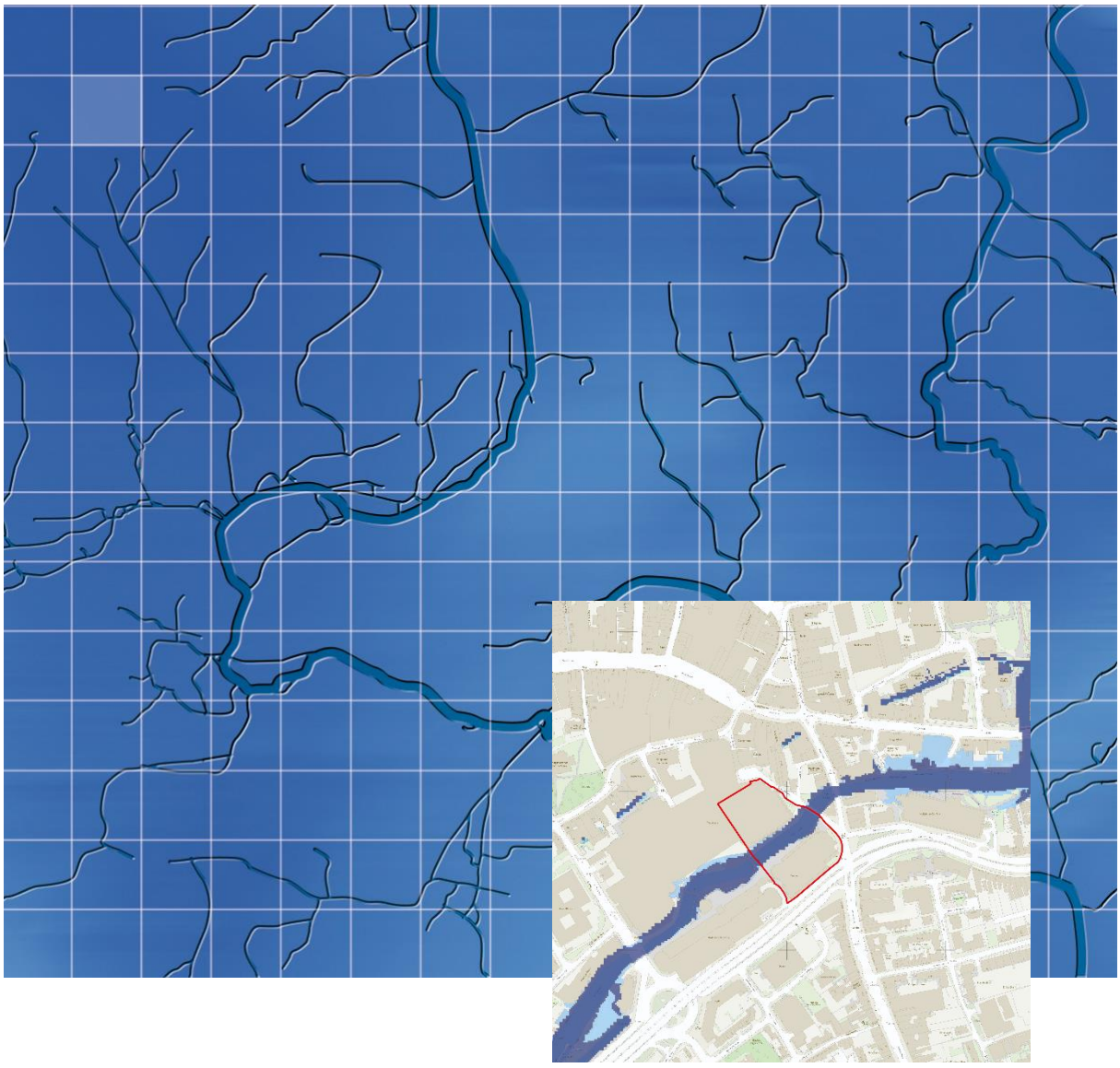
Reading Borough Council

May 2025

The Oracle Riverside East (CR14g)

Level 2 Strategic Flood Risk Assessment



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1.0	02/05/2025	Draft	Daniel Hamilton (*Principal Consultant*)	Paul Blackman (*Director*)

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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The Oracle Riverside East (CR14g) Level 2 SFRA
Flood Risk Overview

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

Flood Risk

Fluvial flood risk represents the greatest risk at the site with the River Kennet running through the centre of the site. However, flood extents are mostly limited to the river channel with the majority of the site in Flood Zone 1.

In the location of the site the latest Flood Map for Planning is based on national scale modelling. However, the River Kennet model (Tyle Mill to Thames Confluence) (2018) which informed the previous flood map was assessed to attain further detail on fluvial flooding. Whilst it shows significant flood depths and velocities at the site, these are mostly limited to the river channel. In this respect fluvial flood risk is considered to be moderate.

It should be noted that pluvial flooding is also significant at the site. It shows greater extents for the higher order 1.0% AEP and 0.1% AEP events than fluvial flooding. However, there is some uncertainty in its accuracy in the national scale mapping. Overall, it has been classified as a moderate risk at this stage. The risk from other sources of flooding is considered to be low.

The overall confidence in the assessment is moderate. Whilst detailed modelling is available it does not inform the latest national scale mapping.

Conclusions and Recommendations

Overall, a new mixed-use development at the site should be possible, however there are some barriers.

