Project Name	: Land Adjacent to 21 Greencourt Drive, Bersted
Job No	: 24-277
Note Title	: Drainage Strategy Technical Note
Author	: CR
Checked	: GG
Approved	: GG
Date	: August 2025

1.0 INTRODUCTION

1.1 Background

1.1.1 Odyssey has been commissioned by UK Signature Homes to undertake a surface water and foul drainage strategy, to support a planning application for a proposed development at Land Adjacent to 21 Greencourt Drive, Bersted.

1.1.2 The proposal comprises a residential development of two dwellings, including the creation of new vehicular access, landscape planting, surface water attenuation and associated infrastructure. The Arun District Council (ADC) planning application number is BE/70/24/PL.

1.1.3 This technical note sets out details of the proposed drainage strategy in response to the ADC Drainage Engineer comments. The ADC comments are presented in **Appendix A**.

2.0 EXISTING SITE CONDITIONS

2.1 Location

2.1.1 The 0.08 hectare (ha) site is located approximately 1.5 kilometres (km) to the north-west of Bognor Regis railway station. The site is bounded by the rear accesses to gardens of dwellings along Nor'Bren Avenue in the north, the gardens of adjacent properties to the east and west, and Greencourt Drive to the south.

2.2 Topography

2.2.1 Based on available Light Detection and Ranging (LiDAR) data, level on site range from 7.8 metres Above Ordnance Datum (m AOD) to 8.2m AOD.

2.3 Geology and Hydrology

2.3.1 British Geological Survey (BGS) online mapping (accessed March 2025) indicates the bedrock geology of the site comprises Lambeth Group (clay, silt and sand). The mapping shows there are superficial River Terrace deposits (sand, silt and clay) present on the site. BGS mapping is presented in **Appendix B**.

2.3.2 Environment Agency (EA) online mapping indicates the nearest Main River is the Aldingbourne Rife, located approximately 1.5km to the north of the site.

2.3.3 BGS hydrogeology mapping (accessed March 2025) shows the site lies within the Lambeth Group, described as *"low productivity aquifer"* and summarised as a *"variable sequence of clays, shell beds, fine sands, silts and pebble beds giving low yields. Sometimes in hydraulic continuity with underlying Chalk aquifer"*.

2.3.4 Groundwater mapping published by the EA indicates the site is not located within a Source Protection Zone.

2.3.5 Groundwater monitoring was undertaken on site between November 2024 and March 2025. The depth of groundwater encountered ranged between 1.40m below ground level (bgl) and 2.50m bgl. The groundwater records and locations are provided in **Appendix C** and **Drawing 24-277-003A**.

2.3.6 Percolation testing was carried out on site to determine an indicative soakage rate. The Vp rates calculated ranged from 49 seconds to 58 seconds. The percolation testing calculations are presented in **Appendix C**.

2.4 Existing Drainage

2.4.1 Southern Water sewer records indicate the presence of a foul water sewer crossing the site. The sewer records are presented in **Appendix D**. A survey would be required to identify any existing private drainage infrastructure on site. There are no existing public surface water sewers within the site boundary, and the nearest is located approximately 100m to the south-east at the junction of Greencourt Drive, South Way, and Collyer Avenue.

2.4.2 As the developable area for this site is less than 50ha, the Institute of Hydrology (IoH) Report 124 Flood Estimation for Smaller Catchments (1994) method is suitable (50ha is used in the formula and the flow rate is linearly interpolated based on the ratio of the development area). This methodology is approved in the Construction Industry Research and Information Association (CIRIA) C753 The SuDS Manual; the parameters used are presented in **Table 2.1**.

Table 2.1: SuDS Parameters

Parameter	Value	Unit
SAAR	718	Millimetres (mm)
Soil Index	0.400	-
Region	7	-
Urban	0.000	-

2.4.3 **Table 2.2** summarises the greenfield discharge rates for the total proposed (positively drained) impermeable area of the site (0.051). Supporting calculations are included in **Appendix E**.

Table 2.2: Greenfield Surface Water Discharge Rates

Return Period	Existing Greenfield Discharge Rates from Site (litres per second (l/s)	Existing Greenfield Discharge Rates per Hectare (l/s/ha)
QBAR	0.2	3.5
Q1	0.2	3.0
Q30	0.4	7.9
Q100	0.6	11.2

3.0 PROPOSED DEVELOPMENT

3.1.1 The development proposals comprise the construction of two dwellings to the rear of 21 Greencourt Drive with associated infrastructure and works including highway access.

3.1.2 The proposed site layout is presented in **Appendix F**.

4.0 SURFACE WATER DRAINAGE STRATEGY

4.1 Surface Water Drainage Strategy Requirements

4.1.1 Any surface water drainage strategy must demonstrate that the proposed development would be drained in a sustainable manner, commensurate with local and national policy. The National Planning Policy Framework (NPPF) requires that flood risk is not increased elsewhere as a result of new development.

4.2 Proposed Surface Water Drainage Strategy

4.2.1 The proposed surface water drainage strategy is shown in **Drawing 24-277-004A**.

4.2.2 The ADC drainage hierarchy states that the most-preferred method of surface water discharge is "*discharge into the ground (infiltration)*". The groundwater monitoring results indicate the highest level encountered was 1.40m bgl, and a 1m unsaturated zone would be required between the base of an infiltration device and the peak groundwater level. The attenuation storage would therefore need to be kept at a maximum depth of 0.40m in order to achieve the 1m unsaturated zone, and the area required to achieve sufficient storage at this shallow depth would not be feasible within the site layout.

4.2.3 Furthermore, a 5m infiltration buffer between an infiltration device and any building. There would be insufficient space to achieve the necessary attenuation on site once a 5m buffer has been applied to both the existing dwellings located to the east and the west of the site, as well as the proposed dwellings. As such, infiltration is deemed to be an unviable option for surface water disposal.

4.2.4 The next most-preferred method of surface water discharge is "*controlled discharge to a surface water body*". There are no water bodies within the vicinity of the site, and therefore this option is not viable.

4.2.5 The next most-preferred method of surface water discharge is "*controlled discharge to a surface water sewer*". It is proposed to connect flows to the Southern Water surface water sewer located to the south-east of the site.

4.2.6 It is proposed that surface water from roads and clean roofs would be conveyed to permeable paving within the shared surfacing serving the two dwellings. Flows would connect to the public sewer at a controlled rate. Owing to the small scale of the development, it is proposed to

discharge flows at 0.5l/s. The risk of blockage associated with a low restricted rate is managed by the inclusion of silt traps and porous paving.

4.2.7 A smart water butt system will be incorporated to each property to provide additional interception drainage and water re-use.

4.2.8 The permeable paving has been designed to accommodate a 1 in 100-year storm plus 45% to account for climate change in line with the latest guidelines. The calculations have been undertaken in Causeway Flow and incorporate FEH 2022 rainfall data. Cv values have been set to 1.0 as per ADC requirements, 10% urban creep has been allowed for (see Drawing **24-277-005**), and a surcharged outfall has been modelled. The Causeway Flow calculations are presented in **Appendix E**.

