



DRAINAGE STRATEGY

HURST BOWLING CLUB, READING
HURST BOWLING CLUB
JULY 2024
5933-HURS-ICS-XX-RP-C-07.002

DRAINAGE STRATEGY

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REPORT ISSUE

Revision	Date	Notes
P01	03/07/2024	First Issue
P02	29/07/2024	Drainage Updated
P03	20/09/2024	Updated Appendix

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1 DRAINAGE STRATEGY

Item	Details	Reference /comment
Method of Foul Water Discharge	Foul water flows from the clubhouse and is drained into the existing clubhouse manhole in the southwest of the site via gravity. A common landlord indicates this will not have been adopted in 2012, and so a 'build-close to' agreement will not be required.	
Method of Surface Water Discharge	The surface water drainage design proposed for the new club house and hardstanding is to follow the drainage hierarchy to ensure the site reflects the natural flows from the site as closely as possible: 1. Rainwater reuse 2. Infiltration 3. Discharge to Surface Water or a Watercourse 4. Discharge to a Surface Water sewer or a Highway Drain 5. Discharge to a Foul Sewer Roof runoff will be discharged to the new crate soakaway in the carparking area. The hardstanding/perimeter path is to fall at the surface to the bowl's pitch, reflecting the current drainage method, to drain via infiltration. The on-site system will be privately maintained by Hurst Bowling Club or their representatives in line with the guidance to the rear of this document.	
Existing Site Drainage	The existing roof discharges at a surface level, with flows routed towards the bowling green gully.	
Local Ground Conditions	A site investigation has yet to be undertaken for the site. However, boreholes local to the development (BGSID:428010, Ref: SU77SE53) indicate that the site is underlaid by Chalk at a depth of 110ft. Excavations for soakage tests indicate sand and topsoil above this.	
Infiltration Rate	A BRE365 test has been undertaken on site by the client and found the site-specific infiltration rate to be $4.1 \times 10^{-5} \text{m/s}$. Soakage rate based on the worst result encountered from three tests to BRE365.	The Infiltration Rate used for the design is $4.1 \times 10^{-5} \text{m/s}$
Surface Water Calculations	The surface water drainage system has been designed for a 1 in 100-year event, plus an allowance of 40% for climate change. 10% added to the impermeable areas to allow for urban creep. Roof Areas = 65m^2	The total impermeable area for the site is 65m^2

Item	Details	Reference /comment
Ground Water	A site investigation has yet to be undertaken for the site. However, boreholes carried out in the vicinity of the site found no groundwater to a depth of 110ft (BGSID:428010, Ref: SU77SE53). A review of the maps within the local SFRA indicates that the site is at low risk of flooding.	Groundwater monitoring is not expected to find groundwater within 5m of the surface.
Water Quality	Flows from private roofs are not anticipated to produce contaminated flows	
Exceedance Flows	It is proposed that finished floor levels is be raised to ensure the surrounding hardstanding falls away from the threshold, towards the gully to mitigate against the risk of any surface water flooding. The proposed surface water drainage measures will be designed to contain the peak storm event that can be expected for a 1 in 100-year situation. A 40% allowance has already been applied to the site to account for future climate change and a further 10% added to the impermeable areas to allow for urban creep.	
Fluvial Flood Risk/ Environment Agency Flood Mapping	The Environment Agency flood map for the development site suggests that the site wholly falls within Flood zone 1, which is defined as land assessed as having a less than 1 in 1000 annual probability of river flooding in any one year.	
SuDS Maintenance	During construction, the SuDS systems will be maintained by the contractor. Upon completion, the SuDS drainage system inclusive of soakaway, filter drain, permeable paving and silt traps are to be maintained by Hurst Bowling Club or their appointed representative(s).	Refer to Appendix A for the suggested SuDS Maintenance Schedule

Table 1 Drainage Strategy

Appendix A - Maintenance Schedule

Item	Required Maintenance	Frequency
Pipe and chambers	CCTV camera survey, flush, descale, repair as necessary	5 Years or upon poor performance
Geocellular/ modular systems (Crates)	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly
	Debris removal from catchment surface (where may cause risks to performance)	Monthly
	Where rainfall infiltrates into blocks from above, check surface of filter for blockage by silt, algae or other matter. Remove and replace surface infiltration medium as necessary.	Monthly (and after large storms)
	Remove sediment from pre-treatment structures	Annually, or as required
	Repair/rehabilitation of inlets, outlet, overflows and vents	As required
	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually and after large storms
Silt traps and catchpits	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly
	Debris removal from catchment surface (where may cause risks to performance)	Monthly
	Inspection of silt traps and catch pits to assess silt accumulation	Monthly (and after large storms)
	Removal of accumulated silt from silt trap and catch pit sumps	Annually, or as required
	Repair/rehabilitation of inlets, outlet, overflows and vents	As required
	Inspect/check all inlets, outlets, and overflows to ensure that they are in good condition and operating as designed	Annually and after large storms

