Happy Drains
12A Chalex Industrial Estate, Southwich Manor Hall Road
Tel. 0800 849 8099
Reports@happydrains.co.uk

Section Inspection - 23/02/2019 - manhole 4X

Section	Inspection	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
4	4	23/02/19	15:11	Not Specified	No Rain Or Snow	N	MANHOLE 4X

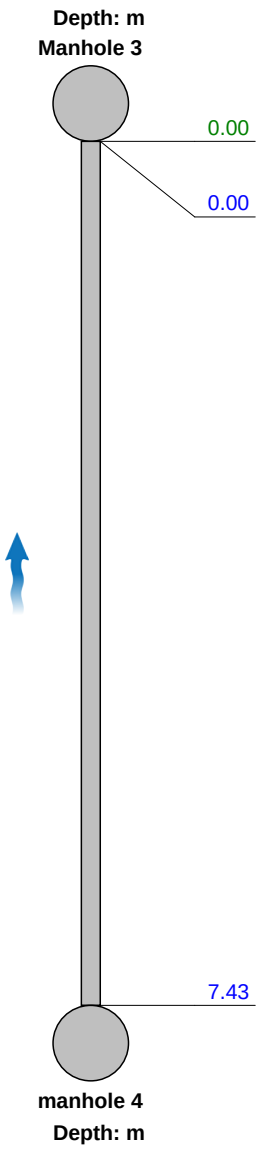
Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID
Not Specified	Not Specified	Not Specified	Not Specified	Private Drain	Not Specified

Town or Village:	Manchester	**Inspection Direction:**	Upstream	**Upstream Node:**	MANHOLE 4
Road:	367 Wilmslow Road	**Inspected Length:**	7.43 m	**Upstream Pipe Depth:**	
Location:	Gardens	**Total Length:**	7.43 m	**Downstream Node:**	MANHOLE 3
Surface Type:		**Joint Length:**	0.00 m	**Downstream Pipe Depth:**	

Use:	Foul	**Pipe Shape:**	Circular		
Type of Pipe:	Gravity drain/sewer	**Dia/Height:**	100 mm	**Width:**	100 mm
Year Constructed:		**Pipe Material:**	Vitrified clay pipe (i.e. all clayware)		
Flow Control:	No flow control	**Lining Type:**	No Lining		
Inspection Purpose:	Routine inspection of condition	**Lining Material:**	No Lining		

Comments:
Recommendations:

Scale: 1:65



Position [m]	Code	Observation	MPEG	Photo	Grade
0.00	WL	Water level, 0% of the vertical dimension			
0.00	MH	Start node type, manhole, reference number: Manhole 3	00:00:00		
7.43	MHF	Finish node type, manhole, reference number: manhole 4: internal manhole	00:00:43		

Structural Defects					Construction Features				
Service & Operational Observations					Miscellaneous Features				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

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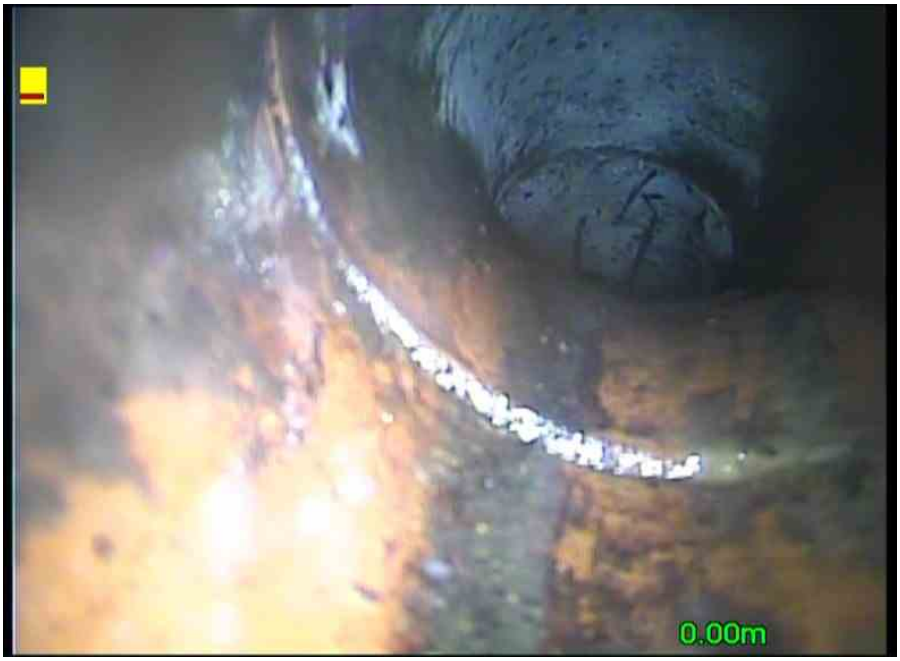
Section Pictures - 23/02/2019 - manhole 4X

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
4	Upstream	MANHOLE 4X		



, 0.00 m
Water level, 0% of the vertical dimension

, 00:00:00, 0.00 m
Start node type, manhole, reference number: Manhole 3

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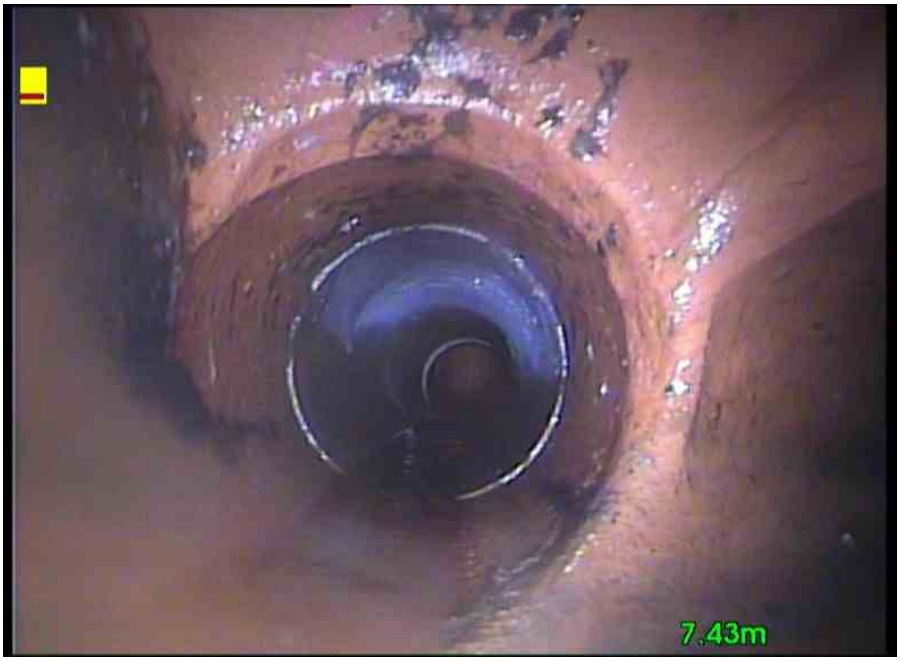
Section Pictures - 23/02/2019 - manhole 4X

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
4	Upstream	MANHOLE 4X		



, 00:00:43, 7.43 m
Finish node type, manhole, reference number: manhole 4, internal manhole

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Section Inspection - 23/02/2019 - SVPX

Section	Inspection	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
5	5	23/02/19	15:20	Not Specified	No Rain Or Snow	N	SVPX

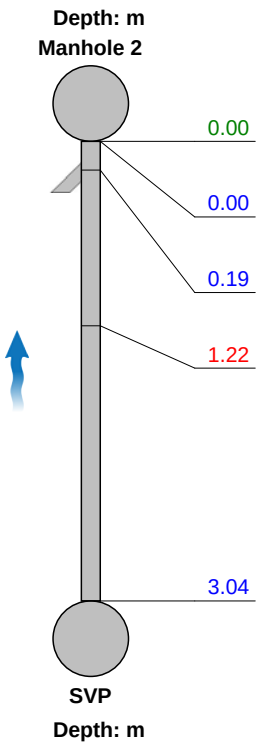
Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID
Not Specified	Not Specified	Not Specified	Not Specified	Private Drain	Not Specified

Town or Village:	Manchester	**Inspection Direction:**	Upstream	**Upstream Node:**	SVP
Road:	367 Wilmslow Road	**Inspected Length:**	3.04 m	**Upstream Pipe Depth:**	
Location:	Gardens	**Total Length:**	3.04 m	**Downstream Node:**	MANHOLE 2
Surface Type:		**Joint Length:**	0.00 m	**Downstream Pipe Depth:**	

Use:	Foul	**Pipe Shape:**	Circular		
Type of Pipe:	Gravity drain/sewer	**Dia/Height:**	100 mm	**Width:**	100 mm
Year Constructed:		**Pipe Material:**	Vitrified clay pipe (i.e. all clayware)		
Flow Control:	No flow control	**Lining Type:**	No Lining		
Inspection Purpose:	Routine inspection of condition	**Lining Material:**	No Lining		

Comments:
Recommendations:

Scale: 1:50



Position [m]	Code	Observation	MPEG	Photo	Grade
0.00	WL	Water level, 0% of the vertical dimension			
0.00	MH	Start node type, manhole, reference number: Manhole 3	00:00:00		
0.19	JN	Junction at 3 o'clock, diameter: 100mm	00:00:14		
1.22	BJ	Broken pipe at joint from 9 o'clock to 1 o'clock ,	00:00:25		4
3.04	BRF	Finish node type, major connection without manhole, reference number: SVP: soil vent pipe	00:00:38		

Structural Defects					Construction Features				
Service & Operational Observations					Miscellaneous Features				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
1	80.0	26.3	80.0	4.0	0	0.0	0.0	0.0	1.0

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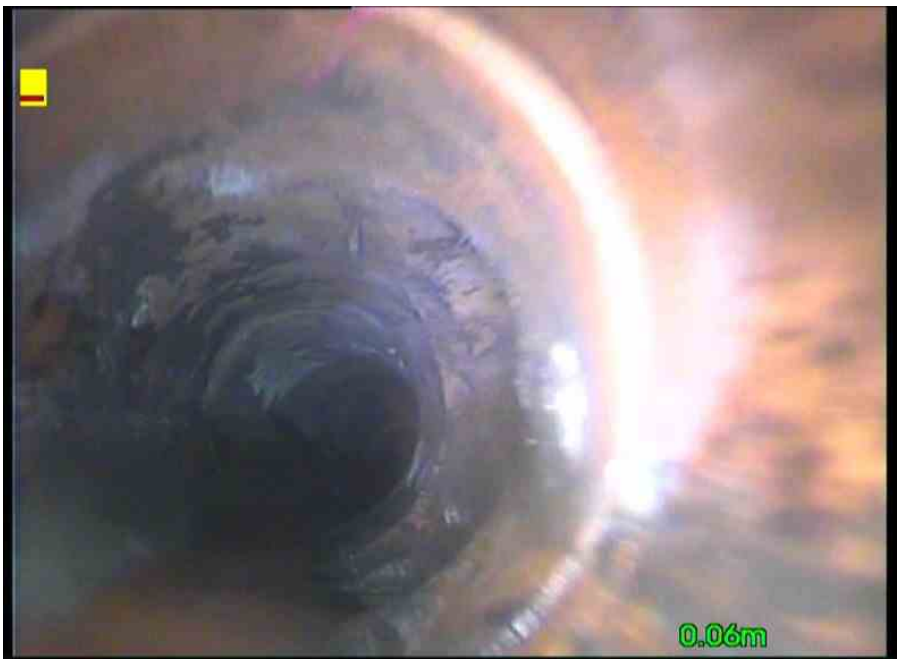
Section Pictures - 23/02/2019 - SVPX

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
5	Upstream	SVPX		

, 0.00 m
Water level, 0% of the vertical dimension



, 00:00:00, 0.00 m
Start node type, manhole, reference number: Manhole 3

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Section Pictures - 23/02/2019 - SVPX

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
5	Upstream	SVPX		

, 00:00:14, 0.19 m
Junction at 3 o'clock, diameter: 100mm

, 00:00:25, 1.22 m
Broken pipe at joint from 9 o'clock to 1 o'clock ,

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Section Pictures - 23/02/2019 - SVPX

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
5	Upstream	SVPX		

, 00:00:38, 3.04 m
Finish node type, major connection without manhole, reference number: SVP, soil vent pipe

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Section Inspection - 23/02/2019 - Manhole 3X

Section	Inspection	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
6	6	23/02/19	15:42	Not Specified	No Rain Or Snow	N	MANHOLE 3X

