

Flood Risk Assessment

for

14 Fitzalan Road,
Arundel, West Sussex



ARCH ASSOCIATES
CONSULTING CIVIL AND STRUCTURAL ENGINEERS

FLOOD RISK ASSESSMENT

for

14 Fitzalan Road
Arundel
West Sussex



Client:

Renaissance Group of Companies Ltd.
12 Headlands Business Park
Ringwood
BH24 3PB

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1.0 Introduction

- 1.1 Arch Associates Limited have been commissioned by Renaissance Group to undertake a Flood Risk Assessment for the proposed redevelopment of 14 Fitzalan Road, Arundel.
- 1.2 The report addresses the relevant flood risk issues of the National Planning Policy Framework 2012.

2.0 Site Details

- 2.1 The site is located on the north-eastern edge of Fitzalan Road and is currently occupied by Blastreat Limited, an industrial and architectural blast cleaning and finishing company. The site also includes the neighbouring residence and garden to the West of the site.

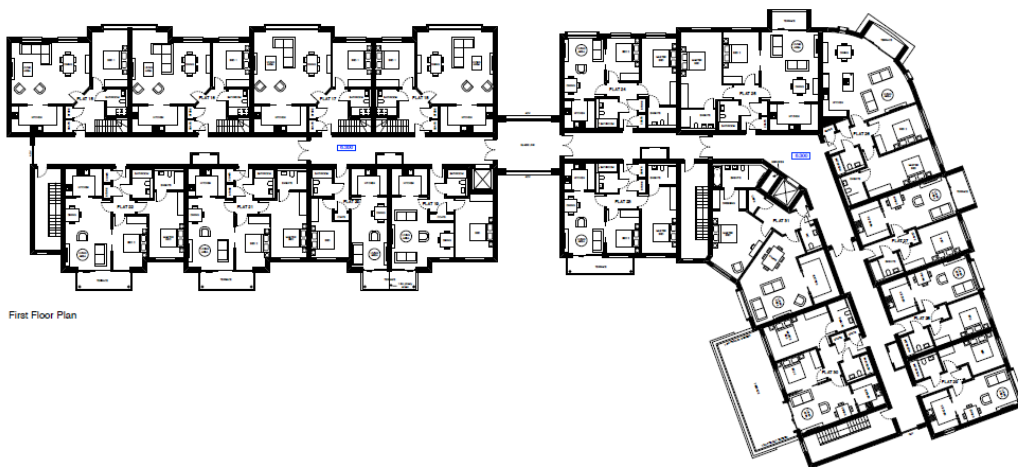
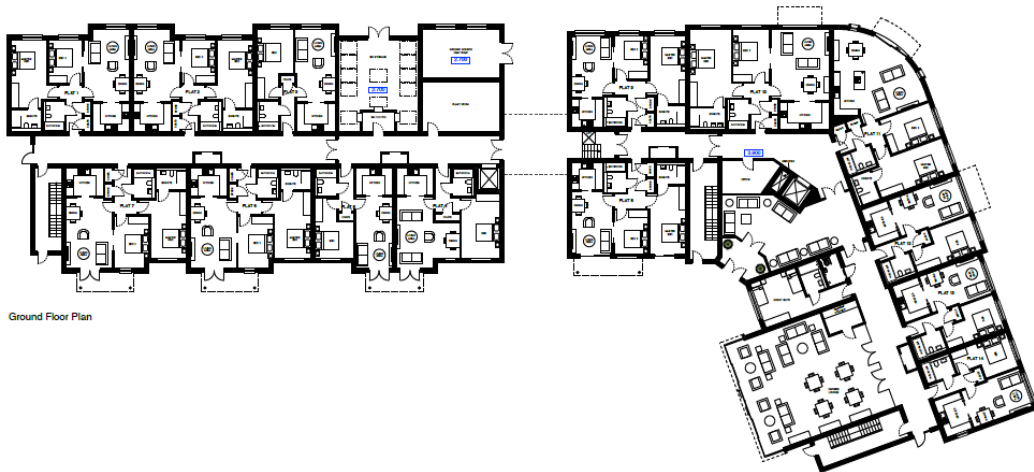


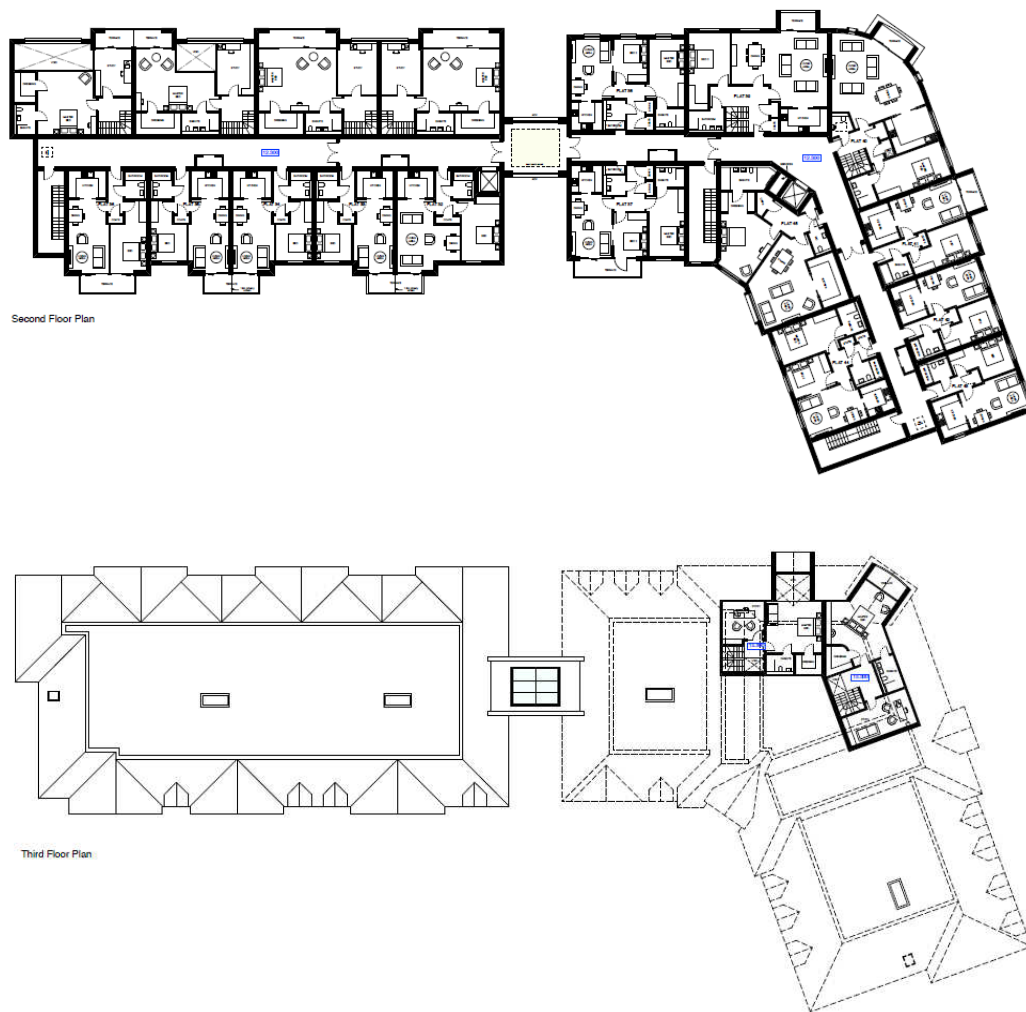
- 2.2 The site is generally flat, roughly rectangular in shape and measures approximately 0.37 hectares in size.

