LAND NORTH OF GUILDFORD ROAD, RUDGWICK

FLOOD RISK ASSESSMENT & DRAINAGE STRATEGY

MAY 2025

WELBECK STRATEGIC LAND IV LLP

RESIDENTIAL SCHEME
LAND NORTH OF GUILDFORD ROAD
RUDGWICK

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1. EXECUTIVE SUMMARY

1.1 This Flood Risk Assessment (FRA) and Drainage Strategy has been prepared by Paul Basham Associates on behalf of Welbeck Strategic Land IV LLP (Welbeck Land) to support an outline planning application for a 90-unit residential site. The land is located to the North of Guildford Road and to the east of Lynwick street. The nearest postcode is RH12 3JP.

1.2 The development is located entirely in Flood Zone 1

1.3 Residual flood risk from:

- Fluvial and tidal flooding is considered to be very low.
- Reservoir flooding is considered to be very low.
- Surface water flooding is considered to be very low.
- Groundwater flooding is considered to be very low.
- Sewer flooding is considered to be low.

1.4 BGS mapping, local borehole logs and the BGS infiltration SuDS GeoReport indicate the site is underlain by Weald Clay formation, with minimal potential for infiltration. Additionally, no superficial deposits that may have infiltration potential were recorded on site. Therefore, drainage through infiltration is not considered a viable solution.

1.5 The surface water drainage strategy involves capturing runoff at source, retaining it on-site within attenuation basins and attenuation crates, and discharging it into the existing watercourse located approximately 170m west of the site boundary, adjacent to Loxwood Road.

1.6 There are isolated areas of low surface water flood risk present on site, a small area located in the southeast corner and a larger area located in the centre of the development. The flood risk will be managed through the use of levels and diverted into the open space areas of the site.

1.7 All run-off (up to and including the 1-in-100-year rainfall event (+45% Climate Change)) shall be no greater the proposed impermeable area's Q_{bar} (17.8 l/s), per section 3.3.1 of The CIRIA SuDS manual. The flow rate will be restricted by a Hydrobrake flow control.

1.8 Foul water will be directed to an existing Southern Water manhole (Ref: 9901) located on Guildford Road, near the site entrance. The connection will be subject to a Section 106 agreement.

2. INTRODUCTION

2.1 This Flood Risk Assessment (FRA) and Drainage Strategy has been prepared by Paul Basham Associates on behalf of Welbeck Strategic Land IV LLP (Welbeck Land) to support an outline planning application for a 90-unit residential site. The land is located to the North of Guildford Road and to the east of Lynwick street. The nearest postcode is RH12 3JP.

2.2 The plot size is approximately 4.41ha and the land is currently open greenfield with a row of trees running through the field as shown below in *Figure 1*.

Figure 1: Site Location Plan (Source Google Maps)

Development Proposals

2.3 The development proposals for the site include a residential scheme comprising 90 dwellings, parking spaces, community orchard, and public open space including SuDS features. The proposed plan is being submitted as an outline planning application, with the indicative site layout provided in **Appendix A.**

3. SITE DESCRIPTION

Topography

3.1 The site's topography generally slopes from north to south with the highest point at 35.2m AOD in the northwest and the lowest point at 27.64m AOD in the southeast. The full topographical survey can be found in **Appendix B.**

Geology

3.2 A review of the British Geological Survey (BGS) mapping indicates that the bedrock geology beneath the site is "Weald Clay Formation - Mudstone. Sedimentary bedrock formed between 133.9 and 126.3 million years ago during the Cretaceous period." Figure 2 below.

Figure 2: BGS bedrock Geology

3.3 The DEFRA 'Magic Map' Groundwater Vulnerability Maps show the vulnerability of groundwater to a pollutant discharged at ground level based on hydrological, geological, hydrogeological and soil properties. *Figure 3* Indicates that the site lies within an area of unproductive groundwater vulnerability.

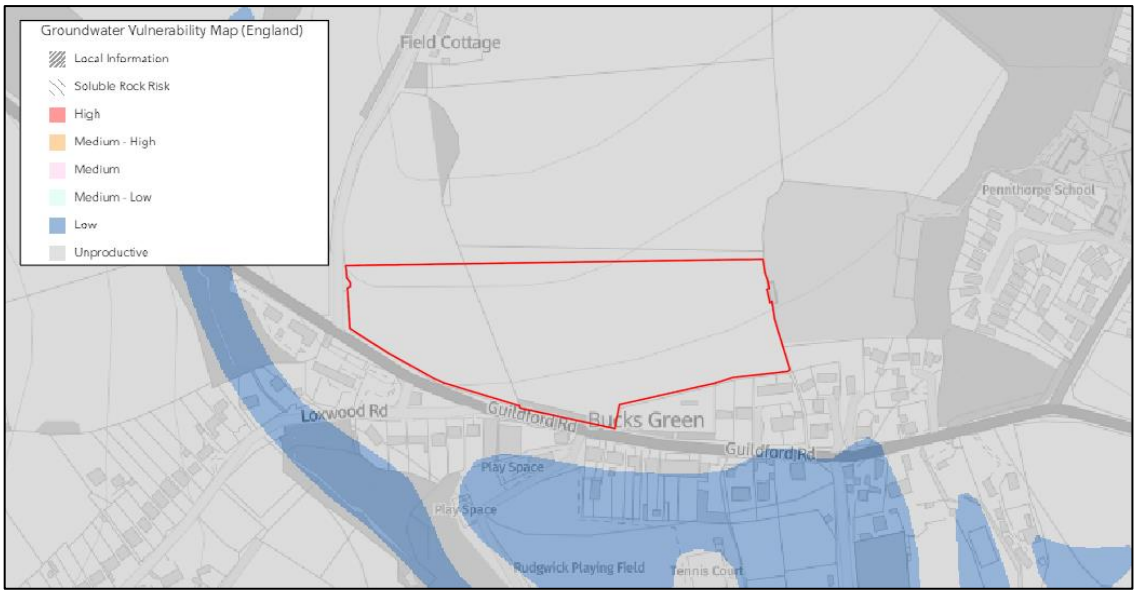


Figure 3: Groundwater vulnerability map (Magic)

3.4 Figure 4 from the BGS website indicates the presence of five boreholes located approximately 450m southeast of the site.

