Highway, Transportation and Infrastructure Consultants

Meadow Cottage
The Street
Preston
Kent

FLOOD RISK ASSESSMENT

On behalf of
David Hanson

MT/6051/FRA.1

Experience and expertise working together

Document Control Sheet

Client: David Hanson
Meadow Cottage
The Street
Preston
CT3 1EB

Report Issue No.	Date	Author	Authorised
MT/6051/FRA.1	28th March 2024	MT	MT

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APPENDICES

1 INTRODUCTION

1.1 Bellamy Roberts has been instructed by Clague on behalf of David Hanson to prepare a Flood Risk Assessment (FRA) to support a planning application for 16 residential units on land at Meadow Cottage, Preston.

1.2 The existing site comprises of a cottage to the south and stables in the centre of the site. Access is currently achieved from Meadow Cottage which connects to the western side of The Street.

1.3 An earlier scheme for 5 units and an access was previously approved by Dover District Council (LPA ref. 20/00544).

1.4 It is recognised that developments that are designed without regard to flood risk may endanger lives, damage property, cause disruption to the wider community, damage the environment, be difficult to insure and require additional expense on remedial works. Current guidance on development and flood risk identifies several key aims for a development to ensure that it is sustainable in flood risk terms. These aims are as follows:

- the development should not be exposed to flood risk such that the health, safety, and welfare of the users of the development, or the population elsewhere, are threatened;
- the development should not be at a significant risk of flooding and should not be susceptible to damage due to flooding;
- safe access to and from the development should be possible during flood events;
- the development should not increase flood risk elsewhere;
- the development should not prevent safe maintenance of watercourses or maintenance and operation of flood defences;
- the development should not be associated with an onerous or difficult operation and maintenance regime to manage flood risk. The responsibility for any operation and maintenance required should be clearly defined;
- future users of the development should be made aware of any flood risk issues relating to the development;

- the development design should be such that future users will not have difficulty obtaining insurance or mortgage finance, or in selling all or part of the development, because of flood risk issues;
- the development should not lead to degradation of the environment, and
- the development should meet all the above criteria for its entire lifetime, including consideration of the potential effects of climate change.

1.5 This assessment has been prepared with due consideration of these sustainability aims.

1.6 In accordance with paragraph 173 of the NPPF (December 2023), it will be ensured that:

- the most vulnerable development is located in areas of lowest flood risk.
- the development is appropriately flood resistant and resilient.
- it incorporates sustainable drainage systems.
- safe access and escape routes are included.

Site Location

1.7 Meadow Cottage is a residential dwelling located west of The Street and is located in the centre of the village Preston. Preston is located approximately 10km east of Canterbury. The site area is approximately 1.8ha. For clarity, an extract of the site location plan is provided at Figure 1 and the full plan is available at **Appendix 1**.

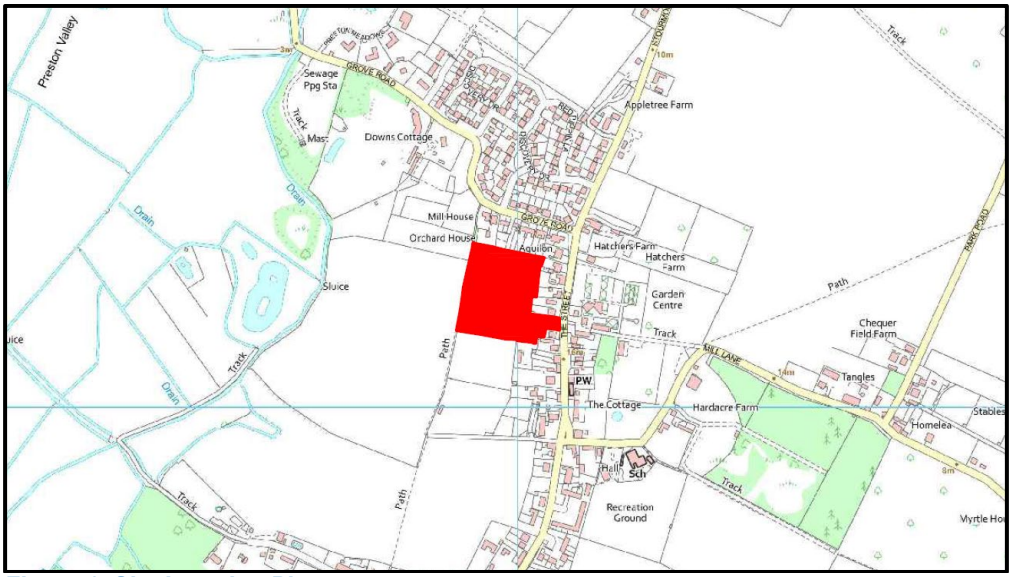

Figure 1: Site Location Plan

Existing Watercourse

1.8 There are no watercourses within the boundary of the site.

Historic Flooding

1.9 There have been no recorded instances of historic flooding at the site.

Existing Surface & Foul Water Sewers

1.10 Mapping obtained from Southern Water and presented at **Appendix 2**, shows a foul sewer within The Street. A highway surface water drain is also present within The Street.

Ground Conditions

1.11 British Geological Survey (BGS) mapping reveals the underlying geology at the site comprises the London Clay Formation. This is confirmed by a nearby borehole log (BGS ref. TR26SE16), drilled to a depth of approximately 6m.

1.12 The borehole log shows 'stiff brown silty sandy clay' at a depth of 5.6m below ground level. Above this, the geology comprises brown fine sand, sandy clayey silt and brown clayey sand and gravel. No groundwater strike was recorded. The borehole log is presented at **Appendix 3**.

1.13 Given the expected geology on site, traditional soakaways (2-3m deep) may be viable given the presence of clay at this depth. Shallower infiltration features, such as permeable paving may also feasible but both would be dependent on further site specific testing. Such testing will be undertaken should planning consent be granted.

Greenfield Run-off Rates

1.14 The greenfield run-off rates for site are provided in Table 1. The figures have been obtained from HR Wallingford and the full results are at **Appendix 4**.

Table 1: Greenfield Runoff Rates

Rainfall Event	Greenfield Runoff Rate
Qbar	4.42 l/s
1 in 1 year	3.76 l/s
1 in 30 years	10.16 l/s
1 in 100 years	16.53 l/s

2 SOURCES OF FLOODING

River/Sea Flooding

2.1 Environment Agency mapping reveals that the site is located wholly within flood zone 1. The Environment Agency's flood map for planning is presented at **Appendix 5** and an extract of this is provided at Figure 2 for reference.

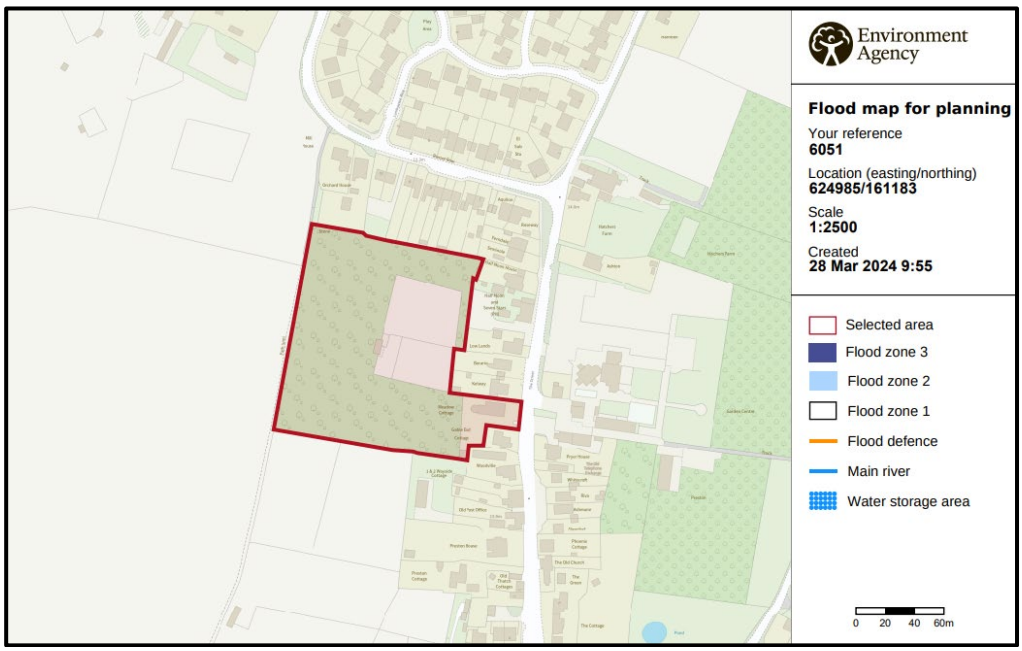

Figure 2: Flood Zone Map (Source: EA)

Surface Water Flooding

2.2 In addition to fluvial flooding, surface water flooding must also be considered. This often occurs when intense, often short duration rainfall is unable to soak into the ground or enter the local drainage system. It is made worse when soils are saturated so that they cannot accept any more water. This type of flooding is usually short lived, localised and associated with heavy downpours of rain, and often has very little warning before it occurs. The amount of runoff is also a function of geology, slope, climate, rainfall, saturation, soil type, urbanisation and vegetation.

2.3 Environment Agency Mapping reveals the application site has a very low risk of surface water flooding. An extract from the gov.uk surface water flood risk map is provided at Figure 3.

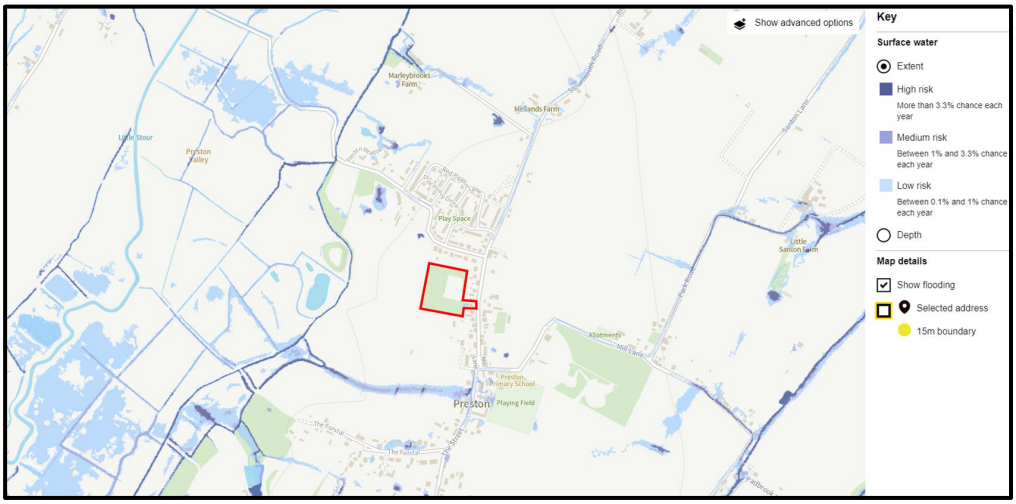

Figure 3: Surface Water Flood Risk Map (Source: EA)

Reservoir Flooding

2.4 Information from the gov.uk website advises that flooding from reservoirs is unlikely in this area.

Groundwater Flooding

2.5 Information from the gov.uk website advises that flooding is possible when groundwater levels are high. To mitigate against any potential risk, no accommodation will be provided at basement level.

2.6 The nearby borehole log referenced earlier in this report, was undertaken in September to a depth of approximately 6m below ground level. No groundwater was recorded and it is therefore considered that the risk of groundwater flooding is very low.

2.7 Nevertheless, winter groundwater monitoring will be undertaken to determine the peak groundwater levels. This can be secured via a suitably worded planning condition.

Summary of Flood Risk

2.8 A summary of the site's flood risk is provided in Table 2.

Table 2: Summary of Flood Risk

Source of Flooding	Risk
Rivers & The Sea (Present Day)	Flood zone 1
Surface Water	Very low
Reservoirs	Unlikely
Groundwater	Very low

2.9 With reference to Tables 2 and 3 of the NPPF Technical Guidance the proposal is classified as 'more vulnerable' and such a use is appropriate in flood zone 1.

2.10 The proposal should therefore be considered acceptable in flood risk terms for residential development and the application of the sequential test is not required in this instance.

3 SURFACE AND FOUL WATER DRAINAGE STRATEGY

Surface Water

3.1 In order to properly mitigate flood risk post-development, it is important that adequate measures are considered to ensure surface water run-off is dealt with, ensuring flood risk is not increased either on or off-site.