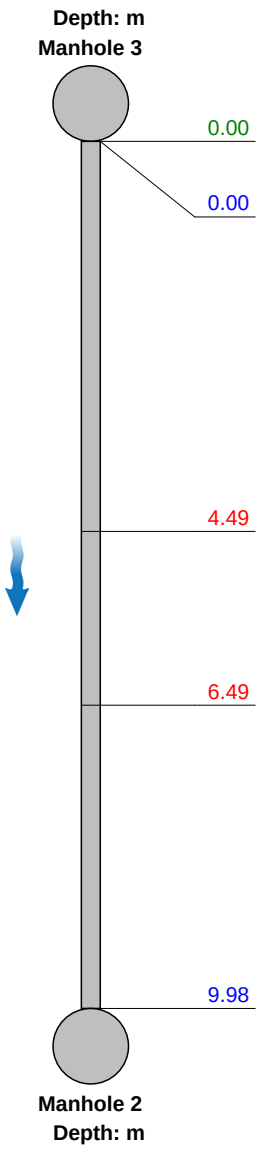
Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID
Not Specified	Not Specified	Not Specified	Not Specified	Private Drain	Not Specified

Town or Village:	Manchester	**Inspection Direction:**	Downstream	**Upstream Node:**	MANHOLE 3
Road:	367 Wilmslow Road	**Inspected Length:**	9.98 m	**Upstream Pipe Depth:**	
Location:	Gardens	**Total Length:**	9.98 m	**Downstream Node:**	MANHOLE 2
Surface Type:		**Joint Length:**	0.00 m	**Downstream Pipe Depth:**	

Use:	Foul	**Pipe Shape:**	Circular		
Type of Pipe:	Gravity drain/sewer	**Dia/Height:**	100 mm	**Width:**	100 mm
Year Constructed:		**Pipe Material:**	Polyvinyl chloride		
Flow Control:	No flow control	**Lining Type:**	No Lining		
Inspection Purpose:	Routine inspection of condition	**Lining Material:**	No Lining		

Comments:
Recommendations:

Scale: 1:87



Position [m]	Code	Observation	MPEG	Photo	Grade
0.00	WL	Water level, 0% of the vertical dimension			
0.00	MH	Start node type, manhole, reference number: Manhole 3	00:00:00		
4.49	CC	Crack, circumferential from 8 o'clock to 3 o'clock	00:00:50		2
6.49	CC	Crack, circumferential from 12 o'clock to 4 o'clock	00:01:10		2
9.98	MHF	Finish node type, manhole, reference number: Manhole 2	00:02:02		

Structural Defects					Construction Features				
Service & Operational Observations					Miscellaneous Features				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
2	10.0	2.0	20.0	2.0	0	0.0	0.0	0.0	1.0

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Section Pictures - 23/02/2019 - Manhole 3X

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
6	Downstream	MANHOLE 3X		

, 0.00 m
Water level, 0% of the vertical dimension

, 00:00:00, 0.00 m
Start node type, manhole, reference number: Manhole 3

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Reports@happydrains.co.uk

Section Pictures - 23/02/2019 - Manhole 3X

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
6	Downstream	MANHOLE 3X		

, 00:00:50, 4.49 m
Crack, circumferential from 8 o'clock to 3 o'clock

, 00:01:10, 6.49 m
Crack, circumferential from 12 o'clock to 4 o'clock

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Reports@happydrains.co.uk

Section Pictures - 23/02/2019 - Manhole 3X

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
6	Downstream	MANHOLE 3X		

, 00:01:10, 6.49 m
Crack, circumferential from 12 o'clock to 4 o'clock

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Reports@happydrains.co.uk

Section Inspection - 23/02/2019 - SwgX

Section	Inspection	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
7	7	23/02/19	15:57	Not Specified	No Rain Or Snow	N	SWGX

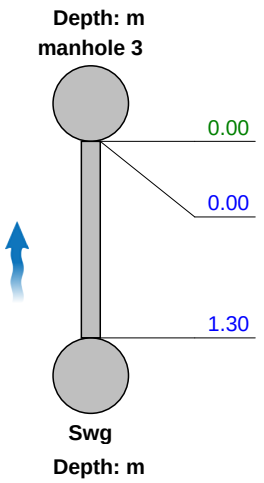
Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID
Not Specified	Not Specified	Not Specified	Not Specified	Private Drain	Not Specified

Town or Village:	Manchester	**Inspection Direction:**	Upstream	**Upstream Node:**	SWG
Road:	367 Wilmslow Road	**Inspected Length:**	1.30 m	**Upstream Pipe Depth:**	
Location:	Gardens	**Total Length:**	1.30 m	**Downstream Node:**	MANHOLE 3
Surface Type:		**Joint Length:**	0.00 m	**Downstream Pipe Depth:**	

Use:	Foul	**Pipe Shape:**	Circular		
Type of Pipe:	Gravity drain/sewer	**Dia/Height:**	100 mm	**Width:**	100 mm
Year Constructed:		**Pipe Material:**	Polyvinyl chloride		
Flow Control:	No flow control	**Lining Type:**	No Lining		
Inspection Purpose:	Routine inspection of condition	**Lining Material:**	No Lining		

Comments:
Recommendations:

Scale: 1:50



Position [m]	Code	Observation	MPEG	Photo	Grade
0.00	WL	Water level, 0% of the vertical dimension			
0.00	MH	Start node type, manhole, reference number: manhole 3	00:00:00		
1.30	GYF	Finish node type, gully, reference number: Swg: surface water gully	00:00:36		

Structural Defects					Construction Features				
Service & Operational Observations					Miscellaneous Features				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

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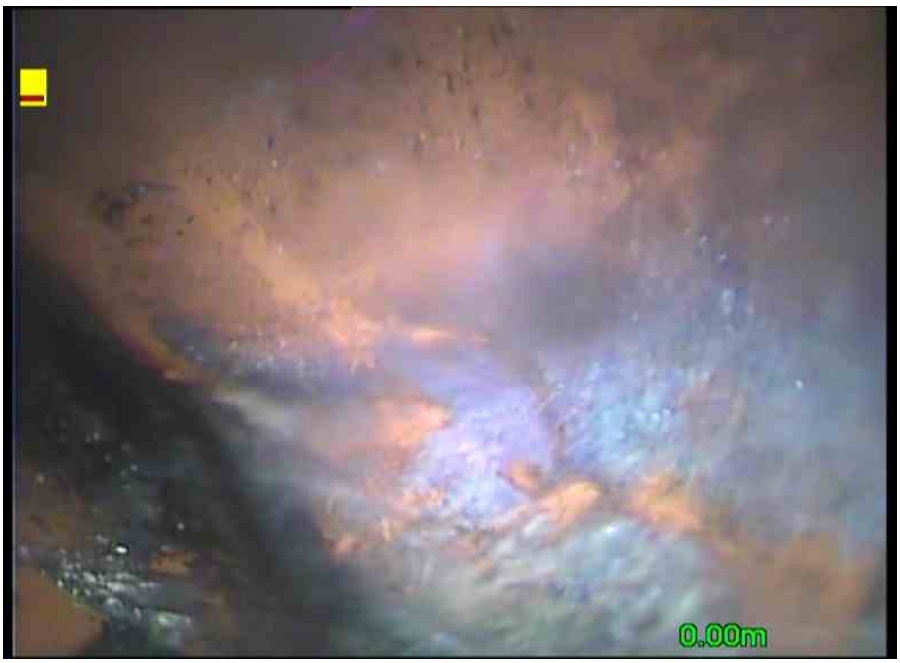
Tel. 0800 849 8099
Reports@happydrains.co.uk

Section Pictures - 23/02/2019 - SwgX

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
7	Upstream	SWGX		

, 0.00 m
Water level, 0% of the vertical dimension



, 00:00:00, 0.00 m
Start node type, manhole, reference number: manhole 3

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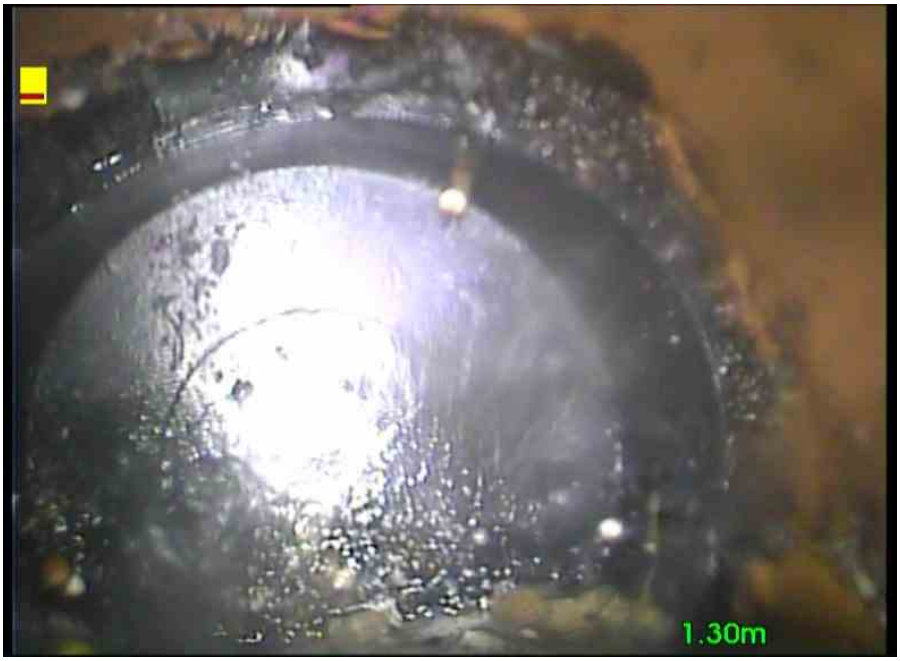
Section Pictures - 23/02/2019 - SwgX

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
7	Upstream	SWGX		



, 00:00:36, 1.30 m
Finish node type, gully, reference number: Swg, surface water gully

Our Ref: YE6723

28th February 2019

Phlorum Limited,
Unit 12,
Hunns Mere Way,
Brighton,
East Sussex,
BN2 6AH

Ref: 169-367 Wilmslow Road, Manchester.

We thank you for your request to undertake permeability testing at the above-mentioned site and take pleasure in enclosing the results of this work. The investigation was undertaken on the 26th February 2019 in accordance with your instruction to proceed. This letter describes the work undertaken, presents the data obtained and discusses the results of the tests.

Geology

An examination of the available British Geological Survey data of the area for the site has been examined and indicates that the site is underlain by Till superficial deposits. Underlying this, solid geology deposits are noted as the Chester Formation, which comprise variable sandstones with occasional conglomerates.

Fieldworks

The programme of this investigation included the excavation of One trial pit, with One test undertaken in the pit. The locations of soakaway tests were positioned where access was achievable and where water could be pumped. Operatives on site were instructed by the representative on site, that one trial pit in the location selected would be sufficient. Due to the very low soakage encountered within the first test, it was deemed that further testing was not required. Weather on the day was good, with no precipitation.

During this work, the soils encountered were logged in general accordance with BS 5930: 1990, as amended in 2007, and full descriptions are given on the borehole records, which are also appended to this letter.

Soakaway Tests

During the soakaway test the water failed to achieve a fall from 75% to 25% of the effective depth of the storage volume. The results obtained from the soakaway tests are summarised below:

Table 1: ***Soakaway Test Results***

TP	Soakage Area Dimensions (m)	Depth (m)	Soil Description (Base of TP)	Infiltration Rate (m/sec)	Drainage Characteristics
TP01 Test 1	2.40 x 0.80	2.125m	Grey mottled brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is	Unable to reliably determine	N/A

			fine to medium, angular to sub-rounded of mixed lithology.	soil infiltration rate.	

Discussion

The soils encountered the trial pit were found to be sandy gravelly Clays, considered likely to be representative of Till superficial deposits. The tests did not achieve a drop between 25% and 75% of the storage volume of the pit and therefore could provide us with an infiltration rate. In this instance, it is considered that soakaways could not be utilised at this site.

References

Building Research Establishment (BRE) Digest 365, *Soakaway Design*, September 1991.

British Standards Institution (1999) BS5930: *Code of practice for site investigations*, B.S.I., London.

British Standards Institution (2007), Amendment No 1, BS5930: *Code of practice for site investigations*, B.S.I., London.

We trust that this information is of interest and should you have any other requirements do not hesitate to contact us.

