MME PLANNING

LAND SOUTH OF HILLYBARN FARM,
HILLYBARN ROAD, CRAWLEY RH11 0LF

Drainage Design Strategy

June 2026
(Revised September 2026)

eas ltd
Environmental Assessment Services Ltd

REPORT DATA SHEET

Requirement	**Data**
Report Reference	914/MMEPlanning/LandSouthofHillybarnFarm/DDS
Date	June 2026
Client	MME Planning
Report type	Drainage Design Strategy
Purpose	Planning
Revisions	September 2026
Prepared by	Daniel Milford BSc (Hons)  Signed
Approved by	Eur Ing Malcolm McKemey BSc (Hons), CEng, CEnv, MICE, MCIWEM, MIEnvSc  Signed

MME PLANNING

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HILLYBARN ROAD, CRAWLEY RH11 0LF

Drainage Design Strategy

June 2026
(Revised September 2026)

1. EXISTING SITE & PROPOSED DEVELOPMENT

1.1 The site comprises of an existing static home with gravel driveway on a field south of Hillybarn Farm. The site area is approximately 0.32 ha. The Ordnance Survey (OS) map reference for the site is TQ 23161 37942. The site elevation is approximately +78 m OD. See Appendix A, Figure 1 for the site location plan.

1.2 According to the British Geological Survey (available online), the site lies on Weald Clay Formation – Mudstone. Online Environment Agency (EA) groundwater mapping identifies the site to lie on an unproductive stratum. The site does not lie within a groundwater source protection zone.

1.3 The proposal is for a two-pitch site for settled gypsy accommodation including commensurate amenity areas and spaces for parking and a touring caravan. The existing topography of the site slopes southward towards Hillybarn Road.

1.4 A drainage ditch runs along the southern boundary flowing west, then south down Hillybarn Road. A sewage treatment plant is installed at the south of the site with outfall flowing into the drainage ditch.

2. FLOOD RISK ASSESSMENT

2.1 According to the EA online Flood Map for Planning, the site lies within Flood Zone 1. The EA online Risk of Flooding from Surface Water map shows that the site is at a low risk of surface water flooding along the western boundary.

2.2 As the site is less than 1 ha in area and lies within Flood Zone 1, there is no requirement for a flood risk assessment under the National Planning Policy Framework (NPPF) and associated guidance documents.

2.3 In this case, it is required by Horsham District Council (HDC) that all runoff for the 1 in 100-year flood event, plus allowance for climate change and urban creep, will be managed on site, and that the discharge from the proposed development will be restricted to Greenfield run-off rate.

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3. EXISTING DRAINAGE

3.1 The site was visited on 20 May 2026 to examine the existing drainage. See Appendix B for site photographs.

3.2 Formal surface water drainage on the site, as existing, comprises drainpipe downpipes on the existing static home that discharge onto the ground, a west flowing drainage ditch along the southern boundary of the site, and shallow drainage channels run north to south across the site to allow flow from the northern and eastern field areas to the southern drainage ditch. The existing driveway for the site consists of a permeable gravel surfacing.

3.3 As a general rule, the flow permitted to leave the developed site should not exceed the 1 in 1 year Greenfield flow rate. The Greenfield runoff rate for the site has therefore been estimated using the UK Sustainable Drainage (UKSUDS) Greenfield Runoff Estimation Tool. The runoff rates are given for scenarios up to (and including) the 1 in 100-year storm event, as summarised in Table 3.1 below and provided in Appendix D.

TABLE 3.1
GREENFIELD RUNOFF RATES

Return period	Flow rates (l/s)
Qbar	3.7
1 in 1 year	3.1
1 in 10 year	5.9
1 in 30 year	8.4
1 in 100 year	11.7

3.4 According to the DEFRA non-statutory technical standards for sustainable drainage systems, the maximum discharge permitted to leave the whole site post development should not exceed 3.1 l/s.

3.5 The foul sewage should also be allowed for in the permitted discharge flow rate. The peak foul sewage design flow has been calculated for the proposed site as 0.10 l/s (see Section 6 below), therefore the surface water discharge should not exceed 3.0 l/s.

4. PROPOSED DRAINAGE

4.1 The proposed residential development may increase the impermeable area of the site compared to its former use, which could increase the peak flow following a rainfall event. It has been estimated that following development 0.02 ha of the site will be impermeable, and the rest (0.3 ha) will consist of permeable surfacing. The permeable surfacing will still discharge informally as Greenfield (as existing) and only the controlled drainage from the impermeable areas will be subject to SuDS measures.

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4.2 It has been required that the drainage design of the developed site should retain onsite flows up to the 1 in 100-year return period event, including an allowance for climate change and urban creep. The ways in which this can be achieved are discussed in 5.3 and 5.4 below.

4.3 Drainage to Soakaway

4.3.1 Drainage to soakaway (infiltration) is the preferred Sustainable Urban Drainage System (SUDS) solution. The underlying Weald clay is not considered a suitable medium for soakaway as it is known to have an exceptionally low or no infiltration value.

4.3.2 A soakaway is not considered practicable in this case.

4.4 Attenuation Storage

4.4.1 The alternative to soakaway drainage would be attenuation storage onsite, with discharge limited to the Greenfield flow for the impermeable areas (in this case 3.0 l/s). This would require a discharge point such as the southern drainage ditch.

4.4.2 Using the UKSUDS Surface Water Storage Requirements model, the total storage volume required for the site, for the 1 in 100 year plus climate change and urban creep scenario, has been calculated as 5.7 m^3. See Appendix D.

4.4.3 Attenuation storage could be provided in the form of ponds, swales, a detention basin or an underground geocellular/modular system wrapped in an impermeable geomembrane. A swale is considered to be appropriate for the site.

4.4.4 A suitable location for the swale would be to the southeastern corner of the site. This would allow for the outlet for the swale to discharge into the drainage ditch along the southern site boundary.

4.4.5 In order to provide the required storage volume for the site, with a storage design depth of 0.6 m and side slope of 1 in 3, the dimensions of the swale base would need to be 1.7 m x 0.6 m (surface dimensions 5.3 m x 4.2 m). See Appendix D.

4.4.6 It would be beneficial to locate the swale outlet upstream of the foul discharge outlet (see 6. below) in the drainage ditch. See Appendix A for the proposed drainage design.

4.4.7 Where drainage to the drainage ditch is required, it will be necessary to obtain an ordinary watercourse land discharge consent from HDC.

4.5 Other Sustainable Urban Drainage System (SUDS) Options

4.5.1 Permeable gravel surfacing has been used for the driveway, permitting surface water to infiltrate into the underlying structure, delay discharge and reduce peak flows following a rainfall event. It is recommended that any extension of the driveway be underlain by a shallow drainage blanket of no fine stone wrapped in a permeable geotextile.

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4.5.2 Additional SUDS options could include rainwater harvesting. Rainwater could be used for irrigation purposes within the garden, via water butts connected to roof downpipes.

4.5.3 It may be possible to incorporate a green roof into the proposed design. Green roofs reduce the volume and rate of runoff and can be low maintenance, generally requiring bi-annual maintenance visits.

5. SURFACE WATER DRAINAGE DESIGN

5.1 Design Philosophy

5.1.1 The drainage strategy is for surface water to be drained into attenuation storage, comprising a swale with outflow discharged into the drainage ditch lying along the southern site boundary, with discharge limited to the 1 in 1 year flow rate for the site (in this case 3.0 l/s). The converted school residences and newly proposed dwellings will have separate storage units. See Figure 3 in Appendix A for the suggested drainage arrangement.

5.2 Design Storm

5.2.1 The surface water drainage system has been designed for the 30-year return period event with 10% urban creep plus a 35% allowance for climate change and tested for surcharge for the 1 in 100-year return period event (1% Annual Exceedance Probability) plus a 45% allowance for climate change. See Appendix A, Figure 3 for the proposed drainage design and Appendix E for pipe and chamber layout and sizing of the attenuation storage from the MasterDrain model.

5.3 Drainage Design Model

5.3.1 The attenuation storage has been designed to accommodate the 1 in 100-year return period storm event plus a 45% allowance for climate change using the MasterDrain network model.

5.3.2 An appropriate attenuation storage size has been calculated as a storage design depth of 0.6 m and side slope of 1 in 3, giving a base length of 1.7 m and base width of 0.6 m (surface dimensions 5.3 m x 4.2 m).

5.4 Hydrogeological Data

5.4.1 Hydrological data based on FEH22 rainfall data for the site and applied to the MasterDrain model is given in Appendix D. The chamber details, pipe sizes and levels are shown in Appendix D and summarised in Table 5.1 below:

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TABLE 5.1
SURFACE WATER DRAINAGE

Ref.	Dia (mm)	Cover level (mAOD)	Invert level (mAOD)	Pipe dia in (mm)	Pipe dia out (mm)
SW1	450	80.00	79.50	-	100
SW2	450	80.00	79.41	100	100
SW3	900	78.00	77.50	-	100
Swale	-	78.00	77.37	100, 100	150
SW4	450	78.00	77.32	150	100
Ditch	-	77.00	76.50	100	-

5.5 **Extreme event**

5.5.1 If an extreme storm event overwhelmed the surface water drainage system at the site and/or if the drainage system were to fail, ground levels would indicate that surface water would discharge into the drainage ditch lying along the southern site boundary, as per the present situation.

6. FOUL SEWERAGE

6.1 There is presently a sewage treatment plant installed in 2021 along the southern boundary of the site with outfall to the adjacent drainage ditch. This sewage treatment plant was installed without necessary planning permission and is sited within 10 m of the watercourse. Foul sewerage for the proposed development would comprise of utilising this sewage treatment plant once it has been relocated to a location 10 m from the watercourse.

