



Waterfront Square, Norman Place, Reading

Flood Risk Assessment

On behalf of



Project Ref: 332610561 | Rev: A | Date: July 2024

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Executive Summary

This Flood Risk Assessment (FRA) has been prepared by Stantec UK Ltd to accompany a planning application for a proposed Waterfront Square development, consisting of the demolition of the former Covea Insurance building on Norman Place, Reading, and construction of residential-led development, with access from Norman Place and associated car parking, infrastructure and landscaping.

In accordance with the fundamental objectives of the National Planning Policy Framework (NPPF), the FRA demonstrates that:

- (i) The development is safe;
- (ii) The development does not increase flood risk; and,
- (iii) The development does not detrimentally affect third parties.

The Environment Agency (EA) data from their River Thames (Pangbourne to Sonning) 2019 model confirms that the majority of the site – and all the proposed development footprint – is located within Flood Zone 1, defined as **‘Low Probability’ less than a 1 in 1000 (0.1%) Annual Probability of flooding from rivers or the sea** (as defined in Planning Practice Guidance (PPG) ‘Flood Risk and Coastal Change’ Table 1). Small areas on the northern boundary with the River Thames lie in Flood Zone 2 ‘Medium Probability’ and 3 ‘High Probability’. The southern boundary with Vastern Road lies in Flood Zone 2 ‘Medium Probability’. The site is at low risk from other sources of flooding

The proposals for residential development constitute a ‘More Vulnerable’ land use. All the development will be located in Flood Zone 1, and at low probability of flooding from other sources, the Sequential Test is de facto passed. The Exception Test is not required.

The potential climate change impacts over the lifetime of the development have been fully assessed, with the site criteria requiring consideration of peak river flow climate change allowances of +31% (Thames and South Chilterns management catchment, ‘Central’ allowance, 2115 epoch). In the absence of a modelled +31% scenario, the EA-modelled 1 in 100 annual probability +35% scenario have been used as a conservative proxy.

The flood risk mitigation strategy for the development consists of the following elements:

- The proposed ground floor levels are set at a minimum of 38.56m AOD, 300mm above the modelled 1 in 100 annual probability plus 35% allowance for climate change fluvial level and a suitable freeboard above surrounding ground level to mitigate surface water in an extreme rainfall event;
- Continuous safe and dry access is available at the present day 1 in 100 annual probability scenario but not available when climate change is considered. Based on the approach advocated in the RBC SFRA, ‘More Vulnerable’ residential development is acceptable on this basis subject to a Flood Management and Evacuation Plan.
- The majority of the site – and all of the proposed building footprint location – lies outside of all modelled flood extents. The EA modelling of the ‘design’ 1 in 100 annual probability +35% climate change allowance flood event indicates shallow flood in the patio to the north of the site and the proposed stepped/sloping transition, which will slightly alter site levels from the development area to the adjacent towpath, will result in an overall betterment in floodplain capacity as well as an improved ecological/amenity buffer alongside the river corridor.
- The proposed surface water drainage strategy for the development consists of on site attenuation through a range of SuDS features and results in a reduction in peak runoff rates discharging from the site to the adjacent culverted Vastern Ditch watercourse.

In summary, the FRA demonstrates that the proposed development is safe and in accordance with the requirements of national and local planning policy.

Summary of Key FRA Data

Aspect of flood risk	Applicable Guidance/ Source of Data	Summary	Section of FRA
Site Location	n/a	Former Covea Insurance Building, Norman Place, Reading, RG1 8DA	3.1
Existing Ground Levels	Topographic Survey by Survey Solutions, August 2023	Ground levels vary from approximately 38.50m AOD to 38.8m AOD.	3.2
Primary source of flood risk	n/a	River Thames lies to the immediate north	3.3
Presence of flood defences	n/a	No flood defences in area	6.13.3
Proposed Development	Proposals by Assael	The demolition of the former Covea Insurance Building and the re-development of the site as a new 4- to 10-storey residential development	6.1
Planning Aspects			
Flood Risk Vulnerability	Planning Practice Guidance (PPG) 'Flood Risk and Coastal Change'	'More Vulnerable'	6.2
Flood Zone		Majority in Flood Zone 1 'Low Probability', with north and south boundaries in Flood Zone 2 and 3	4.1
Sequential Test		De facto passed as building footprint lies fully in Flood Zone 1 (see Planning Statement for further detail)	6.3
Exception Test		Not required	6.3
Applicable Climate Change Allowances	EA climate change allowances guidance	+31% (Central - 2080s epoch (2070-2115)) using modelled +35% as a conservative proxy	5
Reference Flood Levels			
Present Day	EA River Thames (Pangbourne to Sonning) , 2019	<u>North:</u> 1 in 20 annual probability = 37.48m AOD 1 in 100 annual probability = 37.89m AOD 1 in 1000 annual probability = 38.32m AOD <u>South:</u> 1 in 1000 annual probability= 38.25m AOD	4.4
Climate Change		1 in 100 annual probability +35%= 38.26m AOD	5
Proposed Mitigation Measures			
Ground Floor Levels	BS8533:2017 RBC L1 SFRA section 12.3 EA Thames Area guidance	Minimum residential floor levels to be set at 38.56m AOD (300mm above the 1 in 100 annual probability +35% scenario). Access points and 'less vulnerable' elements at lower elevations to incorporate flood resistance/resilience measures as appropriate.	7.3
Floodplain Storage and Flood Flow Routes	RBC L1 SFRA Section 12.5/12.6 EA Thames Area guidance	The proposed development footprint lies outside reference climate change floodplain - no impact on floodplain storage or flow routes.	7.4
Safe Access	RBC L2 SFRA Section 3.4	Safe and dry access via Vastern Road at present day 1 in 100 annual probability event. Flood Risk	7.5

		Management Plan to be prepared to address safe access impacts in 1 in 100 annual probability +35% climate change allowance scenario.	
Surface Water Drainage	RBC L1 SFRA Section 13.3	On site attenuation and controlled discharge to reduce runoff to Vastern Ditch culverted watercourse	7.6

Abbreviations

ABI	-	Association of British Insurers
AP	-	Annual Probability
BGS	-	British Geological Survey
CDM	-	Construction (Design and Management)
CIRIA	-	Construction Industry Research and Information Association
DDA	-	Disability Discrimination Act
DEFRA	-	Department for Environment, Food and Rural Affairs
EA	-	Environment Agency
FAS	-	Flood Alleviation Scheme
FRA	-	Flood Risk Assessment
FRAP	-	Flood Risk Activity Permit
FRMP	-	Flood Risk Management Plan
GIS	-	Geographic Information System
LLFA	-	Lead Local Flood Authority
M. AOD	-	Metres Above Ordnance Datum (Newlyn)
NPPF	-	National Planning Policy Framework
PFRA	-	Preliminary Flood Risk Assessment
PPG	-	Planning Practice Guidance
RBC	-	Reading Borough Council
RoSWF	-	Risk of Surface Water Flooding
SuDS	-	Sustainable Drainage Systems
SFRA	-	Strategic Flood Risk Assessment

1 Introduction

1.1 Scope of Report

- 1.1.1 This Flood Risk Assessment (FRA) has been prepared by Stantec UK Ltd ('Stantec') on behalf of our client, Packaged Living, to support planning applications for the proposed Waterfront Square development at Norman Place, Reading.
- 1.1.2 The report is based on the available flood risk information for the site as detailed in **Section 1.3** and prepared in accordance with the planning policy requirements set out in **Section 2**. The scope of the FRA is consistent with the National Planning Policy Framework (NPPF) requirements and the 'Site-specific Flood Risk Assessment Checklist' from the associated Planning Practice Guidance (PPG).
- 1.1.3 Stantec has many years of experience in, amongst other areas, the assessment of flood risk, hydrology, flood defence and river engineering. The authors and reviewers of the document are all experienced engineers and members of chartered institutions such as the Chartered Institution of Water and Environmental Management (CIWEM) or the Institution of Civil Engineers (ICE).

1.2 Existing Site and Proposed Development

- 1.2.1 The existing site is occupied by the former Covea Insurance Building, at Norman Place, Reading, RG1 8DA, and lies within the administrative boundary of Reading Borough Council (RBC)
- 1.2.2 The proposal is for the demolition of the former Covea Insurance building and construction of residential-led development, with access from Norman Place and associated car parking, infrastructure and landscaping – see further details in **Section 6**.

1.3 Sources of Information

- 1.3.1 The FRA has been prepared based on the following sources of information:
- **Environment Agency (EA) published 'Open Data' datasets available online**, reproduced with OS mapping under licence to Stantec (contains Ordnance Survey data © Crown copyright and database right [2023], contains Environment Agency information © Environment Agency and database right) (see **Appendix A**);
 - **Topographic survey** of the site (Drawing reference 60630BDLS-01, rev A) undertaken by Survey Solutions in February 2024 (see **Appendix B**);
 - **Development proposals** by Assael (see **Appendix C**);
 - **Outputs from the EA Lower Thames (Pangbourne to Sonning) 2019 hydraulic model** (see **Appendix D**);
 - The RBC **Preliminary Flood Risk Assessment (PFRA)**, dated June 2011 and Addendum 2017, and **Level 1 SFRA** dated December 2017.

1.4 Report Structure

- **Section 2: Policy Context** – This section sets out the various national and local policies and guidance that relate to this site.

- **Section 3: Site Setting** – This section provides an overview of the site location, the hydrological context and local features that could impact on flood risk.
- **Section 4: Assessment of Flood Risk** – This section sets out the available base data on flood risk from stakeholders and identifies the flood risk to the existing site.
- **Section 5: Climate Change Impacts** – This section summarises the EA climate change allowances guidance and sets out the flood risk to the site arising from climate change.
- **Section 6: Proposed Development and Sequential Test** – This section outlines the proposed development, and outlines the context of the Sequential Test and, if applicable, the Exception Test..
- **Section 7: Flood Mitigation Strategy** – This section sets out any measures proposed to be incorporated into the development to mitigate flood risk.
- **Section 8: Residual Risk** – This section summarises how residual risk has been addressed within the proposed development.
- **Section 9: Conclusions** – This section summarises the finding of the report.

1.5 Caveats and Exclusions

- 1.5.1 This FRA has been prepared in accordance with the NPPF, the associated PPG and local planning policy. The approach for flood mitigation and proposals for the surface water management strategy are based on the requirements of the EA and RBC in its role as Lead Local Flood Authority (LLFA). The conclusions are based on data available at the time of the study and on the subsequent assessment that has been undertaken in relation to the development proposals as outlined in **Section 1.2**.
- 1.5.2 Activities during the construction phase may have an impact on the existing and future flood risk. Thus, an assessment of the risks and appropriate mitigation measures should be identified and managed by the contractor.
- 1.5.3 The Construction (Design and Management) Regulations (CDM Regulations) will apply to any future development of this site which involves “construction” work, as defined by the CDM Regulations. As such it is the responsibility of the proposed developer (ultimate client) to fulfil its duties under the CDM Regulations.
- 1.5.4 It should be noted that the insurance market applies its own tests to properties in terms of determining premiums and the insurability of properties for flood risk. Those undertaking development in areas which may be at risk of flooding are advised to contact their insurers or the Association of British Insurers (ABI) to seek further guidance prior to commencing development. Stantec does not warrant that the advice in this report will guarantee the availability of flood insurance either now or in the future.

