SuDS and Drainage Report

Land east of Commonmead Barn, Pagham Road, Pagham, West Sussex PO21 3PY

Rev: **P2**

Ref: **C3552**

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Document Control

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Reviewer	CS	Signature	
Approver	CS	Signature	

Revision History

Date	Revision	Author	Approved
2nd May 2025	P-	LH	
24th September 2025	P1	LH	
7th October 2025	P2	LH	CS

Contents

1 Introduction

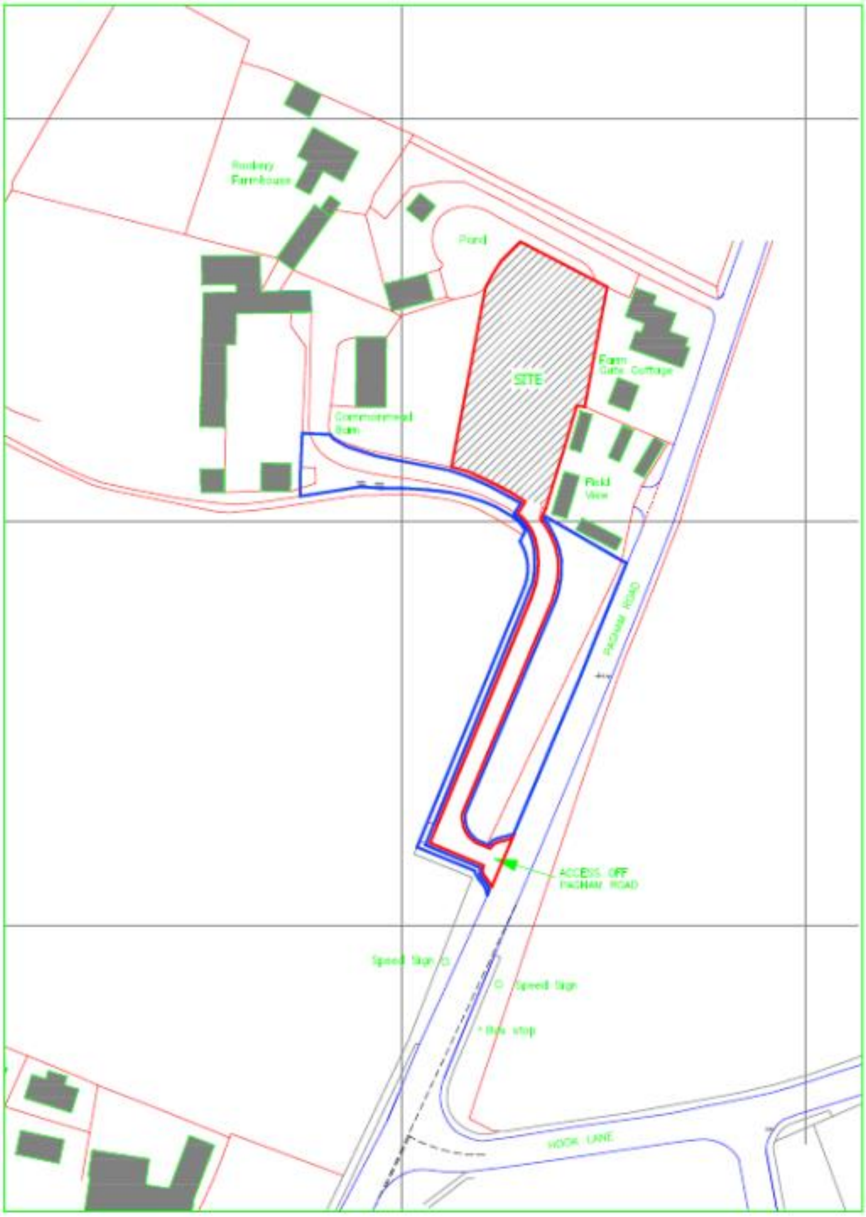
1.1.1 CGS Civils Ltd has been appointed to undertake a drainage strategy report for a proposed development at Land east of Commonmead Barn in Pagham, West Sussex.

1.1.2 The proposed development will consist of the construction of 2 No. detached dwellings and associated parking. The proposed development is located as OS Grid Reference SZ 89332 99033 and has the post code PO21 3PY.

1.1.3 The purpose of this drainage strategy is to demonstrate how the development area can be satisfactorily drained without increasing flood risk onsite and elsewhere. In addition, the following report is intended to supply the relevant data:

- The results of an assessment into the potential for disposing of surface water by means of Sustainable Drainage System (SuDS).
- Details of a management and maintenance plan for the drainage scheme
- The appropriate design standard for the surface water drainage scheme must be the 1 in 100-year return period with a 45% allowance for climate change.

Fig 1. Site Location



2 Executive Summary:

2.1.1 The Surface Water will discharge to the existing culverted watercourse that runs across the site at a rate of 2.0l/s. Surface water runoff from the roof areas will be discharged at a restricted rate of 1.0l/s per plot and will make use of a bio-retention planter for storage in order to cater for the 1 in 100-year +45% storm whilst also providing a degree of infiltration. The hard paved areas are to discharge freely to ground via infiltration and are to be fitted with diffuser units that will allow any exceedance runoff to discharge into the surface water network.

2.1.2 The Foul water will be treated on site via a new package treatment plant prior to discharge to the existing culverted watercourse.

3 Site Geology

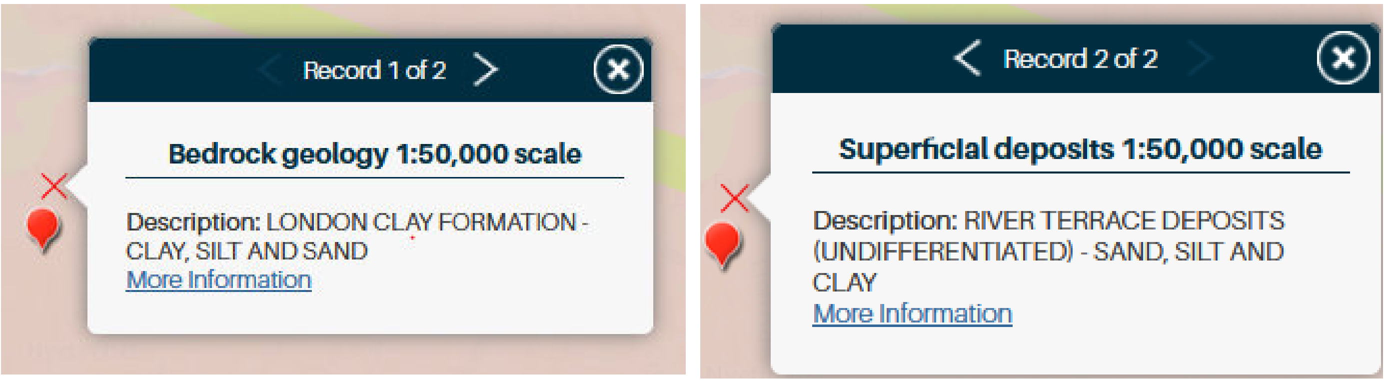
3.1 British Geological Survey information

3.1.1 The British Geological Survey confirms the bedrock geology to be made up London Clay Formation. The BGS website confirms the superficial deposits on site to be made up of River Terrace Deposits. Both formations are comprised of Sand, Silt and Clay.

3.1.2 The British Geological survey also holds records of historical boreholes near the site which give some insight into the ground geology.

- Borehole SZ89NE4 (Located approx. 500m North of the site) – Gravel, Clay and Sand.

Fig 2. British Geological Survey



3.2 Geological Assessment

3.2.1 An infiltration test to BRE365 was conducted on site on the 25th and 27th June 2024, which recorded a worst-case infiltration rate of 5.04×10^{-6}m/s. This is deemed to be a fair rate and confirms that infiltration is viable on site. During the testing, the ground was noted to be thick clay, photographs can be found in **Fig 3.** A copy of the soakaway tests results can be found in **Appendix E.**

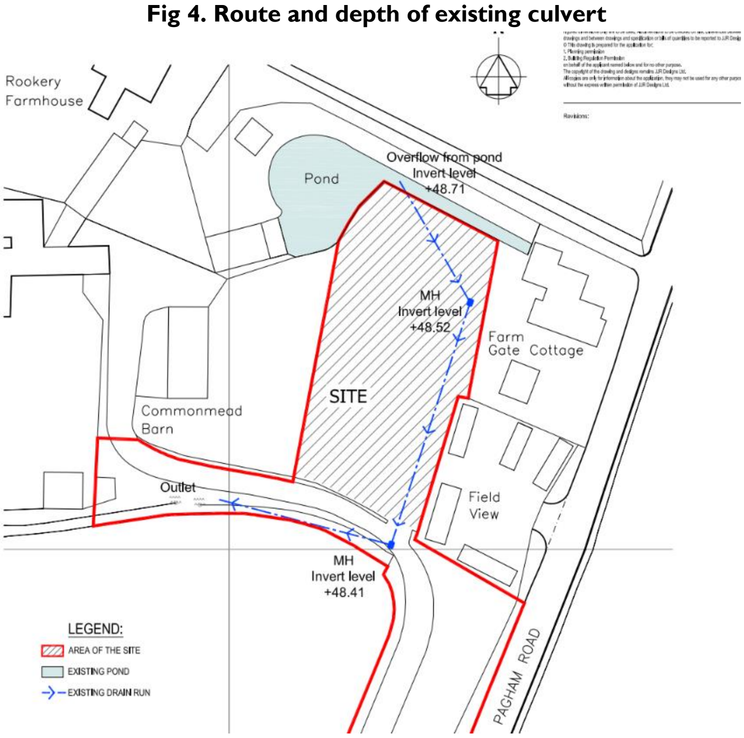
3.2.2 Ground water monitoring was carried out on site over the 2024/2025 winter period, with the monitoring commencing at the start of October and finishing at the end of March. The highest recorded groundwater level was recorded at 1.02mbgl which rules out the use of conventional soakaways due to the requirement of a 1m easement between the base of the soakaway and highest recorded groundwater level as set out by Arun DC. The groundwater monitoring results can be found in **Appendix E.**

Fig 3. Soakaway test photographs

4 Existing Drainage

4.1.1 The site is currently an undeveloped space with no private drainage. It is noted that there is an existing 300mm culverted watercourse that runs across the site prior to discharging into a larger watercourse on the adjacent site of the site access to the south.

Fig 4. Route and depth of existing culvert



5 Proposed Drainage Strategy

5.1 SuDS Hierarchy

5.1.1 All options for the destination of run-off generated on site have been assessed in line with the SuDS hierarchy as set out in Building Regulations Part H document and DEFRA's Draft National Standards for SuDS.

Table 1. SuDS Discharge Hierarchy

Discharge Destination	
Rainwater Harvesting	Can be utilised. To be confirmed at detailed design stage.
Discharge to Ground (infiltration)	On-site infiltration test resulted in a viable infiltration rate, however, due to high groundwater the use of conventional soakaways is ruled out. Infiltration can still be achieved within permeable paving and bio-retention planters which are proposed on site.
Discharge to Watercourse	Surface water runoff from the roof areas are to be discharged into the existing culverted watercourse at a restricted rate of 1.0l/s per plot or 2.0l/s for the entire site.
Discharge to Surface Water Sewer	N/A due to above
Discharge to Other Sewer	N/A due to above

5.2 Proposed Hydraulic Calculation Specifications:

Table 2. SuDS Calculation Settings.

