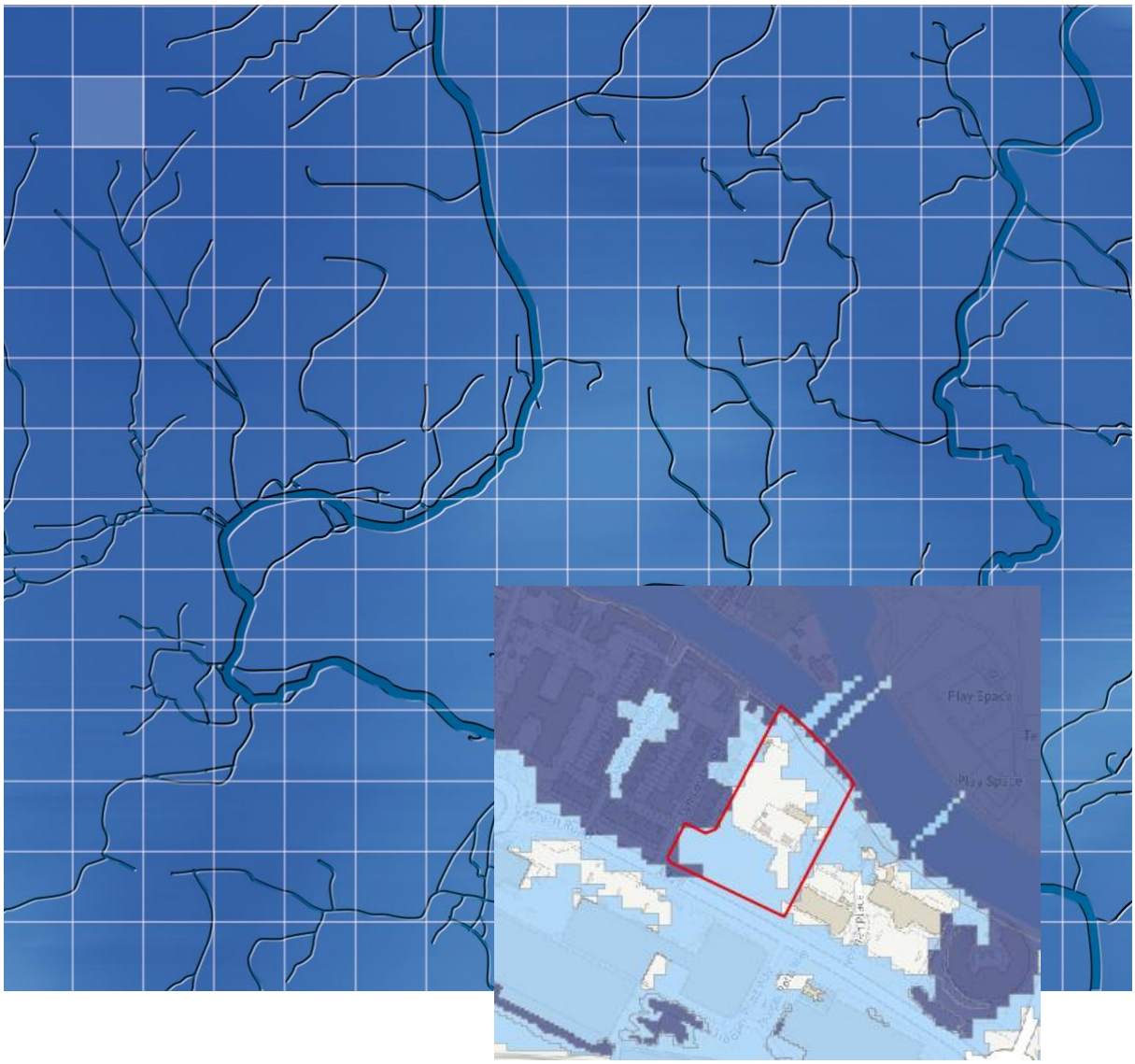
Reading Borough Council

May 2025

Riverside (CR11g)

Level 2 Strategic Flood Risk Assessment



Reading Borough Council

Riverside (CR11g) Level 2 Strategic Flood Risk Assessment

Document issue details

WHS10135

Version	Issue date	Issue status	Prepared By	Approved By
1.0	02/05/25	Draft	Joseph Bentley (*Consultant*)	Daniel Hamilton (*Principal Consultant*)

For and on behalf of Wallingford HydroSolutions Ltd.

This report has been prepared by WHS with all reasonable skill, care and diligence within the terms of the Contract with the client and taking account of both the resources allocated to it by agreement with the client and the data that was available to us. We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above. This report is confidential to the client and we accept no responsibility of any nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at their own risk.

The WHS Quality & Environmental Management system is certified as meeting the requirements of ISO 9001:2015 and ISO 14001:2015 providing environmental consultancy (including monitoring and surveying), the development of hydrological software and associated training.

Registered Office Maclean Building, Benson Lane, Wallingford OX10 8BB
www.hydrosolutions.co.uk

Riverside (CR11g) Level 2 SFRA
Flood Risk Overview

Fluvial Flood Risk	**M**
Pluvial Flood Risk	**L**
Other Sources of Flood Risk	**M**
Confidence in Assessment	**H**

Flood Risk

Fluvial flood risk represents the greatest risk, with 64% of the site lying in Flood Zone 2, based on the EA's fluvial flood map. Only 5% of the site is located in Flood Zone 3a.