2 Planning Policy Context

This FRA has been prepared in accordance with the relevant national, regional, and local planning policy and statutory authority guidance as detailed below.

2.1 National Policy and Guidance

National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG)

- 2.1.1 National policy in relation to flood risk is contained within the National Planning Policy Framework (NPPF), updated December 2023, issued by the Ministry of Housing, Communities and Local Government, with reference to Section 14 'Meeting the challenge of climate change, flooding and coastal change'.
- 2.1.2 The associated Planning Practice Guidance (PPG) was released in March 2014 (with reference to the 'Flood Risk and Coastal Change' section) and last updated in August 2022.
- 2.1.3 The NPPF and PPG demonstrate a flood risk management approach for the lifespan of the proposed development considering the effects of climate change. The document sets the framework to minimise vulnerability, provide resilience to the impacts of climate change, and to fully consider the potential impacts of climate change for the lifetime of the development within the mitigation measures.
- 2.1.4 In May 2022, the guidance within the PPG on the application of climate change allowances in FRAs was significantly updated:
<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>.
- 2.1.5 The guidance provides contingency allowances for the potential increases in peak river flow, peak rainfall intensity and sea level rise which are considered accordingly subject to the site conditions – discussed further in **Section 7.6**.
- 2.1.6 The NPPF sets out the requirement for the Sequential Test and Exception Test in paragraphs 168 and 169 respectively – see below.

“168. The aim of the sequential test is to steer new development to areas with the lowest risk of flooding from any source. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding. The strategic flood risk assessment will provide the basis for applying this test. The sequential approach should be used in areas known to be at risk now or in the future from any form of flooding).

169. If it is not possible for development to be located in areas with a lower risk of flooding (taking into account wider sustainable development objectives), the exception test may have to be applied. The need for the exception test will depend on the potential vulnerability of the site and of the development proposed, in line with the Flood Risk Vulnerability Classification set out in Annex 3”

- 2.1.7 These Tests are to be applied where appropriate, depending on the proposed development flood risk 'vulnerability', the Flood Zone in which it is located and the risk of flooding from other sources. This is detailed further in **Section 6**.

Non-Statutory Sustainable Drainage Technical Standards (March 2015)

- 2.1.8 The 'Sustainable Drainage Systems – Non-statutory technical standards for sustainable drainage systems' (DEFRA, March 2015) sets out the technical standards for the design of sustainable drainage systems for new development. The proposed surface water drainage network has been designed in line with these standards and this is discussed in **Section 7**.

2.2 Local Policy and Guidance

Reading Borough Local Plan (November 2019)

- 2.2.1 Local planning policy is contained within the **Reading Borough Local Plan** adopted November 2019, with specific reference to Policy EN18 'Flooding and Sustainable Drainage Systems', which states:

Policy EN18: Flooding and Sustainable Drainage Systems

"Development will be directed to areas at lowest risk of flooding in the first instance, following the Sequential and Exceptions Test set out in the NPPF, and taking into account the effects of climate change. It will consider flooding from all sources, including fluvial, surface water, groundwater, and sewer flooding. Where development in areas at risk of flooding is necessary, it will not reduce the capacity of the flood plain to store floodwater, impede the flow of floodwater or in any way increase the risks to life and property arising from flooding. Wherever possible, development should be designed to reduce flood risk, both on- and off-site.

All major developments must incorporate sustainable drainage systems (SuDS) as appropriate and in line with the Government's Technical Standards. Smaller schemes are encouraged to incorporate SuDS, where possible. Runoff rates should aim to reflect greenfield conditions and, in any case, must be no greater than the existing conditions of the site. Schemes should ensure that the movement of water through vertical infiltration as well as horizontal run-off does not worsen contamination effects. Wherever possible, SuDS provision should maximise ecological benefits, link into the existing Green Network, incorporate tree planting and landscaping and avoid damage to existing significant trees, including through changes to the site hydrology. All new developments in areas of flood risk should give priority to SuDS.

All developments will demonstrate how they have been designed to incorporate measures to adapt to climate change. The following measures shall be incorporated into development...

- ...All development shall minimise the impact of surface water runoff from the development in the design of the drainage system, and where possible incorporate mitigation and resilience measures for any increases in river flooding levels as a result of climate change."*

- 2.2.2 **Policy CC3: 'Adaption to Climate Change'** states:

"All developments will demonstrate how they have been designed to incorporate measures to adapt to climate change. The following measures shall be incorporated into development...

- ...All development shall minimise the impact of surface water runoff from the development in the design of the drainage system, and where possible incorporate mitigation and resilience measures for any increases in river flooding levels as a result of climate change."*

- 2.2.3 Also of relevance - given the northern boundary of the site is adjacent to the River Thames footpath - is **Policy EN11 'Waterspaces'**, which states:

"Reading's waterspaces will be protected and enhanced, so that they can continue to contribute to local and regional biodiversity and ecology, flood mitigation, local character, heritage and visual amenity, the provision of accessible leisure and recreational opportunities and, where appropriate, navigation. There will be no adverse impact on the functions and setting of any watercourse and its associated corridor."

Where development in the vicinity of watercourses is acceptable, it will:-

- Provide appropriate, attractive uses and buildings that enhance the relationship of buildings, spaces and routes to the watercourse, including through creating or enhancing views of the watercourse, and create a high quality public realm;*
- Make positive contributions to the distinct character, appearance, historic significance, landscape and amenity of the watercourses;*
- Provide a strengthened role for watercourses as important landscape features, wildlife corridors, historic features and recreation opportunities;*
- Wherever practical and consistent with its biodiversity role, provide good, level access to and along the waterside for all those who want to use it;*
- Be set at least ten metres back from the watercourse wherever practicable and appropriate to protect its biodiversity significance;*
- Improve the quality of watercourse environment through protecting and enhancing habitats and ensuring that habitat creation is balanced with access and urban uses; and*

Pursue opportunities for deculverting of watercourses."

Strategic Flood Risk Assessment

- 2.2.4 The **Reading Borough Council Strategic Flood Risk Assessment (SFRA) Level 1** was released in 2017 and forms part of the Local Plan evidence base, to inform future spatial planning and to assist in developing planning policies to address flood risk. Moreover, the document provides an overall understanding of the flood risk within the study area taking into account all potential sources and provides recommendations for safe access for developments in the Borough.
- 2.2.5 It is essential therefore that the Council are in a position to take informed decisions, providing a careful balance between the risk of flooding and other unrelated planning constraints that may place pressure upon 'at risk' areas.
- 2.2.6 A Level 2 SFRA was also released in December 2017 that considers flood risk for allocated sites. This detail is set out in Background Paper EV028 to the Local Plan which identified that, following review of all sites located in Flood Zone 1, there remained a substantial, unmet housing need that would need to be fulfilled by housing development in Flood Zone 2.

Preliminary Flood Risk Assessment

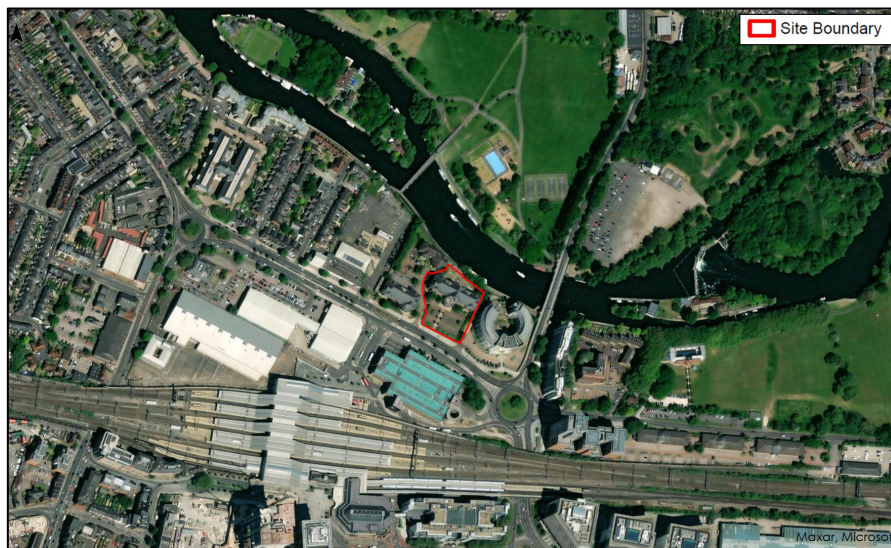
- 2.2.7 The RBC is defined as the Lead Local Flood Authority (LLFA) under the Flood and Water Management Act 2010. The first element of the Flood Risk Regulations (2009) is for LLFAs to produce a Preliminary Flood Risk Assessment (PFRA) providing a high-level overview of flood risk from all sources within a local area, including consideration of surface water, groundwater and ordinary (minor) watercourses. The RBC PFRA was released in 2011 and Addendum released in 2017 and has been reviewed to ascertain any details of historic flooding at the site as part of this study.

3 Site Setting

3.1 Site Description

- 3.1.1 The site is approximately 0.5 hectares (ha) and located at Norman Place, off the A329 Vastern Road, to the north of Reading Train Station (postcode RG1 8DA, site centre OS grid reference 471,670m E, 174,060m N- see **Figure 3.1** and **Appendix A**). The site is currently occupied by the former Covea Insurance Building, with an associated car park on the south side of the building and a raised patio area on the north side.

Figure 3-1: Site Location Plan



- 3.1.2 Norman Place borders the western side of the site, with the A329 Vastern Road to the south. The Thames Water Clearwater Court office borders the site to the east, while further office development lie to the immediate west of the site.
- 3.1.3 The River Thames towpath runs borders the northern boundary of the site (with steps down from the patio to the towpath), and a public footpath runs around the western side of the site linking the towpath to Norman Road (and Vastern Road).

3.2 Topography

- 3.2.1 The topographic survey in **Appendix B** by Survey Solutions shows that the site is mainly at a level of between 38.2m AOD and 38.8m AOD as indicted below:
- The southern carpark ground levels is at 38.50m AOD to 38.60m AOD, rising up from a level on the Vastern Road footpath of 37.9m AOD;
 - The patio in the north of the site varies from 38.20m AOD on the northern boundary to 38.60m AOD at the face of the existing building;
 - The ground level of the former Covea Insurance Building, based on the level access at the main building entrance, is approximately 38.75m AOD.
- 3.2.2 The site is elevated approximately 0.7m above the adjacent towpath, accessed by steps at the midpoint of the northern boundary – see **Figure 3-2**.