- 2.3 The Blastreat element comprises multiple large warehouse structures housing several spray and heat treatment rooms on the west and east. An inverted, roughly L-shaped hard standing area runs in north-south direction across the site. Other features within the site include; an administrative office attached to the northern end of the large warehouse, an electricity substation on the northwest corner, a diesel tank with a 1m high bund wall on the northeast and drums of wastes, gas tanks and chemical storage near the southern boundary. Both untreated and finished metal products are noted on the surface of the hard standing which covers the entirety of the site, except for where there are buildings present.
- 2.4 Access is via Fitzalan Road onto the hard-standing area to the north and a smaller access off the eastern boundary onto Fitzalan Road to the east.
- 2.5 The total site area is 3660m² and it is generally either impermeable hardstanding or occupied building structures. The garden within the existing site is 1034m².
- 2.6 A topographical survey of the site was conducted by Baypoint Surveys Ltd. in October 2016, refer to Appendix 4.
- 2.7 The site is generally flat with levels circa 2.5m to 2.6m AOD.

3.0 Development Proposals

- 3.1 The proposal is to demolish the existing buildings and erect a block of 45 sheltered apartments for the elderly (comprising 21 x one-bedroom apartments and 24 x two bedroom apartments age restricted to 60 years and over); with associated access electric buggy/cycle store and refuse bin store and 34 parking spaces.





4.0 Relevant Planning Policy and Guidance

- 4.1 The National Planning Policy Framework (NPPF) 2012 and Technical Guidance documents published by the Department for Communities and Local Government set out policies for flood risk management and detail the criteria for the content of an FRA report.
- 4.2 The aim of the NPPF in terms of flooding is to guide development towards less vulnerable locations, with Flood Zone 1 being the most preferable.

- 4.3 Table 1 in the Technical Guidance to the NPPF relates to the definitions of predicted flood zones, defined by Environment Agency, which are as follows:

Zone 1 Low Probability

This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).

(Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)

Zone 2 Medium Probability

This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year.

(Land shown in light blue on the Flood Map)

Zone 3a High Probability

This zone comprises 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.

(Land shown in dark blue on the Flood Map)

Zone 3b The Functional Floodplain

This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments 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%) or greater in any year, or is designed to flood in an extreme (0.1%) flood, should provide a starting point for consideration and discussions to identify the functional floodplain.

(Not separately distinguished from Zone 3a on the Flood Map)

4.4 Table 2 in Technical Guidance to the National Planning Policy Framework groups different types of development by their Flood Risk Vulnerability. These groups are:

- Essential infrastructure
- Highly vulnerable
- More vulnerable
- Less vulnerable
- Water-compatible development

4.5 Table 3 (below) within the Technical Guidance then relates Flood Risk Vulnerability with the predicted flood risk zones.

Table 3: Flood risk vulnerability and flood zone ‘compatibility’

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	✗	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	✗	✗	✗

Key: ✓ Development is appropriate.
 ✗ Development should not be permitted.

4.6 Environment Agency Guidelines

In addition to the National Planning Policy Framework, the EA has produced Standing Advice and Guidance on development and FRAs which aim to outline the requirements for a FRA according to the nature of the development and the site location in relation to the Flood Zones. The following extract from the EA guidance sets out these FRA requirements.

When you need an assessment

You need to do a flood risk assessment for most developments within one of the flood zones. This includes developments:

- in flood zone 2 or 3 including minor development and change of use
- more than 1 hectare (ha) in flood zone 1
- less than 1 ha in flood zone 1, including a change of use in development type to a more vulnerable class (e.g. from commercial to residential), where they could be affected by sources of flooding other than rivers and the sea (eg, surface water drains, reservoirs)
- in an area within flood zone 1 which has critical drainage problems as notified by the Environment Agency

When you don't need an assessment

You don't need to do a flood risk assessment for a development that's less than 1 ha in flood zone 1 unless it could be affected by sources of flooding other than rivers and the sea, e.g. surface water drains.

4.7 Arun Local Plan (October 2014)

Policy W DM2 Flood Risk

'Development in areas at risk from flooding, identified on the latest Environment Agency flood risk maps and the Council's Strategic Flood Risk Assessment (SFRA), will only be permitted where all of the following criteria have been satisfied:

- a. The sequential test in accordance with the National Planning Policy Framework Technical Guidance has been met.*
- b. A site specific Flood Risk Assessment demonstrates that the development will be safe, including access and egress, without increasing flood risk elsewhere and reduce flood risk overall.*
- c. The scheme identifies adaptation and mitigation measures.*
- d. Appropriate flood warning and evacuation plans are in place; and*
- e. New site drainage systems are designed to take account of events which exceed the normal design standard i.e. consideration of flood flow routing and utilising temporary storage areas.'*

Policy W DM3 Sustainable Urban Drainage Systems

'Proposals for major development must also integrate SUDS within public open spaces and roads, in liaison with West Sussex County Council, (the SUDS

Approval Body) or its agent. SUDS must therefore be integrated into the overall design of a development and must:

- a. Contribute positively to the appearance of the area
- b. Effectively manage water (including its quality)
- c. Accommodate and enhance biodiversity by making connections to existing Green Infrastructure assets and
- d. Provide amenity for local residents (ensuring a safe environment) and
- e. Retain existing open drainage ditches in their current form.