Hydraulic Calculations Settings – Bio-Retention unit:	
Rainfall Methodology	**FEH-22**
Volumetric Run-off Coefficient Cv	**1**
CV Winter and Summer	**1**
Additional Storage (m^3 / ha)	**0.0**
Maximum Rainfall (mm/hr)	**75**
Flow Control 1	**0.737m Head @ 1l/s discharge**
Flow Control 2	**0.663 Head @ 1l/s discharge**
Bio-Retention unit Design	Base Coefficient (m/hr): **0.01814**
	Side Coefficient (m/hr): **0.01814**
	Factor of Safety: **2**
	Porosity: **30%**
	Time to Half Empty (mins): **11 + 35**
Permeable Paving	Base Coefficient (m/hr): **0.01814**
	Side Coefficient (m/hr): **0.00000**
	Factor of Safety: **2**
	Porosity: **30%**
	Time to Half Empty (mins): **172**

5.3 Surface Water Drainage

5.3.1 Although onsite testing by others indicated a favourable infiltration rate, conventional soakaways are not feasible due to the recorded groundwater level. The highest groundwater level of 1.02mbgl means that the required 1m distance between the soakaway base and groundwater level, as specified in the latest Arun DC policies, cannot be maintained.

5.3.2 It is therefore proposed that all surface water runoff from roof areas are to be discharged into the existing culverted watercourse which runs across the site. Both plots are to be served by a private surface water network before connecting into a single network prior to the discharge to the watercourse. The private networks are to discharge at a restricted rate of 2.0l/s and will make use of a bio-retention planter for storage to cater for the 1 in 100-year +45% storm. The bio-retention planter will also make use of as much infiltration as possible; however, it should be noted that this is not the main means of surface water discharge.

5.3.3 The existing culvert is a 300mm pipe which discharges to the south into an existing watercourse which then flows to the west. The existing culvert and watercourse are within the client's ownership. In order to obtain the necessary permissions for the discharge, an Ordinary Watercourse Consent application is to be undertaken with West Sussex County Council.

Fig 3. Existing manhole/Culvert and existing watercourse.

5.3.4 It is proposed that the access road and the parking spaces are to be constructed from a permeable surface to allow surface water runoff to discharge freely to ground via infiltration. Diffuser units are to be installed at the low points of the permeable paving which will allow any exceedance runoff to discharge into the remainder of the surface water network. This will also allow the permeable paving sub-base to act as a blanket attenuation tank.

5.3.5 Greenfield Runoff and Hydraulic calculations have been carried out which can be found at Appendix C.

Table 3. Greenfield Runoff Calculations

Greenfield Runoff Calculations			
Storm period	**Greenfield runoff rate (l/s)**	**Proposed Discharge Rate (l/s)**	**Difference (l/s)**
Q_{BAR}	0.1	2	+ 1.9
2	0.1	2	+ 1.9
10	0.19	2	+ 1.81
30	0.26	2	+ 1.74
100	0.37	2	+ 1.63

5.4 Water Quality

5.4.1 A key requirement of any SuDS system is that it protects the receiving water body from the risk of pollution.

5.4.2 Frequent and short duration rainfall events are those that are most loaded with potential contaminants (silts, fines, heavy metals, and various organic and inorganic contaminants) Therefore the first 5-10mm of rainfall should be adequately treated with SuDS.

5.4.3 The new SuDS Manual (Ciria C753, November 2015) introduces slightly different approach compared to the previous version for the water quality management of surface water. The Manual describes risks posed by the surface water runoff to the receiving environment as a function of:

- The pollution hazard at a particular site (i.e., the pollution source)
- The effectiveness of SuDS treatment components in reducing levels of pollutants to environmentally acceptable levels
- The sensitivity of the receiving environment

5.4.4 The recommended approaches for water quality risk management are given in the SuDS Manual Table 26.1.

Table 26.1 from SuDS manual. Approaches to Water Quality Risk Management

Table 26.1	Approaches to Water Quality Risk Management		
Design method	**Hazard Characterisation**	**Risk Reduction**	
		For Surface Water	**For Groundwater**
Simple Index Approach	Simple pollution hazard indices based on land use (Table 26.2)	Simple SuDS hazard mitigation indices (Table 26.3)	Simple SuDS hazard mitigation indices (Table 26.4)
Risk Screening	Factors characterising traffic density and extent of infiltration likely to occur (Table 26.5)	N/A	Factors characterising unsaturated soil depth and type, and predominant flow type through the soils (Table 26.5)
Detailed Risk Assessment	Site specific information used to define likely pollutants and their significance	More detailed, component specific performance information used to demonstrate that the proposed SuDS components reduce the hazard to acceptable levels	
Process-based treatment modelling	Time series rainfall used with generic pollution characteristics to determine statistical distributions of likely concentrations and loadings in the runoff	Models that represent the treatment processes in the proposed SuDS components give estimates of reductions in even mean discharge concentrations and total annual load reductions delivered by the system	

5.4.5 As per Table 26.1 Simple Index approach will be used as a design method for this site.

5.4.6 Table 26.2 will provide hazard classification of different land uses. The land uses for the surface water drainage for this site are.

- Residential Roofs
- Individual Property driveways and residential car parks

5.4.7 To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index for each contaminant type that equals or exceeds the pollution hazard index for each contaminant type. Therefore, the following must be achieved for the surface running off the site.

Total SuDS mitigation index >=pollution hazard index

5.4.8 Pollution Hazard Indices are given for different land uses in Table 26.2 of the SuDS manual;

Table 26.2 from SuDS manual. Pollution Hazard Indices for Different Land Use Classifications

Table 26.2 Pollution hazard indices for different land use classifications				
Land Use	**Pollution Hazard Level**	**Total Suspended solids (TSS)**	**Metals**	**Hydro-Carbons**
Residential roofs	Very Low	0.2	0.2	0.05
Other roofs (Typically commercial/industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (e.g., cul-de-sacs, homezones and general access roads) and non-residential car parking with infrequent change (e.g., schools, offices) i.e., < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (e.g., hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	0.7	0.6	0.7
Sites with heavy pollution (e.g., haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways	High	0.8	0.8	0.9

5.4.9 From Table 26.2 the following information is tabulated in Table 1

Table 3: Pollution hazard index and destination of runoff for the proposed site

Table 3: Pollution Hazard Index and Destination of runoff for the proposed Site					
Land Use	**Destination of Runoff**	**Pollution Hazard Level**	**Total Suspended Solids**	**Metals**	**Hydrocarbons**
Residential Roof	Surface Water	Very Low	0.2	0.2	0.05
Individual driveways, residential car parks and low traffic roads	Ground water	Low	0.5	0.4	0.4

5.4.10 The SuDS mitigation index will be obtained from Table 26.4 (for groundwater) of the SuDS manual.

Table 26.4 from SuDS manual. Indicative SuDS Mitigation Indices for discharges to ground waters.

5.4.11 SuDS mitigation index are tabulated in Table 5 as followed.

Table 26.4 Indicative SuDS mitigation indices for discharges to groundwater			
Characteristics of the material overlying the proposed infiltration surface, through which the runoff percolates	**TSS**	**Metals**	**Hydrocarbons**
A layer of dense vegetation underlain by a soil with good containment attenuation potential of at least 300mm in depth	0.6	0.5	0.6
A soil with good contaminant attenuation potential of at least 300mm in depth	0.4	0.3	0.3
Infiltration trench (where a suitable depth of filtration material is included that provides treatment, i.e., graded gravel with sufficient smaller particles but not single size coarse aggregate such as 20mm gravel) underlain by a soil with good contaminant attenuation potential of at least 300mm in depth.	0.4	0.4	0.4
Constructed permeable pavement (where a suitable filtration later is included that provides treatment, and including a geotextile at the base separating the foundation from the subgrade) underlain by a soil with good contaminant attenuation potential of at least 300mm in depth	0.7	0.6	0.7
Bioretention underlain by a soil with good contaminant attenuation potential of at least 300mm in depth	0.8	0.8	0.8
Proprietary treatment systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for inflow concentrations relevant to the contributing drainage area		

Table 26.5 Indicative SuDS mitigation indices for discharges to surface waters			
	Mitigation Indices		
Type of SuDS Components	**TSS**	**Metals**	**Hydrocarbons**
Filter Strip	0.4	0.4	0.5
Filter Drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention System	0.8	0.8	0.8
Permeable Pavement	0.7	0.6	0.7
Detention Basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8
Proprietary treatment systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for inflow concentrations relevant to the contributing drainage area		

Table 4: SuDS mitigation index

Table 4 Mitigation Indices						
Runoff Source	**Destination of Runoff**	**Mitigation Index Source**	**Type of SuDS Component**	**Total Suspended Solids (TSS)**	**Metals**	**Hydrocarbons**
Residential Roof	Surface Water	Table 26.5	Bioretention system	0.8	0.8	0.8
Individual driveways, residential car parks and low traffic roads	Ground water	Table 26.4	Permeable paving	0.7	0.6	0.7

5.4.12 The above analysis demonstrates that the SuDS devices within the design will mitigate any pollution present within the surface water system.

5.5 Foul water drainage

5.5.1 The foul water will be treated on site via a new package treatment plant; all treated effluent runoff will be discharged into the existing watercourse.

5.5.2 The proposed foul water discharge does not require Environment Agency approval as it adheres to the general binding rules for small discharge to surface water. This is because the proposed discharge:

- Is less than $5m^3$ a day
- Utilises a sufficient treatment system
- Is not causing pollution
- Is not within 500 meters of a protected site
- Is not within 50m of any other exempt discharge

6 Summary and Conclusions

6.1.1 CGS Civils has been instructed to produce a Drainage statement under National Planning Policy Framework (NPPF) to support the Planning Application for the construction of 2 No. dwellings.

6.1.2 The Surface Water will discharge to the existing culverted watercourse that runs across the site at a rate of 2.0l/s. Surface water runoff from the roof areas will be discharged at a restricted rate of 1.0l/s per plot and will make use of a bio-retention planter for storage in order to cater for the 1 in 100-year +45% storm whilst also providing a degree of infiltration. The hard paved areas are to discharge freely to ground via infiltration and are to be fitted with diffuser units that will allow any exceedance runoff to discharge into the surface water network.

6.1.3 The Foul water will be treated on site via a new package treatment plant prior to discharge to the existing culverted watercourse.

7 Appendices

7.1 Appendix A – Site Plan

Revisions:

1:200

4m 0 4m 8m

jjr designs

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Architectural Services
Planning
Building Regs
On Site Supervision
Landscape Design

