Technical Note

Project Name	:	**Willowbrook, Hassocks**
Job No.	:	**C2394**
Note Title	:	**Surface and Foul Water Drainage Technical Note**
Author	:	**MR**
Approved	:	**CS**
Date	:	**November 2022**

Revision	Date of Issue	Comments	Prepared By	Checked By
P	01.12.2022	Initial Issue	MR	CS

1 Introduction

1.1.1 CGS Civils Ltd have been appointed by Mr & Mrs Ockenden to undertake a drainage strategy report for a proposed development at Willowbrook, Danworth Lane, Hurstpierpoint, Hassocks.

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.

1.1.3 The existing site consists agricultural farm land with existing barn that is proposed to be converted into a new 1 bedroom house.

1.1.4 The proposed development is located as OS Grid Reference **TQ 28542 18303** and has the post code **BN6 9LW.**

1.1.5 The red green line boundary is approximately 0.2555 Ha and the proposed development will result in a total of 0.0038 Ha of impermeable area which is roof area and 0.0115 Ha of existing roof areas are excluded from drainage calculations.

1.1.6 The proposed site will make use of an existing access located to the East by Danworth Lane.

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

Fig 1. Site Location
Snippet from MagicMaps – Outline of site https://magic.defra.gov.uk/magicmap.aspx

2 Site Geology

2.1 British Geological Survey information

2.1.1 The British Geological Survey confirms the bedrock geology to be made up Weald Clay Formation- Mudstone. The BGS website confirms the superficial deposits on site to be made up of River Terrace Deposits- Sand and gravel.

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

- Borehole TQ21NE95 (Located approx. 1100m West of the site) – Ground geology (Silty Clay, Clay)
- Borehole TQ21NE94 (Located approx. 1200m West of the site) – Ground geology (Silty Clay, Sandy Clay)
- Borehole TQ21NE93 (Located approx. 1250m West of the site) – Ground geology (Clay)

2.1.3 Due to the proposed development site being located within the area underlain by silty Clay soils with a low permeability characteristic, infiltration method for surface water discharge has been ruled out.

2.1.4 The BGS Historical Borehole Logs can be found in **Appendix B**.

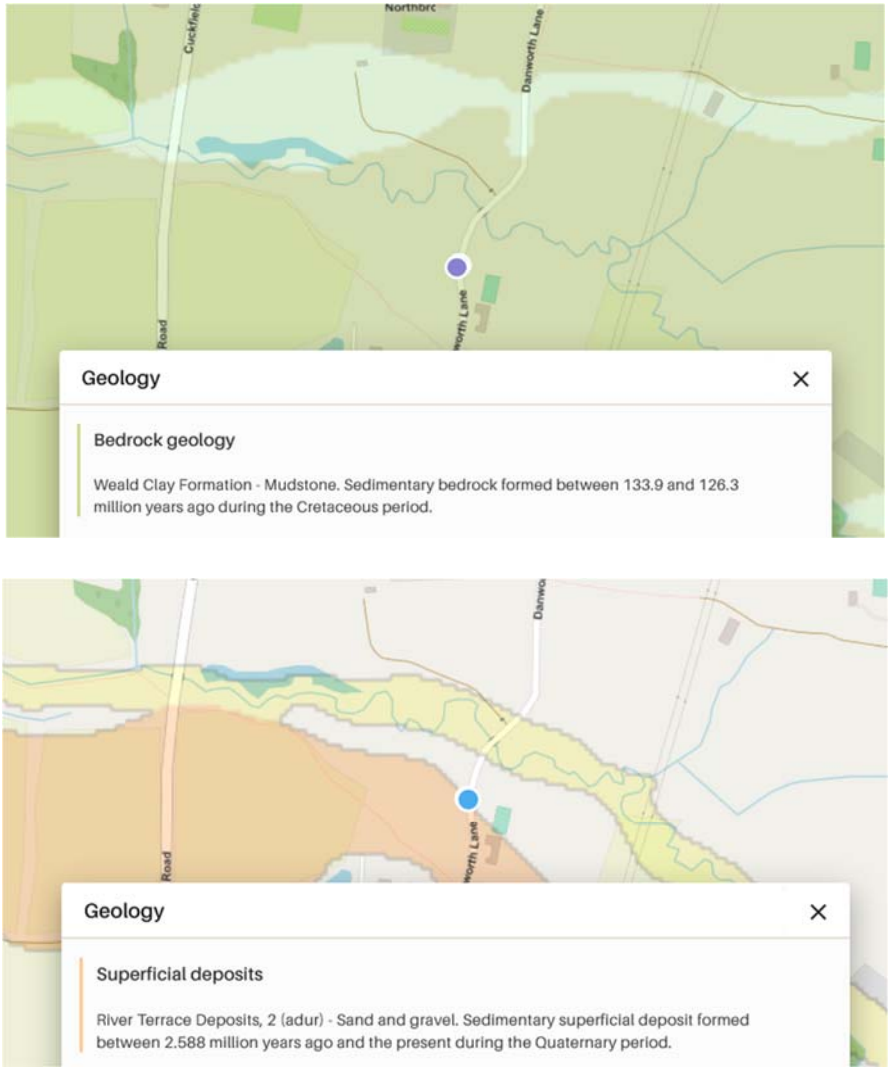


Fig 2. British Geological Survey

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

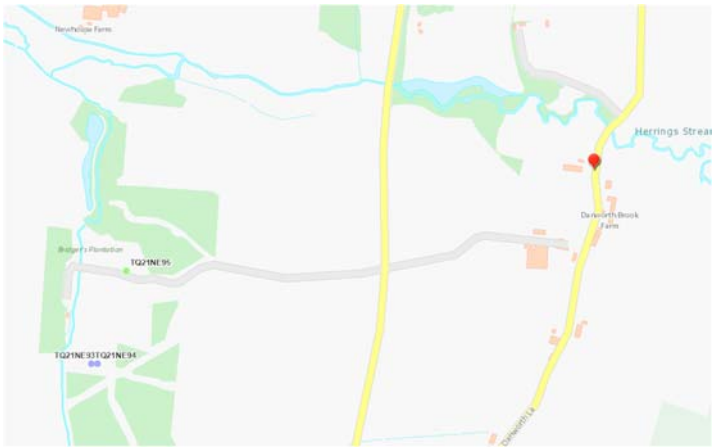


Fig 3. British Geological Survey

Snippet from BGS Website showing Historical Borehole Logs Locations

2.2 Geological Assessment

2.2.1 No intrusive ground investigation testing has been carried out and therefore based on the available BGS historical borehole logs and Desktop Study it is proposed that following surface water runoff discharge hierarchy a restricted discharge to existing watercourse is proposed.

2.2.2 An onsite infiltration test to BRE365 method has been carried out as a part of the drainage strategy scope. Unfortunately, due to the site being located within the area underlain by Clay soils, infiltration test failed confirming surface water discharge via infiltration to be not a viable method at this location.

Fig 4. Infiltration Test – onsite photographs.

2.2.3 The nearest borehole logs indicate that site is underlain by Clay soils with a poor potential for infiltration.

2.3 Hydrogeology Setting

2.3.1 The Environment Agency (EA) mapping service, as provided by Magic Map, indicates the aquifer designation for the bedrock and superficial drift geology and the groundwater vulnerability in the area. The mapping, as included in **Appendix C**, provides the following information for the site:

2.3.2 The site will not pose a risk to the groundwater on site as there will be no discharge of any hazardous materials to ground.

Geology Map	Site Description
Aquifer Designation (Bedrock)	Unproductive
Aquifer Designation (Superficial Drift)	Secondary A
Groundwater Vulnerability	Low
Groundwater Source Protection Zone	N/A

3 Existing Drainage

3.1.1 It is not currently known how existing site discharges surface water runoff, however it is presumed that all surface water runoff is discharged onto the ground and partially into the ground via infiltration and into the existing watercourse via overland flow.

4 Proposed Drainage Strategy

4.1 SuDS Hierarchy

4.1.1 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.

