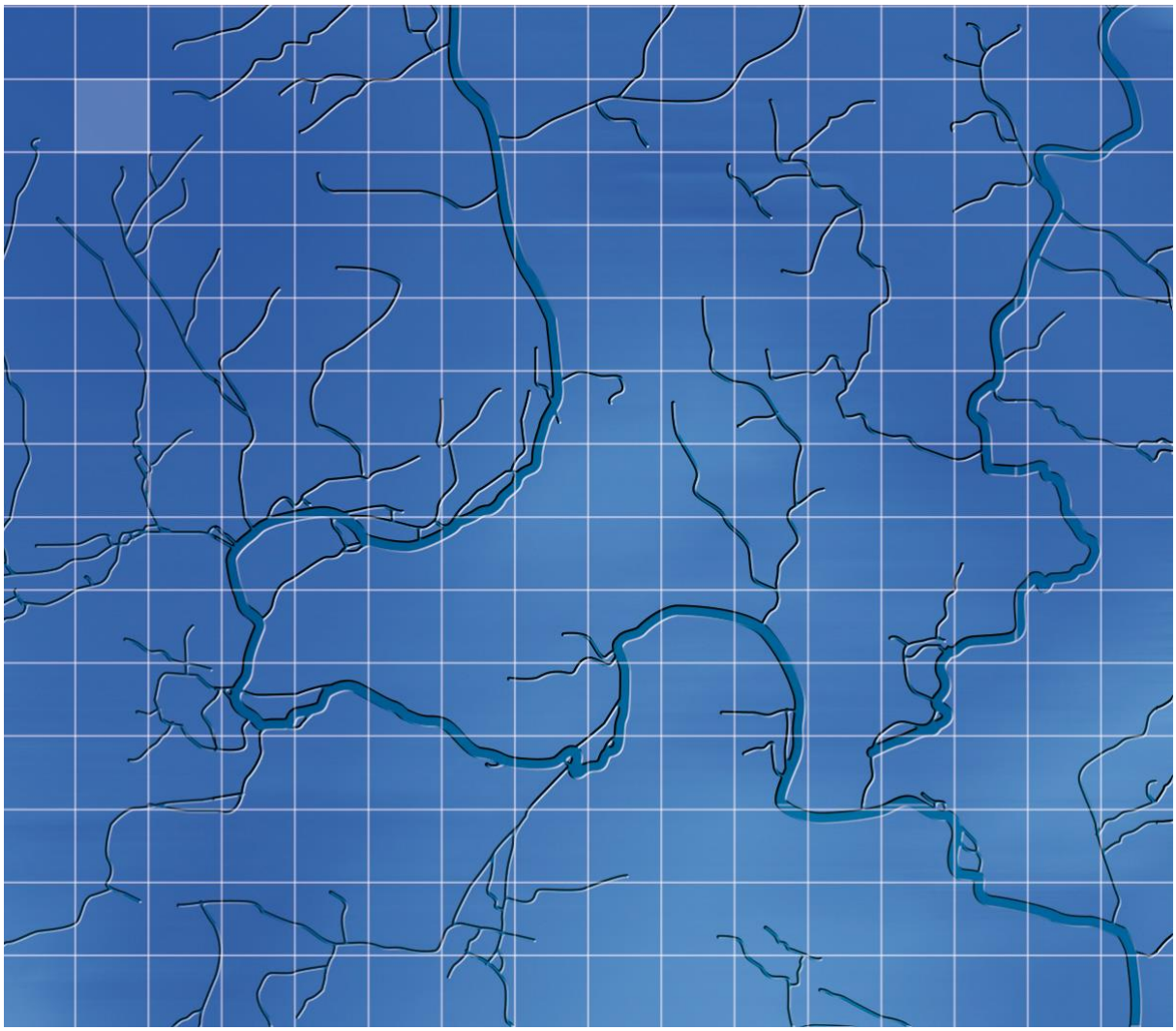
Oxford City Council

October 2025

St Thomas and Osney Warehouse (616)

Level 2 Strategic Flood Risk Assessment



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St Thomas and Osney Warehouse (616) Level 2 Strategic Flood Risk Assessment

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WHS10237

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1.0	24/10/2025	Draft	Jasmine Lucas (*Graduate Consultant*)	Daniel Hamilton (*Principal Consultant*)

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St Thomas and Osney Warehouse (616) Level 2 SFRA
Flood Risk Overview

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

Flood Risk

The site is at risk from both fluvial and pluvial sources.

The EA Flood Map for Planning shows almost 100% of the site is located within fluvial Flood Zone 2 though no part of the site is located in fluvial Flood Zone 3a. The River Thames (2018) 1.0% AEP +26% CC design event flood depths show the St Thomas site to be at a greater risk of flooding than the Osney Warehouse site, with a maximum flood depth of 0.65 m. The design flood level across both sites is 57.1 m AOD.

The EA's surface water flood maps show 19% of the site to be inundated during a 3.3% AEP % event, 47% is inundated during a 1.0% AEP event, and 50% is inundated during a 0.1% AEP event. The Risk of Flooding from Surface Water (RoFSW) depth data shows the extent to be similar to the fluvial extent, with an average depth of 0.3 m at the St Thomas site.

The risk from other sources of flooding is considered to be moderate given it is at risk from reservoir flood risk during the wet day scenario.

The overall confidence in the assessment is high due to the use of detailed EA hydraulic modelling to inform the assessment of flood risk.

Conclusions and Recommendations

The development proposed is categorised as mixed use including both more and less vulnerable development. As the majority of the site is already developed, it is expected that development at the site will be redevelopment. However, a sequential approach to the siting of development at the site should still be used, prioritising development within the lowest areas of flooding before considering areas with higher flood risk.

The site may face significant barriers given that a large proportion falls within the design flood extent (1.0% AEP + 26% Climate Change event). More vulnerable 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 if the development footprint exceeds the existing site footprint.