The proposed development will consist of both housing (more vulnerable) and employment (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. Given that Flood Zone 3a on the site is largely limited to the River Kennet which runs through its centre, it will be possible to locate the majority of infrastructure outside of its extent.

Pluvial flooding is also significant at the site, although the extents shown in the national scale mapping are thought to be uncertain. It should be considered in more detail in a site-specific FRA and should be used to inform the development layout along with fluvial flooding.

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 the Oracle Riverside East (CR14g) site 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, is the 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 Oracle Riverside East (CR14g) site is 1.26ha in area and is located on the north and south banks of the River Kennet. It is located in the centre of Reading and is currently occupied by part of the Oracle shopping centre. The surrounding land use is urban, see Figure 1.

In the Replacement Local Development Plan (RLDP) the site is proposed to be used for residential and commercial development. Between 250-370 dwellings are proposed at the site.

2.2 Topography

Based on 1m LiDAR data, the site is relatively flat, gently sloping towards the River Kennet in its centre and surrounded by higher ground, see Figure 2. The ground levels within the site boundary range from 36.4 to 40.3m AOD, however the lower ground level is taken at the water surface of the River Kennet. The average ground level is 38.2m AOD.

2.3 Nearby Watercourses

The River Kennet runs directly through the centre of the site. The River Kennet runs from west to east at this location. Holy Brook is located approximately 50m north of the site. It runs from west to east at this location before joining the Kennet approximately 0.4 km to the east of the site. Figure 1 shows the location of these watercourses.

