consulting engineers

Hook Meadow, Westergate

Drainage Statement

November 2024

B0457

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1.0 Introduction

1.1 This Drainage Statement (DS) has been produced to support the Reserved Matters Reserved matters application for the appearance, landscaping, layout and scale (pursuant to outline permission AL/178/22/OUT) for the construction of up to 89 residential dwellings and open space and associated works.

1.2 The DS will seek to address the following:

- A summary of the existing work completed to date as part of the outline application including surface and foul water drainage strategies.
- Demonstrate that the proposed surface and foul water drainage strategy meets the principles of the outline planning consent and updated site layout.
- Discussion covering compliance with the Lidsey Catchment Management Plan.
- Discussion of the updates that were made following the pre-application meeting that was held with West Sussex County Council on 6th November 2024.

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2.0 Outline Planning Summary

The extract below from the Flood Risk Assessment 2204050 by Motion Consultants summarises the conclusions from outline planning (full Flood Risk Assessment can be found in Appendix A):

14.2 The Environment Agency's Flood Map for Planning shows that the entire site is located within Flood Zone 1 (less than 1 in 1000 annual probability of flooding from rivers or the sea). Residential development is considered appropriate in Flood Zone 1 and, therefore, the proposed development is appropriate in this location

14.3 The site is in the 'very low' surface water flood risk category (less than a 1 in 1,000-year AEP of flooding) and, therefore, is not within a critical drainage area and does not have any surface water flowpaths crossing or originating on site.

14.4 The BGS Groundwater Flooding Susceptibility mapping in the Envirocheck Landmark flood screening report places the site in an area that is considered to have geological indicators of groundwater flooding and that some groundwater flooding may occur to structures below the surface.

14.5 Intrusive investigations on site, which took place in September 2022, noted elevated groundwater levels (with resting levels between 1.50mMGL and 2.0mBGL). Longer-term winter groundwater monitoring boreholes have been put in place to establish annual average high levels and it is anticipated that groundwater levels will rise following the dry summer of 2022 and as groundwater is recharged from October through to the Spring. The resting groundwater levels found on site would preclude any soakage features because it would not be possible to maintain a clear one metre between the base of any infiltration structures and the highest annual average groundwater levels, as per the requirements of the CIRIA C753 SuDS Manual.

14.6 There are currently no formal drainage systems in place for the site, but land drainage takes place through an existing network of ditches that are on the northern, southern and eastern boundaries of the site. These drainage ditches are approximately 0.75m deep from the top of the bank to the invert of the ditch.

14.7 Southern Water's asset location plans were obtained and these show that there are public foul sewers in Meadow Way and Hook Lane that would also be accessible by gravity from the site. It is proposed to discharge foul sewage from the site to these existing foul sewers and Southern Water have confirmed in writing that the existing foul sewerage has capacity for the foul sewage from the proposed development.

14.8 In terms of surface water management, opportunities for water re-use and recycling on site has been explored and this report recommends the use of water butts for each dwelling. These will reduce the reliance on potable water supplies during activities such as gardening.

14.9 Because infiltration is not possible on this site due to the elevated groundwater levels, System C (non-infiltration) SuDS features have been chosen as the most appropriate form of surface water management for the proposed development.

14.10 Opportunities for a network of SuDS features have been identified that will work independently and in a 'SuDS train' to ensure that attenuation opportunities are maximised, flood risk is minimised and amenity and biodiversity benefits are created wherever possible. It is proposed to use permeable paviours, swales, an attenuation basin and a geocellular attenuation tank for the management of surface water on site.

14.11 This drainage strategy has been modelled in MicroDrainage's Network hydraulic modelling module and has been shown to be successful in the 1 in 100-year + 45% rainfall event with no flooding. This manages flood risk on- and off-site and reduces overall local flood risk. Total site surface water runoff will be no greater than 3 l/s, which is the QBAR greenfield runoff rate for the site.

14.12 An 10% uplift to surface water inputs has been included to compensate for urban creep to the privately-owned impermeable parts of the site, which represents an overall increase of 5.3% in the impermeable areas on site. The proposed drainage strategy can attenuate surface water from the 1 in 100-year + 45% rainfall event with only 0.259m^3 of flooding, which is negligible.

14.13 The proposed drainage strategy is also able to mitigate all pollution hazards created on site using SuDS features and no further pollution mitigation is needed.

14.14 Residual risk has been addressed through the development of a drainage management and maintenance plan that provides a framework through which the site's drainage system should be managed in perpetuity.

14.15 In conclusion, the site is at very low risk of flooding and the proposed drainage strategy can discharge the 1 in 100-year + 45% rainfall event without flooding. As such, flood risk and surface water management should not form an impediment to the progress of this development.

Following the Flood Risk Assessment, winter groundwater monitoring was undertaken (the results of which can be found in Appendix B), this continued to demonstrate the presence of shallow groundwater across the site. Therefore, Type C SuDS features (non-infiltration) are proposed, this is discussed further in Section 3.

2.1 Existing Ground Conditions

The extract below from the Phase 2 Geo-Environmental Ground Investigation (Ref BRD3963-OR2-B) summarises the existing ground conditions:

SUMMARY REPORT - GENERAL INFORMATION

SUBJECT	COMMENTS
CURRENT SITE CONDITION	The site currently comprises a rectangular agricultural field currently used for growing crops. There is an access track in the south western corner and in the south eastern corner, a residential property of No. 24 Meadow Way is also included within the site boundary as a potential future access route.
PROPOSED DEVELOPMENT	It is proposed that the site will be developed as a residential housing estate with around 87No. properties with driveways and private gardens as well as areas of open space. Pedestrian access will be gained from the current site access of Hook Lane and vehicular access will be via the location of No. 24 Meadow Way.
HISTORICAL SUMMARY	The site has remained as an agricultural field similar to the present day throughout its history. The surrounding area has gradually developed with a plant nursery including a large tank present to the north from the 1970s, a sewage pumping station constructed immediately to the east in the 1990s and surrounding housing constructed in the 1930s, 1970s and in the last decade.
PUBLISHED GEOLOGY	The site is shown to be underlain by superficial deposits comprising River Terrace Deposits (undifferentiated) formerly known as Aeolian Deposits ('Brickearth'). A nearby borehole to the north of the site also suggests the presence of Raised Beach Deposits beneath the site containing groundwater. The shallowest bedrock unit is shown to be the London Clay Formation. This was encountered from 6m depth within the borehole (to the north).
ACTUAL GROUND CONDITIONS	The investigation has proved an upper layer of River Terrace Deposits consistent with the material formerly known as 'Brickearth' consisting of sandy silty clays and in most instances this became gravelly toward the base. Beneath, soils considered to comprise Raised Beach Deposits were encountered and these typically consisted of loose to medium dense wet sands. The London Clay Formation was encountered at depths of over 3m in the eastern end of the site.
HYDROGEOLOGY	The site is situated upon superficial deposits designated a Secondary A Aquifer. The underlying bedrock geology is designated as Unproductive Strata. The site is not located within a groundwater Source Protection Zone.
HYDROLOGY	The closest surface water feature to the site are highlighted as the drainage ditches along the northern and eastern boundaries. These flow to a headwall at the south eastern corner of the field, which then presumably flows in a culvert where it meets another ditch present around 130m to the east and this flows into a stream flowing southwards at distance of 400m from the site. The site is not in an area indicated to be at risk of flooding.
PREVIOUS GROUND REPORTS	BRD is not aware of any previous ground investigations having been conducted at the site. However, BRD has undertaken geo-environmental desk study research and this has been reported separately.

SUMMARY REPORT - GEOTECHNICAL

SUBJECT	COMMENTS
EXCAVATIONS	It should be possible to forward excavations employing normal equipment. Specialist groundwater control, such as well pointing, will likely be required at this site for excavations below the water table. It is unlikely that requirements of the Party Wall Act will apply to the development.
SLOPE STABILITY	It is considered that slope stability is unlikely to be a concern at this site.
SUB-SURFACE CONCRETE	River Terrace Deposits/Raised Beach Deposits: Design Sulphate Class of DS-1 and Aggressive Chemical Environment for Concrete class of AC-1 applies.
SOAKAWAYS	The winter groundwater monitoring programme has shown that the water levels are seasonal and can be very shallow following sustained periods of wetter weather. As such it is considered that only shallow infiltration devices could be employed where ground levels are raised to create an artificial unsaturated zone.
PAVEMENT DESIGN	A preliminary design California Bearing Ratio (CBR) of 4% has been recommended.
FOUNDATIONS	
LIKELY FOUNDATION TYPE	The site is marginally suitable for shallow strip/trench fill footings to bear upon the River Terrace Deposits and/or the Raised Beach Deposits. Trench fill footings would be needed for plots located within the influence of zones of trees. Foundations would need to be reinforced where straddling changes in soil type. Excavations encountering groundwater seepages will become unstable and this will complicate the construction of the footings. This will be dependent upon actual groundwater levels present at the time of construction. As a consequence of this, it is recommended that construction of footings is avoided in sustained wet periods and during the winter months when groundwater can be expected to be at its shallowest.
VOLUME CHANGE POTENTIAL	River Terrace Deposits: Low i.e. minimal swelling or shrinking with moisture content changes. Raised Beach Deposits: Non-shrinkable soil type. Note that the London Clay is too deep to influence foundation depths due to tree influence.
ESTIMATED FOUNDATION DEPTHS	The minimum footing depth required is 0.75m, but 1.00m where required to allow for restricted new tree planting. Foundations should be designed to be as shallow as possible to minimise construction risks associated with shallow groundwater.
HEAVE PROTECTION	Will not be required.

SUMMARY REPORT - CONTAMINATION ISSUES

SUBJECT	COMMENTS
SOIL RISKS TO HUMAN HEALTH	No unacceptable contamination in respect of human health have been identified by this investigation.
LANDFILL GAS	No plausible sources of landfill gas have been identified.
RADON GAS	Radon gas protection measures are not required.
RISKS TO THE WATER ENVIRONMENT	No unacceptable contamination risks to water resources have been identified by this investigation.
RISKS TO BUILDING MATERIALS AND SERVICES	No unacceptable contamination risks to building materials and services have been identified by this investigation.
REMEDIATION	No remedial works are considered necessary to facilitate the development at this stage.
ASBESTOS	No asbestos has been detected in the soil samples tested. No suspected asbestos containing materials has been observed in the soils inspected.
WASTE SOIL DISPOSAL	The soils at the site should be classified as non-hazardous waste and characterised as inert waste for any landfill disposal purposes.

3.0 Proposed Surface Water Drainage

The proposed surface water drainage design replicates the SuDS principles agreed as part of the outline planning with three stages of water treatment:

- Lined permeable paving to filter the surface water from roofs and shared parking areas.
- Discharging into a lined attenuation pond.
- Finally discharging into a lined swale which outfalls at a restricted rate of 3l/s (as approved at Outline Planning stage) up to and including the 1:100 year plus 45% climate change event into the existing ditch on the south-eastern corner of the site. The three stages of treatment are in accordance with the outline Flood Risk Assessment.

The detailed surface and foul water drainage strategy can be found in Appendix C, Hydraulic Calculations in Appendix D, and the completed Arun District Council Surface Water Drainage Proposals Checklist in Appendix E.

3.1 SuDS Indices Matrix – Pollution Control

A completed SuDS Indices Matrix worksheet has been enclosed in Appendix F.

This demonstrates the initial polluting factors from a residential road: Suspended Solids 0.5, Metals 0.4 & 0.4 Hydrocarbons.

Based on the proposed mitigating factors (i.e the three stages of treatment) the resultant factors are: Suspended Solids >0.95, Metals >0.95 & Hydrocarbons >0.95.

The benefits from the proposed mitigation measures are significantly greater than the pollution caused by residential roads, therefore this is considered acceptable.

3.2 Lidsey Surface Water Management Plan

Applications within the Lidsey Wastewater Treatments Works catchment area should be assessed to confirm if the application site is within a Local Flood Risk Zone (LFRZ) to determine if any of the preferred interventions are required.

Whilst the proposed development is within the catchment area itself, it does fall outside of the identified LFRZs (a list of these is included below). The proposed development provides drainage features in line with the principles of the Management Plan as discussed in previous sections.

Table 0-2 - LFRZ Prioritisation

Local Flood Risk Zone	Location Name	Priority
LFRZ_006	Lake Lane, Barnham	High
LFRZ_017	Felpham Road, Felpham	High
LFRZ_013	Elmer Sands, Middleton on Sea	High
LFRZ_019	Wandleys Lane, Eastergate	High
LFRZ_023	Rodwicks Close, Broadcroft Road, The Loop, Jacken Close, Bramber Road, Lewman Avenue, Limmer Lane (East), Surrey Road and Dryad Way in Felpham	High
LFRZ_025	Limmer Lane, Felpham	High
LFRZ_003	Walberton Village (Barnham Lane (A))	High
LFRZ_002	Elm Grove, Barnham	Medium
LFRZ_026	Eastergate Lane, Eastergate	Medium
LFRZ_024	West Close, Middleton on Sea	Medium
LFRZ_014	Lodge Close & Willow Brook, Middleton on Sea	Medium
LFRZ_015	Sea Way, Middleton on Sea	Medium
LFRZ_004	Maple Road, Walberton	Medium
LFRZ_021	Marshalls Close / Church Lane, Barnham	Medium
LFRZ_022	Southdean Close, Middleton on Sea	Medium
LFRZ_018	Oak Tree Lane, Woodgate	Medium
LFRZ_020	Highground Lane, Barnham	Medium
LFRZ_012	Yapton Road, Middleton on Sea	Medium
LFRZ_010	Burndell Road, Yapton	Medium
LFRZ_027	Downsview Road, Barnham	Medium
LFRZ_001	West Walberton Lane, Walberton	Medium
LFRZ_016	Golf Links Road, Felpham	Low
LFRZ_009	Yapton Road, Yapton	Low
LFRZ_008	Barnham Lane, Barnham (C)	Low
LFRZ_005	Barnham Lane, Barnham (B)	Low
LFRZ_007	Park Road, Barnham	Low
LFRZ_011	West View Drive, Yapton	Low

3.3 Proposed Foul Water Drainage

As per the Outline Application, there are two points of connection separating the site almost equally reducing the load into the chambers, these discharge into existing adopted sewers Manhole 3703 (45 plots) and Manhole 7705 (44 plots). The proposed foul drainage layout is shown in Appendix C demonstrating the locations of these connections.

3.4 WSCC Pre-application feedback

A pre-application meeting was held with ESCC on 6th November 2024 and the formal response can be found in Appendix G. As a result of this feedback the following updates were undertaken (the numbering corresponds with the response received):

1. For any ordinary watercourses within/along the red line boundary, a 3m easement from the top of bank must be drawn on all approved plans at RM stage. This is for maintenance access. No structures or planting is allowed within these easements. Our mapping suggests there is an open watercourse along the northern and eastern boundary. The watercourses need to be clearly drawn in layouts (including the masterplan).

   A 3m easement is now shown from the top of the existing watercourse within the red line boundary, on our drainage strategy drawings and overall masterplan.

2. As discussed in the meeting, I'm happy for our team to condition construction management plan as part of RM comments.

   Noted

3. As it will not affect the layout of the site, and therefore the approval of this RM application, the investigation into the ditch's connection to the wider watercourse network can be submitted as part of the discharge of condition 11. We are happy to discuss the extent of the investigations once the RM has been approved. Please contact me when required.

   Noted

4. As there have been high groundwater levels during site investigations, these will need to be considered in detailed design, particularly in terms of lining and buoyancy. It is suggested that the groundwater levels are considered when setting finished floor levels, to ensure property is not affected by groundwater flooding. Please note wholesale ground raising is to be avoided as it alters natural flows and can increase flood risk elsewhere.

   Noted, this will be considered during detailed design.

5. It is difficult to be sure but it looks like the watercourse/ditch is an open feature where the access road is located. We are against culverting open watercourses

unless there is no other alternative. Ordinary watercourse consent will be required for this and it is suggested this is considered at Reserved Matters stage as it could affect the layout of the site. Information on applying for consent can be found here: Ordinary watercourse land drainage consent - West Sussex County Council

Noted, however this is unavoidable as the access road passes over the watercourse. An Ordinary Watercourse consent application will be submitted as part of detailed design.

6. There are some areas where the levels/features etc in the drainage layout do not match the calculations. These must match to ensure the calculations reflect the drainage layout properly, otherwise flood risk could increase elsewhere (for example if a cover level is lower in drawing compared to calculations or if the sub base for the permeable paving is deeper in calculations than drawings).

   Our calculations have been updated to match with the strategy drawings.

7. Before submission, drawings cannot be in preliminary for RM application as the layout will be set.

   Noted, drawings updated to 'For Approval.'

Appendix A – Planning Flood Risk Assessment

Land to the Rear of Meadow Way
Westergate

Flood Risk Assessment and Drainage Strategy

For

Gleeson Land

motion

Document Control Sheet

Land to the Rear of Meadow Way

Westergate

Gleeson Land

This document has been issued and amended as follows:

Date	Issue	Prepared by	Approved by
31/10/2022	Final A	Phil Allen MCIWEM C.WEM	Neil Jaques
17/11/2022	Final B	Phil Allen MCIWEM C.WEM	Neil Jaques
21/11/2022	Final C	Phil Allen MCIWEM C.WEM	Neil Jaques
23/11/2022	Final D	Phil Allen MCIWEM C.WEM	Neil Jaques

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B – Topographic Survey of the Site
C – Local BGS Borehole Survey
D – BRE365 Soakage Testing Locations
E – BRE365 Soakage Testing Results
F – Southern Water Confirmation of Foul Sewage Capacity
G – Southern Water Asset Location Plans
H – Pre-Application Development Summary
I – Proposed Development Layout
J – Environment Agency Flood Map for Planning
K – Risk of Flooding from Surface Water (RoFSW) Map
L – Landmark Flood Screening Report
M – UKSuDS Greenfield Runoff Calculator
N – Proposed Drainage Strategy Plan
O – MicroDrainage Network Model Calculation
P – Southern Water's Foul Sewage Modelling Criteria
Q – MicroDrainage Network Model Calculation + 10% for Urban Creep
R – Exceedance Flow Plan
S – Drainage Management and Maintenance Plan

1.0 Introduction

1.1 This flood risk assessment (FRA) and drainage strategy has been produced by Motion on behalf of Gleeson Land, to accompany the outline planning application with all matters reserved, other than principal means of access and demolition of 24 Meadow Way, for up to 89 residential dwellings, with access taken from Meadow Way, together with the provision of open space, landscaping and associated infrastructure. The proposed development falls within the administrative boundary of Arun District Council (ADC)

1.2 The proposed development will provide affordable housing and deliver a range of house types, sizes and tenures to meet needs. The specific housing mix will be addressed at reserved matters stage.

1.3 The 3.8 ha site is located within Flood Zone 1 according the Environment Agency's (EA's) Flood Map for Planning. However, because the site is larger than 1 ha a Flood Risk Assessment (FRA) is required.

1.4 Because the current proposals are for up to 89 dwellings it is classified as a 'major development' and a SuDS Assessment and Surface Water Drainage Strategy is required to accompany the planning application. ADC also require a Foul Water Drainage Strategy to accompany 'major development' planning applications.

1.5 Therefore, this FRA and drainage strategy has been produced to discuss the flood risks to the proposed development, from all sources. This FRA and drainage strategy will also define how the site will manage its surface water and foul sewage so that the development does not increase flood risk in the area or to neighbouring properties.

1.6 This FRA and drainage strategy follows the guidance set out in:

- National Planning Policy Framework (NPPF)
- Planning Practice Guidance (PPG) to the National Planning Policy Framework
- CIRIA SuDS Manual 2015 (C753)
- Environment Agency Rainfall Runoff Management for Developments
- Non-Statutory Technical Standards for SuDS (NSTS)

1.7 This FRA and drainage strategy report pertains only to the design of the drainage system for the built site. It does not provide details of how the site will be drained during the construction phase. This is considered to be temporary works and can only be prescribed and provided by the eventual appointed contractor.

1.8 Similarly, this report does not provide information on how the drainage infrastructure will be protected during the construction phase of the project. The provision of this information is, again, the responsibility of the appointed contractor.

2.0 Site Description

Table 2.1 – Site Summary

Site Name	Land to the rear of Meadow Way
Location	Westergate, West Sussex, P020 3QT
Grid Reference	SU 936 048 (approximate centre of site)
Site Area	37,997m^2 (3.8 ha)
Development Type	Up to 89 dwellings that will provide affordable housing and deliver a range of house types, sizes and tenures to meet needs
Flood Zone	Flood Zone 1
Surface Water Flood Risk	Very Low Risk
Local Water Authority	Southern Water
Local Planning Authority	Arun District Council (ADC)
Lead Local Flood Authority	West Sussex County Council (with devolved LLFA powers to ADC)

Site Location and Description

2.1 The site is approximately 3.8 hectares and is currently accessed from Hook Lane. It is situated between Hook Lane to the west and Meadow Way to the east. Existing residential development is located to the south and east of the Site with arable fields to the north. The Site lies outside the settlement boundary as defined in the Aldingbourne Neighbourhood Development Plan 2.

2.2 The site is currently undeveloped (greenfield) and is occupied by arable land.

2.3 A site location plan that outlines the red line boundary of the site can be seen in Appendix A.

Topography

2.4 A topographical survey of the existing site was undertaken by Healer Surveys Ltd in July 2022 and is provided in Appendix B of this report.