Discharge Destination	
Discharge to Ground	N/A (Confirmed not possible due to the low Permeability)
Discharge to Watercourse	Yes (Storm water at restriction rate of 1l/s and foul water via treatment plant)
Discharge to Surface Water Sewer	N/A
Discharge to Other Sewer	N/A

4.2 Surface Water Drainage

4.2.1 Based upon the information gathered from the British Geological Survey website and soakaway test, it is deemed that discharge to ground via infiltration is not viable therefore, it is proposed that all surface water runoff is to be discharged to the existing ditch located to the east of the site at a restricted discharge rate of **1.0l/s**. All roof areas are to be collected into a positive drainage network being discharged into the existing ditch via a new manhole. The network has been designed to cater for the 1 in 100 – year +40% storm.

4.2.2 Proposed Drainage Strategy and Hydraulic calculations can be found in **Appendix D**.

4.3 Water Quality

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

4.3.2 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.

4.3.3 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

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

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

Fig 5. 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	

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

4.3.7 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
- Low traffic roads

4.3.8 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

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

Fig 6. 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	Low	0.5	0.4	0.4

access roads) and non-residential car parking with infrequent change (e.g., schools, offices) i.e., < 300 traffic movements/day				
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

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

Table 1: **Pollution hazard index and destination of runoff for the proposed site**

Table 1: 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
Existing driveways	Ground water	Low	0.5	0.4	0.4

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

Figure 7 Indicative SuDS Mitigation Indices for discharges to ground waters.

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

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

Table 26.4 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 2: SuDS mitigation index

		Mitigation Indices				
Runoff Source	**Destination of Runoff**	**Mitigation Index Source**	**Type of SuDS Component**	**Total Suspended Solids (TSS)**	**Metals**	**Hydrocarbons**
Individual driveways, residential car parks and low traffic roads	Ground water	Table 26.4 (for ground waters) Table 26.3 (for surface waters)	Permeable Pavement	0.7	0.6	0.7

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

4.4 Foul water drainage

4.4.1 The proposed development is located within the area not being served by public sewers. It is therefore, proposed that foul sewer runoff is discharged into the onsite package treatment plant prior being discharged into the existing watercourse located to the east of the site.

4.4.2 The total number of persons saved by the proposed treatment plant has been assumed as **2**, the treated effluent discharge is less than <2m3 and therefore EA application will not be required.

5 Maintenance

5.1 Introduction

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

5.2 General Drainage Maintenance Specification

5.2.1 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

5.2.2 Below ground drainage pipes

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

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

6 Summary and Conclusions

6.1.1 CGS Civils has been instructed of by to produce a Drainage statement under National Planning Policy Framework (NPPF) to support the Planning Application of an existing barn conversion into a 1 bedroom dwelling.

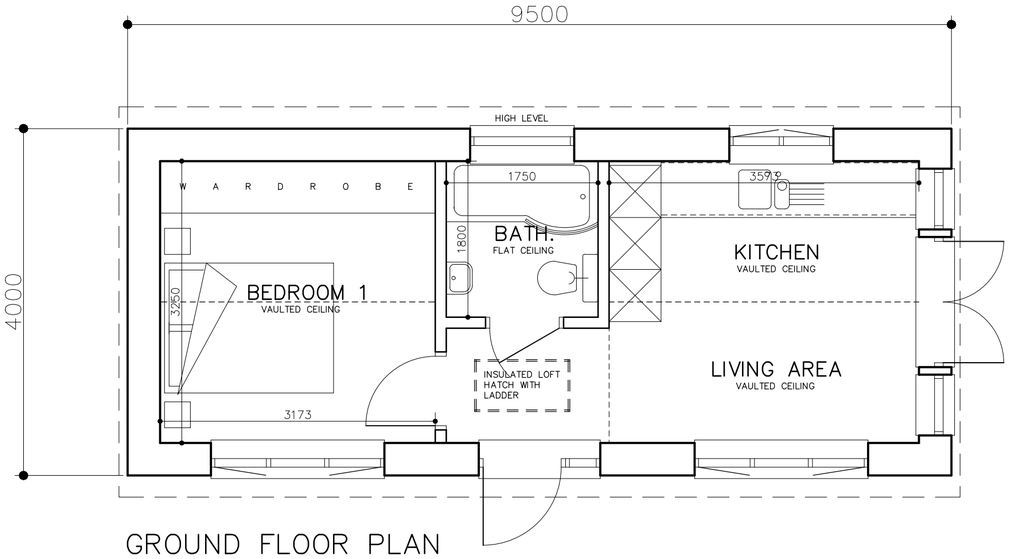
6.1.2 The Surface Water will be discharged into the existing watercourse to the east part of the site at a restricted rate of 1l/s.

6.1.3 The Foul water will discharge into the onsite treatment plant with the treated effluent being discharged into the watercourse.

6.1.4 This 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

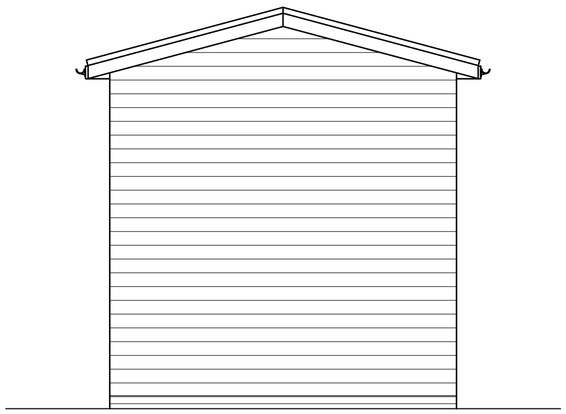
7.1 Appendix A – Site Plan



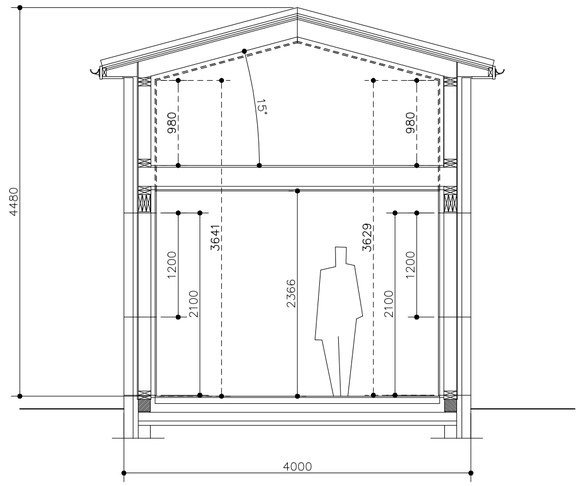
GROUND FLOOR PLAN

ROOF PLAN

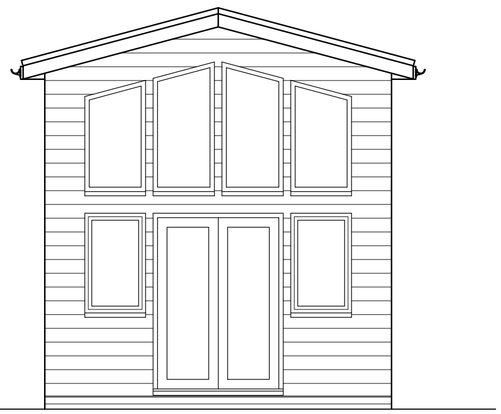
FRONT ELEVATION



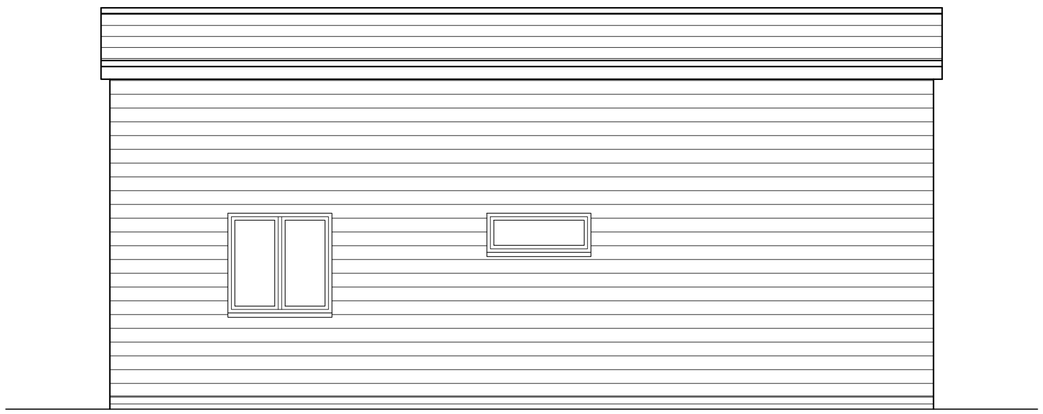
SIDE ELEVATION



OUTLINE SECTION



SIDE ELEVATION



REAR ELEVATION

0 5 10M

THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ANY OTHER RELEVANT DRAWINGS AND THE CONSTRUCTION MANUAL.
THE BUILDER SHOULD CHECK ALL LEVELS AND SITE DIMENSIONS BEFORE WORK STARTS AND NOTIFY SCANDIA OF ANY DISCREPANCY

