Consulting Civil Engineers

Foul and Surface Water Drainage Report

Limekiln farm, Copsale

Planning Ref: DC/23/1325

For

Stephanie Newell

Rev - **P**

Reference **C3296**

Date **03th September 2024**

Revision	Date of Issue	Comments	Prepared By	Checked By
P	03/09/2024	Initial Issue	KCK	CS
P1	06/09/2024	Appendix D updated	KCK	CS
P2	24/09/2024	Appendix D updated	KCK	CS

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1 Introduction

1.1.1 CGS Civils Ltd has been appointed to undertake a drainage strategy report for a proposed development at Limekiln 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 and elsewhere in order to clear Condition 3. The condition is in place on Decision Notice from **13/06/24**, with the planning reference: **DC/23/1325.** The condition requires the following to be included:

- Existing runoff rates during a 100% Annual Exceedance Probability (AEP), 3.33% AEP, 1% AEP storm events.
- Post development discharge rates during a 100% AEP, 3.33% AEP, 1% AEP and 1% AEP + Climate Change storm events.
- greenfield runoff rate (QBAR)
- Water storage capacity volumes of the proposed drainage features to attenuate the 1% AEP + Climate Change storm event.

1.1.3 The existing site consists of an undeveloped area. The proposed development will consist of the construction of a new stable block, barn and a sandschool. 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.**

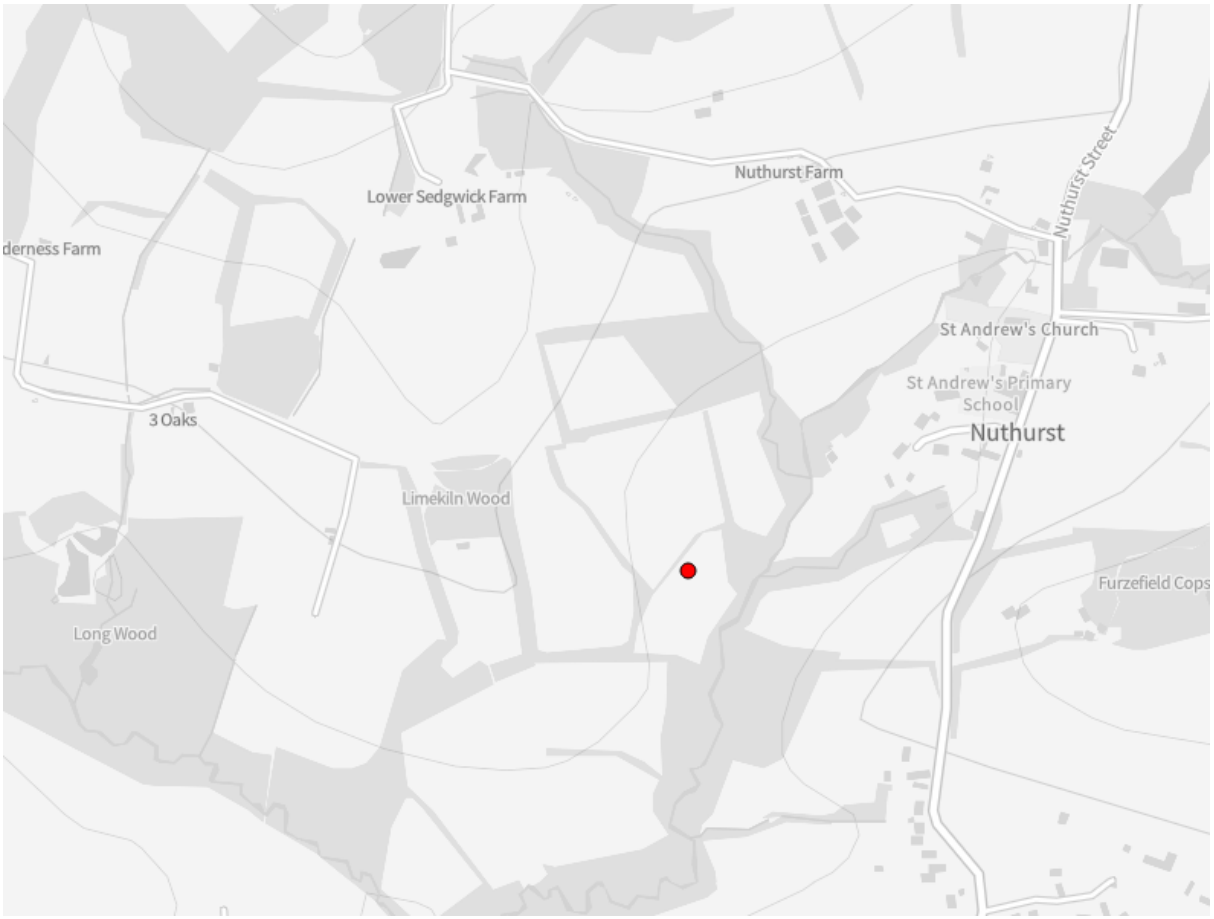


Fig 1. Site Location

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**.

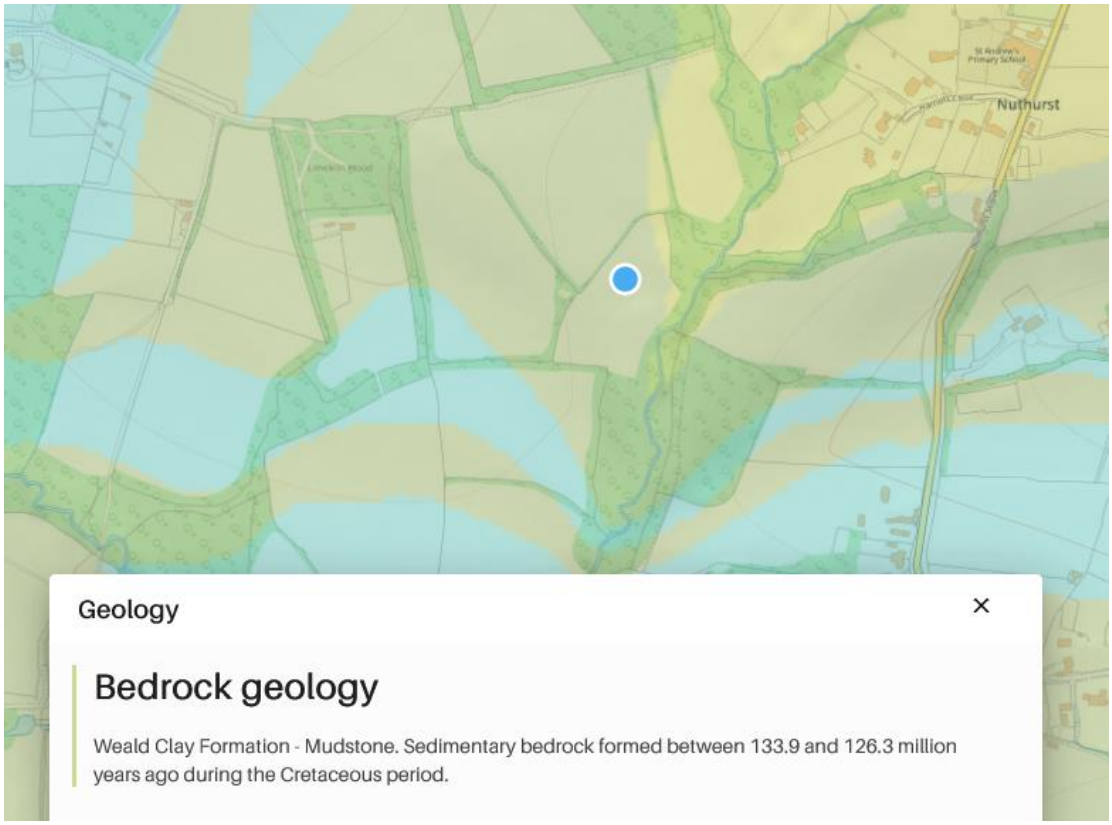


Fig 2. British Geological Survey

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

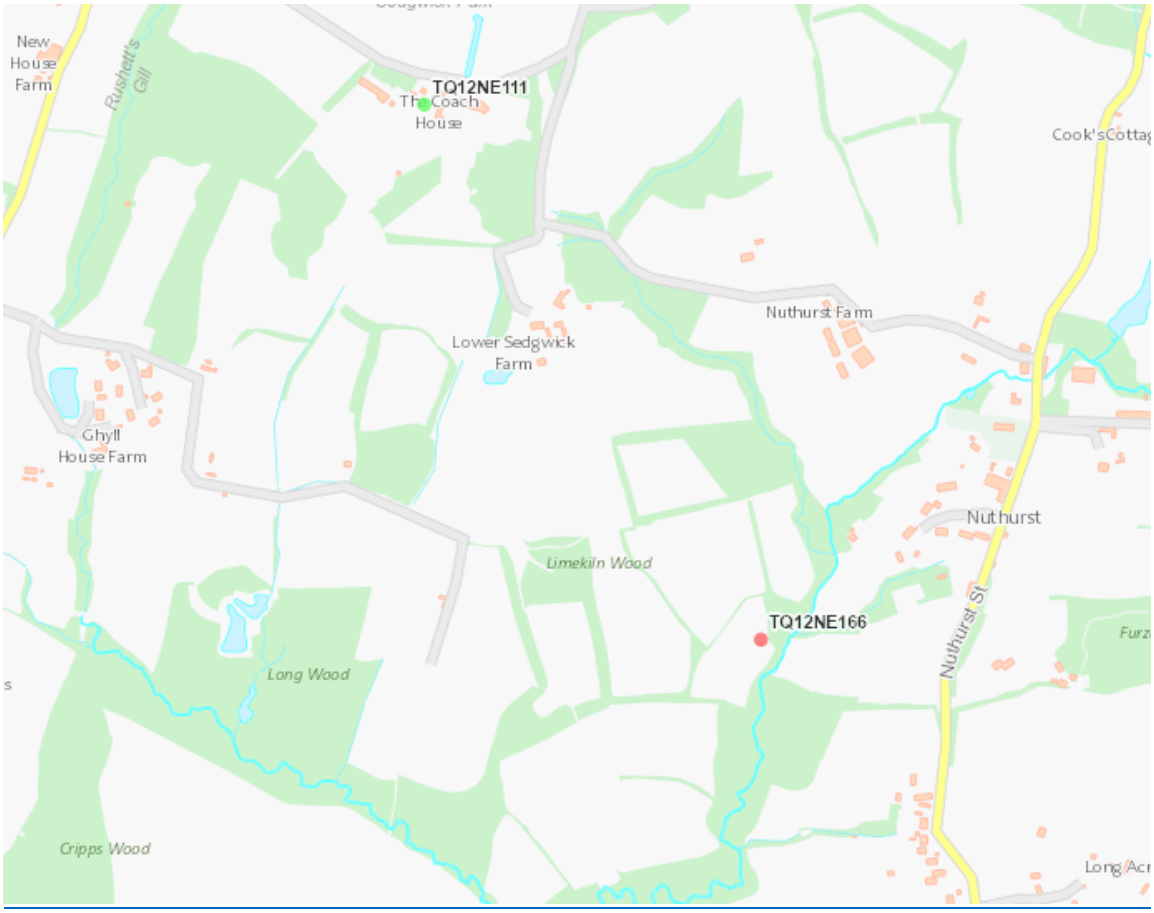


Fig 3. British Geological Survey

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	N/A
Discharge to Ground	N/A
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	**1.60m 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 It should be noted that shallow test results identify potential for shallow infiltration. All hard paved areas are therefore proposed to be constructed using permeable 'self-draining' surface. The proposed permeable paving has been designed to a recorded (wors-case) infiltration of 3.41 x 10-6 m/s and to cater for the 1 in 100-year +45% storm.