Figure 3-2: View west along northern boundary, showing steps up to patio



3.3 Hydrological Setting

- 3.3.1 The River Thames is the dominant watercourse in the area and flows east alongside the northern boundary of the site between Caversham Bridge (upstream of the site) and Reading Bridge (downstream).
- 3.3.2 Caversham Lock lies approximately 300m downstream of the site and maintains a Standard Head Water Level (SHWL) for the upstream reach alongside the site, of 36.59m AOD.
- 3.3.3 The other watercourse of relevance to the site is the Vastern Ditch, a former land drainage channel that has been subsumed into the surface water sewer network. This flows in a culvert along the southern boundary of the site alongside Vastern Road. The watercourse emerges into a small channel on the south side of Caversham Lock which outfalls to the River Thames immediately downstream of the lock.
- 3.3.4 There are currently no flood defences present, or planned, in the area.

3.4 Geology and Hydrogeology

- 3.4.1 The British Geological Survey (BGS) online viewer provides information on the ground conditions in the area as follows:
- The site is underlain by Langley Silt Member superficial deposits (Clay and silt) up to a thickness of 5m.
 - The bedrock geology consists of Seaford Chalk Formation and Newhaven Chalk Formation.
- 3.4.2 River Terrace Deposits are shown overlying the solid geology on the site. Alluvium is shown overlying the Terrace Deposits on the line of the River Thames to the north of the site and is possibly present on the site. It is anticipated that the natural strata are overlain by Made Ground associated with the previous and present developments of the site.
- 3.4.3 From consideration of the geomorphological and topographical setting of the site, it is expected that groundwater level will be consistent with the typical river level at approximately 36.5m AOD, however locally higher water levels may be present following periods of prolonged rainfall and elevated river levels.

- 3.4.4 The site does not lie within an EA Groundwater Source Protection Zone, however it does lie within a 'Drinking Water Safeguard Zone' for surface water. The site lies on a Principal designated bedrock aquifer, and within an area of Groundwater Vulnerability designated 'Major Aquifer High'.

4 Overview of Flood Risk

The assessment of flood risk has been undertaken based on the sources of information listed in [Section 1.3](#).

4.1 EA Opendata Flood Maps

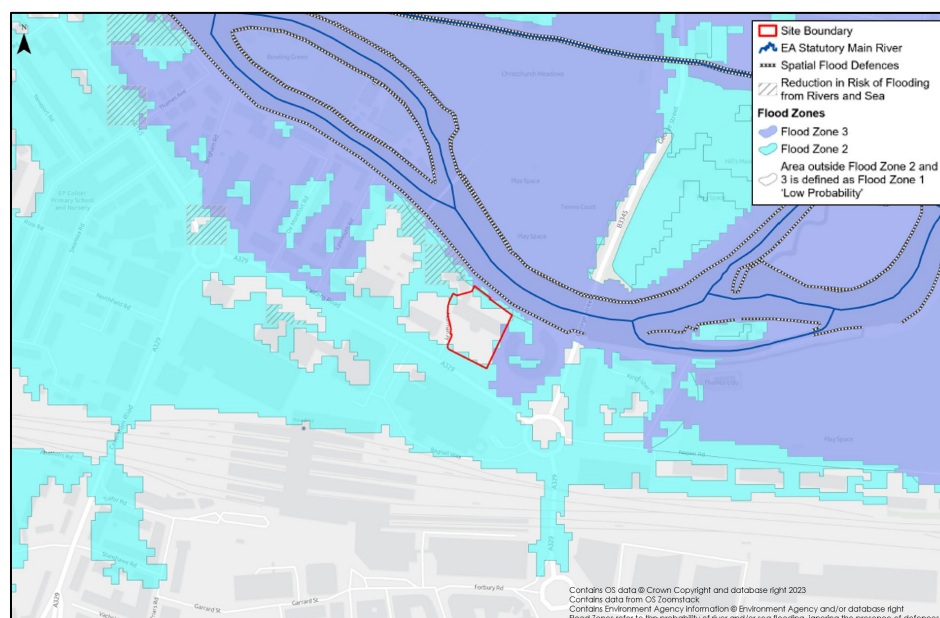
- 4.1.1 The following maps have been taken from the Stantec GIS flood maps report in [Appendix A](#) based on the EA Opendata datasets available online and reproduced with OS mapping under licence to Stantec.

Flood Zone Map

- 4.1.2 The first phase in identifying whether a site is potentially at risk of flooding is to consult the EA's Flood Zone maps, available on the EA's website. This provides an initial indication of the extent of the Flood Zones, which is more detailed site-specific level survey and modelled flood levels. The Flood Zones are defined in Table 1 of the Planning Practice Guidance (PPG) 'Flood Risk and Coastal Change' section as follows:

- **Flood Zone 1 'Low Probability'** – Land at less than 1 in 1000 (0.1%) annual probability of river or sea flooding;
- **Flood Zone 2 'Medium Probability'** – Land between 1 in 100 (1%) and 1 in 1000 (0.1%) annual probability of river flooding, or between 1 in 200 (0.5%) and 1 in 1000 (0.1%) annual probability of sea flooding;
- **Flood Zone 3 'High Probability'** – Land at 1 in 100 (1%) or greater annual probability of river flooding, or 1 in 200 (0.5%) or greater annual probability of sea flooding;

Figure 4-1: EA Flood Zone Map



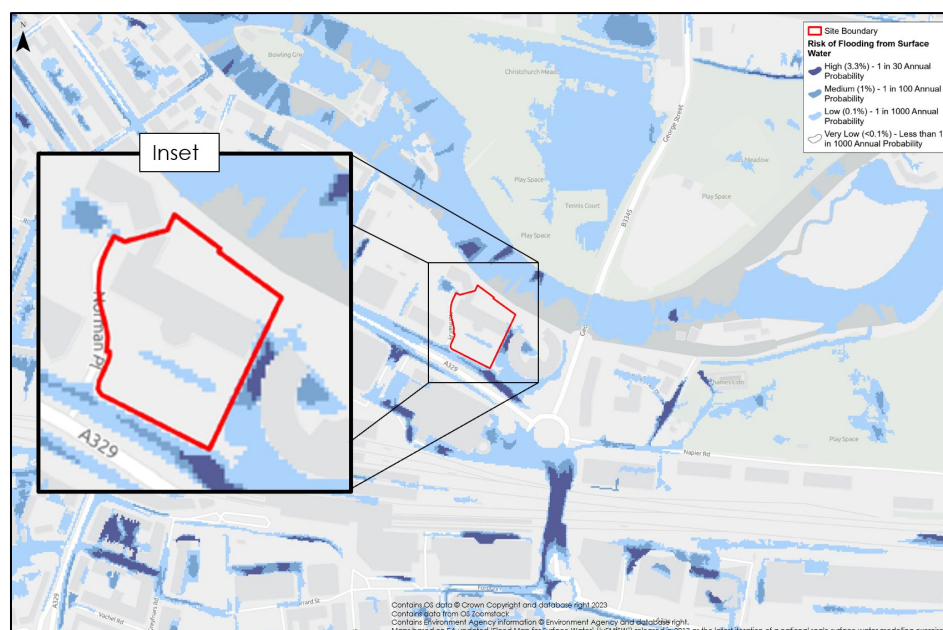
- 4.1.3 The extract in [Figure 4-1](#) indicates the site lies mainly within **Flood Zone 1 'Low Probability'**, but with a small area along the north boundary (and smaller encroachments on the south, east and west sides) within **Flood Zone 2 'Medium Probability'**. Smaller areas on the north and east boundaries lies in **Flood Zone 3 'High Probability'**.

- 10.1.2 The online EA Flood Zone map ('Flood Map for Planning (Rivers and Sea)') provides an initial indication of the impacts at a level, and this should be refined where appropriate as part of a site specific FRA, based on detailed ground level survey and modelled flood levels.

- ## Flood Risk from Surface Water

- 'High' Risk: 1 in 30 (3.3%) or greater AP rainfall event;
- 'Medium' Risk: Between a 1 in 100 (1%) and 1 in 30 (3.3%) AP rainfall event;
- 'Low' Risk: Between 1 in 1000 (0.1%) and 1 in 100 (1%) AP rainfall event;
- 'Very Low' Risk: Lower than 1 in 1000 (0.1%) AP rainfall event.

- Figure 4-2: EA Risk of Flooding from Surface Water Map**

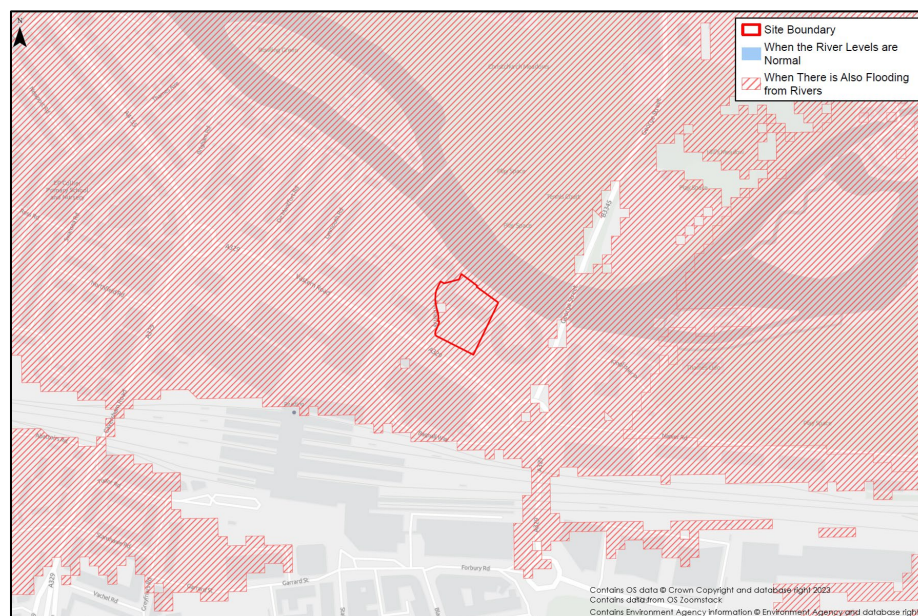


- 4.1.8 It should be noted that the surface water maps are generated using a generic methodology on a national scale, whereby rainfall is routed over a ground surface model. The analysis does not take account of any specific local information on below-ground drainage infrastructure and infiltration, although an adjustment is included in urban areas to account for the impact of sewerage and a standard infiltration allowance based on soil type. Consequently, the mapping provides a guide to potentially vulnerable areas based on the general topography of an area.

Flood Risk from Reservoirs Map

- 4.1.9 The EA reservoir maps show two flooding scenarios, a 'dry-day' and a 'wet-day'. The 'dry-day' scenario predicts the flooding that would occur if the dam or reservoir failed when rivers are at normal levels. The 'wet day' scenario predicts how much worse the flooding might be if a river is already experiencing an extreme natural flood.
- 4.1.10 The mapping confirms the site is not at risk of reservoir breach during a 'dry-day' scenario. However, the site is at risk of flooding during a 'wet-day' scenario – see **Figure 4-3**.

