Consulting Civil Engineers

Foul and Surface Water Drainage Strategy Report

Rosewood Barn, Two Mile Ash Road, Barns Green RH13 7PF

Planning Ref: DC/21/2323

For

Rory Niblock

Rev – **P4**

Reference **C3089**

Date **29th October 2024**

Revision	Date of Issue	Comments	Prepared By	Checked By
P	15/08/2024	Initial Issue	LH	CS
P1	21/08/2024	Revised	LH	CS
P2	19/09/2024	Revised	LH	CS
P3	09/10/2024	Revised	LH	CS
P4	29/10/2024	Revised	LH	CS

Richard Cobden House, Lion Street, Chichester, West Sussex, PO19 1LW
Tel: 01243 933253 E: mail@cgscivils.co.uk W: www.cgscivils.co.uk

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1 Introduction

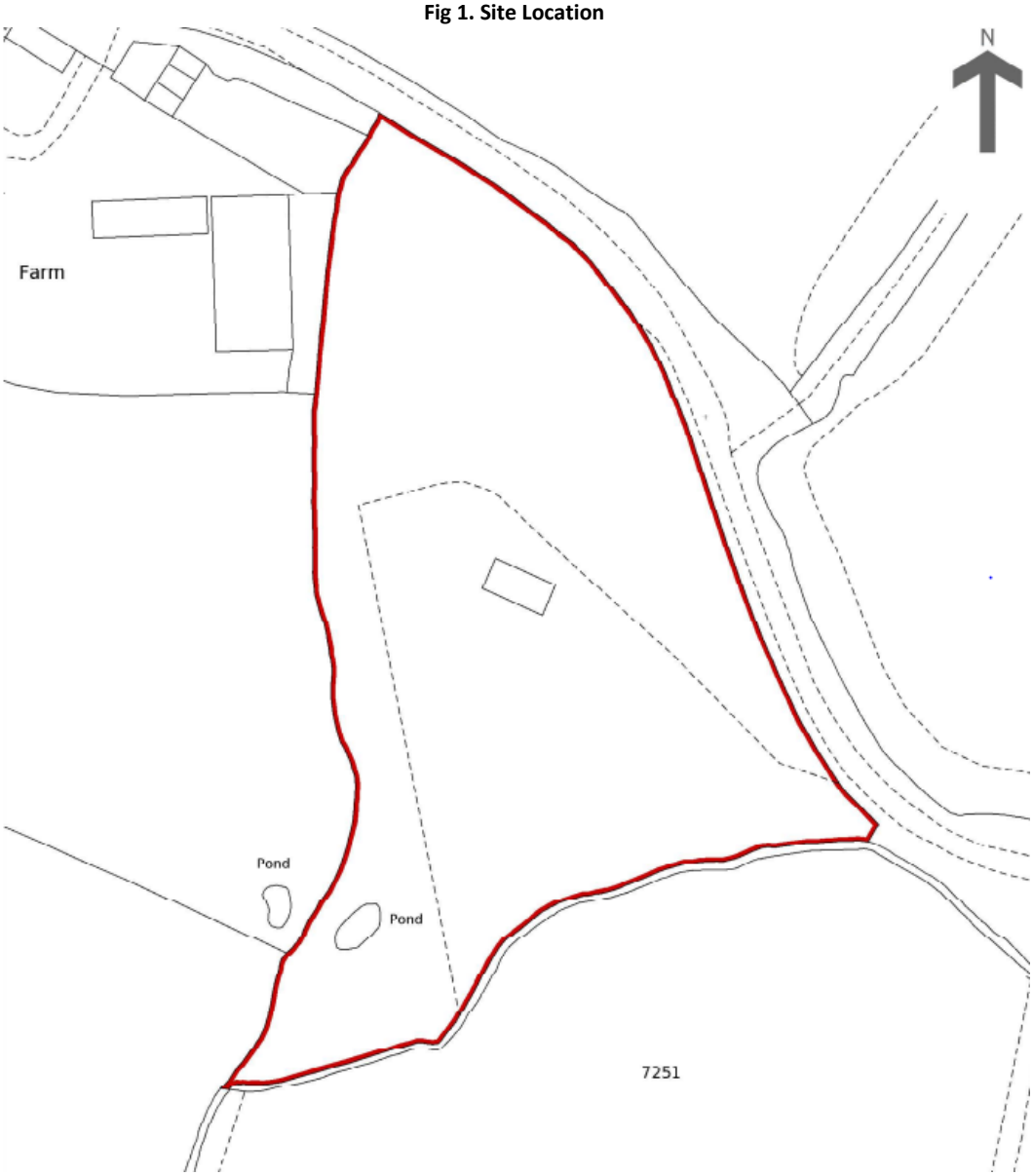
1.1.1 CGS Civils Ltd has been appointed to undertake a drainage strategy report for a proposed development a Rosewood Barn, Two Mile Ash Road in Barns Green.

1.1.2 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 order to clear Condition 3. The condition is in place on Decision Notice with the planning reference: **DC/21/2323.** The condition reads as follows:

- No development shall commence until a drainage strategy detailing the proposed means of foul and surface water disposal has been submitted to and approved in writing by the Local Planning Authority. The development shall be carried out in accordance with the approved scheme.

1.1.3 The proposed development will consist of the conversion of a barn to form a three bedroom dwellinghouse. The proposed development is located as OS Grid Reference TQ 13695 26632 and has the post code RH13 0PF.

