



Consulting Civil Engineers

Flood Risk Assessment

The Hollies, 84 Barnham Road, Barnham, West Sussex PO22 0ES

Rev -

Reference **C3876**

Date **19.12.2025**

Revision	Status	Description	Date	Issued	Checked
-	Final v1	Issued for Approval	19.12.2025	RH	RH

1 SITE AND DEVELOPMENT OVERVIEW

DEVELOPMENT DESCRIPTION	EXISTING (PRE-DEVELOPMENT)	PROPOSED (POST-DEVELOPMENT)
Site Use	Gardens (report ref: existing site coverage)	2no new dwellings
Development Use	Greenfield (report ref: existing site use)	Residential (report ref: proposed site use)
Use Design Life		100 years
Number of Dwellings	0	2
EA Vulnerability Classification	Less Vulnerable (ref: existing site vulnerability)	More Vulnerable (ref: proposed site vulnerability)
Development Class		Minor
County Planning Authority	West Sussex County Council (ref: County Council)	
District Planning Authority	Arun District Council (ref: District Council)	
Local Sewer Authority	Southern Water (ref: Local Sewer Authority)	
SITE CATCHMENT CHARACTERISTICS	DESCRIPTION	SOURCE
River Management Catchment	Arun and Western Streams Management (report ref: River Basin Catchment)	https://environment.data.gov.uk/
KEY FLOOD RISK AND DATA SOURCES	DATA TYPE	SOURCE
EA Fluvial and Tidal Planning Data	UK Government Flood Maps for Planning (ref: FMP)	https://flood-map-for-planning.service.gov.uk/
EA Surface Water Data	DEFRA Risk of Flooding from Surface Water Sources GIS Data (ref: RoFSW)	https://environment.data.gov.uk/DefraDataDownload/?Mode=rofsw
EA Long term Flood Risk	UK Government Long term Flood Risk Maps (ref: LTFRM)	https://www.gov.uk/check-long-term-flood-risk
Environment Agency Product 4/5 Data	N/A (report ref: EA Product Data)	EA Detailed Flood Model
Historic Flood Risk Data	DEFRA Historic Flood Outlines GIS Data	https://environment.data.gov.uk/DefraDataDownload/?mapService=EA/HistoricFloodMap&Mode=spatial
Strategic Flood Risk Assessment Data	Arun SFRA (ref SFRA)	Council Website
Local Flood Risk Assessment Data	(refer to SFRA)	Council Website
Topographic Information	DEFRA Opensource LIDAR Data	https://environment.data.gov.uk/DefraDataDownload/?Mode=survey
DESIGNATION	FLOOD RISK DESIGNATION	NOTE
EA/LLFA Designated Flood Zone	Flood Zone 2 – Medium Risk	*Designation based on highest flood risk between River, Sea or Surface Water - Refer Section 1: Table 2
Sea Flood Risk Present	Very Low	Refer Section 1: Table 2
River Flood Risk Present	Very Low	Refer Section 1: Table 2
Surface Water Flood Risk Present	Very Low	Refer Section 1: Table 2

TABLE OF CONTENTS

1	SITE AND DEVELOPMENT OVERVIEW	2
	TABLE OF CONTENTS	3
2	INTRODUCTION	4
	DEVELOPMENT PROPOSALS	4
	FLOOD RISK ASSESSMENT SCOPE	4
	FLOOD RISK VULNERABILITY	5
3	FLOOD RISK ASSESSMENT SCOPE	6
	SEQUENTIAL TEST/EXCEPTION TEST	7
	ENVIRONMENT AGENCY FLOOD RISK DESIGNATION	8
4	LOCAL FEATURES	10
	RIVERS AND WATERCOURSES	10
	TOPOGRAPHY	10
	GEOLOGY & HYDROGEOLOGY	10
	FLOOD DEFENCES	11
5	CLIMATE CHANGE	13
	INCREASES IN SURFACE WATER FLOODING AND RAINFALL ALLOWANCES	13
6	SOURCES OF FLOOD RISK	14
	HISTORICAL, SEWERS AND DRAINAGE	14
	GROUNDWATER	14
	RESERVOIR	16
	RESIDUAL RISKS	16
	OFFSITE IMPACTS OF DEVELOPMENT	17
7	BUILDING MATERIAL MITIGATIONS.....	18
8	EMERGENCY ACCESS AND EGRESS.....	20
9	FLOOD EVACUATION PLANNING	21
	FLOOD HAZARD PREVENTION	21
	WARNING PROCEDURES	21
	THE EVACUATION PROCEDURE	21
	SAFE REFUGE PROCEDURES	22
10	FLOOD MITIGATION MEASURES.....	23
11	CONCLUSION.....	24
	APPENDIX 1 – ARCHITECTURAL PROPOSALS	25

2 INTRODUCTION

- 2.1 The following report is a Flood Risk Assessment (FRA) for the development proposals at The Hollies, 84 Barnham Road, Barnham, West Sussex PO22 0ES (see site location map, Figure 1).
- 2.2 This assessment is required under the National Planning Policy Framework (NPPF) and Local and District Councils given the location, scale and associated flood risks.



Figure 1 - Site Location Plan (site bordered red) Source: Location Map

- 2.3 This FRA has been written in general accordance with the National Planning Policy Framework (NPPF) and its Technical Guidance, Environment Agency (EA) Standing Advice, LFRMS, County SFRA and associated guidance. This FRA has relied upon publicly available information and data provided from the EA (where relevant). The interpretation of this data has been undertaken with the understand of its accuracy and to a detail deemed suitable for this development type, location and relevant flood risk.

DEVELOPMENT PROPOSALS

- 2.4 The development proposals are for the construction of 2 new dwellings on the existing garden area historically servicing the Hollies dwelling. Architectural proposals are included in Appendix 1.

FLOOD RISK ASSESSMENT SCOPE

- 2.5 The purpose of this FRA is to inform the feasibility and appropriateness of the proposals and to ensure the development proposals incorporate flood resilient measures appropriate to its flood risk.

2.6 It should be noted, where up to date flood risk or climate change models are not available, best efforts have been made to assess these risks and extrapolate the available data where necessary. However, this approach may require further detailed modelling if deemed necessary by the reviewing authorities. Detailed hydraulic modelling is deemed outside the scope of this report.

FLOOD RISK VULNERABILITY

2.7 This FRA has been undertaken with due regard to the statutory requirements of the NPPF and with reference to the Planning Practice Guidance (PPG) in relation to development and flood risk. This FRA has been undertaken to inform on the current flood risk to the site. Therefore, this FRA aims to ensure that the development proposals consider the site-specific flood risk and to avoid inappropriate development in areas potentially at risk of flooding.

2.8 Annex 3 of the NPPF Flood Risk Vulnerability Classification provides guidance on assigning development vulnerability. A summary of this information is provided in Table 1.

Table 1 – Extract from Annex 3 of the National Planning Policy Framework and Table 2: Flood risk vulnerability classification of PPG detailing Flood Risk Vulnerability Classification by use. (Existing Site Classification is Shaded Gray, Proposed Site specific classification shaded blue).

ESSENTIAL INFRASTRUCTURE	HIGHLY VULNERABLE	MORE VULNERABLE	LESS VULNERABLE	WATER-COMPATIBLE
Essential transport infrastructure	Police and ambulance stations; fire stations and telecom installations	Hospitals	Police, ambulance and fire stations which are not required to be operational during flooding.	Flood control infrastructure.
Essential utility infrastructure which has to be located in a flood risk area for operational reasons	Emergency dispersal points.	Residential institutions such as residential care homes, prisons and hostels.	Buildings used for commercial purposes and of a non-residential nature	Water transmission infrastructure and pumping stations.
Wind turbines.	Basement dwellings.	Buildings used for dwelling houses and sleeping, drinking establishments	Land and buildings used for agriculture and forestry.	Sewage transmission infrastructure and pumping stations.
Solar farms.	Caravans, mobile homes and park homes intended for permanent residential use.	Non-residential uses for health services, nurseries and educational uses	Waste treatment (except landfill* and hazardous waste facilities).	Sand and gravel working.
	Installations requiring hazardous substances consent.	Landfill* and sites used for waste management facilities for hazardous waste.	Minerals working and processing (except for sand and gravel working).	Docks, marinas and wharves and Navigation facilities.
		Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.	Water treatment and Sewage treatment works which do not need to remain operational during times of flood.	Ministry of Defence installations.

2.9 The site area for the new dwellings is existing greenspace and therefore is presently considered ‘Less Vulnerable’ in accordance with Table 1 and the NPPF.

2.10 The development proposals are considered ‘More Vulnerable’ due to the construction of 2no new dwellings on the green space.