4.3 Water Quality

4.3.1 The 'pollution hazard indices for different land use classifications' table has been extracted from CIRIA C753 The SuDS Manual, and applied to the development proposals, as shown in **Table 4.1**. The site is classed as having a low pollution hazard level.

Table 4.1: Pollution Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydro-carbons
Residential Roofs	Very low	0.2	0.2	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements /day	Low	0.5	0.4	0.4

4.3.2 The proposed permeable paving would provide treatment for the surface water runoff from the site. Pipe inlets to the permeable paving will be fitted with a silt trap. The SuDS mitigation indices have been calculated in **Table 4.2** in accordance with the guidance contained in The SuDS Manual.

Table 4.2: SuDS Mitigation Indices

Type of SuDS Component	Mitigation Indices		
	TSS	Metals	Hydrocarbons
Permeable Pavement	0.7	0.6	0.7

4.3.3 The total mitigation indices from **Tables 4.2** exceed the corresponding pollution hazard indices for the site from **Table 4.1**, therefore the pollution hazard from the site would be sufficiently mitigated.

5.0 FOUL DRAINAGE STRATEGY

5.1 Proposed Foul Water Drainage Strategy

5.1.1 Proposed foul flows would discharge to the existing Southern Water public foul sewer which crosses the site.

6.0 SUMMARY AND CONCLUSIONS

6.1.1 Odyssey has been commissioned by UK Signature Homes to undertake a surface water and foul drainage strategy in response to consultation comments from ADC, in support of a planning application for a proposed development at Land adjacent to 21 Greencourt Drive, Bersted.

6.1.2 It is proposed that surface water generated by the development would be attenuated onsite using lined permeable paving, and discharged at a restricted rate to the nearby Southern Water surface water sewer. It is proposed that foul flows would be discharged to the Southern Water foul sewer which crosses the site.

6.1.3 This Technical Note demonstrates the design principles for the proposed development regarding surface water and foul drainage are commensurate with national and local policy and meet ADC requirements.

DRAWINGS

S1 PERMEABLE PAVING
PLAN AREA: 73.522m²
COVER LEVEL: 8.0m
INVERT LEVEL: 6.805m - 6.786m
EFFECTIVE DEPTH: 0.895m - 0.914m

RE IL: 7.525
SIC1 SILT TRAP CL 8.125 IL 6.805
100Ø 1:16
D1 IL: 6.805
D2 IL: 6.805
SIC2 SILT TRAP CL 8.125 IL 6.805
100Ø 1:19
RE IL: 7.525
FIC2 CL: 8.125 IL: 6.229
100Ø 1:100
FIC3 CL: 8.125 IL: 6.204
100Ø 1:100
FIC1 CL: 8.125 IL: 6.336
100Ø 1:100
RE IL: 7.525
D4 IL: 6.786
D3 IL: 6.793
150Ø 1:100
SIC4 SILT TRAP CL 8.125 IL 6.785
100Ø 1:70
D6 IL: 6.762
D5 IL: 6.762
SIC3 SILT TRAP CL 8.125 IL 6.816
100Ø 1:10
RE IL: 7.525
D7 IL: 6.751
150Ø 1:100
D8 IL: 6.727

S2 PERMEABLE PAVING
PLAN AREA: 46.90m²
COVER LEVEL: 8.0m
INVERT LEVEL: 6.762m - 6.751m
EFFECTIVE DEPTH: 0.938m - 0.949m

S3 PERMEABLE PAVING
PLAN AREA: 41.32m²
COVER LEVEL: 8.0m
INVERT LEVEL: 6.727m - 6.699m
EFFECTIVE DEPTH: 0.973m - 1.001m

D9 IL: 6.699
150Ø 1:100

S4 VORTEX FLOW CONTROL
FLOW RATE: 0.5 l/s
DESIGN DEPTH: 1m
COVER LEVEL: 8.20
INVERT LEVEL: 6.679

S1.003 150Ø 1:100

S5
CL 8.10
IL 6.587

S1.004 150Ø @ 1:100

GREENCOURT DRIVE

EX 2351
CL 7.70
IL 5.61

225Ø

NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. THIS DRAWING IS FOR PLANNING PURPOSES ONLY AND IS TO BE READ IN CONJUNCTION WITH ALL OTHER DRAWINGS ISSUED BY THE ARCHITECT.
3. SITE LAYOUT HAS BEEN PROVIDED BY WILDERN ARCHITECTURE LTD. DATED MARCH 2023. DRAWING REF. W22-020-102-A
4. PROPOSED SuDS FEATURES ARE INDICATIVE ONLY AND SUBJECT TO EVOLVE IN LINE WITH THE DESIGN DEVELOPMENT.
5. THE PROPOSED SURFACE WATER NETWORK OUTSIDE OF THE PROPOSED BOUNDARY WOULD BE LAID IN VITRIFIED CLAY.
6. DURING CONSTRUCTION, EXACT POSITION OF ALL SERVICES AND EXISTING DRAINAGE TO BE VERIFIED.

LEGEND:

- SITE BOUNDARY
- EXISTING FOUL WATER SEWER AND MANHOLE
- EXISTING SURFACE WATER SEWER AND MANHOLE
- PROPSOED SURFACE WATER SEWER AND MANHOLE
- PROPOSED FOUL WATER SEWER AND MANHOLE
- PROPOSED EXCEEDANCE FLOW ROUTE
- PROPOSED NON-INFILTRATING PERMEABLE PAVING
- PROPOSED PERMEABLE PAVING DIFFUSER
- PROPOSED SMART WATER BUTTS

FOR PLANNING PURPOSES ONLY

Rev	Amendments	Drn	Chk	App	Date
A	UPDATED AS PER ARUN DC COMMENTS	CR	GG	GG	22.08.25

ODYSSEY
Tuscany House
White Hart Lane
Basingstoke
Hampshire RG21 4AF
Telephone: 01256 331144
Fax: 01256 331134
E: info@odysseyconsult.co.uk
W: www.odysseyconsult.co.uk