2.5 The site is generally flat in the western three-quarters of the site. Levels in the north-western corner of the site are the highest at 10.75 metres Above Ordnance Datum (mAOD) and fall to only 10.20 mAOD – 10.10 mAOD in the centre of the site. Levels fall away gently in the final, eastern third of the site to below 10.00 mAOD and down to approximately 8.40 mAOD in the south-eastern corner of the site.

Geology

2.6 The British Geological Survey (BGS) online 1:50,000 Geoindex mapping identifies that the underlying solid geology is London Clay, which is a sedimentary bedrock formed of poorly laminated, blue-grey or grey-brown, slightly calcareous, silty to very silty clay.

2.7 The BGS online Geoindex 1:50,000 mapping lists the superficial deposits in the area as River Terrace Deposits, which are undifferentiated sand, silt and clays.

2.8 The nearest BGS borehole to the site is SU90NW72, which is 130 metres north of the site. This borehole shows the following geological strata, from surface to base:

- Topsoil down to 0.3m
- Silty Brickearth from 0.3m – 0.7m below ground level (mBGL)
- Silty, brown, pebbly brickearth from 0.7m – 2.2mBGL
- Head Gravel from 2.2m to 3.0mBGL
- 'Clayey' pebbly sand from 2.0m to 5.0mBGL
- Sandy Gravel from 5m to 6.0mBGL
- London Clay from 6.0mBGL to the base of the borehole at 6.8mBGL

2.9 The full BGS borehole log for SU90NW72 can be found in Appendix C. This borehole is consistent with the BGS online Geoindex Mapping and suggests that there are permeable strata at shallow levels, with clay coming in at 6.8m or more BGL.

Hydrogeology

2.10 Groundwater Source Protection Zones (SPZ's) are defined around groundwater abstraction sources such as wells, boreholes and springs that are used for public drinking water supply.

2.11 SPZ's show the risk of contamination to groundwater from any activities that might cause pollution in the area. The closer the activity to the source of abstraction, the greater the risk. The maps show three main zones; inner – Zone 1; outer – Zone 2 and; total catchment – Zone 3.

2.12 Certain geologies can contain fractures and pathways that allow groundwater to move more quickly than is defined above, so these should be used as a guideline and if it is suspected that there is potential for groundwater pollution even though a site is in a lower risk SPZ, professional advice should be sought from a geotechnical consultant.

2.13 Defra's Magic Map was reviewed to see where the site is in relation to the Groundwater SPZ's and the site is not within any SPZ's.

2.14 Borehole SU90NW72 in Appendix C was reviewed and this showed that groundwater was encountered 3mBGL. Other boreholes in the area were reviewed and this figure was relatively consistent. Borehole SU90NW71, which is 530 metres north of the site showed groundwater levels as 3.4mBGL.

2.15 This suggests that along with permeable strata being at shallow levels above the London Clay, groundwater levels are also deep enough to make infiltration an appropriate means of surface water discharge because a clear one metre between that base of any infiltration media and the highest groundwater levels will be achievable.

Infiltration Potential

2.16 Site-specific BRE365 soakage tests have been carried out by BRD Environmental as part of this study. 5no. trial pits were dug to 1.5mBGL to 1.6mBGL and the location of these trial pits can be seen in Appendix D.

2.17 The ground conditions were found to be fairly consistent across the site but comprised three different strata with different properties encountered within the upper three metres. An upper layer of firm / stiff sandy silty CLAY was present, which extended to only 0.6mBGL in the north-eastern part of the site but up to 2.5mBGL in the north-western part of the site, but was typically found to be between 1m and 2m deep across the site. An intermittent layer of clayey GRAVEL was then encountered, which was most prevalent in the eastern end of the site where it was up to 0.8m thick. Beneath this are raised beach deposits, which were encountered from a depth of 1.3mBGL at the eastern end of the site and 2.5mBGL at the western end.

2.18 Groundwater was encountered at depths of between 2.0mBGL to 3.0mBGL, with groundwater rebounding and settling at approximately 1.5 mBGL. The resting water levels will be determined by long-term groundwater monitoring, for which boreholes have been installed and monitoring visits have been scheduled. Noting that resting water levels are currently (as of September 2022) between 2.0mBGL and 1.5mBGL and this is likely to rise over the winter months, this would preclude any soakage features because it would not be possible to maintain a clear one metre between the base of any infiltration structures and the highest annual average groundwater levels, as per the requirements of the CIRIA C753 SuDS Manual.

2.19 A summary of the results of the BRE365 Soakage Testing can be seen in Table 2.2, below, with the full soakage testing logs being available for review in Appendix E.

Table 2.2: BRE365 Infiltration Testing Results

Trial Pit Number	Test 1 (m/s)	Test 2 (m/s)	Test 3 (m/s)	Test 3 Infiltration Coefficient (m/hr)
TP01	1.01×10^{-5}	1.03×10^{-5}	$\underline{9.58 \times 10^{-6}}$	0.0345
TP02	3.80×10^{-5}	2.88×10^{-5}	$\underline{2.38 \times 10^{-5}}$	0.0857
TP03	7.44×10^{-6}	8.49×10^{-6}	$\underline{7.35 \times 10^{-6}}$	0.0265
TP04	8.15×10^{-6}	1.15×10^{-5}	$\underline{1.09 \times 10^{-5}}$	0.0392
TP05	5.49×10^{-6}	4.81×10^{-6}	$\underline{6.58 \times 10^{-6}}$	0.0237

2.20 Test 3 (underlined) is the key result as this represents a saturated test. Trial pits TP01, TP02 and TP04 are equivalent to 1×10^{-5} m/s or better. Trial pits TP03 and TP05 represent slower infiltration rates, but only marginally so and, as they are greater than 1×10^{-6}, they still represent infiltration coefficients that are viable for soakage. When the above infiltration is converted to m/hour, as is required by MicroDrainage and has been shown in Table 2.2, above, it shows that the soakage rates encountered on site are relatively consistent.

2.21 The infiltration coefficients in Table 2.2 suggest that infiltration is a viable means of surface water discharge on site. However, the groundwater levels encountered, which are as shallow as 1.5 – 2.0mBGL (and pending further long-term monitoring of resting groundwater levels, which are expected to rise over winter) mean that infiltration structures would not be feasible. Therefore features, such as permeable pavements would need to be lined and swales and attenuation basins would need to be clay lined to ensure there is no groundwater ingress.

Existing Drainage Regime

2.22 As the site is greenfield, there are no formal drainage systems, but land drainage takes place through an existing network of ditches that are on the northern, southern and eastern boundaries of the site. These drainage ditches are approximately 0.75m deep from the top of the bank to the invert of the ditch. These drainage ditches are visible in the topographic survey in Appendix B. It is suspected that these ditches are currently silted up and need clearing, which would lower the invert level of the ditches and improve conveyance.

2.23 Southern Water are the local sewerage operator in the area. Asset location plans were obtained to ascertain the extent and availability of public sewerage within the areas local to the site. These can be seen in Appendix G.

2.24 The asset location plans show that there is a 150mm vitreous clay (VC) foul sewer in Meadow Way that originates at node 7705, outside number 24, which is proposed to be demolished to provide an eastern access to the site. This foul manhole with an invert of 6.99 mAOD could provide a potential connection for 50% of the site's foul sewage. It is anticipated that this invert level can be met by gravity from dwellings on the eastern half of the site.

2.25 The asset location plans show that on Hook Lane to the west of the site there is a foul sewer that collects at node 3703, after which foul waste is pumped east along the southern boundary of the site towards node 8701 in Meadow Way. Node 3703 has an invert level of 7.26 mAOD (and a cover level of 10.55 maOD, thus a depth to invert of 3.29m) and this would also be accessible by gravity from the western half of the site.

2.26 A pre-application enquiry was submitted to Southern Water and they have responded with confirmation that the existing foul sewerage has capacity for the foul sewage from the proposed development. This confirmation letter can be seen in Appendix F.

2.27 The asset location plans in Appendix G also highlight that there is a 150mm to 300mm surface water sewer in Pamorna Gardens that flows towards the southern corner of Meadow Way, where node 8750 has an invert level of 5.59 mAOD, which is 1.69m below the cover level of 7.28 mAOD.

Hydrology

2.28 The nearest water bodies are the drainage ditches that run along the northern, southern and eastern boundary of the site. These ditches are classified as ordinary watercourses. The Environment Agency's Catchment Data Explorer online portal states that these ordinary watercourses are within the catchment of the Lidsey Rife, which is 500m to the east of the site.

3.0 The Proposed Development

3.1 The proposed residential development is for up to 89 residential dwellings, with access taken from Meadow Way, Westergate, West Sussex. Details of the proposed development and how the principle of the development supports the Arun Local Plan (2011 – 2031) can be seen in Appendix N, which is a copy of a request for pre-application advice from Nexus Planning to ADC.

3.2 A proposed site layout can be seen in Appendix I, which shows the layout of the dwellings, access road, parking courts and open spaces on site.

4.0 Legislative and Policy Framework

4.1 The Flood and Water Management Act 2010 (FWMA) received Royal Assent on 8th April 2010. The Act was introduced to enforce some of the key proposals set out within UK Government flood and water strategies along with UK Government's response to the Sir Michael Pitt's Review of the summer 2007 floods.

4.2 LLFA's including West Sussex County Council have a responsibility under the FWMA to develop, maintain, apply and monitor the application of a strategy for local flood risk in their area. Local flood risk is defined as flood risk arising from local sources, such as surface run-off, groundwater and ordinary watercourses (i.e., non main rivers). The EA plays a role in managing the watercourses designated as 'main rivers'.

4.3 Relevant to the sites, the FWMA encourages the uptake of SuDS by removing the automatic right to connect to sewers and providing for LLFA's to adopt SuDS for new developments.

4.4 This report will provide a review of SuDS opportunities and constraints for the development and recommend a sustainable drainage strategy that will employ the highest available tiers of the drainage hierarchy. Thus, this report and will adhere to the Act through looking to use SuDS as a fundamental element of the surface water drainage system.

The Environment Agency Flood Map for Planning

4.5 The Environment Agency's Flood Map for Planning gives an indicative prediction of areas at risk of fluvial and tidal flooding. The mapping is an amalgamation of modelled flood levels and historical flood event outlines.

4.6 The Flood Map is split into 'Flood Zones', which demarcate the extent of flooding from rivers or the sea for different return periods. The Flood Map for Planning shows the extent of the natural floodplain if there were no defences or other man-made structures. They do not provide a definitive picture of where flooding would occur; rather, they provide an indicative prediction of areas at risk.

4.7 Table 4.1, below, lists the flood zone categories and explains the flood risk probabilities they represent.

Table 4.1 – Flood Zone Categories

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of tidal flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of tidal flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their SFRAs areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map, but may be distinguished in Product 4 information, for example)

The National Planning Policy Framework

4.8 The NPPF sets out the Government's national policies on different aspects of land use planning in England in relation to flood risk. The Technical Guidance to the NPPF provides further information on the policies set out in the NPPF. It encourages development to take place in areas of lower flood risk wherever

possible and stresses the importance of preventing increases in flood risk off-site to the wider catchment area. This includes ensuring that flood risk is taken into account at all stages of the planning process, avoiding inappropriate development in areas at risk of flooding and directing development away from those areas where risks are highest.

4.9 A site-specific FRA is required for proposals of 1ha or greater in Flood Zone 1, all proposals for development in Flood Zones 2 and 3, or in an area within Flood Zone 1 that has critical drainage problems (as notified to the local planning authority by the EA). The site is located within Flood Zone 1 and is greater in size than one hectare and, therefore, an FRA is required.

4.10 The FRA should identify and assess the risks of all forms of flooding to and from the development and demonstrate how these flood risks will be managed so that the development remains safe throughout its lifetime, taking climate change into account.

4.11 Within each Flood Zone, a key factor in determining planning applications for development is the flood risk vulnerability of a development. Table 2 of the Technical Guidance to the NPPF categorises different development types according to their vulnerability to flooding. These categories are:

- Essential infrastructure;
- Highly vulnerable development;
- More vulnerable development;
- Less vulnerable development, and;
- Water-compatible development.

4.12 Within the different Flood Zones each of the above development categories are considered appropriate or not permissible. The Technical Guidance to the NPPF lists these as:

Flood Zone 1:

- All the development categories listed above are appropriate.

Flood Zone 2:

- Water-compatible, less vulnerable development, more vulnerable development and essential infrastructure is appropriate in this zone.

Flood Zone 3a:

- Water-compatible and less vulnerable development is appropriate in this zone. Highly vulnerable development should not be permitted in this zone.

Flood Zone 3b:

- Only water-compatible development and essential infrastructure that has to be there should be permitted in this zone.

4.13 The above information sets out the basis by which developments must be assessed in terms of flood risk. Later in this the site will be reviewed against the Flood Zone in which it is located, and, noting the proposed site layout in Appendix 3, an assessment will be made of the appropriateness of the proposed development, as per the advice within the Technical Guidance to the NPPF.

Lead Local Flood Authority

4.14 As of April 2015, the LLFA became a statutory consultee on all major planning applications. The LLFA is required to assess planning applications in respect of surface water drainage and sustainable drainage

systems. West Sussex County Council is the LLFA for Westergate, but has devolved it's LLFA responsibility and powers to ADC.

The Sequential and Exception Tests

4.15 The NPPF specifies that the suitability of all new development in relation to flood risk should be assessed by applying the Sequential Test to demonstrate that there are no reasonably alternative sites available in areas with a lower probability of flooding that would be appropriate to the type of proposed development.

4.16 As the land to the rear of Meadow Way is within Flood Zone 1, the Sequential Test does not apply.

5.0 Current Flood Risk

5.1 Flooding can arise from a variety or combination of sources. These may be natural or artificial and may be affected by climate change. These are discussed, below, in the following two sections and summarised in Table 7.1 within Section 7. The probability of any likely impacts is also assessed, where necessary.

Flooding from Rivers and the Sea

5.2 The Environment Agency's Flood Map for Planning (Appendix J) shows that the entire site is located within Flood Zone 1 (less than 1 in 1000 annual probability of flooding from rivers or the sea).

5.3 Residential development is considered appropriate in Flood Zone 1 and, therefore, the development as presented in the site layout in Appendix I is appropriate.

Surface Water Flooding

5.4 Surface water, or pluvial flooding, results from rainfall-generated overland flow, where rainwater has not yet reached a watercourse or sewer and where the local drainage systems become overwhelmed. Pluvial flooding often occurs during short, very intense storms, but can also occur during longer periods of rainfall when the ground is already saturated, or where land has low permeability due to development.

5.5 In these conditions surface water can build up where the topography allows it to converge or pond. Where it gathers it will travel down prevailing gradients. Pluvial flooding then occurs at locations where significant surface water flow paths converge, at localised low points and/or due to overland obstructions. In urban areas pluvial flooding often occurs where the built environment channels overland flow routes (down roads that are bounded by kerbs, for example) or where there are obstacles to the natural overland flow routes. Boundary walls and buildings are often the main causes and, hence, the likelihood of pluvial flooding to impact property and gardens.

5.6 Pluvial flooding is exacerbated in many cases by the mistreatment or failure of the below ground infrastructure (including partial or full blockages of gullies and/or within the combined sewers and the accumulation of fats, oils and greases within the sewer networks).

5.7 Generally speaking, pluvial flooding is less of an issue in rural areas. This is partly because the natural 'greenfield' state of land allows for the interception of rainfall and the slowing down of overland flow, so the accumulation of surface water is less likely. It is also because there are much less 'receptors' of surface water flooding in rural areas and many incidences of surface water flooding in rural areas go unnoticed or unreported as they are of no consequence.

5.8 The EA's Risk of Flooding from Surface Water (RoFSW) map for the site can be found in Appendix K.

5.9 The site is in the 'very low' surface water flood risk category (less than a 1 in 1,000-year AEP of flooding) and, therefore, is not within a critical drainage area and does not have any surface water flowpaths crossing or originating on site.

5.10 A flood screening report was obtained from the Envirocheck Landmark group. This can be seen in Appendix L and includes JBA's surface water flood mapping. This mapping confirms that the site is not at risk from surface water flooding in any rainfall event up to and including the 1 in 1,000 year storm.

Groundwater Flooding

5.11 The risk of groundwater flooding is dependent on local geological and hydrogeological conditions at any given time. Groundwater levels rise during wet winter months and fall again in the summer when rainfall is low and extractions are higher. In very wet winters, rising groundwater levels can reactivate flow in ephemeral streams that only flow for part of the year or even lead to the flooding of normally dry land.

5.12 BGS mapping has identified that the development site is underlain by the London Clay Formation, which is generally hydraulically unproductive and at low susceptibility to groundwater flooding.

5.13 The BGS Groundwater Flooding Susceptibility mapping in the Envirocheck Landmark flood screening report in Appendix I. places the site in an area that is considered to have geological indicators of groundwater flooding and that some groundwater flooding may occur to structures below the surface. Indeed, on the eastern side of the site this risk level increases to show that there is potential for groundwater flooding to occur at the surface. However, the GeoSmart Information on Groundwater Flood Risk places the site in an area of negligible groundwater flood risk, which contradicts the BGS information.

5.14 Given that groundwater has been recorded at only 2 - 3 mBGL, this suggests that there is a moderate risk of flooding from groundwater.

Flooding from Infrastructure Failure

5.15 Sewer flooding can occur when the capacity of the infrastructure is exceeded by excessive flows, or because of a reduction in capacity due to collapse, siltation, blockage, or if the downstream system becomes surcharged. This can lead to the sewers flooding onto the surrounding ground via manholes and gullies, which can generate overland flows.

5.16 Typically, sewer systems are constructed to accommodate rainstorms with a 30-year return period or less, depending on their age. Consequently, rainstorm events greater than 1 in 30-years would be expected to result in surcharging of some parts of the sewer system. In fact, due to most gullies being poorly maintained and often partially blocked with silt, leaves and other debris, their capacity is often estimated to be closer to the 1 in 10-year storm.

5.17 Because the site currently has no surface water drainage infrastructure on it, it cannot be at risk of flooding from infrastructure failure.

5.18 Looking forward, the development's drainage must be designed in accordance with Sewers for Adoption, The Design and Construction Guidance (DCG), Building Regulations Approved Document Part H and BS EN 752. This will minimise the future risk of flooding due infrastructure failure.

Flooding from Artificial sources

5.19 The EA provides a map showing the maximum potential flood extent should all reservoirs with a capacity of greater than 25,000 cubic metres fail and release the water they hold.

5.20 The map shows that the site would not experience flooding in this scenario.

5.21 There are no canals in the local area and the Envirocheck Landmark flood screening report in Appendix I. provides the JBA Canal Failure flood map, which confirms that the site is not shown to be in an area at risk of flooding from canals.

Historic Flooding

5.22 The Envirocheck Landmark flood screening report in Appendix I. has a historic flood record map and there are no recorded incidences of flooding on the site or in the local area.

6.0 Future Flood Risk & Climate Change

6.1 The 2021 NPPF and the supporting Technical Guidance document sets out how flood risk should be considered over the lifetime of a development. This requires an increase in flood risk due to climate change to be taken into account. Both peak river flows and rainfall intensity should be assessed.

Peak River Flows

6.2 Because the site is in Flood Zone 1, increases in future peak river flows do not technically need to be considered. However, the site's proximity to a ditch classified as an ordinary watercourse means that future peak river flows should be assessed.

6.3 For the Arun and Western Streams catchment, the NPPF does not provide specific information on what climate change allowance should be used for residential (more vulnerable) development in Flood Zone 1. Only sites on Flood Zones 2, 3a and 3b are given advice. Nonetheless, this study will refer to the 'central' climate change allowance, which, for the 2080's, suggests a peak river flow increase of 25%.

6.4 With a 25% increase in peak river flows, the ditch classified as an ordinary watercourse may provide an increased risk of flooding but it is not anticipated that a future increase in peak river flows will materially affect the site's risk of fluvial flooding, which will remain low.

Peak Rainfall Intensity and Climate Change

6.1 As of May 2022, the NPPF's climate change rainfall increase predictions for developments was updated and is to be used with immediate effect. Whereas previous climate change parameters for rainfall increases used set values (20% or 40%) across the UK depending on the probable lifetime of a development, the latest climate change advice is determined by which catchment the development is within and every river catchment in the UK has different climate change rainfall increase predictions.

6.2 This is because the southeast of England tends to see heavier, stormier rainfall than the northwest, which tends to see longer rainfall events with less intensity. This, in combination with the prevailing geo-environmental characteristics of each catchment, has determined the climate change increases that are to be used.

6.3 The other major change to the 2022 climate change rainfall predictions is that climate change increases should also be applied to the 1 in 30-year rainfall event, whereas previously it was only applied to the 1 in 100-year event. As such, the hydraulic modelling for the proposed development will also apply a climate change increase to the 1 in 30-year rainfall event.

6.4 Westergate lies within the Arun and Western Streams Management Catchment. The 2022 peak rainfall climate change allowances are as follows in Table 4.3 (next page):

Table 4.3 – Climate Change Predictions for Arun and Western Streams Catchment

1 in 30-year Rainfall Event	Central Allowance	Upper End Allowance
2050's epoch	20%	35%
2070's epoch	25%	40%
1 in 100-year Rainfall Event	**Central Allowance**	**Upper End Allowance**
2050's epoch	20%	45%
2070's epoch	25%	45%

6.5 For a residential development, which could have a lifespan of up to 100 years, the 2070's epoch should be used and the NPPF advises that for developments with a lifetime beyond 2100, flood risk assessments should assess the upper end allowances for both the 1% and 3.3% annual exceedance probability events.

