Consulting Civil Engineers

Foul and Surface Water Drainage Report

Ghyll House Farm, Copsale

Planning Ref: DC/25/0883

For

Stephanie Newell

Rev - **P**

Reference **C3929**

Date **08th January 2026**

Revision	Date of Issue	Comments	Prepared By	Checked By
P	08/01/2026	Initial Issue	KCK	CS

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Contents

1 Introduction

1.1.1 CGS Civils Ltd has been appointed to undertake a drainage strategy report for a proposed development at Ghyll House Farm, Copsale.

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 or elsewhere, and to provide a robust drainage design in response to the comments received by Horsham DC in planning application DC/25/0883.

- *The Integration with DC/23/1325: Demonstrate clearly how the proposed drainage system for DC/25/0883 ties in with the approved drainage layout for DC/23/1325. Provide confirmation that there are no conflicts or capacity issues between the two schemes*
- *Supporting Calculations and Plans: Submit full hydraulic calculations showing pre- and post-development impermeable areas, greenfield runoff rates, and discharge rates for the 100%, 3.33%, and 1% AEP storm events (including +45% climate change allowance). Include catchment plans and calculations for all impermeable areas and attenuation volumes.*
- *Surface Water Management: Demonstrate adherence to the drainage hierarchy and the use of Sustainable Drainage Systems (SuDS) in line with theSuDS Manual (C753). Confirm how runoff will be managed to achieve greenfield or better runoff rates and show the design capacity for the 1 in 100-year + climate change event. Provide infiltration testing (BRE365) or an infiltration assessment supported by local geology data, if infiltration is proposed.*
- *Foul Drainage: Confirm the proposed method of foul water disposal and demonstrate compliance with Building Regulations Part H. Provide foul flow calculations and details of any treatment plant or discharge permit, where relevant.*
- *Maintenance and Management: Submit a Maintenance and Management Plan for both surface and foul systems, identifying maintenance responsibilities, access arrangements, and frequency.*

1.1.3 The existing site consists of an undeveloped area. The proposed development will consist of the construction of a temporary works dwelling within Limekiln Farm which is currently subject to the approved drainage strategy submitted under planning application reference DC/23/1325. The proposed development is located as OS Grid Reference **TQ 18807 25814** and has the post code **RH13 6QW.**

1.1.4 The proposed site plan can be found in **Appendix A.**

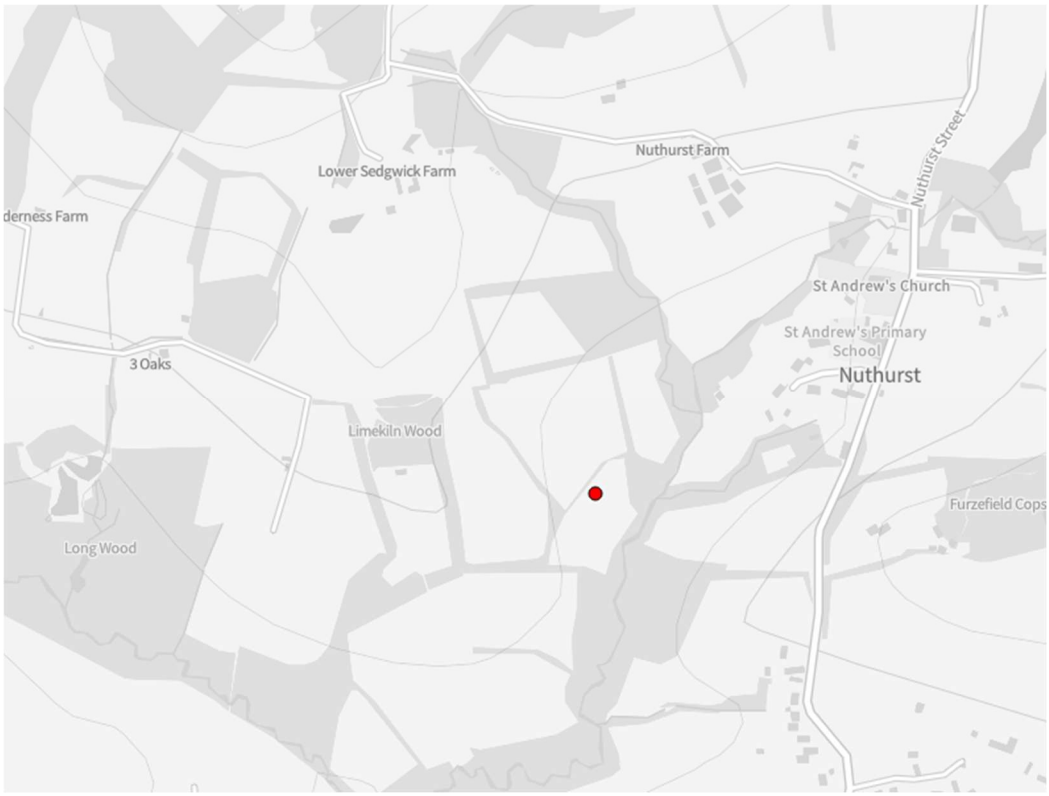

Fig 1. Site Location

2 Executive Summary:

2.1.1 The Surface water will be discharged to an existing stream. All roof areas are to be collected into a positive drainage network before discharging into the stream at a restricted rate of 2.0l/s. The network will make use of an attenuation tank in order to cater for the 1 in 100-year +45% storm.

2.1.2 The foul water will be treated on site via a package treatment plant before discharging treated effluent to stream.

3 Site Geology

3.1 British Geological Survey information

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

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 TQ12NE166 (Located on the site) – Ground geology (Sandy yellow clay, Grey Clay.)

3.1.3 The Borehole Logs can be found in **Appendix B**.

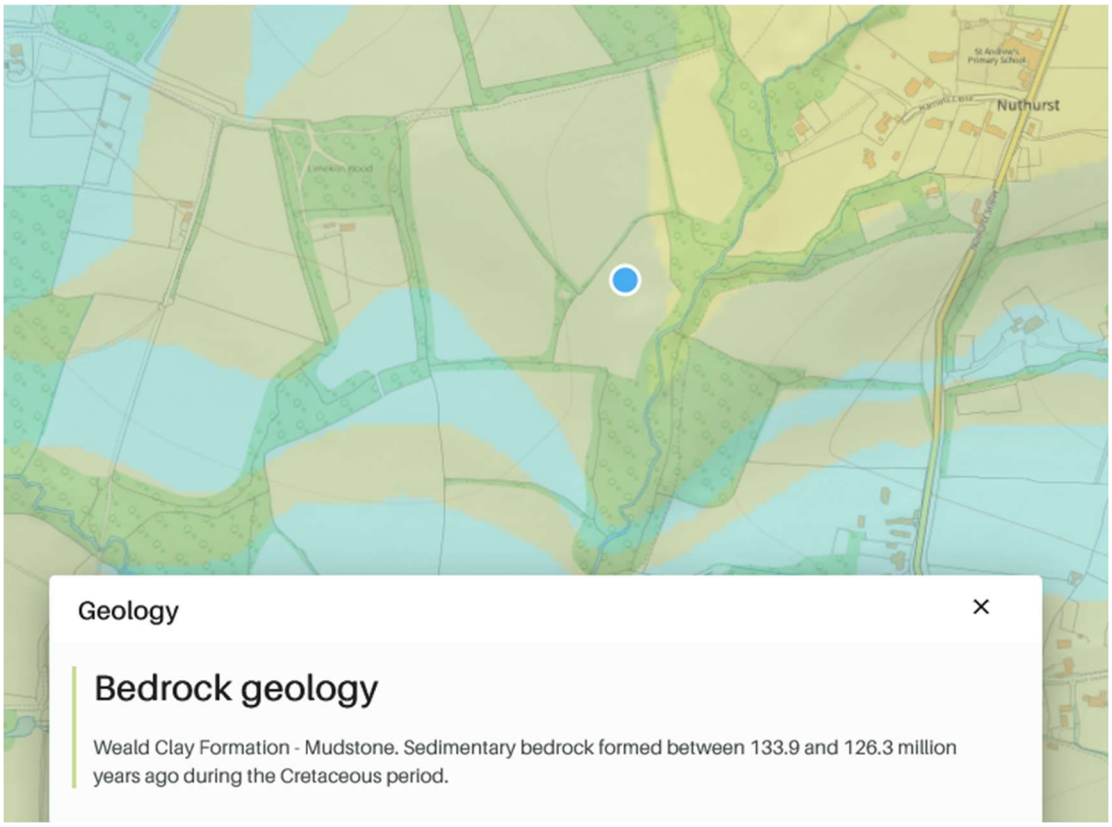

Fig 2. British Geological Survey

Snippet from BGS Website showing Bedrock geology/superficial deposits http://mapapps.bgs.ac.uk/geologyofbritain/home.html?

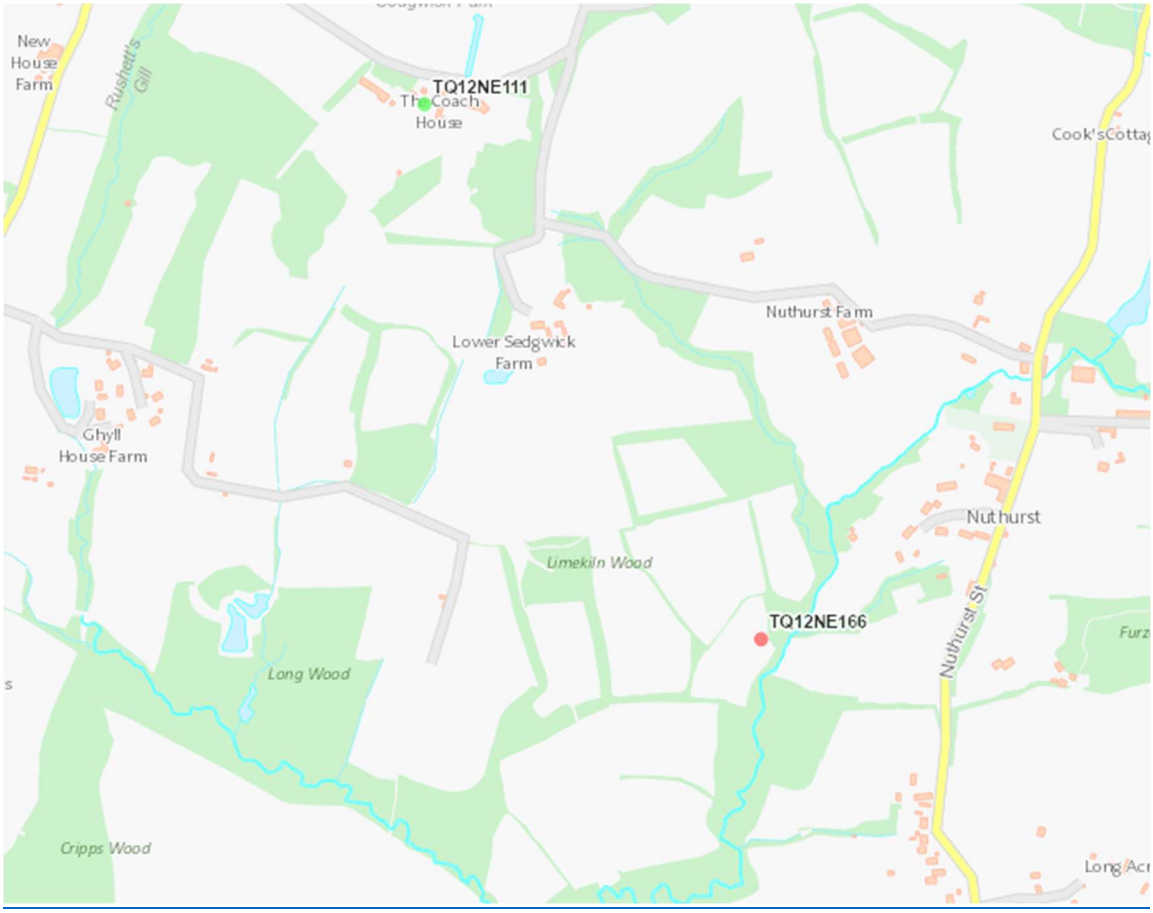

Fig 3. British Geological Survey

Snippet from BGS Website showing the Historical Borehole Log location

3.2 Geological Assessment

3.2.1 No intrusive ground investigation has been conducted; however, an onsite infiltration test was carried out by CGS Civils on the 10th of August 2024. The test was conducted at two locations: SAT 1 and SAT 2. The infiltration test at SAT 1 was conducted to a depth of 0.9m BGL, while SAT 2 was conducted at 0.6m BGL.

3.2.2 In SAT 1, sandy clay soils with low potential for infiltration were identified. No groundwater was encountered during this test. A significant drop in water level was observed over the first 400mm of depth, followed by very slow infiltration beyond that point. Since the proposed soakaway will be installed at the depth of the trial pit, the worst-case infiltration rate was calculated based on the time it took for the water level to drop between 400mm and 900mm below ground level (BGL).

3.2.3 SAT 2 also identified sandy clay soils, with no groundwater encountered. The shallow infiltration test recorded rates ranging between 5.81 x 10^{-6} m/s and 3.41 x 10^{-6} m/s, confirming that shallow infiltration, such as through permeable paving, is feasible.

3.2.4 The Infiltration test report and infiltration results can be found at **Appendix C.**

4 Existing Drainage

4.1.1 This area is currently undeveloped, so it is assumed that all surface water runoff naturally infiltrates into the ground or flows above the surface, following the existing site topography towards the existing stream.

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
Discharge to Ground	Onsite infiltration testing on suitable for shallow infiltration at recorded rate of 3.41 x 10^{-6} m/s
Discharge to Watercourse	Surface water runoff from roof area to be attenuated and discharged into existing stream at restricted rate 2l/s
Discharge to Surface Water Sewer	N/A
Discharge to Other Sewer	N/A

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**
Additional Storage (m^3 / ha)	**0.0**
Flow Control	**1.55m Head @ 2l/s discharge**
Attenuation Tank Design	Base Coefficient (m/hr): **N/A**
	Side Coefficient (m/hr): **N/A**
	Factor of Safety: **2**
	Porosity: **95%**
	Time to Half Empty (mins):

Hydraulic Calculations Settings:	
Hydraulic Calculations Settings (Permeable Paving):	
Rainfall Methodology	**FEH-22**
Volumetric Run-off Coefficient Cv	**1.0**
CV Winter and Summer	**1.0**
Additional Storage (m^3 / ha)	**0.0**
Infiltration	**Recorded worst-case infiltration**
Soakaway Design	Base Coefficient (m/hr: **0.01228**
	Side Coefficient (m/hr): **0.01228**
	Factor of Safety: **2.0**
	Porosity: **95%**
	Time to Half Empty (mins): **232**

5.3 Surface Water Drainage

5.3.1 Based upon the information gathered from the British Geological Survey website, planning portal and onsite infiltration testing, it is deemed that discharge to ground via traditional soakaway is not viable.

5.3.2 The feasibility of a traditional soakaway and drainage field was reviewed during the drainage design process. However, due to low infiltration potential below 400mm, proximity to the existing banking, and the nearby stream floodplain, infiltration methods were deemed unviable. Infiltration testing at 0.9m BGL returned a Vp value of 200, confirming that the site is unsuitable for drainage fields.

5.3.3 Surface water runoff from the proposed roof areas will be collected, attenuated, and discharged into the existing stream at a restricted rate of 2 l/s. The drainage system will incorporate an attenuation tank designed to accommodate the 1 in 100-year storm event plus a 45% allowance for climate change, ensuring controlled discharge and flood risk mitigation.

5.3.4 Notwithstanding the above, shallow infiltration testing indicates limited potential for shallow infiltration. As a result, all proposed hard paved areas will be constructed using permeable, self-draining surfacing. The permeable paving system has been designed using a recorded worst-case infiltration rate of 3.41×10^{-6} m/s and to accommodate a 1 in 100-year storm event with an additional 45% allowance for climate change.

5.3.5 The proposed new building will connect to the drainage system already proposed for Limekiln Farm, Copsale, which is currently subject to the approved drainage strategy submitted under planning application reference **DC/23/1325**. No additional surface water discharge routes are proposed beyond those previously assessed and agreed as part of that application.

5.3.6 The proposed contributing area plan, proposed drainage plan, proposed exceedance flows, proposed construction details and hydraulic calculations can be found at **Appendix D.**

5.3.7 EA Magic Maps can be found at **Appendix F.**

5.3.8 Greenfield runoff calculations can be found at **Appendix G**

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 EA website indicates that the site does not lie within a Source Protection Zone.

5.4.5 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	

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

5.4.7 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

5.4.8 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

5.4.9 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-	Medium	0.7	0.6	0.7

residential car parking with frequent change (e.g., hospitals, retail), all roads except low traffic roads and trunk roads/motorways				
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

5.4.10 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

5.4.11 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.

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

Table 26.4 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**
Footpath	Ground Water	Table 26.3 (for surface waters)	Permeable Pavement	0.7	0.6	0.7
Other Roofs	Surface water	Table 26.3 (for surface waters)	Bioretention System	0.8	0.8	0.8

5.4.13 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 Due to the proposed development site being located within the area not served by public severs, it is proposed that foul water runoff is to be collected and discharged into the onsite package treatment plant. Treated water runoff will be then discharged into the existing stream.

5.5.2 The proposed development will consist of a new stable block, barn and temporary works dwelling within Limekiln Farm.

5.5.3 Proposed treatment plant has been assumed to be **10P**. According to British Water's 'Flows and Loads' guidelines, the development is anticipated to generate approximately **1,400 litres per day** of wastewater. This equates to an average runoff rate of 0.016 litres per second. The system has been designed to serve 6 residents, a maximum of 20 visitors per day, and 2 staff members, with these assumptions used for discharge calculations:
Residents: 150 liters/person/day,
Visitors: 20 liters/person/day,
Staff: 50 liters/person/day

5.6 Construction Phase Drainage

5.6.1 It is an offence to cause or knowingly permit the entry of any polluting, poisonous or noxious material in the water environment. If the pollution is serious enough to lower the ecological status of the water body as set out in terms by the Water Framework Directive (2000/60/EC) than prosecution may occur.

5.6.2 Remediation of any damage caused will not require the polluter to be prosecuted first. If the water pollution is serious enough to be classed an environmental damage, the damage will require to be remediated such that the area is returned to the condition it would have been in if the damage had not occurred.

