

Flood Risk Assessment – Felpham Road

Final Report

March 2021

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Contract

This report describes work commissioned by David Dean, on behalf of Welby Dean Property, by an email dated 16th February 2021. Welby Dean Property's representative for the contract was David Dean. Lucy Archer-Lock of JBA Consulting carried out this work.

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Purpose

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Abbreviations

AEP	Annual Exceedance Probability
BGS	British Geological Survey
CC	Climate Change
CFMP	Catchment Flood Management Plan
DTM	Digital Terrain Model
EA	Environment Agency
FRA	Flood Risk Assessment
FZ	Flood Zone
JBA	Jeremy Benn Associates
LFRMS	Local Flood Risk Management Strategy
LiDAR	Light Detecting and Ranging
LPA	Local Planning Authority
mAOD	Metres Above Ordnance Datum
NPPF	National Planning Policy Framework
PPG	Planning Practise Guidance
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan

Executive summary

Site Summary

The site is located on Felpham Road, Felpham Bognor Regis.

The site has an existing building located on it. The majority of this building is a residential dwelling and the building is semi-detached. The ground floor contains commercial property. The floor area of the ground floor commercial unit is approximately 28m². It is proposed to convert the existing ground floor shop space into residential use. There is no proposed alteration to the external extent of the building, only internal works.

The site is accessed from Felpham Road. The surrounding area is residential.

The site sits approximately 125m east of the Aldingbourne Rife and 300m from the English Channel.

Flood Risk Summary

This Flood Risk Assessment reviews the potential flood risk to the site from a range of sources and follows government planning guidance and Local Planning Authority (LPA) policy.

The risk from flooding at the site can be summarised as follows:

Fluvial/Tidal Flood Risk – The EA's Flood Map for Planning shows that the site is in Flood Zone 3 with a **high** probability of from flooding from tidal sources (greater than 1 in 200 chance of flooding in any year). However, this is associated with an undefended scenario.

Tidal flooding is the dominant mechanism of flooding effecting the wider area. The site benefits from the presence of flood defences. Fluvial flooding does not affect the site.

For the defended scenario, with a site level of 2.84m AOD, the site would not be affected by flooding during present day or modelled climate change flood events. The existing floor level is approximately 450mm above the site level and further reduces risk to the proposed conversion of the building.

The policy for maintenance of the flood defences is 'hold the line'. Therefore, it can reasonably be expected that flood defences will be raised in line with climate change projections, and thus the probability of tidal flooding in the future will not increase.

Therefore, the probability of tidal flooding to the proposed development can be considered to be **low**.

Surface Water Flood Risk - The Environment Agency's Flood Map for Surface Water shows the site to be unaffected by surface water flooding in events up to the 0.1% AEP event and therefore is at a **very low** risk.

Groundwater Flood Risk - No specific records of groundwater flooding at the development site and the immediate surrounding area have been found. Given the proposed development is conversion of an existing building that is raised above ground level, the risk of flooding from groundwater is considered to be **low**.

Flood Risk from Sewers - The Arun District Council Level 1 SFRA includes a postcode level assessment of previous sewer flooding. This indicates 36 sewer flooding incidents have been recorded within the PO22 7 postcode, however this does not specifically reference the development site and does not contain information about specific properties. It is also not known whether these incidents were caused by exceedance of the sewer system, or by operational issues such as blockages. The risk from flooding of sewers is therefore considered to be **medium**.

Reservoir Flood Risk – The Reservoir flood risk mapping does not indicate that the site would be affected by flooding from reservoirs.

Flood Mitigation Measures

As the proposal is for the conversion of an existing building, there are design limitations in terms of the measures that can be implemented (e.g. raising the ground floor level).

Due to the nature of the proposed development, flood mitigation measures are not considered necessary given the building is not shown to be at risk of flooding from tidal sources in the defended scenario, including allowance for climate change. The proposed development will not increase flood risk elsewhere as no changes are being made to the external building.

1 Introduction

1.1 Project Background

JBA Consulting (JBA) was commissioned by Welby Dean Property in February 2021 to undertake a Flood Risk Assessment (FRA) to support a planning application for a proposed development site at 23a Felpham Road, Felpham, Bognor Regis, PO22 7DA. The development will convert the commercial property on the ground floor of the existing building into a residential dwelling.

This FRA has been prepared using existing published flood data and Product 4 data obtained from the Environment Agency. Product 4 data includes: detailed Flood Risk Assessment Mapping, including flood zones, defences and storage areas, areas benefiting from defences, statutory main river designations, historic flood event outlines and more detailed information from the EA's computer river models.

1.2 Requirements

The development site encroaches within Environment Agency (EA) mapped Flood Zone 3, and therefore, under national planning policy and guidance, a Flood Risk Assessment (FRA) is required.

This assessment must demonstrate that the development will be safe throughout its lifetime and that the proposed development will not lead to an increase in flood risk elsewhere.

This report assesses flood risk at the study site from all sources of flooding.

2 Site Details

2.1 Site Description

The site is located on Felpham Road, Felpham, Bognor Regis.

The site has an existing building located on it. The majority of this building is a residential dwelling and the building is semi-detached. The ground floor contains commercial property. The floor area of the ground floor commercial unit is approximately 28m². There is a garden at the rear of the property.

The site is accessed from Felpham Road. The surrounding area is residential.

Figure 2-1 shows the location of the site. Table 2-1 provides general background information on the site location and relevant authorities.

