

SUSTAINABLE DRAINAGE STRATEGY

INFINIUM, MANCHESTER SACKVILLE



DOCUMENT CONTROL:

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Description		Updated Planning Boundary					
Rev	Date	Status	Prepared by		Checked by		Approved by
PL7	10.07.25	Planning	D.McG		AN		ED
Description		Updated Plans in Appendix					

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1.0 INTRODUCTION

EirEng have been appointed to undertake a Sustainable Drainage Strategy in support of a planning application for the redevelopment of an existing site in Manchester.

The report provides information on the proposed Drainage Strategy for the site and follows Government guidance regarding development.

Proposals contained or forming part of this report represent the design intent and may be subject to alteration or adjustment in completing the detailed design for this project. Where such adjustments are undertaken as part of the detailed design and are deemed a material derivation from the intent contained in this document, prior approval shall be obtained from the relevant authority before commencing such works.

Where the proposed works to which this report refers are undertaken more than twelve months following the issue of this report, we shall reserve the right to re-validate the findings and conclusions by undertaking appropriate further investigations at no cost to EirEng Consulting Engineers Ltd.

This report has been prepared according to our client's instructions for their sole and specific use.

2.0 SITE LAYOUT AND PROPOSED DEVELOPMENT

2.1 Site Location

The site is located in the county of Greater Manchester in Northwestern England. The site can be accessed from the South-East via Bloom Street. See **Figure 1**. Its national Grid Reference (NGR) is 384275E, 397866N.



Figure 1 - Site Location

2.2 Proposed Development

The proposed site has a total area of 0.3ha and consists of 0.27ha of hardstanding to be used as surface parking and 0.03ha of soft landscaping that bounds the site. The proposed site once completed will have a total of 36 commercial EV charging spaces. See the proposed site plan in **Appendix A**.

2.3 Site Topography and Geology

The existing site area is 0.3ha comprising of 0.27ha of hardstanding used as surface parking, and 0.03ha of soft landscaping bounding the site. A review of the topographical survey indicates that the site falls from the North to the South with levels varying from 42.43 mAO D down to 41.07 mAO D respectively. A Topographical survey can be found in **Appendix B** along with the proposed levels in **Appendix G**

The British Geological Survey map shown in **Figure 2** indicates that the site is completely underlain by Till, Devensian - Diamicton superficial deposits. The site is also underlain by the Chester Formation bedrock which comprises of sandstone bedrock geology.



Figure 2 - Bedrock Geology From British Geological Survey Map

3.0 SURFACE AND FOUL WATER DRAINAGE

3.1 Climate Change, Greenfield Run-Off Rates and Brownfield Run-Off Rates

In line with the Environment Agency (EA) and Greater Manchester guidelines, and taking a development design life of **50-60 years**, a climate change allowance of **45%** is to be applied to the most extreme rainfall events for the site.

Exiting Greenfield run-off rates have been calculated using the greenfield run-off calculation tool on the HR Wallingford UK SuDS website, see **Appendix C**. These values for the critical rainfall return periods as well as QBar are shown in **Table 1**, using a total site area of 0.3Ha.

RETURN PERIOD (YEARS)	GREENFIELD RUN-OFF RATES (L/S)
1	1.65
QBAR (2.3)	2.0
30	3.22
100	3.94

Table 1 - Table Showing Greenfield Run-Off Rates

3.2 Existing Surface Water Drainage

The site is currently developed for use as a surface car park; however, it has been noted that there are no surface water assets located within the site. See Terrain Surveys inspection in **Appendix D**. There are a number of manholes within the site boundary but upon lifting the covers it was found that they contain cables. Surface water simply runs over the ground and off site into Bloom street and is picked up by the drainage network located in the road.

3.3 Existing Foul Water Drainage

There are no public sewers indicated within the site boundary, however the survey undertaken suggests a public sewer crossing the site Abingdon Street towards Sackville Street.

3.4 Proposed Foul Water Drainage

There is no proposed foul drainage within the site.

3.5 Proposed Surface Water Drainage

Infiltration testing has yet to be undertaken on site. Whilst the geology of the area appears to be permeable in nature it is noted that there are potential services including and large public sewer crossing the site that would likely make infiltration unviable due to the distances required for any system to be away from the sewer. The proposed strategy is based upon current information and surveys and represents a viable solution for draining the site and improving the quality of runoff and reducing flood risk as a result. See surface water calculations in **Appendix H**.

The proposed solution is to drain surface water via a gravity network and into a combined sewer located in Abingdon street via a saddle connection to the pipe. See Proposed Drainage in **Appendix E**.

3.6 Proposed Drainage Network

Under the National Planning Policy Framework (NPPF), a clear hierarchy of surface water disposal methods is set out. Infiltration into the ground is at the top of this hierarchy for viable sites however, given the site constraints, the lack of surface water infrastructure and the proposed use, the most feasible option for

draining the site is to the existing combined public sewer within the site boundary, pending agreement with united utilities.

The car park has a total area of 3000m², this area comprises mostly of hardstanding to provide a number of parking spaces for EV charging. Flows from this hardstanding drain through a series of channel drains across the site and flow into a gravity network. Once these flows have been collected, they are conveyed into a geocellular attenuation tank that provides 200m³ of storage to attenuate flows and prevent flooding during extreme rainfall events. The outfall of the attenuation tank then flows to a flow control manhole to limit the flow off of site to greenfield rate (2l/s). After flowing through this manhole the flows are directed to a two stage petrol interceptor to provide water quality benefits and then off of site.

3.7 SuDs Scheme

Due to the limited soft landscaping on this site and the limited resurfacing works that will be completed it has been decided that the main form of SuDS will be provided through a two-stage petrol interceptor. This on its own provides the level of treatment required using the Simple Index Approach. See SIA in **Appendix F**.