5.3.4 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.

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

5.3.6 EA Magic Maps can be found at **Appendix E.**

5.3.7 Greenfield runoff calculations can be found at **Appendix F**

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.

- Roofs
- Individual Property driveways and car parks
- Low traffic roads

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-residential car parking with frequent change (e.g., hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	0.7	0.6	0.7
Sites with heavy pollution (e.g., haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways	High	0.8	0.8	0.9

5.4.10 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**
Other Roofs	Ground Water	Very Low	0.2	0.2	0.05
Access road and car parks	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.

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**
Car park	Surface water	Table 26.3 (for surface waters)	Permeable Pavement	0.7	0.6	0.7

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

5.5 Foul water drainage

5.5.1 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.

5.6 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 new stable block, barn and a sand school.

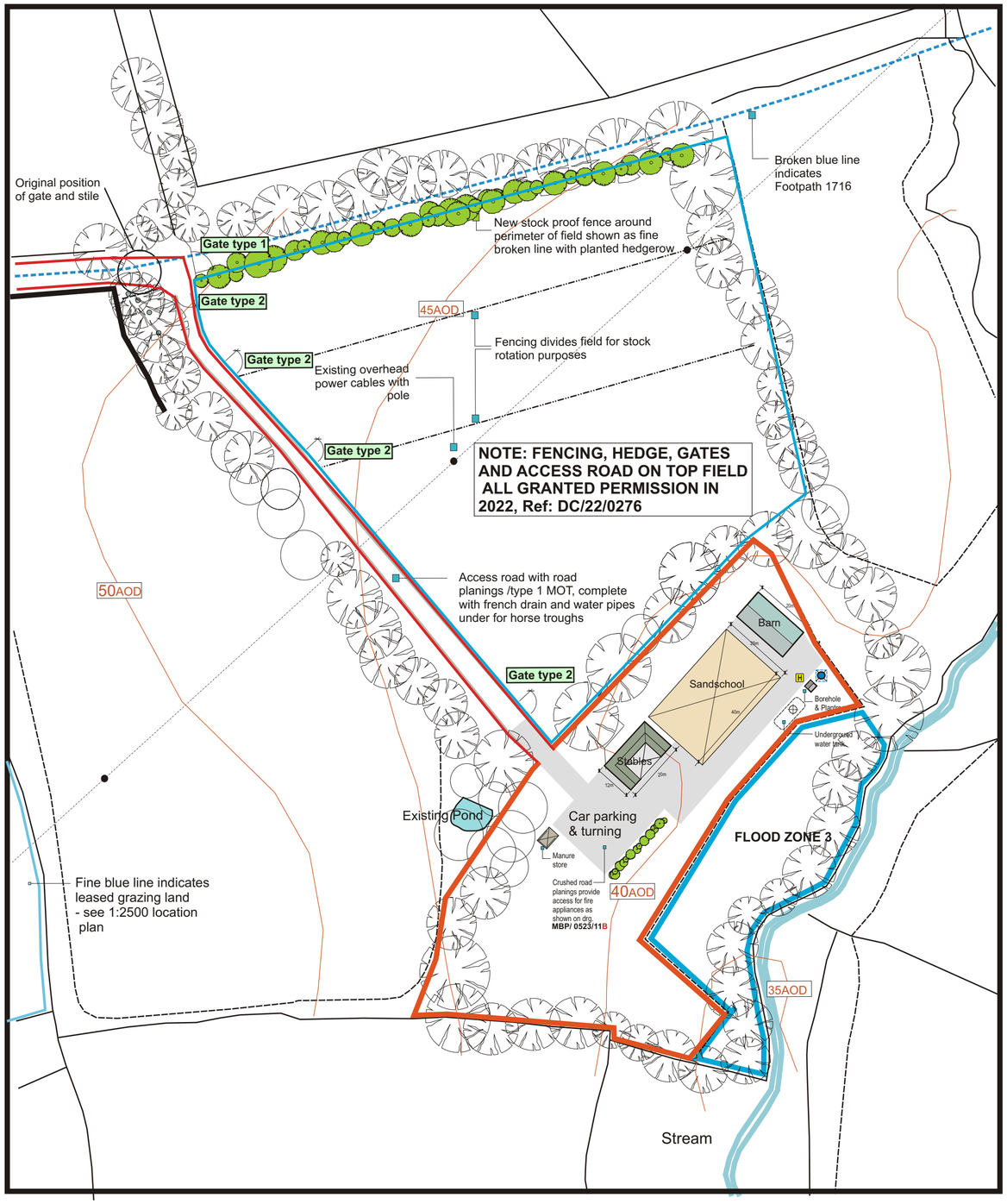
6.1.2 The Surface Water is to be discharged into the existing stream at a restricted discharge rate of 2 l/s. All hard paved areas are to be designed as self-draining permeable systems allowing for shallow infiltration.

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.

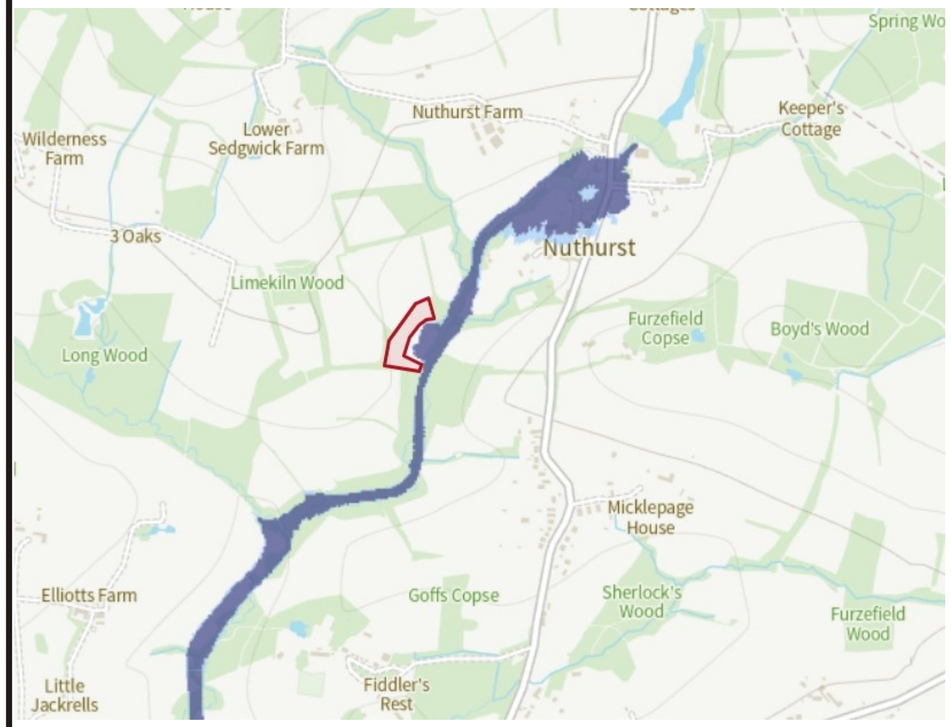
7 Appendices

7.1 Appendix A – Site Plan



BLOCK PLAN : LIMEKILN FARM EQUINE CENTRE

Scale 1 : 1250 @ A2



EXTRACT FROM H M GOV. FLOOD MAP

REVISION 'A': Stable block & sand school re-orientated by 180 degrees — 16-02-2024

REVISION 'B': Red line re-positioned to exclude Flood Zone 3
Blue line modified to show Flood Zone and other land owned by applicant
Permeable paths for vehicles noted
Underground water tank added
Gov flood map added — 26/05/2024

KEY :

- Application area
- Land owned by applicant including access road
- 45AOD — OS Contour levels (Above Ordnance Datum)
- New hedgerow to screen sand school

N

Scale 1 to 1250 @ A2

0 10 20 30 40m

PROJECT: LIMEKILN FARM
BROADWATER LANE
COPSALE RH13 6QW

DESCRIPTION: BLOCK PLAN 2

DATE: MAY 2023

DRAWING No: MBP/ 0523/02B

BLOCK PLAN 2B

7.2 Appendix B – BGS Historical Borehole Logs

British Geological Survey

BGS ID: 578431 : BGS Reference: TQ12NE111
British National Grid (27700) : 518300,126680

TQ12/21

NGR 1830 2668
TQ12 NE 111

302/72

Sussex 24 NW/W

Sudmere Lodge.

A well was sunk 80 feet (widened out from 60 feet) and then a boring was made for 27 feet. Narrow fissures were cut at 67 feet, running W or N of W. The water rose to 75 feet down. There is an older well here.

At Sedgewick Park
Horsham Sussex.
Owner. Lord Rotherwick
At back of house facing Dry Buildings.
Used for drinking purposes only.
R.W.L. c. 75.
Sited on Sussex 24NE/E.