IF IN DOUBT PLEASE ASK

REV	DESCRIPTION	DATE	DRN	CHK

scandiahus
SCANDIA-HUS BUSINESS PARK,
FELCOURT ROAD, FELCOURT, EAST GRINSTEAD,
WEST SUSSEX, RH19 2LP : TEL 01342 838060

FOR
MR. & MRS. OCKENDEN

SITE
Willow Brook, Danworth Lane,
Hurstpierpoint, BN6 9LW

TITLE
PROPOSED DWELLING
FLOOR PLAN, ROOF
PLAN, OUTLINE SECTION
& ELEVATIONS

C/No.	O/No.	SCALE
233221		1:50 @A2

DRAWN	DRAWING NUMBER
FC	X01 OP1 REV
DATE 9/22	

THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ANY OTHER RELEVANT DRAWINGS AND THE CONSTRUCTION MANUAL.
THE BUILDER SHOULD CHECK ALL LEVELS AND SITE DIMENSIONS BEFORE WORK STARTS AND NOTIFY SCANDIA OF ANY DISCREPANCY
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REV	DESCRIPTION	DATE	DRN	CHK

scandiahus
SCANDIA-HUS BUSINESS PARK,
FELCOURT ROAD, FELCOURT, EAST GRINSTEAD,
WEST SUSSEX, RH19 2LP : TEL 01342 838060

FOR
MR. & MRS. OCKENDEN

SITE
Willow Brook, Danworth Lane,
Hurstpierpoint, BN6 9LW

TITLE

PROPOSED BLOCK PLAN

C/No.	O/No.	SCALE
233221		1:500 @A2

DRAWN
FC

DRAWING NUMBER
BP02

DATE
10/22

REV

7.2 Appendix B – BGS Historical Borehole Logs

Contract: Hurstpierpoint WTW

Client: Southern Projects Limited

Borehole No. 1

Sheet No. 1 Of 1.
Depth 0 to 10 metres.

Equipment and Methods
Light Cable Percussion Boring
150mm Diameter

Orientation : Vertical

Ground Level : m.O.D.

Coordinates :

Job Number : S90/801

Location : 2779 1808

Dates : 28/3/90

Daily Prog.	Water Levels	Remarks	In Situ Tests	Samples Taken	Depth (Thick)	Reduced Level	Description	Legend
					0.00			
				J 0632	(0.60)		MADE GROUND (Firm orange brown blue grey clay with occasional brick rubble)	
				J 0633				
				U 0634	0.60			
				J 0635			Very stiff fissured orange brown silty CLAY with lenses of fine orange sand and occasional pyritised wood	
				J 0636				
				J 0637				
				J 0638				
				U 0639				
				J 0640				
				J 0641				
				J 0642				
				J 0643				
				U 0644				
28/3				J 0645	(4.85)			
				J 0646				
				J 0647				
				J 0648				
				U 0649				
				J 0650				
				J 0651				
				J 0652				
				J 0653				
				U 0654				
				J 0655				
				J 0656				
				J 0657				
				J 0658	5.45			
				U 0659			Very stiff fissured locally laminated dark grey silty CLAY with lenses of light grey silt and fissile laminated clay becoming mudstone towards the base of the borehole.	
	▽ 29/3			J 0660				
				J 0661				
				J 0662				
				J 0663				
				U 0664				
				J 0665				
				J 0666				
				J 0667				
				J 0668				
				U 0669				
					(4.55)			
				J 0670				
				J 0671				
				J 0672				
				J 0673				
				U 0674				
				J 0675				
				J 0676				
				J 0677				
				J 0678				
				U 0679				
				J 0680	10.00			
							End of Borehole	

Operator
JC

General Remarks:
Water level observation tube installed to 10.0m.

Appendix
1

Scale
10m/sheet

Sheet No.
1

Contract: Hurstpierpoint WTW

Client: Southern Projects Limited

Borehole No. 2

Sheet No. 1 Of 1.
Depth 0 to 10 metres.

Equipment and Methods
Light Cable Percussion Boring
150mm Diameter

Orientation : Vertical

Ground Level : m.O.D.

Coordinates :

Job Number : S90/801

Location 2778 1808

Dates : 29/3/90

Daily Prog.	Water Levels	Remarks	In Situ Tests	Samples Taken	Depth (Thick)	Reduced Level	Description	Legend
					0.00			
				J 0682			Stiff fissured brown silty CLAY with lenses of fine orange sand and occasional plant remains	
				J 0683				
				U 0684				
				J 0685				
				J 0686				
				J 0687				
				J 0688	(3.00)			
				U 0689				
				J 0690				
				J 0691				
				J 0692				
				J 0693				
				U 0694				
29/3				J 0695	3.00			
				J 0696	3.20		Very stiff fissured orange brown silty CLAY with lenses of fine orange sand and occasional plant roots with traces of pyritised wood	
				J 0697				
				J 0698				
				U 0699				
				J 0700			Very stiff fissured orange brown silty sandy CLAY with grey silty clay	
				J 1				
				U 2				
				U 3				
					(3.10)			
				J 4				
				J 5				
				J 6				
		Piezometer installed		J 7				
				U 8				
				J 9				
				J 10				
				J 11	6.30			
				J 12				
				U 13			Very stiff fissured mottled blue grey silty CLAY with fissile laminated clay becoming mudstone towards the base of the borehole.	
				J 14				
				J 15				
				J 16				
				J 17				
				U 18				
				J 19				
				J 20	(3.70)			
				J 21				
				J 22				
				U 23				
				J 24				
				J 25				
				J 26				
				J 27				
				U 28				
				J 29	10.00			
							End of Borehole	

Operator
JC

General Remarks:
Piezometer installed to 5.4m.

Appendix
1

Scale
10m/sheet

Sheet No.
2

Contract: Hurstpierpoint II

Client: Southern Water Projects Limited

Borehole No. 1

Sheet No. 1 Of 2.
Depth 0 to 10 metres.

Equipment and Methods
Light Cable Percussion Boring
150mm diameter

Orientation : Vertical

Ground Level : m.O.D.

Coordinates :

Job Number : S91/087

Location : 2784 1824

Dates : 11/2/91 12/2/91

Daily Prog.	Water Levels	Remarks	In Situ Tests	Samples Taken	Depth (Thick)	Reduced Level	Description	Legend
					0.00			
				J 3401			Soft to firm brown mottled grey subhorizontally fissured silty CLAY with occasional angular to subrounded medium graveland manganese staining at the top.	
				J 3402				
				U 3403				
				J 3404				
				J 3405	(3.60)			
				J 3406				
				U 3407				
12/2				J 3408				
					3.60			
				J 3409			Firm becoming stiff grey subhorizontally fissured silty CLAY	
				U 3410				
				J 3411				
				J 3412				
				U 3413				
				J 3414	(4.40)			
				J 3415				
				U 3416				
				J 3417				
				J 3418	8.00			
				U 3419			Very stiff grey closely subhorizontally fissured CLAY and SILT	
				J 3420	(6.50)			
				J 3421				
					10.00			
							Continued	

Operator JC

General Remarks:

Appendix

Scale 10m/sheet

Sheet No.