3 FLOOD RISK ASSESSMENT SCOPE

- 3.1 Flood risk as defined by the NPPF, is a combination of the probability and the potential consequences of flooding. Areas at risk of flooding are those at risk of flooding from any source, now or in the future. Sources include rivers and the sea, direct rainfall on the ground surface, rising groundwater, overwhelmed sewers and drainage systems, reservoirs, canals and lakes and other artificial sources. Flood risk also accounts for the interactions between these different sources. This term is key to the application of the presumption in favour of sustainable development in paragraph 11 of the National Planning Policy Framework (NPPF).
- 3.2 The NPPF requires flood risk to be considered on all sites, however more detailed site-specific FRA's are required when one or more of the following criteria apply to the site:
- Where a site is affected by the **Design Flood Event** (DFE) from any source (typically the 1% AEP) for all proposals of any new development (including minor development and change of use); or
 - Greater than 1 ha in size and located in Flood Zone 1; or
 - Located in Flood Zone 1 where there are critical drainage problems or within a designated Critical Drainage Area (CDA) as notified to the LPA by the Environment Agency; or
 - Subject to a change of use to a higher vulnerability classification which may be subject to other sources of flooding; or
 - A Major planning application (i.e. more than 10 residential dwellings).
- 3.3 The NPPF designates that the '**Design Flood Event**' (DFE) is used to assess the suitability of a development proposal against the criteria of the NPPF. The design flood, is a flood event of a given annual flood probability, but is generally taken as:
- River flooding likely to occur with a 1% annual probability (a 1 in 100 chance each year), typically shown as Flood Zone 3a as designated on the EA's Flood Map for Planning; or
 - Tidal flooding with a 0.5% annual probability (1 in 200 chance each year), typically shown as Flood Zone 3a as designated on the EA's Flood Map for Planning; or
 - Surface water flooding likely to occur with a 1% annual probability (a 1 in 100 chance each year), typically shown as the Medium Risk of Surface Water flooding as designated on the EA's Long Term Flood Risk mapping,
- 3.4 In addition to assessing present day risk, the DFE also must be assessed to include and appropriate allowance for climate change (refer to Section 0 for climate change allowances) based on the site's geographical location, vulnerability and design life.
- 3.5 For the purpose of this FRA, the worst case DFE (whether this be from tidal, river or surface water sources), has been used to steer the recommendations of this report. Consideration of extreme events above that of the DFE have not been considered further beyond identifying these as residual risks.
- 3.6 Table 1 of the NPPF provides definitions of the Flood Zones, from low to high probability of river and sea flooding and also in regard to surface water flood risk. These Flood Zone Classification for the purpose of this FRA are:
- Flood Zone 1 - land assessed as having a less than a 1 in 1,000 annual probability (<0.1%);
 - Flood Zone 2 - land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river (1% – 0.1%), 1:100 year or greater of surface water 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;
 - Flood Zone 3 - 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. Flood Zone 3b is land have greater than 1 in 20 to 1 in 30 year annual probability of flooding.

3.7 Following an assessment from the various sources of flood risk for the DFE, this site-specific FRA has applied the key principles for decision making when flood risk is a consideration and includes in order of importance:

1. **Avoid** – This is to physically locating the development proposals to areas of lowest flood risk within the site and/or determined how to vertically place the proposals to such that more vulnerable uses are positioned above the design flood level (such as raising floor levels or placing more vulnerable uses on upper levels). Developers should refer to the BS 85500:2012-Flood resistant and resilient construction. Guide to improving the flood performance of buildings for applicable strategies);
2. **Control** - Planning authorities and developers can investigate measures to control the risk of flooding affecting the site (this may be through flood defences, flood gates, flood storage or other engineered solutions such as SUDS). This is rarely applied at the site level and is mostly address through strategic and county level flood defence strategies. At this site level, typically this will be through applying a Water Exclusion or Water Entry strategy when designing a building or space.
3. **Mitigate** – Is the use of flood resistance and resilience measures to address any residual risks remaining after the use of the avoidance and control measures described above. Passive measures should be prioritised over active measures as they are likely to be more effective and more reliable. Flood Resilience is an approach to building design which aims to reduce flood damage and speed recovery and reoccupation following a flood. It uses a combination of flood resistance and recovery measures (referred to here as resilience measures), and is described in the industry-developed CIRIA Property Flood Resilience Code of Practice, which provides advice for both new-build and retrofit.
4. **Managing Residual Risk** – this will usually involve ensuring either safe access and egress is available from the safe in a DFE, Flood Warning Systems/Evacuation Plans are in place, safe refuge is on site during a DFE, the building is designed to account for flood loadings etc.
5. **Flood Risk is not increased elsewhere** – assuming all the above items can be address, it is critical that the development does not increase flood risk elsewhere as a result. Typically this is addressed by ensuring flood waters are not displaced (in surface water or river flood affected areas, the loss of floodplain storage is less likely to be a concern in areas benefitting from appropriate flood risk management infrastructure or where the source of flood risk is **solely** tidal.) or appropriate hydraulic modelling is provided in support of an application to demonstrate that flood risk is not increased outside of a site (such as through on site flood compensation or detailed site specific hydraulic modelling).

3.8 It should be noted, where up-to date flood risk or climate change models are not available, best efforts have been made to assess these risks and extrapolate the available data where necessary. However, this approach may require further detailed modelling if deemed necessary by the reviewing authorities. Detailed hydraulic modelling is deemed outside the scope of this report.

SEQUENTIAL TEST/EXCEPTION TEST

3.9 For the purpose of this assessment, the application of the Sequential Test has been broken down into three levels. Passing the Sequential Test at the strategic level is a weighting of the risks versus benefit of a development against a wider criterion (such as meeting other sustainability targets, housing needs or other strategic planning goals) than just purely avoiding flood risk issues. However, the Sequential Test can also be applied at the site level, where development is steered towards lower areas of flood risk within a site boundary, and is much more objective in its assessment. For this FRA, the assessment ‘Level’ of the Sequential Test are considered to be:

Level 1 - At the high-level, this test is first implemented by local planning authorities (LPA) at the strategic planning scale. The Sequential Test is applied to steer local planning policy by directing particularly vulnerable new developments (e.g., residential, hospitals, mobile homes etc.) outside of the floodplain and for designating new land uses and future development areas.

Level 2 - At the second instance, the Sequential Test is implemented for a specific development at the request of the LPA to assess other sites within an area defined by the LPA, this type of Sequential Test is present where there is a significant conflict between a proposed development and flood risk.

Level 3 - The third instance is where the Sequential Test is applied with the confines of the site, namely by steering development proposals to **avoid** areas of flood risk within a site itself.

3.10 Application of the first and second level of the Sequential Test is deemed outside the scope of this report.

ENVIRONMENT AGENCY FLOOD RISK DESIGNATION

3.11 Table 2 below presents a helpful guide in identifying the suitability of a site prior to applying Level 1 and 2 of the Sequential Tests and identifies when the Exception Test is required.

Table 2 - The Sequential Test: Flood Risk Vulnerability and Flood Zone 'Compatibility' Table as specified by NPPF. Shaded cells denote the proposed re-development. Please note: ✓ means development is appropriate; x means the development should not be permitted and should be subject to a full sequential test. Refer to Table 2 for selected Flood Zone Designation

FLOOD RISK VULNERABILITY CLASSIFICATION		ESSENTIAL INFRASTRUCTURE	WATER COMPATIBLE	HIGHLY VULNERABLE	MORE VULNERABLE	LESS VULNERABLE
Flood Zone	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test Required	✓	✓
	Zone 3a	Exception Test Required	✓	x	Exception Test Required	✓
	Zone 3b Functional Floodplain	Exception Test Required	✓	x	x	x

3.12 Based on the principles above, a development of this nature is considered appropriate and acceptable and full application of the Sequential Test is not deemed necessary at this time. Therefore, this FRA presents the findings of the Exception Test and recommendations for incorporation of flood resilient measures to improve long term flood resilience of the proposals. The following sections undertakes further analysis of the data available from the Local and District Council and EA data sets relating to flooding from a number of sources.

3.13 Table 3 summarises the sites primary flood risk classifications and the source for the DFE. This designation is based on the EA's Risk of Flooding from Rivers and Sea - Climate Change (RoFRS) (extract provided in Figure 2) and the EA's Risk of Flooding from Surface Water (RoFSW) – Climate Change (extract provided in Figure 3).

3.14 Based on the EA's Flood Maps for Planning data, the site is shown to be wholly unaffected by both fluvial, sea or surface water flooding and is unlikely to be affected in the future due to climate change. However, the Arun SFRA shows that the site is in an area at more than 75% risk of groundwater emergence. As such groundwater flood risk is considered to be the dominant source.