Figure 4-3: EA Risk of Flooding from Reservoirs Map

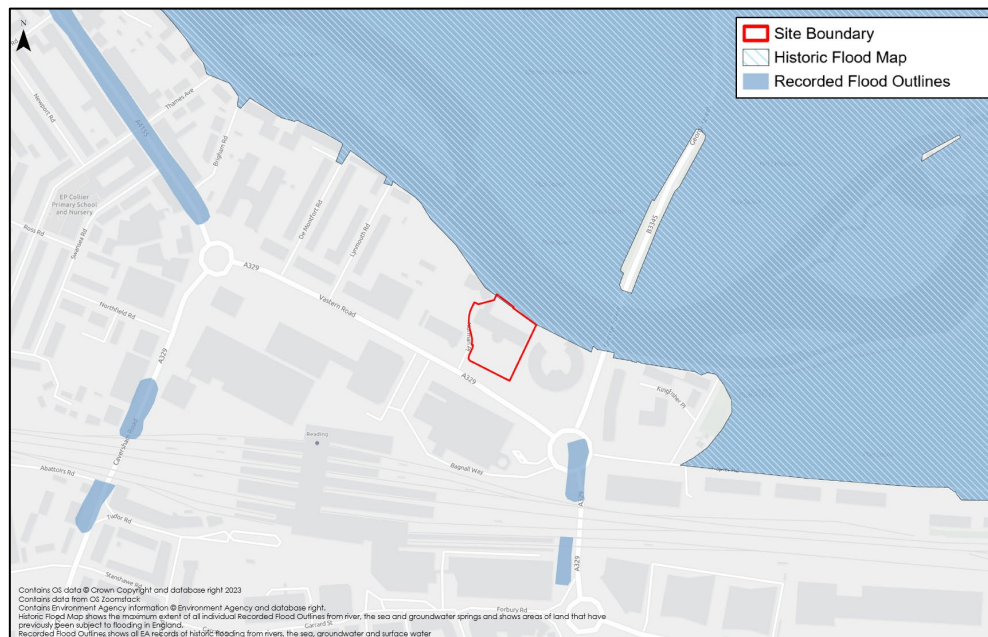


- 4.1.11 It should be emphasised that the risk of flooding from a reservoir breach is very small. The EA is the enforcement authority for the Reservoirs Act (1975) and there is a mandatory requirement for all large, raised reservoirs (where greater than 25,000m³ of water is stored above natural ground level) to be inspected and supervised by reservoir panel engineers. The reservoir owner has a duty of care under the Health and Safety at Work Act 1974 to ensure others are not placed at risk from their assets or actions.
- 4.1.12 Whilst the consequences of a reservoir breach could be severe, the probability of such an occurrence is therefore considered to be very low.

Historic Flood Map

- 4.1.13 The EA 'Historic Flood Map' is a dataset showing the maximum extent of all individual recorded flood outlines from river, the sea and groundwater and shows areas of land that have previously been subject to flooding (see **Figure 4.3** and **Appendix A**). The dataset confirms that the majority of the site has no record of being impacted by historic flood events. A small area along the northern boundary shows evidence of a historic flood outline, however this flood extent is likely covering the extent of the adjacent towpath rather than the site.

Figure 4-4: EA Historic Flood Map



- 4.1.14 The EA also provided individual recorded flood outlines as part of the Product 4 package of flood data (**Appendix D**). This indicates that the flooding identified on the northern boundary of the site was from the flood event in 2000. Critically, the data suggests the site did not flood during the March 1947 floods which are generally considered one of the most severe on record, and the highest flood level of the 20th Century.

4.2 January 2024 Flood Event

- 4.2.1 The Thames Valley was impacted by major flooding in early January 2024 following a sequence of storms at the end of 2023 and start of 2024. This causes particularly significant flooding through the Reading area due to elevated water levels in the River Thames.
- 4.2.2 Flood levels on the Thames rose gradually over a number of days and reached a peak on 7th January 2024. The record for the monitoring station at Reading Bridge, a short distance downstream of the site (installed mid 1990s) was for the 2003 flood (approximately a 1 in 20 annual probability event), and the peak on 7th January 2024 reached a level marginally exceeding the 2003 peak by 30mm, generating a level of approximately 37.66m AOD.
- 4.2.3 Comparison with historic Caversham Lock annual maxima data indicates that this is one of the highest flood levels on record, exceeded only by the 1947 flood in the 20th Century and earlier floods in the 1890s/1900s. Initial indications are that this January 2024 event was in the order of a 1 in 30 to 1 in 50 annual probability flood.
- 4.2.4 A site walkover was carried out shortly after the peak of the event (on the 8th January) and when water levels were approximately 100mm below the peak of the flood, and indicate a site flood level 37.75m AOD, which would correlate with the above severity.

- 4.2.5 The site was unaffected by the flooding, as were the main surrounding access routes (Vestern Road has been fully open – parts of the towpath were flooded, but the only local road closure was Napier Road to the east, which runs alongside Kings Meadow to the Tesco Extra).

Figure 4-5: Photos of River Thames flooding around site – 8th January 2024



4.3 Strategic Flood Risk Assessment

- 4.3.1 The current RBC Strategic Flood Risk Assessment (SFRA) Level 1 and Level 2 reports were prepared by PBA in 2017 and provide advice to RBC on flood risk issues within the Borough. This document has been reviewed and key information of relevance to the site has been extracted.

- **Historic Flooding:** Map F1 provides the EA historic floodplain map, consistent with the data discussed in [Section 4.1](#). Maps F2_N1, F2_N2 and F2_N3 show that historic flood events have affected the north of Reading for 9 recorded flood events. These show that the site has largely been unaffected and, critically, did not flood during the March 1947 floods (F2_N2), which is considered to be the worst recorded historic flooding incident affecting the Reading area. The maps indicate that a small area along the northern boundary of the site was affected during the August 1977 (F2_S1), December 2000 (F2_S2) and Thames 2013-2014 (F2_N3) flood events. However, this is assumed to be a result of the map's low precision as this area is significantly elevated behind the northern boundary wall and would require a significantly more extreme event to affect the site.
- **Flood Zone:** Map F4_N shows the Flood Zone extents across the area, indicating that the site primarily falls within Flood Zone 1, with areas along the site boundary located in Flood Zone 2 and Flood Zone 3. However, the Flood Zones have been updated to take account of more recent EA River Thames and River Kennet modelling and therefore this SFRA map is superseded by the latest version illustrated in [Figure 4-1](#);
- **Modelled Flood Extents:** SFRA map series reference F_5 provide modelled present day and climate change flood extents through the Borough. As mentioned above, this mapping has subsequently been updated to take account of the new EA River Thames and River Kennet modelling and therefore this map is superseded by the information discussed in - [Section 4.4](#);
- **Surface Water:** SFRA map series reference F_6 provides the surface water flood risk through the Borough. These outputs are consistent with the surface water flood maps discussed in [Section 4.1](#);
- **Reservoir Breach:** SFRA Map F_7 shows the flood risk associated with reservoir breach in the area (the only reservoir affecting the Borough being Whiteknights Lake at Reading University). The mapping confirms that any flooding as a result of a breach is limited to land to the south-east of Reading and the site is unaffected, and this dataset has been superseded by the information in [Section 4.1](#);
- **Groundwater:** SFRA Map F_8 provides a high -level overview of areas susceptible to ground water flooding, taken from a national dataset and based on topography and geological conditions across 1km grid squares. The site is shown in an area at 'between 25% and 50% susceptibility, but it should be noted that this analysis is not based on any detailed modelling, or on any records of groundwater flooding; it is annotated to show what percentage of the 1km area could be susceptible to groundwater flooding, thus providing an indication of the degree of probability of groundwater flooding that is present within a broad area.

From consideration of the local geomorphological and topographical setting of the site, it is anticipated that groundwater level will be broadly consistent with the typical river level at approximately 36.6m AOD (based on the SHWL), over 1.5m below the typical site level, although locally higher water levels may be present following periods of prolonged rainfall and elevated river levels.

- **Sewers:** Map F_9 provides a summary of Thames Water sewer flooding incidents by postcode, indicating the postcode area of the site has between 21-50 recorded sewer flooding incidents from both internal and external sources.

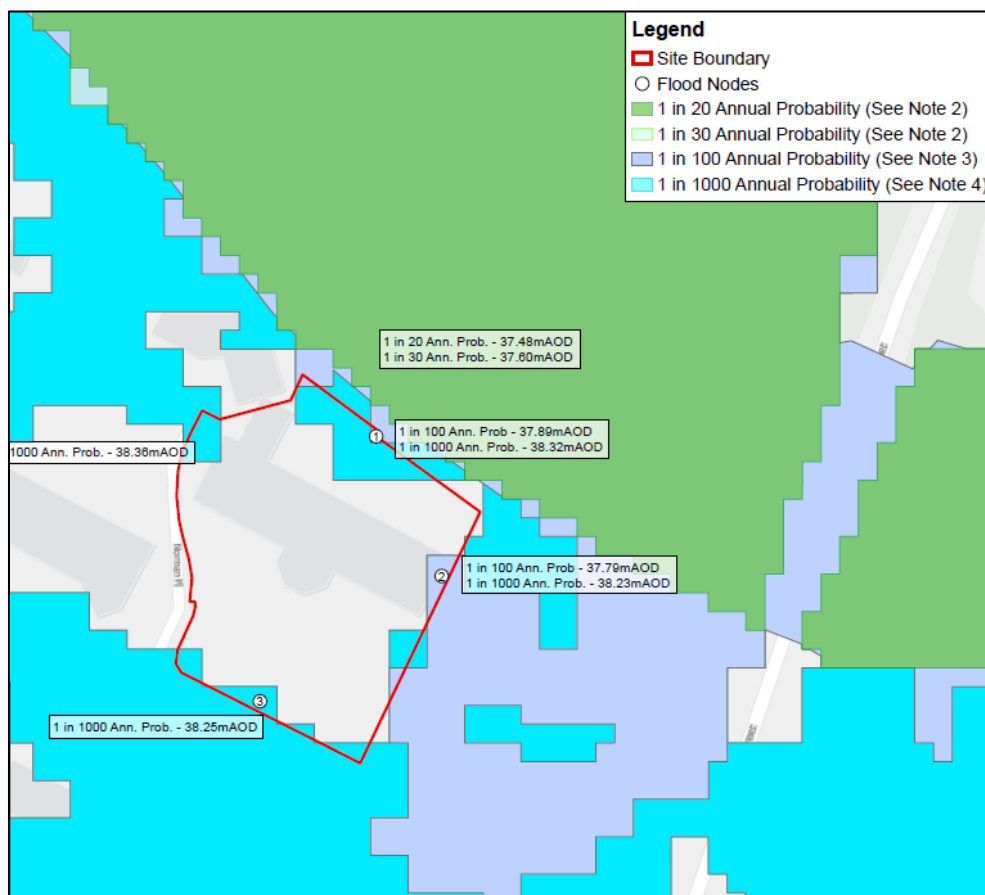
4.4 EA River Thames 2019 Modelling – Present Day

- 4.4.1 Stantec has extracted modelled flood extents from the River Thames (Pangbourne to Sonning) 2019 1D-2D hydraulic model – see [Figure 4-6](#). The 2019 model has been produced more

recently than the model used to generate mapping within the SFRA and forms the basis of the latest EA Flood Zone mapping. This model is therefore considered to be the best available information for assessing flood risk to the site.