Contract: Hurstpierpoint II

Client: Southern Water Projects Limited

Borehole No. 1

Sheet No. 2 Of 2.
Depth 10 to 20 metres.

Equipment and Methods
Light Cable Percussion Boring
150mm diameter

Orientation : Vertical

Ground Level : m.O.D.

Coordinates :

Job Number : S91/087

Location :

Dates : 11/2/91
12/2/91

Daily Prog.	Water Levels	Remarks	In Situ Tests	Samples Taken	Depth (Thick)	Reduced Level	Description	Legend
				U 3422	10.00		Very stiff grey closely subhorizontally fissured CLAY and SILT	
				J 3423				
				J 3424				
				U 3425				
				J 3426				
					(6.50)			
				J 3427				
				U 3428				
				J 3429				
				J 3430				
				J 3431				
				U 3432	14.50			
					(0.60)		Very stiff/moderately weak grey fissured SILT and CLAY	
12/2				J 3433				
				J 3434	15.10		End of Borehole	

Operator
JC

General Remarks:

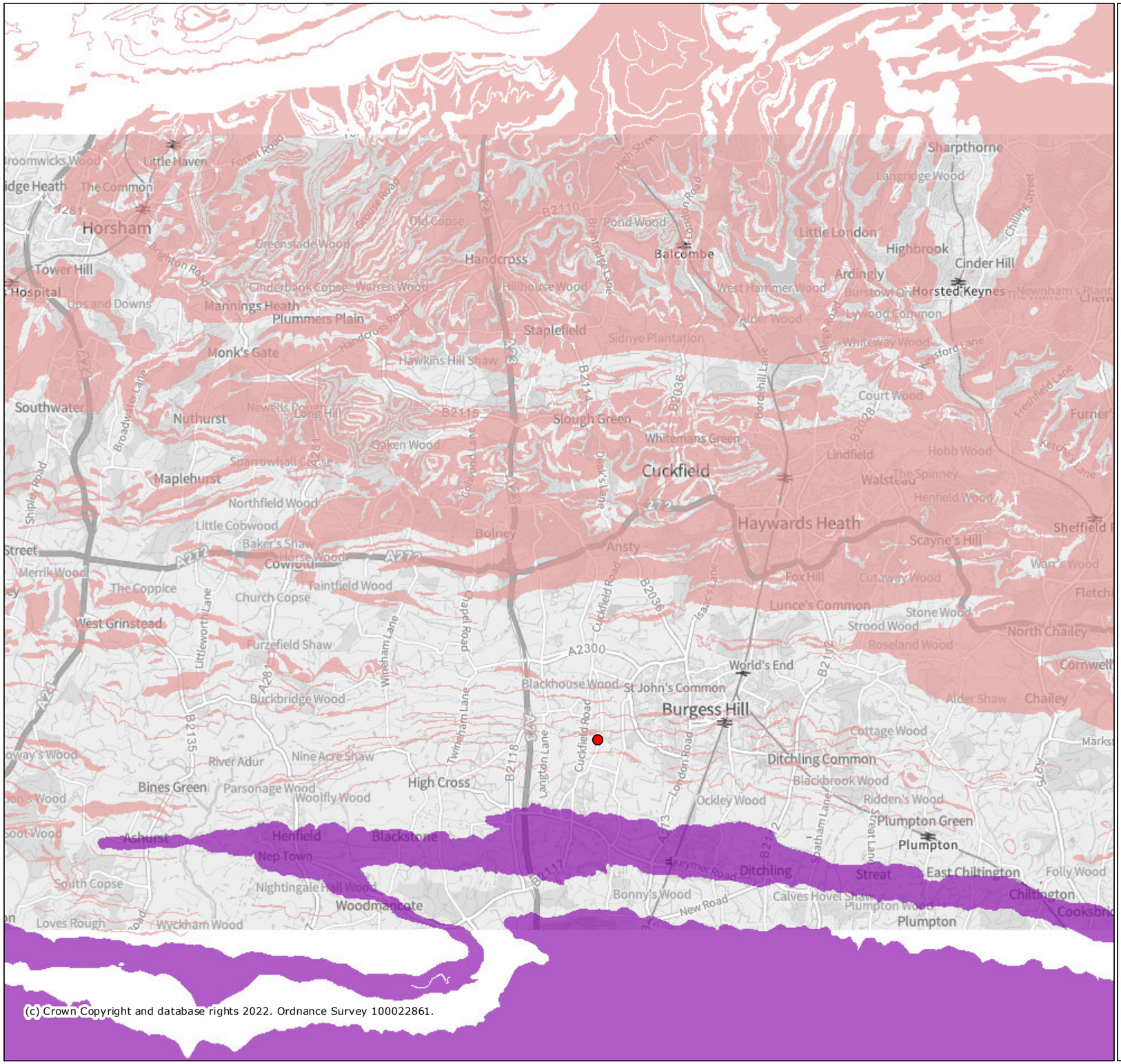
Appendix

Scale
10m/sheet

Sheet No.

7.3 Appendix C – Magic Map from Environment Agency

Aquifer Designation Map (Bedrock)



Legend

Aquifer Designation Map (Bedrock) (England)

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

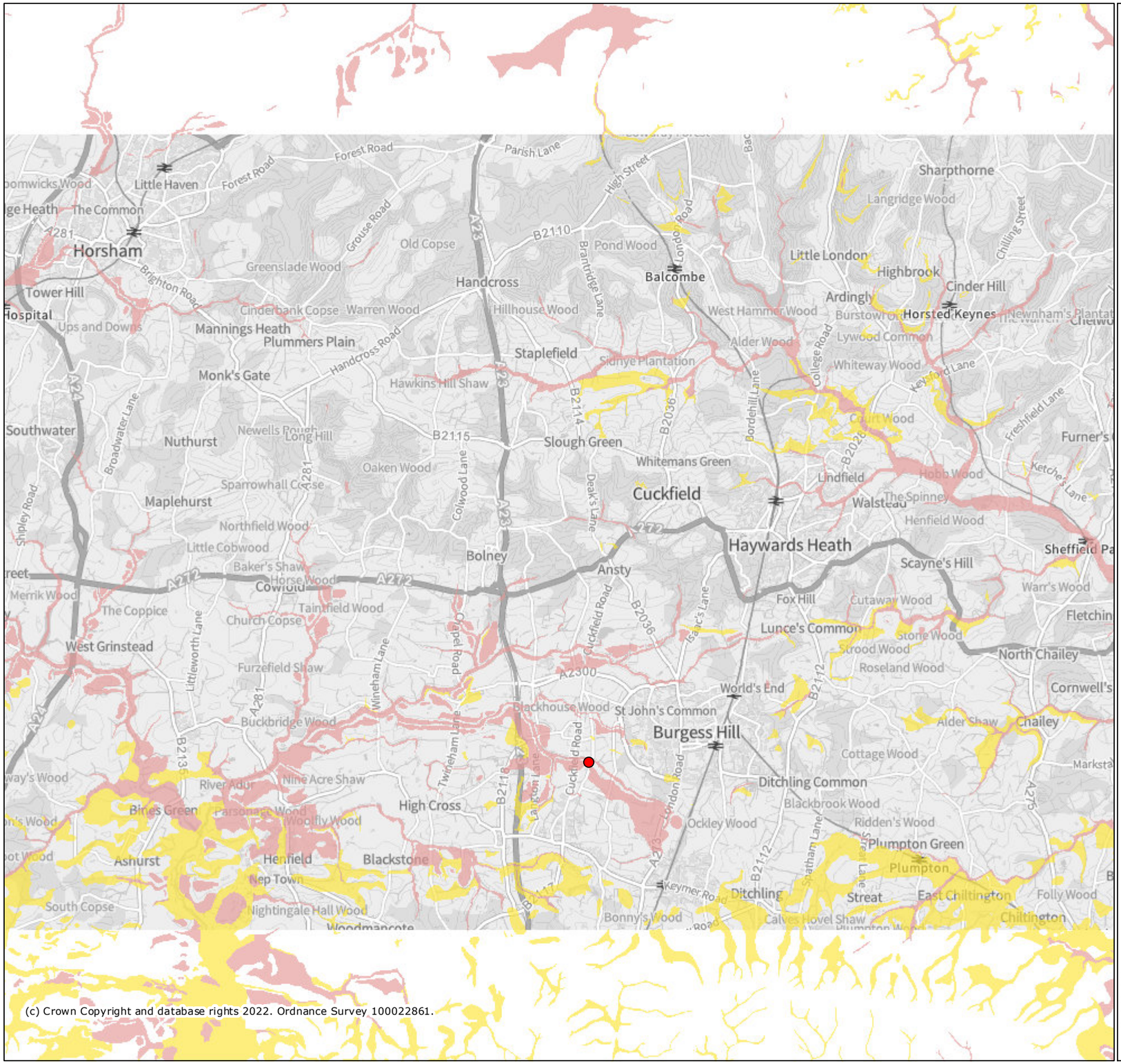
Projection = OSGB36
xmin = 506500
ymin = 113900
xmax = 548900
ymax = 132700

