

# DRAINAGE STRATEGY TECHNICAL NOTE

## LAND TO THE WEST OF HOOK NORTON ROAD, SIBFORD FERRIS, BANBURY

On behalf of Blue Cedar Homes

Date: 09/05/2023 | Pegasus Ref: P21-0804– Author: Maja Raicevic

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## Document Management.

Version	Date	Author	Checked/ Approved by:	Reason revision	for
VO	09/05/2023	Maja Raicevic	Luke Johnson	First Issue	



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# 1. Proposed Drainage Statement

## Site Location

- 1.1. This Technical Note (TN) has been prepared by Pegasus Group Ltd on behalf of Blue Cedar Homes in order to summarise the drainage strategy for the proposed residential development at land to the west of Hook Norton Road, Sibford Ferris, Banbury.
- 1.2. The site is currently entirely greenfield and is bounded by Woodway Road to the west with open fields beyond the road, residential developments to the north and east side and undeveloped arable land to the south side of the development.
- 1.3. Proposed access road will be from the south, connecting into the existing Hook Norton Road. The site area is 0.938ha in size has a total of 5 proposed residential dwellings.
- 1.4. Approximate site co-ordinates are E: 435401; N: 237201, with nearest post code OX15 5RF.
- 1.5. A site-specific topographical survey was undertaken by Clifton Surveys Ltd (date: August 2021, REF: 134/4918/1A) and it indicates the site to have a north westerly fall. The highest ground level is 174.62m AOD in the southeast corner and the lowest ground level is 168.21m AOD in the northwest corner of the development. A copy of the Topographical Survey can be found in **Appendix A**.
- 1.6. A copy of the Site Layout can be found in **Appendix B**.

## Flood Risk & Existing Hydrology

- 1.7. The Environment Agency Flood Map for Planning indicates the entire site to lie within Flood Zone 1 (<1:1000-year probability of flooding occurring). As well as being at a very low risk from surface water flooding and risk of reservoir flooding.
- 1.8. Geological data held by the British Geological Survey (BGS) indicates that the bedrock geology underlying the site is Northampton Sand Formation – sandstone, limestone and ironstone. The Soilscape soils data shows the site to be 'Freely draining slightly acid but base-rich soils.'
- 1.9. Infiltration testing was carried out by Geo Consulting Engineering Limited in December 2021, the results are recorded in their report found in **Appendix C** of this document. It is assumed that the site is suitable for infiltration of surface water runoff due to reasonable rates of infiltration.
- 1.10. There are no main watercourses in the close proximity of the site. The closest unnamed watercourse is located 170m north of the development.

## Surface Water Strategy

- 1.11. The main method of surface water disposal will be infiltration into the ground via an infiltration basin located downhill in the west of the site.



- 1.12. A traditional gravity network for the storm water drainage is proposed falling downhill to the west of the site, network modelling has been undertaken on the network in MicroDrainage and can be found within **Appendix D**.
- 1.13. Source Control calculations have determined the size of the infiltration basin for the worst—case storm event of 1:100 year plus 40% allowance for climate change. The basin will be 1m deep with a slope of 1:3. Source Control calculations can be found in **Appendix D**.
- 1.14. Network / Source Control calculations confirm that no flooding occurs on site in the worst—case storm event of 1:100 year plus 40% allowance for climate change. Impermeable area for houses and garages were calculated including urban creep changes (10% added to the impermeable area) and are shown in the table below.

**Table 1.1 – Impermeable Areas**

Pipe	House added 10% (ha)	Road & Driveway (ha)	<b>Total (ha)</b>
1.000	0.034	0.033	<b>0.067</b>
1.001	0.017	0.022	<b>0.039</b>
1.002	0	0	<b>0</b>
1.003	0.005	0	<b>0.005</b>
1.004	0	0	<b>0</b>
1.005	0	0	<b>0</b>
2.000	0.031	0.057	<b>0.087</b>

- 1.15. Water quality improvements will be maintained through the use of permeable surfacing in the private driveways as well as an attenuation basin that will have fine settlements sat in the base.
- 1.16. A copy of the Drainage Strategy Plan can be found in **Appendix E**.

## **Foul Water Strategy**

- 1.17. The proposed development will be accessed from the south eastern corner from a new proposed residential development which should allow for foul water connection into their sewers from this development. As levels fall to the north, a private pumping station is proposed which would have a rising main outfalling into the proposed foul sewer to the south. Exact details to be determined through the detailed design stage.

## **Maintenance**

- 1.18. An appropriate Operations and Maintenance manual for all drainage aspects would be provided at the detailed design stage of the project where exact responsibilities can be confirmed. This would be expected as a Condition on any planning application.



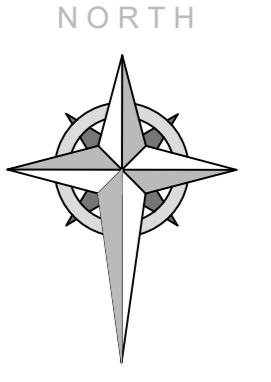
## Appendix A – Topographical Survey

237260.00 N

237220.00 N

237180.00 N

237140.00 N



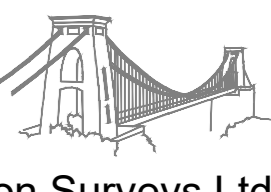
**STANDARD REFERENCES**

**ABBREVIATIONS**

bl	bollard	lp	laptop post
bb	bellish beacon	mk	marker post
bd	bus stop	mh	manhole
bt	baton	nb	notice board
cabv	cable TV cover	np	nameplate (road)
cl	cover level	p	post
conc	concrete	pb	post box
cs	combined sewer	ret	retaining wall
ck	crop mark	re	road eye
elec	electricity ic	rg	road gully
ESS	Elec. Sub-Station	rs	road sign
ep	electricity pole	rsp	reservoir pipe
f	flower bed	sp	signpost
fh	fire hydrant	sv	stop valve
fl	floor level	spp	soil vent pipe
fp	footpath	sws	storm water sewer
f.p	flagstone	tob	telephone cabinet
fws	foul water sewer	tp	telegraph pole
g	gully	t	traffic light
gsv	gate valve	ur	unable to raise
ic	inspection cover	vp	vent pipe
il	invert level	w/f	windfall fence
irf	iron railing fence	w	water tap
j	junction box	wp	wood post
kb	kerb-raiser	w	water tap

- Notes**
1. This survey has been computed and drawn about the Ordnance Survey National Grid.
  2. All levels are in metres and relate to the Ordnance Survey active GPS stations.
  3. This survey was measured for a scale of 1:200, any subsequent enlargements should be verified on site.