In order to ensure that SUDS discharge water from the development at the same or lesser rate, as prior to construction, developers must:

- f. Follow the hierarchy of preference for different types of surface water drainage disposal systems as set out in Approved Document H of the Building Regulations and the SUDS manual produced by CIRIA.
- g. Undertake up to six months groundwater monitoring within the winter period.
- h. Undertake winter percolation testing in accordance with BRE365.
- i. The proposed drainage system must be designed to ensure that there is no flooding on a 1 in 30 year storm event.
- j. The design must also take account of the 1 in 100 year storm event plus 30% allowance for climate change, on stored volumes, to ensure that there is no flooding of properties or the public highway or inundation of the foul sewerage system. Any excess flows must be contained within the site boundary, and within designated storage areas.'

4.8 Arun Combined Level 1 & 2 SFRA

'Assessing Flood Risk and Developments

- The NPPF supports a risk-based and sequential approach to development and flood risk in England, so that development is located in the lowest flood risk areas where possible; it is recommended that this approach is adopted for all future developments within the district.
- A site-specific FRA is required for all developments which are located in the Environment Agency's Flood Zones 2 and 3, or developments greater than 1ha in size in Flood Zone 1. They are also required for developments less than 1ha in Flood Zone 1 where there is a change in use to a more vulnerable development where they could be affected by sources of flooding other than rivers and the sea (e.g. surface water drains, reservoirs). All developments

located in areas of Flood Zone 1 highlighted as having critical drainage problems must also be accompanied by an FRA. The FRA should be proportionate to the degree of flood risk, as well as the scale, nature and location of the development.

- It is recommended that the impact of climate change to a proposed site is considered in FRAs and that the percentage increases which relate to the proposed lifetime of the development and the vulnerability classification of the development is identified and taken into account. The Environment Agency and LLFA should be consulted to confirm a suitable approach to climate change in light of the latest guidance.
- Opportunities to reduce flood risk to wider communities could be sought through the regeneration of Brownfield sites, through reductions in the amount of surface water runoff generated on a site.
- The Local Planning Authority (LPA), Environment Agency and LLFA should be consulted to confirm the level of assessment required and to provide any information on any known local issues.
- When assessing sites not identified in the Local Plan (windfall sites), developers should use evidence provided in this SFRA to apply the Sequential Test as well as provide evidence to show that they have adequately considered other reasonably available sites. '

5.0 Data Sources

5.1 Environment Agency Flood Map.

An EA Flood mapping for the site was obtained from the EA web site and contains flood risk information for various sources of flooding.

5.2 Arun Level 1 & 2 Combined Strategic Flood Risk Assessment

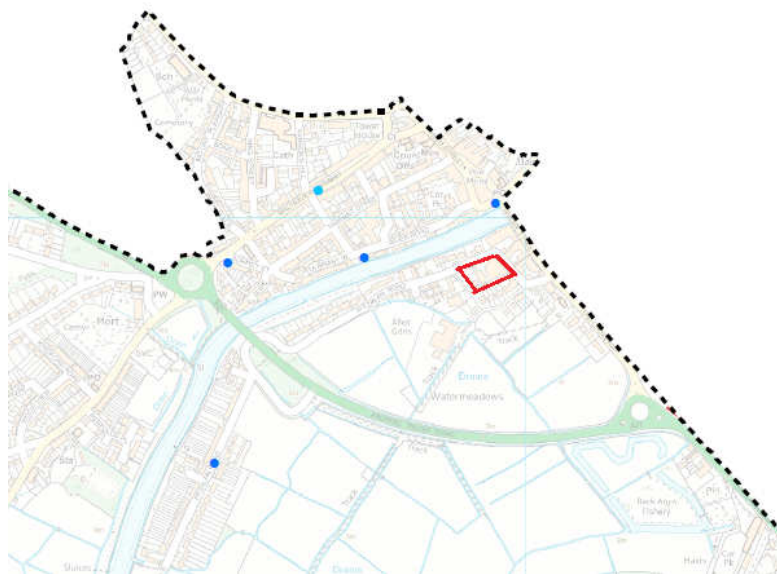
This Strategic Flood Risk Assessment (SFRA) 2016 document replaces the Level 1 and Level 2 SFRA originally published by Arun District Council in February 2008. The report has been prepared to replace the content that was included in the previous SFRA and to provide appropriate supporting evidence for the emerging Local Plan.

5.3 Environment Agency Product 4 Flood Maps and Modelled Flood Levels

A Product 4 package for the site has been supplied by the Environment Agency, which includes site specific flood maps along with the relevant modelled flood levels.

6.0 Site Flood History

- 6.1 The Arun Strategic Flood Risk Assessment flood history mapping indicates a small number of fluvial flood events near the site.

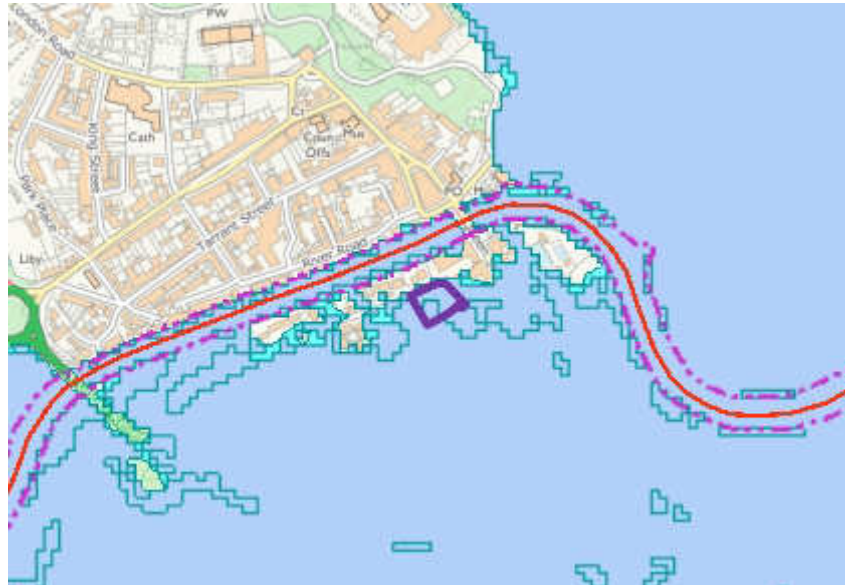


- 6.2 The Environment Agency have no records of the site having flooded but they have confirmed that Arundel was affected by flooding in 1974 and 1975.

7.0 Site Flood Risk

7.1 Environment Agency Flood Zone

The site lies within the outer edges of Flood Zone 3.



