISCHARGE RATES TO BE CONFIRMED BY M&E DESIGNER.
 - ALL SURFACE WATER COLLECTION FEATURES TO BE CONFIRMED BY THE LANDSCAPE ARCHITECT.
 - STORAGE HAS BEEN PROVIDED IN A CELLULAR STORAGE TANK AND U-SIZED MANHOLES AND PIPES.
 - EXISTING SEWER DEPTHS HAVE BEEN APPROXIMATED FROM LIMITED INFORMATION. NEW CONNECTIONS TO BE CONFIRMED PRIOR TO CONSTRUCTION OF ANY DRAINAGE WORKS.
 - LANDSCAPE ARCHITECT TO CONFIRM GULLY AND DRAINAGE CHANNEL LOCATIONS TO LANDSCAPED AREAS.
 - FOUL NETWORK TO BE CONFIRMED FOLLOWING CONFIRMATION OF BRANCH CONNECTION POINTS FROM BUILDING M&E DESIGNER.
 - CITY SURVEY OF EXISTING SITE DRAINAGE REQUIRED PRIOR TO THE COMMENCEMENT OF ANY WORKS STARTING ON SITE.

- LEGEND**
- PROPOSED SURFACE WATER MANHOLE
 - PROPOSED FOUL WATER MANHOLE
 - PROPOSED BASEMENT (LEVEL -1) SURFACE WATER MANHOLE
 - PROPOSED SURFACE WATER DRAINAGE
 - PROPOSED BASEMENT (LEVEL -1) SURFACE WATER DRAINAGE
 - PROPOSED FOUL WATER DRAINAGE
 - PROPOSED MORE RISING MAIN DETAILS TBC BY OTHERS
 - PROPOSED AREAS OF POROUS PAVING (GRASSCRETE)
 - PROPOSED PERFORATED UNDERDRAIN BELOW AREAS OF POROUS PAVING (GRASSCRETE)
 - PROPOSED LINEAR DRAINAGE CHANNEL
 - PROPOSED RAINWATER DOWNPIPE (ASSUMED LOCATIONS TBC)
 - PROPOSED FOUL STUB STACK (ASSUMED LOCATIONS TBC)
 - PROPOSED RODDING EYE
 - PROPOSED GULLY
 - EXISTING PRIVATE SURFACE WATER SEWER TO REMAIN
 - EXISTING PRIVATE FOUL WATER SEWER TO REMAIN
 - EXISTING PRIVATE DRAINAGE TO BE ABANDONED AND GRUBBED UP

NO.	16.06.2021	PRELIMINARY - UPDATED TO SUIT REVISED SITE LAYOUT & RWP LOCATIONS	JPS	PL	PL
NO.	01.04.2020	PRELIMINARY - FOR DISCHARGE OF PLANNING CONDITIONS ONLY	JPS	JAM	JAM
REV.	DATE	DESCRIPTION	BY	CHK	APP

DRAWING STATUS: **PRELIMINARY**

CLIENT: THE CHRISTIE NHS FOUNDATION TRUST

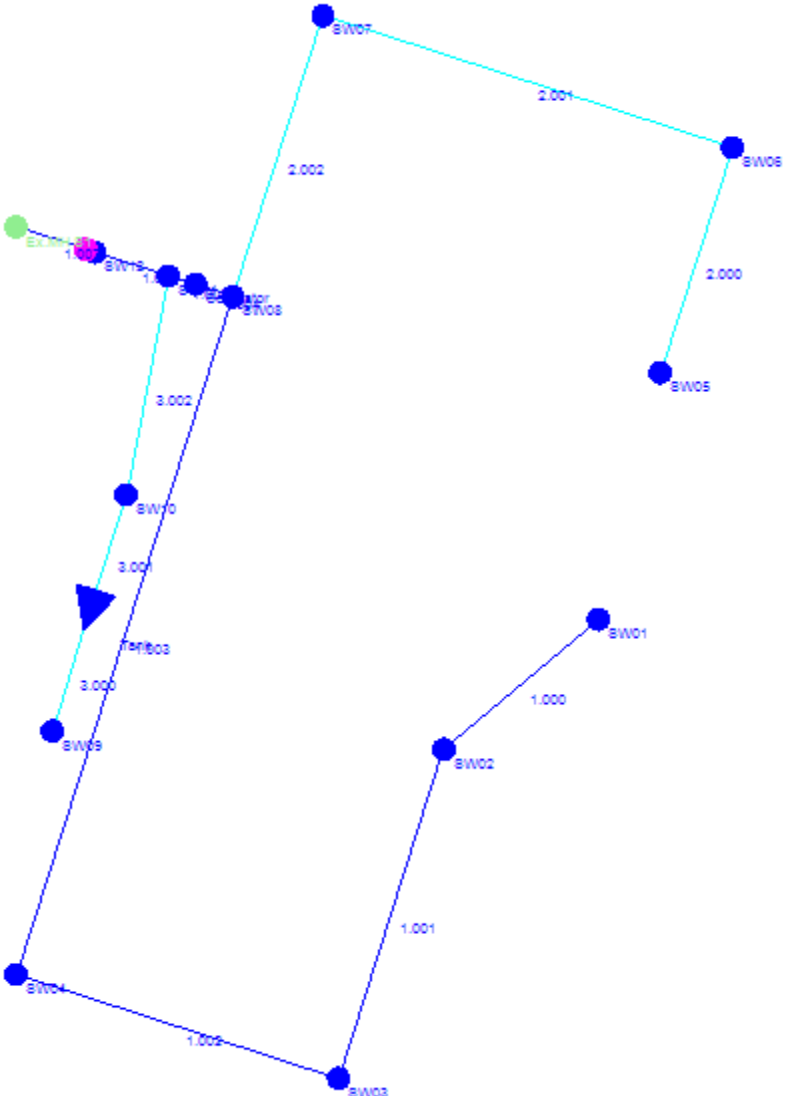
ARCHITECT: IBI GROUP

PROJECT: THE CHRISTIE P22 TIERED CAR PARK

TITLE: BELOW GROUND DRAINAGE DRAINAGE STRATEGY

STATUS	PROJECT NO.	PROJECT	ORIGINATOR	DESIGNED	CHECKED	APPROVED	DATE
S2	218-310	TCP - AJP - XX - XX - DR - C-900100	P02	JPS	JAM	JAM	16.06.2021

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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)	30	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.362	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.194	4-8	0.141

Total Area Contributing (ha) = 0.335

Total Pipe Volume (m³) = 36.854

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
1.000	22.662	0.090	251.8	0.000	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.001	38.712	0.165	234.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.002	38.063	0.130	292.8	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.003	79.713	0.270	295.2	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
2.000	26.480	0.115	230.3	0.163	5.00	0.0	0.600	o	300	Pipe/Conduit	
2.001	48.293	0.160	301.0	0.039	0.00	0.0	0.600	o	375	Pipe/Conduit	
2.002	33.062	0.150	220.0	0.133	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.004	4.432	0.035	128.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.005	3.202	0.025	128.1	0.000	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)
1.000	50.00	5.38	35.130	0.000	0.0	0.0	0.0	0.99	69.7	0.0
1.001	50.00	6.01	35.040	0.000	0.0	0.0	0.0	1.02	72.3	0.0
1.002	50.00	6.62	34.800	0.000	0.0	0.0	0.0	1.05	116.4	0.0
1.003	50.00	7.88	34.670	0.000	0.0	0.0	0.0	1.05	115.9	0.0
2.000	50.00	5.43	34.900	0.163	0.0	0.0	0.0	1.03	72.9	22.1
2.001	50.00	6.20	34.710	0.202	0.0	0.0	0.0	1.04	114.8	27.4
2.002	50.00	6.65	34.550	0.335	0.0	0.0	0.0	1.22	134.5	45.4
1.004	50.00	7.93	34.399	0.335	0.0	0.0	0.0	1.60	176.7	45.4
1.005	50.00	7.96	34.265	0.335	0.0	0.0	0.0	1.60	176.7	45.4