5.6.3 If any pollution has not been reported or the polluter has not taken actions to prevent any further damage; they would then be causing an offence. Third parties (e.g., Private water supply users, landowners, recreation users and the public) who may be affected by possible damage may also report the risk of any environmental damage to the enforcing authority.

5.6.4 The principles of SuDS (Sustainable Drainage Systems) shall be applied to all components of design and construction regarding surface water management. Any design or site works that may impact on the site drainage or the water quality shall:

- Soakaway where soils allow

- Consider and manage erosion
- Remove pollutants in surface water
- Retain any silts on site and prevent silts from discharging to watercourses or drains
- Keep runoff rates at existing greenfield runoff
- Prevent accidental spillages reaching watercourse

5.6.5 As infiltration on site is viable, the temporary drainage for the development will be in the form of land drains which will discharge into the ground.

5.6.6 Pollution will be controlled via the use of catchpit manholes and geotextiles.

5.6.7 Any potential hazardous substances will be within a controlled compound with a separate drainage system that will contain a penstock valve / containment kit in the event of a spillage.

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 a construction of a temporary works dwelling within Limekiln Farm which is currently subject to the approved drainage strategy submitted under planning application reference **DC/23/1325**.

6.1.2 The Surface Water is to be discharged into the existing stream at a restricted discharge rate of 2 l/s. All hard paved areas are to be designed as self-draining permeable systems allowing for shallow infiltration.

6.1.3 The Foul water will be treated on site via a package treatment plant before discharging treated effluent to the stream.

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.

6.1.5 A maintenance schedule has been written up for the drainage network including the SuDS features and can be found within Appendix **E.**

7 Appendices

7.1 Appendix A – Site Plan

SAND SCHOOL

FARM VEHICLES

STABLES

Post & Rail fence

IN

Car Park

Manure store

Bin store

Existing pond for emergency fire-fighting water supply

Post & Rail fence

Rainwater inspection chamber with stop-cock and filter

15m x 6m DWELLING FOR RURAL WORKERS

Red line encloses area of this planning application DC/25/0883
ALL remaining scheme already approved under DC/23/1325

Pasture

NOTE: EVERYTHING TO WEST OF BLUE LINE HAS BEEN APPROVED UNDER HDC Ref: DC/23/1325 WITH EXCEPTION OF RED LINED ENCLOSURE WHICH IS TO BE APPPROVED UNDER DC/25/0883

FLOOD ZONE 1

FLOOD ZONE 3

Existing Stream

WATER & DRAINAGE LEGEND

- Water supply from borehole filtration plantroom
- Rainwater pipes connected to stable block system
- Foul water drainage
- Kingspan Klargester package sewage treatment plant approved by Horsham District Council under DC/23/1325
- Red line indicates area of planning application DC/25/0883
- Water supply to stopcock in kitchen
- Rainwater inspection chamber
- F — Rainwater downpipe from guttering with "Celtic Sustainables" 3P filter collector
- Foul water inspection chamber

NOTE: "SuDS Chart 26.2 indicates a domestic roof has a very low risk of pollution: Total Suspended Solids: 0.2
Metals: 0.2
Hydrocarbons: 0.05
This is a temporary dwelling to be erected on "Groundscrews" because of the sloping land contours, so bio-retention planters cannot be fitted. Filter collectors are, however, fitted on each rainwater down-pipe and clearance of these and checking of the rainwater inspection chamber can be added to the maintenance regime for the whole of the Limekiln Farm site as set out for approved scheme DC/23/1325.

REV. "a" : Drainage etc linked to ex. Scheme
REV. "B" : House re-positioned

WATER/DRAINAGE PLAN : LIMEKILN FARM TEMPORARY EQUINE WORKERS' DWELLING

Scale 1 : 200 @ A2

Scale 1 to 200 @ A2

0 5 10 20

N

PROJECT: LIMEKILN FARM
BROADWATER LANE
COPSALE RH13 6QW

DESCRIPTION: WATER/DRAINAGE PLAN

DATE: AUGUST 2025

DRAWING No: 082/04b

WATER/DRAINAGE PLAN

7.2 Appendix B – BGS Historical Borehole Logs

Borehole record form

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Environment Agency

Water Resources Act 1991 (as amended by the Water Act 2003)

A Site details

Borehole drilled for: Lime Kiln Farm

Location: Lime Kiln Farm Broadwater lane Copsale Horsham RH13 6QW

NGR (ten digits): TQ 18836 25827 Please attach site plan

Ground level (if known): 33 metres Above Ordnance Datum

Drilling company: SussexBoreholes

Date drilling commenced: 09/10/2023 (DD/MM/YYYY) Completed: 16/10/2023 (DD/MM/YYYY)

B Construction details

Borehole datum (if not ground level) _____ metres (m). Please tick if this is above ☐ or below ☐ ground level.
(point from which all measurements of depth are taken, for example, flange, edge of chamber)

Borehole drilled diameter 225 mm from 0 to 45 m/depth

_____ mm from _____ to _____ m/depth

_____ mm from _____ to _____ m/depth

_____ mm from _____ to _____ m/depth

Casing material: upvc diameter: 125 mm from: 0 to: 45 m/depth
and type (for example, if plain steel, plastic slotted). Please record permanent casing details, not temporary casing.

Casing material: plain diameter: 125 mm from: 0 to: 27 m/depth

Casing material: slotted diameter: 125 mm from: 27 to: 45 m/depth

Casing material: _____ diameter: _____ mm from: _____ to: _____ m/depth

Grouting details: gravel pack, bentonite pellets at 16-8 meters and cement groute to surface

Water struck at 1. 5 m (depth below datum – mbd) 2. 9 m (mbd)
3. 12 m (mbd) 4. _____ m (mbd)

C Test pumping summary (Please supply full details on form WR39)

Test pumping datum _____ m. Please tick if this is above ☐ or below ☐ ground level.
(if different from borehole datum)

Pump suction depth _____ mbd

Water level (start of test) +2 mbd

Water level (end of test) _____ mbd

Type of test (for example, bailer, step, constant rate)
OverFlowed @900 lires an hour

Pumping rate _____ m^3/hour ☑ or litres/second ☐. Please tick as appropriate.

for _____ days, _____ hours, _____ mins

Recovery to _____ mbd in _____ days, _____ hours, _____ mins
(from end of pumping)

Date(s) of measurements Pump started _____ (DD/MM/YYYY)

Pump stopped _____ (DD/MM/YYYY)

Please supply chemical analysis if available. If you have included this please tick this box ☐

D Strata log

Geological classification (BGS only)	Description of strata	Thickness m	Depth (to base of strata) m
	Sandy yellow clay with sandstone	5	5
	Grey Clay with hard bands and layers of sandstone	7	12
	Grey sand with layers of sandstone and clay	33	45
	(continue on separate page if necessary)		
	Other comments (for example, gas encountered, saline water intercepted)		

E Completing this form

How long did it take you to fill in this form? ⌊_____⌋

For Official use only

Date received (DD/MM/YYYY)	File	Consent number	BGS reference number
⌊_____⌋	⌊_____⌋	⌊_____⌋	⌊_____⌋
Accession number	**Wellmaster number**	**SOBI number**	**NGR**
⌊_____⌋	⌊_____⌋	⌊_____⌋	⌊_____⌋
LIC NO	**Purpose**		**EA reference number**
⌊_____⌋	⌊_____⌋		⌊_____⌋
Copy number	**Entered by**		
⌊_____⌋	⌊_____⌋		

7.3 Appendix C – Infiltration test

cgs civils Consulting Civil Engineers

Ref: C3296

Stephanie Newell

02th September 2024

Re: Limekiln farm, Copsale– Soakaway Testing – Infiltration Test Result

Dear Stephanie

The following investigation was carried out at the above location in accordance with our quotation.

1. Site Works

The purpose of the investigation was to supply soakaway and drainage field infiltration data in general accordance with BRE document 365 (Soakaway Design) standards. The testing was conducted at two locations, which would be the approximate intended locations for possible infiltration devices.

The appended drawing illustrates the positions of the test pits. The BRE 365 pit was excavated to a depth of 0.9m, while the other pit was excavated to a depth of 0.6m below ground level (BGL).

The infiltration testing was carried out on August 10, 2024.

2. BRE 365 Soakaway Test Findings

The tests (SAT1, SAT2) were carried out at two different places.

In SAT1, the sandy clay layer was identified as having a low potential for infiltration, with rates ranging between 1.68 x 10^{-6} m/s and 1.54 x 10^{-6} m/s. No groundwater was encountered at any point during the test. This rate is considered poor and unsuitable for the proposed soakaway design. During the infiltration test, a significant drop in water level was observed for the first 400mm of depth, followed by very slow infiltration below that level. Since the proposed soakaway will need to be installed at the depth of the trial pit, the worst-case infiltration rate was calculated using the time it took for the water level to drop between 400mm and 900mm below ground level (BGL).

SAT2 revealed sandy clay, indicating a moderate potential for infiltration. The shallow infiltration test confirmed rates ranging between 5.81 x 10^{-6} m/s and 3.41 x 10^{-6} m/s. No groundwater was encountered at any point during this test.

3. BRE 365 Soakaway Test Results

Test Pit No	Infiltration Rate (1-3 Tests)			Depth of Test	Soil Type
SAT1 (deep)	1.68x10^{-6}m/s	1.59x10^{-6}m/s	**1.54x10^{-6}m/s**	0.9m	Sandy clay
SAT2 (shallow)	5.81x10^{-6}m/s	4.55x10^{-6}m/s	**3.41x10^{-6}m/s**	0.2m	Sandy clay

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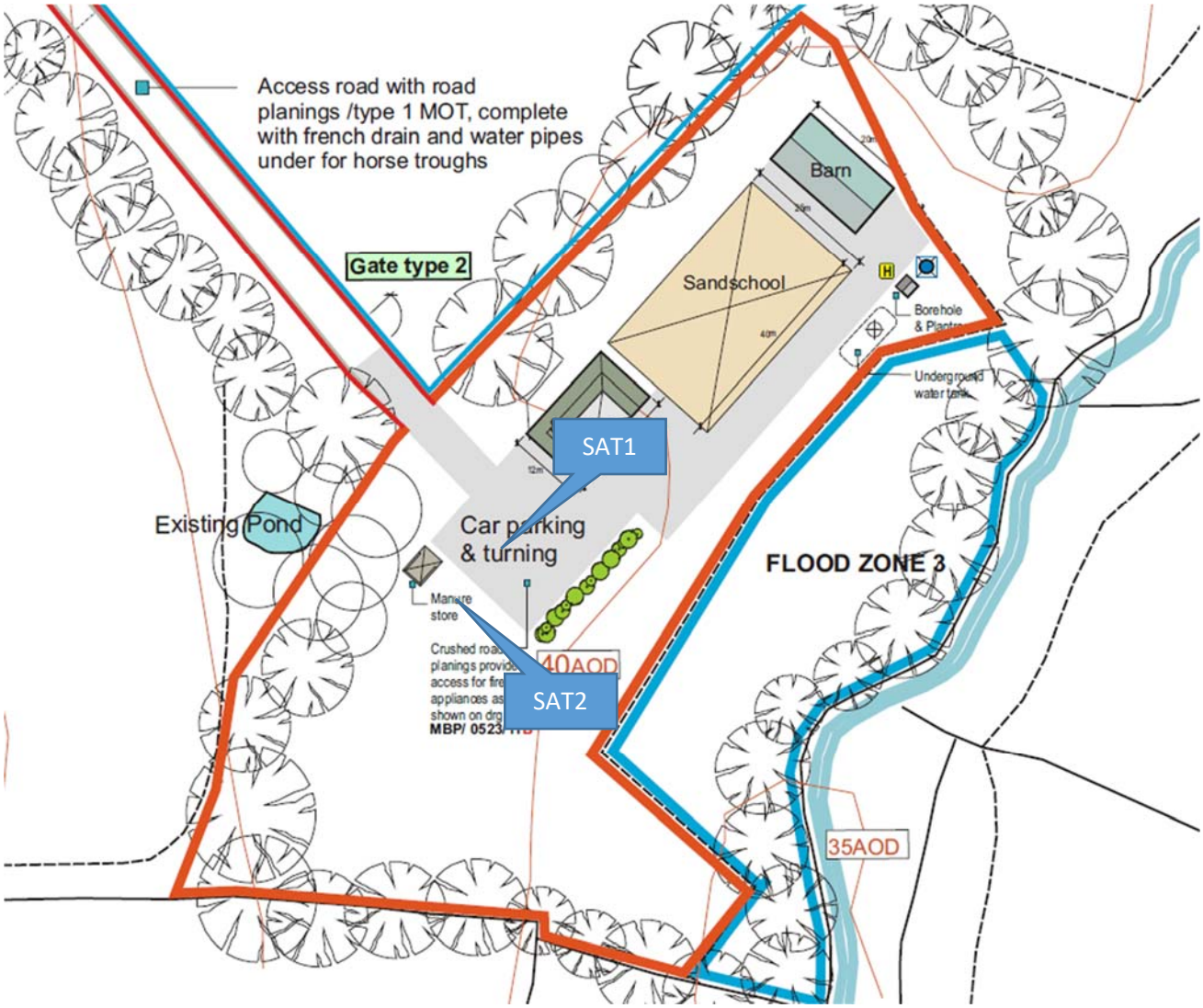
Appendix A – Soakaway Test Location Plan



Appendix B – Soakaway Test Results

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cgs civils Consulting Civil Engineers

Job: Limekiln farm, Copsale - Test 1

Infiltration Calculator

$$f = \frac{Vp75\text{-}25}{ap50 \times tp75\text{-}25}$$

Vp 75-25	=	Effective storage volume between 75% and 25% effective depth
ap50	=	Internal surface area of the trial pit up to 50% effective depth and including the base area
tp75-25	=	The time for the water level to fall from 75% to 25% effective depth
f	=	Infilitration rate

Trial pit width	=	0.3
Trial pit depth	=	0.9
Trial pit length	=	0.6
ap50	=	0.99 m/squared
tp75-25	=	48600 seconds
Vp 75-25	=	0.081 m/cubed
F	=	1.68E-06

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Job: Limekiln farm, Copsale - Test 2

Infiltration Calculator

$$f = \frac{Vp75\text{-}25}{ap50 \times tp75\text{-}25}$$

Vp 75-25	=	Effective storage volume between 75% and 25% effective depth
ap50	=	Internal surface area of the trial pit up to 50% effective depth and including the base area
tp75-25	=	The time for the water level to fall from 75% to 25% effective depth
f	=	Infilitration rate

Trial pit width	=	0.3
Trial pit depth	=	0.9
Trial pit length	=	0.6
ap50	=	0.99 m/squared
tp75-25	=	51500 seconds
Vp 75-25	=	0.081 m/cubed
F	=	1.59E-06

cgs civils Consulting Civil Engineers

Job: Limekiln farm, Copsale - Test 3

Infiltration Calculator

$$f = \frac{Vp75\text{-}25}{ap50 \times tp75\text{-}25}$$

Vp 75-25	=	Effective storage volume between 75% and 25% effective depth
ap50	=	Internal surface area of the trial pit up to 50% effective depth and including the base area
tp75-25	=	The time for the water level to fall from 75% to 25% effective depth
f	=	Infilitration rate

Trial pit width	=	0.3
Trial pit depth	=	0.9
Trial pit length	=	0.6
ap50	=	0.99 m/squared
tp75-25	=	53200 seconds
Vp 75-25	=	0.081 m/cubed
F	=	1.54E-06

cgs civils Consulting Civil Engineers

Job: Limekiln farm, Copsale - Test 1

Infiltration Calculator

$$f = \frac{Vp75\text{-}25}{ap50 \times tp75\text{-}25}$$

Vp 75-25	=	Effective storage volume between 75% and 25% effective depth
ap50	=	Internal surface area of the trial pit up to 50% effective depth and including the base area
tp75-25	=	The time for the water level to fall from 75% to 25% effective depth
f	=	Infilitration rate

Trial pit width	=	0.3
Trial pit depth	=	0.6
Trial pit length	=	0.6
ap50	=	0.72 m/squared
tp75-25	=	12900 seconds
Vp 75-25	=	0.054 m/cubed
F	=	5.81E-06

cgs civils Consulting Civil Engineers

Job: Limekiln farm, Copsale - Test 2

Infiltration Calculator

$$f = \frac{Vp75\text{-}25}{ap50 \times tp75\text{-}25}$$

Vp 75-25	=	Effective storage volume between 75% and 25% effective depth
ap50	=	Internal surface area of the trial pit up to 50% effective depth and including the base area
tp75-25	=	The time for the water level to fall from 75% to 25% effective depth
f	=	Infilitration rate

Trial pit width	=	0.3
Trial pit depth	=	0.6
Trial pit length	=	0.6
ap50	=	0.72 m/squared
tp75-25	=	16500 seconds
Vp 75-25	=	0.054 m/cubed
F	=	4.55E-06

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Job: Limekiln farm, Copsale - Test 3