7.2 Tidal Flood Risk

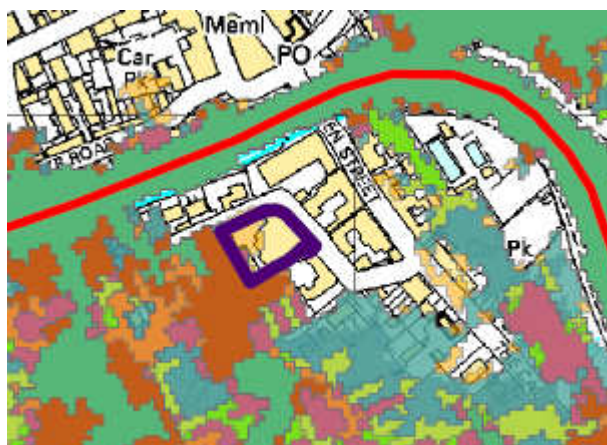
Tidal Flooding is the principle source of flooding at this site due to the tidal effects on the River Arun, which is only a short distance from the site. Refer to Appendix 2 for EA flood maps and data. The site is located within Flood Zone 3 but existing defences reduce the predicted 1 in 200 year event + climate change level to 2.55m AOD (maximum), which is below the majority of the existing site topography. In particular, the area to the Northeast of the site remains dry during this event.

Table 3: Water Levels: Tidal Undefended

Node Reference	NGR		Modelled Flood Levels in Metres			
	Eastings	Northings	Undefended Annual Exceedance Probability			
			5%	0.5%	0.5% (2115)	0.1%
1	501902	106907	-	-	3.58	-
2	501920	106876	-	-	3.58	-
3	501928	106903	-	-	3.58	-
4	501939	106923	-	-	3.58	-
5	501961	106901	-	-	3.58	-

Table 4: Water Levels: Tidal Defended

Node Reference	NGR		Modelled Flood Levels in Metres				
	Eastings	Northings	Defended Annual Exceedance Probability				
			5%	0.5%	0.5% (2070)	0.5% (2115)	0.1%
1	501902	106907	-	-	-	2.55	-
2	501920	106876	-	-	-	2.43	-
3	501928	106903	-	-	-	2.48	-
4	501939	106923	-	-	-	-	-
5	501961	106901	-	-	-	-	-



Defended Tidal Flood Map

7.3 Fluvial Flood Risk

Flooding from the River Arun if undefended places the site in Flood Zone 3. However, the site is defended against Fluvial flooding for the 1 in 100 year event plus climate change. Refer to Appendix 2 Flood Mapping. The site is effectively in Flood Zone 1 when the defences are in effect.

Table 1: Water Levels: Fluvial Undefended

Node Reference	NGR		Modelled Flood Levels in Metres			
	Eastings	Northings	Undefended Annual Exceedance Probability			
			5%	1%	1% Plus Climate Change	0.1%
1	501902	106907	-	-	3.33	2.91
2	501920	106876	2.26	2.47	3.33	2.91
3	501928	106903	-	-	3.33	2.91
4	501939	106923	-	-	3.33	2.91
5	501961	106901	-	-	3.33	2.91

7.4 Flooding from Land (Pluvial)

Pluvial flooding is not considered a significant risk at this site due to the surrounding topography and proximity of the River Arun.

7.5 Groundwater Flood Risk

The site is considered at low risk from groundwater flooding. Groundwater has been recorded at a depth of 1.3m BGL during winter monitoring.

8.0 Flood Risk Management Measures

8.1 As demonstrated in Section 7, the undefended tidal 1 in 200 year + climate change flood plus the undefended 1 in 100 year fluvial flood + climate change will lead to flooding on site. Existing defences greatly reduce this and large areas of the site will remain dry while defences are in place.

8.2 It is necessary to lift all habitable 'more vulnerable' dwellings out of the predicted flood zone with a freeboard allowance.

The proposed ground floor level of the development will therefore need to be set at a **minimum of 3.88m AOD**. This level has been advised by the Environment Agency (Eleonora Pilla, 22/06/2017) and equates to the 1 in 200 year Tidal Flood Level (undefended) of 3.58m + 300mm freeboard. The current Architect's proposals show a finished flood level of 3.9m AOD, which is therefore acceptable.

8.3 A proposed FFL of 3.9m AOD will keep the habitable areas out of the Fluvial undefended flood event at 3.33m AOD.

8.4 Any 'less vulnerable' areas placed within the flood zone, such as refuse stores, will be of flood resilient construction with exposed in-situ concrete ground floor slabs. All electrical infrastructure within these zones should be flood proofed and we would recommend siting all electrical and communication sockets at 1.18m above slab level (3.88m AOD).

8.5 Ground floor slabs throughout the development will be of flood resilient concrete construction.

8.6 Safe access from the site during the 1 in 200 year defended tidal event is found to the East of the site from where occupants have a safe route towards Queen Street Bridge.

- 8.7 Maintenance and improvement works to the flood defences will keep the proposed building defended for at least the lifetime of the development.
- 8.8 Local flood warning predicts the significant tidal flood events in advance. The River Arun at Arundel and Warningcamp and Burpham Flood Warning area is available on 0345 988 1188.

9.0 Residual Flood Risk

- 9.1 Residual flood risk in this case would be that experienced by the residents of during a potential future flood event in which the existing flood defences fail. Although their height would place them safely above the predicted flood levels, access via the ground floor may be curtailed until the flood waters recede, which could present a problem in the event of a fire or medical emergency.
- 9.2 In order to mitigate the above residual risk, a formal emergency evacuation plan will need to be in place and all relevant staff will need to be suitably trained.

10.0 Surface Water Drainage

- 10.1 This report is to be accompanied by Arch Associates Ltd. foul and surface water drainage strategy, which outlines the existing and proposed drainage.