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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
3.000	14.111	0.040	350.0	0.000	5.00	0.0	0.600	o	375	Pipe/Conduit	
3.001	13.618	0.010	1361.8	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
3.002	24.963	0.080	311.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.006	8.691	0.029	297.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.007	9.309	0.031	302.0	0.000	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)
3.000	50.00	5.24	34.370	0.000	0.0	0.0	0.0	0.96	106.3	0.0
3.001	50.00	5.71	34.330	0.000	0.0	0.0	0.0	0.48	53.3	0.0
3.002	50.00	6.12	34.320	0.000	0.0	0.0	0.0	1.02	112.9	0.0
1.006	50.00	8.10	34.240	0.335	0.0	0.0	0.0	1.05	115.5	45.4
1.007	50.00	8.25	34.210	0.335	0.0	0.0	0.0	1.04	114.6	45.4

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SW01	36.200	1.070	Open Manhole	1500	1.000	35.130	300				
SW02	36.200	1.160	Open Manhole	1500	1.001	35.040	300	1.000	35.040	300	
SW03	36.200	1.400	Open Manhole	1500	1.002	34.800	375	1.001	34.875	300	
SW04	36.200	1.530	Open Manhole	1500	1.003	34.670	375	1.002	34.670	375	
SW05	36.100	1.200	Open Manhole	1500	2.000	34.900	300				
SW06	36.100	1.390	Open Manhole	1500	2.001	34.710	375	2.000	34.785	300	
SW07	36.200	1.650	Open Manhole	1500	2.002	34.550	375	2.001	34.550	375	
SW08	36.200	1.801	Open Manhole	1500	1.004	34.399	375	1.003	34.400	375	1
								2.002	34.399	375	
Separator	36.100	1.835	Open Manhole	1500	1.005	34.265	375	1.004	34.365	375	100
SW09	36.100	1.730	Open Manhole	1500	3.000	34.370	375				
Tank	36.100	1.770	Open Manhole	1500	3.001	34.330	375	3.000	34.330	375	
SW10	36.100	1.780	Open Manhole	1350	3.002	34.320	375	3.001	34.320	375	
SW11	36.100	1.860	Open Manhole	1500	1.006	34.240	375	1.005	34.240	375	
								3.002	34.240	375	
SW12	36.250	2.040	Open Manhole	2100	1.007	34.210	375	1.006	34.210	375	
Ex.MH S1	36.710	2.530	Open Manhole	1500		OUTFALL		1.007	34.180	375	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW01	385211.384	392423.978	385211.384	392423.978	Required	
SW02	385194.010	392409.428	385194.010	392409.428	Required	
SW03	385182.169	392372.571	385182.169	392372.571	Required	
SW04	385145.931	392384.213	385145.931	392384.213	Required	
SW05	385218.304	392451.602	385218.304	392451.602	Required	
SW06	385226.403	392476.813	385226.403	392476.813	Required	
SW07	385180.424	392491.584	385180.424	392491.584	Required	
SW08	385170.312	392460.106	385170.312	392460.106	Required	
Separator	385166.103	392461.493	385166.103	392461.493	Required	



Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW09	385149.990	392411.478	385149.990	392411.478	Required	
Tank	385154.211	392424.943	385154.211	392424.943	Required	
SW10	385158.297	392437.934	385158.297	392437.934	Required	
SW11	385163.045	392462.441	385163.045	392462.441	Required	
SW12	385154.770	392465.099	385154.770	392465.099	Required	
Ex.MH S1	385145.907	392467.946			No Entry	

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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)
1.000	o	300	SW01	36.200	35.130	0.770	Open Manhole	1500
1.001	o	300	SW02	36.200	35.040	0.860	Open Manhole	1500
1.002	o	375	SW03	36.200	34.800	1.025	Open Manhole	1500
1.003	o	375	SW04	36.200	34.670	1.155	Open Manhole	1500
2.000	o	300	SW05	36.100	34.900	0.900	Open Manhole	1500
2.001	o	375	SW06	36.100	34.710	1.015	Open Manhole	1500
2.002	o	375	SW07	36.200	34.550	1.275	Open Manhole	1500
1.004	o	375	SW08	36.200	34.399	1.426	Open Manhole	1500
1.005	o	375	Separator	36.100	34.265	1.460	Open Manhole	1500
3.000	o	375	SW09	36.100	34.370	1.355	Open Manhole	1500
3.001	o	375	Tank	36.100	34.330	1.395	Open Manhole	1500
3.002	o	375	SW10	36.100	34.320	1.405	Open Manhole	1350
1.006	o	375	SW11	36.100	34.240	1.485	Open Manhole	1500
1.007	o	375	SW12	36.250	34.210	1.665	Open Manhole	2100

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)
1.000	22.662	251.8	SW02	36.200	35.040	0.860	Open Manhole	1500
1.001	38.712	234.6	SW03	36.200	34.875	1.025	Open Manhole	1500
1.002	38.063	292.8	SW04	36.200	34.670	1.155	Open Manhole	1500
1.003	79.713	295.2	SW08	36.200	34.400	1.425	Open Manhole	1500
2.000	26.480	230.3	SW06	36.100	34.785	1.015	Open Manhole	1500
2.001	48.293	301.0	SW07	36.200	34.550	1.275	Open Manhole	1500
2.002	33.062	220.0	SW08	36.200	34.399	1.426	Open Manhole	1500
1.004	4.432	128.0	Separator	36.100	34.365	1.360	Open Manhole	1500
1.005	3.202	128.1	SW11	36.100	34.240	1.485	Open Manhole	1500
3.000	14.111	350.0	Tank	36.100	34.330	1.395	Open Manhole	1500
3.001	13.618	1361.8	SW10	36.100	34.320	1.405	Open Manhole	1350
3.002	24.963	311.0	SW11	36.100	34.240	1.485	Open Manhole	1500
1.006	8.691	297.0	SW12	36.250	34.210	1.665	Open Manhole	2100
1.007	9.309	302.0	Ex.MH S1	36.710	34.180	2.155	Open Manhole	1500

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)
1.007	Ex.MH S1	36.710	34.180	34.180	1500	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 ³ /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 Offline Controls	0
Number of Online Controls	1	Number of Storage Structures	1
		Number of Time/Area Diagrams	4
		Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.362		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: SW12, DS/PN: 1.007, Volume (m³): 7.8