S.H.C.M. 2.6.47

Contact BGS: ngdc@bgs.ac.uk

British Geological Survey

BGS ID: 578431 : BGS Reference: TQ12NE111
British National Grid (27700) : 518300,126680

TQ12/21

302/72 Sedgewick Park, Nuthurst

W.S.Sx.I, p. 71. Surface +280. Shaft 80 × 4 belled out from 60 down; rest bore. R.W.L. +205. *Before 1899.*

R.W.L. +c.205. *June 1947;* +217. Yield c. 600 g.p.h. Electric pump. *Nov. 1957.*

WC	...	...	107	107

NO DETAILS KNOWN

Contact BGS: ngdc@bgs.ac.uk

British Geological Survey

BGS ID: 578431 : BGS Reference: TQ12NE111
British National Grid (27700) : 518300,126680

TQ 12/21.

302/72

TQ1832 2667

~~Sussex 24 NW/W~~ 24NE/E. Sedgewick Park ?
~~Nuthurst Lodge.~~ Nuthurst

A well was sunk 80 feet (widened out from 60 feet) and then a boring was made for 27 feet. Narrow fissures were cut at 67 feet, running W & N of W. The water level is 75 feet down. There is an older well here.

Published - W.S.Sx. I., p 71.

At Sedgewick Park
Horsham Sussex.
Owner Lord Rothermick
At back of house facing Dry Buildings.
Used for drinking purposes only.
R.W.L. c. 75'.
Sited on Sussex 24NE/E.
S.M^cC.M 2.6.47

Visited. Deal cover 4 ft. at top.
RWL. 63' b.s. Electric pump. Capacity 600 g/h. Drinking water only.
Supply for cattle and house purposes other than drinking is from lake.
60. 280. 20.11.57 RM. (Note. Old well at Dry Buildings is connected over)

Now owned by Mr. Bizony. (1961 R.G.T.)

WC 107

RK xii/64

DATA Bank

Contact BGS: ngdc@bgs.ac.uk

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**	0.6m	Sandy clay

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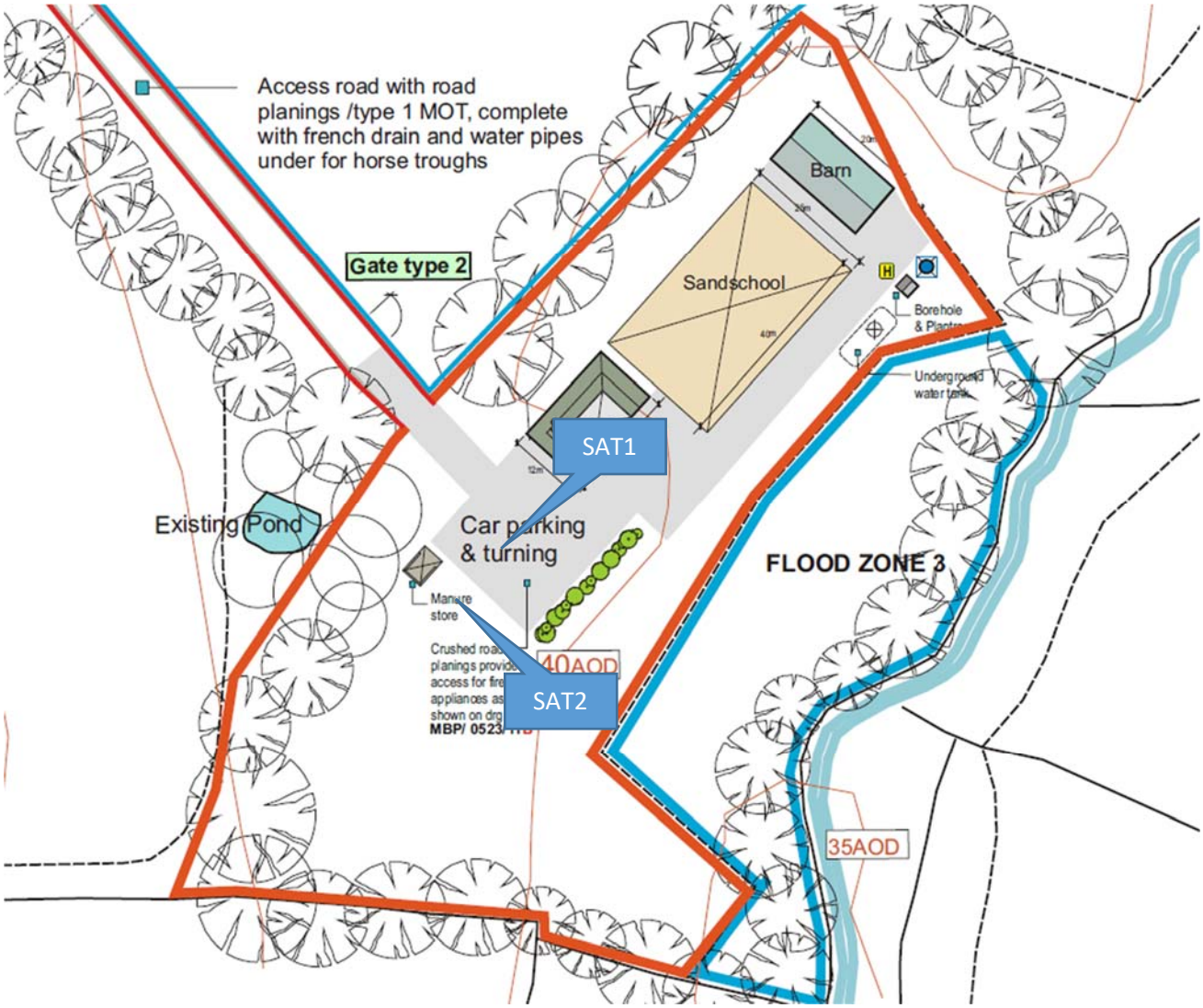
Registered in England No. 8546902 | VAT Registration No.169950851

Appendix A – Soakaway Test Location Plan



Appendix B – Soakaway Test Results

Richard Cobden House, Lion Street, Chichester, West Sussex, PO19 1LW
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Registered in England No. 8546902 | VAT Registration No.169950851

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

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	=	0.9
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

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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

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	=	0.6
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



CONTRIBUTING AREA PLAN (1:200)

Proposed roof drainage area: 0.0392 ha

Proposed premeable sandschool area: 0.100 ha

Proposed permeable areas: 0.196 ha

Proposed discharge rate to be restricted to: 3.0 l/s

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P-	05.09.24	PRELIMINARY ISSUE	KCK	CS	CS

cgs civils
Consulting Civil Engineers

CLIENT: STEPHANIE NEWELL

ARCHITECT: MICHAEL BISSETT POWELL

JOB TITLE: LIMEKILN FARM, COPSALE RH13 6QW

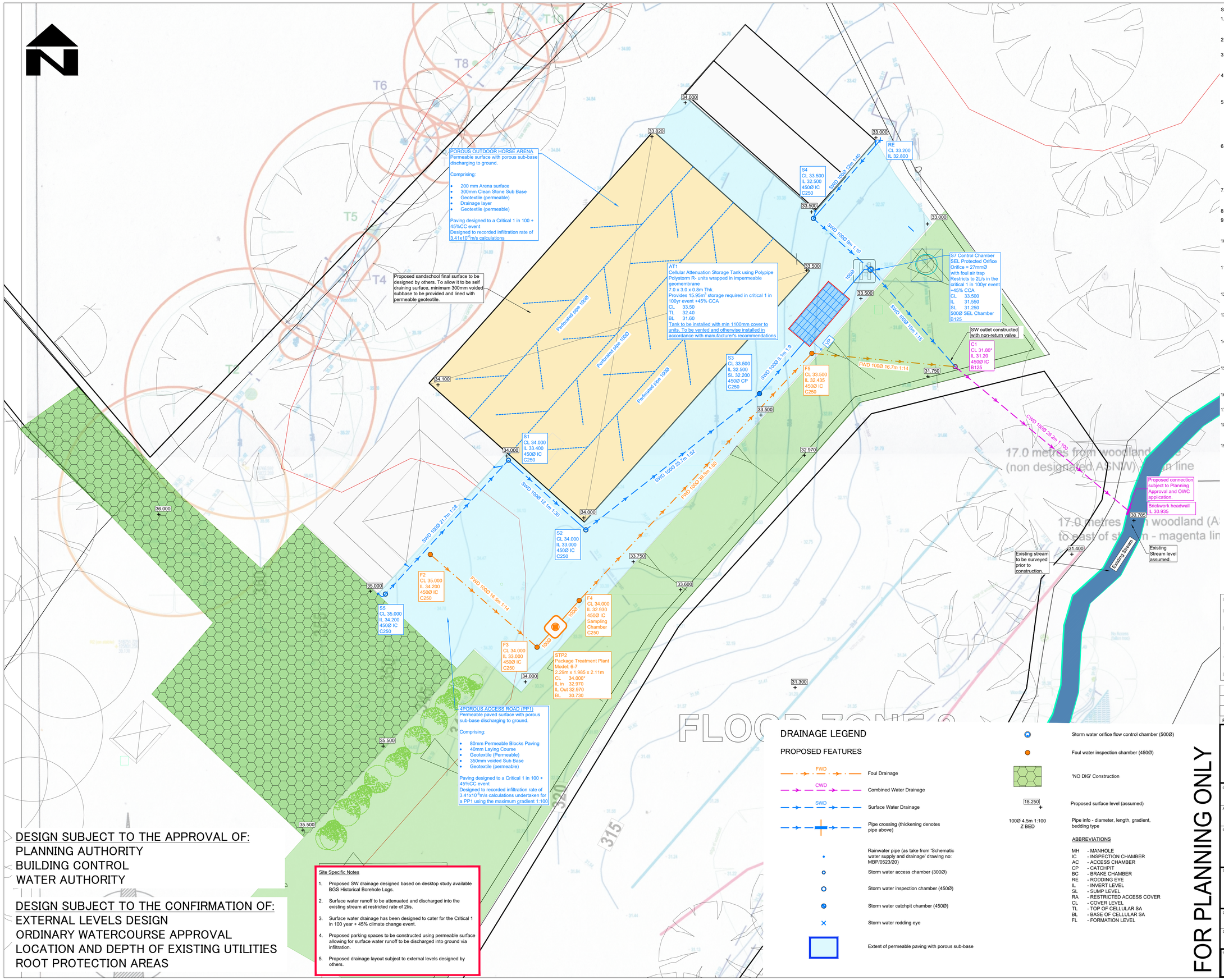
DRAWING TITLE: PROPOSED CONTRIBUTING AREA PLAN

DRAWN	ENGINEER	CHECKED	APPROVED
KCK	TZ	CS	CS

DATE	SCALE @ A1
AUGUST 2024	1:200

JOB No.	STATUS	DRAWING No.	REV.
C3296	P	201	P2

FOR PLANNING ONLY



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DESIGN SUBJECT TO THE APPROVAL OF:
PLANNING AUTHORITY
BUILDING CONTROL
WATER AUTHORITY

DESIGN SUBJECT TO THE CONFIRMATION OF:
EXTERNAL LEVELS DESIGN
ORDINARY WATERCOURSE APPROVAL
LOCATION AND DEPTH OF EXISTING UTILITIES
ROOT PROTECTION AREAS

Site Specific Notes

1. Proposed SW drainage designed based on desktop study available BGS Historical Borehole Logs.
2. Surface water runoff to be attenuated and discharged into the existing stream at restricted rate of 2l/s.
3. Surface water drainage has been designed to cater for the Critical 1 in 100 year + 45% climate change event.
4. Proposed parking spaces to be constructed using permeable surface allowing for surface water runoff to be discharged into ground via infiltration.
5. Proposed drainage layout subject to external levels designed by others.