6.6 Therefore, for the proposed development on the land to the rear of Meadow Way, the climate change increase predictions that should be applied to the hydraulic model are 40% for the 1 in 30-year rainfall event and 45% for the 1 in 100-year event.

6.7 Also, acknowledging that there are ditches on the northern and eastern boundaries of the site, it is imperative that the surface water strategy for the site takes the latest climate change predictions into account, so as not to increase flood risk on or off-site.

Residual Flood Risk

6.8 It is important to recognise that flood risk can never be fully mitigated and there will always be a residual risk of flooding. The residual risk is associated with several potential risk factors, including (but not limited to):

- A flood event that exceeds that for which the local flood defences or local drainage system has been designed to withstand.
- A residual danger posed to property and life because of flood defence failure through overtopping or structural collapse.
- General uncertainties inherent in the prediction of flooding.

6.9 Modelling of flood events is not an exact science. Therefore, there is an inherent uncertainty in the prediction of flood levels and extents used in the assessment of flood risk. EA's Flood Map for Planning is largely based upon detailed modelling within the area. However, other mapping products require numerous assumptions to be made. Whilst they all provide a good depiction of flood risk for specific modelled conditions, all modelling requires the making of core assumptions and these might not occur in the open and dynamic environment of a flood event. Also, the EA's Flood Map for Planning and other flood modelling is updated regularly. Interested parties are recommended to keep abreast of this so that a significant change or increase in flood risk can be determined.

7.0 Summary of Flood Risk

7.1 Table 7.1, below, summarises the level of flood risk to the land behind Meadow Way.

Table 7.1: Summary of Flood Risk

Flood Source	Risk Level				Comment
	High	Medium	Low	Very Low	
Fluvial				X	Flood Zone 1
Tidal				X	Tidal Flood Zone 1
Groundwater		X			Solid geology is hydraulically unproductive, but superficial geology may support high groundwater levels and a moderate risk of groundwater flooding
Surface Water				X	Very low risk
Canals				X	There are no canals in the vicinity
Reservoirs				X	The Reservoir Flood Risk Map places the site well outside a maximum extent of flooding
Infrastructure Failure				X	No existing infrastructure to fail
Increase due to Climate Change			X	X	Increased peak river flows and rainfall intensities are not expected to affect any infrastructure or properties.

7.2 In conclusion, the site is generally at low risk of flooding from all sources and the site's surface water drainage strategy will reduce surface water runoff and flood risk on site by protecting the site from all surface water flood events up to and including the 1 in 100-year + 45% storm.

7.3 The proposed 'more vulnerable' development is acceptable in Flood Zone 1. As such, flood risk should not form an impediment to the proposed development.

8.0 Surface Water and Foul Drainage Strategies

Sustainable Drainage Overview

8.1 Current planning policy and Environment Agency guidance requires developments to employ SuDS (Sustainable Drainage Systems) techniques wherever feasible. Careful design of SuDS features can ensure that a development's surface water drainage closely reflects the natural hydrology of the pre-developed site.

8.2 SuDS will attenuate and treat surface water run-off quantities at the source (source control) in line with NPPF and EA policies.

8.3 Source control systems treat surface water close to the point of origin, in features such as soakaways, permeable paving and swales, to name a few.

8.4 The key benefits of SuDS are as follows:

- Improving water quality over a conventional piped system by removing pollutants from diffuse pollutant sources (e.g., roads);
- Improving amenity through the provision of open green space;
- Improving biodiversity through increased areas for wildlife habitat; and
- Enabling a natural drainage regime that recharges groundwater (where possible).

8.5 SuDS provide a flexible approach to drainage, with a wide range of components from soakaways to large-scale basins or ponds. The individual techniques should be used where possible in a management train that mimics the natural pre-developed pattern of drainage.

Site Areas

8.6 The site areas to undergo development are to be assessed are as follows in Table 8.1:

Table 8.1 – Site Areas

Breakdown of site areas	Existing (ha)	Proposed (ha)	Increase / Decrease
Total Area	3.80	3.80	+ / - 0
Dwellings / Buildings / Patios	0.00	0.50	+ 0.50
Roads and Parking Courts	0.00	0.71	+ 0.71
Private Driveways	0.00	0.29	+ 0.29
Soft Landscaping	3.80	2.30	- 1.50
Total impermeable areas	**0.00**	**1.50**	**+ 1.50**
Total permeable areas	**3.80**	**2.30**	**- 1.50**

Greenfield Runoff Rate

8.7 The greenfield runoff rates have been calculated using HR Wallingford's UKSuDS online calculator and are presented in Table 8.2, below. The greenfield runoff rates have been calculated from the impermeable areas, as these are the parts of the site that will positively drain into the on-site drainage infrastructure. For the purpose of the drainage design and hydraulic modelling, it has been assumed that the undeveloped parts of the site (gardens, verges, beds, etc.) will drain naturally by infiltration or that rainwater will be intercepted by vegetation.

8.8 The full greenfield runoff calculations can be seen in Appendix M.

Table 8.2 – Greenfield Runoff Rate/Volume – Total Impermeable Areas

Return Period	1 in 1	1 in 30	1 in 100	QBAR
Discharge Rate (l/s)	2.52	6.81	9.44	2.96

8.9 The calculated QBAR greenfield runoff rate of 2.96 l/s provides a runoff rate equal to 1.97 l/s/ha.

8.10 The above greenfield runoff rates will be used to guide the appropriate surface water discharge rates and volumes from the development.

The Drainage Hierarchy

8.11 The NPPF states that opportunities to reduce overall flood risk should be sought and achieved through sustainable development and careful drainage design. This can be achieved through the layout and form of development, including green infrastructure and the appropriate application of sustainable drainage systems (SuDS). SuDS are designed to control surface water runoff close to where it falls and mimic natural drainage as closely as possible. They provide opportunities to:

- Reduce the causes and impacts of flooding;
- Remove pollutants from urban run-off at source;
- Combine water management with green space with benefits for amenity, recreation and biodiversity.

8.12 To deliver SuDS benefits and ensure that a development reduces overall flood risk, there is an established hierarchy of surface water drainage methods that should be considered. The most preferable and sustainable are at the top and the least preferable and least sustainable at the bottom.

8.13 The drainage hierarchy is a sequential check that intends to ensure that all practical and reasonable measures are taken to manage surface water as high up the hierarchy (with '1' being the highest) as possible, and that the amount of surface water managed at the bottom of the hierarchy is minimised. The Planning Practice Guidance to the National Planning Policy Framework (NPPF) states that "*Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable*".

8.14 The drainage hierarchy presented in the NPPF presents only four tiers of drainage options. This has been expanded on and adopted by others and now can be viewed as the following:

1. Store rainwater for later use
2. Use infiltration techniques, such as porous surfaces in non-clay areas
3. Attenuate rainwater in ponds or open water features for gradual release

4. Attenuate rainwater by storing in tanks or sealed water features for gradual release
5. Discharge rainwater direct to a watercourse
6. Discharge rainwater to a surface water sewer/drain
7. Discharge rainwater to the combined sewer.
8. Discharge rainwater to the foul sewer.

8.15 Developers should not choose the method that is the most convenient or represents the lowest cost. LPA's, LLFA's and Water Authorities may enforce the surface water drainage hierarchy and demand that the highest practicable tier of the hierarchy is used.

8.16 The first two tiers of the drainage hierarchy ensure that surface water is retained within the site boundary and does not increase flood risk to others. This is always the most preferable method of surface water management.

8.17 The next six tiers of the hierarchy provide regional control, but with decreasing levels of pollution removal and reduced potential for amenity and habitat creation with each tier of the drainage hierarchy.

8.18 Within the lower six tiers of the drainage hierarchy, there must be some form of flow restriction, so that off-site surface water discharge resembles greenfield runoff rates, as much as is reasonably practicable. This requires on-site storage facilities, which may include ponds, swales, subsurface storage tanks and System C (non-infiltration) permeable paviours with flow control devices. Again, methods that provide the most potential for amenity and pollution removal should be favoured.

8.19 With specific reference to the land to the rear of Meadow Way, each tier of the drainage hierarchy has been considered. In order of preference, the outcome of these considerations is below.

Tier 1 – Store rainwater for later use

8.20 Water re-use systems can rarely manage 100% of the surface water discharged from a development. This requires the surface water yield from the building and hardstanding areas to balance perfectly with the demand from the proposed development; too much demand will result in lack of water supply; too little demand will cause the storage systems to become overwhelmed and could result in flooding when the next rainfall event happens. Consequently, even if there are opportunities and a need for rainwater recycling systems, further solutions for attenuating and discharging surface water will almost always be required.

8.21 The rainwater yield from the roof and hardstanding areas of the development is likely to be quite high. The proposed development has extensive areas of soft landscaping, beds and gardens, which may benefit from having a supply of recycled rainwater for the watering of gardens, beds, etc.

8.22 The opportunity for water re-use and recycling on site has been explored and this report recommends the use of water butts for each property. These will reduce the reliance on potable water supplies during activities such as gardening and car washing. They can also provide small amounts of storage for surface water. The typical types and storage volumes of water butts are in Table 8.3, below:

8.23 Water butts can also provide small amounts of storage for surface water and can often assist in achieving zero discharge for rainfall depths up to 5mm, which covers 50% of annual rainfall events (according to the EA's Rainfall Runoff Management for Developments report – SC030219)

Table 8.3 - Types and storage volumes of water butts

Typical Water Butt Options	Dimensions (m)	Storage Volume Provided
Type 1 (wall-mounted - small)	1.22 x 0.46 x 0.23	100 litres (0.10m^3)
Type 2 (standard house water butt)	0.9 x 0.68 diameter	210 litres (0.21m^3)
Type 3 (large house water butt)	1.26 x 1.24 x 0.8	510 litres (0.50m^3)
Type 4 (column tank – very large)	2.23 x 1.28 diameter	2000 litres (2.00m^3)

8.24 This report recommends that 1no. 'Type 2' standard water butts are used on each property. Because there are proposed to be up to 89 dwellings, this approximately equates to up to 18,690 litres (18.69m^3) of surface water attenuation and recycled water on site.

8.25 The surface water storage available in the water butts has not been included in any hydraulic calculations as it can't be guaranteed that they will be empty at the start of a rainfall event.

Tier 2 - Use infiltration techniques, such as porous surfaces in non-clay areas

8.26 As discussed in Paragraphs 2.16 to 2.21 in Section 2 of this report, BRE365 soakage testing has shown that the superficial geology on site shows potential for infiltration. Notwithstanding this, intrusive investigations on site, which took place in September 2022, noted elevated groundwater levels (with resting levels between 1.50mMGL and 2.0mBGL). Longer-term winter groundwater monitoring boreholes have been put in place to establish annual average high levels and it is anticipated that groundwater levels will rise following the dry summer of 2022 and as groundwater is recharged from October through to the Spring.

8.27 The resting groundwater levels found on site would preclude any soakage features because it would not be possible to maintain a clear one metre between the base of any infiltration structures and the highest annual average groundwater levels, as per the requirements of the CIRIA C753 SuDS Manual.

8.28 Consequently, infiltration is not an appropriate form of surface water disposal for the proposed development and will not be carried forward in the drainage strategy for the site, especially because the shallower soils are impermeable, with the permeable gravel coming in lower down.

8.29 Notwithstanding this, the landscaped and 'undeveloped' parts of the site (gardens, verges, beds, etc.) will drain naturally by infiltration and rainwater will be intercepted by vegetation.

Tier 3 - Attenuate rainwater in ponds or open water features for gradual release

8.30 As discussed above, the local groundwater levels are such that infiltration will not be viable on site. As such, the drainage strategy for the development will look to open, surface level SuDS features for surface water attenuation and pollution mitigation. Open SuDS features can also provide amenity and biodiversity benefits, thus supporting all four SuDS pillars.

8.31 Opportunities for a network of SuDS features have been identified that will work independently and in a 'SuDS train' to ensure that attenuation opportunities are maximised, flood risk is minimised and amenity and biodiversity benefits are created wherever possible.

8.32 The SuDS features proposed on site are System C (non-infiltration) permeable paviours, swales and an attenuation basin. The location and connection of these features can be seen in the plan in Appendix N. The design approach for each of these SuDS features is discussed, below. The open water features (the swale and attenuation basin) are discussed in this section and the permeable paviours are discussed in the context of sealed water features, which is the next tier of the drainage hierarchy.

8.33 The site will discharge surface water to the drainage ditches on the boundaries of the site at no greater than the QBAR greenfield runoff rate of 3 l/s. Most of the site will discharge at 2.3 l/s to the ditch on the northern boundary, and surface water from the access road will discharge at just 0.7 l/s to the ditch on the eastern boundary. This total surface water discharge of no greater than 3 l/s will represent a reduction in site runoff for all storms greater than the annual average event.

Swales

8.34 Space has been provided in the centre of the site for 2no. swales that will provide attenuation. These swales are to be 34m long, 0.7m deep and have side slopes of 1-in-3. The swales will have hydrobrakes on their outfalls to make sure that attenuation is maximised, prior to draining back to the main drainage run in the site, which runs to the attenuation basin.

8.35 It is also proposed to have a swale extension on the attenuation basin on the eastern boundary of the site.

8.36 Please refer to the plan in Appendix N, which shows the location of the swales within the site.

Attenuation Basin

8.37 A large space for an attenuation basin with swale extension has been retained in the northeast corner of the site. Please refer to the plan in Appendix N. The space for the infiltration basin is 1,100m^2 and it will be only one metre deep (so that it can outfall to the surrounding ditches by gravity) and will have side slopes of 1-in-3. The attenuation basin will have a volume of approximately 935m^3.

8.38 It is also intended to retain a permanently wetted area within the infiltration basin so that biodiversity and visual amenity benefits can be created.

Tier 4 – Attenuate rainwater by storing in tanks or sealed water features for gradual release

8.39 As discussed above, it is intended to use System C permeable paving throughout the site, which can be considered as sealed water features. The design features of the permeable paved areas are as follows:

Permeable Paviours

8.40 Selected roadways within the development have been identified as an opportunity for 'System C' (non-infiltration) permeable paviours. For all areas of System C permeable paviours, the following makeup will be specified (from surface to base):

- 80mm Concrete Block Permeable Paviours (CBPP)
- 50mm Type 2/6mm Sharp Grit or Clean Sand
- Separating Geotextile
- 450mm Type 4/20 Coarse Graded Aggregate (CGA) Subbase (nominal porosity = 30%)
- Separating Geomembrane

8.41 The total depth of these permeable paviours is 580mm. Please note that the above depth of CGA has been designed on its hydraulic requirements and surface water storage capacity. At the detailed design stage the depth of the CGA, which forms the foundation of the pavement, may need to be refined once the bearing capacity of the sub-grade is known.

8.42 Where permeable paviours are to be used, the proposed drainage strategy will direct surface water falling on the roofs of the dwellings and other nearby hardstanding areas to the permeable paviours where it will discharge into the subbase of the paviours.

8.43 Surface water falling directly onto the permeable paviours will drain into the sub-base, percolating through the joints in the paviours and then through the sharp grit and the geotextile.

8.44 The areas of System C permeable paviours will have an outfall that is regulated by an orifice plate or hydrobrake, which will ensure that the attenuation within the permeable paviours is maximised. The permeable paviours will outfall to a traditional piped network that flows to the attenuation basin shown in the plan in Appendix N.

Geocellular Attenuation Tank

8.45 The eastern-most section of access road (from Meadow Way) will drain to a shallow attenuation tank of modular geocellular storage crates, which will measure 13m x 14m x 0.4m (L x W x D). This geocellular attenuation tank will discharge to the ditch on the eastern boundary of the site via a hydrobrake that will restrict flow to no greater than 0.7 l/s.

8.46 It was evaluated whether this part of the site could be permeable paviours, but WSCC do not adopt System C permeable paving and, because it is not appropriate to have a geotextile permeable liner in this location due to high groundwater and the risk of ingress, it discounts permeable paving as an option.

Tier 5 - Discharge rainwater direct to a watercourse

8.47 As mentioned above, surface water will discharge to the existing ditch network at no greater than 3 l/s. The majority of the site will discharge at 2.3 l/s to the ditch on the northern boundary, and surface water from the access road via the geocellular tank will discharge at just 0.7 l/s to the ditch on the eastern boundary.

Tier 6 - Discharge rainwater to a surface water sewer/drain

8.48 It is anticipated that this tier of the drainage hierarchy will not be needed for surface water discharge.

Tier 7 - Discharge rainwater to the combined sewer

8.49 It is anticipated that this tier of the drainage hierarchy will not be needed for surface water discharge.

Tier 8 - Discharge rainwater to the foul sewer

8.50 It is anticipated that this tier of the drainage hierarchy will not be needed for surface water discharge.

MicroDrainage Hydraulic Modelling

8.51 The drainage system outlined above has been tested in MicroDrainage's Network hydraulic modelling module.

8.52 The results of the MicroDrainage hydraulic modelling for the proposed development can be seen in Appendix O.

8.53 The results of the hydraulic modelling show that the drainage strategy as outlined above can attenuate and discharge surface water generated in the 1 in 100-year + 45% rainfall event without flooding. This manages flood risk on- and off-site and reduces overall local flood risk.

8.54 Most notably, this study is aware that the existing site can overload the surrounding ditch network in heavy rain events and some surface water flooding on Meadow Way has ensued as a result. The proposed drainage strategy for the site will only discharge at the QBAR greenfield runoff rate for all storms up to and including the 1 in 100 + 45% rainfall event. Therefore, surface water generated in heavy rainfall events (anything greater than QBAR) will be attenuated on site. This means that the surcharging of the ditch network with runoff from the site will not happen and that local flood risk will be reduced over the existing situation.

8.55 The total surface water attenuation provided by the permeable paviours, swales and infiltration basin is approximately 1,845m^3.

9.0 Proposed Foul Water Drainage Strategy

9.1 As discussed in Section 2, Southern Water are the local sewerage operator in the area and their asset location plans in the vicinity of Meadow Way can be seen in Appendix G.

9.2 The asset location plans show that there is a 150mm vitreous clay (VC) foul sewer in Meadow Way that originates at node 7705, outside number 24, which is proposed to be demolished to provide an eastern access to the site. This foul manhole with an invert of 6.99 mAOD could provide a potential connection for 50% of the site's foul sewage. It is anticipated that this invert level can be met by gravity from dwellings on the eastern half of the site.

9.3 The asset location plans show that on Hook Lane to the west of the site there is a foul sewer that collects at node 3703, after which foul waste is pumped east along the southern boundary of the site towards node 8701 in Meadow Way. Node 3703 has an invert level of 7.26 mAOD (and a cover level of 10.55 maOD, thus a depth to invert of 3.29m) and this would also be accessible by gravity from the western half of the site.

9.4 Because there are two foul sewers available for connection, it is proposed to split the foul sewage from the proposed development; the eastern half of the site will drain to the foul sewer in Meadow Way and the western half of the site will drain to the foul sewer in Hook Lane.

9.5 The peak foul flow rate from the proposed development has been calculated based on Southern Water's foul sewerage modelling criteria, the details of which can be found in Appendix F. In summary, the calculation is based on the foul flow element, plus an allowance for misconnected surface water.

9.6 Based on Southern Water's foul sewerage modelling criteria, the calculated design foul flows from the proposed residential development are 0.64 l/s. Because it is proposed to split the foul sewage from the site, this means that approximately 0.32 l/s will go node 3703 in Hook Lane and the remaining 0.32 l/s will go to node 7705 in Meadow Way.

9.7 A pre-application enquiry was submitted to Southern Water and they have responded with confirmation that the existing foul sewerage has capacity for the foul sewage from the proposed development on the basis of a split discharge as outlined above. This confirmation letter can be seen in Appendix F.

10.0 Surface Water Runoff Quality

10.1 The NPPF (Paragraph 174) states that the development should not have a detrimental impact on the environment, including the water environment. The technical guidance to the NPPF provides further advice on the benefits of ensuring runoff quality is to an appropriate standard.

10.2 The CIRIA SuDS Manual provides guidance on the treatment of surface water runoff. With regards to the proposed development, Table 4.3 of the CIRIA SuDS Manual rates the pollution hazard from roof water runoff as 'very low'. The only requirement for roof water runoff is the removal of gross solids and sediments, which would be achieved using catchpits and silt traps upstream of the permeable paviours.

10.3 With regards to the property driveways and the access road, Table 4.3 of the CIRIA SuDS Manual rates the pollution hazard from residential car parking and low traffic roads as 'low'. To mitigate a 'low' pollution hazard, the CIRIA SuDS Manual recommends using a simple index approach in line with Section 26.7.1. This is discussed, below.

10.4 Table 26.2 of the CIRIA SuDS Manual provides pollution hazard indices for different land use classifications. The land use classification that requires consideration for the parking areas on the site is in Table 6.3 below.

Table 10.1: Excerpt from Table 26.2 of CIRIA SuDS Manual

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydro-Carbons
Individual property driveways, residential car parks, low traffic roads (e.g. cul-de-sacs, homezones and general access roads) with less than 300 traffic movements per day.	Low	0.5	0.4	0.4

10.5 To deliver adequate pollution treatment and mitigation, the CIRIA SuDS Manual recommends using a SuDS component that has a total pollution mitigation index (for each contaminant type) that equals or exceeds the pollution hazard index (for each contaminant type).