In this location the fluvial flood map is based on detailed modelling in the form of the River Thames model (Pangbourne to Sonning) (2021). The outputs of this model were further assessed and show speed of onset to be very fast on the site during the design event, however the flood depths are generally shallow with hazard ratings of *low* or *danger for Some*. In this respect fluvial flood risk is considered moderate.

The risk from other sources of flooding is considered to be moderate.

The overall confidence in the assessment is high. This is based on the availability of recent detailed modelling in the vicinity of the site.

Conclusions and Recommendations

The proposed development will consist of both housing (more vulnerable) and offices/recreational (less vulnerable) infrastructure. The latter is permissible within Flood Zones 2 and 3a, more vulnerable infrastructure is permissible in Flood Zone 2, but must pass an Exception Test as specified in the latest NPPF if located in Flood Zone 3a. Neither development categorisations are permissible in Flood Zone 3b.

As only a small proportion of the site is located in Flood Zone 3a a mixed-use development should be possible. However, it should be noted that access routes to and from the site are located within Flood Zone 2 and the design flood extent, therefore provision of a Flood Evacuation Plan (FEP) is recommended at the planning stage.

Contents

1 Introduction

1.1 Background

Wallingford HydroSolutions Ltd has been commissioned by Reading Borough Council (RBC) to undertake a Level 2 Strategic Flood Risk Assessment (SFRA) at Riverside (CR11g) in accordance with the National Planning Policy Framework (NPPF), Planning Practice Guidance (PPG) and associated guidance from the Environment Agency (EA).

Where there is a risk of flooding at the site, this risk has been quantified with the latest available datasets and any associated limitations with the assessment have been identified.

Where applicable, recommendations for improving our understanding of flood risk and/or mitigating the risk has also been included in this report.

1.2 Assessment of Flood Risk

For the site, a detailed assessment of the nature of flood hazard was undertaken. This included using the relevant fluvial modelling data to assess:

- The proportion of the site inundated for a range of return periods
- The speed of onset
- Flood depth
- Flood velocity
- Flood hazard

The sites were assessed against a range of return periods, however the design event, the 100-year (plus central climate change) event, was considered most important for planning purposes.

In addition to the analysis of modelling data, the location, standard and condition of existing flood defences was assessed. Other sources of flooding were also reviewed at each site. This included an assessment of surface water flooding and an assessment of groundwater flooding based on available hydrogeological information from BGS and Soilscapes. Potential access/egress routes were identified with respect to the risk posed from all sources of flooding.

Following a review of flood risk, flood defences and the identification of access/egress routes, an assessment was made on whether a future site-specific FRA would be able to show that the site can be allocated for development. The assessment takes into account the flood risk vulnerability of the development, the scale of development proposed along with any requirements for the Exception Test. In this context, any mitigative actions in the form of ground raising and compensatory storage are identified.

The site assessments also include guidance for the preparation of FRAs, including information about the use of SuDS.

1.3 Report Structure

This FRA follows the structure summarised below:

1 - Introduction (this section)

2 - Site Description

3 - Flood Risk

4 – Detailed Review of Primary Flood Risk

5 – Development Viability and FRA Recommendations

2 Site Description

2.1 General Location Plan

The Riverside (CR11g) site is 1.24ha and is located on the south bank of the River Thames, 150m north of Reading Station. It is located in an urban area in central Reading, see Figure 1.

In the Replacement Local Development Plan (RLDP) this site is proposed to be used for residential use. The RLDP states an indicative potential for 250-380 dwellings. These dwellings may be complimented by small-scale leisure and complimentary offices.

2.2 Topography

Based on 1m LiDAR data, the site is relatively flat. The ground levels within the site boundary range from 36.7 to 38.8m AOD, see Figure 2. The average ground level is 37.5m AOD.

2.3 Nearby Watercourses

The site is located directly adjacent to the River Thames. The River Thames runs from west to east at this location. The Christchurch ditch is located on the north of the Thames, 230m from the site. Figure 1 shows the location of the watercourses near to the site.