**Revisions**



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 1 Wellington Park  
 Clifton  
 Bristol  
 BS8 2UR  
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Surveyed	L. Wakeford	Date	August 2021
Drawn	L. Wakeford	Checked	August 2021

Drawing Title: Topographical Survey  
 Land Of Woodway Road  
 Banbury  
 OX15 5RF

Client: Blue Cedar Homes  
 220 Park Ave, Aztec West  
 Bristol  
 BS32 4SY

Drawing No: 134/4918/1A  
 Scale: A0 @ 1:200

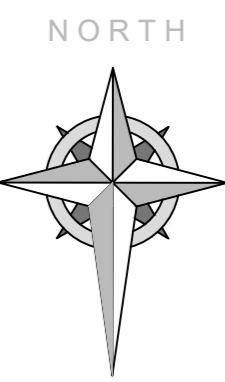
435320.00 E

435360.00 E

435400.00 E

435440.00 E

435480.00 E



**STANDARD REFERENCES**

ABBREVIATIONS	
bl	bollard
bb	bellish beacon
bd	bus stop
bt	telecoms
cabr	cable TV cover
cl	cover level
conc	concrete
com	combined sewer
ok	ok/safe
elec	electricity ic
ESS	Elec. Sub-Station
ep	electricity pole
f	flower bed
fh	fire hydrant
f	floor level
fp	footpath
f.p	flagstone
fws	foul water sewer
g	gully
gsv	gate valve
ic	inspection cover
il	invert level
irf	iron railing fence
j	junction box
kb	kerb-raiser
lp	lamp post
mk	marker post
mh	manhole
nb	notice-board
np	nameplate (road)
p	post
pb	post box
ret	retaining wall
re	roading eye
rg	road gully
rs	road sign
rsp	sewer pipe
sp	signpost
sv	stop valve
svp	soil vent pipe
sws	storm water sewer
tbl	telephone cabinet
tp	telegraph pole
t	traffic light
ur	unable to raise
vp	vent pipe
w/f	windstop fence
w	water tap
wp	wood post
w	water tap

- Notes**
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**Revisions**



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Surveyed	L. Wakeford	Date	August 2021
Drawn	L. Wakeford	Checked	August 2021

Drawing Title: Topographical Survey Land Of Woodway Road Banbury OX15 5RF

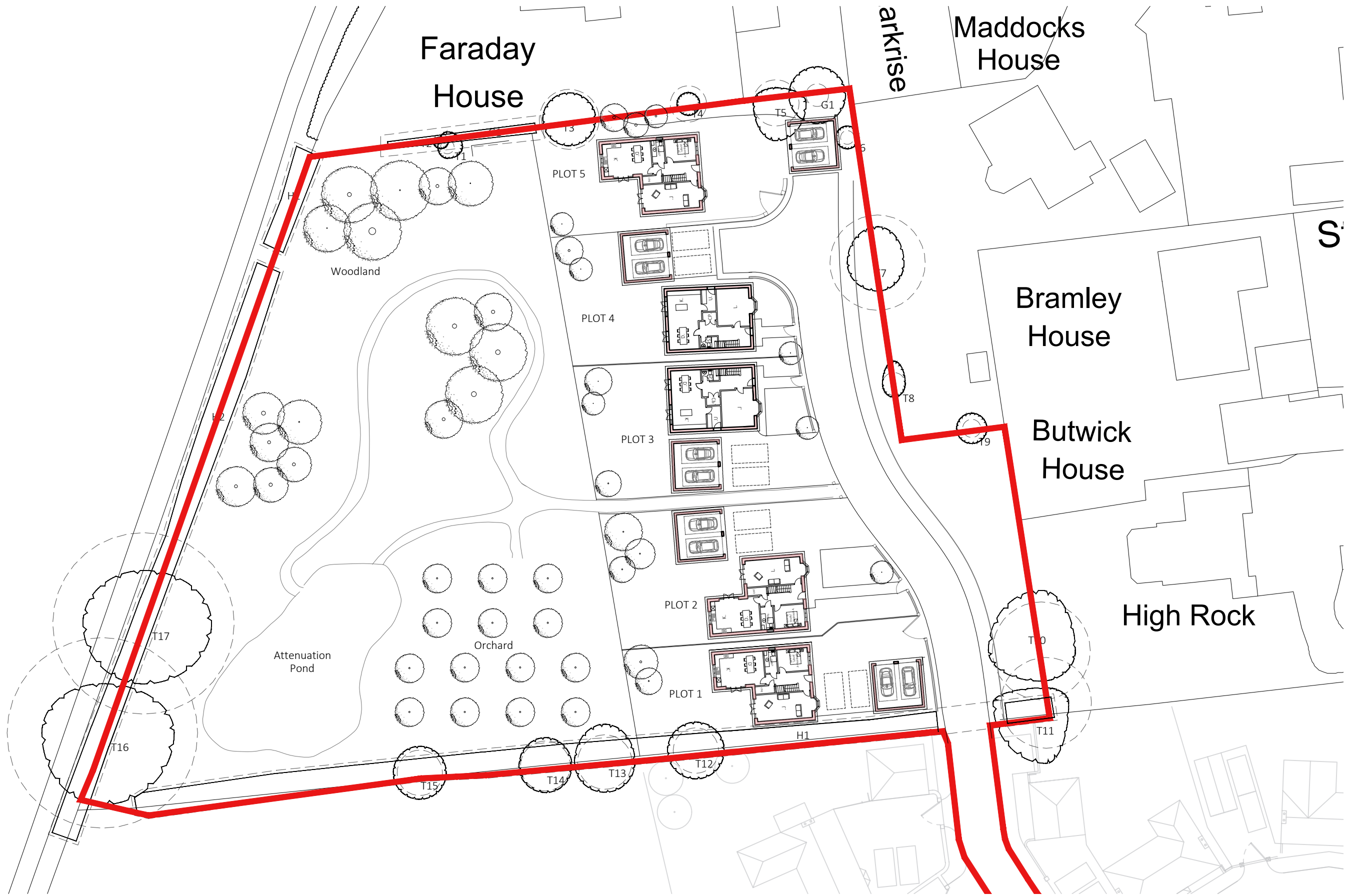
Client: Blue Cedar Homes 220 Park Ave, Aztec West Bristol BS32 4SY

Drawing No: 134/4918/1B Scale: A0 @ 1:200





## Appendix B – Site Plan



T 20.04.2023 (IB) P3 Double garage added. General amendments  
 S 28.03.2023 (IB) New 5 plot 2 storey scheme

Rev	Date	Details	Rev	Status
Project	Stage	Drawing	Rev	Status
4349	3	03	T	FOR COMMENT

Scale 1:500  
 Size A3 L  
 Drawn RL  
 Check MB  
 Creation



Sibford Ferris  
 OX15 5QW

Site Plan  
 As Proposed



THIS DRAWING IS COPYRIGHT ©  
 Responsibility is not accepted for errors made by others in scaling from this drawing  
 All construction information should be taken from figured dimensions only  
 Discrepancies must be reported to the Architect before proceeding