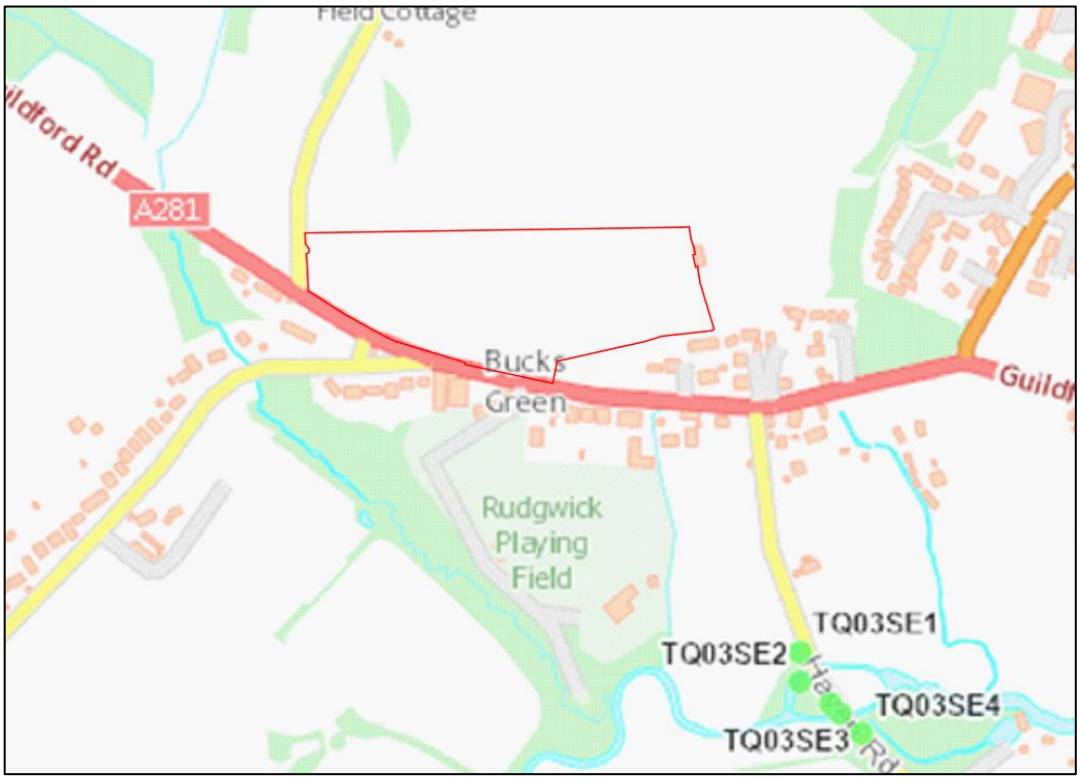


Figure 4: BGS borehole map

3.5 The closest of the five boreholes, referenced as TQ03SE2, indicates that the soil consists of soft to firm brown/blue mottled clay (Weald Clay) extending to a depth of 24m BGL, with no groundwater depth recorded. Similarly, the second nearest borehole (Ref: TQ03SE2) also encountered no groundwater and recorded soft to firm brown/blue mottled clay with traces of peat (alluvium) down to 35m BGL, followed by stiff to very stiff blue shaly clay (Weald Clay) extending an additional 10m.The borehole logs are shown in **Appendix C.**

3.6 Soakage tests were undertaken by Ground & Water in four locations on the 19th of December, the tests showed a breakdown of Weald Clay Formation. Over the four locations it was not possible to calculate the infiltration rate. The trial pits did not drain to 75% or below over a period of two hours therefore the test did not meet BRE365 soakage test requirements. Given this, infiltration is considered to be unviable on the site. The full report is available in **Appendix D**

3.7 The BGS Infiltration SuDS Geo-Report (**Appendix E**) was obtained to review the subsurface conditions proposed for the site. The report indicated that the bedrock permeability is likely to be poorly draining.

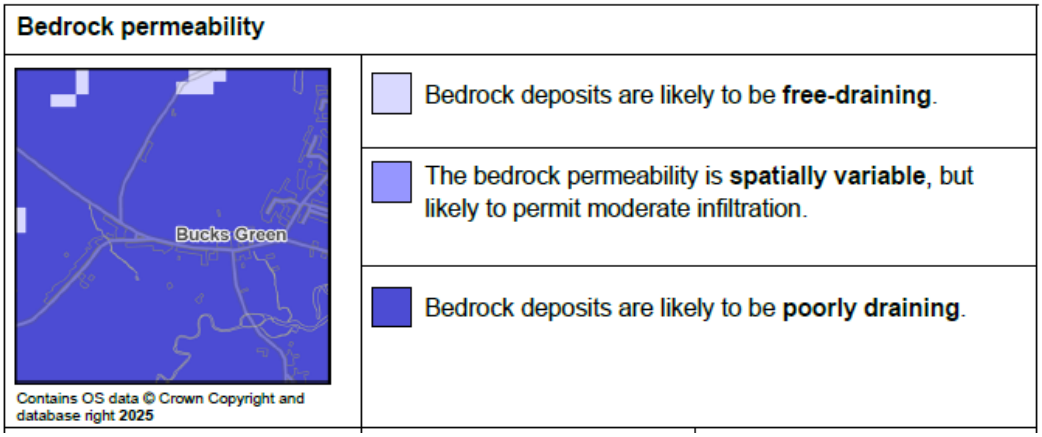


Figure 5 BGS SuDS Infiltration Geo-Report - Bedrock Permeability Extract

3.8 Given the ground conditions and considering that the site is entirely underlain by Weald Clay Formation, which is characterised by low permeability, infiltration is not considered a feasible drainage solution, and the proposed strategy is to discharge to a nearby watercourse.

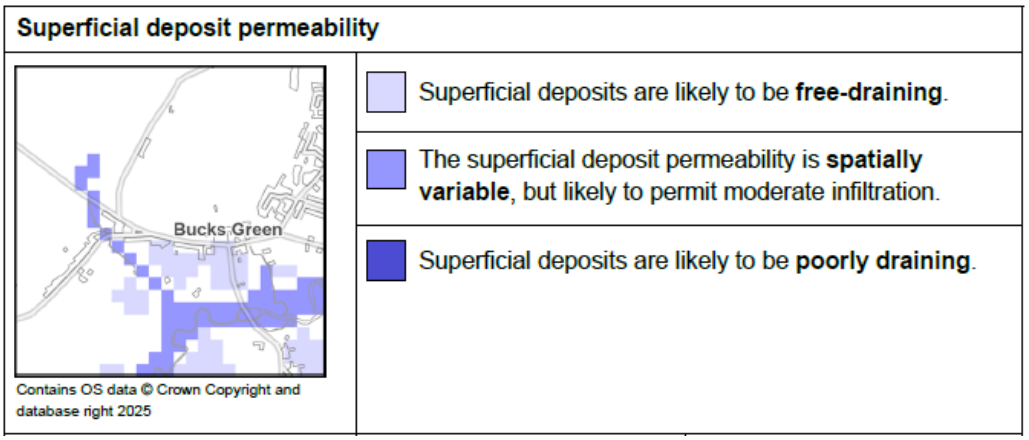


Figure 6: BGS SuDS Infiltration Geo-Report - Superficial Deposit Permeability Extract

Hydrogeology

3.9 The DEFRA (Department for Environment, Food & Rural Affairs) "Magic Map" shows the location and classification of underlying aquifers. From the mapping shown in *Figure 7* it can be considered that no underlying aquifers are present on the site.

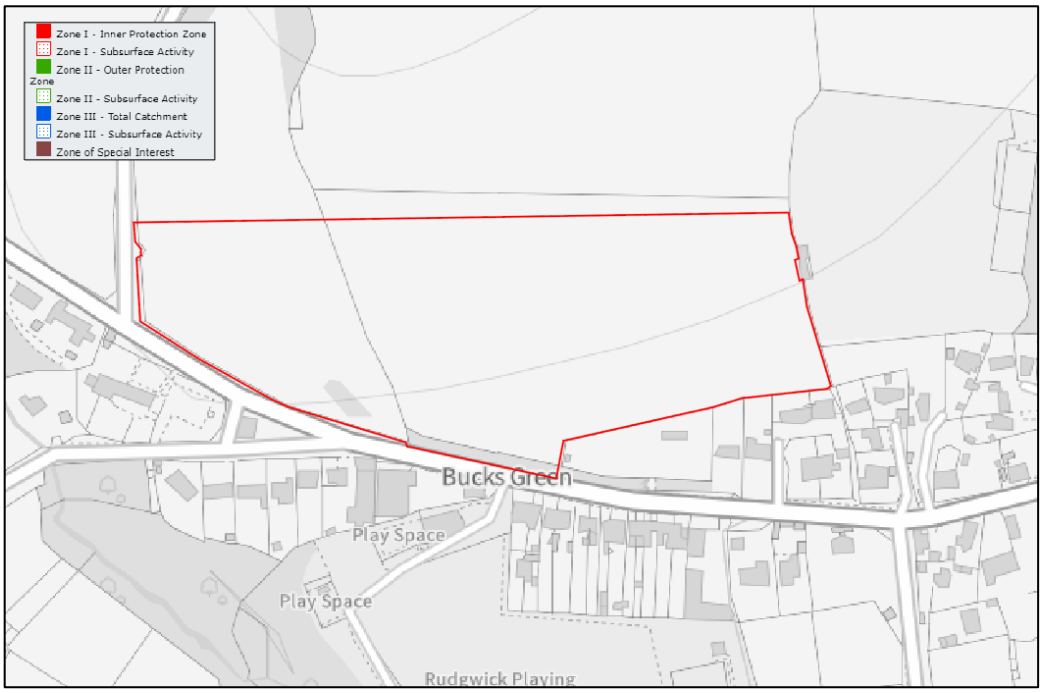


Figure 7: EA Source Protection Zones (Source: Magic map)