Table 3 - Summarises the overall Flood Zone designation based on the highest rated flood risk from either rivers and sea or surface water.

FLOOD ZONE AND SOURCE IDENTIFICATION SUMMARY			
	FLOOD ZONES AFFECTING THE SITE		DOMINANT SOURCE FOR THE DESIGN FLOOD EVENT (DFE)
	Flood Zone 2 (medium risk)	Flood Zone 3 (high risk)	Source
River	No	No	Groundwater Flooding
Sea	No	No	
Surface Water	No	No	

**Flood Zone Designation for assessment is based on the highest flood risk from river, sea or surface water flooding taken from EA's Flood Map for Planning and EA's LTFRM:RoFSW*

3.15 Other sources of flooding have been considered in the proceeding sections (such as groundwater and sewer flooding), but these are typically considered to be ‘minor’ sources of flood risk. As flood risk from river, sea and surface water flooding are considered to be very low, flood risk from these sources have not been considered further in this FRA.



Figure 2 extract from EA Flood Maps for Planning (Source: DEFRA)

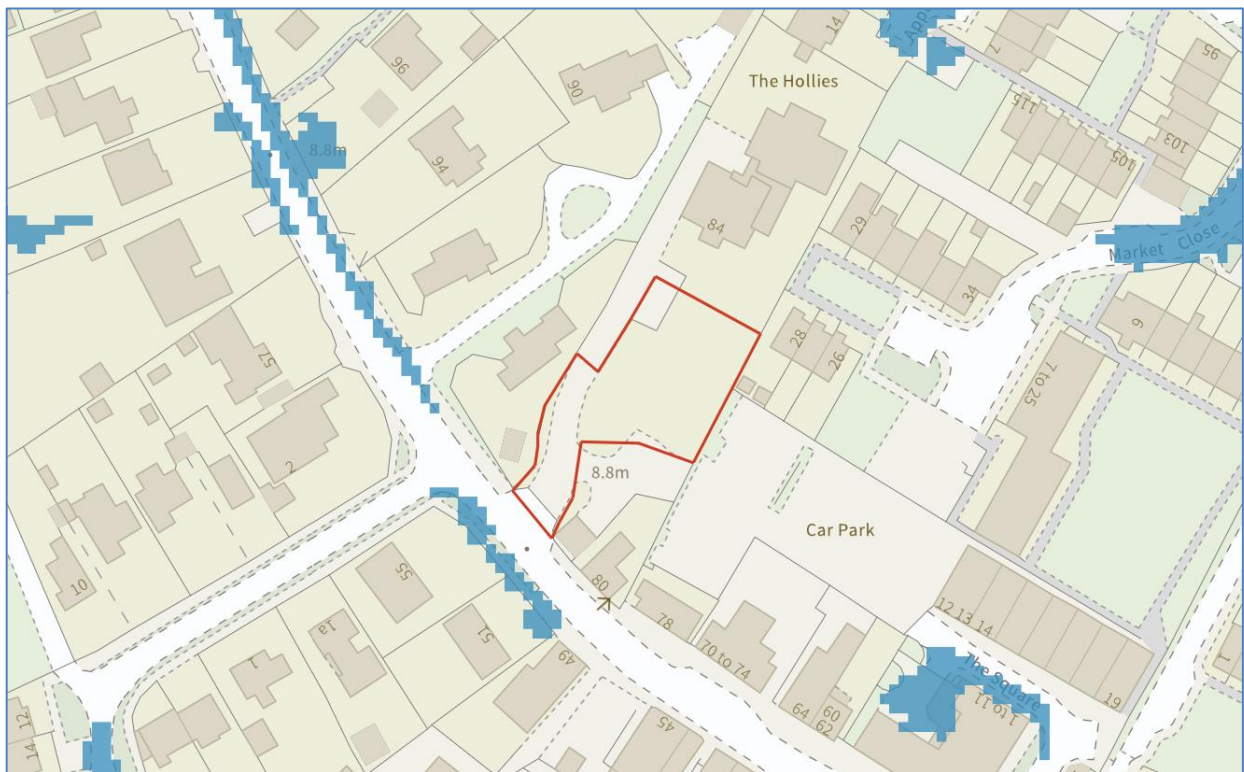


Figure 3 - extract from the EA's Risk of Flooding Surface Water (RoFSW) showing 1 in 1000 year surface water flood risk.

4 LOCAL FEATURES

RIVERS AND WATERCOURSES

- 4.1 The nearest watercourse appears to be the Barnham Rife located approximately 300m to the southeast of the site. The Barnham Rife flows from the northeast to the southwest at this location.

TOPOGRAPHY

- 4.2 The site is located in a slight valley that runs from the north west to the south east. The Hollies is situated slightly above the site at c9mAOD, with the Barnham Road similarly at c9mAOD. The location of the proposed dwellings has an approximate elevation of 8.5mAOD.
- 4.3 Figure 4 below provides long and cross-sectional data through the site demonstrating an approximation of existing site levels based on the available LIDAR information.

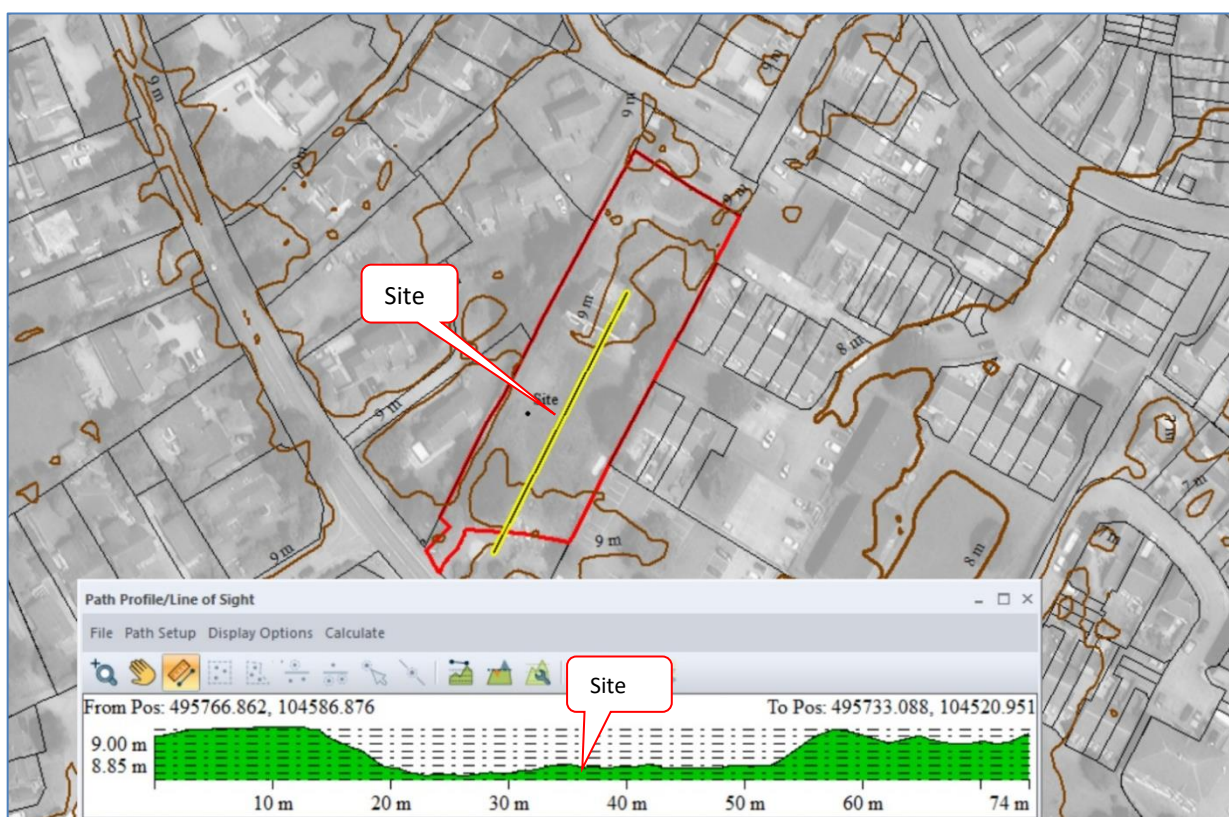


Figure 4 –Terrain profile and contours (source: DEFRA Lidar Data 1m)

GEOLOGY & HYDROGEOLOGY

- 4.4 The online British Geological Survey (BGS) (Figure 5) shows the site to be underlain by 1:50 000 scale bedrock geology description: London Clay Formation-Clay, silt and sand. Raised beach deposits, 1-Sand and gravel superficial deposits recorded.