APPENDIX 1

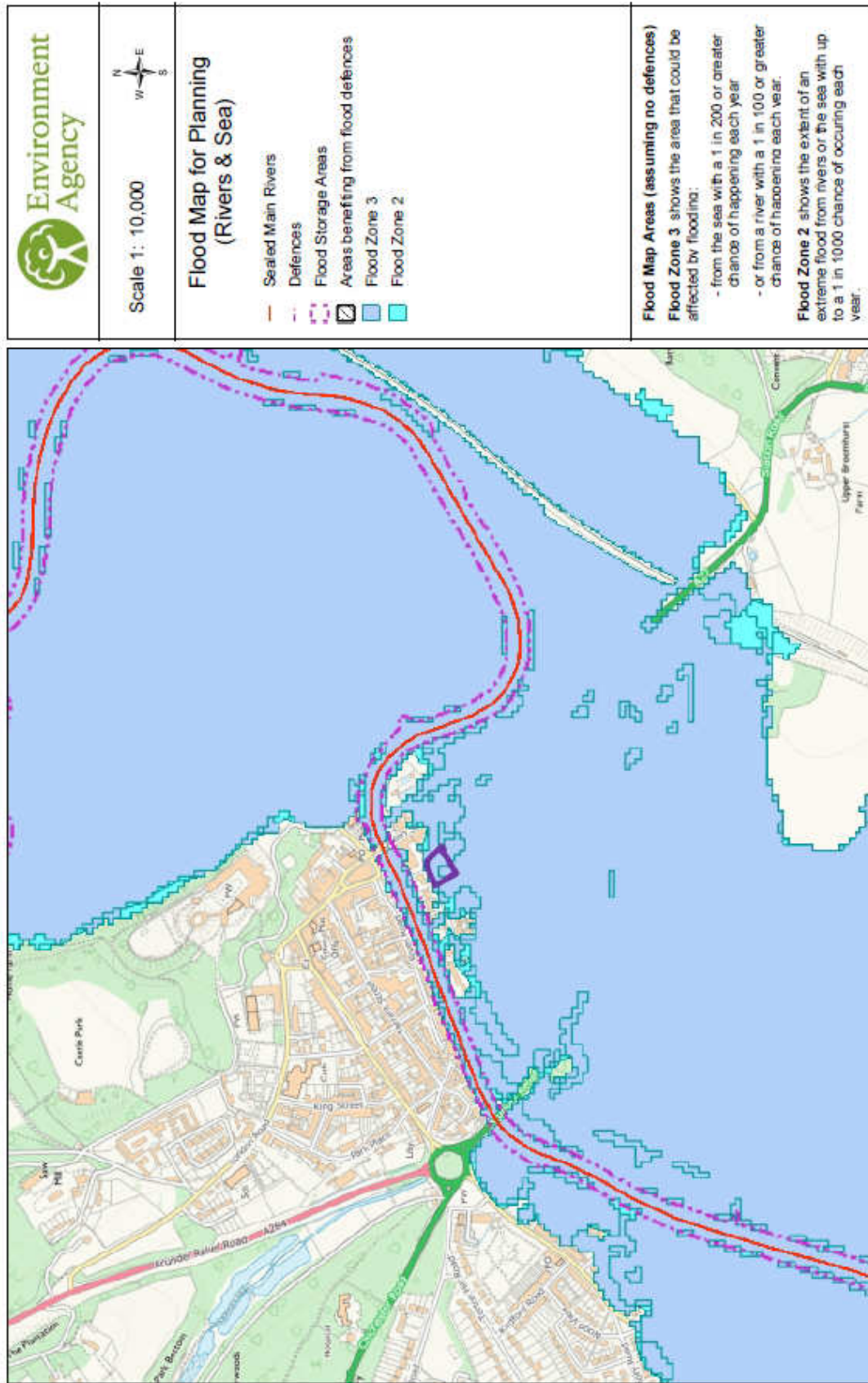
Architect's Site Plan



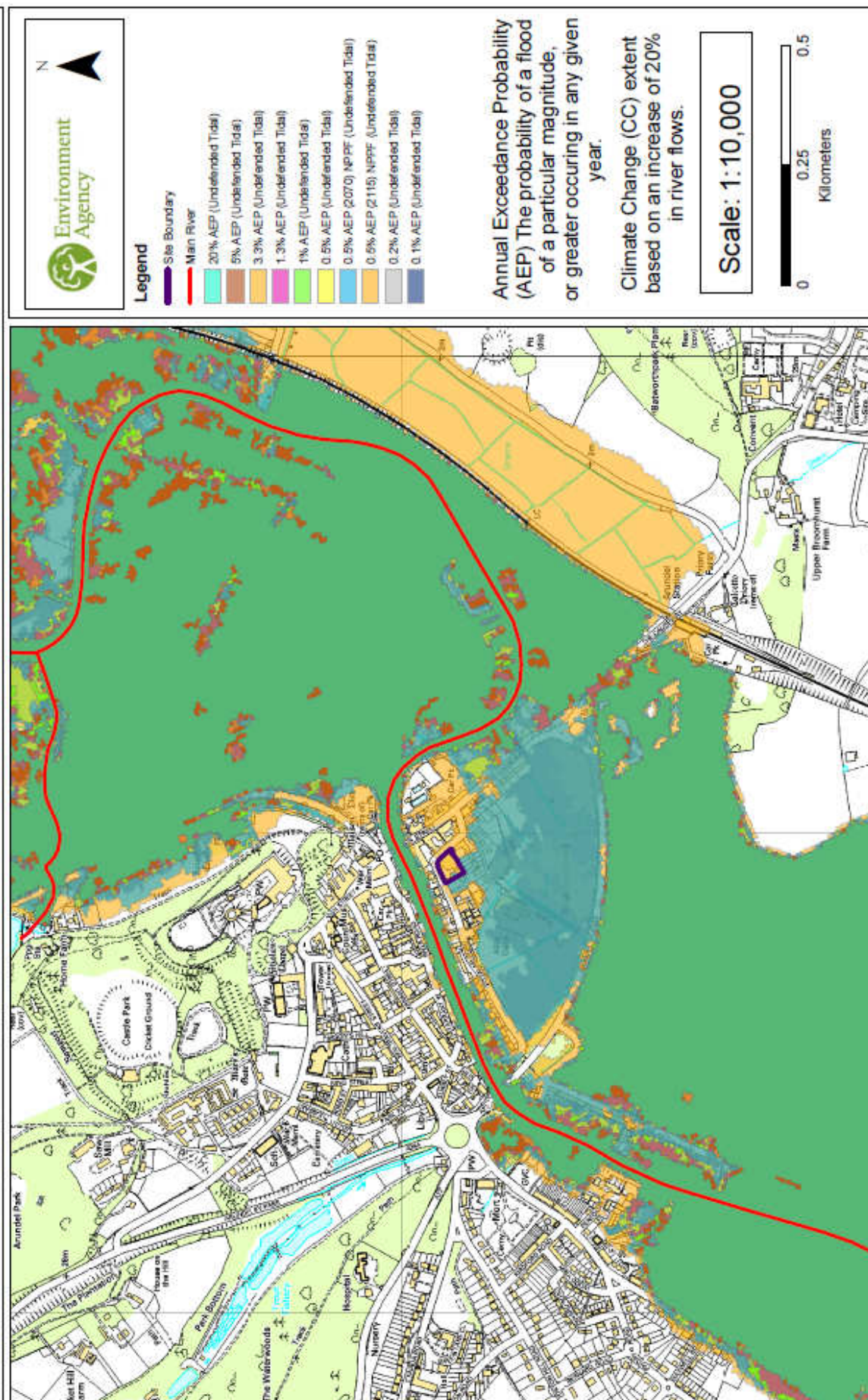
APPENDIX 2

EA Flood Maps and Data

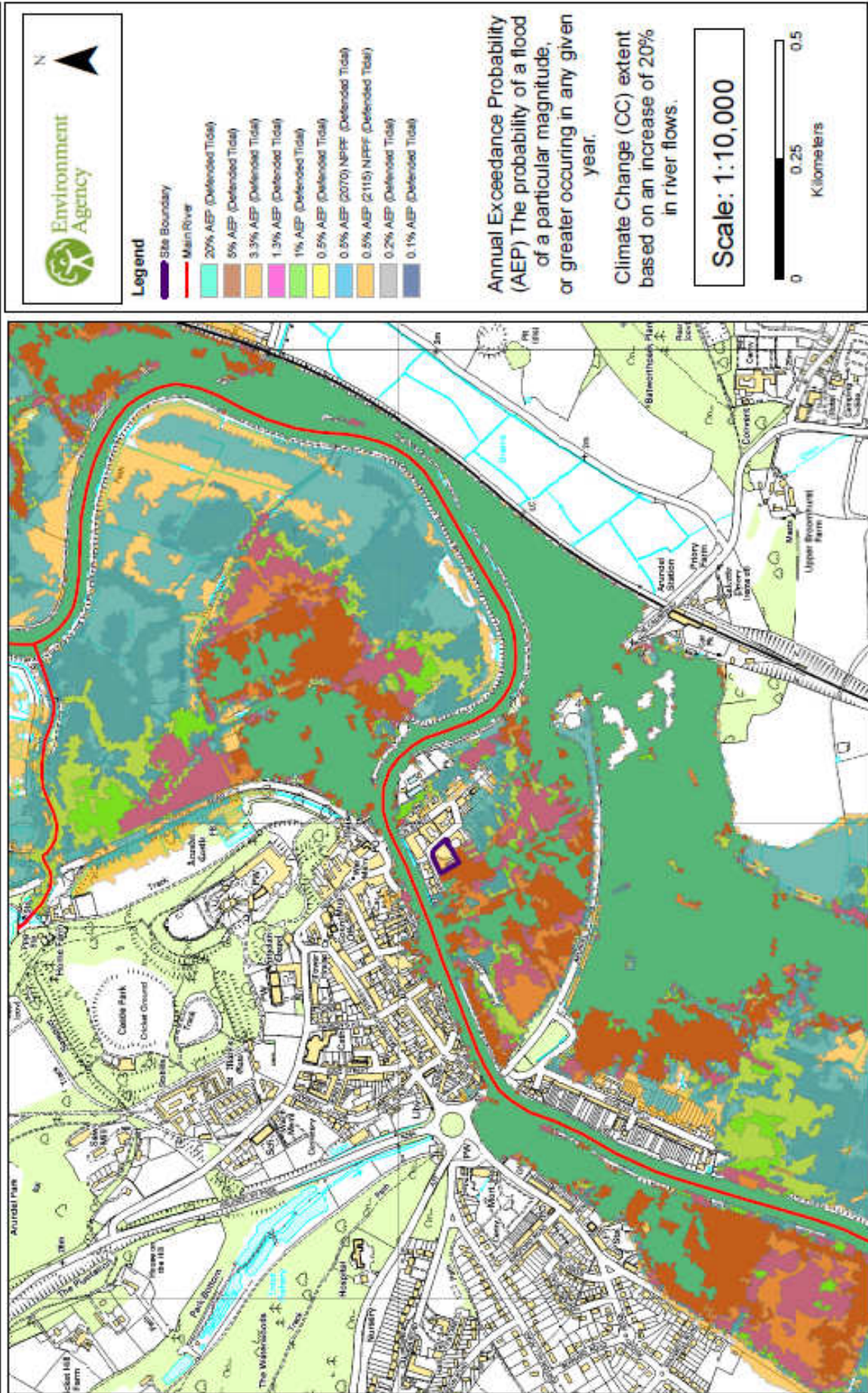
Flood Map for Planning (Rivers and Sea). Centred BN18 9LF. Created 31/05/2017.



Modelled Flood Outlines (Undefended Tidal). Centred BN18 9LF. Created 31/05/2017 (Ref: SSD48221)

