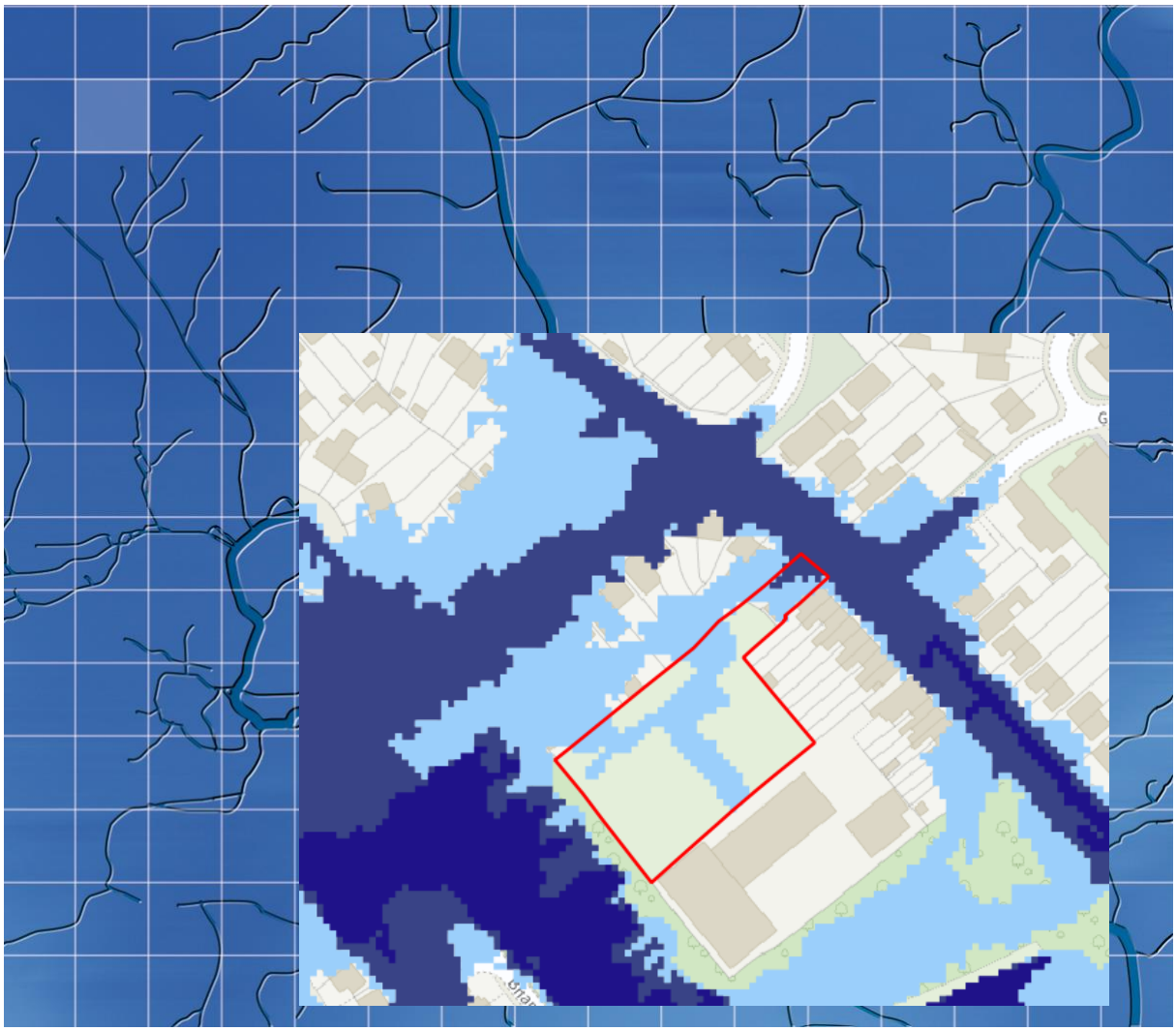
Oxford City Council

October 2025

474 Cowley Road (516)

Level 2 Strategic Flood Risk Assessment



Oxford City Council

474 Cowley Road (516) Level 2 Strategic Flood Risk Assessment

Document issue details

WHS10237

Version	Issue date	Issue status	Prepared By	Approved By
1.0	09/10/2025	Draft	Jasmine Lucas (*Graduate Consultant*)	Daniel Hamilton (*Principal Consultant*)

For and on behalf of Wallingford HydroSolutions Ltd.

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

474 Cowley Road (516) Level 2 SFRA
Flood Risk Overview

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

Flood Risk

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

The EA Flood Map for Planning shows 32% of the site is located within fluvial Flood Zone 2 and 2% of the site is located in fluvial Flood Zone 3a. An estimated design flood level (1.0% AEP + Climate Change Event) of 60.4 m AOD has been inferred from the 1.0% AEP +CC EA Flood Map translating to a maximum depth of 0.3m in the inundated areas.

In terms of pluvial flood risk, for the design event (1.0% AEP + Climate Change Event) the Risk of Flooding from Surface Water (RoFSW) depth data shows 21% of the site to be inundated with the greatest depths (0.3 m) within the site located in the area closest to Cowley Road. Depths across the majority of the site are less than 0.2 m.

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

The overall confidence in the assessment is moderate. This is based on the fact that the EA's latest national scale modelling has informed the assessment of flood risk.

Conclusions and Recommendations

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. More vulnerable development is permissible within Flood Zone 2 but must pass an exception test to be considered permissible within Flood Zone 3a. It is not permissible within Flood Zone 3b.