3.2 Surface water drainage at the site will be based on SuDS principles and in accordance with the Government's Planning Practice Guidance, the aim will be to discharge the surface water run-off as high up the following hierarchy of drainage options as possible:

- Infiltration into the ground.
- To a surface water body, such as a river, ditch, pond or stream.
- To a surface water sewer or highway drain.
- To a combined sewer.

3.3 In order to properly mitigate flood risk post-development, it is important that adequate measures are considered to ensure surface water run-off is dealt with, ensuring flood risk is not increased either on or off-site.

3.4 The underlying geology does not immediately preclude the use of infiltration features to dispose of surface water. Discussions have been held with the Sustainable Drainage Team at Kent County Council who confirmed that assumed infiltration rates would be accepted, provided an alternative strategy is also submitted.

3.5 In this regard, two options for the disposal of surface water have been suggested. Option A assumes infiltration is viable and Option B assumes no infiltration, and proposes that surface water be attenuated with a restricted discharge to the highway drain, as per the PPG. Both options are considered in further detail in the following paragraphs.

Option A - Infiltration

3.6 The KCC Sustainable Drainage team advised that assumed infiltration rates should be based on the guidance contained in Table 25.1 of the CIRIA SuDS Manual.

3.7 This strategy incorporates shallow infiltration (permeable paving/asphalt) and traditional soakaways in the rear gardens of the proposed units.

3.8 The base of the permeable paving/asphalt will be in the region of 500-600mm below ground level. At this depth, the underlying geology comprises clayey sand and gravel. There is no directly comparable soil type within Table 25.1, therefore an indicative infiltration rate of 1 x 10^{-6} m/s has been assumed.

3.9 The traditional soakaways are proposed at a depth of 3m and at this depth, the underlying geology comprises sand and an indicative infiltration rate of 1 x 10^{-5} m/s has been assumed, which accords with Table 25.1 of the CIRIA SuDS Manual.

3.10 The proposed surface water drainage strategy, assuming infiltration is viable, is presented at **Appendix 6**.

3.11 All carriageway and parking areas will be permeable surfaces and surface water will therefore drain to the subbase. All roof water runoff will to traditional soakaways. The proposed soakaways have been sized using the Microdrainage software for the following storm events:

- 1 in 1-year.
- 1 in 30-year + 35% climate change.
- 1 in 100-year + 45% climate change.

3.12 The Microdrainage analysis reveals no risk of flooding during the 1 in 1-year and 1 in 30-year plus 35% rainfall events and no flooding during the 1 in 100-year + 45% rainfall events. The half-drain times are well below the required 24 hour time period. The Microdrainage analysis is presented at **Appendix 7**.

Option B - Attenuation

3.13 If the results of site-specific testing demonstrates infiltration to not be viable, all surface water runoff will be attenuated within the subbase of the carriageway, and discharged at a restricted rate of 2l/s into the existing highway drain in The Street. The proposed surface water drainage strategy, assuming infiltration is not viable, is presented at **Appendix 8**.

3.14 The Sustainable Drainage Team at KCC has advised that in order to connect to the highway drain, the internal drainage network should be adopted by a water and sewerage company. This could be a New Appointments and Variations (NAVs) company who may be more receptive to the adoption of the SuDS network. Discussions in this regard are ongoing.

3.15 The Sustainable Drainage Team at KCC has also stated that the developer must demonstrate that the highway drainage system discharges via a positive outfall (i.e., into a watercourse or public sewer) and that the proposed flows do not result in an increased flood risk to the public highway or elsewhere.

3.16 Investigations regarding the outfall of the highway drainage system are ongoing.

3.17 The proposed discharge rate will be restricted to 2.0l/s during all storm events, which is significantly below the greenfield runoff rates. The proposed flows will therefore not result in an increased flood risk to the public highway or elsewhere.

3.18 The accompanying Microdrainage analysis is presented at **Appendix 9**.

Maintenance and Management

3.19 Maintenance of the proposed drainage system will be undertaken in accordance with the guidance set out in Tables 17.1 (soakaways) and Table 21.3 (attenuation storage tanks) which have been provided at Figures 4 and 5 respectively.

TABLE 13.1 Operation and maintenance requirements for soakaways		
Maintenance schedule	**Required action**	**Typical frequency**
Regular maintenance	Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	Annually
	Cleaning of gutters and any filters on downpipes	Annually (or as required based on inspections)
	Trimming any roots that may be causing blockages	Annually (or as required)
Occasional maintenance	Remove sediment and debris from pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	As required, based on inspections
Remedial actions	Reconstruct soakaway and/or replace or clean void fill, if performance deteriorates or failure occurs	As required
	Replacement of clogged geotextile (will require reconstruction of soakaway)	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year and then annually
	Check soakaway to ensure emptying is occurring	Annually

Figure 4: Soakaway Maintenance Regime (Source: Table 13.1 CIRIA SuDS Manual)

TABLE 21.3 Operation and maintenance requirements for attenuation storage tanks		
Maintenance schedule	**Required action**	**Typical frequency**
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

Figure 5: Attenuation Tank Maintenance Regime (Source: Table 21.3 CIRIA SuDS Manual)

Water Quality Measures

3.20 Water quality management of surface water should be carried out in accordance with the CIRIA SuDS Manual specifically Part E of Chapter 26. Table 26.2 of the SuDS Manual provides the pollution hazard indices for different land use classifications.

3.21 Based on the guidance in Table 26.2, the land use classification for the surface water drainage for the scheme will be *residential roofs* and *low traffic roads*. The pollution hazard indices for these land uses are as summarised in Table 3.

Table 3: Pollution Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids	Metals	Hydrocarbons
Residential Roofs	Very Low	0.2	0.2	0.05
Low Traffic Roads	Low	0.5	0.4	0.4

3.22 The scheme will incorporate filter strips to convey roof water runoff to either the proposed soakaways or permeable paving which will provide sufficient treatment for the roof water runoff. Runoff from the proposed carriageway and parking areas will filter through the permeable paving which will provide sufficient treatment.

Foul Water

3.23 Foul water from the proposed development will discharge to the existing foul water sewer located in The Street.

4 SUMMARY AND CONCLUSIONS

Summary

4.1 Bellamy Roberts has been instructed by Clague on behalf of David Hanson to prepare a Flood Risk Assessment (FRA) to support a planning application for 16 residential units on land at Meadow Cottage, Preston.

4.2 A comprehensive assessment of the application site's risk of flooding has been undertaken which reveals that the site is in flood zone 1 and not at risk from any other source of flooding.

4.3 Two suggested alternative surface water drainage strategies have been proposed, which are dependent on whether adequate infiltration can be achieved at the site. In the event that infiltration is not viable, surface water will be attenuated on-site and discharged at a restricted rate into an existing highway drain, in accordance with the PPG.

Conclusions

4.4 The proposed development accords with the guidance set out at paragraph 167 of the NPPF, in that:

- the most vulnerable development is located in areas of lowest flood risk;
- the development is appropriately flood resistant and resilient;
- it incorporates sustainable drainage systems; and
- safe access and escape routes are included.

4.5 The proposed development accords with the guidance set out at paragraph 169 of the NPPF, in that the scheme incorporates sustainable drainage systems, has maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development and the scheme provides multifunctional benefits.

4.6 The scheme therefore accords with all relevant policies within the NPPF and is acceptable in flooding and drainage terms.

APPENDICES

APPENDIX 1

Site Location Plan

Notes

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Western Lane
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Tel: 01256 703355
Email: info@bellamyroberts.co.uk

CLIENT
David Hanson

PROJECT
Meadow Cottage, The Street, Preston, Kent

TITLE
Site Location Plan

DRAWN BY	DESIGN BY	CHK BY
MB	-	IR

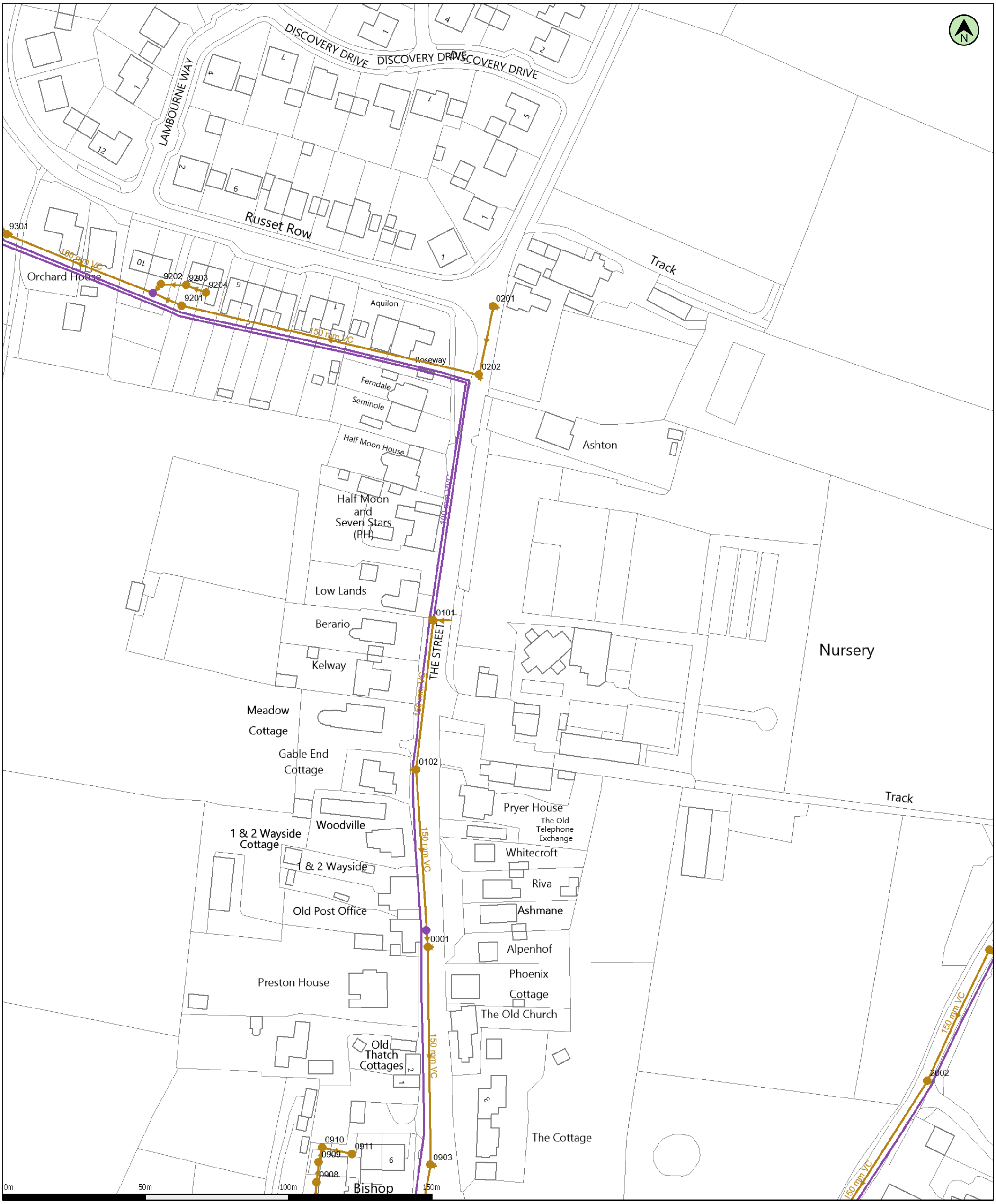
DATE	DRAWING No.	REV No.
01/02/24	6051 / 301	

SCALE
NTS @ A3

Bellamy Roberts Partners Limited (trading as Bellamy Roberts) is a limited company registered in England, Reg.No.14021497, Quality Assured Firm ISO9001 Certificate Number 14135544, Ordnance Survey Licence Number AC000815970

APPENDIX 2

Southern Water Asset Plan



(c) Crown copyright and database rights 2024 Ordnance Survey 100031673

Scale: 1:1250 | Date: 31/01/24 | Wastewater Plan A3

Data updated: 21/11/23 | Map Centre: 625099,161179 | Our Ref: 1382622 - 1 | Powered by digdat

Foul Gravity Sewer
Combined Gravity Sewer
Culverted Water Course or Treated Effluent
Surface Water Gravity Sewer
Rising Main, Vacuum or Syphon
Combined Outfall
Surface Water Outfall
Foul Outfall
Surface Water Inlet
Combined Pumping Station
Surface Water Pumping Station
Foul Pumping Station
WWTW Water Treatment Works
Section 104 Area
Building Over Agreement Area
Foul Manhole
Combined Manhole
Surface Water Manhole
Side Entry Manhole, Decarcation Chamber, Dummy Manhole or Surface Water Soakaway

matttwinberrow@bellamyroberts.co.uk

6051

WATER for LIFE from Southern Water

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2024 Ordnance Survey 100031673 .This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
0001	F	16.04	12.74	
0101	F	15.11	13.52	
0102	F	15.41	13.11	
0201	F	13.97	12.56	
0202	F	14.27	12.15	
0903	F	15.51	12.15	
0908	F	0.00	0.00	
0909	F	0.00	0.00	
0910	F	0.00	0.00	
0911	F	0.00	0.00	
2001	F	15.61	14.16	
2002	F	16.06	13.58	
9201	F	13.13	10.79	
9202	F	0.00	0.00	
9203	F	0.00	0.00	
9204	F	0.00	0.00	
9301	F	12.78	10.78	

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

APPENDIX 3

BGS Borehole Log

British Geological Survey

BGS ID: 16091705 : BGS Reference: TR26SE16
British National Grid (27700) : 625010,160930

RECORD OF BOREHOLE No: 2

Location : EASTRY MAIN DRAINAGE
Contract No. : F69/988
Type of Boring : Shell and Auger
Date (started) : 19th September, 1968.