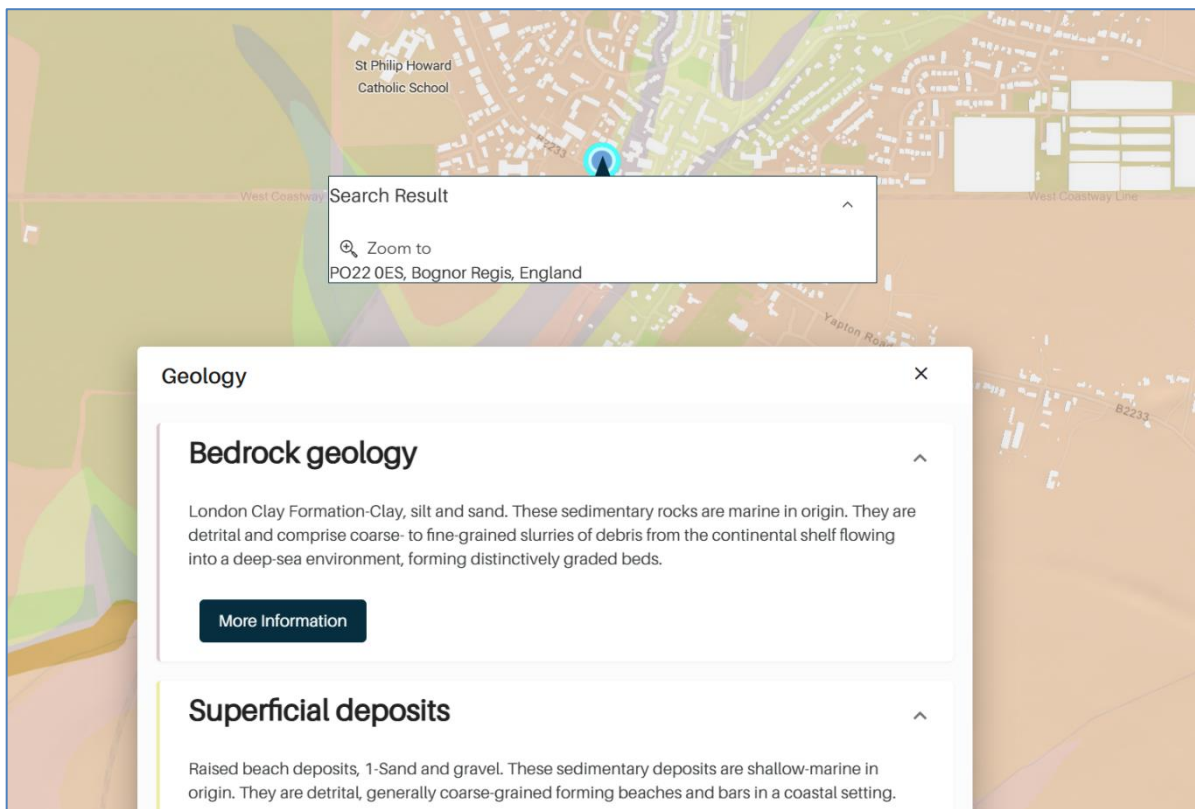


Figure 5 extract from BGS Bedrock and Superficial Deposits Mapping (source: BGS)

- 4.5 The BGS GeoIndex: Borehole Records provides publicly available borehole data at locations around England. These can provide general information relating to groundwater and can provide greater insight into site specific ground conditions. The closest BGS Borehole record at BGS ID: 20190189 : BGS Reference: SU90SE54 approximately 170m to the south west, shows standing groundwater level of 1.2mbgl (or c6.3mAOD).
- 4.6 The site (and dwellings) has an approximate level of 8.5mAOD (based on LiDAR), which would place expected groundwater levels at circa 2.2mbgl.
- 4.7 However, the BGS data should be taken as only indicative and should not be relied upon for detailed design of surface water management systems and during construction. Details of groundwater levels and soil permeability are unknown and should be confirmed. The design permeability should be investigated further for the purpose of surface water management on the site.

FLOOD DEFENCES

- 4.8 The Environment Agency releases a range of flood asset information as Open Data through their AIMS Defence (Spatial Flood Defences) GIS mapping. They are the only comprehensive and up-to-date group of datasets in England that show flood defences currently owned, managed or inspected by the EA.
- 4.9 Figure 6 provides an extract from the SFRA, this data shows that there are no defences within the immediate vicinity of the site.

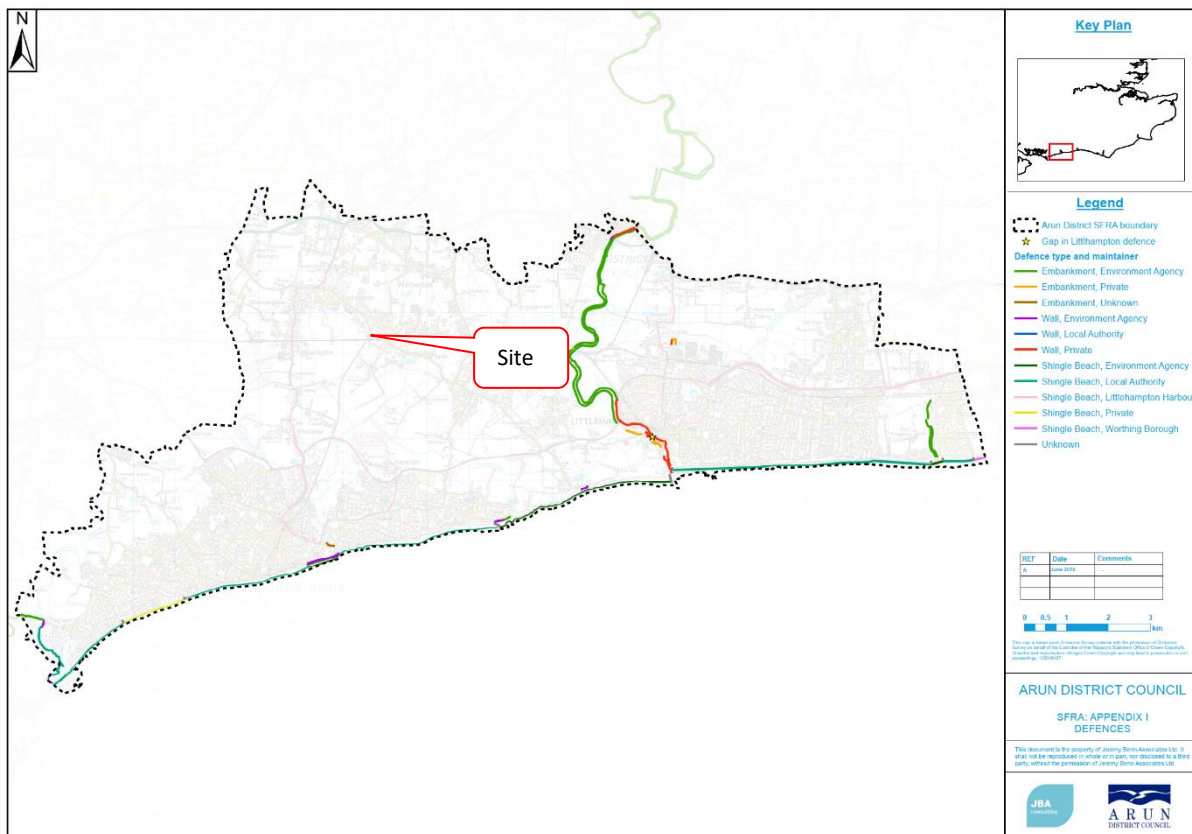


Figure 6 - Extract from EA AIMS Defence Dataset. Site edge red, defences shown in green

5 CLIMATE CHANGE

- 5.1 In 2022, the EA issued updated guidance on the impacts of climate change on flood risk in the UKCP18 to support the NPPF. This guidance sets out that peak rainfall intensity, sea level, peak river flow; offshore wind speed and extreme wave heights are all expected to increase in the future as a result of climate change.
- 5.2 The guidance acknowledges that in relation to certain factors there is considerable uncertainty with respect to the absolute level of change that is likely to occur. As such, in these instances, the guidance provides estimates of possible changes that reflect a range of different emission scenarios (Table 4).

