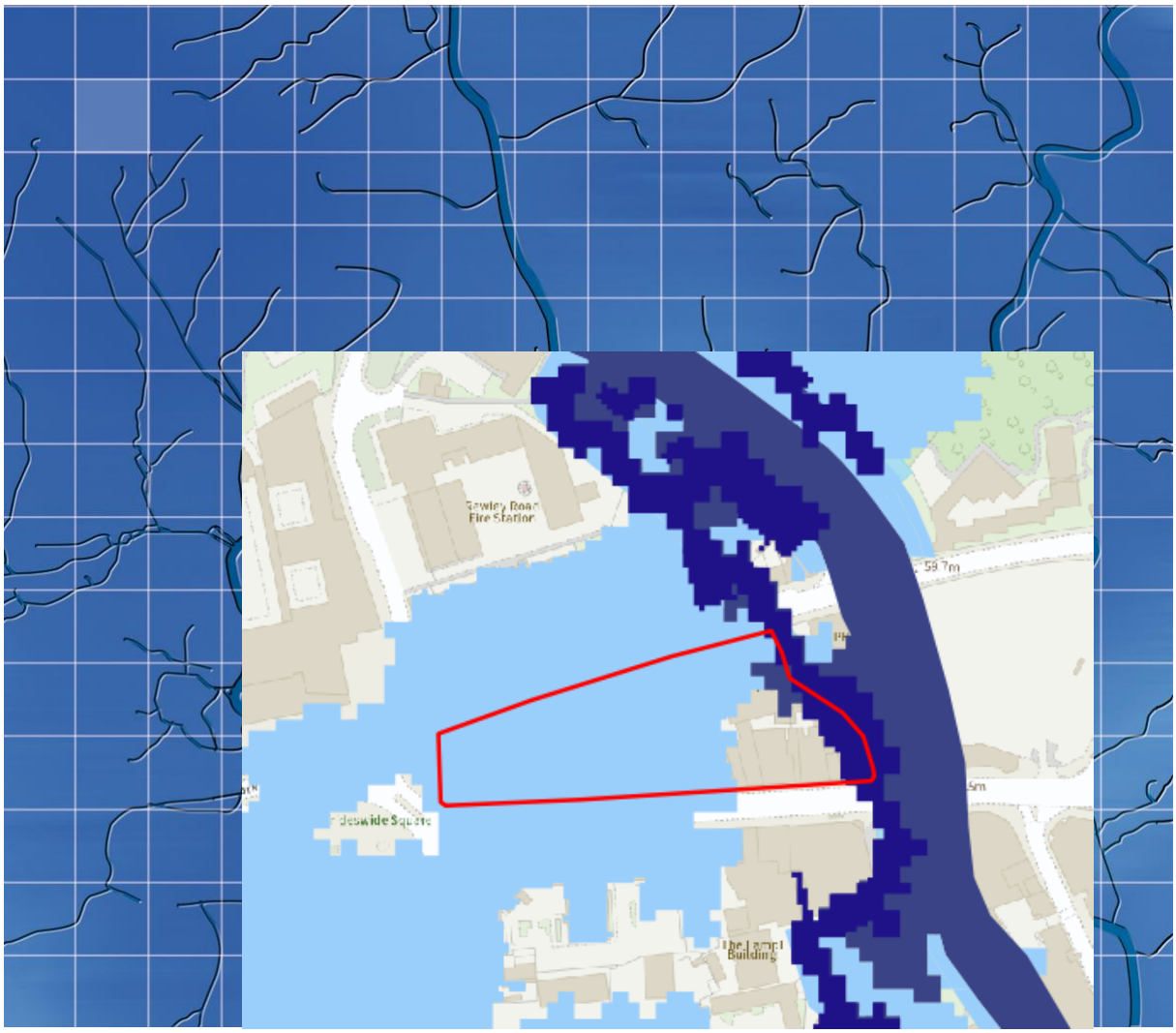
Oxford City Council

October 2025

Island Site (70)

Level 2 Strategic Flood Risk Assessment



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Island Site (70) Level 2 Strategic Flood Risk Assessment

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WHS10237

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1.0	17/10/2025	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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Island Site (70) 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

The main source of flood risk at the site is fluvial. The EA Flood Map for Planning shows 80% of the site is located within fluvial Flood Zone 2 and 6% of the site is located in fluvial Flood Zone 3a. The River Thames (2018) 1.0% AEP +25% CC flood depths indicate the greatest depths in the east of the site, closest to the Wareham Stream, but the greatest flood extents in the west of the site. Flood depths across most of the site are 0.4 m or below.

The risk from pluvial flooding is low though there are multiple areas along Hythe Bridge Street the main access route to the site which are at a high risk of surface water flooding.

The risk of flooding from other sources is moderate due to the risk of reservoir flooding during the wet day scenario and potential groundwater flood risk

The overall confidence in the assessment is high as it is based upon detailed hydraulic modelling results.

Conclusions and Recommendations

The development proposed is mixed with a combination of More Vulnerable and Less Vulnerable development. Neither development category is permissible within Flood Zone 3b, and More Vulnerable Development is required to pass an Exception Test to justify development in Flood Zone 3a.

As the site is predominantly existing development, the proposed development should focus upon redevelopment of the existing building footprints so as not to impact floodplain storage. As a wide area of the site is inundated during the 1.0% AEP +26% CC design event, finished floor levels should be raised a minimum of 300 mm above the design flood level. A site-specific FRA should assess and determine design flood levels for the site.

It should also be noted that parts of the access routes to and from the site are located within Flood Zone 2 and 3 as well as the design flood extent. Safe access and egress should be assessed in more detail in a site-specific FRA.

Contents

1 Introduction

1.1 Background

Wallingford HydroSolutions Ltd has been commissioned by Oxford City Council (OCC) to undertake a Level 2 Strategic Flood Risk Assessment (SFRA) at Island Site (reference: 70) 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

Island Site (70) is a 0.65 ha site located in the centre of Oxford, see Figure 1. Current land use at the site is predominantly commercial and residential.

Development proposed at the site includes retail, residential, community and commercial uses. A total of 59 residential dwellings are proposed within the development.

2.2 Topography

Based on 1m LiDAR data, the site is relatively flat with a slight slope from west to east close to the Wareham Stream, see Figure 2. The ground levels within the site boundary range from 56.3 to 58.3 m AOD. The average ground level is approximately 57.5 m AOD.