10.6 Table 26.4 of the CIRIA SuDS Manual provides indicative SuDS mitigation indices for each SuDS type when discharging to groundwater. Table 10.2, below, which is an excerpt from Table 26.4, shows the mitigation index for permeable paviours.

Table 10.2: Pollution Mitigation Indices for Permeable Pavements

Type of pollution removal component	Total Suspended Solids (TSS)	Metals	Hydro-Carbons
Permeable Pavements	0.7	0.6	0.6

10.7 The mitigation indices for permeable pavements exceed those of the highest pollution hazard index figures from Table 10.1.

10.8 Where surface water is to discharge directly to a swale, the pollution mitigation indices in Table 10.3, below, apply.

Table 10.3: Pollution Mitigation Indices for Permeable Pavements

Type of pollution removal component	Total Suspended Solids (TSS)	Metals	Hydro-Carbons
Swale	0.5	0.6	0.6

10.9 Once again, the swales provide pollution mitigation indices that match or exceed the pollution hazards on site.

10.10 Parts of the site will drain through permeable pavements before outfalling to the infiltration basin in the northeast corner of the site, thus surface water will pass through two mitigation components. Where two mitigation components are used in series, the SuDS manual states that:

Total SuDS mitigation index = mitigation index (component one) + 0.5 mitigation index (component two)

10.11 Thus, the infiltration basin will provide the below further mitigation indices in Table 10.4:

Table 10.4: Pollution Mitigation Indices for Secondary SuDS Feature

Type of pollution removal component	Total Suspended Solids (TSS)	Metals	Hydro-Carbons
Infiltration Basin (with layer of dense vegetation underlain by a soil with good contaminant attenuation potential of at least 300mm in depth).	0.3 (0.6 ÷ 2)	0.25 (0.5 ÷ 2)	0.3 (0.6 ÷ 2)

10.12 And the total mitigation indices for the site is as per Table 10.5:

Table 10.5: Total Pollution Mitigation Offered by Permeable Paviours and Infiltration Basin:

Contaminant Type	Pollution Hazard Index	Pollution Mitigation Index	Difference
Total Suspended Solids	0.5	1.1 (0.8 + 0.3)	+ 0.6
Metals	0.4	0.725 (0.5 + 0.25)	+ 0.325
Hydrocarbons	0.4	1.0 (0.7 + 0.3)	+ 0.6

10.13 The above evidence shows how the permeable paviours or swales provide sufficient pollution mitigation on their own, but with the infiltration basin following the permeable paviours, they combine to ensure all pollution hazards are completely mitigated.

11.0 Urban Creep

11.1 An appropriate allowance should be made for urban creep throughout the lifetime of the development as per 'BS 8582:2013 Code of Practice for Surface Water Management for Developed Sites'.

11.2 In terms of impermeable areas, an uplift should normally be applied to the proposed impermeable areas to account for future development that may increase areas of hardstanding. This is because, as residential developments mature, property owners may extend their property or patios, install decking, or increase driveways to accommodate extra vehicles.

11.3 West Sussex County Council as the LLFA have provided in their Policy for the Management of Surface Water (updated November 2018) guidance on the proportion of urban creep that should be applied based on the development density, as per table 11.1, below.

Table 11.1: Impermeable Area Allowances for Urban Creep

Residential development density (Dwellings per hectare)	Change allowance (% of impermeable area)
≤25	10
30	8
35	6
45	4
≥50	2
Flats and Apartments	0

11.4 The site is 3.8 ha and is proposing 89 dwellings, thus has a proposed development density of 22.9 dwellings per hectare. Following the guidance in Table 11.1, an impermeable creep allowance of 10% should be added to the impermeable areas in the MicroDrainage Network hydraulic model.

11.5 Private homeowners do not have the ability or right to extend publicly owned or shared parts of the site; indeed, they cannot make roadways wider or increase the area of the parking courts as the site matures. As such, these site areas remain a constant as the development matures.

11.6 The total impermeable areas on site, as shown in Table 8.1 is 1.50 hectares. The publicly owned hardstanding areas on site total 0.71 ha, thus the privately owned impermeable areas (dwellings, driveways and patios) total 0.79 ha.

11.7 If the privately owned impermeable areas increase by 10%, they will increase to 0.87 ha. When this is added to the publicly owned hardstanding areas (0.71ha), this totals 1.58 ha.

11.8 The increase from 1.50 ha to 1.58 ha represents a total percentage increased in impermeable areas of 5.3%. Therefore, this increase has been applied to the total additional flow in Simulation Criteria in the MicroDrainage Network model to determine how the drainage strategy performs with this increase in impermeable areas and the results of this modelling can be seen in Appendix Q.

11.9 This hydraulic modelling shows that with an 5.3% increase in total flow that the site can still attenuate surface water from the 1 in 100-year + 45% rainfall event with only 0.259m^3 of flooding, which occurs in the 480-minute winter rainfall event. This flood arises from the permeable paving section in the north of the site. This amount of flooding is negligible in this area because the permeable paviours are 1,200m^2

in this part of the site and 0.259m^3 of flooding equates to 0.21mm of flooding per square metre, which would be contained within the roadway of the access road by the 125mm faces of the HB2 kerbs.

11.10 Therefore, in conclusion, the proposed drainage strategy is appropriate now and in the future because the latest climate change increases have been taken into account and an inclusion for urban creep has been considered and the drainage strategy is shown to be able to attenuate surface water from the 1 in 100-year + 45% rainfall event with a negligible amount of flooding in one part of the site.

12.0 Exceedance Events

12.1 Exceedance events are those greater than the design rainfall event (i.e. greater than the 1 in 100-year rainfall event plus 40% for climate change).

12.2 Any rainfall events greater than the design rainfall event (1 in 100-year plus 40% for climate change) may cause flooding due to them 'exceeding' the capacity of the drainage system. In this situation it is imperative to check whether flooding would occur and, if so, that it can be contained on site and does not ingress into any property or cause nuisance to any neighbouring sites or properties.

12.3 On the land to the rear of Meadow Way, the site is predominantly flat in the western two thirds of the site and exceedance flows would be largely static due to the lack of gradient in this part of the development. In this scenario, exceedance flows would be retained in the carriageway of the access road by the 125mm faces of the HB2 kerbs and, thus, would not cause flooding to properties on site and would not flow offsite to cause issues to neighbouring properties or land.

12.4 In the eastern third of the site land falls eastwards towards the site boundary and the drainage ditch there. As discussed above, the drainage strategy for the site will be removing surface water inputs that would ordinarily drain to these ditches (and has overwhelmed them at times in the past), thus these ditches would be relatively dry in a rainfall event and represent a suitable receptor for exceedance flows.

12.5 Additionally, the drainage strategy in the east of the site, as specified, does not flood in the 1 in 100-year + 45% rainfall event even with an inclusion for urban creep. Therefore, there is an amount of additional capacity ('freeboard') in the system for exceedance events meaning that overland flow due to exceedance may not happen.

12.6 Notwithstanding this, an exceedance plan has been drawn up and can be seen in Appendix R.

13.0 Residual Risk

13.1 Whilst the on-site drainage has been designed and constructed to current standards, there always remains a small residual risk of flooding due to blockage or failure of on-site private drains. Therefore, appropriate and regular maintenance of the drainage infrastructure should be undertaken by the site management agency or by the residents.

13.2 To assist with this process, a Drainage Management and Maintenance Plan has been prepared, which sets out the principles for the long-term management and maintenance of the proposed surface water drainage system on the site. The Drainage Management and Maintenance Plan can be seen in Appendix S.

13.3 The purpose of this document is to ensure that those responsible for site maintenance have a robust inspection and maintenance plan going forwards. This will help ensure the optimum operation of the surface water drainage system and that it will be regularly maintained for the lifetime of the development. This will contribute to reducing the risk of surface water flooding both on- and off-site.

14.0 Summary and Conclusion

14.1 This flood risk assessment (FRA) and drainage strategy has been produced by Motion on behalf of Gleeson Land, to accompany the outline planning application with all matters reserved, other than principal means of access and demolition of 24 Meadow Way, for up to 89 residential dwellings, with access taken from Meadow Way, together with the provision of open space, landscaping and associated infrastructure.

14.2 The Environment Agency's Flood Map for Planning shows that the entire site is located within Flood Zone 1 (less than 1 in 1000 annual probability of flooding from rivers or the sea). Residential development is considered appropriate in Flood Zone 1 and, therefore, the proposed development is appropriate in this location

14.3 The site is in the 'very low' surface water flood risk category (less than a 1 in 1,000-year AEP of flooding) and, therefore, is not within a critical drainage area and does not have any surface water flowpaths crossing or originating on site.

14.4 The BGS Groundwater Flooding Susceptibility mapping in the Envirocheck Landmark flood screening report places the site in an area that is considered to have geological indicators of groundwater flooding and that some groundwater flooding may occur to structures below the surface.

14.5 Intrusive investigations on site, which took place in September 2022, noted elevated groundwater levels (with resting levels between 1.50mMGL and 2.0mBGL). Longer-term winter groundwater monitoring boreholes have been put in place to establish annual average high levels and it is anticipated that groundwater levels will rise following the dry summer of 2022 and as groundwater is recharged from October through to the Spring. The resting groundwater levels found on site would preclude any soakage features because it would not be possible to maintain a clear one metre between the base of any infiltration structures and the highest annual average groundwater levels, as per the requirements of the CIRIA C753 SuDS Manual.

14.6 There are currently no formal drainage systems in place for the site, but land drainage takes place through an existing network of ditches that are on the northern, southern and eastern boundaries of the site. These drainage ditches are approximately 0.75m deep from the top of the bank to the invert of the ditch.

14.7 Southern Water's asset location plans were obtained and these show that there are public foul sewers in Meadow Way and Hook Lane that would also be accessible by gravity from the site. It is proposed to discharge foul sewage from the site to these existing foul sewers and Southern Water have confirmed in writing that the existing foul sewerage has capacity for the foul sewage from the proposed development.

14.8 In terms of surface water management, opportunities for water re-use and recycling on site has been explored and this report recommends the use of water butts for each dwelling. These will reduce the reliance on potable water supplies during activities such as gardening.

14.9 Because infiltration is not possible on this site due to the elevated groundwater levels, System C (non-infiltration) SuDS features have been chosen as the most appropriate form of surface water management for the proposed development.

14.10 Opportunities for a network of SuDS features have been identified that will work independently and in a 'SuDS train' to ensure that attenuation opportunities are maximised, flood risk is minimised and amenity and biodiversity benefits are created wherever possible. It is proposed to use permeable paviours, swales, an attenuation basin and a geocellular attenuation tank for the management of surface water on site.

14.11 This drainage strategy has been modelled in MicroDrainage's Network hydraulic modelling module and has been shown to be successful in the 1 in 100-year + 45% rainfall event with no flooding. This manages flood risk on- and off-site and reduces overall local flood risk. Total site surface water runoff will be no greater than 3 l/s, which is the QBAR greenfield runoff rate for the site.

14.12 An 10% uplift to surface water inputs has been included to compensate for urban creep to the privately-owned impermeable parts of the site, which represents an overall increase of 5.3% in the impermeable areas on site. The proposed drainage strategy can attenuate surface water from the 1 in 100-year + 45% rainfall event with only 0.259m^3 of flooding, which is negligible.

14.13 The proposed drainage strategy is also able to mitigate all pollution hazards created on site using SuDS features and no further pollution mitigation is needed.

14.14 Residual risk has been addressed through the development of a drainage management and maintenance plan that provides a framework through which the site's drainage system should be managed in perpetuity.

14.15 In conclusion, the site is at very low risk of flooding and the proposed drainage strategy can discharge the 1 in 100-year + 45% rainfall event without flooding. As such, flood risk and surface water management should not form an impediment to the progress of this development.

motion

Appendix A

Site Location Plan

Site

LAND TO THE REAR OF MEADOW WAY, WESTERGATE

Drawing

Site location plan

Scale

1:1250@A3

Date

09.11.22

Drawing ref

1318.**01**

0 10 20 30 40 50m

KEY

Site boundary

N

Squirrels
Rya
Willow End
Copp-ins
Copins
Newlands
MEADOW WAY
10
11
13
5
19
24
1
Shangri La
Familia
Garfield
Chiffchaff
Sundew
Kittiemish
St Helier
The Nook
Mildmay
Bramleys
The Crofton
HOOK LANE
2
6
BOWLEY MEAD
TOOP GARDENS
10
66
14
21
33
HASLER GROVE
DIBLEY VALE
16
LAMORNA GARDENS
Grasmere
Fairways
Medomsley
Purbeck
12
23
24
25
26
27
28
29
20
17
35
39

ARUN DISTRICT COUNCIL AL/137/24/RES

richards urban design

ARUN DISTRICT COUNCIL AL/178/22/OUT

motion

Appendix B

Topographic Survey of the Site

Legend:

- Kerb line (& top of kerb).
- Drop Kerb (& top of kerb).
- Surface edge (type of surface annotated).
- Embankment (with slope demarkation).
- Penceline (type and height as annotated).
- Wall (type and height as annotated).
- Hedgeline.
- Barrier (type as annotated).
- Gate.
- Stile.
- Building.
- Telegraph pole (and overhead wires).
- Electricity pole (and overhead wires).
- LP — Lighting Column
- G. — Road Gully.
- MHCL 50.00 — Manhole and cover level.
- ICCL 50.00 — Inspection Chamber and cover level.
- BT — Telecomms. service box.
- CATV — Cable TV service box.
- EB — Electricity / BT Control Gear Box.
- W. — Stop Tap (Water).
- SV — Stop Valve (Water).
- AV — Air Valve (Water).
- FH — Fire Hydrant.
- Gas — Gas Valve.
- Foliage (Ground vegetation) extent.
- Foliage (Overhanging canopy) extent.
- RS — Road Sign (multiple).
- RS — Road Sign (single).
- Mkr — Marker Post.
- Tree with Spread/Girth/Species.
- S1 — Survey Station and Reference.

Notes:

Any surveyed features not shown above are annotated appropriately. Tree species is only annotated where known. Manhole covers are surveyed where accessible. Healer Surveys cannot accept liability for missing covers due to them being buried or obscured by parked vehicles at the time of site visit.

Station Table:

Station	Eosting	Northing	Level
S1	493508.322	104766.711	7.388
S2	493791.026	104846.089	7.640
S3	493870.376	104866.002	7.348

Grid Origin and Level Datum:
Ordnance Survey GPS OSGB36(15) Grid and Levels used.

Revisions:

A:	
B:	
C:	
D:	
E:	
F:	
G:	
H:	

Client:

GLEESON LAND

healer surveys
Land Surveyors
8 Oldfield Road, Bocam Park, Pencoed, Bridgend, CF35 5LJ
tel. 01656 860586
web. www.healersurveys.co.uk

Project:
Meadow Way, Westergate

Drawing:
Topographic Survey

Date:	July 2022
Surveyed:	JAE/JDE
Drawn:	JDE
Checked:	RE

Scale:	Sheet Size:	Sheet No:
1:500	A0	1 of 2

Job No:
P3584

Rev:

Appendix C

Local BGS Borehole Survey

SU 90 NW 73 9359 0581 **Westergate** **Block G**

Surface level +10.8 m
Water struck at +7.8 m
September 1981

Overburden 2.2 m
Mineral 3.8 m
Bedrock 0.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Brickearth	Silt, brown	0.4	0.7
	Clay, silty, brown, with a few pebbles near base	1.5	2.2
Head Gravel	a 'Very clayey' gravel Gravel: fine with coarse, angular to subrounded; flint, some white and porous Sand: coarse with fine and medium Fines: clay	0.8	3.0
Raised Beach Deposits (younger)	b 'Clayey' pebbly sand Gravel: coarse and fine, angular to subrounded; flint, some white and porous Sand: fine with traces of medium and coarse; quartz Fines: silt, brown	2.0	5.0
	c Sandy gravel Gravel: fine and coarse, angular to well rounded; flint (some white and porous), chalk and other rock fragments Sand: fine with coarse and medium; quartz	1.0	6.0
London Clay	Clay, stiff, dark olive grey with a few rounded flint pebbles	0.8+	6.8

GRADING

	Mean for deposit percentages			Depth below surface (m)	Percentages						
	Fines	Sand	Gravel		Fines	Sand			Gravel		
					-4	+4 -2	+2 -1	+1 -4	+4 -16	+16 -64	+64 mm
a	37	17	46	2.2-3.0	37	5	4	8	29	17	0
b	15	79	6	3.0-4.0	15	70	1	1	6	7	0
				4.0-5.0	15	84	1	0	0	0	0
				Mean	15	77	1	1	3	3	0
c	3	56	41	5.0-6.0	3	41	7	8	19	22	0
b+c	11	72	17	**3.0-6.0**	11	66	3	3	8	9	0
a+b+c	16	60	24	**2.2-6.0**	16	53	3	4	13	11	0

COMMERCIAL
IN CONFIDENCE

BS 1586 (1 Feb) 2000: 1/76 — Institute of Geological Sciences — Sheet 1 of

Borehole Reg No: SU 90 NW/72
Temp borehole No: SU90/36
Nat Grid Ref: SU 93590501
Locality: Colt Nursery, Westergate
Surface level: 10.8 m O.D.(ft O.D.)
Drilled by: Sondadores
Drill type:
Hole diameter:
Depth(s) bailed:
Date started: 8/9/81
Date finished: "
Recorded b [redacted]

Classification of ground	Thickness m	Nature
O.B.	to 2.2	silty clay
Min	2.2 to 6.0	variable fine sand, clayey gravel, sandy gr.
BR.	6.0 →6.8	grey London Clay

Remarks

Explanation
▽ Groundwater depth first encountered
a▼ Morning water level
e▼ Evening water level
Casing depth
Borehole depth
w Water sample
U, sample: solid ornament shows fraction recovered
• Spot disturbed sample
Bulk sample
S.P.T. Standard Penetration Test

Geological Classification	Description of Strata	Sampling	Sample Nos	Water level	Drilling and Casing progress
	Soil				
	dry brown silt				
Brickearth	brown silty clay	0.6	CBSS 175		
	brown pebbly silty clay	1.8–1.9	CBSS 176		
Qtg	clayey gravel: 20 c.gr; 30 f.gr } flint; 10 cs; 40 fines	2.2 to 3.0	CCB 095	▽	
Marine Sand + gravel	Sandy gravel: <20 c.gr + a few lge flint cobbles; >10 f.gr; 60 f.s. (%); 10 fines	3.0 to 4.0	CCB 096	3.0	
	9% sand: >95% f.s. - no coarser material seen ? some m.s.; <5% fines (silty)	4.0 to 5.0	CCB 097		
	Sandy gravel: 30 c.gr; 30 f.gr; 10 cs; 30 f/ms	5.0 to 6.0	CCB 098		
London Clay	dark olive grey stiff clay with a few flint pebbles		CBSS 177		end 6.8

Appendix D

BRE365 Soakage Testing Locations

Exploratory Point Plan (Interim)

Key:

- Trial Pit
- Soakage Test Pit
- Proposed Window Sample Borehole (12/10/2022)
- Site Boundary

Reproduced from Gleeson Land Red Line Plan.

Not to scale.

All positions illustrative only.