Fig 1. Site Location



2 Executive Summary:

2.1.1 The Surface Water will discharge to the stream to the south at a restricted rate of 1.0l/s.

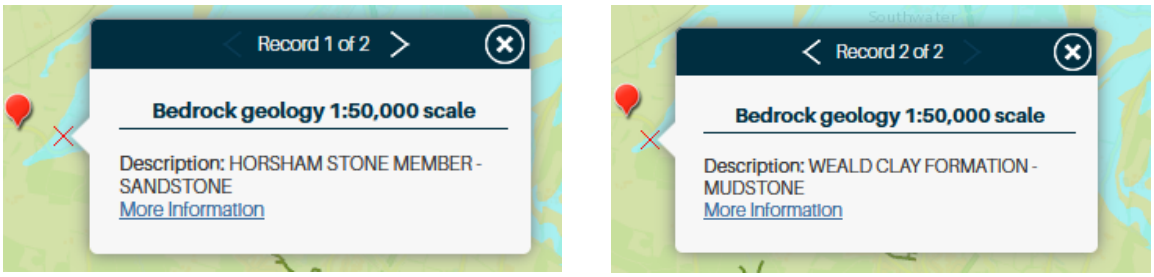
2.1.2 The Foul water will be treated on site via a package treatment plant and all treated effluent runoff will discharge into the stream to the south.

3 Site Geology

3.1 British Geological Survey information

3.1.1 The British Geological Survey confirms the bedrock geology to be made up of Horsham Stone Member and Weald Clay Formation. At the time of writing the British Geological Survey website does not have any recorded information of the Superficial deposits on site.

Fig 2. British Geological Survey



3.2 Geological Assessment

3.2.1 An infiltration test was carried out on site by the client. The water level failed to drain during a sufficient time frame during the test and it is therefore considered to have failed. The location of the test is indicated on the drainage strategy.

4 Existing Drainage

4.1.1 A CCTV Drainage survey was carried out on site which confirmed that the foul and surface water from the existing barn discharges into an existing stream located in the southern end of the site.

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 Hierarchy

Discharge Destination	
Rainwater Harvesting	Yes – Proposed 3000l rainwater harvesting tank
Discharge to Ground	No – infiltration test failed
Discharge to Watercourse	Yes – existing connection to stream to be utilised. Proposed discharge restricted to 1.0l/s
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 Hierarchy

Hydraulic Calculations Settings:	
Rainfall Methodology	**FEH-22**
Volumetric Run-off Coefficient Cv	**1**
CV Winter and Summer	**1 / 1**
Additional Storage (m^3 / ha)	**0.0**
Flow Control	**0.875m Head @ 1l/s discharge**
Attenuation Tank Design	Base Coefficient (m/hr): **0.00000**
	Side Coefficient (m/hr): **0.00000**
	Factor of Safety: **2**
	Porosity: **100%**
	Time to Half Empty (mins): **107**

5.3 Surface Water Drainage

5.3.1 Based upon the failure of the onsite infiltration test, it is proposed that the existing discharge to the ditch is utilised. It is proposed that all surface water runoff from the roof areas is to be discharged into an existing surface water drain that is known to discharge to the ditch in the south. The proposed discharge is to be restricted to 1.0l/s and will make use of a holding tank in order to cater for the 1 in 100-year +45% storm. All hard paved areas are to be constructed from a permeable gravel surface which will allow the runoff to discharge as per the existing arrangement.

5.3.2 As the proposed development will consist of the conversion of an existing barn that discharges to the stream, the existing runoff rate has been calculated with a maximum rainfall of 35mm/hr to ensure that the proposed site will provide a 50% betterment over the existing discharge.

Table 3. Existing Runoff Calculations

Greenfield Runoff Calculations				
Storm period	**Existing runoff rate (l/s)**	**Proposed Discharge Rate (l/s)**	**Difference (l/s)**	**Betterment (%)**
2	2.3	1	- 1.3	56
10	4.6	1	- 3.6	78
30	5.9	1	- 4.9	83
100	7.4	1	- 6.4	86

5.3.3 At time of writing, a topographical survey of the ditch is yet to be carried out which will confirm if a connection is viable. The proposed discharge is within the client's land, no third party approval is required.

5.3.4 Existing runoff and Hydraulic calculations have been carried out which can be found at Appendix C.

Fig 3. Existing Outfall to Stream





5.4 Foul water drainage

5.4.1 The foul water is to be treated on site via a new package treatment plant. All treated effluent runoff is to then be discharged into the existing drainage network on site that ultimately discharges to the stream to the south.

5.4.2 The proposed foul water discharge does not require Environment Agency approval as it adheres to the general binding rules for small discharges to surface water.

6 Summary and Conclusions

6.1.1 CGS Civils has been instructed by to produce a Drainage statement under National Planning Policy Framework (NPPF) to support the Planning Application for the conversion of an existing barn to form a 3-bedroom dwelling.