Unit Reference	MD-SHE-0302-5360-1100-5360
Design Head (m)	1.100
Design Flow (l/s)	53.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	302
Invert Level (m)	34.210
Minimum Outlet Pipe Diameter (mm)	375
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.100	53.6	Kick-Flo®	0.848	47.3
Flush-Flo™	0.465	53.6	Mean Flow over Head Range	-	43.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	9.2	0.800	49.2	2.000	71.5	4.000	100.2	7.000	131.6
0.200	31.0	1.000	51.2	2.200	74.9	4.500	106.1	7.500	136.2
0.300	51.7	1.200	55.9	2.400	78.1	5.000	111.7	8.000	140.5
0.400	53.3	1.400	60.2	2.600	81.2	5.500	117.0	8.500	144.8
0.500	53.5	1.600	64.2	3.000	87.1	6.000	122.1	9.000	148.9
0.600	52.9	1.800	68.0	3.500	93.9	6.500	127.0	9.500	152.9

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Storage Structures for Storm

Cellular Storage Manhole: Tank, DS/PN: 3.001

Invert Level (m) 34.330 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	168.0	0.0	0.800	168.0	0.0	0.801	0.0	0.0

Time Area Diagram at Pipe Number 1.000 for Storm

Total Area (ha) 0.068

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)
0 4 0.015	24 28 0.003	48 52 0.001	72 76 0.000	96 100 0.000					
4 8 0.014	28 32 0.002	52 56 0.001	76 80 0.000	100 104 0.000					
8 12 0.011	32 36 0.002	56 60 0.001	80 84 0.000	104 108 0.000					
12 16 0.005	36 40 0.002	60 64 0.000	84 88 0.000	108 112 0.000					
16 20 0.004	40 44 0.001	64 68 0.000	88 92 0.000	112 116 0.000					
20 24 0.003	44 48 0.001	68 72 0.000	92 96 0.000	116 120 0.000					

Time Area Diagram at Pipe Number 1.001 for Storm

Total Area (ha) 0.135

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)
0 4 0.040	24 28 0.002	48 52 0.001	72 76 0.000	96 100 0.000					
4 8 0.039	28 32 0.001	52 56 0.000	76 80 0.000	100 104 0.000					
8 12 0.038	32 36 0.001	56 60 0.000	80 84 0.000	104 108 0.000					
12 16 0.003	36 40 0.001	60 64 0.000	84 88 0.000	108 112 0.000					
16 20 0.003	40 44 0.001	64 68 0.000	88 92 0.000	112 116 0.000					
20 24 0.002	44 48 0.001	68 72 0.000	92 96 0.000	116 120 0.000					

Time Area Diagram at Pipe Number 1.002 for Storm

Total Area (ha) 0.041

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)
0 4 0.011	24 28 0.001	48 52 0.000	72 76 0.000	96 100 0.000					
4 8 0.009	28 32 0.001	52 56 0.000	76 80 0.000	100 104 0.000					
8 12 0.009	32 36 0.001	56 60 0.000	80 84 0.000	104 108 0.000					
12 16 0.002	36 40 0.001	60 64 0.000	84 88 0.000	108 112 0.000					
16 20 0.002	40 44 0.001	64 68 0.000	88 92 0.000	112 116 0.000					
20 24 0.001	44 48 0.000	68 72 0.000	92 96 0.000	116 120 0.000					

Time Area Diagram at Pipe Number 1.003 for Storm

Total Area (ha) 0.244

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Time Area Diagram at Pipe Number 1.003 for Storm

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)	From: To: (ha)
0 4 0.082	24 28 0.000	48 52 0.000	72 76 0.000	96 100 0.000					
4 8 0.081	28 32 0.000	52 56 0.000	76 80 0.000	100 104 0.000					
8 12 0.080	32 36 0.000	56 60 0.000	80 84 0.000	104 108 0.000					
12 16 0.000	36 40 0.000	60 64 0.000	84 88 0.000	108 112 0.000					
16 20 0.000	40 44 0.000	64 68 0.000	88 92 0.000	112 116 0.000					
20 24 0.000	44 48 0.000	68 72 0.000	92 96 0.000	116 120 0.000					

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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 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 Offline Controls 0 Number of Time/Area Diagrams 4
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.362 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	SW01	30 Winter	1	+0%	100/15 Summer				35.176	-0.254
1.001	SW02	30 Winter	1	+0%	100/15 Summer				35.125	-0.215
1.002	SW03	30 Winter	1	+0%	100/15 Summer				34.891	-0.284
1.003	SW04	30 Winter	1	+0%	100/15 Summer				34.807	-0.238
2.000	SW05	15 Winter	1	+0%	100/15 Summer				35.013	-0.187
2.001	SW06	15 Winter	1	+0%	100/15 Summer				34.829	-0.256
2.002	SW07	15 Winter	1	+0%	30/30 Winter				34.688	-0.237
1.004	SW08	15 Winter	1	+0%	30/15 Summer				34.603	-0.171
1.005	Separator	15 Winter	1	+0%	30/15 Summer				34.533	-0.107
3.000	SW09	15 Summer	1	+0%	100/15 Summer				34.370	-0.375
3.001	Tank	30 Winter	1	+0%	100/15 Summer				34.361	-0.344
3.002	SW10	15 Winter	1	+0%	30/15 Summer				34.482	-0.213
1.006	SW11	15 Winter	1	+0%	2/15 Winter				34.523	-0.092
1.007	SW12	15 Winter	1	+0%	2/15 Winter				34.506	-0.080

PN	US/MH Name	Flooded Volume (m ³)	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Level Exceeded Status
1.000	SW01	0.000	0.05		3.2	OK
1.001	SW02	0.000	0.18		12.0	OK
1.002	SW03	0.000	0.13		14.1	OK
1.003	SW04	0.000	0.28		31.2	OK
2.000	SW05	0.000	0.30		19.4	OK
2.001	SW06	0.000	0.21		22.6	OK
2.002	SW07	0.000	0.29		34.7	OK
1.004	SW08	0.000	0.58		59.5	OK

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XP Solutions	Network 2020.1	

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

PN	US/MH Name	Flooded		Half Drain		Pipe	Level	
		Volume (m ³)	Flow / Overflow Cap. (l/s)	Time (mins)	Flow (l/s)	Status	Exceeded	
1.005	Separator	0.000	0.64		58.8	OK		
3.000	SW09	0.000	0.00		0.0	OK		
3.001	Tank	0.000	0.01		0.5	OK		
3.002	SW10	0.000	0.01		0.5	OK		
1.006	SW11	0.000	0.60		49.0	OK		
1.007	SW12	0.000	0.59		48.9	OK		

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2 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 Offline Controls 0 Number of Time/Area Diagrams 4
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.362 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	SW01	30 Winter	2	+0%	100/15 Summer				35.185	-0.245
1.001	SW02	30 Winter	2	+0%	100/15 Summer				35.137	-0.203
1.002	SW03	30 Winter	2	+0%	100/15 Summer				34.906	-0.269
1.003	SW04	30 Winter	2	+0%	100/15 Summer				34.828	-0.217
2.000	SW05	15 Winter	2	+0%	100/15 Summer				35.030	-0.170
2.001	SW06	15 Winter	2	+0%	100/15 Summer				34.846	-0.239
2.002	SW07	15 Winter	2	+0%	30/30 Winter				34.710	-0.215
1.004	SW08	15 Winter	2	+0%	30/15 Summer				34.644	-0.130
1.005	Separator	15 Winter	2	+0%	30/15 Summer				34.628	-0.012
3.000	SW09	30 Winter	2	+0%	100/15 Summer				34.388	-0.357
3.001	Tank	30 Winter	2	+0%	100/15 Summer				34.389	-0.316
3.002	SW10	15 Winter	2	+0%	30/15 Summer				34.534	-0.161
1.006	SW11	15 Winter	2	+0%	2/15 Winter				34.615	0.000
1.007	SW12	15 Winter	2	+0%	2/15 Winter				34.597	0.011