Project Title:	Hook Lane, Westergate
Client:	Gleeson Land
BRD Reference:	BRD3963-OP5-A
Date Issued:	October 2022

BRD
01295 272244
info@brduk.com

motion

Appendix E

BRE365 Soakage Testing Results

SOIL INFILTRATION RATE

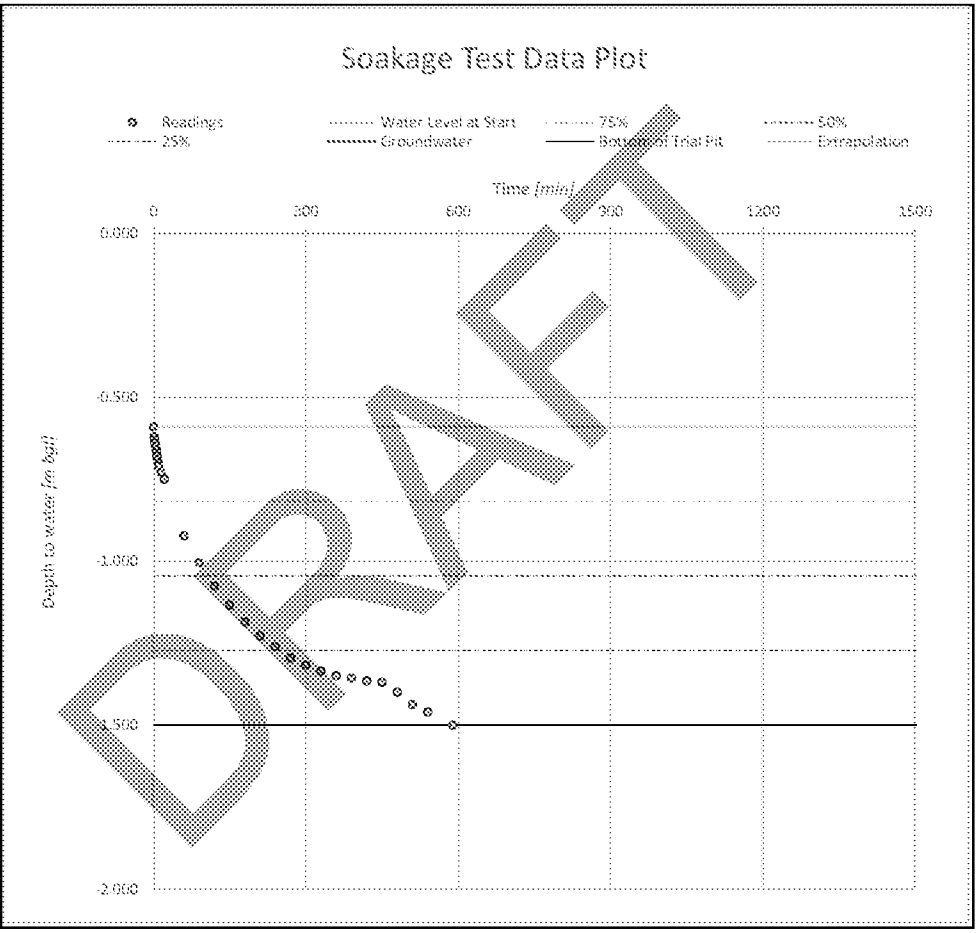
In accordance with BRE Digest 365:2016 - Soakaway Design

Client:	Gleeson Land
Project Title:	Hook Lane, Westergate
Project No:	BRD3963

Trial Pit No:	TP01	**Length *[m]* :**	1.90
Test No:	1	**Depth *[m]* :**	1.50
Date:	20/09/2022	**Width *[m]* :**	0.45
Logged by:	DB	**Groundwater *[m bgl]* :**	Dry

		from - to *[m bgl]*		**Description**
Ground	**Conditions**	0.25	0.60	Slightly gravelly, silty CLAY
		0.60	1.30	Very clayey, slightly sandy GRAVEL
		1.30	1.50	Clayey fine SAND

Time	**Water Depth**
[min]	***[m bgl]***
0	0.590
1	0.620
2	0.630
3	0.640
4	0.650
5	0.660
6	0.670
7	0.680
8	0.690
9	0.700
10	0.710
15	0.730
21	0.750
60	0.923
90	1.005
120	1.076
150	1.135
180	1.185
210	1.228
240	1.261
270	1.295
300	1.317
330	1.335
360	1.349
390	1.357
420	1.365
450	1.370
480	1.400
510	1.437
540	1.460
590	1.500



Soil Infiltration Rate [m/s]: $$f = \frac{V_{p75\_25}}{a_{s50} \times tp_{75-25}}$$

with:

V_{p75_25}	as Effective Storage Volume of water between 75% and 25% effective storage depth ***[m³]***	**0.39**
a_{s50}	as Internal Surface Area of the soakage trial pit up to 50% storage depth including the base area ***[m²]***	**2.99**
t_{p75_25}	as Time for the water level to fall from 75% to 25% effective storage depth ***[s]***	**1.3.E+04**

Soil Infiltration Rate *[m/s]* : 1.01E-05

Remarks:

SOIL INFILTRATION RATE

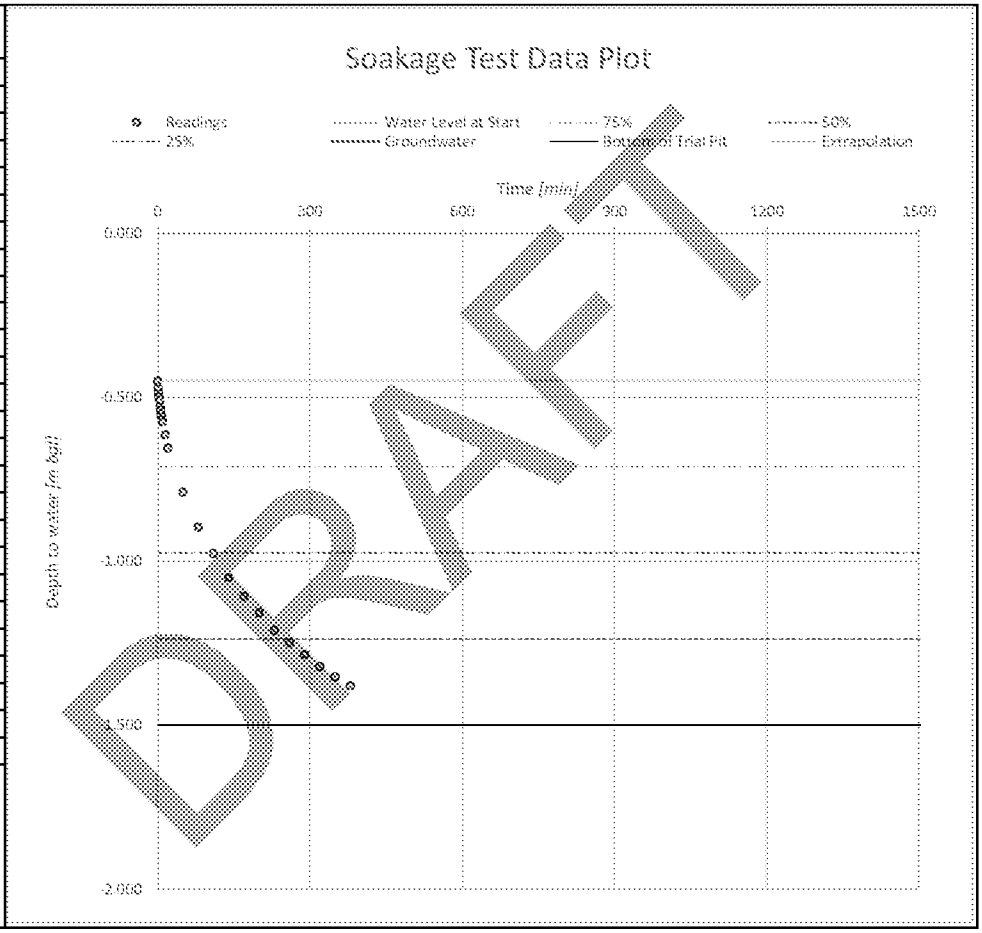
In accordance with BRE Digest 365:2016 - Soakaway Design

Client:	Gleeson Land
Project Title:	Hook Lane, Westergate
Project No:	BRD3963

Trial Pit No:	TP01	**Length *[m]* :**	1.90
Test No:	2	**Depth *[m]* :**	1.50
Date:	21/09/2022	**Width *[m]* :**	0.45
Logged by:	DB	**Groundwater *[m bgl]* :**	Dry

		from - to *[m bgl]*		**Description**
Ground	**Conditions**	0.25	0.60	Slightly gravelly, silty CLAY
		0.60	1.30	Very clayey, slightly sandy GRAVEL
		1.30	1.50	Clayey fine SAND

Time	**Water Depth**
[min]	***[m bgl]***
0	0.450
1	0.475
2	0.490
3	0.500
4	0.510
5	0.530
6	0.540
7	0.550
8	0.560
9	0.570
10	0.575
15	0.615
20	0.655
50	0.790
80	0.896
110	0.977
140	1.050
170	1.107
200	1.157
230	1.211
260	1.248
290	1.285
320	1.322
350	1.353
380	1.380



Soil Infiltration Rate [m/s]: $$f = \frac{V_{p75\_25}}{a_{s50} \times tp_{75-25}}$$

with:

V_{p75_25}	as Effective Storage Volume of water between 75% and 25% effective storage depth ***[m³]***	**0.45**
a_{s50}	as Internal Surface Area of the soakage trial pit up to 50% storage depth including the base area ***[m²]***	**3.32**
t_{p75_25}	as Time for the water level to fall from 75% to 25% effective storage depth ***[s]***	**1.3.E+04**

Soil Infiltration Rate *[m/s]* : 1.03E-05

Remarks:

SOIL INFILTRATION RATE

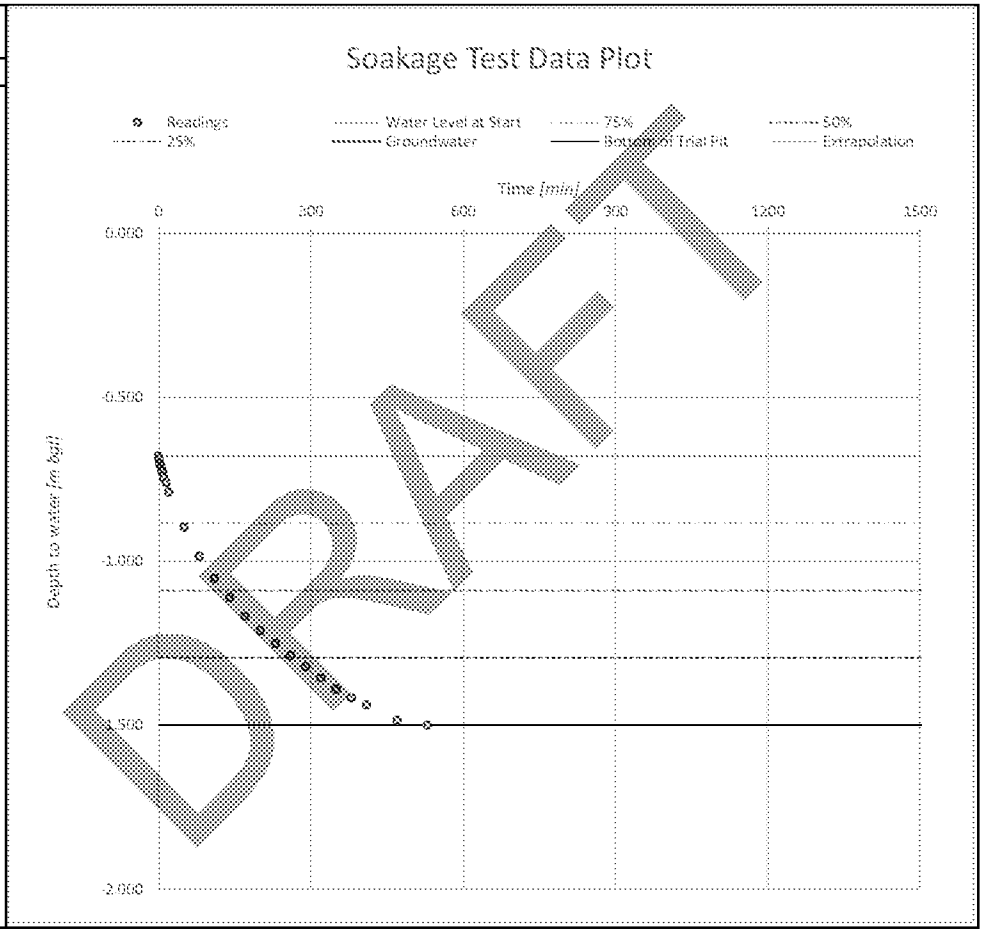
In accordance with BRE Digest 365:2016 - Soakaway Design

Client:	Gleeson Land
Project Title:	Hook Lane, Westergate
Project No:	BRD3963

Trial Pit No:	TP01	**Length *[m]* :**	1.90
Test No:	2	**Depth *[m]* :**	1.50
Date:	21/09/2022	**Width *[m]* :**	0.45
Logged by:	DB	**Groundwater *[m bgl]* :**	Dry

		from - to *[m bgl]*		Description
Ground	**Conditions**	0.25	0.60	Slightly gravelly, silty CLAY
		0.60	1.30	Very clayey, slightly sandy GRAVEL
		1.30	1.50	Clayey fine SAND

Time	**Water Depth**
[min]	*[m bgl]*
0	0.680
1	0.690
2	0.700
3	0.705
4	0.710
5	0.715
6	0.720
7	0.725
8	0.730
9	0.740
10	0.745
15	0.760
20	0.790
50	0.896
80	0.985
110	1.053
140	1.111
170	1.168
200	1.212
230	1.251
260	1.288
290	1.322
320	1.357
350	1.390
380	1.417
410	1.438
470	1.485
530	1.500



Soil Infiltration Rate [m/s]: $$f = \frac{V_{p75\_25}}{a_{s50} \times tp_{75-25}}$$

with:

V_{p75_25}	as Effective Storage Volume of water between 75% and 25% effective storage depth ***[m³]***	**0.35**
a_{s50}	as Internal Surface Area of the soakage trial pit up to 50% storage depth including the base area ***[m²]***	**2.78**
t_{p75_25}	as Time for the water level to fall from 75% to 25% effective storage depth ***[s]***	**1.3.E+04**

Soil Infiltration Rate *[m/s]* : 9.58E-06

Remarks:

SOIL INFILTRATION RATE

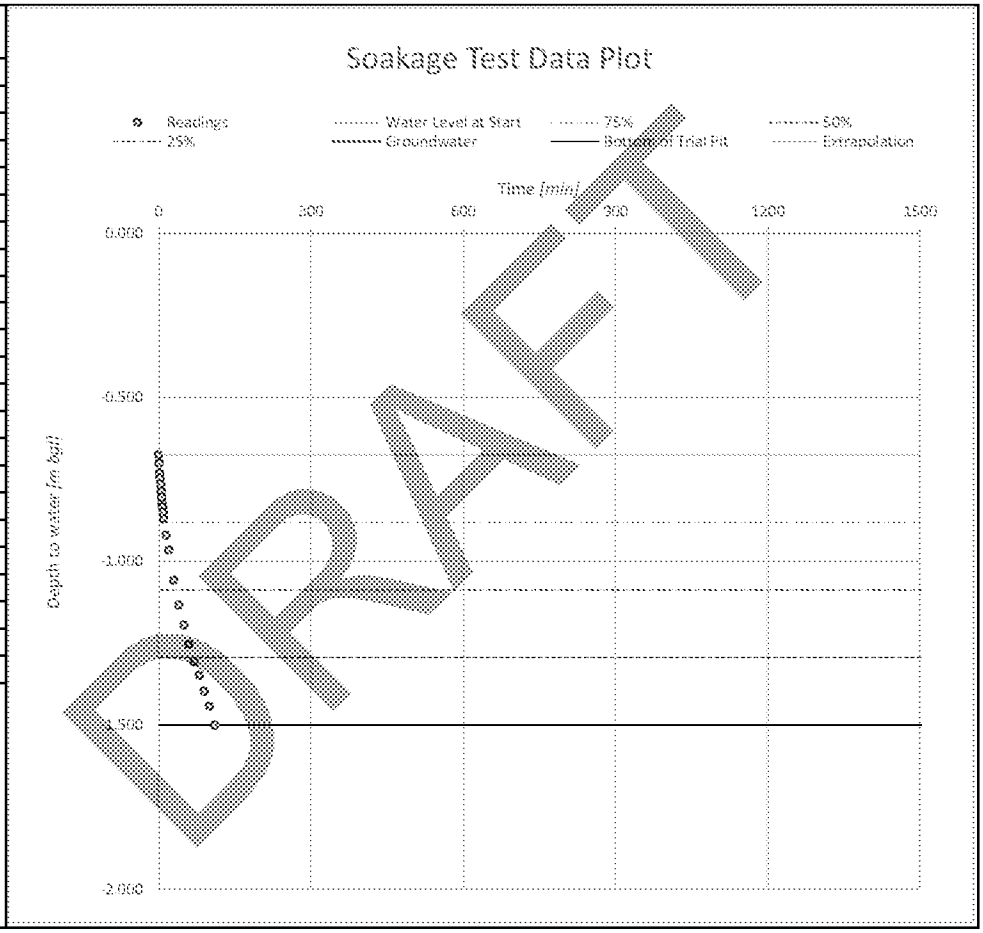
In accordance with BRE Digest 365:2016 - Soakaway Design

Client:	Gleeson Land
Project Title:	Hook Lane, Westergate
Project No:	BRD3963

Trial Pit No:	TP02	**Length *[m]* :**	2.30
Test No:	1	**Depth *[m]* :**	1.50
Date:	20/09/2022	**Width *[m]* :**	0.45
Logged by:	DB	**Groundwater *[m bgl]* :**	Dry

Ground Conditions	**from - to *[m bgl]***		**Description**
	0.25	1.50	Sandy CLAY.

Time	**Water Depth**
[min]	***[m bgl]***
0	0.676
1	0.701
2	0.731
3	0.746
4	0.766
5	0.786
6	0.806
7	0.826
8	0.836
9	0.851
10	0.871
15	0.921
20	0.966
30	1.058
40	1.134
50	1.195
60	1.253
70	1.306
80	1.348
90	1.396
100	1.442
110	1.500



Soil Infiltration Rate [m/s]: $f = \frac{V_{p75\_25}}{a_{s50} \times tp_{75-25}}$

with:

V_{p75_25}	as Effective Storage Volume of water between 75% and 25% effective storage depth ***[m³]***	**0.43**
a_{s50}	as Internal Surface Area of the soakage trial pit up to 50% storage depth including the base area ***[m²]***	**3.30**
t_{p75_25}	as Time for the water level to fall from 75% to 25% effective storage depth ***[s]***	**3.4.E+03**

Soil Infiltration Rate *[m/s]* : 3.80E-05

Remarks:

SOIL INFILTRATION RATE

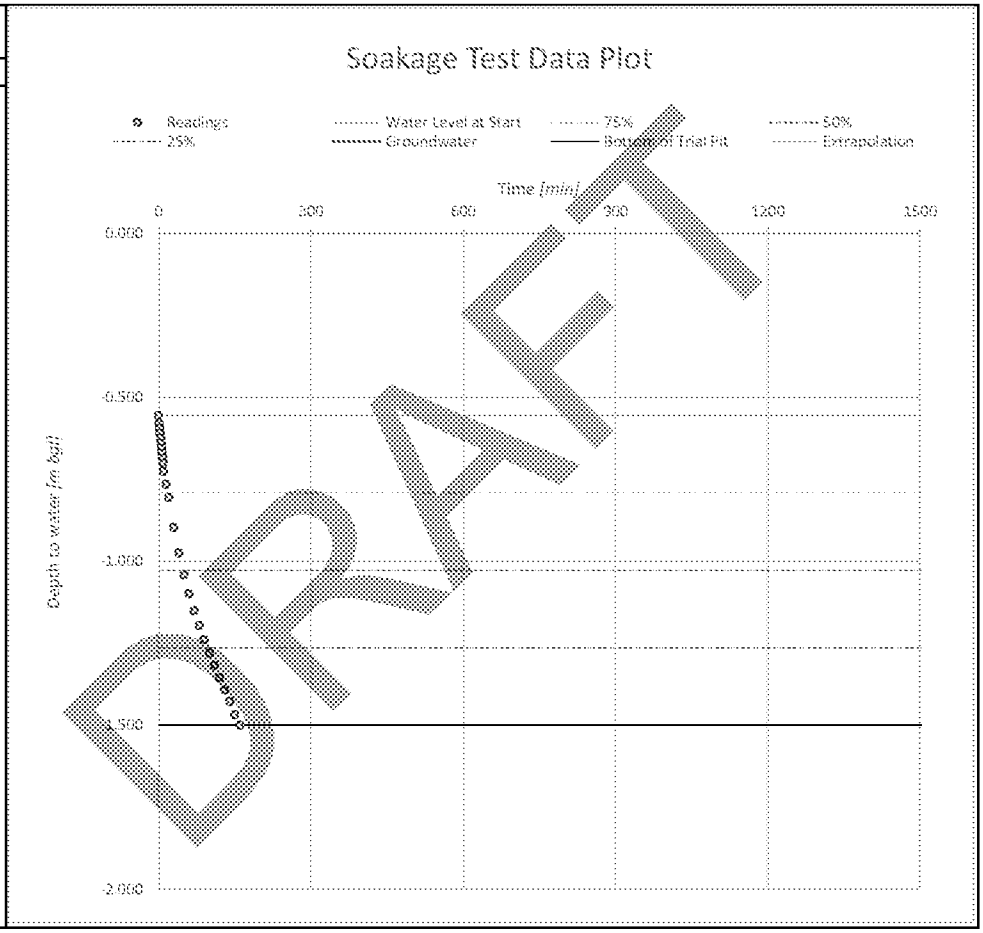
In accordance with BRE Digest 365:2016 - Soakaway Design

Client:	Gleeson Land
Project Title:	Hook Lane, Westergate
Project No:	BRD3963

Trial Pit No:	TP02	**Length *[m]* :**	2.30
Test No:	2	**Depth *[m]* :**	1.50
Date:	21/09/2022	**Width *[m]* :**	0.45
Logged by:	DB	**Groundwater *[m bgl]* :**	Dry

		from - to *[m bgl]*		**Description**
Ground	**Conditions**	0.25	1.50	Sandy CLAY.