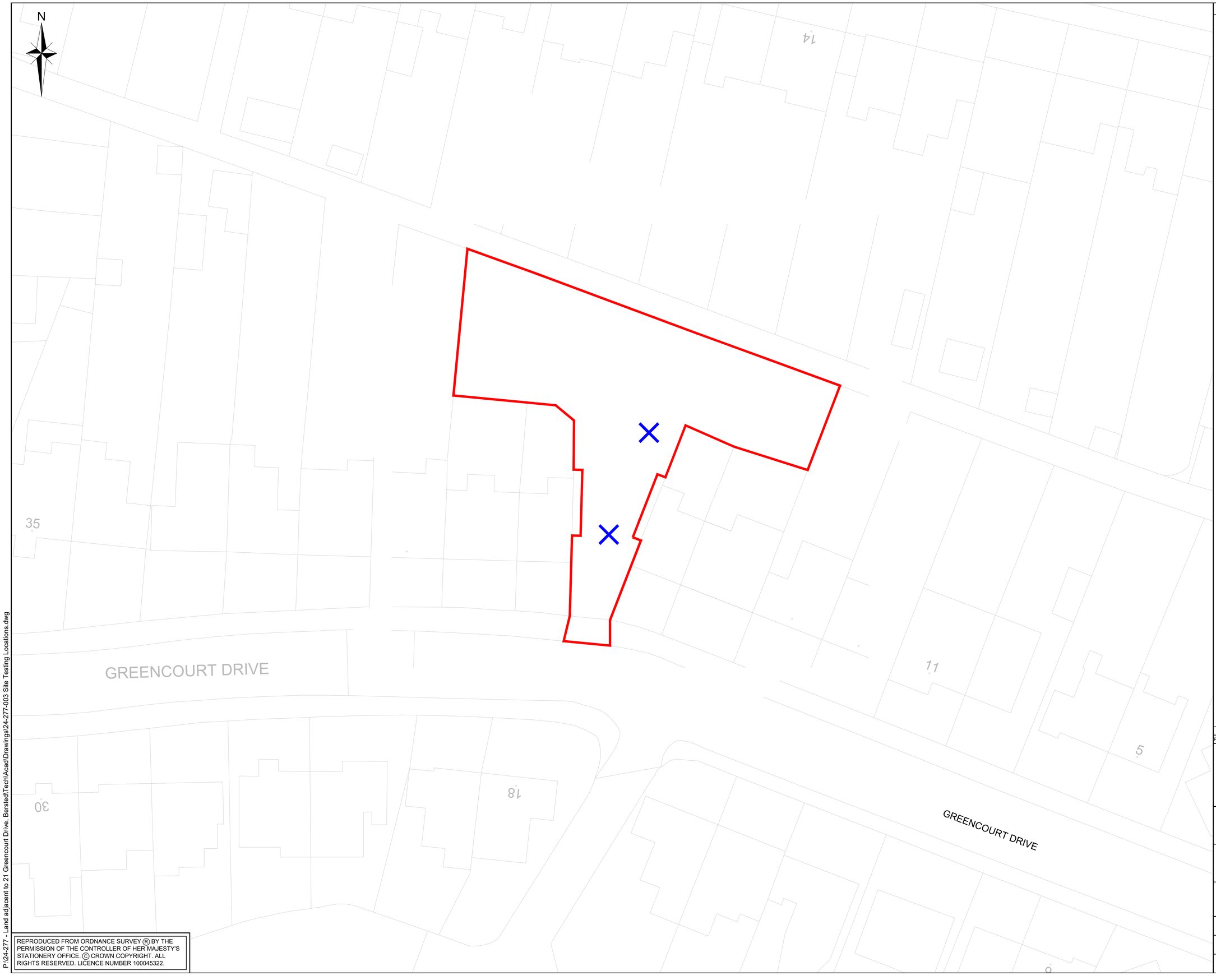
Job Title
LAND ADJACENT TO 21 GREENCOURT DRIVE, BERSTED

Drawing Title
PRELIMINARY DRAINAGE STRATEGY

Client
UK SIGNATURE HOMES

Scale	Date	Designed
1:200 @A1	OCT 24	HM
Drawn	Checked	Approved
HM	NM	GG
Job No	Drawing No	Rev
24-277	24-277-004	A

P:\24-277 - Land adjacent to 21 Greencourt Drive, Bersted\Tech\Acad\Drawings\24-277-004 Preliminary Drainage Strategy.dwg



NOTES

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LEGEND:

SITE BOUNDARY

PROPOSED GROUNDWATER MONITORING LOCATION

Rev	Amendments	Drn	Chk	App	Date
A	UPDATED TO AS SURVEYED LOCATIONS	CR	BC	BC	22.08.25

ODYSSEY

Tuscany House
White Hart Lane
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Job Title
LAND ADJACENT TO 21 GREENCOURT DRIVE, BERSTED

Drawing Title
GROUNDWATER MONITORING LOCATIONS

Client
UK SIGNATURE HOMES

Scale	Date	Designed
1:200 @A1	NOV 24	HM
Drawn	Checked	Approved
HM	NM	GG
Job No	Drawing No	Rev
24-277	24-277-003	A

P:\24-277 - Land adjacent to 21 Greencourt Drive, Bersted\Tech\Acad\Drawings\24-277-003 Site Testing Locations.dwg

PERMEABLE PAVING
AREA 1 CATCHMENT
AREA: 289.7m²
AREA + 10% UC: 318.7m²

PERMEABLE PAVING
AREA 3 CATCHMENT
AREA: 125.7m²
AREA + 10% UC: 138.3m²

PERMEABLE PAVING
AREA 3 CATCHMENT
AREA: 90.4m²
AREA + 10% UC: 99.4m²

GREENCOURT DRIVE

EX 2351
CL 7.70
IL 5.61

225Ø

NOTES

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3. SITE LAYOUT HAS BEEN PROVIDED BY WILDERN ARCHITECTURE LTD. DATED MARCH 2023. DRAWING REF. W22-020-102-A
4. PROPOSED SuDS FEATURES ARE INDICATIVE ONLY AND SUBJECT TO EVOLVE IN LINE WITH THE DESIGN DEVELOPMENT.
5. THE PROPOSED SURFACE WATER NETWORK OUTSIDE OF THE PROPOSED BOUNDARY WOULD BE LAID IN VITRIFIED CLAY.

LEGEND:

- SITE BOUNDARY
- EXISTING FOUL WATER SEWER AND MANHOLE
- EXISTING SURFACE WATER SEWER AND MANHOLE
- PROPSOED SURFACE WATER SEWER AND MANHOLE
- PROPOSED FOUL WATER SEWER AND MANHOLE
- PROPOSED NON-INFILTRATING PERMEABLE PAVING
- PROPOSED PERMEABLE PAVING DIFFUSER
- PERMEABLE PAVING AREA 1 CATCHMENT
- PERMEABLE PAVING AREA 2 CATCHMENT
- PERMEABLE PAVING AREA 3 CATCHMENT

FOR PLANNING PURPOSES ONLY

Rev	Amendments	Drn	Chk	App	Date

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W: www.odysseyconsult.co.uk

Job Title
LAND ADJACENT TO 21 GREENCOURT DRIVE, BERSTED

Drawing Title
IMPERMEABLE AREAS PLAN

Client
UK SIGNATURE HOMES

Scale	Date	Designed
1:200 @A1	AUG 25	HM
Drawn	Checked	Approved
CR	CR	GG
Job No	Drawing No	Rev
24-277	24-277-005	-

P:\24-277 - Land adjacent to 21 Greencourt Drive, Bersted\TechA\cad\Drawings\24-277-005 Impermeable Areas Plan.dwg

APPENDIX A

Arun District Council Drainage Consultation Comments

Engineers Comments Regarding Surface Water Drainage

Application Reference:	BE/44/25/PL	**Reviewer Reference:**	ADC/PC
Planning Officer:	Hannah Kersley	**Date of Review:**	31/07/2025
Site Name:	Land adjacent to 21 Greencourt Drive Bersted PO21 5EU		
Application Description:	2 No 2 bedroom detached bungalows with associated car parking and bin and bike stores (resubmission following BE/70/24/PL. This application is in CIL Zone 4 and is CIL Liable as new dwellings.		
Assessment Number:	1 of 1		

Policy and Guidance Information

Arun District Council Surface Water Drainage Guidance - https://www.arun.gov.uk/surfacewater

Land Drainage Consent – https://www.westsussex.gov.uk/fire-emergencies-and-crime/dealing-with-extreme-weather/flooding/flood-risk-management/ordinary-watercourse-land-drainage-consent/
and
https://www.arun.gov.uk/land-drainage-consent/

Arun District Council surface water pre-commencement conditions -
https://www.arun.gov.uk/planning-pre-commencement-conditions

The SuDs Manual [C753] by CIRIA

Sustainable drainage systems: non-statutory technical standards'
https://assets.publishing.service.gov.uk/media/5a815646ed915d74e6231b43/sustainable-drainage-technical-standards.pdf

National standards for sustainable drainage systems
National standards for sustainable drainage systems - GOV.UK

Response	**Objection**

Critical Items for Surface Water Drainage Design Conditions

The failure to adequately address the following items will result in an objection to a surface water drainage design.