DRAINAGE LEGEND

PROPOSED FEATURES

- FWD — Foul Drainage
- CWD — Combined Water Drainage
- SWD — Surface Water Drainage
- Pipe crossing (thickening denotes pipe above)
- Rainwater pipe (as take from 'Schematic water supply and drainage' drawing no: MBP/0523/20)
- 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)
- Foul water inspection chamber (450Ø)
- 'NO DIG' Construction
- 18.250 + Proposed surface level (assumed)
- 100Ø 4.5m 1:100 Z BED — Pipe info - diameter, length, gradient, bedding type

ABBREVIATIONS

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

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P-	05.09.24	PRELIMINARY ISSUE	KCK	CS	CS

FOR PLANNING ONLY

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Consulting Civil Engineers

CLIENT: STEPHANIE NEWELL

ARCHITECT: MICHAEL BISSETT POWELL

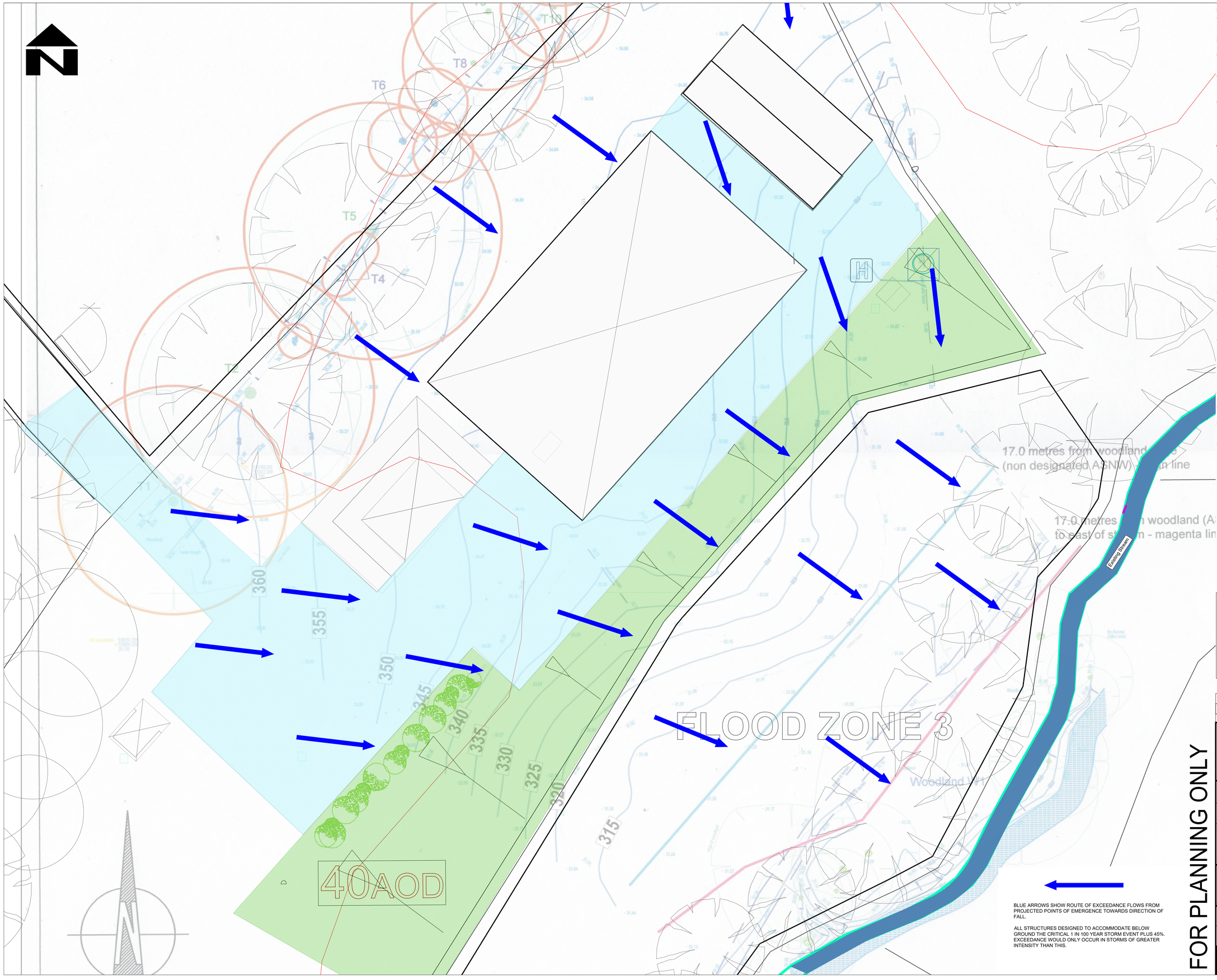
JOB TITLE: LIMEKILN FARM, COPSALE RH13 6QW

DRAWING TITLE: PROPOSED DRAINAGE DESIGN

DRAWN	ENGINEER	CHECKED	APPROVED
KCK	TZ	CS	CS

DATE: AUGUST 2024 — SCALE @ A1: 1:200

JOB No.	STATUS	DRAWING No.	REV.
C3296	P	101	P2



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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.

FOR PLANNING ONLY

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P-	05.09.24	PRELIMINARY ISSUE	KCK	CS	CS

cgs civils
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CLIENT: STEPHANIE NEWELL

ARCHITECT: MICHAEL BISSETT POWELL

JOB TITLE: LIMEKILN FARM, COPSALE RH13 6QW

DRAWING TITLE: EXCEEDANCE FLOW PLAN

DRAWN	ENGINEER	CHECKED	APPROVED
KCK	TZ	CS	CS

DATE	SCALE @ A1
AUGUST 2024	1:200

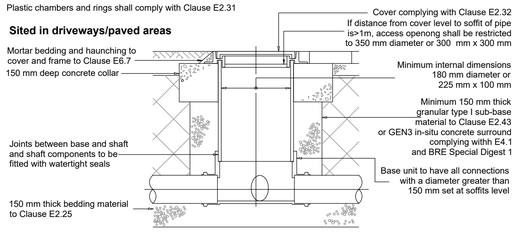
JOB No.	STATUS	DRAWING No.	REV.
C3296	P	301	P1

FIGURE B 23
TYPICAL INSPECTION CHAMBER DETAIL - TYPE E

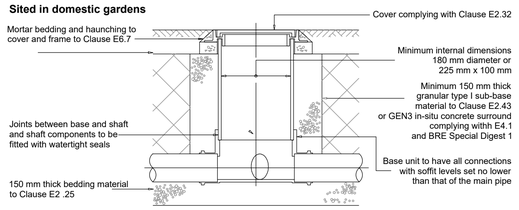
Depth from cover level to soffit of pipe up to 2 m
Flexible material construction

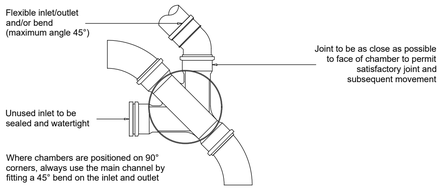
Plastic chambers and rings shall comply with Clause E2.31

Sited in driveways/paved areas



Sited in domestic gardens

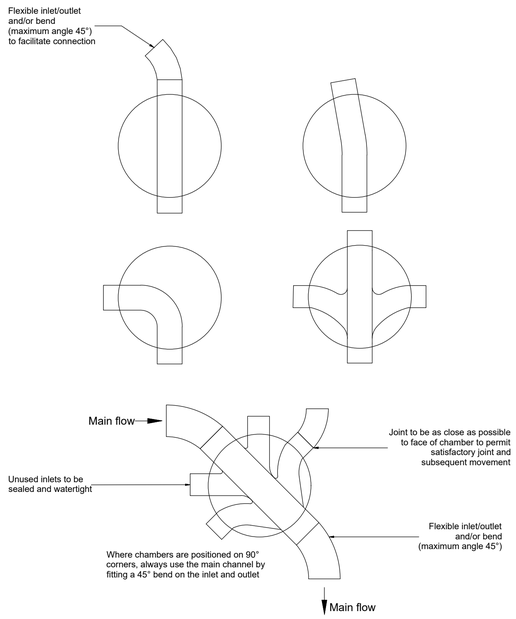




Note: Where the access chamber is in the highway (including any footway) the highway Authority can have specific requirements

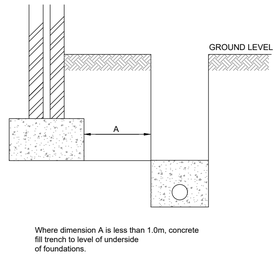
Not to scale

FIGURE B 22
TYPICAL BASE LAYOUTS FOR TYPE D CHAMBERS



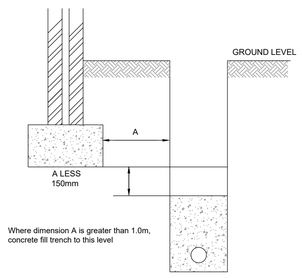
Note: Where a bend is used immediately outside the manhole, this may be used as the rocker pipe

Not to scale



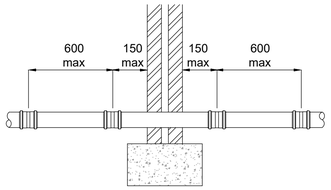
Where dimension A is less than 1.0m, concrete fill trench to level of underside of foundations.