PN	US/MH Name	Flooded Volume (m ³)	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW01	0.000	0.07		4.1	OK	
1.001	SW02	0.000	0.23		15.5	OK	
1.002	SW03	0.000	0.17		18.2	OK	
1.003	SW04	0.000	0.36		40.2	OK	
2.000	SW05	0.000	0.38		25.1	OK	
2.001	SW06	0.000	0.28		29.2	OK	
2.002	SW07	0.000	0.37		45.0	OK	
1.004	SW08	0.000	0.73		75.3	OK	

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

PN	US/MH Name	Flooded		Half Drain Pipe		Status	Level Exceeded
		Volume (m³)	Flow / Overflow Cap. (l/s)	Time (mins)	Flow (l/s)		
1.005	Separator	0.000	0.79		73.2	OK	
3.000	SW09	0.000	0.00		0.0	OK	
3.001	Tank	0.000	0.04		1.6	OK	
3.002	SW10	0.000	0.01		1.2	OK	
1.006	SW11	0.000	0.68		55.6	SURCHARGED	
1.007	SW12	0.000	0.64		52.9	SURCHARGED	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 4
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.362 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	SW01	30 Winter	30	+0%	100/15 Summer				35.213	-0.217
1.001	SW02	30 Winter	30	+0%	100/15 Summer				35.179	-0.161
1.002	SW03	30 Winter	30	+0%	100/15 Summer				35.052	-0.123
1.003	SW04	30 Winter	30	+0%	100/15 Summer				35.027	-0.018
2.000	SW05	15 Winter	30	+0%	100/15 Summer				35.093	-0.107
2.001	SW06	30 Winter	30	+0%	100/15 Summer				34.961	-0.124
2.002	SW07	30 Winter	30	+0%	30/30 Winter				34.942	0.017
1.004	SW08	30 Winter	30	+0%	30/15 Summer				34.914	0.139
1.005	Separator	15 Winter	30	+0%	30/15 Summer				34.853	0.213
3.000	SW09	30 Winter	30	+0%	100/15 Summer				34.602	-0.143
3.001	Tank	30 Winter	30	+0%	100/15 Summer				34.602	-0.103
3.002	SW10	15 Winter	30	+0%	30/15 Summer				34.738	0.043
1.006	SW11	15 Winter	30	+0%	2/15 Winter				34.817	0.202
1.007	SW12	15 Winter	30	+0%	2/15 Winter				34.798	0.213

PN	US/MH Name	Flooded		Half Drain		Pipe		Status	Level Exceeded
		Volume (m ³)	Flow / Overflow Cap. (l/s)	Time (mins)	Flow (l/s)				
1.000	SW01	0.000	0.13		7.9		OK		
1.001	SW02	0.000	0.44		29.3		OK		
1.002	SW03	0.000	0.32		33.7		OK		
1.003	SW04	0.000	0.65		71.4		OK		
2.000	SW05	0.000	0.72		47.4		OK		
2.001	SW06	0.000	0.43		45.3		OK		
2.002	SW07	0.000	0.55		66.6		SURCHARGED		
1.004	SW08	0.000	1.04		107.2		SURCHARGED		
1.005	Separator	0.000	1.16		107.2		SURCHARGED		
3.000	SW09	0.000	0.00		0.3		OK		
3.001	Tank	0.000	0.66	22	26.2		OK		

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

PN	US/MH Name	Flooded		Half Drain Pipe		Status	Level Exceeded
		Volume (m³)	Flow / Overflow Cap. (l/s)	Time (mins)	Flow (l/s)		
3.002	SW10	0.000	0.21		20.8	SURCHARGED	
1.006	SW11	0.000	0.78		64.3	SURCHARGED	
1.007	SW12	0.000	0.65		53.5	SURCHARGED	

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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 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 Offline Controls 0 Number of Time/Area Diagrams 4
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.362 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	SW01	30 Winter	100	+40%	100/15 Summer				36.029	0.599
1.001	SW02	30 Winter	100	+40%	100/15 Summer				36.015	0.675
1.002	SW03	30 Winter	100	+40%	100/15 Summer				35.928	0.753
1.003	SW04	30 Winter	100	+40%	100/15 Summer				35.885	0.840
2.000	SW05	15 Winter	100	+40%	100/15 Summer				35.751	0.551
2.001	SW06	30 Winter	100	+40%	100/15 Summer				35.671	0.586
2.002	SW07	30 Winter	100	+40%	30/30 Winter				35.627	0.702
1.004	SW08	30 Winter	100	+40%	30/15 Summer				35.547	0.772
1.005	Separator	30 Winter	100	+40%	30/15 Summer				35.292	0.652
3.000	SW09	60 Winter	100	+40%	100/15 Summer				35.165	0.420
3.001	Tank	60 Winter	100	+40%	100/15 Summer				35.166	0.461
3.002	SW10	60 Winter	100	+40%	30/15 Summer				35.166	0.471
1.006	SW11	60 Winter	100	+40%	2/15 Winter				35.188	0.574
1.007	SW12	60 Winter	100	+40%	2/15 Winter				35.171	0.585