6.2 No permit from the Environment Agency (EA) would be required for the relocation of the sewage treatment plant, provided that it adheres to the EA's General Binding Rules for a discharge to a watercourse. The General Binding Rules relevant to this type of site and discharge to a watercourse are provided in Appendix E.

6.3 New discharges are not allowed to a ditch or a surface water that does not contain flowing water throughout the whole year. That is unless there is a drought or an unusually long period of dry weather. New discharges to watercourses that seasonally dry up are not allowed under the general binding rules, nor are discharges to enclosed lakes or ponds.

6.4 The proposed development will comprise one dwelling. According to the WRc publication "Sewers for Adoption" (8th Edition), the design (peak) flow from a proposed residential development should be based on water use of 5000 l/dwelling/day. This gives the overall (peak) foul sewage design flow for the site as 0.10 l/s.

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6.5 It is advised that the peak foul sewage design flow (0.10 l/s) should be deducted from the maximum permitted discharge from the surface water attenuation storage.

6.6 The results of the sewerage design from the MasterDrain Foul analysis given in Appendix D and illustrated in Figure 3 are summarised in Table 6.1 below:

TABLE 6.1
FOUL SEWERAGE

Ref.	Dia (mm)	Cover level (mAOD)	Invert level (mAOD)	Pipe dia in (mm)	Pipe dia out (mm)
FW1	450	80.00	79.50	-	100
FW2	450	78.00	77.50	100	100
STP	-	78.00	77.37	100	100
Ditch	-	77.00	76.50	100	-

7. OPERATION AND MAINTENANCE

7.1 The drainage system will generally require minimal operational input once construction has been completed. However, it will require some regular maintenance. The maintenance of the drainage systems will be the responsibility of the owners of the residences.

7.2 Required maintenance will include:

- The chambers, gullies, gutters and channels will require regular removal of any silt or other debris. Maintenance should be carried out at the time of year after most leaf fall has occurred.

- The sewage treatment plant will require regular maintenance including monthly visual inspections for damage, wear and corrosion as well as overall security; cleaning every 6 – 12 months, based on usage; removal of debris as and when necessary; and inspection of pumps and control systems every three months.

- The swale will require monthly, or as required, removal of litter and debris; inspection of inlets, outlets, overflows and infiltration surfaces; vegetation management including removal of nuisance plants; and cutting grass to retain height within design range. Vegetation coverage should be inspected monthly for the first six months, quarterly for two years and then on a half yearly basis. Inspection of inlets and facility surface for silt accumulation should be carried out half yearly. Remedial actions should be carried out, as required, including repair of erosion via re-turfing or reseeding, relevelling uneven surfaces to design levels, and removal of sediment, oils and petrol residues using safe standard practices.

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7.3 In accordance with the CIRIA SuDS Manual (C753) the pollution hazard level for the development is considered to be very low for the residential roofs and low for individual property driveways. For the roofs, it is advised to remove gross solids and sediments to satisfy requirements. For the driveways the simple index approach to determine pollution control measures should be applied. As such the permeable surfacing and swale are considered adequate control measures.

8. CONCLUSIONS

8.1 The proposal is for a two-pitch site for settled gypsy accommodation including commensurate amenity areas and spaces for parking and a touring caravan. It is required that all runoff for the 1 in 100 year flood event, plus allowance for climate change and urban creep, will be managed on site and that that discharge from the proposed development will be restricted to 1 in 1 year Greenfield run-off rate.

8.2 The lies within Flood Zone 1. The EA online Risk of Flooding from Surface Water map shows that the site is at a low risk of surface water flooding along the western boundary.

8.3 Existing surface water drainage on site presently includes the shallow drainage channels and permeable driveway. Surface water from the site either soaks into the ground or flows south, draining into the drainage ditch located along the southern site boundary.

8.4 The total storage volume required to retain the 1 in 100 year plus climate change flood event and urban creep on site has been calculated as 5.7 m^3, based on the HR Wallingford UK SUDS Model. The Greenfield run-off rate for the whole site has been calculated as 3.1 l/s.

8.5 It is considered that the proposed development will result in an increase in the impermeable area of the site compared to its current use. This will increase the peak flow following a rainfall event and may increase the flood risk elsewhere. However, despite no apparent increase compared to the prior use, it is estimated that following development 0.02 ha of the site will comprise impermeable surface, and the rest (0.30 ha) will comprise permeable surfacing.

8.6 The preferred sustainable (SUDS) surface water drainage solution for the site would be drainage to soakaway. The underlying geology comprises Weald Clay formation (mudstone). The Weald clay is not considered a suitable medium for soakaway as it is known to have an exceptionally low or no infiltration value. A soakaway would therefore not be considered practicable at this site.

8.7 The alternative to soakaway drainage would be attenuation storage. This would require a discharge point, of which the most practical option would be to the drainage ditch located along the site's southern boundary. Attenuation storage would be implemented as a swale.

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8.8 It is considered that a swale providing the required storage volume of 5.7 m^3, 0.6 m in depth, side slopes of 1 in 3, and base dimensions of 1.7 m x 0.6 m (surface dimensions 5.3 m x 4.2 m), could be located on site, to the southeast of the dwellings. It is recommended that the outlet for the surface water system is upstream of the outlet for the foul sewerage. The discharge into the drainage ditch lying along the site's southern boundary should be limited to 3.0 l/s.

8.9 Where drainage to the ditch is required, it will be necessary to obtain an ordinary watercourse discharge consent from HDC.

8.10 Additional SUDS options which could be incorporated into the development include rainwater harvesting for garden irrigation purposes via the provision of water butts, and green roofs on the static homes.

8.11 There is presently a sewage treatment plant installed along the southern boundary of the site with outfall to the adjacent drainage ditch. This sewage treatment plant was installed without necessary planning permission and is sited within 10 m of the watercourse. Foul sewerage for the proposed development would comprise of utilising this sewage treatment plant once it has been relocated to a location 10 m from the watercourse. No permit should be required from the EA provided the relocated sewage treatment plant adheres to the EA's General Binding Rules for a discharge to a watercourse (subject to the approval of Building Control and appropriate maintenance).

9. RECOMMENDATIONS

9.1 The drainage system will generally require minimal operational input once construction has been completed. However, it will require some regular maintenance.

9.2 The swale as well as all chambers, gutters and gullies are to be kept clear of debris and build ups of silt to ensure working order and prevent loss of maximum capacity. The swale will additionally require inspection, management and maintenance of vegetation to ensure proper functioning.

9.3 The sewage treatment plant will require regular maintenance including monthly visual inspections for damage, wear and corrosion as well as overall security; cleaning every 6 – 12 months, based on usage; removal of debris as and when necessary; and inspection of pumps and control systems every three months.

9.4 It is advised to remove gross solids and sediments from the roof as and when necessary.

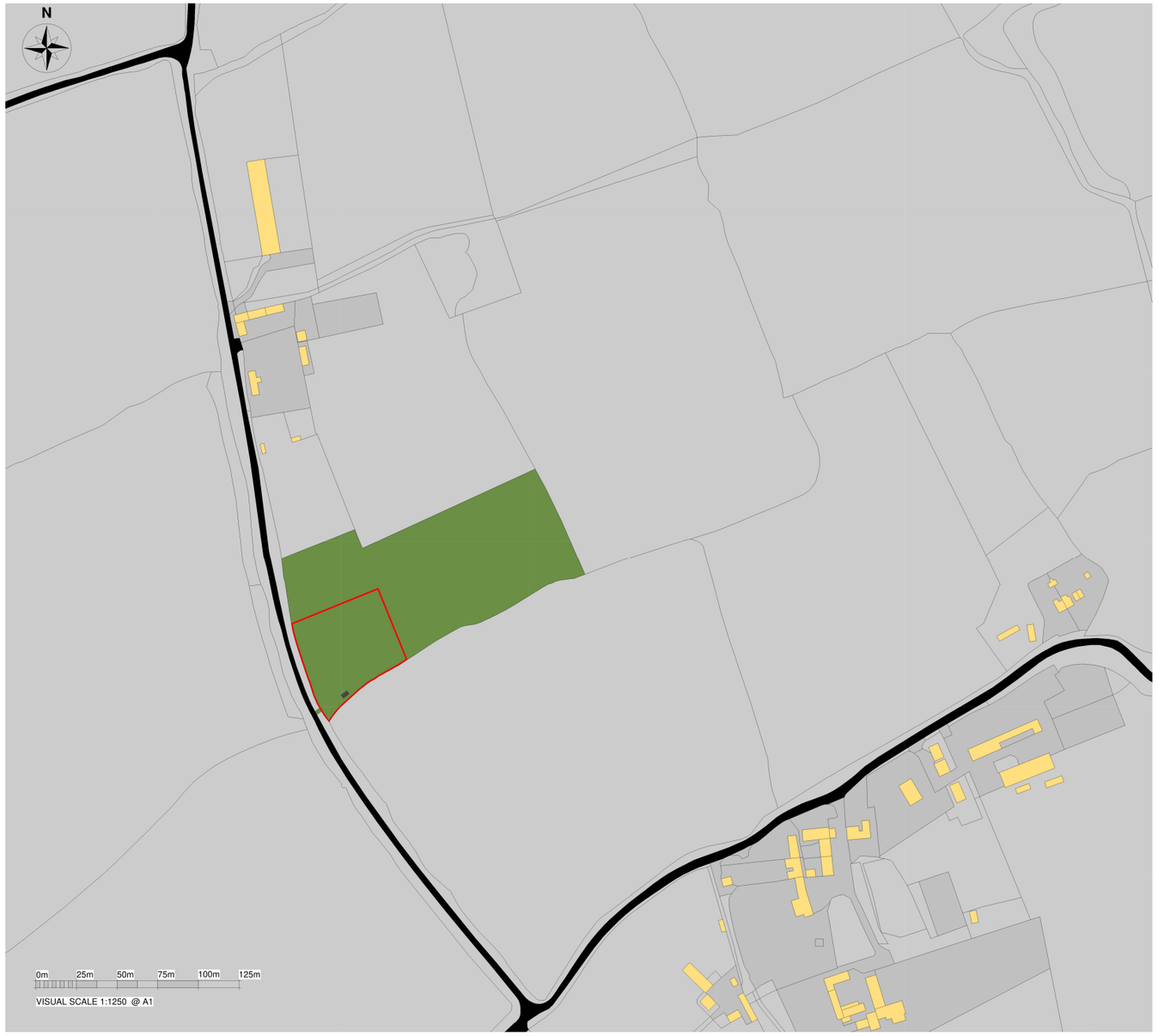
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APPENDIX A