Borehole Dia : 8 ins.
Casing :
Ground Level : 46.3ft. O.D.

Depth of Casing	Water Level	SAMPLES Depth	Type	No.	STRATA Legend	Depth	Thickness	DESCRIPTION OF STRATA
						0'-0"		
						0'-9"	0'-9"	TOPSOIL.
		2'-6"	D	1			4'-3"	Brown clayey SAND and GRAVEL.
		5'-0"	D	2		5'-0"		
		7'-6"	D	3			4'-0"	Sandy clayey SILT.
		10'-0"	D	4		9'-0"		
		12'-6"	D	5			9'-6"	Brown fine SAND.
		15'-0"	D	6				
		17'-6"	D	7				
		19'-0" - 20'-3"	U	8		18'-6"	1'-9"	Stiff brown silty sandy CLAY.
						20'-3"		
						End of Borehole.		

REMARKS:

No water encountered during boring. Water level 18'-6" on 21.9.68.
J.C.B. excavated pit to 6ft.
Piezometer installed at 20ft. Borehole dry.

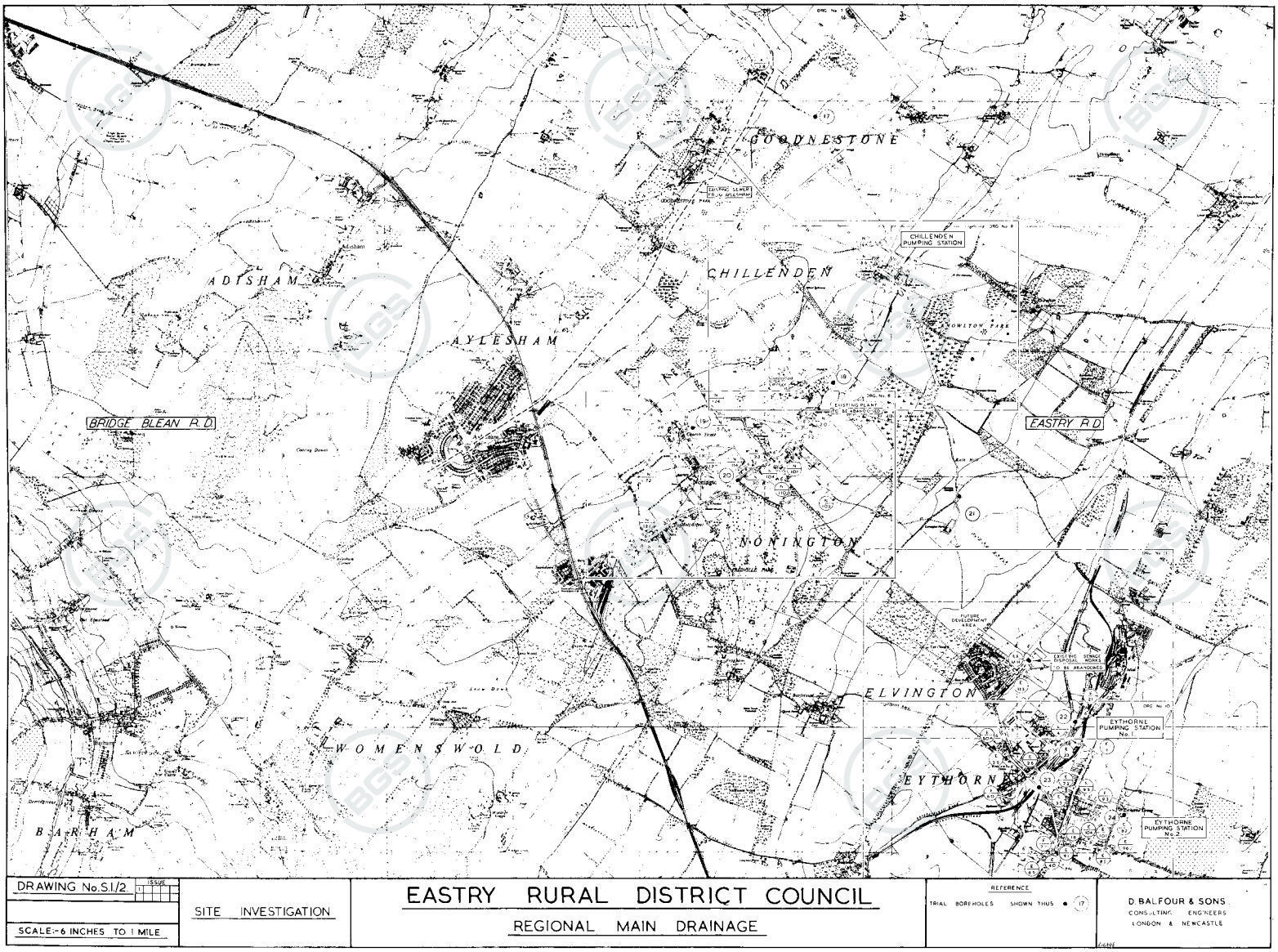
SCALE 1" = 5'

Foundation Engineering Ltd.

Contact BGS: ngdc@bgs.ac.uk

British Geological Survey

BGS ID: 16091705 : BGS Reference: TR26SE16
British National Grid (27700) : 625010,160930



DRAWING No. S.I/2 | ISSUE

SCALE:-6 INCHES TO 1 MILE

SITE INVESTIGATION

EASTRY RURAL DISTRICT COUNCIL

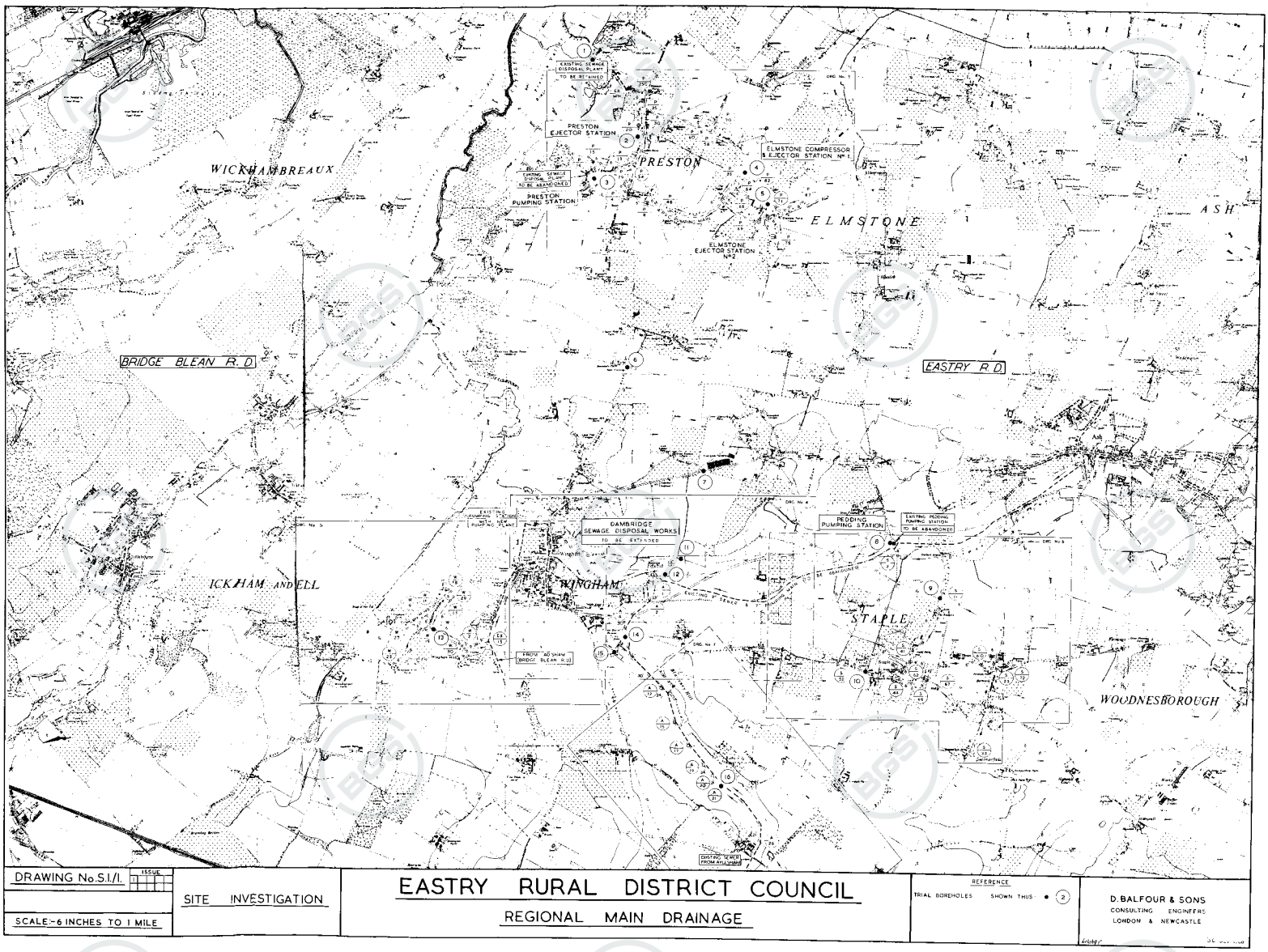
REGIONAL MAIN DRAINAGE

REFERENCE

TRIAL BOREHOLES SHOWN THUS ● (17)

D. BALFOUR & SONS
CONSULTING ENGINEERS
LONDON & NEWCASTLE

Contact BGS: ngdc@bgs.ac.uk


WICKHAMBREAUX
PRESTON
EXISTING SEWAGE DISPOSAL PLANT TO BE RETAINED
PRESTON EJECTOR STATION
PRESTON PUMPING STATION
ELMSTONE COMPRESSOR & EJECTOR STATION No 1
ELMSTONE
ELMSTONE EJECTOR STATION No 2
ASH
BRIDGE BLEAN R.D.
EASTRY R.D.
GAMBRIDGE SEWAGE DISPOSAL WORKS TO BE EXTENDED
PEDDING PUMPING STATION
EXISTING PEDDING PUMPING STATION TO BE ABANDONED
ICKHAM AND ELL
WINGHAM
STAPLE
WOODNESBOROUGH
PROPOSED MAIN BRIDGE BLEAN R.D.
EXISTING SEWER FROM ASH UNDER
DRAWING No.S.I./I.
ISSUE
SCALE:-6 INCHES TO 1 MILE
SITE INVESTIGATION
EASTRY RURAL DISTRICT COUNCIL
REGIONAL MAIN DRAINAGE
REFERENCE
TRIAL BOREHOLES SHOWN THUS
D.BALFOUR & SONS
CONSULTING ENGINEERS
LONDON & NEWCASTLE

APPENDIX 4

Greenfield Runoff Rates

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Matt Twinberrow
Site name:	Meadow Cottage
Site location:	Preston

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

Site Details

Latitude:	51.30534° N
Longitude:	1.22613° E
Reference:	2067932874
Date:	Mar 28 2024 11:00

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	1.8

Methodology

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

Soil characteristics

	Default	Edited
SOIL type:	3	3
HOST class:	N/A	N/A
SPR/SPRHOST:	0.37	0.37

Hydrological characteristics

	Default	Edited
SAAR (mm):	612	612
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

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

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

(2) Are flow rates < 5.0 l/s?