2.3 Nearby Watercourses

Wareham Stream is located directly adjacent to the east of the site and runs parallel to Castle Mill Stream which is located approximately 20m from the eastern site boundary at its closest point, see Figure 1. Both watercourses flow from north to south. Wareham Stream diverges from Castle Mill Stream approximately 120m north of the site and rejoins Castle Mill Stream 290m southeast of the site. The Oxford Canal also flows into the Castle Mill Stream approximately 60m northeast of the site. Castle Mill Stream is a tributary of the River Thames which joins it 730m south of the site.

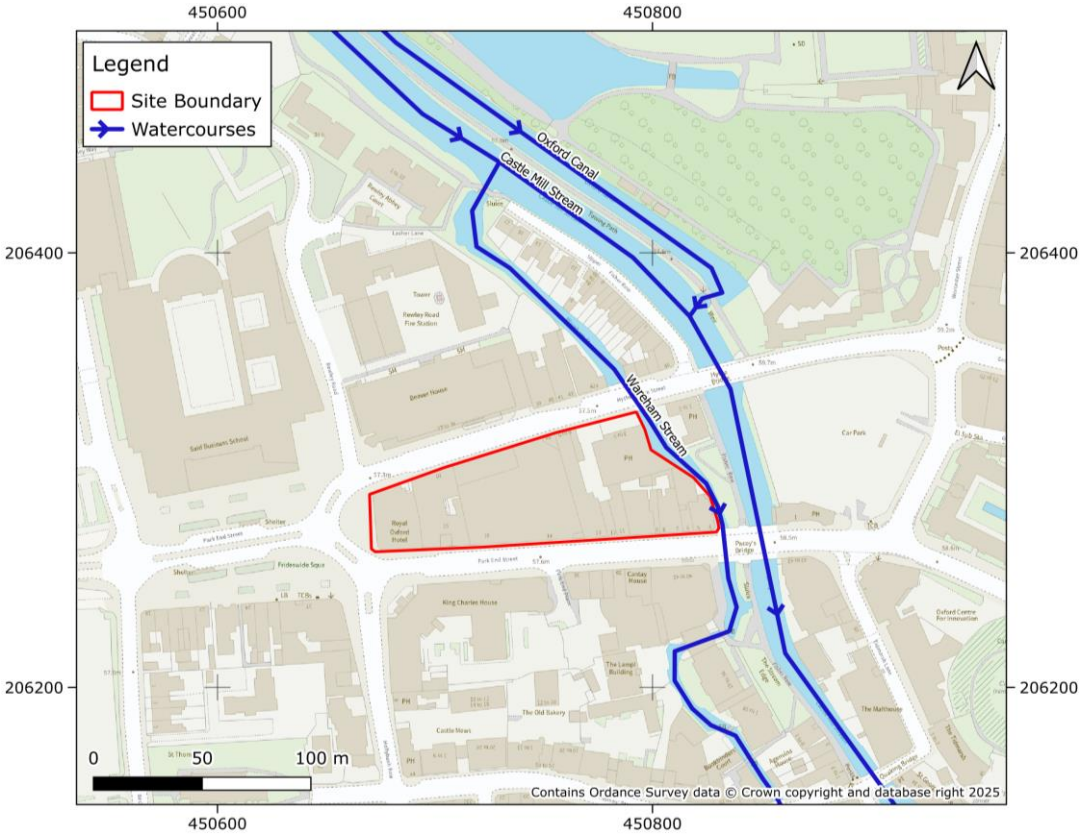

Figure 1 - Site Location

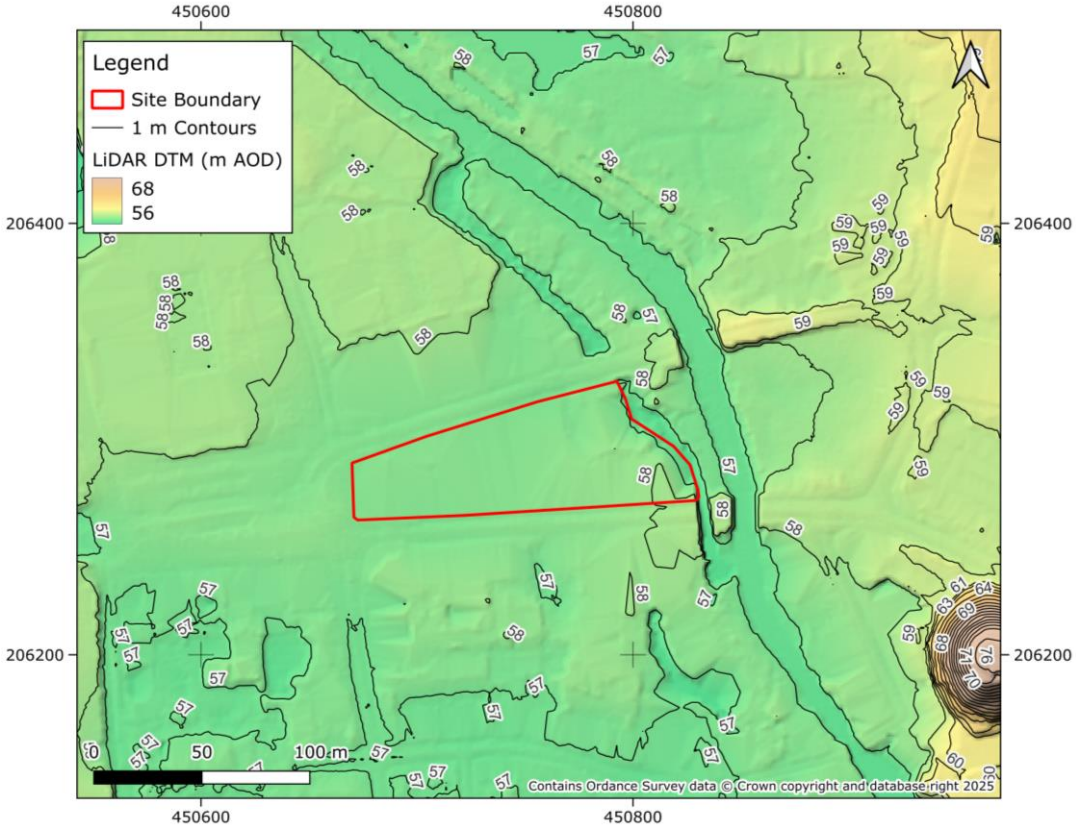

Figure 2 – Topography

3 Flood Risk

3.1 Historical Flooding

The EA does not hold records of historical flooding at the site. Figure 3 shows the greatest historical flood extent which is largely limited to the Wareham stream channel.