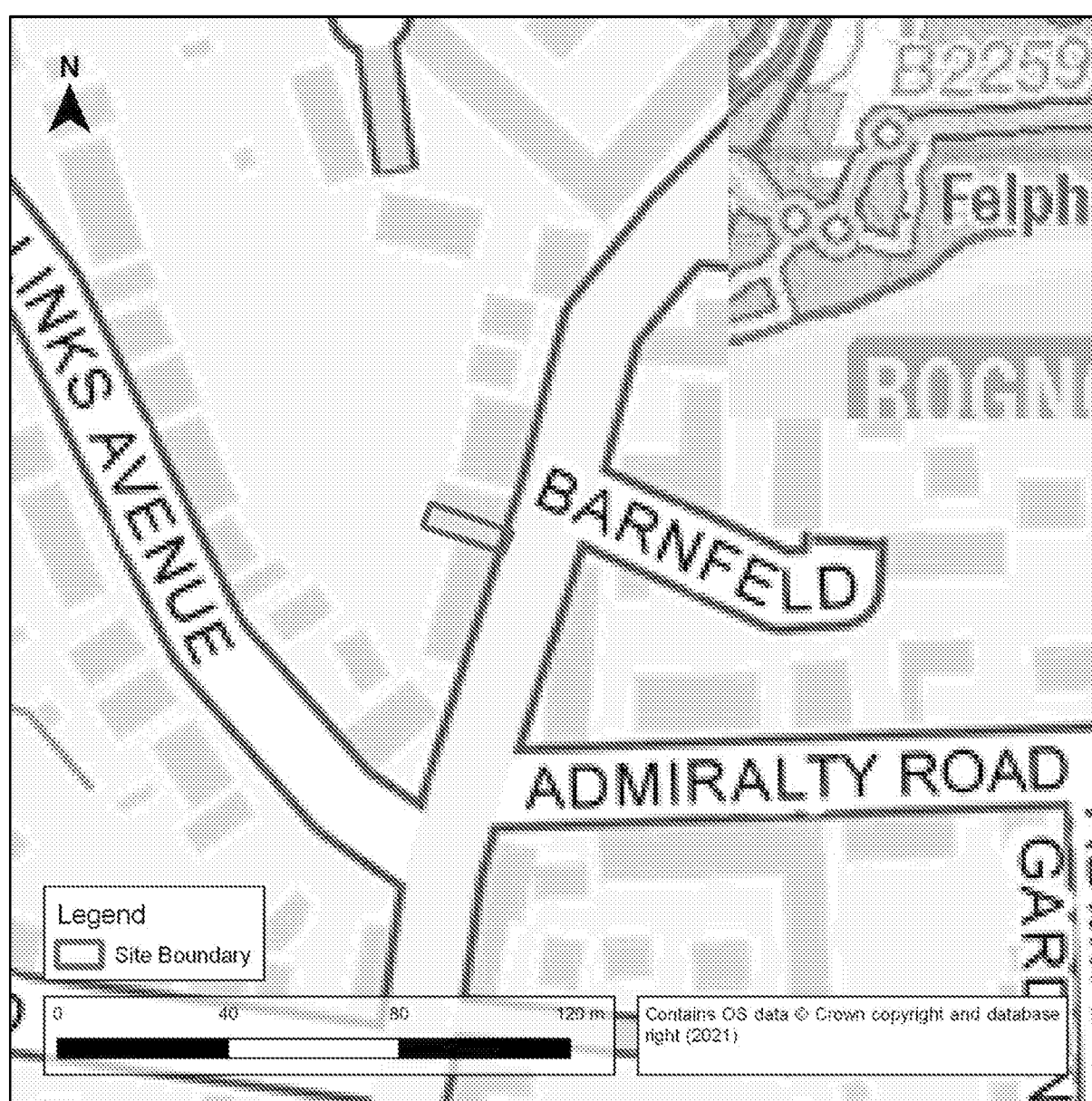


Figure 2-1: Site Location



(image capture April 2019, ©Google 2021)

Figure 2-2: Current Site Condition

Table 2-1: Site Information

Site Name	23a Felpham Road
Site Area	Ground floor unit approx. 28m ²
Address	23a Felpham Road, Felpham, Bognor Regis
Postcode	PO22 7DA
Grid Reference	SZ 94840 99605
Existing Land-Use	Ground floor commercial property, remaining building residential
Proposed Development	Residential
County	West Sussex
Local Planning Authority	Arun District Council
Lead Local Flood Authority	West Sussex County Council

2.2 Proposed Development

It is proposed to convert the existing ground floor shop space into residential use. The floor area of the unit is approximately 28m². There is no proposed alteration to the external extent of the building, only internal works. The flat will be self contained and on the ground floor only.

2.3 Site Topography

The EA's 2m DTM LiDAR 2017 for the study area is shown in Figure 2-3. The site is relatively flat and located on low-lying ground. The ground level generally slopes from east-west with the lowest levels in the garden at the rear of the property.

The current floor level of the property is 450mm above road level. Assuming the lowest road level of 2.84m AOD at the front of the property, as shown in Figure 2-4, this would give an approximate finished floor level of the existing building of 3.29m AOD.