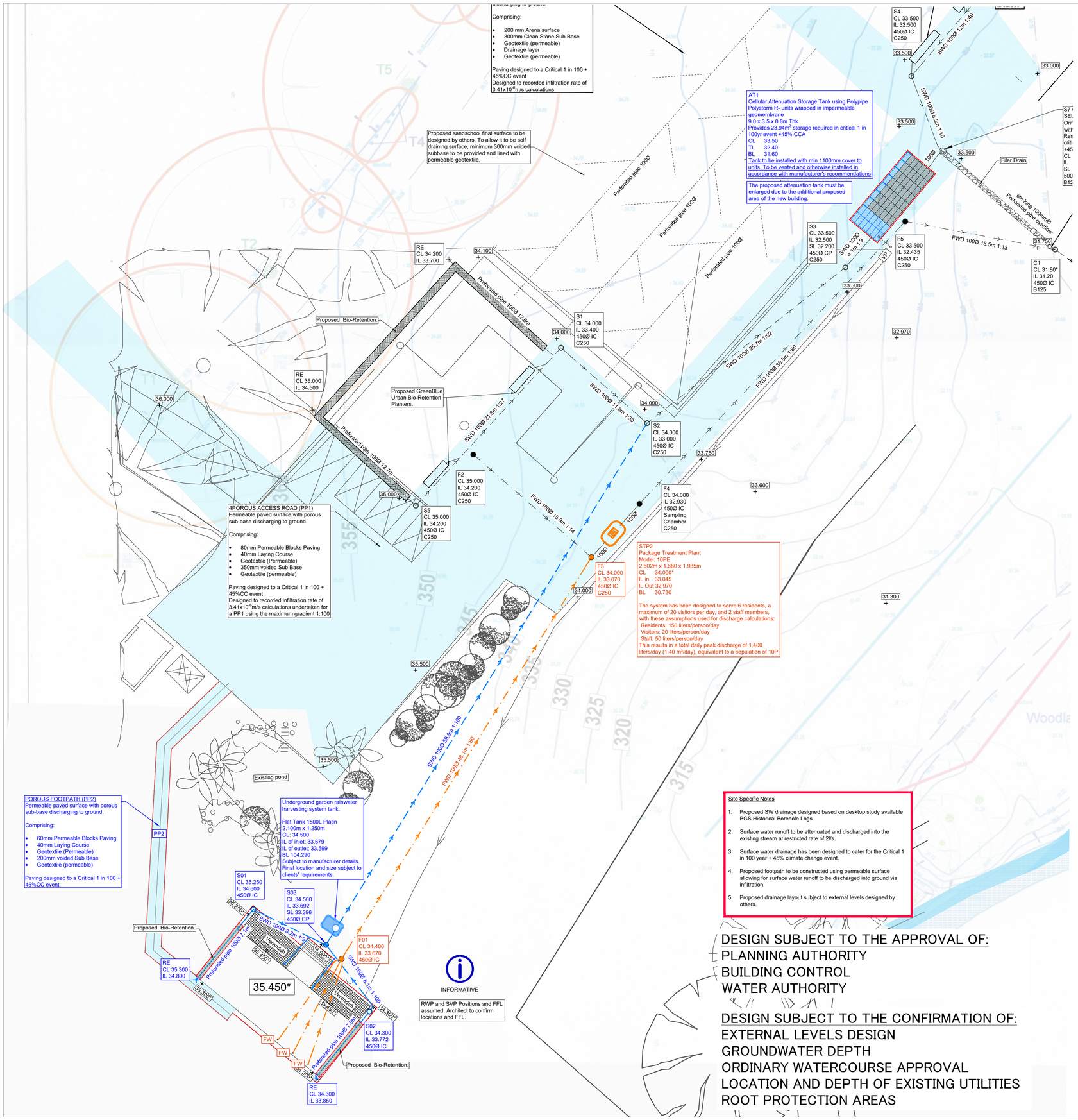
Infiltration Calculator

$$f = \frac{Vp75\text{-}25}{ap50 \times tp75\text{-}25}$$

Vp 75-25	=	Effective storage volume between 75% and 25% effective depth
ap50	=	Internal surface area of the trial pit up to 50% effective depth and including the base area
tp75-25	=	The time for the water level to fall from 75% to 25% effective depth
f	=	Infilitration rate

Trial pit width	=	0.3
Trial pit depth	=	0.6
Trial pit length	=	0.6
ap50	=	0.72 m/squared
tp75-25	=	22000 seconds
Vp 75-25	=	0.054 m/cubed
F	=	3.41E-06

7.4 Appendix D – Proposed Contributing Area Plan, Proposed Surface Water Drainage Plan, Proposed Construction Details, Proposed Exceedance Flows and Hydraulic Calculations



DRAINAGE LEGEND

EXISTING FEATURES

Proposed foul/ storm water drainage from Limekiln Farm which is currently subject to the approved drainage strategy submitted under planning application reference DC/23/1325.

PROPOSED FEATURES

- Foul Drainage
- Surface Water Drainage
- Pipe crossing (thickening denotes pipe above)
- Rainwater pipe (assumed)
- Storm water access chamber (300Ø)
- Storm water inspection chamber (450Ø)
- Storm water catchpit chamber (450Ø)
- Storm water rodding eye
- Extent of permeable paving with porous sub-base
- Storm water orifice flow control chamber (500Ø)
- Soil stack (type TBC by architect/m&e engineer) (assumed)
- Foul water inspection chamber (450Ø)
- Proposed Bio-Retention
- Proposed surface level (assumed)
- Pipe info - diameter, length, gradient, bedding type

100Ø 4.5m 1:100
Z BED

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

STANDARD DRAINAGE NOTES

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Consulting Civil Engineers

CLIENT: STEPHANIE NEWELL

ARCHITECT: MICHAEL BISSETT POWELL

JOB TITLE: GHYLL HOUSE FARM, COPSALE RH13 6QW

DRAWING TITLE: PROPOSED DRAINAGE DESIGN

DRAWN	ENGINEER	CHECKED	APPROVED
KCK	CS	CS	CS

DATE: CS | SCALE @ A1: 1:200

JOB No.	STATUS	DRAWING No.	REV.
C3929	P	101	P-

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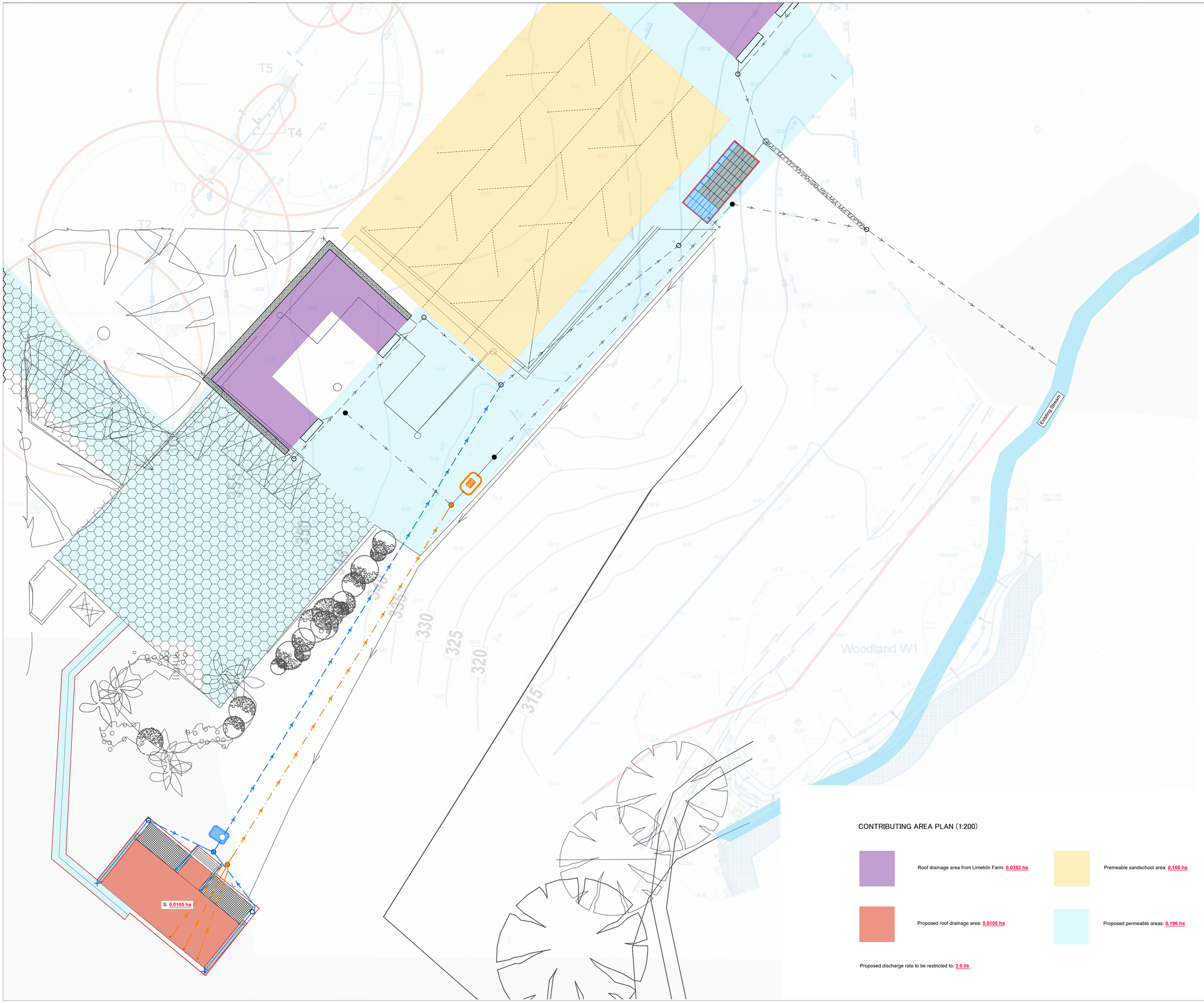

CONTRIBUTING AREA PLAN (1:200)

Roof drainage area from Limekiln Farm: 0.0392 ha

Premeable sandschool area: 0.100 ha

Proposed roof drainage area: 0.0105 ha

Proposed permeable areas: 0.196 ha

Proposed discharge rate to be restricted to: 2.0 l/s

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cgs civils
Consulting Civil Engineers

CLIENT: STEPHANIE NEWELL

ARCHITECT: MICHAEL BISSETT POWELL

JOB TITLE: GHYLL HOUSE FARM, COPSALE RH13 6QW

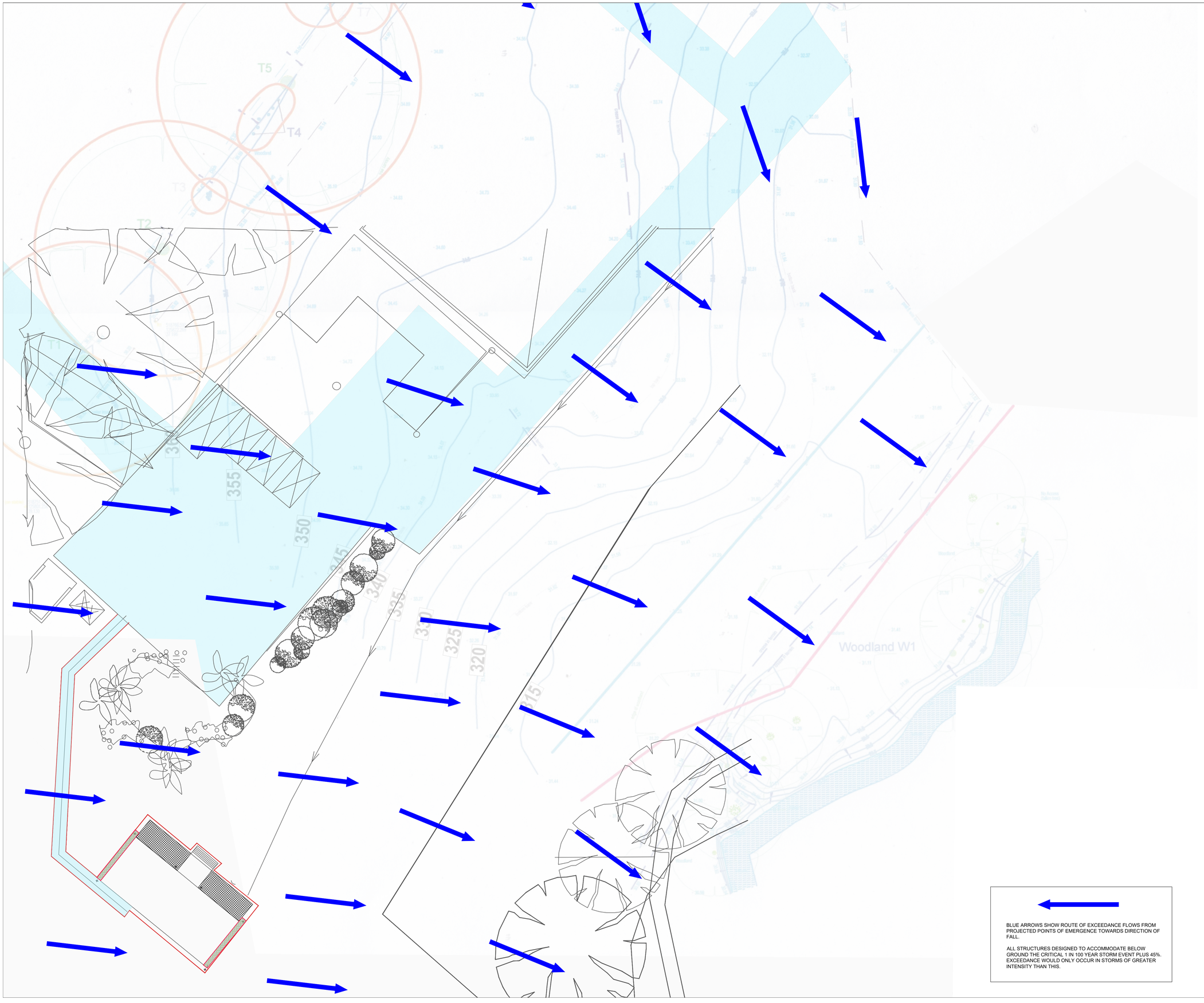
DRAWING TITLE: PROPOSED CONTRIBUTING AREA

DRAWN	ENGINEER	CHECKED	APPROVED
KCK	CS	CS	CS

DATE	SCALE @ A1
CS	1:200

JOB No.	STATUS	DRAWING No.	REV.
C3929	P	201	P-

FOR PLANNING ONLY



BLUE ARROWS SHOW ROUTE OF EXCEEDANCE FLOWS FROM PROJECTED POINTS OF EMERGENCE TOWARDS DIRECTION OF FALL.

ALL STRUCTURES DESIGNED TO ACCOMMODATE BELOW GROUND THE CRITICAL 1 IN 100 YEAR STORM EVENT PLUS 45%. EXCEEDANCE WOULD ONLY OCCUR IN STORMS OF GREATER INTENSITY THAN THIS.

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Consulting Civil Engineers

CLIENT
STEPHANIE NEWELL

ARCHITECT
MICHAEL BISSETT POWELL

JOB TITLE
GHYLL HOUSE FARM, COPSALE
RH13 6QW

DRAWING TITLE
EXCEEDANCE FLOW PLAN

DRAWN	ENGINEER	CHECKED	APPROVED
KCK	CS	CS	CS

DATE	SCALE @ A1
CS	1:200

JOB No.	STATUS	DRAWING No.	REV.
C3929	P	301	P-

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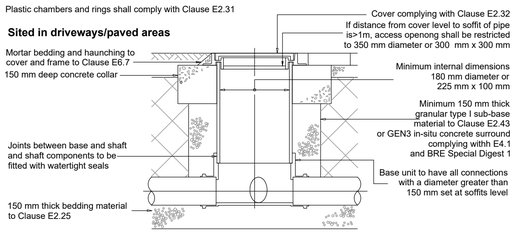
FIGURE B 23
TYPICAL INSPECTION CHAMBER DETAIL - TYPE E

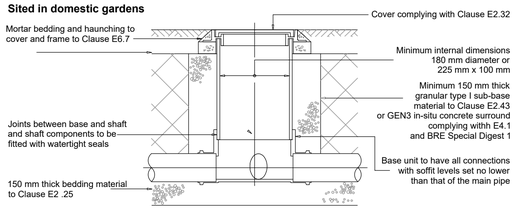
Depth from cover level to soffit of pipe up to 2 m
Flexible material construction

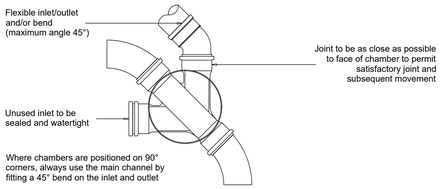
Plastic chambers and rings shall comply with Clause E2.31

Sited in driveways/paved areas



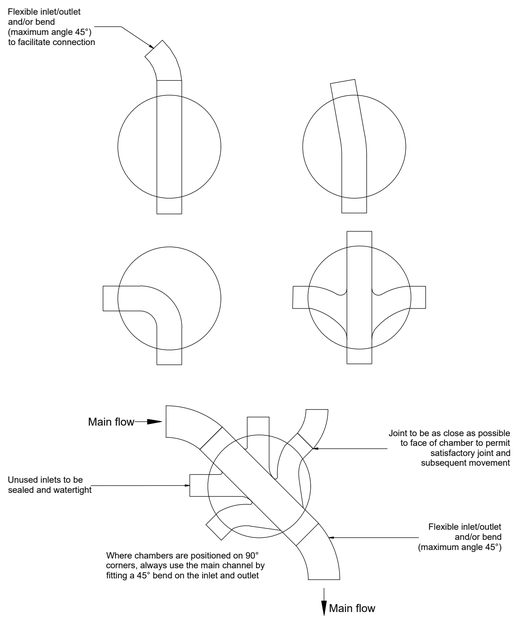
Sited in domestic gardens





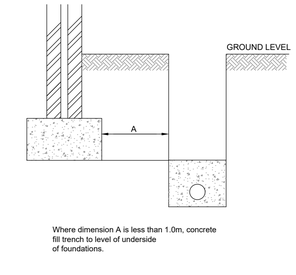
Note: Where the access chamber is in the highway (including any footway) the highway Authority can have specific requirements
Not to scale

FIGURE B 22
TYPICAL BASE LAYOUTS FOR TYPE D CHAMBERS



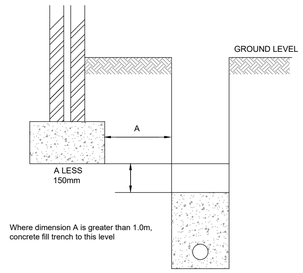
Note: Where a bend is used immediately outside the manhole, this may be used as the rocker pipe

Not to scale



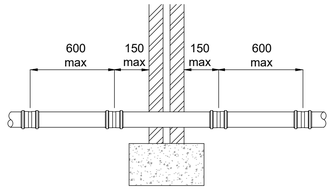
Where dimension A is less than 1.0m, concrete fill trench to level of underside of foundations.

Pipes near buildings
NTS



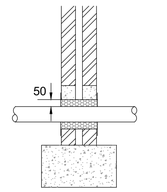
Where dimension A is greater than 1.0m, concrete fill trench to this level

Pipes near buildings
NTS



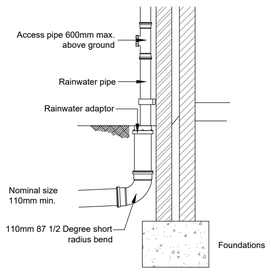
A. Short length of pipe bedded in wall with joints formed within 150mm of each wall face. Adjacent rocker pipes of 600mm max. length with flexible joints.

