Brooklands Barn Garage, Bodicote

Drainage Strategy

Solid Job No:	1669S
Solid Doc Ref:	BBG-SOLID-XX-XX-RP-C-0001
Date:	05/08/2019

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This is a template document for use in all calculations and reports requiring internal review and approval. All areas are to be reviewed for specific project applicability, including but not limited to those elements of highlighted text. The detailed contents section is optional. All text style and sizes and the document layout should be followed.

PROJECT DETAILS

Title: Sustainable Drainage System Report	
Solid Job No: 1669S	**Solid Doc Ref:** BBG-SOLID-XX-XX-RP-C-0001
Date: 05/08/2019	**Status:** S2 – For Information
Rev: P02	**Issued by:** ARD

CONTENTS

APPROVAL

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Diane Ochse - Engineer	Arge Rivera - Associate	Arge Rivera - Associate

REVISION HISTORY

Rev:	Comment:	Approved by:
Rev:	Comment:	Approved by:
Rev:	Comment:	Approved by:

INSTRUCTION AND WARRANTY

Solid Structures Ltd has prepared these calculations in accordance with the instruction given by Mr or Mrs Bratt ("The Client").

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1 INTRODUCTION

Appointment and Brief

1.1 Solid Structures has been appointed by Rowland Bratt to undertake a Sustainable Drainage Strategy for Brooklands Barn Garage, Bodicote.

Objective and Scope of this report

1.2 The objective of this report is to identify the drainage regime of the site at a desk top level. Finally, the report proposes a Sustainable Drainage Systems (SuDS) that can be used on this site.

1.3 To achieve this objective the following documents have been consulted and/or referenced:

- The National Planning Policy Framework (NPPF)
- CIRIA C753 document The SuDS Manual, 2015
- The CIRIA publication 'C635 Designing for exceedance in urban drainage— Good practice'
- Aerial photographs and topographical survey of the site
- British Geological Society Records
- Environment Agency flood maps

2 SITE ASSESSMENT

Existing Site

2.1 The proposed Barn is situated on the side of a valley along Church Street, post code OX15 4DR, coordinates X(Easting):446037; Y(Northing): 237195. The development is bordered on Fairholme House to the east. Access to the site is via Church Street. Refer to figure 1 for details.

Figure 1: Existing Site (Left). Proposed Site Location (right)

2.2 The existing site has a footprint of 1630m^2. The distribution of permeable and impermeable area is as per Table 1. See Appendix A for further details.

Hydrogeology, Geology and Hydrology of the site

2.3 The ground conditions are based on soakaway test undertaken on site. An overview of the finding is shown below. Refer to appendix B for a copy of the report.

2.4 Hydrogeology

Aquifer	The development is outside of an aquifer zone.
Source Protection Zone	The site is not located within a Source Protection Zone.
Ground Water Levels	No Groundwater was recorded at 1.47m and 0.7m bgl.
Groundwater Flooding Incidents	No record.

2.5 Geology

Bedrock & Superficial Deposits	Bedrock: Charmouth Mudstone Formation – Mudstone & Durham Formation – Siltstone and Mudstone Interbedded. Superficial Deposits: Alluvium – Clay, Silt Sand and Gravel.
Soakaway Potential	The soils are considered to be effectively permeable and likely to be conducive to infiltration systems. The two soakaway tests confirm this. The 2 soakaway test pits investigation was carried out by B C Coleman Contracting dated 03/07/19.
Contaminated Land	No records

2.6 Hydrology

Surface Water	The Sor Brook is 140m from the Barn.
Existing Flood Defences	The site is not protected by flood defences.
Surface water drainage network	No records

Proposed Development

2.7 The proposed development comprises of one new building with an access road on the west of the existing barn. The whole site retains the same use class as per existing.

2.8 The estimated lifetime of the proposed development is likely to be between 50-100 years. The distribution of permeable and impermeable areas is as per Table 1. Refer to Appendix A for details.

Table1: Existing and Proposed distribution of permeable and impermeable areas

Areas Description	Existing Site (Ha)	Redeveloped Site (Ha)
Total Site Area	0.163	0.163
Area Positively drained	0.000	0.058
Percentage of drained area that is impermeable	0%	34%
Percentage of drained area that is permeable	100%	66%

3 FLOOD RISK ASSESSMENT

Table 2: Sources of flooding high level assessment and mitigation

Source of Flooding	Assessment	Flood Risk Reduction & Mitigation
Fluvial water (river flows)	Site is located within zone 1	None
Surface water (overland flows)	There are no records of the site flooding.	Based on the permeability tests the proposed SUDS will be able to reduce the post development surface water runoff.
Flooding from Groundwater	There are no records of flooding within the site.	No mitigation is required
Tidal/coastal	The site is not near the coast	Not applicable
Canals	The site is not near a canal	Not applicable
Reservoirs	There are no records of the reservoir flooding within the site.	No mitigation is required
Flooding from sewers	There are no records of sewer flooding within the site.	No mitigation is required

4 SUSTAINABLE SURFACE WATER STRATEGY

4.1 The NPPF states that developers should "seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of SuDS". The surface water drainage is designed in accordance with the Environment Agency and CIRIA C753 SuDS manual.

Sustainable Drainage System (SuDS) Discharge Hierarchy Evaluation

4.2 The evaluation also takes into account the NPPF guidance and Building Regulations Section H3 which stipulates that 'rainwater from roofs and paved areas is carried away from the surface to discharge to one of the following in order of priority:

- *An adequate soakaway or some other infiltration system,*
- *a watercourse, or where that is not practical,*
- *A sewer.'*

Table 3: Discharge Hierarchy Evaluation

Discharge Point	Assessment	Conclusion
Infiltrate to Ground	It is possible to infiltrate to ground at shallow and deep depth	Use as a main discharge system. See SuDS evaluation for more details
Discharge to watercourse	The watercourse id too far away for a sensible discharge.	N/A Infiltration is possible
Discharge to a Surface Water Sewer	There are not sewers in the proximity to site	N/A Infiltration is possible
Discharge to a combined sewer	There are not sewers in the proximity to site	N/A Infiltration is possible

4.3 The SuDS techniques were evaluated in relation to the available site information and the discharge evaluation. The aim is to provide a sustainable design that could attenuate the flows produced by the proposed development and avoid increasing the flood risk to the properties downstream.

4.4 The potential SuDS options that could be used onsite are discussed as follow.

Living Roofs

Green roofs are a multi-layered system that covers the roof of a building with vegetation cover, landscaping or permeable drainage layer. They are designed to intercept and retain precipitation, reducing the volume of runoff and attenuating peak flows.

Site Application
Not applicable as roof does not allow for living roofs.

Basins and Ponds

Detention basins and Ponds are vegetated depressions which are used to store runoff, gradually releasing it in a controlled manner and reducing peak flow rates. Basins are designed to provide attenuation, but have the added benefit of allowing settlement of suspended material.

