RonkeDesigns
Civil & Structural Consultant

Sustainable Drainage System (SUDS) Strategy

For

1 Quarry Way, Southwater, West Sussex, RH13 9ST

Job Number: 15058

Revision	Date	Comment
A	January 2025	Issued for Information

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1. Introduction

1.1. Ronke Designs has been appointed by Atlas Construction to prepare a drainage strategy in relation to 1 Quarry Way, Southwater Horsham, RH13 9ST.

1.2. The drainage strategy aims to provide controlled storm water discharge and water quality in accordance with the following codes of practice:

- London Plan Policy 5.12 Flood Risk Assessment
- London Plan Policy 5.13 Sustainable Drainage
- London Plan Policy 5.14 Water Quality and Wastewater Infrastructure
- London Plan Policy 5.15 Water Use and Supplies
- Environment Agency Modelled
- Topographic site survey

1.3. The proposed drainage system has been developed to follow familiar tried and tested techniques used on many projects. The proposed drainage construction is within the scope and capability of a competent contractor with previous below ground drainage construction experience.

1.4. Ronke Designs Civil & Structural Consultant makes no representation whatsoever concerning the legal significance of its findings or any other matters referred to in the following report. Except as otherwise requested by the client, Ronke Designs Civil & Structural Consultant are not obliged and disclaim any obligation to update the report for events taking place after the Assessment was undertaken.

1.5. The conclusions of this report are that this development is appropriate for the location from a drainage perspective and subject to appropriate detailed design the proposed drainage strategy will provide adequate levels of sustainable drainage strategy and flood protection for the lifetime of the development. Whilst, as with any site, there are detailed design criteria to be addressed as part of the overall foul and surface water drainage design, these items can be accommodated in the design of the new development and there is nothing from a drainage design perspective to prevent the development.

2. Development Proposals

2.1. The development proposal involves the construction of new residential accommodation in Appendix A.

2.1 Existing and Proposed external levels of the site are generally between 50.45 and 50.72m above Ordnance Datum (AOD).

2.2 Approximately 60% of the external hard standing areas are to be positively drained.

2.3 There are no further significant surface water features of note in the vicinity of the site.

2.4 British Geological Survey Mapping indicates that the bedrock geology beneath the site is

sandstone sedimentary bedrock formed between 133.9 and 130.8 million years ago during the Cretaceous period. This is a good permeability geology with high risk and soluble rock risk groundwater present (flood risk zone 1).

2.5 The proposed site is roughly rectangular in shape, occupies a total area of around 0.0173 hectares and is currently an overgrown shrub area with soft and partially hardstanding.

3. Existing Site Description

3.1. Existing Site

3.1.1 The existing site is located west of Quarry Way, north of Station Road and east of Worthing Road (Appendix A – Site Location Plan) in Southwater.

3.1.2 The Local Authority is Horsham District Council.

3.1.3 There are no further significant surface water features of note in the vicinity of the site.

3.1.4 The Ordnance Survey National Grid reference to the centre of the site is 51.025910, -0.35194069.

3.1.5 Wardell Survey Partnership Topographical survey drawing (Appendix B – Topographical Survey) indicates the roadway falls gently from north to south.

3.2 Existing Geology

3.2.1 Using British Geotechnical Survey borehole TQ12NE144 geotechnical investigation (Appendix C1 – British Geotechnical Survey borehole) have been used to determine the strata. The subsoil shown in the geotechnical report is weald clay and can be considered to have a poor infiltration coefficient (see Figure 1) or bad permeability. Therefore, permeable paving will be the preferred option to minimise surface water discharge into the public sewer and control water into the rainwater harvesting tank. It is considered that the proposals meet both the requirements of Horsham District Council and the Local Authority.

Strata name	Characteristic infiltration rate m/s	
	BGS	SuDS Manual
Langley Silt (Brickearth)	2 to 9 x 10^{-8}	2 x 10^{-5} to 2 x 10^{-7} (silt loam)
Alluvium Clayey sand Peat	 1 x 10^{-6} 1 x 10^{-9}	 Variable
River Terrace Gravel Boyn Hill, Kempton Park, Taplow, Lynch Hill	1 x 10^{-3} to 1 x 10^{-5}	3 x 10^{-2} to 3 x 10^{-5}
London Clay	3 x 10^{-9} to 3 x 10^{-11}	< 3 x 10^{-8}

Soil type	Typical infiltration coefficients (m/h)
Good infiltration media	
Gravel	10-1000
Sand	0.1-100
Loamy sand	0.01-1
Sandy loam	0.05-0.5
Loam	0.001-0.1
Silt loam	0.0005-0.05
Chalk	0.001-100
Sandy clay loam	0.001-0.1
Poor infiltration media	
Silty clay loam	0.00005-0.005
Clay	<0.0001
Till	0.00001-0.01
Rock	0.00001-0.1

Ciria C697 – The SUDS Manual

Design & construction of concrete block permeable pavements – 7th Edition in 2018

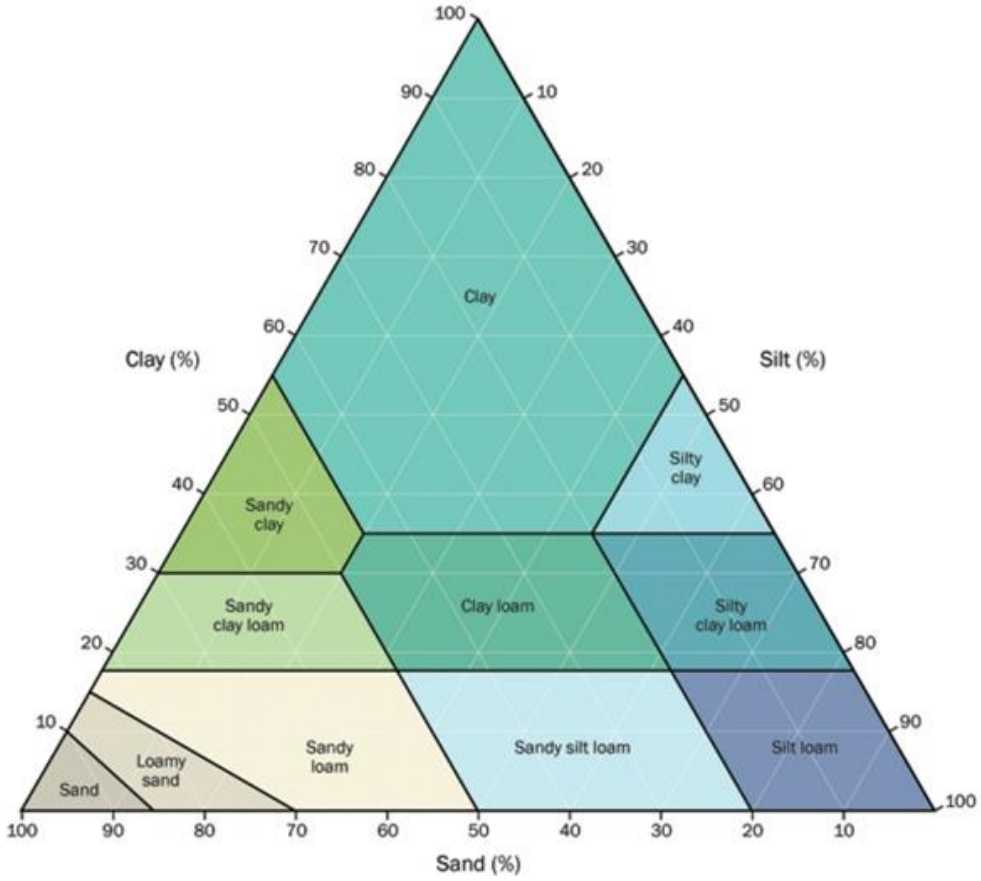


Figure 1 - British Geological Survey, WN97/27 *The Engineering Geology of the London Area* A. Forster BGS

3.3 Existing Drainage Network

3.3.1 The existing Southern Water sewer asset locations have been obtained from Southern Water (Appendix D1 – Southern Water Asset Location). There is an existing Southern Water foul sewer between Worthing Road and the rear of the proposed development. A private surface water interceptor can be found at the front of the development adjacent to Quarry Way.

3.3.2 A CCTV survey is to be undertaken prior to any work on site to determine the viability of reusing the existing drainage network.

3.4 Hydrogeology Setting

3.4.1 Information from the Environment Agency and Department for Environment, Food and Rural Affairs provided by Magic Map (Appendix E – Hydrogeology Setting) indicates the groundwater vulnerability classification of this area as high aquifer, aquifer designation area is Secondary A and outside source protection.

3.4.2 Department for Environment, Food and Rural Affairs has published the peak rainfall allowance for the site as 3.3% (Appendix E – Peak Allowances).

3.5 Proposed Surface Run-off

3.5.1 The proposed Greenfield Runoff Rate Estimation has been calculated using Wallingford calculations and Autodesk Infodrainage Flood Estimation Handbook Appendix F table for a 1 in 100 years return and allowance for 40% climate change. Refer to Appendix F Existing Greenfield Runoff Rate Estimate.

3.5.2 The result indicates the rural Qbar value for the site is 0.042 litre per second and for an increase of 40% of the hardstanding.

3.5.3 In addition, the existing site run-off rates for a small development scheme is estimate at 1.5 litre per second.

4. Proposed Drainage

4.1 Proposed Wastewater Flow Rate

4.1.1. A new foul drainage network will be installed on site to be connected to the existing drainage. The construction of this network will be subject to a Southern Water Section 106 and pre-application application for an indirect / new connection. A peak foul drainage discharge rate of 1.9 litres per second / population peak 0.012 litres per second will be discharged into the Southern Water sewer. Refer to Appendix G Wastewater Flow Rate.

4.2. Proposed Surface Water Run-off

4.2.1 The proposed solution for surface water runoff (as shown in Figure 4) from the development has considered Sustainable Drainage Systems (SUDS) hierarchical approach to provide the most appropriate drainage technique. The aim of SUDS is to drain a site in a sustainable manner with consideration of outflow from the site together with water quality, biodiversity and amenity. It is a requirement of all developments to consider SUDS to offer a robust approach to managing rainfall events that exceed normal design consideration. This is highlighted both in the London Plan and local plans. Failure to implement a carefully considered surface water management plan is likely to result in peak flows to a local watercourse and in turn exacerbate flood risk downstream.

4.2.2 The following table gives details of SUDS options relevant to this site. The most sustainable option for the discharge of the surface water subject to infiltration testing will be permeable paving (see figure 5 - Typical permeable paving). Preliminary calculations have been completed to determine the brownfield runoff rates for the existing site for each return period. The discharge for infiltration into the ground will be restricted to the 1 in 100-year plus 40% climate change rate of 0.1 l/s (see figure 4 – Brownfield Run-off).

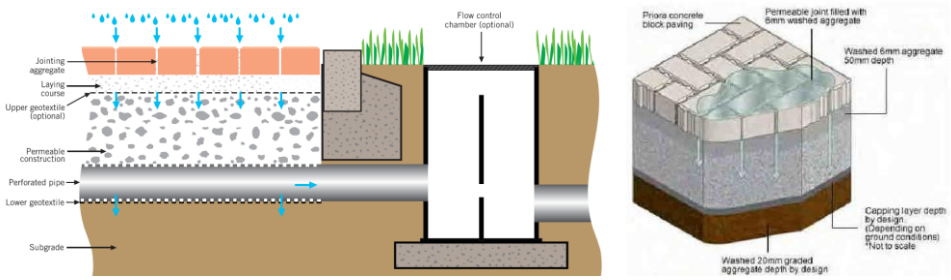
4.2.3 The foul water network design will be subject to a Southern Water pre-application and Section 106 and application for an indirect and new connection.

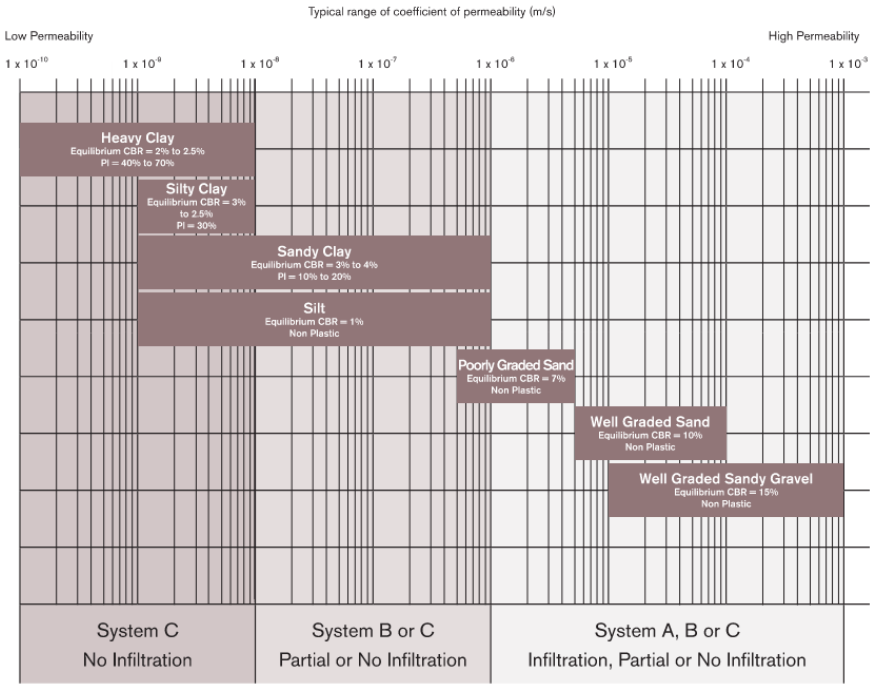
4.2.4 Rainwater harvesting to be installed in accordance with SAPS Water Neutrality Statement. The rainwater harvesting tank provides a mini surface water storage source of water for plant irrigation, washing machine, flushing water closet, etc. It would be prudent to include a water main top up in the system to provide minimum amount of water.



Figure 2 – Rainwater Harvesting Tank

4.2.5 Permeable paving allows water to permeate through the paving build-up into the strata for infiltration and ensure that the surface water does not surcharge the drainage network. The surface water will be held in a permeable structure to delay the water discharge into the rainwater harvest tank and infiltration into the sub-strata below.





Note: A significant proportion of clay and silt (>15% of particles less than 63μm) will reduce the permeability and CBR values of sand and of gravels.

Soil Type	Plasticity Index	Guideline equilibrium CBR Value for CBPP design [1, 3] (%)
Heavy Clay	70	2
	60	2
	50	2
	40	2.5
Silty Clay	30	3
Sandy Clay	20	4
	10	3
Silt [2]	--	1
Sand (Poorly Graded)	--	7
Sand (Well Graded)	--	10
Sandy Gravel (Well Graded)	--	15

Traffic category	Standard axles per day	msa	NRSWA[1] Road Type	Typical application
11	Areas with axle loads greater than permitted by the Construction and Use Regulations are not included in this document.			
10	≤8 000	≤60	0	Adopted highways and commercial/ industrial developments used by a high number of commercial vehicles Ports and airport landside Bus stops and bus lanes
9	≤4 000	≤30	1	
8	≤1 500	≤10	2	
7	≤350	≤2.5	3	
6	≤70	≤0.5	4	Adopted highways and other roads used by a moderate number of commercial vehicles Pedestrian areas subjected to regular overrun of commercial vehicles. Industrial premises Petrol station forecourts
5	≤7	≤0.05		Pedestrian areas subjected to occasional overrun of commercial vehicles Car parks receiving occasional commercia¦ vehicular traffic Railway platforms excluding edge
4	1	N/A		Urban footways with no planned vehicular overrun Pedestrian areas used by light commercial vehicles, emergency vehicles and maintenance vehicles
3	0			Small car parks subject to car, light van and motorcycle access
2	0			Pedestrian and cycle areas, domestic driveways
1	0			Pedestrian-only areas, including domestic applications
0	0			No requirement (decoration)

Traffic category	Concrete paving units – minimum thickness	Laying course – nominal thickness	Base – HBCGA or AC	Sub-base – CGA or Type 3	Design basis
11		Areas with axle loads greater than permitted by the Road Vehicles (Construction and Use) Regulations (1986) as amended are not included in this document			
10		Site specific using Interpave guide for heavy duty pavements (Knapton, 2008)			Knapton (2008)
9		Site specific using Interpave guide for heavy duty pavements (Knapton, 2008)			Knapton (2008)
8	80 mm	50 mm	300 mm HBCGA or 220mm AC32	150 mm	ICPI Permeable Design Pro
7	80 mm	50 mm	200 mm HBCGA or 130mm AC32	150 mm	
6	80 mm	50 mm	125 mm HBCGA or 90mm AC32	150 mm	
5	80 mm	50 mm	100 mm HBCGA or 70mm AC32	150 mm	
4	80 mm	50 mm	--	300 mm	Knapton et al (2012) and ICPI Permeable Design Pro
3	60 mm	50 mm	--	225 mm	
2	60 mm	50 mm	--	150 mm	
1	60 mm	50 mm	--	100 mm	
0	60 mm	50 mm		Sufficient to provide suitable construction base	