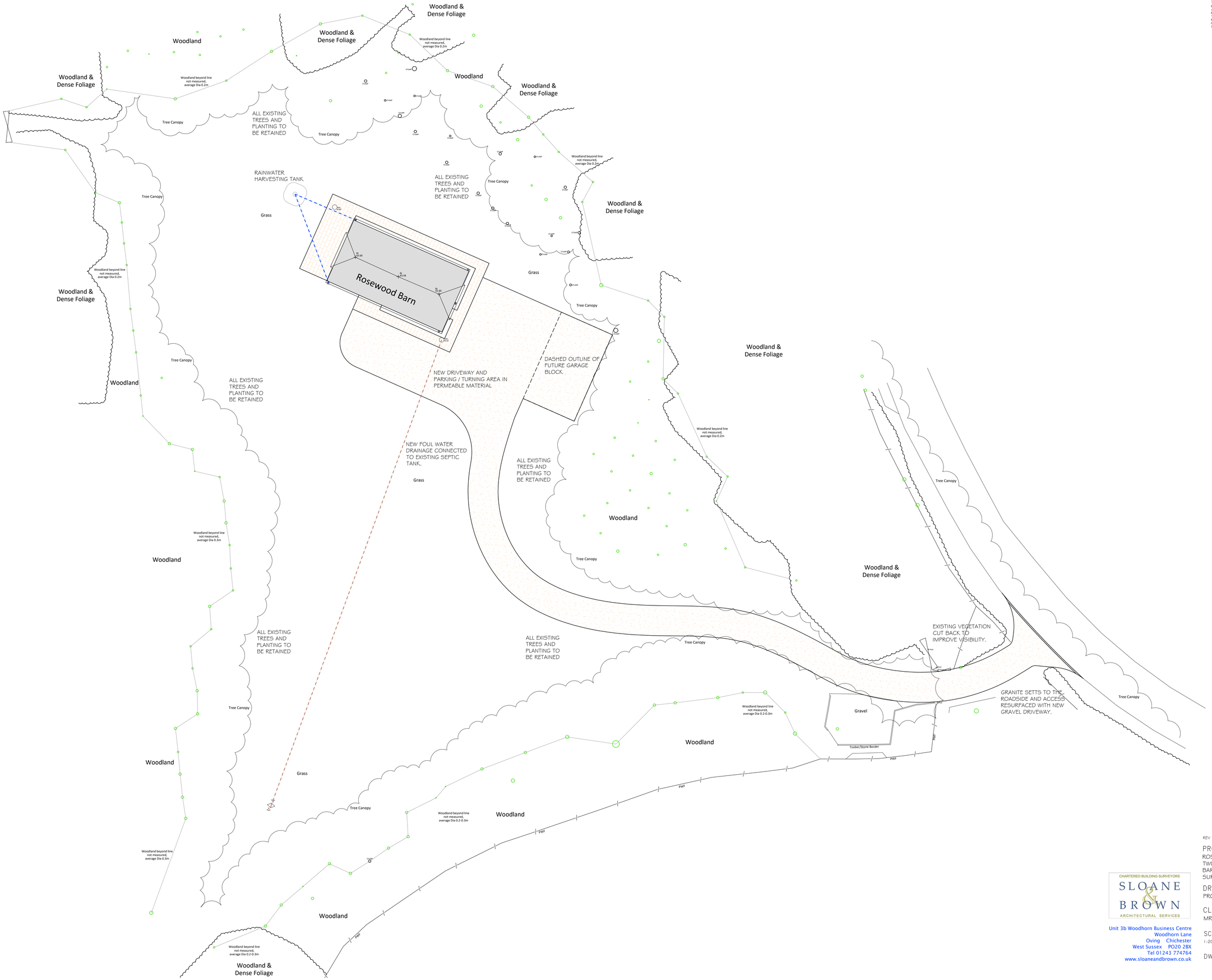
6.1.2 The Surface Water will discharge to the stream to the south at a restricted rate of 1.0l/s.

6.1.3 The Foul water will be treated on site via a package treatment plant and all treated effluent runoff will discharge into the stream to the south.

6.1.4 The report has demonstrated that the proposed drainage measures ensure that suitable means of surface water and foul drainage can be achieved for the proposed development.

7 Appendices

7.1 Appendix A – Site Plan



NOTES
WRITTEN DIMENSIONS TO BE TAKEN IN PREFERENCE TO SCALE, AND ARE TO BE CHECKED ON SITE PRIOR TO COMMENCING WORK.
THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER DOCUMENTS RELATING TO THIS PROJECT.
ANY DISCREPANCIES ARE TO BE REFERRED IMMEDIATELY TO THE PROJECT DESIGNER.
THIS DRAWING IS COPYRIGHT, AND SHOULD NOT BE USED OR REPRODUCED WITHOUT PERMISSION.
IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE COMPLIANCE WITH THE BUILDING REGULATIONS.