Pipes through wall detail
NTS

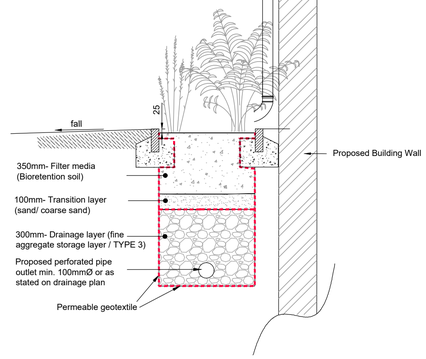


B. Arch or lintelled opening to give min 50mm space all round the pipe.
Mask opening on both sides of the wall with rigid sheet material to prevent entry of fill or vermin.
Important Fill void with compressible material to prevent entry of gas.

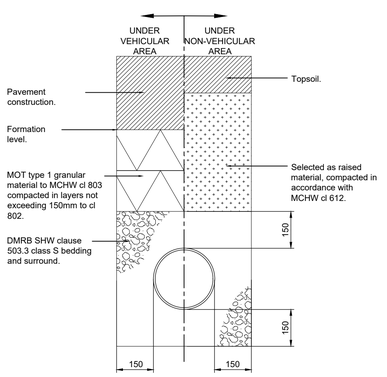
Proposed Permeable Patio Construction (PP2)
(Design based on assumed CBR > 3%)
(Final subbase depth subject to CBR test)



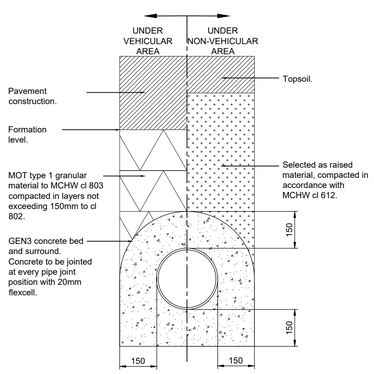
External Rainwater Pipe to Drain
1:20



Proposed Bio-retention Unit Typical Detail
(Scale 1:20)

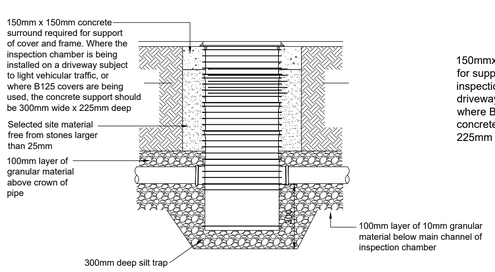


Class S granular pipe bed and surround
To be used for plastic, vitrified and concrete pipework where cover to crown is greater than 900mm.

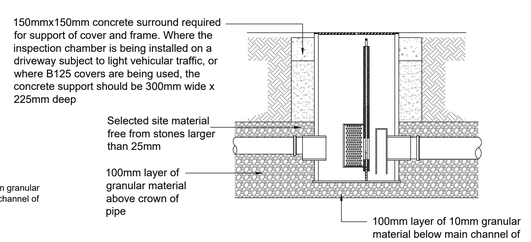


Class Z concrete pipe bed and surround
To be used for plastic, vitrified and concrete pipework where cover to crown is less than 900mm.

Pipe Bedding Details



460mmØ Polypipe basic silt trap detail
SCALE 1:20



Conraflow 500 with foul air trap
SCALE 1:20

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

FOR PLANNING ONLY

REV	DATE	DESCRIPTION	BY	CHK	APP
P-	31.12.25	PRELIMINARY ISSUE	KCK	CS	CS

cgs civils
Consulting Civil Engineers

CLIENT: STEPHANIE NEWELL

ARCHITECT: MICHAEL BISSETT POWELL

JOB TITLE: GHYLL HOUSE FARM, COPSALE RH13 6QW

DRAWING TITLE: PROPOSED TYPICAL CONSTRUCTION DETAILS

DRAWN	ENGINEER	CHECKED	APPROVED
KCK	CS	CS	CS

DATE	SCALE @ A1
CS	AS SHOWN

JOB No.	STATUS	DRAWING No.	REV.
C3929	P	501	P-

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)	1.200
Time of Entry (mins)	4.00	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)
ATT	0.039	4.00	33.500	450	101.941	156.697	1.900
PP	0.196		34.500	450	48.758	117.626	0.480
S1			34.150	450	66.076	139.707	0.750
S2			34.000	450	74.840	132.039	1.000
S3			33.500	450	95.035	147.883	0.932
S4		4.00	33.500	450	100.045	166.794	1.000
S7			33.500	450	107.736	160.048	1.950
OHA	0.100		33.500	450	78.529	157.261	0.500
S5		4.00	35.000	450	51.293	123.635	0.800
S03	0.000	4.00	34.500	450	41.589	79.400	0.863
S01	0.005	4.00	35.250	450	33.500	82.137	0.750
S02	0.005	4.00	34.250	450	45.825	72.372	0.531

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)
3.001	S1	S2	11.645	0.600	33.400	33.000	0.400	29.1	100	4.38	54.4
1.002	S2	S3	25.668	0.600	33.000	32.568	0.432	59.4	100	5.94	50.4
1.003	S3	ATT	6.100	0.600	32.568	31.600	0.968	6.3	100	5.97	50.3
4.000	S4	ATT	10.273	0.600	32.500	31.600	0.900	11.4	100	4.07	54.4
1.004	ATT	S7	2.335	0.600	31.600	31.550	0.050	46.7	150	6.00	50.2
3.000	S5	S1	21.837	0.600	34.200	33.400	0.800	27.3	100	4.25	54.4
1.001	S03	S2	62.261	0.600	33.637	33.000	0.637	97.7	100	5.51	52.2
1.000	S01	S03	8.540	0.600	34.500	33.637	0.863	9.9	100	4.06	54.4
2.000	S02	S03	8.206	0.600	33.719	33.637	0.082	100.1	100	4.18	54.4

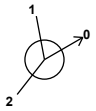
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
3.001	1.435	11.3	0.0	0.650	0.900	0.000	0.0	0	0.000
1.002	1.001	7.9	1.8	0.900	0.832	0.010	0.0	32	0.810
1.003	3.100	24.3	1.8	0.832	1.800	0.010	0.0	18	1.806
4.000	2.300	18.1	0.0	0.900	1.800	0.000	0.0	0	0.000
1.004	1.476	26.1	8.9	1.750	1.800	0.049	0.0	60	1.335
3.000	1.483	11.6	0.0	0.700	0.650	0.000	0.0	0	0.000
1.001	0.778	6.1	1.9	0.763	0.900	0.010	0.0	38	0.683
1.000	2.471	19.4	1.0	0.650	0.763	0.005	0.0	15	1.280
2.000	0.768	6.0	1.0	0.431	0.763	0.005	0.0	27	0.560

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)
3.001	11.645	29.1	100	Circular	34.150	33.400	0.650	34.000	33.000	0.900
1.002	25.668	59.4	100	Circular	34.000	33.000	0.900	33.500	32.568	0.832
1.003	6.100	6.3	100	Circular	33.500	32.568	0.832	33.500	31.600	1.800
4.000	10.273	11.4	100	Circular	33.500	32.500	0.900	33.500	31.600	1.800
1.004	2.335	46.7	150	Circular	33.500	31.600	1.750	33.500	31.550	1.800
3.000	21.837	27.3	100	Circular	35.000	34.200	0.700	34.150	33.400	0.650
1.001	62.261	97.7	100	Circular	34.500	33.637	0.763	34.000	33.000	0.900
1.000	8.540	9.9	100	Circular	35.250	34.500	0.650	34.500	33.637	0.763
2.000	8.206	100.1	100	Circular	34.250	33.719	0.431	34.500	33.637	0.763

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
3.001	S1	450	Manhole	Adoptable	S2	450	Manhole	Adoptable
1.002	S2	450	Manhole	Adoptable	S3	450	Manhole	Adoptable
1.003	S3	450	Manhole	Adoptable	ATT	450	Manhole	Adoptable
4.000	S4	450	Manhole	Adoptable	ATT	450	Manhole	Adoptable
1.004	ATT	450	Manhole	Adoptable	S7	450	Manhole	Adoptable
3.000	S5	450	Manhole	Adoptable	S1	450	Manhole	Adoptable
1.001	S03	450	Manhole	Adoptable	S2	450	Manhole	Adoptable
1.000	S01	450	Manhole	Adoptable	S03	450	Manhole	Adoptable
2.000	S02	450	Manhole	Adoptable	S03	450	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
ATT	101.941	156.697	33.500	1.900	450		1	4.000	31.600	100
							2	1.003	31.600	100
							0	1.004	31.600	150
PP	48.758	117.626	34.500	0.480	450					
S1	66.076	139.707	34.150	0.750	450		1	3.000	33.400	100
							0	3.001	33.400	100
S2	74.840	132.039	34.000	1.000	450		1	3.001	33.000	100
							2	1.001	33.000	100
							0	1.002	33.000	100
S3	95.035	147.883	33.500	0.932	450		1	1.002	32.568	100
							0	1.003	32.568	100
S4	100.045	166.794	33.500	1.000	450		0	4.000	32.500	100

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S7	107.736	160.048	33.500	1.950	450	1	1.004	31.550	150
OHA	78.529	157.261	33.500	0.500	450				
S5	51.293	123.635	35.000	0.800	450	0	3.000	34.200	100
S03	41.589	79.400	34.500	0.863	450	1	2.000	33.637	100
						2	1.000	33.637	100
						0	1.001	33.637	100
S01	33.500	82.137	35.250	0.750	450	0	1.000	34.500	100
S02	45.825	72.372	34.250	0.531	450	0	2.000	33.719	100

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)	240	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 %)
10	0	0	0
30	0	0	0
30	40	0	0
100	0	0	0
100	45	0	0

Node S7 Online Orifice Control

Flap Valve	x	Design Depth (m)	1.550	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	2.0		
Invert Level (m)	31.550	Diameter (m)	0.027		

Node PP Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.01228	Invert Level (m)	34.020	Slope (1:X)	100.0
Side Inf Coefficient (m/hr)	0.01228	Time to half empty (mins)	232	Depth (m)	0.350
Safety Factor	2.0	Width (m)	50.000	Inf Depth (m)	
Porosity	0.30	Length (m)	39.200		

Node ATT Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	31.600	Depth (m)	0.800
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	180	Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	9.000	Number Required	1
Porosity	0.95	Pit Length (m)	3.500		

Node OHA Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.01228	Invert Level (m)	33.000	Slope (1:X)	80.0
Side Inf Coefficient (m/hr)	0.01228	Time to half empty (mins)	277	Depth (m)	0.300
Safety Factor	2.0	Width (m)	40.000	Inf Depth (m)	
Porosity	0.30	Length (m)	25.000		

Results for 10 year Critical Storm Duration. Lowest mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	ATT	132	31.969	0.369	6.4	11.0863	0.0000	SURCHARGED
240 minute winter	PP	196	34.307	0.287	13.6	55.3618	0.0000	OK
15 minute summer	S1	1	33.400	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S2	11	33.055	0.055	3.9	0.0087	0.0000	OK
15 minute summer	S3	11	32.595	0.027	3.8	0.0042	0.0000	OK
15 minute summer	S4	1	32.500	0.000	0.0	0.0000	0.0000	OK
180 minute summer	S7	132	31.968	0.418	2.1	0.0665	0.0000	OK
240 minute winter	OHA	192	33.245	0.245	6.9	27.6609	0.0000	OK
15 minute summer	S5	1	34.200	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S03	10	33.697	0.060	4.0	0.0096	0.0000	OK
15 minute summer	S01	10	34.522	0.022	2.0	0.0035	0.0000	OK
15 minute summer	S02	10	33.759	0.040	2.0	0.0063	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	ATT	1.004	S7	2.1	0.290	0.079	0.0411	
240 minute winter	PP	Infiltration		2.5				
15 minute summer	S1	3.001	S2	0.0	0.000	0.000	0.0257	
15 minute summer	S2	1.002	S3	3.8	1.256	0.480	0.0781	
15 minute summer	S3	1.003	ATT	3.8	0.660	0.154	0.0290	
15 minute summer	S4	4.000	ATT	0.0	0.000	0.000	0.0402	
180 minute summer	S7	Orifice		1.0				17.0
240 minute winter	OHA	Infiltration		1.4				
15 minute summer	S5	3.000	S1	0.0	0.000	0.000	0.0000	
15 minute summer	S03	1.001	S2	3.9	0.867	0.638	0.2816	
15 minute summer	S01	1.000	S03	2.0	0.954	0.103	0.0263	
15 minute summer	S02	2.000	S03	2.0	0.534	0.331	0.0320	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.91%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute summer	ATT	168	32.085	0.485	6.5	14.5938	0.0000	SURCHARGED
240 minute winter	PP	224	34.348	0.328	17.0	71.9414	0.0000	OK
15 minute summer	S1	1	33.400	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S2	11	33.065	0.065	5.1	0.0104	0.0000	OK
15 minute summer	S3	11	32.599	0.031	4.9	0.0049	0.0000	OK
15 minute summer	S4	1	32.500	0.000	0.0	0.0000	0.0000	OK
240 minute summer	S7	168	32.085	0.535	1.7	0.0851	0.0000	OK
240 minute winter	OHA	208	33.278	0.278	8.7	35.7553	0.0000	OK
15 minute summer	S5	1	34.200	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S03	10	33.709	0.072	5.2	0.0115	0.0000	OK
15 minute summer	S01	10	34.525	0.025	2.6	0.0039	0.0000	OK
15 minute summer	S02	10	33.765	0.046	2.6	0.0073	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)
240 minute summer	ATT	1.004	S7	1.7	0.281	0.064	0.0411	
240 minute winter	PP	Infiltration		2.8				
15 minute summer	S1	3.001	S2	0.0	0.000	0.000	0.0316	
15 minute summer	S2	1.002	S3	4.9	1.329	0.627	0.0956	
15 minute summer	S3	1.003	ATT	4.9	0.837	0.202	0.0300	
15 minute summer	S4	4.000	ATT	0.0	0.000	0.000	0.0402	
240 minute summer	S7	Orifice		1.1				22.1
240 minute winter	OHA	Infiltration		1.5				
15 minute summer	S5	3.000	S1	0.0	0.000	0.000	0.0000	
15 minute summer	S03	1.001	S2	5.1	0.910	0.828	0.3471	
15 minute summer	S01	1.000	S03	2.6	0.954	0.134	0.0323	
15 minute summer	S02	2.000	S03	2.6	0.566	0.431	0.0392	

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.86%

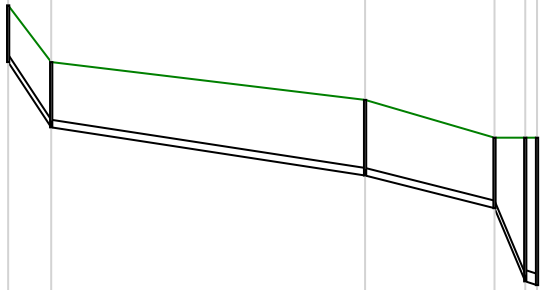
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute summer	ATT	180	32.313	0.713	8.9	21.4595	0.0000	SURCHARGED
240 minute winter	PP	228	34.417	0.397	23.9	105.4664	0.0000	OK
15 minute summer	S1	1	33.400	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S2	12	33.079	0.079	6.5	0.0126	0.0000	OK
15 minute summer	S3	12	32.603	0.035	6.4	0.0056	0.0000	OK
15 minute summer	S4	1	32.500	0.000	0.0	0.0000	0.0000	OK
240 minute summer	S7	180	32.313	0.763	2.0	0.1213	0.0000	OK
240 minute winter	OHA	228	33.340	0.340	12.2	53.0967	0.0000	OK
15 minute summer	S5	1	34.200	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S03	11	33.762	0.125	7.1	0.0198	0.0000	SURCHARGED
15 minute summer	S01	10	34.529	0.029	3.6	0.0047	0.0000	OK
15 minute summer	S02	11	33.781	0.062	3.6	0.0099	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)
240 minute summer	ATT	1.004	S7	2.0	0.353	0.078	0.0411	
240 minute winter	PP	Infiltration		3.4				
15 minute summer	S1	3.001	S2	0.0	0.000	0.000	0.0388	
15 minute summer	S2	1.002	S3	6.4	1.375	0.809	0.1168	
15 minute summer	S3	1.003	ATT	6.4	1.047	0.261	0.0313	
15 minute summer	S4	4.000	ATT	0.0	0.000	0.000	0.0402	
240 minute summer	S7	Orifice		1.3				27.4
240 minute winter	OHA	Infiltration		1.7				
15 minute summer	S5	3.000	S1	0.0	0.000	0.000	0.0000	
15 minute summer	S03	1.001	S2	6.5	0.934	1.056	0.4500	
15 minute summer	S01	1.000	S03	3.6	1.057	0.185	0.0416	
15 minute summer	S02	2.000	S03	3.5	0.597	0.579	0.0531	

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.88%

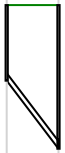
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	ATT	116	32.231	0.631	8.9	18.9736	0.0000	SURCHARGED
240 minute winter	PP	228	34.391	0.371	21.2	92.1214	0.0000	OK
15 minute summer	S1	1	33.400	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S2	11	33.077	0.077	6.3	0.0123	0.0000	OK
15 minute summer	S3	11	32.602	0.034	6.1	0.0054	0.0000	OK
15 minute summer	S4	1	32.500	0.000	0.0	0.0000	0.0000	OK
120 minute winter	S7	116	32.230	0.680	2.3	0.1082	0.0000	OK
240 minute winter	OHA	224	33.315	0.315	10.8	45.9165	0.0000	OK
15 minute summer	S5	1	34.200	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S03	10	33.728	0.091	6.6	0.0145	0.0000	OK
15 minute summer	S01	10	34.528	0.028	3.3	0.0045	0.0000	OK
15 minute summer	S02	10	33.772	0.053	3.3	0.0084	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 winter	ATT	1.004	S7	2.3	0.382	0.087	0.0411	
240 minute winter	PP	Infiltration		3.2				
15 minute summer	S1	3.001	S2	0.0	0.000	0.000	0.0377	
15 minute summer	S2	1.002	S3	6.1	1.373	0.780	0.1135	
15 minute summer	S3	1.003	ATT	6.1	1.011	0.251	0.0311	
15 minute summer	S4	4.000	ATT	0.0	0.000	0.000	0.0402	
120 minute winter	S7	Orifice		1.2				19.9
240 minute winter	OHA	Infiltration		1.7				
15 minute summer	S5	3.000	S1	0.0	0.000	0.000	0.0000	
15 minute summer	S03	1.001	S2	6.3	0.937	1.025	0.4299	
15 minute summer	S01	1.000	S03	3.3	0.954	0.170	0.0396	
15 minute summer	S02	2.000	S03	3.3	0.591	0.547	0.0479	