Figure 3 – Permeable Pavement

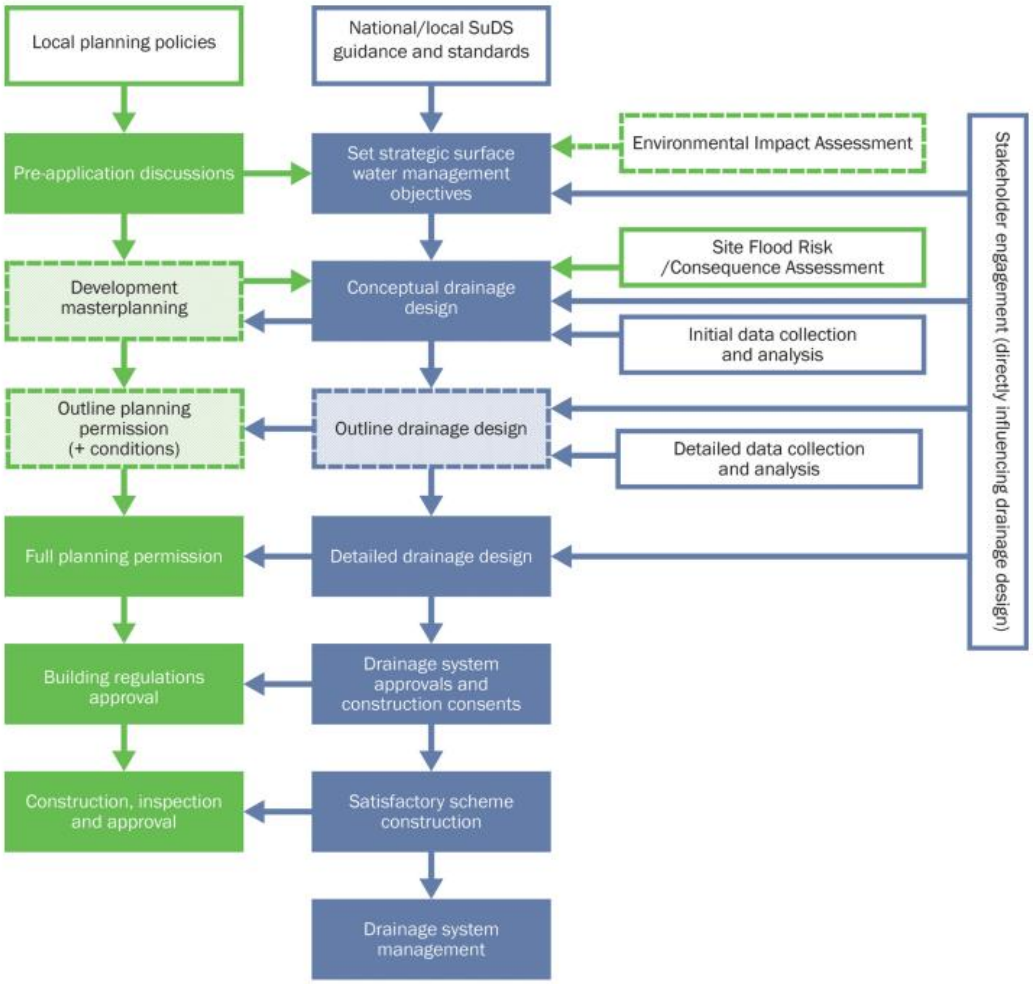


Figure 4 – Extract of CIRIA SUDS Hierarchy

SUDS OPTIONS AND SUITABILITY					
SUDS Feature	**Water Quality Improvements**	**Ground-water Recharge**	**Suitability for Site Ground Conditions**	**Site Specific Recommendations**	**Use on this Site**
Green Roofs	Yes	No	No	Not in character with surrounding buildings	No
Soakaways	No	No	No	Not acceptable due to restricted site area.	No
Swales	No	No	No	Not in character with surrounding buildings	No
Ponds	No	No	No	Not in character with surrounding buildings	No
Attenuation Tank	No	No	No	Not acceptable due to site area and within zone of structural influence.	No
Rainwater Harvest Tank	Yes	No	Yes	In accordance to local authority guideline, refer to SAP Water Neutrality Statement	Yes
Permeable Paving	No	Yes	Yes	The ground conditions are considered permeable for paving. (Infiltration testing to be undertaken).	Yes

Figure 5 – SUDS Options

BROWNFIELD RUN-OFF	
Storm Return Period	**Outflow**
	litres per second
QBar	0.1
1 in 1	0.1
1 in 30	0.1
1 in 100	0.1
1 in 100 plus 40%	0.1

Figure 6 – Brownfield Run-off

5. Foul and Surface Water Operational Maintenance

5.1. Proposed Maintenance Strategy

5.1.1 The below ground drainage strategy provides an overview of typical non-intrusive visual inspection to be undertaken. Thereby, ensuring that any defects can be discovered prior to any failure through the lifetime of the building. The drainage strategy is typically included in the Health and Safety manual of the building.

5.2. Proposed Pavement Maintenance Strategy

5.2.1. The permeable paving maintenance strategy relies on non-intrusive visual checks of top of the pavement to ensure that gap between the pavement are not clog from debris and silt. Refer to Figure 6 for permeable pavement Operational Maintenance Strategy.

5.3. Proposed Rainwater Harvesting Maintenance Strategy

5.3.1. The Rainwater Harvesting Tank maintenance strategy relies on non-intrusive visual checks of the incoming drain and manhole for debris and silt. Refer to Figure 7 for Rainwater Harvesting Tank Operational Maintenance Strategy excluding the mechanical and electrical to specialist specification.

5.4. Proposed Inspection Chamber / Manhole Maintenance Strategy

5.4.1. The Inspection Chamber / Manhole / Catch Pit maintenance strategy relies on non-intrusive visual checks of the incoming drain and manhole for debris and silt. Refer to Figure 9 for Inspection Chamber / Manhole / Catch Pit Operational Maintenance Strategy.

Operation and maintenance requirements for sump pump		
Maintenance schedule	**Required action**	**Typical frequency**
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 6 months, then annually
	Remove debris from tank	Monthly
	Remove sediment from tank	Annually, or as required
	Repair / rehabilitate inlets, outlet, overflows and vents	As required
Remedial actions	Inspect / check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
Monitoring	Survey inside of sump pump for sediment build-up and remove if necessary	Annually

Table 7 – Rainwater Harvest Tank Operational Maintenance Strategy

Operation and maintenance requirements for Permeable Pavement		
Maintenance schedule	**Required action**	**Typical frequency**
Regular maintenance	Check pavement surface for blockage by sediment, algae or other matter; remove from the pavement surface as necessary.	Annually, or as required
Remedial actions	Repair / rehabilitate pavement surface	As required
Monitoring	Inspect / check all inlets, outlets and overflows to ensure that they are in good condition and operating as designed	Annually
	Drainage survey towards permeable pavement with CCTV via inspection chamber and drain for sediment build-up and structural integrate.	Every 5 years or as required

Figure 8 – Permeable Pavement Operational Maintenance Strategy

Operation and maintenance requirements for Inspection Chamber, Manhole and Catch Pit		
Maintenance schedule	**Required action**	**Typical frequency**
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 6 months, then annually
	Remove debris from manhole	Monthly
	Remove sediment from manhole	Annually, or as required
	Repair / rehabilitate inlets, outlet, overflows and vents	As required
Remedial actions	Inspect / check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually

Figure 9 for Inspection Chamber / Manhole / Catch Pit Operational Maintenance Strategy

6. Conclusion

6.1. The Sustainable Drainage System report demonstrates that the surface water runoff from the site can be managed sustainably in accordance with the following:

- Horsham District Council – Level 1 update and Level 2 Strategic Flood Risk Assessment.
- National Planning Policy Framework.
- SSG Appendix C - Design and Construction Guidance for foul and surface water sewers offered for adoption

6.2. Permeable paving will be provided for external footpath areas to provide appropriate treatment of runoff in line with latest CIRIA guidance.

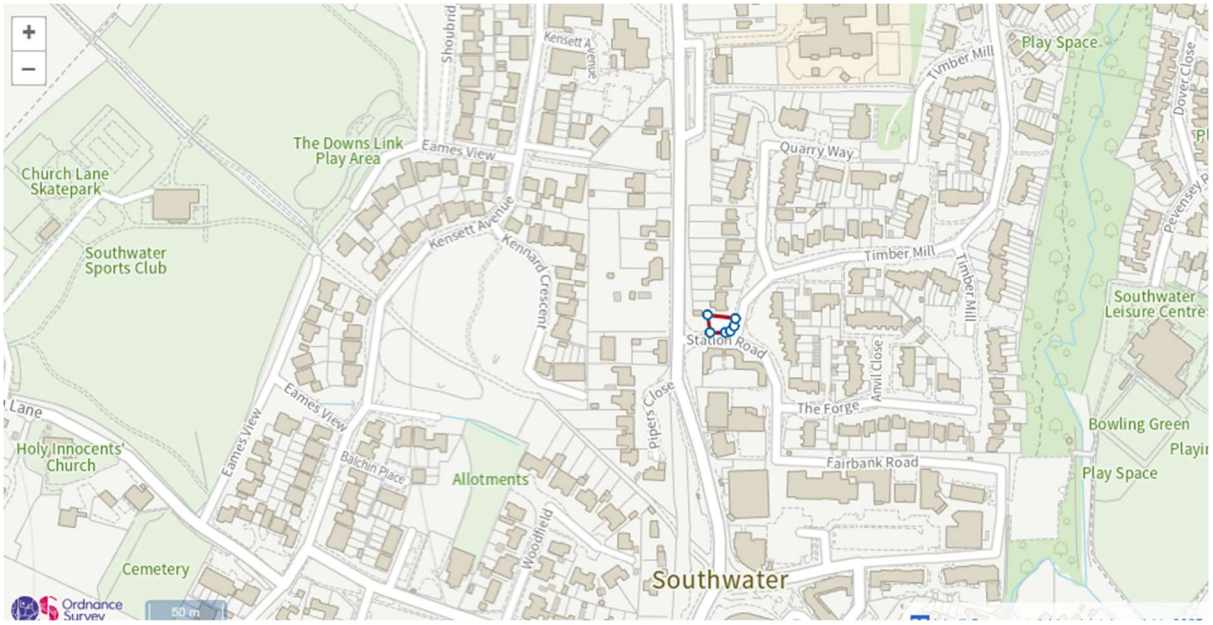
6.3. Permeable paving will be required to restrict the runoff to 0.1 l/s rate, which considers all storm durations and 40% climate change.

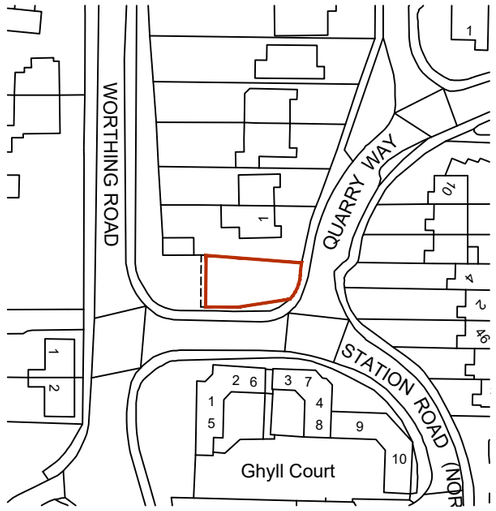
6.4. The proposed maintenance strategy should be reviewed regularly and modified to suit the site conditions.

RonkeDesigns
Civil & Structural Consultant

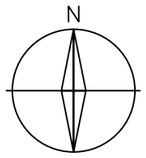
Appendix

A1 – Site Location Plan





Existing Site Plan
Scale 1:1250



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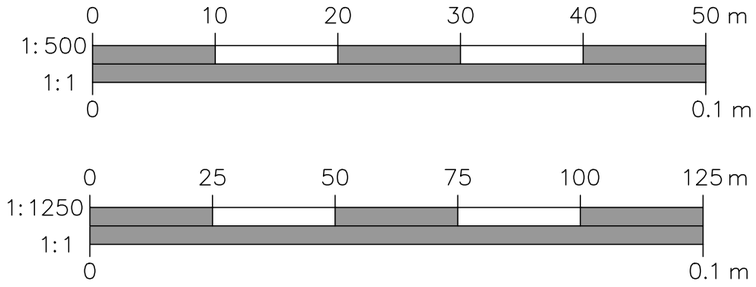
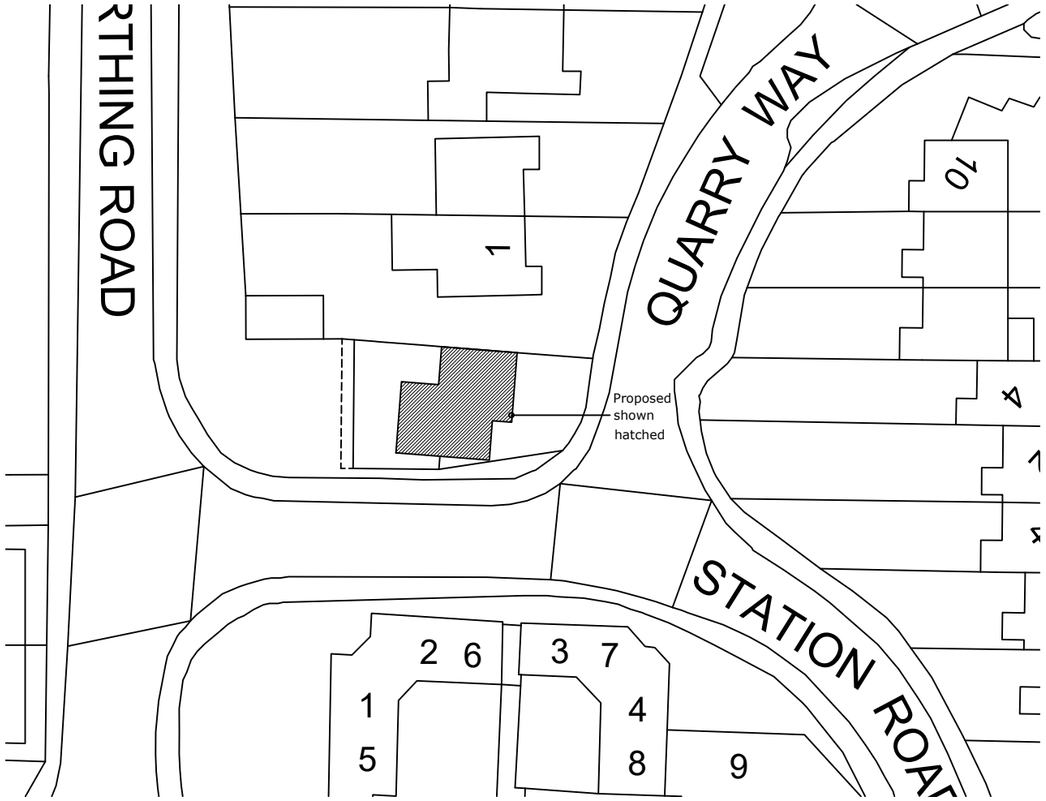
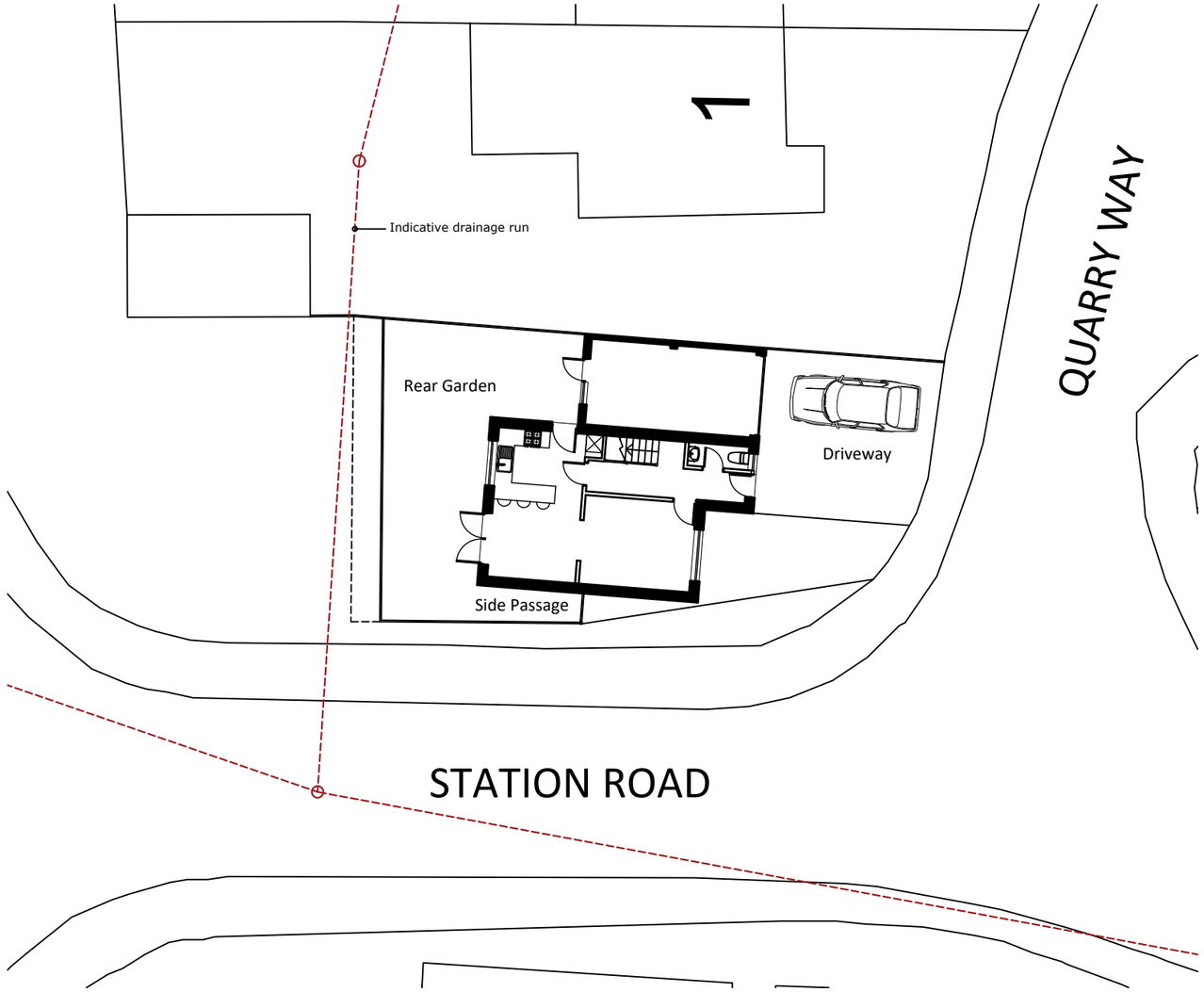


- All materials to Local Authority approval and to match existing unless noted otherwise.
- Any proposed construction within 3m of neighbouring boundaries subject to party wall agreement by party wall surveyor to be appointed by the client.
- Any proposed construction by boundary to be offset min 50mm from boundary with nothing to overhang boundary
- Contractor to confirm boundary locations on site



Proposed Block Plan
Scale 1:500



Proposed Site Plan
Scale 1:200

B	Updated to Highways comments	SM	04.08.22
A	Updated to Highways comments	SM	04.08.22

BLACKSTONE ARCHITECTS

BLACKSTONE ARCHITECTS
SUITE THIRTY TWO
NEW HOUSE
67/68 HATTON GARDEN
LONDON EC1N 8JY
0207 0960907
INFO@BLACKSTONEARCHITECTS.COM
WWW.BLACKSTONEARCHITECTS.COM

NEW BUILD HOUSE

LAND TO SOUTH OF 1 QUARRY WAY, SOUTHWATER, WEST SUSSEX RH13 9ST

LOCATION & BLOCK PLAN
AS SHOWN @ A3 - S.M.