Time	**Water Depth**
[min]	***[m bgl]***
0	0.556
1	0.581
2	0.596
3	0.611
4	0.626
5	0.641
6	0.656
7	0.671
8	0.686
9	0.701
10	0.726
15	0.766
20	0.806
30	0.897
40	0.975
50	1.042
60	1.099
70	1.151
80	1.196
90	1.239
100	1.280
110	1.318
120	1.355
130	1.393
140	1.428
150	1.468
160	1.500



Soil Infiltration Rate [m/s]: $$f = \frac{V_{p75\_25}}{a_{s50} \times tp_{75-25}}$$

with:

V_{p75_25}	as Effective Storage Volume of water between 75% and 25% effective storage depth ***[m³]***	**0.49**
a_{s50}	as Internal Surface Area of the soakage trial pit up to 50% storage depth including the base area ***[m²]***	**3.63**
t_{p75_25}	as Time for the water level to fall from 75% to 25% effective storage depth ***[s]***	**4.7.E+03**

Soil Infiltration Rate *[m/s]* : 2.88E-05

Remarks:

SOIL INFILTRATION RATE

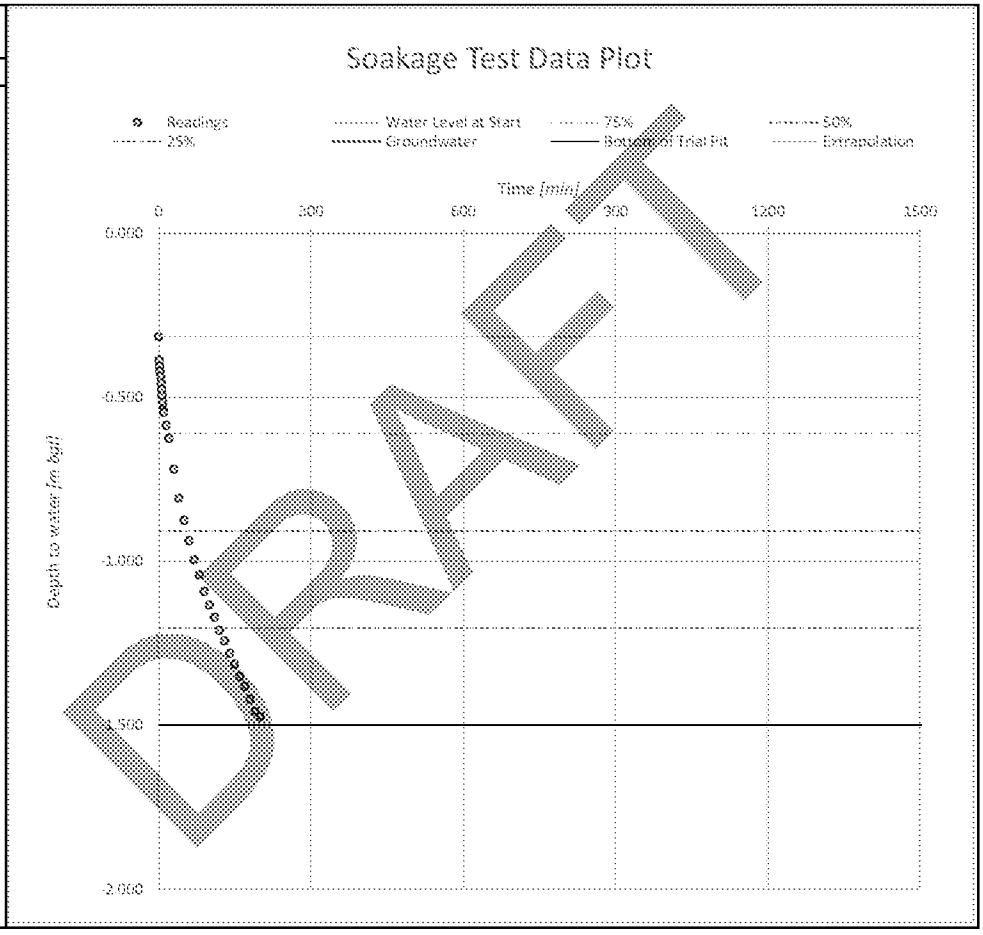
In accordance with BRE Digest 365:2016 - Soakaway Design

Client:	Gleeson Land
Project Title:	Hook Lane, Westergate
Project No:	BRD3963

Trial Pit No:	TP02	**Length *[m]* :**	2.30
Test No:	3	**Depth *[m]* :**	1.50
Date:	21/09/2022	**Width *[m]* :**	0.45
Logged by:	DB	**Groundwater *[m bgl]* :**	Dry

	from - to *[m bgl]*		**Description**
Ground Conditions	0.25	1.50	Sandy CLAY.

Time	**Water Depth**
[min]	***[m bgl]***
0	0.316
1	0.386
2	0.406
3	0.421
4	0.436
5	0.456
6	0.476
7	0.496
8	0.516
9	0.536
10	0.546
15	0.586
20	0.626
30	0.720
40	0.808
50	0.876
60	0.938
70	0.996
80	1.042
90	1.092
100	1.134
110	1.171
120	1.211
130	1.243
140	1.281
150	1.314
160	1.352
170	1.382
180	1.421
190	1.458
200	1.474



Soil Infiltration Rate [m/s]: $$f = \frac{V_{p75\_25}}{a_{s50} \times tp_{75-25}}$$

with:

V_{p75_25}	as Effective Storage Volume of water between 75% and 25% effective storage depth ***[m³]***	**0.61**
a_{s50}	as Internal Surface Area of the soakage trial pit up to 50% storage depth including the base area ***[m²]***	**4.29**
t_{p75_25}	as Time for the water level to fall from 75% to 25% effective storage depth ***[s]***	**6.0.E+03**

Soil Infiltration Rate *[m/s]* : 2.38E-05

Remarks:

SOIL INFILTRATION RATE

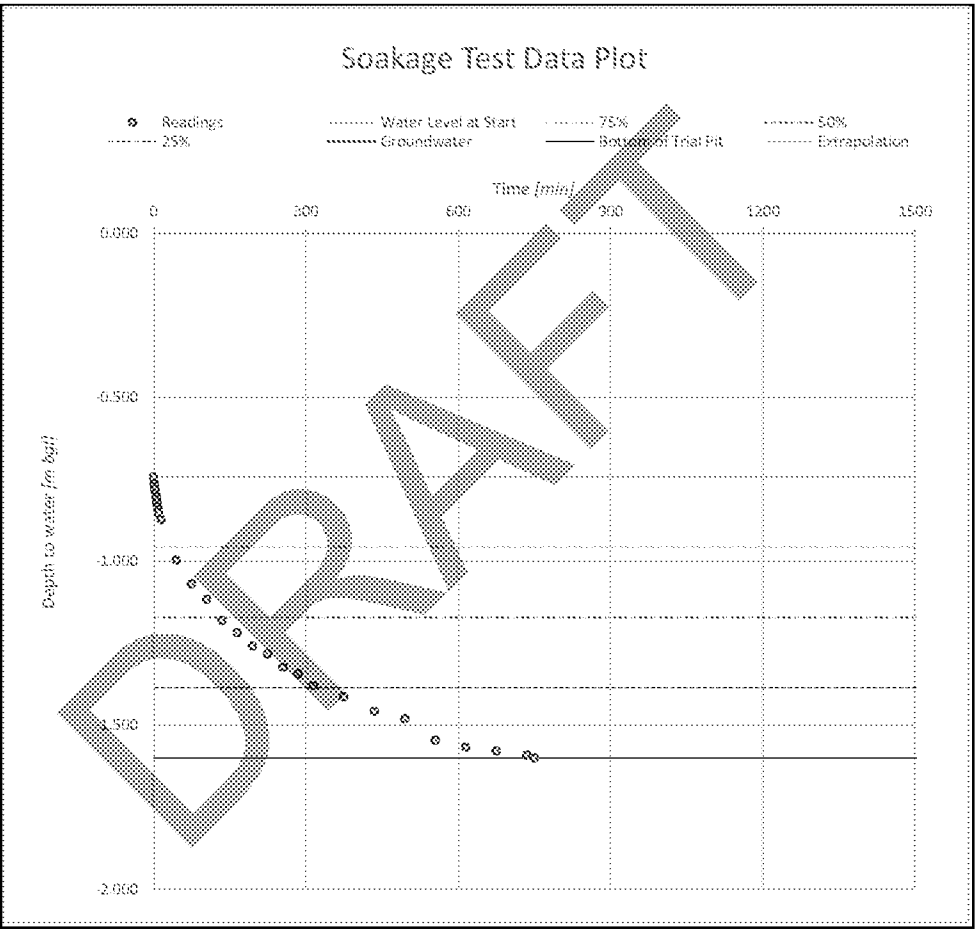
In accordance with BRE Digest 365:2016 - Soakaway Design

Client:	Gleeson Land
Project Title:	Hook Lane, Westergate
Project No:	BRD3963

Trial Pit No:	TP03	**Length *[m]* :**	2.10
Test No:	1	**Depth *[m]* :**	1.60
Date:	20/09/2022	**Width *[m]* :**	0.45
Logged by:	DB	**Groundwater *[m bgl]* :**	Dry

		from - to *[m bgl]*		Description
Ground	**Conditions**	0.30	1.60	Sandy, silty CLAY.

Time	Water Depth
[min]	*[m bgl]*
0	0.743
1	0.763
2	0.773
3	0.783
4	0.793
5	0.803
6	0.813
7	0.823
8	0.833
9	0.843
10	0.853
15	0.873
45	0.997
75	1.069
105	1.116
135	1.181
165	1.218
195	1.259
225	1.283
255	1.323
285	1.344
315	1.380
375	1.414
435	1.458
495	1.480
555	1.546
615	1.567
675	1.579
735	1.591
750	1.600



Soil Infiltration Rate [m/s]: $$f = \frac{V_{p75\_25}}{a_{s50} \times tp_{75-25}}$$

with:

V_{p75_25}	as Effective Storage Volume of water between 75% and 25% effective storage depth ***[m³]***	**0.40**
a_{s50}	as Internal Surface Area of the soakage trial pit up to 50% storage depth including the base area ***[m²]***	**3.13**
t_{p75_25}	as Time for the water level to fall from 75% to 25% effective storage depth ***[s]***	**1.7.E+04**

Soil Infiltration Rate *[m/s]* : 7.44E-06

Remarks:

SOIL INFILTRATION RATE

In accordance with BRE Digest 365:2016 - Soakaway Design

Client:	Gleeson Land
Project Title:	Hook Lane, Westergate
Project No:	BRD3963

Trial Pit No:	TP03	**Length *[m]* :**	2.10
Test No:	2	**Depth *[m]* :**	1.60
Date:	21/09/2022	**Width *[m]* :**	0.45
Logged by:	DB	**Groundwater *[m bgl]* :**	Dry

Ground Conditions	**from - to *[m bgl]***		**Description**
	0.30	1.60	Sandy, silty CLAY.

Time	**Water Depth**
[min]	***[m bgl]***
0	0.490
1	0.500
2	0.510
3	0.520
4	0.535
5	0.550
6	0.560
7	0.570
8	0.580
9	0.590
10	0.595
15	0.620
19	0.620
50	0.798
81	0.904
112	0.977
143	1.045
174	1.106
205	1.163
236	1.212
267	1.262
298	1.298
329	1.337
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391	1.403
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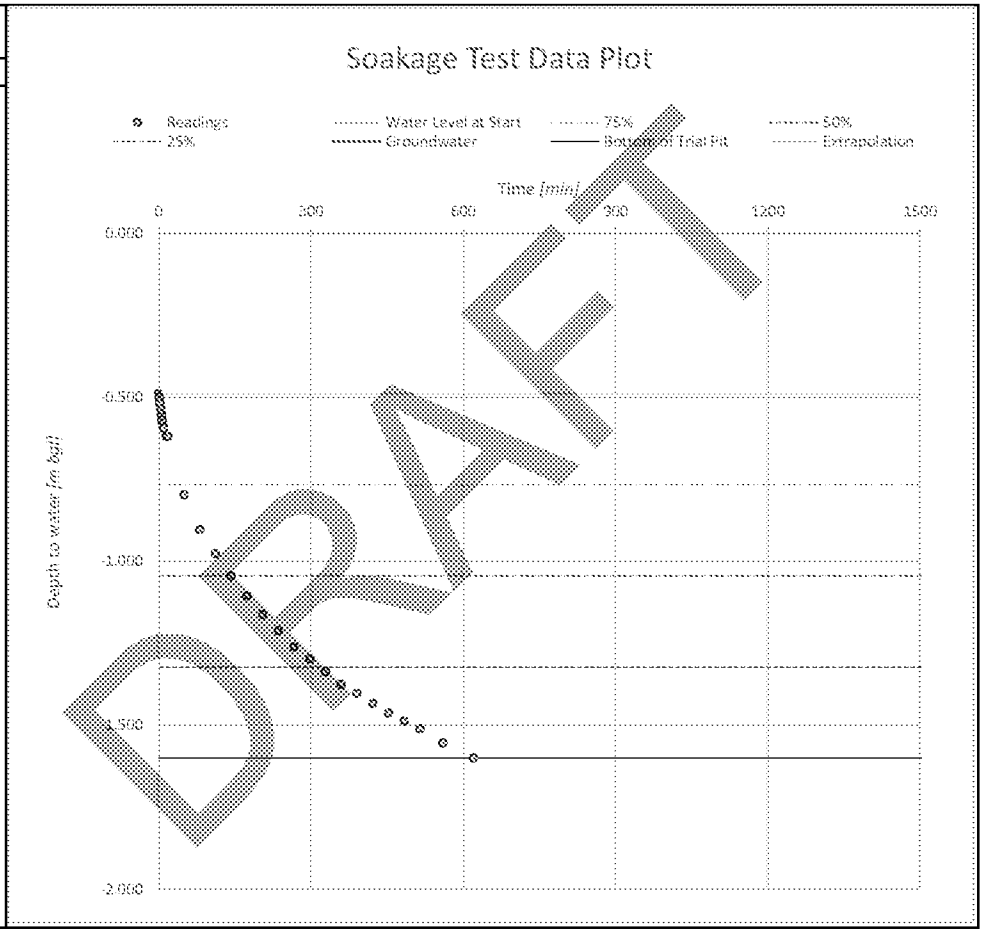
453	1.463
484	1.488
515	1.511
560	1.554
620	1.600



Soil Infiltration Rate [m/s]: $$f = \frac{V_{p75\_25}}{a_{s50} \times tp_{75-25}}$$

with:

V_{p75_25}	as Effective Storage Volume of water between 75% and 25% effective storage depth ***[m³]***	**0.52**
a_{s50}	as Internal Surface Area of the soakage trial pit up to 50% storage depth including the base area ***[m²]***	**3.78**
t_{p75_25}	as Time for the water level to fall from 75% to 25% effective storage depth ***[s]***	**1.6.E+04**

Soil Infiltration Rate *[m/s]* : 8.49E-06

Remarks:

SOIL INFILTRATION RATE

In accordance with BRE Digest 365:2016 - Soakaway Design

Client:	Gleeson Land
Project Title:	Hook Lane, Westergate
Project No:	BRD3963

Trial Pit No:	TP03	**Length *[m]* :**	2.10
Test No:	3	**Depth *[m]* :**	1.60
Date:	22/09/2022	**Width *[m]* :**	0.45
Logged by:	DB	**Groundwater *[m bgl]* :**	Dry

		from - to *[m bgl]*		Description
Ground	**Conditions**	0.30	1.60	Sandy, silty CLAY.

Time	Water Depth
[min]	*[m bgl]*
0	0.780
1	0.785
2	0.790
3	0.795
4	0.800
5	0.805
6	0.810
7	0.815
8	0.820
9	0.825
10	0.830
15	0.860
49	0.951
79	1.022
109	1.083
139	1.131
169	1.176
199	1.220
229	1.255
259	1.299
289	1.330
319	1.363
349	1.392
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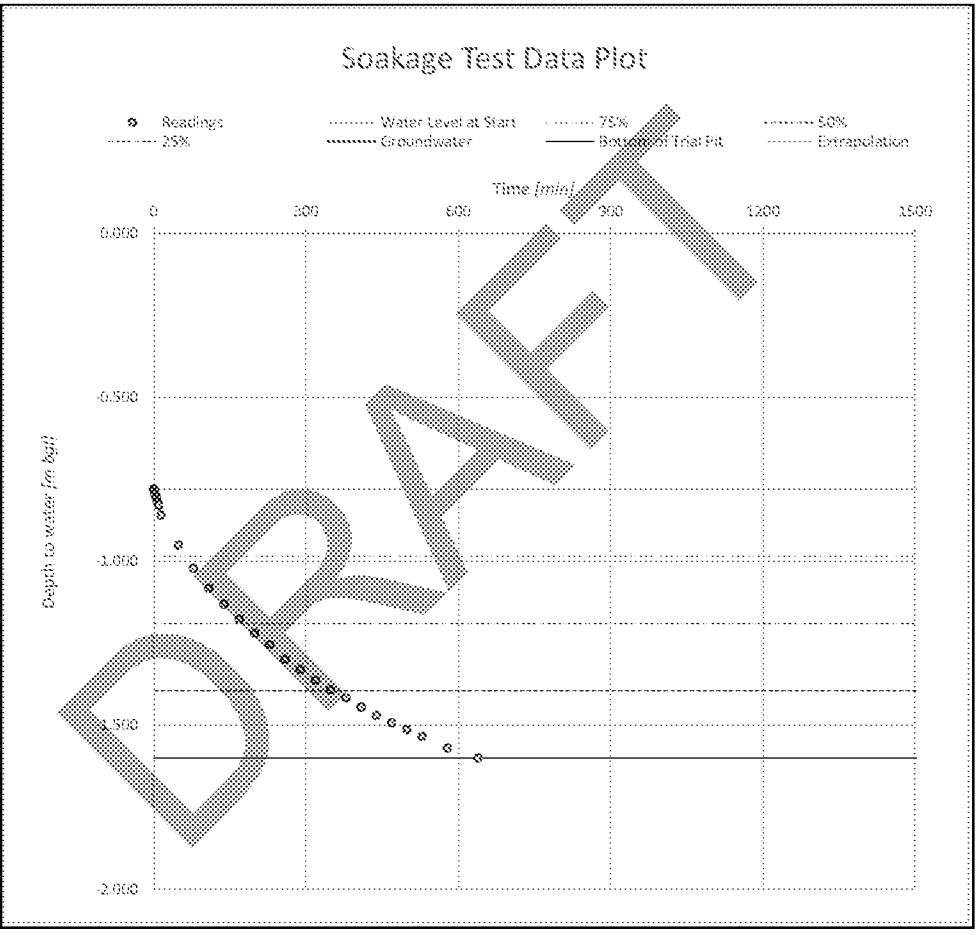
439	1.471
469	1.493
499	1.513
529	1.534
579	1.570
639	1.600



Soil Infiltration Rate [m/s]: $$f = \frac{V_{p75\_25}}{a_{s50} \times tp_{75-25}}$$

with:

V_{p75_25}	as Effective Storage Volume of water between 75% and 25% effective storage depth ***[m³]***	**0.39**
a_{s50}	as Internal Surface Area of the soakage trial pit up to 50% storage depth including the base area ***[m²]***	**3.04**
t_{p75_25}	as Time for the water level to fall from 75% to 25% effective storage depth ***[s]***	**1.7.E+04**

Soil Infiltration Rate *[m/s]* : 7.35E-06

Remarks:

SOIL INFILTRATION RATE

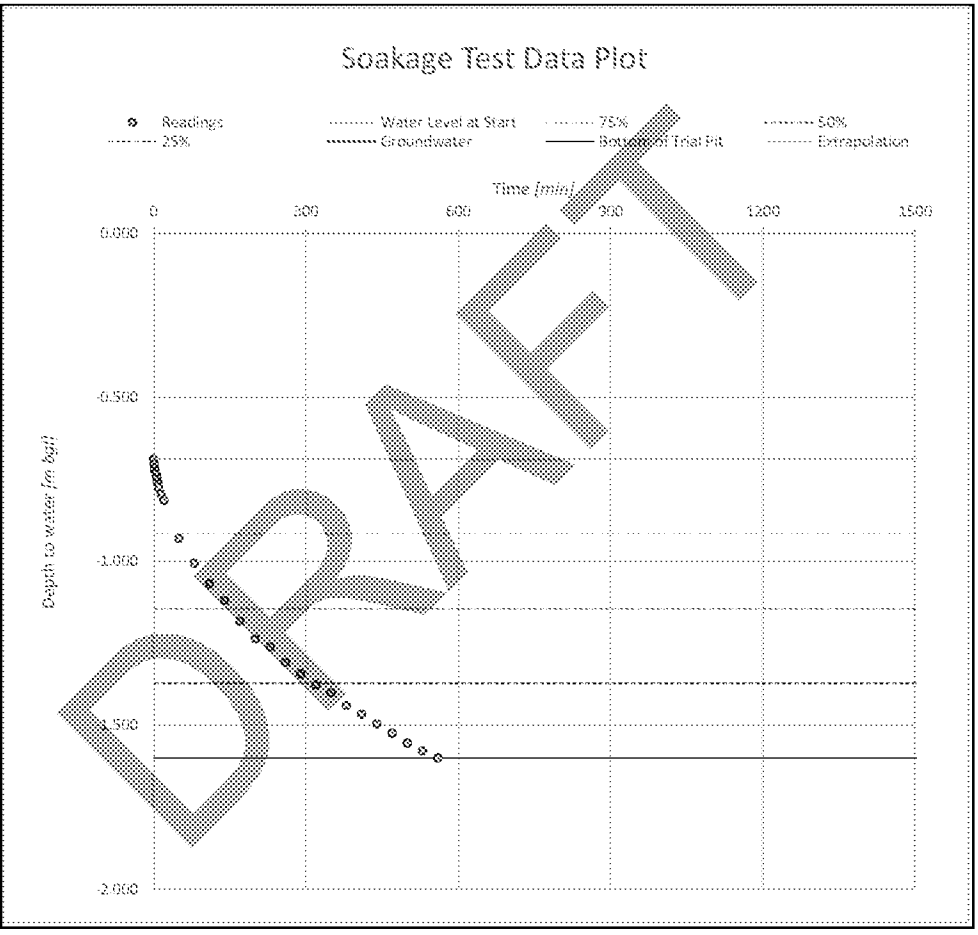
In accordance with BRE Digest 365:2016 - Soakaway Design

Client:	Gleeson Land
Project Title:	Hook Lane, Westergate
Project No:	BRD3963

Trial Pit No:	TP04	**Length *[m]* :**	2.10
Test No:	1	**Depth *[m]* :**	1.60
Date:	20/09/2022	**Width *[m]* :**	0.45
Logged by:	DB	**Groundwater *[m bgl]* :**	Dry

		from - to *[m bgl]*		Description
Ground	**Conditions**	0.25	1.60	Sandy, silty CLAY.