Pipes near buildings
NTS

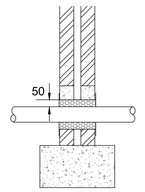


Where dimension A is greater than 1.0m, concrete fill trench to this level

Pipes near buildings
NTS

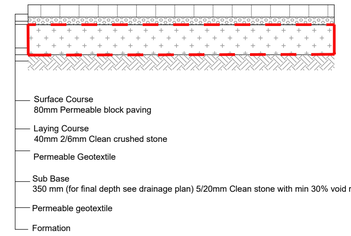


A. Short length of pipe bedded in wall with joints formed within 150mm of each wall face. Adjacent rocker pipes of 600mm max. length with flexible joints.

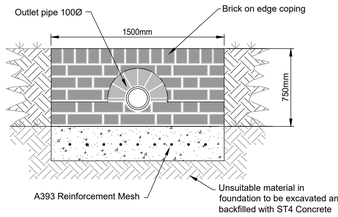


B. Arch or lintelled opening to give min 50mm space all round the pipe. Mask opeing on both sides of the wall with rigid sheet material to prevent entry of fill or vermin. Important. Fill void with compressible material to prevent entry of gas.

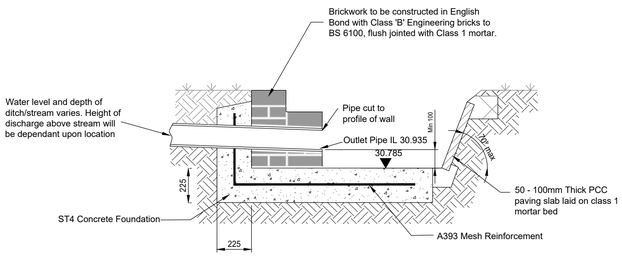
Pipes through wall detail
NTS



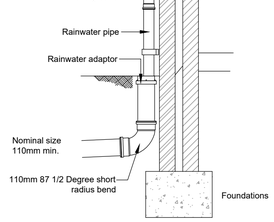
Proposed Permeable block paving Driveway Construction
(Design based on assumed CBR > 3%)
(Final subbase depth subject to CBR test)



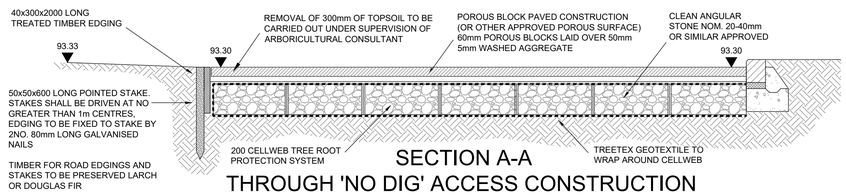
ELEVATION OF HEADWALL OUTFALL TO POND / SIDE OF DITCH



HEADWALL SECTION OUTFALL TO SIDE OF DITCH



External Rainwater Pipe to Drain
1:20

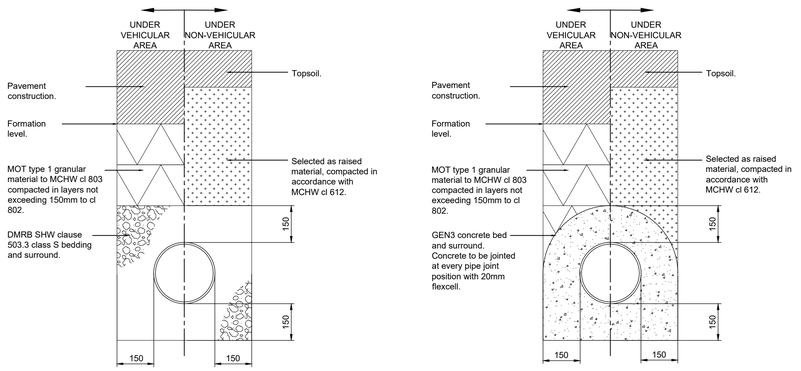


SECTION A-A THROUGH 'NO DIG' ACCESS CONSTRUCTION

TO BE INSTALLED IN ACCORDANCE WITH GEOSYNTHETIC LTDs SINSTALLATION GUIDE AND SPECIFICATION

ALL WORKS WITHIN ROOT PROTECTION AREAS TO BE UNDERTAKEN UNDER THE SUPERVISION OF THE ARBORICULTURAL CONSULTANT

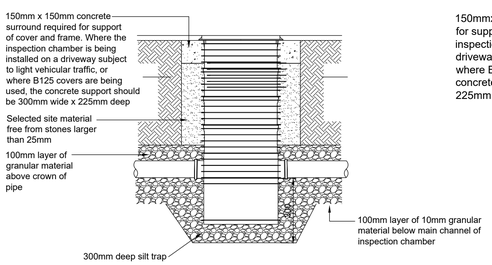
SCALE 1:20



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

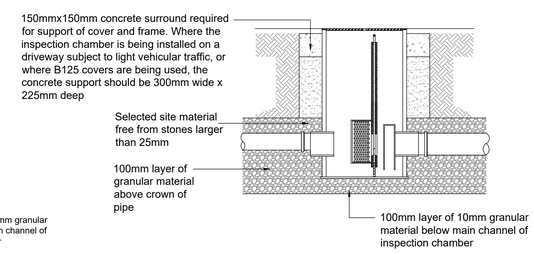
Pipe Bedding Details

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



460mmØ Polypipe basic silt trap detail

SCALE 1:20



Conraflow 500 with foul air trap

SCALE 1:20

Prefixed to drawing numbers shall signify the following:-

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

REV	DATE	DESCRIPTION	BY	CHK	APP
P-	05.09.24	PRELIMINARY ISSUE	KCK	CS	CS

cgs civils
Consulting Civil Engineers

CLIENT: STEPHANIE NEWELL

ARCHITECT: MICHAEL BISSETT POWELL

JOB TITLE: LIMEKILN FARM, COPSALE RH13 6QW

DRAWING TITLE: PROPOSED TYPICAL CONSTRUCTION DETAILS

DRAWN	ENGINEER	CHECKED	APPROVED
KCK	TZ	CS	CS

DATE	SCALE @ A1
AUGUST 2024	AS SHOWN

JOB No.	STATUS	DRAWING No.	REV.
C3296	P	501	P-

FOR PLANNING ONLY

Design Settings

Rainfall Methodology	FEH-22	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	1.200
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0	Include Intermediate Ground	✓
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	✓
CV	1.000	Connection Type	Level Soffits		
Time of Entry (mins)	4.00	Minimum Backdrop Height (m)	0.200		

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	1.950
PP	0.196		34.500	450	48.758	117.626	0.480
S1		4.00	34.150	450	65.842	140.150	0.750
S2			34.000	450	74.840	132.039	1.000
S3			33.500	450	95.035	147.883	1.000
S4		4.00	33.500	450	100.045	166.794	1.000
S7			33.500	450	107.736	160.048	1.996
OHA	0.100		33.500	450	78.529	157.261	0.500

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S1	S2	12.114	0.600	33.400	33.000	0.400	30.3	100	4.14	50.0
1.001	S2	S3	25.668	0.600	33.000	32.500	0.500	51.3	100	4.54	50.0
1.002	S3	ATT	8.100	0.600	32.500	31.800	0.700	11.6	100	4.60	50.0
2.000	S4	ATT	10.273	0.600	32.500	31.800	0.700	14.7	100	4.08	50.0
1.003	ATT	S7	4.600	0.600	31.550	31.504	0.046	100.0	150	4.68	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.407	11.1	0.0	0.650	0.900	0.000	0.0	0	0.000
1.001	1.078	8.5	0.0	0.900	0.900	0.000	0.0	0	0.000
1.002	2.284	17.9	0.0	0.900	1.600	0.000	0.0	0	0.000
2.000	2.027	15.9	0.0	0.900	1.600	0.000	0.0	0	0.000
1.003	1.005	17.8	7.0	1.800	1.846	0.039	0.0	66	0.949

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	12.114	30.3	100	Circular	34.150	33.400	0.650	34.000	33.000	0.900
1.001	25.668	51.3	100	Circular	34.000	33.000	0.900	33.500	32.500	0.900
1.002	8.100	11.6	100	Circular	33.500	32.500	0.900	33.500	31.800	1.600
2.000	10.273	14.7	100	Circular	33.500	32.500	0.900	33.500	31.800	1.600
1.003	4.600	100.0	150	Circular	33.500	31.550	1.800	33.500	31.504	1.846

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	450	Manhole	Adoptable	S2	450	Manhole	Adoptable
1.001	S2	450	Manhole	Adoptable	S3	450	Manhole	Adoptable
1.002	S3	450	Manhole	Adoptable	ATT	450	Manhole	Adoptable
2.000	S4	450	Manhole	Adoptable	ATT	450	Manhole	Adoptable
1.003	ATT	450	Manhole	Adoptable	S7	450	Manhole	Adoptable

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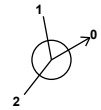
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
ATT	101.941	156.697	33.500	1.950	450		1 2.000 2 1.002 0 1.003	31.800 31.800 31.550	100 100 150
PP	48.758	117.626	34.500	0.480	450				
S1	65.842	140.150	34.150	0.750	450		0 1.000	33.400	100
S2	74.840	132.039	34.000	1.000	450		1 1.000 0 1.001	33.000 33.000	100 100
S3	95.035	147.883	33.500	1.000	450		1 1.001 0 1.002	32.500 32.500	100 100
S4	100.045	166.794	33.500	1.000	450		0 2.000	32.500	100
S7	107.736	160.048	33.500	1.996	450		1 1.003	31.504	150
OHA	78.529	157.261	33.500	0.500	450				

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Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	1.000	Drain Down Time (mins)	240	Check Discharge Volume	x

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 %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
10	0	0	0	100	0	0	0
30	0	0	0	100	45	0	0
30	40	0	0				

Node S7 Online Orifice Control

Flap Valve	x	Invert Level (m)	31.504	Design Flow (l/s)	2.0	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Depth (m)	1.600	Diameter (m)	0.027		

Node PP Carpark Storage Structure

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

Node ATT Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Pit Width (m)	7.000	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	31.600	Pit Length (m)	3.000	Number Required	1
Safety Factor	2.0	Time to half empty (mins)	196	Depth (m)	0.800		