Figures

Figure 1: Site Location
Figure 2: Proposed Development
Figure 3: Suggested Drainage Design



1 Location Plan
1 : 1250

No.	Description	Date

Land South of Hillybarn Farmhouse RH11 0LF

Location Plan

Project number	PR003
Date	13/10/2020
Drawn by	Rhett Flashman
Checked by	Phil Rowe
A100	
Scale	1 : 1250

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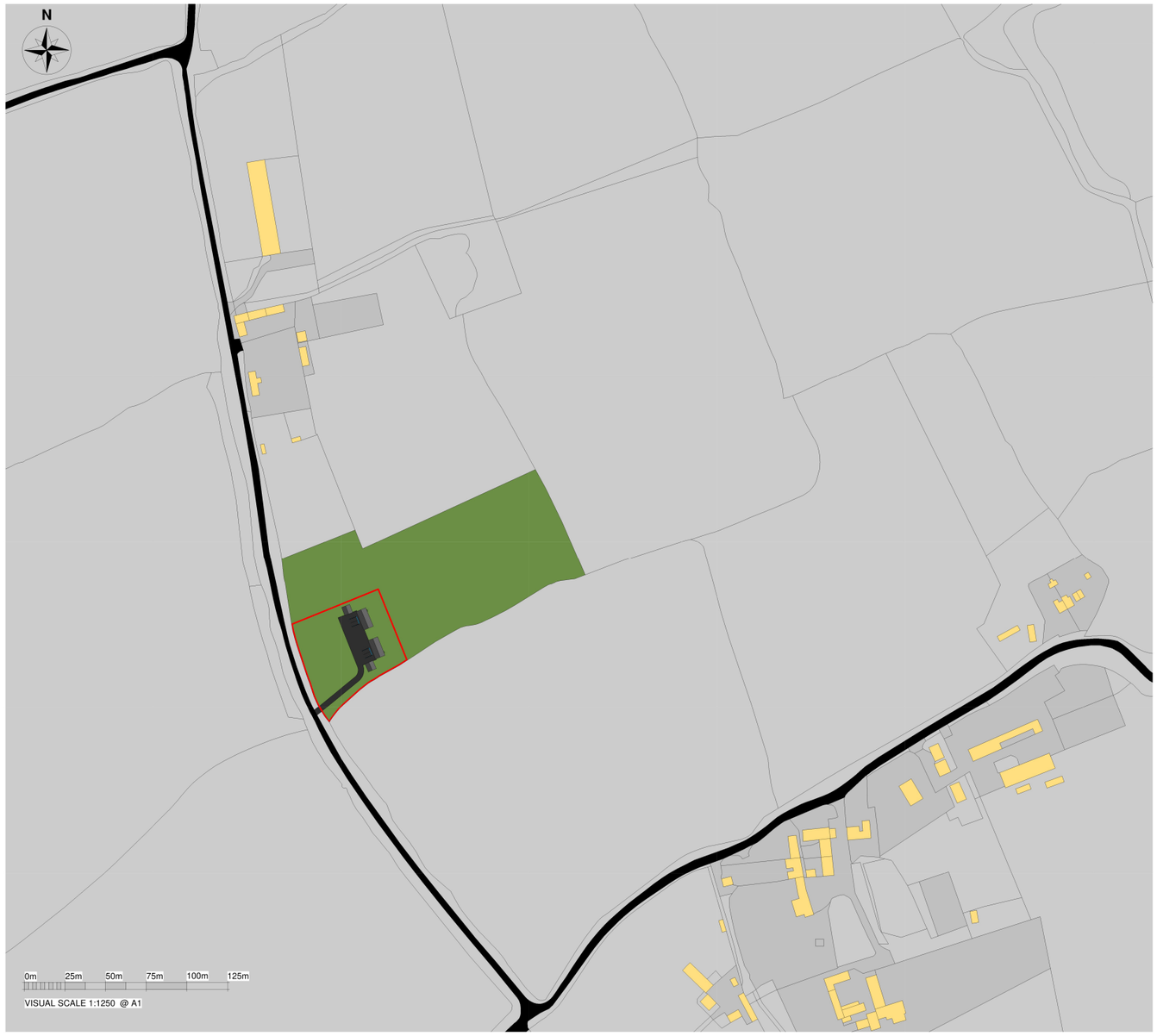
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LAND SOUTH OF HILLYBARN FARM,
HILLYBARN ROAD, CRAWLEY RH11 0LF

Location Plan

Scale as shown

June 2026



1 Proposed Block Plan
1 : 1250

No.	Description	Date

Land South of Hillybarn Farmhouse RH11 0LF

Proposed Block Plan

Project number	PR003
Date	13/10/2020
Drawn by	Rhett Flashman
Checked by	Phil Rowe
A101	
Scale	1 : 1250

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LAND SOUTH OF HILLYBARN FARM,
HILLYBARN ROAD, CRAWLEY RH11 0LF

Proposed Development

Scale as shown

June 2026



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Scale as shown

LAND SOUTH OF HILLYBARN FARM,
HILLYBARN ROAD, CRAWLEY RH11 0LF

Suggested Drainage Design

June 2026

APPENDIX B

Site Photographs

Existing static home



Gravel driveway



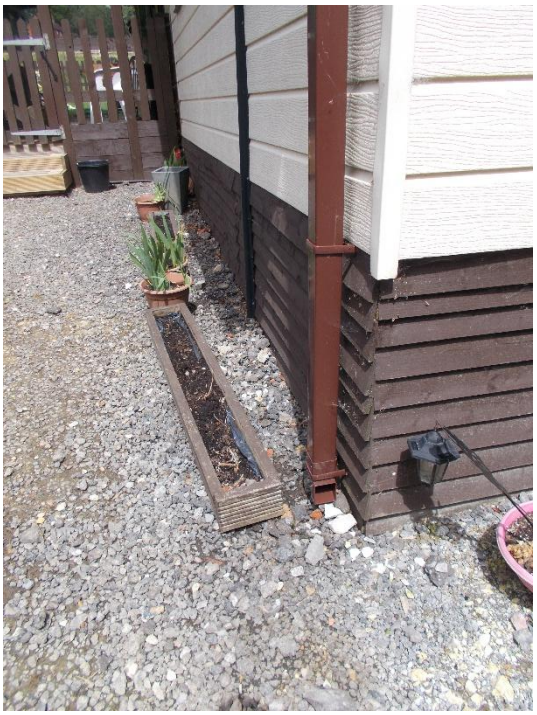
Drainage ditch south of site





Drainpipe downpipes





Drainage channel in east adjacent field



APPENDIX C

UK Sustainable Drainage (UKSUDS) Calculations (Greenfield Runoff Rate and Required Storage Volumes)

Surface water storage volume design tool

www.uksuds.com | Surface water storage volume design tool (https://www.uksuds.com/)

