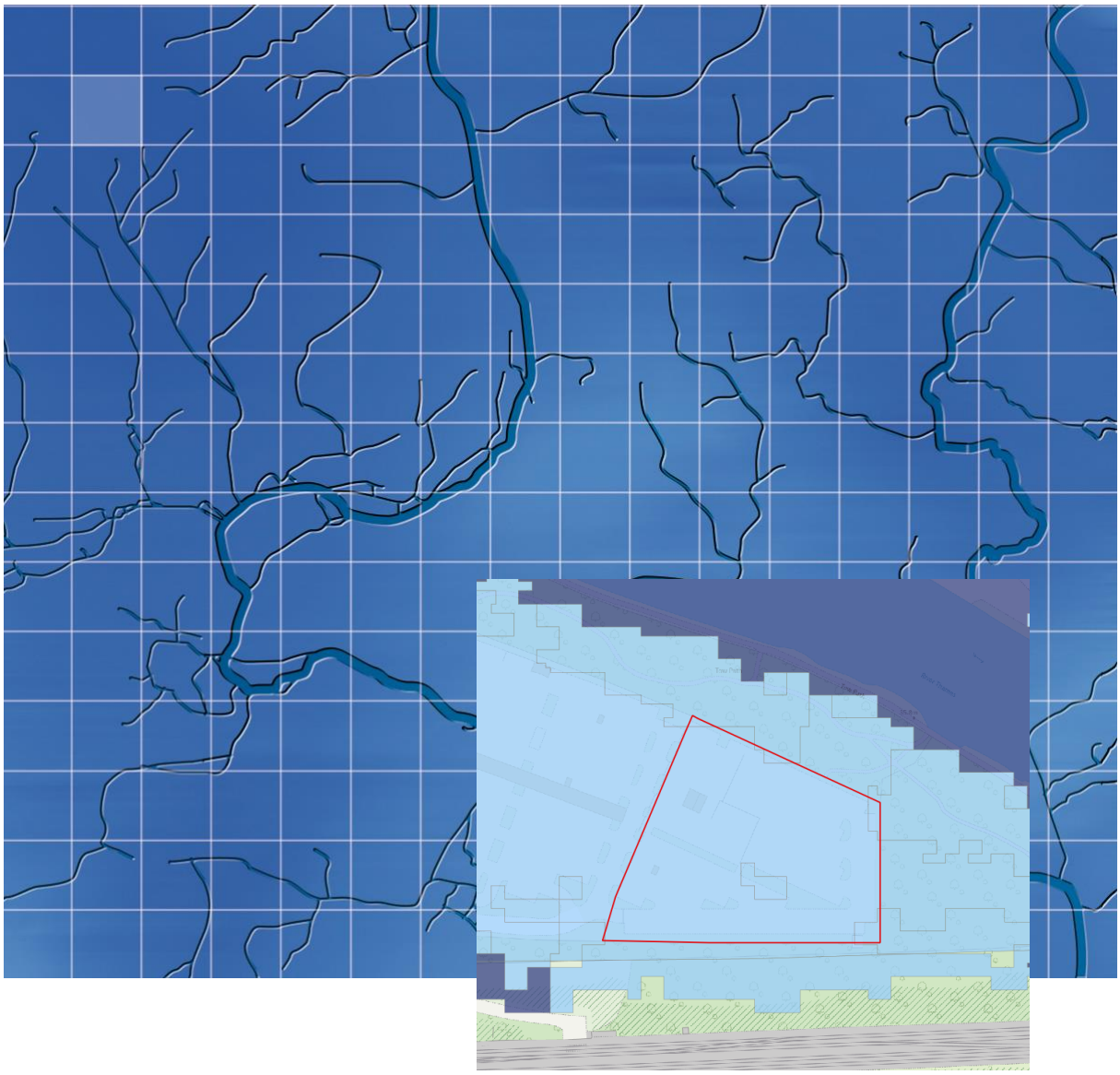
Reading Borough Council

May 2025

Part of Tesco Car Park, Napier Road (CR14x)

Level 2 Strategic Flood Risk Assessment



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Document issue details

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1.0	02/05/25	Draft	Jasmine Lucas (Graduate *Consultant*)	Daniel Hamilton (*Principal Consultant*)

For and on behalf of Wallingford HydroSolutions Ltd.

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.

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Part of Tesco Car Park, Napier Road (CR14x) 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 to the site, the entire of the site is located within Flood Zone 2, however none of the site falls 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 the model show a significant proportion of the site (89%) to be inundated during the design 1.0% AEP plus climate change event. The flood hazard rating at the site is generally *low*, indicating limited flood depths and velocities. Overall, fluvial flood risk is considered to be 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 development proposed is categorised as More Vulnerable Development, which is permissible in Flood Zone 2, but needs to pass the Exception Test to justify development in Flood Zone 3a. More vulnerable development is not permissible in Flood Zone 3b.