e-mail: info@jjrdesigns.com

Client:
MR H. PHILLIPS

Project:
LAND EAST OF COMMONMEAD BARN
PAGHAM ROAD PO21 3PY

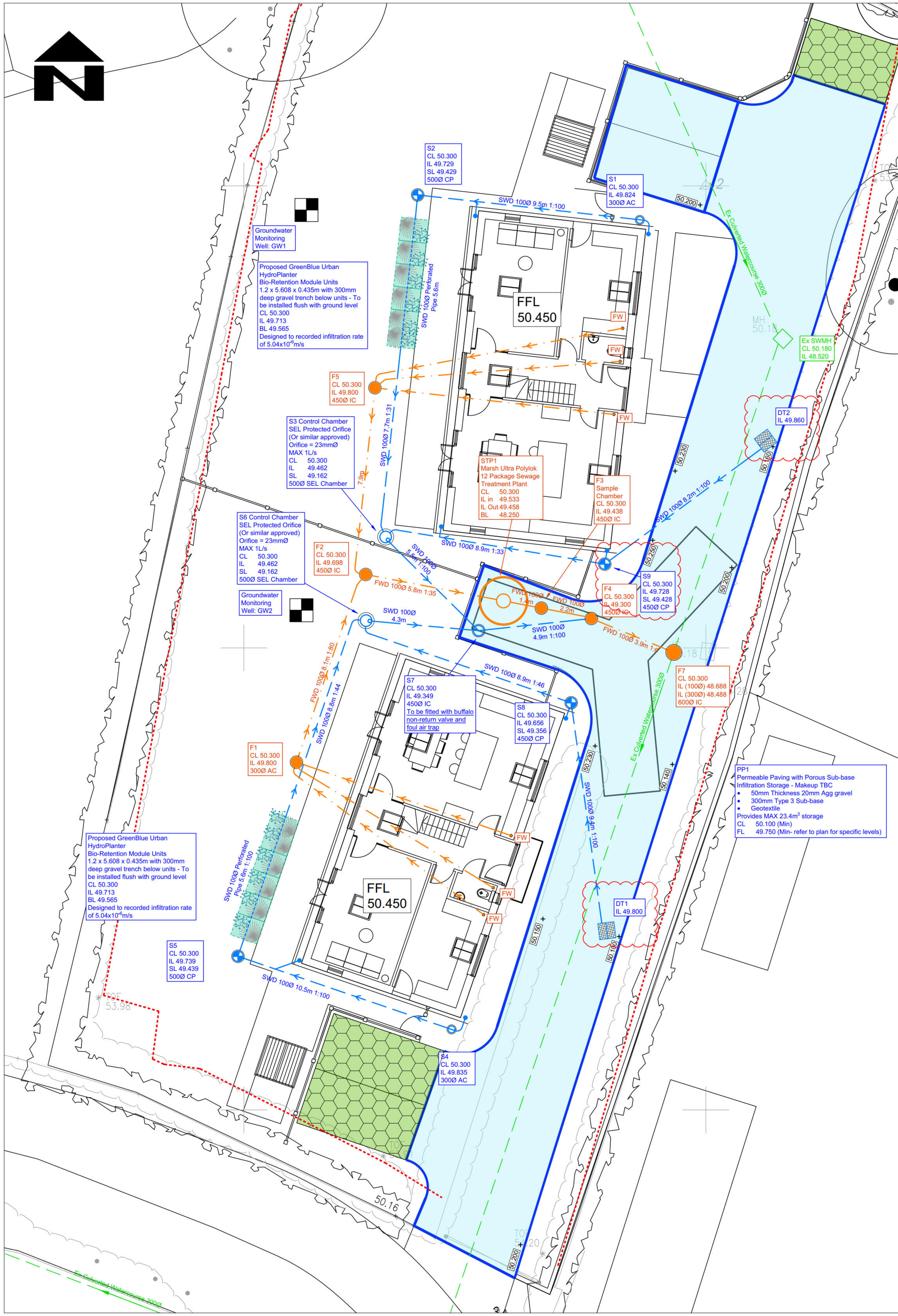
Drawing Title:
PROPOSED SITE PLAN

Issue status:

Outline proposals	☐	Production Information	☐	Scheme design	☐
Tender drawing	☐	Detail design	☐	Contract drawing	☐

Scale:	Drawn:	Checked:	Date:
1:200 @A3			20.08.2025
Job No: 1683		Drawing No: PL 103	Revision:

7.2 Appendix B – Drainage Layout



EXISTING FEATURES

- Ex SWD — Existing Culverted Watercourse

PROPOSED FEATURES

- FWD — Foul Drainage
- SWD — Surface Water Drainage
- Pipe crossing (thickening denotes pipe above)
- CD — Channel drain
- Rainwater pipe
- Storm water access chamber (300Ø)
- Storm water inspection chamber (450Ø)
- Storm water catchpit chamber (450Ø)
- Extent of infiltrating permeable paving with porous sub-base
- DT — Permavoid diffuser units
- 'NO DIG' Construction
- Storm water orifice flow control chamber (500Ø)
- Foul water access chamber (300Ø)
- Foul water inspection chamber (450Ø)
- Foul water manhole (1050Ø)
- 00.000 — Finished floor level
- 100Ø 4.5m 1:100 Z BED — Pipe info - diameter, length, gradient, bedding type

ABBREVIATIONS

MH	- MANHOLE
IC	- INSPECTION CHAMBER
AC	- ACCESS CHAMBER
CP	- CATCHPIT
BC	- BRAKE CHAMBER
RE	- RODDING EYE
IL	- INVERT LEVEL
SL	- SUMP LEVEL
RA	- RESTRICTED ACCESS COVER
CL	- COVER LEVEL
TL	- TOP OF CELLULAR SA
BL	- BASE OF CELLULAR SA
FL	- FORMATION LEVEL

- Root Protection Area
- Groundwater monitoring well location
- 18.250 — Existing surface level

STANDARD DRAINAGE NOTES

1. DO NOT SCALE FROM THIS DRAWING, REFER TO FIGURED DIMENSIONS ONLY. THE CONTRACTOR SHOULD CHECK ALL DIMENSIONS ON SITE.
2. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS ARE IN METERS UNLESS NOTED OTHERWISE.
3. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECT AND ENGINEERING DETAILS, DRAWINGS AND SPECIFICATIONS.
4. ANY DISCREPANCIES SHOULD BE REPORTED TO THE ARCHITECT AND/OR ENGINEER IMMEDIATELY, SO THAT CLARIFICATION CAN BE SOUGHT PRIOR TO THE COMMENCEMENT OF WORK.
5. BEFORE COMMENCING CONSTRUCTION THE CONTRACTOR MUST CHECK THE INVERT LEVELS OF EXISTING SEWERS TO WHICH CONNECTIONS ARE MADE. IN ADDITION THE CONTRACTOR MUST LOCATE AND DETERMINE INVERT LEVELS OF THE EXISTING SPURS TO WHICH CONNECTIONS ARE PROPOSED. ANY DISCREPANCIES ARE TO BE NOTIFIED TO THE ENGINEER IMMEDIATELY, PRIOR TO CONSTRUCTION.
6. ALL DRAINAGE WORKS SHOULD COMMENCE AT THE PROPOSED DOWNSTREAM CONNECTION POINT, THE WORKS CONTINUING UPSTREAM FOLLOWING CONFIRMATION OF THE TIE-IN INVERT LEVELS TO THE ENGINEER. CONNECTIONS TO MANHOLES OR LARGER SIZED PIPES ETC. SHOULD BE SOFFIT TO SOFFIT UNLESS OTHERWISE INSTRUCTED BY THE ENGINEER, IF THIS IS NOT POSSIBLE INFORM THE ENGINEER IMMEDIATELY.
7. COVER LEVELS SHOWN ARE APPROXIMATE. COVERS AND FRAMES SHALL BE SET TO FINISHED GROUND LEVELS AND FALLS.
8. ALL UN-REFERENCED PIPES ARE TO BE 100mm DIA
9. ALL PIPES TO BE ADOPTED, OR CONNECTING TO ADOPTED SEWERS, TO BE VITRIFIED CLAY TO BS EN 295 AND BS65 (SWS ONLY), OR CONCRETE PIPES TO BE EN 1916 AND BS5911:PART 1.
10. ROAD GULLY OUTLET PIPES ARE TO BE 150mm DIA. WITH CONCRETE SURROUND AND FLEXIBLE JOINTS. ALL GULLIES SHALL BE FITTED WITH GRADE D400 GRATINGS AND FRAMES TO BS EN124, UNLESS OTHERWISE STATED.
11. ALL ADOPTABLE SEWERS SHALL BE CONSTRUCTED TO THE STANDARDS AND SPECIFICATION LAID DOWN DOWN IN `SEWERS FOR ADOPTION' 6th EDITION, WITH A VIEW TO ADOPTION UPON COMPLETION OF WORKS.
12. ALL PRIVATE DRAINAGE TO BE IN ACCORDANCE WITH THE BUILDING REGULATIONS APPROVED DOCUMENT PART-H, AND TO THE SATISFACTION OF THE BUILDING CONTROL INSPECTOR.
13. THE CONTRACTOR IS TO KEEP A RECORD OF ANY VARIATIONS MADE ON SITE, INCLUDING THE RELOCATION OF SEWERS OR DRAINS, SO THAT AN AS CONSTRUCTED DRAWING CAN BE PREPARED UPON COMPLETION OF THE PROJECT.
14. STUB CONNECTIONS TO ADOPTABLE MANHOLES SHALL BE MADE FROM VITRIFIED CLAY AND CONSIST OF TWO ROCKER PIPES LAID AT THE SAME GRADIENT AS THE UP OR DOWNSTREAM PIPE.
15. IF ANY SUB SOIL DRAINAGE SYSTEMS ARE UNCOVERED DURING THE WORKS CONTACT THE ENGINEER FOR INSTRUCTIONS. SUB SOIL DRAINS ARE TO BE DIVERTED AROUND NEW WORKS AND CONNECTED INTO THE SURFACE WATER.
16. NO PRIVATE AREAS ARE TO DRAIN ONTO ADOPTABLE AREAS AND VICE VERSA.
17. ALL EXISTING MANHOLE COVER'S, GULLIES, ETC, ARE TO BE RAISED/LOWERED TO SUIT NEW LEVELS.
18. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONFIRM THE LOCATION AND DEPTH OF ALL EXISTING SERVICES AND UTILITIES THAT MAY BE PRESENT
19. UPON COMPLETION BUT PRIOR TO HANDOVER, CONTRACTOR TO CARRY OUT FULL CCTV SURVEY OF DRAINAGE SYSTEM WHICH IS TO BE REVIEWED BY ENGINEER TO ENSURE SATISFACTORY INSTALLATION
20. PROPRIETARY PRODUCTS TO BE INSTALLED IN FULL ACCORDANCE WITH MANUFACTURER'S GUIDANCE.
21. MANHOLE AND CHAMBER COVER GRADES:
 - 'A15' IN ALL LANDSCAPED AREAS AND ON FOOTPATHS
 - 'B125' IN ALL DRIVEWAYS
 - 'C250' IN PRIVATE PARKING AREAS
 - 'D400' IN CARRIAGEWAY/ACCESS ROAD

Prefixed to drawing numbers shall signify the following:-

PL = PLANNING	Shall not be used for contract or construction purposes
P = PRELIMINARY	Shall not be used for contract or construction purposes
T = TENDER	Shall not be used for construction purposes
C = CONSTRUCTION	These are the only drawings that shall be used for construction purposes
R = RECORD	Record of actual completed work

REV	DATE	DESCRIPTION	BY	CHK	APP
P2	07.10.25	REVISED TO SUIT PAVING AS STORAGE	LH	CS	CS
P1	10.09.25	REVISED TO NEW SITEPLAN	LH	CS	CS
P-	15.05.25	PRELIMINARY ISSUE	LH	CS	CS

DESIGN SUBJECT TO THE APPROVAL OF:
PLANNING AUTHORITY
BUILDING CONTROL

DESIGN SUBJECT TO THE CONFIRMATION OF:
EXTERNAL LEVELS DESIGN
ORDINARY WATERCOURSE APPROVAL

Site Specific Notes

1. The proposed scheme consists of the construction of 2 No. dwelling with associated parking and access.
2. The British Geological survey website confirms the geology on site to be made up of London Clay formation and River terrace deposits, which are comprised of Sand, Silt and Clay.
3. An infiltration test to BRE365 was undertaken on site by UNDA which recorded a worst case infiltration rate of 5.04×10^{-6}m/s which is deemed a fair rate; however, groundwater was recorded at a depth of 1.02mbgl which rules out the use of conventional soakaways due to Arun DC policies restricting the use of soakaways if there is groundwater within 1m of the base of the soakaway.
4. It is therefore proposed that all surface water runoff is discharged into the existing culverted watercourse which runs across the site at a restricted rate of 2.0l/s. The surface water networks will make use of bio-retention planters in order to cater for the 1 in 100-year +45% storm whilst also providing a degree of infiltration and treatment. It should be noted that the planters are not the primary source of surface water disposal.
5. It is proposed that the access road and parking areas are to be constructed from a permeable surface to allow surface water runoff to flow freely to ground via infiltration. Diffuer units are to be fitted to allow any exceedance runoff to discharge into the remainder of the surface water network.
6. All storage volumes and flow controls are designed to the critical 1 in 100 year storm event plus an allowance of 45% for the predicted effects of climate change.
7. The foul water is to be treated via a new package treatment plant and all treated effluent runoff is to discharge into the culverted watercourse.