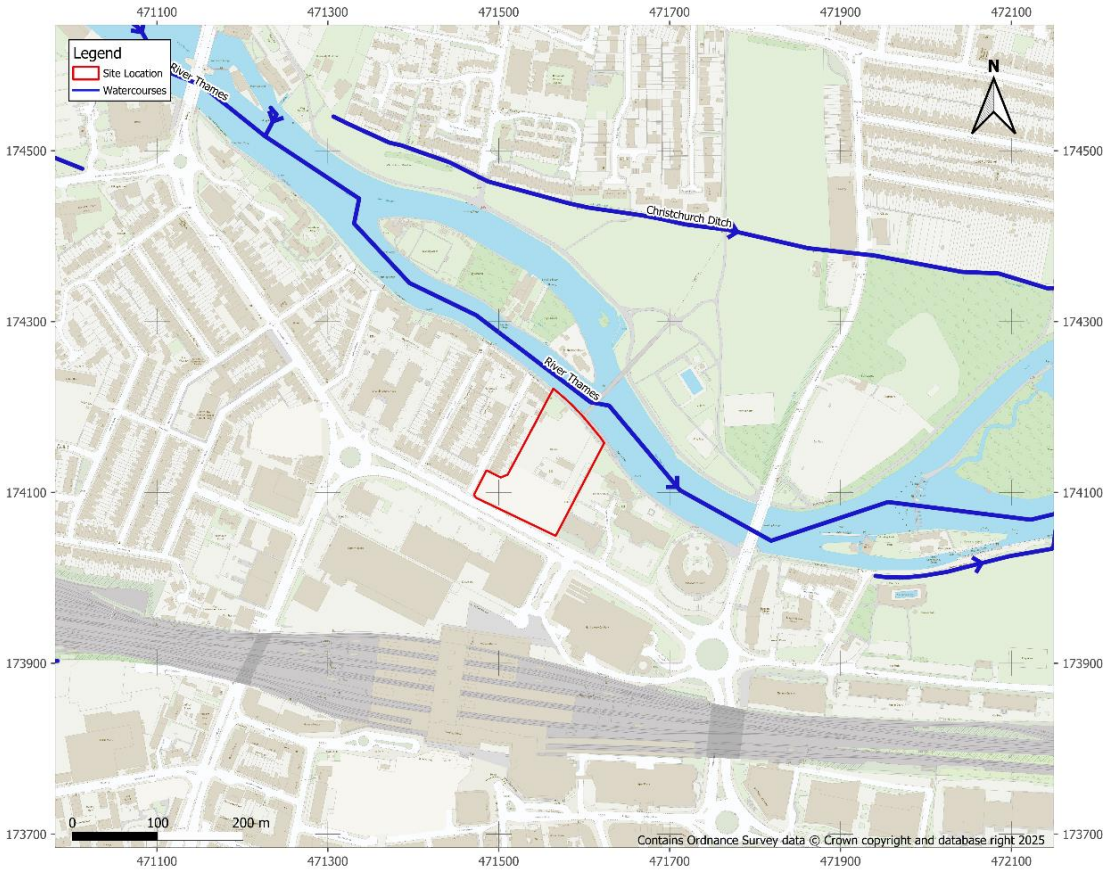


Figure 1 - Site Location

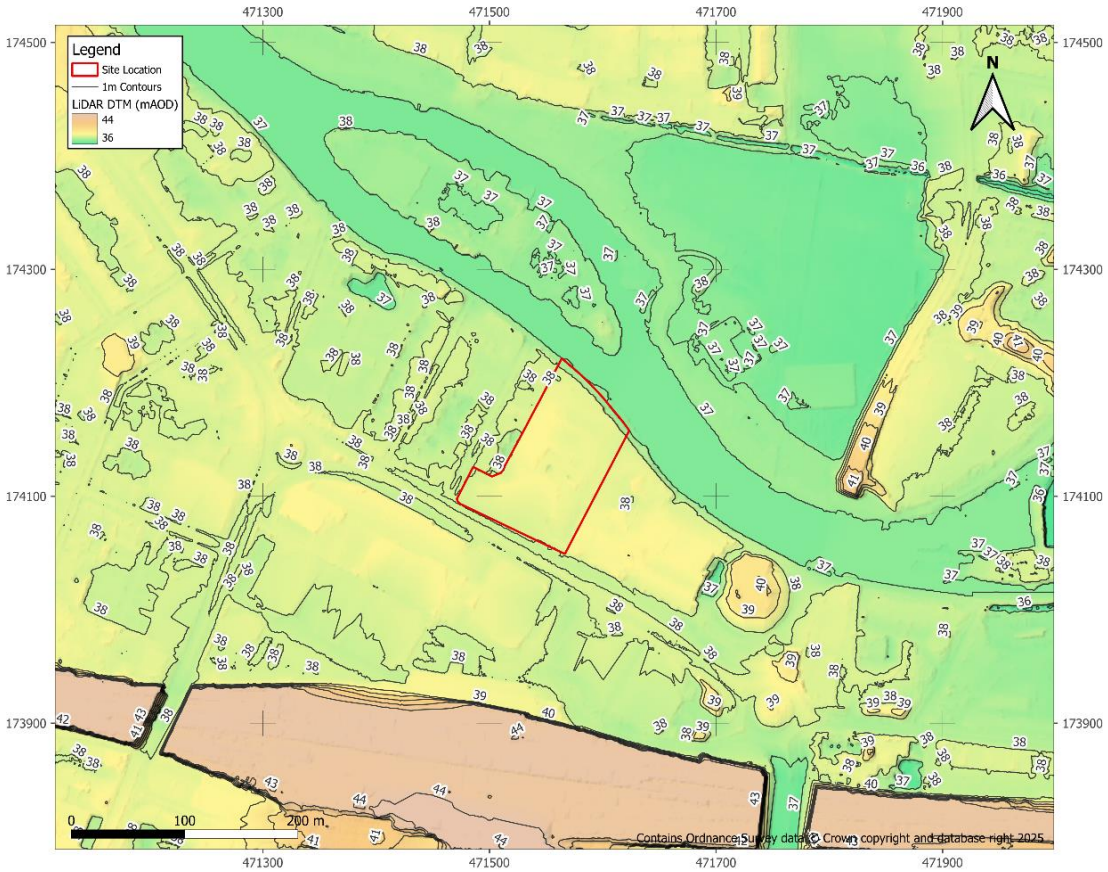


Figure 2 - Topography

3 Flood Risk

3.1 Historical Flooding

The EA has several records of historic flooding at the site. There are five events recorded in the EA database at this location. These events occurred in March 1948, August 1977, December 2000, January 2003, and July 2007. All five were associated with flooding of the River Thames. Note that only a small proportion of the site was inundated by these events.