4.0 CONCLUSION

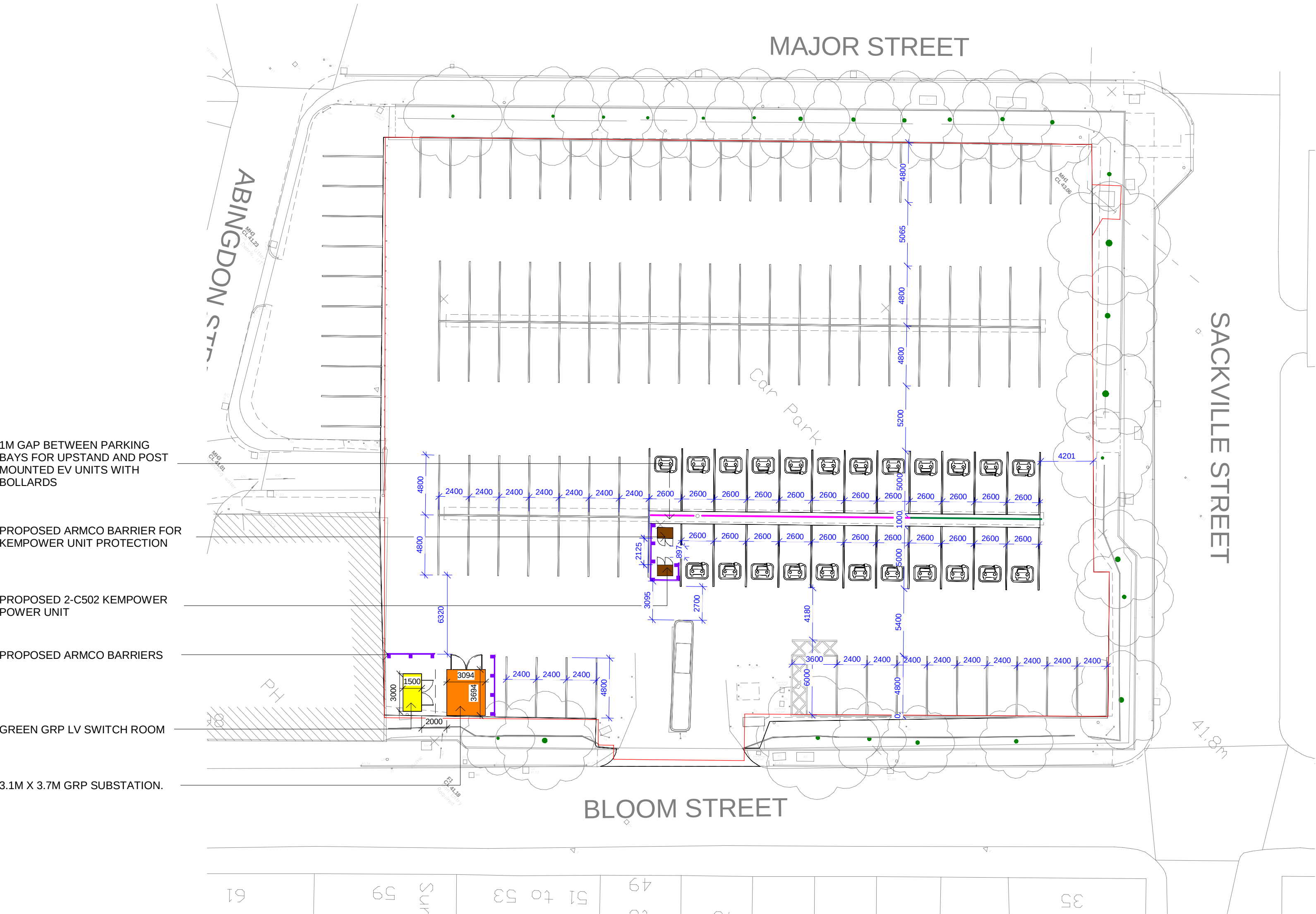
The proposals will result in a reduction in site runoff through virtue of the reduced hardstanding areas proposed and additional landscaping provided.

The proposed surface water drainage flows will continue to be discharged to the United Utilities network. Water quality will be improved via the proposed and existing SuDS measures, which align with the CIRIA SuDS Manual Simple Index Approach.

APPENDIX A– SITE PLAN

PROPOSED SITE PLAN

1 : 250

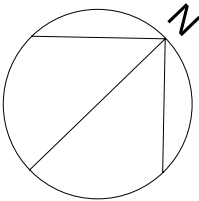
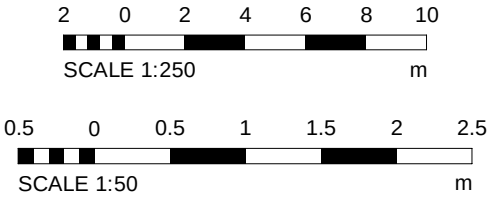


LEGEND:

- SITE BOUNDARY
- EXISTING ELEMENTS
- PROPOSED UPSTAND EV CHARGING POINT
- PROPOSED POST MOUNTED EV CHARGING POINT
- PROPOSED EV PARKING SPACE
- PROPOSED DNO
- PROPOSED LV PANELBOARD
- PROPOSED KEMPOWER
- ARMCO BARRIER

Architects are to be notified of any discrepancies. Contractors must check all dimensions on site. This drawing is subject to copyright laws and is for use on this project only. This drawing is to be used solely for the information as titled only. For other information refer to the latest revision of any cross referenced drawings. To be read in conjunction with relevant design standards/protocols

This is a colour drawing. In order to ensure any subsequent reproduction is viewed correctly it should be printed in full colour.



PROPOSED PARKING SUMMARY	
NUMBER OF EV PARKING SPACES	23
TOTAL LOST PARKING SPACE	5
NUMBER OF NON-EV PARKING SPACES	87

P7	GENERAL UPDATES FOLLOWING PLANNING CONSULTANT COMMENTS, GAGE REMOVED, LOCATION ADJUSTED, DIMENSIONS ADDED, NEW NAMING CONVENTION ADAPTED	08.07.25	KR	JN
P6	RED BOUNDARY LINE AMENDED, KEMPOWER UNIT UPDATED, WHEEL STOPPER ADDED	03.07.25	KR	JN
P5	RED BOUNDARY LINE AMENDED TO DRAINAGE PROPOSAL REVISION, COLOR UPDATED FOR FENCE AND GATE	26.06.25	KR	JM
P4	RED BOUNDARY LINE REVISED TO FULL PARKING AREA	27.02.25	KR	JN
P3	NOTE AMENDMENT	12.02.25	TT	KR
P2	EV PARKING ADJUSTED, PROVISION FOR SPACE BETWEEN EV PARKING BAYS	10.02.25	KR	JM
P1	PLANNING ISSUE	03.02.25	HD	JM
Rev	Description	Date	Drm	Ckd