If any of these items are inadequately addressed by the submission, then their correction may result in a redesign of the surface water drainage scheme. A redesign is likely to have site wide implications such as the potential for storage structures to increase in volume or plan area.

Critical Item	Reason	Status
Winter groundwater monitoring data.	Adequate winter groundwater monitoring data must be supplied to evidence that infiltration designs have sufficient freeboard from the base of structures and the peak groundwater level.	**Supplied but location plan of monitoring points required.**

	The same data is necessary to ensure that the potential for buoyancy has been adequately considered in attenuation designs.	
Winter infiltration testing data.	Adequate winter infiltration testing must be supplied to justify the proposed discharge method and design infiltration rates. Infiltration tests must be completed strictly in accordance with BRE DG 365, CIRIA R156 or a similar approved method. Testing depths must account for peak groundwater levels and correspond with the location and depth of proposed infiltration features. Designs must be based upon the slowest infiltration rate evidenced closest to a proposed infiltration feature. Average design rates will not be accepted. The results of incomplete tests should not be extrapolated to obtain design values for infiltration rates.	**Sufficient – infiltration not deemed feasible due to high groundwater and difficulty to achieve one metre freeboard.**
The hierarchy for sustainable drainage.	The proposed discharge method must accord with the SuDS hierarchy as given below. Evidence must be supplied to justify the proposed discharge method. 1. Rainwater reuse where possible. 2. Complete discharge into the ground (infiltration). 3. Hybrid infiltration and restricted discharge to an appropriate water body or surface water sewer. 4. Restricted discharge to an appropriate water body. 5. Restricted discharge to a surface water sewer. 6. Restricted discharge to a combined sewer. A water body may be defined as a river, watercourse, ditch, culverted watercourse, reservoir, wetland or the sea. **Engineers cannot support any proposed connection of surface water to the foul sewer.**	**Supplied – restricted discharge to Public Surface Water Sewer but discharge rate to be reduced.**
Calculations	Calculations for pre-development run off rates must be based upon the positively drained area only.	**Insufficient**

	Proposed discharge rates must not increase flood risk on site or elsewhere. Discharge rates must be restricted to QBAR or 2 l/s/ha, depending on whichever is higher.	
	Designs must be based on the most recently available rainfall data at the time of conditions being applied. **FSR rainfall data will not be accepted.** FEH rainfall data is based upon more recent records and continues to be updated.	**Sufficient**
	Designs must use the correct climate change allowances at the time of determination of the outline or full planning application. CV values for all events must be set to 1. This includes summer, winter, design, and simulation events. The correct allowance for urban creep must be applied. Additional storage must be set to zero unless it can be evidenced where this is provided. Infiltration half-drain times must be less than 24 hours. Infiltration design rates must be applied to the sides of soakaways, or to the base of infiltration blankets. Design rates must not be applied to both the base and sides of infiltration structures. A surcharged outfall must be modelled.	**Insufficient**
Natural catchments design.	The submission must define the natural drainage characteristics within, and hydraulically linked to, the site and demonstrate that the drainage proposals will integrate with and not compromise the function of the natural and existing drainage systems. The condition, performance (including capacity where appropriate) and ownership of any existing site surface water drainage infrastructure must be accurately reported. Appropriate easements to watercourses and other services must be shown on all plans.	**Sufficient**

	Where there are areas of flood risk from any source on the site, it must be shown how a sustainable surface water drainage design can be accommodated on the site without conflicting with those areas of flood risk. Designs must replicate the natural drainage catchments of the site. All surface water drainage designs must therefore drain via gravity to corresponding points of discharge. **The use of pumps for surface water drainage is not sustainable and will not be supported**. .	
Plans	Plan areas, depths and levels of drainage infrastructure must accurately correspond with the supporting calculations.	**Insufficient**
Water quality benefits.	An assessment of water quality is necessary to evidence that the proposed design provides adequate treatment of surface water.	**Sufficient once silt traps have been incorporated.**
Trees and planting	There should be no conflict between surface water drainage infrastructure and existing or proposed trees or planting. The design must consider the potential growth of proposed trees and adequate mitigation must be provided to protect drainage infrastructure where conflict **cannot** be avoided.	**Sufficient**

Additional comments to the planning officer

The NPPF states that when determining any planning application, local planning authorities should ensure that flood risk is not increased elsewhere (paragraph 173 and 180e). The PPG guides local planning authorities to refer to 'Sustainable drainage systems: non-statutory technical standards' and detailed industry guidance like The SuDS Manual [C753] by CIRIA to guide decisions about the design, maintenance, and operation of sustainable drainage systems for non-major development.

This consultation has been primarily informed by The SuDS Manual.

The applicant has now undertaken ground investigations, which has revealed that groundwater levels peak 1.4m below ground level. This effectively rules out infiltration as an option due to the need to provide one metre freeboard between the bases of any infiltration devices and peak groundwater level. On this site it is not practical to achieve such a shallow (ie. 400mm depth) infiltration system.

The proposal is therefore to discharge to the Public surface Water sewer at the junction of Greencourt Drive and South Way, at a restricted rate. Unfortunately, the proposed discharge rate exceeds what we would expect for this development and will need to be reduced. This fact, together

with other comments listed below need to be addressed at this stage, to ensure that we can adequately assess if flood risk will be increased by the proposed development. **Therefore, currently this application does not accord with the NPPF as set out above.**

Overcoming our objection

As this is not a holding objection or a request for further information, I am not listing requested conditions. If you are minded to approve this application, please reconsult me for a list of suggested conditions to ensure that the development is adequately drained and does not increase flood risk elsewhere.

The imposition of conditions at this stage rather than overcoming my objection could result in a circumstance where the condition cannot be discharged. In the event of attaching a condition that cannot be discharged, permission may be invalid.

If the planning officer is minded to allow the applicant additional time to submit further documents to support this application, then the following evidence may overcome our objection. Please do not submit further documents without prior discussion with the planning officer as to whether it will be possible for these to be assessed or influence their determination.

The matters listed below need to be resolved/agreed in order for our objection to be reconsidered;

1. The proposed discharge rate is excessive for a development of this scale and exceeds the requirements of the National Standards . In this instance, we are prepared to agree a rate of 0.5 l/s in order to help provide a practical solution. Restricting flows to such rates, will result in a flow control device of a small diameter, which needs protection from blockage. However, provided all flows pass through the permeable paving, as currently proposed, then this will act as a means to reduce the risk of blockage. Additional measures can be incorporated as part of the detailed design at a later stage. A suitable revised scheme therefore needs to be provided, to accommodate the increase in storage required, etc.