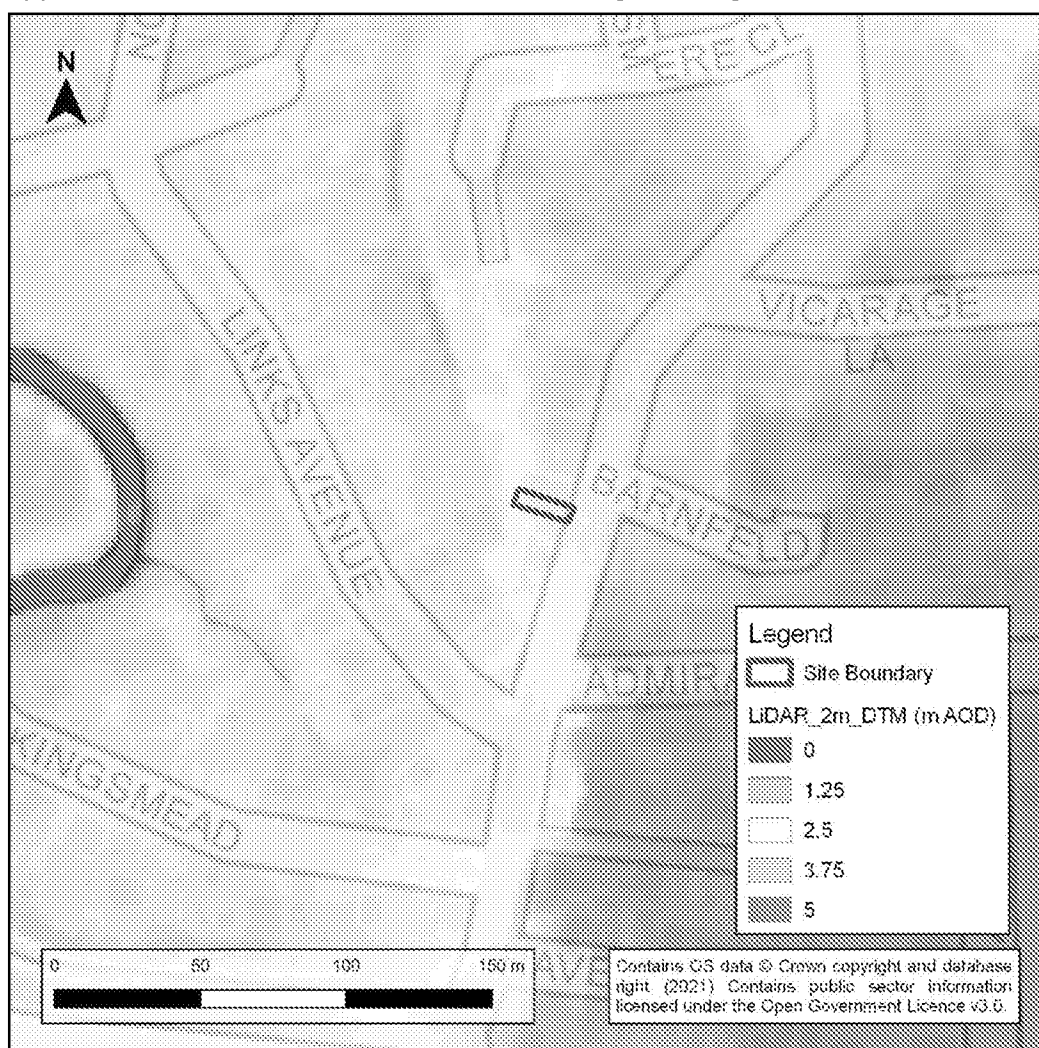


Figure 2-3: Site Topography

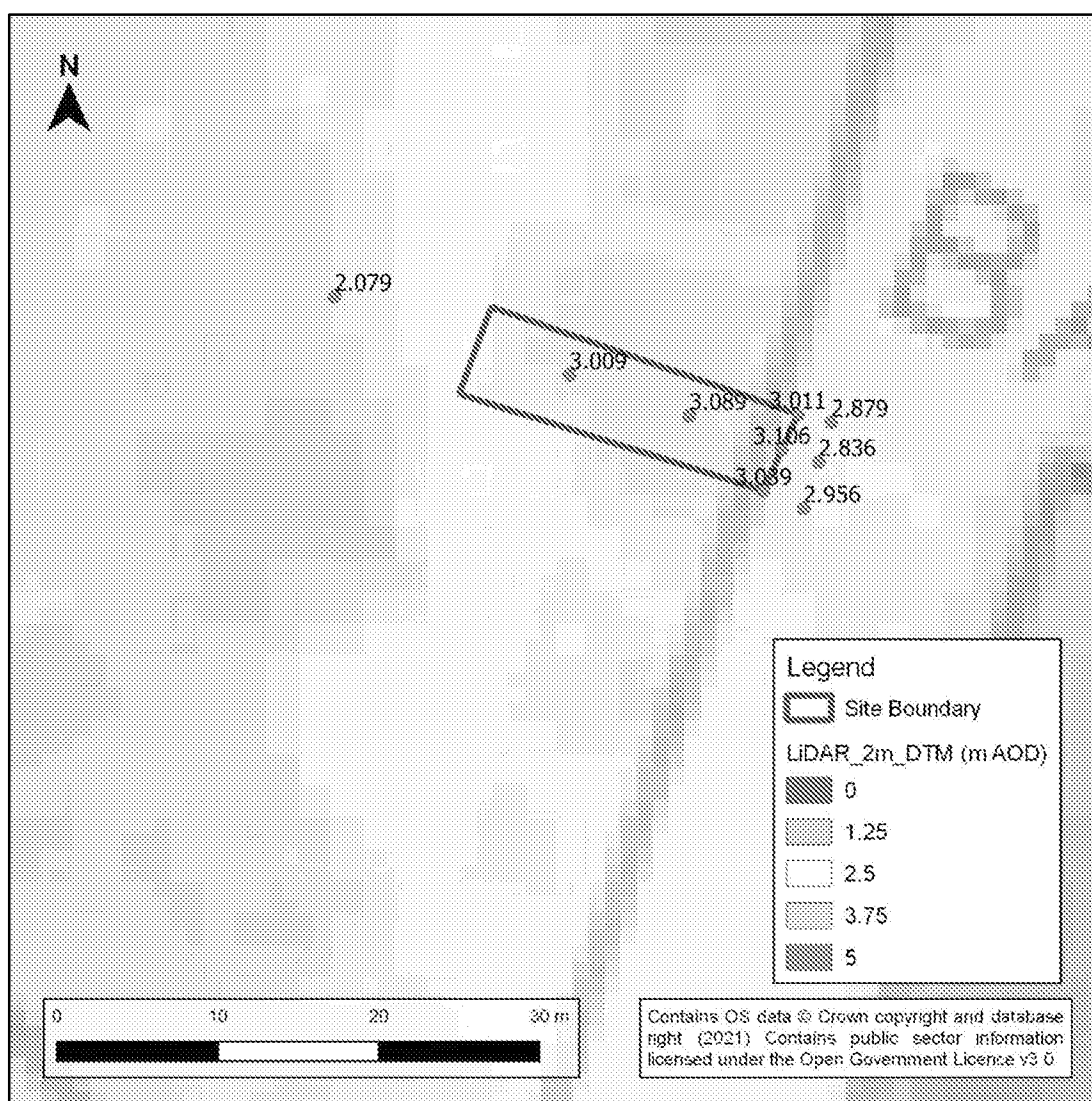


Figure 2-4: Site Levels

2.4 Watercourses

The site sits approximately 125m east of the Aldingbourne Rife. The English Channel is approximately 300m south-east of the site.

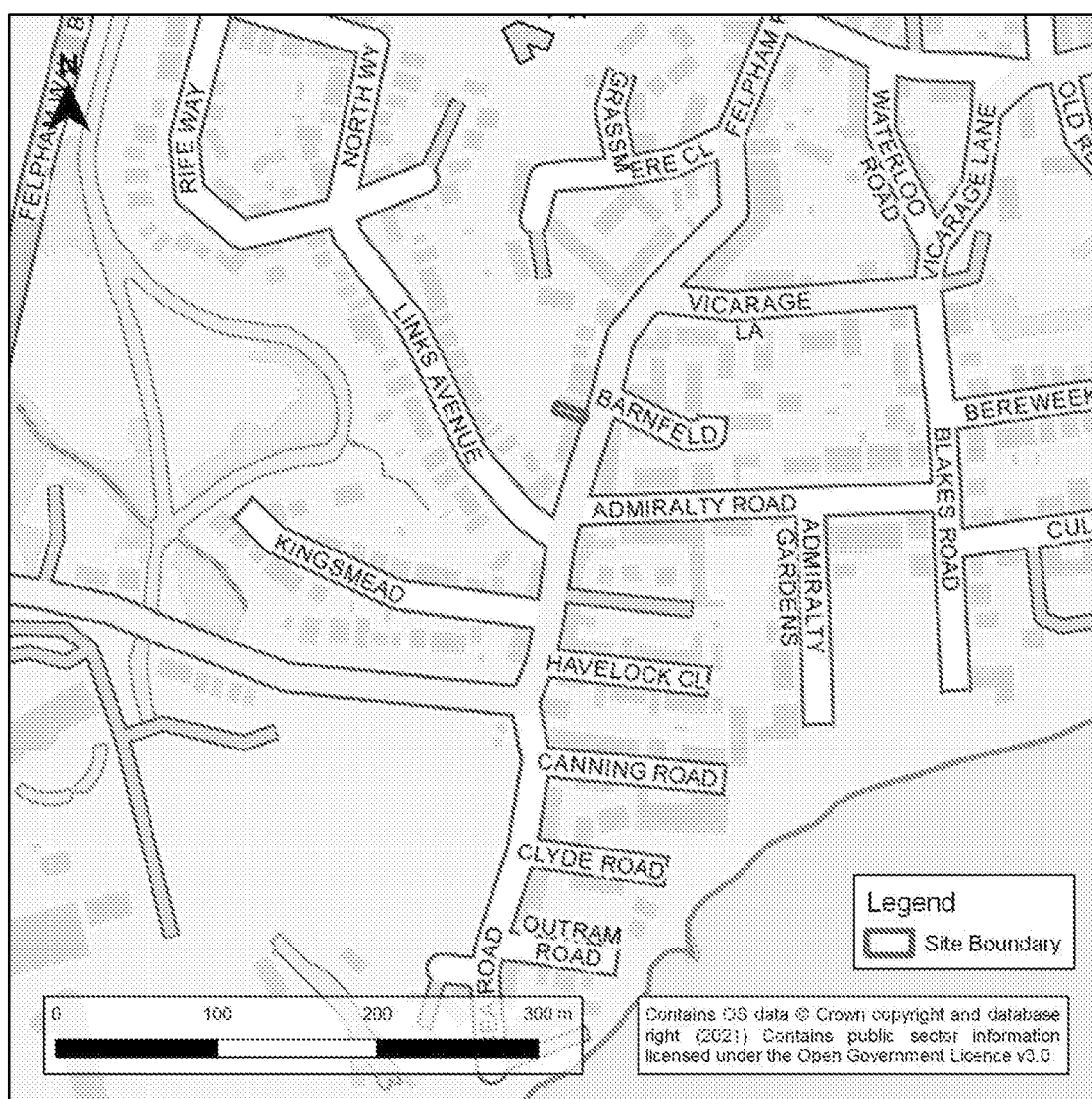


Figure 2-5: Nearby Watercourses

2.5 Geology and Soils

The British Geological Survey (BGS) Geology of Britain Viewer¹ was used to identify the bedrock geology underlying the site. The site is situated upon chalk.

In terms of soils, the Landis Soils Vues Viewer² shows that the site is located upon loamy and clayey soils of coastal flats with naturally high groundwater.

2.6 Historical Flooding

The site is not within the EA's historic flood extents mapping and the EA do not hold records of previous flooding events affecting this site. The Arun District Council Level 1 and Level 2 Strategic Flood Risk Assessment (2016)³ does mention records of surface water flooding in Felpham in May 2009, November 2010, June 2012, however these do not specifically refer to the development site.