3.2 Fluvial Flood Risk

In the existing Flood Map for Planning (FMfP), 64% of the site is located within Flood Zone 2, with 5% of the site located in Flood Zone 3a. Viewing the model results for the 3.3% AEP event, 2% of the site is located in Flood Zone 3b. All flooding at this site is associated with the River Thames, see Figure 3.

The EA climate change fluvial outputs for Flood Zone 2 and 3 have also been assessed, the entire site is inundated by Flood Zone 2 and the proportion of the site located in Flood Zone 3a increases to 47%, see Figure 4.

Fluvial flood risk is considered to be moderate and is assessed in more detail in section 4.

3.3 Flood Defence Infrastructure

There is no formal flood defence infrastructure in the vicinity of the site. However, a small area in the northwest of the site is partially located within an area associated with a reduction in risk of flooding from rivers and sea due to defences. It is not clear what defences are leading to this reduction. The EA has been contacted for comment, but at time of writing is yet to confirm. The site is not located within a flood storage area.

3.4 Surface Water Flood Risk

The EA's surface water flood maps show minimal risk from surface water flooding with isolated pooling in topographic low points. The proportion of the site shown to be inundated is 1%, 1%,and 4% for the 3.3% AEP, 1.0% AEP and 0.1% AEP events respectively, see Figure 5. When accounting for climate change these values increase marginally for the 1.0% AEP and 0.1% AEP events to 3% and 6% respectively. The extent change for the 3.3% AEP event is negligible, see Figure 6. Overall, the risk of surface water flooding is considered to be low.

3.5 Groundwater Flooding

The site is underlain by a bedrock of chalk in the form of the Seaford Chalk formation and the Newhaven Chalk formation. It is expected to permit high amounts of infiltration. Superficial deposits of Alluvium and Silt are also present at this site, these are also expected to be freely draining. The underlying soils are acid loamy soils which are also expected to be freely draining.

Based on the data available the water table at the site could be mobile, translating to a moderate risk of groundwater flooding. More data is required at the planning stage to confirm this. However, given the site's location directly adjacent to a river, groundwater flooding is likely to be heavily correlated with fluvial flooding.

3.6 Reservoir Flood Risk

The FMfP shows that the entire site is at risk from reservoir flooding during the wet day scenario, however the site is not at risk during the dry day scenario, see Figure 7. Whilst the site is shown to be at risk, it should be noted that reservoir failure is a rare event with a very low probability of occurrence. Current reservoir regulations aims to make sure that all reservoirs are properly maintained and monitored to detect and repair any problem.

3.7 Flood Warning Service

The site is located within the River Thames at Reading and Caversham EA Flood Warning Area.