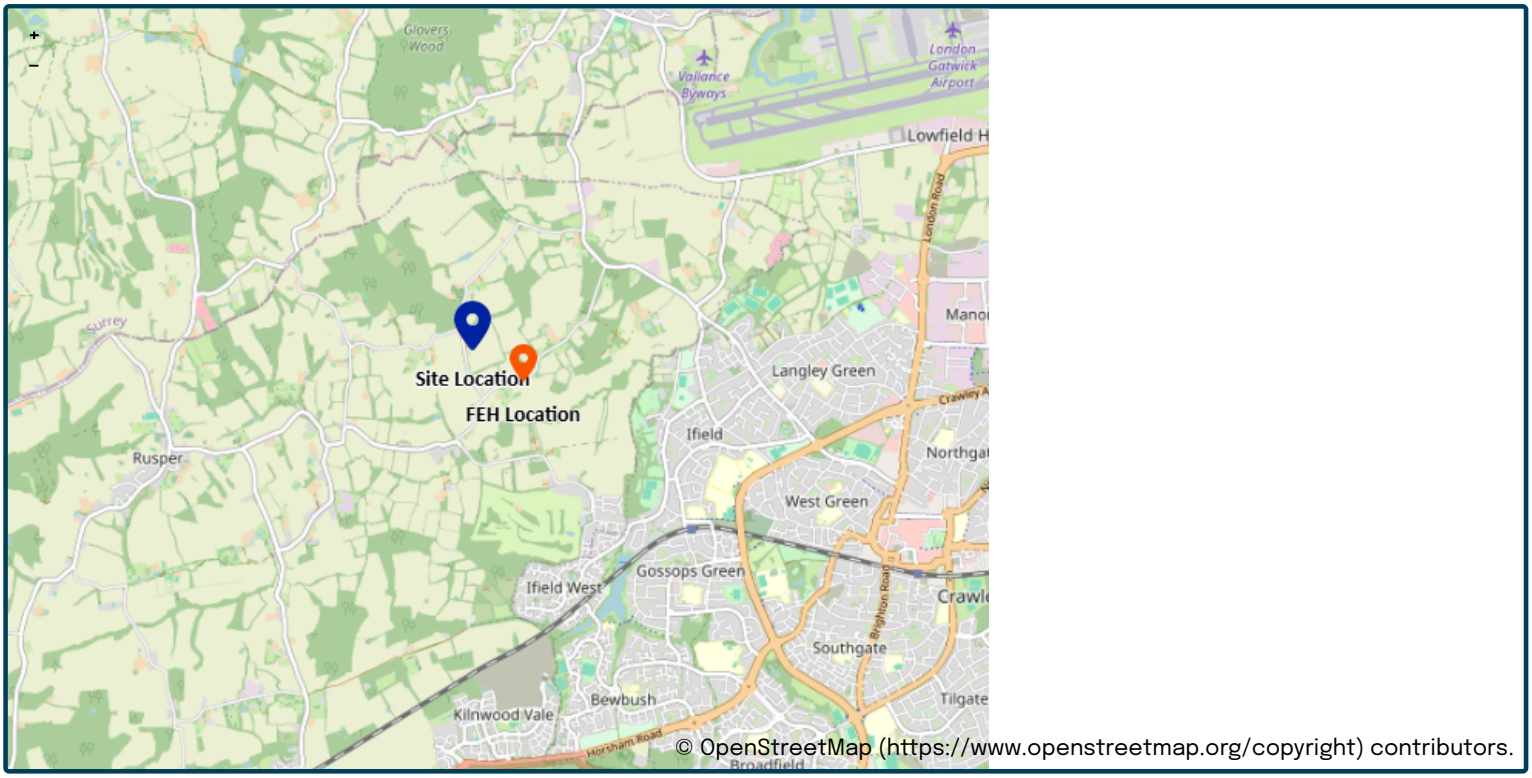
This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). It is recommended that the total storage volume for the site is distributed across the site using multiple SuDS and that hydraulic modelling software is used to undertake and finalise the detailed design of the drainage system.

Project details

Date	18/06/2026
Calculated by	EAS
Reference	914
Model version	2.2.3

Location

Site name	Land South of Hillybarn Farm
Site location	Crawley



Site easting (British National Grid)	523161
Site northing (British National Grid)	137947

Site areas

Total site area (ha)	0.3186	ha

Roof area

Total roof area (ha)	0.0196	ha
Contributing roof area (ha)	0.0196	ha
Non-contributing roof area (ha)	0	ha

Paved area

Total paved area (ha)	0.0546	ha
Contributing paved area (ha)	0	ha
Non-contributing paved area (ha)	0.0546	ha

Grass / vegetated area

Total grass / vegetated area (ha)	0.2444	ha
Contributing grass / vegetated area (ha)	0	ha
Non-contributing grass / vegetated area (ha)	0.2444	ha

Total area

Total contributing area (ha)	0.0196	ha

Contributing areas with urban creep allowance

Urban creep allowance factor	+10%	
Contributing roof area (adjusted for urban creep) (ha)	0.0196	ha
Contributing paved area (adjusted for urban creep) (ha)	0	ha
Contributing grass / vegetated area (adjusted for urban creep) (ha)	0	ha

Storage design parameters

Storage base shape	Rectangular / square	
Storage base length to width ratio	3:1	
Storage design depth (m)	0.6	m
Storage side slope (1 in x)	1 in 3	
Storage voids ratio (%)	100% (all voids)	
Storage volume design return period (years)	1:100 years	

Discharge flow rate from the site

Method

Type of site	Greenfield
Specify the method	FEH statistical (2025)

FEH statistical (2025)

	My value		Map/default value
SAAR9120 (mm)	844 mm		
BFIHOST19scaled	0.237		
QMed (l/s)	2.6 l/s		
QMed-QBar conversion	1.136		1.136
Total area for greenfield runoff calculation (ha)	0.3186 ha		0.3186
QBar (l/s)	2.9 l/s		
Hydrological region	6		6
Return period (years)	1:1 year		
Growth curve factor	0.85		

Final discharge rate

Runoff calculation method	FEH statistical (2025)
Design flow rate (l/s)	2.5 l/s

Blockage risk

Specify the method	Flow rate
Minimum discharge flow rate to prevent blockage	2l/s

	My value		Calculated value
Design orifice diameter (mm)	39 mm		39
Flow rate of orifice (l/s)	2.42 l/s		

Rainfall and runoff

Rainfall input type	FEH22 CSV file
	FEH_Catchment_Rainfall_FEH22_AM_523600_137600.csv
Distance from FEH location to site (km)	0.6 km
Climate change allowance factor	145%
Specify the runoff method from grass / vegetated areas	Fixed percentage - based on rainfall event depth and SPR

	My value		Map value
How should SPR be derived?	WRAP soil type		
WRAP soil type	4		4
SPR	0.47		

Model results

- **Maximum discharge flow rate:** 2.4 (l/s)
- **Outflow orifice diameter:** 39 (mm)
- **Storage base length:** 1.7 (m)
- **Storage base width:** 0.6 (m)
- **Storage base area:** 1.0 (m^2)
- **Storage total volume:** 5.7 (m^3)
- **Storage total water volume:** 5.7 (m^3)
- **Storm return periods run:** 1, 2, 10, 30, 100, 200 (years)
- **Storm durations run:** 15, 30, 60, 120, 180, 240, 360, 540, 720, 900, 1080, 1440, 1800, 2160, 2880, 3600, 4320, 5040, 5760 (minutes)

Return Period (years)	Critical Duration (minutes)	Peak Flow Rate (l/s)	Max Depth (m)	Max water volume (m^3)	Max storage volume (m^3)
1	30	1.4	0.21	0.6	0.6
2	30	1.6	0.27	1.0	1.0
10	30	2.1	0.43	2.6	2.6
30	60	2.2	0.51	4.0	4.0
100	60	2.4	0.60	5.7	5.7
200	60	2.5	0.65	6.8	6.8

Please note runoff estimation and storage volume estimation are subject to uncertainty. Storage volume results are therefore reported to the nearest 1 m^3 value, unless storage volumes are less than 10 m^3, in which case, storage volumes are provided to 1 decimal place.

Disclaimer

This report was produced using the surface water storage volume design tool (2.2.3) developed by HR Wallingford and available at uksuds.com (https://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 uksuds.com/terms-conditions (https://www.uksuds.com/terms-conditions). The outputs from this tool have been used to estimate surface water storage volumes for the whole site based on a limiting discharge rate from the site. 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, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

HR Wallingford are not responsible for any rainfall data shared that is subject to licensing terms imposed by UK Centre for Ecology & Hydrology's Flood Estimation Handbook web service (https://fehweb.ceh.ac.uk/Home/Terms (https://fehweb.ceh.ac.uk/Home/Terms)).

Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

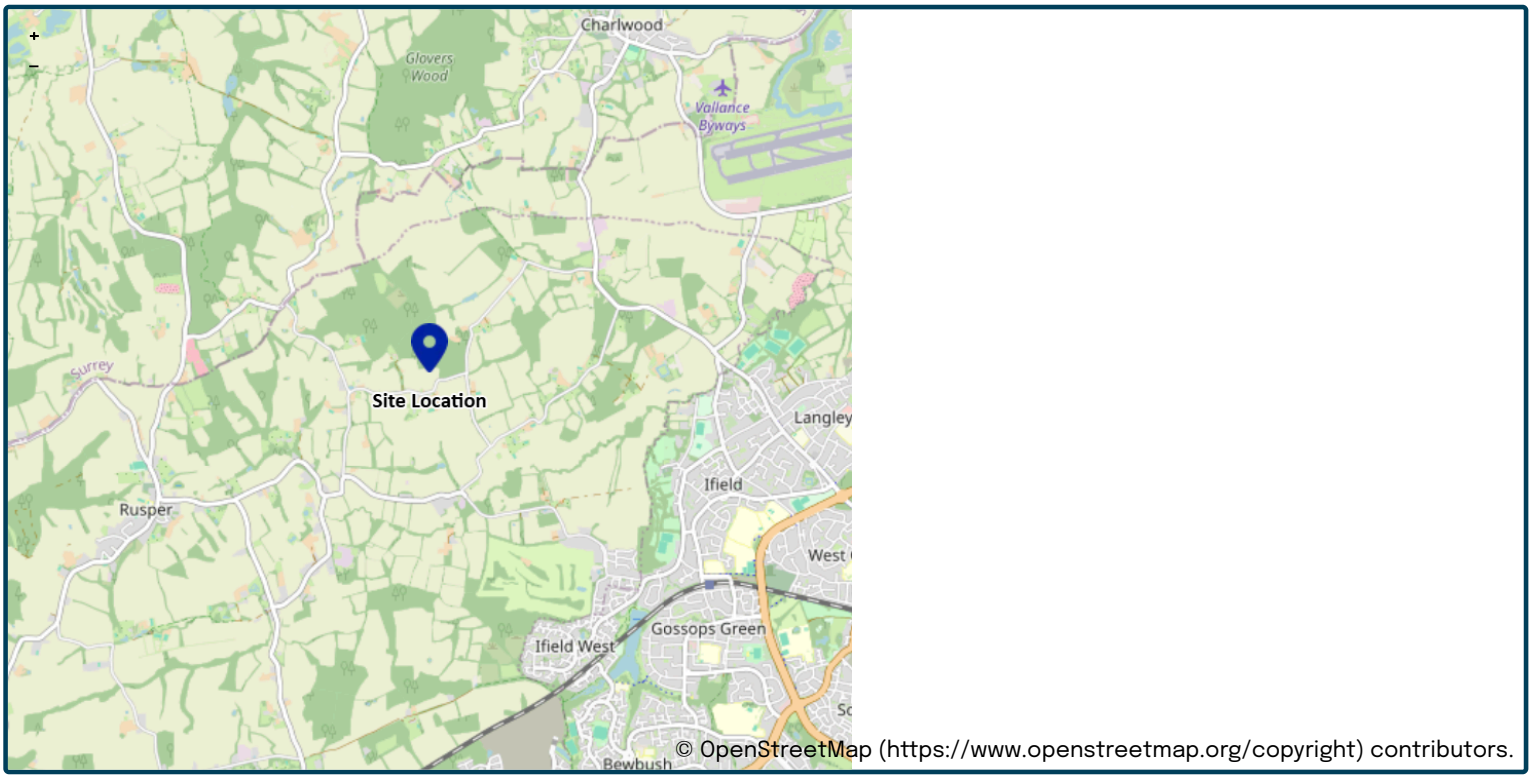
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015).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