None of the site is located in Flood Zone 3a so a residential development should be possible, however there are some barriers. A large proportion of the site is inundated during the design event which takes account of climate change; therefore, a significant amount of infrastructure may need to be raised to ensure it is safe for the development's lifetime. This could in turn compromise floodplain storage which will need to be offset by compensatory storage. Access routes to and from the site are located within Flood Zone 2 and the design flood extent however development is already established in the area and given the slow response time of the Thames this should be manageable.

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 Part of Tesco Car Park, Napier Road (CR14x) 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

Part of Tesco Car Park, Napier Road (CR14x) is a 0.88 ha site located in northeast Reading close to the confluence of the River Kennet and the River Thames, see Figure 1. Surrounding land use is predominantly open land, however a railway line does run from west to east approximately 60m south of the site. The site is a section of a larger supermarket car park.

In the Replacement Local Development Plan (RLDP) it is proposed for its use to be changed to residential consisting of 57-85 dwellings.

2.2 Topography

Based on 1m LiDAR data, the site is relatively flat, see Figure 2. The ground levels within the site boundary range from 37.2 to 38.1 m AOD. The average ground level is approximately 37.4 m AOD.

2.3 Nearby Watercourses

The site is located approximately 160 m west of the confluence of the River Kennet and the River Thames, see Figure 1. The River Thames flows from west to east 40 m northeast of the site, whilst the River Kennet flows from south to north 150 m southeast of the site.