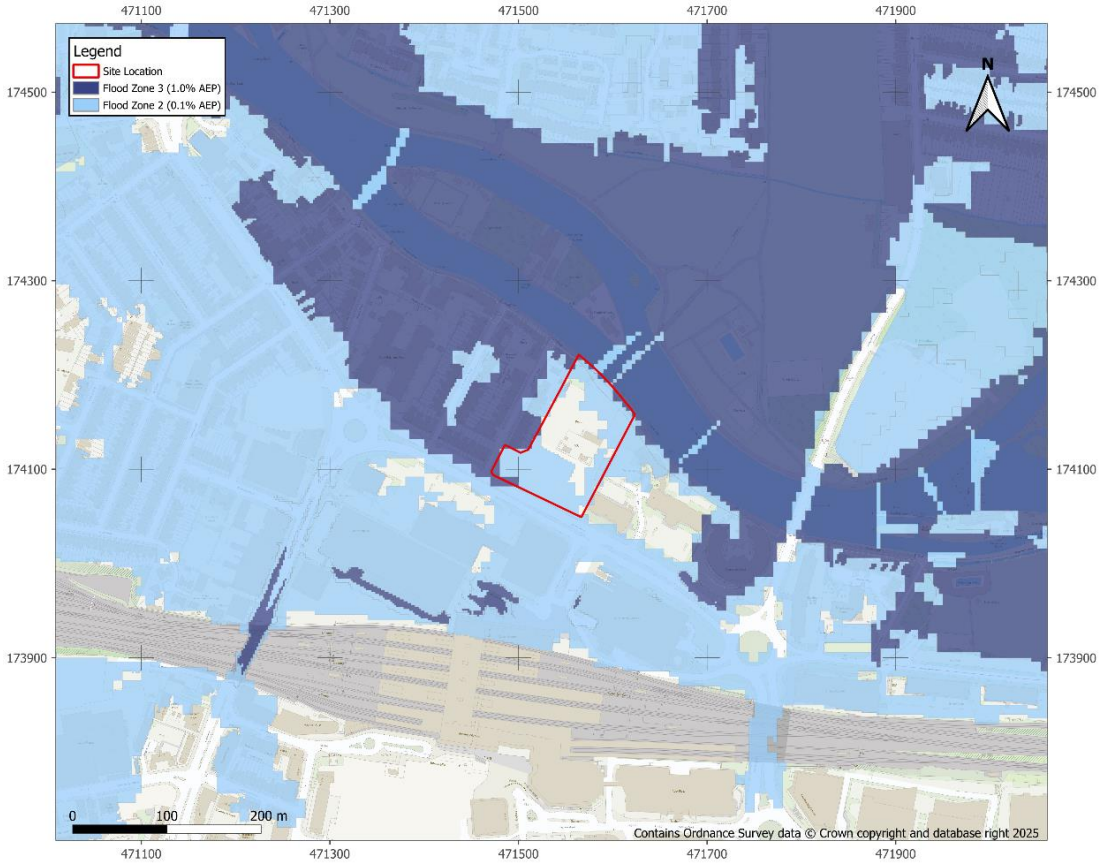


Figure 3 - Fluvial Flood Map

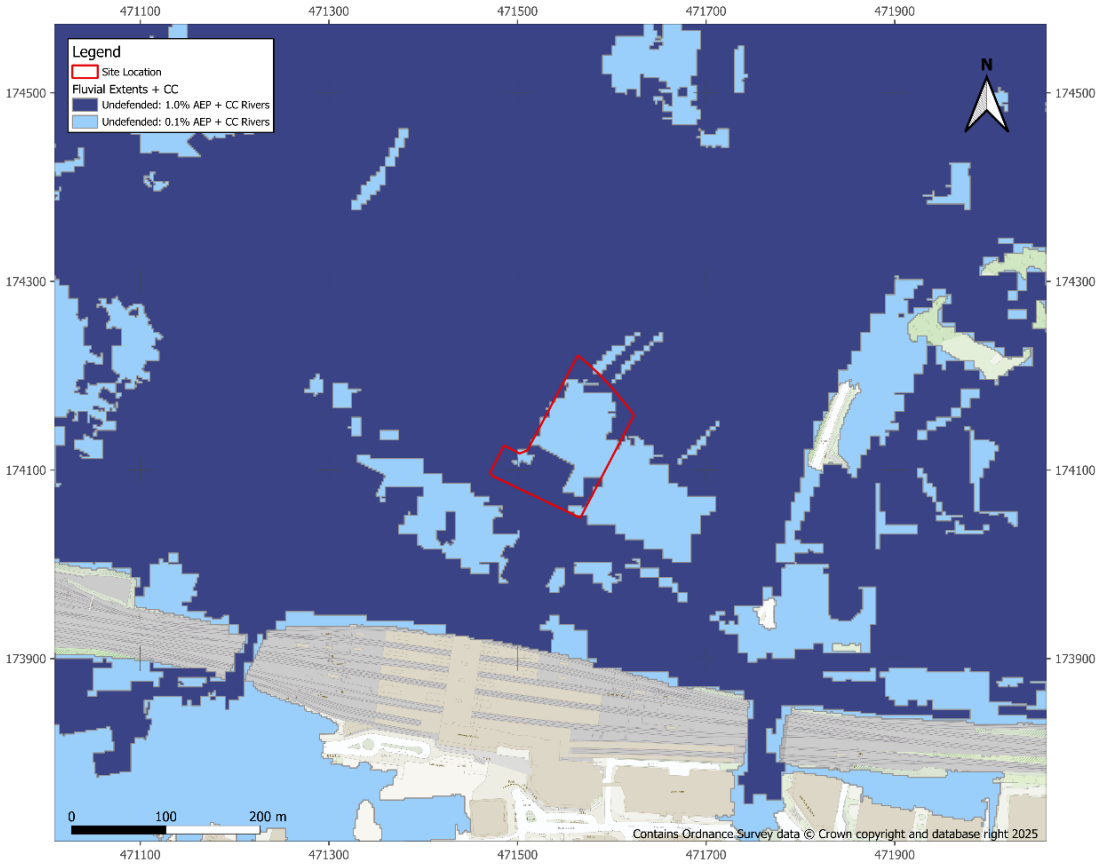


Figure 4 – Fluvial Climate Change Flood Map

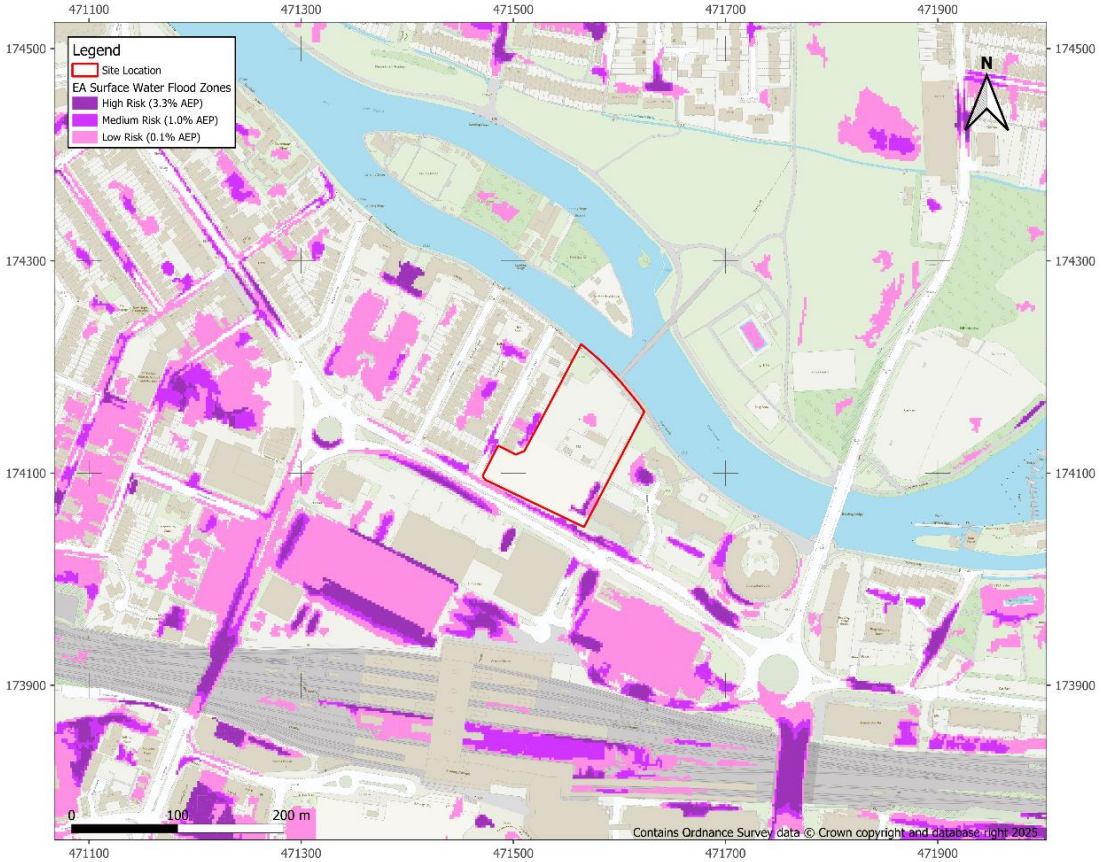


Figure 5 – Surface Water Flood Map

Figure 6 -Surface Water Climate Change Flood Map

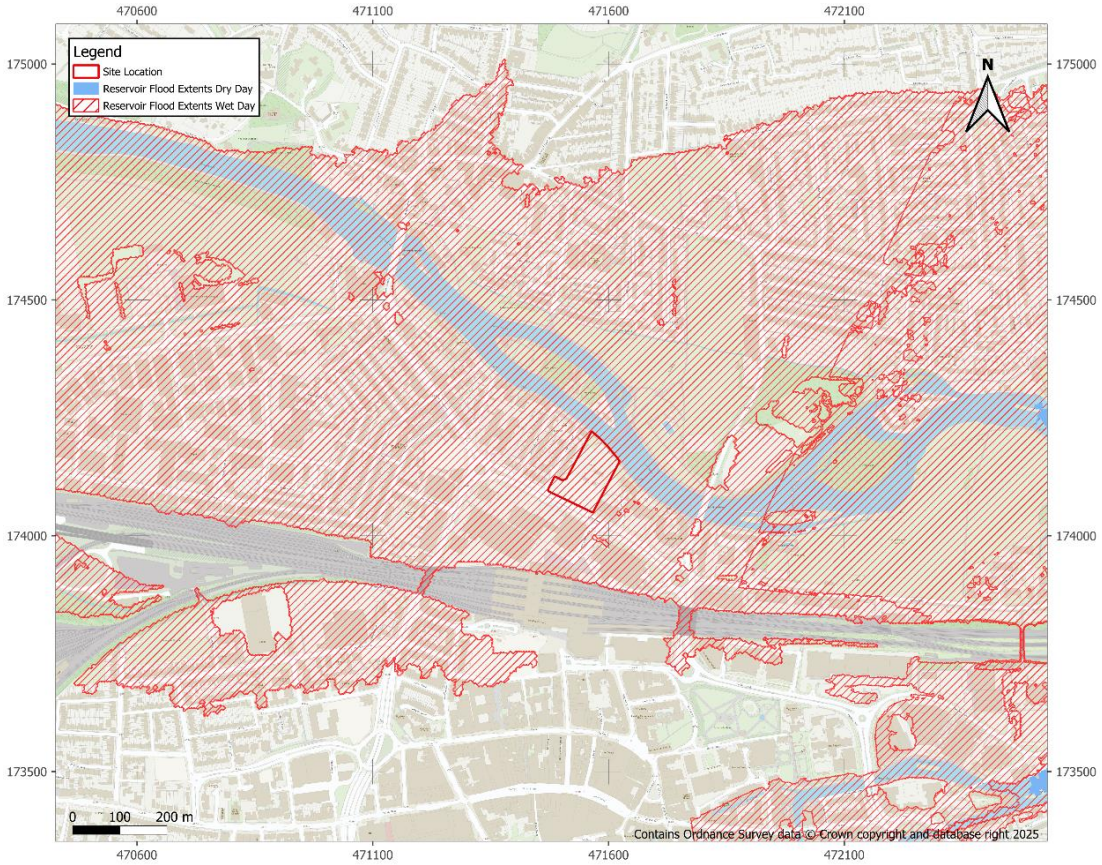


Figure 7 - Reservoir Failure Flood Map

4 Detailed Review of Primary Flood Risk

4.1 Primary Flood Risk

The primary flood risk mechanism at the site is fluvial in origin. The flood risk is quantitively assessed in more detail below.

4.2 Flood Risk Metrics

The River Thames model (Pangbourne to Sonning) (2021) which informs the latest FMfP was assessed to attain further detail on fluvial flooding. For the 100-yr plus central climate change (31%) design event, the maximum flood level at the site is 38.3 m AOD, 0.8m higher than the average ground level at the site. The hazard map for this event (see Figure 8) shows that *low* and *danger for some* are the most common hazard classifications within the site boundary. Given the adjacency of the site to the River Thames, the speed of onset values are very fast (<1-hr). Table 1 shows the flood risk metrics associated with the design event.