## Appendix C – Infiltration Testing results

**Soakaway Test:**

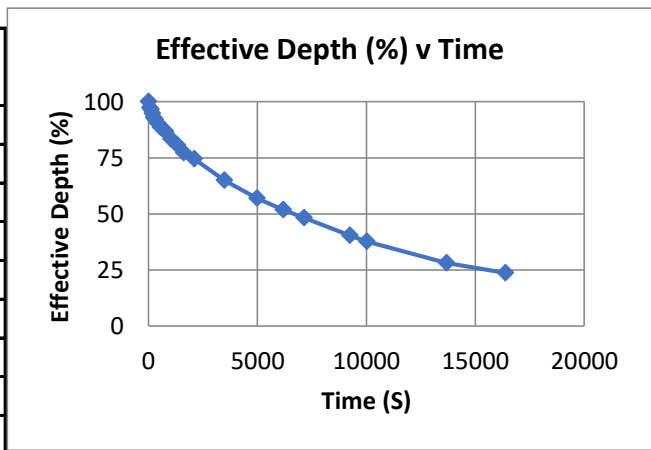
Trial Pit.	TP01
Test No.	1

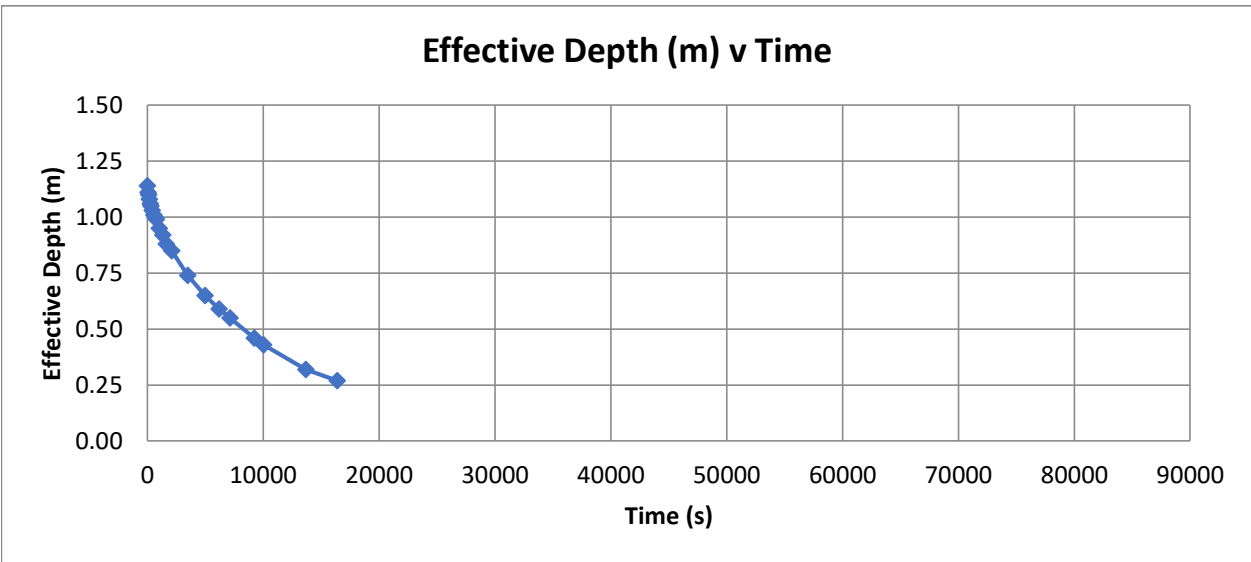
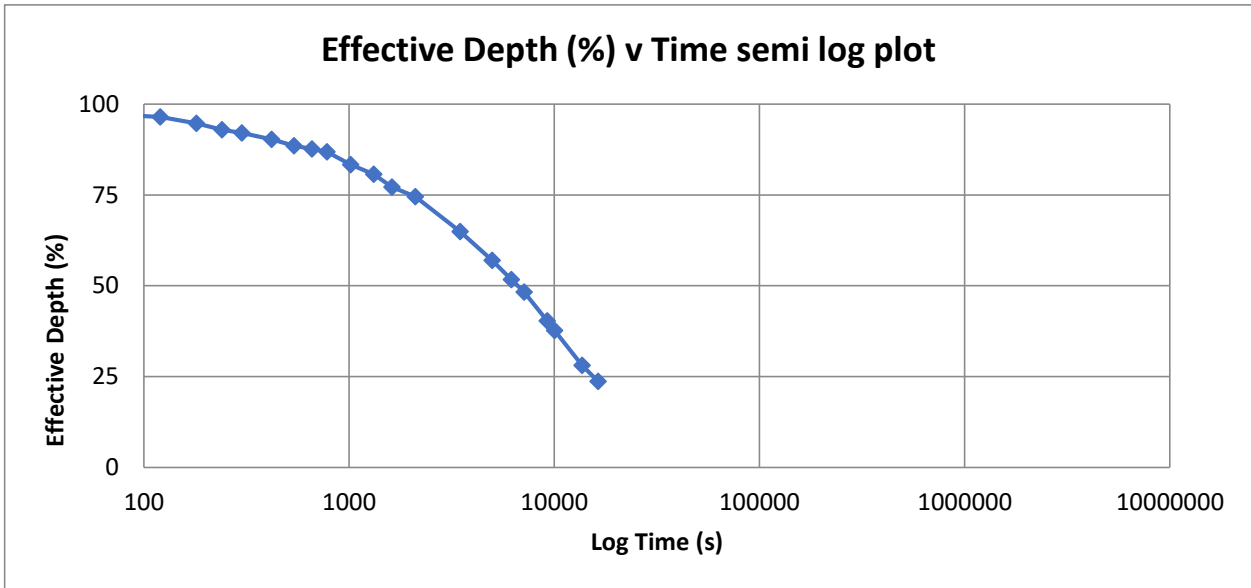
**Dimensions:**

Length	2.10	m
Width	0.70	m
Depth	2.16	m
Start water depth	1.02	m
Effective Depth	1.14	m

Date	Time		Depth (mBGL)	Head/ Effective Depth (m)	Effective Depth (%)
	Hour	Seconds			
19 October 2021	09:32:00	0	1.02	1.14	100
19 October 2021	09:33:00	60	1.05	1.11	97
19 October 2021	09:34:00	120	1.06	1.1	96
19 October 2021	09:35:00	180	1.08	1.08	95
19 October 2021	09:36:00	240	1.10	1.06	93
19 October 2021	09:37:00	300	1.11	1.05	92
19 October 2021	09:39:00	420	1.13	1.03	90
19 October 2021	09:41:00	540	1.15	1.01	89
19 October 2021	09:43:00	660	1.16	1	88
19 October 2021	09:45:00	780	1.17	0.99	87
19 October 2021	09:49:00	1020	1.21	0.95	83
19 October 2021	09:54:00	1320	1.24	0.92	81
19 October 2021	09:59:00	1620	1.28	0.88	77
19 October 2021	10:07:00	2100	1.31	0.85	75
19 October 2021	10:30:00	3480	1.42	0.74	65
19 October 2021	10:55:00	4980	1.51	0.65	57
19 October 2021	11:15:00	6180	1.57	0.59	52
19 October 2021	11:31:00	7140	1.61	0.55	48
19 October 2021	12:06:00	9240	1.70	0.46	40
19 October 2021	12:19:00	10020	1.73	0.43	38
19 October 2021	13:20:00	13680	1.84	0.32	28
19 October 2021	14:05:00	16380	1.89	0.27	24

Effective Depth %	Depth (m)	Time (s)
75	0.855	2100
25	0.285	16000
	Vp75-25	tp75-25
Sum	0.8379	13900
Base	1.47	m <sup>2</sup>
Side long	1.197	m
Side short	0.399	m
ap50	4.662	m <sup>2</sup>
<b>Soil Infiltration Rate</b>	<b>1.29E-05</b>	<b>m/s</b>