Time	Water Depth
[min]	*[m bgl]*
0	0.690
1	0.705
2	0.715
3	0.725
4	0.730
5	0.735
6	0.745
7	0.750
8	0.760
9	0.765
10	0.775
15	0.795
20	0.815
50	0.931
80	1.006
110	1.069
140	1.120
170	1.183
200	1.237
230	1.262
260	1.309
290	1.344
320	1.377
350	1.401
380	1.440
410	1.467
440	1.496
470	1.525
500	1.555
530	1.579
560	1.600



Soil Infiltration Rate [m/s]: $f = \frac{V_{p75\_25}}{a_{s50} \times tp_{75-25}}$

with:

V_{p75_25}	as Effective Storage Volume of water between 75% and 25% effective storage depth ***[m³]***	**0.43**
a_{s50}	as Internal Surface Area of the soakage trial pit up to 50% storage depth including the base area ***[m²]***	**3.27**
t_{p75_25}	as Time for the water level to fall from 75% to 25% effective storage depth ***[s]***	**1.6.E+04**

Soil Infiltration Rate *[m/s]* : 8.15E-06

Remarks:

SOIL INFILTRATION RATE

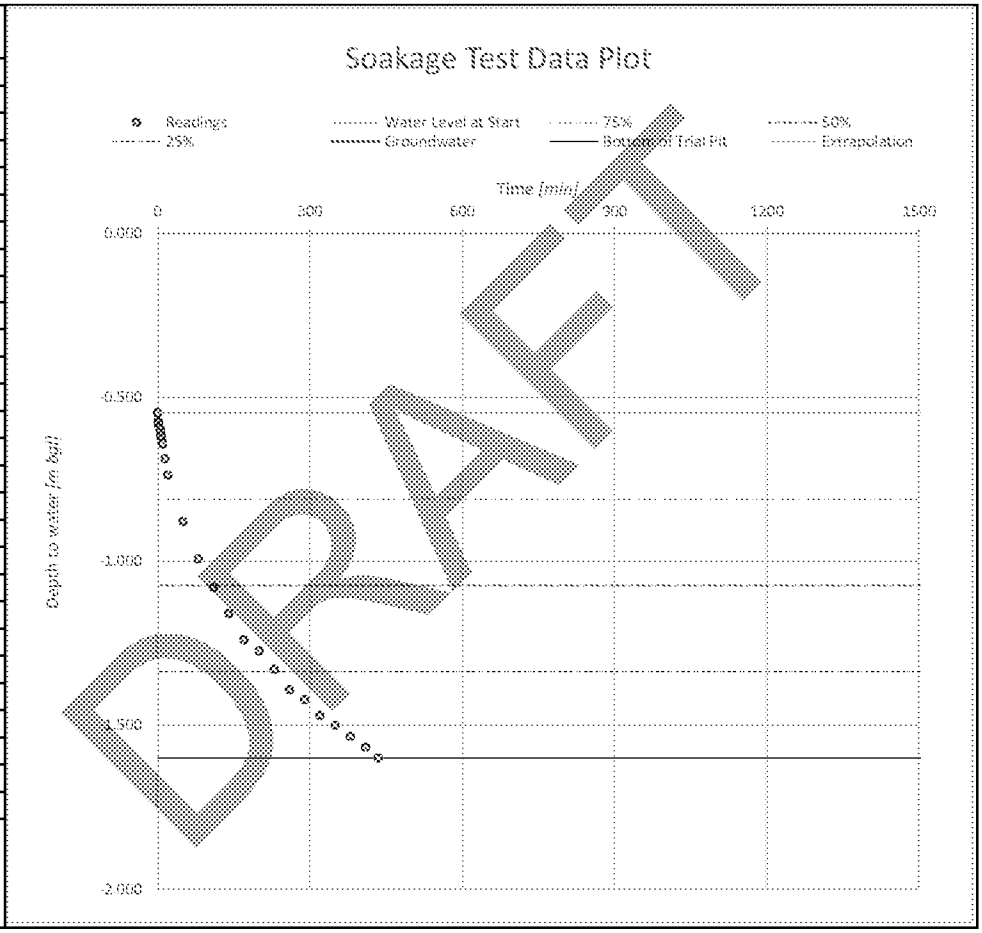
In accordance with BRE Digest 365:2016 - Soakaway Design

Client:	Gleeson Land
Project Title:	Hook Lane, Westergate
Project No:	BRD3963

Trial Pit No:	TP04	**Length *[m]* :**	2.10
Test No:	2	**Depth *[m]* :**	1.60
Date:	21/09/2022	**Width *[m]* :**	0.45
Logged by:	DB	**Groundwater *[m bgl]* :**	Dry

		from - to *[m bgl]*		**Description**
Ground	**Conditions**	0.25	1.60	Sandy, silty CLAY.

Time	**Water Depth**
[min]	***[m bgl]***
0	0.548
1	0.573
2	0.578
3	0.588
4	0.593
5	0.598
6	0.608
7	0.618
8	0.628
9	0.638
10	0.643
15	0.688
20	0.738
50	0.879
80	0.993
110	1.081
140	1.160
170	1.240
200	1.274
230	1.330
260	1.392
290	1.422
320	1.471
350	1.500
380	1.534
410	1.567
435	1.600



Soil Infiltration Rate [m/s]: $f = \frac{V_{p75\_25}}{a_{s50} \times tp_{75-25}}$

with:

V_{p75_25}	as Effective Storage Volume of water between 75% and 25% effective storage depth ***[m³]***	**0.50**
a_{s50}	as Internal Surface Area of the soakage trial pit up to 50% storage depth including the base area ***[m²]***	**3.63**
t_{p75_25}	as Time for the water level to fall from 75% to 25% effective storage depth ***[s]***	**1.2.E+04**

Soil Infiltration Rate *[m/s]* : 1.15E-05

Remarks:

SOIL INFILTRATION RATE

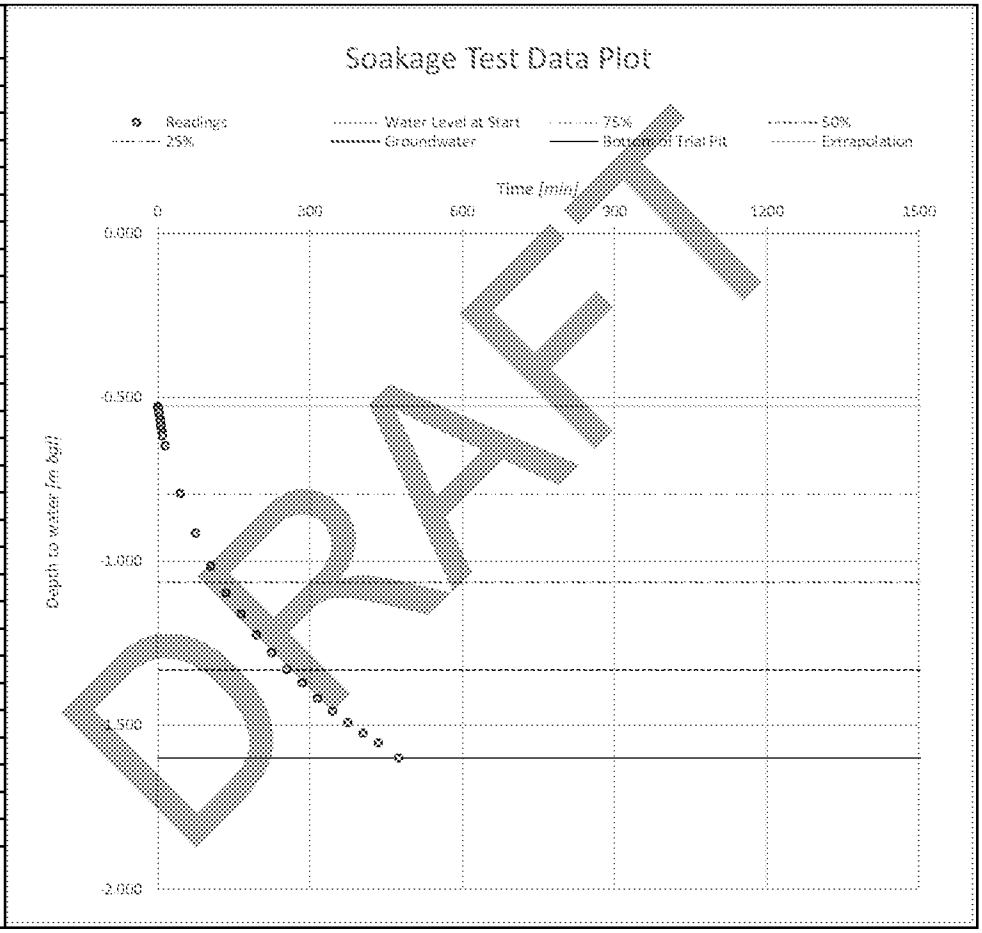
In accordance with BRE Digest 365:2016 - Soakaway Design

Client:	Gleeson Land
Project Title:	Hook Lane, Westergate
Project No:	BRD3963

Trial Pit No:	TP04	**Length *[m]* :**	2.10
Test No:	3	**Depth *[m]* :**	1.60
Date:	22/04/2022	**Width *[m]* :**	0.45
Logged by:	DB	**Groundwater *[m bgl]* :**	Dry

		from - to *[m bgl]*		Description
Ground	**Conditions**	0.25	1.60	Sandy, silty CLAY.

Time	Water Depth
[min]	*[m bgl]*
0	0.528
1	0.533
2	0.538
3	0.548
4	0.558
5	0.568
6	0.578
7	0.588
8	0.598
9	0.608
10	0.618
15	0.648
45	0.794
75	0.915
105	1.015
135	1.097
165	1.161
195	1.225
225	1.279
255	1.330
285	1.371
315	1.418
345	1.458
375	1.492
405	1.525
435	1.554
475	1.600



Soil Infiltration Rate [m/s]: $f = \frac{V_{p75\_25}}{a_{s50} \times tp_{75-25}}$

with:

V_{p75_25}	as Effective Storage Volume of water between 75% and 25% effective storage depth ***[m³]***	**0.51**
a_{s50}	as Internal Surface Area of the soakage trial pit up to 50% storage depth including the base area ***[m²]***	**3.68**
t_{p75_25}	as Time for the water level to fall from 75% to 25% effective storage depth ***[s]***	**1.3.E+04**

Soil Infiltration Rate *[m/s]* : 1.09E-05

Remarks:

SOIL INFILTRATION RATE

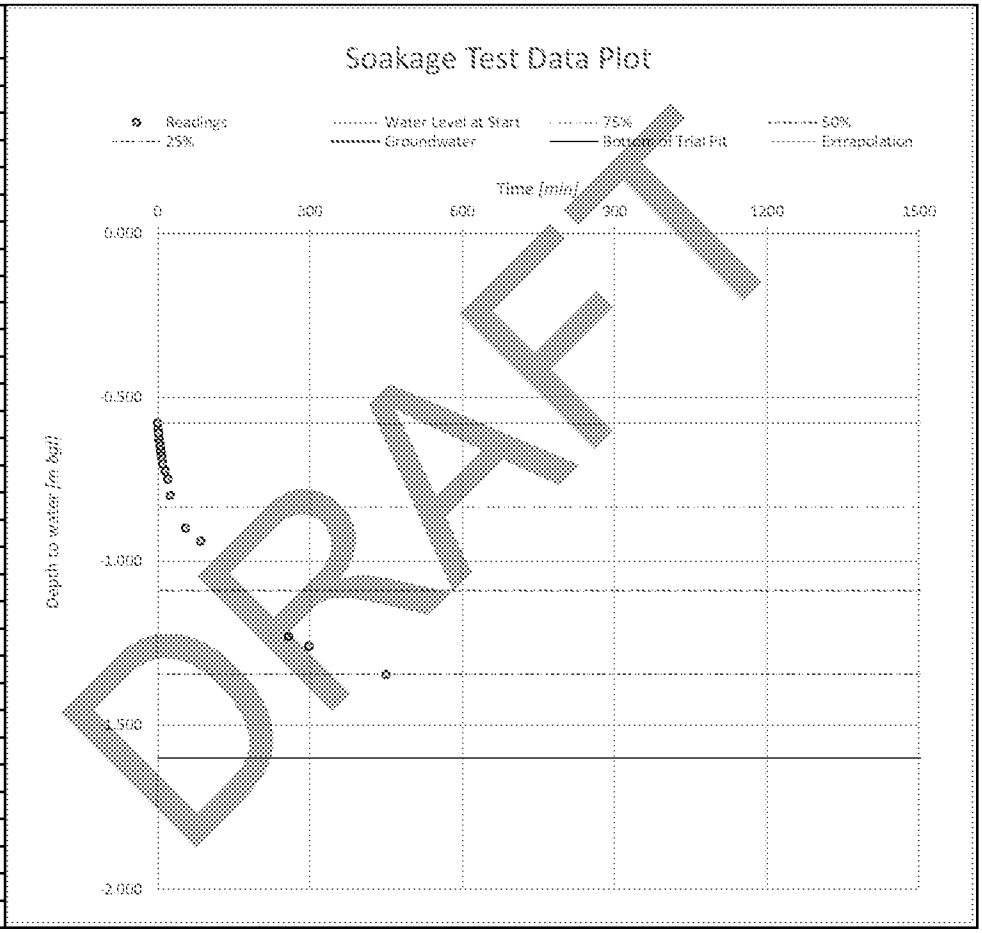
In accordance with BRE Digest 365:2016 - Soakaway Design

Client:	Gleeson Land
Project Title:	Hook Lane, Westergate
Project No:	BRD3963

Trial Pit No:	TP05	**Length *[m]* :**	2.10
Test No:	1	**Depth *[m]* :**	1.60
Date:	21/09/2022	**Width *[m]* :**	0.45
Logged by:	DB	**Groundwater *[m bgl]* :**	Dry

Ground Conditions	from - to *[m bgl]*		Description
	0.25	1.60	Sandy CLAY.

Time *[min]*	Water Depth *[m bgl]*
0	0.580
1	0.600
2	0.610
3	0.630
4	0.640
5	0.650
6	0.660
7	0.670
8	0.680
9	0.690
10	0.705
15	0.725
20	0.750
25	0.800
55	0.900
85	0.939
258	1.230
298	1.260
450	1.346



Soil Infiltration Rate [m/s]: $f = \frac{V_{p75\_25}}{a_{s50} \times tp_{75-25}}$

with:

V_{p75_25}	as Effective Storage Volume of water between 75% and 25% effective storage depth ***[m³]***	**0.48**
a_{s50}	as Internal Surface Area of the soakage trial pit up to 50% storage depth including the base area ***[m²]***	**3.55**
t_{p75_25}	as Time for the water level to fall from 75% to 25% effective storage depth ***[s]***	**2.5.E+04**

Soil Infiltration Rate *[m/s]* : 5.49E-06

Remarks:

SOIL INFILTRATION RATE

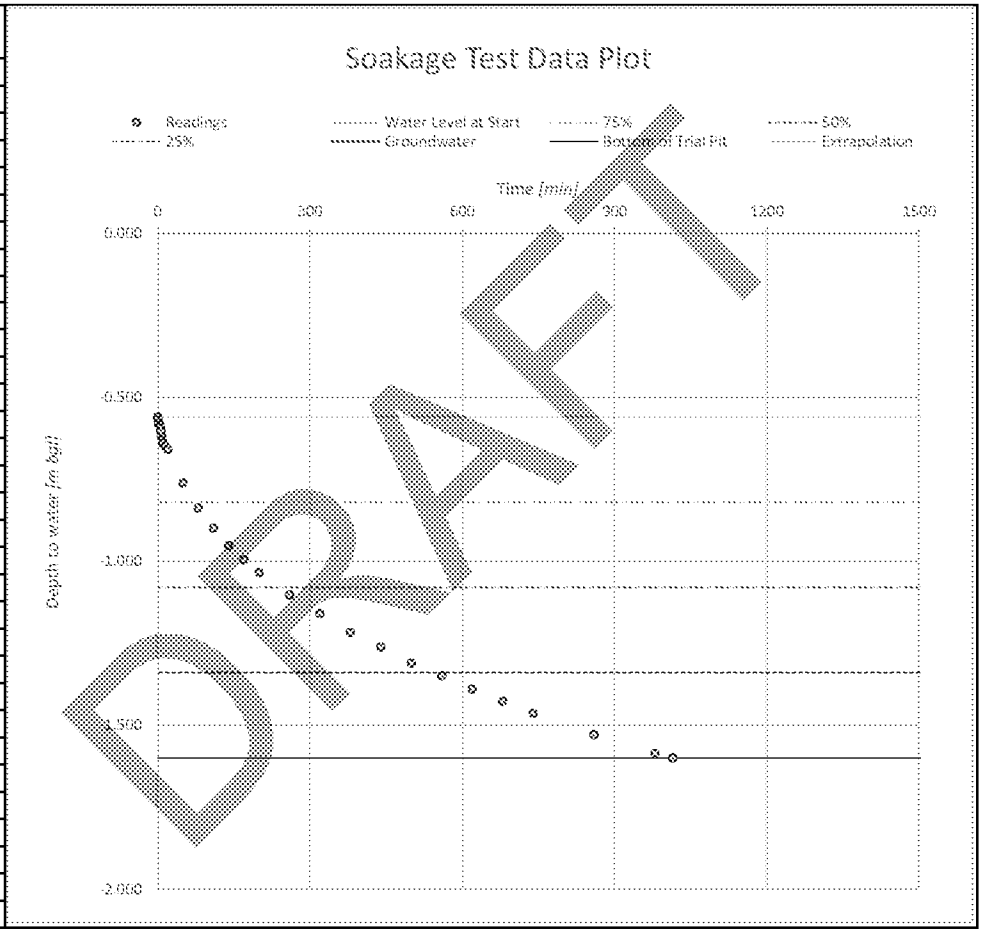
In accordance with BRE Digest 365:2016 - Soakaway Design

Client:	Gleeson Land
Project Title:	Hook Lane, Westergate
Project No:	BRD3963

Trial Pit No:	TP05	**Length *[m]* :**	2.10
Test No:	2	**Depth *[m]* :**	1.60
Date:	21/09/2022	**Width *[m]* :**	0.45
Logged by:	DB	**Groundwater *[m bgl]* :**	Dry

		from - to *[m bgl]*		**Description**
Ground	**Conditions**	0.25	1.60	Sandy CLAY.

Time	**Water Depth**
[min]	***[m bgl]***
0	0.560
1	0.570
2	0.580
3	0.585
4	0.585
5	0.590
6	0.595
7	0.605
8	0.620
9	0.630
10	0.640
15	0.650
20	0.660
50	0.762
80	0.838
110	0.900
140	0.952
170	0.996
200	1.035
260	1.103
320	1.160
380	1.217
440	1.262
500	1.311
560	1.349
620	1.390
680	1.427
740	1.464
860	1.529
980	1.586
1015	1.600



Soil Infiltration Rate [m/s]: $$f = \frac{V_{p75\_25}}{a_{s50} \times tp_{75-25}}$$

with:

V_{p75_25}	as Effective Storage Volume of water between 75% and 25% effective storage depth ***[m³]***	**0.49**
a_{s50}	as Internal Surface Area of the soakage trial pit up to 50% storage depth including the base area ***[m²]***	**3.60**
t_{p75_25}	as Time for the water level to fall from 75% to 25% effective storage depth ***[s]***	**2.8.E+04**

Soil Infiltration Rate *[m/s]* : 4.81E-06

Remarks:

SOIL INFILTRATION RATE

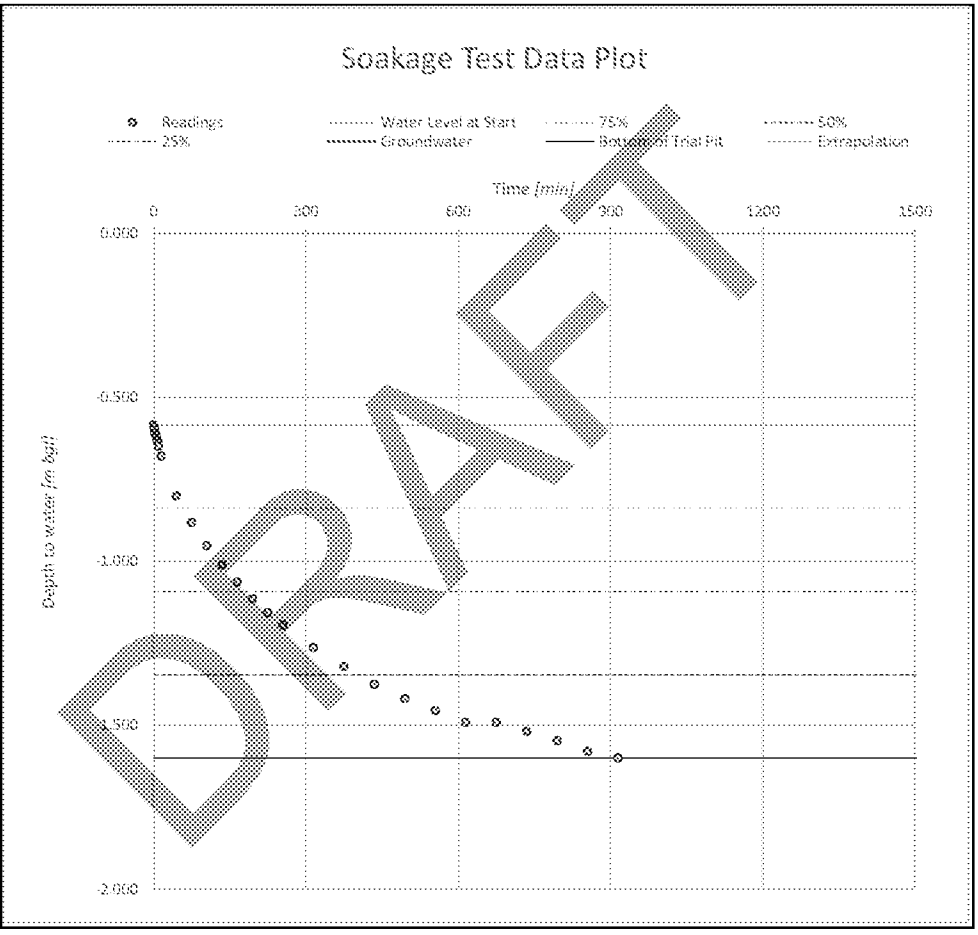
In accordance with BRE Digest 365:2016 - Soakaway Design

Client:	Gleeson Land
Project Title:	Hook Lane, Westergate
Project No:	BRD3963

Trial Pit No:	TP05	**Length *[m]* :**	2.10
Test No:	3	**Depth *[m]* :**	1.60
Date:	22/09/2022	**Width *[m]* :**	0.45
Logged by:	DB	**Groundwater *[m bgl]* :**	Dry

		from - to *[m bgl]*		Description
Ground	**Conditions**	0.25	1.60	Sandy CLAY.