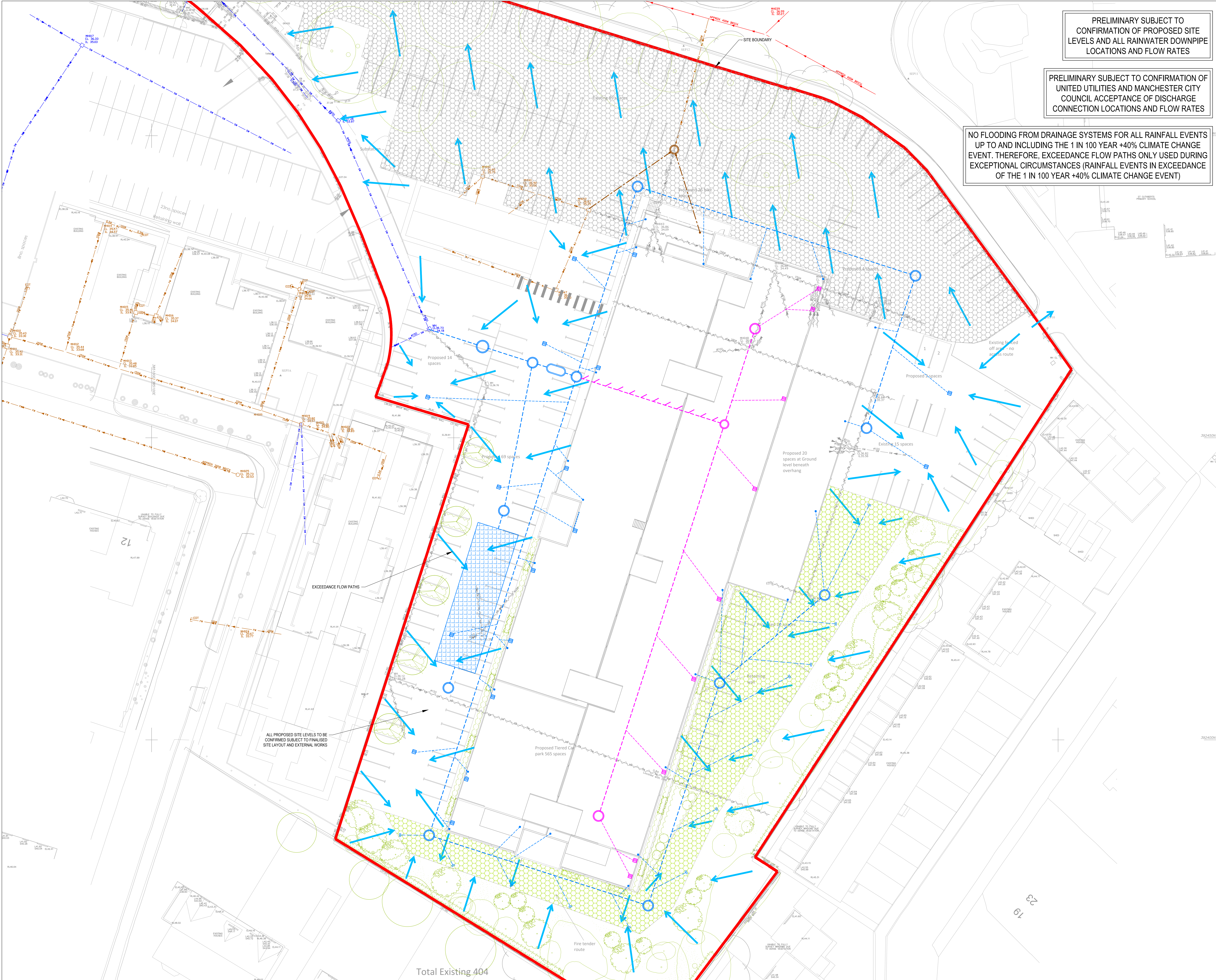
PN	US/MH Name	Flooded		Half Drain	Pipe	Status	Level Exceeded
		Volume (m³)	Flow / Overflow Cap.	Time (mins)	Flow (l/s)		
1.000	SW01	0.000	0.24		15.1	FLOOD RISK	
1.001	SW02	0.000	0.73		49.1	FLOOD RISK	
1.002	SW03	0.000	0.56		58.8	FLOOD RISK	
1.003	SW04	0.000	1.13		124.8	SURCHARGED	
2.000	SW05	0.000	1.20		78.6	SURCHARGED	
2.001	SW06	0.000	0.62		66.2	SURCHARGED	
2.002	SW07	0.000	0.90		108.6	SURCHARGED	
1.004	SW08	0.000	1.92		199.1	SURCHARGED	
1.005	Separator	0.000	2.16		199.6	SURCHARGED	
3.000	SW09	0.000	0.01		0.6	SURCHARGED	
3.001	Tank	0.000	1.48	42	58.7	SURCHARGED	

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

PN	US/MH Name	Flooded		Half Drain		Pipe	Status	Level Exceeded
		Volume (m³)	Flow / Overflow Cap. (l/s)	Time (mins)	Flow (l/s)			
3.002	SW10	0.000	0.43		41.5		SURCHARGED	
1.006	SW11	0.000	0.80		65.6		SURCHARGED	
1.007	SW12	0.000	0.65		53.5		SURCHARGED	

Appendix J Exceedance Flow Path Drawing & Exceedance Event Calculations



PRELIMINARY SUBJECT TO
CONFIRMATION OF PROPOSED SITE
LEVELS AND ALL RAINWATER DOWNPIPE
LOCATIONS AND FLOW RATES

PRELIMINARY SUBJECT TO CONFIRMATION OF
UNITED UTILITIES AND MANCHESTER CITY
COUNCIL ACCEPTANCE OF DISCHARGE
CONNECTION LOCATIONS AND FLOW RATES

NO FLOODING FROM DRAINAGE SYSTEMS FOR ALL RAINFALL EVENTS
UP TO AND INCLUDING THE 1 IN 100 YEAR +40% CLIMATE CHANGE
EVENT. THEREFORE, EXCEEDANCE FLOW PATHS ONLY USED DURING
EXCEPTIONAL CIRCUMSTANCES (RAINFALL EVENTS IN EXCEEDANCE
OF THE 1 IN 100 YEAR +40% CLIMATE CHANGE EVENT)

- IMPORTANT NOTES
- SETTING OUT SHALL BE UNDERTAKEN USING ONLY THE INFORMATION GIVEN. DISTANCES GIVEN SHOULD NOT BE SCALED FROM THIS DRAWING.
 - ALL SEWERS SHALL BE CONSTRUCTED IN ACCORDANCE WITH SEWERS FOR ADOPTABLE HIGHWAYS SHALL BE 150mm UTILITY DETAILS & GUIDELINES.
 - THE MINIMUM GRAVITY PIPE DIAMETER UNDER ADOPTABLE HIGHWAYS SHALL BE 150mm.
 - IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY ALL INFORMATION GIVEN WITH REGARDS TO EXISTING SERVICES AND DRAINAGE CONNECTIONS ETC. PRIOR TO COMMENCING THE WORKS. THE RATES SHALL INCLUDE FOR HANDING AROUND SERVICES WHERE NECESSARY. THE CONTRACTOR SHALL ADHERE TO THE COM REGULATIONS AT ALL TIMES.
 - THE OUTSIDES OF ALL SEWERS SHALL BE A MINIMUM OF 1.0m FROM KERB LINES AND THE OUTSIDE OF MANHOLES SHALL BE A MINIMUM OF 0.5m FROM KERB LINES.
 - EXISTING FLOWS IN WATERCOURSES, SEWERS AND LAND DRAINS SHALL BE MAINTAINED AT ALL TIMES.
 - ONLY TRAINED PERSONNEL SHALL BE PERMITTED TO ENTER CONFINED SPACES.
 - ALL MATERIALS TO BEAR THE RELEVANT B.S. WATERMARK AND COMPLY FULLY WITH THE SPECIFICATIONS. ALL CONCRETE & CONCRETE PRODUCTS MUST USE SULPHATE RESISTANT CEMENT (UNLESS THE SITE INVESTIGATION REPORT PROVES THAT SULPHATE ATTACK FROM SOILS AND GROUNDWATER WILL NOT OCCUR TO WITHSTAND A CLASS).
 - ALL OPENING NOTICES ETC. AS REQUIRED UNDER HIGHWAYS ACTS ETC. ARE TO BE OBTAINED PRIOR TO COMMENCEMENT OF WORKS. ALL WORKS ARE TO BE INSPECTED BY L.A. INBC OR THE NETWORK OPERATOR AS APPLICABLE.
 - WHERE "ULTRA RIB" UPVC PIPES (OR SIMILAR APPROVED) ARE USED IN ADOPTABLE DRAINAGE THEY SHALL STILL BE HANDLED AND Laid IN ACCORDANCE WITH THE SPECIFICATION AND GUIDANCE ISSUED BY THE HIGH PERFORMANCE PIPE ASSOCIATION.
 - A CLASS 5 BED AND SURROUND MUST BE USED FOR SUCH PIPES. TRENCH BACKFILL IN HIGHWAYS TO WITHIN 1M OF HIGHWAY SHALL AS DIRECTED BY THE HIGHWAY AUTHORITY BE A SUITABLE GRANULAR MATERIAL ALL IN ACCORDANCE WITH SEWERS FOR ADOPTABLE CL. 5.4.
 - SUB LEVELS SHALL NOT BE VARIED WITHOUT REFERENCE TO THE ENGINEER FOR GUIDANCE.
 - DOMESTIC DRAINAGE SHALL BE TO BUILDING REGULATIONS APPROVED DOCUMENT H: 110mm UPVC PIPES Laid TO THE FOLLOWING MINIMUM FALLS UNLESS OTHERWISE SHOWN.
- | HEAD RISE | FOUL | S.W. |
|-----------|----------|----------|
| 1 IN 40 | 1 IN 60 | 1 IN 100 |
| 1 IN 80 | 1 IN 100 | 1 IN 100 |
- ALL GULLY CONNECTIONS TO BE 150mm VITRIFIED CLAY UNLESS NOTED OTHERWISE.
 - ALL MANHOLE COVERS TO BE RECESSED TO ACCEPT FINISH AS DETAILED BY LANDSCAPE ARCHITECT.
 - SLOW REST BENDS TO BE USED IN ALL LOCATIONS MADE UP FROM 2m. 45 DEG BENDS 600mm TO INVERT FROM FFL EXTERNAL FINISHES.
 - ALL DRAINS CAST THROUGH FOUNDATIONS TO HAVE ROCKER PIPES ON BOTH SIDES OF FOUNDATION.
 - ALL POP UP POSITIONS TO BE CONFIRMED SET OUT DIMENSIONS TO BE AGREED & PROVIDED BY OTHERS.
 - ALL DISCHARGE RATES TO BE CONFIRMED SET OUT DIMENSIONS TO BE AGREED & PROVIDED BY OTHERS.
 - ALL SURFACE WATER COLLECTION FEATURES TO BE CONFIRMED BY THE LANDSCAPE ARCHITECT.
 - STORAGE HAS BEEN PROVIDED IN A CELLULAR STORAGE TANK AND UP-SIZED MANHOLES AND PIPES.
 - EXISTING SEWER DEPTHS HAVE BEEN APPROXIMATED FROM LIMITED INFORMATION. NEW CONNECTIONS TO BE CONFIRMED PRIOR TO CONSTRUCTION OF ANY DRAINAGE WORKS.
 - LANDSCAPE ARCHITECT TO CONFIRM GULLY AND DRAINAGE CHANNEL LOCATIONS TO LANDSCAPED AREAS.
 - FOUL NETWORK TO BE CONFIRMED FOLLOWING CONFIRMATION OF BRANCH CONNECTION POINTS FROM BUILDING M&E DESIGNER.
 - CITY SURVEY OF EXISTING SITE DRAINAGE REQUIRED PRIOR TO THE COMMENCEMENT OF ANY WORKS STARTING ON SITE.