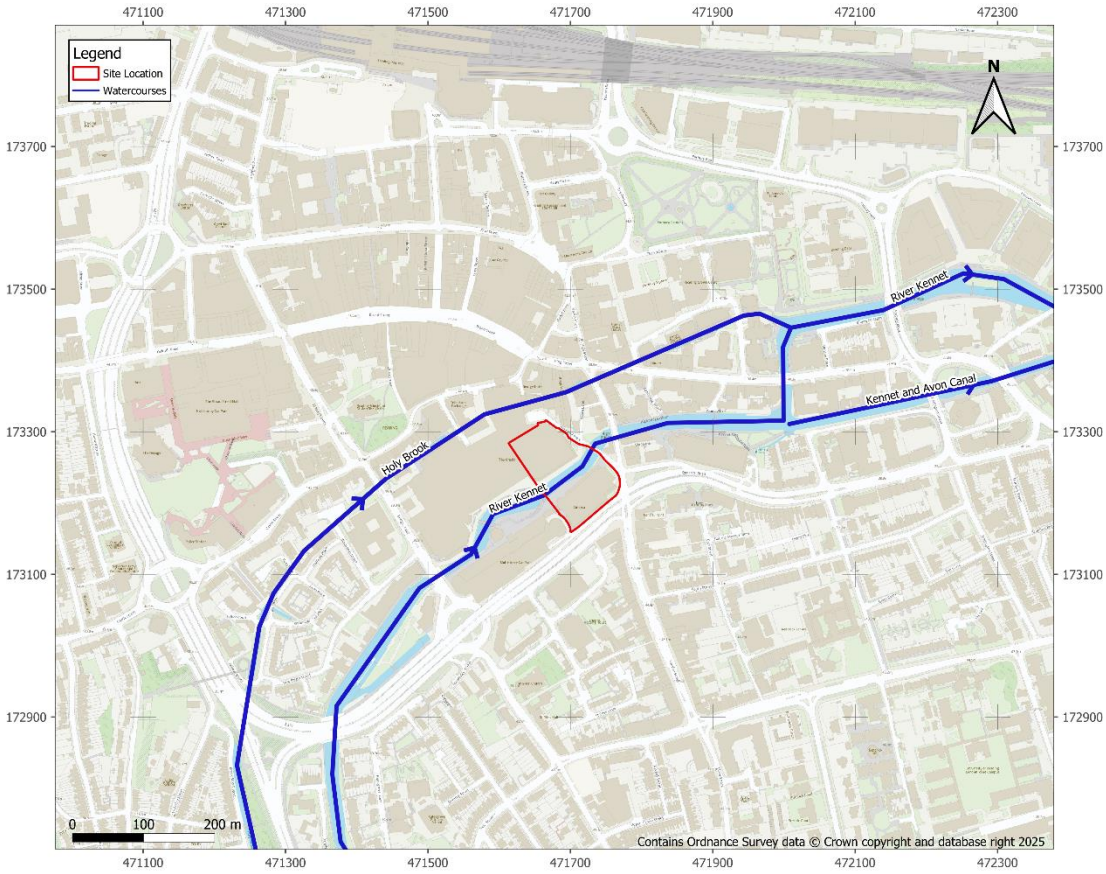

Figure 1 - Site Location

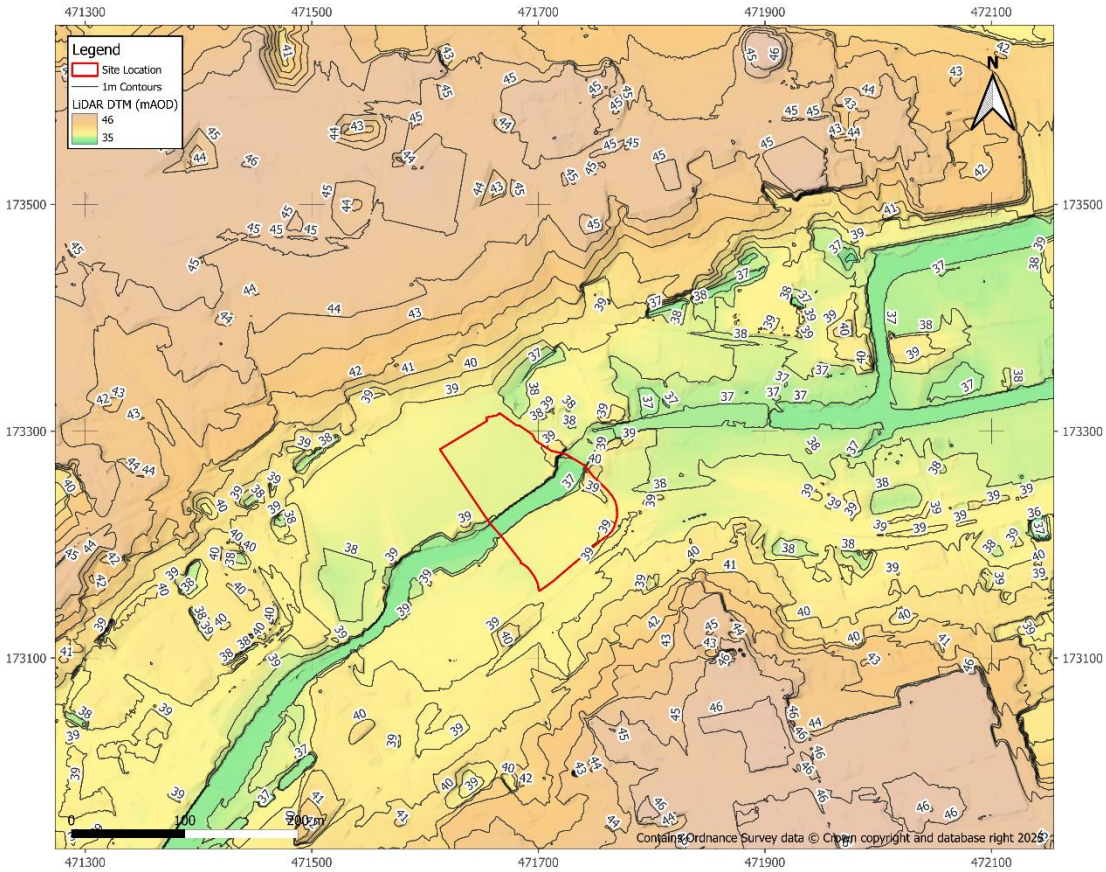

Figure 2 - Topography

3 Flood Risk

3.1 Historical Flooding

The EA has no records of historic flooding at the site.

3.2 Fluvial Flood Risk

In the existing Flood Map for Planning (FMfP), 20% of the site is inundated by Flood Zone 2, with 18% of the site located in Flood Zone 3a. These proportions are based on the latest national scale modelling, rather than the River Kennet (Tyle Mill to Thames Confluence) (2018) model, which informed the previous iteration of the FMfP and the level 1 SFRA for Reading Borough completed in November 2024.

Viewing the 2018 model results when compared to the latest national scale modelling, similar extents were generated for Flood Zone 2 and Flood Zone 3a. The model also has results for the 3.3% AEP event equivalent to Flood Zone 3b, these show 16% of the site to be inundated during this event. All flooding at this site is associated with the River Kennet, see Figure 3.

The EA climate change fluvial outputs for Flood Zone 2 and 3 have also been assessed, 26% of the site is inundated by Flood Zone 2 and the proportion of the site located in Flood Zone 3a remains at 18%, see Figure 4. Similar extents were generated by the River Kennet (Tyle Mill to Thames Confluence) (2018) model.

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 also not located in 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 maps show some level of flood risk across the majority of the site, although the greatest risk is in the south of the site. In total, 2% of the site is inundated in the 3.3% AEP event, 34% is inundated in the 1.0% AEP event and 69% is inundated in the 0.1% AEP event, see Figure 5. When accounting for climate change the proportions moderately increase to 33% in the 3.3% AEP event, 34% in the 1.0% AEP event and 70% in the 0.1% AEP, see Figure 6. Whilst the flood extents are significant, there is some uncertainty in their accuracy (see section 4), therefore overall, the risk of surface water flooding is considered to be moderate at this stage.

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 with naturally high groundwater, these are expected to have impeded drainage.

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 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 site is not at risk from reservoir flooding, see Figure 7.

3.7 Flood Warning Service

The site is located within the River Kennet at the Burghfield, Southcote, Coley and Holybrook flood warning area.