Only a small proportion of the site is located in Flood Zone 3a, with the majority of its area falling in Flood Zone 1 and outside of the design flood extent (1.0% AEP + CC). Furthermore, the areas of high surface water flood risk mirror the fluvial flood extents. In this regard it should be possible to accommodate development at the site. However, it should be noted that the main access route to the site lies within the design flood extent (1.0% AEP + CC) and is at risk during lower order events. Access may pose a barrier to development and will require further investigation within a site-specific flood risk assessment (FRA) likely utilising updated modelling results for the Boundary Brook.

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 474 Cowley Road- Former Powell's Timber Yard (reference: 516) 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

474 Cowley Road (516) is a 0.34 ha site located in southeast Oxford, see Figure 1. The site currently consists of scrubland and a driveway which connects the site to Cowley Road. Land use in the surrounding area is predominantly residential, though a commercial property borders the site to the southeast.

The site is proposed for residential development.

2.2 Topography

Based on 1m LiDAR data, the site slopes slightly from northeast to southwest. Small, shallow topographic depressions are also present within the site, see Figure 2. The ground levels within the site boundary range from 59.6 to 60.7 m AOD. The average ground level is approximately 60.1 m AOD.

2.3 Nearby Watercourses

The closest watercourse to the site is Boundary Brook located approximately 100 m south of the site, see Figure 1. Boundary Brook is a tributary of the River Thames. The River Thames is located 1.35 km west of the site.