Table 2 SuDS Maintenance

Appendix B - Infiltration Testing

Hurst Bowling Club – Site Report for Ground Permeability Test

Introduction

This report provides observations and details of the ground permeability tests conducted at Hurst Bowling Club, RG10 0SH on the 18th and 19th June 2024. The tests are associated with provision of the appropriate sustainable drainage solution for the design of a New Clubhouse Facility for the bowling club. A planning application (number 240976) was submitted to Wokingham District Council on 9th April 2024. The test followed the guidance given by the drainage consultant contracted to provide the detailed design Richard White from Infrastruct CS Ltd.

This report contains a written description of events and observations, photographic evidence, and spreadsheet data on the rate of drainage. It will be passed to the drainage consultant, no later than 24th June 2024, for input into their final designs and reports.

Conditions

The weather was dry and sunny with no rain observed on either day.

Trial Pit Details

The trial pit location was in the same vicinity as the proposed soakaway, inside the property boundary of the bowling club, but outside of any tree root systems and away from any building foundations. It should be noted that no tree roots, services, or other obstructions, were encountered in the trial pit.



A soakaway is proposed to collect rainwater from the new clubhouse roof, and from a land drain in the nearby pub garden, that runs along the rear of the new clubhouse.

A trial pit nominally 1m long 1m deep and 300mm wide (300 litres) was dug using a mechanical excavator with a 12" (300mm) bucket, on 18th June. The soil type removed was regular top soil plus small stones for the first 300mm followed by a more sandy soil with some stones for the bottom 700mm. No clay was encountered. The walls of the trial pit were stable.

A measuring cane was inserted into the trial pit marked at 100mm intervals.

See picture left for details.



Test 1 Details – 18th June

Water fill from the bowling club pumped sprinkler system was used via a 25mm internal diameter hose. The 1.5 Kw pump is fed from a water storage tank, with a 1.5m static head. The trial pit was 15m from the pump discharge. It was found that after approximately 20 minutes, with the trial pit 700mm full, the water level was not increasing, and water was draining from the pit as fast as the fill rate. At this time approximately 180 gallons (imperial assumed) of water was used, giving an input flow rate of approximately 9 galleons/40 litres per minute (recorded from volume drop in storage tank). Water input was then stopped, and the rate of drainage from this point was recorded. The pit walls remained intact. The results of this test have been recorded and are presented in the attached spreadsheet.

A picture of this test is shown left.

After consultation with the drainage consultant an alternative method of fill was recommended for further tests.



Test 2 morning of 19th June, Test 3 afternoon of 19th June

To overcome the fill difficulties of test 1, 180 litre waste bins were used for tests 2 and 3. Three bins were filled with water, from the hose, to just less than capacity (a total of about 450 litres of water). This took 15 minutes, so a flow rate of 30 litres per minute. The water from the bins was then tipped into the trial pit. The trial pit completely filled with water. The bins were emptied in 30 seconds (10 secs each) giving an input flow rate of approximately 900 litres per minute. The rate of drainage was record. The pit walls remained intact. The results of these tests have been recorded and are presented in the attached spreadsheet.

A picture of this test a few seconds after the bins were discharged is shown left.

Summary

It is understood that the details and data provided by Hurst Bowling Club are now sufficient to enable the drainage consultant to complete the detailed design, to ensure compliance with the required standards, and to meet the requirements of the planning application. The principal designer Hives Architects must thereafter incorporate into the overall design.