For and on behalf of

*Your*Environment

Yours Faithfully,

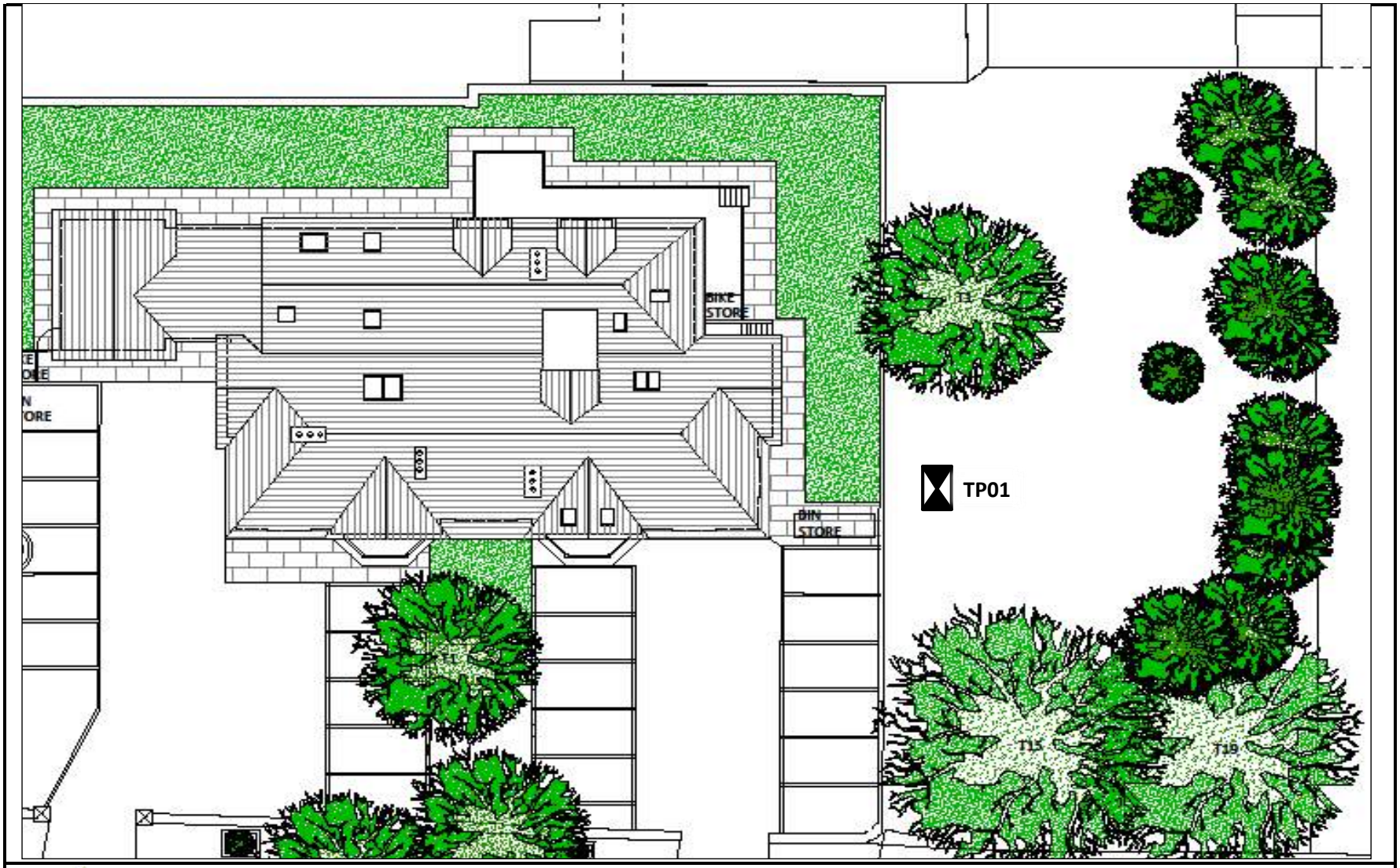
Daniel Speight BSc(Hons)

Graduate Engineer

Enc.

Appendix A: Site Investigation Plan
Appendix B: Trial Pit Logs
Appendix C: Soakaway Test Results
Appendix D: Photographs

APPENDIX A: Site Investigation Plan



Your Environment

Site Investigation Location Plan - Not to Scale

YourEnvironment	Site Name:	Client:	Date:	Job No:
Chilgrove Business Centre, Chilgrove, Nr Chichester, PO18 9HU Tel: 01243 787150 Email: info@yourenvironment.org	169-367 Wilmslow Road, Manchester	Phlorum Ltd.	Feb-19	YE6723

APPENDIX B: Trial Pit Logs

YourGeotechnical

Trial Pit Log

TrialPit No
TP01
Sheet 1 of 1

Project Name: 169-367 Wilmslow Road	Project No. YE6723	Co-ords: - Level:	Date 26/02/2019
Location: Manchester, M14 6AH		Dimensions (m): 2.40 × 0.80	Scale 1:25
Client: Phlorum Limited.		Depth	Logged RE

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADEGROUND: Dark brown, slightly sandy gravelly SILT. Sand is fine to coarse. Gravel is fine to medium, angular to sub-rounded of brick, concrete and mixed lithology. Rootlets noted.
				0.90			Grey mottled brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium, angular to sub-rounded of mixed lithology.
				2.13			

1
2
3
4
5

Remarks:

Stability:

AGS

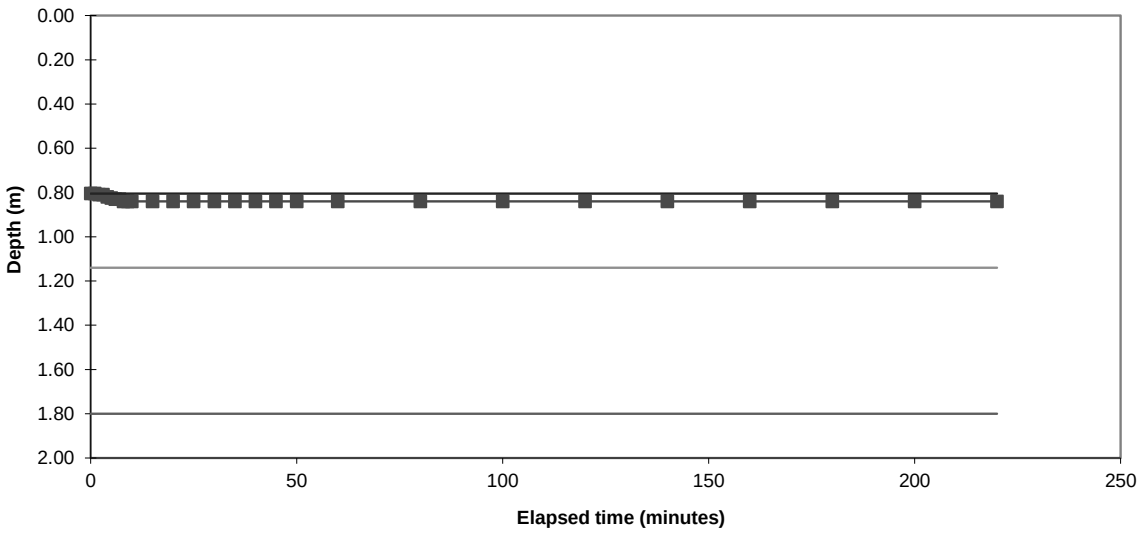
APPENDIX C: Soakaway Test Results

Your Environment

Soakaway Test

Trial Pit No:	TP01	Test No:	1	Date:	26/02/2019
Length (m):	2.400		Datum Height:	0.00 m agl	
Width (m):	0.80		Granular infill: None		
Depth (m):	2.13		Porosity of infill:	0	(assumed)

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	0.805	30	0.840
1	0.805	35	0.840
2	0.810	40	0.840
3	0.810	45	0.840
4	0.820	50	0.840
5	0.825	60	0.840
6	0.830	80	0.840
7	0.830	100	0.840
8	0.840	120	0.840
9	0.840	140	0.840
10	0.840	160	0.840
15	0.840	180	0.840
20	0.840	200	0.840
25	0.840	220	0.840



Start water depth for analysis (mbgl):	0.81		
75% effective depth (mbgl):	1.14	Elapsed time (mins):	#N/A
50% effective depth (mbgl):	1.47		
25% effective depth (mbgl):	1.80	Elapsed time (mins):	#N/A
Base of soakage zone (mbgl):	2.13		

Volume outflow between 75% and 25% effective depth (m^3):

Mean surface area of outflow (m^2): 6.11
(side area at 50% effective depth + base area)

Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate (m/s):	**Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate.**

Remarks Results processed following BRE 365 (2007).

Client:	Phlorum Limited.	**YE6723**
Site:	Wilmslow Road , Manchester	

APPENDIX D: Photographs

A.

B.

C.

D.

Your Environment

A. Showing trial pit.

B. Showing trial pit.

C. Showing trial pit.

D. Site boundary.

Your Environment

E.

F.

Your Environment

E. Plant used – JCB 3CX

F. Vegetation on Site.

G. Vegetation on Site

H. Plant used – JCB 3CX

G.

H.

Your Environment

I.

J.

K.

L.

Your Environment

I. Vegetation on Site

J. Vegetation on Site

K. Vegetation on Site

L. Vegetation on Site

Your Environment

M.

N.

O.

P.

Your Environment

M. Vegetation on Site

N. Vegetation on Site

O. On site fencing.

P. On site fencing

Your Environment

Q.

R.

S.

T.

Your Environment

Q. Vegetation on Site

R. Trial pit infilled

S. Vegetation on Site

T. Trial pit infilled.

Your Environment

Appendix 2
Drainage Strategy Plans

ALL SURFACE WATER RAINWATER DRAINS TO BE 150mm

LEVELS BASED ON 1m LIDAR DATA. LEVELS TO BE CONFIRMED THROUGH TOPOGRAPHIC SURVEY PRIOR TO CONSUTRUCTION

DRAINAGE LAYOUT SUBJECT TO CHANGE. DRAINAGE NETWORK TO BE COORDINATED WITH STRUCTURAL DETAILS AND FOUL DESIGN AND SUBJECT TO FINAL APPROVALS BY THE LPA. LAYOUT AND PROPOSED INVERT LEVELS TO BE CONFIRMED PENDING CONFIRMATION OF SITE LEVELS AND EXISTING PRIVATE AND PUBLIC SEWER LEVELS.

RWP LOCATIONS SHOWN INDICATIVELY; TO BE CONFIRMED PRIOR TO CONSTRUCTION

EXISTING SEWER AND MANHOLES SHOWN INDICATIVELY, TO BE CONFIRMED PRIOR TO SEWER DIVERSION DESIGN

EXISTING ROOF AND HARDSTANDING AREA TO BE DRAINED AS EXISTING

REROUTING OF THE EXISTING ADOPTED COMBINED SEWER COULD BE REQUIRED PENDING EXACT LOCATION OF SEWER. DETAILED DESIGN OF REROUTING TO BE CONDUCTED PENDING INVERT LEVELS AND EXACT LOCATION OF RUN.

MINIMUM 1.2m CLEARANCE REQUIRED BETWEEN STRUCTURES AND EXTENTS OF ADOPTABLE ASSETS.

PERMEABLE PAVEMENT TYPE C TO TREAT AND ATTENUATE THE RUNOFF FROM THE EXTENDED ROOF, NEW ROOF AND NEW HARDSTANDING AREAS

SUB-BASE IL: 38.45 LAID FLAT TO MAXIMISE STORAGE
MIN SUB-BASE DEPTH: 300mm

2 NEW PARKING SPACES FOR HOUSES

CL: 39.00
IL: 38.40

TURNING SPACE FOR VEHICLES

GARDEN

GARDEN

T10

T9

T8

BIKE STORE

BIN STORE

APT. ACCESS

CL: 38.95
IL: 38.30

8 NEW PARKING SPACES FOR FLATS

MARLEY USW30 SILT TRAP WITH INLET FILTER OR SIMILAR

CL: 38.90
IL: 38.25

PVT ENTRY

PVT ENTRY

PUBLIC FOOTPATH

FLOW CONTROL MANHOLE
HYDROBRAKE TO 1.0L/S
CL: 38.90
IL: 38.20

CHAMBER WITH NON-RETURN VALVE
CL: 38.90
IL:38.10

CONNECTION TO EXISTING ADOPTED SEWER TO BE CONFIRMED WITH UNITED UTILITIES AND LPA PRIOR TO CONSTRUCTION. PROPOSED RATES TO BE AGREED WITH THE EA.