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 St Thomas and Osney Warehouse (reference: 616) 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

St Thomas and Osney Warehouse (616) are a pair of sites located in west Oxford with a total site area of 0.41 ha, see Figure 1. Current land use at the sites is predominantly commercial.

Proposed development is for mixed-use including 10 residential dwellings.

2.2 Topography

Based on 1m LiDAR data, the two sites are relatively flat. Ground levels at the Osney Warehouse site range from 56.5 to 57.2 m AOD while ground levels at the St Thomas site range from 56.2 to 57.1 m AOD. The average ground levels at each site are 57.0 m AOD and 56.5 m AOD respectively.

2.3 Nearby Watercourses

The closest watercourse to the sites is the Wareham Stream, located approximately 60 m east of Osney Warehouse, see Figure 1. Wareham Stream joins Castle Mill Stream at their confluence approximately 110 m southeast of Osney Warehouse. The River Thames is located 400 m east of St Thomas.

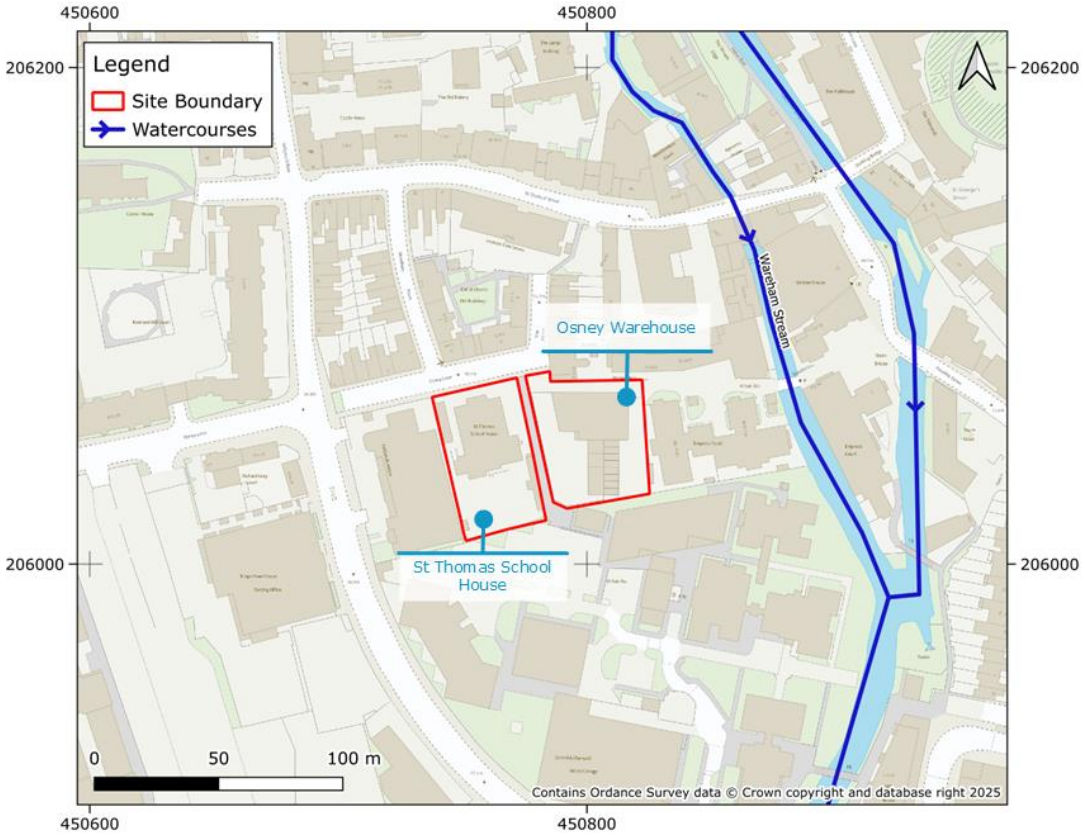

Figure 1 - Site Location

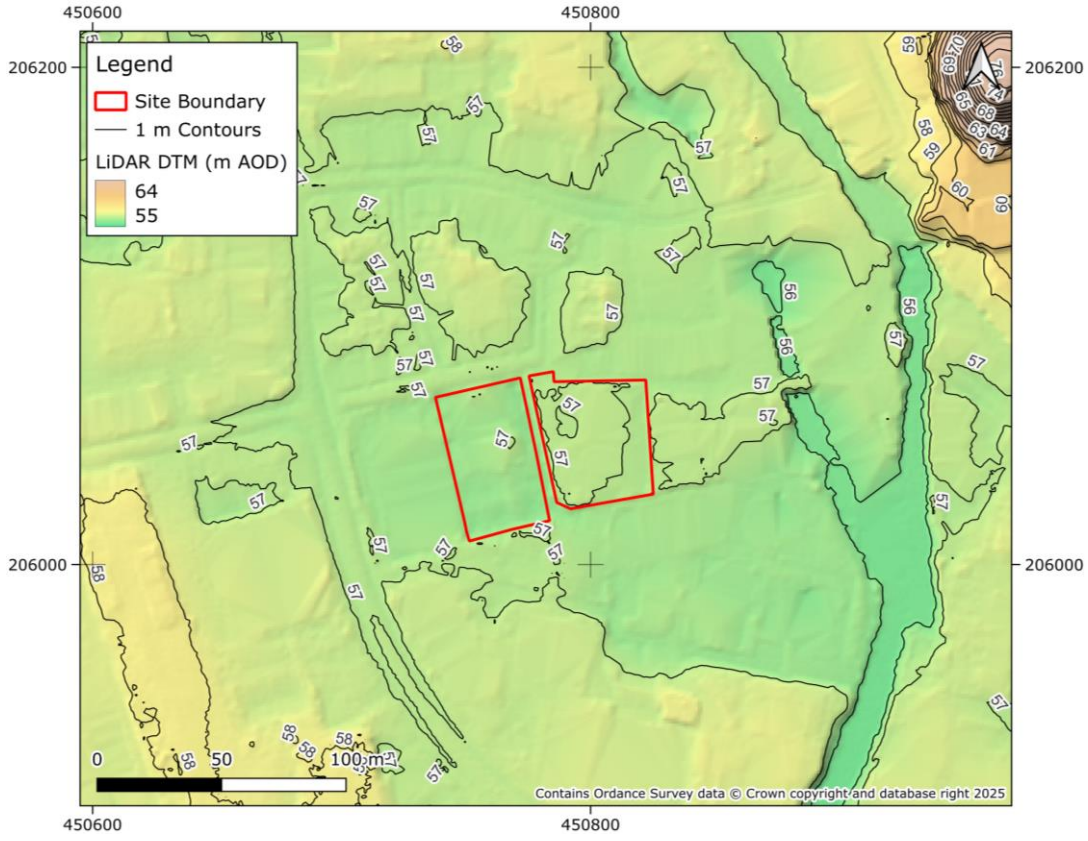

Figure 2 – Topography

3 Flood Risk

3.1 Historical Flooding

The EA does not hold any records of historical flood events at the sites, see Figure 3.

3.2 Fluvial Flood Risk

In the existing Flood Map for Planning (FMfP), almost 100% of the site is located within Flood Zone 2 (0.1% AEP), whereas no part of the site is located within Flood Zone 3a (1% AEP), see Figure 4. Viewing the River Thames 2018 model results for the undefended 3.3% AEP event, no part of the site is located within Flood Zone 3b.