Table 1- Flood Risk Metrics

	Design Event 1.0% AEP (+31%)
Percentage Inundated (%)	28%
Average Flood Depth (m)	0.2m (Max- 1.35*m)
Average Velocity (m/s)	0.12m/s (Max – 0.76*m/s)
Speed of Onset (hrs)	<1hr

*Max values are likely associated with the river channel rather than site due to the coarseness of the model grid.

4.3 Access and egress

Because the River Thames is directly north of the site boundary, the safest route for access and egress is southbound. The suggested route is to head westwards along the Vastern Road to join the A329. Subsequent travel would then be southwards towards lower flood risk areas, see Figure 9.

Because much of the area surrounding the site is flooded, the initial part of the access route is inundated by Flood Zone 2 and the design flood event. Flood Hazard in some locations along the route indicates *danger for most*. Therefore, providing adequate flood warning to site users will be vital. In general, the River Thames in this location is slow responding, however it should be noted that the site borders its southern bank so speed of onset values are very fast. The site is located in a flood warning area and given that it remains mostly flood free for the design and 0.1% AEP events safe refuge could be an option for some site users.

It is also important to note that parts of the route are also at surface water flood risk, this risk is covered in more detail in the other site-specific considerations section. A site-specific FRA should consider in more detail the nature of the flood risk to determine how quickly it occurs and the degree of hazard.