Site Application
Basin and ponds are not recommended due to limited available space.

Filter Strips and Swales

Filter strips are uniformly graded and gently sloping strips of grass or other dense vegetation. Strips are designed to allow runoff from adjacent impermeable areas to flow across its surface at a sufficiently low velocity so that sediment and associated pollutants are filtered out.

Site Application
These systems are not recommended due to limited available space onsite.

Swales are vegetated, trapezoidal shallow depressions, which can be designed to attenuate runoff, convey runoff and can also be used to provide water quality improvements by filtering pollutants.

Infiltration

Soakaways are excavations filled with rubble or lined with brickwork, precast concrete, modular plastic geocellular systems, or perforated pipe system surrounded by granular backfill. Infiltration/Filtration Trenches are shallow excavations filled with rubble or stone that create temporary subsurface storage for either infiltration or filtration.

Site Application
Infiltration works on this site, a permeable surface is more appropriate.

Permeable / Bio-retention Surfaces

Pervious pavements provide a pavement suitable for pedestrian and/or vehicular traffic, while allowing rainwater to infiltrate through the surface and underlying layers. The water is temporarily stored before infiltration to the ground, reuse or being discharged to a watercourse or other drainage system

Site Application
Permeable materials are being used for open areas as infiltration and attenuation.

Tanked Systems

Oversized pipes, water harvesting tanks or modular plastic geocellular systems wrapped in impermeable membrane are systems with a high void ratio that can be used to create a below ground storage structure. The discharge flow is controlled via a hydrobrake or similar flow control device. The storage systems can be installed beneath trafficked and soft landscaped areas but produce limited water treatment.

Site Application
Tanked systems are not recommended as it is possible to infiltrate the flow produced by the development.

Climate Change Allowance

4.5 Following the climate change allowances guidance given by the Environment Agency, both the central and upper end allowances have been considered for the assumed 50-year lifespan of the design. See Table 4 below. Due to the location and importance of the development a 40% climate change allowance should be accommodated within the drainage design for the site.

Table 4: Peak rainfall intensity climate change allowances

Applies across all of England	Total potential change anticipated for 2015 to 2039	Total potential change anticipated for 2040 to 2069	Total potential change anticipated for 2070 to 2115
Upper End	10%	20%	40%
Central	5%	10%	20%

SuDS design and Capacity

4.6 Infiltration can be achieved on this site as confirmed by the permeability tests; therefore the surface strategy will be as follow:

- Attenuation of all flows from the new roof and infiltrate them into the ground by using the permeable access road and parking area in front of the garage.

4.7 As the proposed development area is less than 50ha, the Micro Drainage ICP SUDS (FSR Method) has been used to estimate the existing site peak flow rates. The results for this development are summarised within Table 5. Full calculations can be found within Appendix C.

4.8 The Design Suite for Micro Drainage has been used to calculate the size of the attenuation and infiltration system for all events up to the 1 in 100 rainfall event including an allowance for climate change. The results are summarised within Table 5. Calculations can be found in Appendix C.

Table 5: Peak discharge rates and anticipated attenuation volumes for SuDS

Return Period Event	Existing Peak Discharge Rate (l/s)	Proposed Peak Discharge Rate or Infiltration rate (m/s)	Anticipated attenuation volume (m3)
QBAR (1in 2)	28.2	6.78 x 10^-5	
30	50.1	6.78 x 10^-5	
100	54.5	6.78 x 10^-5	
100+40%CC	N/A	6.78 x 10^-5	9.76

4.9 The attenuation and infiltration storage can be provided by the permeable paving sub-base. See Table 6 and Appendix D for locations and details of the SuDS used in the site.

Table 6: Storage Volume Distribution within SuDS

Sustainable Drainage Systems	Volume (m^3)
Bio-retention areas with 350mm subbase	39.795
TOTAL STORAGE VOLUME PROVIDED	39.795

4.10 The surface water drainage strategy is prepared in outline only to demonstrate that the proposed development can meet national and local requirements. Further development of the strategy will be undertaken at the detailed design.

4.11 It should be noted that the above presents one possible solution to demonstrate that the development can be sustainably drained and comply with the requirements of the NPPF. Other solutions may be feasible that would meet these criteria and may prove to be better suited for the site. These will become apparent during the detailed design stage. The strategy above should therefore not be interpreted as the definitive scheme solution

Maintenance of Drainage System

4.12 Maintenance and Management Plan Guidance from the SuDS Manual, CIRIA C753 (CIRIA, 2015) is to be followed for the effective maintenance of the proposed SuDS techniques outlined throughout Section 4. Maintenance activities will be dependent on the drainage scheme installed following detailed design. A detailed maintenance manual should be provided during the detailed design of the project.

Management of Exceedance

4.13 The drainage network has been designed to attenuate surface runoff for all events up to and including the 1% AEP (1 in 100 years), plus 40% climate change allowance event. However consideration has been given to what may happen when the design capacity of the surface water drainage network is exceeded.

4.14 Surface water will flow to the lowest points within the site located to the south of the site resulting in flows moving away from the buildings and into natural permeable open field. The flood risk to the buildings would therefore remain very low.

5 FOUL WATER DRAINAGE STRATEGY

5.1 The foul water sewer from the Barn Garage will connect into the existing foul water sewer at the main residence. Refer to Appendix D for more details.

6 CONCLUSIONS

6.1 This drainage strategy demonstrates that the proposed development site can be drained in a sustainable manner without increasing flood risk to other parties or contaminating the environment. This design aims to attenuate the surface water runoff within the gravel sub-base of permeable areas.

6.2 The proposed drainage strategy does not attempt to present a final design of the foul and surface water system nor the most value engineered design. This procedure is left until the detailed design stage where other systems will be evaluated following the completion of the site investigation.