2. Evidence of permission in principle from Southern Water is required, in respect to the proposed connection of surface water to the Public Surface Water sewer, at the discharge rate discussed above.

3. The applicant should note that the existing manhole being connected to at the junction of Greencourt Drive and South Way may be at a slightly different location to that shown on the drainage layout plan ie. more into the footpath. Also, it would be advisable to ensure that no third party utility mains/services, including the existing highway drainage in Greencourt Drive, conflict with the routing and levels of the proposed pipework, etc. This matters may result in having to reconfigure the proposed offsite pipework to enable a suitable connection.

4. It is noted that there will be a considerable length of ‘offsite’ pipework and associated manhole/s. Confirmation is required as to whether these assets are to be adopted by a Water Company. Evidence of agreement in principle from the Water Company will be required. It is unlikely, that West Sussex County Council (WSCC), as Highway Authority will permit an unadopted arrangement in the public highway and therefore it is important to establish its future status. If adoption is not sought, then confirmation will be required from WSCC that the principle of the arrangement is acceptable to them.

5. The hydraulic calculations have not been checked as a result of item 1. However, they will need to be altered to reflect the revised scheme that is now required. Urban creep at 10% must be included, irrespective of the sites perceived constraints. A surcharged outfall must also be modelled. Ensure that the calculations reflect the invert level of the proposed flow control devices. Provide a copy of the FEH point descriptors file, so they parameters can be checked.

6. Provide an impermeable area plan to support the hydraulic calculations.

7. The drainage layout must include the pipework/manhole arrangements around the two dwellings and show the connectivity to the permeable paving. Manhole cover levels, invert levels, pipe diameters and gradients to be included. All diffuser units (including those linking the permeable pavements) to have inverts specified. Indicate diameters/gradients of all link pipes. Silt traps to be incorporated prior to any discharge into permeable paving.

8. Provide a location plan for the water table monitoring boreholes, to confirm that they are located on site.

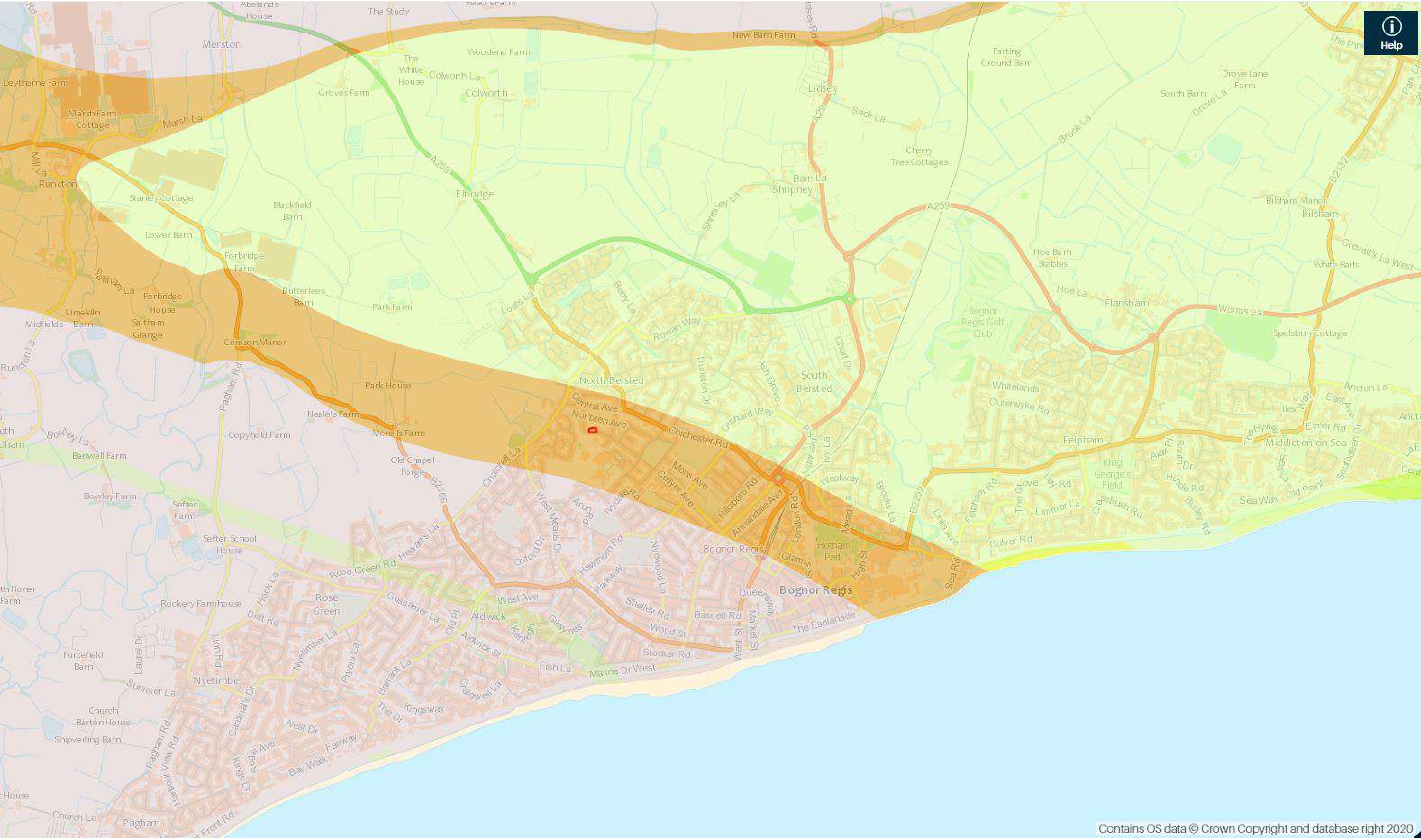
9. Interception drainage needs to be considered. This could take the form of smart water butts and/or other methods of rainwater harvesting. Indicate on drainage layout.

A surface water design checklist is available on our website at https://www.arun.gov.uk/surfacewater/. **If the design is amended following receipt of our consultation the designer may need to refer to the full checklist to ensure that the revised design meets our requirements.**

This checklist is designed to aid an applicant with their submission. The list is not exhaustive, and our engineers may request additional information to enable them to review a proposal to their satisfaction.