3.2 Fluvial Flood Risk

In the existing Flood Map for Planning (FMfP), 80% of the site is located within Flood Zone 2 (0.1% AEP), and 7% is located within Flood Zone 3a (1% AEP), see Figure 4. These Flood Zones consider the undefended scenario whereas Flood Zone 3b (3.3% AEP) considers the defended scenario. This extent shows 6% of the site to be located within Flood Zone 3b. Though the undefended 3.3% AEP River Thames (2018) modelled extent is available and similar, the EA defended 3.3% AEP extent is greater and so is used in this assessment as a conservative measure.

The EA climate change fluvial outputs for the 0.1% AEP and 1.0% AEP undefended extents have also been assessed, these show 99% of the site inundated during the 0.1% AEP event and 85% of the site inundated during the 1.0% AEP event. The climate change extent for the 3.3% AEP defended event was also assessed, it shows 83% of the site to be inundated, see Figure 5.

Fluvial flood risk is considered to be moderate in the present day scenario and high when considering climate change. It is assessed in more detail in section 4.

3.3 Flood Defence Infrastructure

The site does not benefit from flood defence infrastructure nor is it located in an area designated for flood storage.

3.4 Surface Water Flood Risk

The EA's surface water flood maps show 3% of the site to be inundated during a 3.3% AEP event, 4% is inundated during a 1.0% AEP event, and 29% is inundated during a 0.1% AEP event, see Figure 6.

When considering the effects of climate change, the proportion of the site at risk for each event remains at 3%, 4%, and 29% respectively, see Figure 7.

Overall, the surface water flood risk to the site is low, however there is a large area of risk along Hythe Bridge Street bordering the north of the site.

3.5 Groundwater Flooding

The site is underlain by a bedrock of mudstone in the form of the Oxford Clay and West Walton formation. It is expected to permit low amounts of infiltration. Superficial deposits of sand and gravel are also present at the site. The underlying soils are loamy and clayey floodplain soils with naturally high groundwater.

Based on the data available there is a moderate risk of groundwater flooding, however, given that the site is located within the wider River Thames floodplain, groundwater flooding is more likely to be heavily correlated with fluvial flooding.

3.6 Reservoir Flood Risk

The FMfP shows the majority of the site is inundated during the wet day scenario, see Figure 8. This risk can be attributed to a number of reservoirs located upstream of the site, though Farmoor Reservoir is the most notable.

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 aim to make sure

that all reservoirs are properly maintained and monitored to detect and repair any problem. If required, the local planning authority (LPA) can consult the local resilience forum for emergency planning advice in relation to reservoir failure.

3.7 Flood Warning Service

The site is not located within an EA Flood Warning Area.