1:200

Scale bar (m)
0 2 4 6 8 10 20

REV DESCRIPTION DATE

PROJECT
ROSEWOOD BARN
TWO MILE ASH ROAD
BARNS GREEN
SURREY

DRAWING TITLE
PROPOSED SITE LAYOUT PLAN

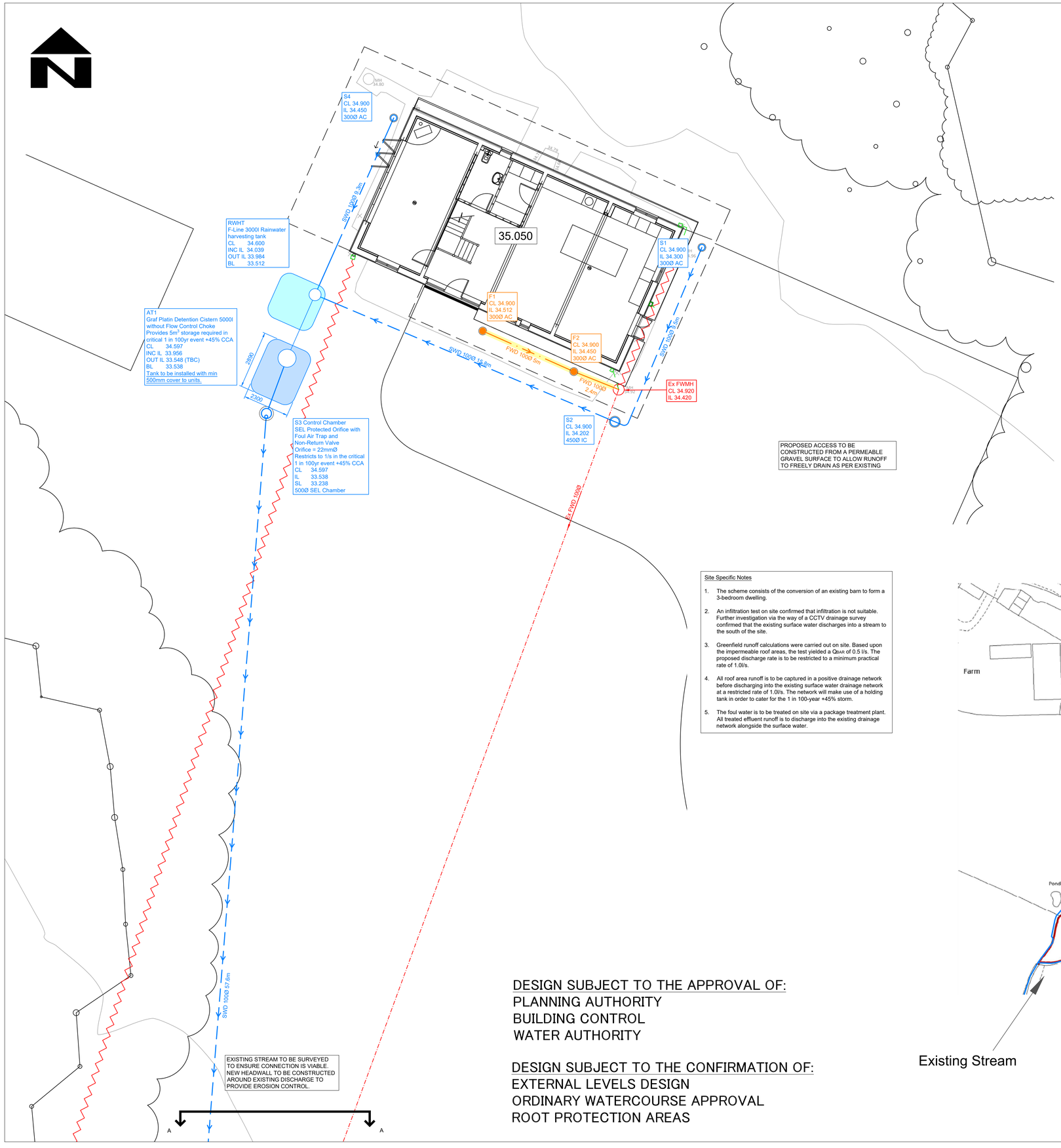
CLIENT
MR & MRS NIBLOCK

CHARTERED BUILDING SURVEYORS
SLOANE & BROWN
ARCHITECTURAL SERVICES
Unit 3b Woodhorn Business Centre
Woodhorn Lane
Oving Chichester
West Sussex PO20 2BX
Tel 01243 774764
www.sloaneandbrown.co.uk

SCALE	DRAWN BY	DATE
1:200 @A1	ML	DEC 2023

DWG NO 1304/17 REV.

7.2 Appendix B – Drainage Layout



Site Specific Notes

1. The scheme consists of the conversion of an existing barn to form a 3-bedroom dwelling.
2. An infiltration test on site confirmed that infiltration is not suitable. Further investigation via the way of a CCTV drainage survey confirmed that the existing surface water discharges into a stream to the south of the site.
3. Greenfield runoff calculations were carried out on site. Based upon the impermeable roof areas, the test yielded a Q_{BAR} of 0.5 l/s. The proposed discharge rate is to be restricted to a minimum practical rate of 1.0l/s.
4. All roof area runoff is to be captured in a positive drainage network before discharging into the existing surface water drainage network at a restricted rate of 1.0l/s. The network will make use of a holding tank in order to cater for the 1 in 100-year +45% storm.
5. The foul water is to be treated on site via a package treatment plant. All treated effluent runoff is to discharge into the existing drainage network alongside the surface water.

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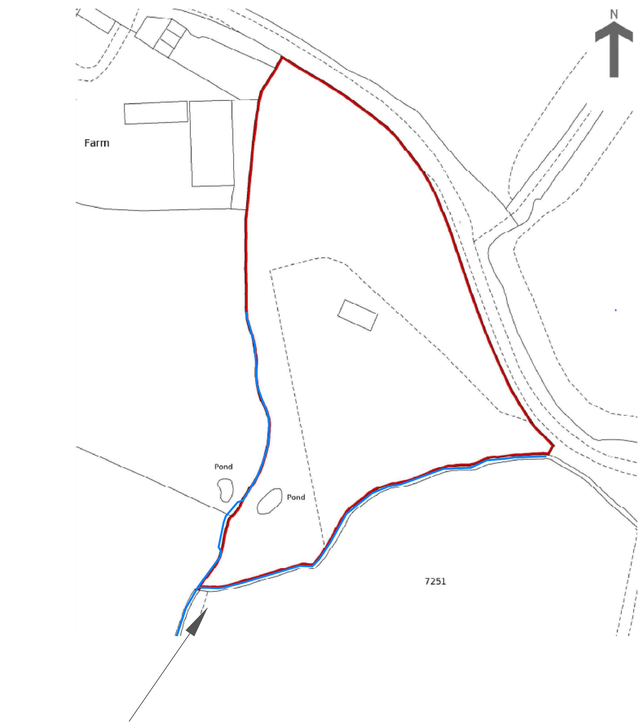

SITE LOCATION PLAN

DRAINAGE LEGEND

EXISTING FEATURES

- Ex FWD — Existing foul water sewer/drain and manhole
- Ex SWD — Existing surface water sewer/drain and manhole
- Existing foul/surface water sewer/drain and manhole to be abandoned