APPENDIX B

British Geological Survey Mapping


Help
Merston
The Study
New Barn Farm
Woodend Farm
Leythorne Farm
Marsh Farm Cottage
Marsh La
Groves Farm
The White House
Colworth La
Colworth
Lidsey
Sack La
Fatting Ground Barn
Drove Lane Farm
South Barn
Drove La
Brook La
Cherry Tree Cottages
Runcton
Stanley Cottage
Blackfield Barn
Elbridge
A259
Barn La
Shripney
Shripney La
Bilsham Manor
Bilsham
Grevatt's La West
White Rails
Hoe Barn Stables
Lower Barn
Forbridge Farm
Saltham La
Forbridge House
Butterlees Barn
Park Farm
Loats La
Berry La
Rowan Way
Hoe La
Flansham
Worms La
Spelsbury Cottage
Bognor Regis Golf Club
Limekiln Barn
Midfields
Saltham Grange
Crimson Manor
Pagham Rd
Park House
North Bersted
Durlston Dr
Ash Grove
South Bersted
Churt Dr
Whitelands
Outerwyke Rd
Arnelon La
Central Ave
Nor'bren Ave
Chichester Rd
Orchard Way
Neale's Farm
Morells Farm
Copyhold Farm
Bowley La
Barnwell Farm
Felpham
The Byway
Elmer Rd
Middleton-on-Sea
Old Chapel Forge
B2166
Chalcraft La
West Meads Dr
Mons Ave
Collyer Ave
Hillsboro Rd
Annandale Ave
London Rd
Westway
Mead La
B2259
Felpham Rd
King George's Field
South Dr
Sea Way
Old Point
Bowley Farm
Sefter Farm
Sefter School House
Rose Green Rd
Hewart's La
Oxford Dr
Hawthorn Rd
Nyewood La
Bognor Regis
Hotham Park
Glamis St
High St
Sea Rd
Culver Rd
Rookery Farmhouse
Hook La
Drift Rd
Rose Green
Gossamer La
West Ave
Aldwick
Parkway
Shelley Rd
Bassett Rd
Queensway
Wood St
The Esplanade
Stocker Rd
West St
Market St
Marine Dr West
Fish La
Aldwick St
Furzefield Barn
Laurel Dr
Summer La
Nyetimber
Nyetimber La
Pryors La
Barrack La
Craigweil La
Kingsway
The Dr
West Dr
Church Barton House
Shipverling Barn
Pagham Rd
Kings Dr
Regis Ave
Fairway
Bay Walk
Church La
Pagham
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Help
The Study
Merston
Woodend Farm
New Barn Farm
Fatting Ground Barn
Drove Lane Farm
South Barn
Drove La
Leythorne Farm
Groves Farm
The White House
Colworth La
Colworth
Lidsey
Sack La
Brook La
Marsh Farm Cottage
Marsh La
Cherry Tree Cottages
A259
A29
Runcton
Mill La
Stanley Cottage
Elbridge
Barn La
Shripney
Shripney La
Bilsham Manor
Bilsham
B2132
Blackfield Barn
Lower Barn
Grevatt's La West
White Pails
Forbridge Farm
Butterlees Barn
Hoe Barn Stables
Hoe La
Flansham
Worms La
Saltham La
Forbridge House
Limekiln Barn
Midfields
Saltham Grange
Park Farm
Loats La
Berry La
Rowan Way
Bognor Regis Golf Club
Spelsbury Cottage
Crimson Manor
Pagham Rd
Durlston Dr
Ash Grove
Churt Dr
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Burley Rd
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Sefter School House
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High St
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Oxford Dr
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Gossamer La
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Drift Rd
Hook La
Old Pl
Shelley Rd
Bassett Rd
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Aldwick St
Fish La
Stocker Rd
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Market St
Nyetimber La
Furzefield Barn
Laurel Dr
Lion Rd
Nyetimber
Summer La
Pryors La
Barrack La
Craigweil La
Church Barton House
Cardinals Dr
Kingsway
The Dr
West Dr
Shipverling Barn
Pagham Rd
Harbour View Rd
Kings Dr
Regis Ave
Bay Walk
Fairway
Church La
Pagham
Front Rd
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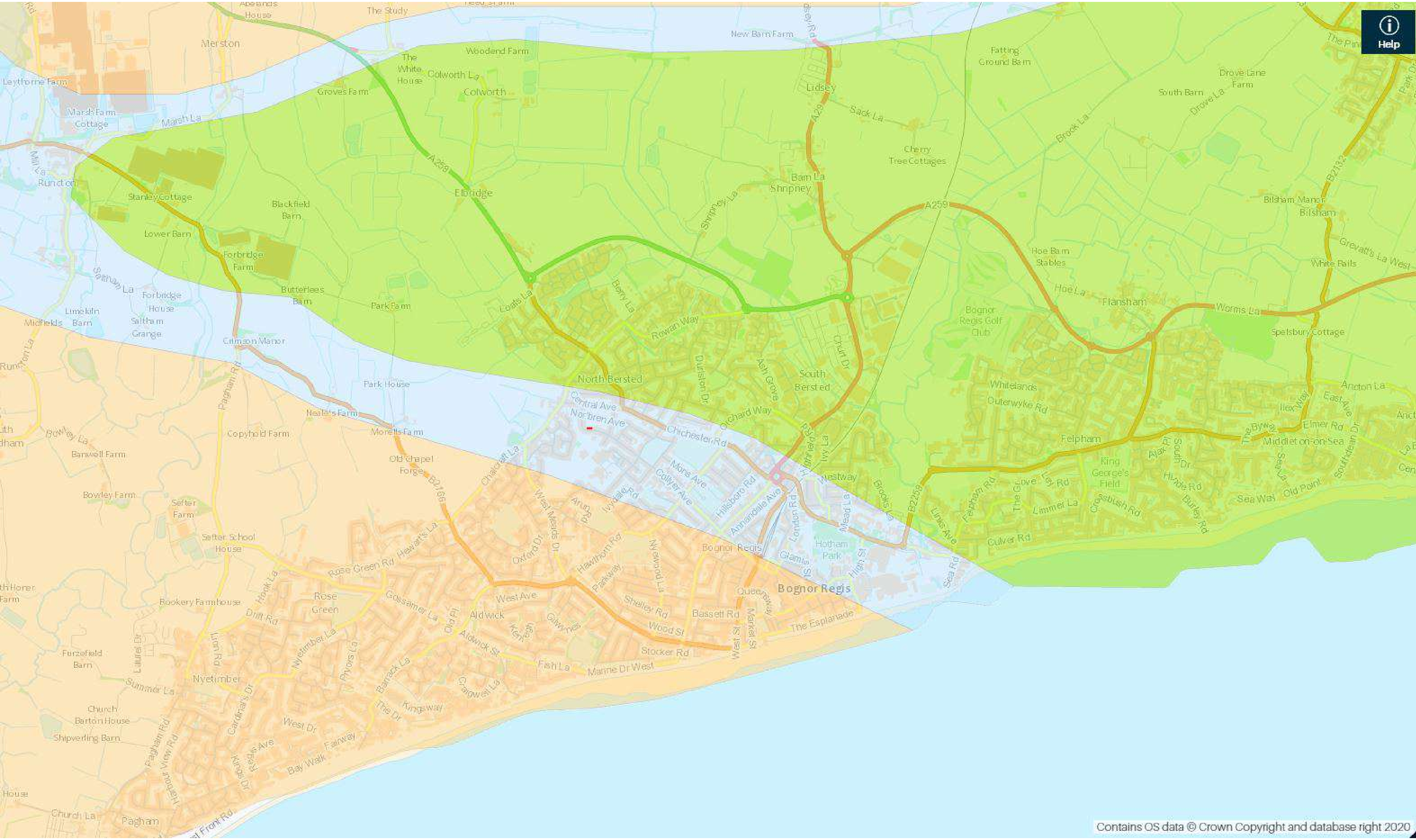
Help
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Shipverling Barn
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Craigweil La
West Dr
Fairway
Bay Walk
Regis Ave
Kings Dr
Pagham Rd
Harbour View Rd
Church La
Pagham
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APPENDIX C