Node Name		S01	S03	S2	S3	ST
A4 drawing Hor Scale 1500 Ver Scale 100 Datum (m) 28.000						
Link Name		1.00	1.001	1.002	1.01	
Section Type		100	100mm	100mm	100	
Slope (1:X)		9.9	97.7	59.4	6.34	
Cover Level (m)		35.250	34.500	34.000	33.500	33.500
Invert Level (m)		34.500 33.837	33.637	33.000	33.000 32.568	31.600
Length (m)		8.54	62.261	25.668	6.12	

Node Name	S02	S03
A4 drawing Hor Scale 1500 Ver Scale 100 Datum (m) 28.000		
Link Name	2.00	
Section Type	100	
Slope (1:X)	100	
Cover Level (m)	34.250	34.500
Invert Level (m)	33.739	33.639
Length (m)	8.20	

Node Name		S5	S1	S2
A4 drawing Hor Scale 1500 Ver Scale 100 Datum (m) 28.000				
Link Name		3.000	3.001	
Section Type		100mm	100m	
Slope (1:X)		27.3	29.1	
Cover Level (m)		35.000	34.150	34.000
Invert Level (m)		34.200	33.400 / 33.400	33.000
Length (m)		21.837	11.64	

Node Name		S4	ATT
A4 drawing Hor Scale 1500 Ver Scale 100 Datum (m) 27.000			
Link Name		4.00(	
Section Type		100n	
Slope (1:X)		11.4	
Cover Level (m)		33.500	33.500
Invert Level (m)		32.500 31.600	
Length (m)		10.2	

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	ATT	144	33.310	1.710	9.7	24.2268	0.0000	FLOOD RISK
360 minute winter	PP	344	34.488	0.468	22.6	142.8167	0.0000	OK
15 minute summer	S1	1	33.400	0.000	0.0	0.0000	0.0000	OK
180 minute winter	S2	144	33.312	0.312	2.0	0.0496	0.0000	SURCHARGED
180 minute winter	S3	144	33.310	0.742	2.0	0.1180	0.0000	FLOOD RISK
180 minute winter	S4	144	33.310	0.810	2.6	0.1287	0.0000	FLOOD RISK
180 minute winter	S7	144	33.309	1.759	2.9	0.2797	0.0000	OK
240 minute winter	OHA	232	33.407	0.407	15.7	72.2839	0.0000	OK
15 minute summer	S5	1	34.200	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S03	11	33.904	0.267	8.1	0.0425	0.0000	SURCHARGED
15 minute summer	S01	10	34.534	0.034	4.7	0.0053	0.0000	OK
15 minute summer	S02	11	33.940	0.221	4.7	0.0351	0.0000	SURCHARGED

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 winter	ATT	1.004	S7	2.9	0.264	0.110	0.0411	
360 minute winter	PP	Infiltration		3.4				
15 minute summer	S1	3.001	S2	0.0	0.000	0.000	0.0426	
180 minute winter	S2	1.002	S3	2.0	1.070	0.254	0.2008	
180 minute winter	S3	1.003	ATT	2.0	0.426	0.082	0.0477	
180 minute winter	S4	4.000	ATT	-2.6	-0.395	-0.142	0.0804	
180 minute winter	S7	Orifice		2.0				30.5
240 minute winter	OHA	Infiltration		1.7				
15 minute summer	S5	3.000	S1	0.0	0.000	0.000	0.0000	
15 minute summer	S03	1.001	S2	7.1	0.939	1.167	0.4716	
15 minute summer	S01	1.000	S03	4.7	1.087	0.242	0.0433	
15 minute summer	S02	2.000	S03	3.6	0.627	0.602	0.0642	

7.5 Appendix E – Maintenance Schedule

Consulting Civil Engineers

Maintenance Schedule

Ghyll House Farm, Copsale

Planning Ref: DC/25/0883

For

Stephanie Newell

Rev - **P**

Reference **C3929**

Date **08th January 2026**

Revision	Date of Issue	Comments	Prepared By	Checked By
P	08/01/2026	Initial Issue	KCK	CS

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Contents

1 SuDS 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 developer will take on the responsibility of these duties as laid out in this report.

1.1.2 Once appointed the Contractor will prepare a site-specific method statement which will include methods for the control of silt and other pollutants during construction. CIRIA Report C5332, Control of water pollution from construction site, provides further guidance on this. This is also further discussed in this statement below.

1.1.3 Once the proposed drainage system has been constructed it will be maintained and operated by the contractor until the handing over of the site and subsequently passed on to the Developer /owner.

1.1.4 The whole proposed surface water and foul drainage system will be monitored and maintained (including repairs and replacement) in accordance with the maintenance schedule in perpetuity by owner

1.1.5 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 Land at Ghyll House Farm, Copsale.

1.2.1 As listed above, in section 5.1.2, the SuDS features used on site will be **Permeable Paving, Attenuation Tank and Bio retention.**

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 Attenuation 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

1.3.2 Permeable Paving

In order to maintain the functioning of the permeable paving, the following maintenance requirements should be adhered to:

Table 21.3 Operation and maintenance requirements for permeable paving		
Maintenance Schedule	**Required Action**	**Typical Frequency**
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required take remedial action	Three-monthly, 48h after large storms in first six months
	Inspect silt accumulation rate and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

1.3.3 Bio retention systems

In order to maintain the functioning of the bio retention systems, the following maintenance requirements should be adhered to:

Table 18.3 Operation and maintenance requirements for bio retention systems

Maintenance Schedule	Required Action	Typical Frequency
Regular Inspections	Inspection infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary	Quarterly
	Check operation of underdrains by inspection of flows after rain	Annually
	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
	Inspect inlets and outlets for blockages	Quarterly
Regular maintenance	Remove litter and surface debris and weeds	Quarterly (or more frequently for tidiness or aesthetic reasons)
	Replace any plants, to maintain planting density	As required
	Remove sediment, litter and debris build-up from around inlets or from forebays	Quarterly to biannually
Occasional maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial actions	Remove and replace filter medium and vegetation above	As required but likely to be > 20 years

1.4 Management of Accidental Spillage of Pollutants on Site

In the event of an accidental spillage of pollutants on site, immediate and effective action must be taken to prevent harm to the environment, human health, and property. The following procedures should be implemented:

1.4.1 Identification and Containment of Spill:

- Immediately Assess the Spill: Identify the nature of the pollutant (e.g., oil, chemicals, fuel) to determine the best course of action.
- Isolate the Area: Restrict access to the affected area to prevent exposure to personnel or the general public.
- Contain the Spill: Use appropriate containment materials such as spill barriers, sandbags, or absorbent booms to limit the spread of the spillage. Ensure that the pollutant does not enter drains, watercourses, or sensitive environmental areas.

1.4.2 Spill Response Equipment:

- Ensure that suitable spill response kits are readily available at key locations on site. These kits should contain absorbents, personal protective equipment (PPE), neutralizing agents (if applicable), and disposal containers.
- For liquid spills, use absorbent pads, granules, or blankets to soak up the spill and prevent further spread.

1.4.3 Notification and Reporting:

- Alert Relevant Authorities: Notify the appropriate authorities, such as the Environmental Agency (EA), local environmental protection body, or the emergency services, if the spill is significant or poses a risk to the environment.
- Report the Spill: Complete a detailed report outlining the circumstances of the spill, the materials involved, the containment measures taken, and any corrective actions carried out. Keep this record for future reference.

1.4.4 Clean-up and Disposal:

- Carefully remove any contaminated materials, including absorbents and impacted soil or surface materials. These materials must be disposed of following the regulations for hazardous waste disposal.

- Clean affected surfaces and areas thoroughly, using appropriate cleaning agents and procedures to remove any residual pollutants.
- If Necessary, for larger or more complex spills, consider hiring professional environmental contractors to manage the clean-up and ensure that all necessary actions are taken.

1.4.5 **Review and Prevention:**

- Investigate the cause of the spill to understand how it occurred and to determine if there were any procedural or equipment failures.
- Based on the findings, update the site's spill prevention plan, providing additional safeguards and training to prevent future incidents.
- Ensure all personnel are trained in spill response protocols, the use of spill kits, and safe handling practices for hazardous materials.

1.4.6 **Environmental Monitoring:**

- After the spill has been cleaned up, monitor surrounding soil, water, and air quality to ensure that no contaminants have been left behind. If necessary, conduct environmental testing to verify that there is no long-term impact.

1.5 General Drainage Maintenance Specification

1.5.1 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

1.5.2 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. Remove debris from the catchment surface (where it may cause risks to performance) Remove sediment from pre-treatment inlet structures and inspection chambers. Maintain vegetation to designed limits within the vicinity of below ground drainage pipes and tanks.	Monthly for 3 months then annually Monthly Annually or as required 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. Survey inside of pipe runs for sediment build up and remove if necessary.	Annually Every 5 years or as required

1.6 Arisings Storage & Disposal Arrangements

- Maintenance Access
  - Designated access routes will be established to facilitate safe and efficient maintenance activities.
  - Access points will be positioned to minimize disruption to site operations and ensure safety.
  - Maintenance personnel will follow established safety protocols, including the use of appropriate PPE.

- Arisings Storage & Disposal
  - Any green waste, organic sediment, or debris removed during maintenance will be stored in designated areas away from the watercourse.
  - Green waste and organic material may be spread across crops where appropriate to promote natural decomposition.
  - Non-biodegradable waste, such as plastics or construction debris, will be collected separately and disposed of site in accordance with environmental regulations.
  - Hazardous materials, if encountered, will be stored in sealed containers and disposed of following regulatory guidelines.

- Environmental Protection Measures
  - Regular inspections will be conducted to ensure waste is managed correctly and does not pose a risk of contamination.
  - Spill response procedures will be in place to address any accidental leakage or discharge.
  - Maintenance records will be kept to track waste disposal and ensure compliance with regulations.

1.7 Health and Safety Risks of Maintenance Activities:

The following outlines common health and safety risks associated with maintenance activities, along with recommended actions for managing these risks:

1.7.1 **Physical Injuries:**

- Risks:
  - Slips, trips, and falls due to wet surfaces or uneven ground.
  - Being struck by falling objects, tools, or equipment.
  - Cuts, burns, or abrasions from using tools or machinery.
  - Injury from handling heavy or awkward items.

- Mitigation:
  - Ensure that walkways and working areas are clear of obstacles, dry, and well-maintained.
  - Use appropriate personal protective equipment (PPE), such as hard hats, gloves, and safety footwear.
  - Train workers on safe lifting techniques and the proper handling of materials and tools.
  - Secure tools and equipment to prevent them from falling.

1.7.2 **Exposure to Hazardous Substances:**

- Risks:
  - Exposure to chemicals, solvents, and asbestos (if present) during maintenance work.
  - Dust, fumes, or vapors from machinery, paints, or cleaning agents.

- Mitigation:
  - Ensure workers are provided with the correct PPE, including respirators or face masks when necessary.
  - Conduct air monitoring to detect hazardous levels of fumes or dust.
  - Implement ventilation systems in enclosed spaces to reduce the concentration of harmful substances.

- Provide training on the proper handling, storage, and disposal of hazardous materials.
- Use safer alternatives to hazardous chemicals wherever possible.

1.7.3 **Confined Space Work:**

- Risks:
  - Workers entering confined spaces (e.g., tanks, pits, ducts) may face risks of asphyxiation, drowning, or exposure to toxic gases.
- Mitigation:
  - Implement a confined space entry program, including air quality testing, ventilation, and continuous monitoring of oxygen levels.
  - Provide workers with proper training and ensure they have rescue equipment readily available.
  - Ensure that a permit-to-work system is in place to control and monitor confined space activities.
  - Maintain communication at all times with workers inside confined spaces.

1.7.4 **Electrical Hazards:**

- Risks:
  - Risk of electrocution or electrical burns when maintaining electrical systems or equipment.
  - Contact with exposed wires or malfunctioning electrical tools.
- Mitigation:
  - Ensure all electrical systems are properly locked out and tagged out before maintenance begins.
  - Only qualified personnel should perform electrical work.
  - Inspect tools and equipment regularly for defects and repair or replace as necessary.
  - Provide PPE, such as rubber gloves and insulated tools, for electrical work.

1.7.5 **Equipment and Machinery Hazards:**

- Risks:
  - Injury from moving parts, entanglement, or accidental start-up of machinery during maintenance.
- Mitigation:
  - Implement lock-out/tag-out (LOTO) procedures to ensure machinery cannot be accidentally started during maintenance.
  - Provide proper training on the safe use and maintenance of machinery.
  - Perform regular inspections and maintenance on tools and equipment to ensure they are in good working order.

1.7.6 **Working at Heights:**

- Risks:
  - Falls from ladders, scaffolds, or roofs during maintenance work.
  - Falling tools or equipment that could injure workers below.
- Mitigation:
  - Use fall protection systems such as guardrails, safety nets, or personal fall arrest systems.
  - Ensure scaffolds and ladders are properly installed and maintained.
  - Train workers on working at height safety protocols.
  - Use tool lanyards to prevent tools from falling and causing injury.

1.7.7 **Manual Handling Risks:**

- Risks:
    - Back injuries, strains, and sprains from lifting heavy or awkward objects.
- Mitigation:
    - Train workers in proper lifting techniques to avoid injury.
    - Use mechanical aids such as cranes, hoists, or forklifts to handle heavy materials.
    - Limit manual lifting to tasks that can be performed safely without assistance.

1.7.8 **Noise and Vibration:**

- Risks:
    - Prolonged exposure to high noise levels can lead to hearing loss.
    - Vibration from power tools and machinery can cause hand-arm vibration syndrome (HAVS) or musculoskeletal disorders.
- Mitigation:
    - Use noise-dampening equipment and hearing protection (earplugs, earmuffs) in high-noise areas.
    - Implement regular hearing checks for workers exposed to high noise levels.
    - Provide vibration-reducing gloves and limit workers' exposure to vibrating tools.

1.7.9 **Weather-Related Risks:**

- Risks:
    - Adverse weather conditions (e.g., high winds, heavy rain, extreme heat or cold) can increase the risk of accidents.
    - Heat stress or hypothermia from prolonged exposure to extreme temperatures.
- Mitigation:
    - Monitor weather conditions regularly and reschedule maintenance activities if necessary to avoid hazardous conditions.
    - Ensure adequate hydration for workers during hot weather and provide protective clothing during cold conditions.
    - Implement shelter or shade for workers in extreme weather and limit exposure to hazardous weather.

1.7.10 **Fire and Explosion Risks:**

- Risks:
    - Sparks from machinery or electrical work could ignite flammable materials, leading to fires or explosions.
- Mitigation:
    - Ensure that fire extinguishers, fire blankets, and other emergency firefighting equipment are available on-site.
    - Conduct regular fire drills and ensure workers know how to respond in the event of a fire.
    - Use non-sparking tools and maintain safe distances from flammable materials during maintenance work.

2 Existing Watercourse Maintenance Regime

2.1 Drainage Ditch

Watercourses and drainage ditches require correct maintenance in order to allow surface water to flow freely, this will also reduce the risks of flooding. Correctly maintained watercourses can also create an excellent habitat for wildlife. There are specific maintenance procedures that should be followed in order to correctly maintain the ditch.

In order to maintain the functioning of a drainage ditch, the following requirements should be adhered to:

Watercourse and Drainage Ditches	
Regular Maintenance	**Frequency**
Keep Watercourse Free of Debris Remove any physical obstructions such as large rocks, rubble, fallen trees and branches and other waste materials (litter, grass cuttings etc) so that water can flow freely. All non-organic waste should be completely removed off site and disposed of in an appropriate manner. Any green waste resulting from the maintenance of ditches can be left a safe distance from the back for a few days to allow any organisms to move back into the watercourse, after which the green waste should be removed so it doesn't wash back into the watercourse. Ensure that any disturbed debris does not end up flowing downstream and causing problems for other landowners. Do no store anything alongside the watercourse which may interfere with maintenance, affect the stability of the back or get washed into the channel.	Monthly
Keep growth of vegetation under control When trimming vegetation, it is important to consider any impact on biodiversity. Mowing of banks around ditches should be minimised during the animal spawning season of March to mid-July. Some trees may have tree protection orders (TPOs) on them, so if in doubt check with local planning authority. It is recommended to cut only up to just above the water level on one side of the watercourse, leaving the fringe of the bank uncut, thereby maintaining some habitat as well as enabling a free flow of water in the ditch. Cuttings from any clearance work should be removed from the channel to avoid it causing blockages downstream. Putting removed material too close to the top of the bank can lead to it falling back in during times of flooding.	As Required
Remove excess Silt Silt should be removed along the length of the ditch to ensure it flows properly in the right direction. If there are any pipes into or out of the ditch you should remove silt to the same level or below the bottom of the pipe(s). Where possible, try to maintain the original slope and cross section of the ditch when de-silting. If the slope of the ditch is altered it can change the flow pattern, cause erosion or increase flood risk either upstream or downstream. As long as the silt is non-hazardous you can put it on the bank of the watercourse. Depositing silt on top of the banks of the watercourse allows for any organisms to move back into the ditch. However; • It is essential that this material does not then block any other ditches or nearby roads, or stop water draining into the ditch if it would normally do so.	As required.

• The silts must be as close as possible to where it was dredged from either: on the bank of the waters from where it was taken or on land directly next to the watercourse. If you think a material may be hazardous. Contact the Environment Agency for advice.	

2.2 Culvert and Headwalls

- Culverts allow the drainage ditch to flow freely under the access road. They should always be free from obstruction to allow free flow.
- Headwalls are used as an outlet to the drainage ditch from the surface water network; they are also used as an inlet and outlet for the culvert.

Culvert and Headwalls	
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 to avoid	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

3 Periodic Evaluation of the Maintenance Regime

To ensure the continued effectiveness of the maintenance activities and to identify and address potential risks, a periodic evaluation of the maintenance regime will be scheduled and carried out. This evaluation is crucial to ensure that all maintenance procedures remain aligned with industry best practices, regulatory requirements, and the operational goals of the project. The following outlines the process and key considerations for the periodic evaluation:

3.1.1 Frequency of Evaluation:

- The maintenance regime will be evaluated at regular intervals, as determined by the nature of the work and the criticality of the system being maintained. Typically, evaluations will occur:
    - **Quarterly:** For high-risk or complex systems that require frequent oversight.
    - **Annually:** For less critical systems or where long-term monitoring and adjustments are needed.
    - **Post-Maintenance Inspections:** After the completion of significant maintenance tasks or changes to the site or infrastructure.