**Soakaway Test:**

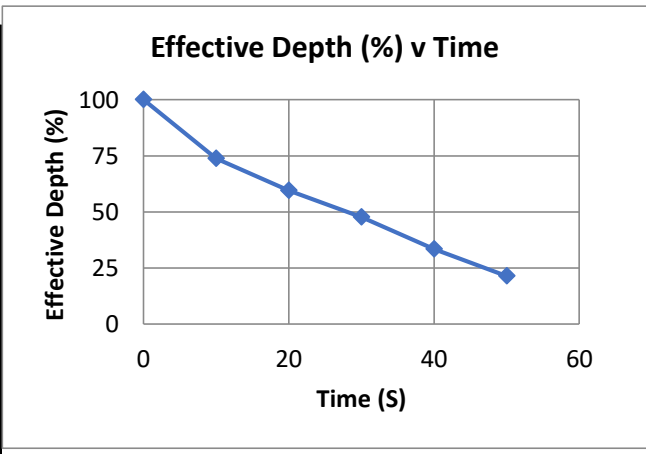
Trial Pit.	TP03
Test No.	1

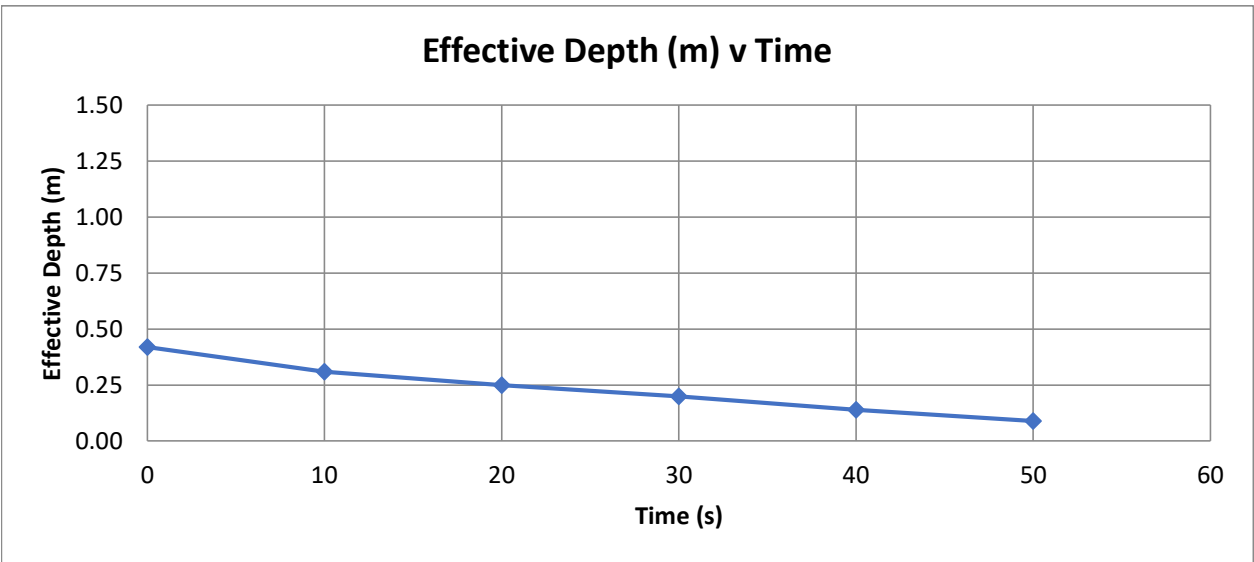
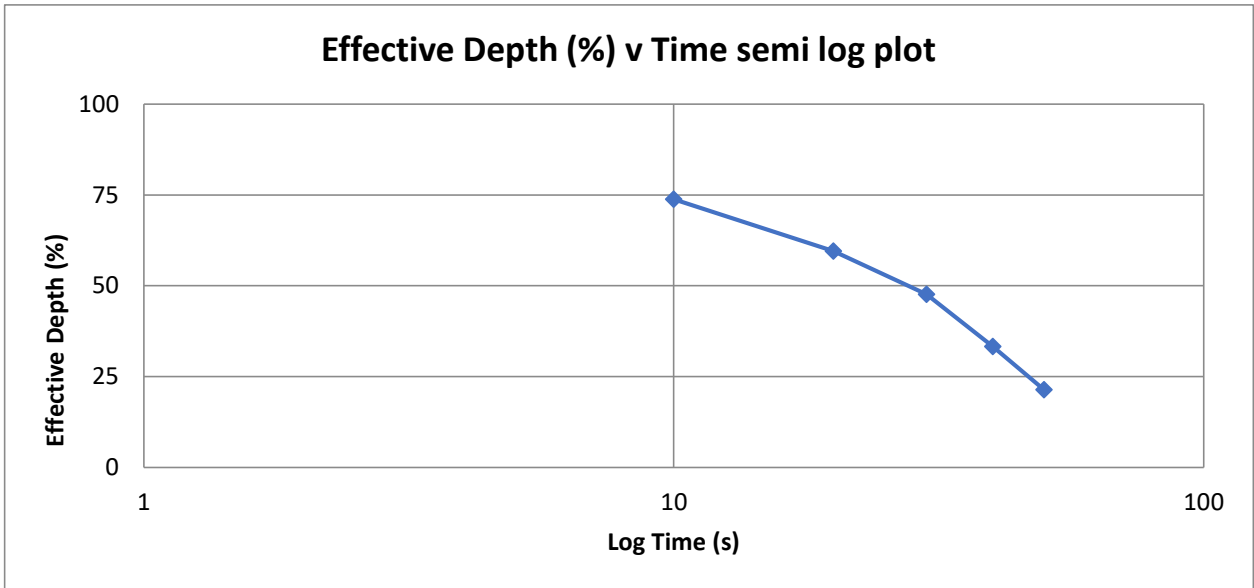
**Dimensions:**

Length	2.00	m
Width	0.70	m
Depth	1.89	m
Start water depth	1.47	m
Effective Depth	0.42	m

Date	Time		Depth (mBGL)	Head/ Effective Depth (m)	Effective Depth (%)
	Hour	Seconds			
19 October 2021	-	0	1.47	0.42	100
19 October 2021	-	10	1.58	0.31	74
19 October 2021	-	20	1.64	0.25	60
19 October 2021	-	30	1.69	0.2	48
19 October 2021	-	40	1.75	0.14	33
19 October 2021	-	50	1.80	0.09	21

Effective Depth %	Depth (m)	Time (s)
75	0.315	10
25	0.105	48
	Vp75-25	tp75-25
Sum	0.294	38
Base	1.4	m <sup>2</sup>
Side long	0.42	m
Side short	0.147	m
ap50	2.534	m <sup>2</sup>
<b>Soil Infiltration Rate</b>	<b>3.05E-03</b>	<b>m/s</b>





**Soakaway Test:**

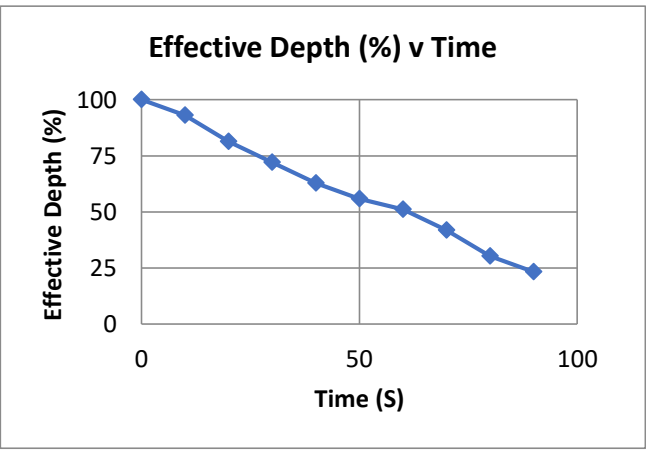
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Test No.	2