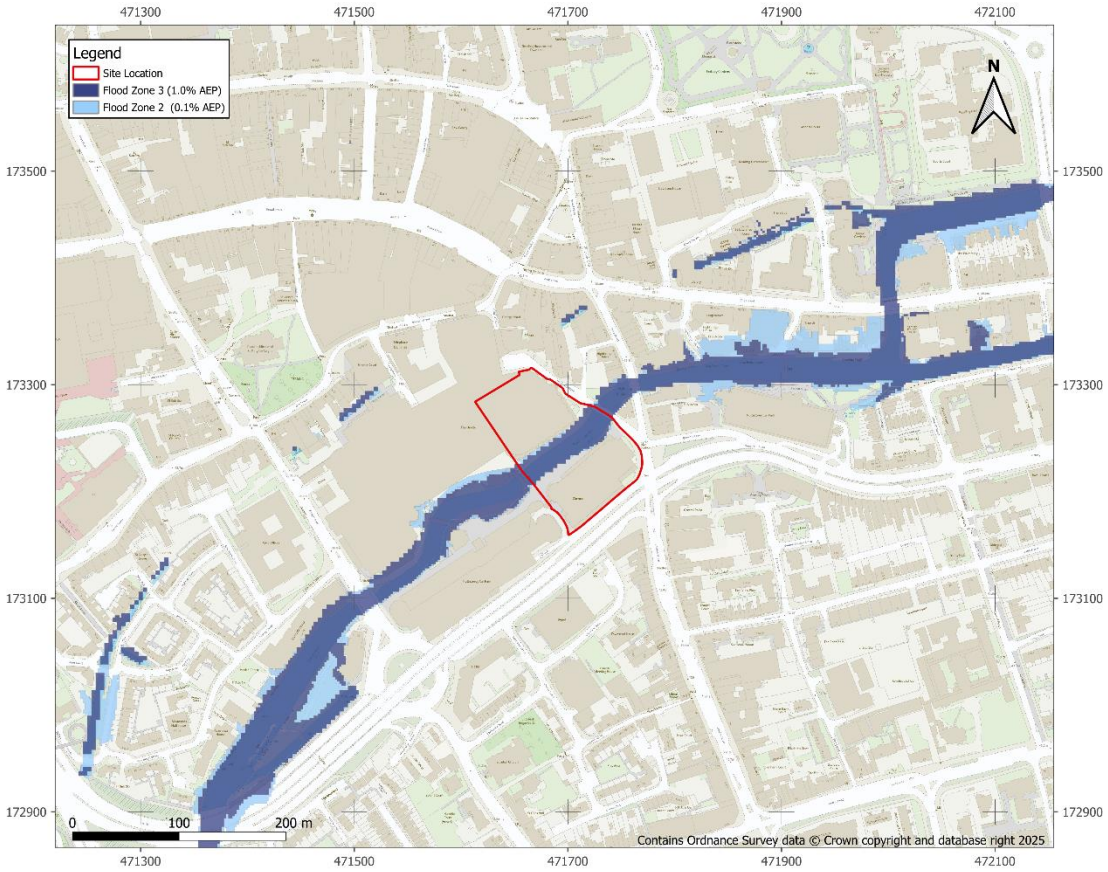

Figure 3 - Fluvial Flood Map

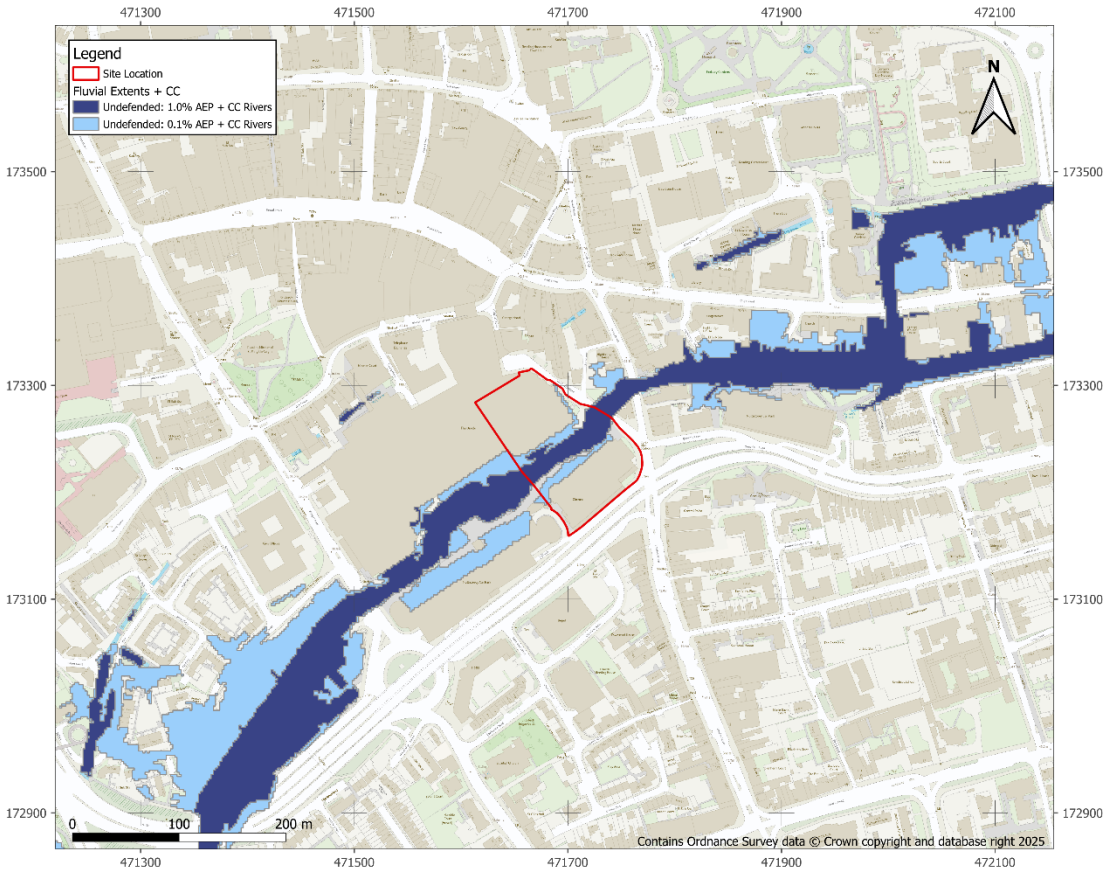

Figure 4 – Fluvial Climate Change Flood Map

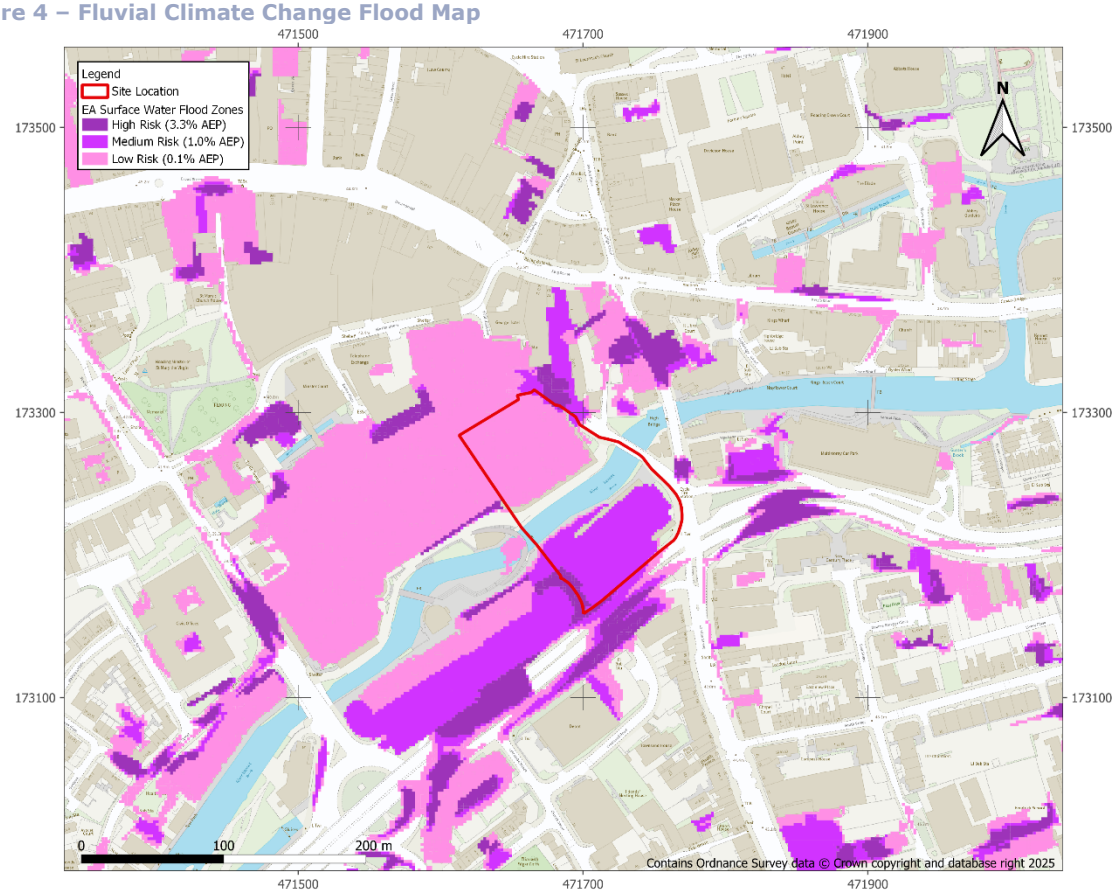

Figure 5 – Surface Water Flood Map

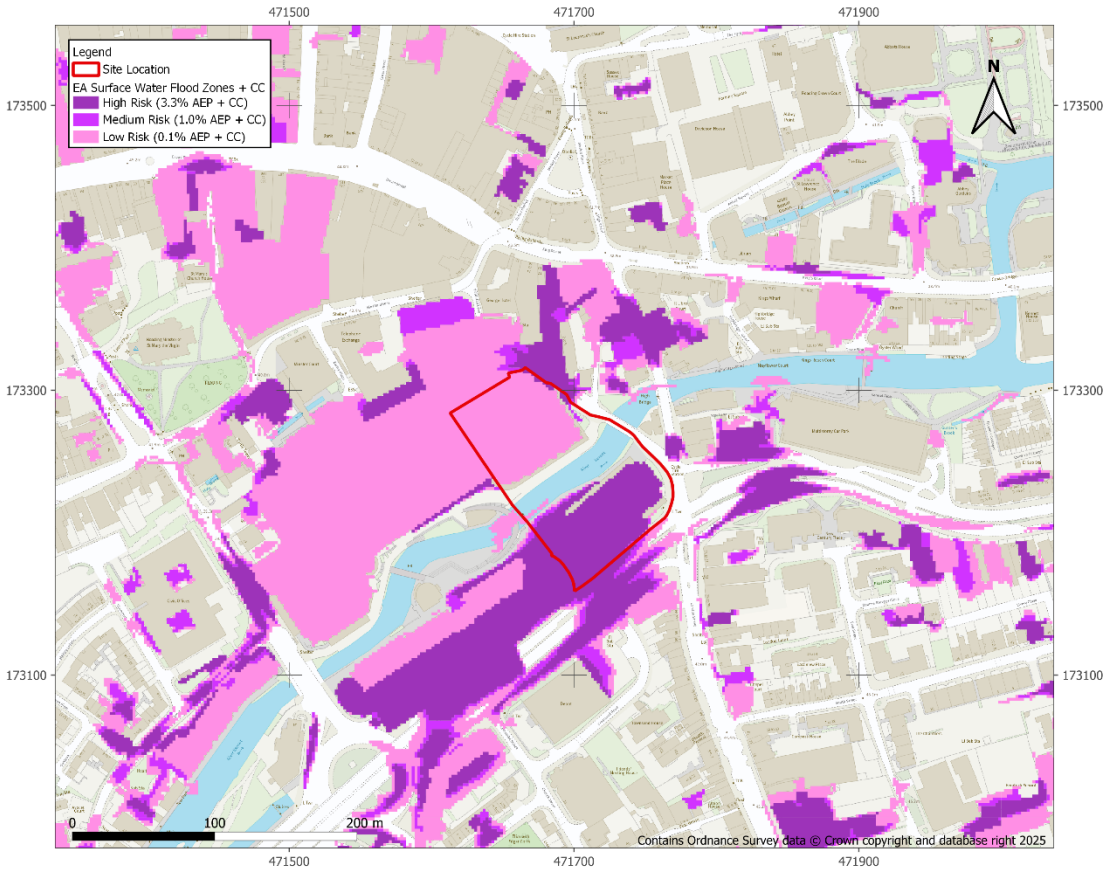