APPENDICES

Appendix A: Existing and Proposed Development Areas

Appendix B: Soil Infiltration Rate

Appendix C: Run off Model Results

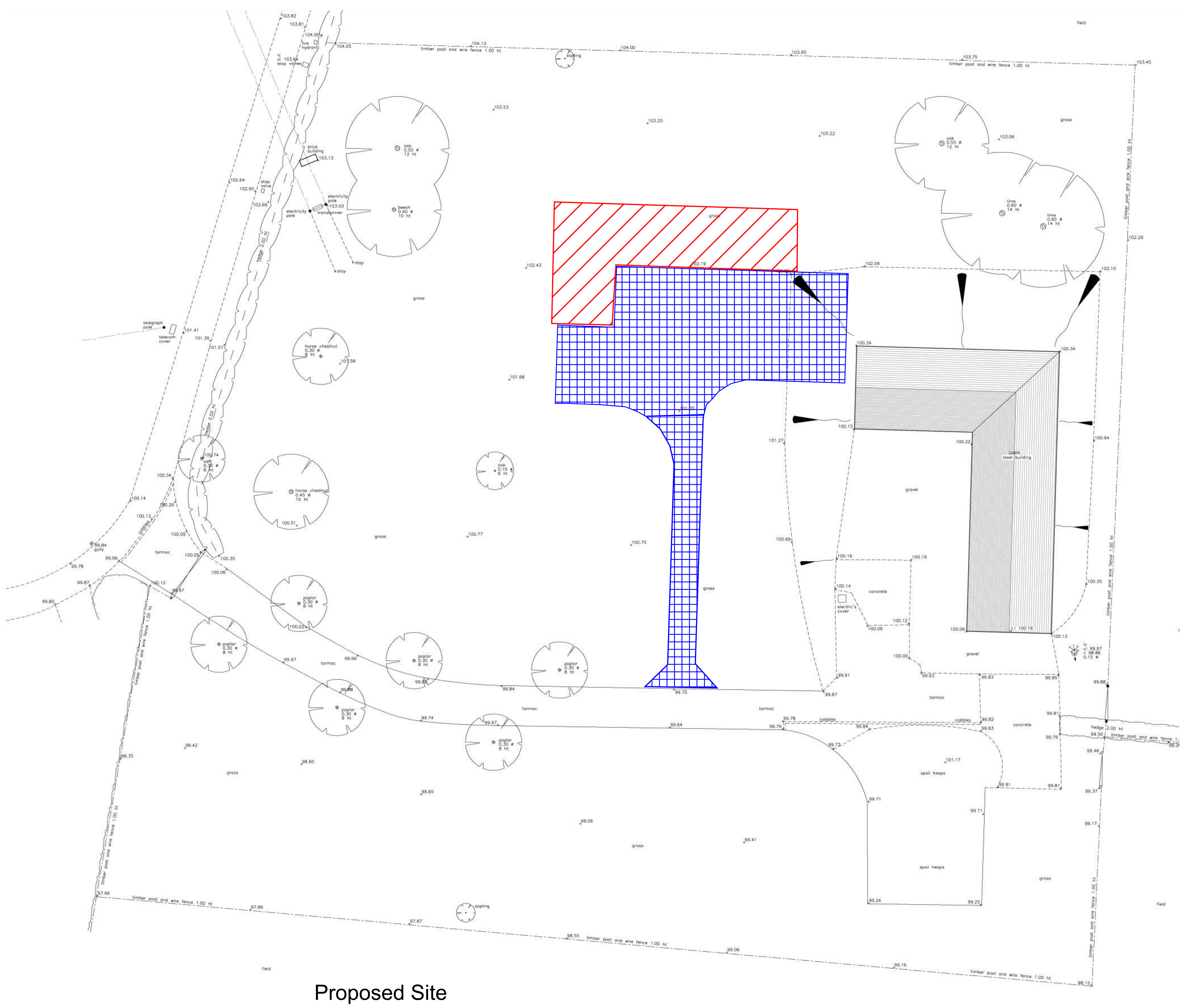
Appendix D: Proposed Surface and Foul Drainage Strategy

Appendix A: Existing and Proposed Development Area

NOTES

1. All Structural Engineer's drawings are to be read in conjunction with all relevant Architect's & Services Engineer's drawings and specifications.

Existing Site



Proposed Site

KEY:

- Proposed New Permeable Surface
- Proposed New Impermeable Surface

P01	Issued for Planning Approval	30.07.19	DO	ARD
Rev	Description	Date	By	Chkd

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Project

Brooklands Barn Garage
Bodicote

Drawing Title

Existing and Proposed Developed Areas

Scale

NTS @ A1

Role

Civil

Status / Stage

S4- For Planning Approval

Job No

1669S

Ref	Org	Zone	Level	Type	Role	Number	Rev
BBG	SOLID	XX	UD	DR	C	6000	P01

Appendix B:
Soil Infiltration Rate

Soil Infiltration Rate: calculations for Brooklands Barn Garage, Bodicote

Solid Job No:	1669S
Solid Doc Ref:	1669S-BBC-SOLID-XX-XX-RP-C-0002
Date:	30/07/2019

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PROJECT DETAILS	
Title: Soil Infiltration Rate calculations report	
Solid Job No: 1669S	**Solid Doc Ref:** 1669S-BBC-SOLID-XX-XX-RP-C-0002
Date: 30/07/2019	**Status:** S4 - Building Regs
Rev: P01	**Issued by:** ARD

CONTENTS

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REVISION HISTORY		
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Rev:	Comment:	Approved by:
Rev:	Comment:	Approved by:

INSTRUCTION AND WARRANTY
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Test Pit 1

Pit Dimensions:

L:	1203	mm
W:	650	mm
D:	1470	mm

Key

(orange)	Input
(grey)	Calculation

Test 1

Mean Surface Area 3.05 m2
Depth of water at start of test 1223 mm
Time at 25% or at 305.8 mm of water

Time Since Start	Water Level from ground level	Depth of water
min	mm	mm
0	247	1223
15	615	855
30	863	607
45	1061	409
60	1243	227
75	1470	0

Interpolating Values

Time	Water Depth
45	409
60	227

t: 53.51 min. From interpolating values

Time at 75% or at 917.3 mm of water

Interpolating Values

Time	Water Depth
0	1223
15	855

t: 12.46 min. From interpolating values

Volume of test Pit between 25% and 75% of water depth: 0.478 m3
Time Taken to drain between 25% and 75% of water depth: 41.05 min or 0.684 hr

Test 1 - Soil Infiltration rate: 6.37E-05 m/s
0.229301 m/hr

Test 2

Mean Surface Area 3.06 m2
Depth of water 1229 mm
Time at 25% or at 307.3 mm of water

Time Since Start	Water Level from GL	Depth of water
min	mm	mm
0	241	1229
15	617	853
30	841	629
45	1024	446
60	1174	296
75	1323	147
90	1470	0

Interpolating Values

Time	Water Depth
45	446
60	296

t: 58.88 min. From interpolating values

Time at 75% or at 921.8 mm of water

Interpolating Values

Time	Water Depth
0	1229
15	853

t: 12.26 min. From interpolating values

Volume of test Pit between 25% and 75% of water depth: 0.481 m3
Time Taken to drain between 25% and 75% of water depth: 46.62 min or 0.777 hr

Test 2 - Soil Infiltration rate: 5.62E-05 m/s
0.202153 m/hr

Test 3

Mean Surface Area 3.056 m2
Depth of water 1227 mm
Time at 25% or at 306.8 mm of water

Time Since Start	Water Level from GL	Depth of water
min	mm	mm
0	243	1227
15	615	855
30	827	643
45	1021	449
60	1167	303
75	1321	149
90	1470	0

Interpolating Values

Time	Water Depth
45	449
60	303

t: 59.61 min. From interpolating values

Time at 75% or at 920.3 mm of water

Interpolating Values

Time	Water Depth
0	1227
15	855

t: 12.37 min. From interpolating values

Volume of test Pit between 25% and 75% of water depth: 0.48 m3

Time Taken to drain between 25% and 75% of water depth: 47.25 min or 0.787 hr

Test 3 - Soil Infiltration rate: 5.54E-05 m/s
0.199383 m/hr

Lowest Soil Infiltration Rate: 5.54E-05 m/s
0.1994 m/hr

Test Pit 2

Pit Dimensions:

L:	1500	mm
W:	1000	mm
D:	700	mm

Key

	Input
	Calculation

Test 1

Mean Surface Area	3.13	m2
Depth of water at start of test	650	mm
Time at 25% or at	162.5	mm of water

Time Since Start	Water Level from ground level	Depth of water
min	mm	mm
0	50	650
15	203	497
30	325	375
45	452	248
60	601	99
75	700	0

Interpolating Values

Time	Water Depth
45	248
60	99

t: 53.61 min. From interpolating values

Time at 75% or at 487.5 mm of water

Interpolating Values

Time	Water Depth
15	497
30	375

t: 16.17 min. From interpolating values

Volume of test Pit between 25% and 75% of water depth: 0.488 m3

Time Taken to drain between 25% and 75% of water depth: 37.44 min or 0.624 hr

Test 1 - Soil Infiltration rate: 6.94E-05 m/s

0.250004 m/hr

Test 2

Mean Surface Area	3.13	m2
Depth of water	653	mm
Time at 25% or at	163.3	mm of water

Time Since Start	Water Level from GL	Depth of water
min	mm	mm
0	47	653
15	201	499
30	317	383
45	443	257
60	596	104
75	700	0

Interpolating Values

Time	Water Depth
45	257
60	104

t: 54.19 min. From interpolating values

Time at 75% or at 489.8 mm of water

Interpolating Values

Time	Water Depth
15	499
30	383

t: 16.2 min. From interpolating values

Volume of test Pit between 25% and 75% of water depth: 0.49 m3

Time Taken to drain between 25% and 75% of water depth: 38 min or 0.633 hr

Test 2 - Soil Infiltration rate: 6.86E-05 m/s

0.246892 m/hr

Test 3

Mean Surface Area 3.148 m2
Depth of water 659 mm
Time at 25% or at 164.8 mm of water

Interpolating Values

Time	Water Depth
45	268
60	109

t: 54.74 min. From interpolating values

Time Since Start	Water Level from GL	Depth of water
min	mm	mm
0	41	659
15	197	503
30	311	389
45	432	268
60	591	109
75	700	0

Time at 75% or at 494.3 mm of water

Interpolating Values

Time	Water Depth
15	503
30	389

t: 16.15 min. From interpolating values

Volume of test Pit between 25% and 75% of water depth: 0.494 m3

Time Taken to drain between 25% and 75% of water depth: 38.59 min or 0.643 hr

Test 3 - Soil Infiltration rate: 6.78E-05 m/s; 0.244155 m/hr

Lowest Soil Infiltration Rate: **6.78E-05** m/s; **0.2442** m/hr

Appendix C:
Micro Drainage Run off

Existing Run-off Results

Solid Structures		Page 1
Solid Studio, Chipping Norton Oxfordshire OX7 5BJ		
Date 30/07/2019 11:47 File	Designed by Diane Checked by	
Innovyze	Source Control 2018.1.1	

ICP SUDS Mean Annual Flood

Input

Return Period (years)	2	Soil	0.470
Area (ha)	0.163	Urban	0.000
SAAR (mm)	654	Region Number	Region 6

Results	**l/s**
QBAR Rural	0.7
QBAR Urban	0.7
Q2 years	0.6
Q1 year	0.6
Q30 years	1.6
Q100 years	2.3

Proposed Run-off Results

Solid Structures		Page 1
Solid Studio, Chipping Norton Oxfordshire OX7 5BJ		
Date 30/07/2019 16:44 File PROPOSED.MDX	Designed by Diane Checked by	
Innovyze	Network 2018.1.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	5	PIMP (%)	100
M5-60 (mm)	19.900	Add Flow / Climate Change (%)	0
Ratio R	0.413	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.600
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	5.000	0.085	58.8	0.020	6.00	0.0	0.600	o	100	Pipe/Conduit	
1.001	5.000	0.085	58.5	0.018	0.00	0.0	0.600	o	100	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	6.08	99.400	0.020	0.0	0.0	0.0	1.01	7.9	2.7
1.001	50.00	6.17	99.315	0.038	0.0	0.0	0.0	1.01	7.9	5.1

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.001		100.000	99.230	0.000	0	0

Simulation Criteria for Storm

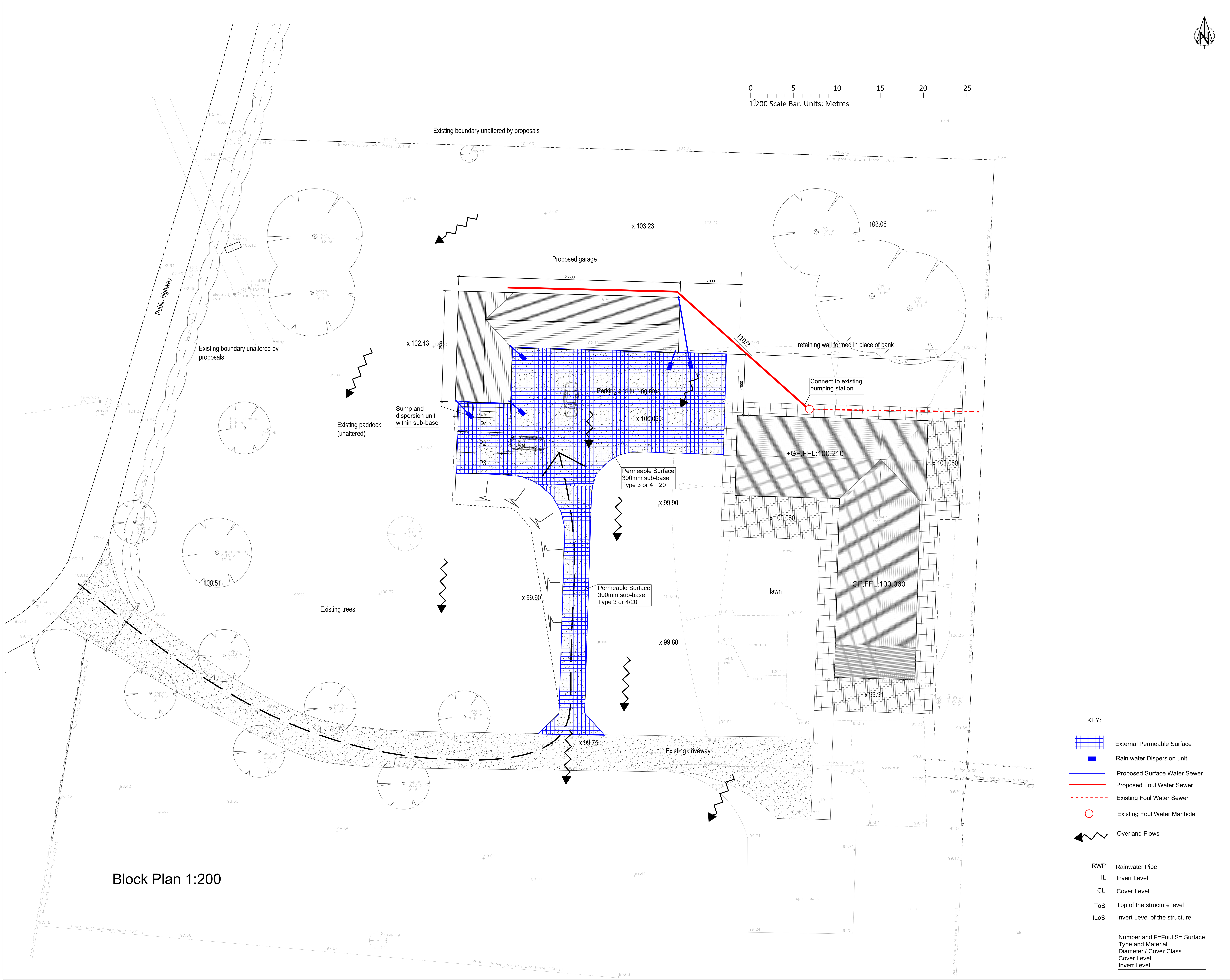
Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	5	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.900	Storm Duration (mins)	30
Ratio R	0.413		