Time	Water Depth
[min]	*[m bgl]*
0	0.585
1	0.590
2	0.600
3	0.610
4	0.615
5	0.620
6	0.625
7	0.630
8	0.635
9	0.640
10	0.650
15	0.680
45	0.801
75	0.882
105	0.953
135	1.012
165	1.064
195	1.115
225	1.157
255	1.195
315	1.263
375	1.321
435	1.376
495	1.419
555	1.456
615	1.491
675	1.491
735	1.519
795	1.547
855	1.580
915	1.600



Soil Infiltration Rate [m/s]: $$f = \frac{V_{p75\_25}}{a_{s50} \times tp_{75-25}}$$

with:

V_{p75_25}	as Effective Storage Volume of water between 75% and 25% effective storage depth ***[m³]***	**0.48**
a_{s50}	as Internal Surface Area of the soakage trial pit up to 50% storage depth including the base area ***[m²]***	**3.53**
t_{p75_25}	as Time for the water level to fall from 75% to 25% effective storage depth ***[s]***	**2.1.E+04**

Soil Infiltration Rate *[m/s]* : 6.58E-06

Remarks:

motion

Appendix F

Southern Water Confirmation of Foul Sewage Capacity

from
Southern Water

Phil Allen
Motion
84 North Street
Guildford
Surrey
GU1 4AU

Your ref

Our ref
DSA000017157

Date
16 November 2022

[redacted]

Dear Mr Allen,

Level 1 Capacity Check Enquiry: Land West of Meadow Lane, Westergate, West Sussex, PO20 3AQ.

We have completed the capacity check for the above development site and the results are as follows:

Foul Water

There is currently adequate capacity in the local sewerage network to accommodate a split foul flow of **0.79 l/s** at manhole SU93043703 and SU93047705. Please note that no surface water flows (existing or proposed) can be accommodated within the existing foul sewerage system unless agreed by the Lead Local Flood Authority in consultation with Southern Water, after the hierarchy Part H3 of Building Regulations has been complied with.

Connecting to our network

It should be noted that this information is only a hydraulic assessment of the existing sewerage network and does not grant approval for a connection to the public sewerage system. A formal Sewer Connection (S106) application is required to be completed and approved by Southern Water Services. To make an application visit: developerservices.southernwater.co.uk

Please note the information provided above does not grant approval for any designs/drawings submitted for the capacity analysis. The results quoted above are only valid for 12 months from the date of issue of this letter.

[redacted]

Should it be necessary to contact us please quote our above reference number relating to this application by email at [redacted]

Yours sincerely,

Future Growth Planning Team
Business Channels

[redacted]

motion

Appendix G

Southern Water Asset Location Plans

(c) Crown copyright and database rights 2022 Ordnance Survey 100031673 | Date: 12/08/22 | Scale: 1:1250 | Map Centre: 493581,104819 | Data updated: 21/07/22 | Our Ref: 925461 - 1 | Wastewater Plan A3

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 2022 Ordnance Survey 100031673 .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.

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, Decantation Chamber, Dummy Manhole or Surface Water Soakaway

pallen@motion.co.uk

1glwes

Southern Water

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
3701	F	10.51	7.50	
3702	F	10.58	7.39	
3703	F	10.64	7.26	
4701	F	10.68	9.06	
5608	F	10.05	8.44	
5609	F	10.08	8.03	
5701	F	10.19	8.69	
5702	F	10.54	8.84	
5703	F	10.27	8.49	
6603	F	10.57	7.65	
6701	F	10.57	7.71	
6702	F	10.10	8.34	
6703	F	10.18	8.14	
6704	F	10.30	8.06	
6705	F	10.40	8.01	
6706	F	10.46	7.97	
6707	F	10.55	7.84	
6708	F	10.57	7.79	
7601	F	9.05	7.72	
7701	F	8.92	7.13	
7702	F	8.08	6.87	
7703	F	8.20	6.33	
7704	F	7.72	5.94	
7705	F	7.65	6.99	
7706	F	0.00	0.00	
7707	F	0.00	0.00	
7708	F	0.00	0.00	
7801	F	7.75	6.38	
7901	F	8.40	8.39	
7902	F	8.29	6.77	
7903	F	8.07	6.61	
7904	F	8.14	7.06	
7905	F	0.00	0.00	
8701	F	7.46	5.66	
8702	F	7.40	5.34	
8710	F	0.00	0.00	
8711	F	0.00	0.00	
8712	F	0.00	0.00	
8801	F	7.36	6.09	
8803	F	7.45	7.44	
8807	F	7.20	6.35	
8808	F	7.27	6.14	
8903	F	8.08	0.00	
7650	S	9.13	8.17	
7651	S	8.17	7.11	
7750	S	8.93	7.48	
7751	S	8.28	6.69	
7752	S	7.73	6.18	
7951	S	8.04	6.87	
8750	S	7.28	5.59	

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Appendix H

Pre-Application Development Summary

NEXUS PLANNING

Arun District Council
Arun Civic Centre
Maltravers Road
Littlehampton
West Sussex
BN17 5LF

Reading
3rd Floor, Suite 3
Apex Plaza
3 Forbury Road
Reading RG1 1AX

[redacted]

20 July 2022

Our Ref: 35425

Dear Sir/Madam

Request for pre-application advice for proposed development at Rear of Meadow Way, Westergate

On behalf of our client, Gleeson Land ("the Applicant"), please find enclosed a pre-application submission in relation to proposals to develop up to 100 dwellings ("the Proposed Development") on Land to the Rear of Meadow Way, Westergate ("the Site"). A site location plan showing the site is enclosed with this letter along with the necessary pre-application form.

As outlined in the completed pre-application advice request form, it is understood that for a site of this size the fee for receiving pre-application advice, including a meeting is £3100.

The Site

As shown on the attached location plan, the Site is approximately 3.8 hectares and is currently accessed from Hook Lane. It is situated between Hook Lane to the west and Meadow Way to the east. Existing residential development is located to the south and east of the Site with arable fields to the north. The Site lies outside the settlement boundary as defined in the Aldingbourne Neighbourhood Development Plan 2 (see below).

Principle of Development

The Arun Local Plan 2011-2031 was adopted in July 2018 and establishes an overall framework for the scale and location of new development in the district, including a total requirement for at least 20,000 homes in the period 2011-2031. It is acknowledged that the Site is located outside but immediately adjacent to (on both its southern and eastern boundaries) the Built Up Area Boundary for Westergate as identified in the Local Plan and is, therefore, countryside for policy purposes. Policy C SP1 states that development in the countryside will only be permitted where it meets one of six identified criteria. It is acknowledged that residential development of the Site would not accord with any of these criteria and development would therefore be contrary to this policy.

The reviewed Aldingbourne Neighbourhood Plan, also known as Aldingbourne Neighbourhood Development Plan 2 (ANP2), was made on 14th July 2021. The plan follows on from the first neighbourhood plan that was made on 9th November 2016. The ANP2 followed adoption of the Arun Local Plan on 18th July 2018.

The ANP 2 includes policies covering a range of themes, including the presumption in favour of development, housing, environment and heritage, getting around, employment and enterprise and leisure and community.

With regards to the Proposed Development, the most relevant neighbourhood plan policy is Policy EH1 Built Up Area Boundary which was amended as part of the recent review. This policy includes a clear presumption in favour of development within the built-up area boundary of Westergate as defined on Map E but does not support development to the west of Westergate Street and outside of the Built up Area Boundary.

However, Policy EH1 includes a scenario for development to come forward outside the Built Up Area Boundary where there is a *"demonstrable shortfall of housing land supply having regard to the requirements of the adopted Arun District Local Plan"* and subject to certain criteria being met.

The Council's most recent Annual Monitoring Report 2020-2021 (published in January 2022) confirms a persistent housing shortfall between 2011/12 and 2020/21. Page 25 of the AMR confirms that the Council accepts that it is only able to demonstrate a supply of 2.42 years – a shortfall of 5,689 dwellings. Furthermore, the latest Housing Delivery Test measurement (2021) is just 65% such that the presumption now applies. Accordingly, it is clear that on the Council's own evidence there is a demonstrable shortfall of housing land supply having regard to the requirements of the Local Plan.

On this basis there is now, having regard to Policy EH1 of the ANP2, a presumption in favour of development outside the existing Built Up Area Boundary provided that each of the seven criteria set out below can be met. The criteria are set out below followed by an initial analysis of the Proposed Development.

i. **The Scale of development is proportionate to the housing supply shortfall and local housing needs of the Parish and can be deliverable in the short term**

As set out above the scale of the housing shortfall is substantial and therefore development of up to 100 homes is clearly appropriate and proportionate to the shortfall. Furthermore it is of a scale that can be completed within approximately 2 years of a start on site and hence would be deliverable within the next 5 years. In addition the proposed development will provide the policy compliant (30%) level of affordable housing and deliver a range of house types, sizes and tenures to meet needs. The specific housing mix will be addressed at reserved matters stage.

ii. **The development will protect the local landscape character and wider setting of the South Downs National Park and support the dark skies policy**

The Site is situated 2.45km from the South Downs National Park boundary and significantly further from the Dark Skies reserve. The Site is barely perceptible in elevated panoramic views from the SDNP that overlook the coastal plain. It represents a very small component in such extensive views where proposed development of this nature on this Site and at this distance would barely register. Wooded elements combined with built form within the setting of the Site interleave to deliver a significant volume of beneficial visual containment close to the Site boundaries. Views out from the Site are heavily filtered. Given this context, the scheme can and will be designed to protect the landscape character and wider setting of the South Downs National Park.

iii. **the proposal is sensitively designed and located and respects the character and built heritage of neighbouring settlements**

The development can be sensitively designed to respect the character of the settlement and there are no heritage designations within the immediate vicinity of the Site

IV. **It is demonstrated through appropriate assessment that there would be no significant harm to biodiversity, including the roosting, feeding and commuting of bat species, or to bat species associated with the Singleton and Cocking Tunnels Special Area of Conservation (SAC) and Slindon Woods;**

A preliminary ecological appraisal has been undertaken for the Site and further survey work for reptile, dormice, great crested newts and bat species is being carried out. The results will inform appropriate mitigation strategies (if required) and enhancement for the site. A biodiversity net gain strategy is also being developed.

The Site lies approximately 11km from the Singleton and Cocking Tunnels Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI) and as such within the recognised 12km zone of influence. The SAC / SSSI is designated for its population of hibernating bats as well as the presence of Barbastelle and Bechstein bats. It is understood that a maternity colony of Barbastelle were identified within Slindon Woods along with Bechstein bats in survey work undertaken in 2016.

The Site contains relatively limited value for foraging and commuting bats currently, with habitat of interest restricted to the boundaries. Development proposals can be designed to retain and adequately buffer existing linear features with the provision (at the detailed design stage) of a sensitive lighting scheme. Bat transect activity surveys are being carried out along with static monitoring to establish a baseline of existing bat activity.

Ecological enhancement will focus on providing additional commuting and foraging habitat for bat species as well as other wildlife, in form of habitats that can support important invertebrate prey sources. Additional linear features such as hedgerow, to increase habitat connectivity across the Site and local landscape, will also be included.

Accordingly, in accordance with this criterion, it will be demonstrated that there would be a biodiversity net gain, and no significant harm in relation to bats.

V. **the proposal is sustainably located and accessible to local facilities and services and sufficient capacity exists or can be provided to accommodate additional needs;**

As demonstrated on the enclosed local facilities plan, the Site is sustainably located and benefits from being within walking distance of a number of services and facilities that will provide for day to day needs, including Aldingbourne Primary school, Aldingbourne Community Sports Centre, Ormiston Six Villages academy (secondary education) the local convenience store and public houses. Technical evidence will be provided to demonstrate that these services have or can / will have sufficient capacity to support the Proposed Development.

VI. **there would be no unacceptable environmental, amenity or traffic implications including an increased risk of groundwater flooding;**

A Transport Statement / Assessment will demonstrate that there is no unacceptable traffic implications arising from the Proposed Development. Furthermore the design of the scheme will help to demonstrate that there are no unacceptable impacts on amenity and further technical evidence including ecology and flood risk and

drainage will help demonstrate that there are no unacceptable environmental implications. Winter groundwater monitoring will be carried out prior to determination of an application.

VII. **the development does not lie within 50 meters of the biodiversity corridors where these are used by roosting or feeding or commuting bats.**

The Proposed Development does not lie within 50 meters of the biodiversity corridors used by roosting or feeding or commuting bats as defined in ADNP2.

On the basis of the above analysis it is considered that the Proposed Development would be consistent with Policy EH1. Importantly this policy was adopted after policy C SP1 of the Arun Local Plan and any conflict should be resolved in favour of the most recently adopted policy (EH1). Alternatively, in the event that there was to be any conflict with any of these criteria, the tilted balance at paragraph 11 of the Framework would of course be engaged both due to the land supply position in the district and also directly as a result of the Housing Delivery Test results.

Application Documentation

The Applicant intends to submit an outline planning application for the Proposed Development with all matters reserved apart from principal access to the highway. Having reviewed the Council's Local Validation Checklist (last updated 10th February 2022) it is considered that the following plans and documentation will need to be submitted to meet the Council's validation requirements:

- Completed application form
- Relevant ownership certificates
- Site Location Plan
- Site layout plan
- CIL addition information form
- Affordable Housing Statement
- Design and Access Statement
- Fire Statement
- Flood Risk Assessment
- Drainage Strategy including Surface Water
- Biodiversity survey report including statement on biodiversity net gain
- Desk based Archaeological Assessment
- Landscape and Visual Impact Assessment and landscape strategy
- Planning Statement
- Transport Statement
- Transport Assessment/Travel Plan
- Tree survey and arboricultural report
- Minerals resource assessment
- Air Quality Assessment

We would please ask for confirmation that this list is correct.

Summary

The proposed development for up to 100 dwellings at Land to the Rear of Meadow Way is in a sustainable location that can help address the demonstrable and significant housing land supply shortfall in the district. The planning application will be supported by robust technical documentation to demonstrate that the Proposed Development is consistent with the relevant development plan policies, most notably Policy EH1 of the ANP2 as summarised above.

I trust the above information, along with the enclosed plans, provides you with a helpful understanding of the Proposed Development, however please don't hesitate to contact me should you have any queries. I look forward to hearing from you with a date for a pre-application meeting.

Yours sincerely

[redacted]

Tom James
Associate Director
[redacted]

enc.

- Completed pre-application form
- Location plan
- Local facilities plan

motion

Appendix I

Proposed Development Layout

Site

LAND TO THE REAR OF MEADOW WAY, WESTERGATE

Drawing

Illustrative masterplan

Scale

1:1000@A2

Date

09.11.22

Drawing ref

1318.**02**

0 10 20 30 40 50m

KEY

Site boundary

richards urban design

This drawing is for planning purposes only

Appendix J

Environment Agency Flood Map for Planning

Flood map for planning

Your reference	Location (easting/northing)	Created
EA Flood Map for Planning	**493588/104827**	**8 Jul 2022 10:52**

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

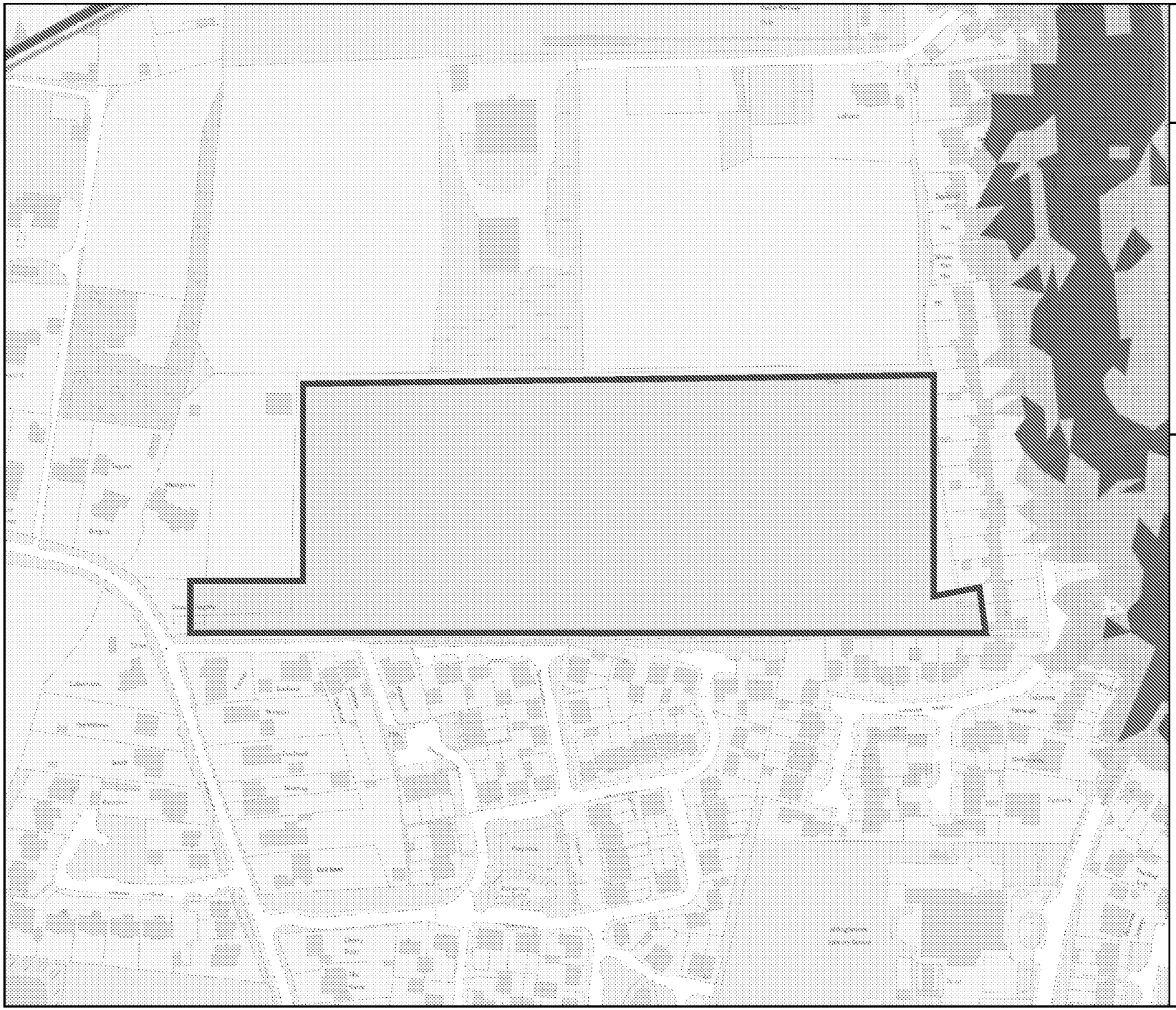
The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

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 2021 OS 100024198. https://flood-map-for-planning.service.gov.uk/os-terms

ARUN DISTRICT COUNCIL AL/138/22/OUT



Environment Agency

Flood map for planning

Your reference
EA Flood Map for Planning

Location (easting/northing)
493588/104827

Scale
1:2500

Created
8 Jul 2022 10:52

- Selected area
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 20 40 60m

Appendix K

Risk of Flooding from Surface Water (RoFSW) Map

Surface Water Flood Risk

Extent of flooding from surface water

High Medium Low Very low Location you selected

Appendix L

Landmark Flood Screening Report