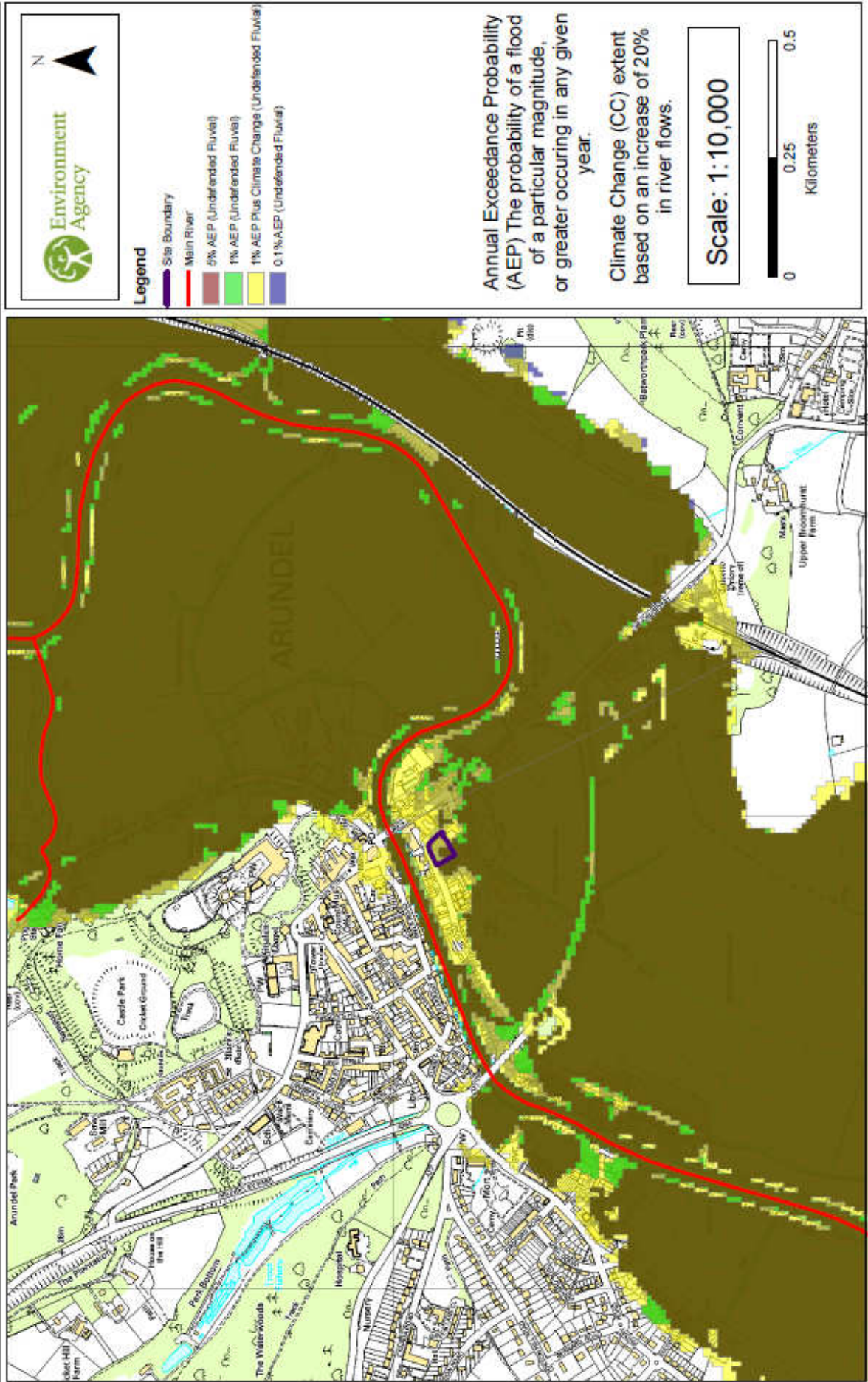


Modelled Flood Outlines (Defended Tidal). Centred BN18 9LF. Created 31/05/2017 (Ref: SSD48221)