Appendix D:
Proposed Drainage Strategy



NOTES

1. All dimensions are in millimetres and levels in m AOD unless stated otherwise.

2. Do not scale. If in any doubt, consult Engineer.

3. Read in conjunction with the architects and engineers schedule drawings.

4. Check inverts and sizes of existing pipes prior to the commencement of any work. Report any discrepancies to the engineer and await instructions.

5. The location of services is shown as indicative. This drawing should be read in conjunction with the utilities drawings. No warranty to their accuracy can be given. The contractor shall take all necessary measures to satisfy himself as to the location of the existing services and connection points. Excavation should be undertaken in compliance with HSG47.

6. Surface water Pipework to be 110mm Thermoplastics U-PVC (Polypipe or similar) installed at 1:100 slopes minimum. Pipe bedding should be class Z in pipes within 1.5m of the building or shallower than 700mm below ground level. For all other areas the pipe bedding should be class S.

7. Joints and fittings for gravity sewers shall comply with the relevant provisions of BS EN 1401-1, BS EN 1852 and BS EN 12666-1. Pipes shall have a limit of 6% deformation. Pipes shall be SN8 ring stiffness and stamped accordingly.
Pipe sections shall not be longer than 3m.

8. Plastic chambers and rings, including demarcation chambers,shall comply with BS EN 3598-1 or BS EN 13598-2 as appropriate.

9. Inspection chamber covers and frames shall comply with the relevant provisions of BS EN 124 and should be double sealed.

10. All inspection chamber covers shall be the non-ventilating type and shall have closed keyways.

11. Testing of pipelines should be as follow:

Gravity Pipework: Air pipe testing. Pipework should withstand a pressure of 100mm water gauge and this should not fall by more than 25mm in a 5minute period. However where traps or gullies are connected they should withstand a pressure of 50mm water gauge and this should not fall by more than 12mm in a 5minute period. It is recommended that pipework installations are tested in sections rather than waiting to complete in one operation.

12. Concrete structures design sulphate class and ACEC concrete class unknown.

13. Manhole covers to be set square to the building. Covers of existing manholes to be adjusted to match final ground levels.

14. Granular Bedding for pipes shall be constructed by spreading and compacting granular bedding material over the full width of the pipe trench. After the pipes have been laid, additional granular material shall, if required, be placed and compacted equally on each side of the pipes and, where practicable, this shall be done in sequence with the removal of the trench supports.