Soakaway Design Calculations to BRE365 (DG 365 Revised 2016)

Test Reference:	TP1
Site:	Hurst Bowling
Client:	Hurst Bowling
Test Date:	19/06/2024
Results logged by:	MW Drilling

Calculations By:	RJW
Calculation Date:	24/06/2024
Length (m) =	1.00
Width (m) =	0.30
Depth (m) =	1.00



File ref:	5933-HUSR-13-001-BRE365.xlsx
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First Fill	
Time [Mins]	Test 1 Depth [m]
0.00	0.30
1.00	0.40
2.00	0.50
4.00	0.60
13.00	0.70
28.00	0.80
63.00	0.90
68.00	1.00

Second Fill	
Time [Mins]	Test 2 Depth [m]
0.00	0.00
0.50	0.10
1.00	0.20
1.00	0.30
2.00	0.40
4.00	0.50
8.00	0.60
20.00	0.70
39.00	0.80
68.00	0.90
72.00	1.00

Third Fill	
Time [Mins]	Test 3 Depth [m]
0.00	0.00
0.50	0.10
1.15	0.20
1.50	0.30
1.50	0.40
4.00	0.50
7.30	0.60
19.00	0.70
38.00	0.80
68.00	0.90
72.00	1.00

RESULTS

Volume Vp75 - 25 [m³]	0.10500
Area A _{p50} [m²]=	1.2100
Time t _{p75-25} [s] =	2100
Surface Water Soil infiltration rate [m/s]	4.132E-05
Treated Effluent Soil infiltration rate (V _p) [s/mm]	6.00
Surface Water Soil infiltration rate [m/hr]	0.149

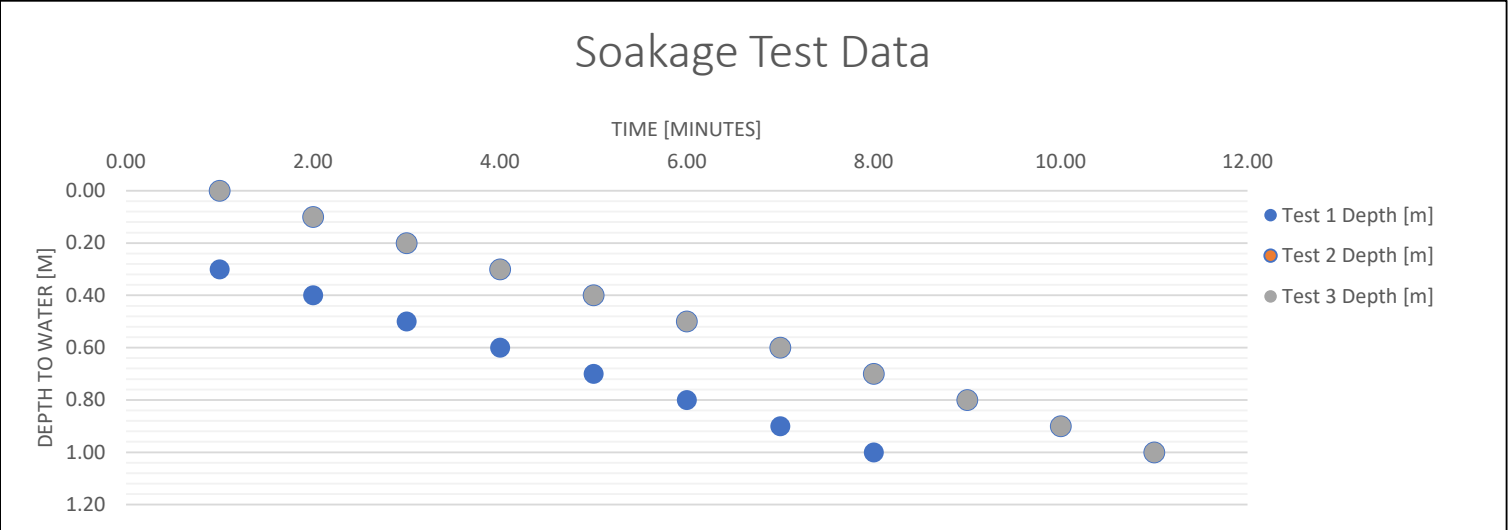
RESULTS

Volume Vp75 - 25 [m³]	0.15000
Area A _{p50} [m²]=	1.6000
Time t _{p75-25} [s] =	1710
Surface Water Soil infiltration rate [m/s]	5.482E-05
Treated Effluent Soil infiltration rate (V _p) [s/mm]	3.42
Surface Water Soil infiltration rate [m/hr]	0.197

RESULTS

Volume Vp75 - 25 [m³]	0.15000
Area A _{p50} [m²]=	1.6000
Time t _{p75-25} [s] =	1631
Surface Water Soil infiltration rate [m/s]	5.750E-05
Treated Effluent Soil infiltration rate (V _p) [s/mm]	3.26
Surface Water Soil infiltration rate [m/hr]	0.207

Slowest Soil Infiltration Rate [m/s] = 4.132E-05



Appendix C - Local Borehole



SU 77 SE 153
7956 7296

268
109

HURST

2. CASTLE INN. Messrs. H. & G. SIMMONDS. 1894.
Bored and communicated by Mr. ALFRED CALLAS
Water rose to within 32 feet of the surface.