- 4.4.2 These modelled outputs for present day scenarios are consistent with the EA 'Flood Map for Planning' (**Figure 4-1**), and since the area does not benefit from defences these flood levels can be used to define the key Flood Zones 2 and 3, to allow refinement of these extents at a site specific level.

Figure 4-6: EA Modelled Flood Extents – Present Day



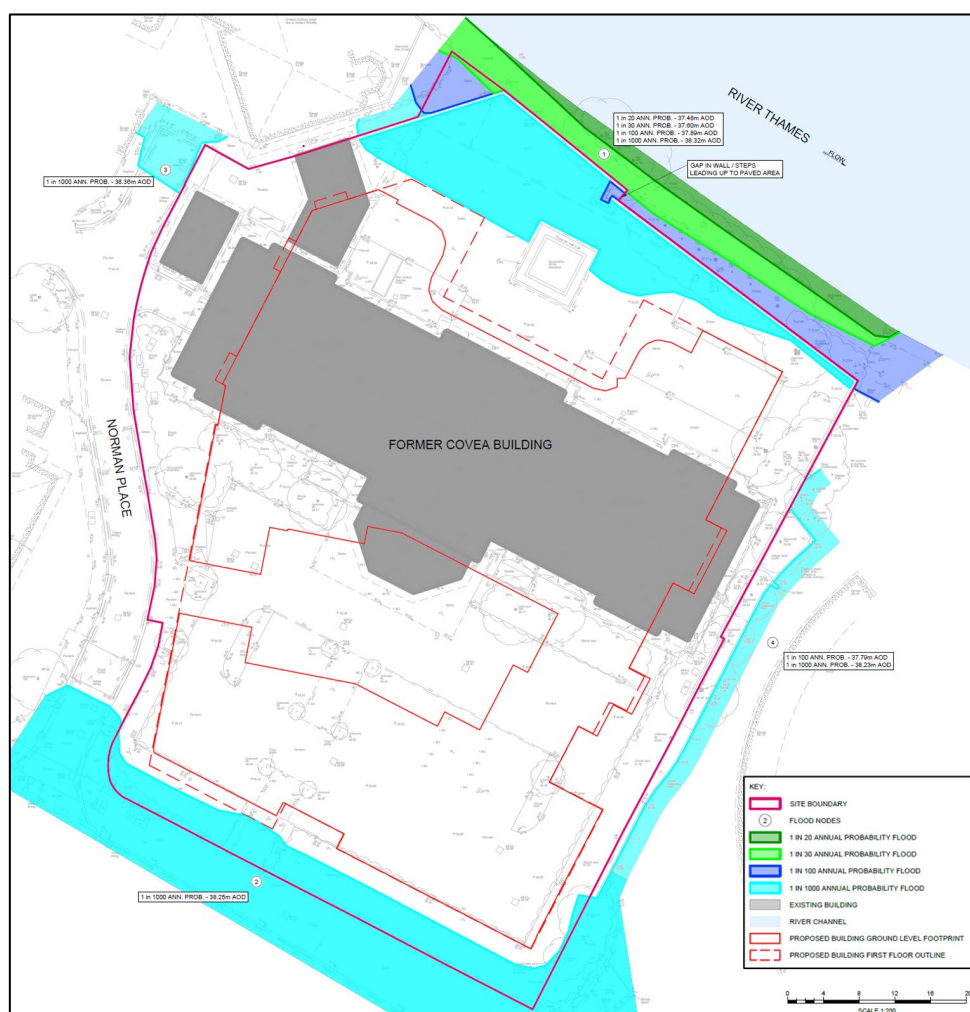
- 4.4.3 The modelled flood levels at the site are summarised in **Table 4-1**. The highest levels are on the north side of the site, adjacent to the River Thames, but levels are also provided on the southern side to allow where the most severe flood results in a flow route along Vastern Road

Table 4-1: EA Modelled Flood Levels – Present Day

Flood Event (Annual Probability)	Modelled Flood Level (mAOD)	
	North	South
1 in 5 (20%)	37.07	-
1 in 20 (5%)	37.48	-
1 in 30 (3.3%)	37.60	-
1 in 100 (1%)	37.89	-
1 in 1000 (0.1%)	38.32	38.25

4.4.4 This data has been refined at a site level through mapping the reference flood levels onto the site topographic survey as shown in **Figure 4-7**; see **Stantec Drawing 332610561-STN-GEN-SW-DR-W-0001** in **Appendix D**.

Figure 4-7: Modelled Flood Extents - Present Day – Detailed



4.4.5 The impact of the flooding is summarised below:

- **1 in 30 annual probability event (Flood Zone 3b, based on latest PPG)** – the flood extent impacts the adjacent River Thames towpath to the north only. The site is unaffected.
- **1 in 100 annual probability flood event (Flood Zone 3a)** – the flood extent impacts the adjacent towpath only. The site is unaffected, with the only areas impacted within the red line being at the base of the steps from the north patio dropping down to the towpath, and the public realm area in the north-west corner.
- **1 in 1000 annual probability flood event (Flood Zone 2)** – Flooding of the surrounding area, impacting the main access route to the site via the A329 Vastern Road and the north patio. Flooding on the south side of the site is limited to the shrub planting area along the site boundary, while on the north side parts of the raised patio are impacted to shallow depths. The existing building remains fully outside the floodplain (in Flood Zone 1), and the proposed building outline is similarly fully outside this floodplain.

4.4.6 The existing building remains fully outside the floodplain (i.e. in Flood Zone 1), and the proposed building outline is similarly fully outside this floodplain.

5 Impact of Climate Change

It is necessary to fully consider the potential impacts of climate change over the lifetime of new development. The applicable allowances to take into consideration are detailed in the 'Flood risk assessments: climate change allowances' planning guidance (see [Section 2.1](#)) and discussed in turn below.

5.1 Peak River Flow

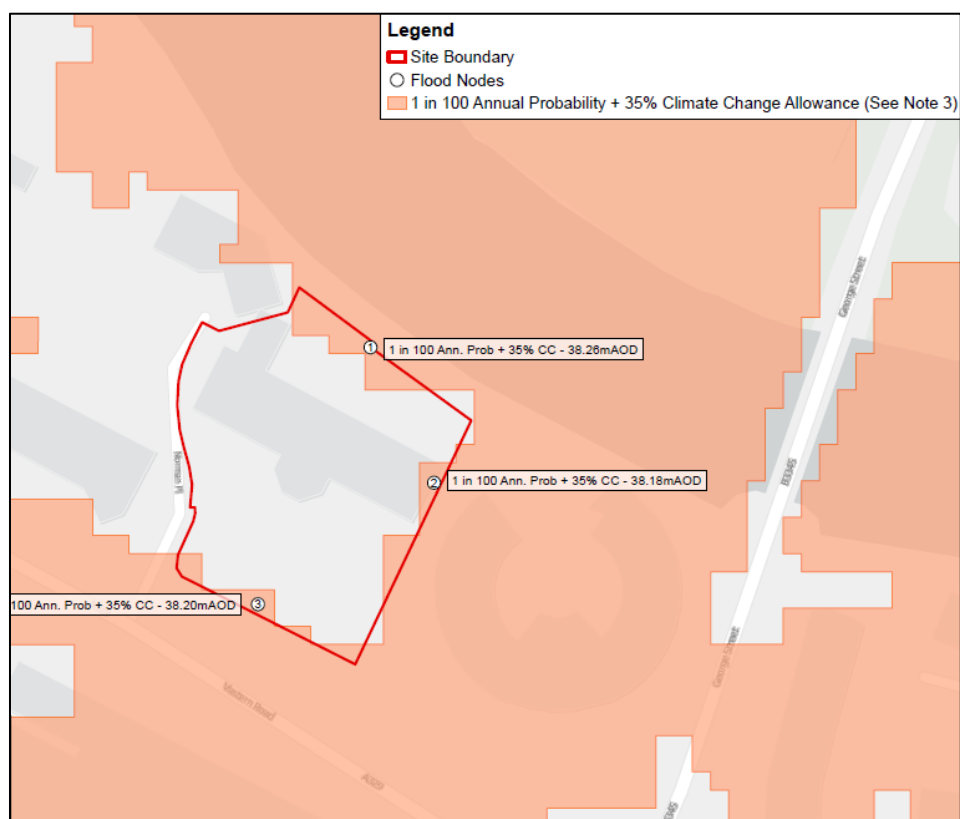
- 5.1.1 The peak river flow allowances provide a range of allowances based on percentile (i.e. the degree of certainty of an event occurring, based on the range of climate change scenarios assessed through scientific investigations). The applicable values for a Site are dependent on the 'River Management Catchment' in which the site is located, which can be confirmed via the online mapping tool embedded within the guidance.
- 5.1.2 The peak river flow allowances provide a range of scenarios based on percentile (i.e., the degree of certainty of an event occurring, based on the range of climate change scenarios assessed through scientific investigations). The provided allowances are subject to the sub-catchments of river basin district (known as management catchments) and the vulnerability classification of the proposed use of the site.
- 5.1.3 The Central allowance is identified as the design standard for most forms of proposed development in all appropriate Flood Zones (the exception being 'Essential Infrastructure' which requires the 'Higher Central' value). The peak river flow allowances to be considered as part of the FRA are as detailed in [Table 5-1](#)

Table 5-1: Climate Change – Peak River Flow - Central Allowances

River Management Catchment	Central Climate Change Allowance - Epoch		
	2020s	2050s	2080s
River Thames <i>Thames and South Chilterns Management Catchment</i>	+12%	+14%	+31%

- 5.1.4 The +31% scenario has not been modelled; therefore the modelled +35% scenario provides a conservative proxy for the 'design event'.
- 5.1.5 The climate change scenario modelled flood extent is shown in [Figure 5.1](#) and flood level is provided in [Table 4.1](#).