377-001B
AUGUST 2022

Appendix
B1 – Topographical Survey

Wardell Survey Partnership

LAND , BUILDING , SETTING OUT SURVEYS

40 Marley Gardens,
Battle, East Sussex, TN33 0DJ
Email. w.s.p@live.co.uk
Tel. 01424584442 Mobile. 07711288622

Job:

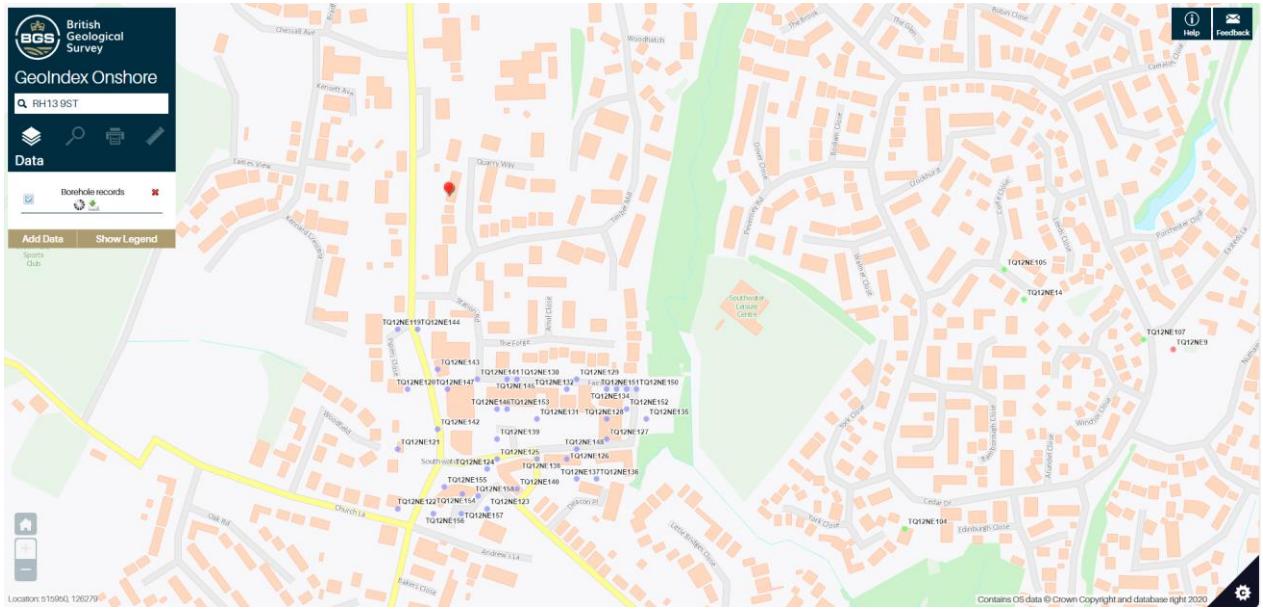
Title: 1 QUARRY WAY HORSHAM LAND SURVEY

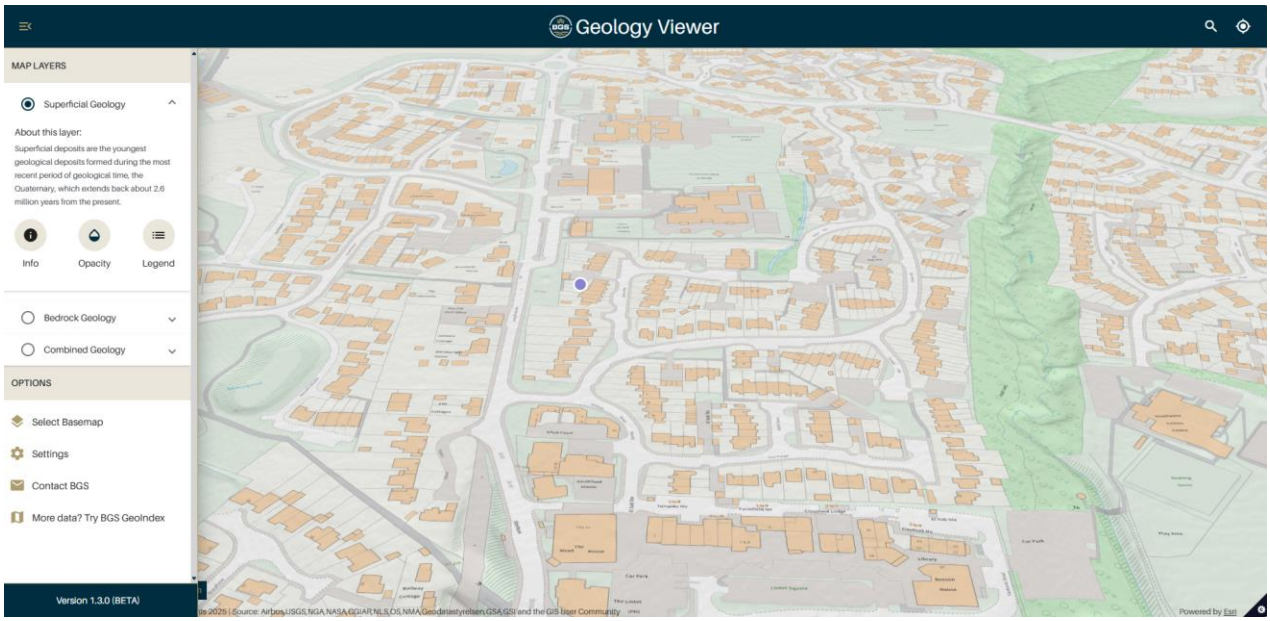
Client: Atlas Construction

Scale:	Date:
1/100	25/11/2024
Drawn: A.Martin	Checked: –
Dwg No: 2530	Rev

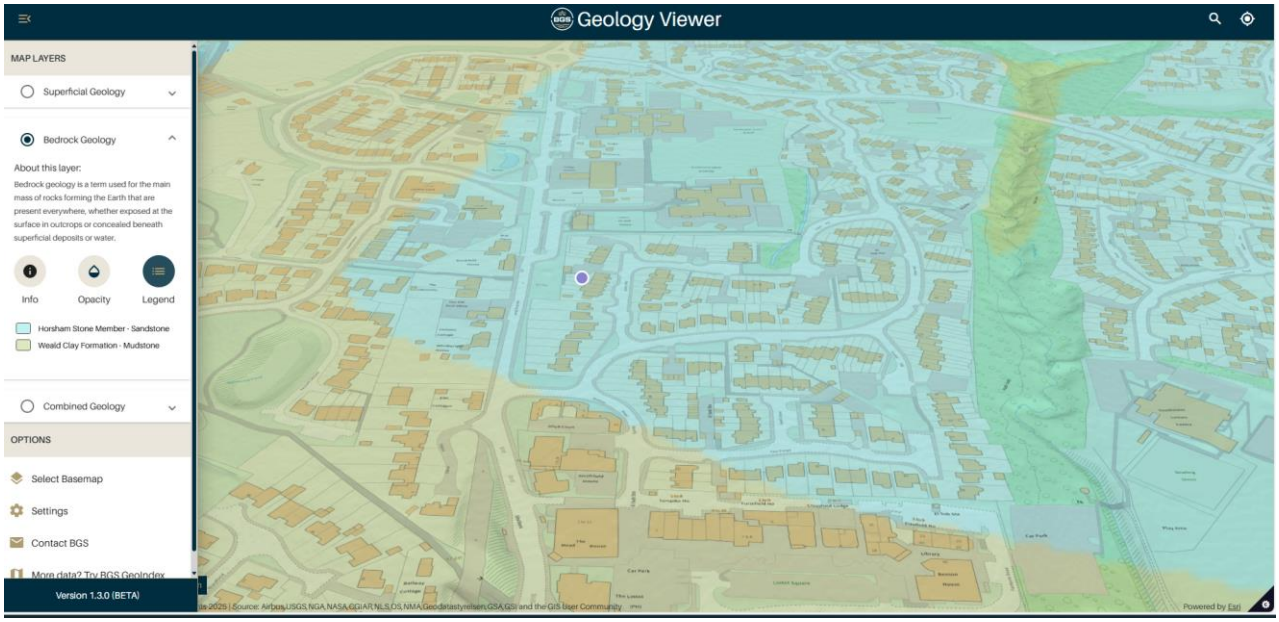
Appendix

C1 – British Geotechnical Survey borehole





Superficial deposits are the youngest geological deposits formed during the most recent period of geological time, the Quaternary, which extends back about 2.6 million years from the present.



Bedrock geology is a term used for the main mass of rocks forming the Earth that are present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

British Geological Survey

Site	Borehole Number
Southwater Village - The Downlink Centre	BH29

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion		45.10	Miller Construction (UK) Ltd.	P3071
	Location: 515653 E 126420 N	Dates: 10/03/2004	Engineer	Sheet: 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.10	D01				44.90	0.20	MADE GROUND : Concrete with 6mm metal reinforcement.		
					44.80	0.30	MADE GROUND : SUBBASE.		
0.50-0.50	D01						Stiff, extremely closely fissured, mottled grey and light brown CLAY. (WEALD CLAY)		
0.50-0.50	D02								
0.50-0.50	D01					(0.90)			
1.20-1.65	CPT N=28			2,3/4,7,7,10	43.90	1.20	Very weak, indistinctly thinly laminated, extremely closely fissured, mottled, light brown and grey MUDSTONE. (WEALD CLAY)		
1.20-2.00	B01								
1.40-1.40	D03					(1.25)			
2.00-2.45	CPT N=62			5,6/7,13,20,22					
				10/03/2004	42.65	2.45	Complete at 2.45m		

Remarks
1. Hand dug service inspection pit from ground level to 1.20m bgl. 2. Borehole backfilled with arisings on completion. 3. Borehole remained dry during excavation.

Scale (approx)	Logged By
1:50	JPW

Figure No.

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

Appendix D

D1. Southern Water Asset Location Search

from Southern Water

Directorate of Planning
Horsham District Council
Parkside
Chart Way
Horsham
West Sussex
RH12 1RL

Your ref
DC/22/1538

Our ref
DSA000015577

Date
15/09/2022

Contact
Tel 0330 303 0119

Dear Sir/Madam,

Proposal: Erection of 1no. 3-bed detached dwellinghouse with a single garage and additional off road, car parking space.
Site: DC/22/1538: - Land 1 Quarry Way, Southwater, West Sussex RH13 9ST.

Thank you for your letter dated 26/08/2022.

Southern Water requires a formal application for a connection to the public foul and surface water and sewer to be made by the applicant or developer.

To make an application visit Southern Water's Get Connected service: developerservices.southernwater.co.uk and please read our New Connections Charging Arrangements documents which are available on our website via the following link: southernwater.co.uk/developing-building/connection-charging-arrangements

In situations where surface water is being considered for discharge to our network, we require the below hierarchy for surface water to be followed which is reflected in part H3 of the Building Regulations. Whilst reuse does not strictly form part of this hierarchy, Southern Water would encourage the consideration of reuse for new developments.

- Reuse

- Infiltration

- Watercourse

- Storm sewer

- Combined Sewer

Guidance on Building Regulations is here:
gov.uk/government/publications/drainage-and-waste-disposal-approved-document-h

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It is possible that a sewer now deemed to be public could be crossing the development site. Therefore, should any sewer be found during construction works, an investigation of the sewer will be required to ascertain its ownership before any further works commence on site.

Southern Water has noted that the applicant has submitted a Water Neutrality report which we understand the Local Planning Authority will be working in conjunction with Natural England on reviewing the developer's proposals. We would not comment on the developer's proposals directly, however if the LPA have any specific questions, they can be forwarded to us for a direct response.

For further advice, please contact Southern Water, Southern House, Yeoman Road, Worthing, West Sussex, BN13 3NX (Tel: 0330 303 0119).

Website: southernwater.co.uk or by email at: SouthernWaterPlanning@southernwater.co.uk

Yours faithfully,

Future Growth Planning Team
Business Channels

southernwater.co.uk/developing-building/planning-your-development

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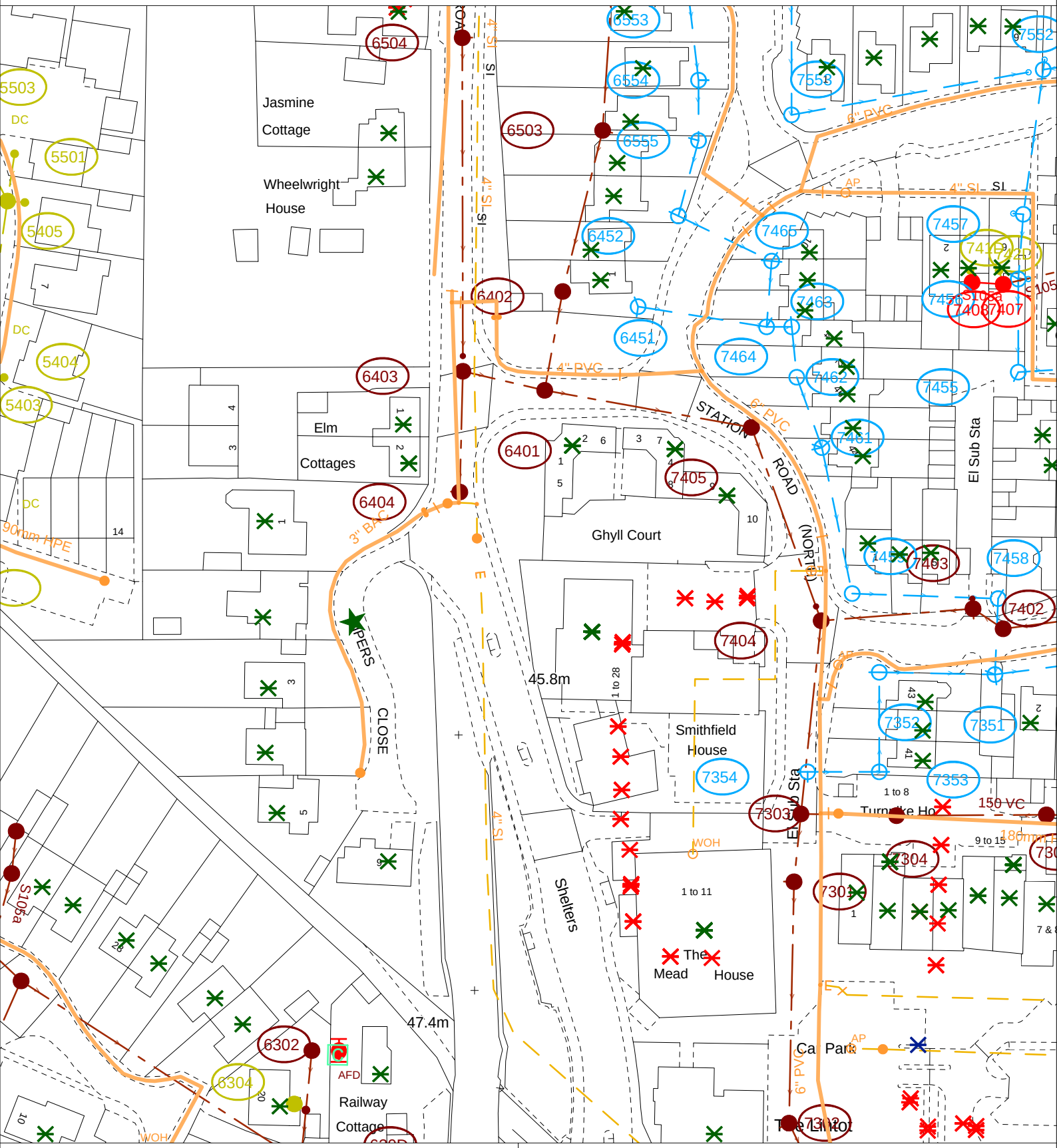
SOUTHERN WATER



The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site.