0 2 4
km

Map produced by MAGIC on 31 October, 2022.

MAGIC

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

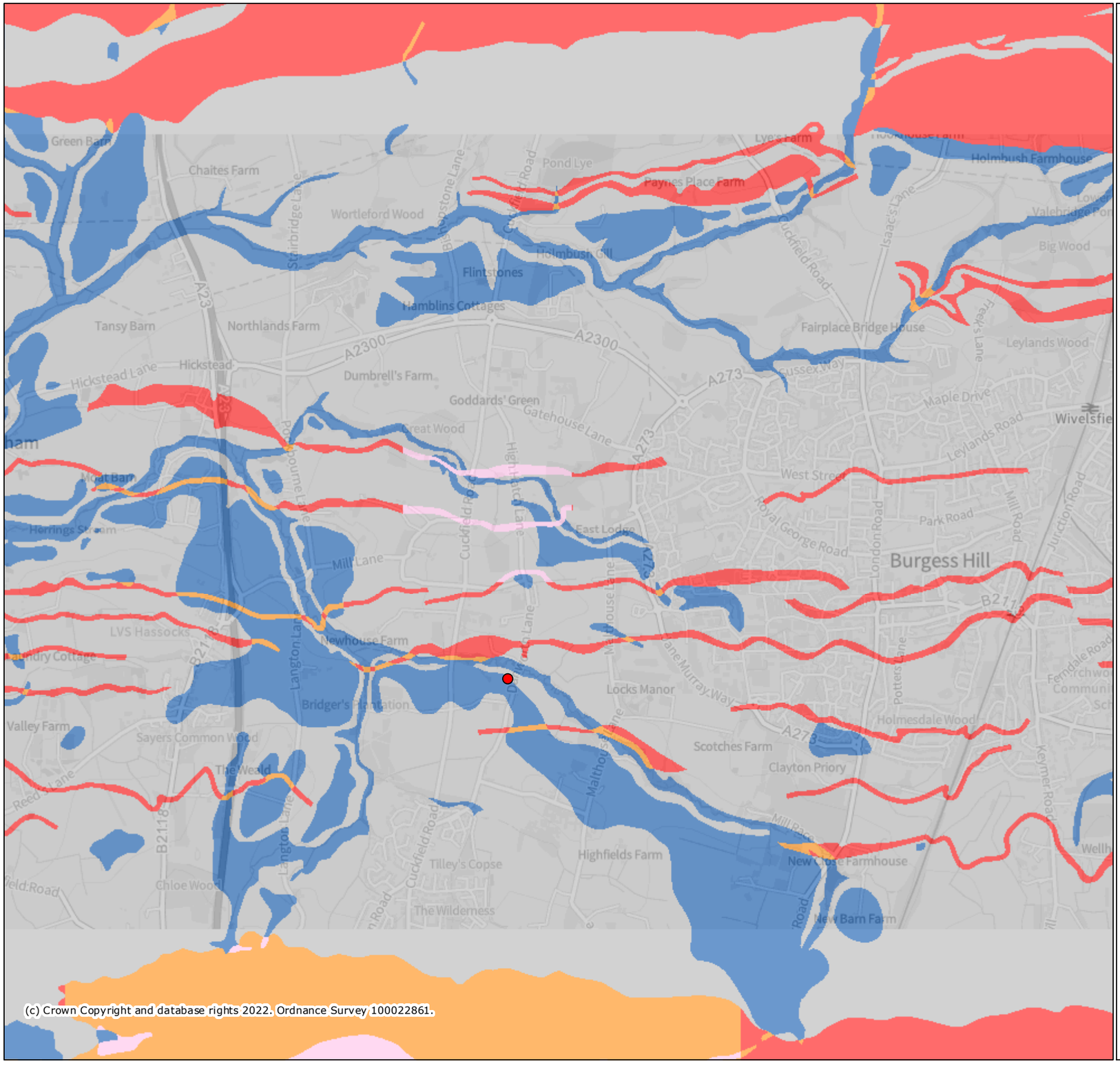
Projection = OSGB36
xmin = 506800
ymin = 114500
xmax = 549100
ymax = 133300

0 2 4
km

Map produced by MAGIC on 31 October, 2022.

MAGIC

Groundwater Vulnerability Map



Legend

Groundwater Vulnerability Map (England)

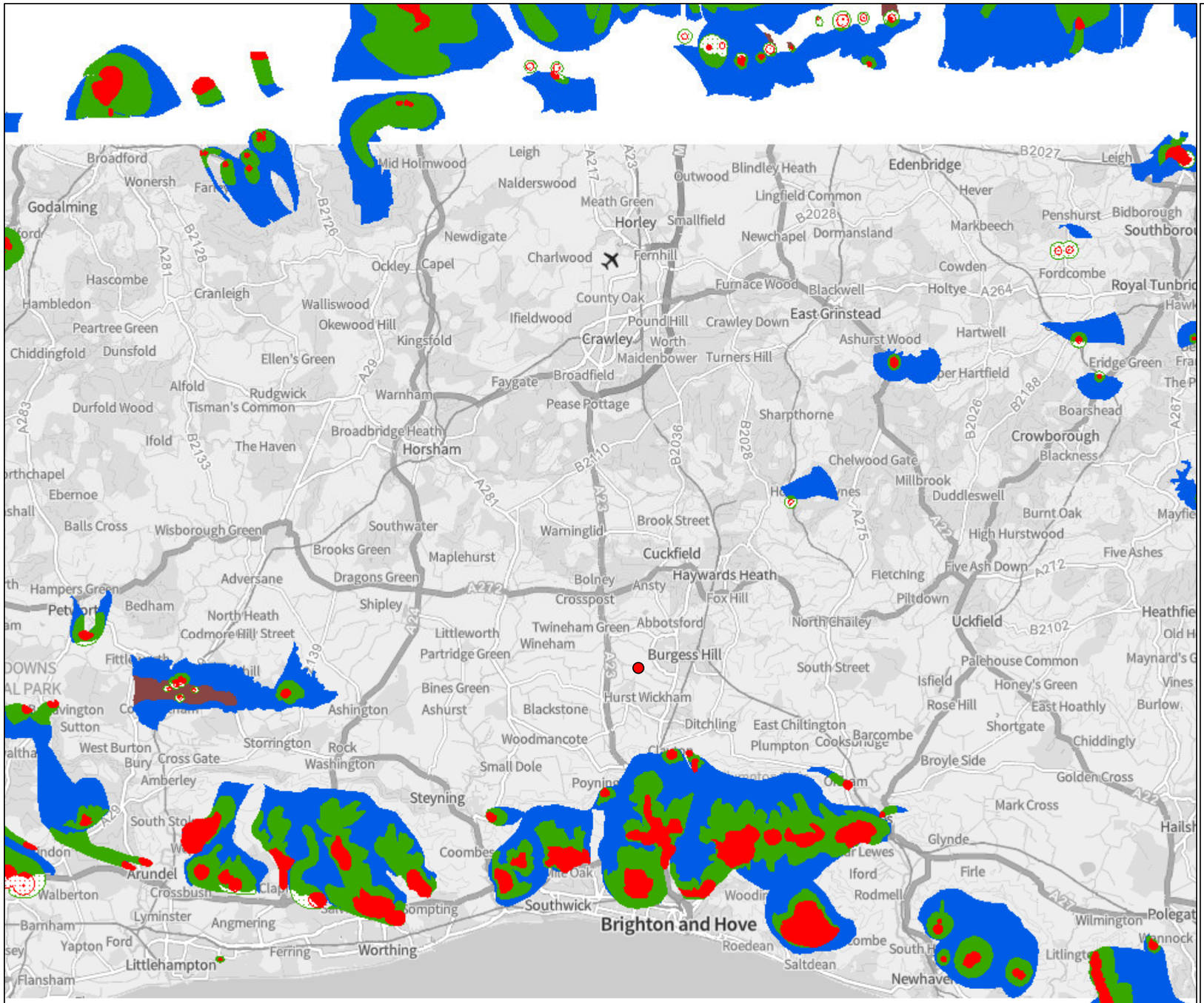
- Local Information
- Soluble Rock Risk
- High
- Medium - High
- Medium
- Medium - Low
- Low
- Unproductive