Figure 6 -Surface Water Climate Change Flood Map

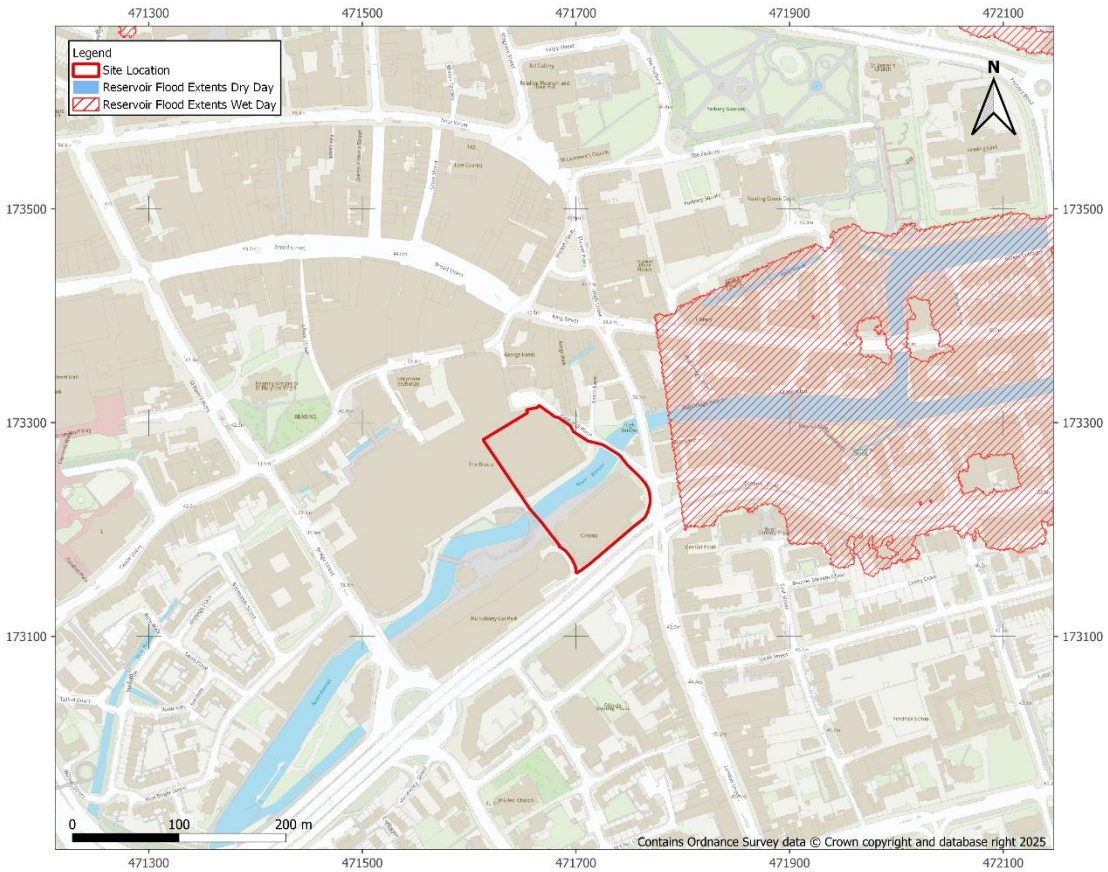

Figure 7 - Reservoir Failure Flood Map

4 Detailed Review of Primary Flood Risk

4.1 Primary Flood Risk

Fluvial flooding is considered to be the primary flood risk mechanism at the site given that the River Kennet runs through its centre. However, it should be noted that pluvial flooding shows the greatest extents for the higher order 1.0% AEP and 0.1% AEP events. As a precautionary approach both fluvial and pluvial flooding are assessed in more detail below.