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

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates

Default Edited

Q_{BAR} (l/s):	4.42	4.42
1 in 1 year (l/s):	3.76	3.76
1 in 30 years (l/s):	10.16	10.16
1 in 100 year (l/s):	14.1	14.1
1 in 200 years (l/s):	16.53	16.53

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

APPENDIX 5

EA Flood Map for Planning

Flood map for planning

Your reference	Location (easting/northing)	Created
6051	**624985/161183**	**28 Mar 2024 9:55**

Your selected location is in flood zone 1, an area with a low probability of flooding.

You will need to do a flood risk assessment if your site is **any of the following:**

- bigger that 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence **which** sets out the terms and conditions for using government data. https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

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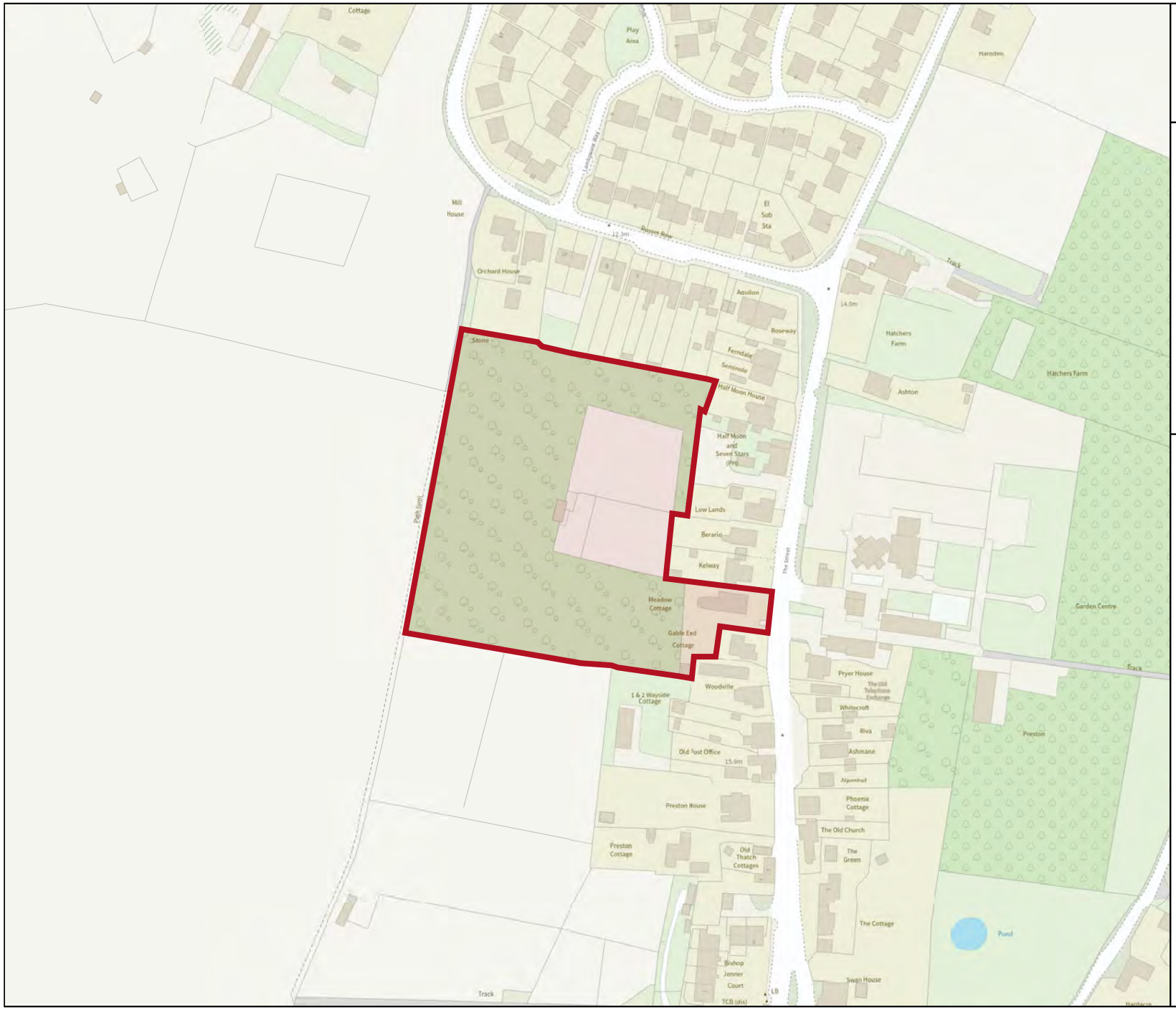

Environment Agency

Flood map for planning

Your reference
6051

Location (easting/northing)
624985/161183

Scale
1:2500

Created
28 Mar 2024 9:55

- Selected area
- Flood zone 3
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 20 40 60m

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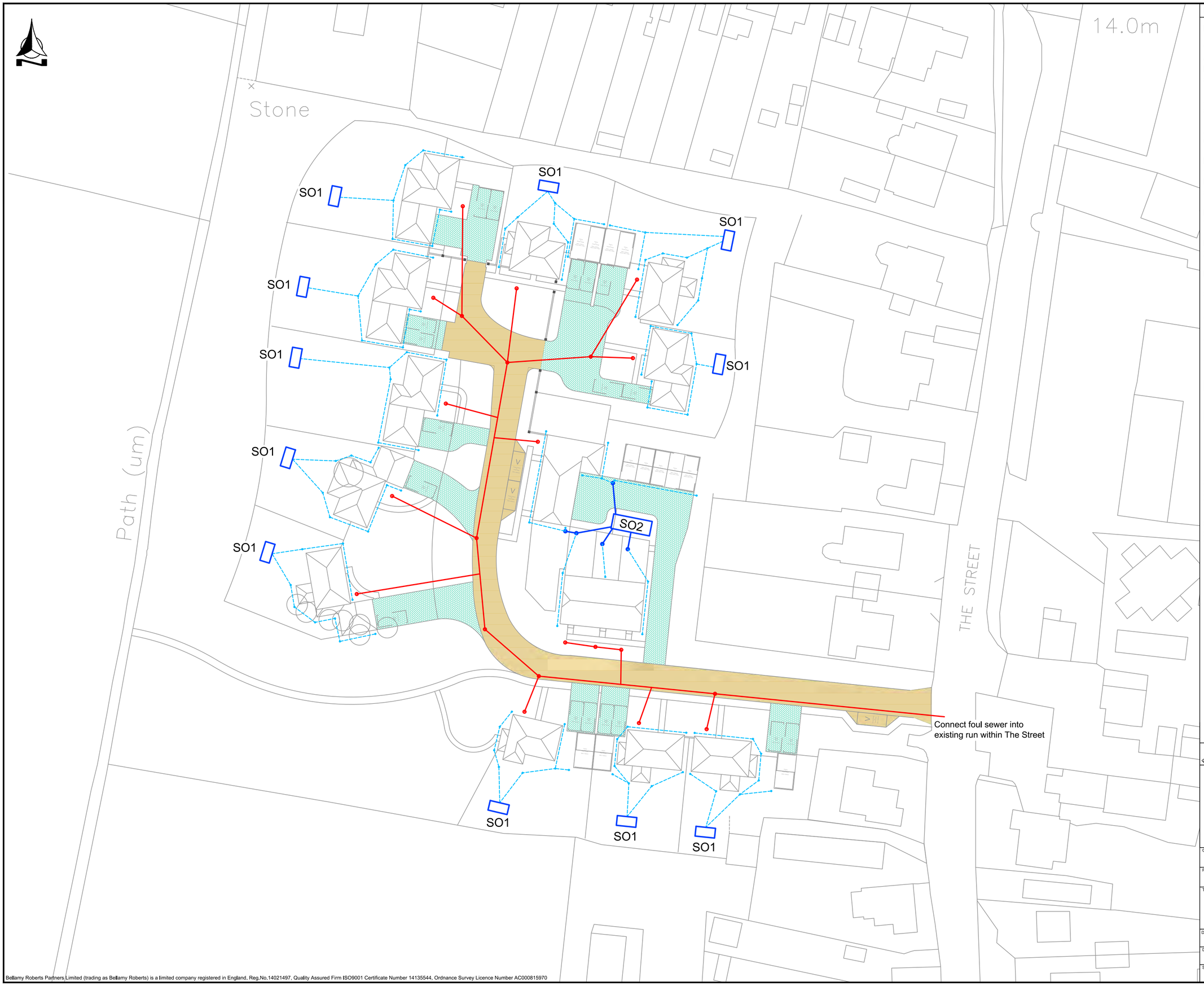
APPENDIX 6

Proposed Drainage Strategy - Infiltration



Notes

Do not scale this drawing

This drawing shall be read in conjunction with all other relevant Engineering, Architectural, Landscaping details, drawings and specifications and all relevant Highway Authority Plans.

Any works constructed prior to technical approval are at the contractors own risk.

All parking spaces are to be permeable block paving (depth by design)

Depths and infiltration rates to be confirmed by further investigation at detailed design to follow BRE365. Estimated figures being used from locally soured borehole data;

For depths 0m - 1.5m
$1.0x10^{-6}$ m/s or 0.0036 m/hr

For depths 1.5m - 3.0m
$2.5x10^{-5}$ m/s or 0.0900 m/hr

Manhole locations are approximate.

Site layout shown in indicative at this stage

- Proposed foul sewer
- Surface water sewer
- House surface water drainage
- Permeable block paving (parking spaces)
- Permeable block or tarmac (Access road)

SO1 (soakaway 01)
2m x 4m x 3m deep
Total impermeable area of 150m²

SO2 (soakaway 02)
3m x 8m x 3m deep
Total impermeable area of 400m²

REVISION	AMENDMENT	DRN	DATE	CHK
A	Site layout revised	JCB	26/03/24	MT

Bellamy Roberts
Clover House
Western Lane
Odiham
Hampshire, RG29 1TU
Tel: 01256 703355
Email: info@bellamyroberts.co.uk

CLIENT: David Hanson

PROJECT: Meadow Cottage, The Street, Preston

TITLE: Proposed Drainage Strategy
Soakaways

DRAWN BY	DESIGN BY	CHK BY
JCB	JCB	MT

DATE	DRAWING No.	REV No.
06/03/24	6051 / 003	A

SCALE: 1:500 @ A2

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APPENDIX 7

Microdrainage Analysis - Infiltration

Summary of Results for 1 year Return Period

Half Drain Time : 69 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	12.325	0.325	0.1	0.8	O K
30 min Summer	12.395	0.395	0.2	0.9	O K
60 min Summer	12.436	0.436	0.2	1.0	O K
120 min Summer	12.448	0.448	0.2	1.1	O K
180 min Summer	12.438	0.438	0.2	1.1	O K
240 min Summer	12.424	0.424	0.2	1.0	O K
360 min Summer	12.385	0.385	0.2	0.9	O K
480 min Summer	12.348	0.348	0.2	0.8	O K
600 min Summer	12.312	0.312	0.1	0.7	O K
720 min Summer	12.280	0.280	0.1	0.7	O K
960 min Summer	12.224	0.224	0.1	0.5	O K
1440 min Summer	12.142	0.142	0.1	0.3	O K
2160 min Summer	12.069	0.069	0.1	0.2	O K
2880 min Summer	12.047	0.047	0.1	0.1	O K
4320 min Summer	12.035	0.035	0.1	0.1	O K
5760 min Summer	12.028	0.028	0.1	0.1	O K
7200 min Summer	12.024	0.024	0.1	0.1	O K
8640 min Summer	12.021	0.021	0.0	0.1	O K
10080 min Summer	12.019	0.019	0.0	0.0	O K
15 min Winter	12.368	0.368	0.2	0.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	31.584	0.0	17
30 min Summer	20.643	0.0	31
60 min Summer	13.089	0.0	54
120 min Summer	8.133	0.0	86
180 min Summer	6.128	0.0	122
240 min Summer	5.007	0.0	156
360 min Summer	3.735	0.0	224
480 min Summer	3.030	0.0	290
600 min Summer	2.575	0.0	356
720 min Summer	2.255	0.0	418
960 min Summer	1.829	0.0	540
1440 min Summer	1.363	0.0	780
2160 min Summer	1.015	0.0	1124
2880 min Summer	0.823	0.0	1468
4320 min Summer	0.612	0.0	2200
5760 min Summer	0.497	0.0	2936
7200 min Summer	0.423	0.0	3656
8640 min Summer	0.371	0.0	4352
10080 min Summer	0.331	0.0	5104
15 min Winter	31.584	0.0	17