The EA climate change fluvial outputs for the 0.1% AEP and 1.0% AEP undefended extents have also been assessed. These show 92% located within the 1.0% AEP extent, and 100% of the site to be located within the 0.1% AEP extent, see Figure 5. The River Thames (2018) undefended 3.3% AEP +26% Climate Change extent equivalent to Flood Zone 3b with climate change, indicates approximately 31.1% of the site is expected to be inundated.

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

3.3 Flood Defence Infrastructure

The site does not benefit from engineered flood defence infrastructure, though it is noted that natural high ground is present along the right bank of the Wareham Stream.

3.4 Surface Water Flood Risk

The EA's surface water flood maps show 19% of the site to be inundated during a 3.3% AEP event, 47% is inundated during a 1.0% AEP event, and 50% is inundated during a 0.1% AEP event, see Figure 6. This extent is almost entirely limited to the St Thomas site.

When considering the effects of climate change, the proportion of the site at risk for each event increases to 47%, 48%, and 52% respectively, see Figure 7. The area of inundation remains almost entirely within the St Thomas site.

Overall, the surface water flood risk to the site is moderate and is assessed in more detail in Section 4.

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, due to the proximity of the site to the River Thames, groundwater flooding is likely to be heavily correlated with fluvial flooding. More data is required at the planning stage to confirm groundwater flood risk.

3.6 Reservoir Flood Risk

The FMfP shows the whole site to be at risk from reservoir failure during the wet day scenario, see Figure 8. A number of reservoirs are located upstream on the River Thames, though most notably Farmoor Reservoir.

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.