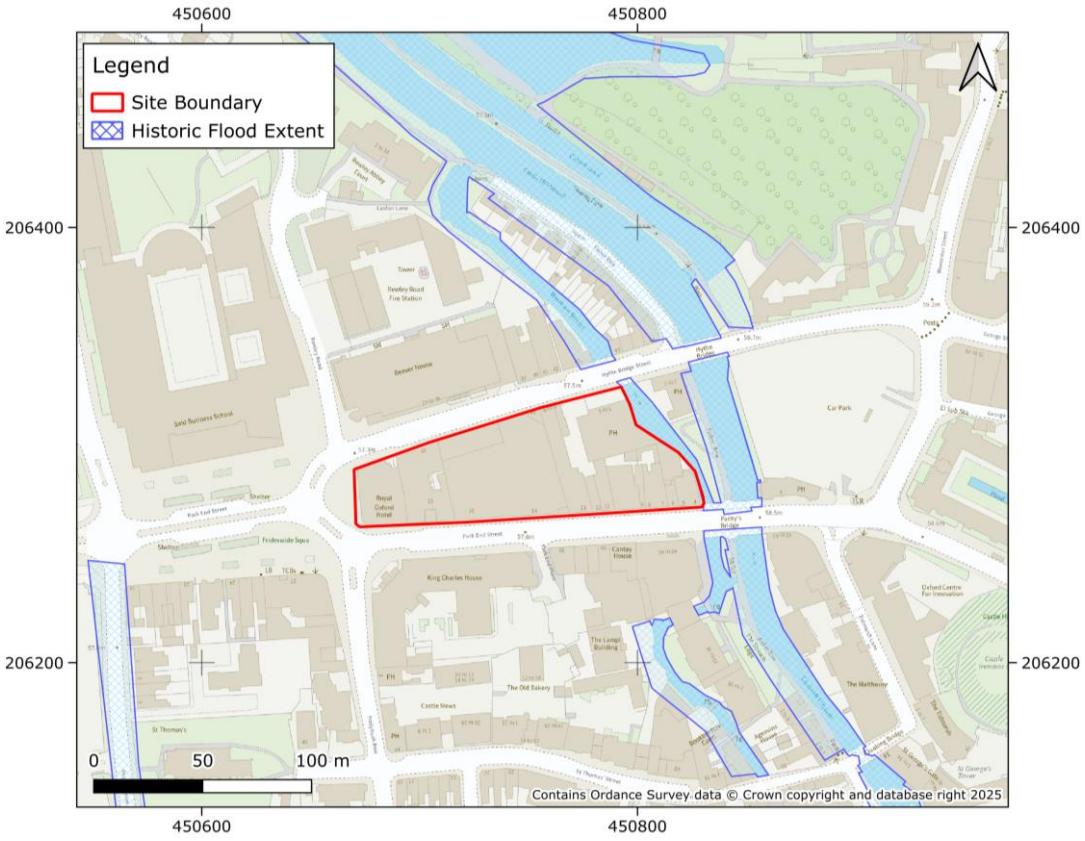

Figure 3 - Recorded Flood Outlines

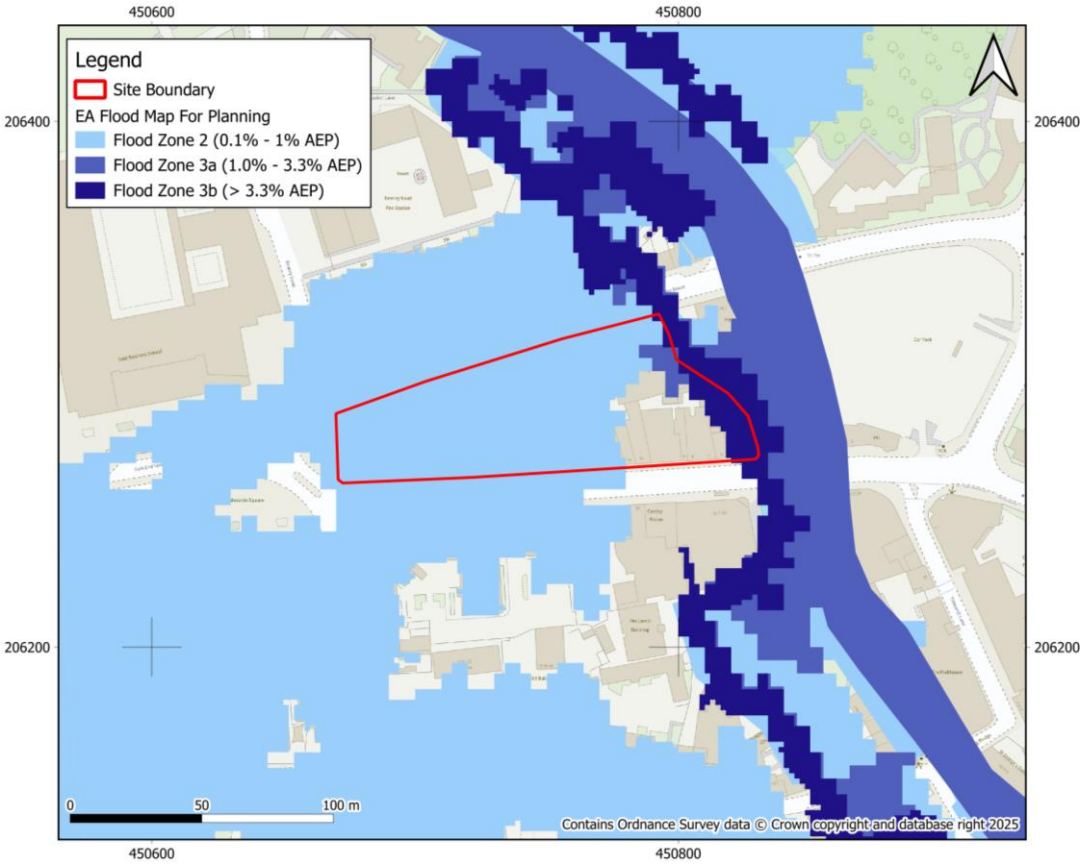

Figure 4 - Fluvial Flood Map

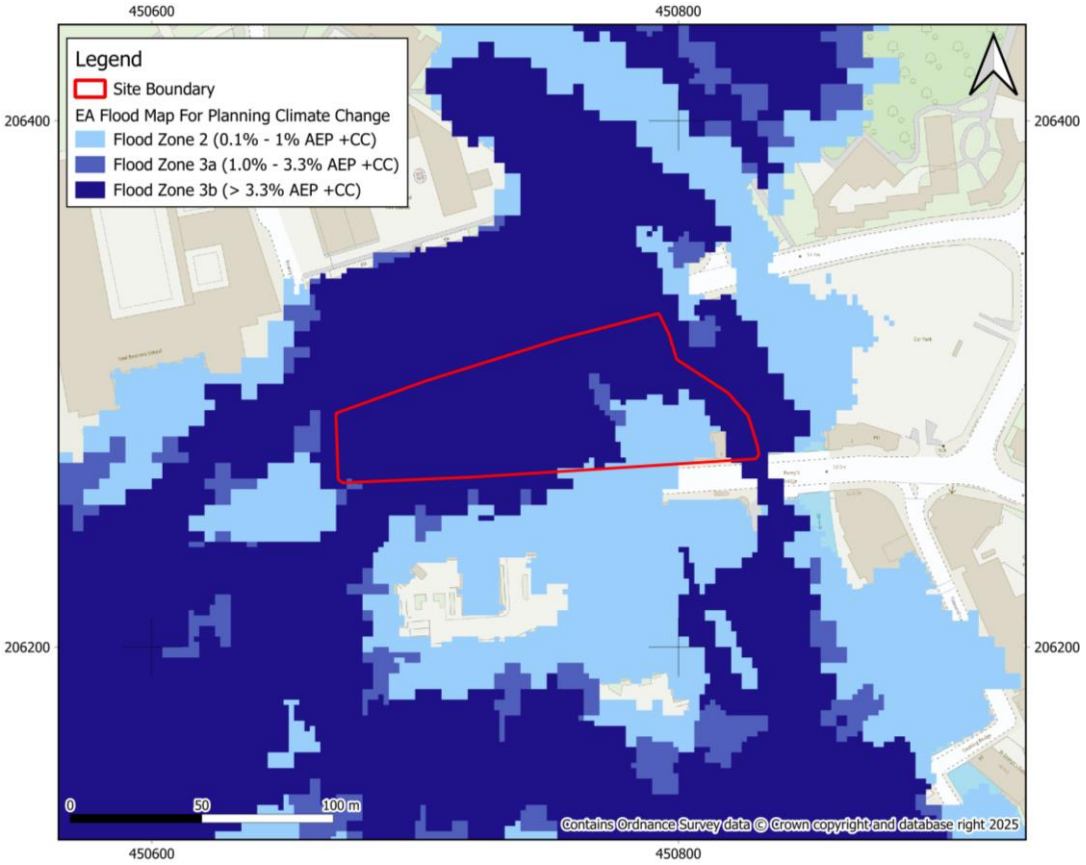

Figure 5 – Fluvial Climate Change Flood Map

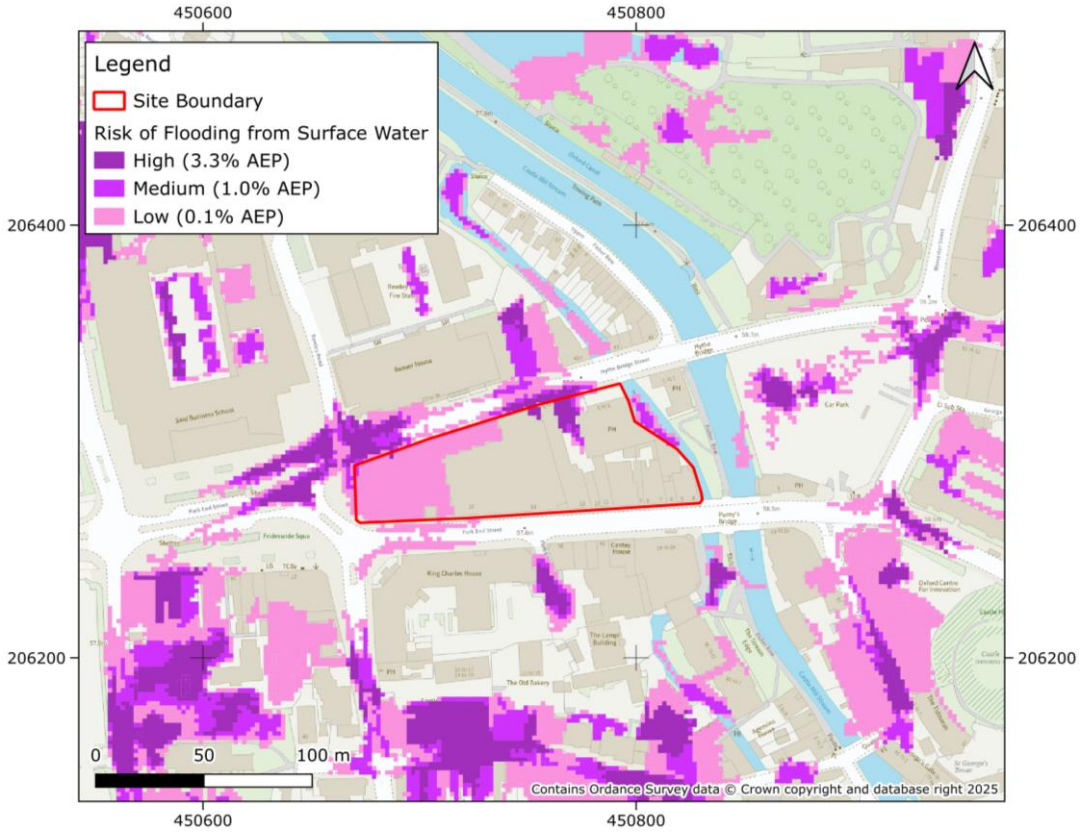

Figure 6 – Surface Water Flood Map

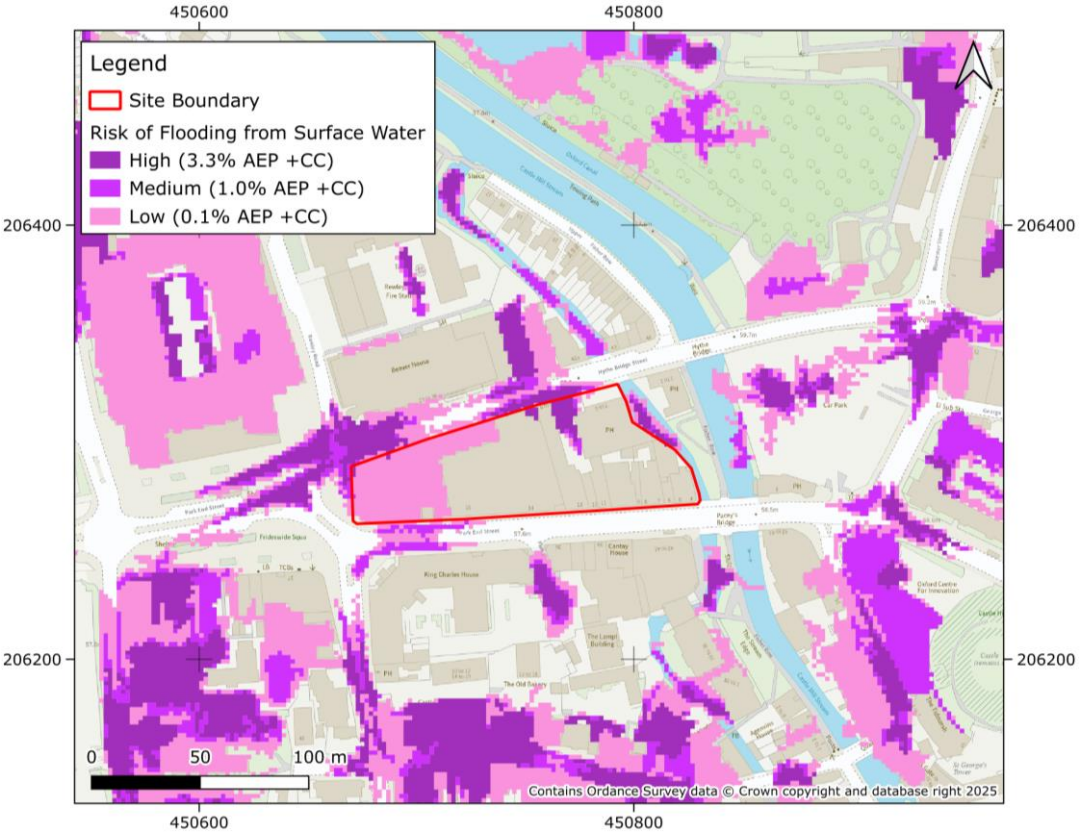

Figure 7 -Surface Water Climate Change Flood Map

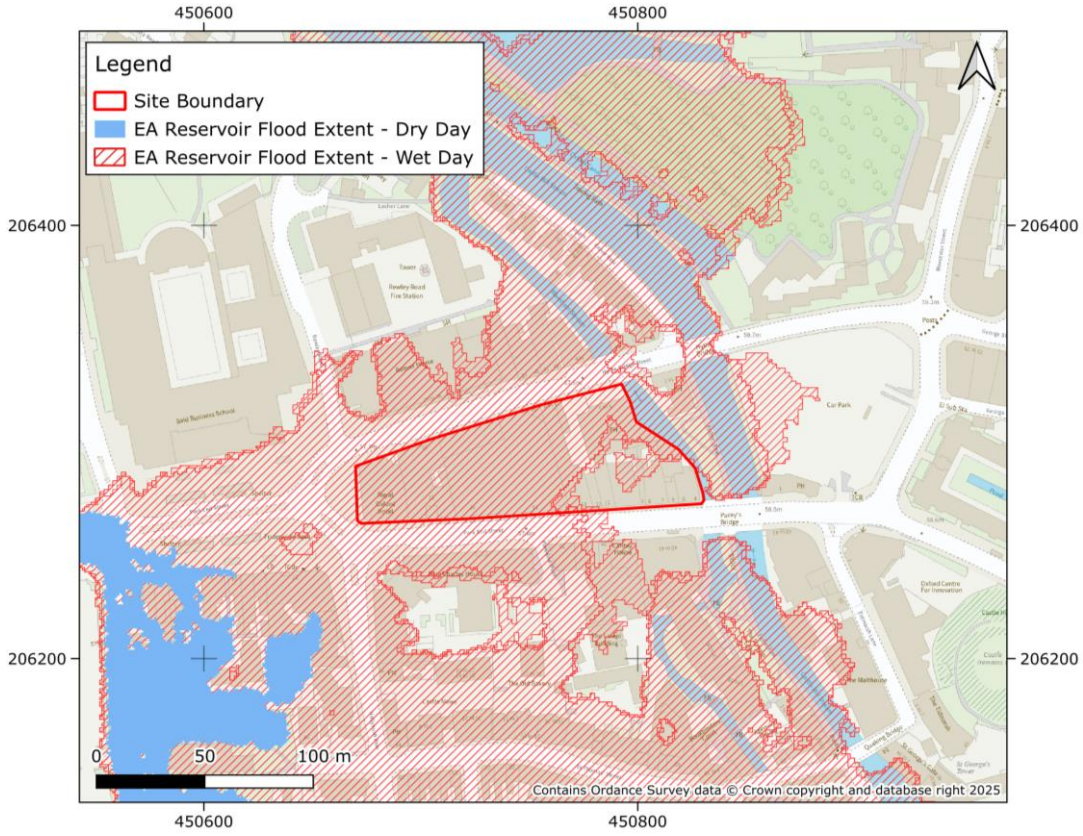

Figure 8 - Reservoir Failure Flood Map

4 Detailed Review of Primary Flood Risk

4.1 Primary Flood Risk

The primary flood risk mechanism at the site is fluvial.

4.2 Flood Risk Metrics

The River Thames Model (2018) was re-run as part of the previous SFRA for Oxford City in 2023. This was to obtain results applying the latest climate change allowances.

Depth data for the 100-yr plus central (26%) climate change design event is first assessed to attain further detail on fluvial flooding. The modelled scenario considers the presence of flood defences unlike the FMfP data, although the impact of defences at this site is minimal.

The depth mapping across the site (see Figure 9) shows the greatest flood extents are located in the west of the site though the greatest flood depths are in the east of the site closest to the Wareham Stream. Flood depths within the majority of the site are between <0.1 m and 0.4 m, with the greatest depths in the north of the site closest to Hythe Bridge Street. The maximum modelled flood depth within the site is 2.3 m, however this is likely to be associated with the Wareham Stream directly. Due to the grid size of the model, differentiation between the