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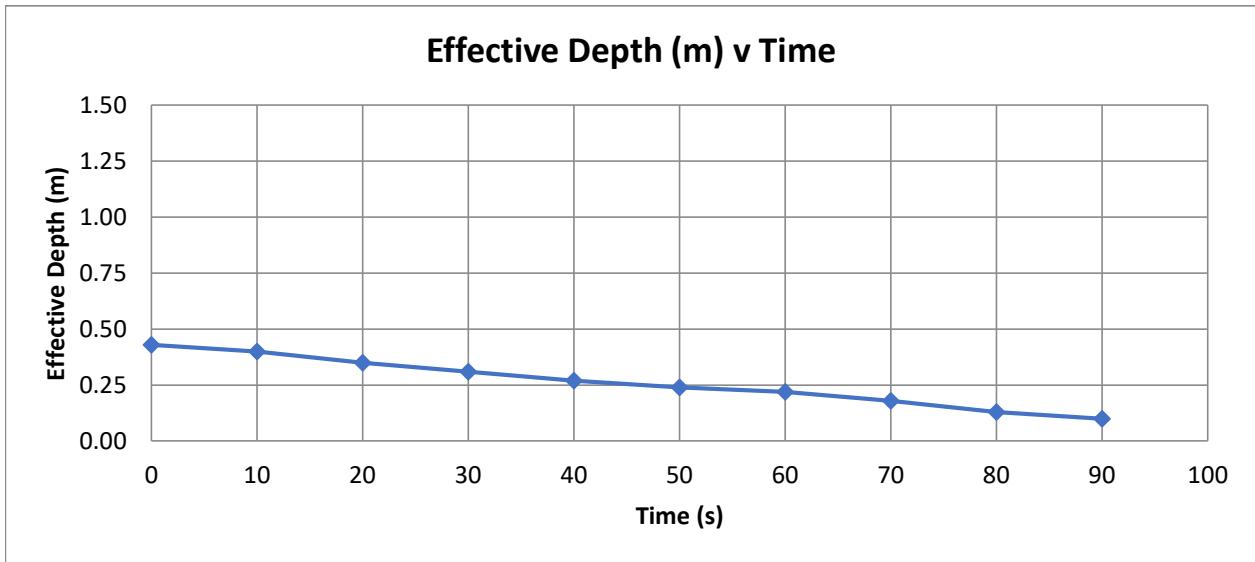
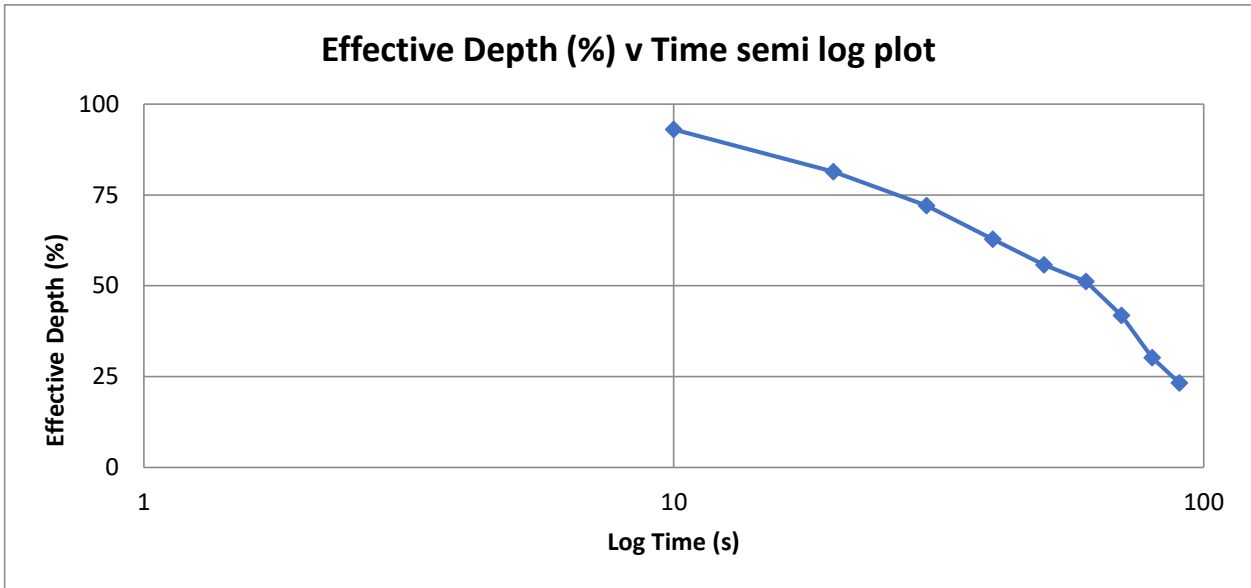
Length	2.00	m
Width	0.70	m
Depth	1.89	m
Start water depth	1.47	m
Effective Depth	0.42	m

Date	Time		Depth (mBGL)	Head/ Effective Depth (m)	Effective Depth (%)
	Hour	Seconds			
19 October 2021	-	0	1.46	0.43	100
19 October 2021	-	10	1.49	0.4	93
19 October 2021	-	20	1.54	0.35	81
19 October 2021	-	30	1.58	0.31	72
19 October 2021	-	40	1.62	0.27	63
19 October 2021	-	50	1.65	0.24	56
19 October 2021	-	60	1.67	0.22	51
19 October 2021	-	70	1.71	0.18	42
19 October 2021	-	80	1.76	0.13	30
19 October 2021	-	90	1.79	0.1	23

Effective Depth %	Depth (m)	Time (s)
75	0.315	26
25	0.105	88
	Vp75-25	tp75-25
Sum	0.294	62
Base	1.4	m <sup>2</sup>
Side long	0.42	m
Side short	0.147	m
ap50	2.534	m <sup>2</sup>
<b>Soil Infiltration Rate</b>	<b>1.87E-03</b>	<b>m/s</b>







**Soakaway Test:**

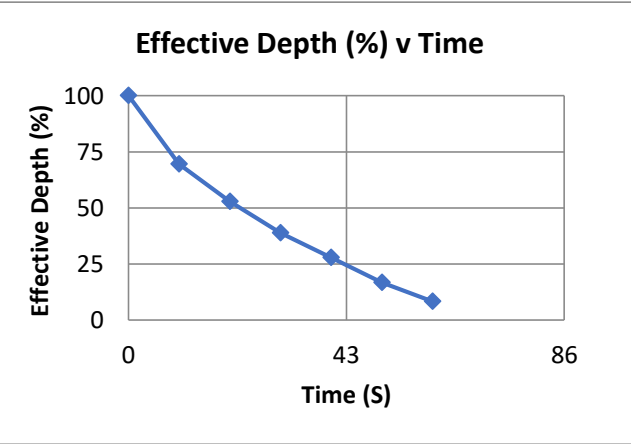
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Test No.	3