		Thickness.	Depth.
		Feet.	Feet.
DRAFT	Soil	2	2
	Shingly gravel	3	5
LONDON CLAY	18 feet. 1	15	20
	18 feet. 2	3	23
READING BEDS	68 feet. 1	28	51
	68 feet. 2	22	73
UPPER CHALK	Chalk	13	86
	Chalk	6	92
		19	110

Berks 6" sheet
38NW/E

152' 0"

Disused but well & pump standing
Hand pump 18th c.

Published in
'The Water Supply
of Berkshire',
P. 51



268

SU77/108

109

HURST

2. CASTLE INN. Messrs. H. & G. SIMMONDS. 1894.
Bored and communicated by Mr. ALFRED CALLAS
Water rose to within 32 feet of the surface.

	Thickness.	Depth.
	<i>Feet.</i>	<i>Feet.</i>
Soil - - - - -	2	2
Drift, Shingly gravel - - -	3	5
[London Clay] Loam and sand - - -	15	20
18 feet.] Green sand and shells - - -	3	23
Mottled clay - - - - -	28	51
[Reading Beds] Mottled sand and loam - - -	22	73
68 feet.] Mottled sand - - - - -	13	86
Blue loam - - - - -	5	91
Upper Chalk - - - - -	19	110

Beds 6" sheet

38 NW/E

SU 7956 7297

Upper

152" O.D.

Disused but well & pumps standing

Hand pumps 4th & 5th

BY

11/75



Castle Inn, Hurst. The pump is still standing
at the edge of the ~~bowling~~ bowling rink at the rear
of the public house. There is no means of identifying
the actual well.

T.W.S. record no 22/108

June. 11/12/78

268
109

Published in
'The Water Supply
of Berkshire',
P. 51

Appendix D - Drainage Layout

BURIED UTILITIES RISK NOTE

- Buried utilities are present on and in the vicinity of the site.
- The Contractor must satisfy themselves that they have seen utility returns for the area and that appropriate Risk Assessment Method Statement (RAMS) are in place and implemented to ensure that buried and/or overhead services are located prior to any works taking place.
- Any RAMS shall address safe procedures for protection and working in the proximity of services.

Construction Note

It is essential that new drainage associated with the development is laid from the outfall(s) into the site. This is essential to avoid unforeseen obstructions where encountered (such as services). If the drainage is laid from the site out to the outfall it can result in significant abortive works to relay and overcome such obstructions.

Location of Public Sewers have been taken from record drawings which should be fully substantiated by the contractor prior to commencing works on site

All manholes covers located within carriageways shall have no slip covers to prevent motorcycles/cycles losing control

Manhole schedules - Invert level shown related to the deepest pipe within the chamber

All adaptable drainage works to follow the requirements of Water UK - Design and Construction Guide (DCG).

DESIGNERS CDM NOTE - RESIDUAL RISKS IDENTIFIED

The design Engineer(s) have analysed this design as the scheme has been developed, in order to identify if there are any significant residual risk hazards (i.e. unusual, unexpected, abnormal or difficult).

Residual risks **HAVE** been identified and are therefore shown on this drawing. These risks have not been possible to remove by design.

This statement assumes that a competent Contractor with the appropriate qualified staff will be employed for the works, and that they will be familiar with site wide construction risks and hazards that they can reasonably be expected to encounter as part of their work.

Drainage Strategy

Foul Drainage

Gravity system discharging into existing private foul drain in pub grounds. A common landlord indicates this will not have been adopted in 2012, and so a build close to agreement will not be required.

Surface Water Drainage

Roof runoff to discharge to new crate soakaway in carparking area. Hardstanding/perimeter path to fall at surface to bowls pitch, as existing, to drain via infiltration.

System to have fail safe exceedance overflow into bowling green gully.

DESIGN RISK ITEM

Surface Water system designed for a 1 in 100 year event plus an allowance of 40% for climate change.

Impermeable areas have had an additional 10% added for urban creep.

A site specific soakage rate of 4.1 x 10-5/ m/s has been utilised for the soakaways.