REV	DATE	DESCRIPTION	BY	CHK	APP
P01	10.04.2021	PRELIMINARY - UPDATED TO SUIT REVISED DRAWING NUMBERS	JRS	PL	PL
P01	01.02.2023	PRELIMINARY - FOR DISCHARGE OF PLANNING CONDITIONS ONLY	JRS	JMM	JMM

DRAWING STATUS: **PRELIMINARY**

CLIENT: THE CHRISTIE NHS FOUNDATION TRUST

ARCHITECT: IBI GROUP

PROJECT: THE CHRISTIE P22 TIERED CAR PARK

TITLE: BELOW GROUND DRAINAGE EXCEEDANCE FLOW PATHS

STATUS	PROJECT No.	PROJECT	DISCIPLINE	LEVEL	TYPE	TRAIL	DRAWING No.	REV
S2	218-310	TCP - AJP - XX - XX - DR - C	900105	P02				

SCALE @ 1:200	DESIGNED	DRAWN	CHECKED	APPROVED	DATE
JRS	JRS	JMM	JMM	JMM	APR 2020

alan johnston partnership LLP
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E-Mail: Mail@ajpstructing.com

APR 2020

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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)	30	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.362	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.194	4-8	0.141

Total Area Contributing (ha) = 0.335

Total Pipe Volume (m³) = 36.854

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
1.000	22.662	0.090	251.8	0.000	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.001	38.712	0.165	234.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.002	38.063	0.130	292.8	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.003	79.713	0.270	295.2	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
2.000	26.480	0.115	230.3	0.163	5.00	0.0	0.600	o	300	Pipe/Conduit	
2.001	48.293	0.160	301.0	0.039	0.00	0.0	0.600	o	375	Pipe/Conduit	
2.002	33.062	0.150	220.0	0.133	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.004	4.432	0.035	128.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.005	3.202	0.025	128.1	0.000	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)
1.000	50.00	5.38	35.130	0.000	0.0	0.0	0.0	0.99	69.7	0.0
1.001	50.00	6.01	35.040	0.000	0.0	0.0	0.0	1.02	72.3	0.0
1.002	50.00	6.62	34.800	0.000	0.0	0.0	0.0	1.05	116.4	0.0
1.003	50.00	7.88	34.670	0.000	0.0	0.0	0.0	1.05	115.9	0.0
2.000	50.00	5.43	34.900	0.163	0.0	0.0	0.0	1.03	72.9	22.1
2.001	50.00	6.20	34.710	0.202	0.0	0.0	0.0	1.04	114.8	27.4
2.002	50.00	6.65	34.550	0.335	0.0	0.0	0.0	1.22	134.5	45.4
1.004	50.00	7.93	34.399	0.335	0.0	0.0	0.0	1.60	176.7	45.4
1.005	50.00	7.96	34.265	0.335	0.0	0.0	0.0	1.60	176.7	45.4

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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
3.000	14.111	0.040	350.0	0.000	5.00	0.0	0.600	o	375	Pipe/Conduit	
3.001	13.618	0.010	1361.8	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
3.002	24.963	0.080	311.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.006	8.691	0.029	297.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.007	9.309	0.031	302.0	0.000	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)
3.000	50.00	5.24	34.370	0.000	0.0	0.0	0.0	0.96	106.3	0.0
3.001	50.00	5.71	34.330	0.000	0.0	0.0	0.0	0.48	53.3	0.0
3.002	50.00	6.12	34.320	0.000	0.0	0.0	0.0	1.02	112.9	0.0
1.006	50.00	8.10	34.240	0.335	0.0	0.0	0.0	1.05	115.5	45.4
1.007	50.00	8.25	34.210	0.335	0.0	0.0	0.0	1.04	114.6	45.4