FOR PLANNING ONLY

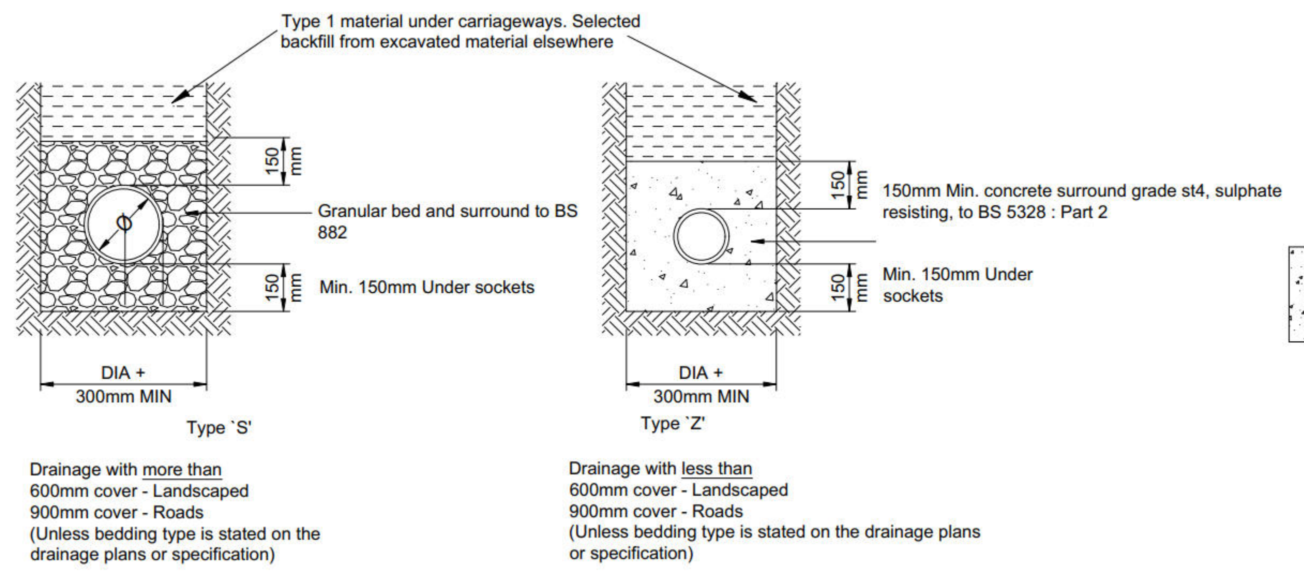
cgs civils
Consulting Civil Engineers

CLIENT	HOWARD PHILLIPS
ARCHITECT	JJR DESIGNS LTD
JOB TITLE	LAND EAST OF COMMONMEAD BARN PAGHAM
DRAWING TITLE	DRAINAGE LAYOUT

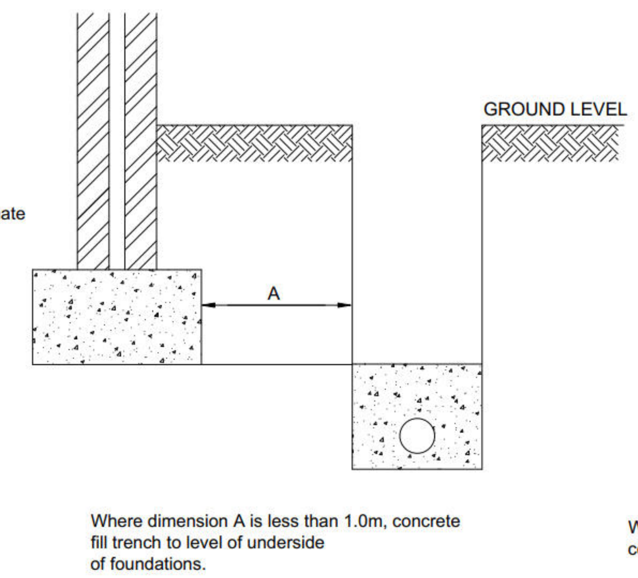
DRAWN	ENGINEER	CHECKED	APPROVED
LH	C SLADE	CS	CS

DATE	SCALE @ A1
MAY 2025	1:100

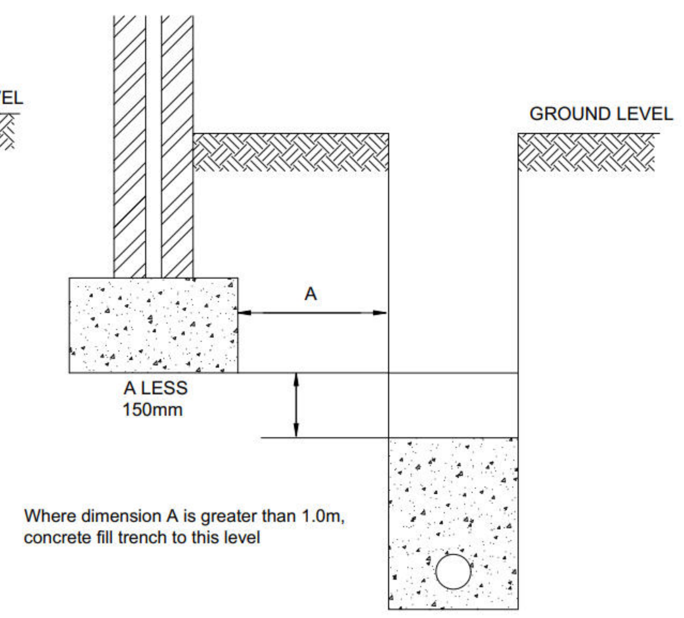
JOB No.	STATUS	DRAWING No.	REV.
C3552	P	101	P2