3.1.2 Review of Maintenance Activities:

- The evaluation will involve reviewing all performed maintenance activities to ensure they have been carried out in accordance with the prescribed procedures. This includes:
    - Assessing whether the planned maintenance tasks have been executed on time and as per the schedule.
    - Checking for any missed or delayed maintenance actions that could potentially lead to risks or failures.
    - Evaluating the effectiveness of the maintenance performed, including whether it successfully addressed identified issues.
    - Reviewing records of inspections, repairs, and replacements.

3.1.3 Performance Monitoring:

- Key performance indicators (KPIs) will be established to track the success and impact of maintenance activities. These may include:
    - Equipment uptime and downtime.
    - Frequency of breakdowns or failures.
    - Cost of maintenance versus budget.
    - Response times to critical issues or failures.
    - Compliance with safety regulations and risk assessments.
    - Efficiency and sustainability of maintenance procedures.

3.1.4 Inspection and Testing:

- Regular inspections and testing of systems and equipment will be incorporated into the evaluation process. This includes:
    - Physical inspections of infrastructure and equipment to check for wear, tear, or any degradation.
    - Functional testing to verify that systems operate correctly after maintenance.
    - Stress testing or simulated fault conditions to assess the robustness of maintenance measures.

3.1.5 Feedback from Staff and Stakeholders:

- Feedback from maintenance personnel, site supervisors, and other stakeholders will be collected to understand any operational challenges or improvements needed. This includes:
    - Gathering input from workers who perform the maintenance activities to identify any difficulties or inefficiencies encountered.
    - Discussing safety concerns and suggestions for improving safety practices during maintenance activities.
    - Reviewing any customer or client feedback related to the maintenance process.

3.1.6 Identification of Improvements and Updates:

- Based on the evaluation findings, the maintenance regime will be updated and adjusted as necessary. This may include:
    - Revising maintenance schedules based on performance trends or new technology developments.
    - Incorporating new safety measures or updated safety protocols.
    - Introducing more efficient or cost-effective methods and tools.
    - Addressing any areas of non-compliance or failure to meet quality standards.

3.1.7 Documentation and Reporting:

- All evaluations, findings, and adjustments to the maintenance regime will be documented comprehensively. Key reports will include:
    - Evaluation summary with identified issues and corrective actions.
    - Updated maintenance schedules, procedures, and protocols.
    - Record of actions taken to address any performance deficiencies or safety issues.
    - Recommendations for further improvements and the timeline for implementing them.

The evaluation process will be part of a continuous improvement cycle, ensuring that maintenance activities evolve to meet changing conditions, new challenges, and advancements in technology or best practices.

The periodic evaluation will also include ensuring that all maintenance activities are compliant with relevant industry regulations, local authorities' requirements, and any contractual obligations.

4 Formal Procedure for Changes to the Maintenance Regime Following Evaluation:

To ensure the ongoing effectiveness and adaptability of the maintenance regime, a formal procedure will be in place to allow for changes and improvements based on the findings of the periodic evaluations. This procedure ensures that any modifications are properly managed, documented, and implemented in a structured manner, aligning with operational goals, safety standards, and regulatory requirements. The key steps in this process are outlined below:

Identification of Need for Change:

- Following each evaluation, any areas where the maintenance regime may need adjustment will be identified. This could be due to:
    - If performance indicators, such as equipment failures or downtime, show that current maintenance practices are insufficient.
    - If new safety risks or hazards are identified during the evaluation that require changes to protocols.
    - Introduction of new technology or maintenance methods that could improve efficiency or effectiveness.
    - Updates to industry standards or regulatory requirements that mandate changes in maintenance practices.
    - Input from those directly involved in maintenance activities may highlight areas for improvement.

Documentation of Proposed Changes:

- Once the need for change has been identified, a proposal for changes to the maintenance regime will be documented. This includes:
    - A clear description of the proposed change(s).
    - The rationale for the change, including any issues or findings from the evaluation that support the change.
    - Expected outcomes and benefits, such as improved efficiency, reduced downtime, or enhanced safety.
    - An assessment of any associated costs, resource requirements, or scheduling implications.
    - Compliance considerations to ensure that any proposed changes adhere to regulatory requirements

Review and Approval:

- The proposed changes will be reviewed by relevant stakeholders to ensure they align with the broader operational objectives and regulatory standards. This step includes:
    - The maintenance team, site managers, and relevant technical experts will assess the proposed changes for feasibility, practicality, and safety.
    - Depending on the scope of the change, approval may be required from the client, regulatory bodies, or other key stakeholders.
    - A risk assessment may be conducted to evaluate any potential risks associated with the change and identify mitigation strategies.

Update of Maintenance Procedures:

- Once the changes have been approved, the maintenance procedures will be updated to reflect the new approach. This will include:
    - Detailed updates to maintenance schedules, tasks, and responsibilities.
    - Updating manuals, checklists, and procedural documents to incorporate the new practices.
    - If the changes involve new equipment, methods, or safety procedures, training sessions will be organised for all relevant personnel to ensure they are equipped to implement the updated regime.

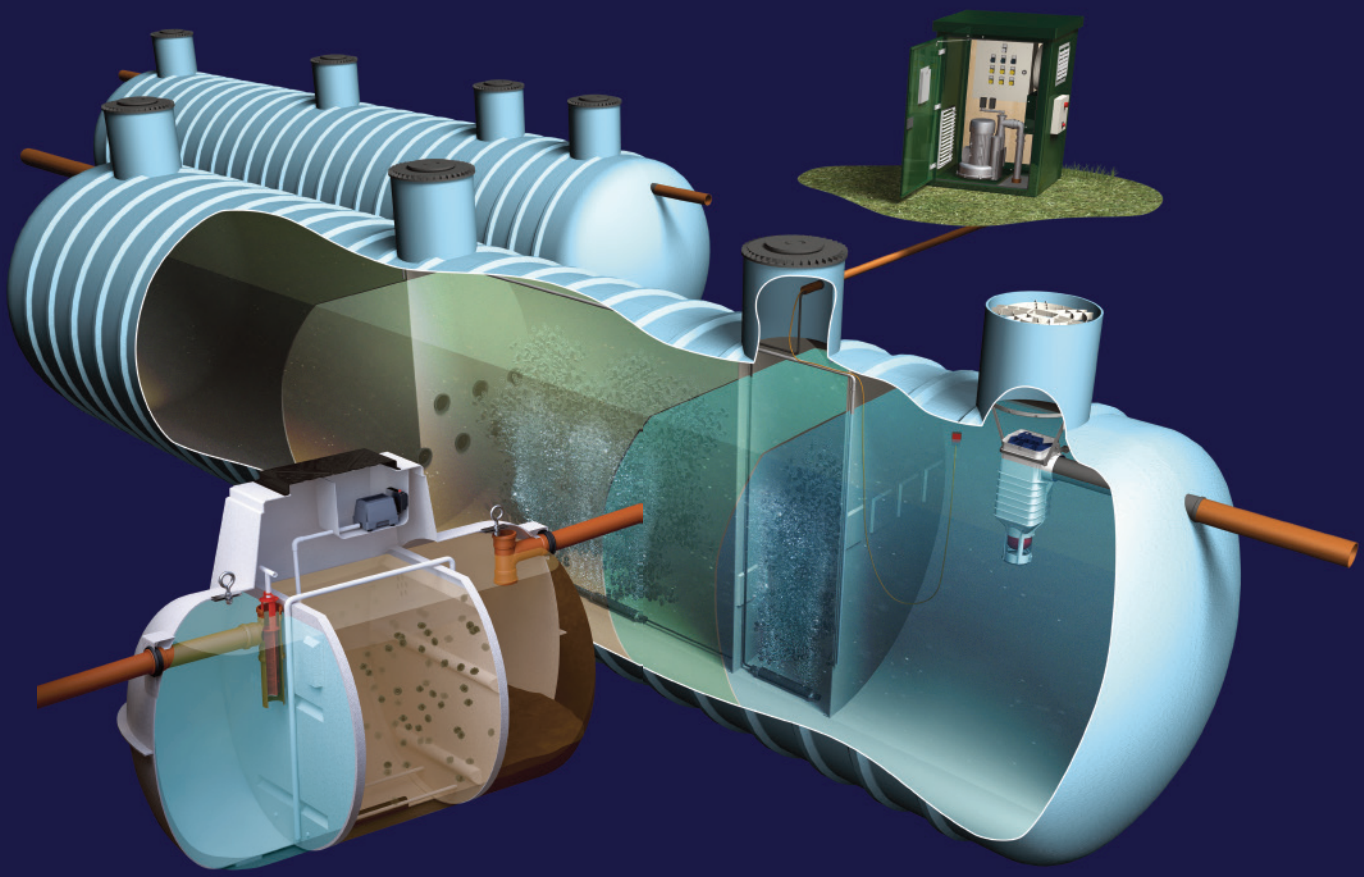
Communication and Implementation:

- Clear communication will be provided to all stakeholders regarding the updated maintenance regime. This includes:
    - Ensuring that the maintenance team and other staff members are fully informed of the changes and their role in the updated procedures.
    - If the changes impact external contractors or partners, they will be informed promptly and provided with any necessary instructions or guidelines.
- The implementation of the changes will be carried out according to the updated maintenance schedule, with monitoring to ensure smooth execution.

5 Foul Treatment Plant Maintenance

Package sewage treatment plants

Installation and operation manual



www.marshindustries.co.uk

Based in Northamptonshire and with extended facilities in Bridgwater, Somerset, Marsh Industries is a leading manufacturer of sewage treatment plant, off-mains drainage products and rainwater harvesting systems for both UK and overseas markets.

Marsh supplies sewage treatment plant and off-mains drainage products for domestic, commercial and industrial applications as well as offering engineering design and technical support.

With one of the largest merchant distributor networks available in Europe, clients ask for Marsh products and services because they know the company delivers from a solid foundation of knowledge, customer support, product quality and proven performance.

Architects, specifiers and installers within the construction sectors seek alliances and partnership with Marsh because its core products and services bring further added value to their own brands.

COVID-19 NOTICE

Start up information for sewage treatment plants after prolonged periods of inactivity

When returning to or reopening your place of business, please follow the instructions below to enable a smooth start-up and to minimise the risk of pollution when restarting your sewage treatment plant.

Firstly, make sure the area is secure and cordoned off to prevent people or animals on site from falling into the sewage treatment plant. Where possible a qualified British Water accredited engineer should be employed to carry out these procedures. This process should be undertaken by two people while observing HM Government Social Distancing (Covid-19). PPE must be worn and handwashing/sanitizing must be carried out.

When first opening the tank chambers please ensure the area is well ventilated and engineers are wearing protective face masks. Sewer gases can accumulate in sewage treatment plants, particularly Hydrogen Sulphide, which can be very dangerous even at low levels. (Sewer gas is a complex mixture of toxic and nontoxic gases produced by the decomposition of organic household or industrial components of sewage.)

- ✓ When your treatment plant is turned on, make sure the compressor/air blower is operational.
- ✓ Inspect the air filters on the top of the compressor and remove any debris impeding the flow of air.
- ✓ Check whether air is reaching the treatment zone of your sewage treatment plant. This can be done by checking for a mild jacuzzi effect in the middle chamber of the plant.
- ✓ Make sure the media (golf ball sized pieces of plastic) are freely circulating in the aeration chamber within the treatment plant. These must not be accumulating at one side of the chamber or the other.
- ✓ Ensure that the treatment plant is vented locally and that air is allowed unhindered access to the plant with no air admittance valves located on the vent.
- ✓ Be aware that when restarting your plant after prolonged periods of inactivity, smell and odour may be generated in the initial weeks while the biomass - 'good bacteria' - starts to grow again on the media (Activated carbon vents are available for purchase from Marsh Industries if this is an issue).
- ✓ Existing recirculation pipes from the final chamber to the primary chamber assist and speed up the sewage treatment process, however a temporary submersible pump with a flow of less than 10 litres a minute can be fitted into the final humus chamber to further enhance the process. The pump must be 1m below the waterline and should discharge to the primary chamber with the hose being under the waterline to minimise the agitation of solids. The pump can be operated for 20mins in every hour for 6 hours per day for the first 4 days of start up. After this period, the pump should be removed, cleaned and stored.

If you have concerns about restarting your sewage treatment plant, please contact the Marsh HQ on 01933 654582.

1 Pre-installation checklist

Prior to installation please check or take note of the following:

✓ Ensure that the information contained in this manual is adhered to at all times.

✓ When the sewage treatment plant arrives on site it is recommended to fully inspect for damage (ie, fractures to the shell or ribs, delamination, scratches or abrasions deeper than 1.5mm, stress cracks or star crazing). If any damage is seen or suspected please notify Marsh Industries immediately as problems cannot be rectified easily after installation.

✓ It is the responsibility of the installer/contractor to undertake installation of the sewage treatment plant as per Marsh Industries' instructions.

✓ All electrical work must be undertaken by fully qualified personnel under the guidance of The Health & Safety at Work Act.

✓ Ensure the plant is properly ventilated.

✓ The end-user of the plant is responsible for the operation and maintenance of the system and its discharge either direct to a watercourse or through a percolation area.

✓ It is important that the product is operated under the conditions for which it is designed. Any variation in these conditions could prevent the unit from performing to its full potential and the effluent discharge may not meet required standards.

✓ Maintain the system in accordance with this handbook.

✓ Any service contract offered by Marsh is mechanical only and does not include desludging (emptying of the system). The end-user must desludge the system in accordance with the guidelines provided in this handbook.

✓ Drainage fields, drains and desludging of the plant remains the responsibility of the end-user. Any damage to the installation due to the influx of surface water or the backing up of drainage fields or drains is not covered by service agreements.

✓ Contact Marsh Industries if you have any technical queries regarding the installation, maintenance or servicing of the system.

To maintain optimum system performance the end-user must be aware of certain precautions, including the following:

✗ Do not open the plant cover without firstly isolating the mains power.

✗ Do not alter in any way, any part of the system or internal parts supplied with the system.

✗ The design loading of the plant should not be exceeded.

✗ High volume discharges such as those from swimming pools and Jacuzzi's must never enter the system.

✗ Surface water must not enter the system.

✗ Heavy duty toilet paper, sanitary towels or incontinence pads must not enter the sewage treatment plant. This could cause severe blockages and can adversely affect organic biomass growth.

✗ If the plant is installed in a care home or medical facility, spent medication must not enter the sewage treatment plant as this can adversely affect organic biomass growth.

✗ Do not allow large quantities of chemicals to enter the system including:

- *Water softener regenerate*
- *Disinfectants or high concentrate bleaches*
- *Strong acids and alkalis*
- *Oil or grease*
- *Pesticides*
- *Photographic chemicals*

2 Site location (For guidance only)

Minimum distances for locating sewage treatment plant is set out below. These are minimum distances only – the unit should be located as far away as is practically possible. However, when locating the plant, consideration should be given to allow adequate access for a desludging tanker.

	Any dwelling	Watercourse or stream	Spring or well	Lake/moat	Site boundary	Road	Slope, break or cuts
Plant	7m	10m	50m	50m	3m	4m	4m
Percolation area	15m	10m	50m	50m	3m	4m	4m

3 Tank installation

Site inspection

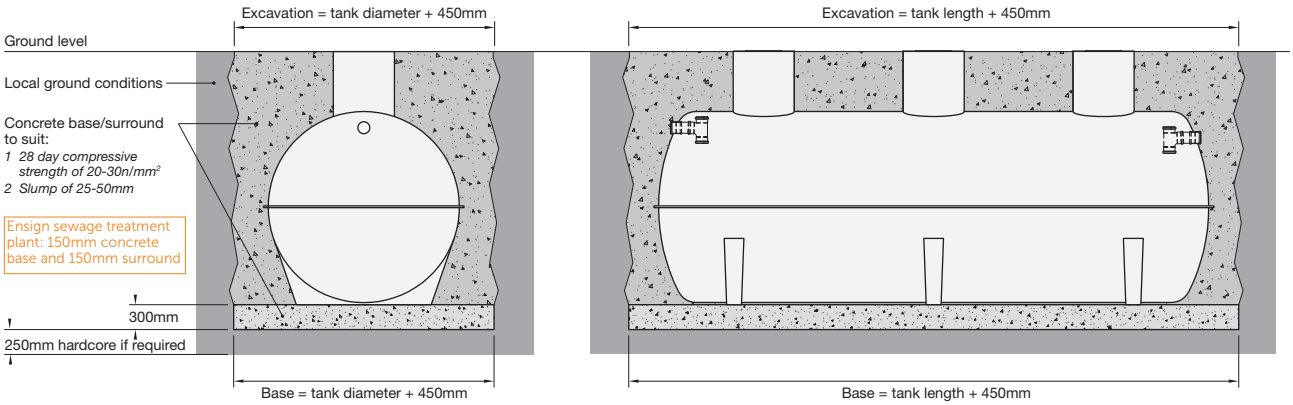
- Ensure site location ground is flat, even and free from rocks.
- If the plant is to be installed in a high traffic area, a qualified civil engineer should design a separate load bearing slab and reinforced base of hard core with metal grid support and concrete.

Movement of the sewage treatment plant

- The weight of the tank is not evenly distributed along its length, so time needs to be taken to ensure the straps are distributed to prevent movement or slippage.
- Use only web straps to lift the tank - do not allow chains, cables or wire ropes to make contact with the tank.

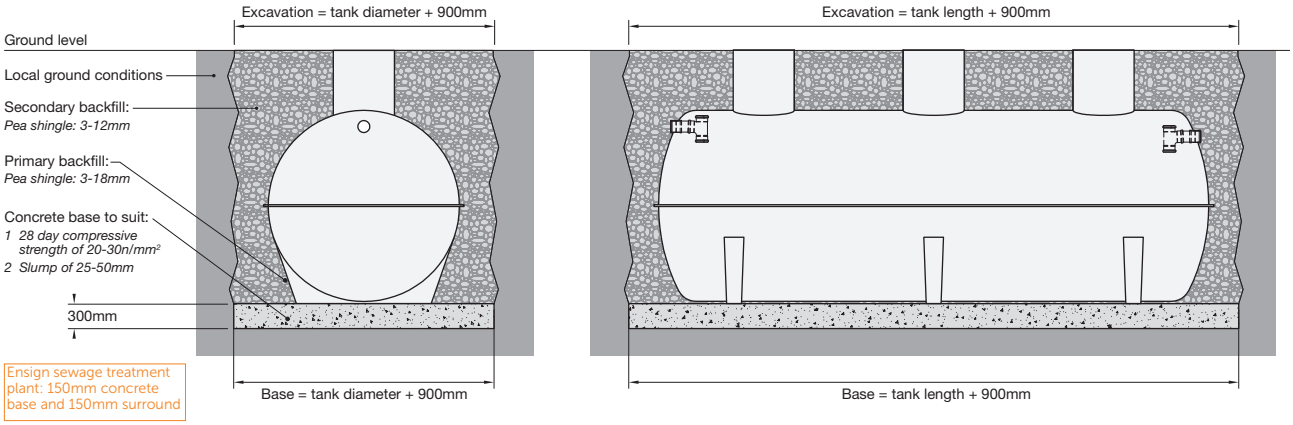
  Note: Lifting eyes (rated to 350kgs) used during the manufacture of Ensign units can be used for on-site handling
- A lifting beam is to be used for tanks over 8m long.
- The tank must be fully lifted off the ground for clear movement – do not drag the tank along the ground.
- The unit needs to be chocked to prevent movement or rolling when sitting on the ground.