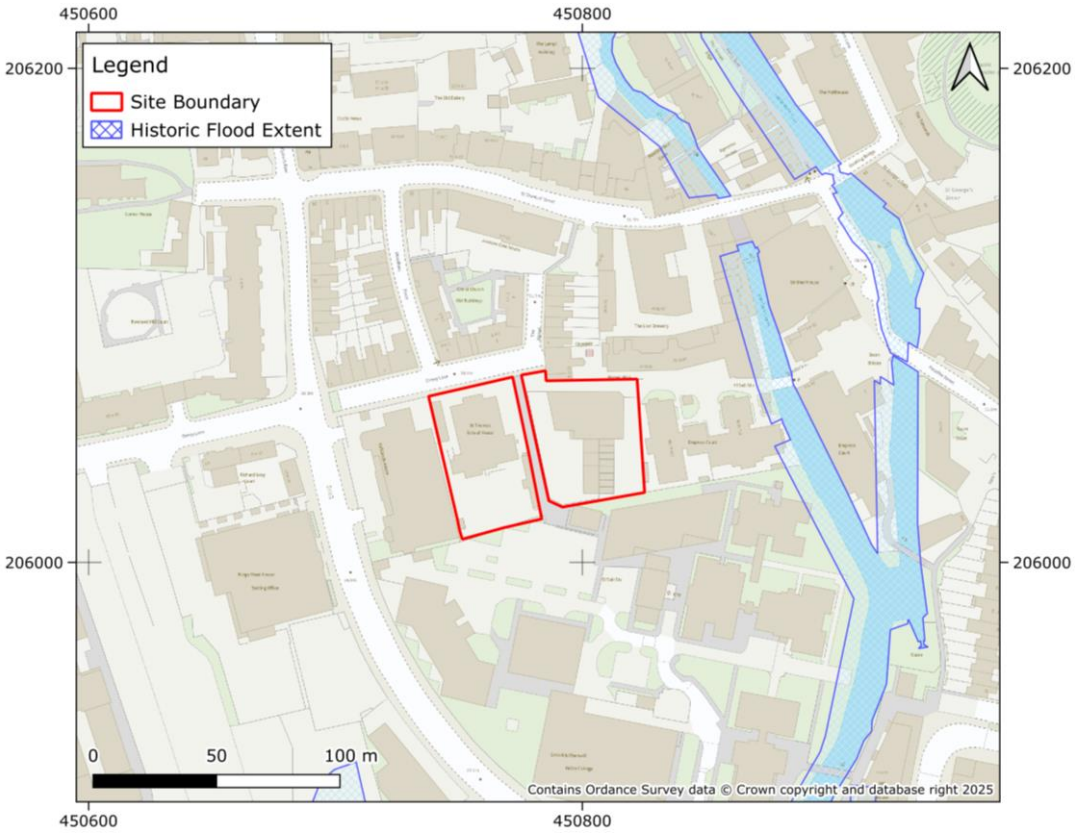

Figure 3 - Recorded Flood Outline

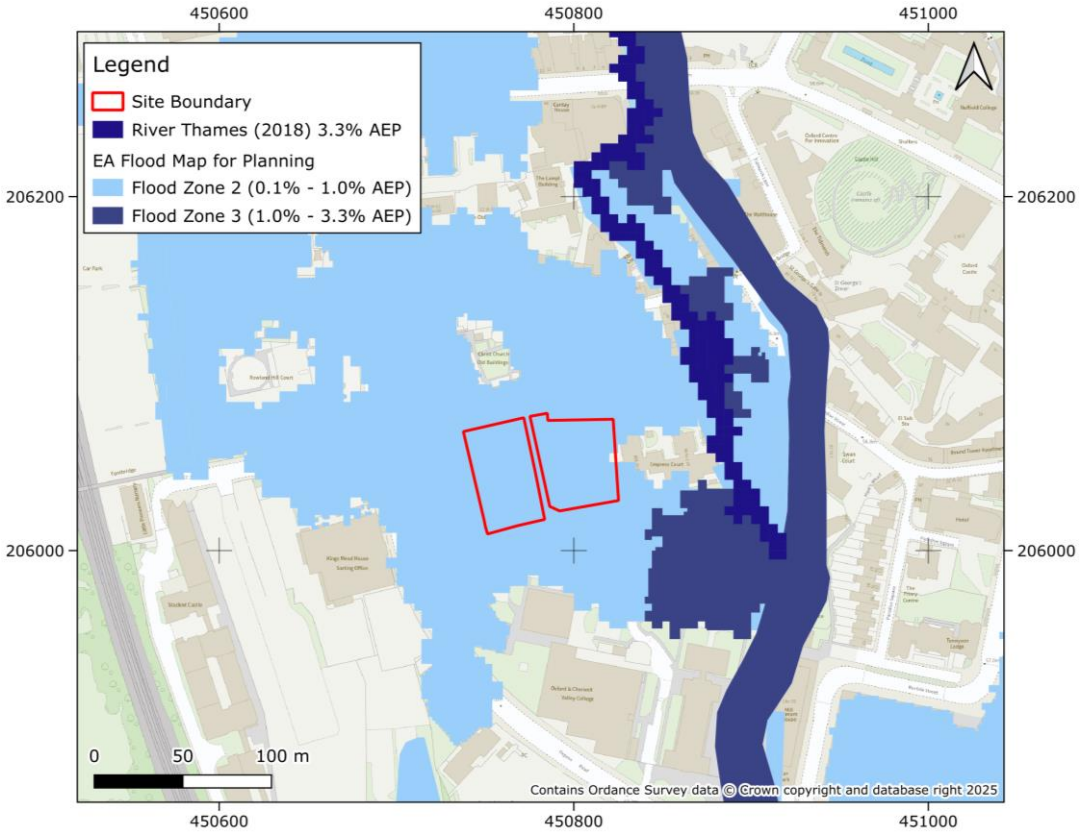

Figure 4 - Fluvial Flood Map

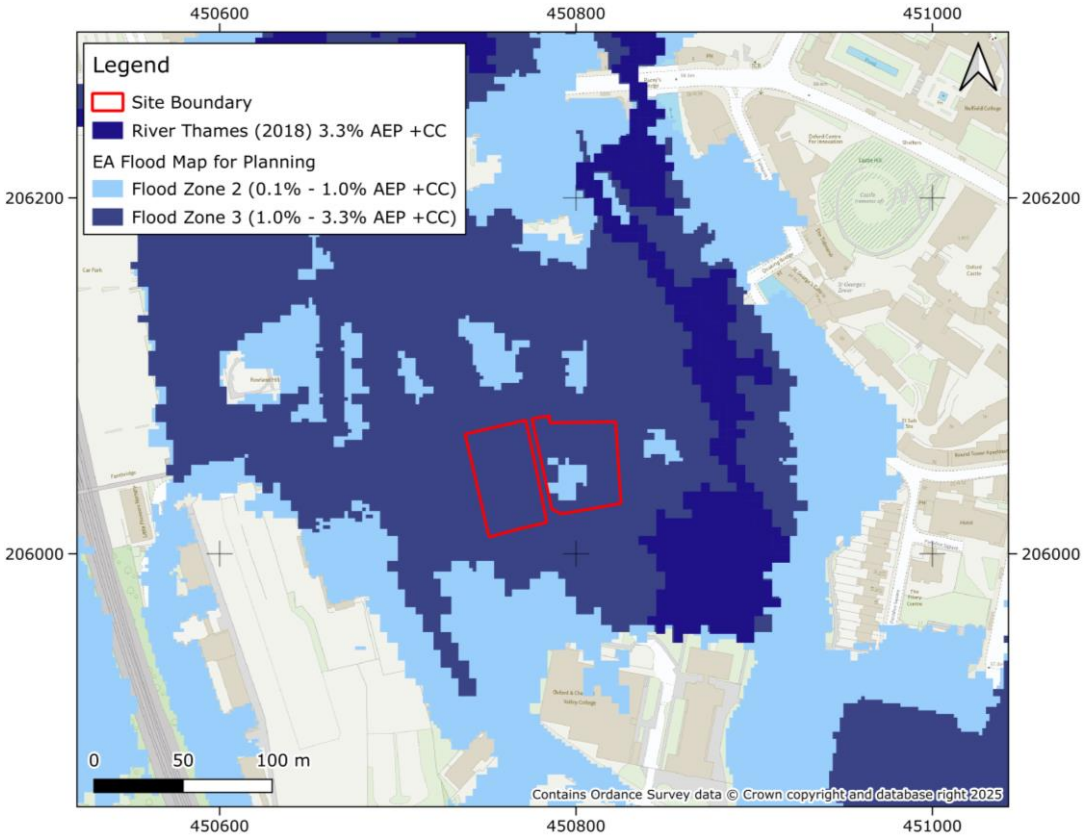

Figure 5 – Fluvial Climate Change Flood Map

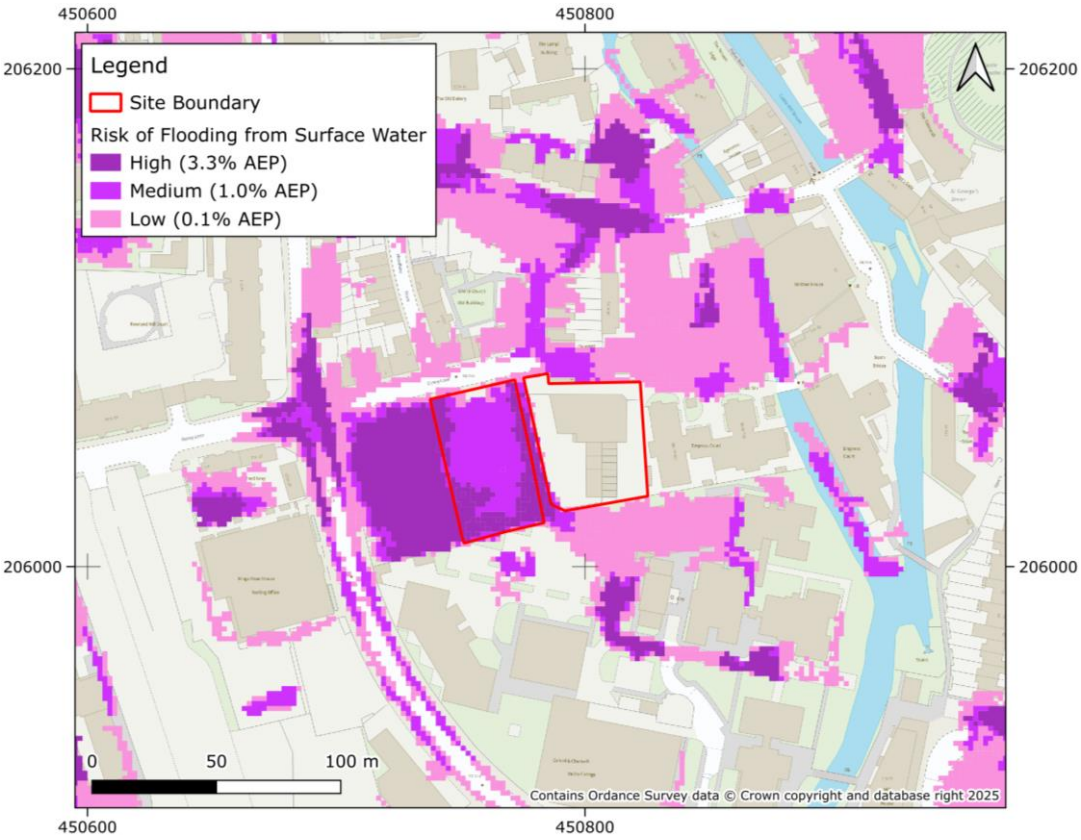

Figure 6 – Surface Water Flood Map

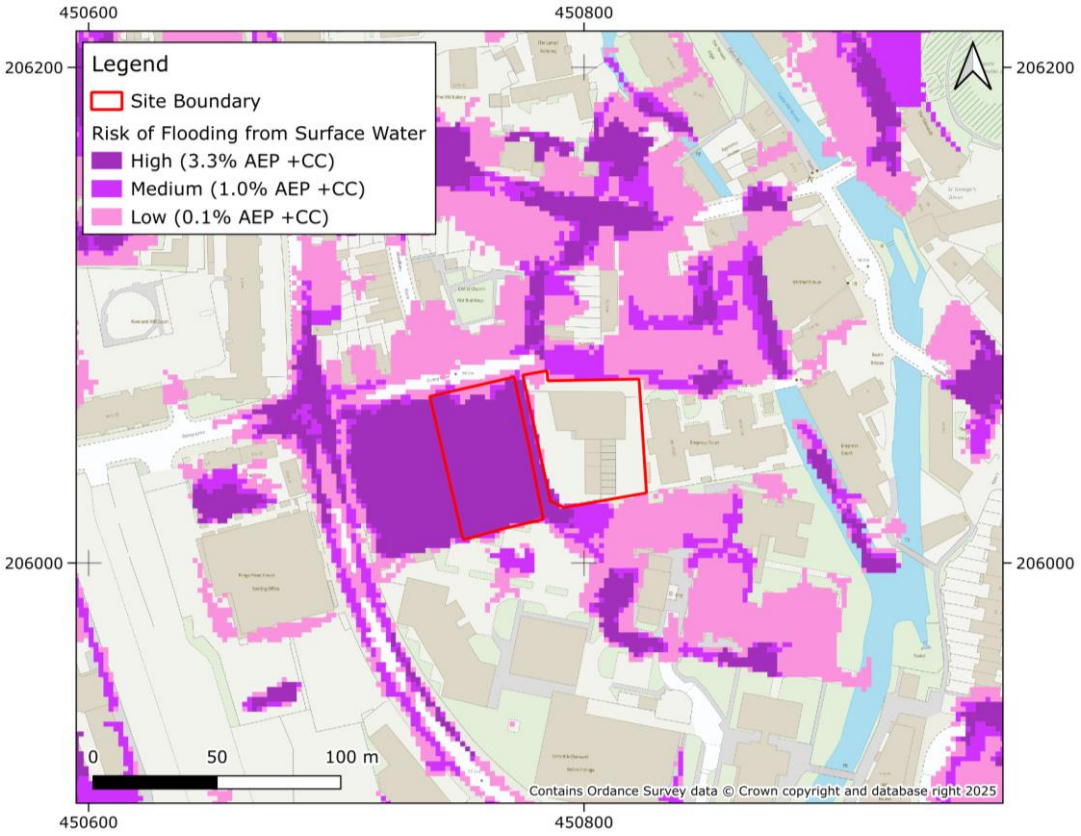

Figure 7 -Surface Water Climate Change Flood Map

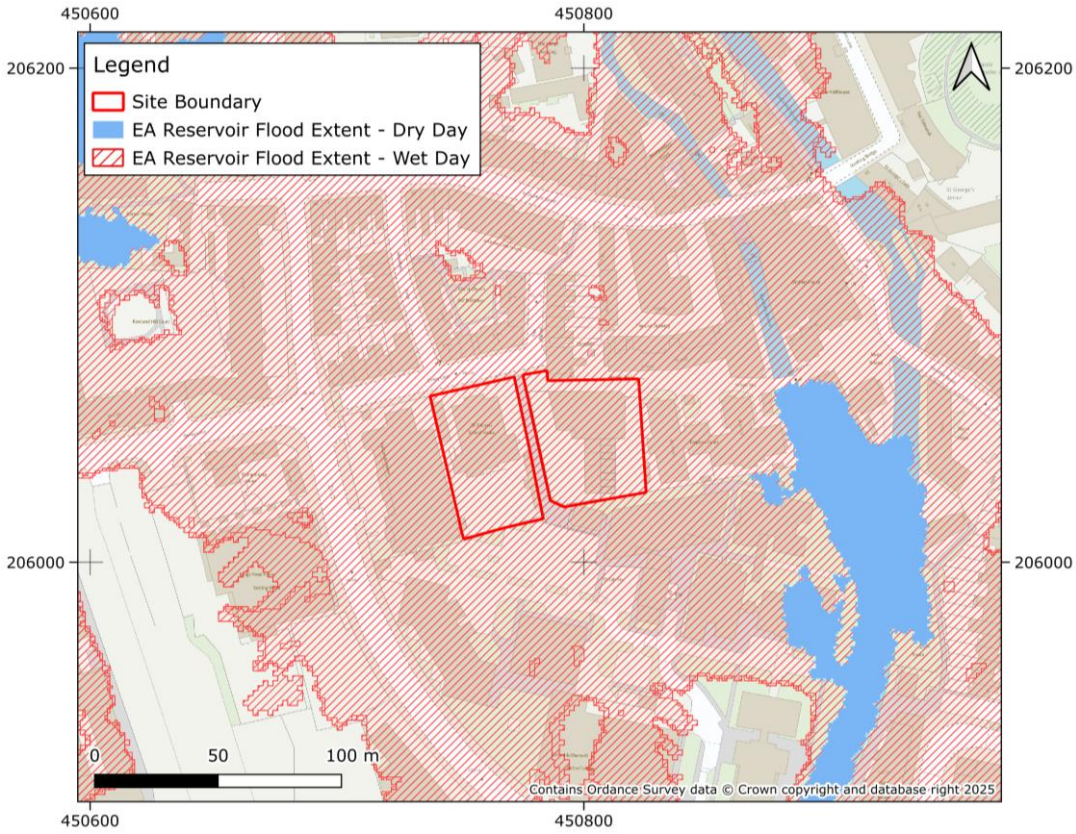

Figure 8 - Reservoir Failure Flood Map

4 Detailed Review of Primary Flood Risk

4.1 Primary Flood Risk

Flood risk to the site occurs via both fluvial and pluvial mechanisms. Therefore, the flood risk generated by both mechanisms is quantitively assessed in more detail below.

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 at this site is minimal.

Modelled results indicate that the risk of fluvial flooding is greater at the St Thomas site rather than the Osney Warehouse site with greater flood extents and depths, see Figure 9. The maximum flood depth within the St Thomas site is approximately 0.69 m