PROPOSED FEATURES

- Pipes at shallow depth - with concrete surround Type 'Z' Bedding or concrete slab protection to Building Regulation Part 'H' Diagram 11
- FWD — Foul Drainage
- SWD — Surface Water Drainage
- Storm water access chamber (300Ø)
- Storm water inspection chamber (450Ø)
- Storm water orifice flow control chamber (500Ø)
- Foul water access chamber (300Ø)
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- 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
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STANDARD DRAINAGE NOTES

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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
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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.
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PL1	21.08.24	REVISED SITE LOCATION PLAN	LH	CS	CS
P-	20.08.24	PRELIMINARY ISSUE	LH	CS	CS

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CLIENT: RORY NIBLOCK

ARCHITECT: SLOANE & BROWN

JOB TITLE: ROSEWOOD BARN
BARNES GREEN

DRAWING TITLE: DRAINAGE STRATEGY
SHEET 1 OF 2

DRAWN	ENGINEER	CHECKED	APPROVED
LH	C SLADE	CS	CS

DATE: AUGUST 2024 — SCALE @ A1: 1:100

JOB No.	STATUS	DRAWING No.	REV.
C3089	PL	101	PL4

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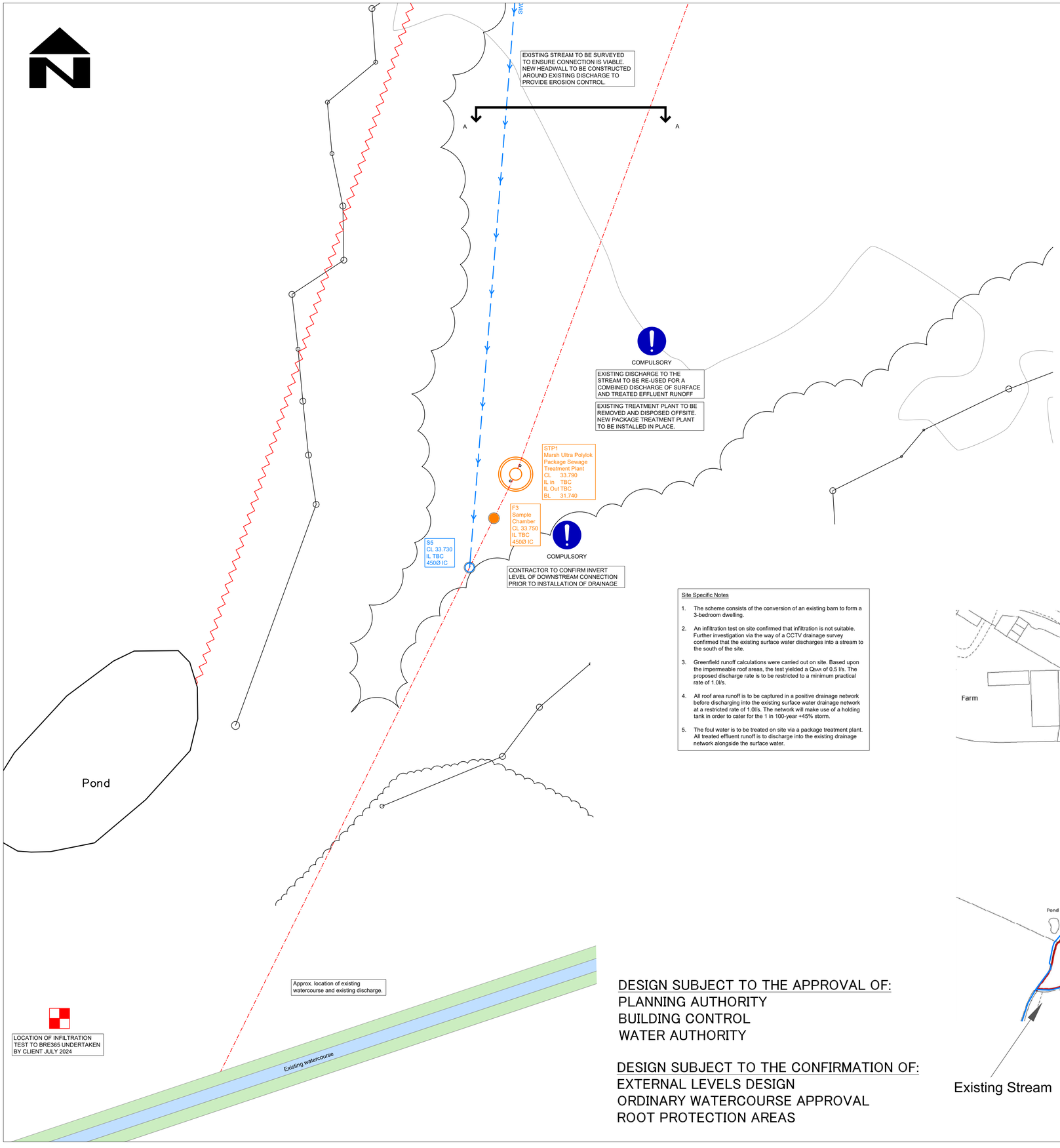