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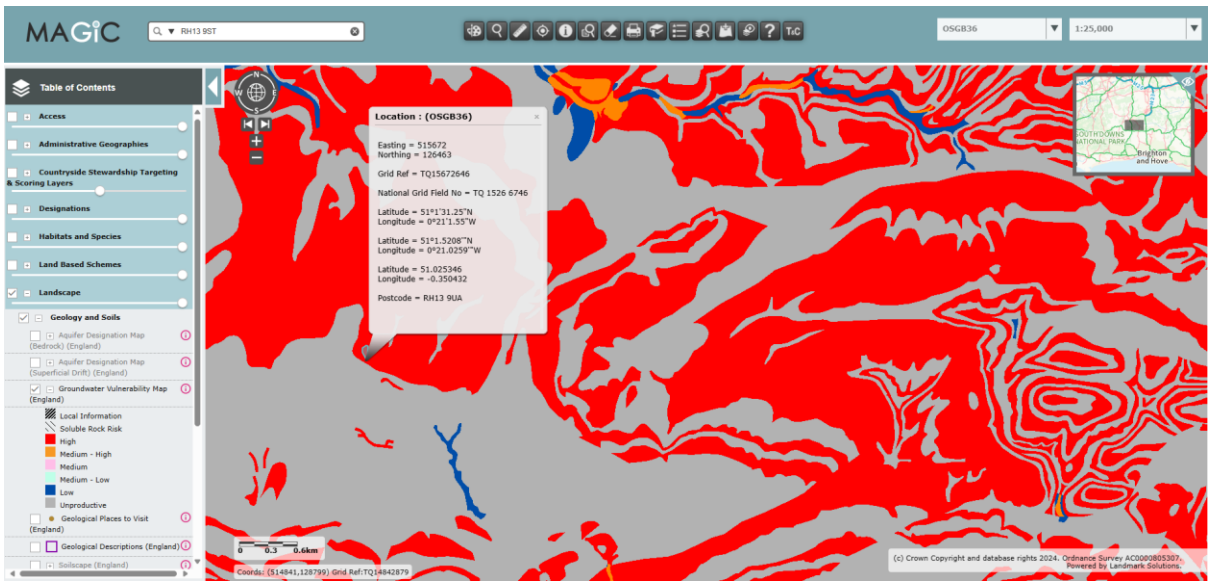
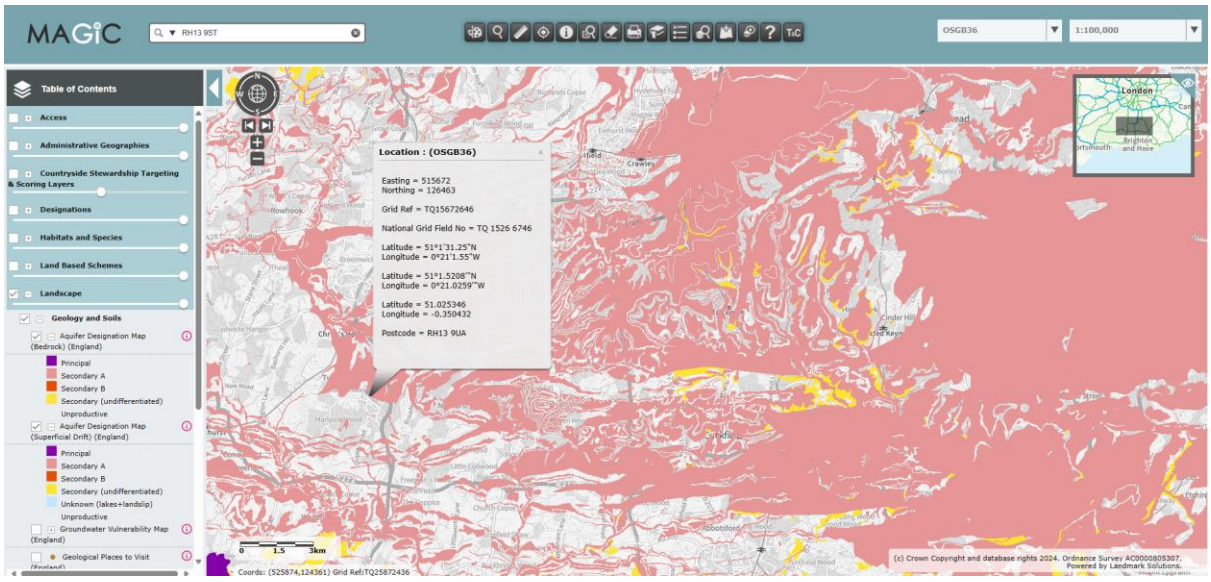
Southern Water

O.S. REF: TQ1526SE	Scale: 1:1000	Printed By: vsveena	Date: 12-9-2022
Screen Print		Southern Water MapGuide Browser	
WARNING: BAC pipes are constructed of Bonded Asbestos Cement		Requested By:	
WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement			

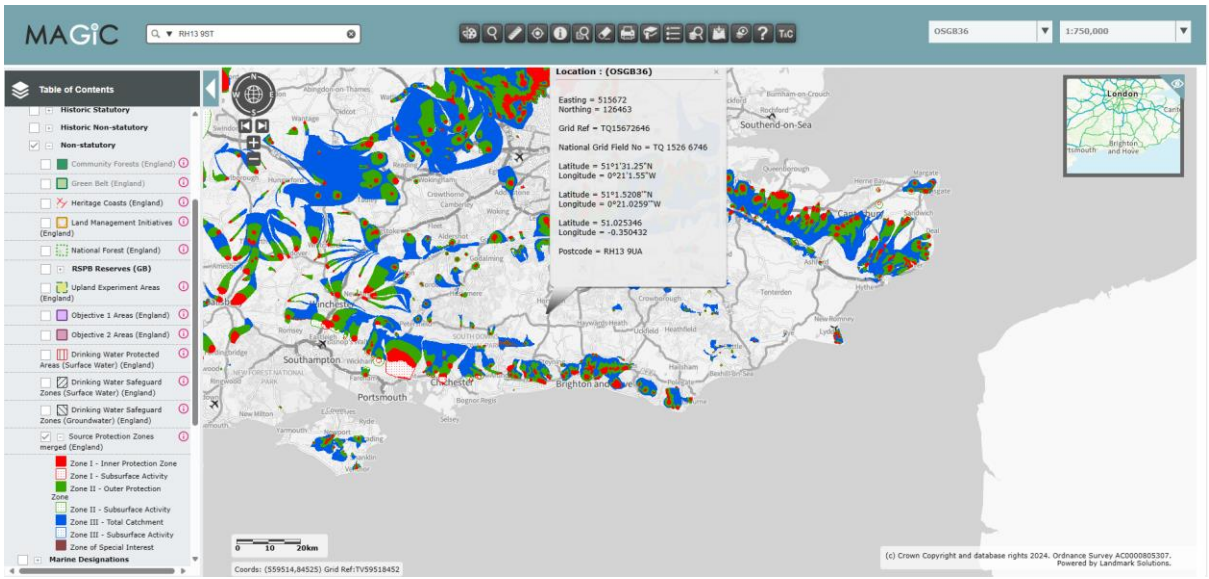
Appendix E - Hydrogeology Setting



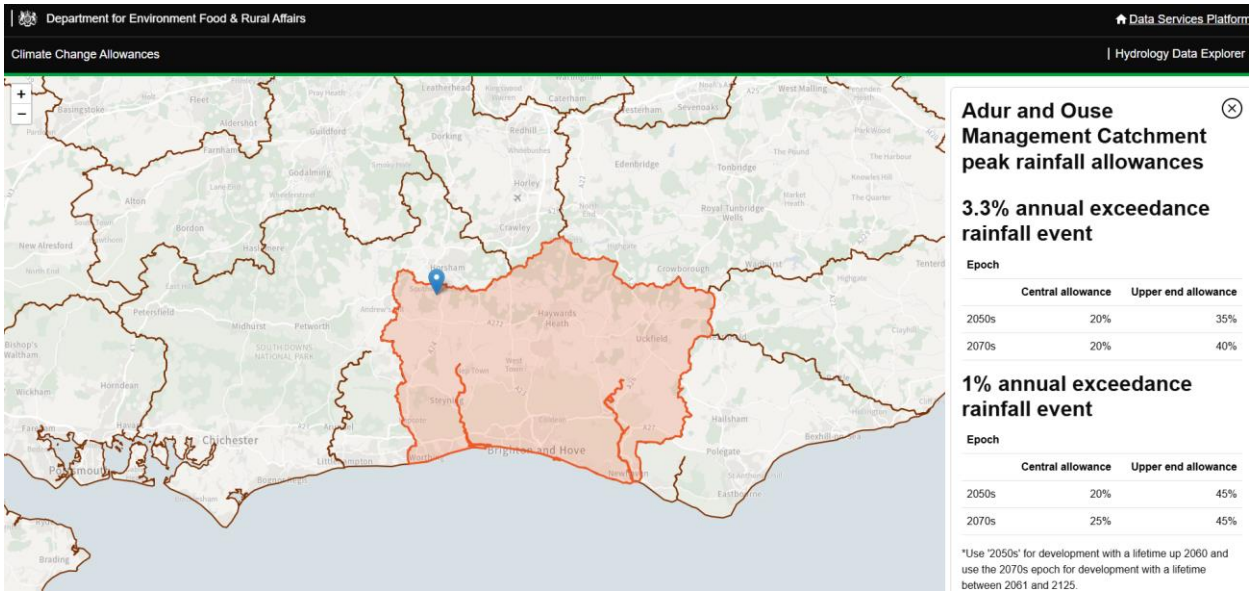
E1. Groundwater Vulnerability Map – High



E2. Aquifer Designation – Secondary A



E3. Source protection Zone – Outside Protection Zone



E4. Peak Rainfall Allowances

RonkeDesigns
Civil & Structural Consultant

Appendix F – Greenfield Runoff Rate Estimate

F1 – Greenfield Run-off
F2 – Wallingford Procedure
F3 – Network Infodrainage FEH

F1 - Greenfield Run-off

Drainage Strategy

The surface water run-off from the new dwelling into the new soakaway tanks situated as illustrated on the proposed drawing. Refer to below for Greenfield Runoff Rate:

Annual rainfall (SAAR)	767
Catchment size (A)	0.018 ha (imperviable area)
Soil runoff coefficient (SPR)	0.1

Catchment mean annual (Q_{BAR}) = $1000x (0.00108x (A/100)^{0.89} \times SAAR^{1.17} \times SPR^{2.17}) = 0.008$

Actual ratio (Q_{BAR}) = $Q_{BAR} \times (A / 50) = 28.8 \times 10^{-5}$ l/s

Mean annual peak flow per hectare = Q_{BAR} / A = 0.44 l/s/ha

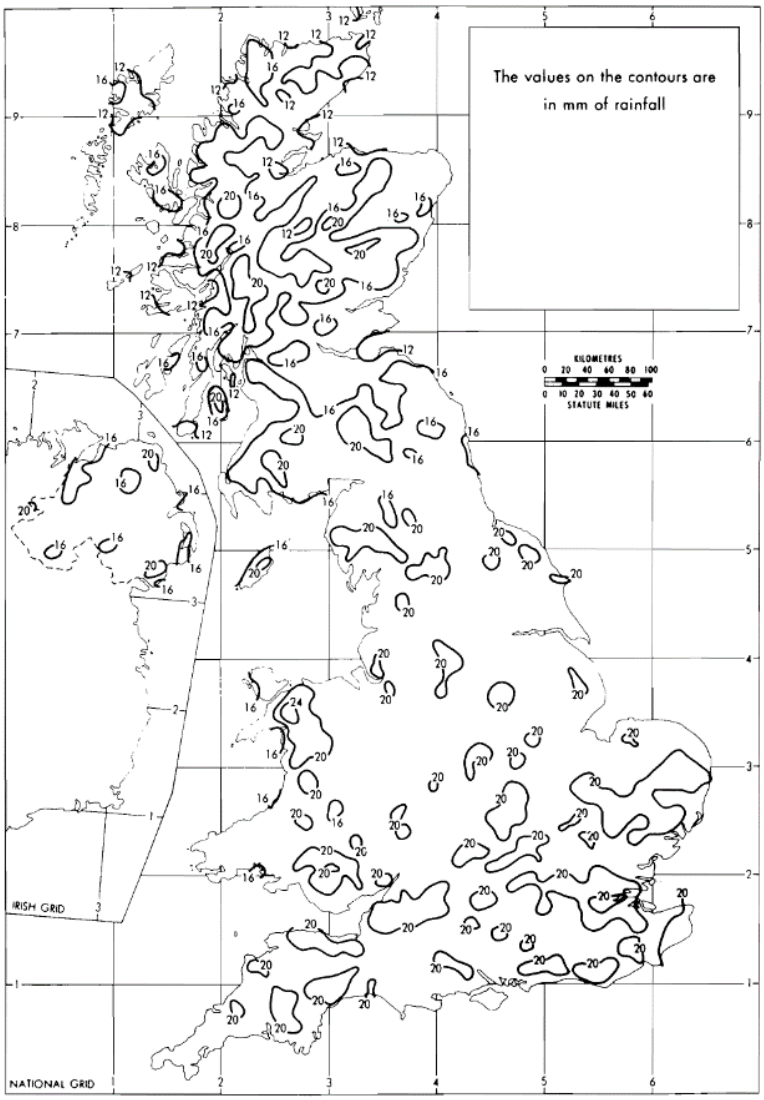
Greenfield Run-off	
Storm Return Period	**Outflow** (litres per second)
1 in 1	Q_{BAR} x 0.85 (GC_1) = 0.007
1 in 30	Q_{BAR} x 2.3 (GC_{30}) =0.018
1 in 100	Q_{BAR} x 3.19 (GC_{100}) = 0.03
1 in 100 plus 40%	Q_{BAR} x 3.19 x 40% = 0.04
1 in 200 plus 40%	Q_{BAR} x 3.74 (GC_{200}) x 40% = 0.042

Greenfield Run-off

The only viable SuDS solution for the site are permeable pavement. A restricted discharge flow rate from the permeable pavement weald clay soil is to be imposed based on Mean Annual Greenfield Peak Flow rate as shown above. The value is based on the calculated Q_{BAR}, however where site mean annual peak flow per hectare is 0.042 l/s/ha, 0.1 l/s/ha should be used.