CAR PARK TO BE DRAINED AS EXISTING

T1

GREEN LANDSCAPING

T2

GREEN LANDSCAPING

T3

T4

BIN STORE

CYCLE STORE

GREEN LANDSCAPING

PEDESTRIAN ACCESS

EXISTING PUBLIC COMBINED SEWER
IL OF CLOSEST UPSTREAM MANHOLE: 32.54

EXISTING PUBLIC COMBINED SEWER
IL OF CLOSEST UPSTREAM MANHOLE: 30.32

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a. THE MAIN CONTRACTOR IS RESPONSIBLE FOR THE DESIGN OF ALL TEMPORARY WORKS, AND IS ALSO RESPONSIBLE FOR THE SAFE MAINTENANCE AND STABILITY OF EXISTING BUILDINGS AT ALL TIMES.
b. THE MAIN CONTRACTOR IS RESPONSIBLE FOR ALL OCCURRENCES OF GROUND WATER DURING THE CONSTRUCTION PERIOD.
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d. THE CONTRACTOR MUST COMPLY WITH ALL CURRENT LEGISLATION RELATING TO HEALTH & SAFETY.
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3. BELOW GROUND DRAINAGE
a. PIPEWORK TO BE UPVC-U PIPES TO BS 4660 : 2000 AND INSPECTION CHAMBERS TO BS 7158 : 2001.
b. ALL ADOPTABLE DRAINAGE TO BE CONSTRUCTED IN ACCORDANCE WITH 'SEWERS FOR ADOPTION' 7TH EDITION AND THE RELEVANT COUNCIL DESIGN GUIDE.
c. ALL PRIVATE SURFACE WATER SEWERS TO BE LAID AT 1 IN 100 UNLESS OTHERWISE STATED ON THE DRAWING.
d. ALL PRIVATE FOUL WATER SEWERS TO BE LAID AT 1 IN 40 AT THE HEAD OF PIPE RUNS AND 1 IN 80 ELSEWHERE UNLESS OTHERWISE STATED.
e. ALL PRIVATE FOUL SEWER PIPES TO BE 150MM DIAMETER UNLESS OTHERWISE STATED ON THE DRAWING. ALL PRIVATE SURFACE WATER SEWER PIPES TO BE 100MM DIAMETER FROM DOWNPIPES AND 150MM DIAMETER ELSEWHERE UNLESS OTHERWISE STATED ON THE DRAWING.
f. ALLOW FOR RODDING ACCESS ABOVE GROUND WHERE RAINWATER DOWNPIPES DO NOT HAVE A DIRECT CONNECTION TO AN INSPECTION CHAMBER. EXISTING SEWER PIPE TO BE RE-USED TO BE SURVEYED AND LEVELLED PRIOR TO COMMENCEMENT OF THE DRAINAGE WORKS AND REFURBISHED IF NECESSARY.
g. CONNECTIONS TO AN ADOPTED SEWER ONLY TO BE MADE FOLLOWING APPROVAL FROM THE RELEVANT ADOPTING AUTHORITY.
h. ALL DRAINS, SEWER PIPES AND MANHOLES TO BE CLEANED AND TESTED FOR WATER TIGHTNESS ON COMPLETION OF CONSTRUCTION.

4. MANHOLE COVERS AND FRAMES
a. MANHOLE COVERS TO BE CLASS D400 IN HIGHWAYS, CLASS B125 IN FOOTWAYS AND VERGES, CLASS A15 IN NON-TRAFFICKED AREAS.
b. MANHOLE COVER AND FRAME TO BE BEDDED AND SURROUNDED IN 1:3 MORTAR.

LEGEND

SW	PRIVATE SURFACE WATER DRAIN
	PERFORATED SURFACE WATER DRAIN
	PUBLIC COMBINED DRAIN
	PROPOSED REROUTE OF COMBINED DRAIN
	FLOW CONTROL MANHOLE
	TYPE 3 INSPECTION CHAMBER
	SILT TRAP
	TYPE 3 INSPECTION CHAMBER
RE	RODDING EYE
RWP	RAIN WATER PIPE
	BOTTLE GULLY
	PERMEABLE PAVING
	OVERLAND FLOWROUTE

REV	DATE	CKD	APPD	BY	DESCRIPTION
##	XX.XX.XX	...	...	...	...

PRELIMINARY DRAWING
FOR INFORMATION ONLY. NOT FOR CONSTRUCTION.

Client
PHLORUM

AMBIENTAL
ENVIRONMENTAL ASSESSMENT

The Sussex Innovation Centre | Science Park Square | Falmer | Brighton |BN1 9SB
Tel +44 (0) 203 857 8530 | www.ambiental.co.uk | drainage@ambiental.co.uk

Project
367 WILMSLOW ROAD
MANCHESTER, M14 6AH

Drawing
SURFACE WATER DRAINAGE
DRAINAGE LAYOUT

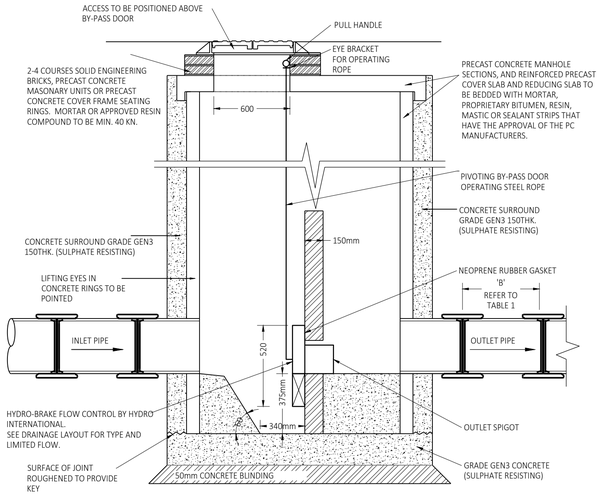
Drawn by: BB
Date: 13/03/2019

Drawing No.
4330 - DR01

Revision
-

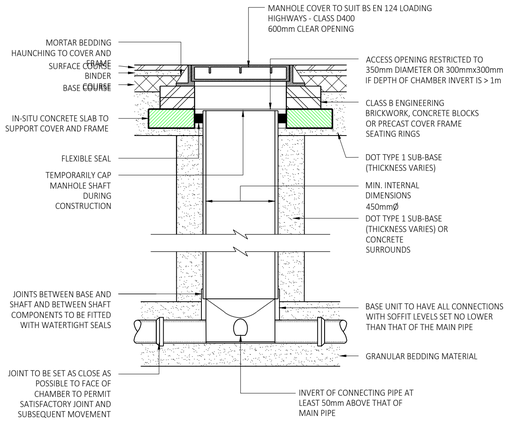
Drawing Scale: 1:100 @ A1
0 1m 2m 3m 4m 5m

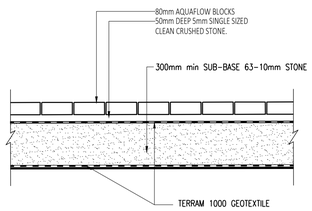
Drawing No: Y:\PROJECTS\4330_Phlorum_WilmslowRoad\Plans\AMB\4330_DR01_recover.dwg



MANHOLE CONTROL
(HYDRODBRAKE) SECTION

N.T.S.





PERMEABLE PAVEMENT TYPICAL DETAIL.

(1:20)

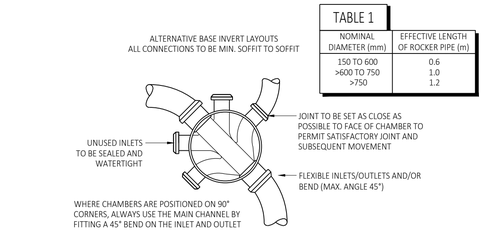
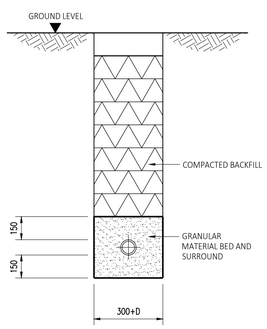


TABLE 1	
NOMINAL DIAMETER (mm)	EFFECTIVE LENGTH OF ROCKER PIPE (m)
150 TO 600	0.6
>600 TO 750	1.0
>750	1.2

TYPE 3 ACCESS CHAMBER - FLEXIBLE MATERIAL.

(SUBJECT TO VEHICLE LOADING,
MAX. DEPTH 3m, NON-ENTRY)

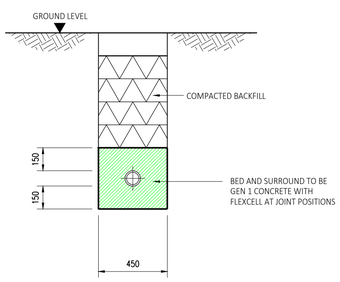
(1:20)



GRANULAR BEDDING DETAIL
FOR NON-FLEXIBLE PIPES.

(WHERE COVER >600mm)

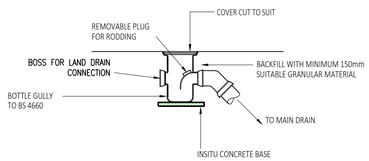
(1:20)



CONCRETE BEDDING DETAIL
FOR NON-FLEXIBLE PIPES.

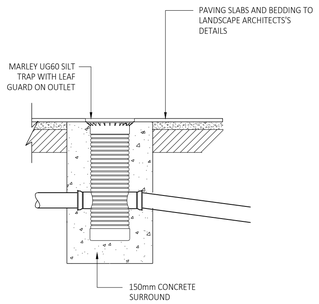
(WHERE COVER <600mm)

(1:20)



BOTTLE GULLY CONNECTION.

(1:20)



MARLEY WATERLOC TYPE
UG60 SILT TRAP

(1:20)

NOTE
ALL BACKFILLING AND REINSTATEMENT WITHIN ROADS AND STREETS TO BE IN ACCORDANCE WITH THE HIGHWAY AUTHORITY AND HAUC SPECIFICATION.

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REV	DATE	CKD	APPD	BY	DESCRIPTION
##	xx.xx.xx	--	--	--	--

PRELIMINARY DRAWING
FOR INFORMATION ONLY. NOT FOR CONSTRUCTION.

Client
PHLORUM

AMBIENTAL
ENVIRONMENTAL ASSESSMENT

The Sussex Innovation Centre | Science Park Square | Falmer | Brighton |BN1 9SB
Tel +44 (0) 203 857 8530 | www.ambiental.co.uk | drainage@ambiental.co.uk

Project
367 WILMSLOW ROAD
MANCHESTER, M14 6AH

Drawing
SURFACE WATER DRAINAGE
STANDARD DETAILS

Drawn by: BB
Date: 14/03/2019

Drawing No.
4330 - DR02

Revision
-

Drawing Scale: 1:20 @ A1
0 200 400 600 800 1000mm

Drawing No: Y:\PROJECTS\4330_Phlorum_Wilmslowroad\Plans\AMB\4330_DR01_recover.dwg

Appendix 3
Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.300
Area (ha)	0.063	Urban	0.000
SAAR (mm)	839	Region Number	Region 10

Results	**l/s**
QBAR Rural	0.1
QBAR Urban	0.1
Q100 years	0.3
Q1 year	0.1
Q30 years	0.2
Q100 years	0.3

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Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	38.109	0.109	8.2	0.2	O K
30 min Summer	38.103	0.103	7.1	0.2	O K
60 min Summer	38.086	0.086	5.2	0.1	O K
120 min Summer	38.071	0.071	3.5	0.1	O K
180 min Summer	38.062	0.062	2.8	0.1	O K
240 min Summer	38.056	0.056	2.3	0.1	O K
360 min Summer	38.049	0.049	1.7	0.1	O K
480 min Summer	38.045	0.045	1.5	0.1	O K
600 min Summer	38.041	0.041	1.2	0.0	O K
720 min Summer	38.038	0.038	1.1	0.0	O K
960 min Summer	38.035	0.035	0.9	0.0	O K
1440 min Summer	38.029	0.029	0.7	0.0	O K
2160 min Summer	38.024	0.024	0.5	0.0	O K
2880 min Summer	38.022	0.022	0.4	0.0	O K
4320 min Summer	38.019	0.019	0.3	0.0	O K
5760 min Summer	38.017	0.017	0.3	0.0	O K
7200 min Summer	38.016	0.016	0.2	0.0	O K
8640 min Summer	38.016	0.016	0.2	0.0	O K
10080 min Summer	38.015	0.015	0.2	0.0	O K
15 min Winter	38.109	0.109	8.2	0.2	O K
30 min Winter	38.094	0.094	6.1	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	27.046	0.0	3.2	10
30 min Summer	17.779	0.0	4.2	17
60 min Summer	11.376	0.0	5.4	32
120 min Summer	7.155	0.0	6.8	62
180 min Summer	5.432	0.0	7.7	92
240 min Summer	4.463	0.0	8.4	122
360 min Summer	3.382	0.0	9.6	182
480 min Summer	2.760	0.0	10.4	240
600 min Summer	2.356	0.0	11.1	306
720 min Summer	2.071	0.0	11.7	358
960 min Summer	1.690	0.0	12.8	484
1440 min Summer	1.269	0.0	14.4	716
2160 min Summer	0.954	0.0	16.2	1068
2880 min Summer	0.779	0.0	17.7	1456
4320 min Summer	0.584	0.0	19.9	2184
5760 min Summer	0.477	0.0	21.6	2896
7200 min Summer	0.408	0.0	23.1	3608
8640 min Summer	0.359	0.0	24.4	4304
10080 min Summer	0.322	0.0	25.6	4968
15 min Winter	27.046	0.0	3.6	10
30 min Winter	17.779	0.0	4.7	17