Concrete base and surround (Recommended)



- Essential for wet sites where the water table can rise above the base of the system (Installation in a wet site may be precluded by site considerations in relation to effluent disposal).
- Groundwater must be controlled and prevented during the installation, even when the tank has been strapped or anchored. Failure to do so will damage the shell and invalidate all warranties.
- The excavation must be kept as dry as possible. Excess water should be evacuated using a site pump/sump, hole/suction hose arrangement. Dewatering should be continued for as long as necessary or at least until the concrete base has set.
- Ensure the excavation is safe with sloped surrounds and shuttering to safeguard the installation.
- The grade and thickness of the concrete base should be designed to suit site conditions - a minimum thickness of 300mm (Ensign sewage treatment plant: 150mm concrete base) and for high water table/wet sites a 250mm hardcore sub-base should be laid, compacted and levelled.
- *The choice of concrete is the responsibility of the installer and should be chosen to suit local ground conditions. In normal conditions with non-aggressive soils, a concrete with a 28 day compressive strength of 20 to 30N/mm^2 with a 25 to 50mm slump – this must adhere to the relevant BS EN standards. If in doubt seek specialist advice prior to installation.*
- *When pouring concrete around the sewage treatment plant, please ensure the maximum pressure of 15kN/m^2 around the plant is not exceeded. The concrete should never be poured directly on to the tank.*
- *Do not use vibrating pokers.*
- Lower the sewage treatment plant onto the concrete base ensuring the tank is level at all laterals.
- Connect up the pipework - the system is plumbed for 160mm UPVC pipe (Ensign sewage treatment plant up to 16pe: 110mm UPVC pipe). A short length of pipe with flexible joints should be used immediately before and after the sewage treatment plant to allow for movement between the tank and the pipe work.
- The excavation should be backfilled with concrete of minimum 225mm pour width to approximately 300mm below the ground level (full surround to top of tank, around turrets and inlet/outlet points).
- In a multiple tank arrangement, there must be a minimum of 500m distance between the tanks. This 500mm void must be filled with concrete during the pouring.
- Evenly fill each chamber of the tank with clean water to a depth of 700mm. Continually check the pipework levels and connections visually.
- Backfill evenly around the tank with concrete ensuring no voids are present, especially around the bottom of the tank shell and ribs.
- Continue filling the tank chambers with water whilst evenly backfilling and pouring concrete around the tank ensuring that the water level is no more than 300mm above the concrete level.
- Ensure all turrets and access covers are sealed to prevent concrete entering the plant. Use framework around the turrets to prevent distortion and damage to the tank.
- **We recommend that normally the depth from ground level to inlet invert of the sewage treatment plant should be no more than 1.5m.** This could change due to groundwater conditions. Deeper inverts with heavier duty shells and ribs are available from Marsh Industries.

Granular surround (For free draining sites)



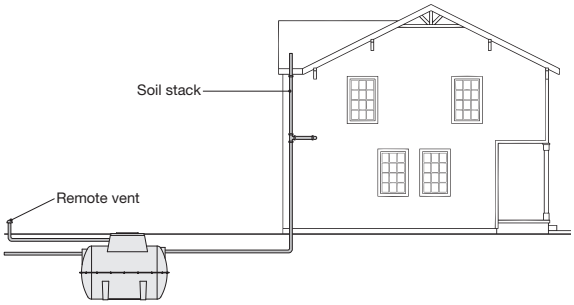
Primary backfill

- Primary granular backfill is pea shingle between 3-18mm in size. It should be washed, have no sharp edges and contain no boulders. In winter, check to ensure there are no clumps of ice in the materials as this can create voids causing long term damage.
- Tanks must be installed with primary backfill only within the region immediately surrounding the tanks - the pour width should be 450mm. During the pour, check to make sure that no voids are created and that the pour is evenly distributed.
- The pour should be evenly to the top of the turrets and access points. Care needs to be taken to avoid distortion.

Secondary backfill

- Secondary backfill is pea shingle between 3-12mm or coarse sand. This once again is judged to be clean, free flowing with no voids whilst pouring.
- If crushed stone is used as the secondary backfill, ensure that it is at least 450mm from the tank walls and dome ends.
- Be careful as dug material needs to be carefully selected and sifted to ensure no roots, clay or boulders are present.
- Take care when compacting the backfill material not to distort the turrets or access chambers.

Ventilation



- It is important that a specific air venting point is provided by the installer to allow the system to freely vent and disperse gas, and also ensure air supply to the compressor if this is integral to the tank.
- For all sewage treatment plants it is recommended that a remote vent stack should be installed. This should be connected into the (marked) vent position on the tank using the 110mm grommet supplied, and terminate at a suitable distance and height from any surrounding dwellings to allow dispersal of air from the system. Consideration should be given to the prevailing wind and any local site geography that may inhibit air dispersion or allow any odours to return towards the dwellings.
- Marsh recommend external compressors (in housing supplied) to ensure a constant supply of clean, dry air. If the compressor is supplied integral to the unit (in 'basin' under manway lid) it is recommended to fit a vent local to the tank to improve air supply and quality.
- If in any doubt as to the installation of an appropriate vent, please contact Marsh Industries.

4 Electrical guidelines

NOTE: If the plant is not due to be commissioned for at least two weeks it is advisable to remove the compressor.

- Connection must be performed by a suitably qualified and experienced electrical contractor.
- The electrical requirement of the unit will be either Single Phase or Three Phase. Please check the specification that has been supplied to you about your system.
- The compressor is either linear or side channel and will come with wiring instructions.
- A GRP kiosk or above ground housing may be supplied/required dependent on the size of the plant. Please check your system specification in advance so that you are able to prepare the site for your kiosk.

Standard gravity system with air blower (Conforms to European Standards)

- A 230V, 16amp waterproof plug and socket connector will be supplied with the unit, one for each compressor required. Please check your system specification about the quantity and type of compressor(s). On larger units, connection details can be bespoke, please check prior to installation.

It is the end-user's responsibility for the provision of:

- A single run of 1.5mm (or greater dependent on distance/voltage drop considerations) 3 core SWA cable from the end-user's distribution cabinet to the tank unit socket, or to the pre-wired distribution box fitted inside the GRP kiosk. The cable armour must be properly bonded to the main earth at the premises
- Cable protection via 10amp MCB/RCD or RCBO, rated 230V AC and tripping current 30mA.
- The unit will come with power failure alarm as standard. Other alarms are available, depending on your application, please check the specification supplied to you about your alarm options.
- The air pump/compressors and electric power must never be switched off. It is imperative they run 24 hours a day, every day, to ensure a constant supply of oxygen to the bacteria in the biozone.

Alarm options

Various alarm systems are available to suit different standards and system specifications. Please contact Marsh Industries for full details.

5 Service checklist and maintenance

The plant must be switched off and isolated before checking the electrical components and supply.

General

- Check to ensure the levels in the tank are even across all chambers.
- Regularly check to see if the primary chamber requires desludging (See section 7).

Compressor

- Check to ensure all compressors are working and air hose connections are secure.
- Annually clean the filter on the top of the compressor.
- Annually check the diaphragms and replace if required.
- Check the loss of pressure alarm on compressors.
- If the compressors are housed, either in a kiosk or housing, check to ensure ventilation is adequate.

Media (Within aeration chamber)

- Ensure media is moving around the aeration chamber freely by the diffuser/diffusers.
- Visually check to ensure adequate bio-mass growth on the media surface area.

Polylok Filter (Tertiary filtration)

- If a Polylok Filter is fitted to the plant at the outlet end (normally only on plants over 50PE) carefully lift the filter out of the casket and wash down before returning it back into the casket securely. This should be done normally once a month.
- A high level alarm should be fitted to alert the site owner of when the filter needs cleaning.

High level alarm

- If a high level alarm is fitted, check to ensure the high level alarm float switch is secure and working by lifting of the float switch by approximately 200mm.

Structural

- Check to ensure the baffles are not damaged.
- Check that all manhole cover and frames are secure and all locking nuts are in place.

Electrical

- Check supply current and amps.
- Check wiring condition and IP plugs.

6 Drainage fields

For development proposals in sewered areas it is usually a legal requirement to connect to the public sewer, either by gravity or pumping, as the sewage is conveyed to a municipal sewage treatment works. However, if it can be demonstrated that the proposed sewage disposal system offers a more sustainable solution to the overall water management of the site, then the regulators will consider the installation of a 'private' system.

For any such proposal you should:

- Check with your regulating body to confirm current status with regard to Registration/Consent, quality and volume limits, etc.
- Take account of the requirements of Building Regulations and discuss with the local planning authority at an early stage - well before any planning application is made.

Drainage fields

- If you have access to a suitable area of land, discharge from your septic tank or treatment plant to a properly designed and sized drainage field is the best environmental option as the treated effluent recharges groundwater, nutrients are retained in the soil, and nutrient loads on surface waters are reduced.
- The most common form of drainage field is a subsurface percolation area comprising perforated infiltration pipes laid in shingle filled trenches – normally within 1m of ground level to allow the micro-organisms in the soil to break down the organic matter, and at least 1.2m above the winter water table.
- The drainage field has two principal purposes:
    - To allow percolation of partially treated/treated effluent to ground at a controlled rate.
    - To allow further treatment of partially treated effluent before it reaches the groundwater level.

- Before you can dispose of effluent via a drainage field you first need to assess whether such a route is appropriate, ie, you have a good depth of well-drained, well-aerated soil away from watercourses, wells/boreholes, dwellings, and avoiding sloping sites and areas prone to waterlogging.

Trial hole and percolation test method (See figure 1)

- To calculate the exact area of land required for effective disposal an 'assessment' is required, usually by performing a percolation/water table test as outlined in BS6297 (Code of Practice for the Design and Installation of Drainage Fields for use in Wastewater Treatment) and the latest version of Building Regulations: H2.
- A trial hole should be dug to determine the position of the standing groundwater table a minimum of 1m^2 in area and 2m deep, or a minimum of 1.5m below the invert of the proposed drainage field pipework.
- The groundwater table should not rise to within 1m of the invert level of the proposed effluent distribution pipes. If the test is carried out in summer, the likely winter groundwater levels should be considered.
- A percolation test should then be carried out to assess the further suitability of the proposed area. A hole 300mm square should be excavated to a depth 300mm below the proposed invert level of the effluent distribution pipe. Where deep drains are necessary the hole should conform to this shape at the bottom, but may be enlarged above the 300mm level to enable safe excavation to be carried out.
- Fill the 300mm square section of the hole to a depth of at least 300mm with water and allow it to seep away overnight.
- Next day, refill the test section with water to a depth of at least 300mm and observe the time, in seconds, for the water to seep away from 75% full to 25% full level (ie, a depth of 150mm). Divide this time by 150. The answer gives the average time in seconds (Vp) required for the water to drop 1mm.
- The test should be carried out at least three times with at least two trial holes and the average figure from the tests should be taken. The test should not be carried out during abnormal weather conditions such as heavy rain, severe frost or drought.

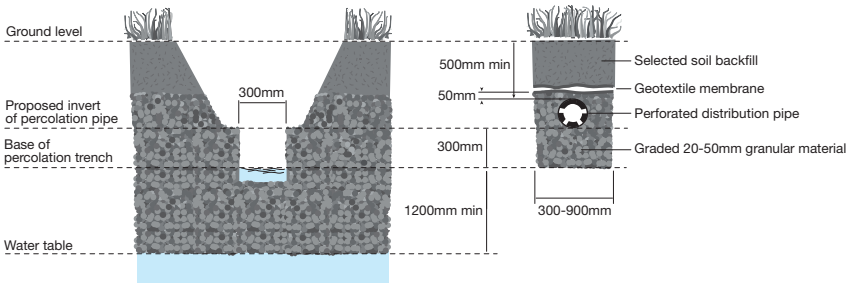


Figure 1 - Percolation/water table test

- Drainage field disposal should only be used when percolation tests indicate average values of Vp of between 12 and 100. This minimum value ensures that untreated effluent cannot percolate too rapidly into groundwater. Where Vp is outside these limits effective treatment is unlikely to take place in a drainage field.

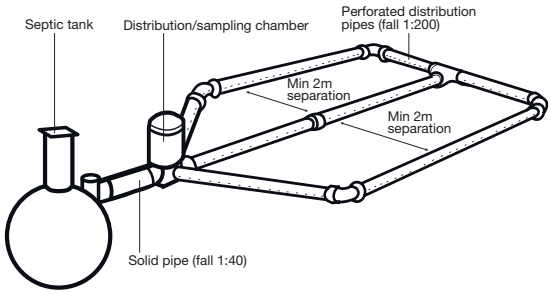


Figure 2 - Typical drainage field construction

Drainage field construction (See figures 1 and 2)

- Drainage fields should be designed and constructed to ensure aerobic contact between the liquid effluent and the subsoil using perforated pipe laid in trenches.
- Pipes should be laid on a 300mm layer of clean shingle or broken stone (graded between 20mm and 50mm) at a minimum depth of 500mm and a uniform gradient not steeper than 1:200.
- Trenches should be filled to a level 50mm above the pipe and covered with a layer of geotextile to prevent the entry of silt. The remainder of the trench can be filled with soil.
- Trenches should be from 300mm to 900mm wide with areas of undisturbed ground 2m wide being maintained between parallel trenches.
- An inspection chamber should be installed between the septic tank and the drainage field.
- Drainage fields should be set out as a continuous loop fed from the inspection chamber.
- To calculate the floor area of the drainage field (A_t in m^2), the following formulas should be used:
    - For septic tanks: $A_t = p \times V_p \times 0.25$
    - For treatment plant: $A_t = p \times V_p \times 0.20$

  Where p is the number of persons served by the tank and V_p is the percolation value (secs/mm) obtained.

7 Desludging

NOTE: If effluent samples are to be taken they should be taken from the sample chamber or, alternatively, from the discharge pipe. Sampling should only be taken by approved test centres.

The sewage treatment plant will require desludging and maintenance as follows:

- *6PE-35PE – Annually or as required*
- *40PE-100PE – Six monthly or as required*
- *100PE-300PE – As advised*

The desludging of the plant is the responsibility of the site owner. Desludging should be carried out according to the size of the plant and dependent on usage.

It is the site owner's responsibility to provide access for the vacuum tanker, to desludge the plant. Vehicles should never drive over the system. Keep at least 4 metres away from the covers on the plant.

Desludging procedure

- Desludging should normally be carried out by a vacuum sludge tanker.
- Licensed tankers are available commercially and the service is also provided by some local authorities.
- The sludge should be disposed of in accordance with local authority instructions or in a manner which will not cause pollution.
- The tank should be desludged before the onset of winter if conditions do not allow a tanker on site.
- The sludge in the primary chamber (s) should not be removed completely, but approximately 75mm should be kept in the bottom of the tank to re-seed the new sludge, which will be formed when the tank is put into use again.

  The depth of sludge can be checked using the following technique:
    - *Use a pole that can touch the bottom of the tank and wrap the bottom 1.4m with a white rag.*
    - *Lower the pole to the bottom of the tank and hold for several minutes to allow the sludge layer to penetrate the rag.*
    - *Remove the pole and note the sludge line, which will be darker than the colouration caused by the liquid waste.*

      (Typically a dark sludge line approximately 2/3rd from the bottom of the pole means you should desludge).
- On every alternative desludge, dead humus/scum should be skimmed from the final settlement tank(s). Ensure the tee pieces in all chambers are clear.

- Care must be taken not to damage the treatment plant with the hose of the vacuum tanker.

Please note:

- The sewage treatment plant should be clearly marked and vacuum tanker should never come closer than the depth of the excavation for the system unless the appropriate precautions have been taken. Never drive over the sewage treatment plant.
- Desludging should never be carried out alone due to potential dangers.
- The access cover should never be left off while the unit is unattended.
- The continued performance of the plant will depend on regular maintenance and cleaning. It is the end-user's responsibility to desludge the unit and keep the vents clear.

Further safety precautions

- Naked flames should not be used in vicinity of the tank due to the danger of explosion.
- Never enter a tank unless a safety line is attached to the person entering the tank and a second person is above ground to help if the entrant is overcome by gasses or foul air. Personnel entering the tank must have suitable breathing equipment and be fully trained in man entry techniques.
- As safety and security is of vital importance in sewage treatment systems, the following aspects are critical:
    - *Protective clothing/gloves/breathing apparatus, should be worn at all times.*
    - *Always remove contaminated clothing and protective equipment after working with sewage treatment Systems.*
    - *Wash hands and face prior to eating, drinking or smoking.*
    - *Adequate first aid boxes should be present.*
    - *When working with machinery/electrical equipment, proximity of water should be noted. All tools and electrical equipment should be kept dry.*
    - *A second person should be present when carrying out non-routine maintenance.*
- Disused or abandoned tanks should be demolished, filled in or sealed so that accidental entry is impossible.

8 Warranty information

Marsh Industries offers an initial 12-month warranty on every plant installed provided that it is installed, commissioned (if required) and maintained in accordance with the manufacturer's instructions and also provided that the unit has not been subject to damage or abuse. This warranty covers all of the GRP components and any other additional installed components against malfunction.

Marsh Industries

Marsh Industries delivers world-class water/wastewater treatment products and solutions to the domestic, commercial and agricultural sectors from its UK manufacturing plants in Kettering and Bridgwater.