Node OHA Carpark Storage Structure

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

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Results for 10 year 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
120 minute summer	ATT	90	31.960	0.410	6.7	7.2490	0.0000	SURCHARGED
240 minute winter	PP	196	34.307	0.287	13.6	55.3452	0.0000	OK
15 minute summer	S1	1	33.400	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S2	1	33.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S3	1	32.500	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S4	1	32.500	0.000	0.0	0.0000	0.0000	OK
120 minute summer	S7	90	31.959	0.455	1.4	0.0724	0.0000	OK
240 minute winter	OHA	192	33.245	0.245	6.9	27.6527	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	ATT	1.003	S7	1.4	0.371	0.078	0.0810	
240 minute winter	PP	Infiltration		2.5				
15 minute summer	S1	1.000	S2	0.0	0.000	0.000	0.0000	
15 minute summer	S2	1.001	S3	0.0	0.000	0.000	0.0000	
15 minute summer	S3	1.002	ATT	0.0	0.000	0.000	0.0127	
15 minute summer	S4	2.000	ATT	0.0	0.000	0.000	0.0162	
120 minute summer	S7	Orifice		1.0				12.7
240 minute winter	OHA	Infiltration		1.4				

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Results for 30 year 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
120 minute winter	ATT	96	32.090	0.539	5.7	9.8613	0.0000	SURCHARGED
240 minute winter	PP	224	34.348	0.328	17.0	71.9238	0.0000	OK
15 minute summer	S1	1	33.400	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S2	1	33.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S3	1	32.500	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S4	1	32.500	0.000	0.0	0.0000	0.0000	OK
120 minute winter	S7	96	32.089	0.585	1.2	0.0930	0.0000	OK
240 minute winter	OHA	208	33.278	0.278	8.7	35.7463	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	1.003	S7	1.2	0.442	0.068	0.0810	
240 minute winter	PP	Infiltration		2.8				
15 minute summer	S1	1.000	S2	0.0	0.000	0.000	0.0000	
15 minute summer	S2	1.001	S3	0.0	0.000	0.000	0.0000	
15 minute summer	S3	1.002	ATT	0.0	0.000	0.000	0.0317	
15 minute summer	S4	2.000	ATT	0.0	0.000	0.000	0.0402	
120 minute winter	S7	Orifice		1.2				16.3
240 minute winter	OHA	Infiltration		1.5				

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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
120 minute winter	ATT	110	32.335	0.785	7.9	14.7923	0.0000	SURCHARGED
240 minute winter	PP	228	34.417	0.397	23.9	105.4517	0.0000	OK
15 minute summer	S1	1	33.400	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S2	1	33.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S3	1	32.500	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S4	1	32.500	0.000	0.0	0.0000	0.0000	OK
120 minute winter	S7	110	32.334	0.830	1.5	0.1320	0.0000	OK
240 minute winter	OHA	228	33.340	0.340	12.2	53.0888	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	1.003	S7	1.5	0.455	0.083	0.0810	
240 minute winter	PP	Infiltration		3.4				
15 minute summer	S1	1.000	S2	0.0	0.000	0.000	0.0000	
15 minute summer	S2	1.001	S3	0.0	0.000	0.000	0.0000	
15 minute summer	S3	1.002	ATT	0.0	0.000	0.000	0.0317	
15 minute summer	S4	2.000	ATT	0.0	0.000	0.000	0.0402	
120 minute winter	S7	Orifice		1.4				21.0
240 minute winter	OHA	Infiltration		1.7				

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Results for 100 year 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
120 minute winter	ATT	100	32.249	0.699	7.1	13.0705	0.0000	SURCHARGED
240 minute winter	PP	228	34.391	0.371	21.2	92.1050	0.0000	OK
15 minute summer	S1	1	33.400	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S2	1	33.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S3	1	32.500	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S4	1	32.500	0.000	0.0	0.0000	0.0000	OK
120 minute winter	S7	100	32.249	0.745	1.4	0.1184	0.0000	OK
240 minute winter	OHA	224	33.315	0.315	10.8	45.9083	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	1.003	S7	1.4	0.455	0.078	0.0810	
240 minute winter	PP	Infiltration		3.2				
15 minute summer	S1	1.000	S2	0.0	0.000	0.000	0.0000	
15 minute summer	S2	1.001	S3	0.0	0.000	0.000	0.0000	
15 minute summer	S3	1.002	ATT	0.0	0.000	0.000	0.0317	
15 minute summer	S4	2.000	ATT	0.0	0.000	0.000	0.0402	
120 minute winter	S7	Orifice		1.3				19.5
240 minute winter	OHA	Infiltration		1.7				

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Results for 100 year +45% 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
120 minute winter	ATT	98	33.183	1.633	10.3	16.2396	0.0000	SURCHARGED
360 minute winter	PP	344	34.488	0.468	22.6	142.8036	0.0000	OK
15 minute summer	S1	1	33.400	0.000	0.0	0.0000	0.0000	OK
120 minute winter	S2	98	33.183	0.183	1.2	0.0292	0.0000	SURCHARGED
120 minute winter	S3	98	33.183	0.683	2.6	0.1086	0.0000	SURCHARGED
120 minute winter	S4	98	33.183	0.683	2.5	0.1086	0.0000	SURCHARGED
120 minute winter	S7	98	33.182	1.678	2.8	0.2668	0.0000	OK
240 minute winter	OHA	232	33.407	0.407	15.7	72.2747	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	1.003	S7	2.8	0.456	0.156	0.0810	
360 minute winter	PP	Infiltration		3.4				
15 minute summer	S1	1.000	S2	0.0	0.000	0.000	0.0000	
120 minute winter	S2	1.001	S3	-1.2	-0.198	-0.140	0.2008	
120 minute winter	S3	1.002	ATT	-2.6	-0.431	-0.145	0.0634	
120 minute winter	S4	2.000	ATT	-2.5	-0.374	-0.158	0.0804	
120 minute winter	S7	Orifice		2.0				25.7
240 minute winter	OHA	Infiltration		1.7				

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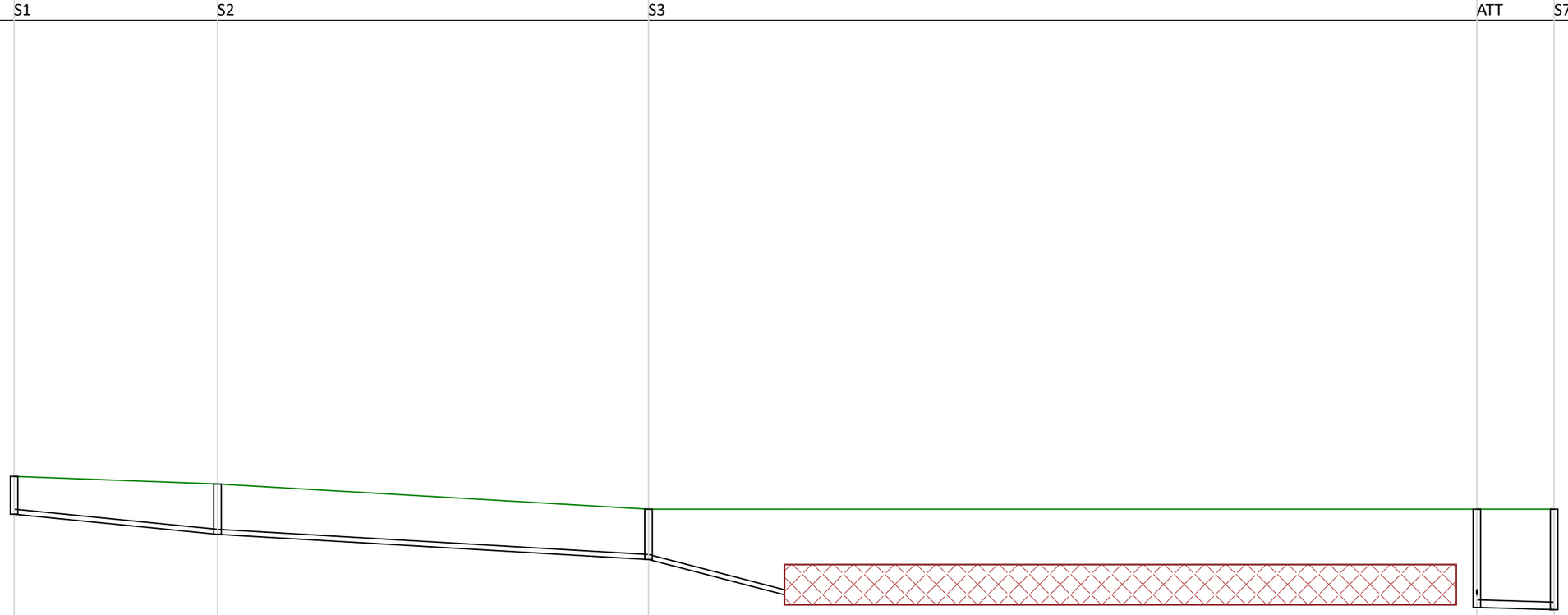

Node Name	S1		S2		S3		ATT	S7
A3 drawing Hor Scale 300 Ver Scale 100 Datum (m) 23.000								
Link Name		1.000		1.001		1.002	1.003	
Section Type		100mm		100mm		100mm	150mm	
Slope (1:X)		30.3		51.3		11.6	100.0	
Cover Level (m)		34.150	34.000		33.500		33.500	33.500
Invert Level (m)		33.400	33.000	33.000	32.500	32.500 31.800	31.550	31.504
Length (m)		12.114		25.668		8.100	4.600	

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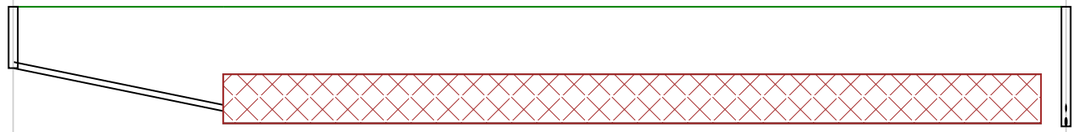
Node Name		S4	ATT	
A3 drawing Hor Scale 300 Ver Scale 100 Datum (m) 22.000				
Link Name		2.000		
Section Type		100mm		
Slope (1:X)		14.7		
Cover Level (m)		33.500	33.500	
Invert Level (m)		32.500	31.800	
Length (m)		10.273		