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Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	38.076	0.076	4.1	0.1	O K
120 min Winter	38.061	0.061	2.7	0.1	O K
180 min Winter	38.053	0.053	2.0	0.1	O K
240 min Winter	38.049	0.049	1.7	0.1	O K
360 min Winter	38.042	0.042	1.3	0.0	O K
480 min Winter	38.037	0.037	1.0	0.0	O K
600 min Winter	38.035	0.035	0.9	0.0	O K
720 min Winter	38.032	0.032	0.8	0.0	O K
960 min Winter	38.028	0.028	0.6	0.0	O K
1440 min Winter	38.024	0.024	0.5	0.0	O K
2160 min Winter	38.020	0.020	0.4	0.0	O K
2880 min Winter	38.019	0.019	0.3	0.0	O K
4320 min Winter	38.016	0.016	0.2	0.0	O K
5760 min Winter	38.015	0.015	0.2	0.0	O K
7200 min Winter	38.014	0.014	0.2	0.0	O K
8640 min Winter	38.014	0.014	0.1	0.0	O K
10080 min Winter	38.013	0.013	0.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	11.376	0.0	6.0	32
120 min Winter	7.155	0.0	7.6	62
180 min Winter	5.432	0.0	8.6	90
240 min Winter	4.463	0.0	9.4	120
360 min Winter	3.382	0.0	10.7	182
480 min Winter	2.760	0.0	11.7	236
600 min Winter	2.356	0.0	12.5	302
720 min Winter	2.071	0.0	13.2	368
960 min Winter	1.690	0.0	14.3	484
1440 min Winter	1.269	0.0	16.1	724
2160 min Winter	0.954	0.0	18.2	1120
2880 min Winter	0.779	0.0	19.8	1408
4320 min Winter	0.584	0.0	22.3	2084
5760 min Winter	0.477	0.0	24.2	2848
7200 min Winter	0.408	0.0	25.9	3696
8640 min Winter	0.359	0.0	27.3	4320
10080 min Winter	0.322	0.0	28.6	5152

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.369	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.063

Time (mins) From:	To:	Area (ha)
0	4	0.063

Time Area Diagram

Total Area (ha) 0.000

Time (mins) From:	To:	Area (ha)
0	4	0.000

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Model Details

Storage is Online Cover Level (m) 38.900

Pipe Structure

Diameter (m)	0.225	Length (m)	10.000
Slope (1:X)	80.000	Invert Level (m)	38.000

Pipe Outflow Control

Diameter (m)	0.225	Entry Loss Coefficient	0.500
Slope (1:X)	80.0	Coefficient of Contraction	0.600
Length (m)	10.000	Upstream Invert Level (m)	38.000
Roughness k (mm)	0.600		

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Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	38.184	0.184	20.4	0.4	O K
30 min Summer	38.166	0.166	17.5	0.3	O K
60 min Summer	38.133	0.133	12.7	0.2	O K
120 min Summer	38.110	0.110	8.4	0.2	O K
180 min Summer	38.097	0.097	6.4	0.2	O K
240 min Summer	38.087	0.087	5.3	0.1	O K
360 min Summer	38.074	0.074	3.9	0.1	O K
480 min Summer	38.067	0.067	3.1	0.1	O K
600 min Summer	38.061	0.061	2.7	0.1	O K
720 min Summer	38.056	0.056	2.3	0.1	O K
960 min Summer	38.051	0.051	1.9	0.1	O K
1440 min Summer	38.043	0.043	1.4	0.1	O K
2160 min Summer	38.037	0.037	1.0	0.0	O K
2880 min Summer	38.033	0.033	0.8	0.0	O K
4320 min Summer	38.027	0.027	0.6	0.0	O K
5760 min Summer	38.024	0.024	0.5	0.0	O K
7200 min Summer	38.021	0.021	0.4	0.0	O K
8640 min Summer	38.020	0.020	0.4	0.0	O K
10080 min Summer	38.019	0.019	0.3	0.0	O K
15 min Winter	38.184	0.184	20.3	0.4	O K
30 min Winter	38.150	0.150	15.2	0.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	66.174	0.0	7.8	10
30 min Summer	43.695	0.0	10.3	17
60 min Summer	27.653	0.0	13.1	32
120 min Summer	17.016	0.0	16.1	62
180 min Summer	12.680	0.0	18.0	92
240 min Summer	10.248	0.0	19.4	122
360 min Summer	7.545	0.0	21.4	184
480 min Summer	6.072	0.0	23.0	242
600 min Summer	5.128	0.0	24.2	306
720 min Summer	4.465	0.0	25.3	358
960 min Summer	3.586	0.0	27.1	480
1440 min Summer	2.630	0.0	29.8	734
2160 min Summer	1.926	0.0	32.8	1092
2880 min Summer	1.543	0.0	35.0	1416
4320 min Summer	1.128	0.0	38.4	2192
5760 min Summer	0.902	0.0	40.9	2888
7200 min Summer	0.758	0.0	43.0	3616
8640 min Summer	0.658	0.0	44.8	4296
10080 min Summer	0.583	0.0	46.3	5040
15 min Winter	66.174	0.0	8.8	10
30 min Winter	43.695	0.0	11.6	17

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Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	38.119	0.119	10.0	0.2	O K
120 min Winter	38.096	0.096	6.3	0.1	O K
180 min Winter	38.081	0.081	4.7	0.1	O K
240 min Winter	38.074	0.074	3.9	0.1	O K
360 min Winter	38.063	0.063	2.8	0.1	O K
480 min Winter	38.056	0.056	2.3	0.1	O K
600 min Winter	38.051	0.051	1.9	0.1	O K
720 min Winter	38.049	0.049	1.7	0.1	O K
960 min Winter	38.043	0.043	1.4	0.1	O K
1440 min Winter	38.037	0.037	1.0	0.0	O K
2160 min Winter	38.031	0.031	0.7	0.0	O K
2880 min Winter	38.027	0.027	0.6	0.0	O K
4320 min Winter	38.022	0.022	0.4	0.0	O K
5760 min Winter	38.020	0.020	0.3	0.0	O K
7200 min Winter	38.019	0.019	0.3	0.0	O K
8640 min Winter	38.017	0.017	0.3	0.0	O K
10080 min Winter	38.017	0.017	0.2	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	27.653	0.0	14.6	32
120 min Winter	17.016	0.0	18.0	60
180 min Winter	12.680	0.0	20.1	88
240 min Winter	10.248	0.0	21.7	118
360 min Winter	7.545	0.0	24.0	184
480 min Winter	6.072	0.0	25.7	244
600 min Winter	5.128	0.0	27.1	290
720 min Winter	4.465	0.0	28.4	368
960 min Winter	3.586	0.0	30.4	476
1440 min Winter	2.630	0.0	33.4	732
2160 min Winter	1.926	0.0	36.7	1092
2880 min Winter	1.543	0.0	39.2	1436
4320 min Winter	1.128	0.0	43.0	2144
5760 min Winter	0.902	0.0	45.8	2744
7200 min Winter	0.758	0.0	48.2	3640
8640 min Winter	0.658	0.0	50.1	4400
10080 min Winter	0.583	0.0	51.9	5392

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.369	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.063

Time (mins) From:	To:	Area (ha)
0	4	0.063

Time Area Diagram

Total Area (ha) 0.000

Time (mins) From:	To:	Area (ha)
0	4	0.000

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Model Details

Storage is Online Cover Level (m) 38.900

Pipe Structure

Diameter (m)	0.225	Length (m)	10.000
Slope (1:X)	80.000	Invert Level (m)	38.000

Pipe Outflow Control

Diameter (m)	0.225	Entry Loss Coefficient	0.500
Slope (1:X)	80.0	Coefficient of Contraction	0.600
Length (m)	10.000	Upstream Invert Level (m)	38.000
Roughness k (mm)	0.600		

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Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	38.213	0.213	26.1	0.5	O K
30 min Summer	38.198	0.198	23.0	0.4	O K
60 min Summer	38.160	0.160	16.6	0.3	O K
120 min Summer	38.124	0.124	11.1	0.2	O K
180 min Summer	38.111	0.111	8.5	0.2	O K
240 min Summer	38.101	0.101	6.9	0.2	O K
360 min Summer	38.084	0.084	5.0	0.1	O K
480 min Summer	38.076	0.076	4.1	0.1	O K
600 min Summer	38.070	0.070	3.4	0.1	O K
720 min Summer	38.065	0.065	3.0	0.1	O K
960 min Summer	38.057	0.057	2.4	0.1	O K
1440 min Summer	38.049	0.049	1.7	0.1	O K
2160 min Summer	38.042	0.042	1.3	0.0	O K
2880 min Summer	38.037	0.037	1.0	0.0	O K
4320 min Summer	38.031	0.031	0.7	0.0	O K
5760 min Summer	38.027	0.027	0.6	0.0	O K
7200 min Summer	38.025	0.025	0.5	0.0	O K
8640 min Summer	38.022	0.022	0.4	0.0	O K
10080 min Summer	38.021	0.021	0.4	0.0	O K
15 min Winter	38.213	0.213	26.1	0.5	O K
30 min Winter	38.181	0.181	19.8	0.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	85.460	0.0	10.1	10
30 min Summer	56.977	0.0	13.5	17
60 min Summer	36.294	0.0	17.1	32
120 min Summer	22.382	0.0	21.2	62
180 min Summer	16.654	0.0	23.6	92
240 min Summer	13.425	0.0	25.4	122
360 min Summer	9.818	0.0	27.8	184
480 min Summer	7.870	0.0	29.7	244
600 min Summer	6.624	0.0	31.3	306
720 min Summer	5.750	0.0	32.6	362
960 min Summer	4.597	0.0	34.8	476
1440 min Summer	3.347	0.0	38.0	722
2160 min Summer	2.432	0.0	41.4	1092
2880 min Summer	1.937	0.0	43.9	1428
4320 min Summer	1.403	0.0	47.7	2140
5760 min Summer	1.115	0.0	50.6	2856
7200 min Summer	0.932	0.0	52.9	3560
8640 min Summer	0.805	0.0	54.8	4352
10080 min Summer	0.711	0.0	56.4	5024
15 min Winter	85.460	0.0	11.3	10
30 min Winter	56.977	0.0	15.1	17

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Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	38.137	0.137	13.3	0.3	O K
120 min Winter	38.109	0.109	8.2	0.2	O K
180 min Winter	38.095	0.095	6.2	0.1	O K
240 min Winter	38.084	0.084	5.0	0.1	O K
360 min Winter	38.072	0.072	3.7	0.1	O K
480 min Winter	38.064	0.064	2.9	0.1	O K
600 min Winter	38.059	0.059	2.5	0.1	O K
720 min Winter	38.054	0.054	2.1	0.1	O K
960 min Winter	38.049	0.049	1.7	0.1	O K
1440 min Winter	38.041	0.041	1.3	0.0	O K
2160 min Winter	38.036	0.036	0.9	0.0	O K
2880 min Winter	38.031	0.031	0.7	0.0	O K
4320 min Winter	38.025	0.025	0.5	0.0	O K
5760 min Winter	38.022	0.022	0.4	0.0	O K
7200 min Winter	38.020	0.020	0.4	0.0	O K
8640 min Winter	38.019	0.019	0.3	0.0	O K
10080 min Winter	38.018	0.018	0.3	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	36.294	0.0	19.2	32
120 min Winter	22.382	0.0	23.7	60
180 min Winter	16.654	0.0	26.4	92
240 min Winter	13.425	0.0	28.4	122
360 min Winter	9.818	0.0	31.2	182
480 min Winter	7.870	0.0	33.3	246
600 min Winter	6.624	0.0	35.1	306
720 min Winter	5.750	0.0	36.5	358
960 min Winter	4.597	0.0	38.9	494
1440 min Winter	3.347	0.0	42.5	712
2160 min Winter	2.432	0.0	46.3	1068
2880 min Winter	1.937	0.0	49.2	1444
4320 min Winter	1.403	0.0	53.5	2180
5760 min Winter	1.115	0.0	56.7	2968
7200 min Winter	0.932	0.0	59.2	3696
8640 min Winter	0.805	0.0	61.4	4792
10080 min Winter	0.711	0.0	63.2	5056

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.369	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.063

Time (mins) From:	To:	Area (ha)
0	4	0.063

Time Area Diagram

Total Area (ha) 0.000

Time (mins) From:	To:	Area (ha)
0	4	0.000

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Model Details

Storage is Online Cover Level (m) 38.900

Pipe Structure

Diameter (m)	0.225	Length (m)	10.000
Slope (1:X)	80.000	Invert Level (m)	38.000

Pipe Outflow Control

Diameter (m)	0.225	Entry Loss Coefficient	0.500
Slope (1:X)	80.0	Coefficient of Contraction	0.600
Length (m)	10.000	Upstream Invert Level (m)	38.000
Roughness k (mm)	0.600		