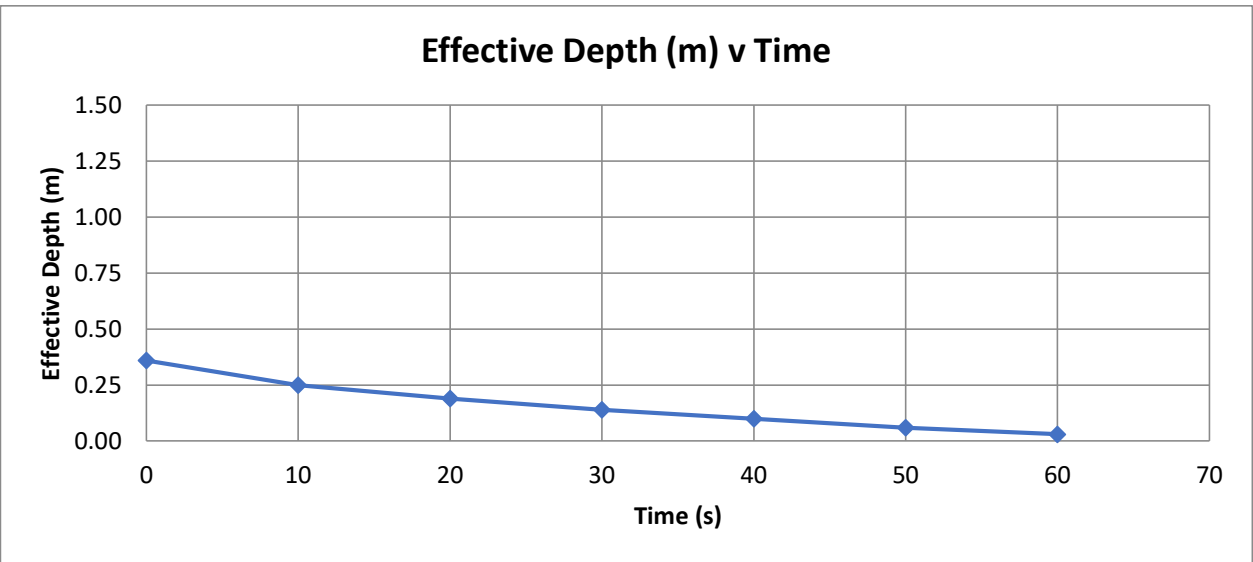
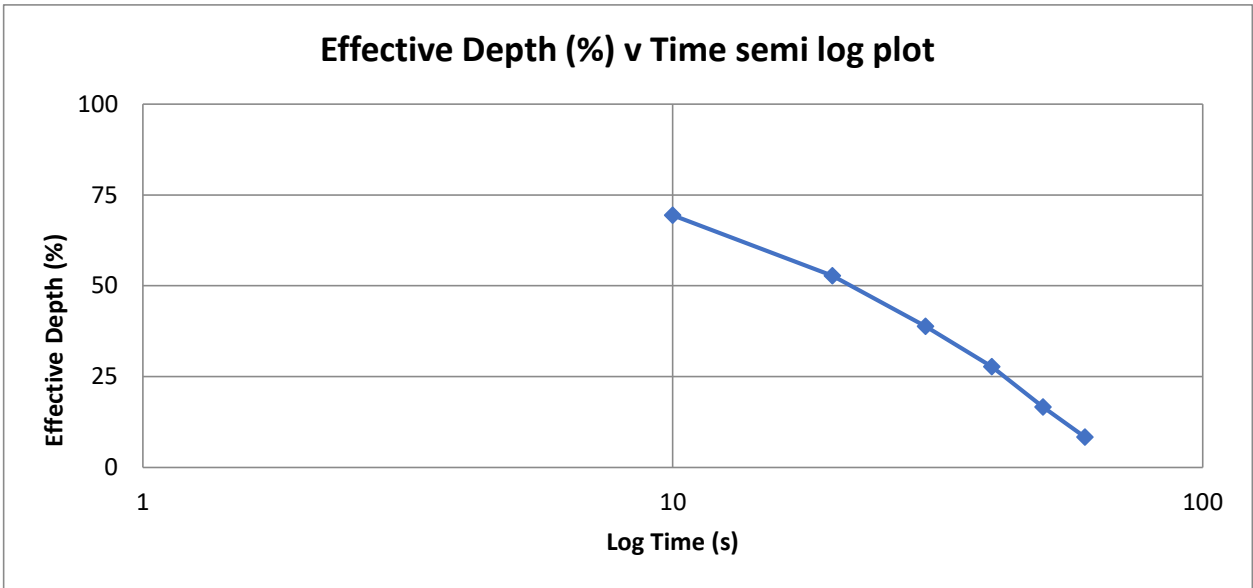
**Dimensions:**

Length	2.00	m
Width	0.70	m
Depth	1.89	m
Start water depth	1.47	m
Effective Depth	0.42	m

Date	Time		Depth (mBGL)	Head/ Effective Depth (m)	Effective Depth (%)
	Hour	Seconds			
19 October 2021	-	0	1.53	0.36	100
19 October 2021	-	10	1.64	0.25	69
19 October 2021	-	20	1.70	0.19	53
19 October 2021	-	30	1.75	0.14	39
19 October 2021	-	40	1.79	0.1	28
19 October 2021	-	50	1.83	0.06	17
19 October 2021	-	60	1.86	0.03	8

Effective Depth %	Depth (m)	Time (s)
75	0.315	8
25	0.105	43
	Vp75-25	tp75-25
Sum	0.294	35
Base	1.4	m <sup>2</sup>
Side long	0.42	m
Side short	0.147	m
ap50	2.534	m <sup>2</sup>
<b>Soil Infiltration Rate</b>	<b>3.31E-03</b>	<b>m/s</b>





GCE01141/R1

## 8.7 Buried Concrete

The pH and Sulphate results indicate that buried concrete can be designed in accordance with design sulphate class DS-1 ACEC class AC-1 of BRE Special Digest 1(2005), assuming mobile groundwater is present.

## 8.8 Infiltration Testing

Large-scale infiltration testing was carried out in TP01, TP02 and TP03. The following table summarises the results of the testing undertaken within TP01 and TP03:

Location	Test Range (mBGL)	Infiltration Rate (ms <sup>-1</sup> )		
		Test 1	Test 2	Test 3
TP01	1.00 – 2.16	1.29x10 <sup>-5</sup>	-( <sup>1</sup> )	-( <sup>1</sup> )
TP03	1.50 – 1.89	3.05x10 <sup>-3</sup>	1.87x10 <sup>-3</sup>	3.31x10 <sup>-3</sup>

(<sup>1</sup>) Trial not undertaken.

Due to the rates of infiltration encountered, only one trial was undertaken within TP01 during the course of the investigation. This is not in accordance with BRE 365 guidance.

Rapid rates of infiltration encountered within TP03 resulted in a maximum head of only 0.39m being achieved within the excavation.

Rapid rates of infiltration encountered within TP02 resulted in no head being able to be achieved, i.e. water drained within the excavation as quickly as it was introduced, and therefore 'standard' calculation of infiltration rate is not possible.

A full water bowser of size 2,600 gallons was emptied into the excavation over a period of 7 minutes and 16 seconds, indicating an outflow rate of at least 0.27m<sup>3</sup>/second. The base dimensions of the pit have been taken to produce an infiltration test area of 1.61m<sup>2</sup>. The outflow rate combined with the hypothetical test area has produced an approximate infiltration rate of 1.68x10<sup>-1</sup>m/s.