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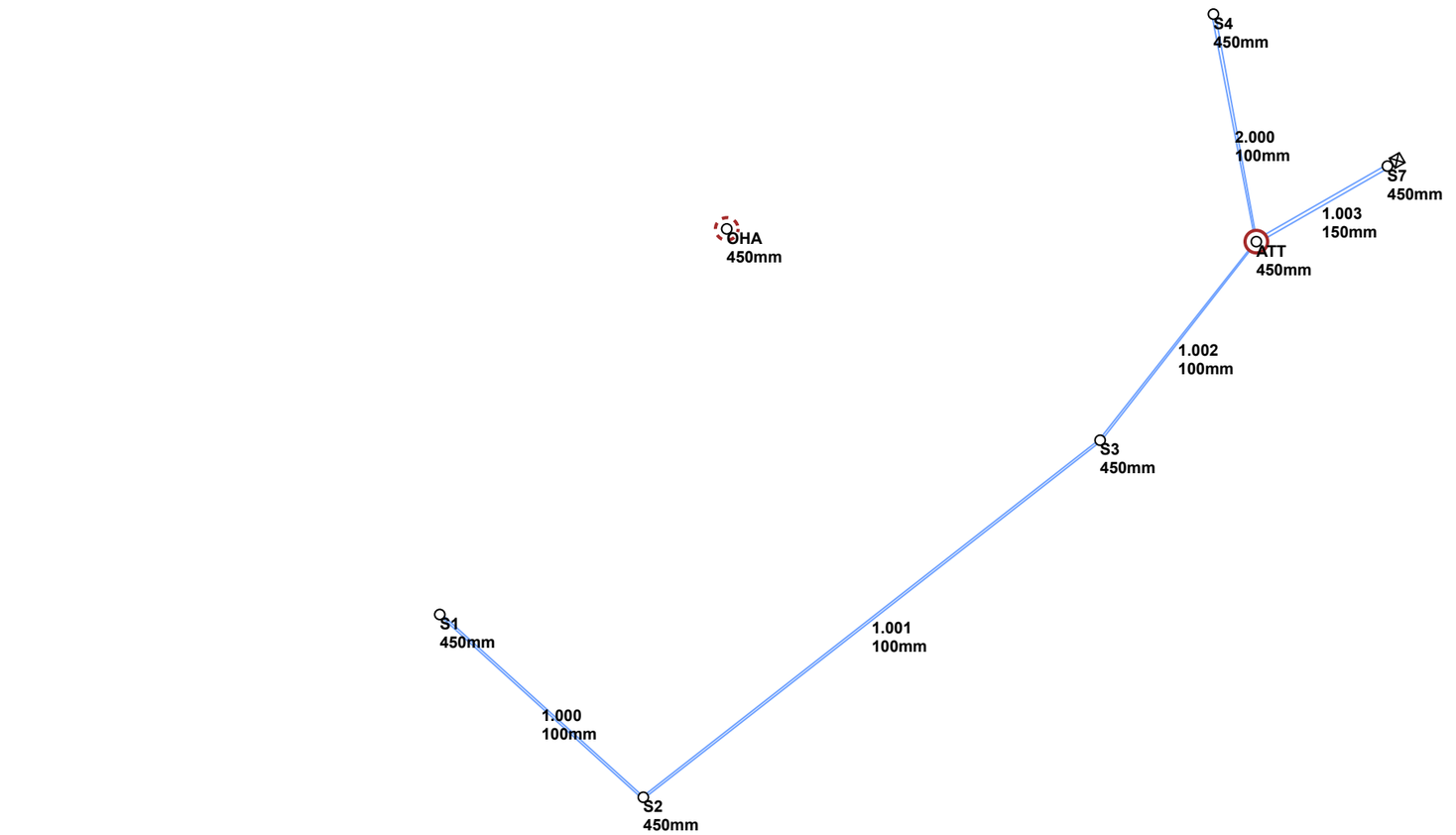

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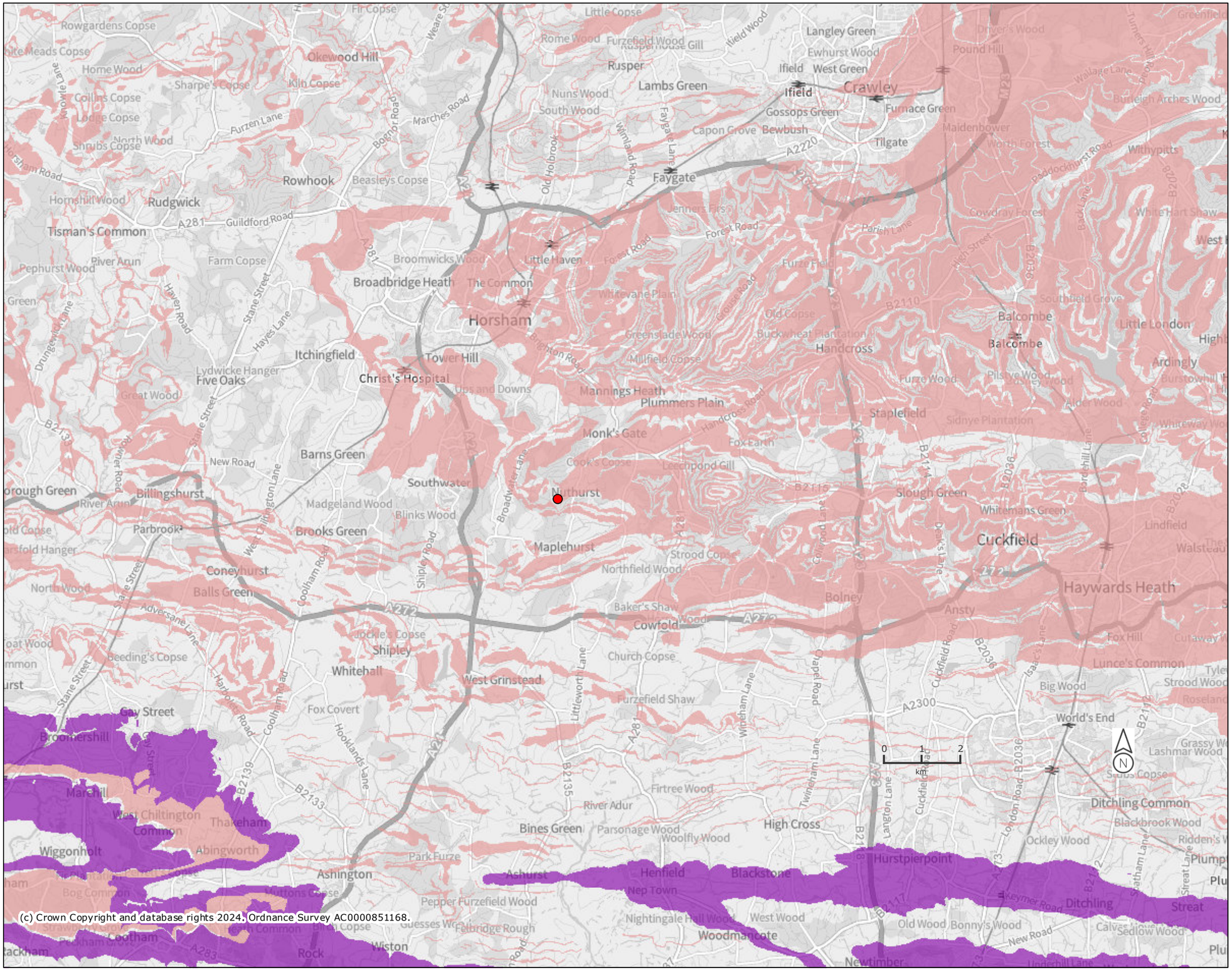
7.5 Appendix E – Magic Map from Environment Agency

Aquifer Designation Map (Bedrock)



Legend

Aquifer Designation Map (Bedrock) (England)

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

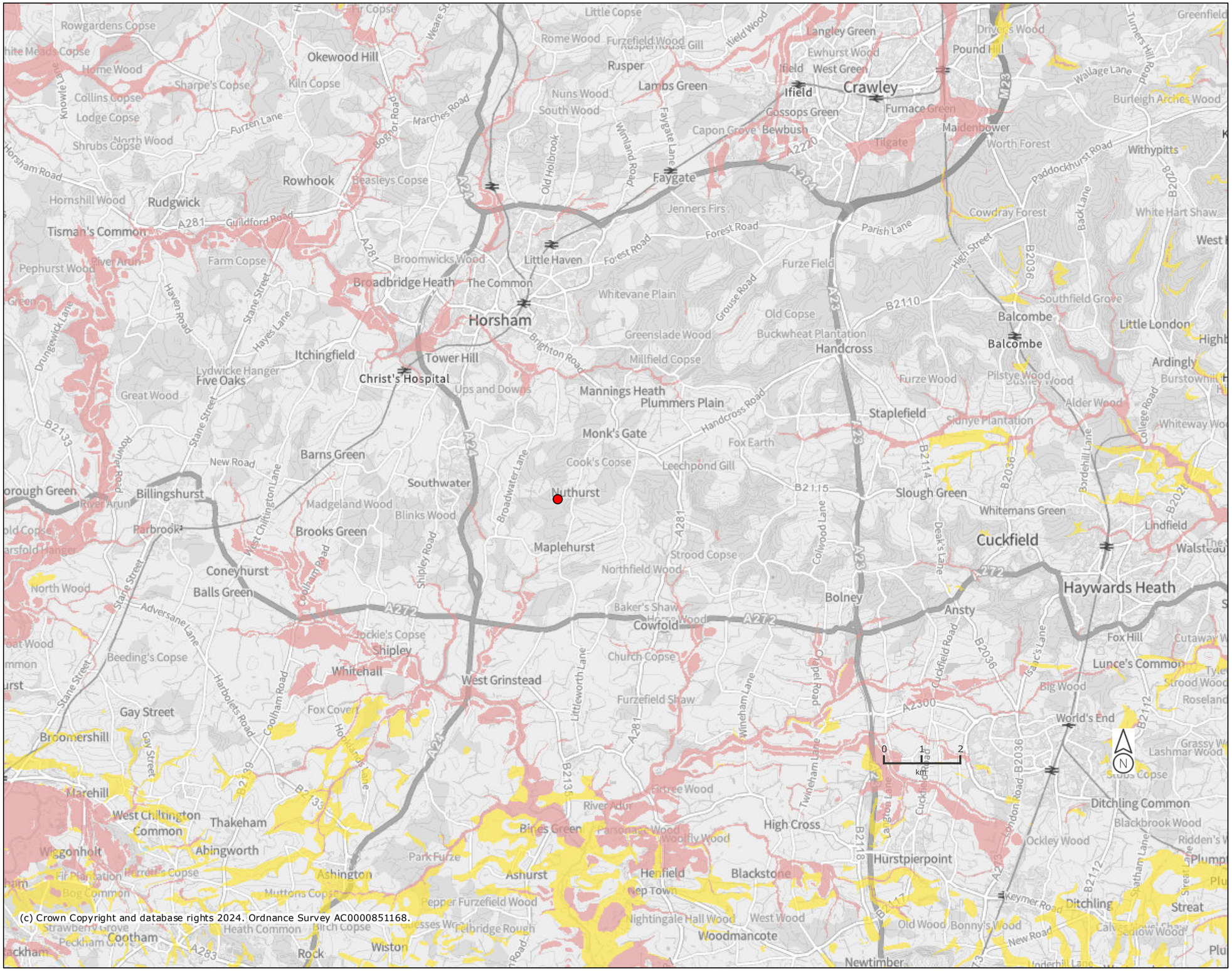
Projection = OSGB36
xmin = 494900
ymin = 113700
xmax = 545700
ymax = 138800

0 2 4 km

Map produced by MAGIC on 1 August, 2024.