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Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	38.104	0.104	7.2	0.2	O K
30 min Summer	38.095	0.095	6.2	0.1	O K
60 min Summer	38.080	0.080	4.5	0.1	O K
120 min Summer	38.066	0.066	3.1	0.1	O K
180 min Summer	38.058	0.058	2.4	0.1	O K
240 min Summer	38.052	0.052	2.0	0.1	O K
360 min Summer	38.046	0.046	1.5	0.1	O K
480 min Summer	38.041	0.041	1.3	0.0	O K
600 min Summer	38.038	0.038	1.1	0.0	O K
720 min Summer	38.036	0.036	0.9	0.0	O K
960 min Summer	38.032	0.032	0.8	0.0	O K
1440 min Summer	38.027	0.027	0.6	0.0	O K
2160 min Summer	38.022	0.022	0.4	0.0	O K
2880 min Summer	38.020	0.020	0.4	0.0	O K
4320 min Summer	38.018	0.018	0.3	0.0	O K
5760 min Summer	38.017	0.017	0.2	0.0	O K
7200 min Summer	38.016	0.016	0.2	0.0	O K
8640 min Summer	38.015	0.015	0.2	0.0	O K
10080 min Summer	38.014	0.014	0.2	0.0	O K
15 min Winter	38.104	0.104	7.2	0.2	O K
30 min Winter	38.088	0.088	5.4	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	27.046	0.0	2.8	10
30 min Summer	17.779	0.0	3.7	17
60 min Summer	11.376	0.0	4.7	32
120 min Summer	7.155	0.0	5.9	62
180 min Summer	5.432	0.0	6.7	92
240 min Summer	4.463	0.0	7.4	122
360 min Summer	3.382	0.0	8.4	184
480 min Summer	2.760	0.0	9.1	244
600 min Summer	2.356	0.0	9.7	302
720 min Summer	2.071	0.0	10.3	360
960 min Summer	1.690	0.0	11.2	490
1440 min Summer	1.269	0.0	12.6	728
2160 min Summer	0.954	0.0	14.2	1092
2880 min Summer	0.779	0.0	15.4	1464
4320 min Summer	0.584	0.0	17.4	2184
5760 min Summer	0.477	0.0	18.9	2928
7200 min Summer	0.408	0.0	20.2	3744
8640 min Summer	0.359	0.0	21.3	4272
10080 min Summer	0.322	0.0	22.3	5112
15 min Winter	27.046	0.0	3.1	10
30 min Winter	17.779	0.0	4.1	17

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Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	38.072	0.072	3.7	0.1	O K
120 min Winter	38.057	0.057	2.3	0.1	O K
180 min Winter	38.050	0.050	1.8	0.1	O K
240 min Winter	38.045	0.045	1.5	0.1	O K
360 min Winter	38.039	0.039	1.1	0.0	O K
480 min Winter	38.035	0.035	0.9	0.0	O K
600 min Winter	38.032	0.032	0.8	0.0	O K
720 min Winter	38.030	0.030	0.7	0.0	O K
960 min Winter	38.026	0.026	0.6	0.0	O K
1440 min Winter	38.022	0.022	0.4	0.0	O K
2160 min Winter	38.019	0.019	0.3	0.0	O K
2880 min Winter	38.017	0.017	0.3	0.0	O K
4320 min Winter	38.016	0.016	0.2	0.0	O K
5760 min Winter	38.015	0.015	0.2	0.0	O K
7200 min Winter	38.014	0.014	0.1	0.0	O K
8640 min Winter	38.013	0.013	0.1	0.0	O K
10080 min Winter	38.012	0.012	0.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	11.376	0.0	5.3	32
120 min Winter	7.155	0.0	6.6	60
180 min Winter	5.432	0.0	7.5	92
240 min Winter	4.463	0.0	8.2	122
360 min Winter	3.382	0.0	9.4	182
480 min Winter	2.760	0.0	10.2	234
600 min Winter	2.356	0.0	10.9	304
720 min Winter	2.071	0.0	11.5	364
960 min Winter	1.690	0.0	12.5	480
1440 min Winter	1.269	0.0	14.1	710
2160 min Winter	0.954	0.0	15.9	1144
2880 min Winter	0.779	0.0	17.3	1356
4320 min Winter	0.584	0.0	19.4	2016
5760 min Winter	0.477	0.0	21.2	2768
7200 min Winter	0.408	0.0	22.6	3808
8640 min Winter	0.359	0.0	23.9	4440
10080 min Winter	0.322	0.0	25.0	4984

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.369	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.055

Time (mins) From:	To:	Area (ha)
0	4	0.055

Time Area Diagram

Total Area (ha) 0.000

Time (mins) From:	To:	Area (ha)
0	4	0.000

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Model Details

Storage is Online Cover Level (m) 38.900

Pipe Structure

Diameter (m)	0.225	Length (m)	10.000
Slope (1:X)	80.000	Invert Level (m)	38.000

Pipe Outflow Control

Diameter (m)	0.225	Entry Loss Coefficient	0.500
Slope (1:X)	80.0	Coefficient of Contraction	0.600
Length (m)	10.000	Upstream Invert Level (m)	38.000
Roughness k (mm)	0.600		

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Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	38.167	0.167	17.6	0.4	O K
30 min Summer	38.150	0.150	15.2	0.3	O K
60 min Summer	38.124	0.124	11.1	0.2	O K
120 min Summer	38.105	0.105	7.4	0.2	O K
180 min Summer	38.090	0.090	5.6	0.1	O K
240 min Summer	38.081	0.081	4.6	0.1	O K
360 min Summer	38.070	0.070	3.4	0.1	O K
480 min Summer	38.062	0.062	2.7	0.1	O K
600 min Summer	38.057	0.057	2.3	0.1	O K
720 min Summer	38.053	0.053	2.0	0.1	O K
960 min Summer	38.048	0.048	1.6	0.1	O K
1440 min Summer	38.040	0.040	1.2	0.0	O K
2160 min Summer	38.035	0.035	0.9	0.0	O K
2880 min Summer	38.030	0.030	0.7	0.0	O K
4320 min Summer	38.025	0.025	0.5	0.0	O K
5760 min Summer	38.022	0.022	0.4	0.0	O K
7200 min Summer	38.020	0.020	0.4	0.0	O K
8640 min Summer	38.019	0.019	0.3	0.0	O K
10080 min Summer	38.018	0.018	0.3	0.0	O K
15 min Winter	38.167	0.167	17.6	0.3	O K
30 min Winter	38.136	0.136	13.2	0.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	66.174	0.0	6.8	10
30 min Summer	43.695	0.0	9.0	17
60 min Summer	27.653	0.0	11.4	32
120 min Summer	17.016	0.0	14.0	62
180 min Summer	12.680	0.0	15.7	92
240 min Summer	10.248	0.0	16.9	122
360 min Summer	7.545	0.0	18.7	182
480 min Summer	6.072	0.0	20.0	244
600 min Summer	5.128	0.0	21.2	302
720 min Summer	4.465	0.0	22.1	360
960 min Summer	3.586	0.0	23.7	490
1440 min Summer	2.630	0.0	26.0	712
2160 min Summer	1.926	0.0	28.6	1084
2880 min Summer	1.543	0.0	30.6	1444
4320 min Summer	1.128	0.0	33.5	2176
5760 min Summer	0.902	0.0	35.7	2912
7200 min Summer	0.758	0.0	37.5	3616
8640 min Summer	0.658	0.0	39.1	4272
10080 min Summer	0.583	0.0	40.4	5208
15 min Winter	66.174	0.0	7.6	10
30 min Winter	43.695	0.0	10.1	17

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Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	38.112	0.112	8.8	0.2	O K
120 min Winter	38.089	0.089	5.5	0.1	O K
180 min Winter	38.076	0.076	4.1	0.1	O K
240 min Winter	38.069	0.069	3.4	0.1	O K
360 min Winter	38.058	0.058	2.5	0.1	O K
480 min Winter	38.052	0.052	2.0	0.1	O K
600 min Winter	38.048	0.048	1.7	0.1	O K
720 min Winter	38.045	0.045	1.5	0.1	O K
960 min Winter	38.040	0.040	1.2	0.0	O K
1440 min Winter	38.035	0.035	0.9	0.0	O K
2160 min Winter	38.028	0.028	0.6	0.0	O K
2880 min Winter	38.025	0.025	0.5	0.0	O K
4320 min Winter	38.021	0.021	0.4	0.0	O K
5760 min Winter	38.019	0.019	0.3	0.0	O K
7200 min Winter	38.018	0.018	0.3	0.0	O K
8640 min Winter	38.017	0.017	0.2	0.0	O K
10080 min Winter	38.016	0.016	0.2	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	27.653	0.0	12.8	32
120 min Winter	17.016	0.0	15.7	62
180 min Winter	12.680	0.0	17.6	92
240 min Winter	10.248	0.0	18.9	122
360 min Winter	7.545	0.0	20.9	182
480 min Winter	6.072	0.0	22.4	246
600 min Winter	5.128	0.0	23.7	298
720 min Winter	4.465	0.0	24.8	356
960 min Winter	3.586	0.0	26.5	474
1440 min Winter	2.630	0.0	29.2	726
2160 min Winter	1.926	0.0	32.0	1088
2880 min Winter	1.543	0.0	34.2	1412
4320 min Winter	1.128	0.0	37.5	2196
5760 min Winter	0.902	0.0	40.0	2880
7200 min Winter	0.758	0.0	42.0	3592
8640 min Winter	0.658	0.0	43.8	4336
10080 min Winter	0.583	0.0	45.3	4936

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.369	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.055

Time (mins) From:	To:	Area (ha)
0	4	0.055

Time Area Diagram

Total Area (ha) 0.000

Time (mins) From:	To:	Area (ha)
0	4	0.000

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Model Details

Storage is Online Cover Level (m) 38.900

Pipe Structure

Diameter (m)	0.225	Length (m)	10.000
Slope (1:X)	80.000	Invert Level (m)	38.000

Pipe Outflow Control

Diameter (m)	0.225	Entry Loss Coefficient	0.500
Slope (1:X)	80.0	Coefficient of Contraction	0.600
Length (m)	10.000	Upstream Invert Level (m)	38.000
Roughness k (mm)	0.600		

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Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	38.197	0.197	22.8	0.4	O K
30 min Summer	38.182	0.182	19.9	0.4	O K
60 min Summer	38.145	0.145	14.5	0.3	O K
120 min Summer	38.117	0.117	9.7	0.2	O K
180 min Summer	38.105	0.105	7.4	0.2	O K
240 min Summer	38.094	0.094	6.1	0.1	O K
360 min Summer	38.079	0.079	4.4	0.1	O K
480 min Summer	38.071	0.071	3.6	0.1	O K
600 min Summer	38.065	0.065	3.0	0.1	O K
720 min Summer	38.060	0.060	2.6	0.1	O K
960 min Summer	38.054	0.054	2.1	0.1	O K
1440 min Summer	38.046	0.046	1.5	0.1	O K
2160 min Summer	38.039	0.039	1.1	0.0	O K
2880 min Summer	38.035	0.035	0.9	0.0	O K
4320 min Summer	38.028	0.028	0.6	0.0	O K
5760 min Summer	38.025	0.025	0.5	0.0	O K
7200 min Summer	38.022	0.022	0.4	0.0	O K
8640 min Summer	38.021	0.021	0.4	0.0	O K
10080 min Summer	38.020	0.020	0.3	0.0	O K
15 min Winter	38.197	0.197	22.8	0.4	O K
30 min Winter	38.164	0.164	17.2	0.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	85.460	0.0	8.8	10
30 min Summer	56.977	0.0	11.8	17
60 min Summer	36.294	0.0	15.0	32
120 min Summer	22.382	0.0	18.5	62
180 min Summer	16.654	0.0	20.6	92
240 min Summer	13.425	0.0	22.2	122
360 min Summer	9.818	0.0	24.3	184
480 min Summer	7.870	0.0	26.0	244
600 min Summer	6.624	0.0	27.3	306
720 min Summer	5.750	0.0	28.5	358
960 min Summer	4.597	0.0	30.3	478
1440 min Summer	3.347	0.0	33.1	724
2160 min Summer	2.432	0.0	36.1	1076
2880 min Summer	1.937	0.0	38.4	1440
4320 min Summer	1.403	0.0	41.7	2124
5760 min Summer	1.115	0.0	44.2	2904
7200 min Summer	0.932	0.0	46.2	3568
8640 min Summer	0.805	0.0	47.8	4248
10080 min Summer	0.711	0.0	49.3	4960
15 min Winter	85.460	0.0	9.9	10
30 min Winter	56.977	0.0	13.2	17