Status

PLANNING

SMR

SMALLEY MARSEY RISPIN

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Harrogate
HG1 1TS

Project

NCP SACKVILLE STREET, MANCHESTER M1 3LY

Client

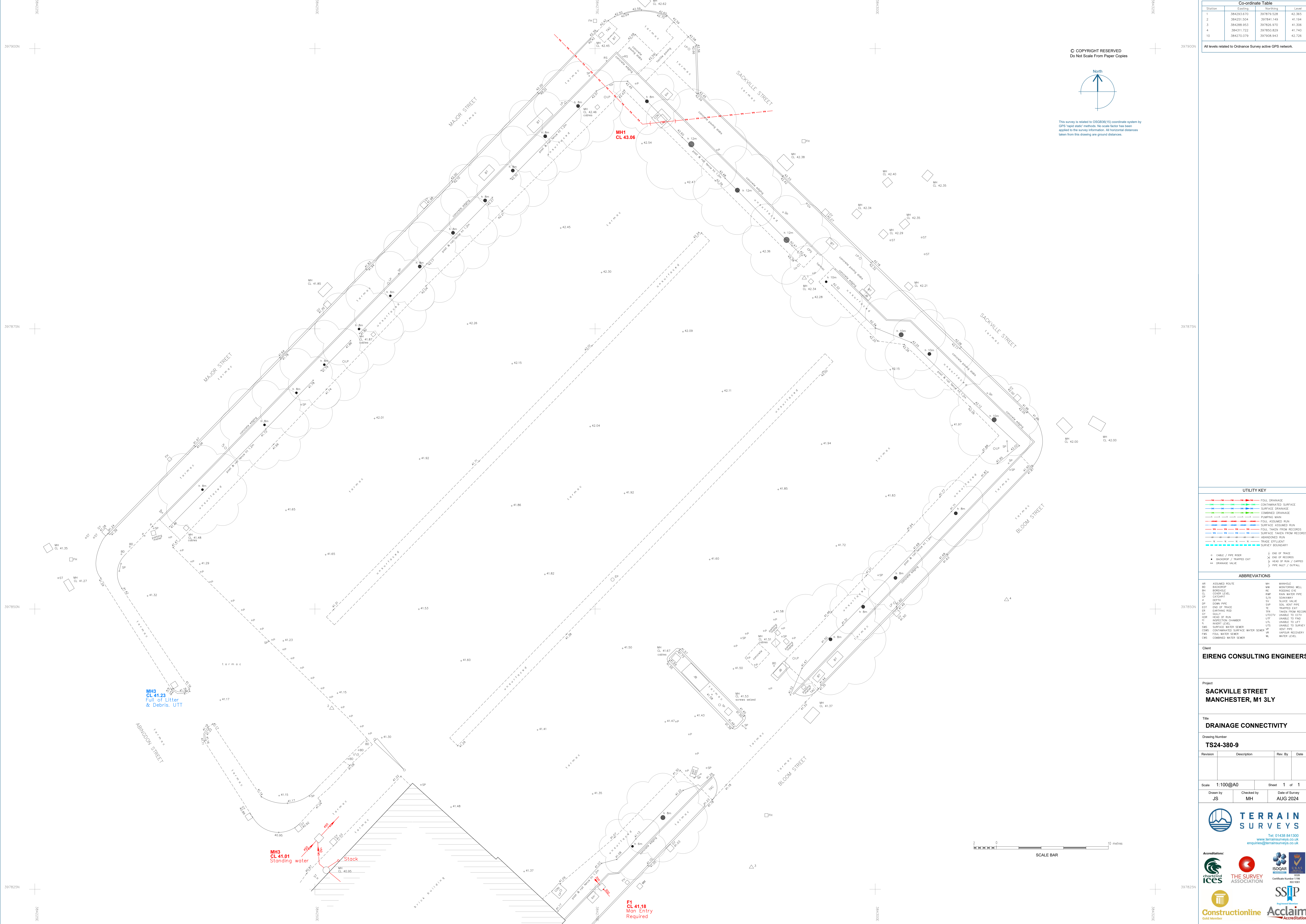


Drawing Title

PROPOSED SITE PLAN

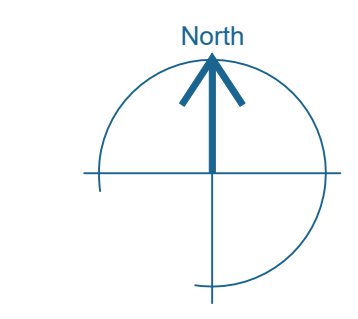
Proj Ref	Origin	Zone	Level	Type	Role	Num	Status	Rev
7944	SMR	MA	ZZ	DR	A	2003	S3	P7
SMR Job Ref	Sheet	Scale	Drawn					
7944-MA-2003	A2	NOTED	KR					

APPENDIX B – TOPOGRAPHICAL SURVEY



Co-ordinate Table			
Station	Easting	Northing	Level
1	384293.670	397879.528	42.365
2	384293.504	397841.149	41.194
3	384285.953	397826.970	41.306
4	384311.722	397850.829	41.740
10	384270.079	397908.943	42.726

All levels related to Ordnance Survey active GPS network.



This survey is related to OSGB36(15) coordinate system by GPS 'rapid static' methods. No scale factor has been applied to the survey information. All horizontal distances taken from this drawing are ground distances.

UTILITY KEY	
	FOUL DRAINAGE
	CONTAMINATED SURFACE
	SURFACE DRAINAGE
	COMBINED DRAINAGE
	PUMPING MAIN
	FOUL ASSUMED RUN
	SURFACE ASSUMED RUN
	FOUL TAKEN FROM RECORDS
	SURFACE TAKEN FROM RECORDS
	ABANDONED RUN
	TRADE EFFLUENT
	SURVEY BOUNDARY
	CABLE / PIPE ROSE
	BACKDROP / TRAPPED EXIT
	END OF TRASE
	END OF RECORDS
	HEAD OF RUN / CAPED
	PIPE INLET / OUTFALL

ABBREVIATIONS	
AR	ASSUMED ROUTE
BD	BACKDROP
BR	BOREROLE
CL	COVER LEVEL
CP	CATCHPI
d	DEPTH
DP	DOWN PIPE
EOT	END OF TRADE
EV	EXISTING ROAD
GV	GULLY
HR	HEAD OF RUN
IC	INVERT LEVEL
IS	INVERT LEVEL
MS	MANHOLE
OWS	CONTAMINATED SURFACE WATER SEWER
FW	FOUL WATER SEWER
CWS	COMBINED WATER SEWER
MR	MANHOLE
MR	MONITORING WELL
RE	ROOFING EYE
RWP	RAIN WATER PIPE
S/A	SOAKAWAY
SV	SURFACE VALVE
SV	SOIL VENT PIPE
TE	TRAPPED EXT
TR	TAKEN FROM RECORD
UTCTV	UNABLE TO CITY
UT	UNABLE TO FIND
UTL	UNABLE TO LET
UTS	UNABLE TO SURVEY
VP	VENT PIPE
VR	VENT PIPE
WR	WATER LEVEL

Client: EIRENG CONSULTING ENGINEERS

Project: SACKVILLE STREET MANCHESTER, M1 3LY

Title: DRAINAGE CONNECTIVITY

Drawing Number: TS24-380-9

Revision	Description	Rev. By	Date

Scale: 1:100@A0	Sheet: 1 of 1
Drawn by: JS	Checked by: MH
Date of Survey: AUG 2024	

TERRAIN SURVEYS
Tel: 01438 841300
www.terrainsurveys.co.uk
enquiries@terrainsurveys.co.uk

Accreditations:

APPENDIX C – HR WALLINGFORD GREENFIELD CALCULATIONS

Calculated by:	Daniel McGrath
Site name:	Infinium
Site location:	Manchester Sackville

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	53.47722° N
Longitude:	2.23839° W
Reference:	495290481
Date:	Jan 06 2025 10:21

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	0.3
-----------------------	-----

Methodology

Q _{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Notes

(1) Is $Q_{\text{BAR}} < 2.0 \text{ l/s/ha}$?