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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)
SW01	36.200	1.070	Open Manhole	1500	1.000	35.130	300				
SW02	36.200	1.160	Open Manhole	1500	1.001	35.040	300	1.000	35.040	300	
SW03	36.200	1.400	Open Manhole	1500	1.002	34.800	375	1.001	34.875	300	
SW04	36.200	1.530	Open Manhole	1500	1.003	34.670	375	1.002	34.670	375	
SW05	36.100	1.200	Open Manhole	1500	2.000	34.900	300				
SW06	36.100	1.390	Open Manhole	1500	2.001	34.710	375	2.000	34.785	300	
SW07	36.200	1.650	Open Manhole	1500	2.002	34.550	375	2.001	34.550	375	
SW08	36.200	1.801	Open Manhole	1500	1.004	34.399	375	1.003	34.400	375	1
								2.002	34.399	375	
Separator	36.100	1.835	Open Manhole	1500	1.005	34.265	375	1.004	34.365	375	100
SW09	36.100	1.730	Open Manhole	1500	3.000	34.370	375				
Tank	36.100	1.770	Open Manhole	1500	3.001	34.330	375	3.000	34.330	375	
SW10	36.100	1.780	Open Manhole	1350	3.002	34.320	375	3.001	34.320	375	
SW11	36.100	1.860	Open Manhole	1500	1.006	34.240	375	1.005	34.240	375	
								3.002	34.240	375	
SW12	36.250	2.040	Open Manhole	2100	1.007	34.210	375	1.006	34.210	375	
Ex.MH S1	36.710	2.530	Open Manhole	1500		OUTFALL		1.007	34.180	375	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW01	385211.384	392423.978	385211.384	392423.978	Required	
SW02	385194.010	392409.428	385194.010	392409.428	Required	
SW03	385182.169	392372.571	385182.169	392372.571	Required	
SW04	385145.931	392384.213	385145.931	392384.213	Required	
SW05	385218.304	392451.602	385218.304	392451.602	Required	
SW06	385226.403	392476.813	385226.403	392476.813	Required	
SW07	385180.424	392491.584	385180.424	392491.584	Required	
SW08	385170.312	392460.106	385170.312	392460.106	Required	
Separator	385166.103	392461.493	385166.103	392461.493	Required	



Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW09	385149.990	392411.478	385149.990	392411.478	Required	
Tank	385154.211	392424.943	385154.211	392424.943	Required	
SW10	385158.297	392437.934	385158.297	392437.934	Required	
SW11	385163.045	392462.441	385163.045	392462.441	Required	
SW12	385154.770	392465.099	385154.770	392465.099	Required	
Ex.MH S1	385145.907	392467.946			No Entry	

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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)
1.000	o	300	SW01	36.200	35.130	0.770	Open Manhole	1500
1.001	o	300	SW02	36.200	35.040	0.860	Open Manhole	1500
1.002	o	375	SW03	36.200	34.800	1.025	Open Manhole	1500
1.003	o	375	SW04	36.200	34.670	1.155	Open Manhole	1500
2.000	o	300	SW05	36.100	34.900	0.900	Open Manhole	1500
2.001	o	375	SW06	36.100	34.710	1.015	Open Manhole	1500
2.002	o	375	SW07	36.200	34.550	1.275	Open Manhole	1500
1.004	o	375	SW08	36.200	34.399	1.426	Open Manhole	1500
1.005	o	375	Separator	36.100	34.265	1.460	Open Manhole	1500
3.000	o	375	SW09	36.100	34.370	1.355	Open Manhole	1500
3.001	o	375	Tank	36.100	34.330	1.395	Open Manhole	1500
3.002	o	375	SW10	36.100	34.320	1.405	Open Manhole	1350
1.006	o	375	SW11	36.100	34.240	1.485	Open Manhole	1500
1.007	o	375	SW12	36.250	34.210	1.665	Open Manhole	2100

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)
1.000	22.662	251.8	SW02	36.200	35.040	0.860	Open Manhole	1500
1.001	38.712	234.6	SW03	36.200	34.875	1.025	Open Manhole	1500
1.002	38.063	292.8	SW04	36.200	34.670	1.155	Open Manhole	1500
1.003	79.713	295.2	SW08	36.200	34.400	1.425	Open Manhole	1500
2.000	26.480	230.3	SW06	36.100	34.785	1.015	Open Manhole	1500
2.001	48.293	301.0	SW07	36.200	34.550	1.275	Open Manhole	1500
2.002	33.062	220.0	SW08	36.200	34.399	1.426	Open Manhole	1500
1.004	4.432	128.0	Separator	36.100	34.365	1.360	Open Manhole	1500
1.005	3.202	128.1	SW11	36.100	34.240	1.485	Open Manhole	1500
3.000	14.111	350.0	Tank	36.100	34.330	1.395	Open Manhole	1500
3.001	13.618	1361.8	SW10	36.100	34.320	1.405	Open Manhole	1350
3.002	24.963	311.0	SW11	36.100	34.240	1.485	Open Manhole	1500
1.006	8.691	297.0	SW12	36.250	34.210	1.665	Open Manhole	2100
1.007	9.309	302.0	Ex.MH S1	36.710	34.180	2.155	Open Manhole	1500

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)
1.007	Ex.MH S1	36.710	34.180	34.180	1500	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 ³ /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 Offline Controls	0
Number of Online Controls	1	Number of Storage Structures	1
		Number of Time/Area Diagrams	4
		Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.362		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: SW12, DS/PN: 1.007, Volume (m³): 7.8

Unit Reference	MD-SHE-0302-5360-1100-5360
Design Head (m)	1.100
Design Flow (l/s)	53.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	302
Invert Level (m)	34.210
Minimum Outlet Pipe Diameter (mm)	375
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.100	53.6	Kick-Flo®	0.848	47.3
Flush-Flo™	0.465	53.6	Mean Flow over Head Range	-	43.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	9.2	0.800	49.2	2.000	71.5	4.000	100.2	7.000	131.6
0.200	31.0	1.000	51.2	2.200	74.9	4.500	106.1	7.500	136.2
0.300	51.7	1.200	55.9	2.400	78.1	5.000	111.7	8.000	140.5
0.400	53.3	1.400	60.2	2.600	81.2	5.500	117.0	8.500	144.8
0.500	53.5	1.600	64.2	3.000	87.1	6.000	122.1	9.000	148.9
0.600	52.9	1.800	68.0	3.500	93.9	6.500	127.0	9.500	152.9

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Storage Structures for Storm

Cellular Storage Manhole: Tank, DS/PN: 3.001

Invert Level (m) 34.330 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	168.0	0.0	0.800	168.0	0.0	0.801	0.0	0.0

Time Area Diagram at Pipe Number 1.000 for Storm

Total Area (ha) 0.068

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.015	24 28	0.003	48 52	0.001	72 76	0.000	96 100	0.000
4 8	0.014	28 32	0.002	52 56	0.001	76 80	0.000	100 104	0.000
8 12	0.011	32 36	0.002	56 60	0.001	80 84	0.000	104 108	0.000
12 16	0.005	36 40	0.002	60 64	0.000	84 88	0.000	108 112	0.000
16 20	0.004	40 44	0.001	64 68	0.000	88 92	0.000	112 116	0.000
20 24	0.003	44 48	0.001	68 72	0.000	92 96	0.000	116 120	0.000

Time Area Diagram at Pipe Number 1.001 for Storm

Total Area (ha) 0.135

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)	From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0	4 0.040	24	28 0.002	48	52 0.001	72	76 0.000	96	100 0.000		
4	8 0.039	28	32 0.001	52	56 0.000	76	80 0.000	100	104 0.000		
8	12 0.038	32	36 0.001	56	60 0.000	80	84 0.000	104	108 0.000		
12	16 0.003	36	40 0.001	60	64 0.000	84	88 0.000	108	112 0.000		
16	20 0.003	40	44 0.001	64	68 0.000	88	92 0.000	112	116 0.000		
20	24 0.002	44	48 0.001	68	72 0.000	92	96 0.000	116	120 0.000		