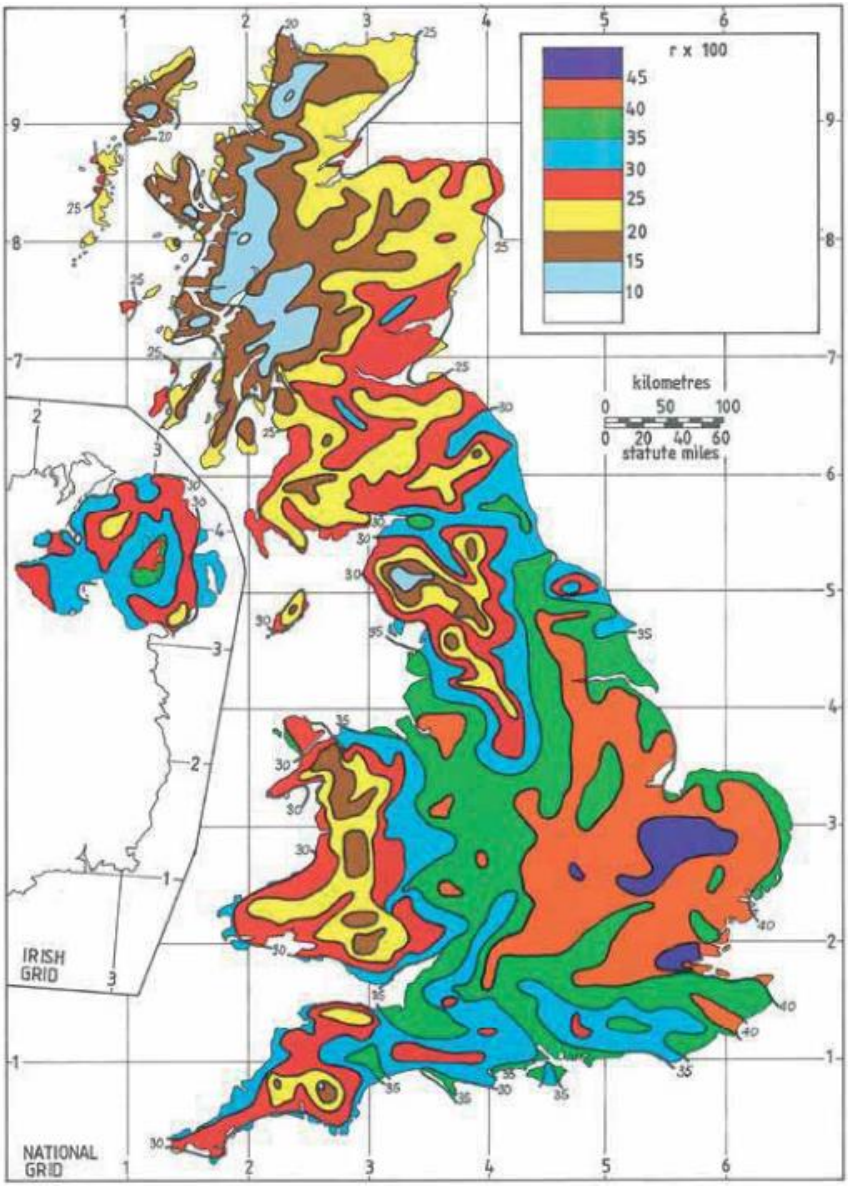
F2 – Wallingford Procedure

Using Wallingford Procedure design and analysis of urban storm drainage



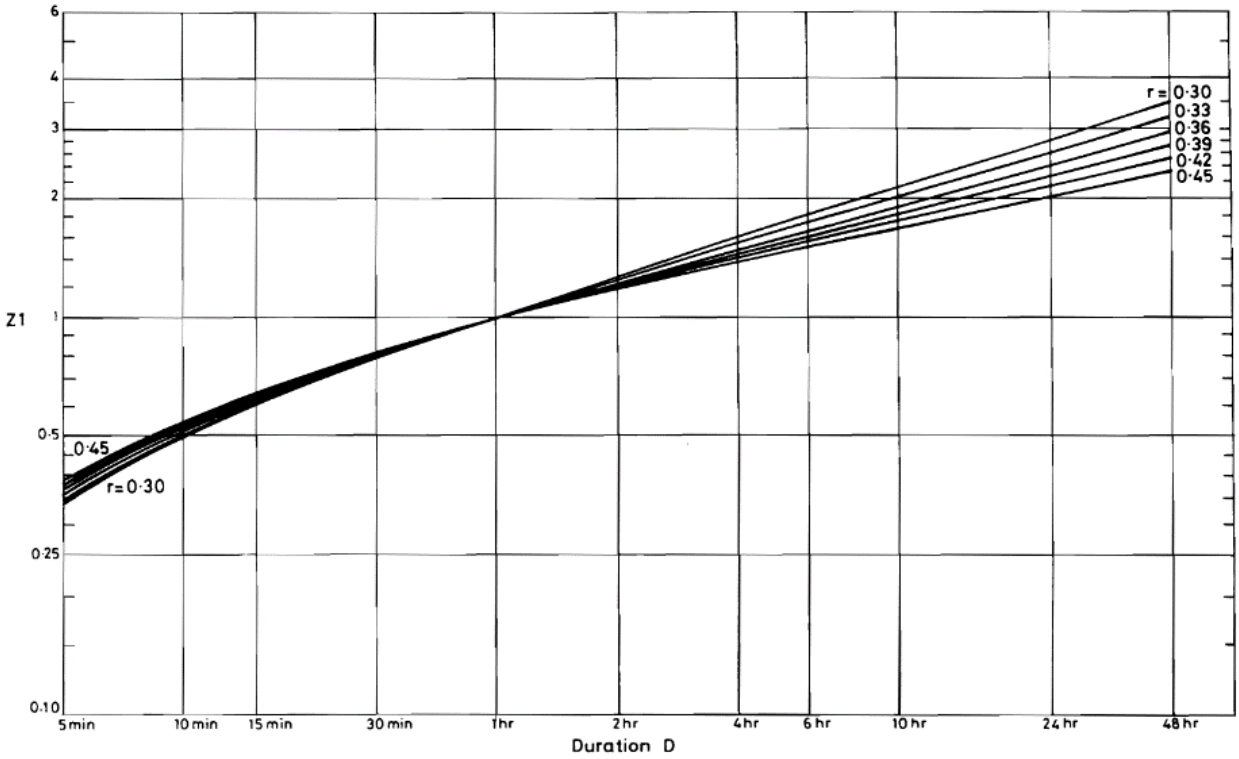
Wallingford Report, Rainfall depths of five-year return period and 60 minutes duration (M5-60 min)

$M5 - 60 = 20mm$



Wallingford Report - Ratio of sixty minutes to two-day rainfalls for a five-year return period.

$r = 35$



Wallingford Report – Relation between Z1 and D for different values of r. (0.30 < r < 0.45).

$$Rainfall = Z1 \times (M5 - 30) = Z1 \times 20\ mm$$

Duration, D (min)	Growth Factor Z1	M5-30 min rainfall (mm) ($Z1 \times 20\ mm$)	M5-30 rainfall + 40% climate change (mm) (M5-30 min x 1.4)
5	0.357	7.1	10.0
10	0.507	10.1	14.2
15	0.617	12.3	17.3
30	0.787	15.7	22.0
60	1.000	20.0	28.0
120	1.230	24.6	34.4
240	1.497	29.9	41.9
360	1.690	33.8	47.3
600	1.947	38.9	54.5
1440	2.480	49.6	69.4

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Civil & Structural Consultant

M5 Rainfall mm	M1	M2	M3	M4	M5	M10	M20	M50	M100
5	0.62	0.79	0.89	0.97	1.02	1.19	1.36	1.56	1.79
10	0.61	0.79	0.90	0.97	1.03	1.22	1.41	1.65	1.91
15	0.62	0.80	0.90	0.97	1.03	1.24	1.44	1.70	1.99
20	0.64	0.81	0.90	0.97	1.03	1.24	1.45	1.73	2.03
25	0.66	0.82	0.91	0.97	1.03	1.24	1.44	1.72	2.01
30	0.68	0.83	0.91	0.97	1.03	1.22	1.42	1.70	1.97
40	0.70	0.84	0.92	0.97	1.02	1.19	1.38	1.64	1.89
50	0.72	0.85	0.93	0.98	1.02	1.17	1.34	1.58	1.81
75	0.76	0.87	0.93	0.98	1.02	1.14	1.28	1.47	1.64
100	0.78	0.88	0.94	0.98	1.02	1.13	1.25	1.40	1.54
150	0.78	0.88	0.94	0.98	1.01	1.12	1.21	1.33	1.45
200	0.78	0.88	0.94	0.98	1.01	1.11	1.19	1.30	1.40

Wallingford Report -Relationship between rainfall of return period T(MT) and M5 England and Wales (ratio Z2)

Duration, D (min)	Growth Factor Z1	M5-30 min rainfall (mm) (Z1 x 20mm)	M5-30 rainfall + 40% climate change (mm) (M5-30 min x 1.4)	Growth Factor Z2 (100 Year return period)	M100-60 rainfall + 40% climate change (mm) (M5-30 min x 1.4)	M100-60 min Inflow (m^3) (I = A x (M100-600 min x 1.4mm))	M100-60 min Outflow (m^3) ($O = a_{s50} \times f \times D$)	M100-60 min Storage (m^3) (S =I - O)
5	0.387	0.357	10	1.79	17.9	3.3	0.5	2.8
10	0.537	0.507	14.2	1.91	27.122	5.0	1.0	4.0
15	0.647	0.617	17.3	1.95	33.735	6.2	1.4	4.7
30	0.817	0.787	22	2	44	8.0	2.9	5.2
60	1	1	28	2.03	56.84	10.4	5.8	4.6
120	1.2	1.23	34.4	2.01	69.144	12.6	11.5	1.1
240	1.393	1.497	41.9	1.97	82.543	15.1	23.0	-7.9
360	1.53	1.69	47.3	1.94	91.762	16.8	34.6	-17.8
600	1.7	1.947	54.5	1.9	103.55	18.9	57.6	-38.7
1440	2.073	2.48	69.4	1.81	125.614	23.0	138.2	-115.3

Area	182.9
Effective Void	0.9
Total	164.61

Soil type	*f* (infiltration coefficients) (m/sec)
Gravel	2.777777778
Sand	0.277777778
Loam Sand	0.002777778
Sandy loam	0.001388889
Loam	0.000277778
Silt Loam	0.000138889
Chalk	0.277777778
Sandy clay loam	0.000277778
Silty clay loam	1.38889E-05
clay	2.77778E-07
till	2.77778E-05
rock	0.000277778

Permeable Paving	Dimension
length	15
Width	4.2
Storage depth	0.3

Internal Surface area (a_{s50}) (50% effective depth) a_{s50} = 2 x (length + Width) x (Storage depth / 2)	5.76

Discharge factor of safety = 2

F3 – Permeable Paving Autodesk Infodrainage FEH

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	300

Site Location	GB 515669 126464 TQ 15669 26464
Rainfall Version	2022
Data Type	Point
Area (ha)	0.018
SAAR (mm)	767.0
SPRHOST	0
BFIHOST	0.248
FARL	0
Summer	√
Winter	√

ICP SUDS / IH 124

Method ICP	SUDS
Area (ha)	0.018
SAAR (mm)	767.0
Soil	0.248
Region	Region 7

Region	QBAR Rural (L/s)	QBAR Urban (L/s)	Q 1 (years) (L/s)	Q 30 (years) (L/s)	Q 100 (years) (L/s)
Region 7	0.0	0.0	0.0	0.1	0.1

Permeable paving Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. Avg. Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Avg. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Half Drain Down Time (mins)	Percentage Available (%)
FEH: 100 years: +40 %: 15 mins: Summer	50.013	50.380	50.195	0.000	0.370	0.185	6.8	2.666	0.000	0.002	0.5	0.326		59
FEH: 100 years: +40 %: 15 mins: Winter	50.013	50.377	50.194	0.000	0.367	0.184	6.3	2.647	0.000	0.002	0.5	0.322		59
FEH: 100 years: +40 %: 30 mins: Summer	50.531	50.531	50.530	0.518	0.521	0.520	5.1	3.591	0.353	0.005	0.6	0.899		45
FEH: 100 years: +40 %: 30 mins: Winter	50.531	50.531	50.530	0.518	0.521	0.520	4.7	3.596	0.357	0.005	0.6	0.900		45
FEH: 100 years: +40 %: 60 mins: Summer	50.557	50.557	50.555	0.544	0.547	0.545	4.4	4.572	1.270	0.010	0.7	1.925		29
FEH: 100 years: +40 %: 60 mins: Winter	50.557	50.557	50.555	0.544	0.547	0.545	3.4	4.565	1.265	0.010	0.7	1.951		30
FEH: 100 years: +40 %: 120 mins: Summer	50.563	50.563	50.562	0.550	0.553	0.552	2.9	4.816	1.500	0.021	0.7	2.752		26
FEH: 100 years: +40 %: 120 mins: Winter	50.559	50.559	50.557	0.546	0.549	0.547	2.0	4.660	1.337	0.021	0.7	2.739		28
FEH: 100 years: +40 %: 180 mins: Summer	50.561	50.561	50.560	0.548	0.551	0.550	2.1	4.749	1.431	0.032	0.7	3.016		27
FEH: 100 years: +40 %: 180 mins: Winter	50.552	50.552	50.551	0.539	0.542	0.541	1.3	4.429	1.099	0.032	0.7	2.928		32
FEH: 100 years: +40 %: 240 mins: Summer	50.555	50.555	50.554	0.542	0.545	0.544	1.7	4.550	1.224	0.042	0.7	3.015		30
FEH: 100 years: +40 %: 240 mins: Winter	50.541	50.541	50.540	0.528	0.531	0.530	1.0	4.050	0.719	0.043	0.7	2.774	637	38
FEH: 100 years: +40 %: 360 mins: Summer	50.539	50.539	50.537	0.526	0.529	0.527	1.2	3.954	0.630	0.064	0.6	2.743	9071	39
FEH: 100 years: +40 %: 360 mins: Winter	50.016	50.452	50.232	0.003	0.442	0.222	0.6	3.192	0.000	0.064	0.5	2.352	200	51
FEH: 100 years: +40 %: 480 mins: Summer	50.018	50.523	50.522	0.005	0.513	0.512	0.9	3.316	0.061	0.086	0.6	2.496	229	49
FEH: 100 years: +40 %: 480 mins: Winter	50.015	50.360	50.185	0.002	0.350	0.175	0.4	2.523	0.000	0.079	0.5	1.732	102	61
FEH: 100 years: +40 %: 600 mins: Summer	50.015	50.415	50.213	0.002	0.405	0.203	0.7	2.923	0.000	0.100	0.6	2.153	125	55
FEH: 100 years: +40 %: 600 mins: Winter	50.013	50.234	50.122	0.000	0.224	0.112	0.2	1.614	0.000	0.084	0.1	0.860		75
FEH: 100 years: +40 %: 720 mins: Summer	50.015	50.366	50.188	0.002	0.356	0.178	0.5	2.566	0.000	0.110	0.5	1.833	98	60
FEH: 100 years: +40 %: 720 mins: Winter	50.013	50.217	50.113	0.000	0.207	0.103	0.2	1.489	0.000	0.098	0.1	0.769		77
FEH: 100 years: +40 %: 960 mins: Summer	50.013	50.239	50.124	0.000	0.229	0.114	0.1	1.649	0.000	0.130	0.1	0.987		75
FEH: 100 years: +40 %: 960 mins: Winter	50.013	50.196	50.103	0.000	0.186	0.093	0.1	1.340	0.000	0.128	0.0	0.677		79
FEH: 100 years: +40 %: 1440 mins: Summer	50.013	50.206	50.108	0.000	0.196	0.098	0.1	1.410	0.000	0.190	0.1	0.870		78
FEH: 100 years: +40 %: 1440 mins: Winter	50.013	50.176	50.093	0.000	0.166	0.083	0.1	1.195	0.000	0.190	0.0	0.652		82

SURFACE WATER - ROOF DRAINAGE To BS EN 12056-3:2000 Roof drainage, layout and calculation.

Rainfall Intensity/Category of Design Rate:-	Category 1			Anticipated life of building T =	N/A in Category 1 / 50 Years
A return period,T, of 1 year is the minimum that should be used for eaves gutters and flat roofs. Rainfall intensities for a 2 min event, within a storm of longer duration, are given in Figure NB.1 of the BS. -				Design life of building	0 Years
NB 1 to NB 5 to suit Building Design life or Different Return Periods & Storm Durations of up to 10 minutes					
Storm Duration in minutes	10	**Return period in years**	From design life 0	Select the required return period normally the return period above the design life of	NB 6 Rainfall for calculation of other return periods
Select the location of the building	Perth / Peterborough / Plymouth / Portsmouth		**0** From user input		
Design rainfall intensity From figures NB.1 to NB.5		**Rainfall Depth 3.5 mm**			
Design rainfall intensity for NB 6	**0.000 l/s/m2**	9.59 M5 (mm)		Match rainfall intensity as near as possible to result	0.055l/s/m3 — 198mm/hr
Risk Factor:-	**Risk Factor 1.0**			Risk Factor 1.0	
Eaves gutters (or used to calculate design rainfall intensity from maps)				If users rainfall input is to be used the risk factor multiplier should also be applied If design rainfall, based on calculated return period is used, select Risk factor 1 Confirmed Risk = **1**	
				Design rainfall = **0.055**	Adjusted intensity = **0.055**

Roof area:-		Design rainfall intensity	0.055	l/sec	Additional areas	10	m^2
Length of pitch	7.800	Roof pitch	30	Deg's	Catchment Roof area	70	m^2
Width ie. length of roof along gutter	6.000	Catchment length	10.052	m	Design Flow rate	3.9	l/sec
Select situatoin for rainwater pipe and outlet sizing for:-					Valley/Parapet gutter		

Parapet and Valley Gutters							
Gutter Type	Rectangular gutter	End outlet on gutter section			Number of rain water outlets	4	
Fall on gutter	Capacity of gutter section	$Q_{L=}$ **11.38**			Enter width of gutter Wd1	500 mm	
0 to 3mm/m	Capacity with change in direction	**11.38**			Sole width not required for rectangular gutter	425 mm	Design flow load = 1.0
Slected gutter Rectangular gutter	Capacity with fitted strainers	**5.69**			Enter overall depth of gutter Z	115 mm	Length = 1.50
Fall on gutter 0 to 3mm/m			**Capacity**		Angle not required for rectangular gutter	45 degrees	L/W= 19
This is a 'short' gutter calculated using equation (5)	Comment		**5.69**		Freeboard	34.5 mm	Has the gutter a change in direction of more than 10o: No
	This size of gutter is satisfactory				Design water depth ***W***	81 mm	
					Cross sectional area of water flow A_w	**40250** mm^2	Are the outlets from the gutter fitted with stainers: Yes

Eaves Gutter:-		Gutter Type	Square/rectangular		Number of rain water outlets	4	End outlet on gutter section	
Width mm	100				Percentage of total gutter length on which capacity is calculated (assuming freely discharging)	25%	Design flow load = 1.0 Length = 1.50 L/W= 25	
Depth mm	60	Cross sectional area mm^2	6000					
Capacity of gutter section		$Q_{L=}$	**1.44**					
Capacity with allowance for change in direction			**1.22**					
Capacity with fitted strainers			**1.22**	Fall on gutter 0 to 3mm/m	Proprietary gutter with design information Tested capacity = 0.00		Has the gutter a change in direction of more than 10°: Yes	
Selected gutter **Square/rectangular** Fall on gutter **0 to 3mm/m**				**Capacity**	Comment			
This is a "short" gutter calculated using equation (4)				**1.22**	**This size of gutter is OK**		Are the outlets from the gutter fitted with stainers: No	