Table 4 - Extract from NPPF designating Flood Risk Climate Change Allowances by Flood Zone and Use. The developments required climate change probability scenario is highlighted blue

FLOOD ZONE	ESSENTIAL INFRASTRUCTURE	HIGHLY VULNERABLE	MORE VULNERABLE	LESS VULNERABLE	WATER COMPTABLE
1/2	Higher Central and Upper End	Higher Central and Upper End	Central and Higher Central	Central	None of these allowances
3a	Upper End	Development should not be permitted	Higher Central and Upper End	Central and Higher Central	Central
3b	Upper End	Development should not be permitted	Development should not be permitted	Development should not be permitted	Central

INCREASES IN SURFACE WATER FLOODING AND RAINFALL ALLOWANCES

- 5.3 When considering climate change impacts to surface water (pluvial) flooding, The DEFRA peak climate change rainfall allowances detail predicted rainfall increase due to climate change in different regions around England. For all developments with a design epoch up to (and presently beyond) 2070, the NPPF states developments should adopt the Upper End and Central allowances. The site-specific climate change allowances based on the DEFRA data is summarised in Table 5 below and should also be adopted for the purposes of surface water drainage design.

Table 5 - Summary of Table 2: peak rainfall intensity allowance in small catchments (less than 5km²) or urban drainage

Management Catchment peak rainfall allowances 2070's	3.3% Annual Exceedance Probability Event	1% Annual Exceedance Probability Event
Central	25%	25%
Upper End	40%	45%

- 5.4 The EA, through their RoFSW Climate Change mapping, presents the risk which takes account for climate change in the near term up to 2060 and based on the latest UK Climate Projections (UKCP18) from the Met Office, using the Representative Concentration Pathway (RCP) 8.5 associated with the Central Allowance. This data can be considered suitable for assessing short term development and understanding the sensitivity of a catchment to increases in rainfall, however for developments with a design life in excess of 2060 (and in the absence of additional climate change modelling) the Low risk event (1 in 1000 year event or 0.1% AEP) is used to assess climate change impacts.
- 5.5 All Councils considers the implementation of SuDS as an essential element of reducing future flood risk to both the site and its surroundings. Indeed, reducing the rate of discharge from sites is one of the most effective ways of reducing and managing flood risk. SuDS can effectively be used to minimise the potential increase of risk to the property and users in the future. In accordance with the NPPF, the sites surface water drainage should account for minimum 45% climate change allowance to site rainfall profiles, to ensure climate change is appropriately considered.
- 5.6 SUDS should try to achieve an infiltration solution, however careful consideration of the underlying geology and its principal nature as an aquifer needs to be considered in the water quality and treatment aspects of the drainage design.

6 SOURCES OF FLOOD RISK

- 6.1 To assist the implementation of the Governments NPPF, the EA has undertaken national scale flood risk mapping. This mapping considers a range of sources including flooding from rivers, sea, surface water and reservoir breach. Furthermore, each Council produces a Strategic (county scale) Flood Risk Assessments (SFRA) that aim to specifically identify local flood risk issues (such as critical drainage areas and local groundwater flooding).
- 6.2 The following section reviews both the EA data as well as the relevant information available from the SFRA.

HISTORICAL, SEWERS AND DRAINAGE

- 6.3 A common source of flooding is a result of sewer or other drainage infrastructure becoming surcharged and flooding.
- 6.4 The SFRA does not directly present any records relating to sewer flooding directly impacting the site, although one record of surface water flooding was experienced in the area. The EA have confirmed that there are no historical records of flooding affecting the site directly.
- 6.5 There have been no other noted flood events specifically at the site, however this does not directly indicate that the site has not flooded in the past or may flood in the future.
- 6.6 Therefore, it is considered the risk of sewer flooding to the site is low, assuming that any new development flows include appropriate protective measures to manage runoff and not increase the risk of sewer flooding.

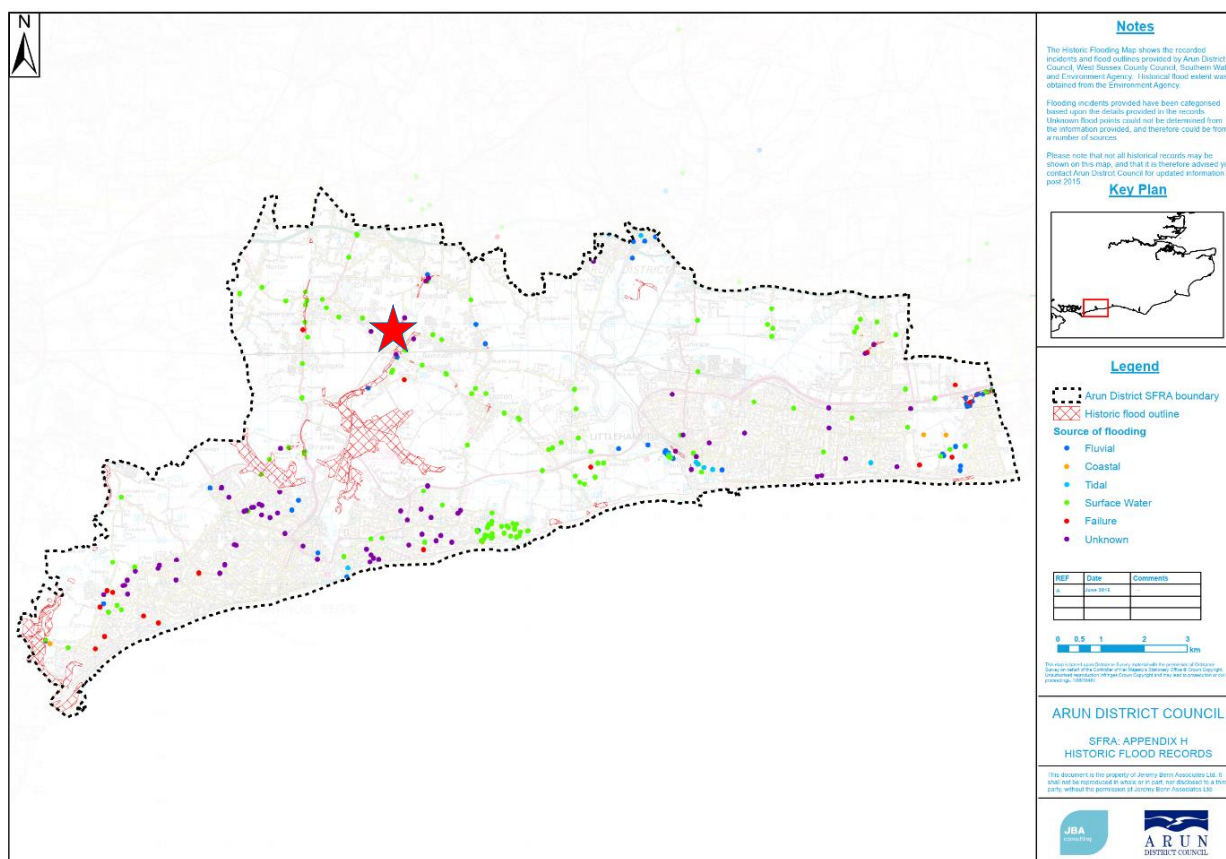


Figure 7 - extract from SFRA Appendix B - Historical Flooding (star marks approximate site location).

GROUNDWATER

- 6.7 Groundwater flooding is the emergence of groundwater at the ground surface or into subsurface voids arising as a result of:
- ⇒ abnormally high groundwater heads or flows;

- ⇒ the introduction of an obstruction to groundwater flow; or
- ⇒ the rebound of previously depressed groundwater levels.

- 6.8 Groundwater flooding usually occurs following a prolonged period of low intensity rainfall. As groundwater flow is much slower than surface flow, the flooding may not recede for long periods of time, typically weeks or even months. It is important to recognise the risk of groundwater flooding is typically highly variable and heavily dependent upon local geology, topography and weather conditions, as well as local abstraction regimes. Groundwater flooding is hard to predict and challenging to mitigate.
- 6.9 Groundwater susceptibility maps are typically designed for planners, identifying areas where groundwater flooding might be an issue. The computer models used to classify areas produces maps with a pixel size of approximately 50 metres. Because of this coarse resolution it is possible that the actual susceptibility at your property may be different due to small-scale variations in rock and soil type and local landscape. It's important to note that Susceptibility is not the same as risk. These maps show where there is the potential for groundwater flooding but do not give any indication of the probability that it will occur.
- 6.10 The SFRA, shows that the site is in an area where groundwater flood risk is considered to be greater than 75% (or high risk) (see Figure 8). However, it should be noted that groundwater depths so close to a tidal body can be influenced by change in tidal ranges. Nonetheless, the data would still suggest that overall groundwater flood risk is likely to be low to the site.