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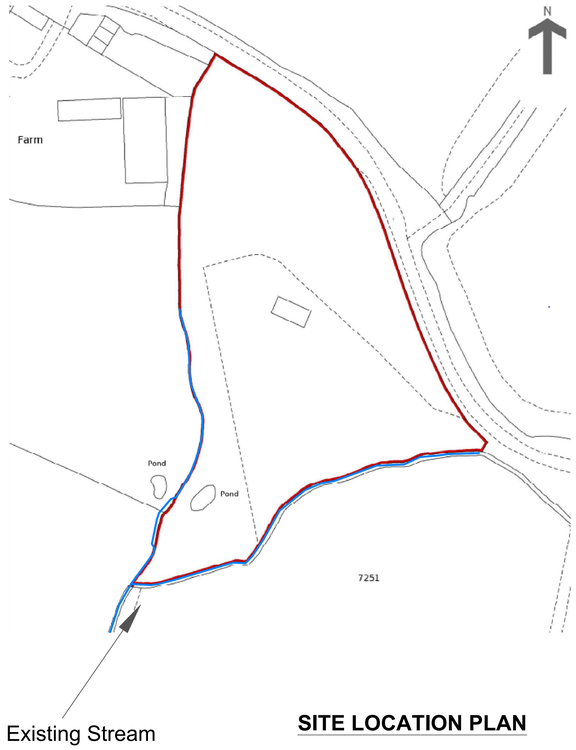

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SHEET 2 OF 2

DRAWN	ENGINEER	CHECKED	APPROVED
LH	C SLADE	CS	CS

DATE	SCALE @ A1
AUGUST 2024	1:100

JOB No.	STATUS	DRAWING No.	REV.
C3089	PL	102	PL1

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7.3 Appendix C – Surface Water Calculations and existing runoff calculations

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	0.350
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	75.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1	0.003	5.00	34.900	300	-1379.862	3030.872	0.600
S2	0.003	5.00	34.900	450	-1384.201	3022.192	0.698
S3	0.003	5.00	34.597	500	-1399.267	3028.216	1.059
S4	0.003	5.00	34.900	300	-1395.215	3037.317	0.450
S5			33.730	450	-1406.169	2964.943	0.829

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S1	S2	9.704	0.600	34.300	34.202	0.098	99.0	100	5.21	57.2
1.001	S2	S3	16.226	0.600	34.202	33.538	0.664	24.4	100	5.38	56.6
1.002	S3	S5	63.648	0.600	33.538	32.901	0.637	99.9	100	6.76	52.0
1.003	S4	S3	9.962	0.600	34.450	33.538	0.912	10.9	100	5.07	57.6

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.773	6.1	0.6	0.500	0.598	0.003	0.0	21	0.492
1.001	1.568	12.3	1.2	0.598	0.959	0.006	0.0	21	1.003
1.002	0.769	6.0	2.3	0.959	0.729	0.012	0.0	43	0.715
1.003	2.351	18.5	0.6	0.350	0.959	0.003	0.0	13	1.094

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	9.704	99.0	100	Circular	34.900	34.300	0.500	34.900	34.202	0.598
1.001	16.226	24.4	100	Circular	34.900	34.202	0.598	34.597	33.538	0.959
1.002	63.648	99.9	100	Circular	34.597	33.538	0.959	33.730	32.901	0.729

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	300	Manhole	Adoptable	S2	450	Manhole	Adoptable
1.001	S2	450	Manhole	Adoptable	S3	500	Manhole	Adoptable
1.002	S3	500	Manhole	Adoptable	S5	450	Manhole	Adoptable

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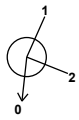
Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.003	9.962	10.9	100	Circular	34.900	34.450	0.350	34.597	33.538	0.959

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.003	S4	300	Manhole	Adoptable	S3	500	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1	-1379.862	3030.872	34.900	0.600	300	 0	1.000	34.300	100
S2	-1384.201	3022.192	34.900	0.698	450	 1	1.000	34.202	100
						0	1.001	34.202	100
S3	-1399.267	3028.216	34.597	1.059	500	 1	1.003	33.538	100
						2	1.001	33.538	100
						0	1.002	33.538	100
S4	-1395.215	3037.317	34.900	0.450	300	 0	1.003	34.450	100
S5	-1406.169	2964.943	33.730	0.829	450	 1	1.002	32.901	100

Simulation Settings

Rainfall Methodology	FEH-22	Drain Down Time (mins)	240	30 year (l/s)	0.2
Summer CV	1.000	Additional Storage (m³/ha)	0.0	100 year (l/s)	0.3
Winter CV	1.000	Check Discharge Rate(s)	✓	Check Discharge Volume	x
Analysis Speed	Normal	2 year (l/s)	0.1		
Skip Steady State	x	10 year (l/s)	0.2		

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	0	0
10	0	0	0
30	45	0	0
100	45	0	0

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Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	2.40
Greenfield Method	FEH	Growth Factor 100 year	3.19
Positively Drained Area (ha)	0.012	Betterment (%)	0
SAAR (mm)	775	QMed	0.1
Host	1	QBar	0.1
BFIHost	0.235	Q 2 year (l/s)	0.1
Region	7	Q 10 year (l/s)	0.2
QBar/QMed conversion factor	1.136	Q 30 year (l/s)	0.2
Growth Factor 2 year	0.88	Q 100 year (l/s)	0.3
Growth Factor 10 year	1.62		

Node S3 Online Orifice Control

Flap Valve	x	Design Depth (m)	0.875	Discharge Coefficient	0.650
Replaces Downstream Link	✓	Design Flow (l/s)	1.0		
Invert Level (m)	33.538	Diameter (m)	0.021		

Node S3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	33.538
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	107

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	8.3	0.0	0.600	8.3	0.0	0.601	0.0	0.0