3.10 The BGS Infiltration SuDS Geo-Report (**Appendix E**) indicates that the site is split between having groundwater levels deeper than 5m BGL and less than 3m BGL. To inform the detail design of the drainage, further, groundwater monitoring shall be undertaken ahead of detail design stage to inform the drainage design. (*Figure 8)*

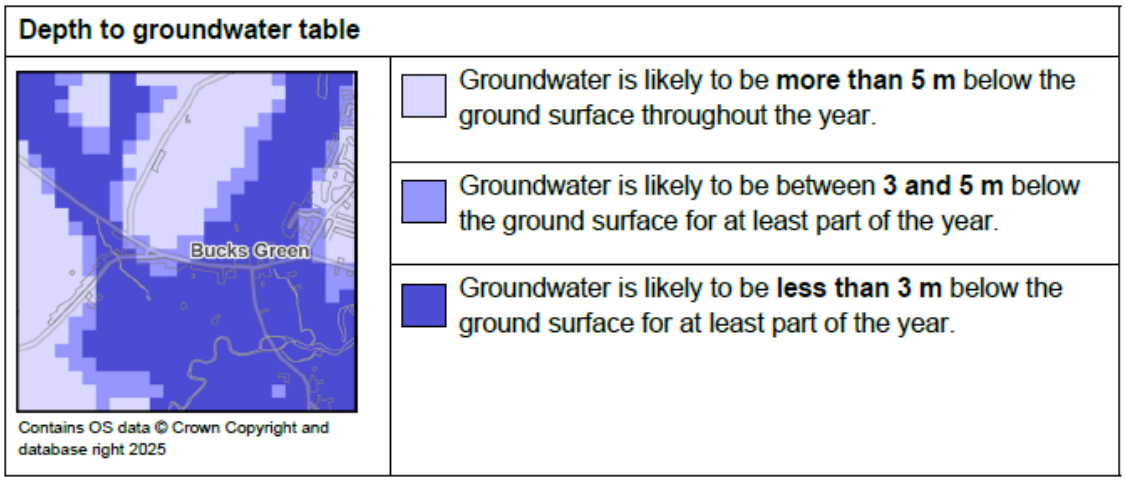


Figure 8: BGS SuDS Infiltration Geo-Report - Depth to Groundwater

Hydrology

3.11 There is an existing watercourse located roughly 130m to the southwest of the site. This watercourse is a tributary of the river Arun.

Public Sewer

3.12 Based on the sewer mapping provided by Southern Water (**Appendix F**), there are no nearby surface water sewers. There is an existing foul water sewer located within Guildford Road to the south of the site.

Pre-development drainage, greenfield rates

3.13 The greenfield run-off rates for the existing site have been estimated using the HR Wallingford online calculator on the UK SuDS website using the FEH statistical method. The Q_{bar} for the 2.72ha developable area of the site is estimated to be 17.8l/s summary of run off rates are shown below. The full report can be found in **Appendix G.**

Q_{bar} (l/s)	17.80
1 in 2 years (l/s)	15.6
1 in 30 years (l/s)	40.8
1 in 100 years (l/s)	56.6

Table 1: Greenfield runoff rates

Existing Foul Water Drainage

3.14 There is no existing foul drainage on site, the nearest foul drainage connection is located to the south of the site. Shown on Southern Water sewer mapping (**Appendix F**).

4. PLANNING POLICY

4.1 The planning policies and guidance that are relevant to the proposed Development with regard to flood risk and surface water management are outlined below.

National Planning policy

4.2 2024 updated National Planning Policy Framework (NPPF) and the associated 2022 updated Planning Practice Guidance (PPG) by the Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government

- 2022 updated EA Standing Advice
- EA National Strategy for Flood and Coastal Erosion Risk Management 2020
- DEFRA Sustainable Drainage System: Non-Statutory Technical Standards 2015
- CIRIA C753 The SuDS Manual 2015
- Flood and Water Management Act 2010
- Flood Risk Regulations 2009
- Flood risk assessments: climate change allowances 2016 (updated in 2022).

Regional Planning policy

- West Sussex County Council Local Flood Risk Management Strategy 2021-2023
- West Sussex Local Flood Risk Management Strategy (2013-2018)
- West Sussex's LLFA Policy for Management of Surface Water

Local Planning Policy

4.3 The Horsham District Council local plan contains the following policies relating to flooding, drainage, and surface water:

- Policy 24 Environmental Protection
- Policy 31 Green Infrastructure and Biodiversity
- Policy 35 Climate Change
- Policy 38 Flooding

4.4 Based on the above policies, the key requirements in relation to the surface water management and flood risk for the proposed Development are considered as to be follows:

- National Planning Policy Framework (2024): "A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use."

- Environment Agency Standing Advice: "The surface water management needs to meet requirements set out in either your local authority's Surface Water Management Plan (SWMP), Strategic Flood Risk Assessment (SFRA) and Building Regulations Part H. Emergency escape plans for any parts of a building that are below the estimated flood level are required"

- CIRIA C753 The SuDS manual 2015: "Control the quantity of runoff to support the management of flood risk and maintain and protect the natural water cycle. To ensure that the surface water runoff from a developed site does not have a detrimental impact on people, property, and the environment, it is important to control how fast runoff is discharged from the site (i.e., the peak runoff rate) and how much runoff is discharged from the site (i.e., the runoff volume). Suds that are designed to manage water quantity in this way reduce the likelihood of flooding caused by the development. They can help protect natural water cycles by promoting the recharge of soil moisture levels, by maintaining stream and river baseflows and by replenishing groundwater".

- SuDS Policy 2 of WSCC LLFA Policy for management of surface water states: "The drainage system must be designed to operate without any flooding occurring during any rainfall event up to (and including) the critical 1 in 30-year storm (3.33% AEP). The system must also be able to accommodate the rainfall generated by events of varying durations and intensities up to (and including) the critical, climate change adjusted 1 in 100-year storm (1% AEP) without any on-site property flooding and without exacerbating the off-site flood-risk. Sufficient steps are to be taken to ensure that any surface flows between the 1 in 30 and 1 in 100-year events are retained on site. Storage should be based upon analyses of a range of winter and summer storm profiles to determine a critical storm event."

- Horsham DC *Policy 24- Environmental Protection, Section 3* promotes ensuring developments "Maintain or improve the environmental quality of any watercourses, groundwater and drinking water supplies, and prevents contaminated run-off to surface water sewers".

- Horsham DC *Policy 35- Climate Change, Section 2* promotes developments being adaptive to climate change through the "Use of green infrastructure and dual use SuDS to help absorb heat, reduce surface water runoff, provide flood storage capacity and assist habitat migration"

- Horsham DC *Policy 38 – Flooding.* An extract of Policy 38 is shown in *Figure 9*.