Rainwater Outlets and Rainwater Pipes							
				Select shape of outlet	Round-edged outlet		
Discharge to each outlet - Q_{RWP}	1.0	l/sec		Enter filling degree (normally 0.33)		Filling degree	0.32
Maximum flow from selected rwp	10.17	l/sec		If h is less or equal to D/2 outlet operates as weir-type			
Calculated rainwater pipe - Di	41	100mm selected		If h is greater D/2 outlet operates as orifice-type			
Top dia of outlet - D_o	150	mm		Flow as weir-type outlet			
Effective diameter - D_i	135	mm		Head above outlet - h	14	Use this head of water	
Outlet radius - r	25	mm		Flow as orifice-type outlet			
Length of taper - Lt	0	mm		Head above outlet - h	1	Do not use	
				Head above outlet taken as - h		14 mm	

Gutter overflows (used in conjunction with parapet/valley gutters)				
Number of outlets	4			
Length of the weir - L_w	100 mm		Total discharge through weir Q_w	2.2 l/sec
Depth of water above the weir - h	65 mm		Total discharge from overflows	8.7 l/sec
	Total discharge from roof with all outlets and overflows operating	**49.4 Litres/sec**	**This discharge equates to1278% of the design flow rate for this gutter**	

Appendix G

G1. Wastewater Flow Rate

Calculation

RonkeDesigns
Civil & Structural Consultant

Project: 1 Quarry Way, Southwater Hors

Project No: 15058

By	KY	Item	Proposed Wastewater Flow rate	Calc No	1	Revision	1

		Frequency Factor				
Appliance	**DU**	Dwelling, guesthouse, office (intermittent use)	Hospital, school, restaurant, hotel (frequent use)	Toilets and/or shower open to public (congested use)	Laboratory building (special use)	**Total DU**
Wash basin	0.3	3				0.90
Shower	0.4	1				0.40
Urinal	0.4					0.00
Bath	1.3	1				1.30
Kitchen sink	1.3	1				1.30
Dishwasher	0.2	1				0.20
Household Washing machine	0.6	1				0.60
Commercial Washing machine	1.2					0.00
WCs	2.0	3				6.00
Floor Drains	2.0					0.00
Subtotal		10.7	0	0	0	10.70
kDU		0.5	0.7	1	1.2	
Flow Qww l/sec		1.6	0	0	0	

Total Flow Qww l/sec 1.6

BS EN 752:2017 Population Method

Total population: 5 (based on 3-No. dewellings x 4 persons per dwelling)

0.02083 l/sec x 5 = 0.104166667 l/sec

Appendix H

H1. Below Ground Drainage General Arrangement Drawings

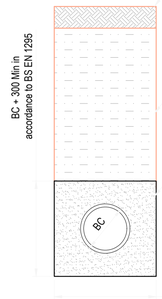
Site Area
Existing Impermeable Area = say 55m²
Proposed Impermeable Area = 70m²

Surface Water Connection
Peak Surface Water run-off (Q) = CIA
Q = peak discharge coefficient
C = run-off coefficient
I = intensity (mm)
A = drainage area (ha)
Existing surface water run-off for 100 year event
Q = 2.78 x 1.5 x 1.3 x 50 x Say 0.0055 = 1.5 l/s
Proposed run-off for 100 year event plus 40% client change
Q = 0.1 l/s

Foul Water Connection
Peak foul water flow from the proposed buildings based on unit method to BS EN 12056-2-2000
FW peak flow = 5.8 l/s
Deverlopment size (N) = 1
Occupancy - persons / dwellings (O) = 2.4
Population of development (P) = NxO =2.4
Dry weather flow multiplier (PF) = 2.5
Per capita flow -litres/ head / day (G) = 125 l/h/d
Infiltration – percentage (I) = 10%
Population design flow = (PF + 0.1) PG = (2.5 + 0.1) x (2.4 x (125/(60secx60minx24hr)) = 0.012 l/

Below Ground Drainage Notes

1. All drainage to be installed in accordance with relevant Building Regulations documents, British Standards and Sewers for Adoption 7th edition where applicable.
2. All indirect connections to public sewers to be agreed and inspected by Local Water Authority.
3. Exploratory works to be undertaken to locate all public utility services on site prior to commencing drainage works to ensure no clashes between the drains & service runs occur. Using hand digging means.
4. Any redundant external existing drainage on site that is to be made redundant shall be completely removed from the ground and backfilled to suit.
5. A CCTV survey and report in WINCAN format for all new drainage will be required before "As Built" drawings are issued.
6. Contractor to allow for waterbars around pipe penetration through structures.
7. Contractor to confirm feasibility of reusing existing below ground drainage prior to commencing drainage works.
8. The cover levels of all proposed drainage infrastructure to be ascertained prior to works commencing.
9. Contractor to allow for application to Thames Water for new or indirect connection.
10. Manhole cover & invert levels shown are subject to confirmation of finished site levels.
11. Any existing drainage on site that is to be made redundant shall be completely removed from the ground and backfilled to suit.
12. All rwp's & svp's to have rodding access points above FFL.
13. All pipes built into manhole inverts should be installed with soffits level unless noted otherwise.
14. All down pipes to project minimum 100mm above finished floor levels
15. All internal manholes and inspection chambers to have double sealed recessed trays to suit proposed finishes by architect.



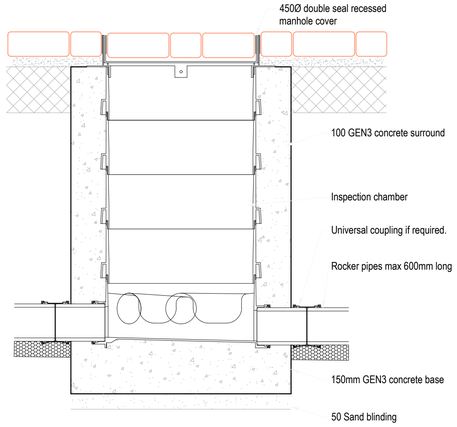
Detail 4 - Typical External Class S Bedding Details

1:20

Extract from Table A2 WIS 4-08-02

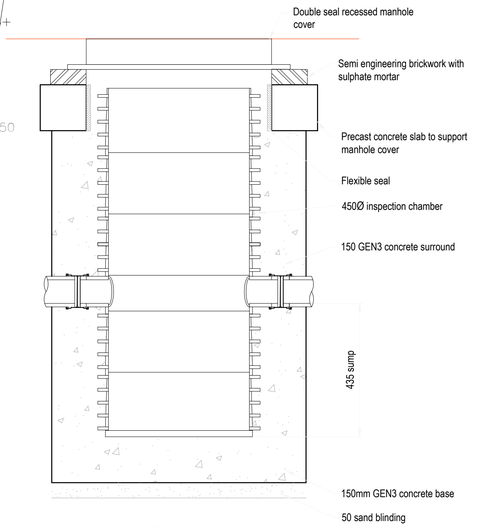
Pipe nominal bore (mm) see note (4)	Nominal maximum particle size (mm)	Materials specified in British Standards see note (a)
100	10	10mm nominal single-size
Over 100 to 500	15	10 or 14mm nominal single-size or 14mm to 5mm graded
Over 150 to 300	20	10, 14 or 20mm nominal single-size or 14mm to 5mm graded or 20mm to 5mm graded
Over 300 to 550	20	14 or 20mm nominal single-size or 14mm to 5mm graded or 20mm to 5mm graded
Over 550	40	14, 20 or 40mm nominal single-size or 14mm to 5mm graded or 20mm to 5mm graded or 40mm to 5mm graded

Note (a) - Processed granular material to include aggregates



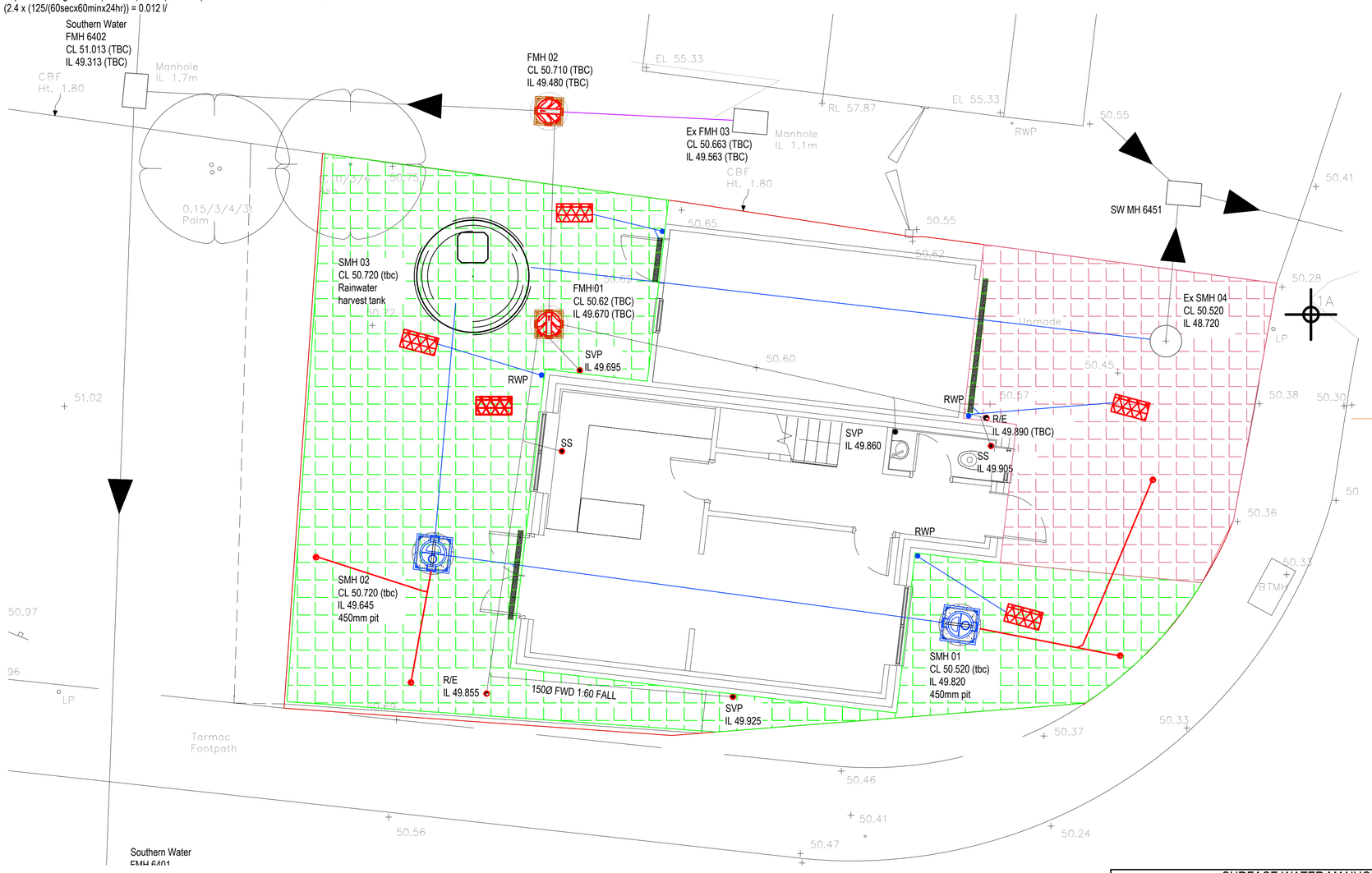
Detail 2 - Typical Foul Water Inspection

1:10



Detail 1 - Typical Surface Water Inspection

1:10



DRAINAGE LEGEND

- Existing foul / surface water drainage adoption.
- FWMH 100Ø FW — Private foul water drainage and inspection chamber.
- SWMH 100Ø SW — Private surface water drainage and inspection chamber.
- 100Ø SW — Perforated surface water drain.
- ACO M100D MultiDrain 135 x 150 depth and sump unit (with silt basket and air traps). Grating loading class C250
- Proposed foul water down pipes.
- Proposed surface water down pipes.
- 60mm concrete paving on 50 mm laying course on Terrain geotextile or similar approved 350mm sub base (CGA or Type 3) on Terrain geotextile or similar approved
- or
- 708x354x150 Formpave distribution tank with geotextile surround on 10mm pipe bedding. Minimum 200 top and side cover.

FOUL WATER MANHOLE SCHEDULE

Note: Levels to be confirmed. Levels to Ordnance Survey Datum.

MANHOLE REF	COVER LEVEL (m)approx	INVERT LEVEL (m)	MANHOLE TYPE	MANHOLE SIZE (mm)	COVER & FRAME (New manhole with double seal recessed U.N.O)	NOTES	BACKDROP/ CATCHPIT
FWMH1	50.62 tbc	49.670 tbc	Figure B18	450Ø	minimum 450 x 450 class B125 double seal recessed	-	-
FWMH2	50.710 tbc	49.480 tbc	Figure B18	450Ø	minimum 450 x 450 class B125 double seal recessed	-	-

SURFACE WATER MANHOLE SCHEDULE

Note: Levels to be confirmed. Levels to Ordnance Survey Datum.

MANHOLE REF	COVER LEVEL (m)approx	INVERT LEVEL (m)	MANHOLE TYPE	MANHOLE SIZE (mm)	COVER & FRAME (New manhole with double seal recessed U.N.O)	NOTES	BACKDROP/ CATCHPIT
SWMH1	50.520 tbc	49.820 tbc	Figure B18	450Ø	minimum 450 x 450 class B125 double seal recessed	450 mm pit	Catchpit
SWMH2	50.720 tbc	49.645 tbc	Figure B18	450Ø	minimum 450 x 450 class B125 double seal recessed	450 mm pit	Catchpit
SWMH3	50.720 tbc				minimum 600 x 600 class B125 double seal recessed	-	Rainwater Harvest Tank
Ex SWMH4	50.520	48.720	Figure B18	450Ø	Existing	-	-

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This drawing is to be read in conjunction with all relevant drawings and specifications

NOTES
1. All setting out to be in accordance with the Architect's drawings. Any discrepancies between the Engineer's and the Architect's drawings to be referred to the Architect before proceeding. Dimensions must not be scaled.
2.

CDM 2015

1. Potential buried below ground services locations to be identified.
2. Proposed connection to the public sewer to be agreed with the local water authority.

Rev.	Amendment	Drn	Chkd	Date
P1	Issued for Information	KY	-	22.01.25

Drg Status: Preliminary

RonkeDesigns
Civil & Structural Consultant

Client: ATLAS CONSTRUCTION

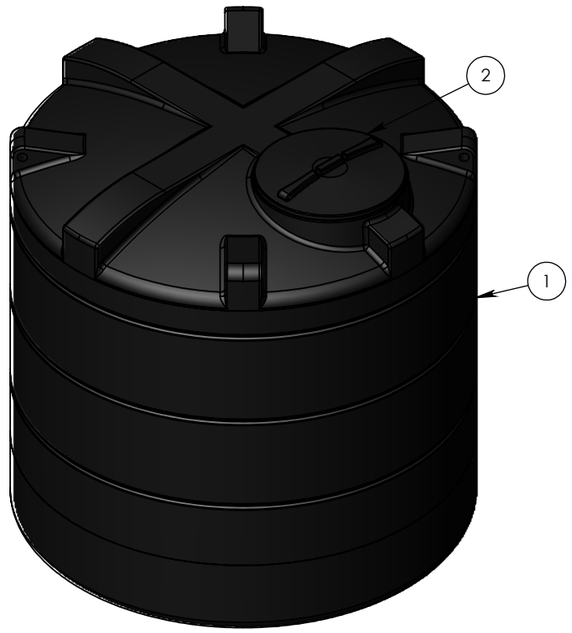
Project: **1 Quarry Way Southwater Horsham RH13 9ST**

Title: **Below Ground Drainage LOWER GROUND**

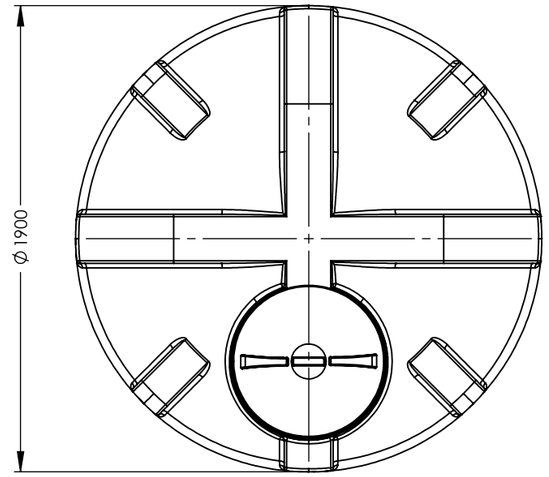
Scales: A1 AS NOTED Status: S3

Project No.: **15058-RD-ZZ-DR** Drg No.: **C500** Rev.: **P1**

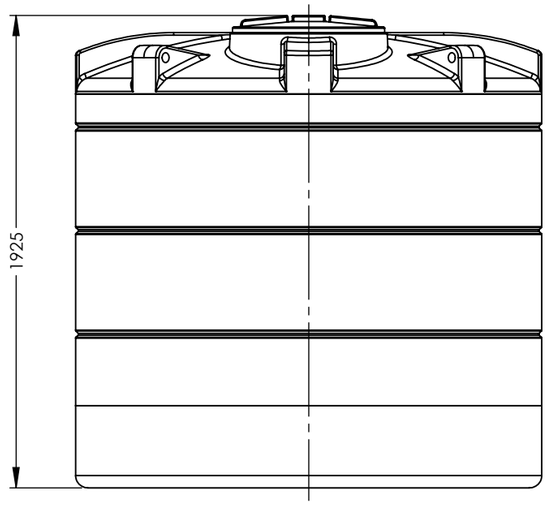
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	172212	4000L VERTICAL TANK	1
2	135362	Ø620 SCREW LID & RIM	1



LEFT ISO VIEW



PLAN VIEW



FRONT VIEW

DESIGN DATA

DESIGN PRESSURE: ATMOSPHERIC	MAXIMUM CAPACITY (LTRS): 4930
DESIGN TEMPERATURE: 40°C	WORKING CAPACITY (LTRS): -
WORKING PRESSURE: ATMOSPHERIC	APPROX. WEIGHT FULL (KGS): 5025
WORKING TEMPERATURE: 40°C	APPROX. WEIGHT EMPTY (KGS): 95
MOULDED LIFTING LUGS: 4 - 0°, 90°, 180° & 270°	
METHOD OF SUPPORT: FIRM, FLAT, FULLY SUPPORTING BASE OF CONCRETE OR OTHER SUITABLE MATEREAL	

MATERIAL DATA

MATERIALS OF CONSTRUCTION:

MATRIX REVOLVE N-307. REVOLVE IS A HIGH DENSITY (0.939 g/cm3), LOW MELT (3.5 g/ 10 min) HEXENE POLYETHYLENE GRADE FOR ROTOMOULDING. THE GRADE IS FULLY PROTECTED AGAINST THERMAL AND LIGHT DEGRADATION: N-307 IS UV10 STABILISED.