4.2 Flood Risk Metrics

The national scale modelling does not provide details on flood depths, velocities, hazard or speed of onset. Therefore, the River Kennet model (Tyle Mill to Thames Confluence) (2018) was assessed to attain further detail on fluvial flooding.

For the 100-yr plus central climate change (21%) design event, the maximum flood level at the site is 37.51 m AOD, significantly lower than the average ground level on the site. The hazard map for this event (see Figure 8) shows that flooding and therefore significant flood hazard is located either within or very close to the river channel. Given the location of the site relative to the River Kennet, speed of onset values are very fast (<1-hr), however as mentioned fluvial flood extents are limited to a small proportion of the site. Table 1 shows the flood risk metrics associated with the design event.

Table 1- Flood Risk Metrics

	Design Event 1.0% AEP (+21%)
Percentage Inundated (%)	18%
Average Flood Depth (m)	2.44m* (Max- 3.76m)
Average Velocity (m/s)	1.50m/s* (Max – 2.10m/s)
Speed of Onset (hrs)	<1-hr

**Maximum values taken from within the river channel.*

In terms of pluvial flooding, for the design 100-yr plus climate change event 34% of the site is flooded. The current extents are based on national scale mapping, velocity data is not available however depth banding is available. Across the majority of the site the depth banding is between 0.2-0.3m depth, suggesting limited flood depths for the design event. The mapping shows flood risk to be largely focused in the south of the site. Based on the surface topography there is a slight rise in ground levels along London Street and Yield Hall Place which border the southeast of the site, this could prevent surface water flows from leaving the site leading to pooling. However, this must be balanced against the fact that the site and area surrounding it is heavily urbanised with several multi-storey buildings, surface water flow routes in such locations could be complex and it is unclear how surface water in reality would pool in this location. In summary the true pluvial flood risk in the location of the site may not be captured by the assumptions in the national scale mapping.

4.3 Access and egress

Vehicular access to and from the site would be southwards along Yield Hall Place and London Street. Onward travel would likely be to continue southwards along the A327. The route lies within Flood Zone 1 and is also at minimal pluvial flood risk, see Figure 9.

To ensure the access route can be utilised by site users, development on the site should be located in Flood Zone 1.