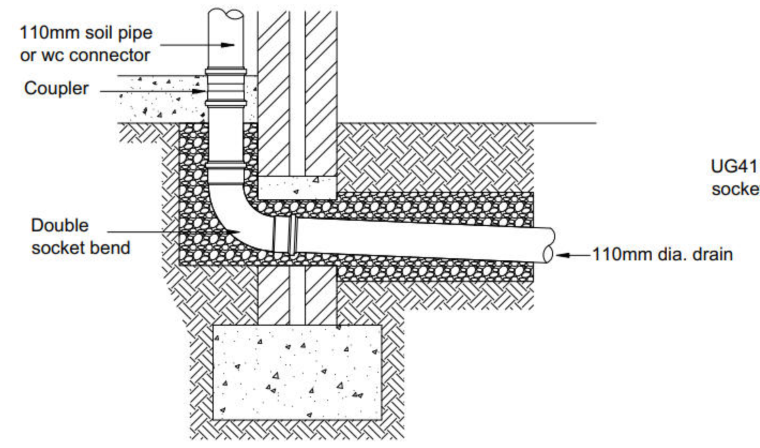
Pipe bedding details in private Areas



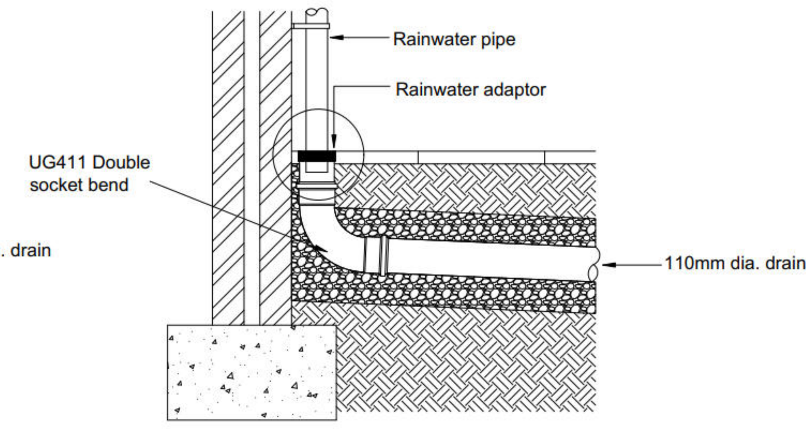
Pipes near buildings



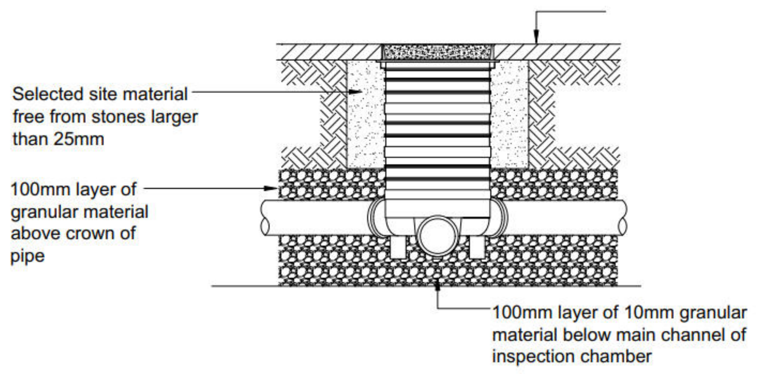
Pipes near buildings



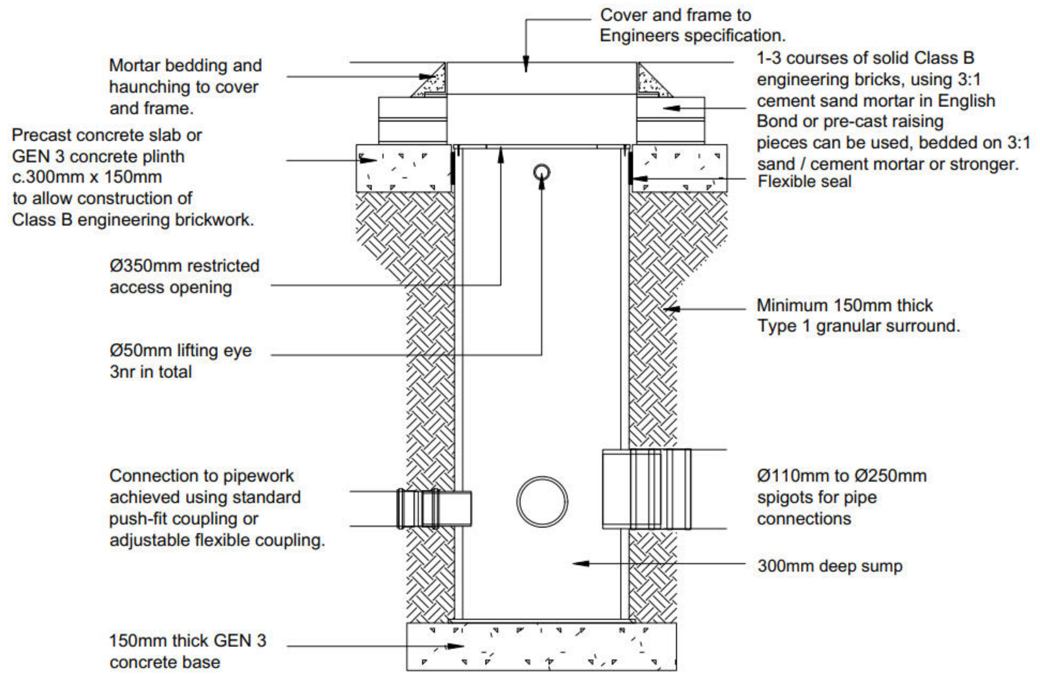
Soil pipe / wc connection



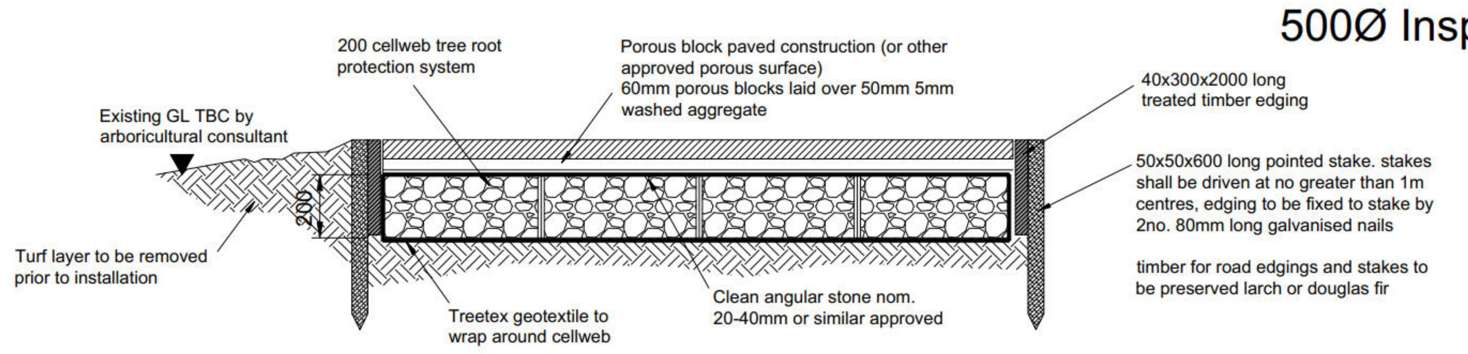
Rainwater pipe connection



300mmØ SHALLOW INSPECTION CHAMBER DETAIL



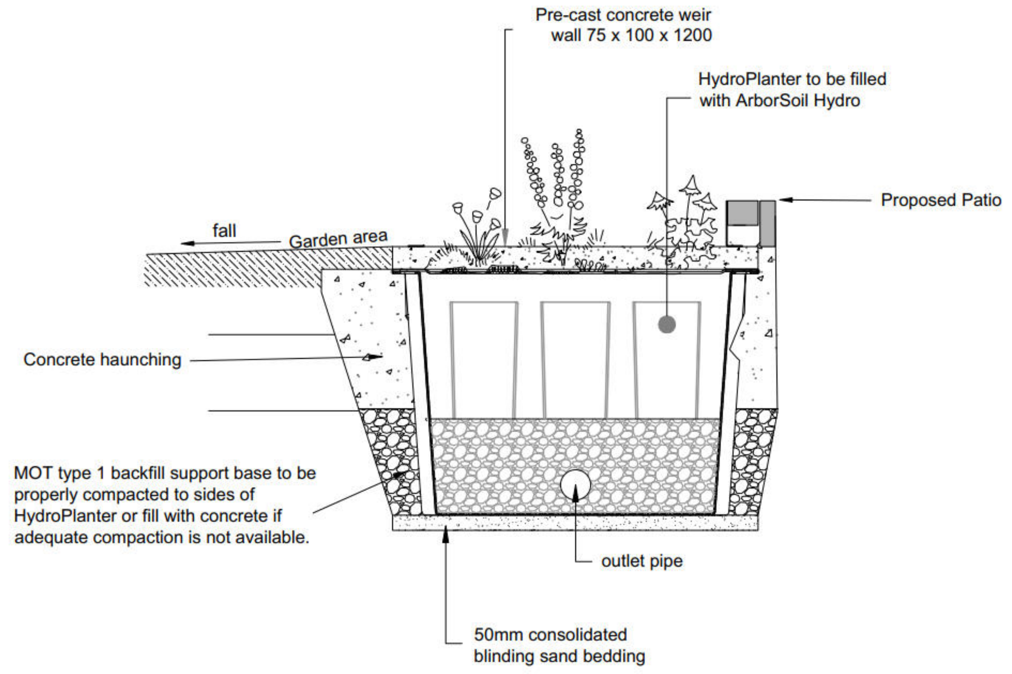
SEL WASP05050
500Ø Inspection Chamber



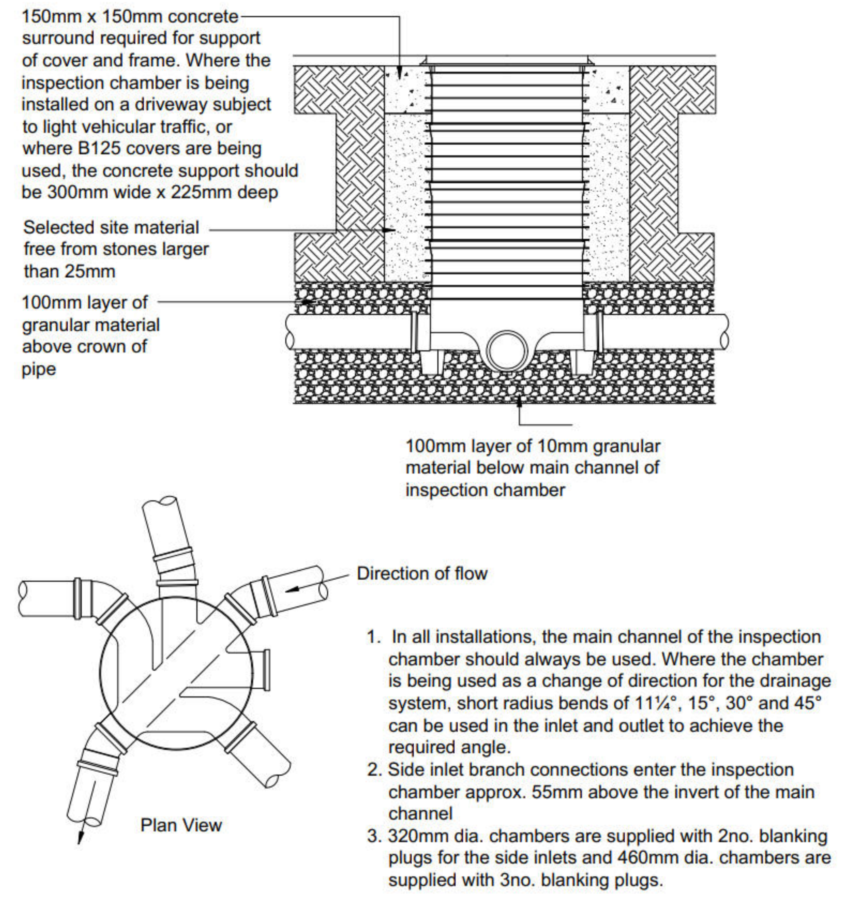
Typical 'no dig' access road construction

subject to detailed design by geosynthetics ltd

to be installed in accordance with geosynthetic ltds sinstallation guide and specification



HydroPlanter (Infiltrating) Typical Detail
by GreenBlue Urban
Final detail to be confirmed by the manufacturer

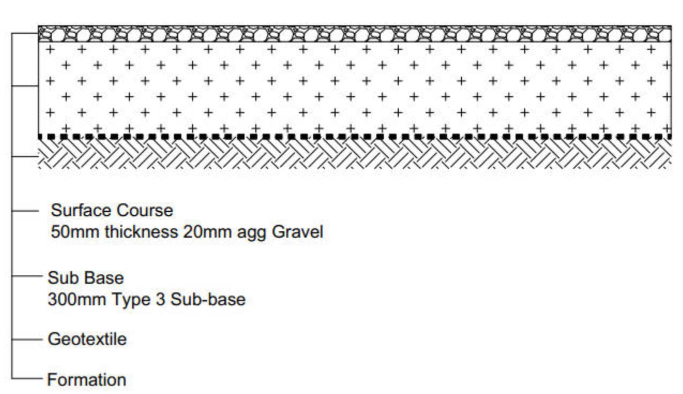


1. In all installations, the main channel of the inspection chamber should always be used. Where the chamber is being used as a change of direction for the drainage system, short radius bends of 11¼°, 15°, 30° and 45° can be used in the inlet and outlet to achieve the required angle.
2. Side inlet branch connections enter the inspection chamber approx. 55mm above the invert of the main channel
3. 320mm dia. chambers are supplied with 2no. blanking plugs for the side inlets and 460mm dia. chambers are supplied with 3no. blanking plugs.

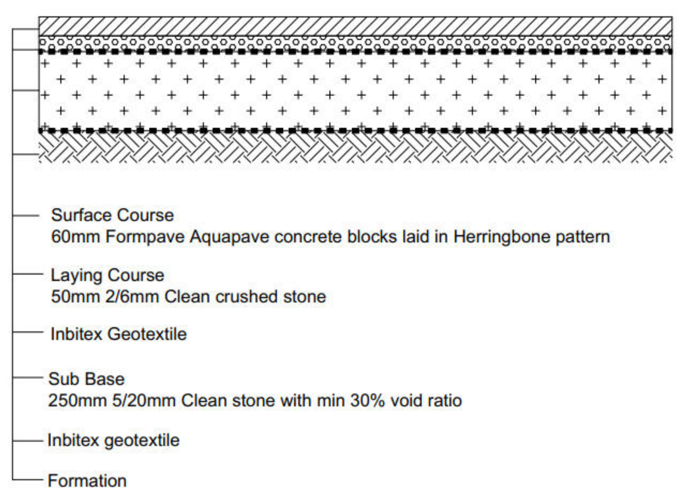
460mmØ INSPECTION CHAMBER DETAIL

Prefixed to drawing numbers shall signify the following:-

PL = PLANNING	Shall not be used for contract or construction purposes
P = PRELIMINARY	Shall not be used for contract or construction purposes
T = TENDER	Shall not be used for construction purposes
C = CONSTRUCTION	These are the only drawings that shall be used for construction purposes
R = RECORD	Record of actual completed work

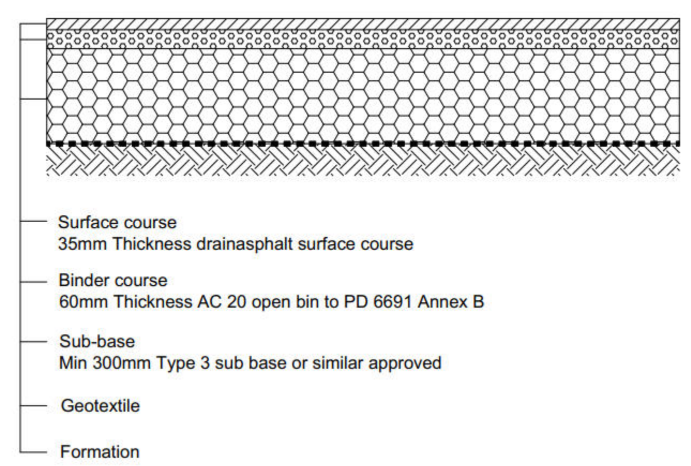


Infiltrating Gravel Car Parking area construction



Formpave permeable block paving private driveway construction

To be read in accordance with Formpave details and specification



Permeable asphalt construction

To be read in accordance with Aggregate Industries details and specification

PERMEABLE PAVED CONSTRUCTION
TBC BY CLIENT
1:20

FOR PLANNING ONLY

REV	DATE	DESCRIPTION	BY	CHK	APP
P-	15.05.25	PRELIMINARY ISSUE	LH	CS	CS

cgs civils
Consulting Civil Engineers

CLIENT	HOWARD PHILLIPS
ARCHITECT	JJR DESIGNS LTD
JOB TITLE	LAND EAST OF COMMONMEAD BARN PAGHAM
DRAWING TITLE	CONSTRUCTION DETAILS

DRAWN	ENGINEER	CHECKED	APPROVED
LH	C SLADE	CS	CS

DATE	SCALE @ A1
MAY 2025	1:20

JOB No.	STATUS	DRAWING No.	REV.
C3552	P	301	P-

FOR PLANNING ONLY

Prefixed to drawing numbers shall signify the following:-

PL = PLANNING	**Shall not be used for contract or construction purposes**
P = PRELIMINARY	**Shall not be used for contract or construction purposes**
T = TENDER	**Shall not be used for construction purposes**
C = CONSTRUCTION	These are the only drawings that shall be used for construction purposes
R = RECORD	Record of actual completed work