INSPECTION AND TESTING

WORKS TEST: ALL TANKS ARE THICKNESS TESTED BY ULTRASOUND AFTER DEMOULD IN ADDITION AIR SUPPORTED LEAK TEST ARE CARRIED OUT ON FLANGE LINES.

NOTE SECTION

	NAME	SIGNATURE	DATE
DRAWN	LC	L.Crane	25/06/2021
CHECKED			

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN MILLIMETERS
SURFACE FINISH: MDPE
TOLERANCES: ±3%

3RD ANGLE PROJECTION

DO NOT SCALE DRAWING | REVISION: -

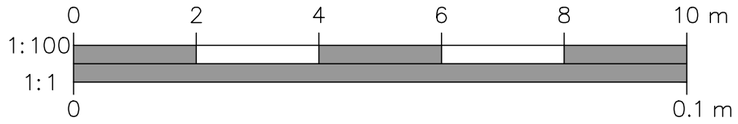
ENDURAMAXX®
FLUID MANAGEMENT INNOVATION

DWG TITLE:

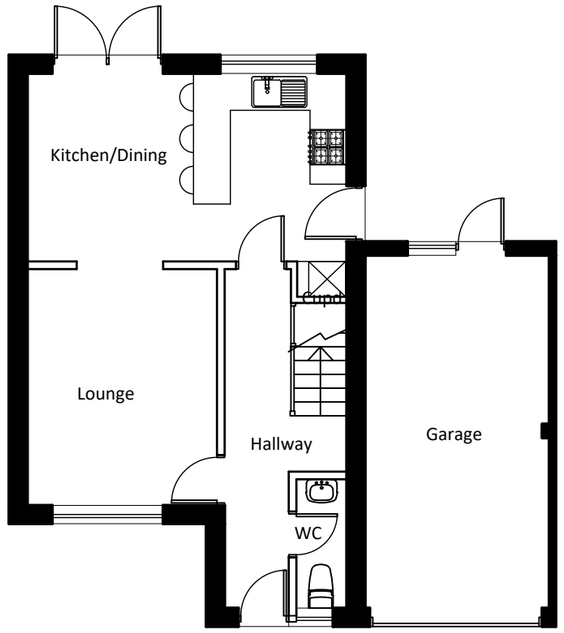
4000L VERTICAL TANK

DWG NO: 172212-4000L-VERTICAL | A3

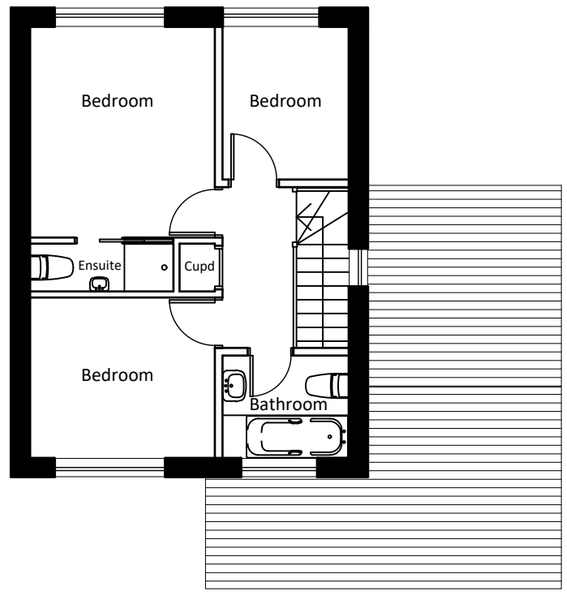
SCALE:1:25 | SHEET 1 OF 1



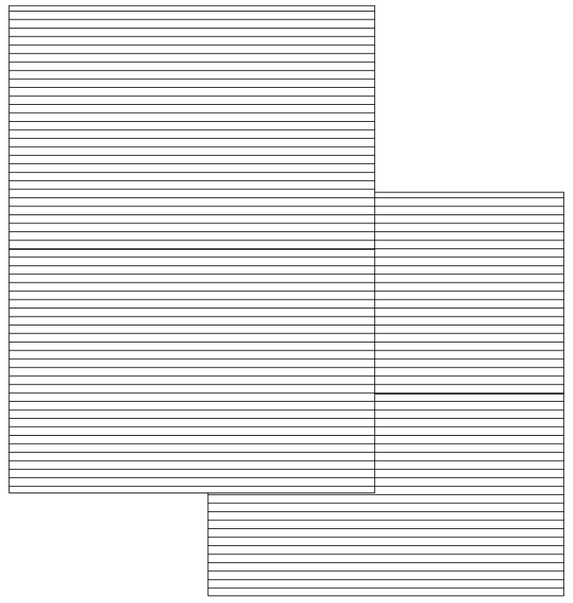
- All materials to Local Authority approval and to match existing unless noted otherwise.
- Any proposed construction within 3m of neighbouring boundaries subject to party wall agreement by party wall surveyor to be appointed by the client.
- Any proposed construction by boundary to be offset min 50mm from boundary with nothing to overhang boundary
- External ground levels not surveyed
- Removal of any walls/structure/chimney to be confirmed by structural engineer
- Contractor to confirm boundary locations on site
- Contractor to ensure any roof/wall junctions are 150mm below existing window cill



Ground Floor Plan
Scale 1:100



First Floor Plan
Scale 1:100



Roof Plan
Scale 1:100

A	Updated to Highways comments	SM	04.08.22

BLACKSTONE ARCHITECTS

SUITE THIRTY TWO
NEW HOUSE
67/68 HATTON GARDEN
LONDON EC1N 8JY

0207 096 0907
INFO@BLACKSTONEARCHITECTS.COM
WWW.BLACKSTONEARCHITECTS.COM

NEW BUILD HOUSE

LAND TO SOUTH OF 1 QUARRY WAY, SOUTHWATER, WEST SUSSEX RH13 9ST

PROPOSED PLANS
AS SHOWN @ A3 - S.M.

377-002A
AUGUST 2022

Appendix J

J1. Surface Water run-off Drainage Calculations

Existing Drainage Discharged

$$Peak\ Run-off\ Rate\ Q = CiA$$

$$run-off\ coeffcient\ (C) = C_v\, C_r$$

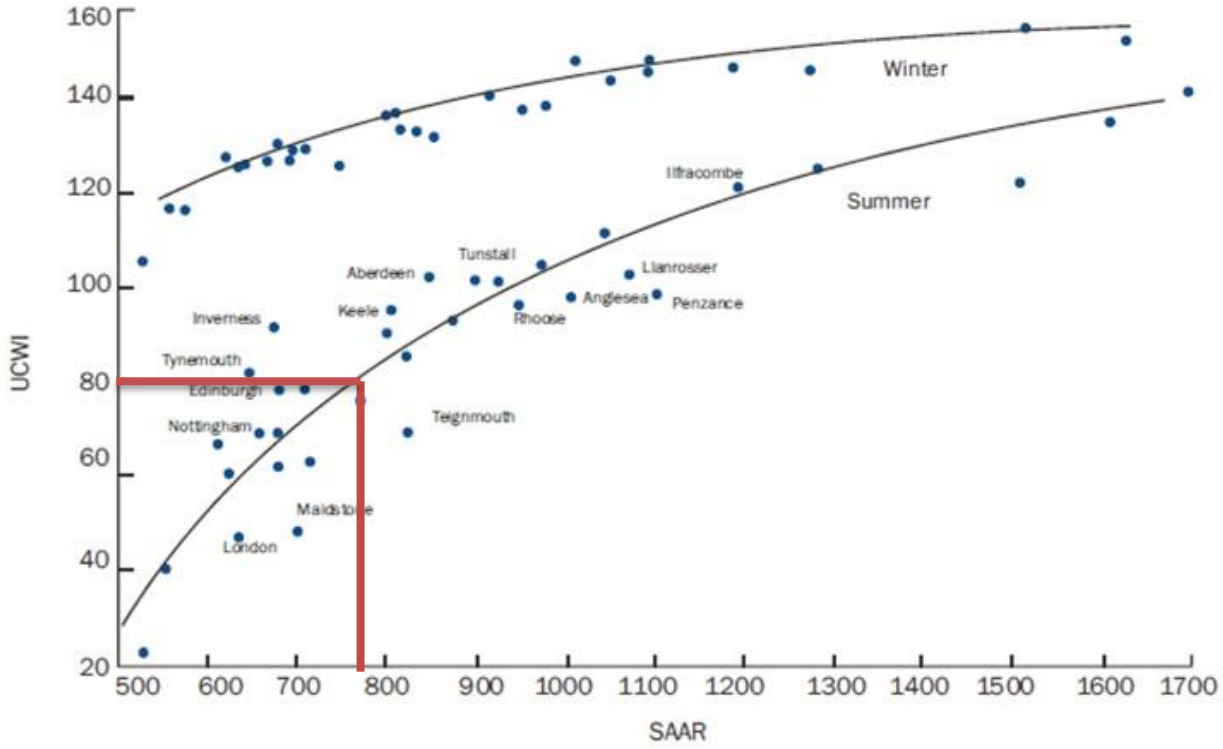
$$volumetric\ run-off\ coeffcient\ (C_v) = \frac{0{,}829\ Pimp + 25\ Soil + 0{,}078\ UCWI + 20.7}{100}$$

$$= \frac{(0{,}829 \times 100) + (25 \times 0.3) + (0{,}078 \times 80) + 20.7}{100} = 1.5$$

PIMP- is the percentage of the surface area contributing to the run-off that is impermeable,

SOIL - is an index between 0,15 and 0,5 depending on the Winter Rainfall Acceptance Potential (WRAP) Class of the soil [11], [12],

UCWI - is the design urban catchment wetness index as defined in the Wallingford Procedure



Volume 3 -Wallingford Procedure

C_R - is a routing coefficient that varies with the shape of the catchment and the peak rainfall event. The Wallingford Procedure [11], [13], recommends a value of 1.3 for use in the UK.

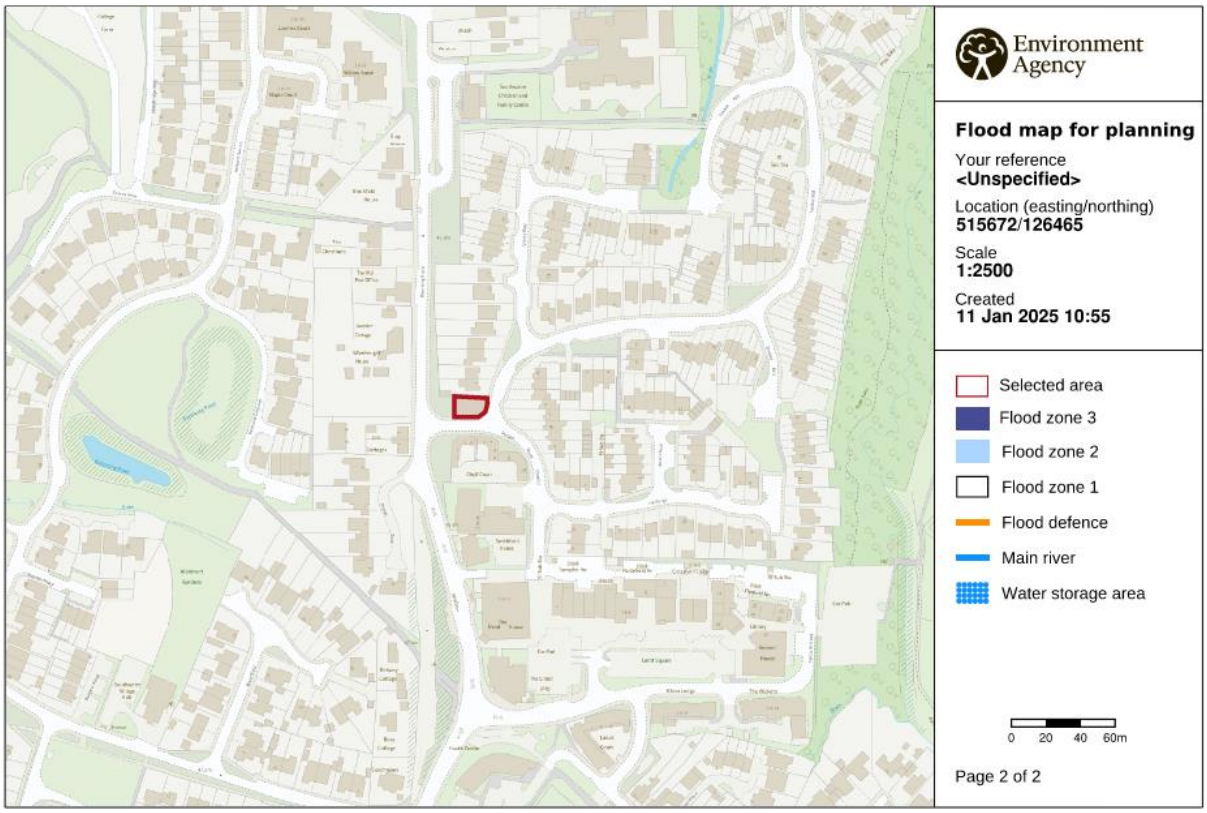
2.78 - conversion.

$$Q = CiA = 2.78 \times 1.5 \times 1.3 \times 50 \times say\ 0.0055 = 1.5\ l/s$$

Appendix K – Flood Risk Assessment

K1. Flood Zone

K2. Historical Sewer Flooding Record



K1 – Outside Flood Zone

Flood map for planning

Your reference	Location (easting/northing)	Created
<Unspecified>	**515669/126465**	**21 Jan 2025 23:20**

Your selected location is in flood zone 1, an area with a low probability of flooding.