watercourse and its banks is unclear in this location. Velocity vectors indicate that flood waters across the site originate from the Wareham Stream and flow west. Using the River Thames (2018) model a design flood extent of 57.6 m AOD, slightly above the average ground level of the site based on LIDAR (57.5 m AOD).

As part of this site lies in Flood Zone 3b, the River Thames Model (2018) depth data for the 100-yr plus higher central (41%) climate change design event (re-run in 2023) was assessed to attain further detail on fluvial flooding. Once more, the modelled scenario considers the presence and condition of flood defences unlike the FMfP data.

The depth mapping (see Figure 10) shows no increase in flood extent during the 1.0% AEP +41% CC event compared to the 1.0% AEP +26% CC event. However, increases in flood depths are indicated with a maximum flood depth of 2.4m associated with the channel of the Wareham Stream. Depths across the rest of the site are 0.5 m or less with the greater depths located in the northeast of the site, close to Hythe Bridge Street. The design flood level for the 1.0% AEP +41% CC design event is estimated to be 57.7 m AOD.

4.3 Access and egress

Access and egress to the site is via Hythe Bridge Street to the north and Park End Street to the south. Routes from both sides of the site are required as it is assumed there is limited connectivity between the two sides of the site. It should be noted that the outlined route will need to be reassessed in a site-specific FRA considering the development layout and final site access points. The FRA should also consider routes across the site once the development layout is known.

Due to the watercourses in the surrounding area, neither route can entirely avoid the design 1.0% AEP +26% CC extent. Both routes should initially travel east before continuing north towards the A4144 which allows onward travel towards flood free areas in the north of Oxford, see Figure 11.

Neither route can avoid areas of inundation with the majority of the routes designated as low hazard. However, the area of flood risk associated with the Wareham Stream directly is categorised as dangerous to most. A site-specific FRA should determine whether these depths consider the presence of the bridge above the stream and whether they are representative.

Early flood warning will be vital at the site to ensure that the access route can be utilised before it is inundated by floodwaters. The River Thames catchment is dominated by chalk and has a relatively slow river response times to storm events, being groundwater, rather than surface water dominated. This increases the time taken for inundation and for adequate warnings and preparation in an extreme flood event. It should be noted that the site is not currently located within an EA Flood Warning Area. However, other areas of Oxford are located within flood warning areas and so Flood Warnings from these should be considered when assessing the need for evacuation from the site.

The routes identified are also at surface water flood risk. Whilst this is less significant that fluvial flood risk, a site-specific FRA should consider the risk of surface water flooding to the proposed access and egress routes in more detail including speed of onset and hazard.