¹ <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

² <http://www.landis.org.uk/soils/soils/>

³ <https://www.arun.gov.uk/download.cfm?doc=docm93jjm4n9774.pdf&ver=9670>

3 Planning Policy and Flood Risk

3.1 Planning Context

The National Planning Policy Framework (NPPF) was introduced by the Department for Communities and Local Government (DCLG) in March 2012 (and updated in February 2019) and supersedes the Planning Policy Statements. This framework provides technical guidance relating to development planning and flood risk using a sequential characterisation of risk based on planning zones and the EA Flood Map. The main study requirement is to identify the Flood Zones and vulnerability classification relevant to the proposed development, based on an assessment of current and future conditions. The NPPF is accompanied by Planning Policy Guidance (PPG) on Flood Risk and Coastal Change, which gives further information on the approaches to be adopted in the assessment of flood risk for new development.

3.2 Development Site Flood Zones

The EA states that the flood risk is a function of:

1. "The likelihood of a particular flood happening, best expressed as a chance or probability over a period of one year. For example, a 1 in 100-year (1% Annual Exceedance Probability (AEP)) flood means that 'there is a 1 in 100 chance of flooding in any given year in this location.'"
2. "The impact or consequences that will result if the flood occurs."

The EA categorise the risk into a series of Flood Zones; a definition of these Flood Zones can be found in Table 3-1. The EA has also developed a Flood Map which shows the risk of flooding in England for different return period events.

The EA also provide additional flood information upon request (such as Product 4 Data). This information provides the basis for the assessment of flood risk and development suitability. Table 3-2 shows how the Flood Zones relate to a sequential planning response as advised by the NPPF.

It should also be noted that the EA flood map does not take into account flood defences or the residual flood risk associated with culvert blockages, sewer flooding or any other specific local conditions.

The EA Flood Map for Planning (Figure 4-1) shows that the site is within Flood Zone 3. This is discussed further in Section 4.

3.3 NPPF Flood Zones

Table 3-1 shows how the Flood Zones relate to a sequential planning response. Advisory notes placed upon various types of development are detailed in Table 3-2. Details of permitted development and the Exception Test requirements are provided in Table 3-3.

The NPPF classifies the proposed development as 'More Vulnerable'. The construction of this type of development is permitted in Flood Zone 1, 2 & 3a. Therefore, according to the NPPF, the proposed development in the proposed location is appropriate.

Table 3-1: NPPF Flood Zones⁴

Zone 1: Low Probability	
Land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1% AEP).	Appropriate Uses: All uses of land are appropriate in this zone. FRA Requirements: For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in an FRA. This need only be brief unless factors above or other local considerations require particular attention. Policy Aims: Developers and Local Planning Authorities (LPAs) should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage systems.
Zone 2: Medium Probability	
Land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1% AEP) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% – 0.1% AEP) in any year.	Appropriate Uses: The water-compatible, less vulnerable and more vulnerable uses of land and essential infrastructure in Table 3-2 are appropriate in this zone. Highly vulnerable uses in Table 3-2 are only appropriate in this zone if the Exception Test is passed. FRA Requirements: All proposals in this zone should be accompanied by an FRA. Policy Aims: Developers and LPAs should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development, and the appropriate application of sustainable drainage techniques.
Zone 3a: High Probability	
Land assessed as having a 1 in 100 or greater probability of river flooding (>1% AEP) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5% AEP) in any year.	Appropriate Uses: The water-compatible and less vulnerable uses of land in Table 3-2 are appropriate in this zone. The highly vulnerable uses in Table 3-2 should not be permitted in this zone. The more vulnerable and essential infrastructure uses in Table 3-2 should only be permitted in this zone if the Exception Test is passed. Essential infrastructure permitted in this zone should be designed and constructed to remain operational and safe for users in times of flood. FRA Requirements: All proposals in this zone should be accompanied by an FRA. Policy Aims: Developers and LPAs should seek opportunities to: reduce the overall level of flood risk through the layout and form of the development and the appropriate application of sustainable drainage techniques; relocate existing development to land in zones with a lower probability of flooding; create space for flooding to occur by restoring functional

⁴ Source: Table 1, PPG/NPPF Technical Guidance.
FII-JBAU-XX-XX-RP-EN-0001-S3-P01-Felpham_Road_FRA

	floodplain and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage.
Zone 3b: Functional Floodplain	
Land where water has to flow or be stored in times of flood. LPAs should identify in their Strategic Flood Risk Assessments (SFRA) areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. But land which would flood with an annual probability of 1 in 20 (5% AEP) or greater in any year or is designated to flood in an extreme (0.1% AEP) flood, should provide a starting point for consideration and discussions to identify functional floodplain.	Appropriate Uses: Only the water-compatible uses and the essential infrastructure listed in Table 3-2 that has to be there should be permitted. It 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. Essential infrastructure in this zone should pass the Exception Test. FRA Requirements: All proposals in this zone should be accompanied by an FRA. Policy Aims: In this zone, developers and local authorities should seek opportunities to: reduce the overall level of flood risk through the layout and form of the development and the appropriate application of sustainable drainage techniques; relocate existing development to land with a lower probability of flooding.

Table 3-2: Classification of Flood Risk Vulnerability⁵

Essential Infrastructure	Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. Wind turbines.
Highly Vulnerable	Police stations, Ambulance stations and Fire stations and Command Centres and telecommunications installations required to be operational during flooding. Emergency dispersal points. Basement dwellings. Caravans, mobile homes and park homes intended for permanent residential use (Sequential and Exception Tests required for any change of land use to these sites). Installations requiring hazardous substances consent (where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the faculties should be classified as "Essential Infrastructure").

⁵ Source: Table 2, NPPF Technical Guidance
FII-JBAU-XX-XX-RP-EN-0001-S3-P01-Felpham_Road_FRA

More Vulnerable	Hospitals. Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. Buildings used for: dwelling houses; student halls of residence; drinking establishments; nightclubs; and hotels. Non-residential uses for health services, nurseries and educational establishments Landfill and sites used for waste management facilities for hazardous waste. Sites used for holiday or short-let caravan and camping, subject to a specific warning and evacuation plan.
Less Vulnerable	Police, ambulance and fire stations which are not required to be operational during flooding. Buildings used for: shops; financial, professional and other services; restaurants and cafes; hot food takeaways; offices; general industry; storage and distribution; non-residential institutions not included in 'more vulnerable'; and assembly and leisure. Land and buildings used for agriculture and forestry. Waste treatment (except landfill and hazardous waste facilities). Minerals working and processing (except for sand and gravel working). Water treatment works and which do not need to remain operational during times of flood. Sewerage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).
Water - Compatible Development	Flood control infrastructure. Water transmission infrastructure and pumping stations. Sewage transmission infrastructure and pumping stations. Sand and gravel workings. Docks, marinas and wharves. Navigation facilities. MOD defence installations. Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. Water-based recreation (excluding sleeping accommodation). Lifeguard and coastguard stations. Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

Notes:

These classifications are based partly on Defra/Environment Agency research on Flood Risks to People (FD2321/TP2) and also on the need of some uses to keep functioning during flooding.

Buildings that combine a mixture of uses should be placed into the higher of the relevant classes of flood risk sensitivity. Developments that allow uses to be distributed over the site may fall within several classes of flood risk sensitivity.

The impact of a flood on the particular uses identified within this flood risk vulnerability classification will vary within each vulnerability class. Therefore, the flood risk management infrastructure and other risk mitigation measures needed to ensure the development is safe may differ between uses within a particular vulnerability classification.

Table 3-3: Flood Risk Vulnerability and Flood Zone 'Compatibility'⁶

Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test	✓	✓
	Zone 3a	Exception Test	✓	X	Exception Test	✓
	Zone 3b	Exception test	✓	X	X	X

✓ - Development Appropriate X - Development should not be permitted

This table does not show:

The application of the sequential test which guides development to Flood Zone 1 first, then Zone 2, and then Zone 3; Flood Risk Assessment requirements; The policy aims for each flood zone

3.4 Planning for Flood Risk

3.4.1 Sequential and Exception Tests

The Sequential Test aims to promote development in low flood risk areas, while the Exception Test is used where no suitable development areas can be found in low risk zones. When planning a development, a sequential approach should be applied to identify suitable sites which are at minimal risk from flooding, avoiding Flood Zones 2 and 3 where possible. If no suitable areas can be identified in Flood Zone 1, then sites with the lowest flood risk should be considered next. If development is necessary within a medium (between a 1 in 100 and 1 in 1000 chance of flooding in any year) or high-probability zone (greater than a 1 in 100 chance of flooding in any year), the application of the Exception Test may be required to demonstrate the need for the development in that location and plans to mitigate flood risk.