Project details

Date	29/05/2026
Calculated by	EAS
Reference	914
Model version	2.2.3

Location

Site name	Hillybarn Farm
Site location	Hillybarn Road



Site easting (British National Grid)	522754
Site northing (British National Grid)	138145

Site details

Total site area (ha)	0.4 ha

Greenfield runoff

Method

Method	FEH statistical (2025)

FEH statistical (2025)

	My value		Map value
SAAR9120 (mm)	844 mm		
BFIHOST19scaled	0.237		
QMed-QBar conversion	1.136		1.136
QMed (l/s)	3.2 l/s		
QBar (FEH statistical 2025) (l/s)	3.7 l/s		

Growth curve factors

	My value		Map value
Hydrological region	6		6
1 year growth factor	0.85		
2 year growth factor	0.88		
10 year growth factor	1.62		
30 year growth factor	2.3		
100 year growth factor	3.19		
200 year growth factor	3.74		

Results

Method	FEH statistical (2025)
Flow rate 1 year (l/s)	3.1 l/s
Flow rate 2 year (l/s)	3.2 l/s
Flow rate 10 years (l/s)	5.9 l/s
Flow rate 30 years (l/s)	8.4 l/s
Flow rate 100 years (l/s)	11.7 l/s
Flow rate 200 years (l/s)	13.7 l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.3) developed by HR Wallingford and available at uksuds.com (https://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 uksuds.com/terms-conditions (https://www.uksuds.com/terms-conditions). The outputs from this tool have been used to estimate 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, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

APPENDIX D:

Output from Drainage Design Software

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MasterDrain
HY 11.0

Job No.	914
Sheet no.	1
Date	28/05/26
Project	Land South of Hillybarn Farmhouse
Title	Hydrological data for Hillybarn Farmhouse

By	Checked	Reviewed
EAS		

Data:-

FSR values

Location	= ISFIELD	Grid reference	= TQ4417
M5-60 (mm)	= 20.1	SAAR (mm/yr)	= 815
r	= 0.36	Soil	= 0.40
Long reference	= 544117	Area	= England and Wales
Hydrological area	= 7	Hydrological zone	= 7

Soil classification for WRAP type 3
i) Relatively impermeable soils in boulder and sedimentary clays, and in alluvium, especially in eastern England;
ii) Permeable soils with shallow ground water in low-lying areas;
iii) Mixed areas of permeable and impermeable soils, in approximately equal proportions.

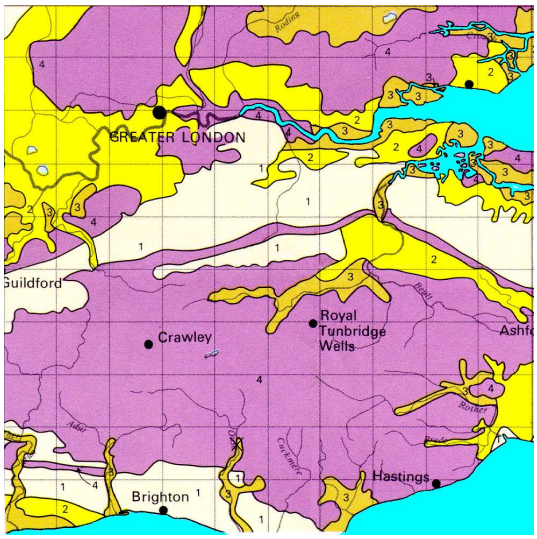
FEH values

c	= -0.026	d1	= 0.360	d2	= 0.340
d3	= 0.348	e	= 0.317	f	= 2.483

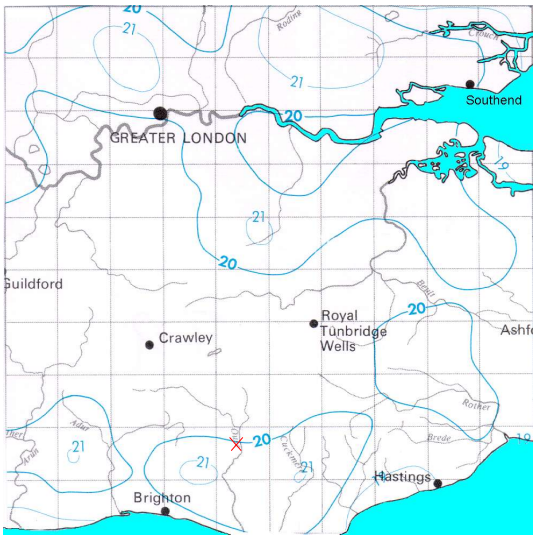
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Job No. 914			
Sheet no. 2			
Date 28/05/26			
Project: Land South of Hillybarn Farmhouse	By EAS	Checked	Reviewed
Title: Hydrological data for Hillybarn Farmhouse			



<- Soil



M5-60 ->



<- SAAR



r x 100 ->

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Job No. 914			
Sheet no. 1			
Date 18/06/26 12:07			
Project LAND SOUTH OF HILLYBARN FARM	By	Checked	Reviewed
Title Manhole printout for LAND SOUTH OF HILLYBARN FARM.SW			

Manhole ref.	X ref	Y ref	Form	Cham diam. or length	Rect. width	Chamb. height	Shaft height	MH Volume	Exit Diam	Exit Crown	Exit Invert	Chamb const	Slab level	Cover Level	Dwnstr MH
SW1	15.9	69.2	circ	450	N/A	0.50		0.08	100	79.625	79.500	N/A	79.450	80.000	SW2
SW2	24	72.2	circ	450	N/A	0.59		0.09	100	79.535	79.410	N/A	79.360	80.000	SWALE
SW3	32.7	37.9	circ	900	N/A	0.50		0.32	150	77.675	77.500	N/A	77.450	78.000	SWALE
SWALE	45.5	38.8	circ	3394	N/A	0.63		5.70	150	77.545	77.370	N/A	77.320	78.000	SW4
SW4	41.5	36.2	circ	450	N/A	0.68		0.11	100	77.445	77.320	N/A	77.270	78.000	DITCH

All manholes to be as per 'Sewers for Adoption'

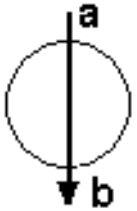
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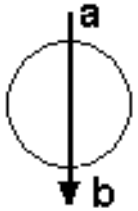
Job No.	914
Sheet no.	2
Date	18/06/26 12:07

Project	By	Checked	Reviewed
LAND SOUTH OF HILLYBARN FARM			

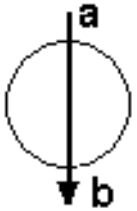
Title Manhole printout for LAND SOUTH OF HILLYBARN FARM.SW



MH = SW1
a=head
b = 100

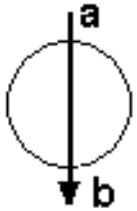


MH = SW2
a= 100
b = 100



MH = SW3
a=head
b = 150

MH = SWALE
a= 100
b = 150
c = 150



MH = SW4
a= 150
b = 100

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Job No.	914
Sheet no.	3
Date	18/06/26 12:07

Project	By	Checked	Reviewed
LAND SOUTH OF HILLYBARN FARM			
Title: Manhole printout for LAND SOUTH OF HILLYBARN FARM.SW			

These explanatory notes should be read in conjunction with the Manhole printout

1) Manhole ref - the reference for the manhole in question
2) Form - either circular or rectangular
3) Chamber diam or length - diameter of chamber if circular, or length if rectangular - in metres
4) Rectangular width - if form is rectangular, this gives the width of the chamber
5) Chamber height - height of chamber from invert
6) Shaft height - height of access shaft if applicable, from top of chamber to ground level
7) Manhole volume - cubic capacity of manhole chamber
8) Exit diameter - diameter of pipe leaving this manhole
9) Exit crown - crown level of pipe leaving this manhole
10) Exit invert - invert level of pipe leaving this manhole
11) Chamb const - manhole construction :-
    - N/A - not specified
    - Conc - concrete rings
    - Poly - polypropylene rings surrounded by selected fill
    - Poly/conc - polypropylene rings surrounded by concrete
    - Brick - brick built with waterproof render
    - In situ - concrete cast in situ
12) Slab level - surface level of base slab (if no sump, this is placed at 50mm below exit invert to allow levels manipulation).
13) Manhole diameters of 9999 have exceeded the sizes available in SfA
14) Manhole diameters may have to be modified due to the number of branches

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MasterDrain SW

Job No.	914
Sheet no.	1
Date	18/06/26
By	
Checked	
Reviewed	

Project: LAND SOUTH OF HILLYBARN FARM

Title: Surcharge calcs (Sized at 30 yrs storm) for LAND SOUTH OF HILLYBARN FARM.SW CCF = 45%

Using in-line restrictors
Return period = 100 yrs
Climate change factor = 45

PEAK hydrograph values printed
Storm duration = 15 mins
No offline storage

Mean rain intens. 310.00 mm/hr
Storm profile = Summer
Using FEH data

Peak rain intens. 1215.20 mm/hr
Sample period = 7.5 secs.