Projection = OSGB36
xmin = 523600
ymin = 116900
xmax = 534200
ymax = 121700

0 0.5 1
km

MAGIC

Source Protection Zones



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Legend

Source Protection Zones merged (England)

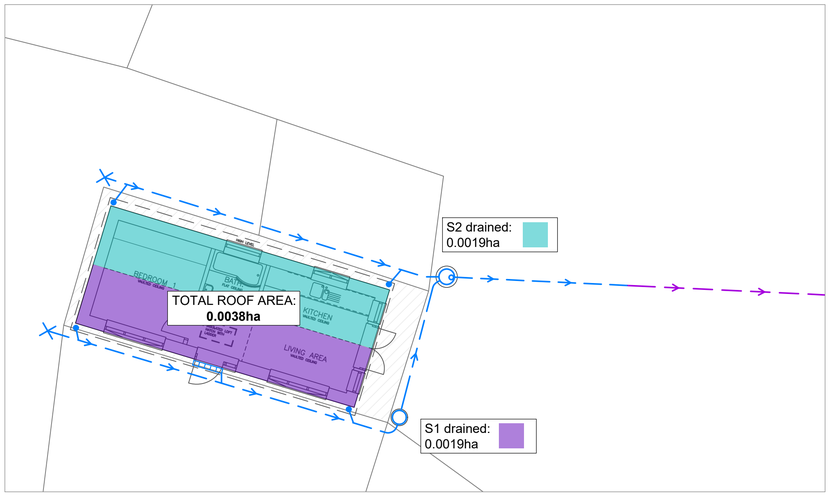
- Zone I - Inner Protection Zone
- Zone I - Subsurface Activity
- Zone II - Outer Protection Zone
- Zone II - Subsurface Activity
- Zone III - Total Catchment
- Zone III - Subsurface Activity
- Zone of Special Interest

Projection = OSGB36
xmin = 473600
ymin = 100300
xmax = 579400
ymax = 147300

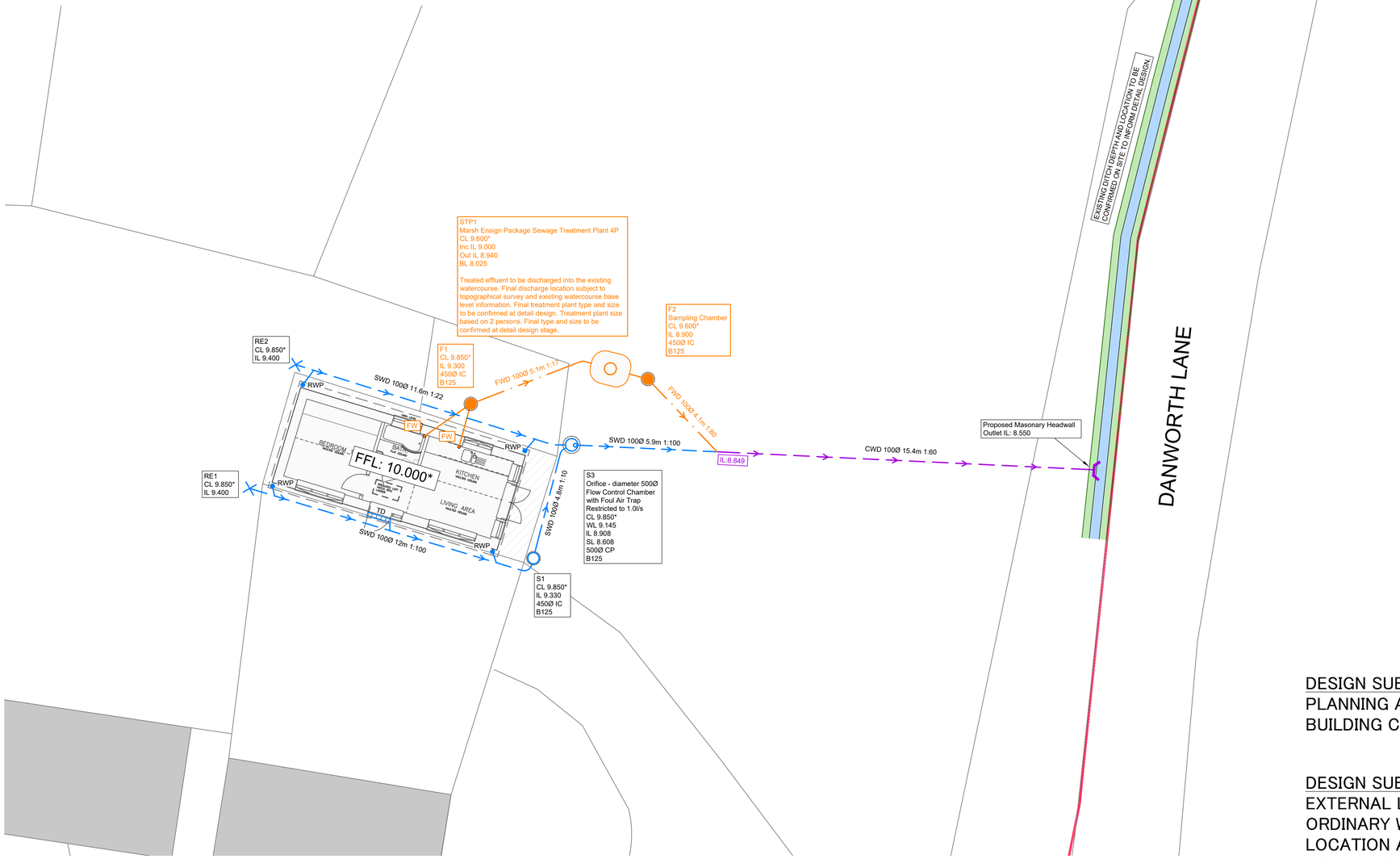
0 5 10
km

Map produced by MAGIC on 31 October, 2022.

7.4 Appendix D – Proposed Drainage Strategy and Hydraulic Calculations



CONTRIBUTING DRAINAGE AREA PLAN (scale 1:100)



PROPOSED DRAINAGE STRATEGY (scale 1:100)

DRAINAGE LEGEND (1:100)

PROPOSED FEATURES

- SWD — Proposed storm water sewer/drain
- TD — Proposed threshold drain channel
- Proposed rainwater pipe (assumed location- tbc by architect)
- Proposed storm water inspection chamber (450Ø)
- Proposed storm water rodding eye
- Proposed storm water orifice flow control chamber (500Ø)
- FWD — Proposed foul water sewer/drain
- FW — Proposed soil stack (assumed location- tbc by architect)
- Proposed foul water inspection chamber (450Ø)
- CWD — Proposed Combined water (Treated effluent and surface water) discharge pipe
- 00.000* — Finished floor level (indicative only for drainage purposes)
- 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
CL	- COVER LEVEL

- Site Boundary (as taken from 'Location Plan' Plan Ref no. TQRQM21221141340686, dated: 09 August 2021)

Site Specific Notes

1. The proposed surface water drainage has been designed based on desktop study. Infiltration method for SW discharge has been ruled out due to the site confirmed to be underlain by Clay soils with poor infiltration characteristics.
2. It is proposed that surface water runoff is discharged into the existing ditch located adjacent to the site along its eastern boundary. Surface water runoff to be discharged at restricted rate of 1l/s.
3. Final discharge design is subject to external levels design and existing ditch depth and exact location.
4. FW and RWP assumed and to be confirmed by the Architect at detail design stage.