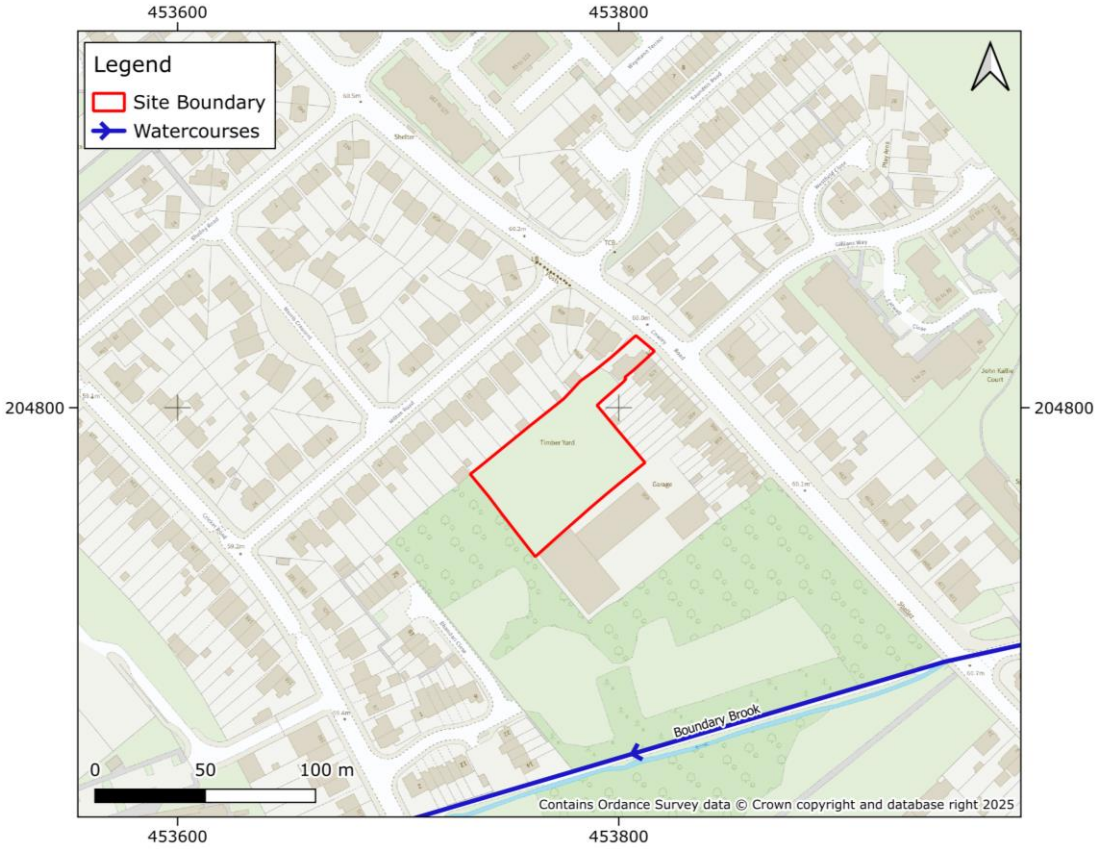


Figure 1 - Site Location

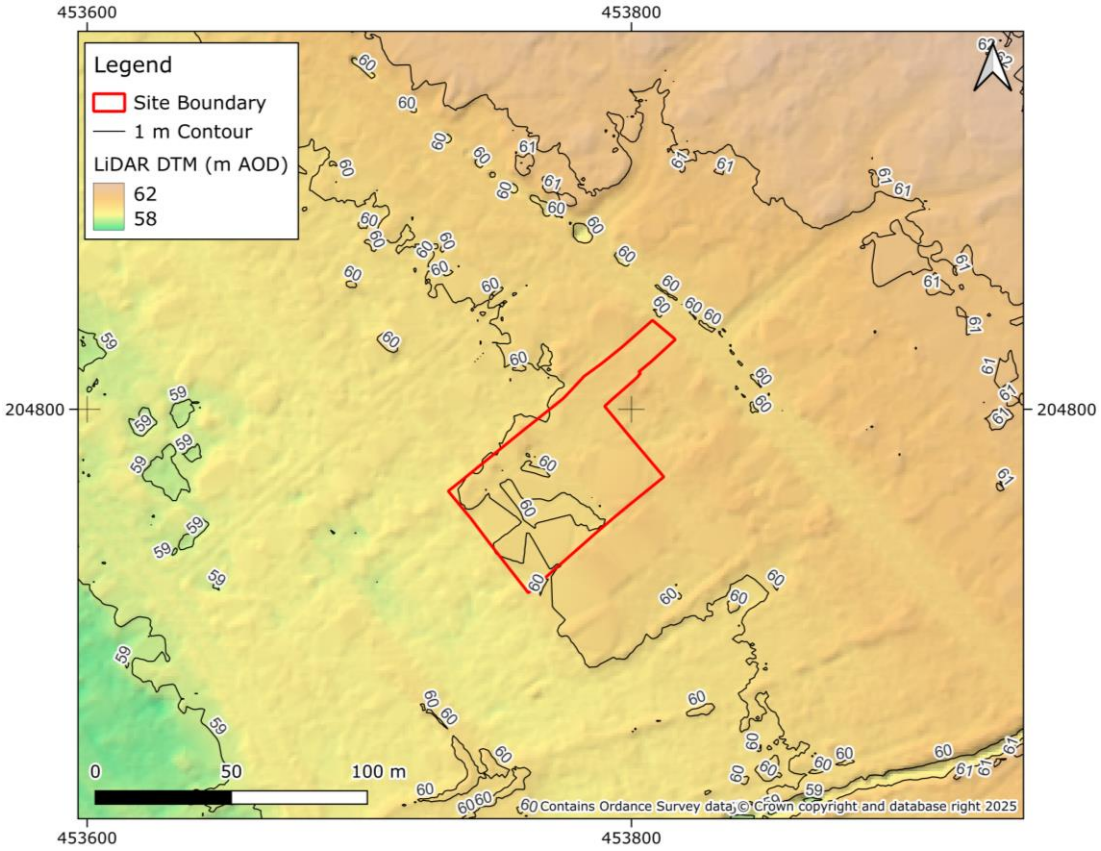


Figure 2 – Topography

3 Flood Risk

3.1 Historical Flooding

The EA does not hold any record of historical flooding at the site.

3.2 Fluvial Flood Risk

In the existing Flood Map for Planning (FMfP), 32% of the site is located within Flood Zone 2 (0.1% AEP), and 2% is located within Flood Zone 3a (1% AEP), see Figure 3. These Flood Zones consider the undefended scenario whereas the national 3.3% AEP extent considers the defended scenario. This is used to inform the Flood Zone 3b extent at the site, it shows that no part of the site is located within Flood Zone 3b.

The EA climate change fluvial outputs for the 0.1% AEP and the 1.0% AEP undefended extents have also been assessed, with 36% of the site located within the 0.1% AEP +CC extent and 29% of the site located within the 1.0% AEP +CC extent, see Figure 4. When considering an allowance for climate change, 2% of the site is inundated by in the 3.3% AEP defended event.

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 any engineered flood defences, neither is it located within a flood storage area.

3.4 Surface Water Flood Risk

The EA's surface water flood maps show 2% of the site to be inundated during a 3.3% AEP event, 15% is inundated during a 1.0% AEP event, and 25% is inundated during a 0.1% AEP event, see Figure 5. The areas at risk of flooding are located closest to Cowley Road and within the shallow topographic depression within the centre of the site.

When considering the effects of climate change, the proportion of the site at risk for the 3.3%, 1.0%, and 0.1% AEP event increases to 10%, 21%, and 27% respectively, see Figure 6.

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 West Walton formation. It is expected to permit low amounts of infiltration. Superficial deposits of head are also present at this site. The underlying soils are slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils with impeded drainage.

Based on the data available there is unlikely to be a significant risk of groundwater flooding, however more data is required at the planning stage to confirm this.

3.6 Reservoir Flood Risk

The FMfP shows that no part of the site is at risk from reservoir flooding during either the wet or dry day scenarios, see Figure 7.