The sequential approach should also be applied to the layout design of the proposed development, locating the most vulnerable development in the areas of lowest risk.

3.5 Flood Risk and Drainage Planning Guidance Review

The following area-specific documents or data sources were reviewed as part of this study:

- Beachy Head to Selsey Bill Shoreline Management Plan (2006)⁷
- Arun District Council Level 1 and Level 2 Strategic Flood Risk Assessment (2016)⁸
- West Sussex Local Flood Risk Management Strategy (2013)⁹

Conclusions from these documents with regards to flood risk relevant to the site and surrounding area, are provided in Section 4.

⁶ Source: Table 3, NPPF Technical Guidance

⁷ <https://se-coastalgroup.org.uk/shoreline-management-plans/beachy-head-to-selsey-bill/>

⁸ <https://www.arun.gov.uk/download.cfm?doc=docm93jjm4n9774.pdf&ver=9670>

⁹ https://www.westsussex.gov.uk/media/1596/west_sussex_lfrms_strategic_environmental_assessment_final.pdf

4 Assessment of Flood Risk

The flood risk from all sources of flooding is assessed in this section.

4.1 Fluvial/Tidal Flooding analysis

An analysis of fluvial and tidal flooding is undertaken in this section.

4.1.1 EA Product 4 data

Product 4 flood data for the development site was requested. This data and the published flood data are analysed further, below. Product 4 data includes: detailed Flood Risk Assessment Mapping, including flood zones, defences and storage areas, areas benefiting from defences, statutory main river designations, historic flood event outlines and more detailed information from the EA's computer river models. Refer to Appendix A for EA Product 4 data.

4.1.2 Published flood mapping

The Product 4 data shows that the modelled fluvial flooding, even for the 1% AEP event + 105% climate change allowance, does not reach the site. The Product 4 data indicates that Tidal flooding is the predominant form of flooding that affects the site and the surrounding area. Therefore, no further analysis of fluvial flooding is undertaken.

The EA's Flood Map for Planning is shown in Figure 4-1. The flood extents shown are the result of tidal flood modelling. It can be seen the site is in Flood Zone 3 with a **high probability** from flooding from tidal sources (greater than 1 in 200 chance of flooding in any year). The EA Flood Zones are produced using the natural floodplain scenario, i.e. no flood defences in place.

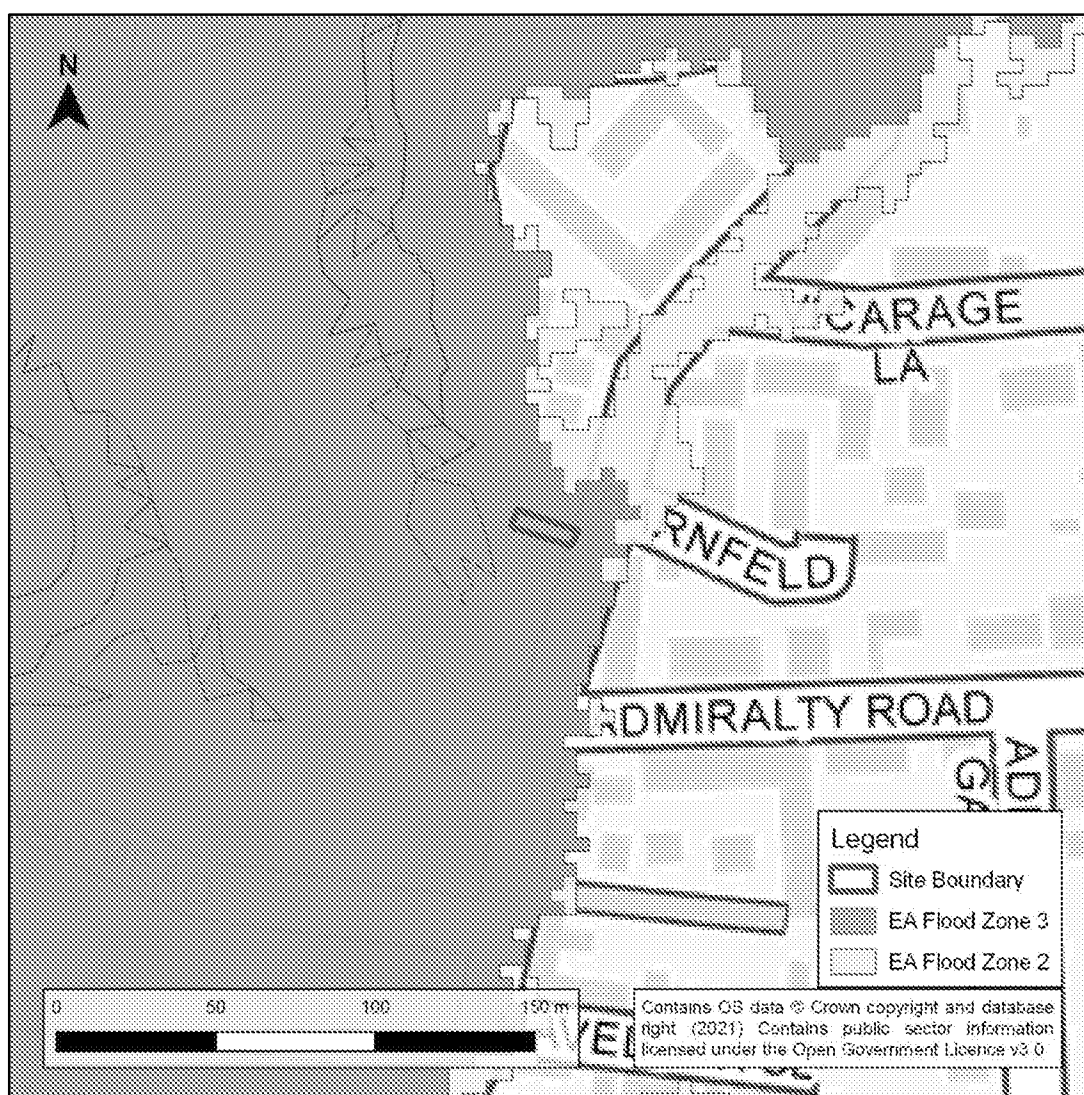


Figure 4-1: Environment Agency's Flood Map for Planning

4.1.3 EA Flood Defences

Figure 4-2 below shows that whilst the site is not identified by the EA as being within an area benefiting from flood defences, the site is located behind tidal defences (sea wall and embankment) along the sea front. The provided flood data includes both defended and undefended flood data; the defended flood levels at the site are lower than the undefended flood levels, and therefore the site does benefit from the presence of flood defences.