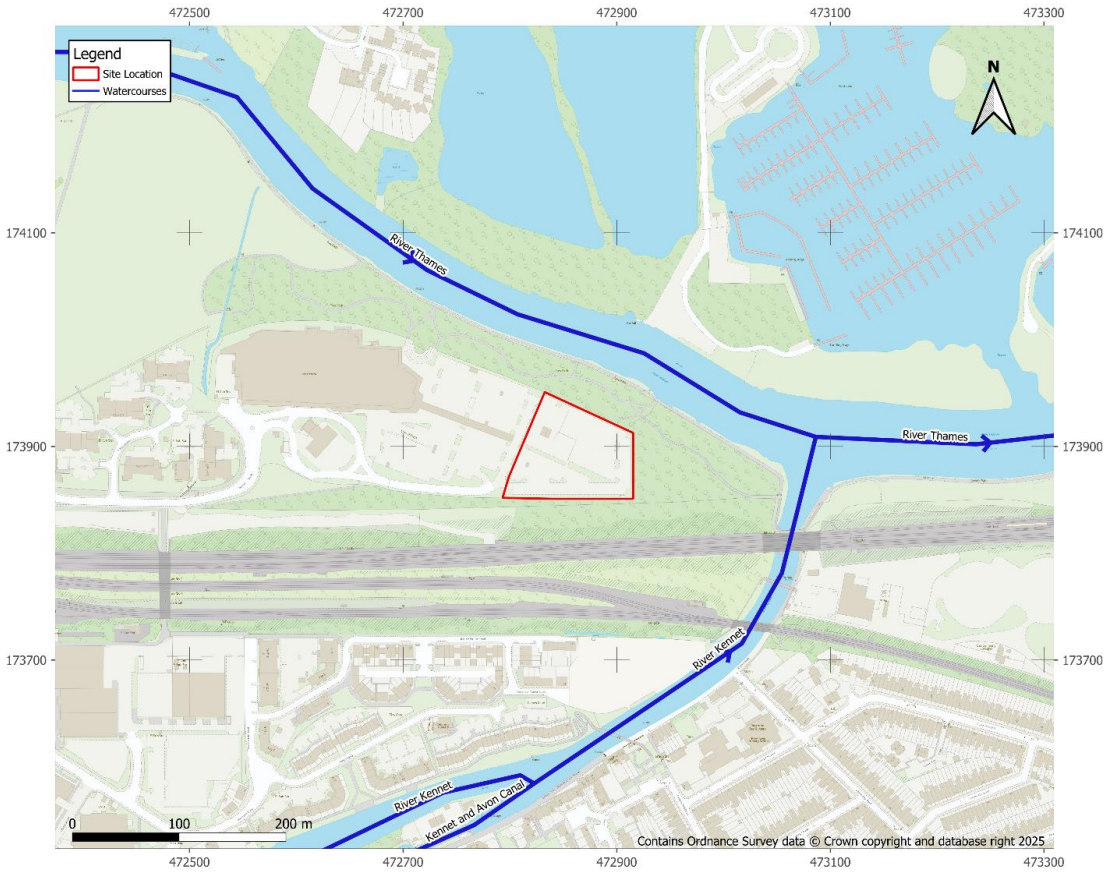

Figure 1 - Site Location

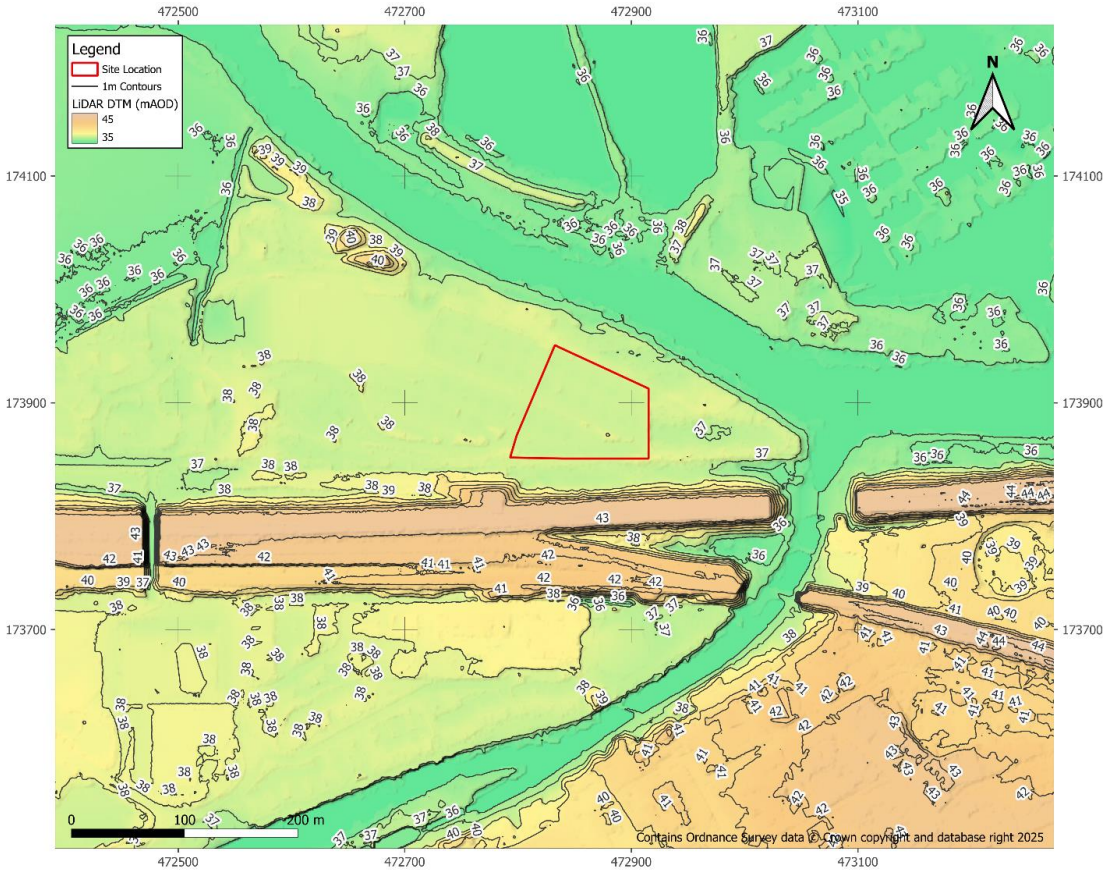

Figure 2 – Topography

3 Flood Risk

3.1 Historical Flooding

The EA has one record of historic flooding at the site. This occurred in March 1947 and inundated the entirety of the site area.

3.2 Fluvial Flood Risk

In the existing Flood Map for Planning (FMfP), the entire site is inundated by Flood Zone 2, though no part is within Flood Zone 3a. Viewing the model results for the 3.3% AEP event, none of the site is located in Flood Zone 3b. All flooding at this site is associated with the River Thames with floodwater from the River Kennet prevented from reaching the site by the railway line to the south of the site, 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 89%, 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. The site is not located within an area associated with a reduction in risk of flooding from rivers and sea due to defences nor is it located within a flood storage area.

3.4 Surface Water Flood Risk

The EA's surface water flood map shows 25% of the site is inundated during the 0.1% AEP event, there is no risk for the lower order 1.0% and 3.3% AEP events, see Figure 5. When accounting for climate change the 0.1% AEP event inundates 37% of the site, with 1% of the site also inundated during the 1.0% AEP, 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. It is expected to permit high amounts of infiltration. Superficial deposits of Alluvium are also present at this site, these are also expected to be freely draining. The underlying soils are loamy and clayey floodplain soils which are naturally wet.

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 proximity to two rivers, 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.