Soakage rate based on the worst result encountered from 3 tests to BRE365.

- CDM RESIDUAL RISK ITEM**
- Overhead cables within site area.
- CDM RESIDUAL RISK ITEM**
- Works within public Highway.
- Danger to site personnel and general public
- CDM RESIDUAL RISK ITEM**
- Existing services likely within working area.
- Danger to site personnel and general public
- CDM RESIDUAL RISK ITEM**
- Drainage pipes, manhole rings covers and fittings.
- Risk of Manual handling injury.
- CDM RESIDUAL RISK ITEM**
- Contact with waste water when making drainage connections.
- Risk of infection from Wells disease etc.
- CDM RESIDUAL RISK ITEM**
- Above Ground activities.
- Possibility of objects falling from operations at high level onto persons working or passing below.
- CDM RESIDUAL RISK ITEM**
- Works within confined spaces.

Surface Water Network						
Manhole Reference	Invert Level (m)	Cover Level (m)	Depth (m)	Chamber Details	Cover Loading	
S0	9.300	10.00	0.70	Crates	-	
S1	9.360	10.00	0.64	PPIC S/T Ø450	B125	
S2	9.552	10.10	0.55	PPIC Ø450	B125	
S3	9.656	10.10	0.44	Rod. Eye	B125	
J1	9.488	-	-	Junction	-	
S4	9.588	10.10	0.51	Rod. Eye	B125	
						Grade 1 in
						Pipe DIA (mm)
						Length (m)

- NOTES**
- All dimensions and levels are in metres unless otherwise noted
 - This drawing is to be read in conjunction with the relevant Architect's/Engineer's drawings, specifications and CDM documentation
 - This drawing has been produced electronically and may have been photo reduced or enlarged when copied. Work to figured dimensions only (DO NOT SCALE - EXCEPT FOR PLANNING PURPOSES). All dimensions to be checked on site. Any errors or omissions to be reported to the engineer immediately.
 - This drawing contains coloured lines / information that may not be clear if reproduced in black and white.
 - Digital copies of this plan can only be considered accurate if supplied directly by Infrastruct CS Ltd.

Drainage Key	
Sewers	
	Foul water drain (private/non adaptable)
	Surface water drain (private/non adaptable)
	Perforated Pipe
	Existing foul water drain (private/non adopted)
Chamber Key	
FW/SW	
	Mini access chamber (mac) - 300mmØ
	PPIC - 475mmØ*
	P.C.C. units/brick*
	Adaptable demarcation manhole within 1m of boundary
	Manhole Depth: 1.25m to 1.5m* Depth: 1.55m to 3.0m*
* General note (Refer to standard details & longitudinal sections for chamber sizes. Size may need to increase dependant on number of incoming pipes/site of incoming pipes)	
RE	Surface water rodding eye
	Rain water down pipe (roddable access)
	Soil vent pipe/soil stack
	Silt Trap (ST) with removable silt bucket
S1/F1	Manhole reference number
	Cellular soakaway (refer to drawing for sizes)
FFL XX.XX	Finished Floor Level (FFL)
	500mm French Drain
	Black paving - standard (permeable)

P05	NJ	RJW	Linear drainage added to access points, FFL updated as per architectural design information	10/09/24
P04	RSI	RJW	Soakage note removed	02/07/24
P03	FM	RJW	Soakaway resized and relocation to minimise impact on club during construction	26/06/24
P02	FM	RJW	Soakage rate updated	24/06/24
P01	RSI	RJW	Initial issue	20/06/24
REV	DRAWN	CHECK	REVISION COMMENTS	ISSUE DATE
DRAWING TITLE				SHEET NO.
Drainage Design				1/1
PROJECT				
Hurst Bowling Club Reading RG10 0SJ				
CLIENT		 Infrastruct CS Ltd		
SCALE @ A1 1:100				
				
PROJECT NUMBER		STATUS		ENGINEER
5933		S2		RJW
		INFORMATION		DRAFT
				NJ
				APPROVED
				MBD
PROJECT	ORIGIN	PHASE	LEVEL	TYPE
HURS	ICS	01	XX	DR
ROLE	NO.			REVISION
C	0200			P05