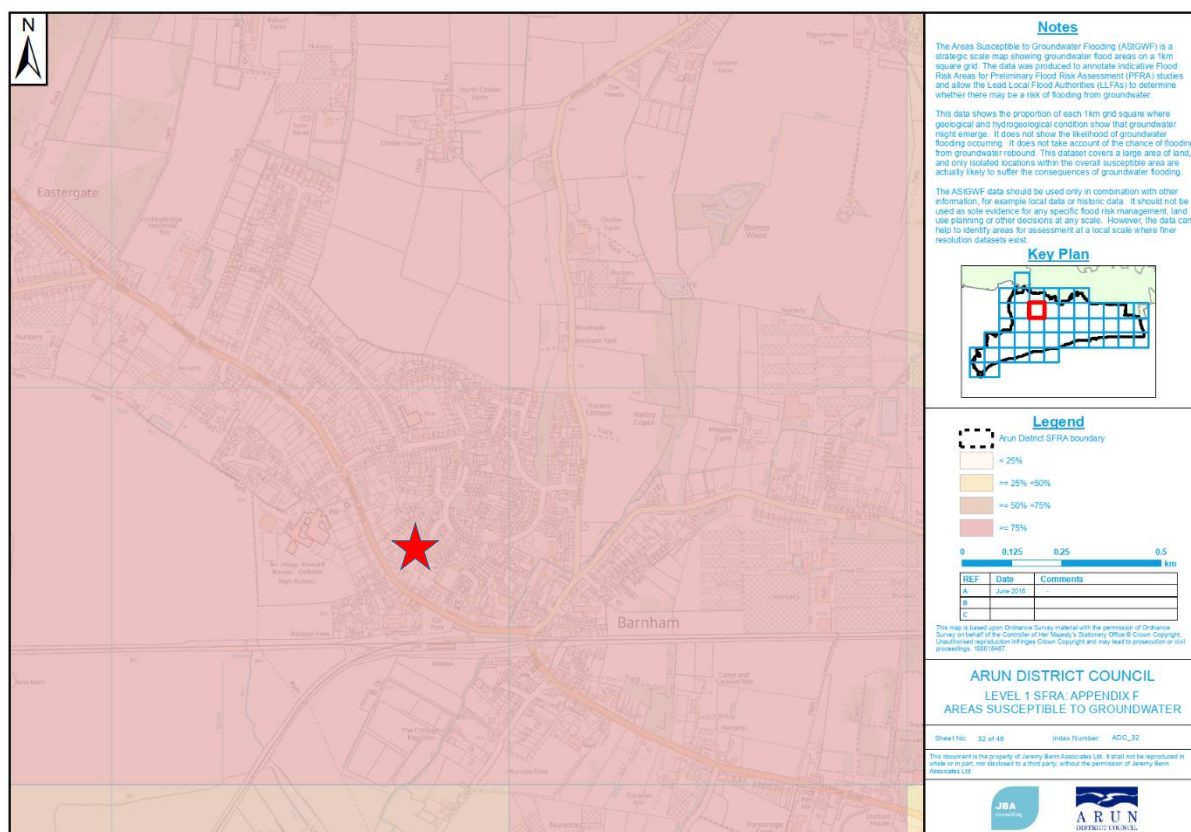


Figure 8 extract from SFRA Groundwater flood map risks (star marks approximate site location).

- 6.11 So, although information from the maps can be used to highlight an area at risk, it is not designed to be used as a sole indicator of groundwater flooding susceptibility and risk at individual properties. The BGS and SFRA's recommend the following for assessing site specific risk:
1. Review BGS geological maps or and BGS (or site specific) borehole records for information on water strikes and groundwater levels. Where underlying geology of is sufficiently permeable, this may allow groundwater to rise more freely and frequently

2. Review the RoFSW mapping, should groundwater emerge at surface, its flow path can be estimated by looking at the RoFSW mapping. However, it should be noted that groundwater flows at surface are a lot lower than surface water runoff events, however groundwater flows may occur over a longer period. Therefore, the risk event assessed for the DFE for groundwater flooding is the high-risk surface water event (or the 1 in 30 year event).
3. Review historical records and SFRA mapping, for example, if a specific property has experienced groundwater related flood risk in the past. This is often the best indicator of site-specific risk for groundwater flooding and can carry the most weighting in assess risk.

6.12 Table 6 below provides a summary of groundwater flood risk indicators as advised by the BGS. It is considered that if any of these risk indicators are negative (or not present), then the overall risk of groundwater emergence is likely to be low.

Table 6 - Summary of groundwater flood risk indicators to the site

GROUNDWATER FLOOD RISK SUMMARY		
Data Source	Risk Indicator	Risk Present
BGS Geological Maps	Is the underlying geology permeable (such as gravels and sands) and may allow free flow of groundwater	Yes
BGS/Site Borehole Data	Is the depth to Groundwater less than 1m	No
Surface Water Flood Risk	Is there surface water flood risk present in the high-risk 1 in 30 year event	No
Historical Records	Does the SFRA include any records of groundwater flooding occurring at the site	No
SUMMARY OF GROUNDWATER FLOOD RISK		LOW

6.13 The potential effects of climate change on groundwater levels are uncertain. Greater seasonality in groundwater level fluctuation is a potential outcome under a pattern of higher winter rainfall and less summer rainfall. Broad predictions of the impacts of climate change on groundwater levels are difficult to make at the present time

RESERVOIR

6.14 Reservoir flooding is very different from other forms of flooding. It may happen with little or no warning and evacuation will need to happen immediately. The likelihood of such flooding is difficult to estimate, but it is less likely than flooding from rivers or surface water. It may not be possible to seek refuge upstairs from floodwater as buildings could be unsafe or unstable due to the force of water from the reservoir breach or failure. The risk of inundation to the study area as a result of reservoir breach or failure of several reservoirs within the area was assessed as part of the National Inundation Reservoir Mapping (NIRIM) study.

6.15 The EA has undertaken failure scenarios of the UK reservoirs and summarised these extents through their Long Term Flood Risk Maps for Reservoir Flooding. This data shows the individual flood extents for all large, raised reservoirs in the event that they were to fail and release the water held on a “wet day” when local rivers had already overflowed their banks. Flood extents are not included for smaller reservoirs or for reservoirs commissioned after the reservoir modelling programme began in October 2016

6.16 It represents a prediction of a credible worst case scenario, however it’s unlikely that any actual flood would be this large. The data gives no indication of likelihood or probability of reservoir flooding. A review of this data shows that the site is at low risk flooding from this source.

RESIDUAL RISKS

6.17 Residual risks are those remaining after applying the sequential approach to the location of development and taking mitigating actions. Examples of residual flood risk include:

- the failure of flood management infrastructure such as a breach of a raised flood defence, blockage of a surface water conveyance system, overtopping of an upstream storage area, or failure of a pumped drainage system;
- failure of a reservoir, or;
- a severe flood event that exceeds a flood management design standard, such as a flood that overtops a raised flood defence, or an intense rainfall event which the drainage system cannot cope with.

6.18 Given that the site is not located behind flood defences or in a reservoir failure area, the primary risk to the site is residual failure of onsite drainage or an extreme exceedance event.

OFFSITE IMPACTS OF DEVELOPMENT

6.19 In accordance with Paragraph 167 of the *National Planning Policy Framework (NPPF)*, development should ensure that it “does not increase flood risk elsewhere” and should “manage residual risks of flooding by ensuring safe access and escape routes are included where appropriate, and any residual risk is safely managed.” The proposed development has been designed and assessed to ensure full compliance with these requirements.

6.20 The assessment confirms that post-development runoff rates will be limited to existing greenfield discharge rates, in line with *Planning Practice Guidance: Flood Risk and Coastal Change* (Reference ID: 7-050-20220825). The Sustainable drainage measures have been incorporated to attenuate stormwater on-site for all events up to and including the 1 in 100 year + climate change allowance, ensuring no increase in the volume or rate of surface water leaving the site.

6.21 Furthermore, as required by NPPF Paragraph 159 and PPG guidance, the design ensures that flood risk will not be transferred to adjacent land or downstream receptors. The development proposals will not displace existing flood plain volumes or intercept existing surface water overland flow paths. The proposed drainage strategy will be required to operate effectively during extreme events, preventing exceedance flows from leaving the site in an uncontrolled manner.

6.22 The development therefore satisfies the NPPF and PPG policy tests by:

- ⇒ Managing runoff on-site through appropriately designed attenuation and discharge control;
- ⇒ Incorporating exceedance routing to direct flows away from vulnerable receptors;
- ⇒ Ensuring no increase in flood risk to third-party land under current or future climate scenarios.
- ⇒ Refer to Section 8 for demonstration of “safe” access and egress.

6.23 To prevent flooding from failure of the local urban drainage system, regular maintenance should be undertaken of the gullies, sewers and laterals within, and in the vicinity of, the site.