Copyright resides with the data suppliers and the map must not be reproduced without their permission. Some information in MAGIC is a snapshot of the information that is being maintained or continually updated by the originating organisation. Please refer to the metadata for details as information may be illustrative or representative rather than definitive at this stage.

Aquifer Designation Map (Superficial Drift)



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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

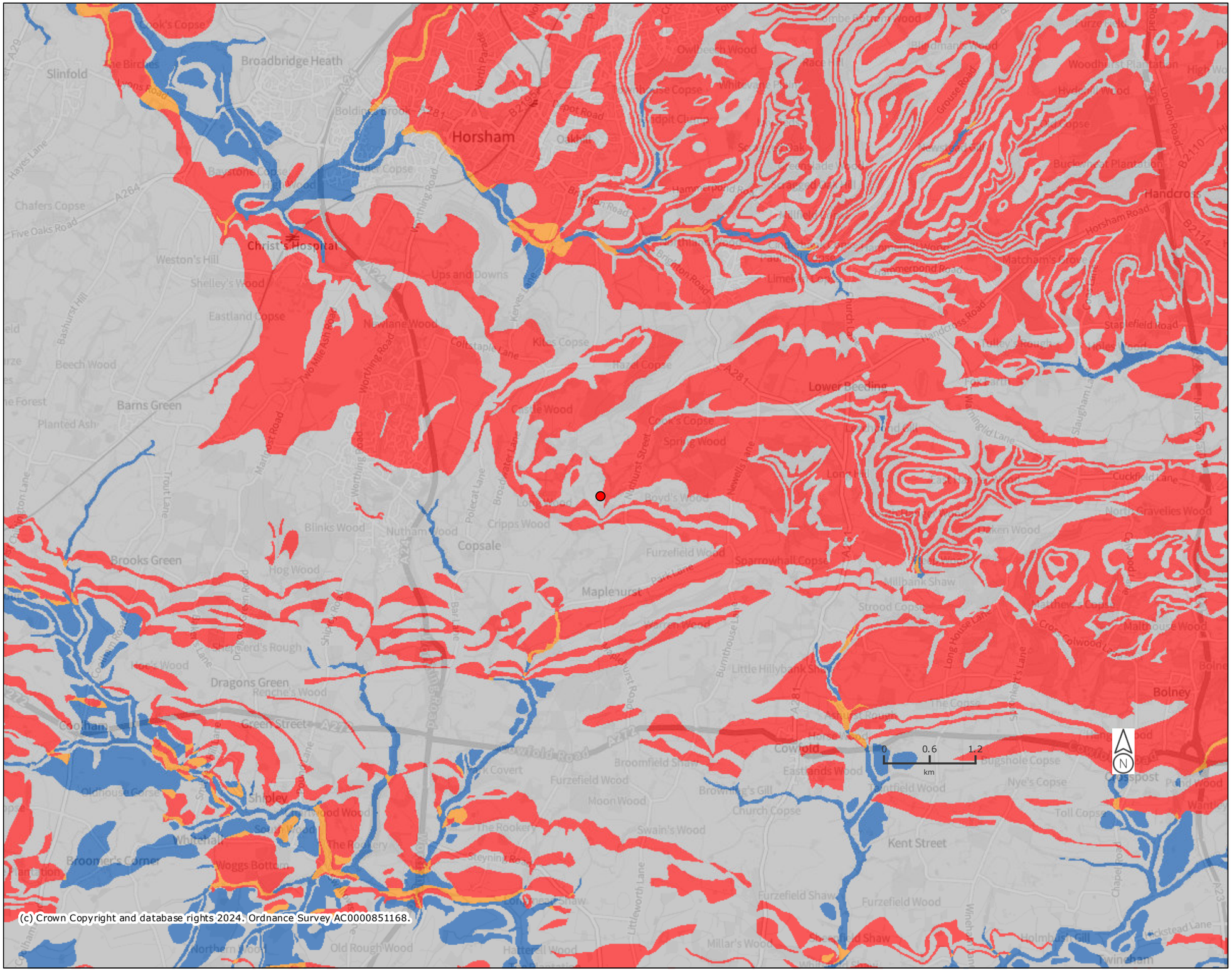
0 2 4
km

Map produced by MAGIC on 1 August, 2024.

Copyright resides with the data suppliers and the map must not be reproduced without their permission. Some information in MAGIC is a snapshot of the information that is being maintained or continually updated by the originating organisation. Please refer to the metadata for details as information may be illustrative or representative rather than definitive at this stage.

MAGIC

Groundwater Vulnerability Map



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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.

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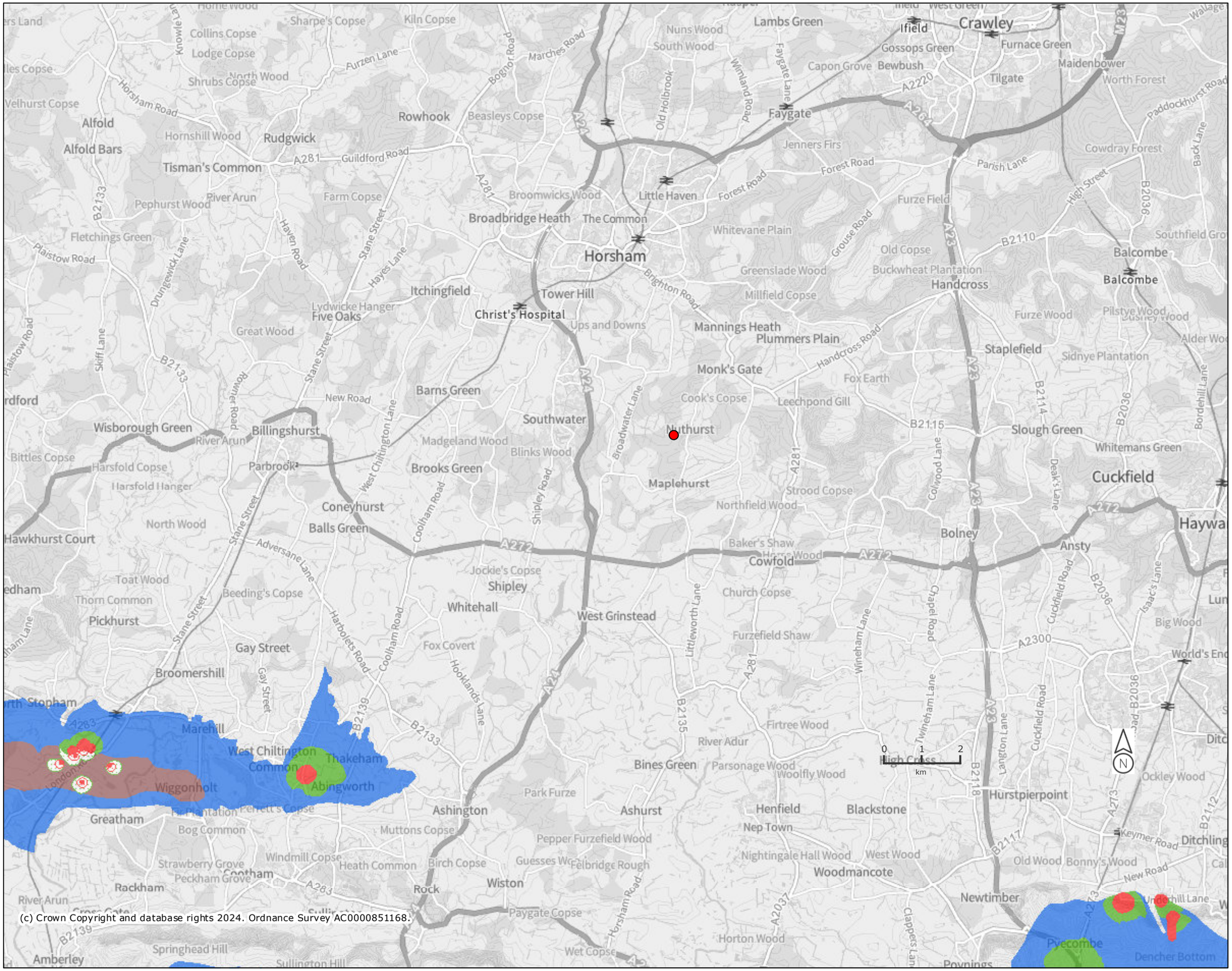
Source Protection Zones merged



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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.

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7.6 Appendix E – Greenfield runoff

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Tom Zajac
Site name:	Limekiln farm, Copsale
Site location:	

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.

Site Details

Latitude:	51.01875° N
Longitude:	0.31148° W
Reference:	4075380210
Date:	Aug 27 2024 11:40

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 0.476

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	784	784
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited

Q_{BAR} (l/s):	2.62	2.62
1 in 1 year (l/s):	2.23	2.23
1 in 30 years (l/s):	6.03	6.03
1 in 100 year (l/s):	8.37	8.37
1 in 200 years (l/s):	9.81	9.81

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.