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

Half Drain Time : 140 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	9.293	0.293	0.3	2.8	O K
30 min Summer	9.370	0.370	0.3	3.5	O K
60 min Summer	9.690	0.690	0.3	4.1	O K
120 min Summer	9.920	0.920	0.3	4.3	Flood Risk
180 min Summer	9.879	0.879	0.3	4.3	Flood Risk
240 min Summer	9.770	0.770	0.3	4.2	Flood Risk
360 min Summer	9.482	0.482	0.3	3.9	O K
480 min Summer	9.380	0.380	0.3	3.6	O K
600 min Summer	9.353	0.353	0.3	3.4	O K
720 min Summer	9.328	0.328	0.3	3.1	O K
960 min Summer	9.281	0.281	0.3	2.7	O K
1440 min Summer	9.205	0.205	0.3	1.9	O K
2160 min Summer	9.124	0.124	0.2	1.2	O K
2880 min Summer	9.074	0.074	0.2	0.7	O K
4320 min Summer	9.044	0.044	0.2	0.4	O K
5760 min Summer	9.035	0.035	0.2	0.3	O K
7200 min Summer	9.029	0.029	0.1	0.3	O K
8640 min Summer	9.025	0.025	0.1	0.2	O K
10080 min Summer	9.022	0.022	0.1	0.2	O K
15 min Winter	9.293	0.293	0.3	2.8	O K
30 min Winter	9.371	0.371	0.3	3.5	O K
60 min Winter	9.712	0.712	0.3	4.1	Flood Risk
120 min Winter	9.959	0.959	0.3	4.4	Flood Risk
180 min Winter	9.875	0.875	0.3	4.3	Flood Risk
240 min Winter	9.729	0.729	0.3	4.1	Flood Risk
360 min Winter	9.393	0.393	0.3	3.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	126.078	0.0	18
30 min Summer	82.894	0.0	32
60 min Summer	52.002	0.0	62
120 min Summer	31.583	0.0	110
180 min Summer	23.307	0.0	140
240 min Summer	18.689	0.0	172
360 min Summer	13.582	0.0	240
480 min Summer	10.822	0.0	308
600 min Summer	9.073	0.0	376
720 min Summer	7.853	0.0	442
960 min Summer	6.247	0.0	576
1440 min Summer	4.519	0.0	824
2160 min Summer	3.264	0.0	1172
2880 min Summer	2.588	0.0	1504
4320 min Summer	1.864	0.0	2204
5760 min Summer	1.476	0.0	2936
7200 min Summer	1.230	0.0	3672
8640 min Summer	1.060	0.0	4392
10080 min Summer	0.934	0.0	5104
15 min Winter	126.078	0.0	18
30 min Winter	82.894	0.0	32
60 min Winter	52.002	0.0	60
120 min Winter	31.583	0.0	114
180 min Winter	23.307	0.0	144
240 min Winter	18.689	0.0	182
360 min Winter	13.582	0.0	258

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
480 min Winter	9.353	0.353	0.3	3.4	O K
600 min Winter	9.315	0.315	0.3	3.0	O K
720 min Winter	9.280	0.280	0.3	2.7	O K
960 min Winter	9.217	0.217	0.3	2.1	O K
1440 min Winter	9.122	0.122	0.2	1.2	O K
2160 min Winter	9.049	0.049	0.2	0.5	O K
2880 min Winter	9.039	0.039	0.2	0.4	O K
4320 min Winter	9.029	0.029	0.1	0.3	O K
5760 min Winter	9.023	0.023	0.1	0.2	O K
7200 min Winter	9.019	0.019	0.1	0.2	O K
8640 min Winter	9.016	0.016	0.1	0.2	O K
10080 min Winter	9.014	0.014	0.1	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
480 min Winter	10.822	0.0	330
600 min Winter	9.073	0.0	402
720 min Winter	7.853	0.0	470
960 min Winter	6.247	0.0	600
1440 min Winter	4.519	0.0	840
2160 min Winter	3.264	0.0	1120
2880 min Winter	2.588	0.0	1472
4320 min Winter	1.864	0.0	2204
5760 min Winter	1.476	0.0	2896
7200 min Winter	1.230	0.0	3672
8640 min Winter	1.060	0.0	4320
10080 min Winter	0.934	0.0	5144

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	18.400	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.010

Time (mins)		Area
From:	To:	(ha)
0	4	0.010

Model Details

Storage is Online Cover Level (m) 10.000

Cellular Storage Structure

Invert Level (m) 9.000 Safety Factor 2.0

Infiltration Coefficient Base (m/hr) 0.14760 Porosity 0.95

Infiltration Coefficient Side (m/hr) 0.14760

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	10.0	10.0	0.400	10.0	15.1	0.401	0.0	15.1