whereas the maximum depth at the Osney Warehouse is 0.38 m. Velocity vectors at the site indicate the flood waters originate from the Wareham Stream. The design flood level during this event is 57.1 m AOD which is above the average ground level at both sites (Osney Warehouse: 57.0 m AOD & St Thomas: 56.5 m AOD).

The Risk of Flooding from Surface Water (RoFSW) depth data for the 100-yr plus climate change design event was also assessed to attain further detail on surface water flooding.

Mapping at the site (Figure 10) indicates that the extent of surface water flooding is similar to the extent of fluvial flooding during the 1.0% AEP +CC design event. Depths within the St Thomas Site are predominantly 0.3 m, whilst the Osney Warehouse site remains mostly flood free.

It should be noted that the climate change allowances used in RoFSW are based on the 2050's epoch (2041-2069) and reflect the median estimate of rainfall increases. If the development has a lifetime beyond this time period, a site-specific FRA should consider the climate change impacts for the 2080's epoch (2075-2125).

4.3 Access and egress

Access to both sites is via Osney Lane along their northern boundaries which joins to Woodbine Place. Given the extent of flooding in this part of Oxford, no route can entirely avoid areas of fluvial flood risk. Therefore, the route located within the smallest area of flood risk has been provided in Figure 11.

Travelling east from Woodbine Place, site users should cross Wareham Stream and Castle Mill Stream before continuing north along Tidmarsh Lane. From here a number of options are available for further travel north and east towards flood free areas.

This route travels through the smallest area of inundated land with a maximum depth of 2.5 m, however, this depth is assumed to be attributed to the Wareham Stream directly. Outside of the watercourse the maximum flood depth is approximately 0.5 m. The hazard rating along the route is predominantly low or danger to some, however the Wareham Stream is associated with a hazard rating of danger for 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.