6.24 The long term maintenance of the surface water sewers and road gullies within the site will be the responsibility of the developer, landowner or a management company which may be set up to maintain the site,

7 BUILDING MATERIAL MITIGATIONS

7.1 The final step in the flood risk management hierarchy is to mitigate through building design. NPPF considers this as the least preferred option and should not be used in place of the sequential approach to land use planning on a site. The Department for Communities and Local Government has published guidance on improving the flood performance of new buildings. The guide identifies a hierarchy of building design which fits within step 5 of the flood risk management hierarchy of NPPF (assess, avoid, substitute, control and mitigate). This is set out below:

- ⇒ **Flood avoidance:** Constructing a building and its surrounds (at site level) to avoid it being flooded (e.g. by raising it above the flood level).
- ⇒ **Flood resistance:** Constructing a building in such a way to prevent flood water entering the building and damaging its fabric.
- ⇒ **Flood resilience:** Constructing a building in such a way that although flood water may enter the building its impact is reduced (i.e. no permanent damage is caused, structural integrity is maintained and drying and cleaning are facilitated).
- ⇒ **Flood repairable:** Constructing a building in such a way that although flood water enters a building, elements that are damaged by flood water can be easily repaired or replaced.

7.2 The EA Guidance on Flood Risk Assessment: Local Planning Authorities sets out to help the designer determine the best option or design strategy for flood management at the building site level, based on knowledge of basic flood parameters (e.g. depth, duration and frequency). Depending on these parameters (in particular depth) and after utilising options for flood avoidance at site level, designers may opt for a water exclusion strategy or a water entry strategy, as illustrated in Figure 9.

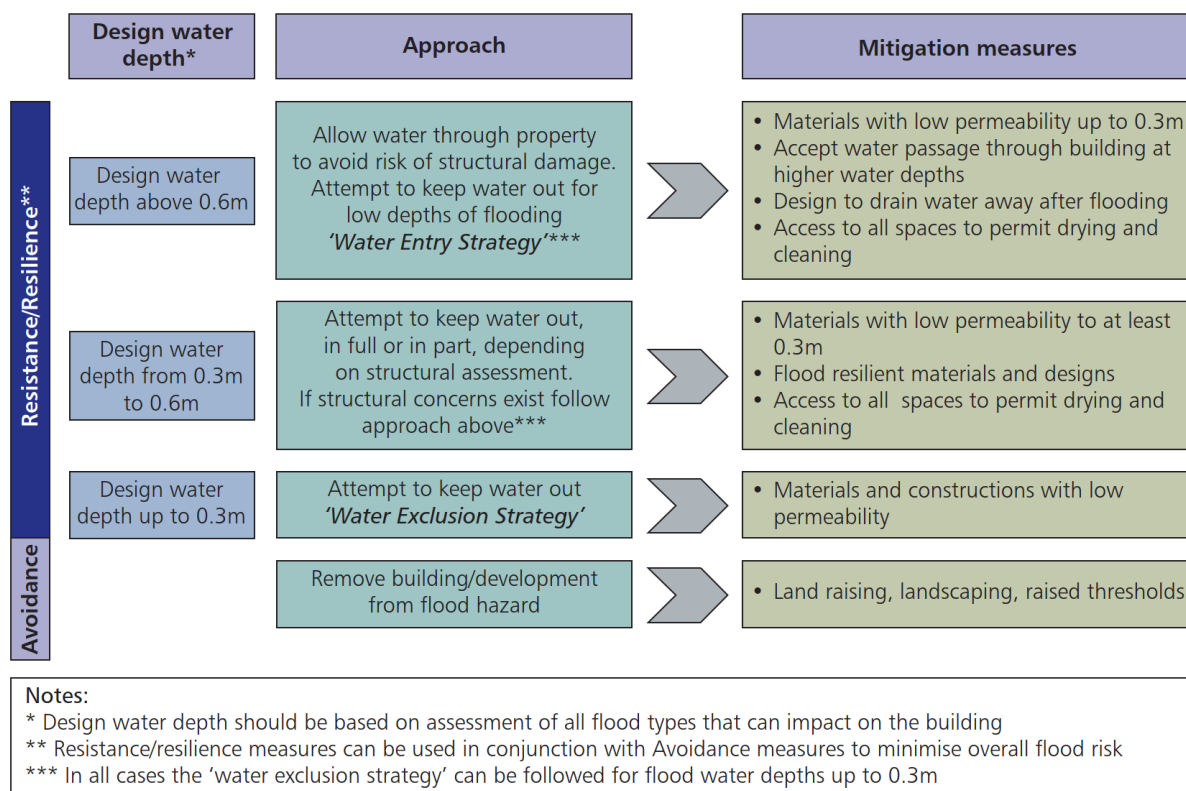


Figure 9 - Flexible and risk averse approaches to flood risk management and safe development (source: Figure taken from "Improving the Flood Performance of New Buildings – Flood Resilient Construction")

7.3 The adoption of either Water Exclusion or Water Entry is based on the expected flood depth that may affect a building or site. These are summarised below:

- ⇒ **Water exclusion strategy** is when the emphasis is placed on minimising water entry whilst maintaining structural integrity, and on using materials and construction techniques to facilitate drying and cleaning. This strategy is favoured when low flood water depths are involved (not more than 0.3m). According to the definitions adopted in this Guidance, this strategy can be considered as a resistance measure, but it is part of the aim to achieve overall building resilience
- ⇒ **Water entry strategy** is when the emphasis is placed on allowing water into the building, facilitating draining and consequent drying. Standard masonry buildings are at significant risk of structural damage if there is a water level difference between outside and inside of about 0.6m or more. This strategy is therefore favoured when high flood water depths are involved (greater than 0.6m) by utilising resilient materials, and construction methods.
- ⇒ **Flood resistant measures** are incorporated where it is considered feasible to prevent floodwater entering the building and take the form of flood barriers. Many flood resistant products/barriers are only suitable to typical maximum height being 0.68m, before the risk of structural damage is incurred. As this is a historic structure with limited scope for structural reinforcement.
- ⇒ **Flood resilient measures** are incorporated where it is accepted that, in severe flood events, water may enter parts of the building so it is necessary to ensure the building will remain useable after the floodwater has receded and the area has been cleaned. Therefore, materials should be incorporated that retain their structural integrity and have good drying and cleaning properties or are waterproof, and services and sockets etc. are located as high as practical to minimise flood damage.

7.4 Given the primary risk is related to surface water flooding most likely from an exceedance event or failure of onsite drainage, it is considered that some key principles of the **Water Exclusion Strategy** should be adopted for the buildings on the site. Some simple construction measures can greatly protect buildings during such an event without incurring large additional construction costs. Some recommendations include:

- The route of all electrical services will run from ceilings at ground floor (where possible), down toward sockets;
- All plumbing insulation to be of closed-cell design;
- Non-return valves to be fitted to all drain and sewer outlets;
- (If possible) Finish Floor Levels to be minimum 150mm above external ground levels.
- External ground levels are graded to direct exceedance runoff around buildings and building thresholds.

7.5 Further detail can be found at <https://assets.publishing.service.gov.uk/> and within BS 85500:2025-Flood resistant and resilient construction. Guide to improving the flood performance of buildings for applicable strategies.

8 EMERGENCY ACCESS AND EGRESS

8.1 Under the UK National Planning Policy Framework (NPPF) and its supporting Planning Practice Guidance (PPG), residential development must ensure that safe access and egress is provided during flood events. The key points regarding flood-free or safe access and egress are as follows:

1. Policy Requirements – NPPF & PPG

Paragraph 167 of the NPPF states that new development should be planned to avoid increased vulnerability to the range of impacts arising from flood risk, and where development is necessary in areas at risk of flooding:

"...it should be made safe for its lifetime without increasing flood risk elsewhere."

- This includes ensuring that safe access and escape routes are included as part of a flood risk assessment (FRA). The PPG elaborates that safe access and egress must be:

"...provided to enable the occupants of the development to reach a place of safety during a design flood event."

2. Definition of "Safe" Access and Egress

The PPG identifies three key principles for access/egress:

- Access and egress should be safe for all users, including the most vulnerable (e.g. elderly, disabled).
- Safe pedestrian access is the minimum requirement.
- Routes should remain operational and not become inaccessible or hazardous during a design flood event (typically the 1% AEP or 1 in 100-year flood + climate change allowance).

3. Depth, Velocity, and Hazard Thresholds

The PPG refers to the Environment Agency's flood hazard matrix (Table 13.1 of FD2320), where safe pedestrian access is generally considered to be:

- Flood depth < 0.3 metres
- Velocity < 0.5 m/s
- Hazard rating < 0.75 (Very low hazard)

If flood conditions exceed these thresholds, evacuation must occur before flooding, or dry/raised routes must be available.