GCE01141/R1

It is noted that the speed of infiltration is attributed to water discharging within the cobbles and boulders and/ or underlying weathered limestone bedrock.

The concentration of water discharge into weathered limestone bedrock has the potential to wash out fines which previously filled fractures/ voids as well as creating new dissolution features within the bedrock. Both of these instances could lead to potentially significant settlement/ collapse within the near-surface.

As a result, careful consideration should be given to the use and design of soakaway drainage within the weathered limestone at this site.

In the absence of specific industry guidance on the placement of soakaway drainage within weathered limestone, as a minimum it is considered that guidance provided within CIRIA C574, Engineering in Chalk, should be followed. This guidance states that:

*'In designing shallow foundations for structures, concentrations of rainwater percolating into the ground should be avoided by careful detailing of the structure. Soakaways should be avoided if at all possible. If unavoidable, they should be sited at least 5-10m away from and structure, depending on the chalk density.'*


Based on the above, a precautionary approach of siting soakaways 10m from any existing or proposed structures should be adopted as a minimum if soakaway drainage is to be used.

It is also recommended that flexible drainage runs are used within the drainage construction to limit the potential for settlement damage which may lead to additional erosion and therefore increased settlement.

The local drainage authority should be contacted for further guidance on their acceptance of soakaway drainage within weathered limestone geology.



## **Appendix D – MicroDrainage Source Control and Network Calculations**

Pegasus Group		Page 0
Unit 5, The Priory, London Road, Sutton Coldfield B75 5SH		
Date 09/05/2023 18:18	Designed by luke.johnson	
File P21-0804_NETWORK_LAJ_V2.MDX	Checked by	
Innovyze	Network 2020.1.3	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Surface Network 1








Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.300	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500


Designed with Level Soffits

Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	25.609	0.175	146.3	0.067	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	12.014	0.100	120.1	0.039	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.000	22.326	2.725	8.2	0.087	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	5.046	0.050	100.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.003	30.073	0.200	150.4	0.005	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.004	23.615	0.350	67.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.005	7.384	0.050	147.7	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.40	169.800	0.067	0.0	0.0	0.0	1.08	42.9	9.1
1.001	50.00	5.54	169.550	0.106	0.0	0.0	0.0	1.43	101.3	14.4
2.000	50.00	5.08	172.250	0.087	0.0	0.0	0.0	4.60	182.9	11.8
1.002	50.00	5.59	169.450	0.193	0.0	0.0	0.0	1.57	110.6	26.1
1.003	50.00	5.98	169.400	0.198	0.0	0.0	0.0	1.28	90.5	26.8
1.004	50.00	6.19	169.200	0.198	0.0	0.0	0.0	1.92	135.5	26.8
1.005	50.00	6.28	168.850	0.198	0.0	0.0	0.0	1.29	91.3	26.8

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Free Flowing Outfall Details for Surface Network 1

<b>Outfall Pipe Number</b>	<b>Outfall C. Level Name (m)</b>	<b>I. Level (m)</b>	<b>Min I. Level (m)</b>	<b>D,L (mm)</b>	<b>W (mm)</b>
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1.005	S8	169.800	168.800	0.000	1350 0
-------	----	---------	---------	-------	--------

Simulation Criteria for Surface Network 1


Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m <sup>3</sup> /ha Storage	0.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.300	Storm Duration (mins)	30
Ratio R	0.400		



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

Simulation Criteria

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

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

Synthetic Rainfall Details


Rainfall Model	FSR	Ratio R	0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.300	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S4	15 Winter	1	+0%	100/15	Summer			169.873
1.001	S3	15 Winter	1	+0%	100/15	Summer			169.633
2.000	S1	15 Winter	1	+0%					172.289
1.002	S2	15 Winter	1	+0%	100/15	Summer			169.584
1.003	S5	15 Winter	1	+0%	100/15	Summer			169.514
1.004	S7	15 Winter	1	+0%	100/15	Summer			169.293
1.005	S9	15 Winter	1	+0%	100/15	Summer			168.985

PN	US/MH Name	Surcharged Flooded			Half Drain Pipe		Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap. (l/s)	Time (mins)	Flow (l/s)	
1.000	S4	-0.152	0.000	0.22		8.8	OK
1.001	S3	-0.217	0.000	0.17		13.4	OK

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

PN	US/MH Name	Surcharged		Flooded	Flow / Overflow Cap. (l/s)	Half Drain	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m <sup>3</sup> )	Time (mins)		Flow (l/s)			
2.000	S1	-0.186	0.000	0.07		11.7		OK	
1.002	S2	-0.166	0.000	0.41		25.0		OK	
1.003	S5	-0.186	0.000	0.31		25.4		OK	
1.004	S7	-0.207	0.000	0.21		25.1		OK	
1.005	S9	-0.165	0.000	0.41		25.4		OK	

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

Simulation Criteria

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

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

Synthetic Rainfall Details


Rainfall Model	FSR	Ratio R	0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.300	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

									<b>Water</b>
<b>PN</b>	<b>US/MH</b>	<b>Storm</b>	<b>Return</b>	<b>Climate</b>	<b>First (X)</b>	<b>First (Y)</b>	<b>First (Z)</b>	<b>Overflow</b>	<b>Level</b>
	<b>Name</b>		<b>Period</b>	<b>Change</b>	<b>Surcharge</b>	<b>Flood</b>	<b>Overflow</b>	<b>Act.</b>	<b>(m)</b>
1.000	S4 15	Winter	30	+0%	100/15	Summer			169.921
1.001	S3 15	Winter	30	+0%	100/15	Summer			169.740
2.000	S1 15	Winter	30	+0%					172.313
1.002	S2 15	Winter	30	+0%	100/15	Summer			169.710
1.003	S5 15	Winter	30	+0%	100/15	Summer			169.598
1.004	S7 15	Winter	30	+0%	100/15	Summer			169.354
1.005	S9 15	Winter	30	+0%	100/15	Summer			169.117

		<b>Surcharged</b>	<b>Flooded</b>		<b>Half Drain</b>	<b>Pipe</b>			
<b>PN</b>	<b>US/MH</b>	<b>Depth</b>	<b>Volume</b>	<b>Flow /</b>	<b>Time</b>	<b>Flow</b>		<b>Level</b>	
	<b>Name</b>	<b>(m)</b>	<b>(m<sup>3</sup>)</b>	<b>Cap.</b>	<b>(l/s)</b>	<b>(mins)</b>	<b>(l/s)</b>	<b>Status</b>	<b>Exceeded</b>
1.000	S4	-0.104	0.000	0.55		21.6		OK	
1.001	S3	-0.110	0.000	0.43		34.0		OK	

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

PN	US/MH Name	Surcharged		Flooded		Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m <sup>3</sup> )	Flow / Cap.	Overflow (l/s)				
2.000	S1	-0.162	0.000	0.17			28.7	OK	
1.002	S2	-0.040	0.000	1.00			61.4	OK	
1.003	S5	-0.102	0.000	0.76			62.7	OK	
1.004	S7	-0.146	0.000	0.52			62.7	OK	
1.005	S9	-0.033	0.000	1.00			61.4	OK	