Figure 5-1: EA Modelled Flood Extent – Climate Change



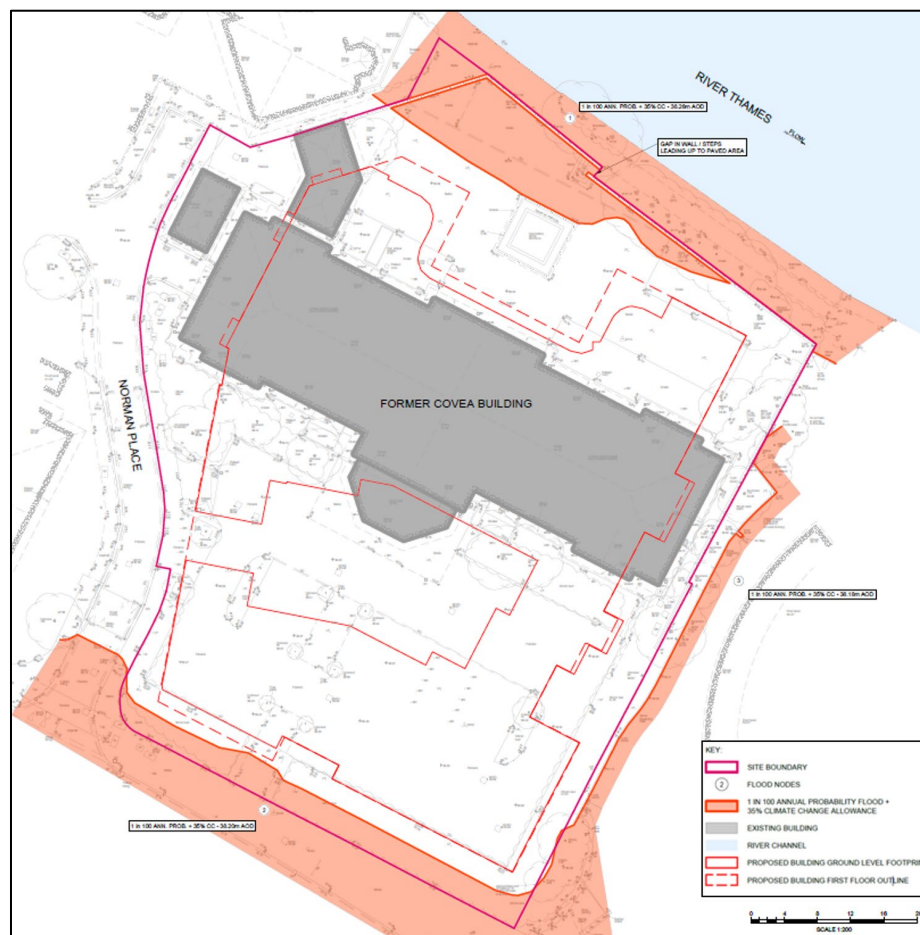
5.1.6 The available 1 in 100 annual probability plus allowance for climate change floodplain levels for the site are provided in **Table 5.2**.

Table 5-2: EA Modelled Flood Level - Climate Change

Flood Event (1 in 100 Annual Probability plus climate change allowances)	Maximum Flood Level (m AOD)	
	North	South
+35%	38.26	38.20

5.1.1 This data has been refined at a site level through mapping the reference flood levels onto the site topographic survey as shown in **Figure 5-2**; see **Stantec Drawing 332610561-STN-GEN-SW-DR-W-0002** in **Appendix D**.

Figure 5-2: Modelled Flood Extents – Climate Change – Detailed



5.1.2 The flooding in the 1 in 100 annual probability +35% climate change event is shown to impact part of the north patio to shallow depths, and similarly the vegetated bank along the southern boundary with Vastern Road. The existing – and proposed – building footprint lies fully outside the floodplain.

5.2 Peak Rainfall

5.2.1 The potential increase in peak rainfall intensity needs to be considered in the surface water drainage strategy for new developments.

5.2.2 The EA climate change allowances guidance was updated in May 2022 to include a GIS based 'peak rainfall allowances' map showing the anticipated changes in rainfall intensity based on river management catchment. The anticipated changes in peak rainfall intensity in small catchments (less than 5km²), or urbanised drainage catchments are summarised in **Table 5-3** for large rural drainage catchments the peak river flow allowances are applied.

Table 5-3: Climate Change – Peak Rainfall Intensity Allowances

<i>Thames and South Chilterns Management Catchment</i>	Total potential change anticipated (2070s epoch – i.e. 2061 to 2125)	
	<i>Central</i>	<i>Upper End</i>
<i>3.3% (1 in 30-year) rainfall</i>	<i>25%</i>	<i>35%</i>
<i>1% (1 in 100-year) rainfall</i>	<i>25%</i>	<i>40%</i>

- 5.2.3 As the development proposals are considered as having a design life of 100 years, a 40% climate change allowance will be assessed within the surface water drainage strategy discussed in **Section 7.6**.

6 Proposed Development and Sequential Test

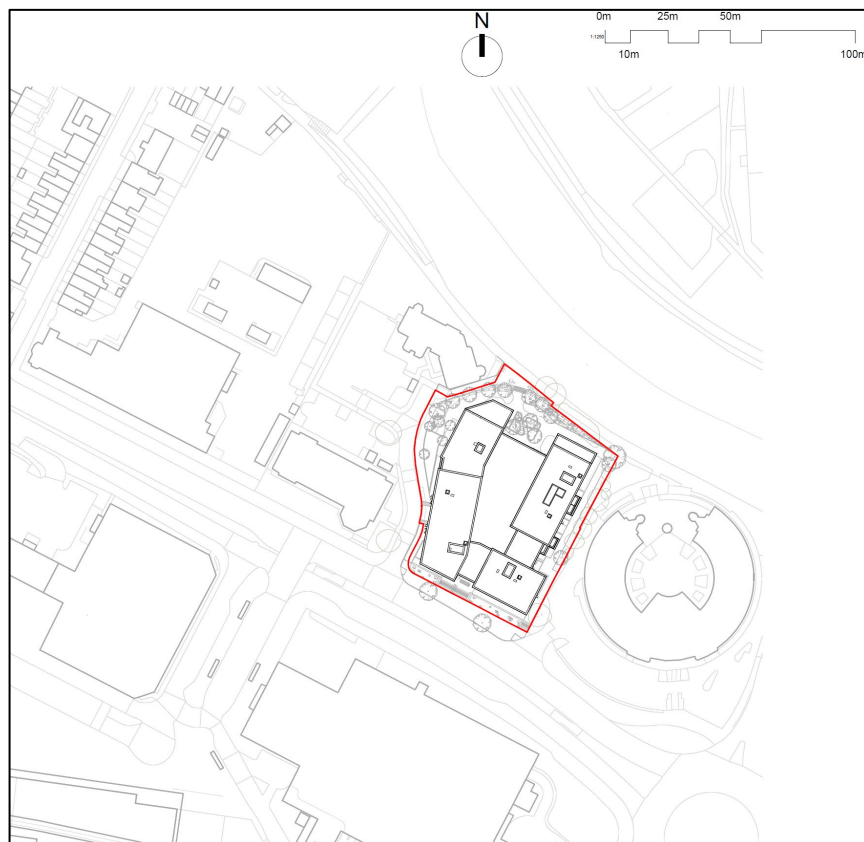
6.1 Proposed Development

6.1.1 This FRA accompanies a planning application for:

“Demolition of the former Covea Insurance building and construction of residential-led development, access from Norman Place and associated car parking, infrastructure and landscaping”

6.1.2 Details of the proposals by Assael Architects are included in **Appendix C**, while an extract of proposed ground floor layout is shown in **Figure 6-1**.

Figure 6-1: Proposed Site Plan



- 6.1.3 The Proposed Development seeks to deliver 254 studio, one, two and three bedroom residential dwellings (Use Class C3), together with 278m² (GEA) of flexible Class E floorspace at ground floor level. A series of internal and external amenity spaces feature within the layout. New pedestrian accesses are proposed from Vastern Road and Norman Place and a vehicular access to a ground floor undercroft car parking area is proposed from Norman Place. Substantial public realm surrounds the development, providing significant visual improvement to Vastern Road, Norman Place and the River Thames frontage.
- 6.1.4 The proposed mitigation is based on a design life for the development of 100 years, and the climate change allowances discussed in **Section 7** are also based on this assumption.

6.2 Flood Risk Vulnerability

- 6.2.1 The NPPF Annex 3 confirms the '*Flood risk vulnerability classification*' of a site, depending upon the proposed usage.
- The proposed residential development is classed as '**more vulnerable**' development.
 - The proposed 'Class E' ground floor uses have a '**less vulnerable**' classification.
- 6.2.2 This classification is subsequently applied to PPG 'Flood Risk and Coastal Change' Table 2 'Flood risk vulnerability and flood zone incompatibility' to determine whether:
- The proposed development is permitted or not for the Flood Zone in which it is located, and;
 - Whether an Exception Test is required for the proposed development.
- 6.2.3 All forms of development are appropriate in Flood Zone 1 'Low Probability'.

6.3 NPPF Sequential Test

- 6.3.1 The NPPF follows a sequential risk-based approach in determining the suitability of land for development in flood risk areas, with the intention of steering all new development to the lowest flood risk areas.
- 6.3.2 The location of the proposed building footprint is sited entirely in the Flood Zone 1 'Low Probability' and is at low probability of flooding from other sources. As the lowest risk Flood Zone, the Sequential Test is de facto passed, and the Exception Test is not required.
- 6.3.3 This is to be confirmed through liaison with RBC; as the 'decision maker' it is for the Local Planning Authority to consider the Sequential Test as it requires consideration of local planning issues, whereas the EA role will be in reviewing the technical flood risk aspects during the planning application process.

7 Flood Mitigation Strategy

7.1 Sequential Approach

- 7.1.1 The NPPF encourages the application of the 'sequential approach' in the master-planning process for new development, i.e. locating the more sensitive/vulnerable elements of new development in the areas which lie at lowest probability of flooding and, conversely, reserve the areas of the site at greatest risk of flooding for the least vulnerable elements of the development (or, preferably, leave such areas undeveloped or as soft landscaping).
- 7.1.2 The proposed development layout adheres to this approach, with the proposed built development located within Flood Zone 1 'Low Probability', consistent with the existing building, and any 'less vulnerable' elements at ground floor level.

7.2 Construction Phase Mitigation

- 7.2.1 For the construction phase, a Construction Environmental Management Plan (CEMP) will be produced so that the potential impacts of construction are managed efficiently, including measures to mitigate the adverse impacts of construction and ensure that there is no detrimental impact on flood risk and surface water. The CEMP will be a live document that will be reviewed and updated at regular intervals throughout the construction phase.
- 7.2.2 Measures will be adopted to mitigate against the risk to local watercourses from contaminated surface water runoff arising from general construction activities and the operation of construction vehicles present on the site during the construction phase. These procedures may include:
- Building and raising the ground where pollutant material is stored;
 - Creating a temporary surface water drainage network, separate from the existing drainage routes to the unnamed watercourse, to manage surface water run-off during the construction phase; and
 - Pollution clean-up measures in the event of accidental spillages.