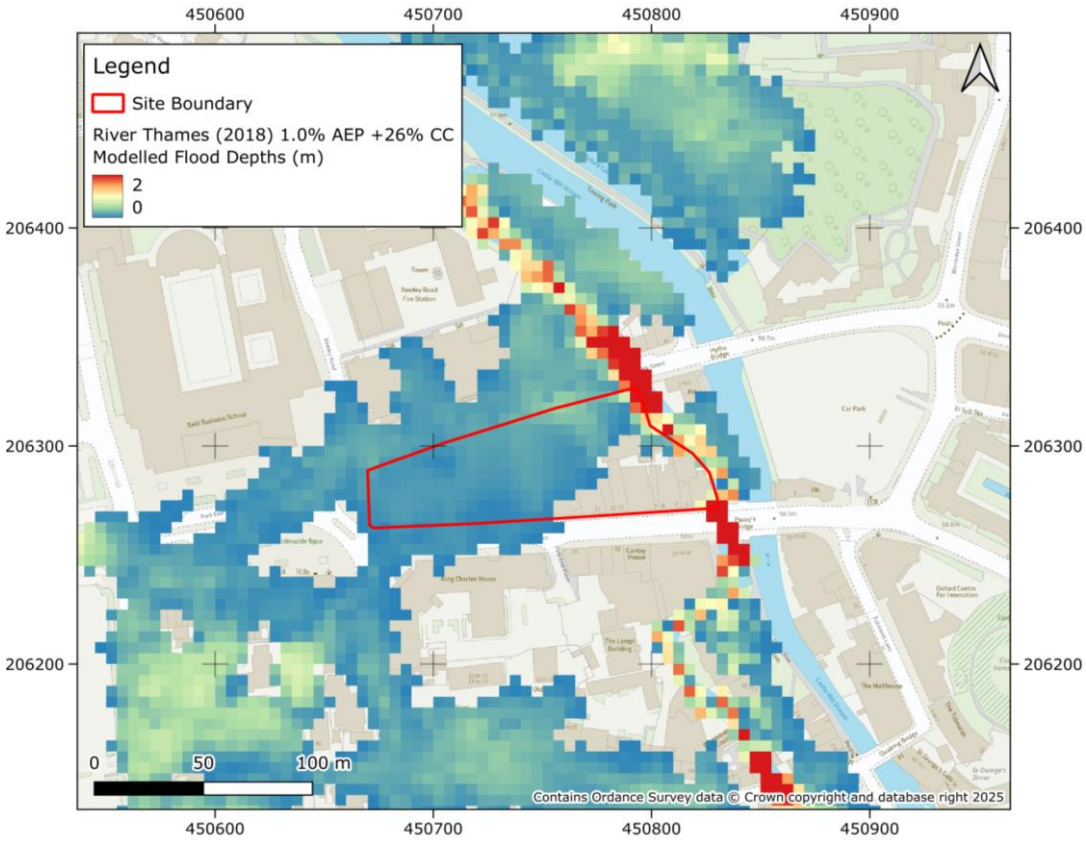

Figure 9 – River Thames (2018) 1.0% AEP +26% CC Modelled Flood Depths

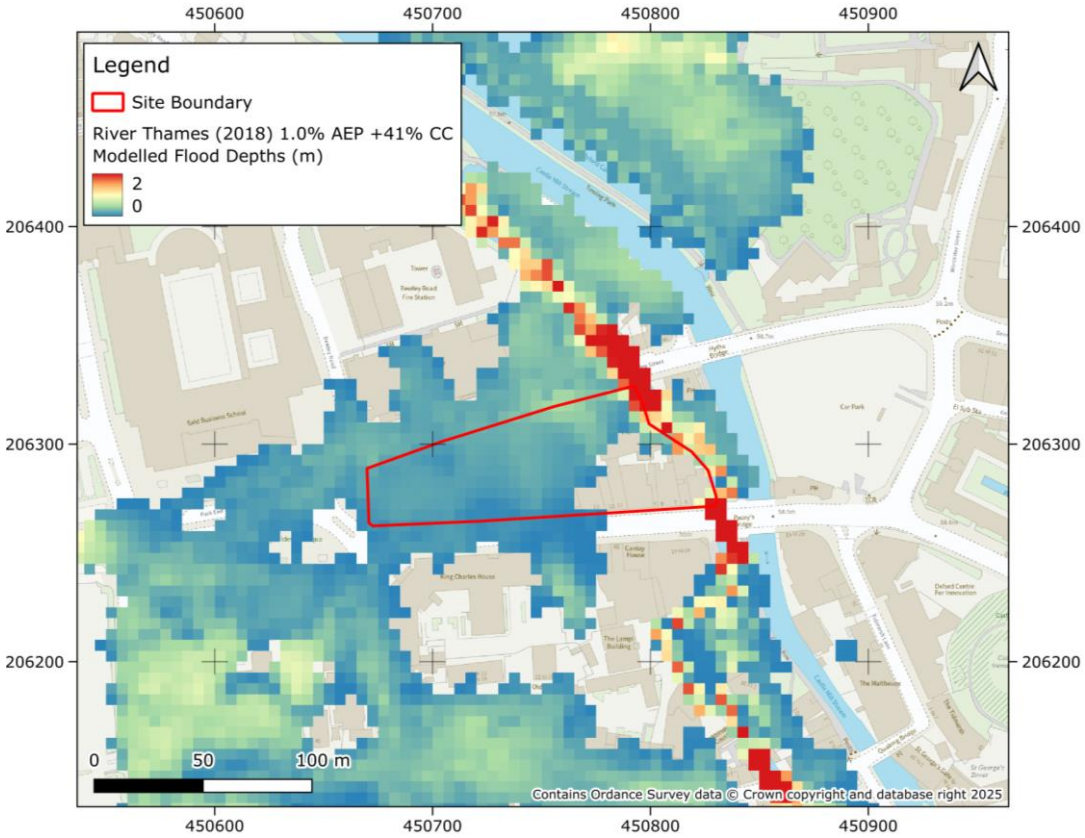

Figure 10 - River Thames (2018) 1.0% AEP +41% CC Modelled Flood Depths

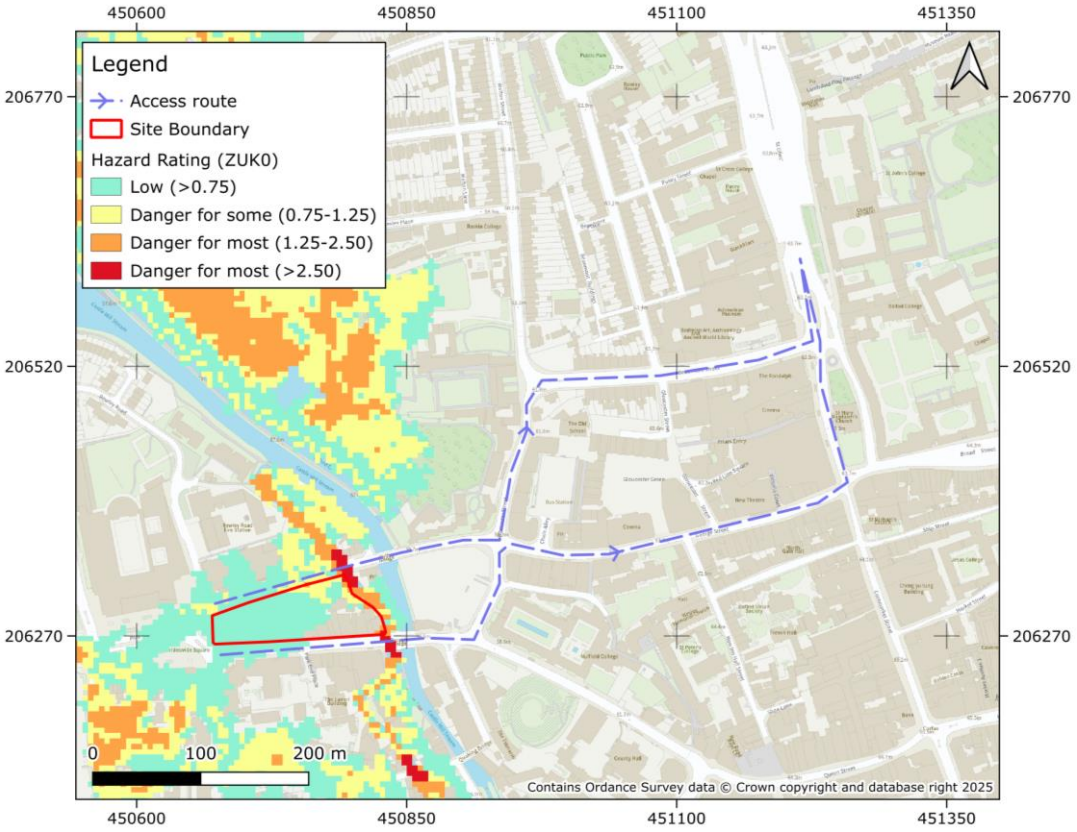

Figure 11 – Access/Egress Routes

5 Development Viability and FRA recommendations

5.1 Development Categorisation

A sequential approach to the siting of the development should be used, with development prioritised first within Flood Zone 1 prior to consideration of any siting within Flood Zone 2 or 3a.

The development proposed is mixed including residential, retail, community, and commercial uses. Residential development is categorised as More Vulnerable Development, whereas the other development types are categorised as Less Vulnerable Development. Neither development category is permissible within Flood Zone 3b, and More Vulnerable Development is required to pass an exception test to be permissible within Flood Zone 3a.

Given that Flood Zone 3b inundates a small proportion of the east of the site (6%), it should be possible to locate all infrastructure outside of its extent. However, the site may face significant barriers given that a large proportion (85%) of the site falls within the design flood extent (1.0% AEP + 26% Climate Change event). Development located in its extent will need to be raised above the design flood level and compensatory storage may need to be provided to offset any 3rd party flood risk impacts.

5.2 Scale of Development

As much of the site is covered by existing development, it is assumed that the majority of the proposed development will be re-development. Any additional development within the site should be located within the lowest area of flood risk. If development is located within the design flood extent and the development footprint (in terms of volume) exceeds the existing footprint, compensatory flood storage will be required. However, given the scale of the proposed development it may be possible to accommodate all development without causing a decrease in floodplain storage.

As a large area of the site is at risk during the 1.0% AEP +26% CC design event, redevelopment at the site will need to incorporate appropriate finished floor levels (FFL) to provide a minimum 300 mm freeboard above the design flood level of 57.6 m AOD.

5.3 Sequential Approach

It is important that a sequential approach is implemented at the site, prioritising development in Flood Zone 1 wherever possible, followed by Flood Zone 2 and then Flood Zone 3a. As already stated, no development should be located in Flood Zone 3b. If required more vulnerable housing development should be prioritised in lower flood risk areas with less vulnerable infrastructure (i.e. employment land, car parks and open spaces) located in higher flood risk areas if required. This is on the assumption that it does not increase flood risk elsewhere when considering the design flood event (57.6 m AOD) and is designed to be appropriately resistant and resilient to flooding.