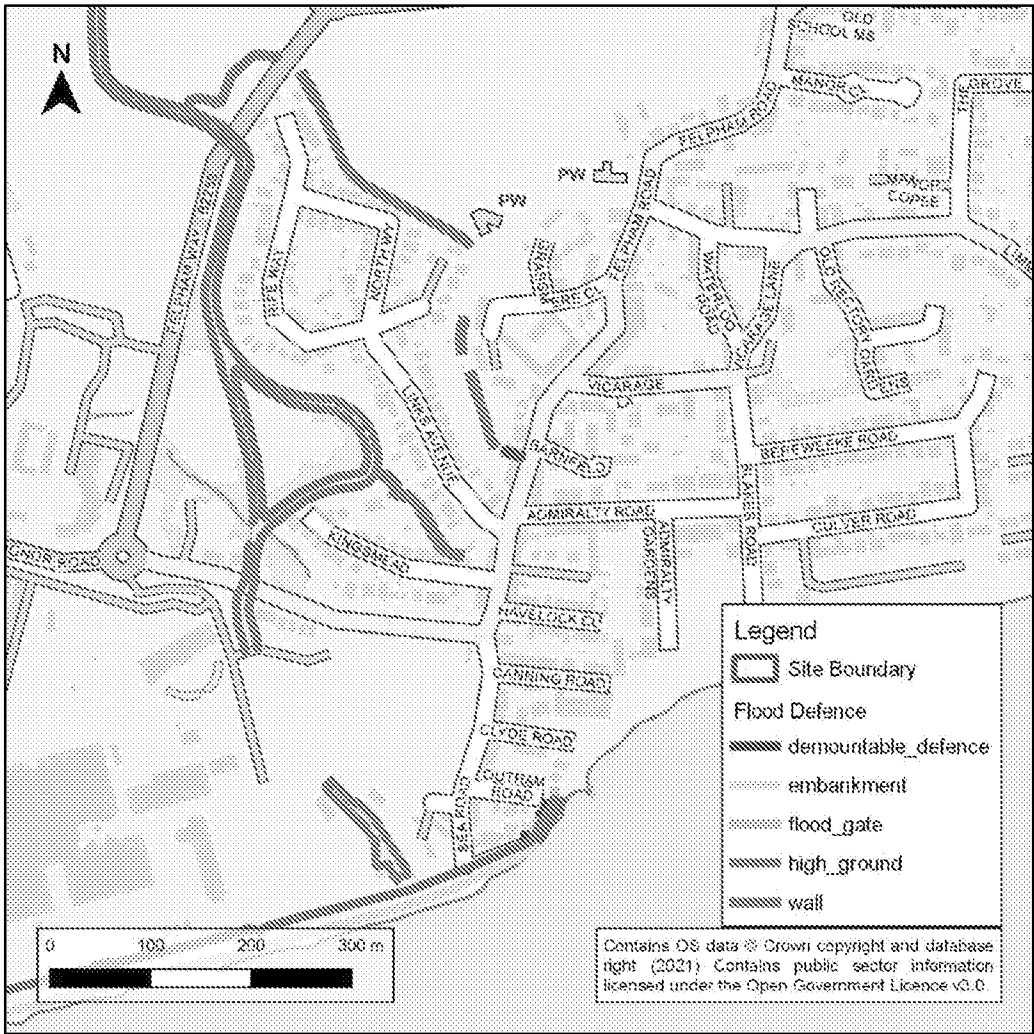


Figure 4-2: Environment Agency Flood Defences

The EA's Defended Tidal Flood Map, Figure 4-3 below, shows the flood extents with flood defences in place; this is the actual current scenario for the area. It can be seen that the site is outside of the 0.1% AEP flood extents and on the fringe of the modelled flood extents for the 0.5% AEP (2115) climate change event.

For the defended scenario, the present-day probability of flooding in any year is less than 1 in 1000. Therefore, the site has a **low** probability of flooding.

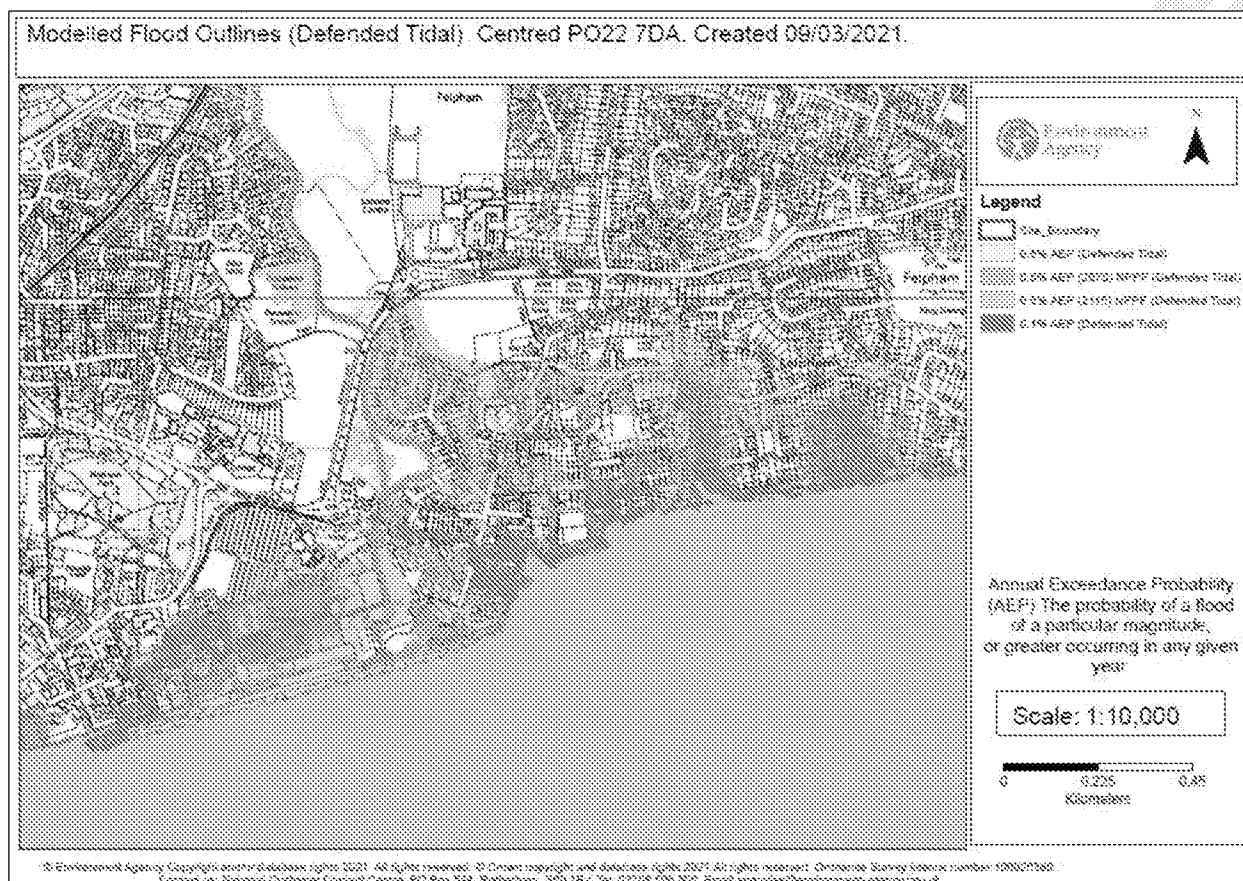


Figure 4-3: EA Tidal Defended Map

4.1.4 Present Day Modelled Flood Levels

The present day modelled flood levels closest to the site are provided below in Table 4-1 and Table 4-2.

Table 4-1: Defended Tidal Flood Levels

Defended Scenario	Maximum Level (mAOD)
0.5% AEP	No flooding
0.1% AEP	No flooding

Table 4-2: Undefended Tidal Flood Levels

Undefended Scenario	Maximum Level (mAOD)
0.5% AEP	3.10
0.1% AEP	3.37

4.1.5 Climate Change Allowances

Climate change (Fluvial)

The site is located within the South East River Basin District. Fluvial climate change allowances for this basin are shown in Table 4-3. Tidal climate change allowances are shown in Table 4-4.