REV	DATE	DESCRIPTION	BY	CHK	APP
P1	10.09.25	REVISED TO SUIT NEW SITEPLAN	LH	CS	CS
P-	15.05.25	PRELIMINARY ISSUE	LH	CS	CS

cgs civils
Consulting Civil Engineers

CLIENT
HOWARD PHILLIPS

ARCHITECT
JJR DESIGNS LTD

JOB TITLE
LAND EAST OF COMMONMEAD BARN
PAGHAM

DRAWING TITLE
IMPERMEABLE AREAS
& OVERLAND FLOW ROUTE PLAN

DRAWN	ENGINEER	CHECKED	APPROVED
LH	C SLADE	CS	CS

DATE	SCALE @ A1
MAY 2025	1:100

JOB No.	STATUS	DRAWING No.	REV.
C3552	P	401	P1

7.3 Appendix C – Surface Water Calculations

Design Settings

Rainfall Methodology	FEH-22
Return Period (years)	2
Additional Flow (%)	0
CV	1.000
Time of Entry (mins)	2.00
Maximum Time of Concentration (mins)	30.00
Maximum Rainfall (mm/hr)	75.0

Minimum Velocity (m/s)	1.00
Connection Type	Level Soffits
Minimum Backdrop Height (m)	0.200
Preferred Cover Depth (m)	0.350
Include Intermediate Ground	✓
Enforce best practice design rules	✓

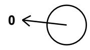
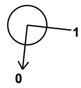
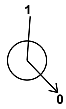
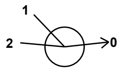
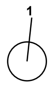
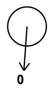
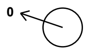
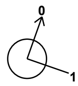
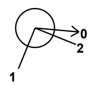
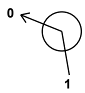
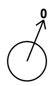
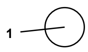
Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1	0.002	2.00	50.300	Manhole	Adoptable	300	997.139	998.526	0.476
S2	0.002	2.00	50.300	Manhole	Adoptable	500	987.523	999.608	0.571
S3	0.004	2.00	50.300	Manhole	Adoptable	500	986.208	984.874	0.838
S7			50.300	Manhole	Adoptable	450	990.163	980.746	0.951
BIO1	0.000		50.300	Manhole	Adoptable	100	987.411	998.577	0.577
BIO2		2.00	50.300	Manhole	Adoptable	100	986.790	993.004	0.587
S4	0.002	2.00	50.300	Manhole	Adoptable	300	988.990	963.487	0.465
S5	0.002	2.00	50.300	Manhole	Adoptable	500	979.742	966.651	0.561
S6	0.002	2.00	50.300	Manhole	Adoptable	500	985.291	981.182	0.838
S8	0.002	2.00	50.300	Manhole	Adoptable	300	993.829	977.741	0.644
BIO3	0.000		50.300	Manhole	Adoptable	100	980.117	967.695	0.577
BIO4		2.00	50.300	Manhole	Adoptable	100	981.812	972.693	0.587
OUTFALL	0.000		50.300	Manhole	Adoptable	450	995.043	981.273	1.000
PP1	0.026	2.00	50.100	Manhole	Adoptable	100	995.495	968.089	0.300

Links (Input)

Name	US Node	DS Node	Length (m)	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
1.000	S1	S2	9.677	49.824	49.729	0.095	101.9	100
1.001	S2	BIO1	1.037	49.729	49.723	0.006	172.8	100
1.002	BIO2	S3	8.151	49.713	49.462	0.251	32.5	100
1.003	S3	S7	5.717	49.462	49.349	0.113	50.6	100
2.000	S4	S5	9.774	49.835	49.739	0.096	101.8	100
2.001	S5	BIO3	1.109	49.739	49.723	0.016	69.3	100
2.002	BIO4	S6	9.174	49.713	49.462	0.251	36.6	100
2.003	S6	S7	4.891	49.462	49.349	0.113	43.3	100
3.000	S8	S6	9.205	49.656	49.462	0.194	47.5	100
1.003_1	S7	OUTFALL	4.908	49.349	49.300	0.049	100.2	100
3.001	PP1	S8	9.795	49.800	49.656	0.144	68.0	100

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	MH Type	Connections		Link	IL (m)	Dia (mm)	Link Type
S1	997.139	998.526	50.300	0.476	300	Manhole	Adoptable		0	1.000	49.824	100	Circular
S2	987.523	999.608	50.300	0.571	500	Manhole	Adoptable		1	1.000	49.729	100	Circular
									0	1.001	49.729	100	Circular
S3	986.208	984.874	50.300	0.838	500	Manhole	Adoptable		1	1.002	49.462	100	Circular
									0	1.003	49.462	100	Circular
S7	990.163	980.746	50.300	0.951	450	Manhole	Adoptable		1	1.003	49.349	100	Circular
									2	2.003	49.349	100	Circular
									0	1.003_1	49.349	100	Circular
BIO1	987.411	998.577	50.300	0.577	100	Manhole	Adoptable		1	1.001	49.723	100	Circular
BIO2	986.790	993.004	50.300	0.587	100	Manhole	Adoptable		0	1.002	49.713	100	Circular
S4	988.990	963.487	50.300	0.465	300	Manhole	Adoptable		0	2.000	49.835	100	Circular
S5	979.742	966.651	50.300	0.561	500	Manhole	Adoptable		1	2.000	49.739	100	Circular
									0	2.001	49.739	100	Circular
S6	985.291	981.182	50.300	0.838	500	Manhole	Adoptable		1	2.002	49.462	100	Circular
									2	3.000	49.462	100	Circular
									0	2.003	49.462	100	Circular
S8	993.829	977.741	50.300	0.644	300	Manhole	Adoptable		1	3.001	49.656	100	Circular
									0	3.000	49.656	100	Circular
BIO3	980.117	967.695	50.300	0.577	100	Manhole	Adoptable		1	2.001	49.723	100	Circular
BIO4	981.812	972.693	50.300	0.587	100	Manhole	Adoptable		0	2.002	49.713	100	Circular
OUTFALL	995.043	981.273	50.300	1.000	450	Manhole	Adoptable		1	1.003_1	49.300	100	Circular

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	MH Type	Connections	Link	IL (m)	Dia (mm)	Link Type
PP1	995.495	968.089	50.100	0.300	100	Manhole	Adoptable	 0	3.001	49.800	100	Circular

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	1.000	Drain Down Time (mins)	1440	Check Discharge Volume	x
Winter CV	1.000	Additional Storage (m³/ha)	0.0		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	10	0
10	0	10	0
30	45	10	0
100	45	10	0

Node OUTFALL Surcharged Outfall

Overrides Design Area	x	Depression Storage Area (m²)	0	Evapo-transpiration (mm/day)	0
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	0		

Applies to 2yr, 10yr, 30yr+45% CC, 100yr+45% CC 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440 minute storms

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
0	0.750	11	0.000	22	0.000	33	0.000	44	0.000	55	0.000
1	0.750	12	0.000	23	0.000	34	0.000	45	0.000	56	0.000
2	0.000	13	0.000	24	0.000	35	0.000	46	0.000	57	0.000
3	0.000	14	0.000	25	0.000	36	0.000	47	0.000	58	0.000
4	0.000	15	0.000	26	0.000	37	0.000	48	0.000	59	0.000
5	0.000	16	0.000	27	0.000	38	0.000	49	0.000	60	0.000
6	0.000	17	0.000	28	0.000	39	0.000	50	0.000		
7	0.000	18	0.000	29	0.000	40	0.000	51	0.000		
8	0.000	19	0.000	30	0.000	41	0.000	52	0.000		
9	0.000	20	0.000	31	0.000	42	0.000	53	0.000		
10	0.000	21	0.000	32	0.000	43	0.000	54	0.000		

Node S3 Online Orifice Control

Flap Valve	x	Design Depth (m)	0.737	Discharge Coefficient	0.650
Replaces Downstream Link	x	Design Flow (l/s)	1.0		
Invert Level (m)	49.462	Diameter (m)	0.021		

Node S6 Online Orifice Control

Flap Valve	x	Design Depth (m)	0.663	Discharge Coefficient	0.650
Replaces Downstream Link	x	Design Flow (l/s)	1.0		
Invert Level (m)	49.462	Diameter (m)	0.023		

Node BIO2 Bioretention Area Storage Structure

Underdrain Link Type	Circular	Base Inf Coefficient (m/hr)	0.01814
Underdrain Diameter (mm)	100	Side Inf Coefficient (m/hr)	0.00000
Underdrain Velocity	Colebrook-White	Safety Factor	2.0
Underdrain ks (mm) / n	0.030	Porosity	0.30
Underdrain Length (m)	6.600	Invert Level (m)	49.913
Underdrain Slope (1:X)	999.0	Time to half empty (mins)	38
Underdrain Height above base (m)	0.100	Main Channel Length (m)	6.700
Underdrain DS Node	S3	Main Channel Slope (1:X)	999.0
Filter Conductivity (m/hr)	0.03600	Main Channel n	0.030
Filter Depth (m)	0.300		

Inlet Node	Connects To
BIO1	Underdrain

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	6.7	0.435	6.7

Node BIO4 Bioretention Area Storage Structure

Underdrain Link Type	Circular	Base Inf Coefficient (m/hr)	0.01814
Underdrain Diameter (mm)	100	Side Inf Coefficient (m/hr)	0.00000
Underdrain Velocity	Colebrook-White	Safety Factor	2.0
Underdrain ks (mm) / n	0.030	Porosity	0.30
Underdrain Length (m)	6.600	Invert Level (m)	49.913
Underdrain Slope (1:X)	999.0	Time to half empty (mins)	0
Underdrain Height above base (m)	0.100	Main Channel Length (m)	6.600
Underdrain DS Node	S7	Main Channel Slope (1:X)	999.0
Filter Conductivity (m/hr)	0.03600	Main Channel n	0.030
Filter Depth (m)	0.300		

Inlet Node	Connects To
BIO3	Underdrain

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	6.7	0.435	6.7

Node PP1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.01814	Invert Level (m)	49.750	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	228	Depth (m)	0.300
Safety Factor	2.0	Width (m)	26.000	Inf Depth (m)	
Porosity	0.30	Length (m)	10.000		

Results for 2 year +10% A Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	9	49.845	0.021	0.6	0.0015	0.0000	OK
15 minute summer	S2	9	49.767	0.038	1.2	0.0075	0.0000	OK
30 minute summer	S3	21	49.721	0.259	1.3	0.0508	0.0000	SURCHARGED
30 minute summer	S7	19	49.386	0.037	1.6	0.0058	0.0000	OK
15 minute summer	BIO1	1	49.723	0.000	0.0	0.0000	0.0000	OK
30 minute summer	BIO2	21	49.721	0.008	0.1	0.0002	0.0000	OK
30 minute summer	BIO2 Filter Layer	18	49.738	0.125	0.9	0.2486	0.0000	OK
15 minute summer	S4	9	49.856	0.021	0.6	0.0015	0.0000	OK
15 minute summer	S5	9	49.770	0.031	1.2	0.0061	0.0000	OK
15 minute summer	S6	11	49.626	0.164	1.2	0.0321	0.0000	SURCHARGED
15 minute summer	S8	9	49.674	0.018	0.6	0.0013	0.0000	OK
15 minute summer	BIO3	1	49.723	0.000	0.0	0.0000	0.0000	OK
15 minute summer	BIO4	1	49.713	0.000	0.0	0.0002	0.0000	OK
30 minute summer	BIO4 Filter Layer	18	49.738	0.125	0.9	0.2492	0.0000	OK
30 minute summer	OUTFALL	19	49.335	0.035	1.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1	1.000	S2	0.6	0.304	0.100	0.0193	
15 minute summer	S2	1.001	BIO1	1.2	0.458	0.258	0.0027	
30 minute summer	S3	1.003	S7	0.5	0.403	0.058	0.0097	
30 minute summer	S7	1.003_1	OUTFALL	1.6	0.626	0.261	0.0123	1.4
15 minute summer	BIO1	Bioretention Area	BIO2	0.0	0.000	0.000		
30 minute summer	BIO2	1.002	S3	-0.1	-0.033	-0.014	0.0331	
30 minute summer	BIO2	Filtration		0.0				
30 minute summer	BIO2 Filter Layer	Underdrain		0.9	0.423	0.406	0.0141	
30 minute summer	BIO2 Filter Layer	Infiltration		0.0				
15 minute summer	S4	2.000	S5	0.6	0.364	0.100	0.0161	
15 minute summer	S5	2.001	BIO3	1.2	0.581	0.159	0.0022	
15 minute summer	S6	2.003	S7	0.5	0.386	0.050	0.0077	
15 minute summer	S8	3.000	S6	0.6	0.226	0.068	0.0403	
15 minute summer	BIO3	Bioretention Area	BIO4	0.0	0.000	0.000		
15 minute summer	BIO4	2.002	S6	0.0	0.000	0.000	0.0359	
15 minute summer	BIO4	Filtration		0.0				
15 minute summer	BIO4 Filter Layer	Underdrain		1.0	0.444	0.456	0.0150	
30 minute summer	BIO4 Filter Layer	Infiltration		0.0				