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Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	38.127	0.127	11.6	0.2	O K
120 min Winter	38.104	0.104	7.2	0.2	O K
180 min Winter	38.088	0.088	5.4	0.1	O K
240 min Winter	38.079	0.079	4.4	0.1	O K
360 min Winter	38.068	0.068	3.2	0.1	O K
480 min Winter	38.060	0.060	2.6	0.1	O K
600 min Winter	38.055	0.055	2.2	0.1	O K
720 min Winter	38.051	0.051	1.9	0.1	O K
960 min Winter	38.046	0.046	1.5	0.1	O K
1440 min Winter	38.039	0.039	1.1	0.0	O K
2160 min Winter	38.033	0.033	0.8	0.0	O K
2880 min Winter	38.028	0.028	0.6	0.0	O K
4320 min Winter	38.023	0.023	0.5	0.0	O K
5760 min Winter	38.021	0.021	0.4	0.0	O K
7200 min Winter	38.019	0.019	0.3	0.0	O K
8640 min Winter	38.018	0.018	0.3	0.0	O K
10080 min Winter	38.017	0.017	0.3	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	36.294	0.0	16.8	32
120 min Winter	22.382	0.0	20.7	62
180 min Winter	16.654	0.0	23.1	90
240 min Winter	13.425	0.0	24.8	118
360 min Winter	9.818	0.0	27.2	182
480 min Winter	7.870	0.0	29.1	238
600 min Winter	6.624	0.0	30.6	304
720 min Winter	5.750	0.0	31.9	358
960 min Winter	4.597	0.0	34.0	486
1440 min Winter	3.347	0.0	37.1	730
2160 min Winter	2.432	0.0	40.5	1076
2880 min Winter	1.937	0.0	43.0	1416
4320 min Winter	1.403	0.0	46.7	2076
5760 min Winter	1.115	0.0	49.5	3024
7200 min Winter	0.932	0.0	51.7	3504
8640 min Winter	0.805	0.0	53.6	4296
10080 min Winter	0.711	0.0	55.2	5088

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.369	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.055

Time (mins) From:	To:	Area (ha)
0	4	0.055

Time Area Diagram

Total Area (ha) 0.000

Time (mins) From:	To:	Area (ha)
0	4	0.000

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Model Details

Storage is Online Cover Level (m) 38.900

Pipe Structure

Diameter (m)	0.225	Length (m)	10.000
Slope (1:X)	80.000	Invert Level (m)	38.000

Pipe Outflow Control

Diameter (m)	0.225	Entry Loss Coefficient	0.500
Slope (1:X)	80.0	Coefficient of Contraction	0.600
Length (m)	10.000	Upstream Invert Level (m)	38.000
Roughness k (mm)	0.600		

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Summary of Results for 1 year Return Period (+40%)

Half Drain Time : 43 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	38.476	0.026	0.0	1.0	1.0	2.4	O K
30 min Summer	38.485	0.035	0.0	1.0	1.0	3.2	O K
60 min Summer	38.493	0.043	0.0	1.0	1.0	3.9	O K
120 min Summer	38.496	0.046	0.0	1.0	1.0	4.2	O K
180 min Summer	38.493	0.043	0.0	1.0	1.0	4.0	O K
240 min Summer	38.490	0.040	0.0	1.0	1.0	3.7	O K
360 min Summer	38.483	0.033	0.0	1.0	1.0	3.0	O K
480 min Summer	38.475	0.025	0.0	1.0	1.0	2.3	O K
600 min Summer	38.469	0.019	0.0	1.0	1.0	1.7	O K
720 min Summer	38.463	0.013	0.0	1.0	1.0	1.2	O K
960 min Summer	38.455	0.005	0.0	1.0	1.0	0.5	O K
1440 min Summer	38.450	0.000	0.0	0.9	0.9	0.0	O K
2160 min Summer	38.450	0.000	0.0	0.7	0.7	0.0	O K
2880 min Summer	38.450	0.000	0.0	0.6	0.6	0.0	O K
4320 min Summer	38.450	0.000	0.0	0.4	0.4	0.0	O K
5760 min Summer	38.450	0.000	0.0	0.3	0.3	0.0	O K
7200 min Summer	38.450	0.000	0.0	0.3	0.3	0.0	O K
8640 min Summer	38.450	0.000	0.0	0.2	0.2	0.0	O K
10080 min Summer	38.450	0.000	0.0	0.2	0.2	0.0	O K
15 min Winter	38.481	0.031	0.0	1.0	1.0	2.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	37.865	0.0	2.9	17
30 min Summer	24.891	0.0	4.3	31
60 min Summer	15.926	0.0	5.9	50
120 min Summer	10.018	0.0	7.8	84
180 min Summer	7.605	0.0	9.1	118
240 min Summer	6.248	0.0	10.1	154
360 min Summer	4.735	0.0	11.6	220
480 min Summer	3.864	0.0	12.7	282
600 min Summer	3.299	0.0	13.7	342
720 min Summer	2.900	0.0	14.4	398
960 min Summer	2.366	0.0	15.7	510
1440 min Summer	1.776	0.0	17.7	0
2160 min Summer	1.335	0.0	19.8	0
2880 min Summer	1.090	0.0	21.4	0
4320 min Summer	0.818	0.0	23.5	0
5760 min Summer	0.668	0.0	25.1	0
7200 min Summer	0.571	0.0	26.3	0
8640 min Summer	0.502	0.0	27.1	0
10080 min Summer	0.451	0.0	27.8	0
15 min Winter	37.865	0.0	3.4	17

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Summary of Results for 1 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	38.493	0.043	0.0	1.0	1.0	3.9	O K
60 min Winter	38.500	0.050	0.0	1.0	1.0	4.6	O K
120 min Winter	38.503	0.053	0.0	1.0	1.0	4.8	O K
180 min Winter	38.499	0.049	0.0	1.0	1.0	4.5	O K
240 min Winter	38.493	0.043	0.0	1.0	1.0	4.0	O K
360 min Winter	38.481	0.031	0.0	1.0	1.0	2.8	O K
480 min Winter	38.469	0.019	0.0	1.0	1.0	1.7	O K
600 min Winter	38.459	0.009	0.0	1.0	1.0	0.9	O K
720 min Winter	38.453	0.003	0.0	1.0	1.0	0.2	O K
960 min Winter	38.450	0.000	0.0	0.9	0.9	0.0	O K
1440 min Winter	38.450	0.000	0.0	0.6	0.6	0.0	O K
2160 min Winter	38.450	0.000	0.0	0.5	0.5	0.0	O K
2880 min Winter	38.450	0.000	0.0	0.4	0.4	0.0	O K
4320 min Winter	38.450	0.000	0.0	0.3	0.3	0.0	O K
5760 min Winter	38.450	0.000	0.0	0.2	0.2	0.0	O K
7200 min Winter	38.450	0.000	0.0	0.2	0.2	0.0	O K
8640 min Winter	38.450	0.000	0.0	0.2	0.2	0.0	O K
10080 min Winter	38.450	0.000	0.0	0.2	0.2	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	24.891	0.0	5.0	31
60 min Winter	15.926	0.0	6.8	58
120 min Winter	10.018	0.0	8.9	92
180 min Winter	7.605	0.0	10.4	130
240 min Winter	6.248	0.0	11.5	166
360 min Winter	4.735	0.0	13.2	234
480 min Winter	3.864	0.0	14.4	296
600 min Winter	3.299	0.0	15.5	350
720 min Winter	2.900	0.0	16.4	396
960 min Winter	2.366	0.0	17.9	0
1440 min Winter	1.776	0.0	20.1	0
2160 min Winter	1.335	0.0	22.5	0
2880 min Winter	1.090	0.0	24.3	0
4320 min Winter	0.818	0.0	26.9	0
5760 min Winter	0.668	0.0	28.8	0
7200 min Winter	0.571	0.0	30.2	0
8640 min Winter	0.502	0.0	31.3	0
10080 min Winter	0.451	0.0	32.3	0

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.369	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.063

Time (mins) From:	To:	Area (ha)
0	4	0.063

Time Area Diagram

Total Area (ha) 0.000

Time (mins) From:	To:	Area (ha)
0	4	0.000

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Model Details

Storage is Online Cover Level (m) 38.900

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.0
Membrane Percolation (mm/hr)	1000	Length (m)	43.8
Max Percolation (l/s)	85.2	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	38.450	Membrane Depth (m)	150

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0053-1000-0550-1000
Design Head (m)	0.550
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	53
Invert Level (m)	38.200
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	0.550	1.0
Flush-Flo™	0.166	1.0
Kick-Flo®	0.358	0.8
Mean Flow over Head Range	-	0.9

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

Depth (m)	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	1.0	1.200	1.4	3.000	2.2	7.000	3.2
0.200	1.0	1.400	1.5	3.500	2.3	7.500	3.3
0.300	0.9	1.600	1.6	4.000	2.5	8.000	3.4
0.400	0.9	1.800	1.7	4.500	2.6	8.500	3.5
0.500	1.0	2.000	1.8	5.000	2.7	9.000	3.6
0.600	1.0	2.200	1.9	5.500	2.8	9.500	3.7
0.800	1.2	2.400	1.9	6.000	3.0		
1.000	1.3	2.600	2.0	6.500	3.1		

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Summary of Results for 30 year Return Period (+40%)

Half Drain Time : 171 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	38.545	0.095	0.0	1.0	1.0	8.7	O K
30 min Summer	38.576	0.126	0.0	1.0	1.0	11.6	O K
60 min Summer	38.604	0.154	0.0	1.0	1.0	14.1	O K
120 min Summer	38.619	0.169	0.0	1.0	1.0	15.5	O K
180 min Summer	38.618	0.168	0.0	1.0	1.0	15.5	O K
240 min Summer	38.614	0.164	0.0	1.0	1.0	15.1	O K
360 min Summer	38.605	0.155	0.0	1.0	1.0	14.3	O K
480 min Summer	38.596	0.146	0.0	1.0	1.0	13.4	O K
600 min Summer	38.587	0.137	0.0	1.0	1.0	12.6	O K
720 min Summer	38.577	0.127	0.0	1.0	1.0	11.7	O K
960 min Summer	38.557	0.107	0.0	1.0	1.0	9.9	O K
1440 min Summer	38.518	0.068	0.0	1.0	1.0	6.3	O K
2160 min Summer	38.477	0.027	0.0	1.0	1.0	2.5	O K
2880 min Summer	38.456	0.006	0.0	1.0	1.0	0.6	O K
4320 min Summer	38.450	0.000	0.0	0.8	0.8	0.0	O K
5760 min Summer	38.450	0.000	0.0	0.6	0.6	0.0	O K
7200 min Summer	38.450	0.000	0.0	0.5	0.5	0.0	O K
8640 min Summer	38.450	0.000	0.0	0.5	0.5	0.0	O K
10080 min Summer	38.450	0.000	0.0	0.4	0.4	0.0	O K
15 min Winter	38.559	0.109	0.0	1.0	1.0	10.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	92.644	0.0	9.3	18
30 min Summer	61.173	0.0	12.9	33
60 min Summer	38.715	0.0	16.7	62
120 min Summer	23.822	0.0	20.8	120
180 min Summer	17.752	0.0	23.5	160
240 min Summer	14.347	0.0	25.4	192
360 min Summer	10.563	0.0	28.2	256
480 min Summer	8.501	0.0	30.3	326
600 min Summer	7.179	0.0	32.0	394
720 min Summer	6.250	0.0	33.4	462
960 min Summer	5.020	0.0	35.7	598
1440 min Summer	3.682	0.0	39.3	838
2160 min Summer	2.696	0.0	42.9	1188
2880 min Summer	2.160	0.0	45.6	1500
4320 min Summer	1.579	0.0	49.4	0
5760 min Summer	1.263	0.0	52.1	0
7200 min Summer	1.062	0.0	54.1	0
8640 min Summer	0.921	0.0	55.6	0
10080 min Summer	0.817	0.0	56.9	0
15 min Winter	92.644	0.0	10.7	18

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Summary of Results for 30 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	38.595	0.145	0.0	1.0	1.0	13.3	O K
60 min Winter	38.626	0.176	0.0	1.0	1.0	16.2	O K
120 min Winter	38.648	0.198	0.0	1.0	1.0	18.2	O K
180 min Winter	38.650	0.200	0.0	1.0	1.0	18.4	O K
240 min Winter	38.644	0.194	0.0	1.0	1.0	17.8	O K
360 min Winter	38.632	0.182	0.0	1.0	1.0	16.7	O K
480 min Winter	38.618	0.168	0.0	1.0	1.0	15.5	O K
600 min Winter	38.604	0.154	0.0	1.0	1.0	14.1	O K
720 min Winter	38.588	0.138	0.0	1.0	1.0	12.7	O K
960 min Winter	38.557	0.107	0.0	1.0	1.0	9.8	O K
1440 min Winter	38.497	0.047	0.0	1.0	1.0	4.3	O K
2160 min Winter	38.451	0.001	0.0	1.0	1.0	0.1	O K
2880 min Winter	38.450	0.000	0.0	0.8	0.8	0.0	O K
4320 min Winter	38.450	0.000	0.0	0.6	0.6	0.0	O K
5760 min Winter	38.450	0.000	0.0	0.5	0.5	0.0	O K
7200 min Winter	38.450	0.000	0.0	0.4	0.4	0.0	O K
8640 min Winter	38.450	0.000	0.0	0.3	0.3	0.0	O K
10080 min Winter	38.450	0.000	0.0	0.3	0.3	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	61.173	0.0	14.6	32
60 min Winter	38.715	0.0	18.8	60
120 min Winter	23.822	0.0	23.5	118
180 min Winter	17.752	0.0	26.5	172
240 min Winter	14.347	0.0	28.6	220
360 min Winter	10.563	0.0	31.7	276
480 min Winter	8.501	0.0	34.1	352
600 min Winter	7.179	0.0	36.0	428
720 min Winter	6.250	0.0	37.7	504
960 min Winter	5.020	0.0	40.3	646
1440 min Winter	3.682	0.0	44.2	880
2160 min Winter	2.696	0.0	48.5	1124
2880 min Winter	2.160	0.0	51.5	0
4320 min Winter	1.579	0.0	55.9	0
5760 min Winter	1.263	0.0	59.0	0
7200 min Winter	1.062	0.0	61.4	0
8640 min Winter	0.921	0.0	63.2	0
10080 min Winter	0.817	0.0	64.7	0