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Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	12.450	0.450	0.2	1.1	O K
60 min Winter	12.502	0.502	0.2	1.2	O K
120 min Winter	12.512	0.512	0.2	1.2	O K
180 min Winter	12.494	0.494	0.2	1.2	O K
240 min Winter	12.468	0.468	0.2	1.1	O K
360 min Winter	12.407	0.407	0.2	1.0	O K
480 min Winter	12.349	0.349	0.2	0.8	O K
600 min Winter	12.297	0.297	0.1	0.7	O K
720 min Winter	12.251	0.251	0.1	0.6	O K
960 min Winter	12.175	0.175	0.1	0.4	O K
1440 min Winter	12.073	0.073	0.1	0.2	O K
2160 min Winter	12.042	0.042	0.1	0.1	O K
2880 min Winter	12.034	0.034	0.1	0.1	O K
4320 min Winter	12.025	0.025	0.1	0.1	O K
5760 min Winter	12.021	0.021	0.0	0.0	O K
7200 min Winter	12.018	0.018	0.0	0.0	O K
8640 min Winter	12.015	0.015	0.0	0.0	O K
10080 min Winter	12.014	0.014	0.0	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	20.643	0.0	31
60 min Winter	13.089	0.0	58
120 min Winter	8.133	0.0	92
180 min Winter	6.128	0.0	130
240 min Winter	5.007	0.0	168
360 min Winter	3.735	0.0	240
480 min Winter	3.030	0.0	310
600 min Winter	2.575	0.0	376
720 min Winter	2.255	0.0	440
960 min Winter	1.829	0.0	566
1440 min Winter	1.363	0.0	782
2160 min Winter	1.015	0.0	1100
2880 min Winter	0.823	0.0	1468
4320 min Winter	0.612	0.0	2168
5760 min Winter	0.497	0.0	2864
7200 min Winter	0.423	0.0	3592
8640 min Winter	0.371	0.0	4400
10080 min Winter	0.331	0.0	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)	20.400	Shortest Storm (mins)	15
Ratio R	0.398	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.015

Time (mins) From:	To:	Area (ha)
0	4	0.015

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Model Details

Storage is Online Cover Level (m) 15.000

Trench Soakaway Structure

Infiltration Coefficient Base (m/hr)	0.09000	Trench Width (m)	2.0
Infiltration Coefficient Side (m/hr)	0.09000	Trench Length (m)	4.0
Safety Factor	2.0	Slope (1:X)	0.0
Porosity	0.30	Cap Volume Depth (m)	0.000
Invert Level (m)	12.000	Cap Infiltration Depth (m)	0.000

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Summary of Results for 30 year Return Period (+35%)

Half Drain Time : 129 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	13.147	1.147	0.3	2.8	O K
30 min Summer	13.433	1.433	0.3	3.4	O K
60 min Summer	13.645	1.645	0.3	3.9	O K
120 min Summer	13.725	1.725	0.4	4.1	O K
180 min Summer	13.723	1.723	0.4	4.1	O K
240 min Summer	13.693	1.693	0.4	4.1	O K
360 min Summer	13.609	1.609	0.3	3.9	O K
480 min Summer	13.519	1.519	0.3	3.6	O K
600 min Summer	13.434	1.434	0.3	3.4	O K
720 min Summer	13.358	1.358	0.3	3.3	O K
960 min Summer	13.223	1.223	0.3	2.9	O K
1440 min Summer	13.006	1.006	0.3	2.4	O K
2160 min Summer	12.768	0.768	0.2	1.8	O K
2880 min Summer	12.597	0.597	0.2	1.4	O K
4320 min Summer	12.366	0.366	0.2	0.9	O K
5760 min Summer	12.218	0.218	0.1	0.5	O K
7200 min Summer	12.119	0.119	0.1	0.3	O K
8640 min Summer	12.061	0.061	0.1	0.1	O K
10080 min Summer	12.046	0.046	0.1	0.1	O K
15 min Winter	13.290	1.290	0.3	3.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	104.644	0.0	18
30 min Summer	68.161	0.0	32
60 min Summer	42.440	0.0	60
120 min Summer	25.637	0.0	98
180 min Summer	18.882	0.0	130
240 min Summer	15.130	0.0	166
360 min Summer	11.067	0.0	234
480 min Summer	8.857	0.0	304
600 min Summer	7.446	0.0	372
720 min Summer	6.460	0.0	438
960 min Summer	5.160	0.0	570
1440 min Summer	3.755	0.0	824
2160 min Summer	2.729	0.0	1192
2880 min Summer	2.175	0.0	1560
4320 min Summer	1.578	0.0	2292
5760 min Summer	1.256	0.0	3000
7200 min Summer	1.051	0.0	3680
8640 min Summer	0.909	0.0	4408
10080 min Summer	0.804	0.0	5136
15 min Winter	104.644	0.0	18

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Summary of Results for 30 year Return Period (+35%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	13.619	1.619	0.3	3.9	O K
60 min Winter	13.870	1.870	0.4	4.5	O K
120 min Winter	13.963	1.963	0.4	4.7	O K
180 min Winter	13.956	1.956	0.4	4.7	O K
240 min Winter	13.910	1.910	0.4	4.6	O K
360 min Winter	13.788	1.788	0.4	4.3	O K
480 min Winter	13.657	1.657	0.3	4.0	O K
600 min Winter	13.532	1.532	0.3	3.7	O K
720 min Winter	13.421	1.421	0.3	3.4	O K
960 min Winter	13.233	1.233	0.3	3.0	O K
1440 min Winter	12.945	0.945	0.2	2.3	O K
2160 min Winter	12.649	0.649	0.2	1.6	O K
2880 min Winter	12.450	0.450	0.2	1.1	O K
4320 min Winter	12.201	0.201	0.1	0.5	O K
5760 min Winter	12.061	0.061	0.1	0.1	O K
7200 min Winter	12.043	0.043	0.1	0.1	O K
8640 min Winter	12.038	0.038	0.1	0.1	O K
10080 min Winter	12.033	0.033	0.1	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	68.161	0.0	32
60 min Winter	42.440	0.0	60
120 min Winter	25.637	0.0	110
180 min Winter	18.882	0.0	138
240 min Winter	15.130	0.0	178
360 min Winter	11.067	0.0	252
480 min Winter	8.857	0.0	326
600 min Winter	7.446	0.0	398
720 min Winter	6.460	0.0	468
960 min Winter	5.160	0.0	604
1440 min Winter	3.755	0.0	866
2160 min Winter	2.729	0.0	1252
2880 min Winter	2.175	0.0	1616
4320 min Winter	1.578	0.0	2336
5760 min Winter	1.256	0.0	2992
7200 min Winter	1.051	0.0	3672
8640 min Winter	0.909	0.0	4400
10080 min Winter	0.804	0.0	4984

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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)	20.400	Shortest Storm (mins)	15
Ratio R	0.398	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+35

Time Area Diagram

Total Area (ha) 0.015

Time (mins) From:	To:	Area (ha)
0	4	0.015

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Model Details

Storage is Online Cover Level (m) 15.000

Trench Soakaway Structure

Infiltration Coefficient Base (m/hr)	0.09000	Trench Width (m)	2.0
Infiltration Coefficient Side (m/hr)	0.09000	Trench Length (m)	4.0
Safety Factor	2.0	Slope (1:X)	0.0
Porosity	0.30	Cap Volume Depth (m)	0.000
Invert Level (m)	12.000	Cap Infiltration Depth (m)	0.000

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Summary of Results for 100 year Return Period (+45%)

Half Drain Time : 142 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	13.614	1.614	0.3	3.9	O K
30 min Summer	14.043	2.043	0.4	4.9	O K
60 min Summer	14.374	2.374	0.5	5.7	O K
120 min Summer	14.512	2.512	0.5	6.0	O K
180 min Summer	14.519	2.519	0.5	6.0	O K
240 min Summer	14.481	2.481	0.5	6.0	O K
360 min Summer	14.378	2.378	0.5	5.7	O K
480 min Summer	14.260	2.260	0.4	5.4	O K
600 min Summer	14.142	2.142	0.4	5.1	O K
720 min Summer	14.032	2.032	0.4	4.9	O K
960 min Summer	13.840	1.840	0.4	4.4	O K
1440 min Summer	13.541	1.541	0.3	3.7	O K
2160 min Summer	13.219	1.219	0.3	2.9	O K
2880 min Summer	12.986	0.986	0.2	2.4	O K
4320 min Summer	12.671	0.671	0.2	1.6	O K
5760 min Summer	12.463	0.463	0.2	1.1	O K
7200 min Summer	12.320	0.320	0.1	0.8	O K
8640 min Summer	12.213	0.213	0.1	0.5	O K
10080 min Summer	12.134	0.134	0.1	0.3	O K
15 min Winter	13.814	1.814	0.4	4.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	145.969	0.0	18
30 min Summer	95.877	0.0	32
60 min Summer	59.944	0.0	62
120 min Summer	36.168	0.0	102
180 min Summer	26.535	0.0	132
240 min Summer	21.165	0.0	168
360 min Summer	15.395	0.0	236
480 min Summer	12.269	0.0	306
600 min Summer	10.281	0.0	374
720 min Summer	8.895	0.0	440
960 min Summer	7.071	0.0	572
1440 min Summer	5.110	0.0	834
2160 min Summer	3.686	0.0	1208
2880 min Summer	2.921	0.0	1584
4320 min Summer	2.101	0.0	2296
5760 min Summer	1.662	0.0	3048
7200 min Summer	1.384	0.0	3752
8640 min Summer	1.192	0.0	4488
10080 min Summer	1.050	0.0	5152
15 min Winter	145.969	0.0	18

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Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	14.303	2.303	0.4	5.5	O K
60 min Winter	14.691	2.691	0.5	6.5	O K
120 min Winter	14.855	2.855	0.5	6.9	Flood Risk
180 min Winter	14.849	2.849	0.5	6.8	Flood Risk
240 min Winter	14.791	2.791	0.5	6.7	Flood Risk
360 min Winter	14.635	2.635	0.5	6.3	O K
480 min Winter	14.464	2.464	0.5	5.9	O K
600 min Winter	14.298	2.298	0.4	5.5	O K
720 min Winter	14.145	2.145	0.4	5.1	O K
960 min Winter	13.879	1.879	0.4	4.5	O K
1440 min Winter	13.484	1.484	0.3	3.6	O K
2160 min Winter	13.083	1.083	0.3	2.6	O K
2880 min Winter	12.811	0.811	0.2	1.9	O K
4320 min Winter	12.468	0.468	0.2	1.1	O K
5760 min Winter	12.261	0.261	0.1	0.6	O K
7200 min Winter	12.123	0.123	0.1	0.3	O K
8640 min Winter	12.049	0.049	0.1	0.1	O K
10080 min Winter	12.043	0.043	0.1	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	95.877	0.0	32
60 min Winter	59.944	0.0	60
120 min Winter	36.168	0.0	112
180 min Winter	26.535	0.0	140
240 min Winter	21.165	0.0	178
360 min Winter	15.395	0.0	254
480 min Winter	12.269	0.0	328
600 min Winter	10.281	0.0	398
720 min Winter	8.895	0.0	470
960 min Winter	7.071	0.0	606
1440 min Winter	5.110	0.0	868
2160 min Winter	3.686	0.0	1252
2880 min Winter	2.921	0.0	1616
4320 min Winter	2.101	0.0	2376
5760 min Winter	1.662	0.0	3064
7200 min Winter	1.384	0.0	3816
8640 min Winter	1.192	0.0	4312
10080 min Winter	1.050	0.0	5048

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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)	20.400	Shortest Storm (mins)	15
Ratio R	0.398	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.015

Time (mins) From:	To:	Area (ha)
0	4	0.015

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Model Details

Storage is Online Cover Level (m) 15.000

Trench Soakaway Structure

Infiltration Coefficient Base (m/hr)	0.09000	Trench Width (m)	2.0
Infiltration Coefficient Side (m/hr)	0.09000	Trench Length (m)	4.0
Safety Factor	2.0	Slope (1:X)	0.0
Porosity	0.30	Cap Volume Depth (m)	0.000
Invert Level (m)	12.000	Cap Infiltration Depth (m)	0.000