Policy 38

Strategic Policy: Flooding

1. **Development proposals will follow a sequential approach to flood risk management, giving priority to development sites with the lowest risk of flooding and making required development safe without increasing flood risk elsewhere. Development proposals will;**
   a. **take a sequential approach to ensure most vulnerable uses are placed in the lowest risk areas.**
   b. **avoid the functional floodplain (Flood zone 3b) except for water-compatible uses and essential infrastructure.**
   c. **only be acceptable in Flood Zone 2 and 3 following completion of a sequential test and exceptions test if necessary.**
   d. **require a site-specific Flood Risk Assessments for all developments over 1 hectare in Flood Zone 1 and all proposals in Flood Zone 2 and 3.**
2. **Comply with the tests and recommendations set out in the Horsham District Strategic Flood Risk Assessment (SFRA).**
3. **Where there is the potential to increase flood risk, proposals must incorporate the use of sustainable drainage systems (SuDS) where technically feasible, or incorporate water management measures which reduce the risk of flooding and ensure flood risk is not increased elsewhere.**
4. **Consider the vulnerability and importance of local ecological resources such as water quality and biodiversity when determining the suitability of SuDS. New development should undertake more detailed assessments to consider the most appropriate SuDS methods for each site. Consideration should also be given to amenity value and green infrastructure.**
5. **Utilise drainage techniques that mimic natural drainage patterns and manage surface water as close to its source as possible will be required where technically feasible.**
6. **Be in accordance with the objective of the Water Framework Directive, and accord with the findings of the Gatwick Sub Region Water Cycle Study in order to maintain water quality and water availability in rivers and wetlands and wastewater treatment requirements.**

Figure 9: Extract for HDC Planning Framework 2015 - Policy 38

5. CLIMATE CHANGE

Peak Rainfall Intensity Allowance

5.1 The "Flood Risk Assessments: Climate Change Allowances Guidance" 2016 (updated in 2022) published by the EA indicates that climate change is currently expected to result in increased peak rainfall and rising sea levels.

5.2 **Table 2** & **Table 3** show anticipated changes in peak rainfall intensity in small and urban catchments within England. **Table 2** shows the climate change allowance for 1 in 30-year events (3.3% AEP Events) and **Table 3** shows the climate change allowance for 1 in 100-year events (1% AEP Events)

5.3 The development is classed as more vulnerable as it is a housing development, and the design life is approximately 100 years. Accordingly, the upper end allowance has been selected for the climate change.

5.4 The peak rainfall intensity based on the upper end allowance is therefore, 40% and 45% for a 3.3% AEP and a 1% AEP respectively.

Epoch	Central Allowance	Upper End Allowance
2050s	20%	35%
2070s	25%	40%

Table 2: Peak Rainfall Intensity allowance in small and urban catchments. 3.3% AEP Events

Epoch	Central Allowance	Upper End Allowance
2050s	20%	45%
2070s	25%	45%

Table 3: Peak Rainfall Intensity allowance in small and urban catchments. 1% AEP Events

Source: https://environment.data.gov.uk/hydrology/climate-change-allowances/rainfall

National Planning Policy Framework (NPPF)

5.5 This report has been prepared considering the National Planning Policy Framework (NPPF) Technical Guidance and the Environment Agency's (EA) flood risk standing advice.

5.6 Table 2 from the Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government Flood risk and coastal change guidance has been included as *Figure 10* below. This provides the classes of development (based on flood risk vulnerability) that are permitted within each of the flood zones. The Flood Risk Vulnerability Classification for the site is 'More Vulnerable' as it is a housing development, which is defined in Annexxe 3 of the NPPF. The site lies entirely within Flood Zone 1, therefore it does not trigger a sequential nor exception test.

Flood Zones	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	X	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	X	X	X	✓*

Table 2 - Flood risk vulnerability and flood zone 'compatibility'

Key: ✓ Exception test not required X Development should not be permitted.

Notes to table 2:

- *This table does not show the application of the Sequential Test which should be applied first to guide development to Flood Zone 1, then Zone 2, and then Zone 3; nor does it reflect the need to avoid flood risk from sources other than rivers and the sea;*
- *The Sequential and Exception Tests do not need to be applied to minor developments and changes of use, except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site;*
- *Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.*

† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

*" * "In Flood Zone 3b (functional floodplain) essential infrastructure that has passed the Exception Test, and water-compatible uses, should be designed and constructed to:*

- *remain operational and safe for users in times of flood;*
- *result in no net loss of floodplain storage;*
- *not impede water flows and not increase flood risk elsewhere.*

Figure 10: NPPF Planning Practice Guidance Table – Flood Risk Vulnerability and Flood Zone Compatibility

6. FLOOD RISK

6.1 In line with the EA Standing Advice, the estimated flood level is considered to be the higher of:

- A river flood level with a 1 in 100 or greater annual probability plus an allowance for climate change; and
- A tidal flood level with a 1 in 200 or greater annual probability plus an allowance for climate change.

6.2 The following Flood Zone definitions ignoring flood defence, are set out in the Planning Practice Guidance:

- Zone 1 Low Probability - Land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%);
- Zone 2 Medium Probability - Land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5%– 0.1%) in any year; and
- Zone 3 High Probability - Land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

Fluvial / Tidal Flood Risk

6.3 Flood mapping obtained from the government's 'flood map for planning' website has identified that the site falls within Flood Zone 1. (*Figure 11*)

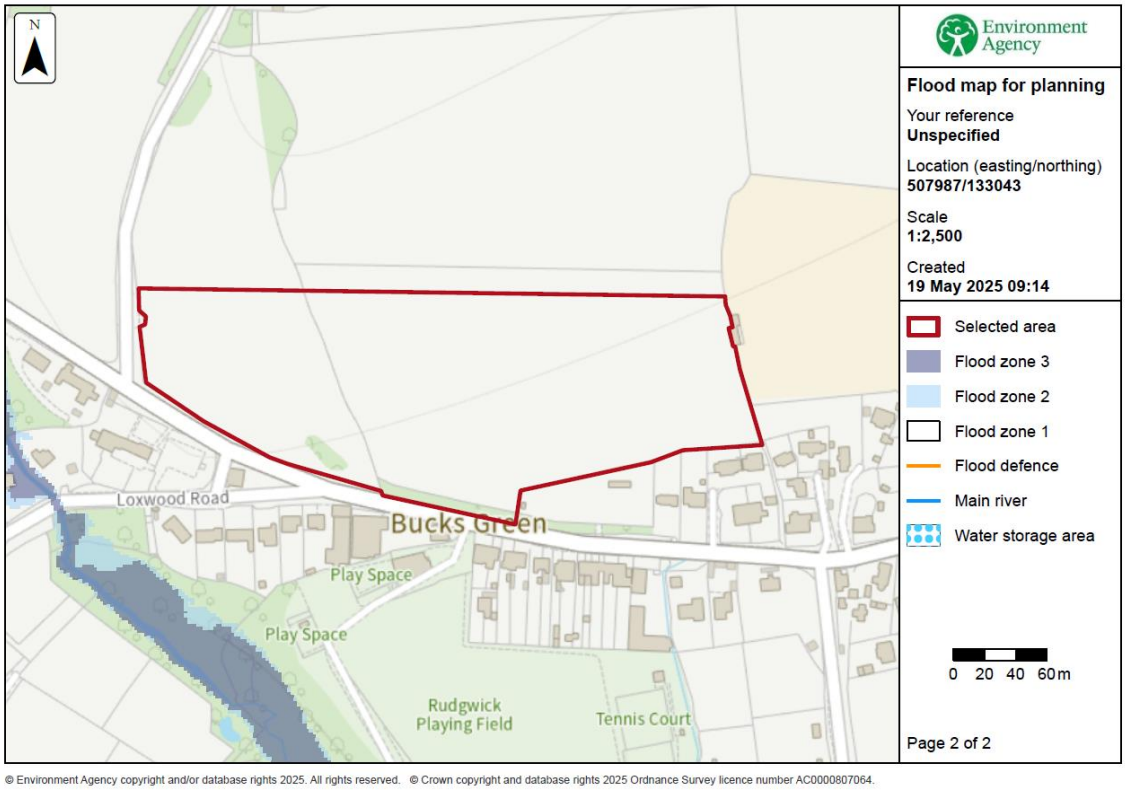


Figure 11: Flood Map for Rivers and Seas

6.4 The EA long-term flood risk and from rivers and seas (yearly chance of flooding between 2036-2069) mapping shows that the site is not affected by long-term flood risk from rivers and seas.