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. 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

DESIGN SUBJECT TO THE APPROVAL OF:
PLANNING AUTHORITY
BUILDING CONTROL

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

FOR PLANNING ONLY

REV	DATE	DESCRIPTION	BY	CHK	APP
PL	01.12.22	PRELIMINARY ISSUE	MR	TZ	CS

cgs civils
Consulting Civil Engineers

CLIENT: MR & MRS OCKENDEN

ARCHITECT: SCANDIA HUS

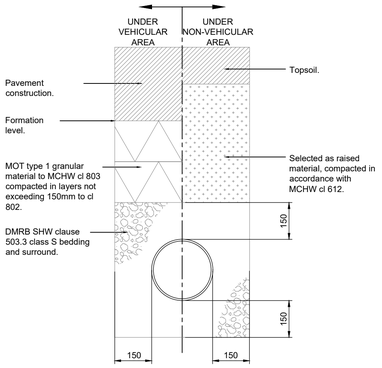
JOB TITLE: WILLOWBROOK, HASSOCKS BN6, 9LW

DRAWING TITLE: PROPOSED DRAINAGE STRATEGY & CONTRIBUTING AREA PLAN

DRAWN	ENGINEER	CHECKED	APPROVED
MR	TZ	TZ	CS

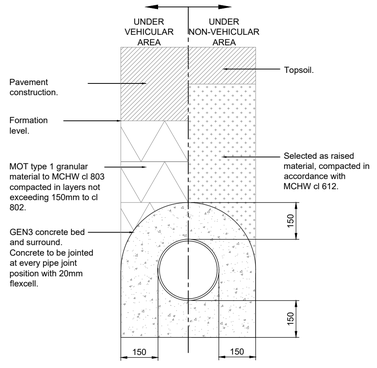
DATE: NOVEMBER 2022 | SCALE @ A1: 1:100

JOB No.	STATUS	DRAWING No.	REV.
C2394	P	100	PL-



Class S granular pipe bed and surround

To be used for plastic, vitrified and concrete pipework where cover to crown is greater than 900mm.

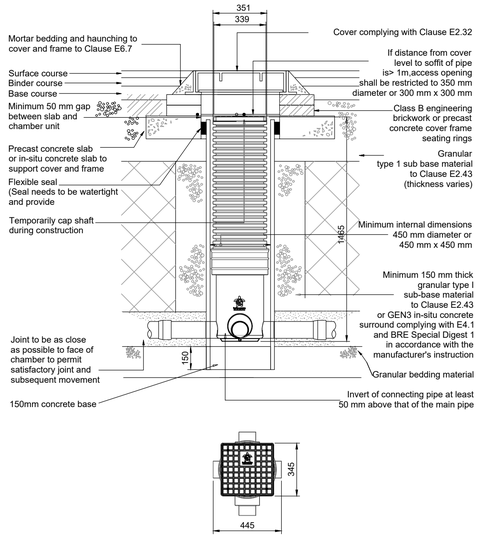


Class Z granular pipe bed and surround

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

Pipe Bedding Details

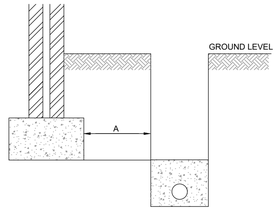
(not to scale)



PRODUCT CODE	MAIN INTEL&OUTLET PIPEWORKØ mm	DRAINAGE FILED OUTLETS Ø mm	OVERALL DEPTH mm	DEPTH TO INVERT mm	DEPTH TO OUTLET mm	APPROX. WEIGHT kg
ASDC300B (BASE)	110-160	3x110	604	374	579	4.5
ASDC300115SP	110-160	3x110	1465	1225	1440	13

Typical Sampling & Distribution chamber detail by Turtle Enviro

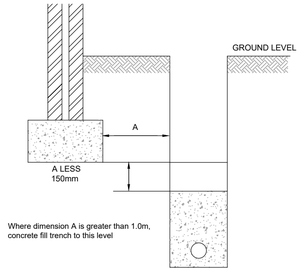
(constructed to manufacturer specification)



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

Pipes near buildings

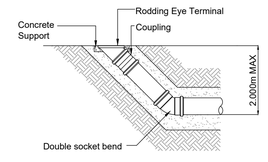
(not to scale)



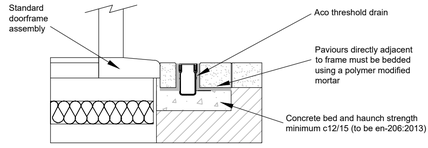
Where dimension A is greater than 1.0m, concrete fill trench to this level

Pipes near buildings

(not to scale)

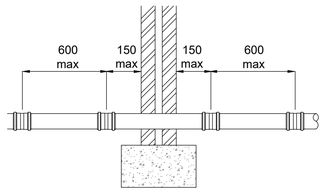


Rodding eye detail



Aco Threshold Drain

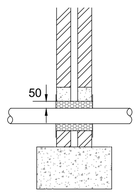
(scale 1:10)



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

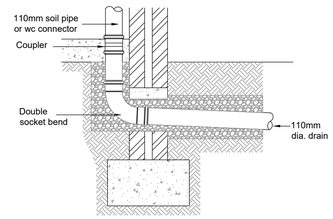
(not to scale)



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.

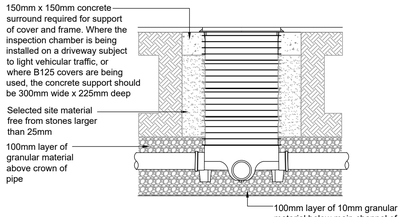
Pipes through wall with lintel detail

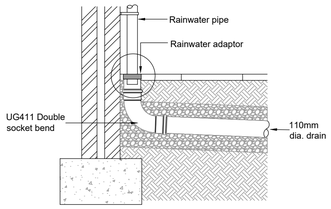
(not to scale)



Soil pipe / wc connection

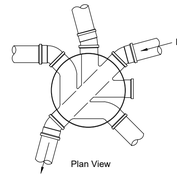
(scale 1:20)





Rainwater pipe connection

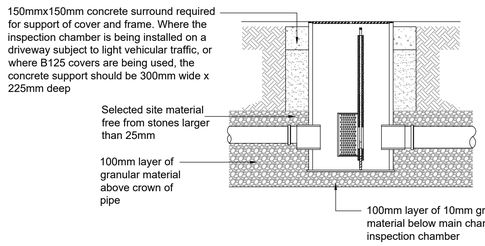
(scale 1:20)



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

460mmØ Inspection chamber detail

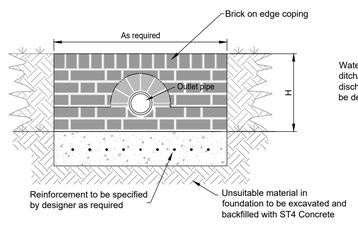
(scale 1:20)



Sel Controflow 500 Orifice Chamber

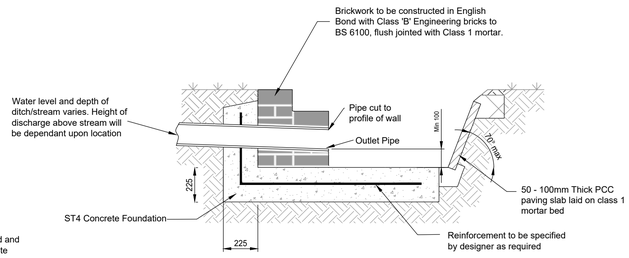
SEL Environmental LTD
Phone: 01254 589987
Email: sales@selenvironmental.com