3.7 Flood Warning Service

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

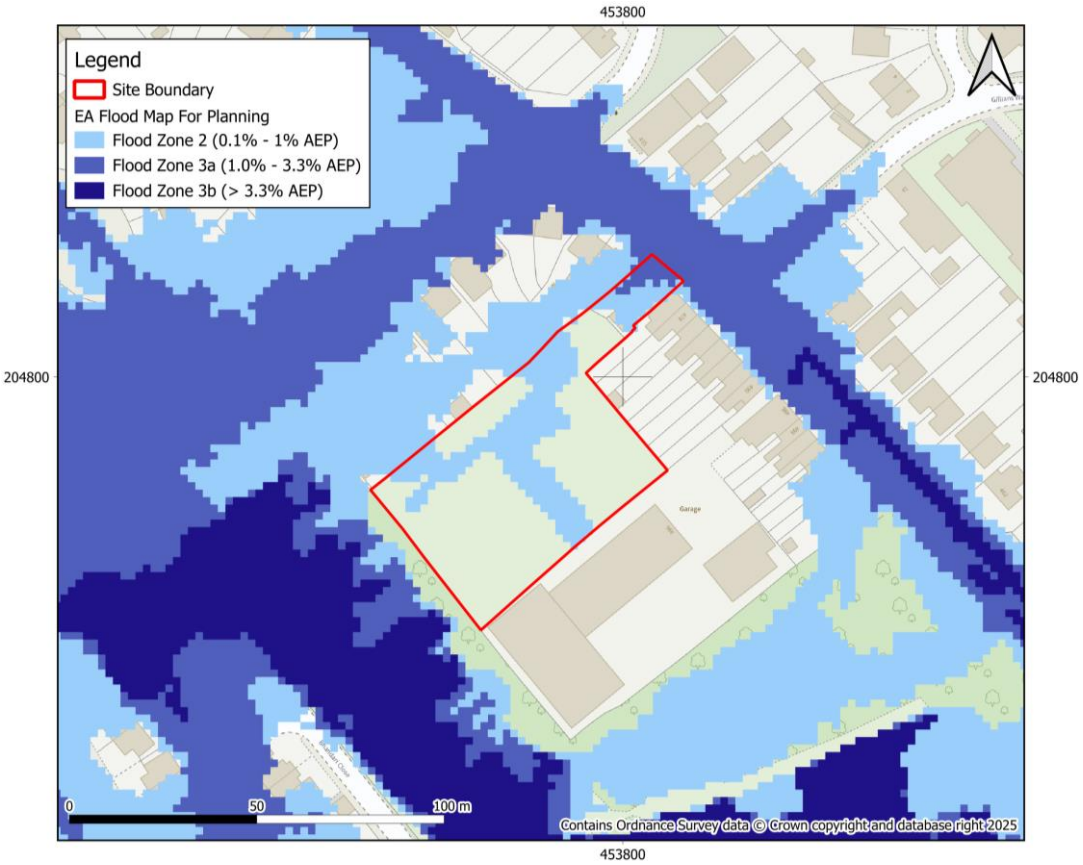


Figure 3 - Fluvial Flood Map

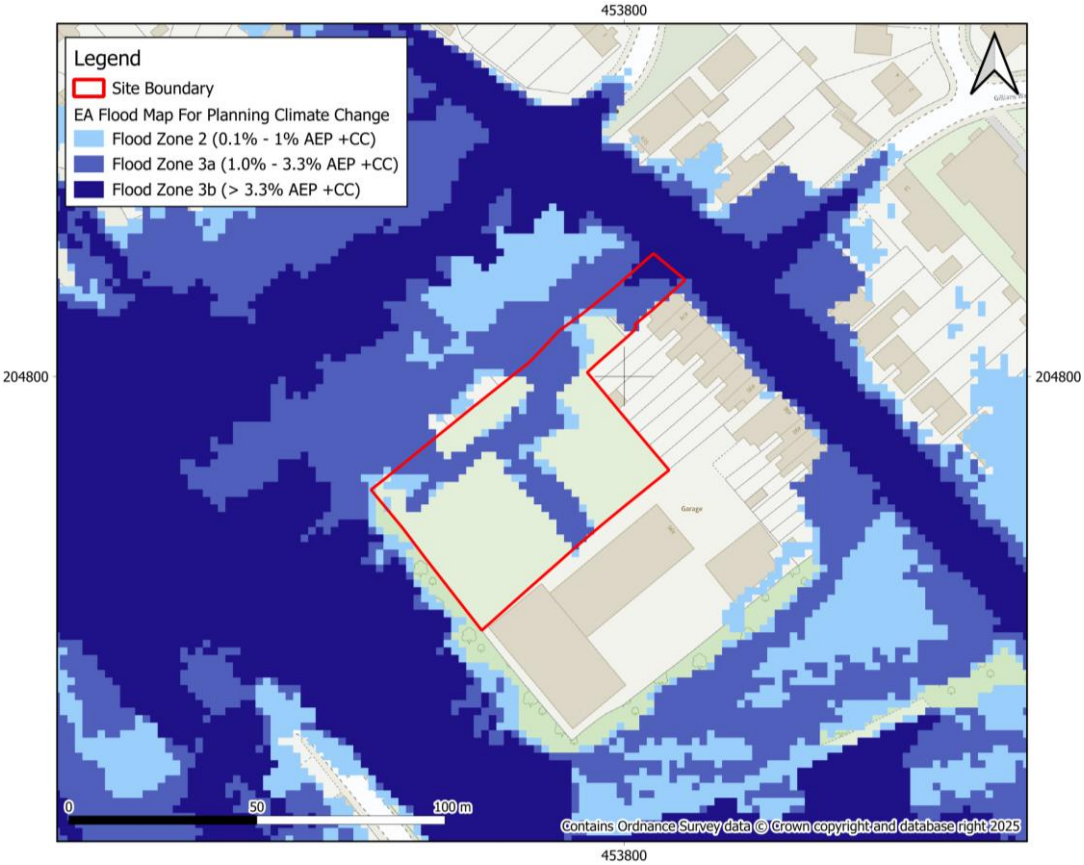


Figure 4 – Fluvial Climate Change Flood Map

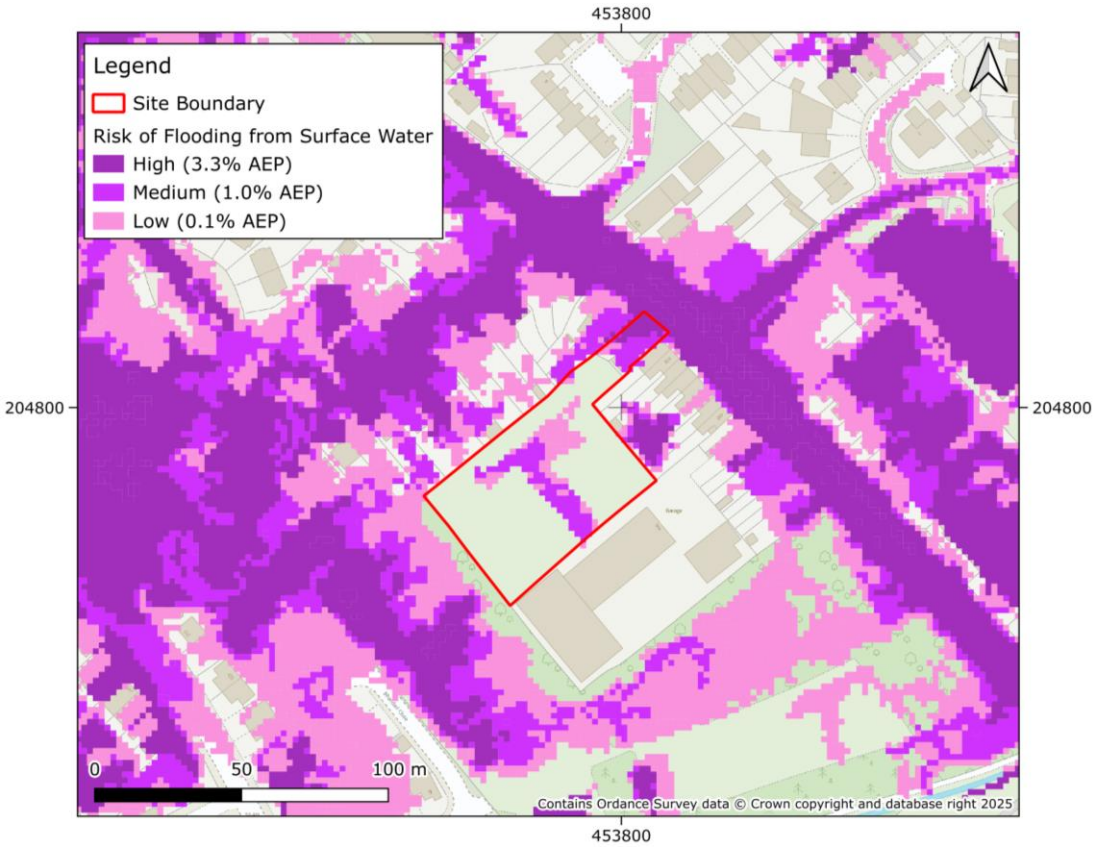


Figure 5 – Surface Water Flood Map

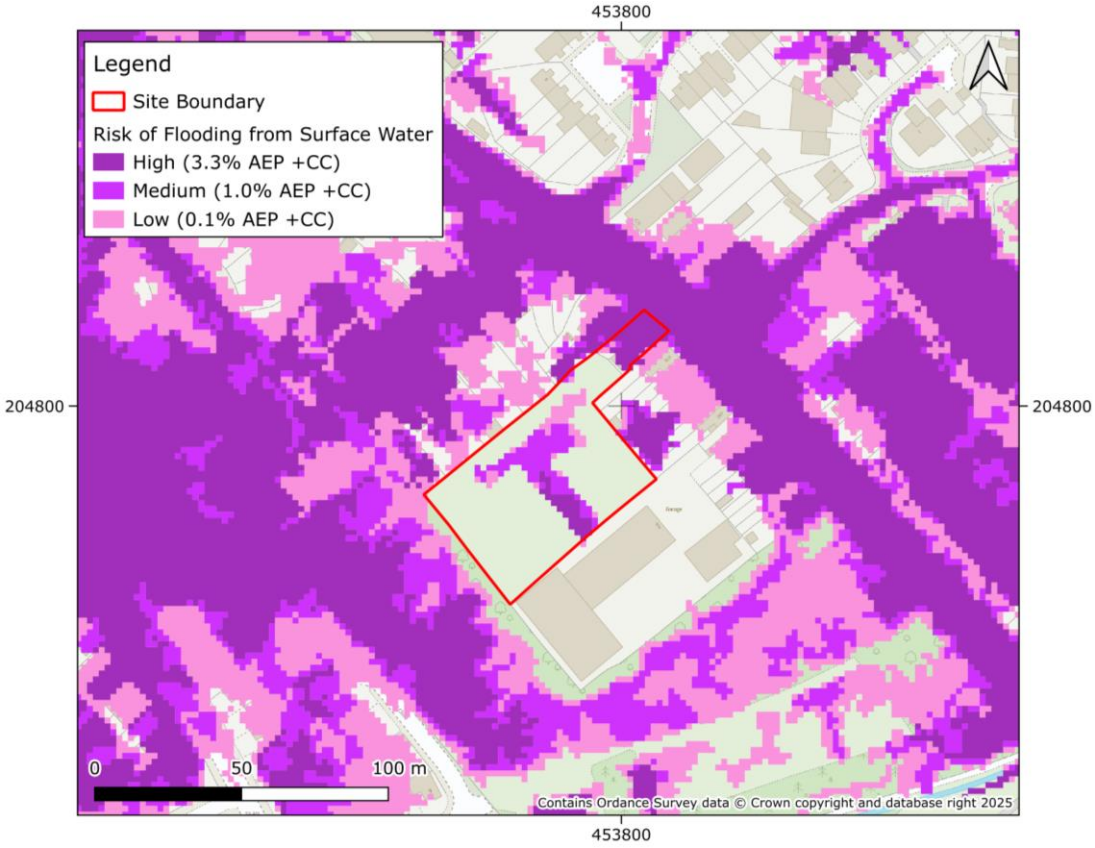


Figure 6 -Surface Water Climate Change Flood Map

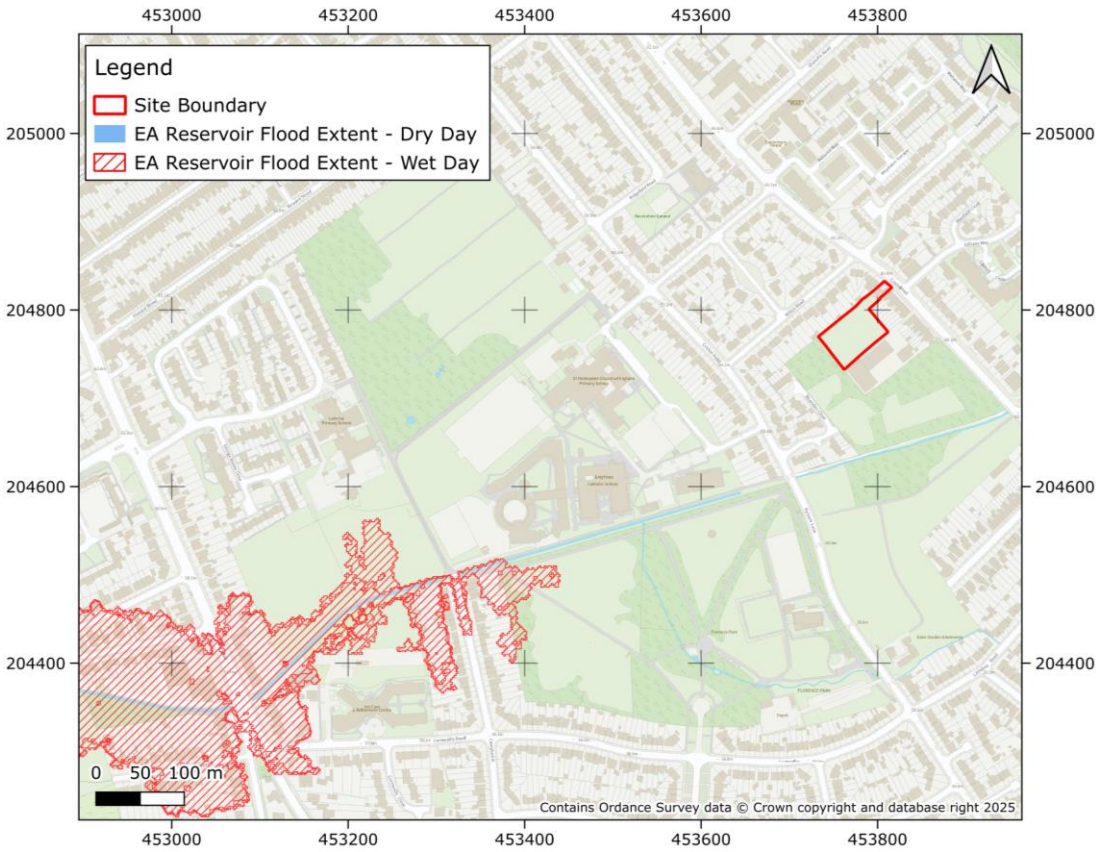


Figure 7 - Reservoir Failure Flood Map

4 Detailed Review of Primary Flood Risk

4.1 Primary Flood Risk

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

As the Boundary Brook (2009) model has been replaced by national mapping, the EA FMfP undefended 1.0% AEP +CC extent has been used to inform the assessment of flood risk.

Figure 8 illustrates the inundated areas of the site. Overall, 29% of the site is inundated during the design event. Comparison of the flood extents with LiDAR mapping