You will need to do a flood risk assessment if your site is **any of the following:**

- bigger that 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

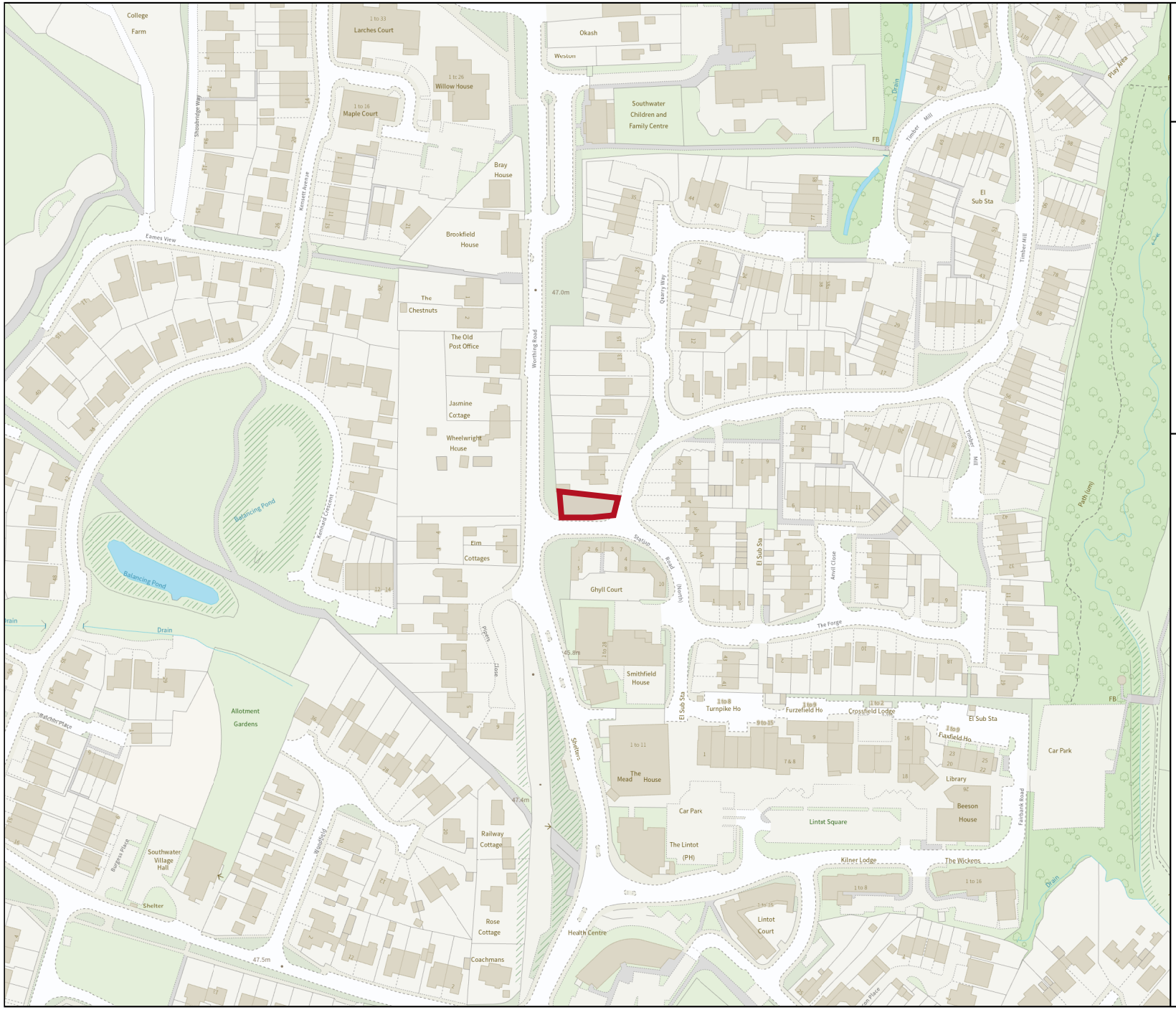
Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence **which** sets out the terms and conditions for using government data. https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2024 OS AC0000807064. https://flood-map-for-planning.service.gov.uk/os-terms



Environment Agency

Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
515669/126465

Scale
1:2500

Created
21 Jan 2025 23:20

- Selected area
- Flood zone 3
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 20 40 60m

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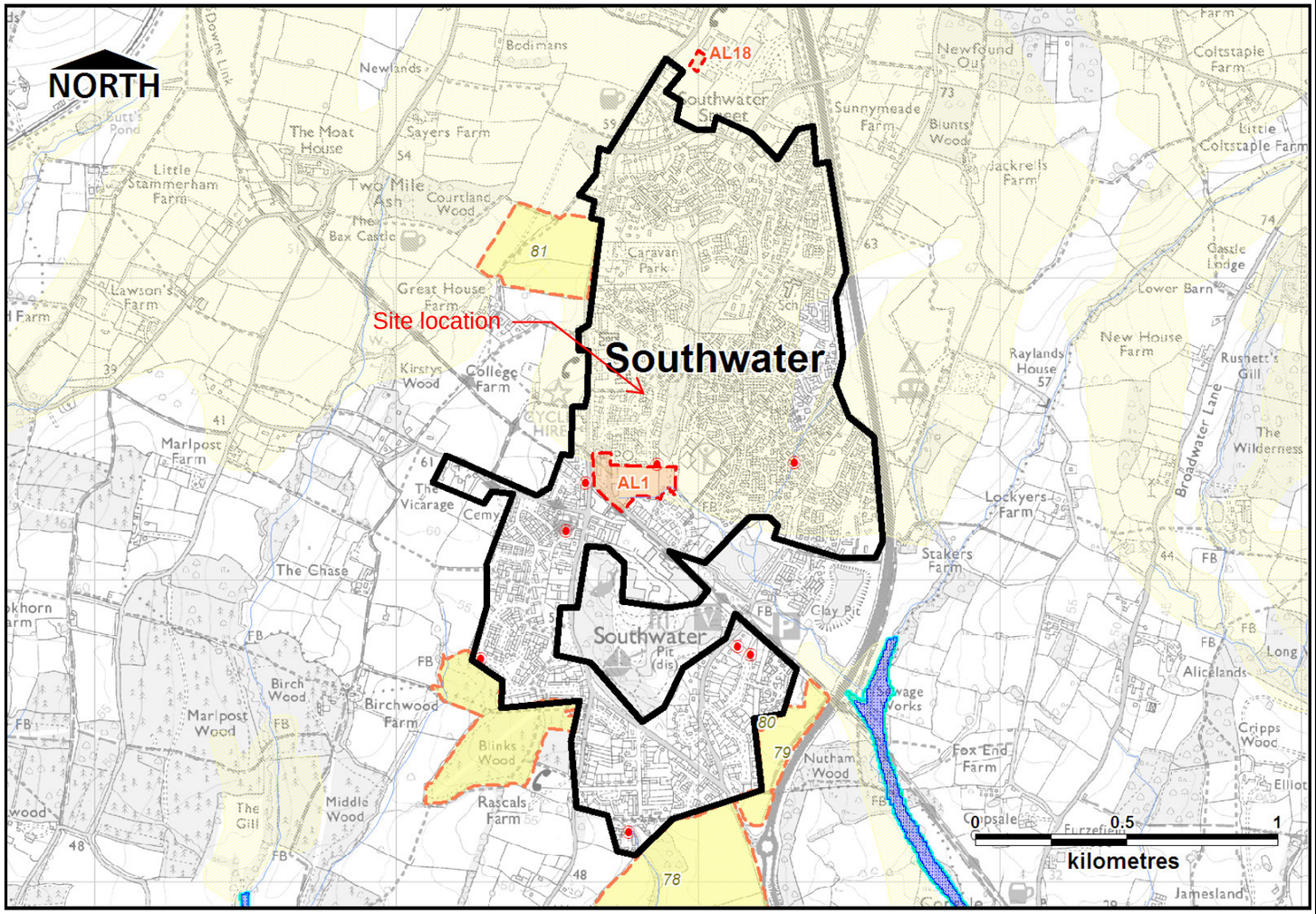
Horsham District Council LDF: Level 1 SFRA

Horsham District Council

Scott Wilson

Settlement Sustainability Hierarchy: Category 1

Southwater



Flood Zone 3b - Functional Floodplain
Flood Zone 3a - 100yr Floodplain
Flood Zone 2 - 1000yr Floodplain
Climate Change Floodplain (Combined)
Historical Flood Outlines
Sewer Flooding (hydraulic Incapacity)
Flood Defences
Flood Warning Areas
Reservoir Act Water Bodies
Groundwater Emergence Zone
Ground Water Vulnerability Classifications
Major - High Permeability
Major - Intermediate Permeability
Major - Low Permeability
Minor - High Permeability
Minor - Intermediate Permeability
Minor - Low Permeability
CEH River Network - BFI Classification
0
0.7
0.8
0.9
Tidal Limits
Urban Areas
Potential Allocation Sites
Alternative Development Sites (rejected)

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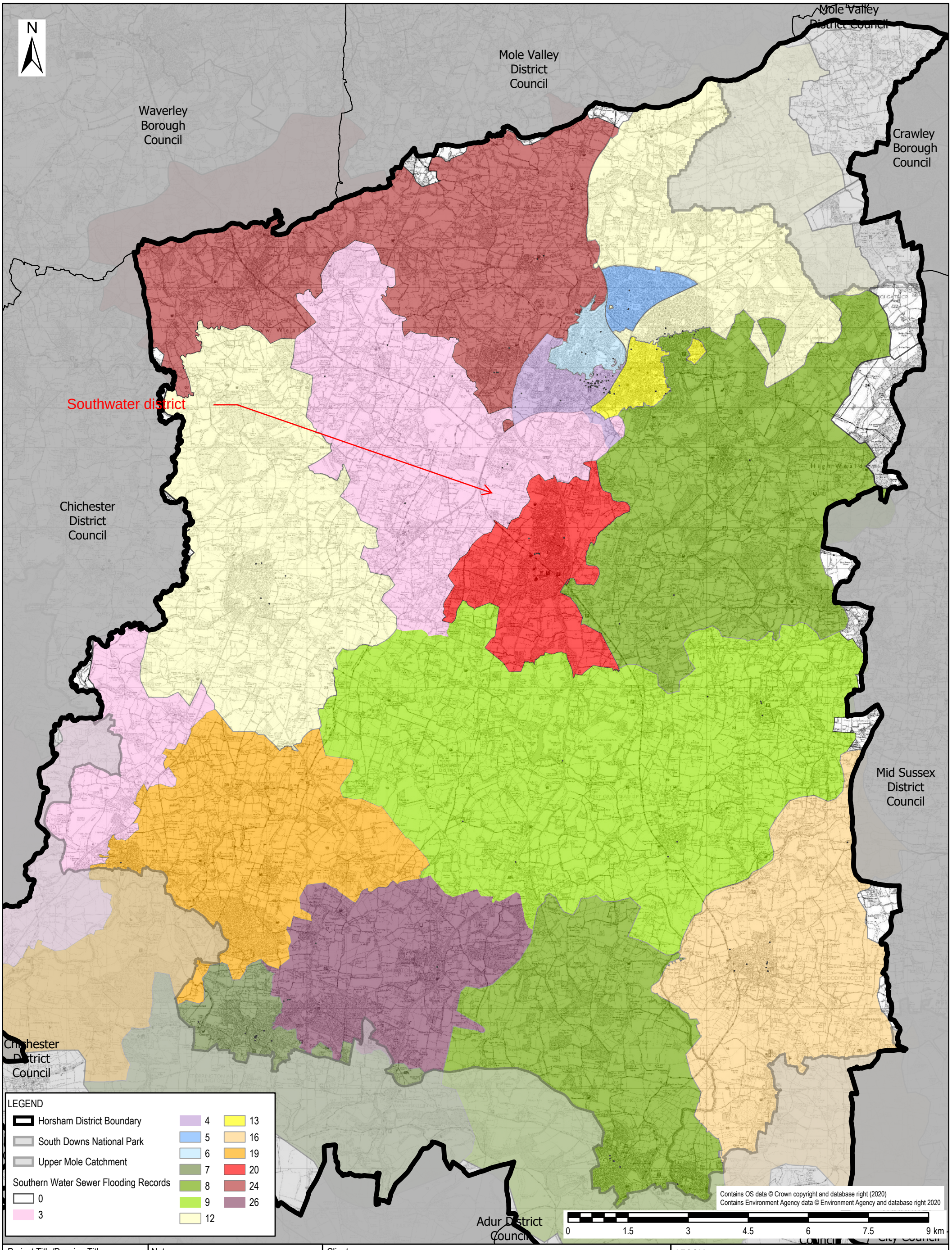
Preliminary Core Strategy Assessment

Flood Zone	**1**
Potential Housing Allocation	The Adopted Core Strategy classifies Southwater as a Category 1 Settlement, one which is "capable of sustaining some expansion, infilling and redevelopment") and could therefore be allocation for some of the proposed 2740 further homes which are to be provided by 2018. Preliminary assessment shows that any new allocations for housing development at Billingshurst will not fall within Flood Zone 2 or 3 regions.
Potential Employment Allocation	The Adopted Core Strategy states that there is "no provision before 2018 for any further large scale development at Southwater but recognition that this position may need to be reviewed in the light of the approval of the South East Plan and any requirements stemming from the final regional/sub regional strategy to accommodate additional development in the District". Preliminary assessment shows that any new allocations for employment development at Southwater will not fall within Flood Zone 2 or 3 regions.
Main River	None
Flood Record Information data	An extensive flooding incident was recorded in 1981 in the area of Southwater Street. As a result extensive watercourse improvements and large land drainage culverts were carried out. Minor flooding events have been recorded at Cripplegate Lane, New Road, Worthing Road, Boars Head Pub, King Edwards Close, Two Mile Ash Road and Downslink.

Settlement Level Coarse Assessment

	Size of settlement	Area in Zone 3		Area in Zone 2	Likely new development in Zones 2 and 3
		FZ3b FFP	FZ3a 100yr		
Area (ha)	180.10	0.00	0.00	0.00	0.00
% of Area		0.00	0.00	0.00	0.00

K2 – Historical Sewer Flooding Record



Project Title/Drawing Title

HORSHAM DISTRICT COUNCIL SFRA

FIGURE 11- HISTORIC INCIDENTS OF SEWER FLOODING BY POSTCODE

Notes

Southern Water has provided an extract from their DG5 Register for Horsham District. Due to data protection requirements, the data has been provided for the number of properties within a 4 or 5 digit postcode area that have experienced flooding either internally or externally within the last 10 years.
It should be noted that records only appear on the DG5 Register where they have been reported to Southern Water, and as such they may not include all instances of sewer flooding.
Furthermore, given that Southern Water target these areas for maintenance and improvements, areas that have experienced flooding in the past may no longer be at greatest risk of flooding in the future.
This map is intended to provide a strategic overview of areas at risk of sewer flooding and should not be used to assess flood risk for individual properties.

Client: HORSHAM DISTRICT COUNCIL

Drawn	Checked	Approved
JB	SL	EC
Date	Scale @ A3	Purpose of Issue
09/01/2020	1:85,000	FINAL
Drawing Number		Rev
FIGURE 11		02

AECOM
Midpoint
Alençon Link, Basingstoke
Hampshire, RG21 7PP
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Fax (01256) 310201
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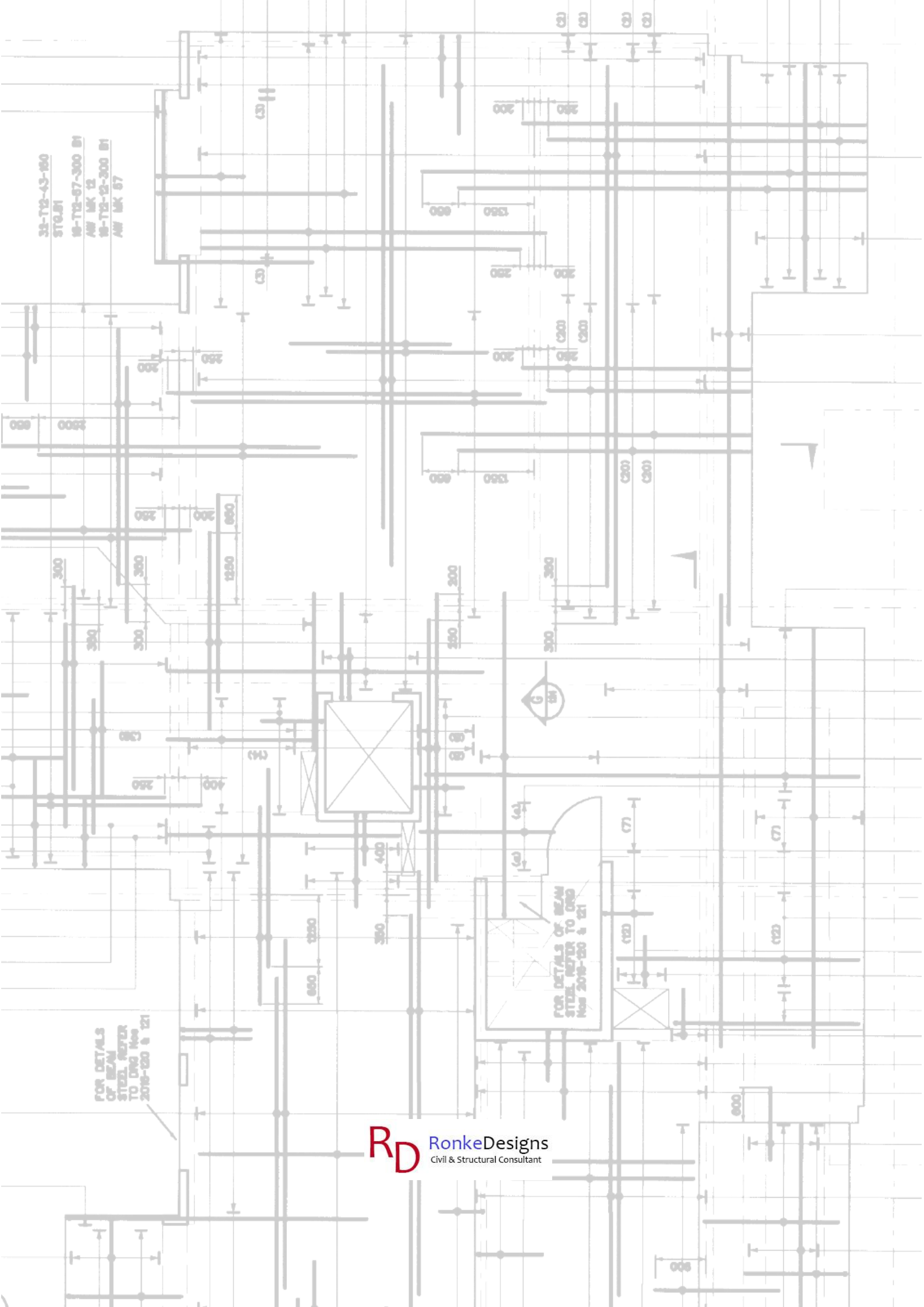
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