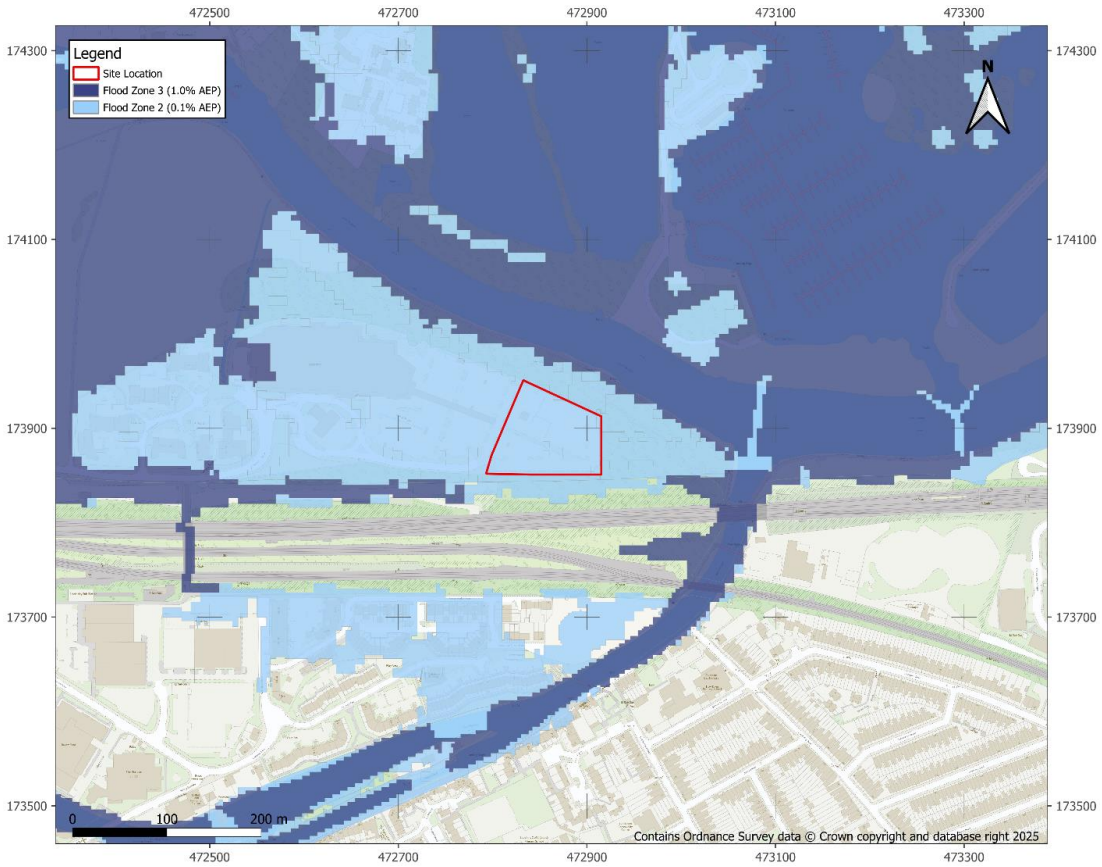

Figure 3 - Fluvial Flood Map

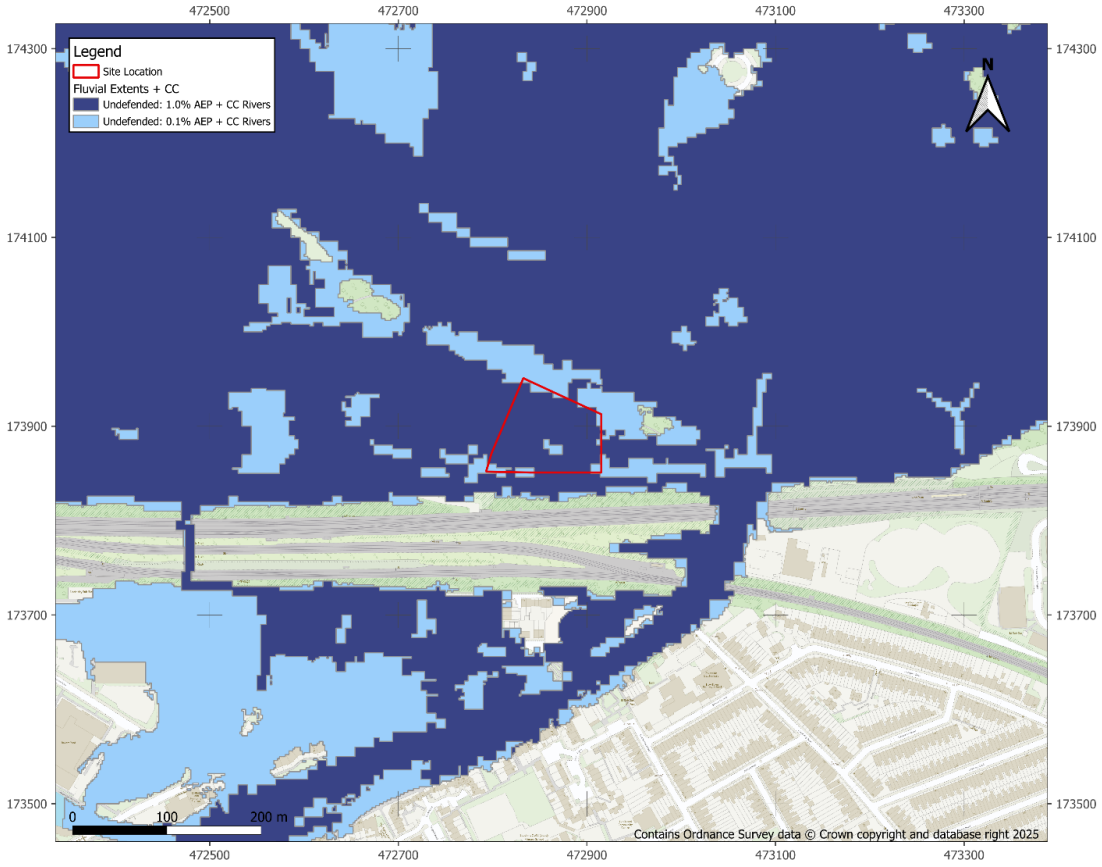

Figure 4 – Fluvial Climate Change Flood Map

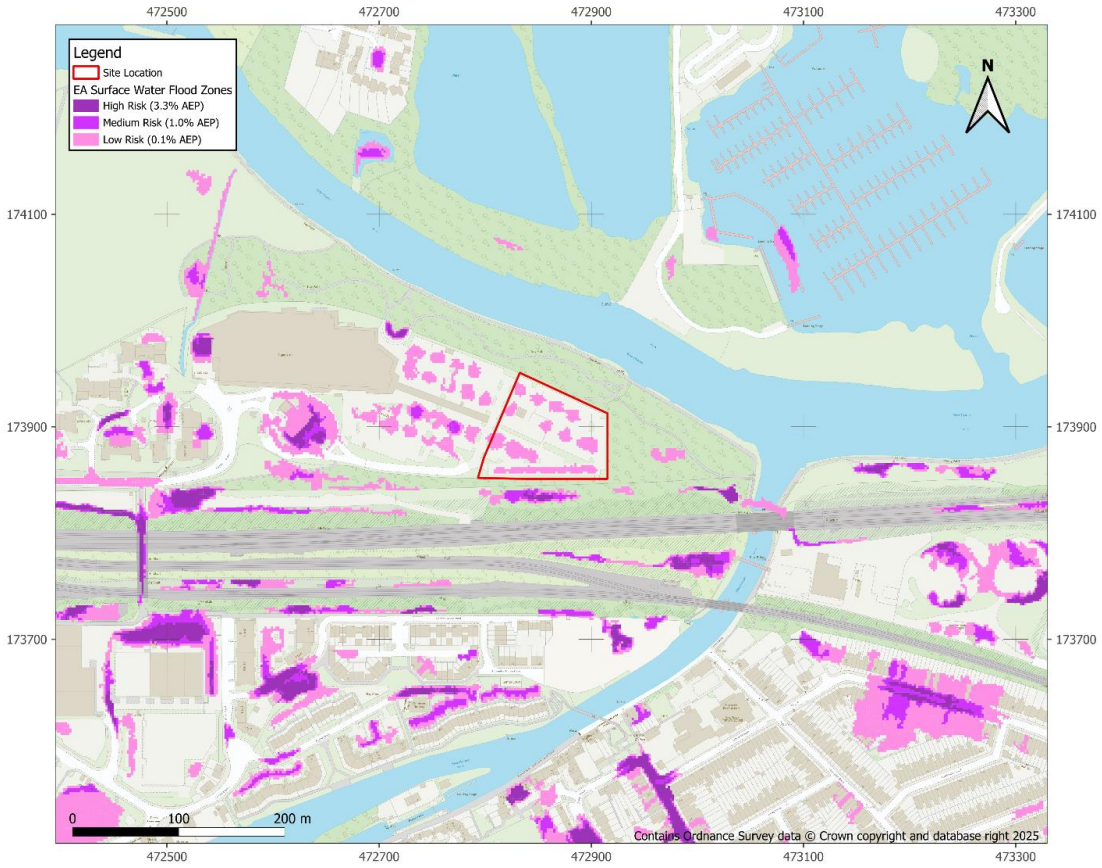

Figure 5 – Surface Water Flood Map

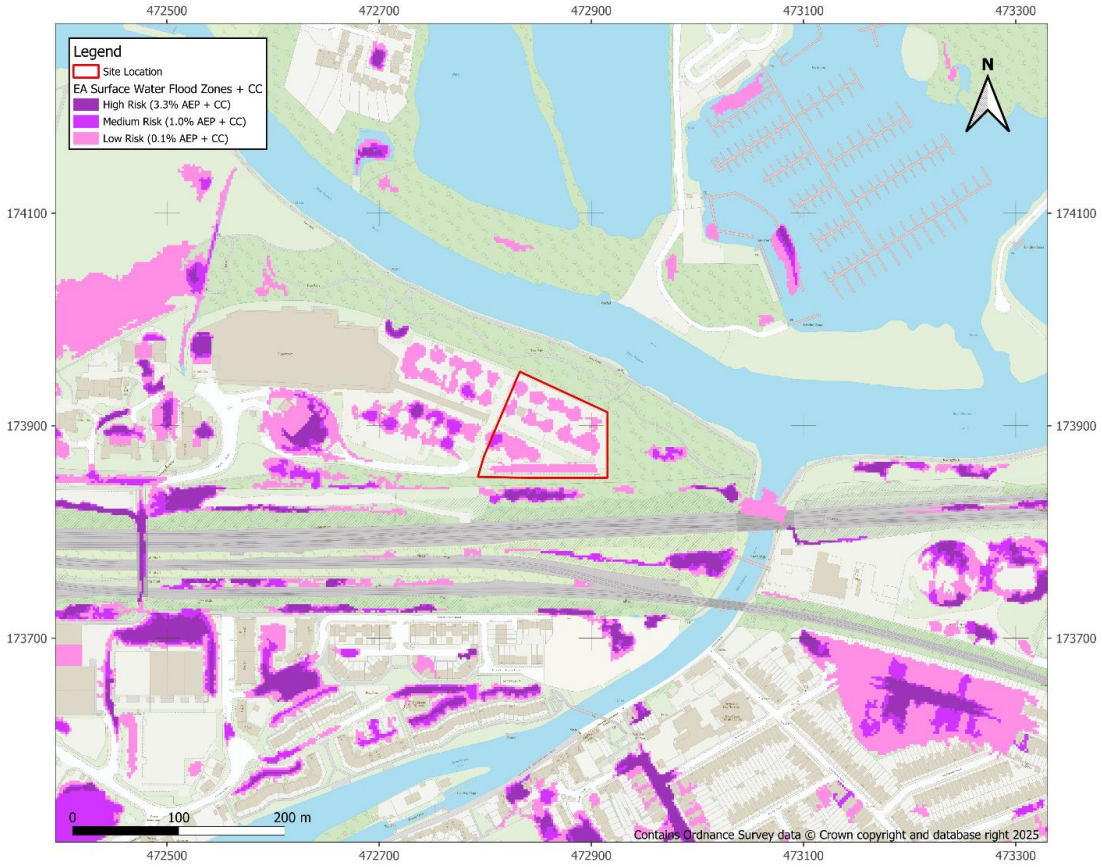

Figure 6 -Surface Water Climate Change Flood Map

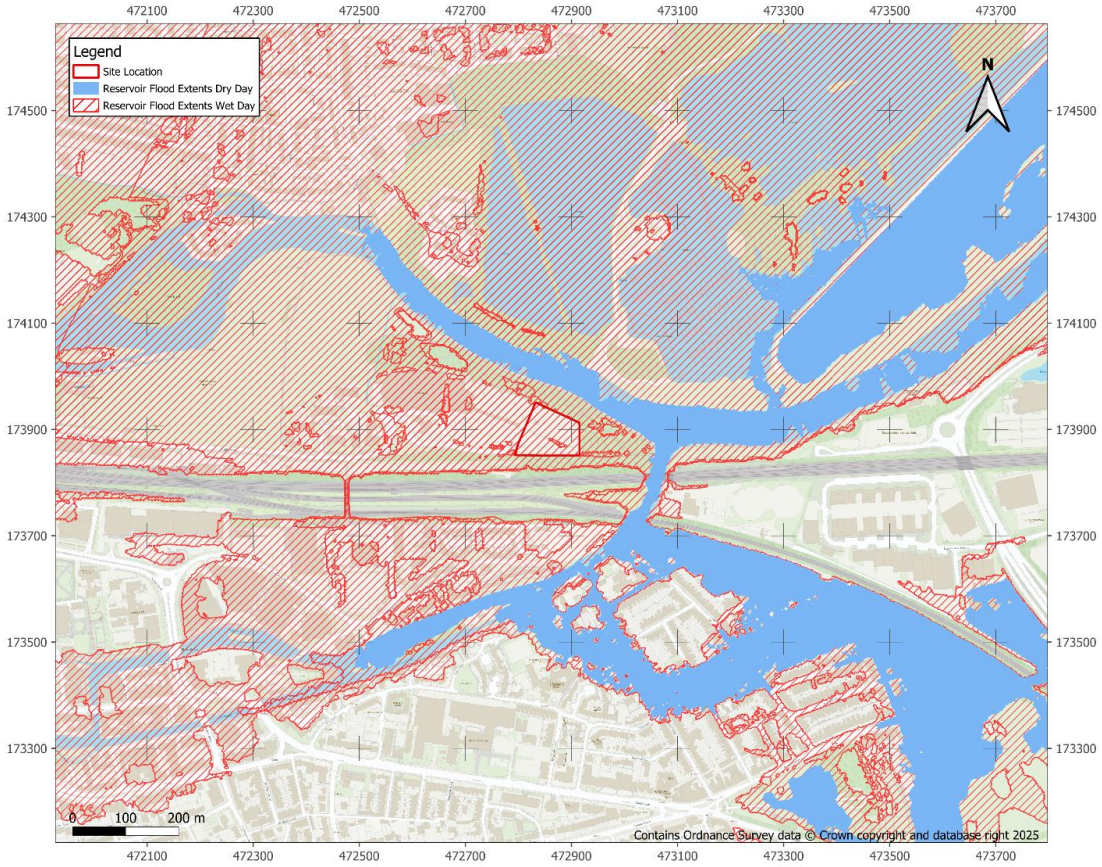

Figure 7 - Reservoir Failure Flood Map

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 37.5 m AOD, similar to the average ground level on the site. The hazard map for this event (see Figure 8) shows that the whole site has a *low* hazard rating indicating relatively low flood depths and velocities. In this location, it takes time for floodwater to reach the site, resulting in a slow speed of onset. 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 (%)	89%
Average Flood Depth (m)	0.16 m (Max - 0.26 m)
Average Velocity (m/s)	0.01 m/s (Max – 0.50 m/s)
Speed of Onset (hrs)	239 hrs

4.3 Access and egress

Access to the site is via an internal road of the wider supermarket site, which lies west of the proposed site area. This road joins with Napier Road, which continues west towards Reading train station. The supermarket site can also be accessed by pedestrians from the Thames path to the north.

During an extreme flood event, the route to the west is considered the safest option due to lower overall flood hazard. Figure 9 shows the safest route away from areas of flood risk. Site users would follow Napier Road east until it meets Vastern Road, before following Vastern Road south beneath the railway line towards areas of the city at lower risk of flooding.

Some of this route is inundated by Flood Zone 2 (0.1% AEP) and during the design event with flood hazard in some locations indicating *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 as shown by the speed of onset value above. The site is also located in a flood warning area so safe access should be possible.

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.