(scale 1:20)



Elevation of headwall Outfall to pond / side of ditch

(scale 1:20)



Headwall section Outfall to side of ditch

(scale 1:20)

Prefixed to drawing numbers shall signify the following:-

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REV	DATE	DESCRIPTION	BY	CHK	APP
PL	01.12.22	PRELIMINARY ISSUE	MR	TZ	CS

FOR PLANNING ONLY

cgs civils
Consulting Civil Engineers

CLIENT: MR & MRS OCKENDEN

ARCHITECT: SCANDIA HUS

JOB TITLE: WILLOWBROOK, HASSOCKS BN6, 9LW

DRAWING TITLE: PROPOSED TYPICAL CONSTRUCTION DETAILS

DRAWN	ENGINEER	CHECKED	APPROVED
MR	TZ	TZ	CS

DATE	SCALE @ A1
NOVEMBER 2022	AS SHOWN

JOB No.	STATUS	DRAWING No.	REV.
C2394	P	200	PL-

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.300	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
RE1		4.00	9.850	150	6.182	6.644	0.450
S1	0.002	4.00	9.850	450	17.684	3.867	0.568
RE2		4.00	9.850	150	7.933	11.764	0.450
S3	0.002	4.00	9.850	500	19.095	8.522	0.942
Outfall			9.000	150	40.477	7.835	0.450

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	RE1	S1	11.832	0.600	9.400	9.282	0.118	100.0	100	4.26	50.0
1.002	S3	Outfall	21.393	0.600	8.908	8.550	0.358	59.8	100	4.65	50.0
2.000	RE2	S3	11.623	0.600	9.400	8.908	0.492	23.6	100	4.12	50.0
1.001	S1	S3	4.864	0.600	9.282	8.908	0.374	13.0	100	4.29	50.0

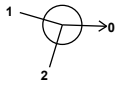
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.769	6.0	0.0	0.350	0.468	0.000	0.0	0	0.000
1.002	0.998	7.8	0.7	0.842	0.350	0.004	0.0	21	0.623
2.000	1.595	12.5	0.0	0.350	0.842	0.000	0.0	0	0.000
1.001	2.154	16.9	0.4	0.468	0.842	0.002	0.0	11	0.877

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	11.832	100.0	100	Circular	9.850	9.400	0.350	9.850	9.282	0.468
1.002	21.393	59.8	100	Circular	9.850	8.908	0.842	9.000	8.550	0.350
2.000	11.623	23.6	100	Circular	9.850	9.400	0.350	9.850	8.908	0.842
1.001	4.864	13.0	100	Circular	9.850	9.282	0.468	9.850	8.908	0.842

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	RE1	150	Manhole	Adoptable	S1	450	Manhole	Adoptable
1.002	S3	500	Manhole	Adoptable	Outfall	150	Manhole	Adoptable
2.000	RE2	150	Manhole	Adoptable	S3	500	Manhole	Adoptable
1.001	S1	450	Manhole	Adoptable	S3	500	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
RE1	6.182	6.644	9.850	0.450	150				
						0	1.000	9.400	100
S1	17.684	3.867	9.850	0.568	450		1	1.000	9.282	100
						0	1.001	9.282	100
RE2	7.933	11.764	9.850	0.450	150				
						0	2.000	9.400	100
S3	19.095	8.522	9.850	0.942	500		1	2.000	8.908	100
							2	1.001	8.908	100
						0	1.002	8.908	100
Outfall	40.477	7.835	9.000	0.450	150		1	1.002	8.550	100

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.300	Additional Storage (m³/ha)	20.0
Summer CV	1.000	Check Discharge Rate(s)	x
Winter CV	1.000	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 %)
1	0	0	0
10	0	0	0
30	0	0	0
100	40	0	0

Node S3 Online Orifice Control

Flap Valve	x	Design Depth (m)	0.600	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	1.0		
Invert Level (m)	8.900	Diameter (m)	0.025		

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE1	1	9.400	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S1	10	9.293	0.011	0.4	0.0025	0.0000	OK
15 minute summer	RE2	1	9.400	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S3	12	8.987	0.079	0.8	0.0191	0.0000	OK
15 minute summer	Outfall	1	8.550	0.000	0.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE1	1.000	S1	0.0	0.000	0.000	0.0026	
15 minute summer	S1	1.001	S3	0.4	0.533	0.024	0.0169	
15 minute summer	RE2	2.000	S3	0.0	0.000	0.000	0.0387	
15 minute summer	S3	Orifice	Outfall	0.4				0.3

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

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE1	1	9.400	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S1	10	9.296	0.014	0.7	0.0032	0.0000	OK
15 minute summer	RE2	1	9.400	0.000	0.0	0.0000	0.0000	OK
30 minute summer	S3	21	9.112	0.204	1.2	0.0488	0.0000	SURCHARGED
15 minute summer	Outfall	1	8.550	0.000	0.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE1	1.000	S1	0.0	0.000	0.000	0.0039	
15 minute summer	S1	1.001	S3	0.7	0.533	0.041	0.0206	
15 minute summer	RE2	2.000	S3	0.0	0.000	0.000	0.0455	
30 minute summer	S3	Orifice	Outfall	0.6				0.8

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

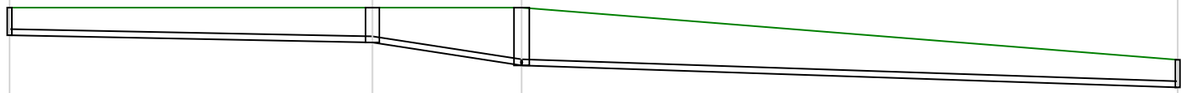
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE1	1	9.400	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S1	10	9.298	0.016	0.9	0.0036	0.0000	OK
15 minute summer	RE2	1	9.400	0.000	0.0	0.0000	0.0000	OK
30 minute summer	S3	21	9.172	0.264	1.6	0.0632	0.0000	SURCHARGED
15 minute summer	Outfall	1	8.550	0.000	0.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE1	1.000	S1	0.0	0.000	0.000	0.0047	
15 minute summer	S1	1.001	S3	0.9	0.533	0.053	0.0209	
15 minute summer	RE2	2.000	S3	0.0	0.000	0.000	0.0455	
30 minute summer	S3	Orifice	Outfall	0.7				0.9

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE1	1	9.400	0.000	0.0	0.0000	0.0000	OK
30 minute summer	S1	22	9.394	0.112	1.5	0.0255	0.0000	SURCHARGED
15 minute summer	RE2	1	9.400	0.000	0.0	0.0000	0.0000	OK
30 minute summer	S3	22	9.394	0.486	3.0	0.1162	0.0000	SURCHARGED
15 minute summer	Outfall	1	8.550	0.000	0.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE1	1.000	S1	0.0	0.000	0.000	0.0362	
30 minute summer	S1	1.001	S3	1.5	0.533	0.088	0.0381	
15 minute summer	RE2	2.000	S3	0.0	0.000	0.000	0.0455	
30 minute summer	S3	Orifice	Outfall	0.9				1.7

Node Name		RE1	S1	S3	Outfall
A3 drawing Hor Scale 200 Ver Scale 100 Datum (m) -1.000					
Link Name		1.000	1.001	1.002	
Section Type		100mm	100mm	100mm	
Slope (1:X)		100.0	13.0	59.8	
Cover Level (m)		9.850	9.850	9.850	9.000
Invert Level (m)		9.400	9.282 / 9.282	8.908 / 8.908	8.550
Length (m)		11.832	4.864	21.393	

Node Name		RE2	S3
			
A3 drawing Hor Scale 200 Ver Scale 100 Datum (m) -1.000			
Link Name		2.000	
Section Type		100mm	
Slope (1:X)		23.6	
Cover Level (m)		9.850	9.850
Invert Level (m)		9.400	8.908
Length (m)		11.623