Rev	Description	Date	By	Chkd
P01	Issued for Planning Approval	30.07.19	DO	ARD

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Project

Brooklands Barn Garage
Bodicote

Drawing Title

PROPOSED DRAINAGE NETWORK SKETCH

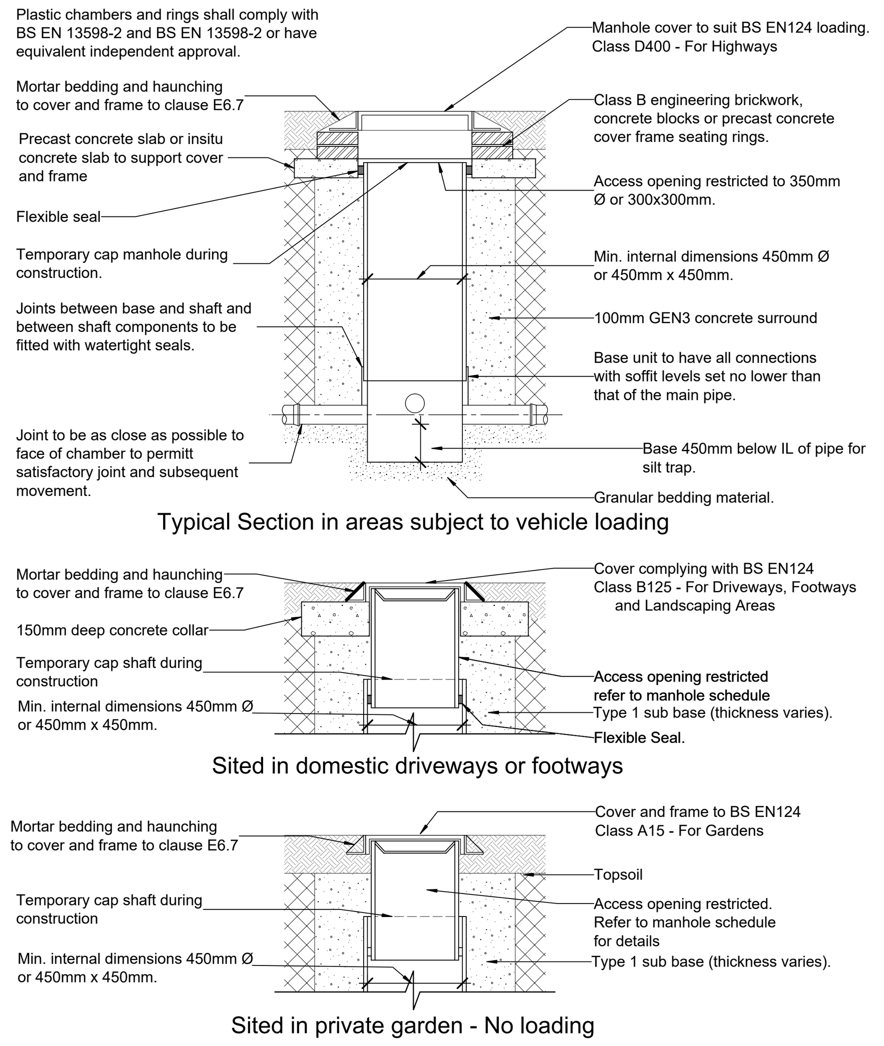
Scale: **1:100 @ A1**

Role: **Civil**

Status / Stage: **S4- For Planning Approval**

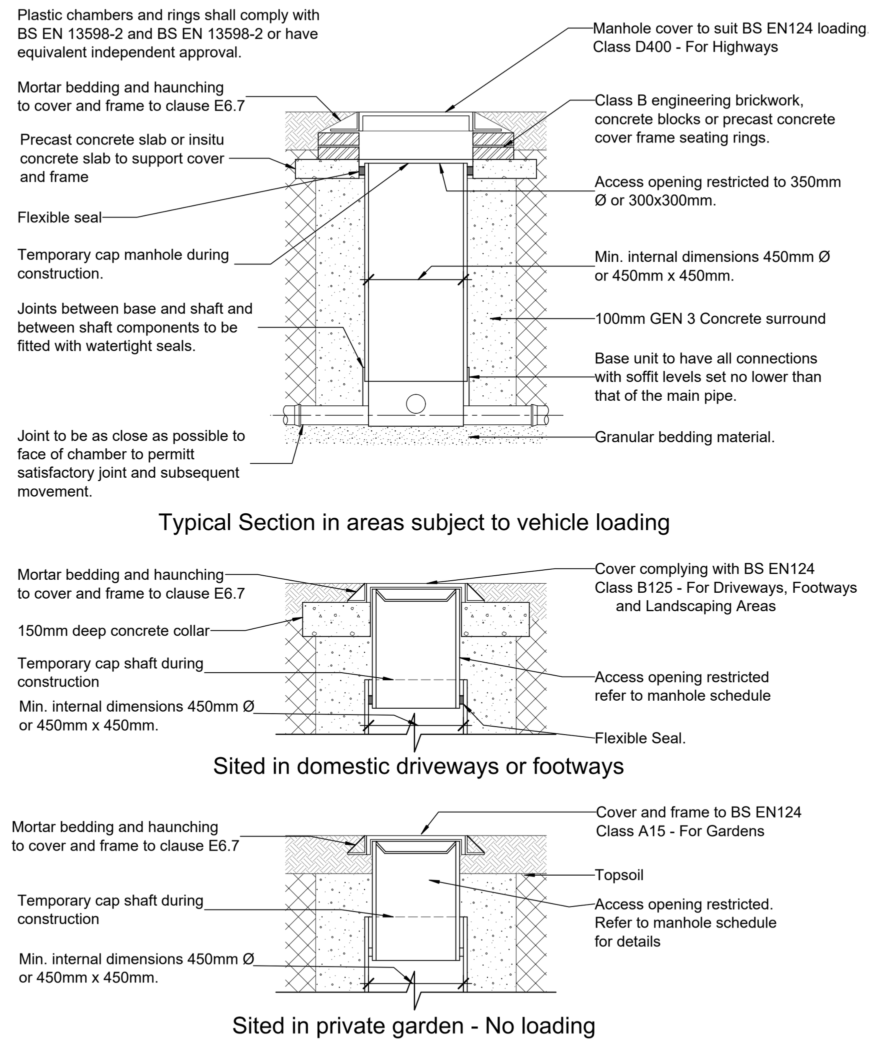
Job No: **1669S**

Ref	Org	Zone	Level	Type	Role	Number	Rev
BBG	SOLID	XX	UD	DR	C	6100	P01



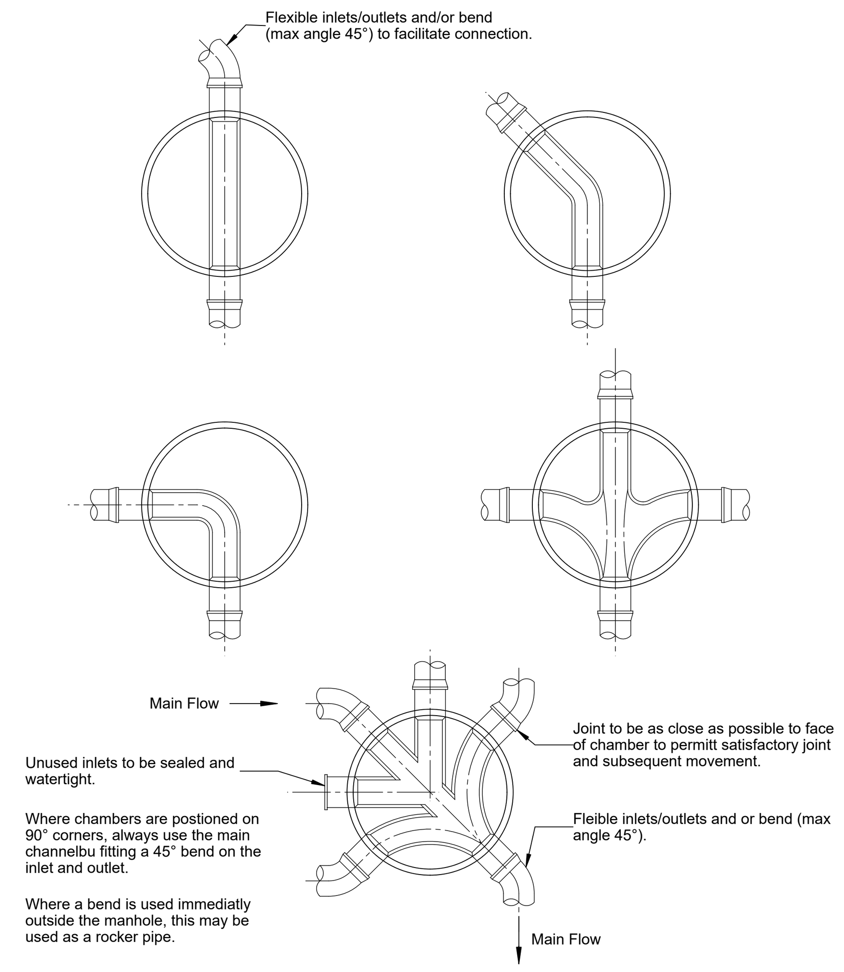
Notes:
1. Refer to drawing 8193 for base layouts.