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Summary of Results for 1 year Return Period

Half Drain Time : 76 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	12.289	0.289	0.4	2.1	O K
30 min Summer	12.353	0.353	0.4	2.5	O K
60 min Summer	12.391	0.391	0.4	2.8	O K
120 min Summer	12.402	0.402	0.4	2.9	O K
180 min Summer	12.394	0.394	0.4	2.8	O K
240 min Summer	12.381	0.381	0.4	2.7	O K
360 min Summer	12.346	0.346	0.4	2.5	O K
480 min Summer	12.310	0.310	0.4	2.2	O K
600 min Summer	12.277	0.277	0.4	2.0	O K
720 min Summer	12.246	0.246	0.4	1.8	O K
960 min Summer	12.192	0.192	0.4	1.4	O K
1440 min Summer	12.113	0.113	0.3	0.8	O K
2160 min Summer	12.054	0.054	0.3	0.4	O K
2880 min Summer	12.043	0.043	0.3	0.3	O K
4320 min Summer	12.032	0.032	0.2	0.2	O K
5760 min Summer	12.026	0.026	0.2	0.2	O K
7200 min Summer	12.022	0.022	0.1	0.2	O K
8640 min Summer	12.019	0.019	0.1	0.1	O K
10080 min Summer	12.017	0.017	0.1	0.1	O K
15 min Winter	12.328	0.328	0.4	2.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	31.584	0.0	17
30 min Summer	20.643	0.0	31
60 min Summer	13.089	0.0	56
120 min Summer	8.133	0.0	88
180 min Summer	6.128	0.0	122
240 min Summer	5.007	0.0	158
360 min Summer	3.735	0.0	226
480 min Summer	3.030	0.0	292
600 min Summer	2.575	0.0	356
720 min Summer	2.255	0.0	420
960 min Summer	1.829	0.0	542
1440 min Summer	1.363	0.0	778
2160 min Summer	1.015	0.0	1104
2880 min Summer	0.823	0.0	1468
4320 min Summer	0.612	0.0	2200
5760 min Summer	0.497	0.0	2936
7200 min Summer	0.423	0.0	3608
8640 min Summer	0.371	0.0	4400
10080 min Summer	0.331	0.0	5136
15 min Winter	31.584	0.0	17

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Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	12.403	0.403	0.4	2.9	O K
60 min Winter	12.453	0.453	0.4	3.3	O K
120 min Winter	12.463	0.463	0.4	3.3	O K
180 min Winter	12.448	0.448	0.4	3.2	O K
240 min Winter	12.425	0.425	0.4	3.1	O K
360 min Winter	12.368	0.368	0.4	2.6	O K
480 min Winter	12.312	0.312	0.4	2.2	O K
600 min Winter	12.262	0.262	0.4	1.9	O K
720 min Winter	12.216	0.216	0.4	1.6	O K
960 min Winter	12.140	0.140	0.3	1.0	O K
1440 min Winter	12.052	0.052	0.3	0.4	O K
2160 min Winter	12.038	0.038	0.2	0.3	O K
2880 min Winter	12.031	0.031	0.2	0.2	O K
4320 min Winter	12.023	0.023	0.1	0.2	O K
5760 min Winter	12.019	0.019	0.1	0.1	O K
7200 min Winter	12.016	0.016	0.1	0.1	O K
8640 min Winter	12.014	0.014	0.1	0.1	O K
10080 min Winter	12.013	0.013	0.1	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	20.643	0.0	31
60 min Winter	13.089	0.0	58
120 min Winter	8.133	0.0	94
180 min Winter	6.128	0.0	132
240 min Winter	5.007	0.0	170
360 min Winter	3.735	0.0	244
480 min Winter	3.030	0.0	312
600 min Winter	2.575	0.0	380
720 min Winter	2.255	0.0	442
960 min Winter	1.829	0.0	562
1440 min Winter	1.363	0.0	750
2160 min Winter	1.015	0.0	1096
2880 min Winter	0.823	0.0	1472
4320 min Winter	0.612	0.0	2168
5760 min Winter	0.497	0.0	2880
7200 min Winter	0.423	0.0	3656
8640 min Winter	0.371	0.0	4368
10080 min Winter	0.331	0.0	5040

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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)	20.400	Shortest Storm (mins)	15
Ratio R	0.398	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.040

Time (mins) From:	To:	Area (ha)
0	4	0.040

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Model Details

Storage is Online Cover Level (m) 15.000

Trench Soakaway Structure

Infiltration Coefficient Base (m/hr)	0.09000	Trench Width (m)	3.0
Infiltration Coefficient Side (m/hr)	0.09000	Trench Length (m)	8.0
Safety Factor	2.0	Slope (1:X)	0.0
Porosity	0.30	Cap Volume Depth (m)	0.000
Invert Level (m)	12.000	Cap Infiltration Depth (m)	0.000

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Summary of Results for 30 year Return Period (+35%)

Half Drain Time : 181 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	13.028	1.028	0.6	7.4	O K
30 min Summer	13.296	1.296	0.7	9.3	O K
60 min Summer	13.512	1.512	0.7	10.9	O K
120 min Summer	13.613	1.613	0.7	11.6	O K
180 min Summer	13.614	1.614	0.7	11.6	O K
240 min Summer	13.591	1.591	0.7	11.5	O K
360 min Summer	13.526	1.526	0.7	11.0	O K
480 min Summer	13.453	1.453	0.7	10.5	O K
600 min Summer	13.384	1.384	0.7	10.0	O K
720 min Summer	13.320	1.320	0.7	9.5	O K
960 min Summer	13.202	1.202	0.6	8.7	O K
1440 min Summer	13.001	1.001	0.6	7.2	O K
2160 min Summer	12.764	0.764	0.5	5.5	O K
2880 min Summer	12.585	0.585	0.5	4.2	O K
4320 min Summer	12.334	0.334	0.4	2.4	O K
5760 min Summer	12.174	0.174	0.3	1.3	O K
7200 min Summer	12.080	0.080	0.3	0.6	O K
8640 min Summer	12.048	0.048	0.3	0.3	O K
10080 min Summer	12.042	0.042	0.3	0.3	O K
15 min Winter	13.157	1.157	0.6	8.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	104.644	0.0	18
30 min Summer	68.161	0.0	33
60 min Summer	42.440	0.0	62
120 min Summer	25.637	0.0	116
180 min Summer	18.882	0.0	144
240 min Summer	15.130	0.0	176
360 min Summer	11.067	0.0	244
480 min Summer	8.857	0.0	314
600 min Summer	7.446	0.0	384
720 min Summer	6.460	0.0	452
960 min Summer	5.160	0.0	586
1440 min Summer	3.755	0.0	850
2160 min Summer	2.729	0.0	1232
2880 min Summer	2.175	0.0	1588
4320 min Summer	1.578	0.0	2332
5760 min Summer	1.256	0.0	3008
7200 min Summer	1.051	0.0	3680
8640 min Summer	0.909	0.0	4384
10080 min Summer	0.804	0.0	5104
15 min Winter	104.644	0.0	18

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Summary of Results for 30 year Return Period (+35%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	13.463	1.463	0.7	10.5	O K
60 min Winter	13.717	1.717	0.8	12.4	O K
120 min Winter	13.855	1.855	0.8	13.4	O K
180 min Winter	13.849	1.849	0.8	13.3	O K
240 min Winter	13.823	1.823	0.8	13.1	O K
360 min Winter	13.737	1.737	0.8	12.5	O K
480 min Winter	13.632	1.632	0.7	11.8	O K
600 min Winter	13.527	1.527	0.7	11.0	O K
720 min Winter	13.432	1.432	0.7	10.3	O K
960 min Winter	13.261	1.261	0.6	9.1	O K
1440 min Winter	12.979	0.979	0.6	7.0	O K
2160 min Winter	12.666	0.666	0.5	4.8	O K
2880 min Winter	12.443	0.443	0.4	3.2	O K
4320 min Winter	12.154	0.154	0.3	1.1	O K
5760 min Winter	12.047	0.047	0.3	0.3	O K
7200 min Winter	12.040	0.040	0.2	0.3	O K
8640 min Winter	12.034	0.034	0.2	0.2	O K
10080 min Winter	12.030	0.030	0.2	0.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	68.161	0.0	32
60 min Winter	42.440	0.0	60
120 min Winter	25.637	0.0	116
180 min Winter	18.882	0.0	150
240 min Winter	15.130	0.0	186
360 min Winter	11.067	0.0	264
480 min Winter	8.857	0.0	338
600 min Winter	7.446	0.0	412
720 min Winter	6.460	0.0	484
960 min Winter	5.160	0.0	626
1440 min Winter	3.755	0.0	896
2160 min Winter	2.729	0.0	1280
2880 min Winter	2.175	0.0	1648
4320 min Winter	1.578	0.0	2340
5760 min Winter	1.256	0.0	2848
7200 min Winter	1.051	0.0	3664
8640 min Winter	0.909	0.0	4304
10080 min Winter	0.804	0.0	4952

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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)	20.400	Shortest Storm (mins)	15
Ratio R	0.398	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+35

Time Area Diagram

Total Area (ha) 0.040

Time (mins) From:	To:	Area (ha)
0	4	0.040

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Model Details

Storage is Online Cover Level (m) 15.000

Trench Soakaway Structure

Infiltration Coefficient Base (m/hr)	0.09000	Trench Width (m)	3.0
Infiltration Coefficient Side (m/hr)	0.09000	Trench Length (m)	8.0
Safety Factor	2.0	Slope (1:X)	0.0
Porosity	0.30	Cap Volume Depth (m)	0.000
Invert Level (m)	12.000	Cap Infiltration Depth (m)	0.000

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Summary of Results for 100 year Return Period (+45%)

Half Drain Time : 202 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	13.448	1.448	0.7	10.4	O K
30 min Summer	13.850	1.850	0.8	13.3	O K
60 min Summer	14.189	2.189	0.9	15.8	O K
120 min Summer	14.374	2.374	1.0	17.1	O K
180 min Summer	14.383	2.383	1.0	17.2	O K
240 min Summer	14.358	2.358	0.9	17.0	O K
360 min Summer	14.285	2.285	0.9	16.5	O K
480 min Summer	14.193	2.193	0.9	15.8	O K
600 min Summer	14.097	2.097	0.9	15.1	O K
720 min Summer	14.007	2.007	0.9	14.4	O K
960 min Summer	13.845	1.845	0.8	13.3	O K
1440 min Summer	13.577	1.577	0.7	11.4	O K
2160 min Summer	13.265	1.265	0.6	9.1	O K
2880 min Summer	13.027	1.027	0.6	7.4	O K
4320 min Summer	12.684	0.684	0.5	4.9	O K
5760 min Summer	12.451	0.451	0.4	3.2	O K
7200 min Summer	12.285	0.285	0.4	2.1	O K
8640 min Summer	12.169	0.169	0.3	1.2	O K
10080 min Summer	12.089	0.089	0.3	0.6	O K
15 min Winter	13.628	1.628	0.7	11.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	145.969	0.0	18
30 min Summer	95.877	0.0	33
60 min Summer	59.944	0.0	62
120 min Summer	36.168	0.0	120
180 min Summer	26.535	0.0	150
240 min Summer	21.165	0.0	182
360 min Summer	15.395	0.0	248
480 min Summer	12.269	0.0	318
600 min Summer	10.281	0.0	386
720 min Summer	8.895	0.0	456
960 min Summer	7.071	0.0	590
1440 min Summer	5.110	0.0	854
2160 min Summer	3.686	0.0	1236
2880 min Summer	2.921	0.0	1616
4320 min Summer	2.101	0.0	2336
5760 min Summer	1.662	0.0	3064
7200 min Summer	1.384	0.0	3816
8640 min Summer	1.192	0.0	4496
10080 min Summer	1.050	0.0	5144
15 min Winter	145.969	0.0	18