Table 4-3: Peak River Flood Climate Change Allowances (South East)

Allowance Category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
H++	30%	60%	120%
Upper End	25%	50%	105%
Higher Central	15%	30%	45%
Central	10%	20%	35%

Table 4-4: Sea Level Climate Change Allowances (South East)

Allowance Category	2000 to 2035 (mm)	2036 to 2065 (mm)	2066 to 2095 (mm)	2096 to 2125 (mm)
Upper End	6.9 (242)	11.3 (339)	15.8 (474)	18.2 (546)
Higher Central	6.8 (242)	8.8 (264)	11.6 (348)	13.1 (393)

For the south east river basin district¹⁰, the higher central allowance, for the year 2125, the EA provide a total cumulative sea level rise of 1.20m, and for the upper end allowance, a total cumulative sea level rise of 1.60m. This climate change scenario is discussed further in Section 4.1.6.

4.1.6 Climate Change Modelled Flood Levels

The modelled climate change flood levels closest to the site are provided below in Table 4-5 and Table 4-6.

Table 4-5: Defended Tidal Flood Levels with climate change

Defended Scenario	Maximum Level (mAOD)
0.5% AEP (2115)	2.66
0.5% AEP (2121)*	2.77

¹⁰ <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

*A yearly sea level rise of 18.2mm was added to the modelled 2115 tidal flood level. Refer to Table 4-4 for allowances.

Table 4-6: Undefended Tidal Flood Levels with climate change

Undefended Scenario	Maximum Level (mAOD)
0.5% AEP (2115)	4.39
0.5% AEP (2121)*	4.50

*A yearly sea level rise of 18.2mm was added to the modelled 2115 tidal flood level. Refer to Table 4-4 for allowances.

4.1.7 Tidal Flood Levels Assessment

For the purposes of analysis of flood levels versus the site level, the level of the site is taken at the front of the existing building at a point on the road. This would generally be the route taken for emergency pedestrian access and egress during a flood event. The level is obtained from LiDAR data (refer Figure 2-4); the adopted level is 2.84m AOD.

The existing floor level of the building is raised above normal ground level (approximately 450mm). The floor level of the existing building is approximately 3.29m AOD. Refer to Appendix B for building elevations.

A comparison of the modelled flood levels (present day and future) versus the existing building floor level and site level has been undertaken below.

- **Present day defended** – Flood levels in Table 4-1 indicate that the site would not be flooded during the modelled flood events (up to the 0.1% AEP event). It can be assumed that adequate freeboard to the existing floor level (+450mm above site level) is therefore provided.
- **Climate Change 2121 defended** – Flood levels in Table 4-5 indicate that the site would not flood during the 0.5% AEP event (2121). It can be assumed that adequate freeboard to the existing floor level (+450mm above site level) is therefore provided.
- **Present Day undefended** – Flood levels in Table 4-2 indicate that the site (and building) would be subject to flooding during the present-day modelled flood events. However, the undefended scenario is not the actual site condition.
- **Climate Change 2121 undefended** - Flood levels in Table 4-6 indicate that the site (and building) would be subject to flooding during the present-day modelled flood events. However, the undefended scenario is not the actual site condition.

Due to the above analysis of the defended (actual) scenario, the probability of tidal flooding to the site can be considered to be **low**.

From review of the flood level data, the site is shown to benefit from the presence of EA flood defences; it can reasonably be expected that flood defences will be raised in future in line with climate change projections to maintain the current day standard of defence. This is supported by the Beachy Head to Selsey Bill Shoreline Management Plan (2017) which identifies a "maintain defences and hold the line" policy for Littlehampton Harbour to Selsey Bill behind which the site is located. Thus, the flood risk at the site will be maintained at present day levels. Therefore, if the EA flood defences are raised in line with climate change projections then the probability of flooding will remain as **low**.

4.2 Surface Water Flood Risk

Surface water flooding occurs when rain falling on saturated ground flows overland, following the local topography. Surface water flooding and subsequent overland flow can also originate from surcharging or blocked sewers and drains. Overland flow can therefore pose risks to developments sites and surrounding land. The surface water may originate from the site itself or from adjoining land a higher elevation from which flows migrates across the development site.

It is a requirement that all development and redevelopments of sites do not increase the risk of surface water flood elsewhere and that the development does not cause a deterioration in the water quality in local watercourses. Surface water flood risk can be exacerbated if the rate of runoff from the site is increased.

Surface water flood risk to the site has been assessed using the national scale Environment Agency Flood Map for Surface Water which identifies and classifies surface water flood risk into four categories:

- High Risk – A greater than 1 in 30 chance of flooding (>3.3% AEP) in any year.
- Medium Risk – A chance of flooding of between 1 in 30 and 1 in 100 (3.3% - 1% AEP) annually
- Low Risk – A chance of flooding of between 1 in 1000 and 1 in 100 (0.1% - 1% AEP) annually
- Very Low Risk – A chance of flooding of less than 1 in 1000 (<0.1% AEP) in any year.

The Environment Agency's Flood Map for Surface Water shows that the site is unaffected by surface water flooding in events up to the 0.1% AEP event and is therefore at a **very low** risk. In the 0.1% AEP event there is some surface water flooding shown on Felpham Road and also to the west of the garden at the rear of the property. Figure 4-4 below shows the EA's surface water flood map.