Results for 2 year +10% A Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	PP1	116	49.797	-0.003	2.2	3.2657	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute summer	PP1	3.001	S8	0.0	0.000	0.000	0.0020	
180 minute summer	PP1	Infiltration		0.6				

Results for 10 year +10% A Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	S1	39	49.857	0.033	0.6	0.0023	0.0000	OK
60 minute summer	S2	40	49.857	0.128	1.2	0.0251	0.0000	SURCHARGED
60 minute summer	S3	40	49.857	0.395	1.5	0.0773	0.0000	SURCHARGED
15 minute summer	S7	10	49.405	0.056	3.2	0.0089	0.0000	OK
15 minute summer	BIO1	1	49.723	0.000	0.0	0.0000	0.0000	OK
60 minute summer	BIO2	40	49.857	0.144	0.7	0.0013	0.0000	SURCHARGED
60 minute summer	BIO2 Filter Layer	40	49.854	0.241	0.9	0.4685	0.0000	OK
15 minute summer	S4	9	49.864	0.029	1.1	0.0021	0.0000	OK
15 minute summer	S5	9	49.787	0.048	2.2	0.0095	0.0000	OK
120 minute summer	S6	80	49.823	0.361	1.0	0.0708	0.0000	SURCHARGED
120 minute summer	S8	80	49.824	0.168	1.0	0.0119	0.0000	SURCHARGED
15 minute summer	BIO3	1	49.723	0.000	0.0	0.0000	0.0000	OK
120 minute summer	BIO4	80	49.823	0.110	0.2	0.0011	0.0000	SURCHARGED
15 minute summer	BIO4 Filter Layer	10	49.757	0.144	2.2	0.2837	0.0000	OK
15 minute summer	OUTFALL	10	49.352	0.052	3.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	S1	1.000	S2	0.6	0.288	0.095	0.0487	
60 minute summer	S2	1.001	BIO1	0.9	0.425	0.206	0.0081	
60 minute summer	S3	1.003	S7	0.6	0.363	0.072	0.0122	
15 minute summer	S7	1.003_1	OUTFALL	3.2	0.746	0.531	0.0211	2.3
15 minute summer	BIO1	Bioretention Area	BIO2	0.0	0.000	0.000		
60 minute summer	BIO2	1.002	S3	-0.7	-0.132	-0.067	0.0638	
60 minute summer	BIO2	Filtration		0.0				
60 minute summer	BIO2 Filter Layer	Underdrain		0.8	0.400	0.353	0.0516	
60 minute summer	BIO2 Filter Layer	Infiltration		0.0				
15 minute summer	S4	2.000	S5	1.1	0.409	0.184	0.0275	
15 minute summer	S5	2.001	BIO3	2.2	0.600	0.300	0.0042	
120 minute summer	S6	2.003	S7	0.7	0.450	0.076	0.0091	
120 minute summer	S8	3.000	S6	0.9	0.222	0.097	0.0720	
15 minute summer	BIO3	Bioretention Area	BIO4	0.0	0.000	0.000		
120 minute summer	BIO4	2.002	S6	-0.2	-0.042	-0.020	0.0718	
120 minute summer	BIO4	Filtration		0.0				
120 minute summer	BIO4 Filter Layer	Underdrain		0.8	0.406	0.356	0.0128	
15 minute summer	BIO4 Filter Layer	Infiltration		0.0				

Results for 10 year +10% A Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	PP1	76	49.824	0.024	4.8	5.3449	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	PP1	3.001	S8	0.9	0.384	0.121	0.0452	
120 minute summer	PP1	Infiltration		0.7				

Results for 30 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 98.50%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	S1	45	49.988	0.164	1.1	0.0116	0.0000	SURCHARGED
60 minute summer	S2	45	49.988	0.259	1.8	0.0507	0.0000	SURCHARGED
60 minute summer	S3	45	49.987	0.525	3.0	0.1029	0.0000	SURCHARGED
15 minute summer	S7	10	49.430	0.081	5.3	0.0128	0.0000	OK
60 minute summer	BIO1	46	49.987	0.264	2.2	0.0000	0.0000	OK
60 minute summer	BIO2	45	49.987	0.274	2.3	0.4761	0.0000	SURCHARGED
15 minute summer	BIO2 Filter Layer	10	49.913	0.300	3.4	0.5870	0.0000	OK
15 minute summer	S4	9	49.876	0.041	2.1	0.0029	0.0000	OK
15 minute summer	S5	9	49.814	0.075	4.2	0.0148	0.0000	OK
120 minute summer	S6	92	49.904	0.442	1.9	0.0867	0.0000	SURCHARGED
120 minute summer	S8	92	49.906	0.250	1.7	0.0177	0.0000	SURCHARGED
15 minute summer	BIO3	1	49.723	0.000	0.0	0.0000	0.0000	OK
120 minute summer	BIO4	92	49.904	0.191	0.7	0.0017	0.0000	SURCHARGED
15 minute summer	BIO4 Filter Layer	9	49.783	0.170	4.2	0.3308	0.0000	OK
15 minute summer	OUTFALL	10	49.372	0.072	5.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	S1	1.000	S2	0.9	0.295	0.146	0.0757	
60 minute summer	S2	1.001	BIO1	1.5	0.425	0.329	0.0081	
60 minute summer	S3	1.003	S7	0.7	0.461	0.083	0.0168	
15 minute summer	S7	1.003_1	OUTFALL	5.3	0.823	0.878	0.0315	6.1
60 minute summer	BIO1	Bioretention Area	BIO2	-2.2	-0.122	-0.017		
60 minute summer	BIO2	1.002	S3	-2.3	-0.289	-0.212	0.0638	
60 minute summer	BIO2	Filtration		0.0				
60 minute summer	BIO2 Filter Layer	Underdrain		1.5	0.400	0.688	0.0516	
15 minute summer	BIO2 Filter Layer	Infiltration		0.0				
15 minute summer	S4	2.000	S5	2.1	0.462	0.351	0.0456	
15 minute summer	S5	2.001	BIO3	4.2	0.677	0.574	0.0069	
120 minute summer	S6	2.003	S7	0.8	0.578	0.084	0.0124	
120 minute summer	S8	3.000	S6	1.2	0.197	0.138	0.0720	
15 minute summer	BIO3	Bioretention Area	BIO4	0.0	0.000	0.000		
120 minute summer	BIO4	2.002	S6	-0.7	-0.090	-0.070	0.0718	
120 minute summer	BIO4	Filtration		0.0				
120 minute summer	BIO4 Filter Layer	Underdrain		1.4	0.484	0.627	0.0190	
15 minute summer	BIO4 Filter Layer	Infiltration		0.0				

Results for 30 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 98.50%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	PP1	92	49.907	0.107	9.1	11.8277	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	PP1	3.001	S8	1.1	0.249	0.154	0.0766	
120 minute summer	PP1	Infiltration		0.7				

Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 98.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	S1	47	50.063	0.239	0.9	0.0169	0.0000	FLOOD RISK
60 minute winter	S2	49	50.062	0.333	1.7	0.0654	0.0000	FLOOD RISK
60 minute winter	S3	49	50.062	0.600	3.3	0.1176	0.0000	FLOOD RISK
15 minute summer	S7	10	49.453	0.104	6.4	0.0165	0.0000	SURCHARGED
60 minute winter	BIO1	50	50.062	0.339	1.9	0.0000	0.0000	OK
60 minute winter	BIO2	49	50.062	0.349	2.5	0.9791	0.0000	FLOOD RISK
15 minute summer	BIO2 Filter Layer	9	49.913	0.300	2.6	0.5870	0.0000	OK
15 minute summer	S4	9	49.881	0.046	2.6	0.0033	0.0000	OK
15 minute summer	S5	9	49.829	0.090	5.2	0.0176	0.0000	OK
120 minute winter	S6	112	49.949	0.487	1.9	0.0954	0.0000	SURCHARGED
120 minute winter	S8	110	49.950	0.294	1.7	0.0209	0.0000	SURCHARGED
120 minute winter	BIO3	114	49.949	0.226	0.7	0.0000	0.0000	OK
120 minute winter	BIO4	112	49.949	0.236	0.7	0.2174	0.0000	SURCHARGED
15 minute summer	BIO4 Filter Layer	9	49.794	0.181	5.2	0.3502	0.0000	OK
15 minute summer	OUTFALL	10	49.381	0.081	6.2	0.0000	0.0000	OK

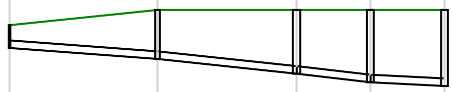
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	S1	1.000	S2	0.8	0.272	0.134	0.0757	
60 minute winter	S2	1.001	BIO1	1.6	0.397	0.350	0.0081	
60 minute winter	S3	1.003	S7	0.8	0.413	0.089	0.0161	
15 minute summer	S7	1.003_1	OUTFALL	6.2	0.827	1.034	0.0358	8.3
60 minute winter	BIO1	Bioretention Area	BIO2	-2.5	-0.116	-0.019		
60 minute winter	BIO2	1.002	S3	-2.5	-0.324	-0.237	0.0638	
60 minute winter	BIO2	Filtration		0.0				
60 minute winter	BIO2 Filter Layer	Underdrain		1.5	0.376	0.671	0.0516	
15 minute summer	BIO2 Filter Layer	Infiltration		0.0				
15 minute summer	S4	2.000	S5	2.6	0.481	0.435	0.0535	
15 minute summer	S5	2.001	BIO3	5.2	0.712	0.708	0.0080	
120 minute winter	S6	2.003	S7	0.8	0.584	0.089	0.0120	
120 minute winter	S8	3.000	S6	1.4	0.222	0.160	0.0720	
120 minute winter	BIO3	Bioretention Area	BIO4	-0.7	-0.063	-0.005		
120 minute winter	BIO4	2.002	S6	-0.7	-0.088	-0.069	0.0718	
120 minute winter	BIO4	Filtration		0.0				
120 minute winter	BIO4 Filter Layer	Underdrain		1.2	0.460	0.537	0.0171	
15 minute summer	BIO4 Filter Layer	Infiltration		0.0				

Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 98.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
120 minute winter	PP1	110	49.952	0.152	7.5	15.3393	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
120 minute winter	PP1	3.001	S8	1.2	0.323	0.161	0.0766	
120 minute winter	PP1	Infiltration		0.7				

Causeway	CGS Civils Ltd Richard Cobden House Lion Street, Chichester PO19 1LW	File: C3552 Flow.pfd Network: Storm Network Luke Honeywill 08/10/2025	Page 1 C3552 Commonmead Barn