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Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	14.085	2.085	0.9	15.0	O K
60 min Winter	14.477	2.477	1.0	17.8	O K
120 min Winter	14.712	2.712	1.0	19.5	Flood Risk
180 min Winter	14.722	2.722	1.0	19.6	Flood Risk
240 min Winter	14.688	2.688	1.0	19.4	O K
360 min Winter	14.592	2.592	1.0	18.7	O K
480 min Winter	14.466	2.466	1.0	17.8	O K
600 min Winter	14.333	2.333	0.9	16.8	O K
720 min Winter	14.203	2.203	0.9	15.9	O K
960 min Winter	13.967	1.967	0.8	14.2	O K
1440 min Winter	13.595	1.595	0.7	11.5	O K
2160 min Winter	13.182	1.182	0.6	8.5	O K
2880 min Winter	12.882	0.882	0.5	6.3	O K
4320 min Winter	12.480	0.480	0.4	3.5	O K
5760 min Winter	12.226	0.226	0.4	1.6	O K
7200 min Winter	12.069	0.069	0.3	0.5	O K
8640 min Winter	12.045	0.045	0.3	0.3	O K
10080 min Winter	12.040	0.040	0.2	0.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	95.877	0.0	32
60 min Winter	59.944	0.0	60
120 min Winter	36.168	0.0	116
180 min Winter	26.535	0.0	168
240 min Winter	21.165	0.0	188
360 min Winter	15.395	0.0	266
480 min Winter	12.269	0.0	342
600 min Winter	10.281	0.0	416
720 min Winter	8.895	0.0	490
960 min Winter	7.071	0.0	634
1440 min Winter	5.110	0.0	908
2160 min Winter	3.686	0.0	1300
2880 min Winter	2.921	0.0	1676
4320 min Winter	2.101	0.0	2420
5760 min Winter	1.662	0.0	3120
7200 min Winter	1.384	0.0	3752
8640 min Winter	1.192	0.0	4392
10080 min Winter	1.050	0.0	4984

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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)	20.400	Shortest Storm (mins)	15
Ratio R	0.398	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.040

Time (mins) From:	To:	Area (ha)
0	4	0.040

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Model Details

Storage is Online Cover Level (m) 15.000

Trench Soakaway Structure

Infiltration Coefficient Base (m/hr)	0.09000	Trench Width (m)	3.0
Infiltration Coefficient Side (m/hr)	0.09000	Trench Length (m)	8.0
Safety Factor	2.0	Slope (1:X)	0.0
Porosity	0.30	Cap Volume Depth (m)	0.000
Invert Level (m)	12.000	Cap Infiltration Depth (m)	0.000

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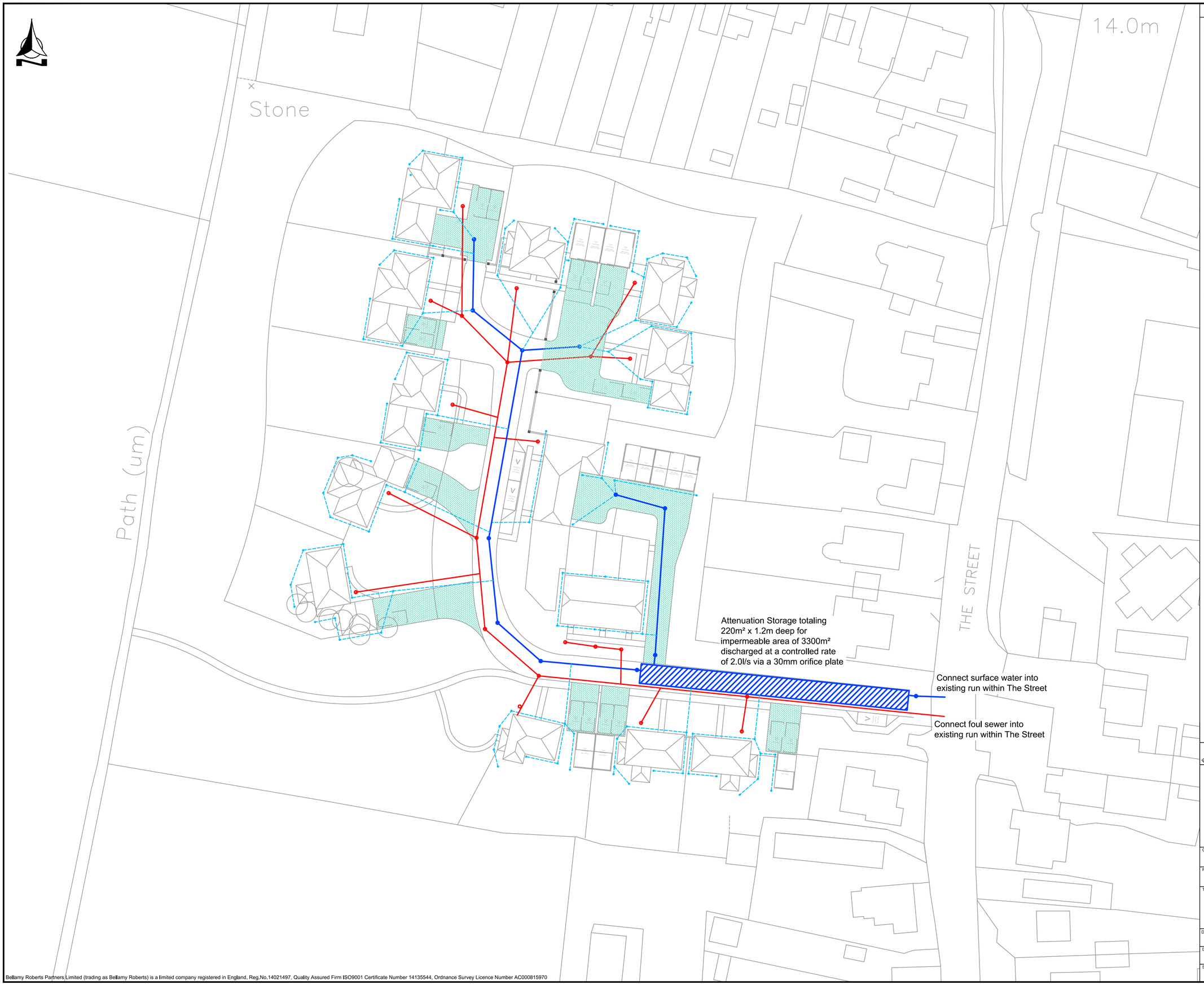
APPENDIX 8

Proposed Drainage Strategy - Attenuation



Notes

Do not scale this drawing

This drawing shall be read in conjunction with all other relevant Engineering, Architectural, Landscaping details, drawings and specifications and all relevant Highway Authority Plans.

Any works constructed prior to technical approval are at the contractors own risk.

All parking spaces are to be permeable block paving depth by design)

Infiltration is not expected on site, an attenuation storage system is being proposed with the capacity to store all surface water runoff from impermeable areas calculated as follows;

1100m² for Road
2200m² for Houses and Garages
TOTAL Impermeable area - 3300m²

Both discharged into the nearby highway drain situated in The Street, discharged at a controlled rate of 2.0 l/s max) via a 30mm orifice plate

Manhole locations are approximate.

Site layout shown in indicative at this stage

- Proposed foul sewer
- Surface water sewer
- House surface water drainage
- Permeable block paving (parking spaces)

(All permeable paving with tanked reservoir - depth to equal or greater than required volume)

REVISION	AMENDMENT	DRN	DATE	CHK
A	Site layout revised	JCB	26/03/24	MT

Bellamy Roberts
Clover House
Western Lane
Odiham
Hampshire, RG29 1TU
Tel: 01256 703355
Email: info@bellamyroberts.co.uk

CLIENT: David Hanson

PROJECT: Meadow Cottage, The Street, Preston

TITLE: Proposed Drainage Strategy **Attenuation**

DRAWN BY	DESIGN BY	CHK BY
JCB	JCB	MT

DATE	DRAWING No.	REV No.
06/03/24	6051 / 004	A

SCALE: 1:500 @ A2

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APPENDIX 9

Microdrainage Analysis

Summary of Results for 1 year Return Period

Half Drain Time : 578 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	13.092	0.092	0.0	0.5	0.5	19.2	O K
30 min Summer	13.119	0.119	0.0	0.6	0.6	24.9	O K
60 min Summer	13.148	0.148	0.0	0.7	0.7	31.0	O K
120 min Summer	13.178	0.178	0.0	0.8	0.8	37.1	O K
180 min Summer	13.194	0.194	0.0	0.8	0.8	40.5	O K
240 min Summer	13.204	0.204	0.0	0.8	0.8	42.7	O K
360 min Summer	13.214	0.214	0.0	0.8	0.8	44.7	O K
480 min Summer	13.218	0.218	0.0	0.8	0.8	45.6	O K
600 min Summer	13.222	0.222	0.0	0.9	0.9	46.3	O K
720 min Summer	13.224	0.224	0.0	0.9	0.9	46.7	O K
960 min Summer	13.226	0.226	0.0	0.9	0.9	47.1	O K
1440 min Summer	13.224	0.224	0.0	0.9	0.9	46.8	O K
2160 min Summer	13.215	0.215	0.0	0.8	0.8	44.9	O K
2880 min Summer	13.204	0.204	0.0	0.8	0.8	42.6	O K
4320 min Summer	13.182	0.182	0.0	0.8	0.8	38.0	O K
5760 min Summer	13.163	0.163	0.0	0.7	0.7	34.1	O K
7200 min Summer	13.147	0.147	0.0	0.7	0.7	30.8	O K
8640 min Summer	13.134	0.134	0.0	0.6	0.6	28.0	O K
10080 min Summer	13.123	0.123	0.0	0.6	0.6	25.6	O K
15 min Winter	13.103	0.103	0.0	0.6	0.6	21.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	31.584	0.0	17.3	19
30 min Summer	20.643	0.0	22.9	33
60 min Summer	13.089	0.0	31.2	64
120 min Summer	8.133	0.0	38.9	122
180 min Summer	6.128	0.0	44.1	182
240 min Summer	5.007	0.0	48.1	242
360 min Summer	3.735	0.0	53.8	358
480 min Summer	3.030	0.0	58.2	410
600 min Summer	2.575	0.0	61.8	472
720 min Summer	2.255	0.0	64.9	534
960 min Summer	1.829	0.0	70.0	666
1440 min Summer	1.363	0.0	77.5	940
2160 min Summer	1.015	0.0	89.6	1360
2880 min Summer	0.823	0.0	96.7	1760
4320 min Summer	0.612	0.0	107.5	2548
5760 min Summer	0.497	0.0	117.7	3296
7200 min Summer	0.423	0.0	125.0	4040
8640 min Summer	0.371	0.0	131.3	4760
10080 min Summer	0.331	0.0	136.6	5544
15 min Winter	31.584	0.0	19.5	19

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Summary of Results for 1 year Return Period

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	13.134	0.134	0.0	0.6	0.6	27.9	O K
60 min Winter	13.166	0.166	0.0	0.7	0.7	34.8	O K
120 min Winter	13.200	0.200	0.0	0.8	0.8	41.8	O K
180 min Winter	13.219	0.219	0.0	0.8	0.8	45.7	O K
240 min Winter	13.231	0.231	0.0	0.9	0.9	48.2	O K
360 min Winter	13.243	0.243	0.0	0.9	0.9	50.8	O K
480 min Winter	13.248	0.248	0.0	0.9	0.9	51.9	O K
600 min Winter	13.250	0.250	0.0	0.9	0.9	52.3	O K
720 min Winter	13.252	0.252	0.0	0.9	0.9	52.7	O K
960 min Winter	13.253	0.253	0.0	0.9	0.9	52.8	O K
1440 min Winter	13.246	0.246	0.0	0.9	0.9	51.5	O K
2160 min Winter	13.230	0.230	0.0	0.9	0.9	48.1	O K
2880 min Winter	13.212	0.212	0.0	0.8	0.8	44.4	O K
4320 min Winter	13.180	0.180	0.0	0.8	0.8	37.6	O K
5760 min Winter	13.153	0.153	0.0	0.7	0.7	32.1	O K
7200 min Winter	13.133	0.133	0.0	0.6	0.6	27.7	O K
8640 min Winter	13.116	0.116	0.0	0.6	0.6	24.3	O K
10080 min Winter	13.103	0.103	0.0	0.6	0.6	21.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	20.643	0.0	25.7	33
60 min Winter	13.089	0.0	35.0	62
120 min Winter	8.133	0.0	43.7	120
180 min Winter	6.128	0.0	49.5	178
240 min Winter	5.007	0.0	53.9	236
360 min Winter	3.735	0.0	60.4	346
480 min Winter	3.030	0.0	65.3	452
600 min Winter	2.575	0.0	69.3	492
720 min Winter	2.255	0.0	72.7	562
960 min Winter	1.829	0.0	78.4	716
1440 min Winter	1.363	0.0	86.6	1024
2160 min Winter	1.015	0.0	100.4	1452
2880 min Winter	0.823	0.0	108.4	1876
4320 min Winter	0.612	0.0	120.5	2680
5760 min Winter	0.497	0.0	131.8	3464
7200 min Winter	0.423	0.0	140.1	4184
8640 min Winter	0.371	0.0	147.1	4936
10080 min Winter	0.331	0.0	153.1	5656