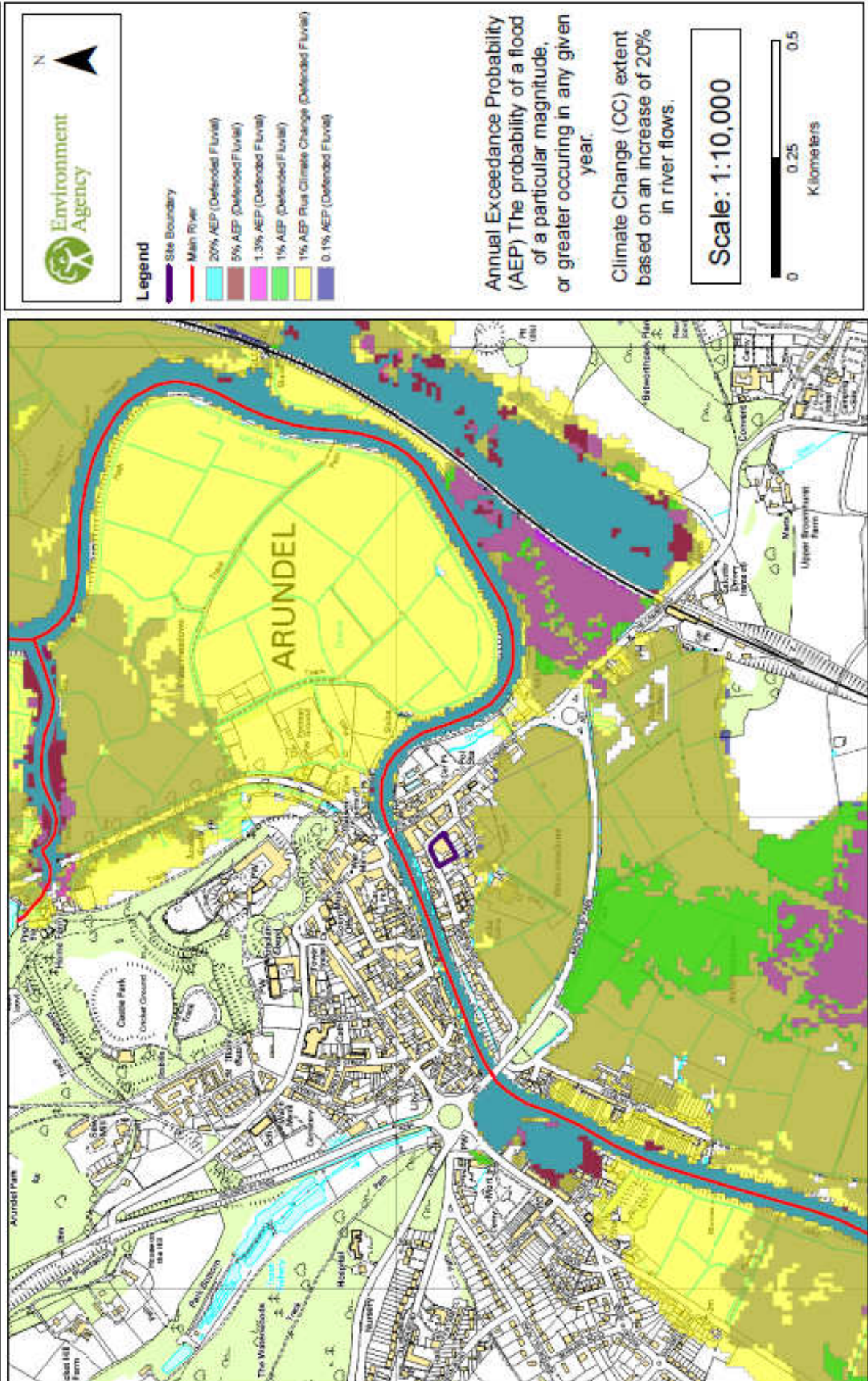


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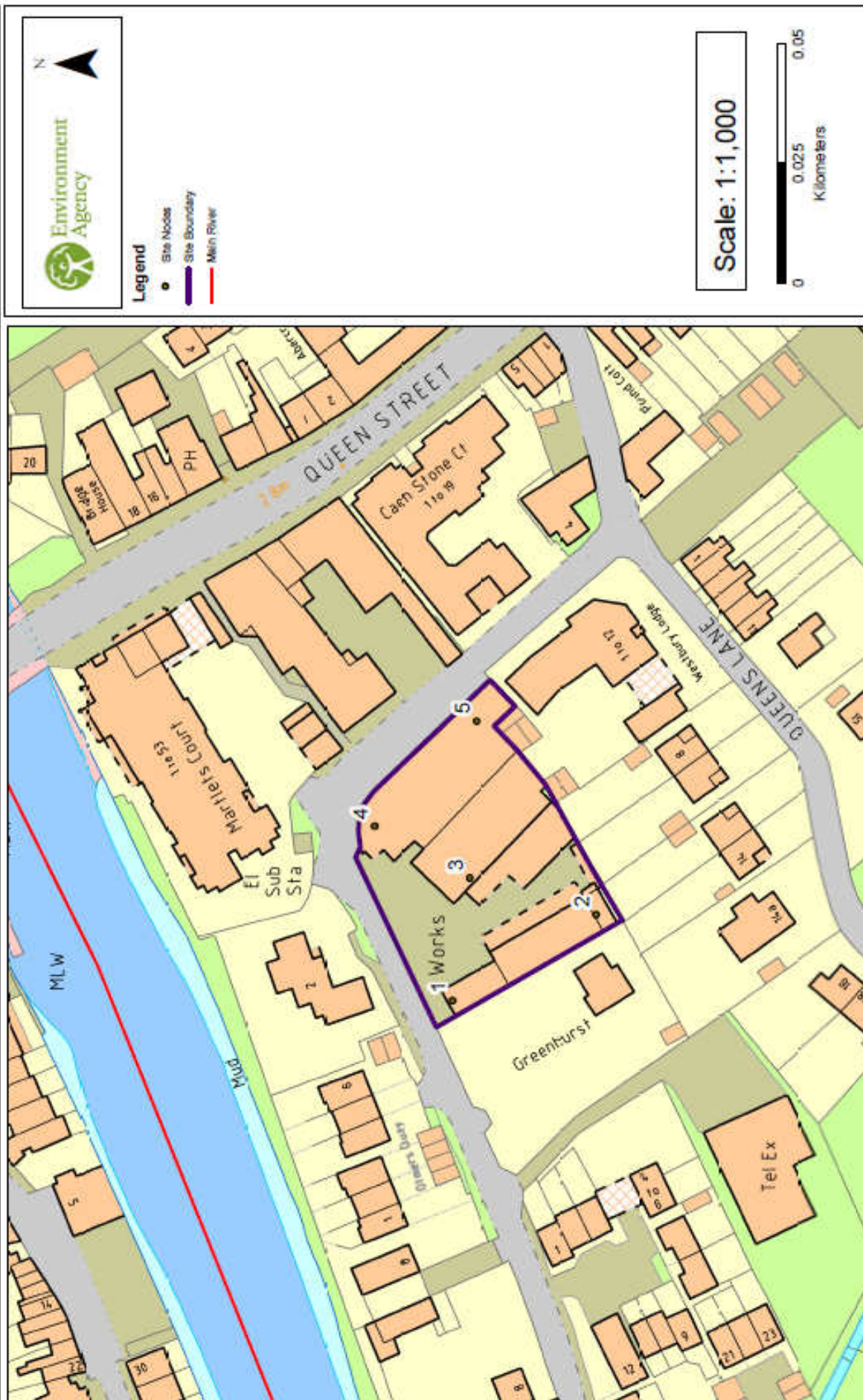
Modelled Flood Outlines (Undefended Fluvial). Centred BN18 9LF. Created 31/05/2017 (Ref: SSD48221)



Modelled Flood Outlines (Defended Fluvial). Centred BN18 9LF. Created 31/05/2017 (Ref: SSD48221)



Site Boundary and Node Points. Centred BN18 9LF. Created 31/05/2017 (Ref: SSD48221)



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Product 4 Flood Risk Data Requested by: Chris Hendry

Site: 14 Fitzalan Road, Arundel, BN18 9LF

Table 1: Water Levels: Fluvial Undefended

Node Reference	NGR		Modelled Flood Levels in Metres			
	Eastings	Northings	Undefended Annual Exceedance Probability			
			5%	1%	1% Plus Climate Change	0.1%
1	501902	106907	-	-	3.33	2.91
2	501920	106876	2.26	2.47	3.33	2.91
3	501928	106903	-	-	3.33	2.91
4	501939	106923	-	-	3.33	2.91
5	501961	106901	-	-	3.33	2.91

Table 3: Water Levels: Tidal Undefended

Node Reference	NGR		Modelled Flood Levels in Metres			
	Eastings	Northings	Undefended Annual Exceedance Probability			
			5%	0.5%	0.5% (2115)	0.1%
1	501902	106907	-	-	3.58	-
2	501920	106876	-	-	3.58	-
3	501928	106903	-	-	3.58	-
4	501939	106923	-	-	3.58	-
5	501961	106901	-	-	3.58	-

Table 3: Water Depth: Fluvial Undefended

Node Reference	NGR		Modelled Flood Depth in Metres			
	Eastings	Northings	Undefended Annual Exceedance Probability			
			5%	1%	1% Plus Climate Change	0.1%
1	501902	106907	-	-	0.73	0.31
2	501920	106876	0.11	0.32	1.19	0.76
3	501928	106903	-	-	0.81	0.38
4	501939	106923	-	-	0.54	0.11
5	501961	106901	-	-	0.65	0.22

Table 4: Water Levels: Tidal Defended

Node Reference	NGR		Modelled Flood Levels in Metres				
	Eastings	Northings	Defended Annual Exceedance Probability				
			5%	0.5%	0.5% (2070)	0.5% (2115)	0.1%
1	501902	106907	-	-	-	2.55	-
2	501920	106876	-	-	-	2.43	-
3	501928	106903	-	-	-	2.48	-
4	501939	106923	-	-	-	-	-
5	501961	106901	-	-	-	-	-

Table 7: Water Depth: Tidal Undefended

Node Reference	NGR		Modelled Flood Depth in Metres			
	Eastings	Northings	Undefended Annual Exceedance Probability			
			5%	0.5%	0.5% (2115)	0.1%
1	501902	106907	-	-	0.97	-
2	501920	106876	-	-	1.22	-
3	501928	106903	-	-	1.05	-
4	501939	106923	-	-	0.78	-
5	501961	106901	-	-	0.88	-

Table 6: Water Depth: Tidal Defended

Node Reference	NGR		Modelled Flood Depth in Metres				
	Eastings	Northings	Defended Annual Exceedance Probability				
			5%	0.5%	0.5% (2070)	0.5% (2115)	0.1%
1	501902	106907	-	-	-	0.05	-
2	501920	106876	-	-	-	0.04	-
3	501928	106903	-	-	-	-	-
4	501939	106923	-	-	-	-	-
5	501961	106901	-	-	-	-	-

APPENDIX 3

Topographical Survey