8005 - Silt Trap Plastic

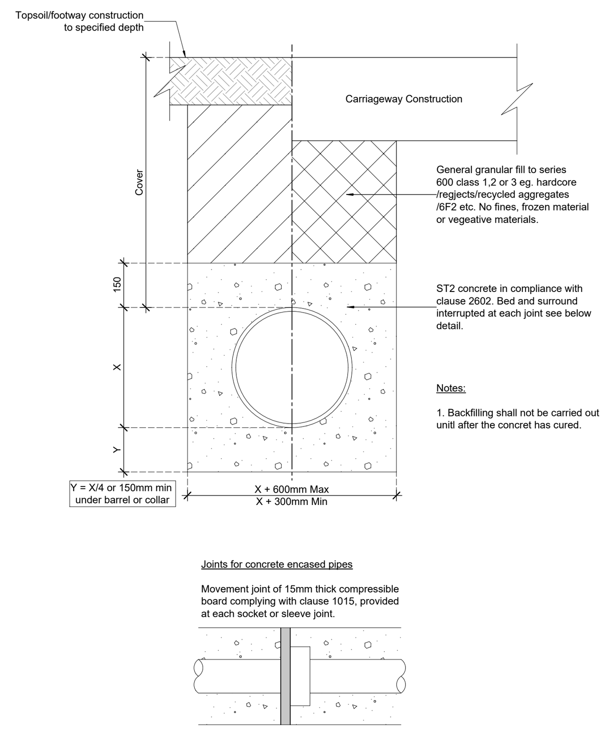


Notes:
1. Refer to drawing 8193 for base layouts.

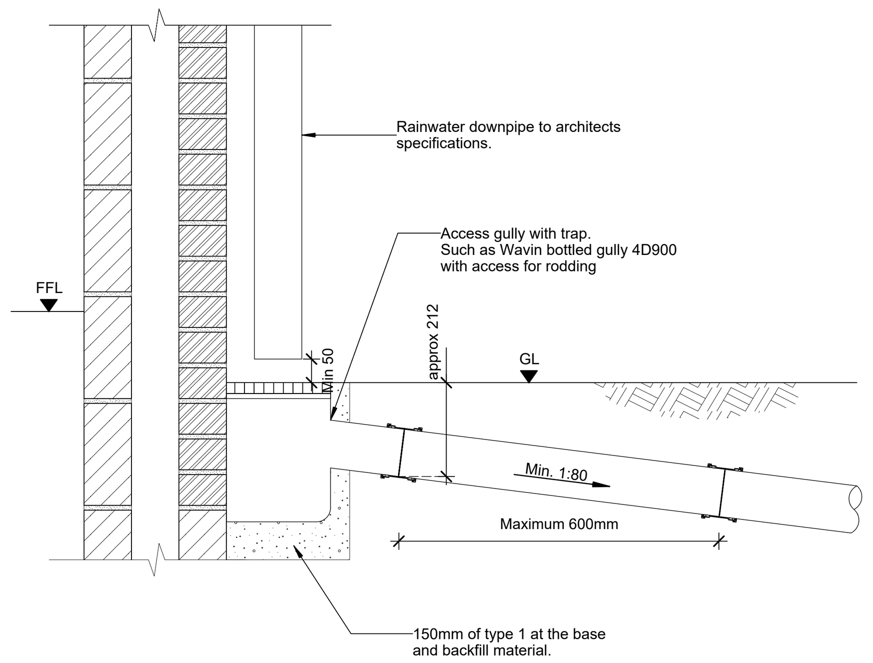
8190 - Chamber Type 3 - Flexible Material



8193 - Chamber Type 3 Base Layouts



8061 - Pipe Bedding Detail Type Z

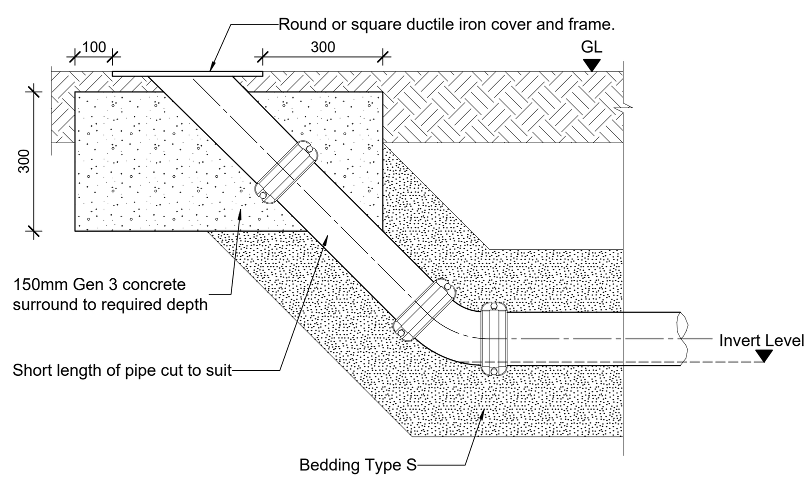


NOTES:

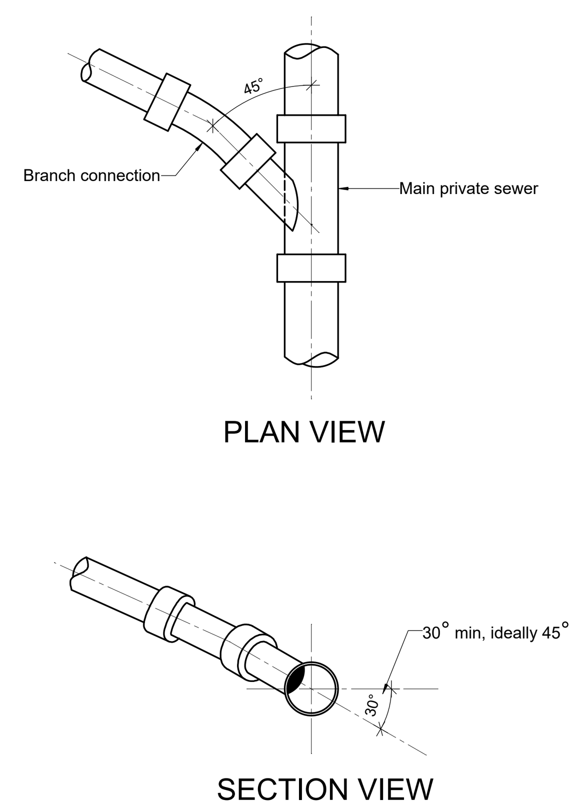
1. This details shows the standard generic arrangement.

2. The pipe and connector details will be different for each manufacturer of the components. They are to be in installed in accordance with the manufacturers recommendations.