Note, surface water flood risk is also present in smaller areas across the site. Therefore, it should be used alongside the FMfP to inform the development layout and steer development outside of high-risk areas, if possible.

5.4 Other Site-Specific Considerations

Development will need to be set at a floor level to provide an appropriate freeboard (typically 300mm minimum) above the design flood level of 57.6 m AOD for the defended 1.0% AEP (plus central climate change allowance) design event. If ground raising is implemented within the design flood extents, modelling will need to be undertaken to assess 3rd party impacts and compensatory storage requirements. This assessment will need to consider the existing development footprint within the design flood extent. A site-specific FRA should confirm any modelling requirements with the EA to assess 3rd party impacts, including the

need to for breach analysis to further assess the protection provided by the flood defences in the vicinity of the site and confirm the finished floor levels (FFLs).

Areas of flood risk surround the site, with no completely flood free egress options. A route with the lowest hazard has been identified during the design event. However given there is no advance flood warning provision for the site, a site-specific FRA should consider the evacuation requirements before the design event and a more extreme fluvial or pluvial event taking account of the site layout and advice to sought from the emergency services, including Oxford City Council's emergency planner.

A site-specific FRA should also consider in more detail the nature of the surface water flood risk in more detail to determine how quickly it occurs and the degree of hazard on site. This will need to apply the design 1.0% AEP event with an appropriate allowance for climate change considering the vulnerability and expected lifetime of the development.

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 national standards for SuDS and any relevant Local Authority Local Plan policies. It is noted that the existing site is comprised of hard standing so there is potential for the site to offer a significant betterment on existing rates. The geology at the site has low permeability and this combined with soils which have naturally high groundwater, means the effectiveness of infiltration SuDS solutions may be limited. 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.

Due to some parts of the site being in the wet day reservoir failure inundation extent, any development in this area could affect the reservoirs risk designation, design category and how it is operated with potential cost implications for developers. However, it is noted that the quantum of development is very small in comparison to the existing development in Oxford already lying within the reservoir flood extents so any change in designation is assumed to be unlikely.