When Q_{BAR} is $< 2.0 \text{ l/s/ha}$ then limiting discharge rates are set at 2.0 l/s/ha .

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

(2) Are flow rates $< 5.0 \text{ l/s}$?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

Hydrological
characteristics

	Default	Edited
SAAR (mm):	881	881
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

(3) Is $\text{SPR/SPRHOST} \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

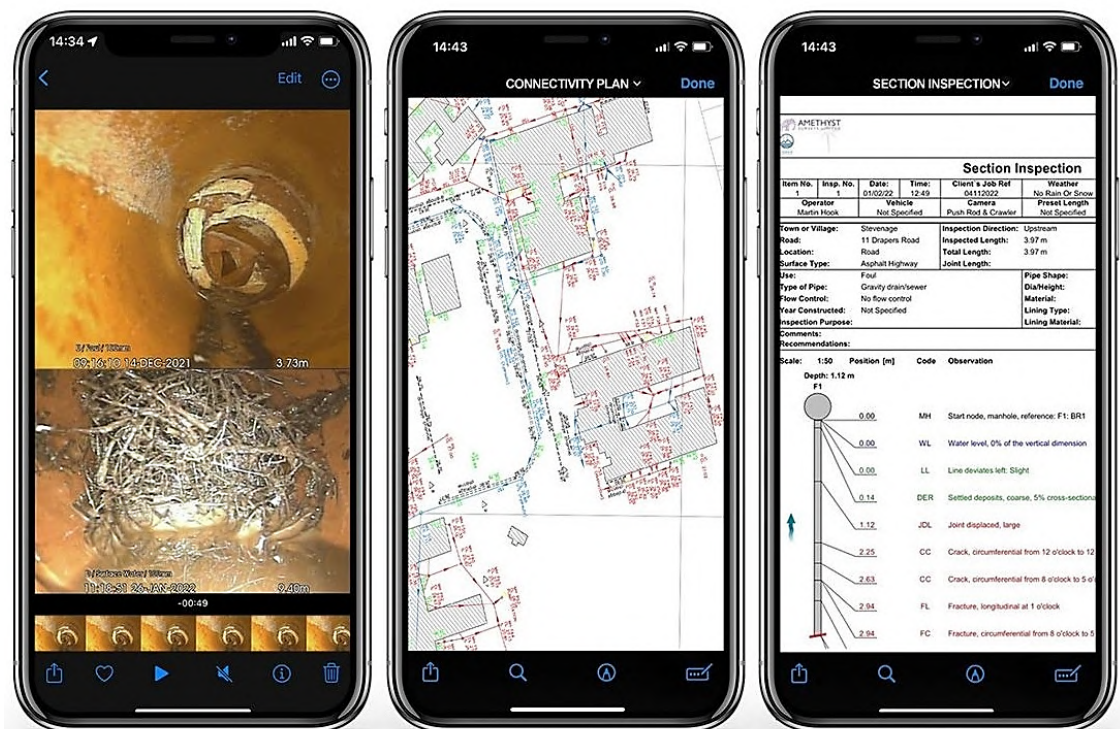
	Default	Edited
Q_{BAR} (l/s):	1.9	1.9
1 in 1 year (l/s):	1.65	1.65
1 in 30 years (l/s):	3.22	3.22
1 in 100 year (l/s):	3.94	3.94
1 in 200 years (l/s):	4.49	4.49

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

APPENDIX D – DRAINAGE SURVEY

Terrain Surveys Site Attendance Report

Client: Eireng Consulting Engineers
Contact: Daniel McGrath
Date: August 2024
Site: CP9 Sackville Street
Job Ref: TS24-380



Services we provide

- Topographical surveys
- Measured building surveys
- 3D Revit survey models
- Laser scanning
- Pointcloud data & viewer files
- Arboriculturist reports
- PAS 128 underground utility surveys
- CCTV drainage surveys
- Drainage Repairs (trenches and excavated)
- Aerial/Drone surveys
- Hydrographic surveys
- Monitoring

Accreditations

- The Survey Association (TSA)
- CICES
- CHAS
- CSCS
- Construction Line (Gold/Level 3)
- Acclaim
- ISO9001:2015

Works Overview

Attended site to undertake a CCTV condition and connectivity survey of the accessible below ground drainage system within the boundary of the Sackville Street carpark, following a full topographical survey undertaken to produce a current site plan for markup purposes etc. On arrival undertook a site walkover to assess and locate any potential manholes and drainage assets located within the site boundary. Scoping confirmed this site was possibly an original building that has been demolished/levelled with the remaining ground area utilised as a carpark. There are no manholes or drainage assets located on site, with the surface water during rainfall simply running over ground and off site then draining into the highway's located within the surrounding road network. As part of the survey, we lifted various covers within the site boundary detailed on the site topo plan supplied and confirmed these to be utilities services chambers.

Note: There is a pub referenced New York New York which shares a boundary with the carpark at the southern end of the site (Bloom Street). While undertaken the site walk over, we noted there is a foul water gully serving this premises which is currently blocked and overflowing into the carpark site at present, that will require the owners to clear and clean up/washdown the overspill etc.

All covers lifted were put back down safe & secure on completion of the survey.

Recommendations

Contact the owners of New York New York to clear the blocked foul water gully and clean up/washdown the overspill & standing water located in the carpark boundary.

Site Reference Pictures

Overflowing FW Gully From Pub



Standing Water In Carpark From FW Gully



Site Connectivity Plan



APPENDIX E – PROPOSED DRAINAGE

NOTES

- LINE AND LEVEL SURVEY REQUIRED AT THE EXISTING MANHOLE TO THE NORTH EAST OF THE SITE WHERE IT IS INTENDED TO DISCHARGE TO, AS SHOWN ON THE SCHEME.
- INFILTRATION TEST REQUIRED TO VALIDATE OR DISCOUNT THE SOLUTION FOR THE LOCAL PLANNING AND WATER AUTHORITIES
- DESIGN OF THE ATTENUATION TANK REQUIRES COORDINATION WITH THE SOLAR CANOPY FOOTINGS TO INFORM ALLOWABLE SETTING OUT OF THE GRADE, DEPTH, AND PLAN ARRANGEMENT OF THE TANK BELOW

GENERAL NOTES :-

1. DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT DESIGN DRAWINGS
2. ALL DIMENSIONS ARE IN METRES
3. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
4. ALL LEVELS ARE IN METERS RELATIVE TO DATUM U.N.O.
5. IT IS THE CONTRACTORS RESPONSIBILITY TO VERIFY OR DETERMINE ALL DIMENSIONS AND LEVELS REQUIRED PRIOR TO COMMENCEMENT OF CONSTRUCTION OR PRODUCTION OF FABRICATION DRAWINGS.