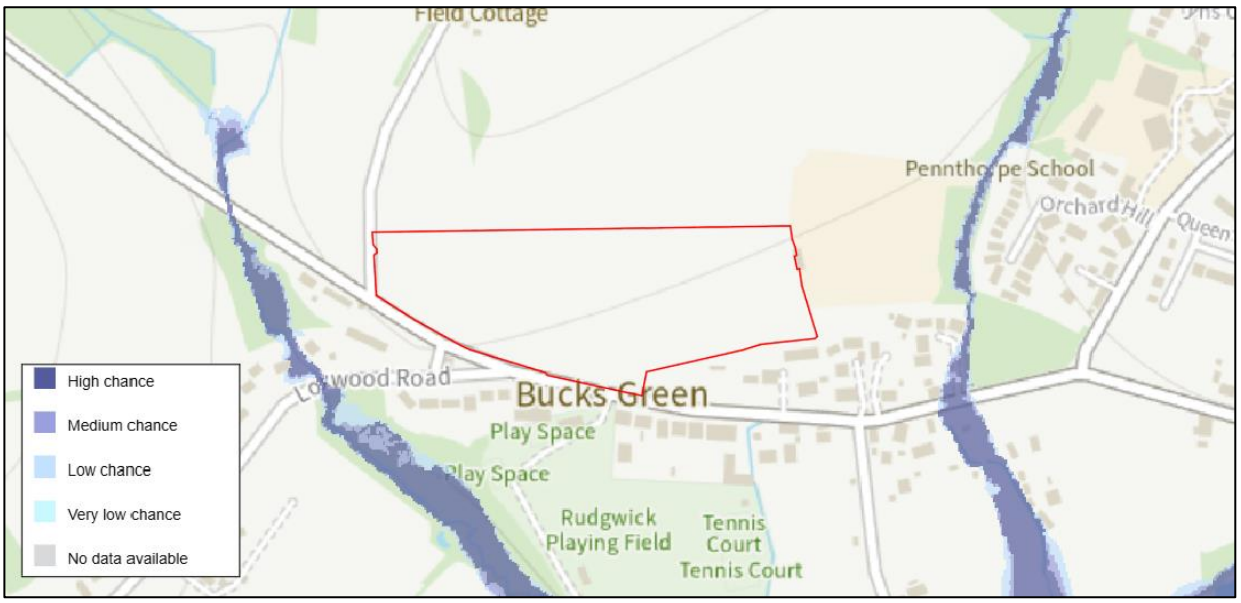


Figure 12: Long-term flood risk from rivers and seas map

6.5 Horsham district Council strategic flood risk assessment (HDC SFRA1) shows that the site is not affected by long term flood risk from rivers and seas.

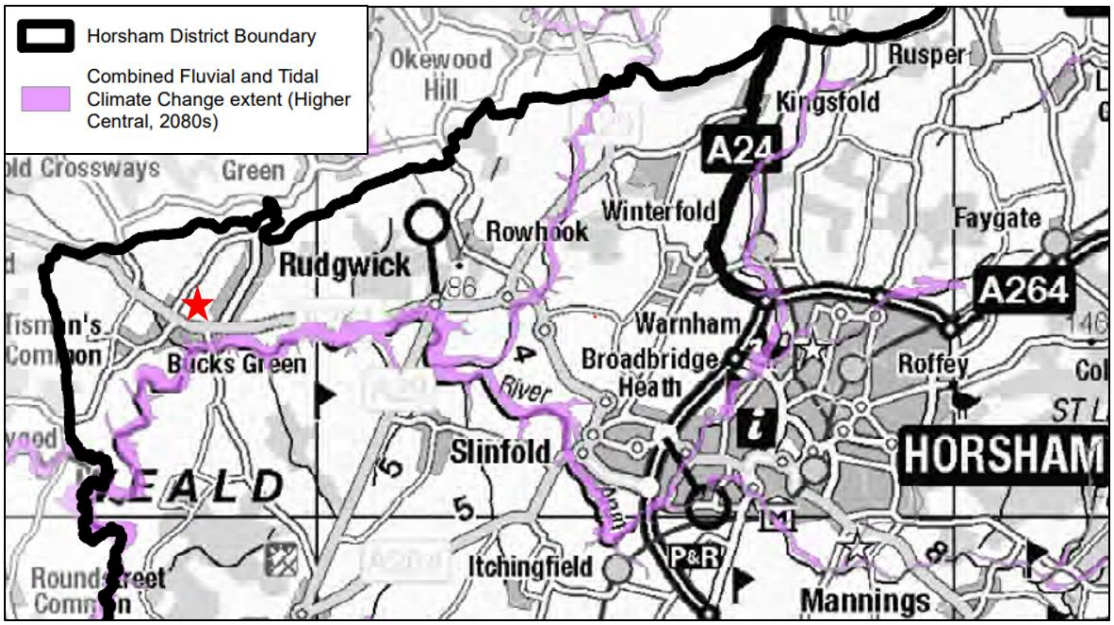


Figure 13: Future Fluvial and tidal Extents (HDC SFRA1, Appendix 1, Figure A7)

Fluvial/tidal flooding – Residual Risk

6.6 Based on the information above, the site is considered to be at very low risk of fluvial and tidal flooding.

Reservoirs Flood Risk

6.7 The EA long-term flood risk from reservoirs shows that the site is not considered to be at risk of flooding from reservoirs. (*Figure 14)*