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

Simulation Criteria

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

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

Synthetic Rainfall Details


Rainfall Model	FSR	Ratio R	0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.300	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S4	15 Winter	100	+40%	100/15 Summer				170.328
1.001	S3	15 Winter	100	+40%	100/15 Summer				170.169
2.000	S1	15 Winter	100	+40%					172.336
1.002	S2	15 Winter	100	+40%	100/15 Summer				170.066
1.003	S5	15 Winter	100	+40%	100/15 Summer				169.884
1.004	S7	15 Winter	100	+40%	100/15 Summer				169.542
1.005	S9	15 Winter	100	+40%	100/15 Summer				169.270

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m <sup>3</sup> )	Flow / Cap. (l/s)	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S4	0.303	0.000	0.95			37.8	SURCHARGED	
1.001	S3	0.319	0.000	0.75			59.1	SURCHARGED	

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

PN	US/MH Name	Surcharged		Flooded		Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m <sup>3</sup> )	Flow / Cap.	Overflow (l/s)				
2.000	S1	-0.139	0.000	0.31			52.1	OK	
1.002	S2	0.316	0.000	1.78			109.2	SURCHARGED	
1.003	S5	0.184	0.000	1.34			110.2	SURCHARGED	
1.004	S7	0.042	0.000	0.88			106.1	SURCHARGED	
1.005	S9	0.120	0.000	1.73			106.4	SURCHARGED	

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

Half Drain Time : 442 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m <sup>3</sup> )	Status
15 min Summer	168.975	0.175	1.9	47.9	O K
30 min Summer	169.023	0.223	2.0	62.0	O K
60 min Summer	169.067	0.267	2.1	75.5	O K
120 min Summer	169.103	0.303	2.1	86.7	O K
180 min Summer	169.116	0.316	2.1	91.0	O K
240 min Summer	169.120	0.320	2.1	92.3	O K
360 min Summer	169.117	0.317	2.1	91.2	O K
480 min Summer	169.111	0.311	2.1	89.5	O K
600 min Summer	169.105	0.305	2.1	87.6	O K
720 min Summer	169.099	0.299	2.1	85.5	O K
960 min Summer	169.085	0.285	2.1	81.2	O K
1440 min Summer	169.058	0.258	2.0	72.8	O K
2160 min Summer	169.020	0.220	2.0	61.2	O K
2880 min Summer	168.986	0.186	1.9	51.1	O K
4320 min Summer	168.930	0.130	1.8	34.9	O K
5760 min Summer	168.889	0.089	1.8	23.6	O K
7200 min Summer	168.862	0.062	1.7	16.3	O K
8640 min Summer	168.849	0.049	1.7	12.9	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m <sup>3</sup> )	Time-Peak (mins)
15 min Summer	132.861	0.0	19
30 min Summer	87.290	0.0	33
60 min Summer	54.663	0.0	62
120 min Summer	33.095	0.0	122
180 min Summer	24.358	0.0	182
240 min Summer	19.485	0.0	240
360 min Summer	14.144	0.0	330
480 min Summer	11.275	0.0	386
600 min Summer	9.449	0.0	448
720 min Summer	8.176	0.0	514
960 min Summer	6.502	0.0	652
1440 min Summer	4.700	0.0	924
2160 min Summer	3.392	0.0	1320
2880 min Summer	2.689	0.0	1704
4320 min Summer	1.935	0.0	2424
5760 min Summer	1.531	0.0	3120
7200 min Summer	1.276	0.0	3752
8640 min Summer	1.099	0.0	4408

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m <sup>3</sup> )	Status
10080 min Summer	168.844	0.044	1.5	11.5	O K
15 min Winter	168.995	0.195	1.9	53.7	O K
30 min Winter	169.048	0.248	2.0	69.7	O K
60 min Winter	169.098	0.298	2.1	85.1	O K
120 min Winter	169.139	0.339	2.2	98.4	O K
180 min Winter	169.155	0.355	2.2	103.8	O K
240 min Winter	169.162	0.362	2.2	105.9	O K
360 min Winter	169.161	0.361	2.2	105.8	O K
480 min Winter	169.154	0.354	2.2	103.4	O K
600 min Winter	169.146	0.346	2.2	100.8	O K
720 min Winter	169.138	0.338	2.2	98.2	O K
960 min Winter	169.120	0.320	2.1	92.3	O K
1440 min Winter	169.081	0.281	2.1	79.9	O K
2160 min Winter	169.025	0.225	2.0	62.7	O K
2880 min Winter	168.976	0.176	1.9	48.0	O K
4320 min Winter	168.897	0.097	1.8	25.6	O K
5760 min Winter	168.851	0.051	1.7	13.4	O K
7200 min Winter	168.843	0.043	1.5	11.2	O K
8640 min Winter	168.837	0.037	1.3	9.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m <sup>3</sup> )	Time-Peak (mins)
10080 min Summer	0.968	0.0	5144
15 min Winter	132.861	0.0	18
30 min Winter	87.290	0.0	33
60 min Winter	54.663	0.0	62
120 min Winter	33.095	0.0	120
180 min Winter	24.358	0.0	178
240 min Winter	19.485	0.0	234
360 min Winter	14.144	0.0	344
480 min Winter	11.275	0.0	444
600 min Winter	9.449	0.0	476
720 min Winter	8.176	0.0	552
960 min Winter	6.502	0.0	704
1440 min Winter	4.700	0.0	998
2160 min Winter	3.392	0.0	1424
2880 min Winter	2.689	0.0	1816
4320 min Winter	1.935	0.0	2508
5760 min Winter	1.531	0.0	3048
7200 min Winter	1.276	0.0	3744
8640 min Winter	1.099	0.0	4416




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

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Volume (m<sup>3</sup>)</b>	<b>Status</b>
10080 min Winter	168.833	0.033	1.1	8.5	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Flooded Volume (m<sup>3</sup>)</b>	<b>Time-Peak (mins)</b>
10080 min Winter	0.968	0.0	5136

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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)	19.300	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.198

Time (mins)		Area
From:	To:	(ha)
0	4	0.198

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Model Details

Storage is Online Cover Level (m) 171.500

Infiltration Basin Structure

Invert Level (m) 168.800 Safety Factor 2.0  
 Infiltration Coefficient Base (m/hr) 0.04644 Porosity 1.00  
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )
0.000	255.6	1.000	491.0



# Appendix E – Drainage Strategy Plan

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Notes:

1. Site layout provided by BBA Architects.
2. Design levels shown indicatively only and are subject to detailed design modelling.
3. Infiltration testing undertaken to BRE365 standards by others.
4. Private pumping station to be designed by others.
5. Pegasus Group takes no liability for the mis-use of this drawing.

Key:

- Proposed storm water drain
- Proposed foul water drain
- Proposed foul water rising main
- Permeable paving

REV	DATE	DESCRIPTION	REVISED BY	APPROVED BY
P1	09/05/2023	First Issue	MR	LAJ

Drainage Strategy Plan

Land at Sibford Ferris  
Banbury

CLIENT:  
Blue Cedar Homes

DATE: 09/05/2023 SCALE: 1:200@A1 TEAM/DRAWN BY: MR APPROVED BY: LAJ

DRAWING NUMBER:  
P21-0804-PEG-XX-XX-DR-C-0200-P1

PEGASUS REF No: P21-0804 DRAWING STATUS: SO



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