Site Investigation Results

PERCOLATION TESTS AND CALCULATIONS

For the proposed installation of a new soak away system

Calculations

Result of 1st Percolation Test

(a) Depth of water (mm) **250** (b) Time taken to soak away (secs) **14,400**

Percolation Value (V_p) = (b) ÷ (a) **57.6** (secs)

Result of 2nd Percolation Test

(a) Depth of water (mm) **250** (b) Time taken to soak away (secs) **12,600**

Percolation Value (V_p) = (b) ÷ (a) **50.4** (secs)

Result of 3rd Percolation Test

(a) Depth of water (mm) **250** (b) Time taken to soak away (secs) **12,240**

Percolation Value (V_p) = (b) ÷ (a) **48.96** (secs)

Calculations (continued)

Average V_p Value of test 1, 2 & 3 **52.32** (secs) (This is known as the Percolation Value)

Number of persons (P) to be served by the new system **6**

(Allow a realistic figure here, e.g for a 3 bedroom house, 4 to 5 persons)

Area of drainage trench (A_t) required = P x V_p x 0.25 (or 0.2)

Substituting the values given above: A_t = **6** x **52,32** x **.25**

= 78.48 square metres

Width (W) of new drainage trench = **.6** **metres**

Length (L) of new drainage trench **= A_t ÷ W**

= **78.48** ÷ **.6** metres

= **130.8** **metres**

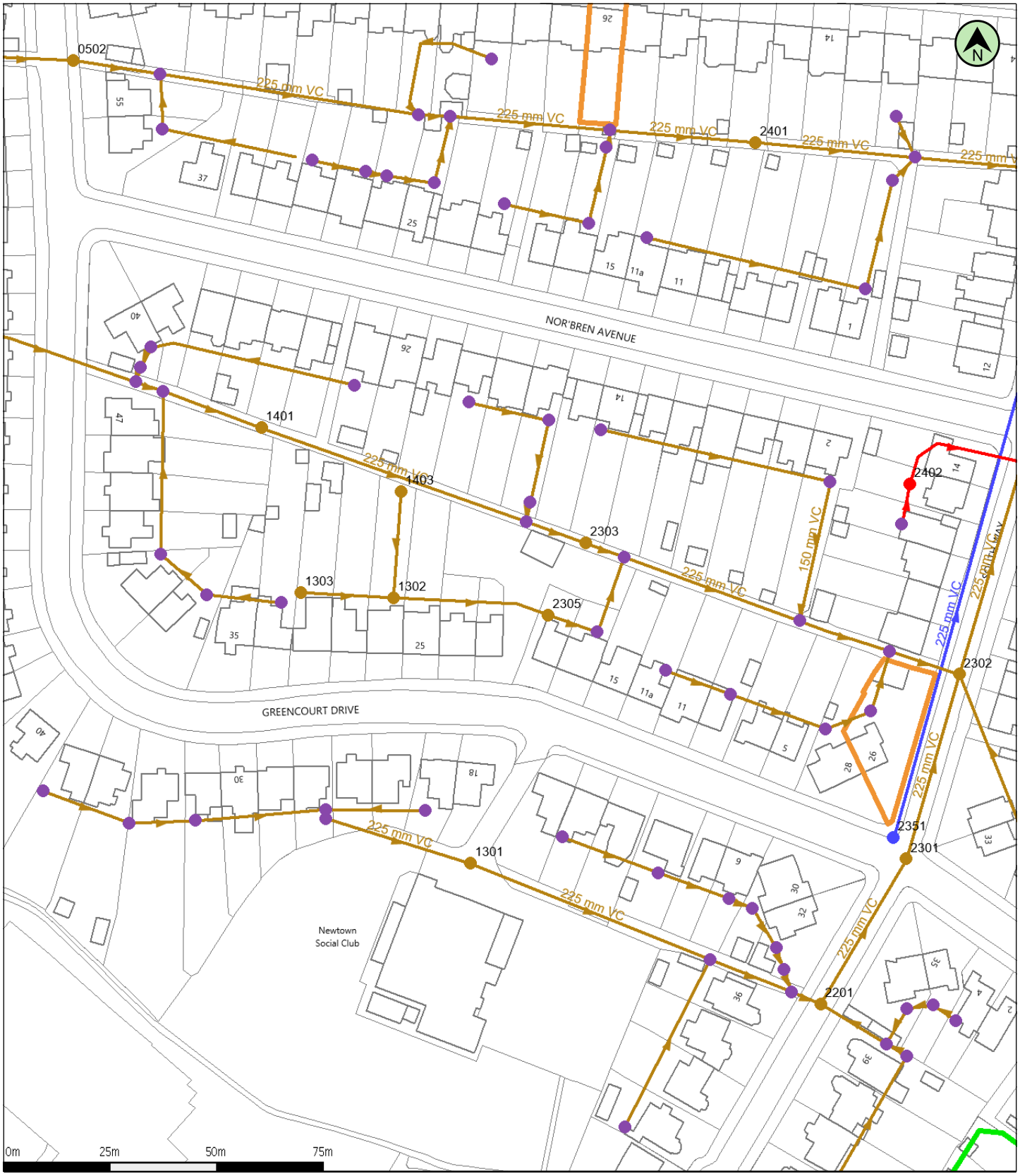
Notes

Test was carried out on February 28th.
Test hole filled overnight.
The 27th had prolonged heavy rain in the morning.
The 28th was dry and fair.
Hole size was 1m x .6 x .8 and filled to a depth of 250mm with water.
First test conducted at 7am.
Second test conducted at 1230pm.
Third test conducted at 8am on the next day.

Depth of Standing Groundwater			
Trial Hole	**Date**	**Depth of Groundwater (m bgl)**	**Depth of Standpipe (m bgl)**
WS1	25/11/2024	1.40	3.25
	05/12/2024	1.50	3.20
	07/01/2024	1.40	3.30
	12/02/2025	2.50	3.00
	03/03/2025	2.40	3.30
WS2	25/11/2024	1.87	3.25
	05/12/2024	2.00	3.20
	07/01/2024	1.80	3.20
	12/02/2025	2.50	3.15
	03/03/2025	2.41	3.10

APPENDIX D

Southern Water Sewer Records



Scale: 1:1250

Date: 17/10/24

Wastewater Plan A4

Data updated: 24/09/24

Map Centre: 492193,100379

Our Ref: 1597664 - 1

Powered by digdat

Foul Gravity Sewer
Combined Gravity Sewer
Culverted Water Course or Treated Effluent
Surface Water Gravity Sewer
Rising Main, Vacuum or Syphon
Combined Outfall
Surface Water Outfall
Foul Outfall
Surface Water Inlet
Combined Pumping Station
Surface Water Pumping Station
Foul Pumping Station
Water Treatment Works
Section 104 Area
Building Over Agreement Area
Foul Manhole
Combined Manhole
Surface Water Manhole
Side Entry Manhole, Demarcation Chamber, Dummy Manhole or Surface Water Soakaway

cneedham@odysseyconsult.co.uk

24-277

from 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. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2024 Ordnance Survey AC0000808122 .This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
2402	C	0.00	0.00	
0502	F	6.51	0.00	
1301	F	8.39	5.35	
1302	F	0.00	0.00	
1303	F	0.00	0.00	
1401	F	7.24	0.00	
1403	F	0.00	0.00	
2201	F	7.91	4.98	
2301	F	7.68	0.00	
2302	F	7.07	0.00	
2303	F	0.00	0.00	
2305	F	0.00	0.00	
2401	F	6.44	0.00	
2351	S	7.70	5.61	