DRAINAGE LEGEND:

- PROPOSED SURFACE WATER DRAINAGE
- PROPOSED SURFACE WATER MANHOLE
- PROPOSED ROAD GULLY
- PROPOSED SW INSPECTION CHAMBER
- PROPOSED SURFACE WATER RISING MAIN
- EXISTING SURFACE WATER MANHOLE
- EXISTING SURFACE WATER DRAINAGE
- EXISTING GULLY
- EXISTING SW INSPECTION CHAMBER
- PROPOSED FOUL DRAINAGE
- PROPOSED FOUL DRAINAGE MANHOLE
- PROPOSED FOUL DRAINAGE INSPECTION CHAMBER
- PROPOSED FOUL DRAINAGE RISING MAIN
- PROPOSED FILTER DRAIN
- EXISTING FOUL DRAINAGE
- EXISTING FOUL DRAINAGE MANHOLE
- PROPOSED SURFACE WATER CHANNEL DRAIN
- PROPOSED FOUL WATER CHANNEL DRAIN
- PROPOSED SURFACE WATER KERB DRAIN
- EXISTING COMBINED DRAINAGE
- EASEMENTS FROM BUILDINGS (SM) AND ROAD (2.5M)
- PLANNING RED LINE BOUNDARY
- EXCEEDANCE FLOW ROUTES

PL9 10.07.25	CE	MR	Updated Site Layout
PL9 07.07.25	CJ	MR	Updated Site Boundary
PL7 24.06.25	DM	MS	Revised Scheme
PL8 13.06.25	DM	MS	Planning Issue
PL5 19.02.25	DM	MS	Planning Issue
PL4 14.02.25	DM	MS	Planning Issue
PL3 01.01.25	DM	MS	Updated Site Layout
PL2 23.01.25	DM	AN	Revised Site Layout
PL1 09.01.25	DM	AN	Planning Issue
REV	DATE	BY	APPROV
DESCRIPTION			

CLIENT

Infinium Logistics

PROJECT TITLE

Infinium Logistics
Manchester Sackville
Surface Parking

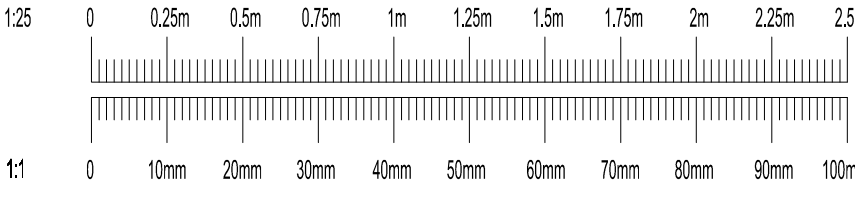
DRAWING TITLE

Proposed Drainage



DRAWN BY	D McGrath	DATE	19.02.25
ENG CHECK	M Sundal	DATE	19.02.25
APPROVED	E Deasy	DATE	19.02.25

STATUS	1:100 @ A0	JOB No.	242037
Planning		REVISION	PL9
DWG No.	242037-ECE-ZZ-XX-DR-C-5210		



MAJOR STREET

SACKVILLE STREET

BLOOM STREET

CAR PARK

ATTENUATION
TANK
CL. 41.500
TOT. 40.600
IL. 40.200
DEPTH = 0.4M
VOLUME = 200M3

S3
CL. 41.235
IL. 40.335

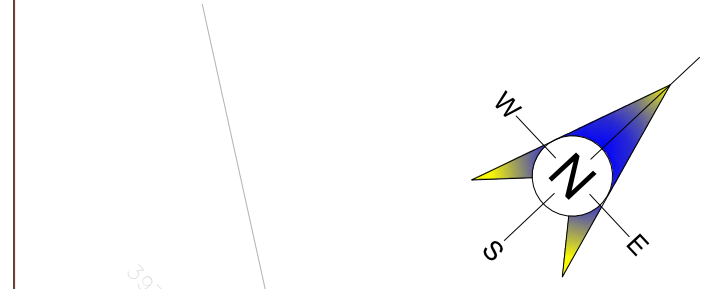
S2
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IL. 40.503