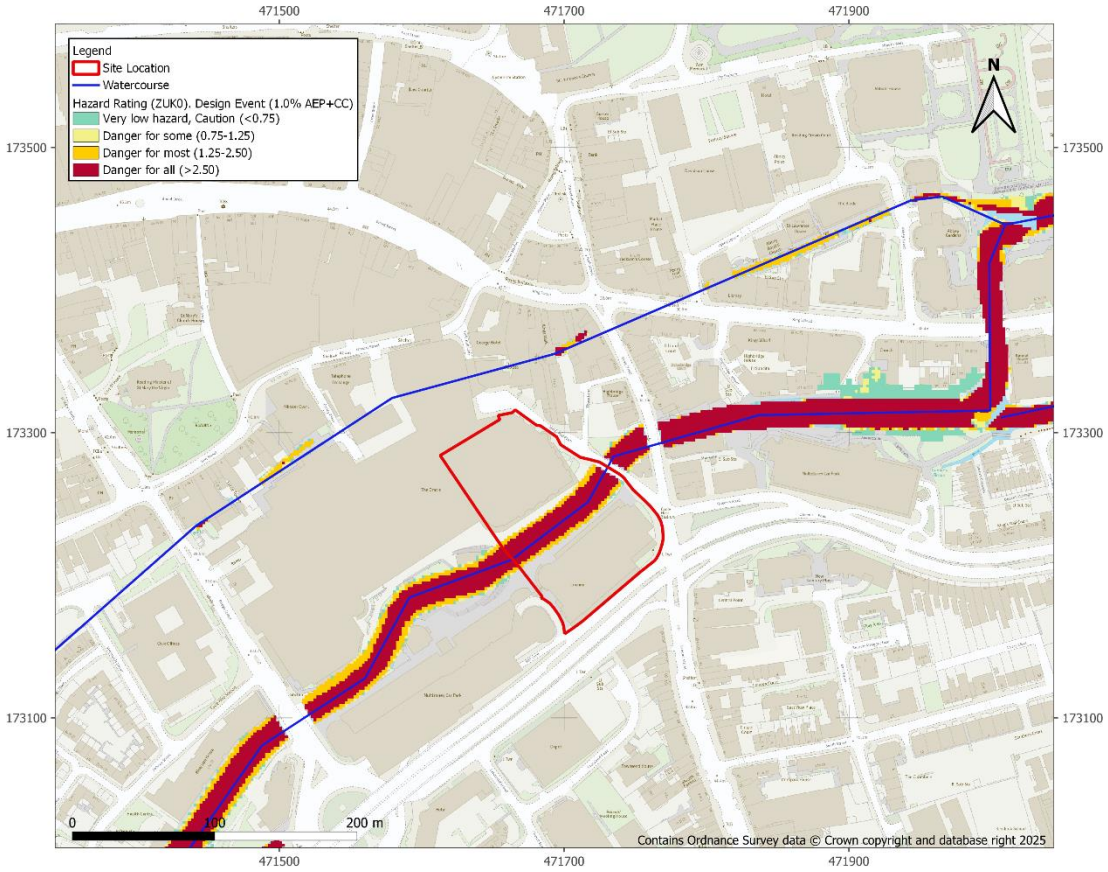

Figure 8 – Flood Hazard Map for the Design Event

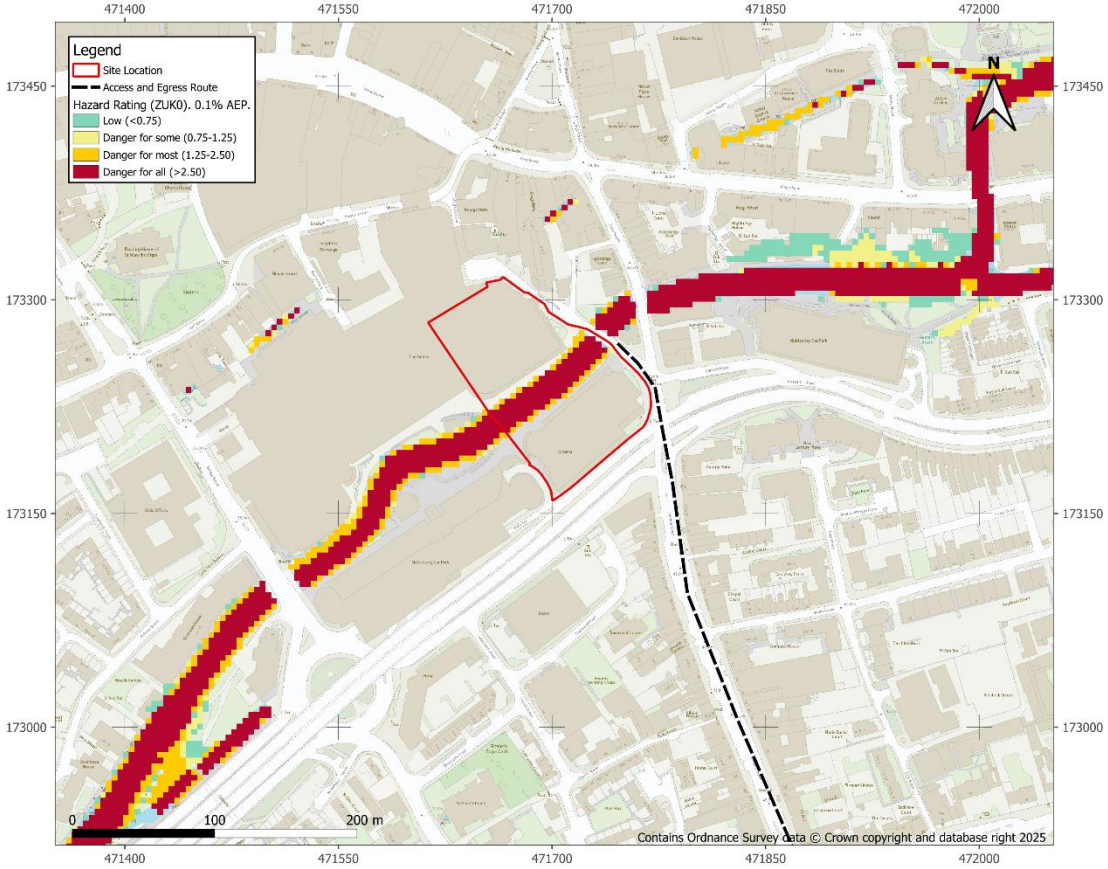

Figure 9 – Access/Egress Routes

5 Development Viability and FRA recommendations

5.1 Development Categorisation

Overall, a new mixed-use development at the site should be possible, however there are some barriers.

The proposed development will consist of both housing (more vulnerable) and employment (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 if located in Flood Zone 3a as specified in the latest NPPF. Neither development categorisations are permissible in Flood Zone 3b.

Given that Flood Zone 3a on the site is largely limited to the River Kennet which runs through its centre, it will be possible to locate the majority of infrastructure outside of its extent. However, pluvial flooding is also significant at the site, although depths are limited and the extents shown in the national scale mapping. It should be considered in more detail in a site-specific FRA with potential development of a bespoke model to better inform flood risk.

5.2 Scale of Development

The total site area is 1.26ha; allocated for between 250-370 dwellings. Given the size of the site, it is assumed that the development will either be high density housing or utilise multistorey flats. As mentioned, 16% of the site (0.23ha) lies in Flood Zone 3b so is not developable which reduces the amount of available land to 1.03ha. More analysis is required to verify the pluvial flood extents.

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 employment 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. Pluvial flood risk should also be used to inform the development layout with more vulnerable infrastructure located outside of high-risk areas.

5.4 Other Site-Specific Considerations

The pluvial flood risk at the site is considered to be moderate. 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 as there is some uncertainty in the national scale mapping given the urban setting of the site. This may involve development of a bespoke surface water model for the site. If new infrastructure is proposed, 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 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 to be high and at the same level as the river, therefore the significant use of infiltration SuDS solutions may not be possible. 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. Storage and modelling requirements should be confirmed with the EA for a site-specific FRA.