7.3 Building Design and Floor Levels

- 7.3.1 Standard requirements for ground floor levels of new development are set out in BS8533:2017 'Assessing and Managing Flood Risk in New Development – Code of Practice'. This recommends floor levels are set a minimum of 300mm above the modelled 1 in 100 annual probability plus allowance for climate change flood level.
- 7.3.2 This is also consistent with the guidance from the EA and the recommendations in the RBC SFRA.
- 7.3.3 Based upon EA guidance, and a reference 1 in 100 annual probability +35% climate change flood level of 38.26m AOD, the minimum residential floor level of the proposed development is proposed at 38.56m AOD.
- 7.3.4 It is also recommended that ground floor levels are set a suitable freeboard above surrounding ground (minimum 150mm) to mitigate the residual flood risk associated with excess surface water runoff in an extreme rainfall event. Similarly, exterior ground levels across the site should also be appropriately contoured to direct surface water away from dwellings in such a scenario.

7.3.5 Due to local planning constraints, some 'less vulnerable' elements of the development such as lobby/access points may have thresholds below 38.56m AOD (e.g. in order to provide level access off the adjacent public realm to the south of the site), and such areas will incorporate flood resistance/resilience measures as appropriate to address the residual risk.

- Flood resistant measures aim to keep flood water out of the building by providing barriers and incorporating low permeability measures in the wall and floors. Typically, flood resistance measures are effective up to a maximum flood depth of approximately 500mm, with suitable measures incorporated up to the flood level.
- Flood resilient measures are incorporated where it is accepted that, in severe flood events, water may enter parts of a building so it is necessary to ensure the building will remain useable after the floodwater has receded and the area has been cleaned. Therefore, the key issue is to incorporate materials that retain their structural integrity and have good drying and cleaning properties (e.g. the use of suitable tiling over areas, with water resilient grout). It is also recommended that services are secured and sockets etc. are located a suitable freeboard above floor level.

7.4 Floodplain Storage

7.4.1 Any new development located in the vicinity of a watercourse should be constructed such that it does not detrimentally impact on flow routes or reduce the available floodplain storage over a site; either of which could potentially cause an increase in flood levels on-site or elsewhere. This is considered up to the benchmark of the 1 in 100 annual probability plus allowance for climate change fluvial flood level.

7.4.2 In the 'design' 1 in 100 annual probability +35% climate change allowance flood event, the EA modelling indicates the existing site is outside the floodplain, other than limited shallow flooding in the patio on the north side of the site and along the planting on the southern boundary with the Vastern Road public realm.

7.4.3 The proposed building overlay on **Stantec Drawing 332610561-STN-GEN-SW-DR-W-0002** in **Appendix D** (see extract in **Figure 5-2**) confirms that both the existing and proposed building footprint lies fully outside this floodplain and therefore will not impact on floodplain capacity.

7.4.4 The proposal includes significant enhancements to the northern boundary treatment with the adjacent – and significantly lower – Thames towpath. This includes a more open public realm area in the north-west corner of the site, and stepped terracing/graded buffer planting to slope up to the new patio area on the north side of the site – replacing the existing vertical wall along the entire north boundary. This will have the effect of providing an improvement in floodplain capacity adjacent to the river channel.

7.4.5 In conclusion, the proposals will have no detrimental impact and instead provide an improvement in floodplain storage capacity.

7.5 Safe Access

7.5.1 It is necessary to consider and incorporate safe access arrangements as part of the mitigation, to ensure the users/occupants of the development are safe in times of flooding.

7.5.2 The PPG Flood Risk and Coastal Change section (para 005) states that, as well as other aspects, is necessary to consider *"the ability of residents and users to safely access and exit a building during a design flood and to evacuate before an extreme flood (0.1% annual probability of flooding with allowance for climate change)"*

7.5.3 Consideration of the safety of any pedestrian route has been based on the guidance in the EA document *'Supplementary Note on Flood Hazard Ratings and Thresholds for Development Planning and Control Purpose – Clarification of the Table 13.1 of FD2320/TR2 and Figure 3.2*

of FD2321/TR1'. Due to the developed nature of the area, it is assumed that velocities would be very low, in which case the pedestrian routes would still be considered a 'Very Low Hazard' for depths up to 250mm.

7.5.4 The 'hazard to people' classification has four ratings:

- **Very low hazard** – caution (Flood Hazard Rating ('FHR') less than 0.75)
- **Danger for some** – i.e. children, the elderly and infirm (FHR between 0.75 and 1.25)
- **Danger for most** – includes the general public (FHR between 1.25 and 2.0)
- **Danger for all** – includes the emergency services (FHR greater than 2.0)

7.5.5 The flood hazard mapping outputs from the EA modelling at the key present day 1 in 100 annual probability flood event and the +35% climate change equivalent are shown in **Figure 7-1** and **Figure 7-2** respectively.

Figure 7-1: Flood Hazard - 1 in 100 Annual Probability Scenario

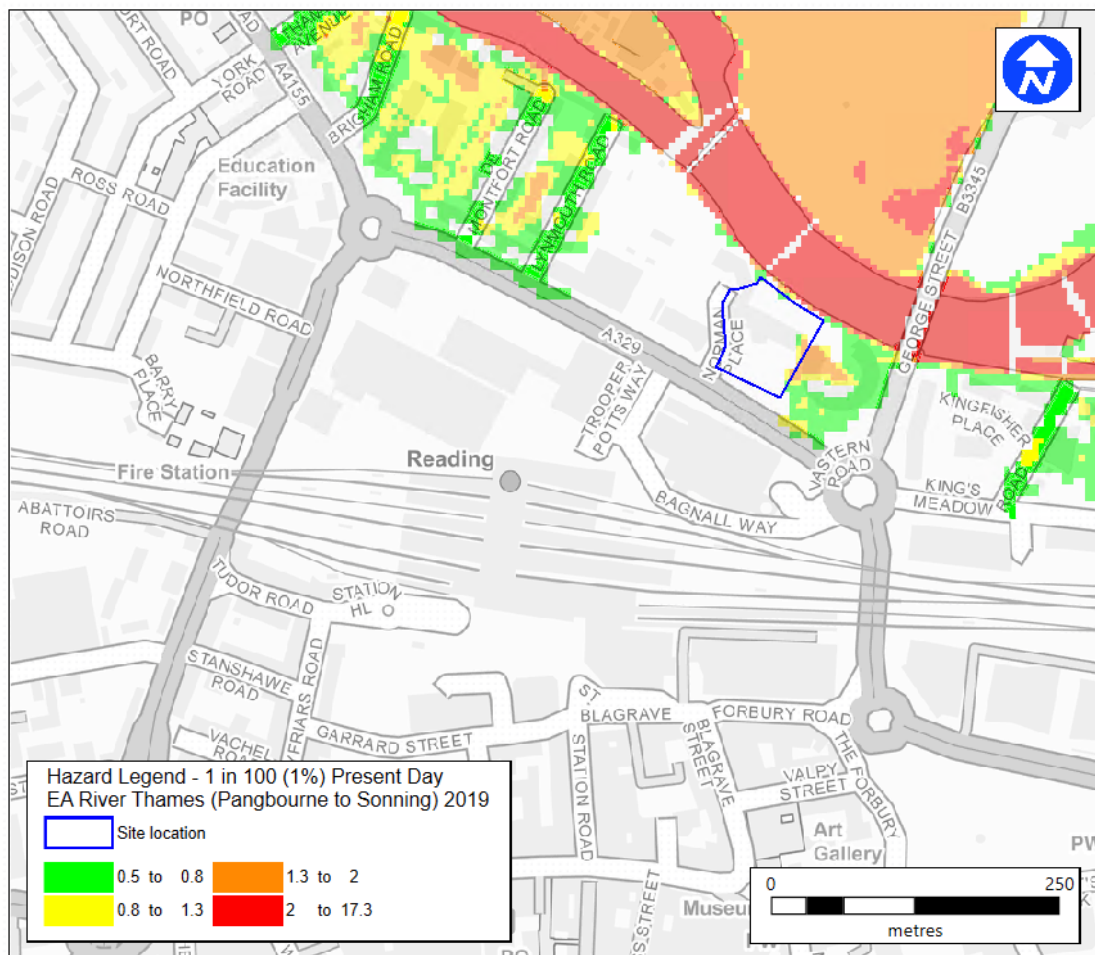
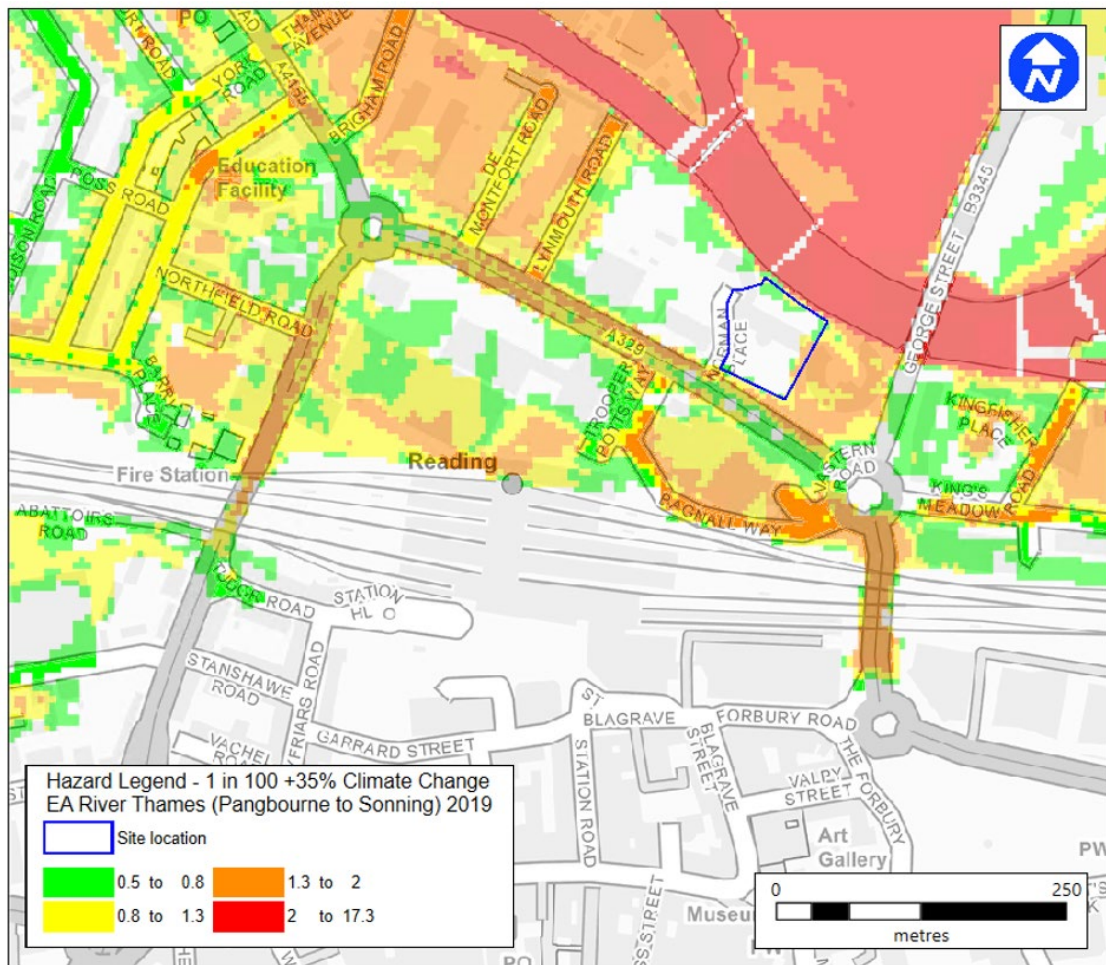