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.369	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.063

Time (mins) From:	To:	Area (ha)
0	4	0.063

Time Area Diagram

Total Area (ha) 0.000

Time (mins) From:	To:	Area (ha)
0	4	0.000

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Model Details

Storage is Online Cover Level (m) 38.900

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.0
Membrane Percolation (mm/hr)	1000	Length (m)	43.8
Max Percolation (l/s)	85.2	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	38.450	Membrane Depth (m)	150

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0053-1000-0550-1000
Design Head (m)	0.550
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	53
Invert Level (m)	38.200
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	0.550	1.0
Flush-Flo™	0.166	1.0
Kick-Flo®	0.358	0.8
Mean Flow over Head Range	-	0.9

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

Depth (m)	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	1.0	1.200	1.4	3.000	2.2	7.000	3.2
0.200	1.0	1.400	1.5	3.500	2.3	7.500	3.3
0.300	0.9	1.600	1.6	4.000	2.5	8.000	3.4
0.400	0.9	1.800	1.7	4.500	2.6	8.500	3.5
0.500	1.0	2.000	1.8	5.000	2.7	9.000	3.6
0.600	1.0	2.200	1.9	5.500	2.8	9.500	3.7
0.800	1.2	2.400	1.9	6.000	3.0		
1.000	1.3	2.600	2.0	6.500	3.1		

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Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 242 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	38.579	0.129	0.0	1.0	1.0	11.9	O K
30 min Summer	38.623	0.173	0.0	1.0	1.0	15.9	O K
60 min Summer	38.663	0.213	0.0	1.0	1.0	19.6	O K
120 min Summer	38.691	0.241	0.0	1.0	1.0	22.2	O K
180 min Summer	38.695	0.245	0.0	1.0	1.0	22.5	O K
240 min Summer	38.691	0.241	0.0	1.0	1.0	22.1	O K
360 min Summer	38.678	0.228	0.0	1.0	1.0	21.0	O K
480 min Summer	38.668	0.218	0.0	1.0	1.0	20.1	O K
600 min Summer	38.659	0.209	0.0	1.0	1.0	19.2	O K
720 min Summer	38.648	0.198	0.0	1.0	1.0	18.3	O K
960 min Summer	38.628	0.178	0.0	1.0	1.0	16.4	O K
1440 min Summer	38.589	0.139	0.0	1.0	1.0	12.8	O K
2160 min Summer	38.531	0.081	0.0	1.0	1.0	7.4	O K
2880 min Summer	38.488	0.038	0.0	1.0	1.0	3.5	O K
4320 min Summer	38.451	0.001	0.0	1.0	1.0	0.1	O K
5760 min Summer	38.450	0.000	0.0	0.8	0.8	0.0	O K
7200 min Summer	38.450	0.000	0.0	0.7	0.7	0.0	O K
8640 min Summer	38.450	0.000	0.0	0.6	0.6	0.0	O K
10080 min Summer	38.450	0.000	0.0	0.5	0.5	0.0	O K
15 min Winter	38.597	0.147	0.0	1.0	1.0	13.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	119.643	0.0	12.5	18
30 min Summer	79.768	0.0	17.3	33
60 min Summer	50.812	0.0	22.4	62
120 min Summer	31.335	0.0	28.0	122
180 min Summer	23.316	0.0	31.3	180
240 min Summer	18.795	0.0	33.8	210
360 min Summer	13.745	0.0	37.1	272
480 min Summer	11.018	0.0	39.8	338
600 min Summer	9.273	0.0	41.8	408
720 min Summer	8.051	0.0	43.7	478
960 min Summer	6.436	0.0	46.5	616
1440 min Summer	4.686	0.0	50.6	882
2160 min Summer	3.405	0.0	54.9	1252
2880 min Summer	2.712	0.0	58.1	1584
4320 min Summer	1.965	0.0	62.5	2204
5760 min Summer	1.561	0.0	65.6	0
7200 min Summer	1.305	0.0	67.9	0
8640 min Summer	1.127	0.0	69.7	0
10080 min Summer	0.996	0.0	71.1	0
15 min Winter	119.643	0.0	14.2	18

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	38.647	0.197	0.0	1.0	1.0	18.2	O K
60 min Winter	38.694	0.244	0.0	1.0	1.0	22.4	O K
120 min Winter	38.730	0.280	0.0	1.0	1.0	25.7	O K
180 min Winter	38.739	0.289	0.0	1.0	1.0	26.5	O K
240 min Winter	38.736	0.286	0.0	1.0	1.0	26.3	O K
360 min Winter	38.719	0.269	0.0	1.0	1.0	24.8	O K
480 min Winter	38.706	0.256	0.0	1.0	1.0	23.6	O K
600 min Winter	38.691	0.241	0.0	1.0	1.0	22.2	O K
720 min Winter	38.676	0.226	0.0	1.0	1.0	20.8	O K
960 min Winter	38.645	0.195	0.0	1.0	1.0	17.9	O K
1440 min Winter	38.584	0.134	0.0	1.0	1.0	12.4	O K
2160 min Winter	38.495	0.045	0.0	1.0	1.0	4.1	O K
2880 min Winter	38.451	0.001	0.0	1.0	1.0	0.1	O K
4320 min Winter	38.450	0.000	0.0	0.7	0.7	0.0	O K
5760 min Winter	38.450	0.000	0.0	0.6	0.6	0.0	O K
7200 min Winter	38.450	0.000	0.0	0.5	0.5	0.0	O K
8640 min Winter	38.450	0.000	0.0	0.4	0.4	0.0	O K
10080 min Winter	38.450	0.000	0.0	0.4	0.4	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	79.768	0.0	19.5	32
60 min Winter	50.812	0.0	25.2	62
120 min Winter	31.335	0.0	31.6	118
180 min Winter	23.316	0.0	35.3	174
240 min Winter	18.795	0.0	38.1	228
360 min Winter	13.745	0.0	41.8	288
480 min Winter	11.018	0.0	44.7	364
600 min Winter	9.273	0.0	47.1	442
720 min Winter	8.051	0.0	49.0	520
960 min Winter	6.436	0.0	52.3	666
1440 min Winter	4.686	0.0	57.0	952
2160 min Winter	3.405	0.0	62.0	1280
2880 min Winter	2.712	0.0	65.5	1500
4320 min Winter	1.965	0.0	70.6	0
5760 min Winter	1.561	0.0	74.1	0
7200 min Winter	1.305	0.0	76.8	0
8640 min Winter	1.127	0.0	78.9	0
10080 min Winter	0.996	0.0	80.6	0

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.369	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.063

Time (mins) From:	To:	Area (ha)
0	4	0.063

Time Area Diagram

Total Area (ha) 0.000

Time (mins) From:	To:	Area (ha)
0	4	0.000

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Model Details

Storage is Online Cover Level (m) 38.900

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.0
Membrane Percolation (mm/hr)	1000	Length (m)	43.8
Max Percolation (l/s)	85.2	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	38.450	Membrane Depth (m)	150

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0053-1000-0550-1000
Design Head (m)	0.550
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	53
Invert Level (m)	38.200
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	0.550	1.0
Flush-Flo™	0.166	1.0
Kick-Flo®	0.358	0.8
Mean Flow over Head Range	-	0.9

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

Depth (m)	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	1.0	1.200	1.4	3.000	2.2	7.000	3.2
0.200	1.0	1.400	1.5	3.500	2.3	7.500	3.3
0.300	0.9	1.600	1.6	4.000	2.5	8.000	3.4
0.400	0.9	1.800	1.7	4.500	2.6	8.500	3.5
0.500	1.0	2.000	1.8	5.000	2.7	9.000	3.6
0.600	1.0	2.200	1.9	5.500	2.8	9.500	3.7
0.800	1.2	2.400	1.9	6.000	3.0		
1.000	1.3	2.600	2.0	6.500	3.1		

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Appendix 4
General Requirements Maintenance

GENERAL MAINTENCE MAINTENANCE	
Maintenance activities comprise Regular Maintenance Occasional Tasks Remedial Work	Frequency
Generally Litter Collect all litter or other debris and remove from site at each site visit. **Avoid** use of weedkillers and pesticides to prevent chemical pollution **Avoid** de-icing agents wherever possible to allow bio-remediation of pollutants in permeable surfaces. **Protect** all permeable, porous and infiltration surfaces from silt, sand, mulch and other fine particles.	Monthly
REGULAR MAINTENANCE	
LITTER MANAGEMENT	
Pick up all litter in SuDS and Landscape areas and remove from site	monthly
GRASS MAINTENANCE – all cuttings to wildlife piles	

Mow all grass verges, paths and amenity at 35-50mm with 75mm max. Leaving grass in situ	As required or monthly
Mow all dry swales, dry SuDS basins and margins to low flow channels and other SuDS features at 100mm with 150mm max. Cut wet swales or basins annually as wildflower areas	4-8 visits as required Annually
Wildflower areas strimmed to 50mm in Sept or at end of school holidays Or Wildflower areas strimmed to 50mm on 3 year rotation 30% each year	1 visit annually 1 Visit Annually
Inspect monthly, remove silt from slab aprons and debris. Strim 1m round for access	12 visits monthly
HARD SURFACES	
Sweep all paving regularly. Sweep and suction brush permeable paving in autumn after leaf fall.	1 visit
PERMEABLE AND POROUS SURFACES	
Regular Maintenance	Frequency
Cleaning Brush regularly and remove sweepings from all hard surfaces	Monthly

Occasional Tasks	Frequency
Permeable Pavements. Brush and vacuum surface once a year to prevent silt blockage and enhance design life.	Annually
Remedial Work	**Frequency**
Monitor effectiveness of permeable pavement and when water does not infiltrate immediately advise Client of possible need for reinstatement of top layers or specialist cleaning. Recent experience suggests jet washing and suction cleaning will substantially reinstate pavement to 90% efficiency.	As required
OVERFLOWS AND FLOOD ROUTES	
Regular Maintenance	**Frequency**
Overflows. Jet pipes leading from overflow structures annually and check running water through the overflow. Check free flow at next SUDS featur inlet to basin or chamber.	Annually
Overflows. Remove any accumulated grass cuttings or other debris on top of grass weirs or stone filled baskets overflows.	Monthly
Flood Routes. Make visual inspection. Check route is not blocked by new fences, walls, soil or other rubbish. Remove as necessary.	Monthly
Remedial	**Frequency**
Overflows. If overflow is not clear then dismantle structure and reassemble to design detail.	

	As required
PLANTING AND EXISTING VEGETATION	
Regular Maintenance	Frequency
Grass maintenance	
Amenity Grass - Mow all grass verges, paths and amenity grass at 35-50mm with 75mm max. All cuttings to remain in situ	16 visits
Rough grass – Mow at 75-100mm but not to exceed 150mm All cuttings to wildlife piles	4 - 8 visits
Wildflower areas strimmed to 50mm in Sept-Oct or Wildflower areas strimmed to 50mm July and Sept or Wildflower areas strimmed to 50mm on 3 year rotation 30% each year All cuttings to wildlife piles	1 visit 2 visit 1 visit
Ornamental tree & shrub planting. Weed all shrub beds as detailed spec as necessary. Cut back planting from lights, paths and visibility sight lines in late autumn and as necessary. Cut hedges slightly tapered back from base with flat top at specified height.	4 visits

Do not mulch planting adjacent to permeable/ porous paving surfaces. Remove stakes and ties from trees when no longer needed for support and within 3 years of planting. Protect from strimmer damage and remove competitive growth until well established.	
Native trees & shrub planting. Prune to shape in year 1. Protect trees from strimmer damage and remove competitive growth until well established. Remove stakes and ties from trees when no longer needed for support and within 3 years from planting.	1 visit
Existing trees Check existing trees for safety.	1 visit
Remedial	**Frequency**
Replace trees and shrubs which fail in the first five years after planting. Carry out tree surgery as necessary.	**As Required**

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