Once the development layout is known, a site-specific FRA should consider onsite routes across the site and any infrastructure required to reach the proposed access route. The proposed route should also be reassessed in a site-specific FRA when all access points to the site are known, to ensure the route with the lowest hazard remains the same.

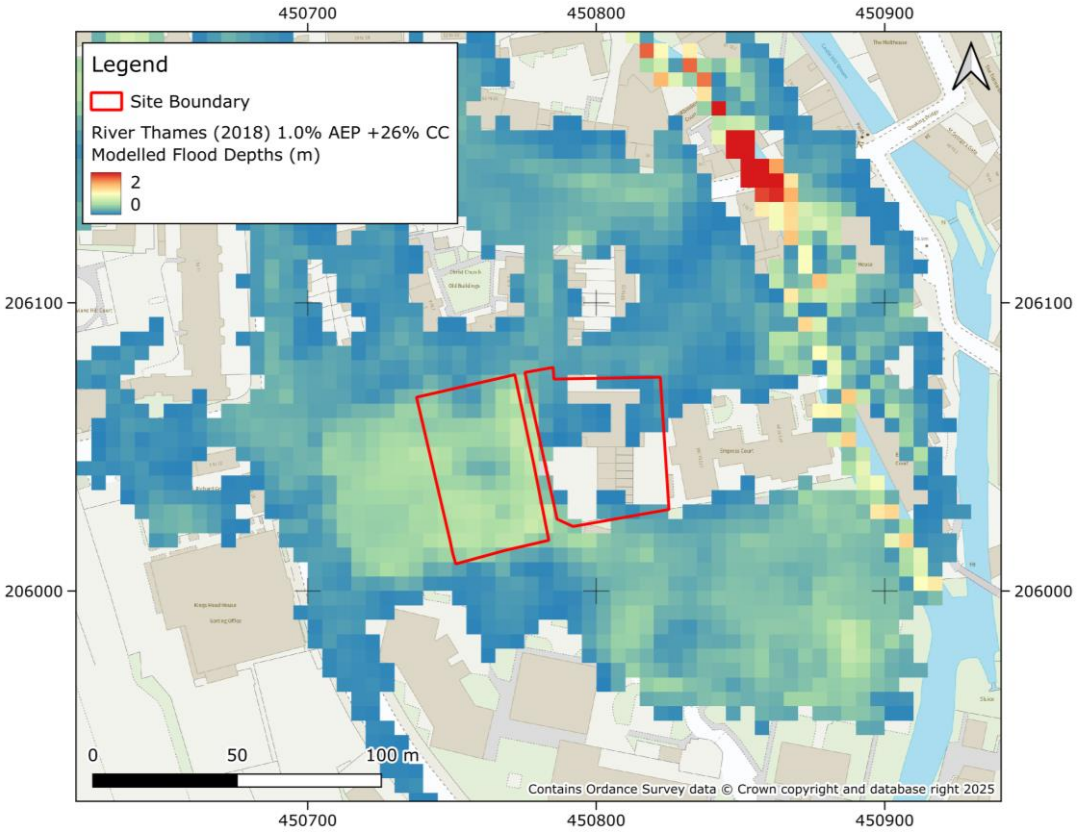

Figure 9 – River Thames (2018) 1.0% AEP +25% CC Modelled Flood Depth (m)