S4 (HB)
2l/s (TBC)
CL. 42.240
IL. 40.133

S1
CL. 41.937
IL. 41.037

EX-CWMH
CL. 43.060
IL. 40.073

MANHOLE LEVELS IN
ABEYANCE,
INFORMED TO DATE
BY VISUAL
INSPECTION



ABINGDON STREET

PH

98

61

59

51

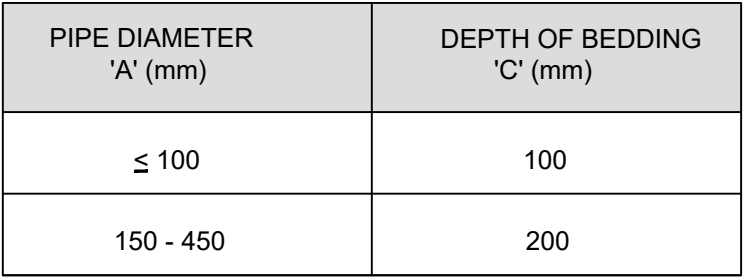
53

49

35

35

41.8m

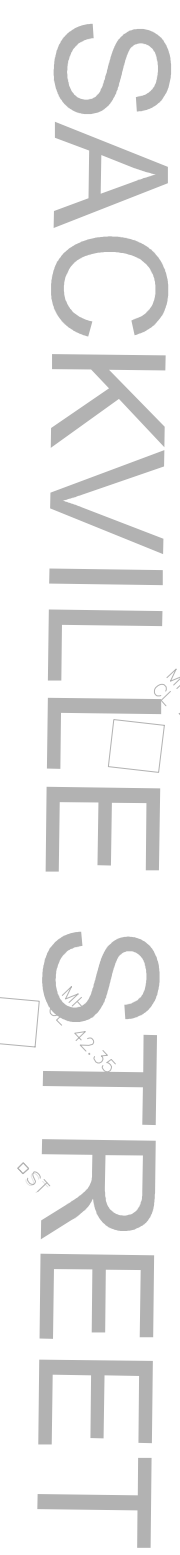


APPENDIX F – SIA

SUMMARY TABLE		DESIGN CONDITIONS			
		1	2	3	4
Land Use Type Pollution Hazard Level Pollution Hazard Indices TSS Metals Hydrocarbons	Non-residential car parking with frequent change (eg hospitals, retail) Medium 0.7 0.6 0.7				
SuDS components proposed					
Component 1	SPEL Puraceptor ESR	Detailed assessment of performance of designed component in reducing inflow concentrations of each pollutant type require as evidence of adopted indices. Enter indices approved by the environmental regulator in appropriate 'User Defined Indices' row below	SEPA only considers proprietary treatment systems as appropriate in exceptional circumstances where other types of SuDS component are not practicable. Proprietary treatment systems may also be considered appropriate for existing sites that are causing pollution where there is a requirement to retrofit treatment. WAT-RM-08 (SEPA, 2014) also provides a flow chart with a summary of checks on suitability of a proprietary system	See Chapter 15 Proprietary treatment systems for approaches to demonstrate product performance. Note: a British Water/Environment Agency assessment Code of Practice is currently under development that will allow manufacturers to complete an agreed test protocol for systems intended to treat contaminated surface water runoff. Full details can be found at: http://www.britishwater.co.uk/Publications/codes-of-practise.aspx .	
Component 2	None				
Component 3	None				
SuDS Pollution Mitigation Indices TSS Metals Hydrocarbons	 0.8 0.6 0.9				
Groundwater protection type Groundwater protection Pollution Mitigation Indices TSS Metals Hydrocarbons	None 0 0 0				
Combined Pollution Mitigation Indices TSS Metals Hydrocarbons Acceptability of Pollution Mitigation TSS Metals Hydrocarbons	 0.8 0.6 0.9 Sufficient Sufficient Sufficient	Note: In order to meet both Water Quality criteria set out in the SuDS Manual (Chapter 4), Interception should be delivered for all impermeable areas wherever possible. Interception delivery and treatment may be met by the same components, but Interception requires separate evaluation.	Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see Chapter 7 The SuDS design process). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England		

APPENDIX G – PROPOSED LEVELS

#



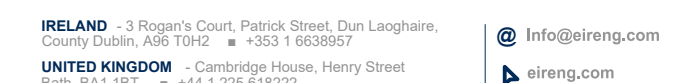
- CONTOUR LEGEND:**
- MAJOR CONTOUR
- MINOR CONTOUR

Infinium Logistics

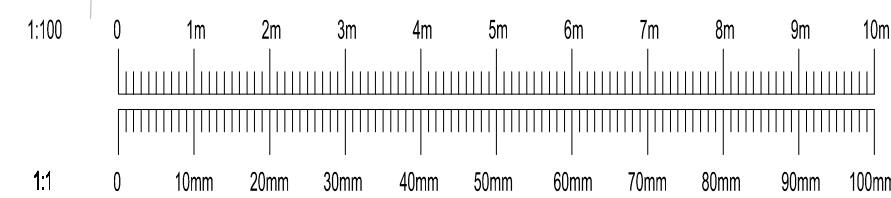
PROJECT TITLE
Infinium Logistics
Manchester Sackville
Surface Parking

DRAWING TITLE

EXISTING TOPO CONTOURS



DRAWN BY D McGrath		DATE 19.02.25
ENG CHECK M.Sundal		DATE 19.02.25
APPROVED E Deasy		DATE 19.02.25
SCALE 1:100 @ A0		JOB No. 242037
STATUS Planning		REVISION PL3
DWG NO. 242037-ECE-ZZ-XX-DR-C-9010		



APPENDIX H – SURFACE WATER CALCULATIONS

Network Details

Manhole Schedule

Manhole	Catchment Area (ha)	Diameter (m)	Type	CL (m)	IL (m)	Depth To Soffit (m)	Easting (m)	Northing (m)
S1	0.088	1.350	Type C	41.937	40.583	1.129	384302.607	397864.184
S2	0.000	1.350	Type C	41.403	40.260	0.918	384267.883	397830.206
S3	0.181	1.350	Type C	41.235	40.125	0.885	384253.492	397844.272
S5	0.000	1.200	Type B	42.014	39.525	2.264	384278.741	397872.538
S4	0.000	1.200	Type B	42.240	39.500	2.590	384286.355	397880.328
S7	0.000	1.200	Type B	42.541	39.403	2.988	384280.931	397893.802

Pipe Schedule

Pipe Number	US Manhole	US IL (m)	DS Manhole	DS IL (m)	Shape	Dimension (m)	Length (m)	Gradient (1:x)	Roughness (mm)	US Depth To Soffit (m)	DS Depth To Soffit (m)
1.000	S1	40.583	S2	40.260	Circ	0.225mØ	48.583	150.4	0.600	1.129	0.918
1.001	S2	40.260	S3	40.125	Circ	0.225mØ	20.124	149.1	0.600	0.918	0.885
1.002	S3	40.125	S5	39.525	Circ	0.225mØ	37.901	63.2	0.600	0.885	2.264
1.003	S5	39.600	S4	39.527	Circ	0.15mØ	10.893	150.0	0.600	2.264	2.563
1.004	S4	39.500	S7	39.403	Circ	0.15mØ	14.525	150.0	0.600	2.590	2.988

Outfall Details

Outfall Manhole S7 : Free Discharge

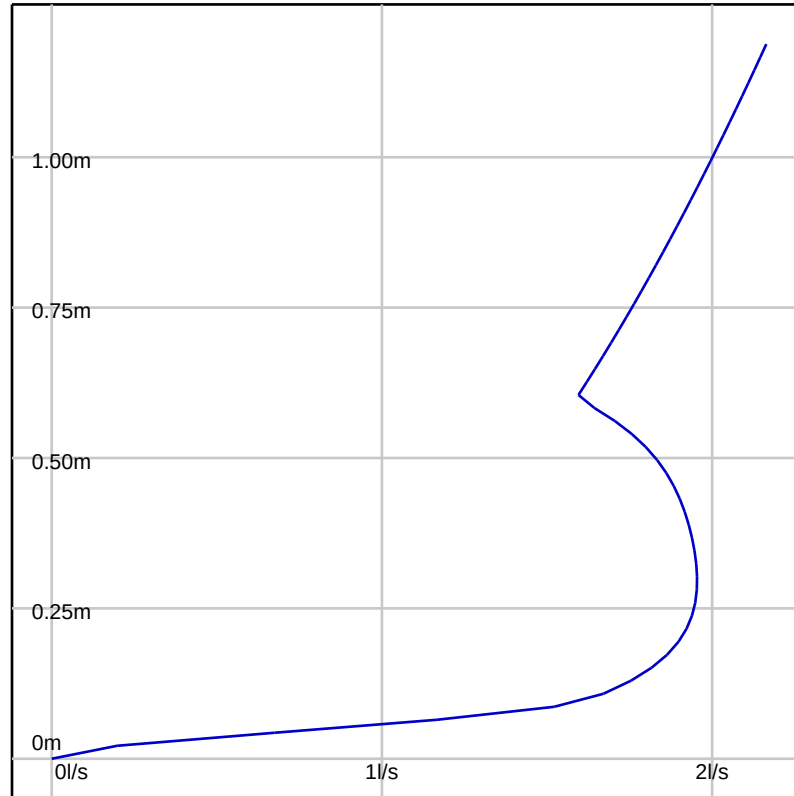
Flow Control Details

Controls within Manhole S5

Hydro-Brake® Optimum Control at Manhole S5

Model Ref	Design Depth (m)	Design Flow (l/s)	Depth Above Invert (m)	FF Head (m)	FF Flow (l/s)	KF Head (m)	KF Flow (l/s)
SHE-0067-2000-1000-2000	1.000	2.000	0.000	0.296	1.954	0.599	1.588