APPENDIX E

Drainage Strategy Supporting Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.400
Area (ha)	1.000	Urban	0.000
SAAR (mm)	718	Region Number	Region 7

Results l/s

QBAR Rural	3.5
QBAR Urban	3.5
Q100 years	11.2
Q1 year	3.0
Q30 years	7.9
Q100 years	11.2

Nodes

	Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Notes
✓	S1 Permeable Paving	0.032	4.00	8.000	Manhole	Adoptable	1200	492194.711	100377.703	1.214	Auto-design is off
✓	S2 Permeable Paving	0.014	4.00	8.000	Junction			492194.228	100372.068	1.249	Auto-design is off
✓	S3 (Permeable Paving)	0.010	4.00	8.000	Junction			492194.602	100366.263	1.301	Auto-design is off
✓	S4 Flow Control			8.200	Manhole	Adoptable	1200	492194.633	100363.408	1.521	Auto-design is off
✓	S5			8.100	Manhole	Adoptable	1200	492197.389	100361.048	1.513	Auto-design is off
✓	S6 Outfall			7.700	Manhole	Adoptable	1200	492206.838	100361.012	2.015	

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S1 Permeable Paving	S2 Permeable Paving	2.425	0.600	6.786	6.762	0.024	101.0	150	4.04	50.0
1.001	S2 Permeable Paving	S3 (Permeable Paving)	2.452	0.600	6.751	6.727	0.024	102.2	150	4.08	50.0
1.002	S3 (Permeable Paving)	S4 Flow Control	1.966	0.600	6.699	6.679	0.020	98.3	150	4.11	50.0
1.003	S4 Flow Control	S5	9.201	0.600	6.679	6.587	0.092	100.0	150	4.27	50.0
1.004	S5	S6 Outfall	90.231	0.600	6.587	5.685	0.902	100.0	150	5.76	50.0

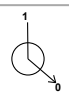
	Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Minimum Depth (m)	Maximum Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
?	1.000	S1 Permeable Paving	S2 Permeable Paving	0.999	17.7	5.8	1.064	1.088	1.064	1.088	0.032	0.0	59	0.895
?	1.001	S2 Permeable Paving	S3 (Permeable Paving)	0.994	17.6	8.3	1.099	1.123	1.099	1.123	0.046	0.0	72	0.979
?	1.002	S3 (Permeable Paving)	S4 Flow Control	1.013	17.9	10.1	1.151	1.371	1.151	1.371	0.056	0.0	81	1.043
?	1.003	S4 Flow Control	S5	1.005	17.8	10.1	1.371	1.363	1.363	1.371	0.056	0.0	81	1.037
✓	1.004	S5	S6 Outfall	1.004	17.7	10.1	1.363	1.865	1.363	1.865	0.056	0.0	81	1.037

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	2.425	101.0	150	Circular	8.000	6.786	1.064	8.000	6.762	1.088
1.001	2.452	102.2	150	Circular	8.000	6.751	1.099	8.000	6.727	1.123
1.002	1.966	98.3	150	Circular	8.000	6.699	1.151	8.200	6.679	1.371
1.003	9.201	100.0	150	Circular	8.200	6.679	1.371	8.100	6.587	1.363
1.004	90.231	100.0	150	Circular	8.100	6.587	1.363	7.700	5.685	1.865

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1 Permeable Paving	1200	Manhole	Adoptable	S2 Permeable Paving		Junction	
1.001	S2 Permeable Paving		Junction		S3 (Permeable Paving)		Junction	
1.002	S3 (Permeable Paving)		Junction		S4 Flow Control	1200	Manhole	Adoptable
1.003	S4 Flow Control	1200	Manhole	Adoptable	S5	1200	Manhole	Adoptable
1.004	S5	1200	Manhole	Adoptable	S6 Outfall	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	MH Type	Connections	Link	IL (m)	Dia (mm)	Link Type
S1 Permeable Paving	492194.711	100377.703	8.000	1.214	1200	Manhole	Adoptable	 0	1.000	6.786	150	Circular
S2 Permeable Paving	492194.228	100372.068	8.000	1.249		Junction		 1 0	1.000 1.001	6.762 6.751	150 150	Circular Circular
S3 (Permeable Paving)	492194.602	100366.263	8.000	1.301		Junction		 1 0	1.001 1.002	6.727 6.699	150 150	Circular Circular
S4 Flow Control	492194.633	100363.408	8.200	1.521	1200	Manhole	Adoptable	 1 0	1.002 1.003	6.679 6.679	150 150	Circular Circular

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	MH Type	Connections	Link	IL (m)	Dia (mm)	Link Type
S5	492197.389	100361.048	8.100	1.513	1200	Manhole	Adoptable	1	1.003	6.587	150	Circular
												
								0	1.004	6.587	150	Circular
S6 Outfall	492206.838	100361.012	7.700	2.015	1200	Manhole	Adoptable	1	1.004	5.685	150	Circular
												

Simulation Settings

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

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

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

Node S6 Outfall Surcharged Outfall

Overrides Design Area	x	Depression Storage Area (m²)	0	Evapo-transpiration (mm/day)	0
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	0		

Applies to All storms

Time (mins)	Depth (m)	Time (mins)	Depth (m)
0	0.150	1440	0.150

Node S4 Flow Control Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	6.679	Product Number	CTL-SHE-0032-5000-1000-5000
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	0.5	Min Node Diameter (mm)	1200

Node S1 Permeable Paving Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	6.786	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	
Safety Factor	2.0	Width (m)	7.591	Inf Depth (m)	
Porosity	0.30	Length (m)	9.685		

Node S2 Permeable Paving Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	6.751	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	
Safety Factor	2.0	Width (m)	8.901	Inf Depth (m)	
Porosity	0.30	Length (m)	5.269		

Node S3 (Permeable Paving) Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	6.699	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	
Safety Factor	2.0	Width (m)	2.948	Inf Depth (m)	
Porosity	0.30	Length (m)	14.016		

APPENDIX F

Proposed Site Layout

Site Plan - As Proposed 1:100

Rev.		By	Date
A	Red line amended - Re-issued for Planning Application	NJ	25-09-24
-	Issued for Planning Application	NJ	30-07-24

Wildern Architecture Ltd
The Hawthorns, 105 Dibles Road,
Warsash, Southampton, SO31 9JL
07920 260758

Project

Land adjacent to 21 Greencourt Drive, Bersted, PO21 5EU

Client

Sherfield Homes Ltd

Title

Site Plan - As Proposed

Date March 23 Drawn By NJ

Job No.	Drawing No.	Scale	Revision
W22-020	102	1:100@A1	A