indicates an inferred design flood level of 60.4 m AOD. This corresponds to a maximum flood depth of approximately 0.3 m, observed in the northeast near Cowley Road as well as within depressions in the central and eastern parts of the site. It should be noted that, due to the absence of detailed hydraulic modelling, both the design flood level and estimated flood depths are uncertain. These should be verified through a site-specific Flood Risk Assessment (FRA), which is likely to require updated modelling of the Boundary Brook.

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

The depth mapping (see Figure 9) shows surface water flooding occurs along the driveway of the site closest to Cowley Road and within the slight topographic depressions within the site. A maximum flood depth of 0.3 m is noted at the boundary of the site closest to Cowley Road. Flood depths across the rest of the site are predominantly less than 0.2 m.

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

It is assumed that access to the site will be via Cowley Road. Due to the extent of flooding during both the fluvial and pluvial design events along Cowley Road, no route can entirely avoid inundated areas. The best route identified that travels through the smallest extent of inundated land in the design event is shown in Figure 10. Site users should turn left from the site onto Cowley Road and continue north to reach areas that remain flood free during the design event. The hazard associated with this route should be assessed within a site-specific FRA using updated modelling results for the Boundary Brook.

Based on FEH catchment descriptors[1] extracted for the Boundary Brook, the catchment is relatively impermeable and heavily urbanised. Therefore, it is expected to have a flashy response to rainfall reducing the time for adequate flood warnings. 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.