Entry No.		SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	SURCHARGE Depth	EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) x FACTOR	STATUS
1	I	1.01	SW1	6.2	3.9	100	450	79.50	79.56	80.00	0.63	0.06	0.00	0.000	27	OK
2	I	1.02	SW2	14.0	13.4	100	450	79.41	79.50	80.00	0.96	0.09	0.00	0.000	93	OK
3	B	2.01	SW3	17.8	13.4	150	900	77.50	77.61	78.00	0.75	0.11	0.00	0.000	93	OK
4	I	1.03	SWALE	18.2	26.9	150	3394	77.37	77.53	78.00	1.48	0.16	8.70	0.000	186	Surch.
5	I	1.04	SW4‡	35.3	3.0	100	450	77.32	77.33	78.00	0.08	0.01	0.00	0.000	186	OK

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Job No.	914
Sheet no.	2
Date	18/06/26

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Project	LAND SOUTH OF HILLYBARN FARM	By	Checked / Reviewed
Title	Surcharge calcs (Sized at 30 yrs storm) for LAND SOUTH OF HILLYBARN FARM.SW CCF = 45%		

Notes

Printout headings

1) Entry no - position in file
2) Section no - pipe identifier
3) Manhole ref - Manhole identifier
4) Pipe cap - full bore capacity of that pipe
5) Rate of flow - calculated flow rate (l/s) ‡ = flow restrictor.
6) Pipe diam - outlet pipe diameter (mm)
7) Chamber diam - chamber diam. at base of MH
8) Invert level - invert level of manhole
9) Water level - calculated peak water level.
10) Grnd level - ground / cover level
11) Surch. fract - calc.flow/pipe capacity
12) Surch. depth - surcharge level above soffit
13) Overflow - surcharged flow rate (l/s)
14) Flooded vol - volume of water above cover
15) Upstrm Vol - upstream pipe vol to previous manhole(s)
16) Status - OK - outlet not surcharged
17) Status - Surcharged - outlet surcharged
18) Status - Warning - water level within 299mm of cover level
19) Status - Flooded - cover over-topped
20) § against diameter indicates throttle pipe used.

Title box

Hydrograph data

1) Ret. period - that used to calculate profile
2) Duration - length of storm (mins)
3) Profile - either Winter (75%) or Summer (50%)

Flow restrictors

Manhole reference - SW4

Restrictor flowrate - 3 l/s

Flood volumes

Check that the upstream storage of the manhole is adequate to take the flood volume - see Upstrm Vol above.

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Sheet no.	3
Date	18/06/26

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Project: LAND SOUTH OF HILLYBARN FARM

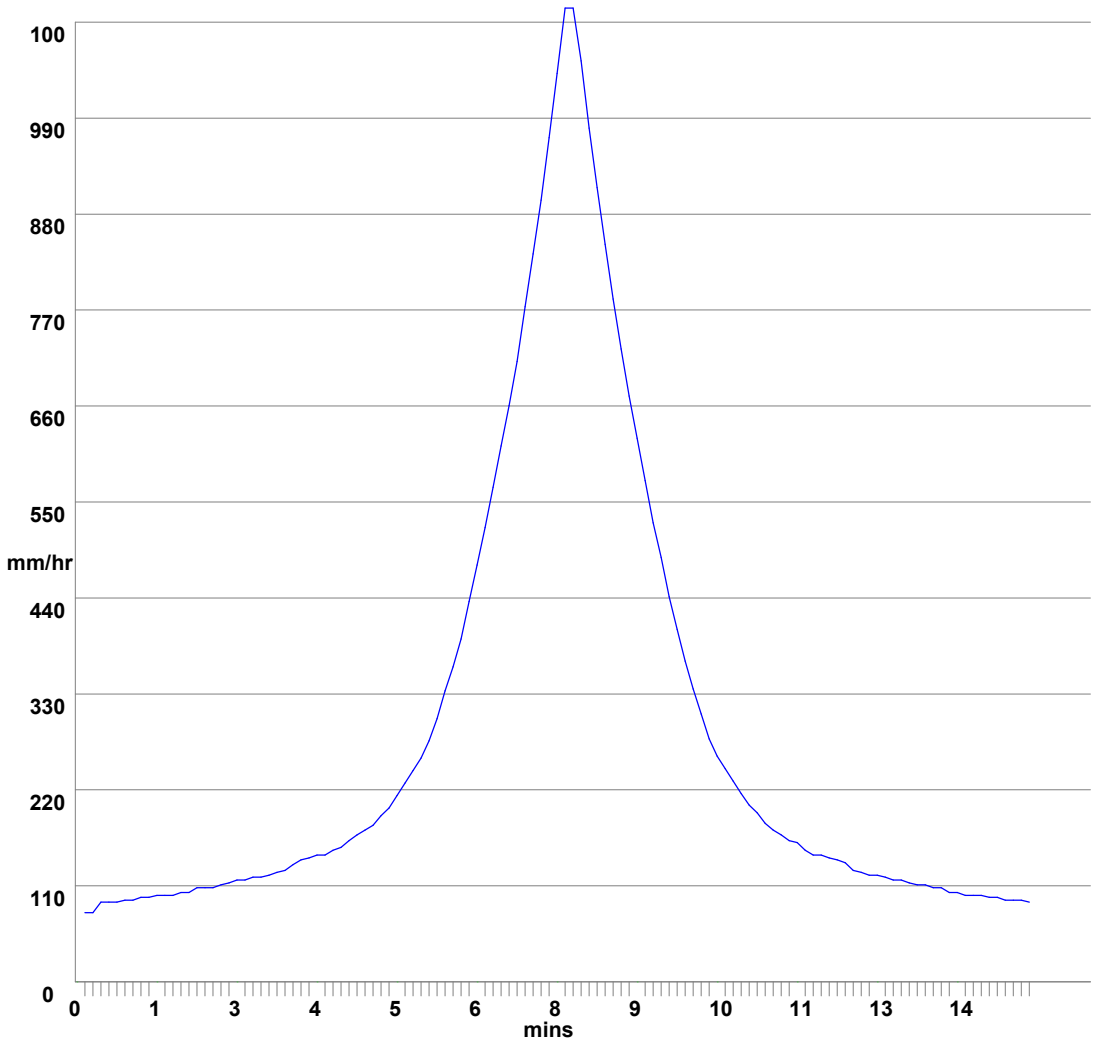
Title: Surcharge calcs (Sized at 30 yrs storm) for LAND SOUTH OF HILLYBARN FARM.SW CCF = 45%

By	Checked	Reviewed

Time mins	Rain mm/hr	Time mins	Rain mm/hr	Time mins	Rain mm/hr
0:08	72.39	5:08	206.84	10:08	222.35
0:15	72.39	5:15	219.77	10:15	209.43
0:22	82.74	5:22	232.69	10:22	196.50
0:30	82.74	5:30	250.79	10:30	183.57
0:38	82.74	5:38	274.06	10:38	175.81
0:45	85.32	5:45	302.50	10:45	165.47
0:52	85.32	5:52	328.36	10:52	157.72
1:00	87.91	6:00	356.80	11:00	152.54
1:08	87.91	6:08	395.58	11:08	147.37
1:15	90.49	6:15	434.36	11:15	144.79
1:22	90.49	6:22	473.15	11:22	137.03
1:30	90.49	6:30	514.51	11:30	131.86
1:38	93.08	6:38	558.47	11:38	131.86
1:45	93.08	6:45	599.84	11:45	129.27
1:52	98.25	6:52	646.37	11:52	126.69
2:00	98.25	7:00	703.25	12:00	124.10
2:08	98.25	7:08	757.55	12:08	116.35
2:15	100.83	7:15	814.43	12:15	113.76
2:22	103.42	7:22	879.07	12:22	111.18
2:30	106.01	7:30	946.29	12:30	111.18
2:38	106.01	7:38	1013.51	12:38	108.59
2:45	108.59	7:45	1013.51	12:45	106.01
2:52	108.59	7:52	959.22	12:52	106.01
3:00	111.18	8:00	889.41	13:00	103.42
3:08	113.76	8:08	827.36	13:08	100.83
3:15	116.35	8:15	767.89	13:15	100.83
3:22	121.52	8:22	711.01	13:22	98.25
3:30	126.69	8:30	659.30	13:30	98.25
3:38	129.27	8:38	610.18	13:38	93.08
3:45	131.86	8:45	566.22	13:45	93.08
3:52	131.86	8:52	522.27	13:52	90.49
4:00	137.03	9:00	478.32	14:00	90.49
4:08	139.62	9:08	442.12	14:08	90.49
4:15	147.37	9:15	400.75	14:15	87.91
4:22	152.54	9:22	367.14	14:22	87.91
4:30	157.72	9:30	333.53	14:30	85.32
4:38	162.89	9:38	305.09	14:38	85.32
4:45	173.23	9:45	279.23	14:45	85.32
4:52	180.98	9:52	253.38	14:52	82.74
5:00	193.91	10:00	235.28	15:00	82.74