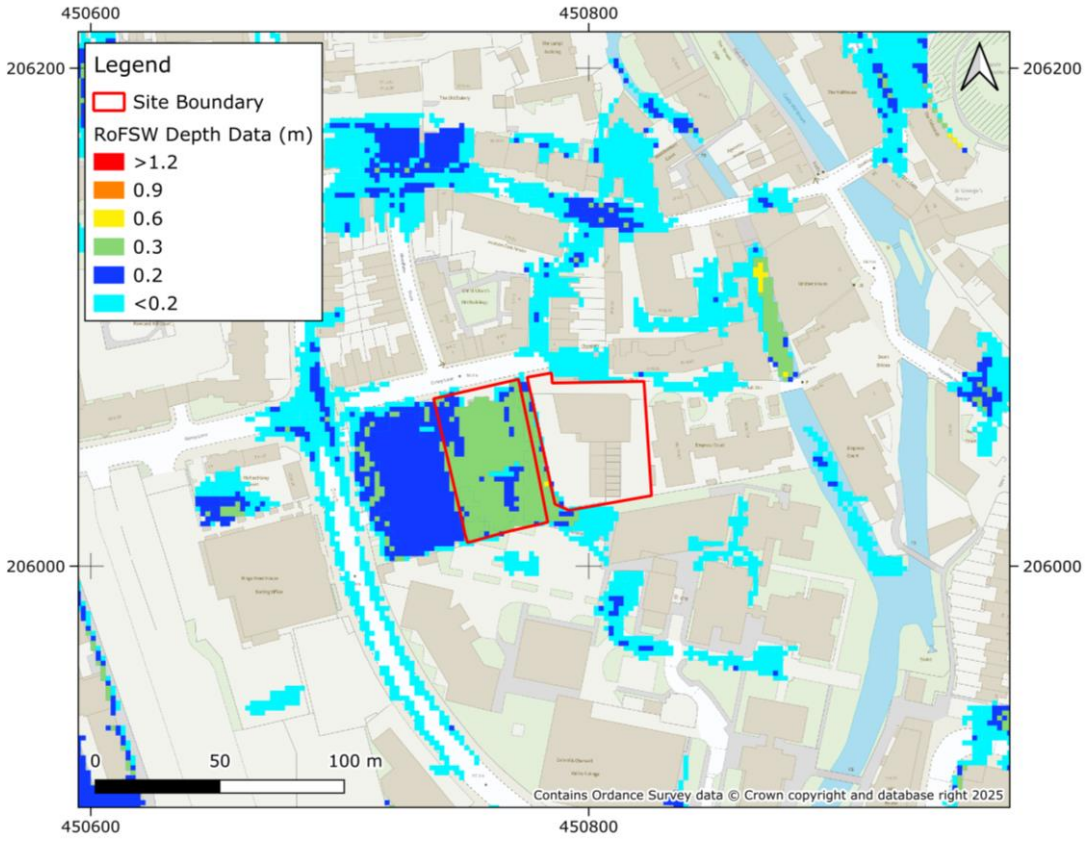

Figure 10 - RoFSW Depth Data for 1.0% AEP + Climate Change Event

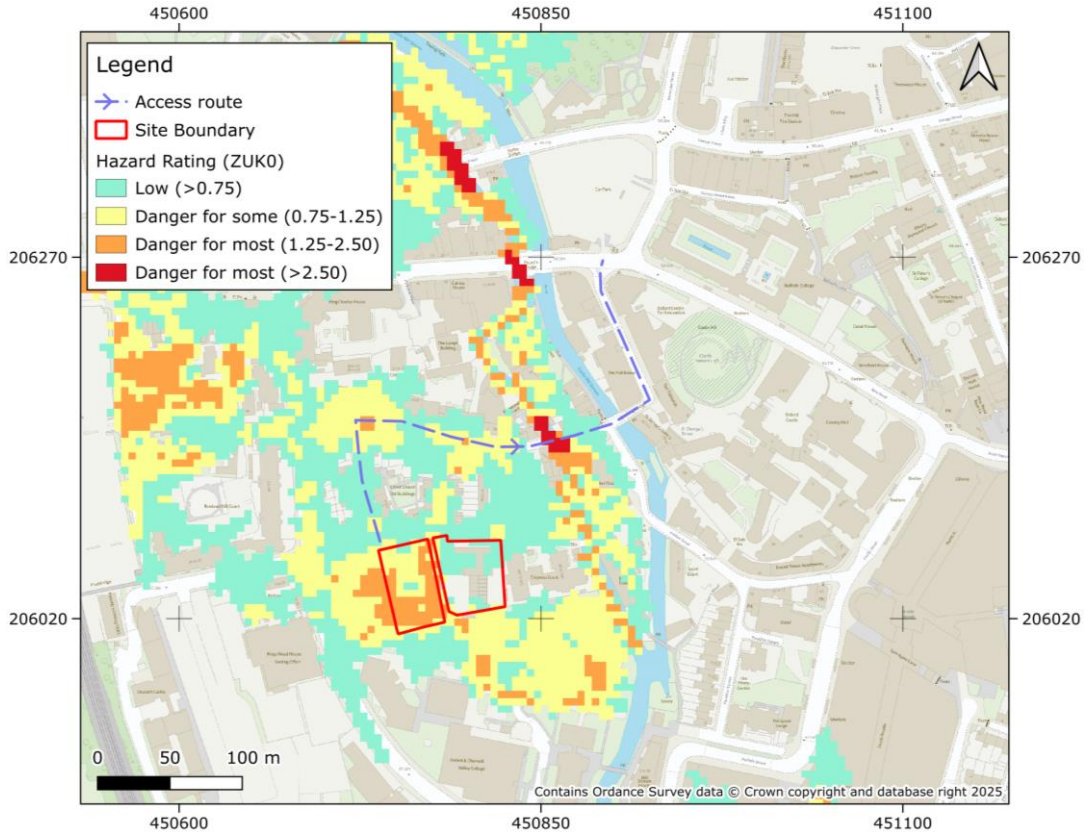

Figure 11 – Access/Egress Routes

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 proposed development at the site is mixed-use. Residential areas are More Vulnerable Development, which is permissible in Flood Zone 2, but needs to pass the Exception Test to justify development in Flood Zone 3a. Less vulnerable uses are permissible in Flood Zone 2 and 3a without the need to pass an exception test. Both types of development are not permissible in Flood Zone 3b.

No part of the sites is inundated by Flood Zone 3b. However, a large proportion 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. Existing development is already present at the site which will displace a volume of floodwater, if the new development exceeds this volume due to raising compensatory storage will be required.

5.2 Scale of Development

The total site area is currently 0.41 ha, allocated for a mix of uses including 10 residential dwellings. Assuming medium density housing (60 dwelling per hectare), 10 dwellings would require 0.17 ha of land.

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.

The main area of flood risk is associated with the St Thomas site, therefore the more vulnerable residential dwellings should be prioritised within the Osney Warehouse site.

As a large area of the site is at risk during the 1.0% AEP +26% CC design event, redevelopment at the site located within this area will likely need to incorporate appropriate finished floor levels (FFL) to provide a minimum 300 mm freeboard above the design flood level of 57.1 m AOD. Note if the volume of floodwater displaced by the development exceeds the current site, compensatory storage will be required which may compromise the amount of space available for development.

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 located in higher flood risk areas if required. This is on the assumption that it does not increase flood risk elsewhere and is designed to be appropriately resistant and resilient to flooding.

Note, surface water flood risk is also present in the St Thomas site. Therefore, it should be used to inform the development layout with more vulnerable development located outside of high-risk areas if possible.

5.4 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 57.1 m AOD for the defended 1.0% annual exceedance probability (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. A site-specific FRA should confirm any modelling requirements with the EA to assess 3rd party impacts and confirm the finished floor levels (FFLs).

The sites are surrounded by areas of fluvial flood risk on all sides. 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 to determine how quickly it occurs and the degree of hazard on site. It should be noted that the climate change allowances used in the pluvial design event scenario are based on the 2050's epoch (2041-2069) and reflect the median estimate of rainfall increases. If the development has a lifetime beyond this time period, the site-specific FRA should consider the climate change impacts for the 2080's epoch (2075-2125).

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. 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. Attenuated discharge to a watercourse or a sewer will also need to be considered as part of a site-specific FRA.

Due to the site being located in the wet day reservoir failure inundation extent, any development 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.