Time Area Diagram at Pipe Number 1.002 for Storm

Total Area (ha) 0.041

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)	From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0	4 0.011	24	28 0.001	48	52 0.000	72	76 0.000	96	100 0.000		
4	8 0.009	28	32 0.001	52	56 0.000	76	80 0.000	100	104 0.000		
8	12 0.009	32	36 0.001	56	60 0.000	80	84 0.000	104	108 0.000		
12	16 0.002	36	40 0.001	60	64 0.000	84	88 0.000	108	112 0.000		
16	20 0.002	40	44 0.001	64	68 0.000	88	92 0.000	112	116 0.000		
20	24 0.001	44	48 0.000	68	72 0.000	92	96 0.000	116	120 0.000		

Time Area Diagram at Pipe Number 1.003 for Storm

Total Area (ha) 0.244

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Time Area Diagram at Pipe Number 1.003 for Storm

Time (mins) From: To:	Area (ha)	Time (mins) From: To:	Area (ha)	Time (mins) From: To:	Area (ha)	Time (mins) From: To:	Area (ha)	Time (mins) From: To:	Area (ha)
0 4	0.082	24 28	0.000	48 52	0.000	72 76	0.000	96 100	0.000
4 8	0.081	28 32	0.000	52 56	0.000	76 80	0.000	100 104	0.000
8 12	0.080	32 36	0.000	56 60	0.000	80 84	0.000	104 108	0.000
12 16	0.000	36 40	0.000	60 64	0.000	84 88	0.000	108 112	0.000
16 20	0.000	40 44	0.000	64 68	0.000	88 92	0.000	112 116	0.000
20 24	0.000	44 48	0.000	68 72	0.000	92 96	0.000	116 120	0.000

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200 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 Offline Controls 0 Number of Time/Area Diagrams 4
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.362 Cv (Winter) 0.840

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

Profile(s)

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 200, 1000
 Climate Change (%) 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	SW01	30 Winter	200	+0%	200/15 Winter	1000/15 Winter			35.642	0.212
1.001	SW02	30 Winter	200	+0%	200/15 Summer	1000/15 Winter			35.631	0.291
1.002	SW03	30 Winter	200	+0%	200/15 Summer	1000/30 Winter			35.573	0.398
1.003	SW04	30 Winter	200	+0%	200/15 Summer				35.538	0.493
2.000	SW05	30 Winter	200	+0%	200/15 Summer	1000/30 Winter			35.440	0.240
2.001	SW06	30 Winter	200	+0%	200/15 Summer	1000/60 Winter			35.393	0.308
2.002	SW07	30 Winter	200	+0%	200/15 Summer				35.352	0.427
1.004	SW08	30 Winter	200	+0%	200/15 Summer				35.285	0.510
1.005	Separator	30 Winter	200	+0%	200/15 Summer	1000/60 Winter			35.111	0.471
3.000	SW09	60 Winter	200	+0%	200/30 Summer				34.913	0.168
3.001	Tank	60 Winter	200	+0%	200/15 Summer				34.913	0.208
3.002	SW10	60 Winter	200	+0%	200/15 Summer				34.918	0.223
1.006	SW11	60 Winter	200	+0%	200/15 Summer	1000/60 Winter			34.968	0.354
1.007	SW12	60 Winter	200	+0%	200/15 Summer				34.950	0.365

PN	US/MH Name	Flooded		Half Drain	Pipe	Status	Level Exceeded	
		Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)			Flow (l/s)
1.000	SW01	0.000	0.21			13.0	SURCHARGED	5
1.001	SW02	0.000	0.63			42.4	SURCHARGED	4
1.002	SW03	0.000	0.48			50.8	SURCHARGED	2
1.003	SW04	0.000	0.96			106.0	SURCHARGED	
2.000	SW05	0.000	0.85			55.6	SURCHARGED	2
2.001	SW06	0.000	0.55			57.9	SURCHARGED	1
2.002	SW07	0.000	0.74			88.6	SURCHARGED	
1.004	SW08	0.000	1.58			164.0	SURCHARGED	
1.005	Separator	0.000	1.77			163.6	SURCHARGED	1
3.000	SW09	0.000	0.01			0.6	SURCHARGED	
3.001	Tank	0.000	1.41		32	55.7	SURCHARGED	

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

PN	US/MH Name	Flooded		Half Drain Pipe		Status	Level Exceeded
		Volume (m³)	Flow / Overflow Cap. (l/s)	Time (mins)	Flow (l/s)		
3.002	SW10	0.000	0.42		41.4	SURCHARGED	
1.006	SW11	0.000	0.87		71.6	SURCHARGED	1
1.007	SW12	0.000	0.65		53.5	SURCHARGED	

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1000 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 Offline Controls 0 Number of Time/Area Diagrams 4
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.362 Cv (Winter) 0.840

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

Profile(s)

Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 200, 1000
 Climate Change (%) 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	SW01	30 Winter	1000	+0%	200/15 Winter	1000/15 Winter			36.207	0.777
1.001	SW02	30 Winter	1000	+0%	200/15 Summer	1000/15 Winter			36.206	0.866
1.002	SW03	30 Winter	1000	+0%	200/15 Summer	1000/30 Winter			36.200	1.025
1.003	SW04	30 Winter	1000	+0%	200/15 Summer				36.196	1.151
2.000	SW05	60 Winter	1000	+0%	200/15 Summer	1000/30 Winter			36.106	0.906
2.001	SW06	60 Winter	1000	+0%	200/15 Summer	1000/60 Winter			36.102	1.017
2.002	SW07	60 Winter	1000	+0%	200/15 Summer				36.127	1.203
1.004	SW08	60 Winter	1000	+0%	200/15 Summer				36.120	1.345
1.005	Separator	60 Winter	1000	+0%	200/15 Summer	1000/60 Winter			36.101	1.461
3.000	SW09	60 Winter	1000	+0%	200/30 Summer				36.096	1.351
3.001	Tank	60 Winter	1000	+0%	200/15 Summer				36.096	1.391
3.002	SW10	60 Winter	1000	+0%	200/15 Summer				36.097	1.402
1.006	SW11	60 Winter	1000	+0%	200/15 Summer	1000/60 Winter			36.100	1.485
1.007	SW12	60 Winter	1000	+0%	200/15 Summer				36.076	1.491

PN	US/MH Name	Flooded Volume (m ³)	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW01	7.235	0.86		52.9	FLOOD	5
1.001	SW02	6.036	1.08		72.5	FLOOD	4
1.002	SW03	0.660	0.73		77.1	FLOOD	2
1.003	SW04	0.000	1.14		125.7	FLOOD RISK	
2.000	SW05	5.705	0.75		49.4	FLOOD	2
2.001	SW06	2.356	0.56		59.3	FLOOD	1
2.002	SW07	0.000	0.82		98.9	FLOOD RISK	
1.004	SW08	0.000	1.96		203.1	FLOOD RISK	
1.005	Separator	0.817	2.18		201.8	FLOOD	1
3.000	SW09	0.000	0.03		2.1	FLOOD RISK	
3.001	Tank	0.000	1.39		63	55.1 FLOOD RISK	

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1000 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Flooded		Half Drain Pipe		Status	Level Exceeded
		Volume (m³)	Flow / Overflow Cap. (l/s)	Time (mins)	Flow (l/s)		
3.002	SW10	0.000	0.45		43.9	FLOOD RISK	
1.006	SW11	0.092	0.97		80.1	FLOOD	1
1.007	SW12	0.000	0.83		68.4	FLOOD RISK	