8250 - External Rainwater (High Level)



8230 - External Rodding Eye Detail



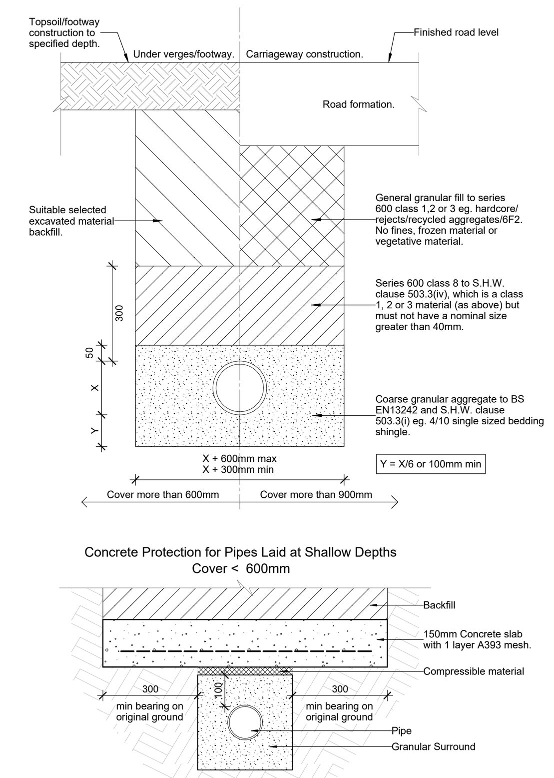
NOTES:

1. The vertical angle between the connecting pipe and the horizontal should be greater than 0° and not more than 60°.

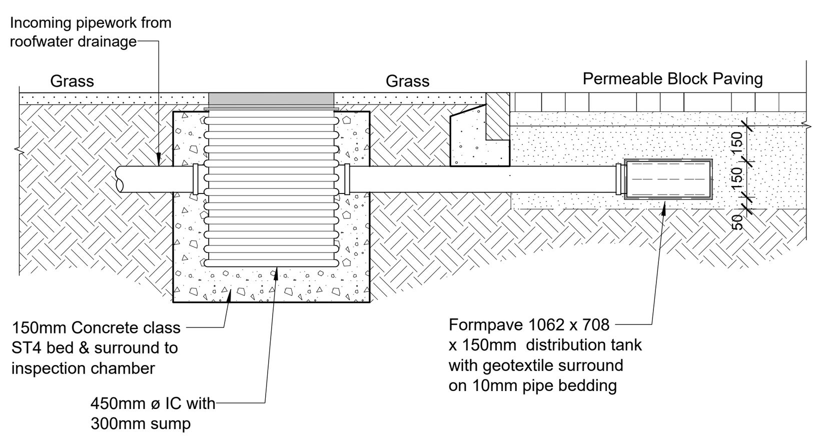
2. Where the connection is being made to a sewer with a nominal internal diameter of 300 mm or less, connections should be made using 45° angle, or 90° angle, curved square junctions.

3. Connections made with junction fittings should be made by cutting the existing pipe, inserting the junction fitting and jointing with flexible repair couplings or slip couplers.

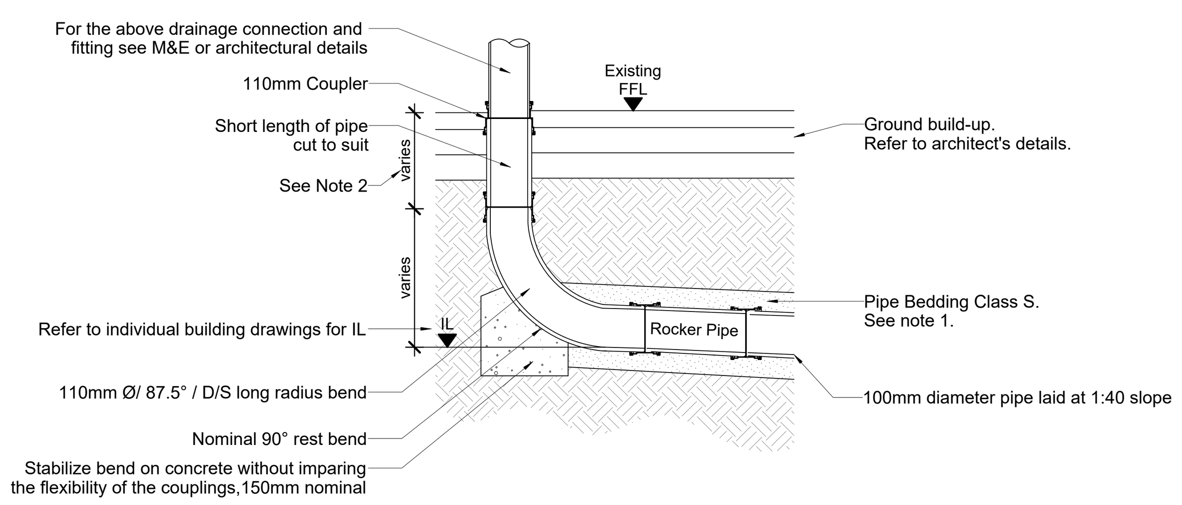
8225 - Lateral Connection to private sewer



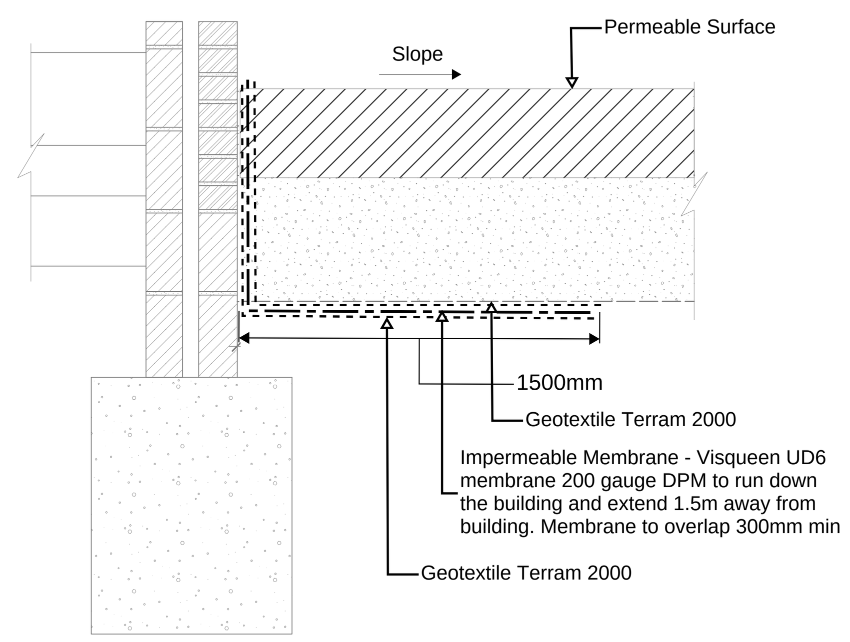
8064 - Pipe Bedding Detail Type S



SD064 - Sump and Dispersion Unit



8241 - Internal Foul Water Direct Connection



PERMEABLE SURFACE DETAIL AGAINST BUILDING

NOTES

1. All Structural Engineer's drawings are to be read in conjunction with all relevant Architect's & Services Engineer's drawings and specifications.

P01	Issued for Planning Approval	18.07.19	DO	ARD
Rev	Description	Date	By	Chkd

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Project
Brooklands Barn Garage
Bodicote

Drawing Title
DRAINAGE STANDARD DETAILS

Scale
NTS @ A1

Role
Civil

Status / Stage
S4 For Planning Approval

Job No
1669/M

Ref	Org	Zone	Level	Type	Role	Number	Rev
BBC	SOLID	XX	DT	DR	C	3400	P01