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Results for 2 year 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	11	34.322	0.022	0.6	0.0015	0.0000	OK
15 minute summer	S2	11	34.223	0.021	1.2	0.0034	0.0000	OK
180 minute summer	S3	124	33.665	0.127	0.8	1.0793	0.0000	SURCHARGED
15 minute summer	S4	10	34.462	0.012	0.6	0.0009	0.0000	OK
15 minute summer	S5	1	32.901	0.000	0.3	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)
15 minute summer	S1	1.000	S2	0.6	0.490	0.099	0.0119	
15 minute summer	S2	1.001	S3	1.2	0.794	0.097	0.0642	
180 minute summer	S3	Orifice	S5	0.3				2.1
15 minute summer	S4	1.003	S3	0.6	0.885	0.032	0.0384	

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Results for 10 year 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	10	34.331	0.031	1.2	0.0022	0.0000	OK
15 minute summer	S2	10	34.232	0.030	2.4	0.0047	0.0000	OK
120 minute summer	S3	82	33.816	0.278	2.0	2.3616	0.0000	SURCHARGED
15 minute summer	S4	10	34.467	0.017	1.2	0.0012	0.0000	OK
15 minute summer	S5	1	32.901	0.000	0.4	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	1.2	0.589	0.192	0.0192	
15 minute summer	S2	1.001	S3	2.3	0.873	0.188	0.0789	
120 minute summer	S3	Orifice	S5	0.5				4.6
15 minute summer	S4	1.003	S3	1.2	0.918	0.064	0.0433	

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Results for 30 year +45% CC 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	10	34.343	0.043	2.2	0.0031	0.0000	OK
15 minute summer	S2	10	34.243	0.041	4.4	0.0065	0.0000	OK
120 minute summer	S3	90	34.081	0.543	4.0	4.6140	0.0000	SURCHARGED
15 minute summer	S4	10	34.473	0.023	2.2	0.0017	0.0000	OK
15 minute summer	S5	1	32.901	0.000	0.6	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	2.2	0.695	0.358	0.0303	
15 minute summer	S2	1.001	S3	4.3	0.906	0.352	0.0881	
120 minute summer	S3	Orifice	S5	0.7				7.7
15 minute summer	S4	1.003	S3	2.2	0.985	0.118	0.0459	

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Results for 100 year +45% CC 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 winter	S1	56	34.405	0.105	1.4	0.0075	0.0000	SURCHARGED
60 minute winter	S2	56	34.405	0.203	2.8	0.0323	0.0000	SURCHARGED
60 minute winter	S3	56	34.404	0.866	5.6	5.1539	0.0000	FLOOD RISK
15 minute summer	S4	10	34.476	0.026	2.8	0.0019	0.0000	OK
15 minute summer	S5	1	32.901	0.000	0.7	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	1.4	0.620	0.231	0.0759	
60 minute winter	S2	1.001	S3	2.8	0.818	0.227	0.1270	
60 minute winter	S3	Orifice	S5	0.9				8.2
15 minute summer	S4	1.003	S3	2.8	1.054	0.150	0.0472	

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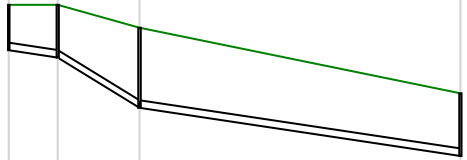
CAUSEWAY	CGS Civils Ltd	File: C3089 Flow.pfd Network: Storm Network Chris Slade 29/10/2024	Page 1 C3089 Rosewood Barn Barnes Green

Node Name		S1	S2	S3	S5
A4 drawing Hor Scale 1500 Ver Scale 100 Datum (m) 28.000					
Link Name		1.00	1.001	1.002	
Section Type		100r	100mm	100mm	
Slope (1:X)		99.0	24.4	99.9	
Cover Level (m)		34.900	34.900	34.597	33.730
Invert Level (m)		34.300 34.202	34.202	33.538	33.538 32.901
Length (m)		9.70	16.226	63.648	

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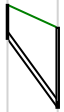
Node Name		S4	S3
A4 drawing Hor Scale 1500 Ver Scale 100 Datum (m) 28.000			
Link Name		1.00	
Section Type		100r	
Slope (1:X)		10.9	
Cover Level (m)		34.900	34.597
Invert Level (m)		34.450	33.538
Length (m)		9.96	

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Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	0.350
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	35.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1	0.012	5.00	34.900	300	-1379.862	3030.872	0.600
S2	0.000	5.00	34.900	450	-1384.201	3022.192	0.695

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S1	S2	9.704	0.600	34.300	34.205	0.095	102.1	100	5.21	35.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.760	6.0	1.5	0.500	0.595	0.012	0.0	35	0.638

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	9.704	102.1	100	Circular	34.900	34.300	0.500	34.900	34.205	0.595

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	300	Manhole	Adoptable	S2	450	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1	-1379.862	3030.872	34.900	0.600	300	 0	1.000	34.300	100
S2	-1384.201	3022.192	34.900	0.695	450	 1	1.000	34.205	100

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Simulation Settings

Rainfall Methodology	FEH-22	Drain Down Time (mins)	240	30 year (l/s)	0.2
Summer CV	1.000	Additional Storage (m³/ha)	0.0	100 year (l/s)	0.3
Winter CV	1.000	Check Discharge Rate(s)	✓	Check Discharge Volume	x
Analysis Speed	Normal	2 year (l/s)	0.1		
Skip Steady State	x	10 year (l/s)	0.2		

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	0	0
10	0	0	0
30	0	0	0
100	0	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	2.40
Greenfield Method	FEH	Growth Factor 100 year	3.19
Positively Drained Area (ha)	0.012	Betterment (%)	0
SAAR (mm)	775	QMed	0.1
Host	1	QBar	0.1
BFIHost	0.235	Q 2 year (l/s)	0.1
Region	7	Q 10 year (l/s)	0.2
QBar/QMed conversion factor	1.136	Q 30 year (l/s)	0.2
Growth Factor 2 year	0.88	Q 100 year (l/s)	0.3
Growth Factor 10 year	1.62		