[1] UKCEH (2025) *Flood Estimation Handbook Web Service* https://fehweb.ceh.ac.uk/

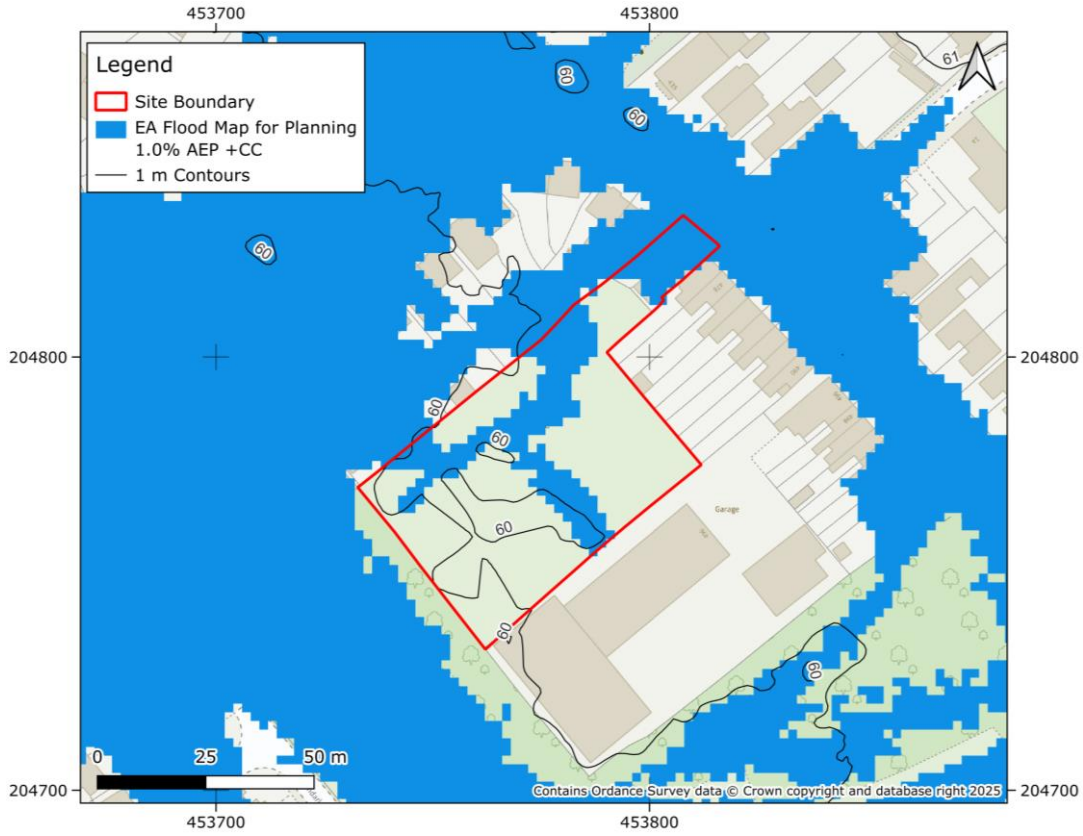


Figure 8 – EA Flood Map for Planning undefended 1.0% AEP +CC flood extent

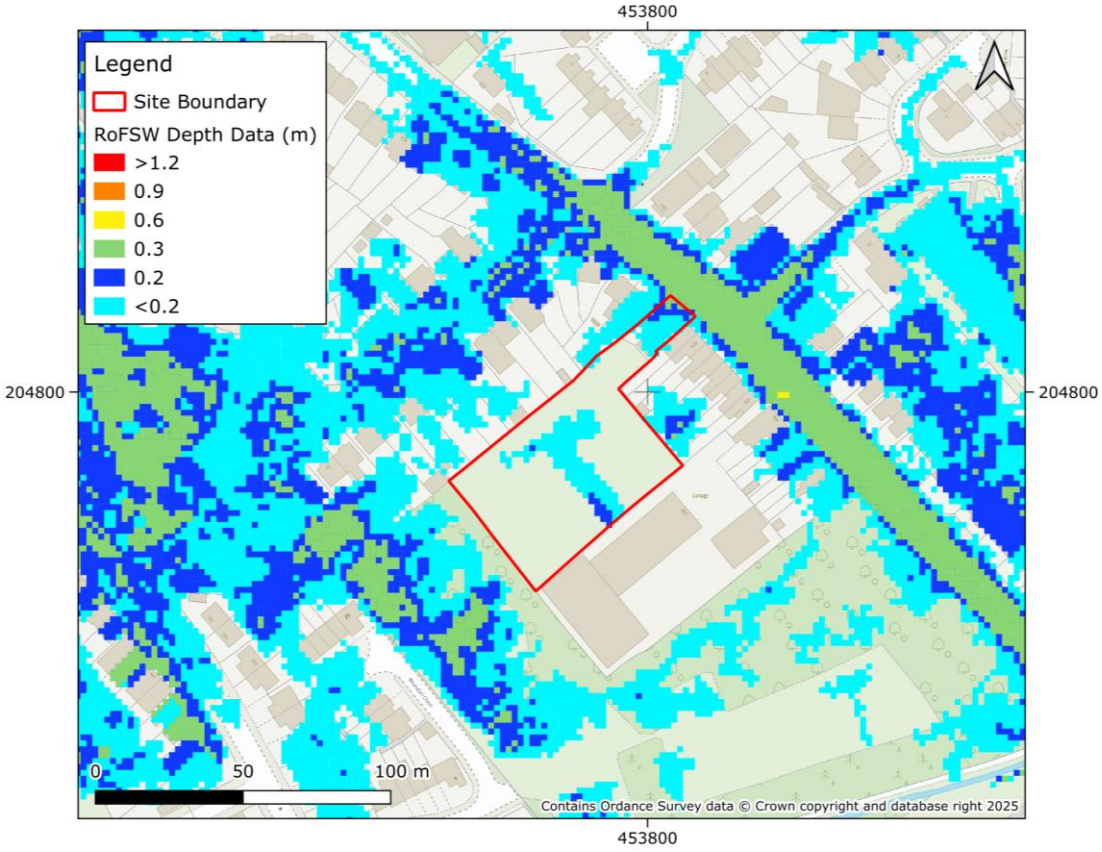


Figure 9 - RoFSW Depth Data for 1.0% AEP + Climate Change Event

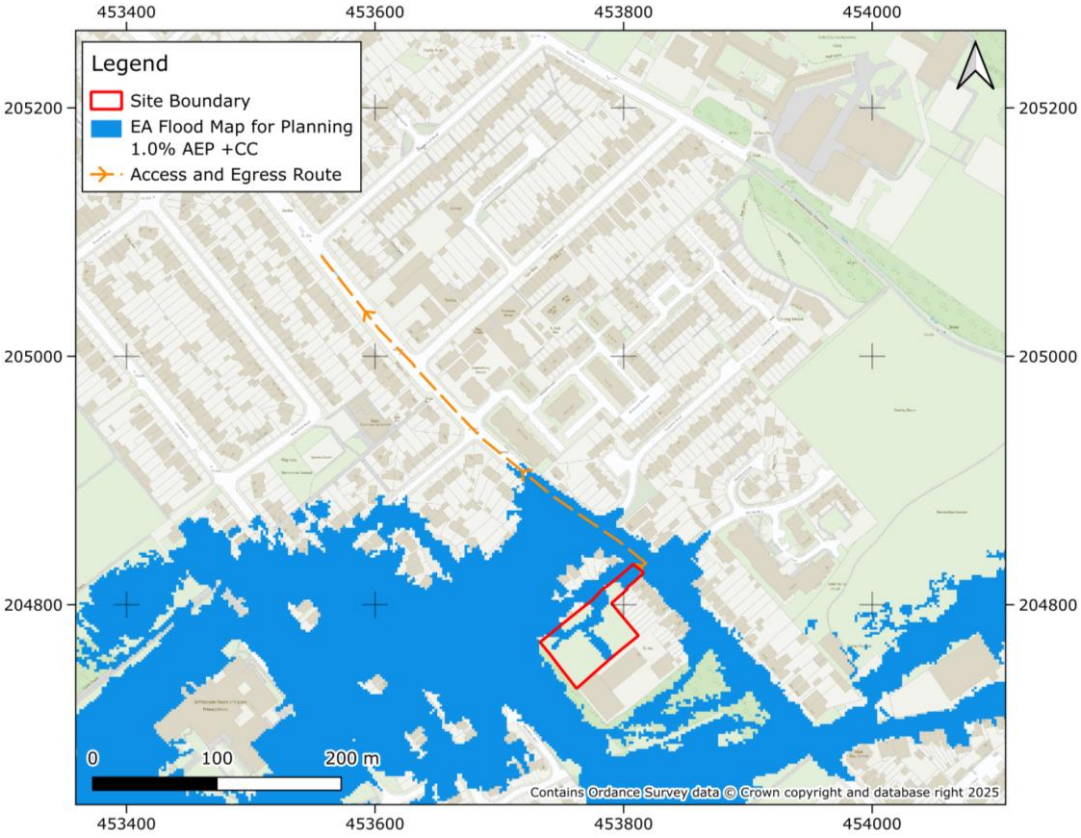


Figure 10 – Access/Egress Routes

5 Development Viability and FRA recommendations

5.1 Development Categorisation

The development proposed is categorised as *More Vulnerable Development*. 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. More vulnerable development is permissible within Flood Zone 2 but must pass an exception test to be considered permissible within Flood Zone 3a. It is not permissible within Flood Zone 3b. The locations of surface water flood extents should also be used to inform the sequential siting of infrastructure prioritising development in the lowest areas of flood risk.

Only a small proportion of the site is located in Flood Zone 3a, with the majority of its area falling in Flood Zone 1 and outside of the design flood extent (1.0% AEP + CC). Furthermore, the areas of high surface water flood risk mirror the fluvial flood extents. In this regard it should be possible to accommodate development at the site. However, it should be noted that the main access route to the site lies within the design flood extent (1.0% AEP + CC) and is at risk during lower order events. Access may pose a barrier to development and will require further investigation within a site-specific flood risk assessment (FRA) likely utilising updated modelling results for the Boundary Brook.

5.2 Scale of Development

In total 36% of the site or 0.12 ha of land lies within the fluvial flood zones when accounting for climate change. Therefore, it should be possible to locate the most at-risk infrastructure within Flood Zone 1. This is provided there are no constraints (non-flood related) which require development to be located in at-risk areas. Even if