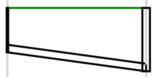
A4 drawing

Hor Scale 500
Ver Scale 100

Datum (m) 40.000

Node Name	PP1		S8		S6		S7		OUTFALL
Link Name		3.001		3.000		2.003		1.003_	
Section Type		100mm		100mm		100mn		100mn	
Slope (1:X)		68.0		47.5		43.3		100.2	
Cover Level (m)	50.100		50.300		50.300		50.300		50.300
Invert Level (m)	49.800	49.656	49.656	49.462	49.462	49.349	49.349	49.300	
Length (m)		9.795		9.205		4.891		4.908	

Node Name	BIO4	S6



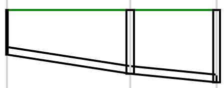
A4 drawing

Hor Scale 500
Ver Scale 100

Datum (m) 40.000

Link Name	2.002	
Section Type	100mm	
Slope (1:X)	36.6	
Cover Level (m)	50.300	50.300
Invert Level (m)	49.713	49.462
Length (m)	9.174	

Node Name	BIO2		S3		S7



A4 drawing

Hor Scale 500
Ver Scale 100

Datum (m) 40.000

	BIO2		S3		S7
Link Name		1.002		1.003	
Section Type		100mm		100mm	
Slope (1:X)		32.5		50.6	
Cover Level (m)	50.300		50.300		50.300
Invert Level (m)	49.713	49.462	49.462	49.349	
Length (m)		8.151		5.717	

Node Name	S4	S5	BIO3

A4 drawing

Hor Scale 500
Ver Scale 100

Datum (m) 40.000

Link Name	2.000	2	
Section Type	100mm	10	
Slope (1:X)	101.8	6	
Cover Level (m)	50.300	50.300	50.300
Invert Level (m)	49.835	49.739 49.723	49.739
Length (m)	9.774	1	

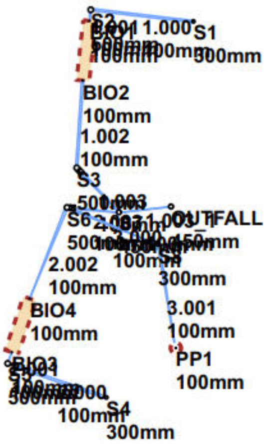
Node Name	S1	S2	BIO1

A4 drawing

Hor Scale 500
Ver Scale 100

Datum (m) 40.000

Link Name	1.000	1	
Section Type	100mm	1	
Slope (1:X)	101.9	1	
Cover Level (m)	50.300	50.300	50.300
Invert Level (m)	49.824	49.729 / 49.723	49.723 / 49.729
Length (m)	9.677	1	



1.000
S1
300mm
BIO2
100mm
1.002
100mm
S3
2.002
100mm
BIO4
100mm
3.001
100mm
PP1
100mm
S4
300mm

Greenfield runoff rate estimation tool

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

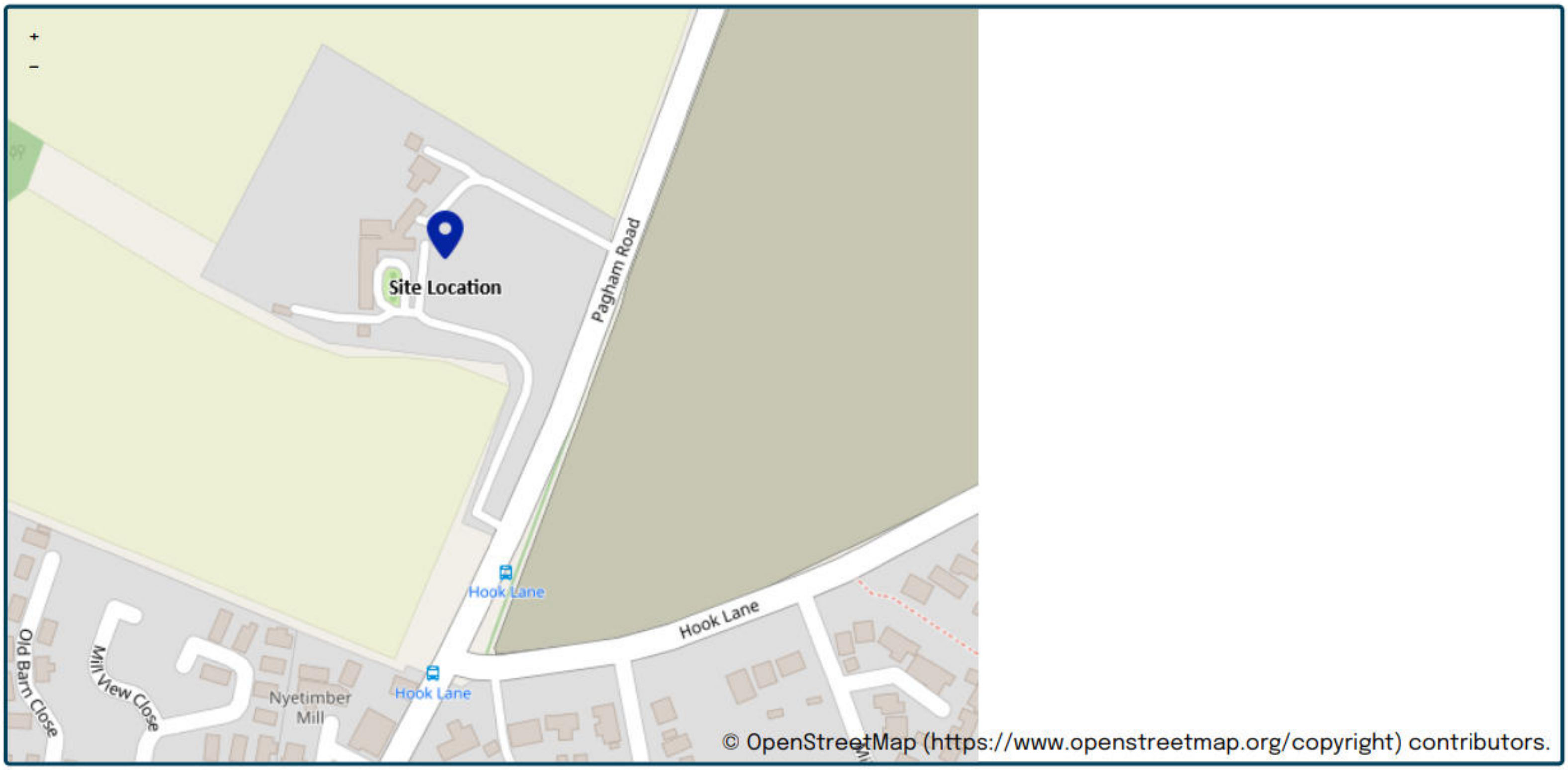
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). 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	06/05/2025
Calculated by	LH
Reference	C3552
Model version	2.0.0

Location

Site name	Land east of commonmead Barn
Site location	Pagham



Site easting	489293
Site northing	99035

Site details

Total site area (ha)	0.04 ha

Greenfield runoff

Method

Method	IH124

IH124

	My value		Map value
SAAR (mm)	700 mm		700
How should SPR be derived?	WRAP soil type		
WRAP soil type	3		3
SPR	0.37		
QBar (IH124) (l/s)	0.11 l/s		

Growth curve factors

	My value		Map value
Hydrological region	7		7
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	IH124
Flow rate 1 year (l/s)	0.098 l/s
Flow rate 2 year (l/s)	0.1 l/s
Flow rate 10 years (l/s)	0.19 l/s
Flow rate 30 years (l/s)	0.26 l/s
Flow rate 100 years (l/s)	0.37 l/s
Flow rate 200 years (l/s)	0.43 l/s

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.0.0) 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.

7.5 Appendix E – Groundwater monitoring and infiltration test results

Groundwater Monitoring

Hole ID	Instrument ID	Instrument Type	Recorded Base of Instrument (mBGL)	Reading			
				Date	Water Level (mBGL)	Water level (mOD)	Ground Level m(OD)
GW1	1	SP	2m	03.10.24	1.940	3.11	5.05
				09.10.24	1.92	3.13	5.05
				17.10.24	1.895	3.155	5.05
				25.10.24	1.885	3.17	5.05
				08.11.24	1.800	3.25	5.05
				22.11.24	1.770	3.28	5.05
				13.12.24	1.735	3.32	5.05
				27.12.24	1.420	3.63	5.05
				03.01.25	1.200	3.85	5.05
				17.01.25	1.720	3.33	5.05
				31.01.25	1.480	3.57	5.05
				06.02.25	1.400	3.65	5.05
				22.02.25	1.330	3.72	5.05
				26.02.25	1.110	3.94	5.05
				02.03.25	1.290	3.76	5.05
				10.03.25	1.44	3.61	5.05
				18.03.25	1.520	3.53	5.05
				28.03.25	1.470	3.58	5.05
GW2	2	SP	2m	03.10.24	1.905	3.145	5.05
				09.10.24	1.89	3.16	5.05
				17.10.24	1.855	3.195	5.05
				25.10.24	1.825	3.23	5.05
				08.11.24	1.715	3.34	5.05
				22.11.24	1.660	3.39	5.05
				13.12.24	1.630	3.42	5.05
				27.12.24	1.380	3.67	5.05
				03.01.25	1.075	3.98	5.05
				17.01.25	1.520	3.53	5.05
				31.01.25	1.440	3.61	5.05
				06.02.25	1.250	3.80	5.05
				22.02.25	1.250	3.80	5.05
				26.02.25	1.020	4.03	5.05
				02.03.25	1.220	3.83	5.05
				10.03.25	1.40	3.65	5.05
				18.03.25	1.400	3.65	5.05
				28.03.25	1.470	3.58	5.05

Project:	Land east of Commonmead Barn, Pagham	GW1
Project No:	C3552	
Client:	Howard Phillips	

The soil infiltration rate (f) is calculated by dividing the volume of water lost between 75% and 25% of the initial test depth by the sum of the average surface area of the sides of the trial pit in contact with the water during the test monitoring period (time taken for the water level to fall between 75% and 25% of the initial test depth), and its base area. This figure is then divided by the test duration to give the soil infiltration rate in metres per second. Each pit should be filled and allowed to drain three times to near empty on the same or consecutive days.

Trail Pit 1							
V(p75-25)		Length	Width	Total Deptl	75% depth	25% depth	50%depth
length*width*(75%depth-25%depth)		0.3	1	0.4	0.3	0.1	0.2
0.06							
a(p50)							
(length*(50% total depth)*2)+(width*(50% total depth)*2)+(area base)							
0.82							
t(p75-25)							
Cycle 1 =	61						
Cycle 2 =	161						
Cycle 3 =	242						
f=V(p75-25)/(ap50*tp75-25)							
1.9992E-05	Test 1	m/s					
7.57461E-06	Test 2	m/s					
5.03931E-06	Test 3	m/s					

The soil infiltration rate (f) is calculated by dividing the volume of water lost between 75% and 25% of the initial test depth by the sum of the average surface area of the sides of the trial pit in contact with the water during the test monitoring period (time taken for the water level to fall between 75% and 25% of the initial test depth), and its base area. This figure is then divided by the test duration to give the soil infiltration rate in metres per second. Each pit should be filled and allowed to drain three times to near empty on the same or consecutive days.

Trail Pit 2							
V(p75-25)		Length	Width	Total Deptl	75% depth	25% depth	50%depth
length*width*(75%depth-25%depth)		0.3	1	0.6	0.45	0.15	0.3
0.09							
a(p50)							
(length*(50% total depth)*2)+(width*(50% total depth)*2)+(area base)							
1.08							
t(p75-25)							
Cycle 1 =	128						
Cycle 2 =	252						
Cycle 3 =	200						
f=V(p75-25)/(ap50*tp75-25)							
1.08507E-05	Test 1	m/s					
5.51146E-06	Test 2	m/s					
6.94444E-06	Test 3	m/s					