Figure 7-2: Flood Hazard - 1 in 100 Annual Probability +35% Climate Change Scenario



7.5.6 The RBC SFRA Level 2 sets out the following hierarchy to be applied when considering the provision of safe access:

More Vulnerable Development:

- a) *The preference is to have a continuous dry route at the 1 in 100 annual probability plus appropriate allowance for climate change event;*
- b) *If (a) is not achievable, then developer should assess if safe access is available at the current 1 in 100 annual probability flood event (in accordance with Defra flood hazard guidance);*

If (b) is achievable, then it is considered safe access in more extreme events could be addressed through provision of a site 'Flood Management and Evacuation Plan', subject to a detailed analysis of the flood hazard along the route and RBC emergency planning department approval;

If (b) is not achievable, it is recommended that the site is not suitable for new (or intensification of) permanent residential development and other uses should be considered (i.e. 'Less Vulnerable' commercial/office development).

- 7.5.7 Vastern Road is unaffected up to and including the 1 in 100 annual probability flood event, as such a continuous safe and dry access route to the site is provided at this event.
- 7.5.8 Vastern Road is impacted in the extreme 1 in 1000 annual probability flood extent as well as the 1 in 100 annual probability +35% climate change scenario, due to a flood flow route along the road flowing west to east in these extreme scenarios.
- 7.5.9 Based on the above information, while option (a) is not feasible, Vastern Road is unaffected by the present day 1 in 100 annual probability event in order to meet criterion (b).
- 7.5.10 It is therefore proposed that a 'Flood Management and Evacuation Plan' is produced in order to ensure that residents are provided with sufficient advance warning to evacuate the site prior to the access routes becoming blocked. This can be secured through planning condition, and as detailed in the Reading SFRA, the River Thames is a slow-responding catchment and there has been widespread public awareness of prior flood events in the area several days before the area was affected, and there would be visual signs of wider flooding and the slowing rising floodwater from the site for a period of days before any access routes are compromised.

7.6 Surface Water Management

- 7.6.1 As of April 2015, the Lead Local Flood Authority (LLFA) has become the statutory consultee for surface water management on planning applications for 'major development'. The NPPF recognises that flood risk and other environmental damage can be managed by minimising changes in the volume and rate of surface runoff from development sites and recommends that priority is given to the use of Sustainable Drainage Systems (SuDS) in new development, this being complementary to the control of development within the floodplain.
- 7.6.2 As the intention of SuDS is to mimic the natural drainage regime of the undeveloped site, the NPPF PPG states the following (consistent with the Building Regulations H3 hierarchy):

"...The types of sustainable drainage system which it may be appropriate to consider, will depend on the proposed development and its location, as well as any planning policies and guidance that apply locally. Where possible, preference should be given to multi-functional sustainable drainage systems, and to solutions that allow surface water to be discharged according to the following hierarchy of drainage options::

- into the ground (infiltration),*
- to a surface water body,*
- to a surface water sewer, highway drain or another drainage system,*
- to a combined sewer"*

- 7.6.3 A 'Drainage Strategy' document has been prepared by Hexa Consulting and is provided separately as part of the planning submission, key points from which are summarised below:
- *"A culverted watercourse is present along the southern boundary of the Site. The existing surface water drainage system connects to the culverted watercourse and this philosophy will be retained for the development. The existing connection point to the culverted watercourse is proposed to be retained..."*
 - *Surface water discharge will be restricted to a maximum rate of 8l/s for the design storm events.*

- *The restriction to the discharge rate has been calculated by providing at least 50% betterment to the pre-development 1 in 1 year discharge rate (using the Modified Rational Method) based on a catchment area of 0.377ha and controlling the discharge volume”.*

7.6.4 The associated proposals identify the provision of on-site attenuation in an array of SuDS features including rain gardens, permeable paving, green roof and cellular storage, which will enhance the on-site capacity for surface water and result in an improved (reduced) runoff rate from the site. See the Hexa Consulting report for further details.

7.7 Flood Risk Activity Permit Requirements

- 7.7.1 Proposed works in, over, under or near a main river require a ‘Flood Risk Activity Permit’ (FRAP) application to be made to the EA (this replaced the previous ‘Flood Defence Consent’ (FDC) procedure). This is required to demonstrate any new development does not have a detrimental impact on flood risk.
- 7.7.2 The northern end of the development lies within 8m of the edge of the River Thames, and the proposals to enhance this boundary will be submitted to the EA as part of a FRAP application in due course outside the planning process.

8 Residual Risk

8.1.1 The PPG states the following in relation to residual risk:

“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.”*

8.1.2 It is difficult to completely guard against flooding since extreme events greater than the design standard event are always possible however, it is practicable to minimise the risk by allowing a substantial freeboard (safety margin) and by using suitable construction and management techniques.

- To minimise residual risks, such as climate change and other uncertainties, floor levels of proposed units will be set a minimum of 38.56m AOD; 300mm above the modelled 1 in 100 annual probability +35% allowance for climate change design flood level. They will also be a suitable freeboard above surrounding ground in order to mitigate the residual risk from surface water flooding in an extreme rainfall event.
- Continuous safe access will be available at the present day 1 in 100 annual probability flood event. Continuous safe access is compromised at the peak of the more extreme climate change scenarios and therefore a Flood Management and Evacuation Plan will inform occupants of the measures to take in the event of a flood to the area, in accordance with Reading SFRA requirements.

8.1.3 As such, the residual risk is considered to be acceptable for the lifetime of the development.

9 Conclusions

- 9.1.1 This Flood Risk Assessment (FRA) has been prepared by Stantec to accompany a planning application at Norman Place, Reading, RG1 8DA for the demolition of the former Covea Insurance building at Norman Place, Reading, and construction of 'Waterfront Square'; a new residential-led development, with access from Norman Place and associated car parking, infrastructure and landscaping.

Vulnerability and Sequential Test

- 9.1.2 The proposals are for redevelopment of the site for residential uses, classified as 'More Vulnerable' as defined in as defined in the National Planning Practice Framework (NPPF) Annex 3.
- 9.1.3 The site lies predominantly in Flood Zone 1 'Low Probability'; the only exceptions to this are the small areas over the northern patio and southern boundary that extend into Flood Zone 2 'Medium Probability', and smaller areas of public realm alongside the River Thames in Flood Zone 3 'High Probability'.
- 9.1.4 A Sequential Test is de facto passed as the proposed building footprint lies solely within Flood Zone 1 and is at low risk from other sources. The Exception Test is not required.

Flood Risk

- 9.1.5 The main source of flood risk is from the River Thames to the immediate north. The remaining sources of flood risk are considered to be a low risk.
- 9.1.6 National climate change guidance set out in the Planning Practice Guidance (PPG) confirms that the site conditions require consideration of an increase in peak river flow of 31% ('Central' allowance for 2080 epoch).
- 9.1.7 The +31% climate change scenario has not been modelled by the EA and therefore the modelled +35% scenario has been used as a conservative proxy. This results in shallow flowing along part of the northern patio of the site, and along the southern boundary. The existing and proposed building footprints lie fully outside this 'design' floodplain.

Mitigation Strategy

- 9.1.8 To mitigate against this residual risk the minimum residential floor level will be set above 38.56m AOD, which includes a 300mm freeboard above the 1 in 100 annual probability +35% climate change flood level.
- 9.1.9 Continuous safe and dry access is available at the present day 1 in 100 annual probability scenario but not available when climate change is considered. Based on the approach advocated in the RBC SFRA, 'More Vulnerable' residential development is acceptable on the basis subject to a Flood Management and Evacuation Plan.
- 9.1.10 The proposed building is outside the 1 in 100 annual probability +35% climate change flood extent and will not impact on floodplain storage capacity. Improvements to the northern boundary treatment and landscaping enhancements will result in a stepped/sloping bank that will improve the local floodplain capacity from the existing conditions.
- 9.1.11 A surface water drainage strategy has been developed that propose on-site attenuation through a range of SuDS features, and controlled discharge to the Vastern Ditch culverted watercourse at a reduced rate, in accordance with the Lead Local Flood Authority (LLFA) requirements.

Summary

- 9.1.12 In conclusion, the future occupants and users of the proposed development will be at a low risk of flooding and the development will not increase flood risk elsewhere. It is demonstrated that the proposal complies with the NPPF, Planning Practice Guidance (PPG) and the local planning policy with respect to flood risk and is an appropriate development at this location.

Appendix A OpenData Flood Maps

- Site Location Plan
- Site Location (Aerial Photography)
- Area Topography (LiDAR)
- Area Topography (LiDAR) – Detailed
- EA Flood Zone Map
- Watercourse Location
- EA Surface Water Flood Risk
- EA Surface Water Flood Risk – Depth 3.3 Percent Chance
- EA Surface Water Flood Risk – Depth 1.0 Percent Chance
- EA Surface Water Flood Risk – Depth 0.1 Percent Chance
- Reservoir Flood Map
- EA Ground Water Source Protection Zone
- EA Historic Flood Map

Appendix B Topographic Survey

- Topographic Site Survey drawing 60630BDLS-01 rev A produced by Survey Solutions, dated February 2024

Appendix C Development Proposals by Assael

- A4012-ASA-XX-GF-DR-A-0150- Proposed Site Plan
- A4012-ASA-XX-GF-DR-A-0151- Proposed Block Plan
- A4012-ASA-XX-GF-DR-A-0100- Site Location Plan
- A4012-ASA-ZZ-ZZ-DR-A-0400-P02 – North and West Elevation
- A4012-ASA-ZZ-ZZ-DR-A-0401-P02 – South and East Elevation
- A4012-ASA-ZZ-ZZ-DR-A-0402 – Courtyard West Elevation
- A4012-ASA-ZZ-ZZ-DR-A-0403 – Courtyard East Elevation

Appendix D Modelled Flood Extent

- Stantec Drawing 332610561-STN-GEN-SW-DR-W-0001 - Modelled Flood Extent – Present Day
- Stantec Drawing 332610561-STN-GEN-SW-DR-W-0002 - Modelled Flood Extent – Climate Change