this is the case, as stated above housing development is permissible in Flood Zone 2 without requirement for an exception test. Based on the available national extents it also appears a large proportion of the site lies outside of the design flood extent. However, a site-specific FRA will likely be required to reassess flood depths and the design flood levels at the site using updated modelling results for the Boundary Brook.

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 development should be located within Flood Zone 1 with ancillary infrastructure like car parks located in Flood Zone 2 and 3. 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 at the site. However, the extent of flooding is similar to the extent of fluvial flooding. Therefore, areas of the site remain flood free from both sources of flooding. Development should be prioritised within these areas first before considering development within areas of higher flood risk from any source.

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 flood level for the defended 1.0% annual exceedance probability (plus central climate change allowance) design event. The extents and depths required to set this level should be estimated through updated modelling results for the Boundary Brook. If ground raising is implemented within the design flood extents, modelling will also need to be undertaken to assess 3rd party impacts and compensatory storage requirements. Although as stated above it should be possible to avoid this requirement by siting infrastructure outside of the design flood extents.

Areas of flood risk are present along the main access route to the site. Given there is no advance flood warning provision for the site, the potential for evacuation before a more extreme fluvial or pluvial flood, considering the effects of climate change for the lifetime of the development, needs to be considered by a site-specific FRA with advice to sought from the emergency services and 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.