Hydrograph profile derived from data in the Flood Studies Report

Return period= 100 yrs Duration= 15 mins Profile - summer



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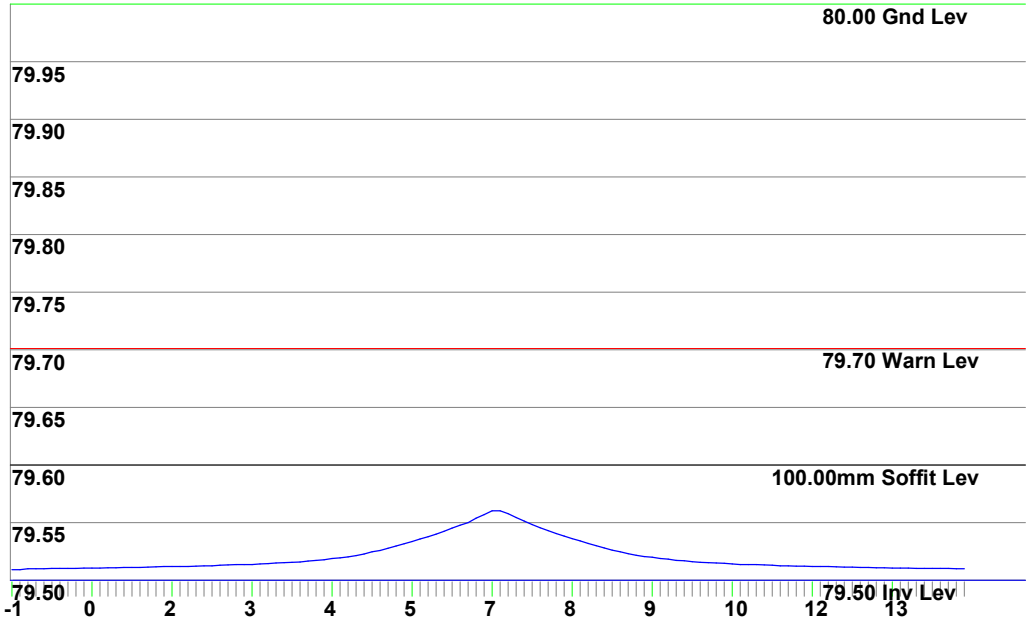
Job No.	914
Sheet no.	4
Date	18/06/26

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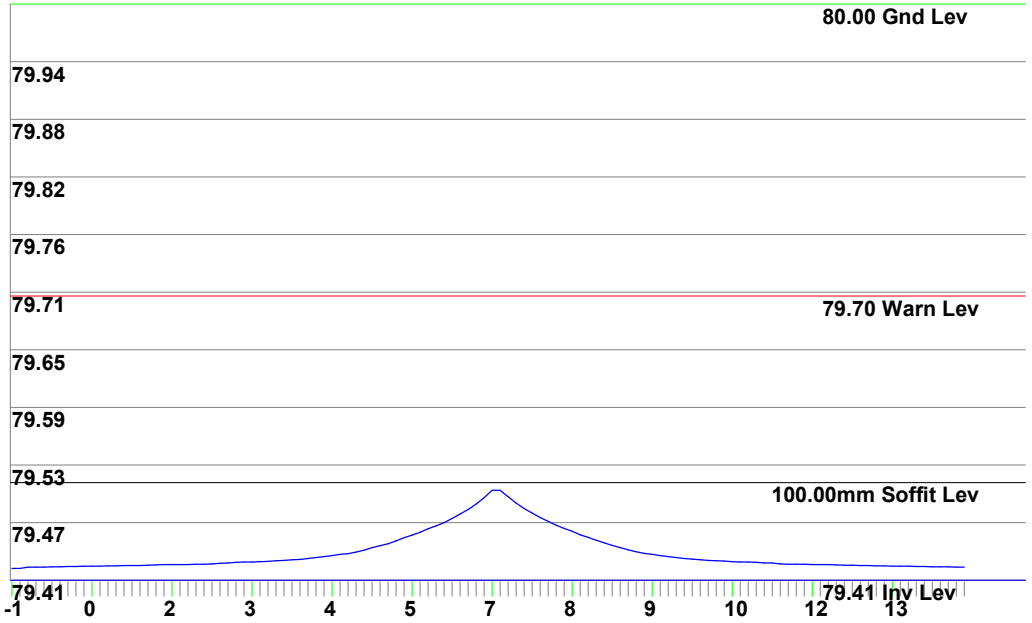
Project: LAND SOUTH OF HILLYBARN FARM

Title: Surcharge calcs (Sized at 30 yrs storm) for LAND SOUTH OF HILLYBARN FARM.SW CCF = 45%

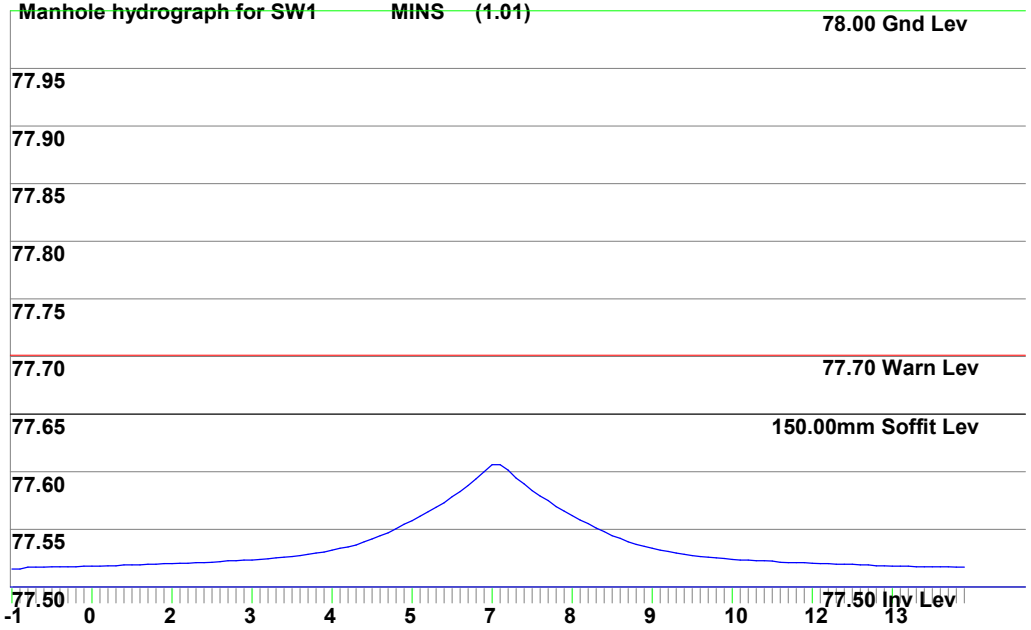
By	Checked	Reviewed



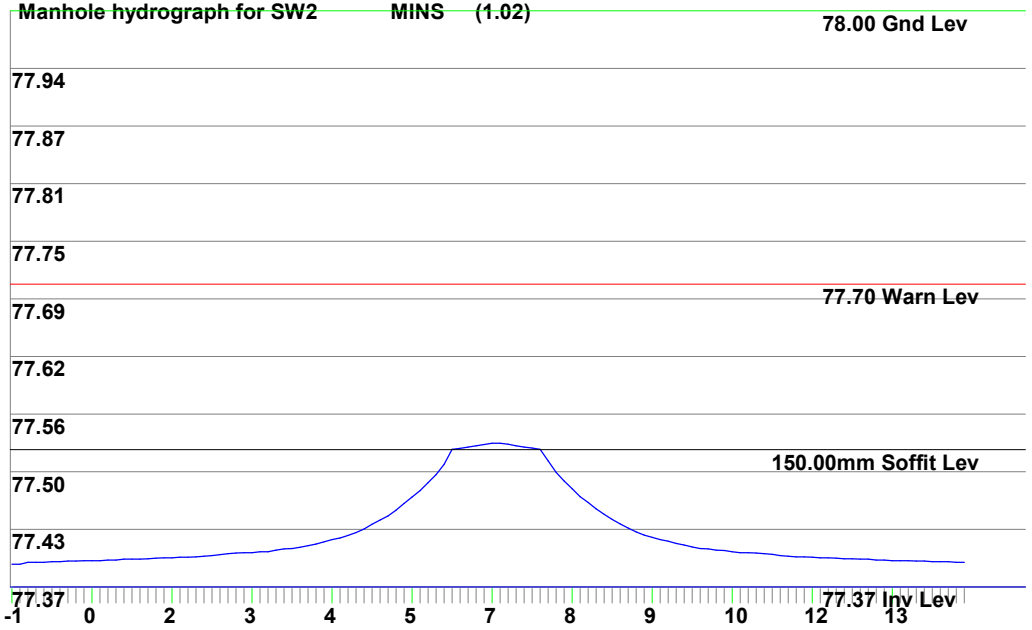
Manhole hydrograph for SW1 MINS (1.01)



Manhole hydrograph for SW2 MINS (1.02)



Manhole hydrograph for SW3 MINS (2.01)



Manhole hydrograph for SWALE MINS (1.03)