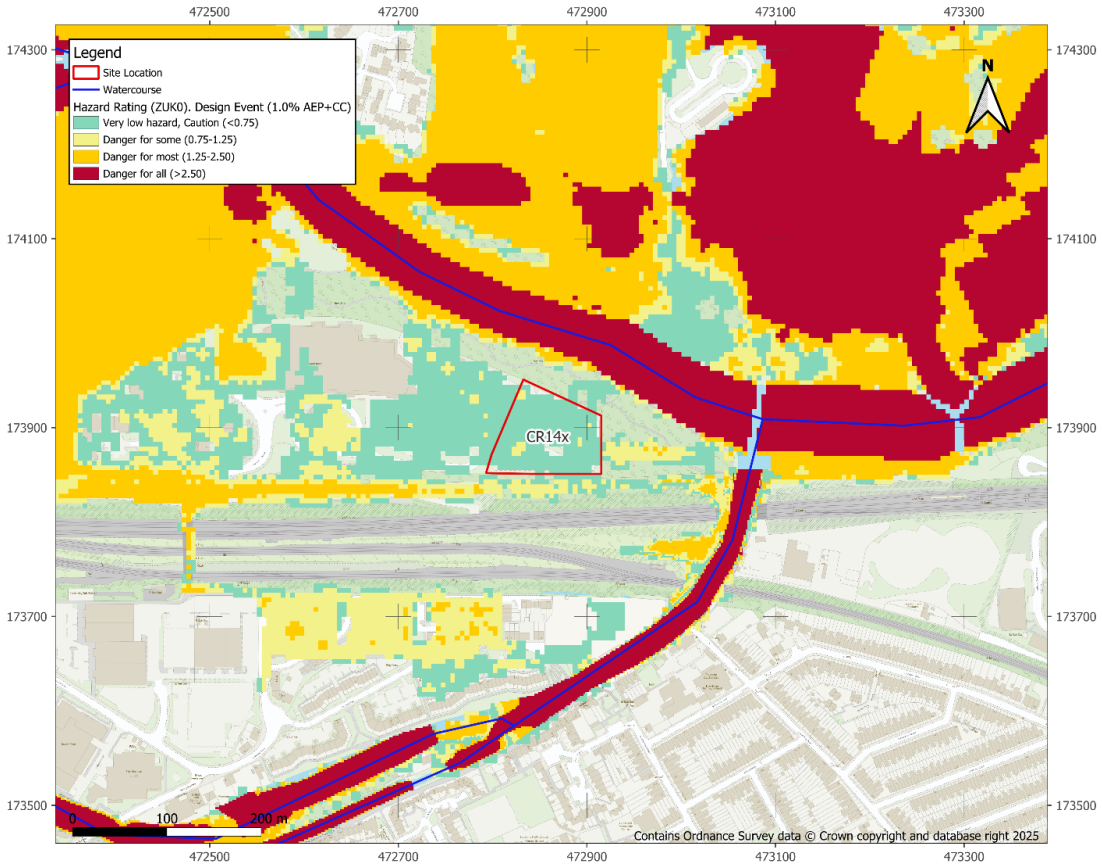

Figure 8 – Flood Hazard Map for the Design Event

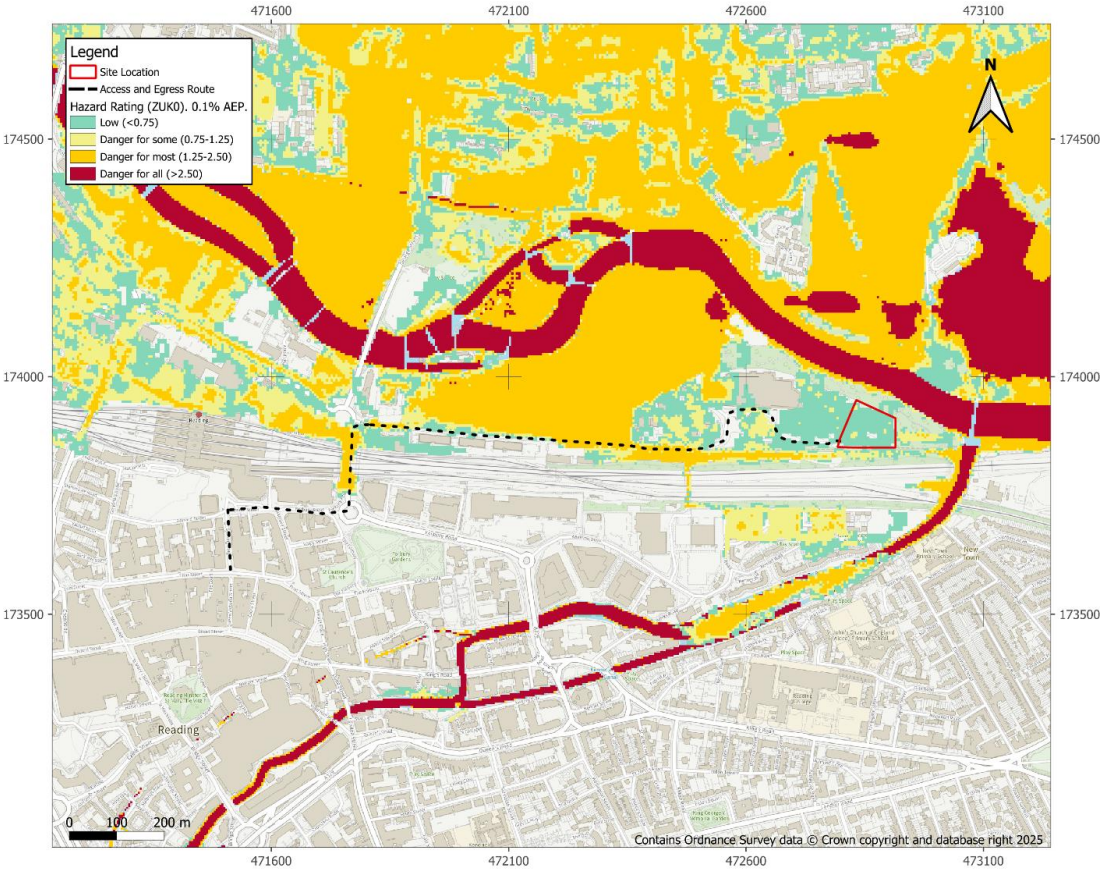

Figure 9 – Access/Egress Routes

5 Development Viability and FRA recommendations

5.1 Development Categorisation

The development proposed is categorised as More Vulnerable Development, which is permissible in Flood Zone 2, but needs to pass the Exception Test to justify development in Flood Zone 3a. More vulnerable development is not permissible in Flood Zone 3b.

None of the site is located in Flood Zone 3a so a residential development should be possible, however there are some barriers. A large proportion of the site is inundated during the design event which takes account of climate change; therefore a significant amount of infrastructure may need to be raised to ensure it is safe for the development's lifetime. This could in turn compromise floodplain storage which will need to be offset by compensatory storage. Access routes to and from the site are located within Flood Zone 2 and the design flood extent however development is already established in the area and given the slow response time of the Thames this should be manageable.

5.2 Scale of Development

The total site area is currently 0.88 ha; allocated for a change in use to residential including 57-85 dwellings. Given the size of the site, it is assumed that the residential development onsite will either be high density housing or utilise multistorey flats. 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 modelled design flood extent wherever possible. 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 in lower flood risk areas with ancillary infrastructure such as car parks and green spaces located in higher flood risk areas if required. This is under the assumption, that it does not increase flood risk elsewhere and is designed to be appropriately resistant and resilient to flooding. For this site it is recommended that the climate change extents are used, which more clearly show the graduation in flood risk across the site.

5.4 Other Site-Specific Considerations

Areas of surface water flood risk are present 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. 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 given the site's proximity to two rivers, 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.

As mentioned, new infrastructure may compromise flood plain storage. Hydraulic modelling may need to be undertaken to assess 3rd party impacts and compensatory storage requirements. Storage and modelling requirements should be confirmed with the EA for a site-specific FRA. Furthermore, given the flood risk at the site provision of a Flood Evacuation Plan (FEP) should be considered.