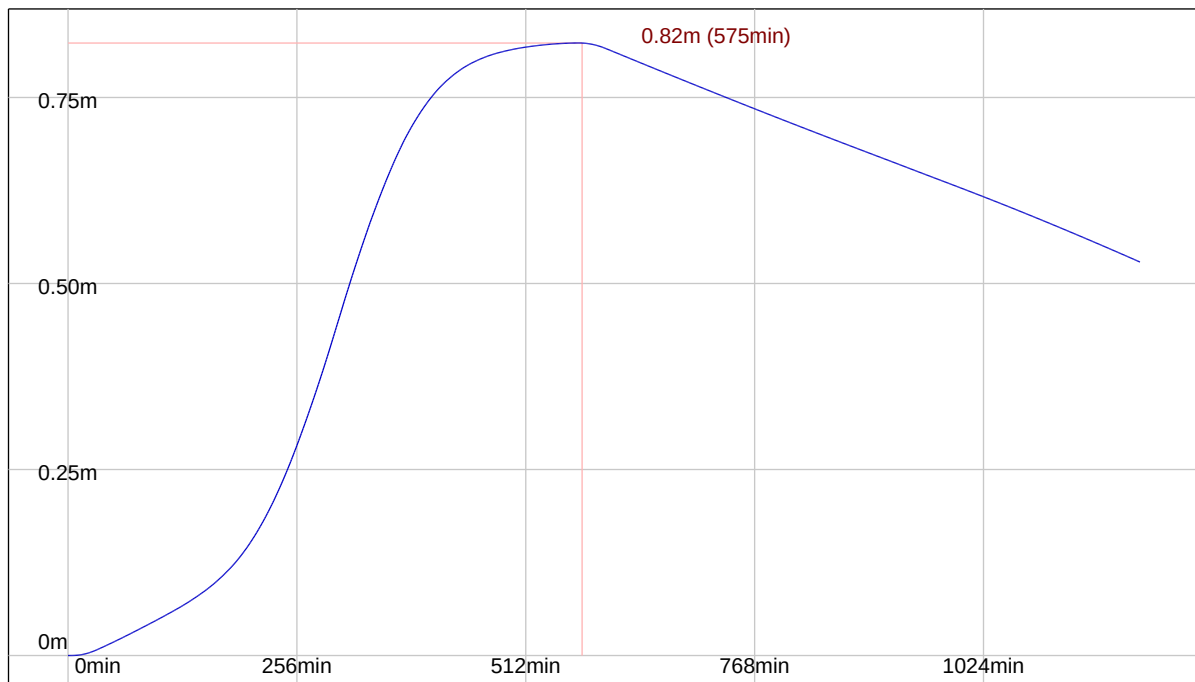
Hydro-Brake® Optimum Control at S5



Tank Structure at Manhole S5

Tank Invert (m)	Tank Height (m)	Porosity Ratio (%)	Area (m2)	Effective Area (m2) Area x Porosity Ratio	Max Storage (m3) Effective Area x Height	Infil Base (m/hr)	Infil Side (m/hr)	Safety Factor
39.525	1.000	95.00	210.233	199.722	199.722	0.00000000	0.00000000	2.00

Tank at S5 (100Yr+45% 600Min Winter)



Simulation Settings

FSR: M5-60=18.00, R=0.36, Locale=England and Wales

Summer (Cv: 0.75), Winter (Cv: 0.84)

Global Time of Entry: 5.0 mins

Durations (mins): 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080

Return Periods (yrs) + Climate Change: (1, +0%), (30, +0%), (100, +45%)