The company is recognised as a collaborative and trusted partner to its customers, with a reputation for providing quality products that really do add value:

- *Sewage treatment plants 4-500+ PE*
- *Pump stations 234-20,000+ litres*
- *Septic tanks and cesspools 2800-20,000+ litres*
- *Septic conversion units 4-60+ PE*
- *Grease traps 234-20,000+ litres*
- *Trash/debris barriers*
- *Agri-silage tanks up to 100,000 litres*
- *Stormwater attenuation up to 130,000 litres*
- *Rainwater harvesting systems 1500-20,000+ litres*
- *Oil separators, wash-down separators and silt traps*

All products are fully type-tested and certified to ensure compliance with relevant environmental permitting programmes and building regulations.

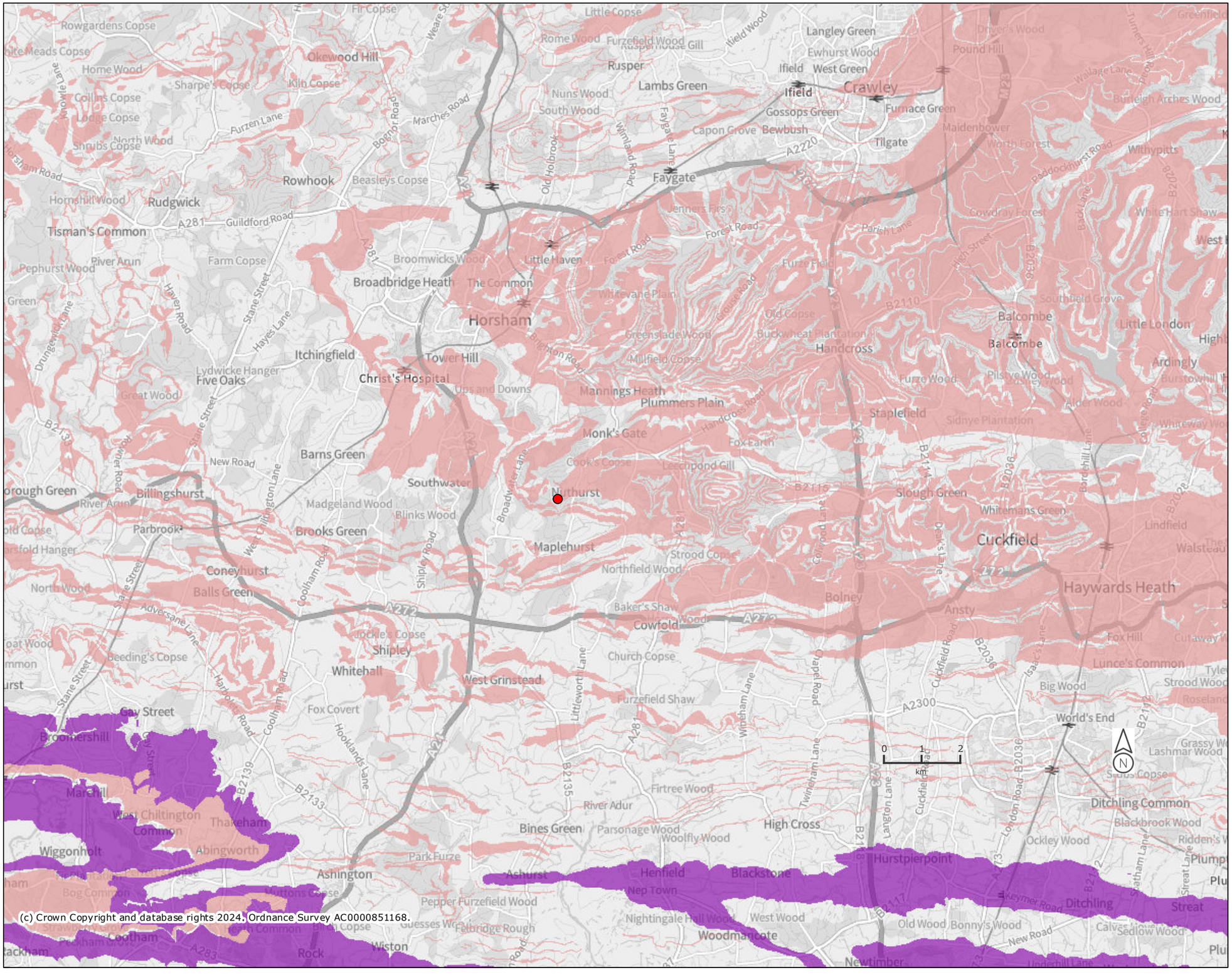
In addition, the company's state-of-the art computer software, GAIA, can generate precise, bespoke commercial sewage treatment plants and pump chamber systems to the finest specification.

sales@marshindustries.co.uk
+44 (0)1933 654582
www.marshindustries.co.uk

MI-UP-INST-0518-RevF

7.6 Appendix F – Magic Map from Environment Agency

Aquifer Designation Map (Bedrock)



Legend

Aquifer Designation Map (Bedrock) (England)

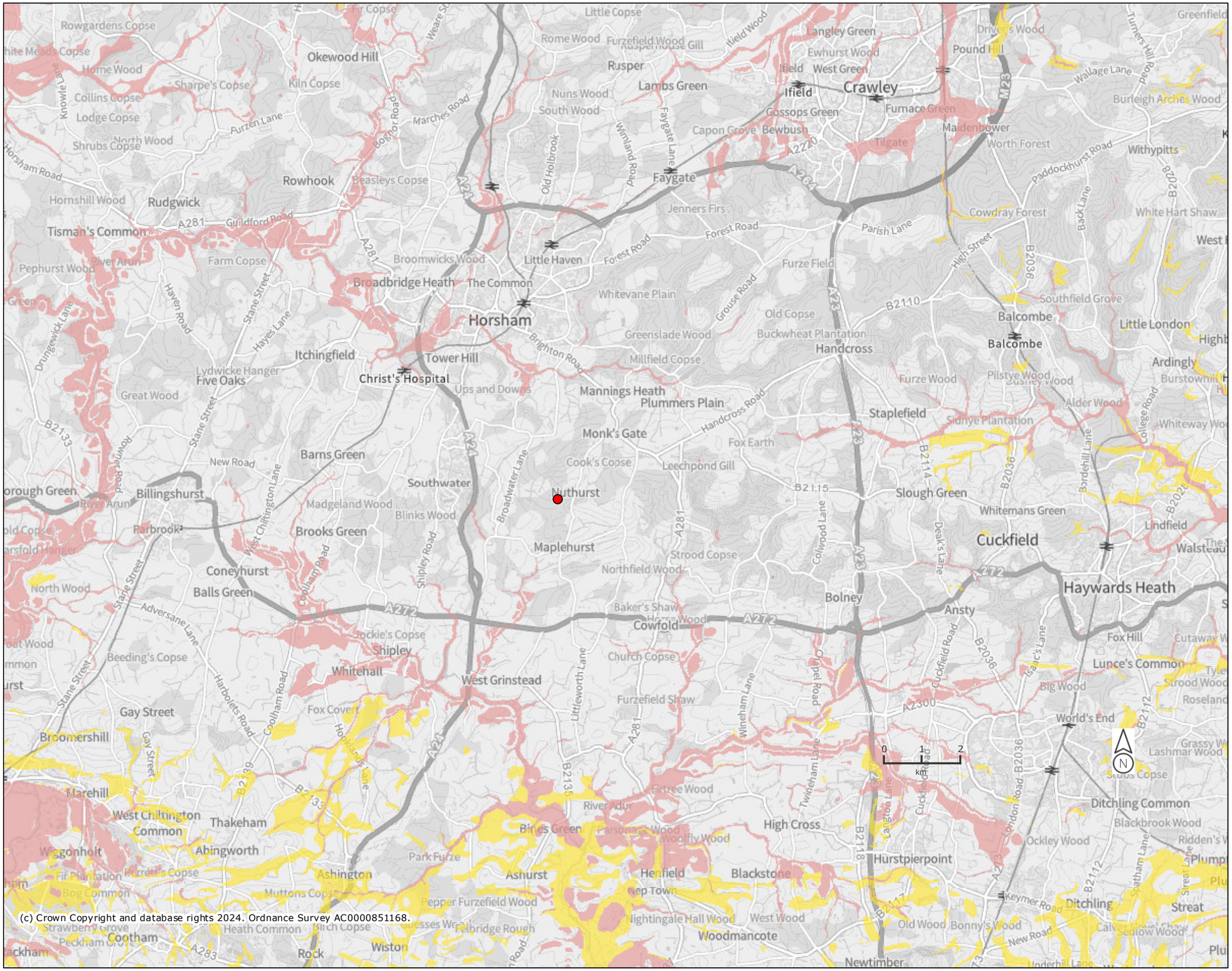
- Principal
- Secondary A
- Secondary B
- Secondary (undifferentiated)
- Unproductive

Projection = OSGB36
xmin = 494900
ymin = 113700
xmax = 545700
ymax = 138800

0 2 4 km

Map produced by MAGIC on 1 August, 2024.

Aquifer Designation Map (Superficial Drift)



Legend

Aquifer Designation Map (Superficial Drift) (England)

- Principal
- Secondary A
- Secondary B
- Secondary (undifferentiated)
- Unknown (lakes+landslip)
- Unproductive

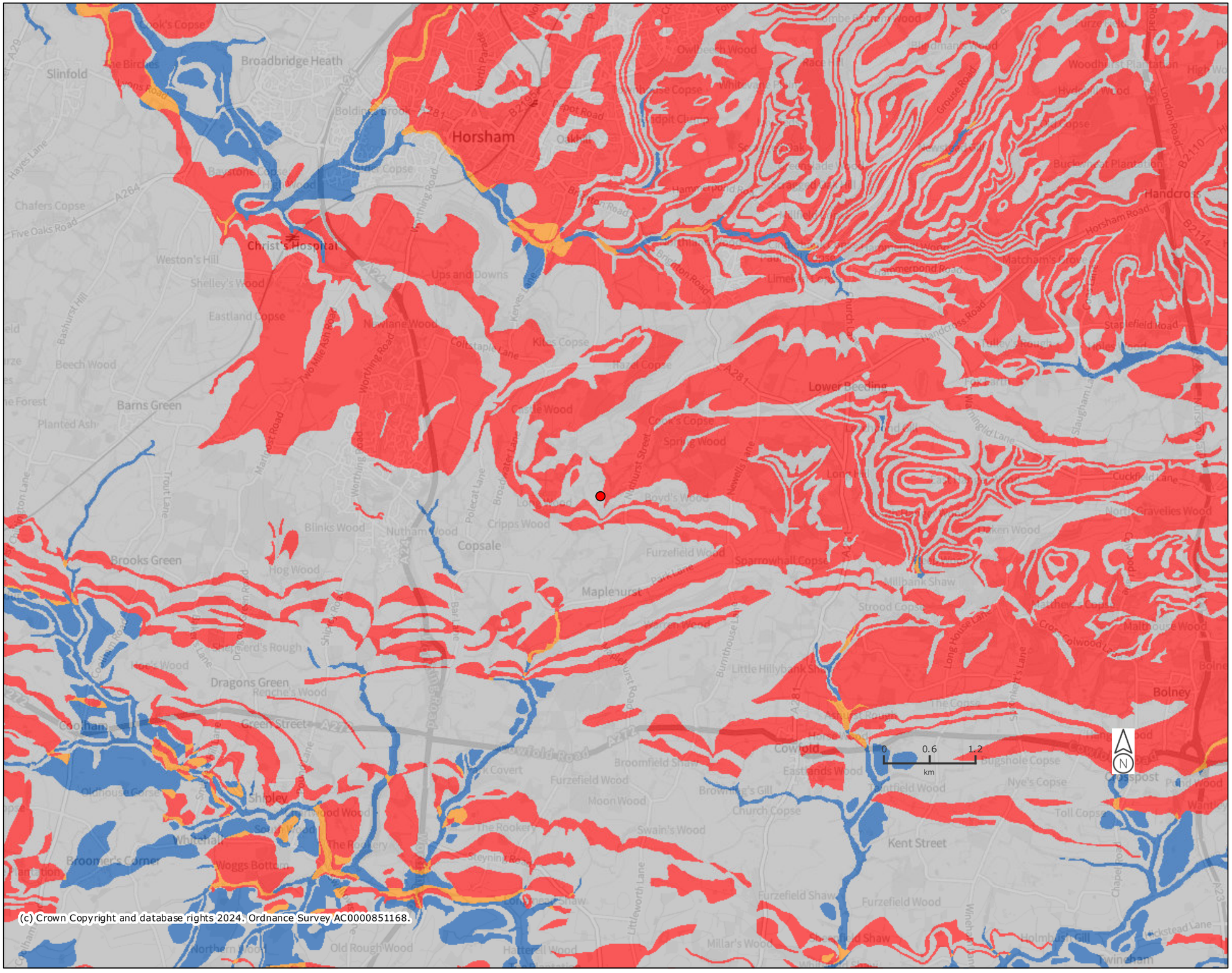
Projection = OSGB36
xmin = 494900
ymin = 113700
xmax = 545700
ymax = 138800

0 2 4
km

Map produced by MAGIC on 1 August, 2024.

MAGIC

Groundwater Vulnerability Map



Legend

Groundwater Vulnerability Map (England)

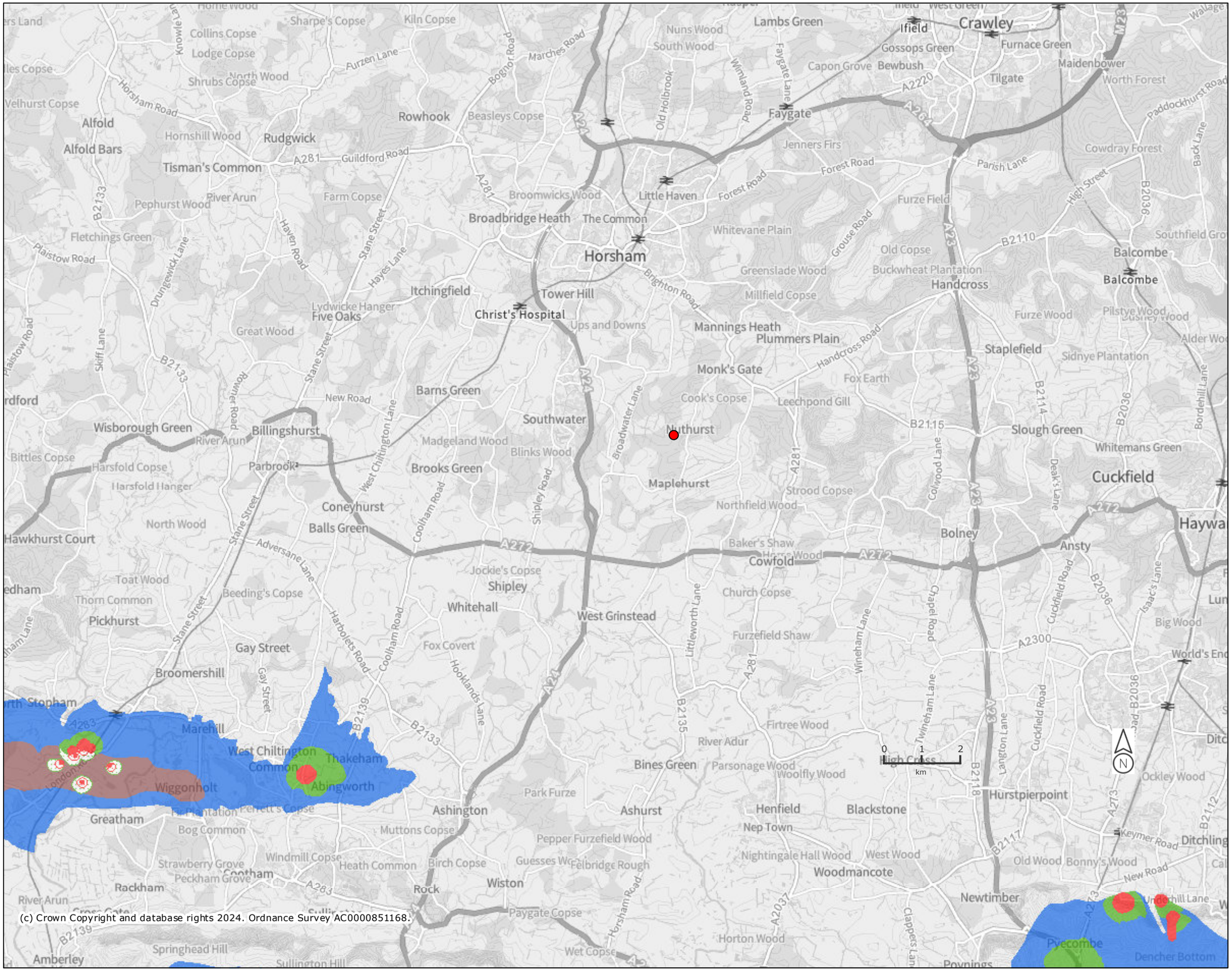
- Local Information
- Soluble Rock Risk
- High
- Medium - High
- Medium
- Medium - Low
- Low
- Unproductive

Projection = OSGB36
xmin = 506300
ymin = 119700
xmax = 531700
ymax = 132300

0 1 2
km

Map produced by MAGIC on 1 August, 2024.

Source Protection Zones merged



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Legend

Source Protection Zones merged (England)

- Zone I - Inner Protection Zone
- Zone I - Subsurface Activity
- Zone II - Outer Protection Zone
- Zone II - Subsurface Activity
- Zone III - Total Catchment
- Zone III - Subsurface Activity
- Zone of Special Interest

Projection = OSGB36
xmin = 491900
ymin = 112000
xmax = 542700
ymax = 137100

0 2 4
km

Map produced by MAGIC on 1 August, 2024.

7.7 Appendix G – Greenfield runoff

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	08/01/2026
Calculated by	
Reference	
Model version	2.2.2

Location

Site name	Limekiln farm, Copsale
Site location	

Site easting (British National Grid)	518807
Site northing (British National Grid)	125808

Site details

Total site area (ha)	0.58 ha

Greenfield runoff

Method

Method	IH124

IH124

	My value		Map value
SAAR (mm)	784 mm		784
How should SPR be derived?	WRAP soil type		
WRAP soil type	4		4
SPR	0.47		
QBar (IH124) (l/s)	3.2 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)	2.7 l/s
Flow rate 2 year (l/s)	2.8 l/s
Flow rate 10 years (l/s)	5.2 l/s
Flow rate 30 years (l/s)	7.4 l/s
Flow rate 100 years (l/s)	10.2 l/s
Flow rate 200 years (l/s)	12.0 l/s

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

Disclaimer