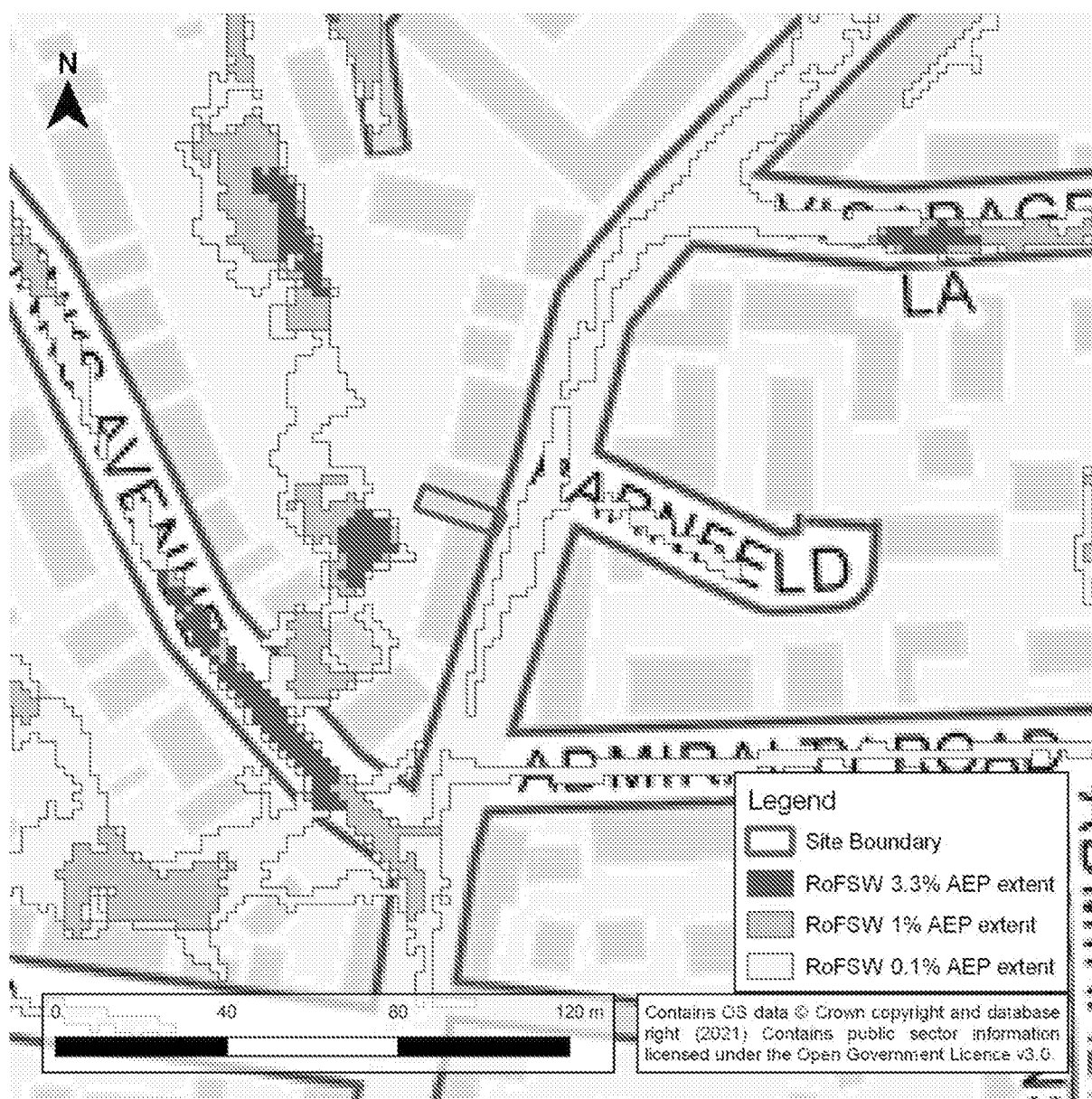


Figure 4-4: Environment Agency's Flood Map for Surface Water

4.3 Groundwater Flood Risk

Groundwater flooding occurs when the water table rises above ground level, especially after prolonged rainfall periods. This is most likely to occur in low-lying areas that are underlain by permeable bedrock and superficial geologies. Unlike other forms of flooding, groundwater flood does not pose a significant risk to life but can cause serious damage to property.

The review of flood related documentation (particularly West Sussex Local Flood Risk Management Strategy and Arun District Level 1 SFRA) did not identify the site as being at specific risk of groundwater flooding, however the documents did mention that there is a history of groundwater flooding in West Sussex and Arun District, due to the chalk geology. Mapping is provided as part of the SFRA, which uses the Area Susceptible to Groundwater Flooding (ASStGWF) dataset, which indicates the proportion of each 1km grid square where geological and hydrogeological conditions show groundwater might emerge. The development site is contained in a 1km grid square where the proportion is 50%-75%. However, it is important to note this dataset should be used only in combination with other information, such as local data or historical data.

No specific records of groundwater flooding at the development site and the immediate surrounding area have been found, given the proposed development is conversion of an existing building that is raised above ground level, the risk of flooding from groundwater is considered to be **low**.

4.4 Flood Risk from Sewers

Sewer flooding is caused by a blockage or incapacity of a sewer or urban drainage system. The sewers are administered by Southern Water who is a statutory sewerage undertaker and is responsible for the public sewerage systems within this area.

The Arun District Council Level 1 SFRA includes a postcode level assessment of previous sewer flooding. This indicates 36 sewer flooding incidents have been recorded within the PO22 7 postcode, however this does not specifically reference the development site and does not contain information about specific properties. It is also not known whether these incidents were caused by exceedance of the sewer system, or by operational issues such as blockages.

The risk from flooding of sewers is therefore considered to be **medium**.

4.5 Reservoir Flood Risk

Under the Reservoir Act 1975, in England the Environment Agency (as the enforcement authority) ensures that reservoirs are regularly inspected, and essential safety work is carried out. In 2009, the Environment Agency produced a series of reservoir inundation flood maps to show the extent of flooding should a reservoir fail or breach (i.e. the worst-case scenario). If a location is shown to be at risk, the regulated nature of reservoir management meant a failure is still extremely unlikely. There has been no loss of life in the UK from reservoir flooding since 1925.

The Environment Agency's Flood Risk from Reservoirs Map shows the potential extent of flooding that could occur as a result of the failure of a large reservoir. The mapping shows the development site as not being at risk of reservoir flooding.

4.6 Mitigation Measures

As the proposal is for the conversion of an existing building, there are design limitations in terms of the measures that can be implemented (e.g. raising the ground floor level).

Due to the nature of the proposed development, flood mitigation measures are not considered necessary given the building is not shown to be at risk of flooding from tidal sources in the defended scenario including allowances for climate change. The proposed development will not increase flood risk elsewhere as no changes are being made to the external building.

5 Summary and Conclusions

5.1 Site Summary

The site is located on Felpham Road, Bognor Regis.

The site has an existing building located on it. The majority of this building is a residential dwelling and the building is semi-detached. The ground floor contains commercial property. The floor area of the ground floor commercial unit is approximately 28m². It is proposed to convert the existing ground floor shop space into residential use. There is no proposed alteration to the external extent of the building, only internal works.

The site is accessed from Felpham Road. The surrounding area is residential.

The site sits approximately 125m east of the Aldingbourne Rife and 300m from the English Channel.

5.2 Flood Risk Summary

This Flood Risk Assessment reviews the potential flood risk to the site from a range of sources and follows government planning guidance and Local Planning Authority (LPA) policy.

The risk from flooding at the site can be summarised as follows:

- **Fluvial/Tidal Flood Risk** – The EA's Flood Map for Planning shows that the site is in Flood Zone 3 with a high probability of from flooding from tidal sources (greater than 1 in 200 chance of flooding in any year). However, this is associated with an undefended scenario.

Tidal flooding is the dominant mechanism of flooding effecting the wider area. The site benefits from the presence of flood defences. Fluvial flooding does not affect the site.

For the defended scenario, with a site level of 2.84m AOD, the site would not be affected by flooding during present day or modelled climate change flood events. The existing floor level is approximately 450mm above the site level and further reduces risk to the proposed conversion of the building.

The policy for maintenance of the flood defences is 'hold the line'. Therefore, it can reasonably be expected that flood defences will be raised in line with climate change projectations, and thus the probability of tidal flooding in the future will not increase.

Therefore, the probability of tidal flooding to the proposed development can be considered to be **low**.

- **Surface Water Flood Risk** - The Environment Agency's Flood Map for Surface Water shows the site to be unaffected by surface water flooding in events up to the 0.1% AEP event and therefore is at a **very low** risk.
- **Groundwater Flood Risk** - No specific records of groundwater flooding at the development site and the immediate surrounding area have been found. Given the proposed development is conversion of an existing building that is raised above ground level, the risk of flooding from groundwater is considered to be **low**.
- **Flood Risk from Sewers** - The Arun District Council Level 1 SFRA includes a postcode level assessment of previous sewer flooding. This indicates 36 sewer flooding incidents have been recorded within the PO22 7 postcode, however this does not specifically reference the development site and does not contain information about specific properties. It is also not known whether these incidents were caused by exceedance of the sewer system, or by operational issues such as blockages. The risk from flooding of sewers is therefore considered to be **medium**.

- **Reservoir Flood Risk** – The Reservoir flood risk mapping does not indicate that the site would be affected by flooding from reservoirs.

Flood Mitigation Measures

As the proposal is for the conversion of an existing building, there are design limitations in terms of the measures that can be implemented (e.g. raising the ground floor level).

Due to the nature of the proposed development, flood mitigation measures are not considered necessary given the building is not shown to be at risk of flooding from tidal sources in the defended scenario, including allowance for climate change. The proposed development will not increase flood risk elsewhere as no changes are being made to the external building.

Appendices

A EA Product 4 Data

B Building Elevations

Offices at

Coleshill
Doncaster
Dublin
Edinburgh
Exeter
Glasgow
Haywards Heath
Isle of Man
Limerick
Newcastle upon Tyne
Newport
Peterborough
Saltaire
Skipton
Tadcaster
Thirsk
Wallingford
Warrington

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ISO 14001:2015
ISO 27001:2013
ISO 45001:2018