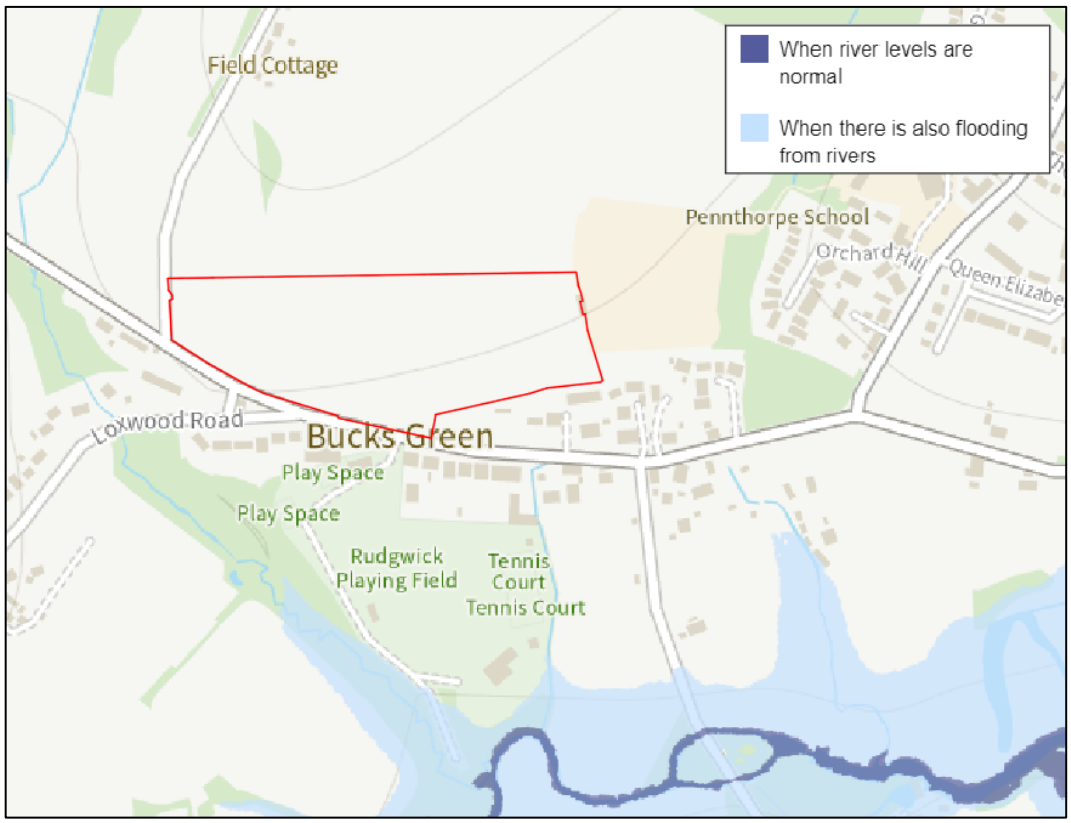


Figure 14: Long term flood risk from reservoirs map

Reservoirs Flooding – Residual Risk

6.8 Based on the above mapping, it can be concluded that the site is considered to be at very low risk of flooding from reservoirs.

Surface Water Flood Risk

6.9 Surface water or 'pluvial' flooding results from rainfall running over ground before eventually entering a watercourse or sewer. It is usually associated with high intensity rainfall events but can also occur with lower intensity rainfall or melting snow where the ground is already saturated, frozen, developed (for example in an urban setting), or otherwise has low permeability.

6.10 The EA surface water flood risk map (yearly chance of flooding between 2040 and 2060) is shown in *Figure 15* and indicates that the majority of the site is considered to be very low except for some localised spots which are subject to low risk of surface water flooding. After a review of topographical survey, it can be concluded that the localised flood risk areas are due to depressions in the land.

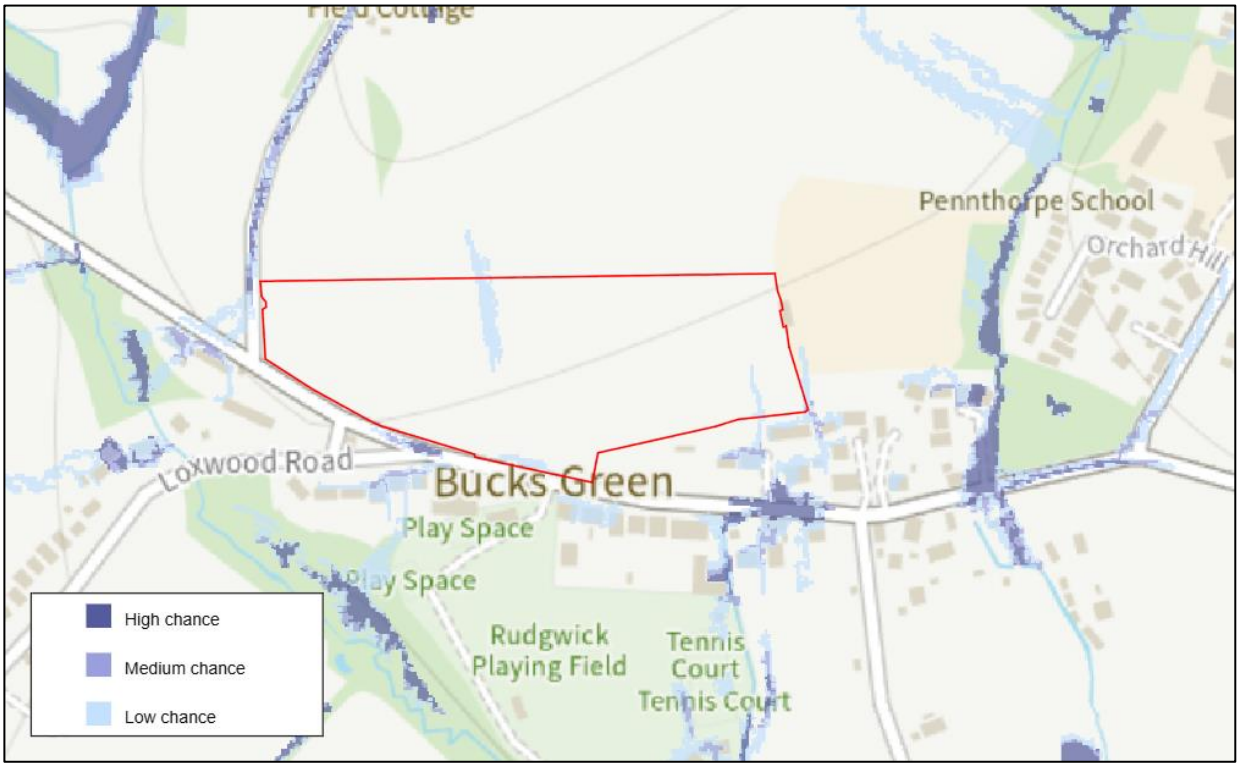


Figure 15: Long term flood risk from surface water

Surface Water Flooding– Mitigation measures

6.11 Localised low-risk areas within the site are caused by low spots within the topography that are not properly drained due to poor soil permeability. These low spots shall be re-designed as part of the site's level's strategy. The proposed site levels shall be set to ensure the site is positively drained and surface water runoff within these areas are managed on site and drained through the sustainable drainage network.

6.12 There is a localised area which cuts through northern boundary of the site which is subject to low risk of surface water flooding. To mitigate against this exiting flooding a berm shall be proposed to the south of the boundary. The berm shall be designed to intercept any overland flow from the northern boundary and will redirect the surface water flooding that has been displaced by the proposals. The depth of the pluvial floods has been obtained from the EA mapping and is estimated to be less than 200mm, accordingly the displaced flooded volume was calculated based on the area of the displaced flood extents multiplied by the average flood depth of 200mm.

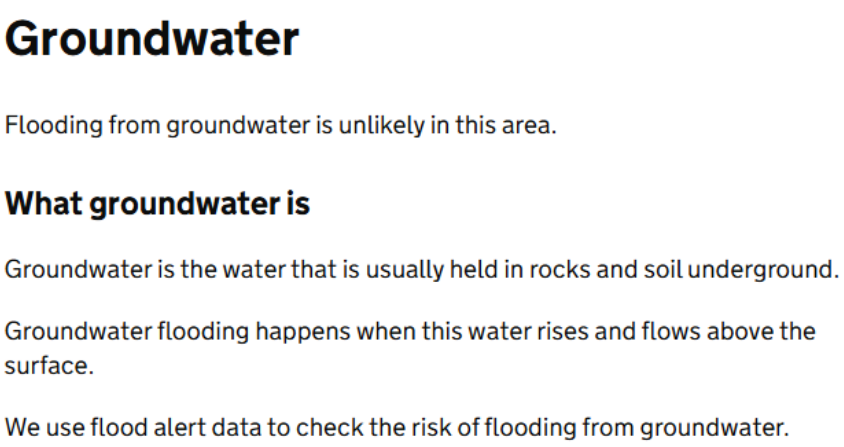
Surface Water Flooding – Residual Risk

6.13 Considering the above mitigation measures. The site is considered to have low risk of flooding from surface water.

Groundwater Flood Risk

6.14 Groundwater flooding occurs when groundwater levels increase sufficiently for the water table to intersect the ground surface. Groundwater flooding can occur in a variety of geological settings including valleys and in areas underlain by chalk, and in river valleys with thick deposits of alluvium and river gravels.