Simulated Rainfall Events

Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %	Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %
1Yr 15Min Winter	31.890	0.00	-0.17	30Yr 720Min Winter	4.528	0.00	0.00
1Yr 15Min Summer	31.890	0.00	0.00	30Yr 960Min Summer	3.643	0.00	0.00
1Yr 30Min Winter	20.563	0.00	-0.17	30Yr 960Min Winter	3.643	0.00	0.00
1Yr 30Min Summer	20.563	0.00	-0.17	30Yr 1440Min Summer	2.677	0.00	0.00
1Yr 60Min Winter	12.828	0.00	-0.17	30Yr 1440Min Winter	2.677	0.00	0.00
1Yr 60Min Summer	12.828	0.00	-0.17	30Yr 2160Min Summer	1.965	0.00	0.00
1Yr 120Min Winter	7.878	0.00	-0.12	30Yr 2160Min Winter	1.965	0.00	0.00
1Yr 120Min Summer	7.878	0.00	-0.12	30Yr 2880Min Summer	1.577	0.00	0.00
1Yr 180Min Summer	5.911	0.00	-0.08	30Yr 2880Min Winter	1.577	0.00	0.00
1Yr 180Min Winter	5.911	0.00	-0.09	30Yr 4320Min Summer	1.155	0.00	0.00
1Yr 240Min Summer	4.824	0.00	0.00	30Yr 4320Min Winter	1.155	0.00	0.00
1Yr 240Min Winter	4.824	0.00	0.00	30Yr 5760Min Summer	0.925	0.00	0.00
1Yr 360Min Summer	3.628	0.00	0.00	30Yr 5760Min Winter	0.925	0.00	0.00
1Yr 360Min Winter	3.628	0.00	0.00	30Yr 7200Min Summer	0.778	0.00	0.00
1Yr 480Min Summer	2.960	0.00	0.00	30Yr 7200Min Winter	0.778	0.00	0.00
1Yr 480Min Winter	2.960	0.00	0.00	30Yr 8640Min Summer	0.676	0.00	0.00
1Yr 600Min Summer	2.527	0.00	0.00	30Yr 8640Min Winter	0.676	0.00	0.00
1Yr 600Min Winter	2.527	0.00	0.00	30Yr 10080Min Summer	0.600	0.00	0.00
1Yr 720Min Summer	2.221	0.00	0.00	30Yr 10080Min Winter	0.600	0.00	0.00
1Yr 720Min Winter	2.221	0.00	0.00	100Yr+45% 15Min Summer	122.849	0.00	1.35
1Yr 960Min Summer	1.812	0.00	0.00	100Yr+45% 15Min Winter	122.849	0.00	1.47
1Yr 960Min Winter	1.812	0.00	0.00	100Yr+45% 30Min Summer	82.249	0.00	1.06
1Yr 1440Min Winter	1.360	0.00	0.00	100Yr+45% 30Min Winter	82.249	0.00	0.90
1Yr 1440Min Summer	1.360	0.00	0.00	100Yr+45% 60Min Summer	52.627	0.00	0.51
1Yr 2160Min Winter	1.021	0.00	0.00	100Yr+45% 60Min Winter	52.627	0.00	0.46
1Yr 2160Min Summer	1.021	0.00	0.00	100Yr+45% 120Min Summer	32.592	0.00	0.51
1Yr 2880Min Summer	0.834	0.00	0.00	100Yr+45% 120Min Winter	32.592	0.00	0.66
1Yr 2880Min Winter	0.834	0.00	0.00	100Yr+45% 180Min Summer	24.304	0.00	0.61
1Yr 4320Min Summer	0.627	0.00	0.00	100Yr+45% 180Min Winter	24.304	0.00	0.67
1Yr 4320Min Winter	0.627	0.00	0.00	100Yr+45% 240Min Summer	19.616	0.00	0.59
1Yr 5760Min Summer	0.512	0.00	0.00	100Yr+45% 240Min Winter	19.616	0.00	0.65
1Yr 5760Min Winter	0.512	0.00	0.00	100Yr+45% 360Min Summer	14.378	0.00	0.50
1Yr 7200Min Summer	0.438	0.00	0.00	100Yr+45% 360Min Winter	14.378	0.00	0.58
1Yr 7200Min Winter	0.438	0.00	0.00	100Yr+45% 480Min Summer	11.541	0.00	0.38
1Yr 8640Min Summer	0.386	0.00	0.00	100Yr+45% 480Min Winter	11.541	0.00	0.50
1Yr 8640Min Winter	0.386	0.00	0.00	100Yr+45% 600Min Summer	9.724	0.00	0.26
1Yr 10080Min Winter	0.346	0.00	0.00	100Yr+45% 600Min Winter	9.724	0.00	0.39
1Yr 10080Min Summer	0.346	0.00	0.00	100Yr+45% 720Min Summer	8.449	0.00	0.14
30Yr 15Min Summer	65.624	0.00	0.00	100Yr+45% 720Min Winter	8.449	0.00	0.28
30Yr 15Min Winter	65.624	0.00	0.00	100Yr+45% 960Min Summer	6.764	0.00	-0.04
30Yr 30Min Summer	43.507	0.00	-0.10	100Yr+45% 960Min Winter	6.764	0.00	0.07
30Yr 30Min Winter	43.507	0.00	-0.09	100Yr+45% 1440Min Summer	4.934	0.00	-0.01
30Yr 60Min Summer	27.653	0.00	0.00	100Yr+45% 1440Min Winter	4.934	0.00	-0.01
30Yr 60Min Winter	27.653	0.00	0.10	100Yr+45% 2160Min Summer	3.592	0.00	0.00
30Yr 120Min Summer	17.088	0.00	0.00	100Yr+45% 2160Min Winter	3.592	0.00	0.00
30Yr 120Min Winter	17.088	0.00	0.13	100Yr+45% 2880Min Summer	2.864	0.00	0.00
30Yr 180Min Summer	12.763	0.00	-0.05	100Yr+45% 2880Min Winter	2.864	0.00	0.00
30Yr 180Min Winter	12.763	0.00	0.07	100Yr+45% 4320Min Summer	2.078	0.00	0.00
30Yr 240Min Summer	10.331	0.00	-0.07	100Yr+45% 4320Min Winter	2.078	0.00	0.00
30Yr 240Min Winter	10.331	0.00	0.00	100Yr+45% 5760Min Summer	1.653	0.00	0.00
30Yr 360Min Summer	7.624	0.00	-0.07	100Yr+45% 5760Min Winter	1.653	0.00	0.00
30Yr 360Min Winter	7.624	0.00	-0.07	100Yr+45% 7200Min Summer	1.383	0.00	0.00
30Yr 480Min Summer	6.146	0.00	-0.04	100Yr+45% 7200Min Winter	1.383	0.00	0.00
30Yr 480Min Winter	6.146	0.00	-0.05	100Yr+45% 8640Min Summer	1.196	0.00	0.00
30Yr 600Min Summer	5.196	0.00	0.00	100Yr+45% 8640Min Winter	1.196	0.00	0.00

Simulated Rainfall Events

Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %	Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %
30Yr 600Min Winter	5.196	0.00	-0.03	100Yr+45% 10080Min Winter	1.056	0.00	0.00
30Yr 720Min Summer	4.528	0.00	0.00	100Yr+45% 10080Min Summer	1.056	0.00	0.00

Simulation Results

Return Period Yrs: 1.0

Climate Change %: 0

Small amount of surcharging,
this is actually water backing up
in the tank.

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
S1	15 min Winter	8	40.667	0.084	12.951		OK
S2	15 min Winter	9	40.343	0.083	12.597		OK
S3	15 min Winter	8	40.271	0.146	38.483		OK
S5	360 min Winter	266	39.759	0.159	1.713		Surcharged
S4	360 min Winter	266	39.535	0.035	1.731		OK
S7	360 min Winter	266	39.438	0.035	1.731		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Winter	9	S1	S2	0.083	0.958	12.685	0.300	OK
1.001	15 min Winter	9	S2	S3	0.114	0.648	12.698	0.299	OK
1.002	15 min Winter	9	S3	S5	0.094	2.580	38.692	0.591	OK
1.003	360 min Winter	266	S5	S4	0.035	0.557	1.731	0.120	OK
1.004	360 min Winter	266	S4	S7	0.035	0.557	1.731	0.120	OK

Return Period Yrs: 30.0

Climate Change %: 0

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
S1	15 min Winter	8	40.710	0.127	26.652		OK
S2	15 min Winter	10	40.579	0.319	22.597		Surcharged
S3	15 min Winter	10	40.535	0.410	67.576		Surcharged
S5	480 min Winter	383	39.977	0.377	1.936		Surcharged
S4	960 min Winter	760	39.537	0.037	1.954		OK
S7	600 min Winter	605	39.440	0.037	1.954		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Winter	9	S1	S2	0.175	1.114	26.158	0.619	OK
1.001	15 min Winter	12	S2	S3	0.225	0.870	30.460	0.718	OK
1.002	15 min Winter	12	S3	S5	0.184	2.684	69.444	1.061	OK
1.003	960 min Winter	760	S5	S4	0.037	0.577	1.954	0.135	OK
1.004	960 min Winter	761	S4	S7	0.037	0.577	1.954	0.135	OK

Return Period Yrs: 100.0

Climate Change %: 45

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
S1	15 min Winter	10	41.645	1.062	39.860		Flood Risk
S2	15 min Winter	10	41.354	1.094	41.026		Flood Risk
S3	15 min Winter	9	41.235	1.110	128.150	3.239	Flood
S5	600 min Winter	571	40.423	0.823	1.803		Surcharged
S4	5760 min Summer	3174	39.537	0.037	1.954		OK
S7	5760 min Summer	3444	39.440	0.037	1.954		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Winter	10	S1	S2	0.225	1.137	41.026	0.971	OK
1.001	15 min Winter	13	S2	S3	0.225	1.163	46.247	1.090	OK
1.002	15 min Winter	13	S3	S5	0.225	2.889	101.169	1.545	OK
1.003	5760 min Summer	3174	S5	S4	0.037	0.577	1.954	0.135	OK
1.004	5760 min Summer	3444	S4	S7	0.037	0.577	1.954	0.135	OK



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