4. Location and Route Criteria

Safe access/egress must connect to dry land or a safe refuge, typically beyond the 1% AEP + CC flood outline (Flood Zone 1). Therefore, to comply with the NPPF, all occupants should be able to make their way, unassisted by the Emergency Services, to dry land. This is known as 'safe access to dry land' and does not have to be dry, just not *hazardous* at the peak of the predicted critical 1% (1 in 100 year) plus climate change storm.

8.2 As demonstrated in the preceding sections, the site and its points of access and egress onto Barnham Road are at very low risk of flooding from all sources. Therefore, there is unlikely to be flood related impacts to access and egress in the DFE. If, however the area is impacted by flooding, it is advised that occupants proceed north west away from the Barham Rife where flood risk is likely to be considerably worse in extreme weather events.

9 FLOOD EVACUATION PLANNING

- 9.1 If in the worst-case scenario, flooding has begun and depths appear anywhere along the escape routes appear to be greater than 25cm, it is advised that the occupants seek refuge within the dwelling on the first floor.
- 9.2 The Environment Agency usually issues a flood alert between 2 and 12 hours before flooding. Flood alerts are usually issued during waking hours where possible.

FLOOD HAZARD PREVENTION

- 9.3 It is recommended that the residential occupants are aware of the emergency procedures and local evacuation and contact points.
- 9.4 Each occupant of the site should be made fully aware of the flood risks and made aware of the required evacuation route away from the site and to Flood Zone 1.
- 9.5 Each occupant **MUST** be registered for flood alerts and warnings.

WARNING PROCEDURES

- 9.6 This section contains general information on the types of flood warning available to site owners and occupants, as well as suggested actions in the event of these warnings being enacted.
- 9.7 The EA operates a 24-hour telephone service on 0345 988 1188 that provides frequently updated flood warnings and associated floodplain information.
- 9.8 The site owner(s) **MUST** register for this service. It is advised that all residents/occupants and also register for this service, as site owner(s) may not be on site at the time of a flood event. It is the responsibility of the site owner to make this service available to all users.
- 9.9 Further information can be found on www.environment-agency.gov.uk/floodline and <https://www.iow.gov.uk/keep-the-island-safe/severe-weather/flooding/>. Floodline Warnings Direct is a free service operated by the EA that provides flood warnings direct to occupants by telephone, mobile phone, fax or pager.
- 9.10 It is the responsibility of the site owner(s) to keep the evacuation routes and areas of safe refuge known to all occupants and clear at all times.
- 9.11 Upon receipt of a flood warning, and following liaison and agreement with the Emergency Services, the site should be evacuated.
- 9.12 All occupants should be advised not to return to the site until the site is deemed to be safe for return by the Emergency Services / EA. If flood waters have receded the site can be accessed provided it is safe to do so.
- 9.13 Site owners will be responsible for informing future occupants and site owners of the risk posed from flooding.

THE EVACUATION PROCEDURE

- 9.14 It is the property owner's responsibility to liaise with the Emergency Services in relation to the decision to evacuate all occupants.
- 9.15 The Emergency Services will become the lead agencies in respect to the flood incident. Emergency Services will lead on the decision to evacuate and any subsequent evacuation of the development. The site owner(s) will be responsible for making contact with all occupants and site users as required during an evacuation event.
- 9.16 Once the decision to evacuate has been made, it is the site owner's responsibility to make contact with occupants as required during an evacuation event. If any occupants cannot or will not evacuate the Emergency Services are required to be informed immediately.

- 9.17 The residents should continue to liaise with the Emergency Services and Emergency Planners throughout the evacuation procedure and will report to them once the evacuation has been successful to avoid unnecessary strain on the resources of the Emergency Services.
- 9.18 If feasible, occupants should inform supervisors, close relatives and friends of their safe evacuation, this will also help avoid unnecessary strain on the resources of the Emergency Services.
- 9.19 As flood hazard is a combination of the depth and velocity of floodwater, evacuees should **not** enter floodwater unless:
- Emergency Services are present as part of an assisted / supervised evacuation,
 - **or if the depths are below 25cm before evacuating.**
- 9.20 The Emergency Services, including but not limited to the Police and the Fire Brigade will be the lead agencies in respect of flood evacuation.
- 9.21 Evacuees should ensure that their chosen action and route is suitable to all members of their party (i.e. the elderly, very young, or disabled).

SAFE REFUGE PROCEDURES

- 9.22 Safe refuge is considered a last resort but is available within the dwelling (as FFLs are designed to be above the DFE). Safe refuge is advised when flood waters are perceived to be deeper than 250mm (25cm) along a proposed access route (unless directed by emergency services), and instead occupants should seek safe refuge within the building.
- 9.23 To facilitate making an informed decision during a flooding event, it is recommended that the site owners/ occupants sign up to the EA flood alert service and monitor weather reports as per the EA guidance.

10 FLOOD MITIGATION MEASURES

- 10.1 The proposals allow the opportunity to improve flood resilience of the site by incorporating several flood mitigation measures, both through the incorporation of flood resilient building materials, surface water drainage improvements and signing up to the EA Flood Warning/Alert System.
- 10.2 Table 7 presents the key flood mitigation measures based the critical DFE on the NPPF and PPG decision making principles:

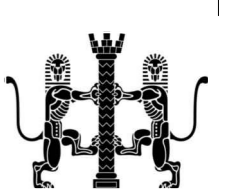
Table 7 - Key Decision Making principles and measures applied to avoid, control, mitigate, and manage flood risk

DECISION MAKING: ORDER OF PRIORITY	PROPOSED MEASURES
1. Avoid	The proposed residential use is shown to be sequentially located on land above all modelled DFE's. Therefore, the proposals have been designed to avoid flooding of the dwelling for all DFE's and flood risk to the proposals is generally considered to be low.
2. Control	Surface Water Drainage systems should be designed to accommodate the 1 in 100 year plus climate change DFE.
3. Mitigate	Recommend that the developer incorporates the recommendations of BS 85500:2025 - Flood resistant and resilient construction.
4. Manage residual flood risk	Safe Access and Egress is deemed possible.
5. Flood Risk is not increased elsewhere	<p>Any new drainage should be designed in accordance with Building Regulations Part H, SuDS Manual and 'DCG' guidance, ensuring drainage proposals include an allowance for climate change.</p> <p>Any additional flows to be directed into the Local Sewer Authorities public sewers or water courses to receive confirmation of capacity and connection approvals prior to detailed design and construction.</p>

11 CONCLUSION

- 11.1 This assessment is required under the National Planning Policy Framework (NPPF) and Local and District Councils given the location, scale and associated flood risks.
- 11.2 Table 3 summarises the sites primary flood risk classifications and the source for the DFE. This designation is based on the EA's Flood Map for Planning (extract provided in Figure 2 below) and the EA's Risk of Flooding from Surface Water (RoFSW) (extract provided in Figure 3).
- 11.3 Based on the information available at the time of writing, this FRA has confirmed the site is in an area at very low risk of flooding (including an allowance for climate change) from all sources of flood risk (including fluvial, sea, surface water and groundwater).
- 11.4 Table 7 summarises how this FRA has applied the PPG's key decision making principles to avoid, control, mitigate, manage residual risk and to ensure the development proposals do not increase flood risk post development. Based on the PPG and NPPF, and assuming the recommendations of this FRA are followed, it is considered that a residential development on this site should be considered appropriate.
- 11.5 To assist in mitigating the present flood risk to the site's users based on the development proposals, several recommendations have been discussed, the core of these include:
- The sites drainage should be designed in accordance with Building Regulations Part H, SuDS Manual and 'DCG' guidance, ensuring drainage proposals include an allowance for climate change and that there is no additional strain placed on downstream infrastructure.
 - Any additional flows to be directed into the Local Sewer Authorities public sewers to receive confirmation of capacity and connection approvals prior to detailed design and construction.
 - Adopt the measures (as applicable) within Local Government (CLG) 2007 'Improving the Flood Performance of New Buildings' publication.
- 11.6 This report demonstrates that the proposals could be accommodated within the site in accordance with the EA guidance, Council SFRA, and the NPPF. It is considered that as long as the development follows the advice presented in this report, that the development proposals should be considered appropriate at this location.

APPENDIX 1 – ARCHITECTURAL PROPOSALS



Car Park

Client	Elberry Estates Ltd							
Job title	84 Barnham Road Barnham West Sussex PO22 0ES							
Drawing title	Proposed Site Plan							
Drawn	Date	Checked	Date	Scale at A1				
AE	Sep 25	CJP	Sep 25	1:200				
Job No.	Pro.	Org.	Zone	Level	Type	Role	No.	Rev.
23-087	BHR	MHA	XX	00	DR	A	0043	P05
Purpose of Issue								
PRELIMINARY								