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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)	20.400	Shortest Storm (mins)	15
Ratio R	0.398	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.330

Time (mins) From:	To:	Area (ha)
0	4	0.330

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Model Details

Storage is Online Cover Level (m) 15.000

Cellular Storage Structure

Invert Level (m) 13.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	220.0	0.0	1.210	0.0	0.0
1.200	220.0	0.0			

Orifice Outflow Control

Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 13.000

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Summary of Results for 30 year Return Period (+35%)

Half Drain Time : 997 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	13.307	0.307	0.0	1.0	1.0	64.1	O K
30 min Summer	13.397	0.397	0.0	1.2	1.2	83.0	O K
60 min Summer	13.488	0.488	0.0	1.3	1.3	102.1	O K
120 min Summer	13.577	0.577	0.0	1.4	1.4	120.6	O K
180 min Summer	13.624	0.624	0.0	1.5	1.5	130.4	O K
240 min Summer	13.652	0.652	0.0	1.5	1.5	136.4	O K
360 min Summer	13.687	0.687	0.0	1.5	1.5	143.6	O K
480 min Summer	13.704	0.704	0.0	1.6	1.6	147.1	O K
600 min Summer	13.711	0.711	0.0	1.6	1.6	148.5	O K
720 min Summer	13.712	0.712	0.0	1.6	1.6	148.8	O K
960 min Summer	13.712	0.712	0.0	1.6	1.6	148.8	O K
1440 min Summer	13.705	0.705	0.0	1.6	1.6	147.3	O K
2160 min Summer	13.682	0.682	0.0	1.5	1.5	142.5	O K
2880 min Summer	13.653	0.653	0.0	1.5	1.5	136.6	O K
4320 min Summer	13.595	0.595	0.0	1.4	1.4	124.3	O K
5760 min Summer	13.541	0.541	0.0	1.4	1.4	113.0	O K
7200 min Summer	13.494	0.494	0.0	1.3	1.3	103.2	O K
8640 min Summer	13.453	0.453	0.0	1.2	1.2	94.6	O K
10080 min Summer	13.417	0.417	0.0	1.2	1.2	87.1	O K
15 min Winter	13.344	0.344	0.0	1.1	1.1	71.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	104.644	0.0	56.5	19
30 min Summer	68.161	0.0	69.3	34
60 min Summer	42.440	0.0	102.5	64
120 min Summer	25.637	0.0	123.5	124
180 min Summer	18.882	0.0	135.9	182
240 min Summer	15.130	0.0	144.6	242
360 min Summer	11.067	0.0	157.0	362
480 min Summer	8.857	0.0	165.2	480
600 min Summer	7.446	0.0	171.1	600
720 min Summer	6.460	0.0	175.5	672
960 min Summer	5.160	0.0	181.1	780
1440 min Summer	3.755	0.0	184.8	1038
2160 min Summer	2.729	0.0	241.5	1448
2880 min Summer	2.175	0.0	256.1	1848
4320 min Summer	1.578	0.0	274.2	2680
5760 min Summer	1.256	0.0	297.8	3464
7200 min Summer	1.051	0.0	311.6	4248
8640 min Summer	0.909	0.0	323.2	5016
10080 min Summer	0.804	0.0	332.8	5752
15 min Winter	104.644	0.0	61.8	19

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Summary of Results for 30 year Return Period (+35%)

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	13.445	0.445	0.0	1.2	1.2	93.0	O K
60 min Winter	13.548	0.548	0.0	1.4	1.4	114.5	O K
120 min Winter	13.648	0.648	0.0	1.5	1.5	135.5	O K
180 min Winter	13.702	0.702	0.0	1.6	1.6	146.7	O K
240 min Winter	13.735	0.735	0.0	1.6	1.6	153.7	O K
360 min Winter	13.777	0.777	0.0	1.6	1.6	162.3	O K
480 min Winter	13.799	0.799	0.0	1.7	1.7	166.9	O K
600 min Winter	13.810	0.810	0.0	1.7	1.7	169.3	O K
720 min Winter	13.814	0.814	0.0	1.7	1.7	170.2	O K
960 min Winter	13.810	0.810	0.0	1.7	1.7	169.4	O K
1440 min Winter	13.797	0.797	0.0	1.7	1.7	166.6	O K
2160 min Winter	13.762	0.762	0.0	1.6	1.6	159.2	O K
2880 min Winter	13.719	0.719	0.0	1.6	1.6	150.2	O K
4320 min Winter	13.632	0.632	0.0	1.5	1.5	132.1	O K
5760 min Winter	13.556	0.556	0.0	1.4	1.4	116.1	O K
7200 min Winter	13.490	0.490	0.0	1.3	1.3	102.5	O K
8640 min Winter	13.435	0.435	0.0	1.2	1.2	90.9	O K
10080 min Winter	13.388	0.388	0.0	1.1	1.1	81.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	68.161	0.0	75.4	33
60 min Winter	42.440	0.0	114.7	62
120 min Winter	25.637	0.0	137.8	122
180 min Winter	18.882	0.0	151.4	180
240 min Winter	15.130	0.0	160.6	238
360 min Winter	11.067	0.0	173.2	354
480 min Winter	8.857	0.0	181.6	468
600 min Winter	7.446	0.0	187.6	578
720 min Winter	6.460	0.0	192.0	686
960 min Winter	5.160	0.0	197.6	886
1440 min Winter	3.755	0.0	200.8	1098
2160 min Winter	2.729	0.0	270.5	1560
2880 min Winter	2.175	0.0	286.6	2016
4320 min Winter	1.578	0.0	304.1	2856
5760 min Winter	1.256	0.0	333.6	3688
7200 min Winter	1.051	0.0	349.1	4472
8640 min Winter	0.909	0.0	362.0	5272
10080 min Winter	0.804	0.0	373.0	6048

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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)	20.400	Shortest Storm (mins)	15
Ratio R	0.398	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+35

Time Area Diagram

Total Area (ha) 0.330

Time (mins) From:	To:	Area (ha)
0	4	0.330

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Model Details

Storage is Online Cover Level (m) 15.000

Cellular Storage Structure

Invert Level (m) 13.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	220.0	0.0	1.210	0.0	0.0
1.200	220.0	0.0			

Orifice Outflow Control

Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 13.000

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Summary of Results for 100 year Return Period (+45%)

Half Drain Time : 1188 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	13.428	0.428	0.0	1.2	1.2	89.5	O K
30 min Summer	13.560	0.560	0.0	1.4	1.4	117.0	O K
60 min Summer	13.693	0.693	0.0	1.5	1.5	144.8	O K
120 min Summer	13.820	0.820	0.0	1.7	1.7	171.4	O K
180 min Summer	13.886	0.886	0.0	1.8	1.8	185.1	O K
240 min Summer	13.925	0.925	0.0	1.8	1.8	193.4	O K
360 min Summer	13.974	0.974	0.0	1.8	1.8	203.6	O K
480 min Summer	14.000	1.000	0.0	1.9	1.9	209.0	O K
600 min Summer	14.012	1.012	0.0	1.9	1.9	211.5	O K
720 min Summer	14.016	1.016	0.0	1.9	1.9	212.3	O K
960 min Summer	14.012	1.012	0.0	1.9	1.9	211.4	O K
1440 min Summer	13.998	0.998	0.0	1.9	1.9	208.6	O K
2160 min Summer	13.966	0.966	0.0	1.8	1.8	202.0	O K
2880 min Summer	13.928	0.928	0.0	1.8	1.8	193.9	O K
4320 min Summer	13.849	0.849	0.0	1.7	1.7	177.3	O K
5760 min Summer	13.775	0.775	0.0	1.6	1.6	161.9	O K
7200 min Summer	13.710	0.710	0.0	1.6	1.6	148.3	O K
8640 min Summer	13.652	0.652	0.0	1.5	1.5	136.3	O K
10080 min Summer	13.602	0.602	0.0	1.4	1.4	125.9	O K
15 min Winter	13.480	0.480	0.0	1.3	1.3	100.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	145.969	0.0	73.1	19
30 min Summer	95.877	0.0	88.6	34
60 min Summer	59.944	0.0	143.8	64
120 min Summer	36.168	0.0	170.9	124
180 min Summer	26.535	0.0	185.0	182
240 min Summer	21.165	0.0	194.1	242
360 min Summer	15.395	0.0	206.6	362
480 min Summer	12.269	0.0	214.8	482
600 min Summer	10.281	0.0	220.5	600
720 min Summer	8.895	0.0	224.5	720
960 min Summer	7.071	0.0	229.1	836
1440 min Summer	5.110	0.0	230.1	1082
2160 min Summer	3.686	0.0	325.8	1476
2880 min Summer	2.921	0.0	342.5	1900
4320 min Summer	2.101	0.0	352.8	2724
5760 min Summer	1.662	0.0	394.2	3520
7200 min Summer	1.384	0.0	410.4	4320
8640 min Summer	1.192	0.0	423.7	5096
10080 min Summer	1.050	0.0	434.8	5848
15 min Winter	145.969	0.0	79.4	19

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Summary of Results for 100 year Return Period (+45%)

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	13.627	0.627	0.0	1.5	1.5	131.1	O K
60 min Winter	13.777	0.777	0.0	1.6	1.6	162.4	O K
120 min Winter	13.921	0.921	0.0	1.8	1.8	192.5	O K
180 min Winter	13.996	0.996	0.0	1.9	1.9	208.3	O K
240 min Winter	14.042	1.042	0.0	1.9	1.9	217.7	O K
360 min Winter	14.100	1.100	0.0	2.0	2.0	229.9	O K
480 min Winter	14.132	1.132	0.0	2.0	2.0	236.7	O K
600 min Winter	14.150	1.150	0.0	2.0	2.0	240.3	O K
720 min Winter	14.158	1.158	0.0	2.0	2.0	242.0	O K
960 min Winter	14.157	1.157	0.0	2.0	2.0	241.8	O K
1440 min Winter	14.132	1.132	0.0	2.0	2.0	236.7	O K
2160 min Winter	14.087	1.087	0.0	1.9	1.9	227.3	O K
2880 min Winter	14.031	1.031	0.0	1.9	1.9	215.6	O K
4320 min Winter	13.917	0.917	0.0	1.8	1.8	191.6	O K
5760 min Winter	13.812	0.812	0.0	1.7	1.7	169.8	O K
7200 min Winter	13.722	0.722	0.0	1.6	1.6	150.8	O K
8640 min Winter	13.644	0.644	0.0	1.5	1.5	134.7	O K
10080 min Winter	13.578	0.578	0.0	1.4	1.4	120.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	95.877	0.0	95.8	33
60 min Winter	59.944	0.0	160.1	62
120 min Winter	36.168	0.0	188.3	122
180 min Winter	26.535	0.0	203.1	180
240 min Winter	21.165	0.0	212.6	238
360 min Winter	15.395	0.0	225.6	354
480 min Winter	12.269	0.0	234.1	470
600 min Winter	10.281	0.0	239.9	584
720 min Winter	8.895	0.0	243.9	694
960 min Winter	7.071	0.0	248.4	906
1440 min Winter	5.110	0.0	248.7	1138
2160 min Winter	3.686	0.0	364.4	1600
2880 min Winter	2.921	0.0	381.8	2048
4320 min Winter	2.101	0.0	387.8	2936
5760 min Winter	1.662	0.0	441.5	3752
7200 min Winter	1.384	0.0	459.6	4608
8640 min Winter	1.192	0.0	474.6	5360
10080 min Winter	1.050	0.0	487.1	6152

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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)	20.400	Shortest Storm (mins)	15
Ratio R	0.398	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.330

Time (mins) From:	To:	Area (ha)
0	4	0.330

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Model Details

Storage is Online Cover Level (m) 15.000

Cellular Storage Structure

Invert Level (m) 13.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	220.0	0.0	1.210	0.0	0.0
1.200	220.0	0.0			

Orifice Outflow Control

Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 13.000

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