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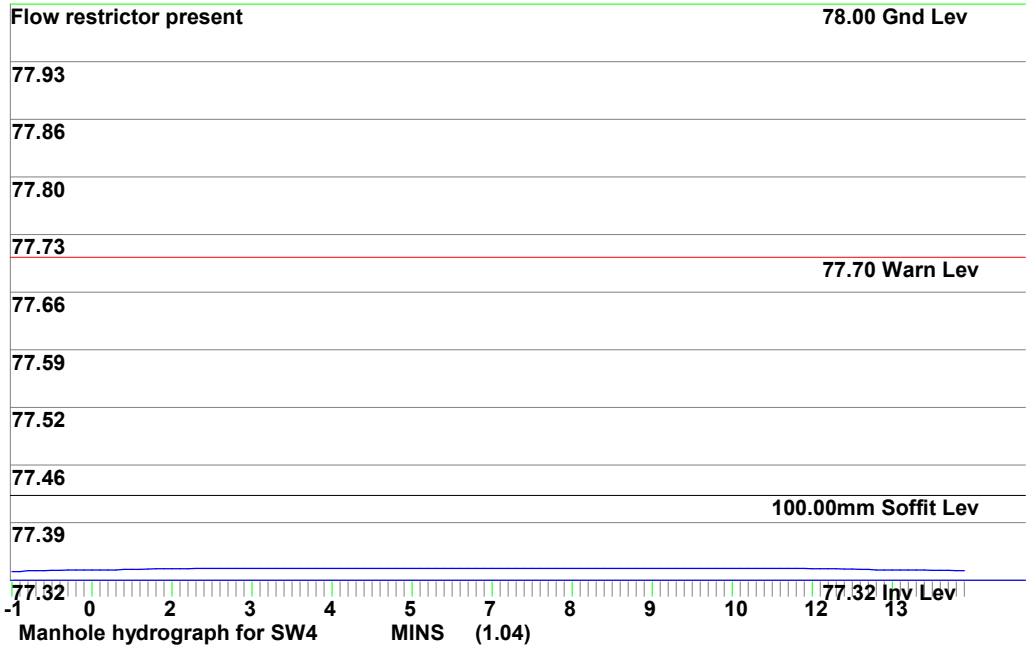
Job No.	914
Sheet no.	5
Date	18/06/26

MasterDrain SW

Project LAND SOUTH OF HILLYBARN FARM

Title Surcharge calcs (Sized at 30 yrs storm) for LAND SOUTH OF HILLYBARN FARM.SW CCF = 45%

By	Checked	Reviewed

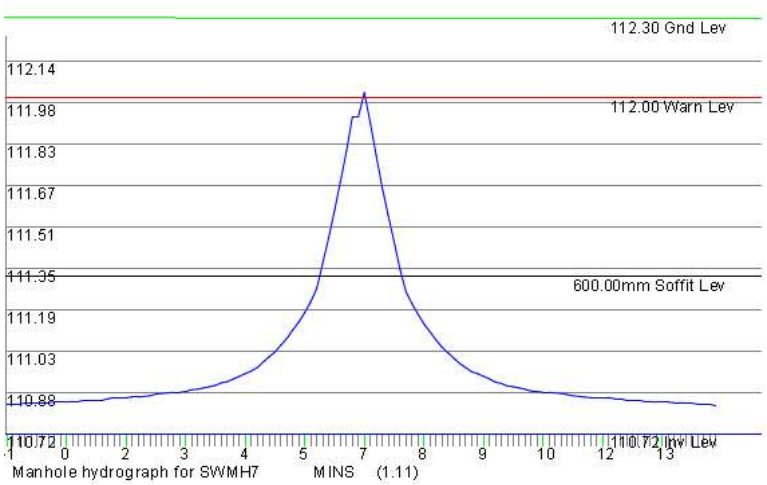


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Job No. 914			
Sheet no. 6			
Date 18/06/26			
Project LAND SOUTH OF HILLYBARN FARM	By	Checked	Reviewed
Title Surcharge calcs (Sized at 30 yrs storm) for LAND SOUTH OF HILLYBARN FARM.SW CCF = 45%			



1) Ground / cover level

2) Warning level - in this case, set at 300mm below cover level.

3) Soffit level of outflow pipe.

4) Invert level of chamber.

Notes

a) Lower section of the graph shows the water depth filling the channel. Channel is assumed to be a full pipe diameter in depth.

b) Upper section of the graph shows the water depth filling the chamber. Chamber has a greater width/diameter than the channel, so increases in depth are proportionally less.

c) The top of the graph clips the warning level and would be marked thus on the printout.

d) In many cases the invert of the offline storage is required to enter at the channel soffit level, meaning that the pipe will still surcharge but flooding risk reduced.

e) The diagram above is a general one and is not part of the current calculation.

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Job No.	914
Sheet no.	0
Date	09/09/26

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Foul 11.5

Project	Land South of Hillbarn Farm	By	Checked / Reviewed
Title	Manhole printout for LAND SOUTH OF HILLYBARN FARM.FL		

Manhole ref.	Form	Cham diam. or length	Rect. width	Chamb. height	Shaft height	MH Volume	Ent. Diam	Ent. Crown	Ent. Invert	Exit Diam	Exit Crown	Exit Invert	Chamb const	Cover Level	Dwnstr MH
FW1	circ	450	N/A	0.50		0.08	Head	----	----	100	79.625	79.500	N/A	80.000	FW2
FW2	circ	450	N/A	0.50		0.08	100	0.000	0.000	100	77.625	77.500	N/A	78.000	STP
STP	circ	450	N/A	0.63		0.10	100	0.000	0.000	100	77.495	77.370	N/A	78.000	DITCH

All manholes to be as per 'Sewers for Adoption'

Levels calculated for level inverts

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Job No.	914
Sheet no.	0
Date	09/09/26
Project	Land South of Hillbarn Farm
Title	Manhole printout for LAND SOUTH OF HILLYBARN FARM.FL

By	Checked	Reviewed

These explanatory notes should be read in conjunction with the Manhole printout

1) Manhole ref - the reference for the manhole in question

2) Form - either circular or rectangular

3) Chamber diam or length - diameter of chamber if circular, or length if rectangular - in metres

4) Rectangular width - if form is rectangular, this gives the width of the chamber

5) Chamber height - height of chamber from invert

6) Shaft height - height of access shaft if applicable, from top of chamber to ground level

7) Manhole volume - cubic capacity of manhole chamber

8) Exit diameter - diameter of pipe leaving this manhole

9) Exit crown - crown level of pipe leaving this manhole

10) Exit invert - invert level of pipe leaving this manhole

11) Manhole diameters of 9999 have exceeded the sizes available in SfA

12) Manhole diameters may have to be modified due to the number of branches

APPENDIX E:

Environment Agency General Binding Rules for Sewage Treatment Plant Discharge

EA GENERAL BINDING RULES
Available online at www.gov.uk

The sewage must:

- be domestic in nature eg from a toilet, bathroom, shower or kitchen of a house, flat or business (eg a pub, hotel or office).
- not cause pollution.

For a discharge to a surface water, eg a river or stream, you must:

- use a small sewage treatment plant. No permit is required as long as you are not discharging more than 5 cubic metres (5,000 litres) per day.

Required maintenance:

- you must get the sludge which builds up in your sewage treatment plant removed (desludged) before it exceeds the maximum capacity. As a minimum, you should have your treatment system desludged once a year or in line with the manufacturer's instructions.
- the company you use to dispose of your waste sludge must be a registered waste carrier. Ask the company to confirm this when you arrange to have your tank emptied or ask the tanker driver for a copy of the company's waste carrier's certificate.
- you should have your treatment system regularly maintained in line with the manufacturer's instructions.
- Anyone who carries out maintenance on your system must be competent.

You must have your treatment system repaired or replaced if it isn't in good working order, for example if it has:

- leaks
- cracks in tank walls or pipes
- blocked pipes
- signs that the effluent isn't draining properly (pools of water around the drainage point)
- sewage smells
- a failed motor
- a failed pump
- a failed electrical supply

Additional rules for new treatment systems installed and in use on or after 1 January 2015 apply if you**:**

- started a new discharge from a small sewage treatment plant on or after 1 January 2015.
- had a discharge to ground before 1 January 2015 which you now want to change to discharge to a surface water (or the other way round).

- had a discharge to a surface water before 1 January 2015 and you want to install a new drainage pipe which discharges more than 10 metres away from the existing one or which goes to a different surface water.
- If any part of the building your treatment plant serves is within 30 metres of a public sewer, the Environment Agency will not allow you to start a new discharge from a sewage treatment plant under the general binding rules.

You must have planning permission and Building Regulations approval if you have or are planning to install a new sewage treatment plant.

New discharges are not allowed to a ditch or a surface water that does not contain flowing water throughout the whole year. That is unless there is a drought or an unusually long period of dry weather.

New discharges to watercourses that seasonally dry up are not allowed under the general binding rules, nor are discharges to enclosed lakes or ponds.

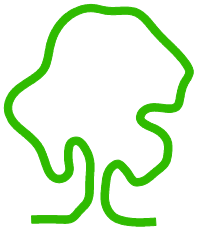
Contact the Environment Agency if you are unsure whether the surface water you want to discharge to is suitable.

If you have or are planning to start a new discharge to a surface water in or near to a designated sensitive area, you must apply for a permit. You will need a permit if the new discharge will be in or within 500 metres of any:

- special areas of conservation
- special protection areas
- Ramsar sites
- biological sites of special scientific interest
- freshwater pearl mussel population
- designated bathing water
- protected shellfish water

You will also need a permit if the new discharge will be in or within:

- 200 metres of an aquatic local nature reserve
- 50 metres of a chalk river or aquatic local wildlife site



eas ltd
Environmental Assessment Services Ltd
Unit 4B, The Courtyard, Holmsted Farm, Staplefield Road, Cuckfield,
West Sussex, RH17 5JT
Phone : +44 (0) 1444 882552 email : info@easltd.co.uk
web site : www.easltd.co.uk