6.15 The EA long term flood Mapping states that groundwater flooding is unlikely in this area.



Groundwater

Flooding from groundwater is unlikely in this area.

What groundwater is

Groundwater is the water that is usually held in rocks and soil underground.

Groundwater flooding happens when this water rises and flows above the surface.

We use flood alert data to check the risk of flooding from groundwater.

Figure 16: EA long term flood mapping extract

6.16 The infiltration test carried out by *Ground and Water Limited* identified that groundwater was not encountered when digging 2m below ground level. The report also states "From analysis of hydrogeological and topographical maps the actual groundwater table was anticipated to be encountered below the Weald Clay Formation (Mudstone). Some amounts of groundwater however may be present at shallower depths within granular layers of the Weald Clay Formation."

6.17 The BGS SuDS GeoReport mapping (*Figure 8*) indicates that the eastern portion of the site groundwater could be encountered less than 3m below ground level.

6.18 *Figure 17* indicates that the site (marked by a red star) is classed as Class 4 risk in the ground water flood map. The SFRA describes Class 4 as "negligible risk".

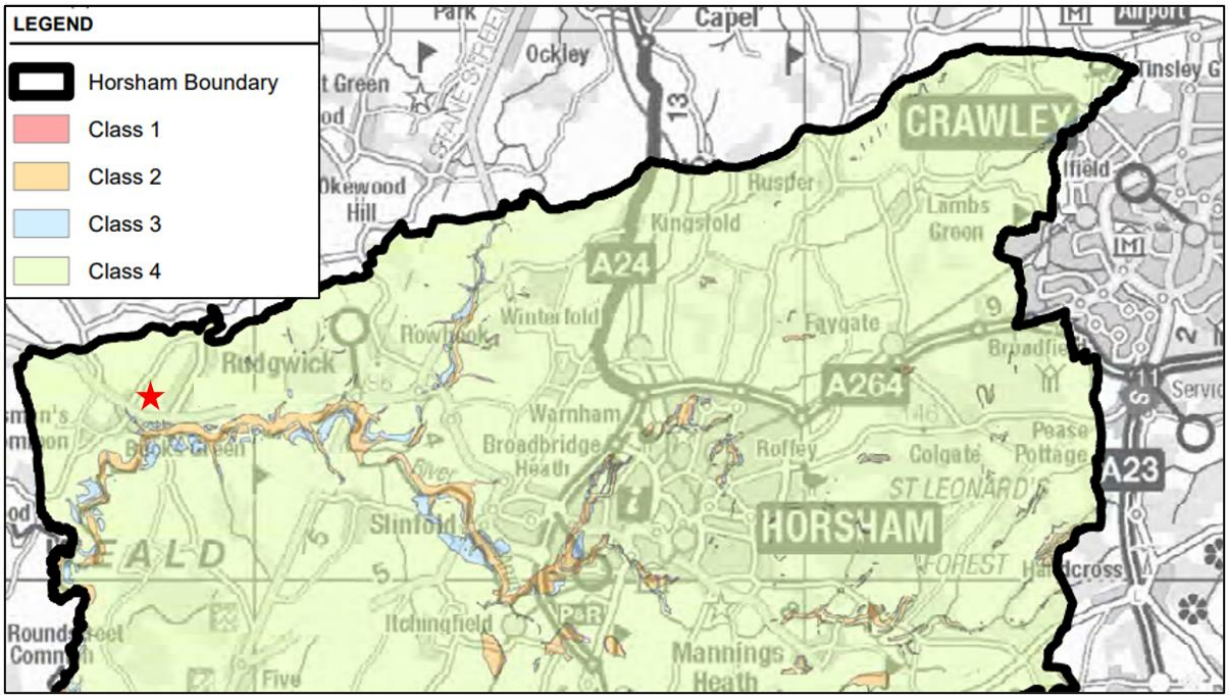


Figure 17: Ground Water Flooding - HDC SFRA1, Appendix A, Figure A8

Groundwater Flooding – Residual Risk

6.19 Given the above information, the residual risk from groundwater flooding is considered to be very low.

Public Sewers Flood Risk

6.20 There are no existing public sewers located on the site, as shown on southern waters sewer mapping in Appendix F. Therefore, sewer flooding is considered to be unlikely to occur on the site

6.21 However, based on the HDC SFRA1, Rudgwick has been identified as an area with high sewer flooding records. *Figure A8* from Appendix A of the SFRA (extracted in *Figure 18* below for ease) shows the number of sewer flooding incidents recorded by Southern Water between 2014-2024. The map below shows that the postcode RH12, within which the site is located has experienced between 41-120 sewer flooding incidents in the past 10 years.

6.22 Given the lack of existing public sewers on the site itself, and the specific characteristics and topography of the site that offer some resilience to localised flooding, despite the high historical sewer flooding records in the broader postcode area (RH12), the site is considered to be at low risk of flooding from surface water and foul water sewers.

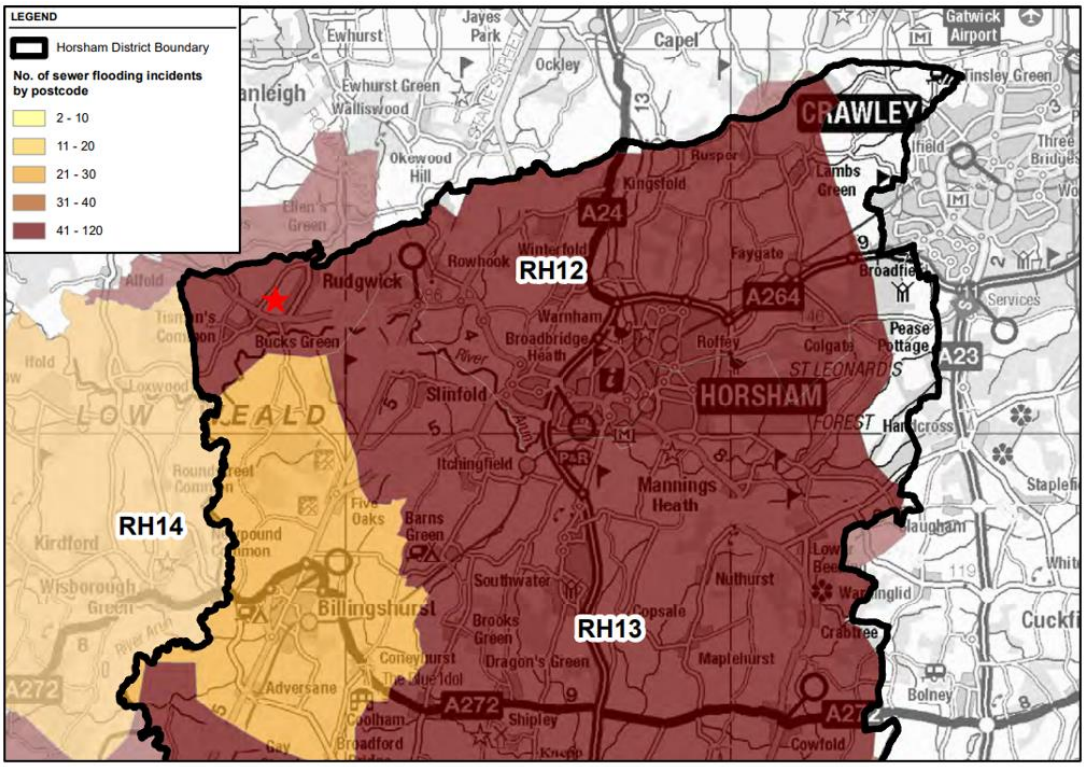


Figure 18: Sewer Flooding Incidents (2014-2024) - HDC SFRA1, Appendix A, Figure A

Public Sewers Flooding – Residual Risk

6.23 Based on the above information the site is considered to be low risk of flooding from public sewers.

Public Sewers Flooding – Mitigation Measures and Considerations

6.24 Mitigation from sewer flooding can be applied through several methods. Firstly, as the surface water network will be discharging into the nearest watercourse and therefore will not cause an overload on the public network, nor will it be affected by any surcharge events within the public network.