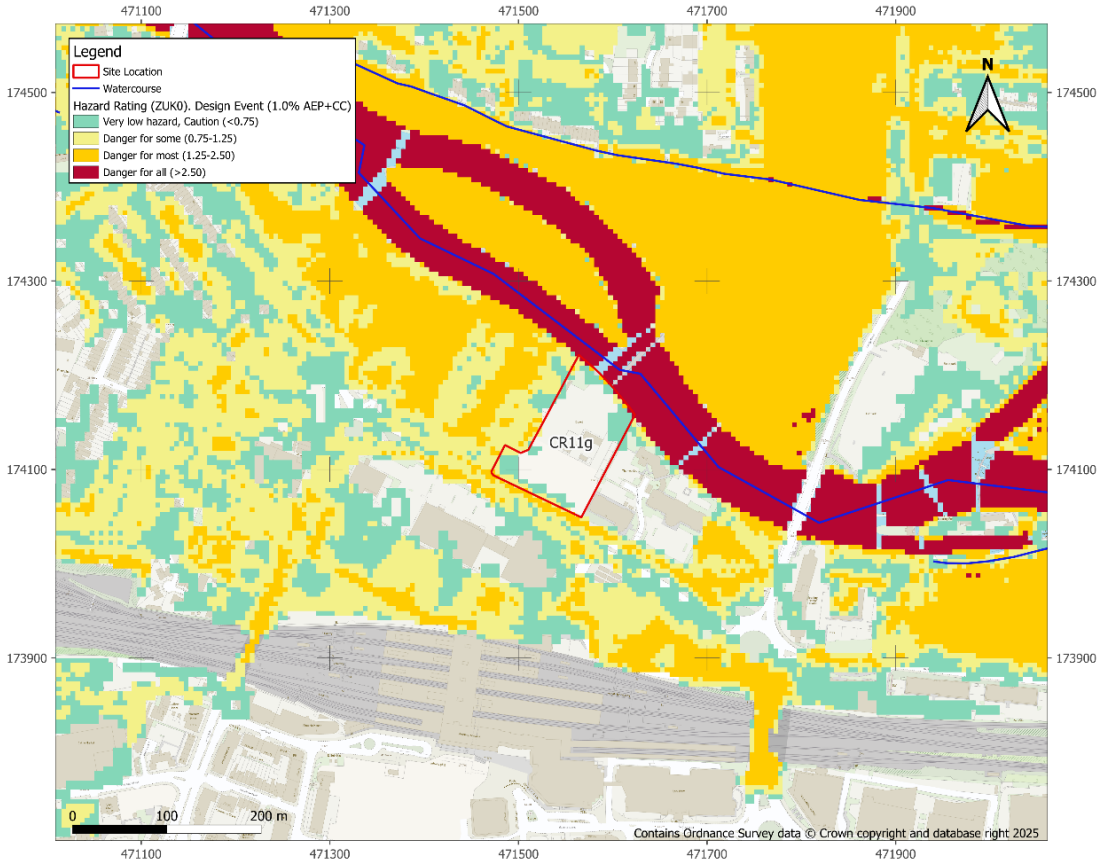


Figure 8 – Flood Hazard Map for the Design Event

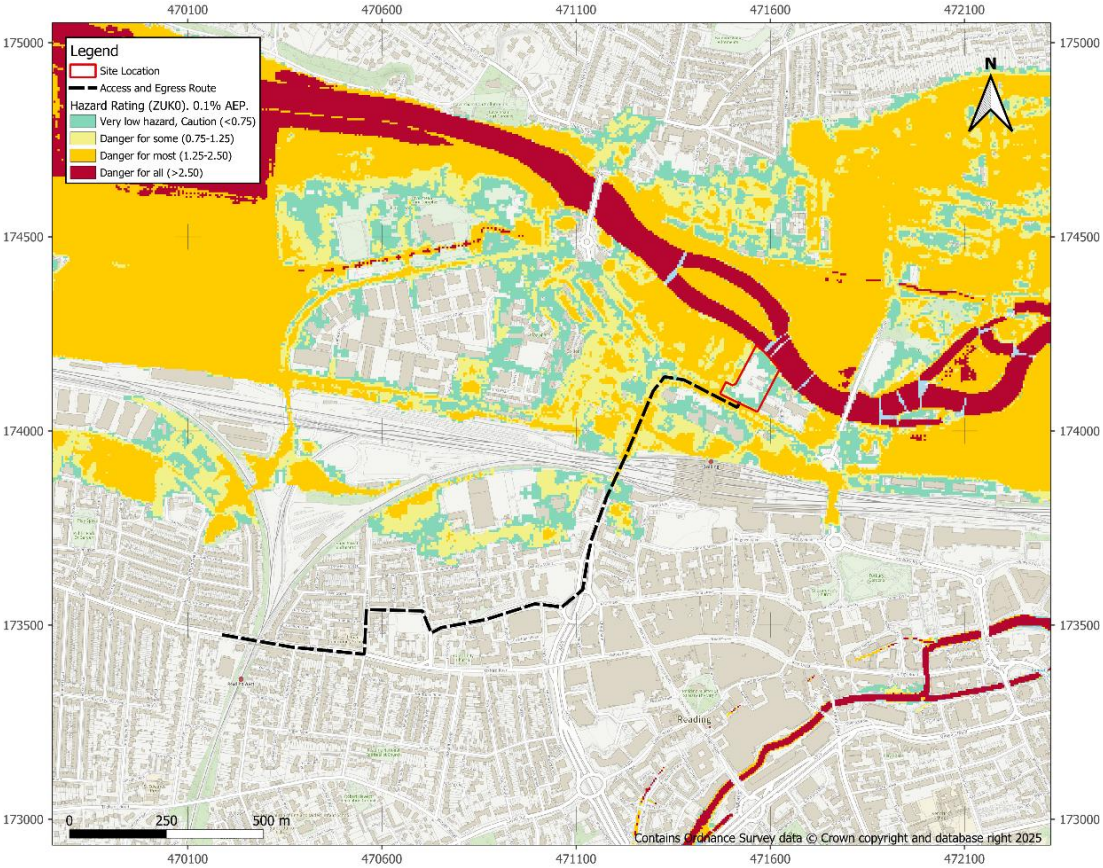


Figure 9 – Access/Egress Routes

5 Development Viability and FRA recommendations

5.1 Development Categorisation

The proposed development will consist of both housing (more vulnerable) and offices/recreational (less vulnerable) infrastructure. The latter is permissible within Flood Zones 2 and 3a, more vulnerable infrastructure is permissible in Flood Zone 2, but must pass an Exception Test as specified in the latest NPPF if located in Flood Zone 3a. Neither development categorisations are permissible in Flood Zone 3b.

As only a small proportion of the site is located in Flood Zone 3a a mixed-use development should be possible. However, it should be noted that access routes to and from the site are located within Flood Zone 2 and the design flood extent, therefore provision of a Flood Evacuation Plan (FEP) is recommended at the planning stage.

5.2 Scale of Development

The total site area is currently 1.24ha; allocated for a mixed-use development including between 250-380 dwellings. The scale of the office and recreational part of the development, is yet to be confirmed. In any case it is assumed that given the scale of the development it is likely to cover the majority of the site area. To reduce the impact on floodplain storage, building footprints and infrastructure should be sited outside of the small area lying within the modelled design flood extent. This should in turn reduce the need for compensatory storage which could compromise the land available for development.

5.3 Sequential Approach

It is important that a sequential approach is implemented at the site, prioritising more vulnerable residential development outside of Flood Zone 3a and the 1% AEP plus an appropriate allowance for climate change flood extent (the design flood extent) where possible. Less vulnerable development is also preferred in these zones however can be located in Flood Zone 3a (without the need for the Exception Test) if more space is required for residential uses as long as it is demonstrated that the development does not increase flood risk elsewhere and is designed to be appropriately resistant and resilient to flooding.

5.4 Other Site-Specific Considerations

Areas of surface water flood risk are present within the car park of the existing development and along the access route. Therefore, a site-specific FRA should consider in more detail the nature of the surface water flood risk to determine how quickly it occurs and the degree of hazard on site. Given both the fluvial and surface water flood risk to the site access route, as already mentioned provision of a FEP is recommended.

The drainage strategy for the proposed development should be suitably designed to manage additional runoff arising from the development and ensure that surface water flood risk at the site and to third party land is managed and not increased.

In assessing and demonstrating the viability of any drainage solution for the site, a site-specific FRA should follow the non-statutory technical standards for SuDS and any relevant Local Authority Local Plan policies. The geology at the site is freely draining. However, the water table is likely high, therefore the significant use of infiltration SuDS solutions may be challenging. It is recommended that a geotechnical investigation is undertaken at this site to obtain further information relating to infiltration rates, this will confirm whether infiltration could be viable in some areas. Attenuated discharge to a watercourse or a sewer will also need to be considered as part of a site-specific FRA.

If it is necessary to locate new infrastructure in Flood Zone 3a it may compromise flood plain storage. In turn, hydraulic modelling may need to be undertaken to assess 3rd party impacts

and compensatory storage requirements. A site-specific FRA should confirm any storage and modelling requirements with the EA.