Node S3 Online Orifice Control

Flap Valve	x	Design Depth (m)	0.725	Discharge Coefficient	0.650
Replaces Downstream Link	✓	Design Flow (l/s)	1.0		
Invert Level (m)	0.000	Diameter (m)	0.022		

Node S3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	0.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	5.0	0.0	0.600	5.0	0.0	0.601	0.0	0.0

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Results for 2 year 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	10	34.344	0.044	2.3	0.0032	0.0000	OK
15 minute summer	S2	10	34.248	0.043	2.3	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)
15 minute summer	S1	1.000	S2	2.3	0.694	0.380	0.0318	1.0

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Results for 10 year 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	10	34.370	0.070	4.7	0.0050	0.0000	OK
15 minute summer	S2	10	34.271	0.066	4.6	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	4.6	0.814	0.773	0.0551	2.0

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Results for 30 year 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	10	34.390	0.090	6.0	0.0064	0.0000	OK
15 minute summer	S2	10	34.284	0.079	5.9	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	5.9	0.840	0.987	0.0679	2.6

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Results for 100 year 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	11	34.454	0.154	7.6	0.0109	0.0000	SURCHARGED
15 minute summer	S2	11	34.292	0.087	7.4	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	7.4	0.945	1.234	0.0729	3.3

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7.4 Appendix D – Maintenance Schedule

Consulting Civil Engineers

Maintenance Schedule

Rosewood Barn, Two Mile Ash Road, Barns Green RH13 7PF

Planning Ref: DC/21/2323

For

Rory Niblock

Rev – **P**

Reference **C3089**

Date **19th September 2024**

Revision	Date of Issue	Comments	Prepared By	Checked By
P	19/09/2024	Initial Issue	LH	CS

Contents

1 MAINTENANCE 3

1 Maintenance

1.1 Introduction

1.1.1 During construction, the Contractor will be responsible for maintaining the drainage and SuDS (Sustainable Drainage Systems). Upon handover, the client occupier will take on the responsibility of these duties as laid out in this report.

1.1.2 The maintenance schedule for the proposed development will be split down into two separate categories; SuDS features and regular private drainage.

1.2 SuDS at Rosewood Barn, Barns Green

1.2.1 As listed above, in section 5.1.2, the SuDS features used on site will be Storage Tank

1.2.2 The SuDS features have been designed for easy maintenance and comprise:

- Regular Day-to-Day care – litter collection, regular gardening to control vegetation growth and checking inlets where water enters the SuDS features
- Occasional tasks – checking the SuDS features and removing any silt that builds up in the SuDS feature
- Remedial work – repairing damage where necessary

1.3 SuDS Drainage Maintenance Specification

1.3.1 Storage Tank

In order to maintain the functioning of the attenuation tanks, the following maintenance requirements should be adhered to:

Table 21.3 Operation and maintenance requirements for attenuation storage tanks

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

1.4 General Drainage Maintenance Specification

1.4.1 Inlet Structures and Inspection Chambers

- Inlet structures such as rainwater downpipes, road gullies and channel drains should be free from obstruction at all times to all free flow through the SuDS
- Inspection Chambers and Rodding Eyes are used on bends or where pipes come together. They allow access and cleaning to the system if necessary.

Inlet Structures and Inspection Chambers	
Regular Maintenance	**Frequency**
Inlet Structures **Inspect rainwater downpipes, channel drains and road gullies, removing obstructions and silt as necessary. Check that there is no physical damage.** **Strim vegetation 1m min surround to structures and keep area free from silt and debris**	Monthly
Inspections Chambers and below ground control chambers. **Remove cover and inspect, ensuring that the water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt.** **Undertake inspection after leaf fall in Autumn**	Annually
Occasional Maintenance **Check topsoil levels are 20mm above edges of chambers to avoid mower damage.**	As necessary
Remedial Work **Repair physical damage if necessary**	As required

1.4.2 Below ground drainage pipes

- Below ground drainage pipes convey water to the SuDS system. They should always be free from obstruction to allow free flow.

Below Ground Drainage Pipes	
Regular Maintenance	**Frequency**
Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months then annually
Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
Remove sediment from pre-treatment inlet structures and inspection chambers.	Annually or as required
Maintain vegetation to designed limits within the vicinity of below ground drainage pipes and tanks.	Monthly or as required
Remedial Work **Repair physical damage if necessary**	As required
Monitoring **Inspect all inlets, outlets and vents to ensure that they are in good conditions and operating as designed.**	Annually
Survey inside of pipe runs for sediment build up and remove if necessary.	Every 5 years or as required

7.5 Appendix E – Soakaway Test Results

Drainage

31st July 2024

Soak away test results – Rosewood Barn, RH130PF

Volume - 300ltrs Trial pit dimensions – 30cm(w)x100cm(l)x90cm(d) Location – South of plot, W3W ///sourced.heckler.lease		
Pit depth(PD)/water level(WL)	Depth (% of pit)	Time (measured)
90cm(PD)	100% (ground level)	-
67.5cm(WL)	75%	1309hrs (start)
45cm(WL)	50%	1334hrs
36cm(WL)	32.4%	1536hrs (levelled out, no further movement)
22.5cm(WL)	25%	- (never achieved) Trial abandoned after speaking with drainage consultant

Photos with measurements taken throughout.

Passed to CGS Civils upon completion.