6.25 To further protect the site from on-site sewer flooding in the event of the outfall being surcharged; a non-return valve shall be proposed upstream of the proposed connection point to prevent foul water from backflowing into the proposed network and causing flooding within properties.

7. RESIDUAL FLOOD RISK

7.1 Table 4 outlines the initial qualitative assessment of risk posed by the potential sources of flooding, the mechanisms for flooding and the likely consequences. It also includes a review of possible mitigation measures and the effect that the proposed mitigation measures are likely to have on the residual risk posed by the potential flood source.

Flood Risk	Flood Mechanism and Possible Consequences	Existing Assessment of Risk	Mitigation Measures	Residual Risk
Fluvial / Tidal	Flooding from the river Arun	Very Low	N/A	Very Low
Reservoirs	Flooding from reservoir failure.	Very low	N/A	Very Low
Surface Water (Pluvial)	Flooding from surface water runoff caused by poor drainage	Low	The variety of SuDS utilised on site will capture and store surface water runoff then discharge into the existing water course. Flooding from surface water is unlikely	Low
Groundwater	Flooding from high ground water table.	Very Low	N/A	Very Low
Public Sewers	Flooding caused by overloaded sewers, mainly caused by ground water infiltration	Low	The proposed separated system along with the discharge to an existing water course will decrease the impact of the development on the existing public sewer system. A non-return valve is proposed downstream of the foul network to prevent any on-site flooding during a surcharge event within the public sewers.	Low

Table 4: Summary of Existing and Residual Flood Risk

8. DRAINAGE STRATEGY

Potential Surface Water Drainage Strategy

8.1 In line with the Building Regulations Part H3, surface water shall discharge to one of the following, listed in order of priority:

- An adequate infiltration system: or, where not reasonably practicable,
- A watercourse; or, where not reasonably practicable,
- A sewer.

8.2 The soakage testing carried out by Ground&Water in December 2024 confirmed that Infiltration is not a viable option. Therefore, the proposals for the surface water drainage are to be attenuated on site by an attenuation basin, then discharged to the existing watercourse located to the southwest of the site. The Drainage layout is shown **Appendix H**.

8.3 The site is separated into two catchments; Catchment A surface water runoff will be stored in an attenuation basin and attenuation crates. Catchment B surface water runoff will be stored in a series of two attenuation basins.

8.4 Existing Surface water flood risk will be managed though the utilisation of SuDS features and redirecting open space area. Permeable paving will be used on private drives, parking bays and parking courts to provide pollution mitigation.

8.5 A HydroBrake flow control will be used to limit the discharge rate to Q_{bar}=17.8l/s for the 2.72ha developable area.

Catchment	Area (ha.)	Greenfield Rate (l/s)				Post Development Rate (l/s)		
		Q_{bar}	1 in 2 years	1 in 30 years	1 in 100 years	1 in 2 years	1 in 30 years	1 in 100 years
Whole Site	**2.72**	**17.8**	**15.6**	**40.8**	**56.6**	**15.7**	**17.3**	**17.3**
Catchment A	0.66	4.3	3.8	9.9	13.7	3.3	4.0	4.5
Catchment B	2.06	13.4	11.8	30.9	42.9	12.5	12.5	12.5

Table 5: Predevelopment and post development discharge rates

Hydraulic Calculations

8.6 Hydraulic Calculations have been carried out in Site3D. The parcels have been modelled for a 1 in 2-years rainfall event (50% AEP), a in 1 in 30-years rainfall event (3.3% AEP) plus 40% climate change and a 1 in 100-years rainfall event (1% AEP) plus 45% climate change. The calculations show that no flooding occurs during any of the simulated storms across all catchments. A summary of the hydraulic calculations can be found within **Appendix I.**

8.7 The below table contains the parameters used in the supporting network modelling

Parameter	Input	Guidance/notes
Rainfall Data	FEH 2022	
Urban Creep	10%	Refer to policy
CV (Summer and Winter)	1.0	SFA 7
Climate Change 3.3% AEP 1% AEP	 40% 45%	EA Climate change allowances for peak rainfall in England https://environment.data.gov.uk/hydrology/climate-change-allowances/rainfall

Table 6: Hydraulic Modelling Parameters

Potential Foul Water Drainage Strategy

8.8 The foul water drainage proposals include for a gravity-led sewer network that connects upstream of the existing foul water manhole MH0901 identified in the southern water mapping. Southern Water have confirmed that there is currently adequate capacity of a 0.95l/s foul discharge rate. The pre - development letter from southern water can be found in **Appendix J**

9. WATER QUALITY

9.1 *Figure 19* & *Figure 20* are extracted from the SuDS Manual and demonstrate the pollution risks associated with various discharge situations.

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

Figure 19: Table 26.2 of the SuDS Manual

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

	Mitigation indices[1]		
Type of SuDS component	**TSS**	**Metals**	**Hydrocarbons**
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond[4]	0.7[3]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[5,6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Figure 20: Table 26.3 of the SuDS Manual

9.2 The UKSuDS Water Quality toolkits (based on the Simple Index Assessment method) has been used to assess water quality improvement for the site. **Table 7** below summarises the results of the toolkit, and a full copy of the toolkit can be found in **Appendix K**.

Land Use			**SuDS Component**			**Water Treatment**
Low Traffic Roads			Detention Basin			Sufficient
Pollution Indices			Mitigation Indices			
TSS	Metals	Hydrocarbons	TSS	Metals	Hydrocarbons	
0.5	0.4	0.4	0.5	0.5	0.6	

Table 7: Water Quality Summary

10. SUMMARY AND CONCLUSION

10.1 This Flood Risk Assessment (FRA) and Drainage Strategy has been prepared by Paul Basham Associates on behalf of Welbeck Strategic Land IV LLP (Welbeck Land) to support an outline planning application for a 90-unit residential site. The land is located to the North of Guildford Road and to the east of Lynwick street. The nearest postcode is RH12 3JP.

10.2 The development is located entirely in Flood Zone 1

10.3 Residual flood risk from:

- Fluvial and tidal flooding is considered to be **very low**.
- Reservoir flooding is considered to be **very low**.
- Surface water flooding is considered to be **very low**.
- Groundwater flooding is considered to be **very low**.
- Sewer flooding is considered to be **low**.

10.4 BGS mapping, local borehole logs and the BGS infiltration SuDS GeoReport indicate the site is underlain by Weald Clay formation, with minimal potential for infiltration. Additionally, no superficial deposits that may have infiltration potential were recorded on site. Therefore, drainage through infiltration is not considered a viable solution.

10.5 The surface water drainage strategy involves capturing runoff at source, retaining it on-site within attenuation basins and attenuation crates, and discharging it into the existing watercourse located approximately 170m west of the site boundary, adjacent to Loxwood Road.

10.6 There are isolated areas of low surface water flood risk present on site, a small area located in the southeast corner and a larger area located in the centre of the development. The flood risk will be managed through the use of levels and diverted into the open space areas of the site.

10.7 All run-off (up to and including the 1-in-100-year rainfall event (+45% Climate Change)) shall be no greater the proposed impermeable area's Q_{bar} (17.8 l/s), per section 3.3.1 of The CIRIA SuDS manual. The flow rate will be restricted by a Hydrobrake flow control.

10.8 Foul water will be directed to an existing Southern Water manhole (Ref: 9901) located on Guildford Road, near the site entrance. The connection will be subject to a Section 106 agreement.