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*Flood Risk and  
Sequential Test of  
Sites*

**Oxford Local Plan  
2040**

**BACKGROUND  
PAPER 9b**

This paper addresses the flood risk and the sequential test of sites within the city.  
**SA objective:** To build resilience to climate change, including reducing risks from overheating, flooding and the resulting detriment to well-being, the economy and the environment.  
**SEA theme(s):** Water, climatic factors and human health.

## 1. Introduction

1.1 With two rivers running through it, and a high water table, Oxford has large areas of land that are at risk of flooding. A Level 1 Strategic Flood Risk Assessment (SFRA) for the city was completed in October 2023 to provide detailed information on flood risk to inform the Local Plan 2040. The SFRA presents information about different sources of flood risk and shows variations in flood risk across the city. Variation in flood risk from fluvial sources has been classed according to probability.

1.2 Figure 1 below maps the flood zones in Oxford (based on fluvial flood risk):

- Flood Zone 1 has a low probability of flooding
- Flood Zone 2 a medium probability of flooding
- Flood Zone 3a a high probability of flooding and Flood Zone 3b is functional flood plain.

1.3 The SFRA shows that some of the development sites being considered through the Submission Draft Oxford Local Plan 2040 are in Flood Zones 2 or 3. It is important to identify whether those developments can be directed to other parts of Oxford that are at less risk of flooding, this is called the Sequential Test.

### Legend

-  Oxford CC boundary
-  Proposed Site Allocations
-  Watercourses
-  Flood Zone 3b\*
-  Flood Zone 3a
-  Flood Zone 2

\*Flood Zone 3b based on 3.3% AEP for River Thames & River Cherwell. Elsewhere Flood Zone 3a extent is adopted for Flood Zone 3b.

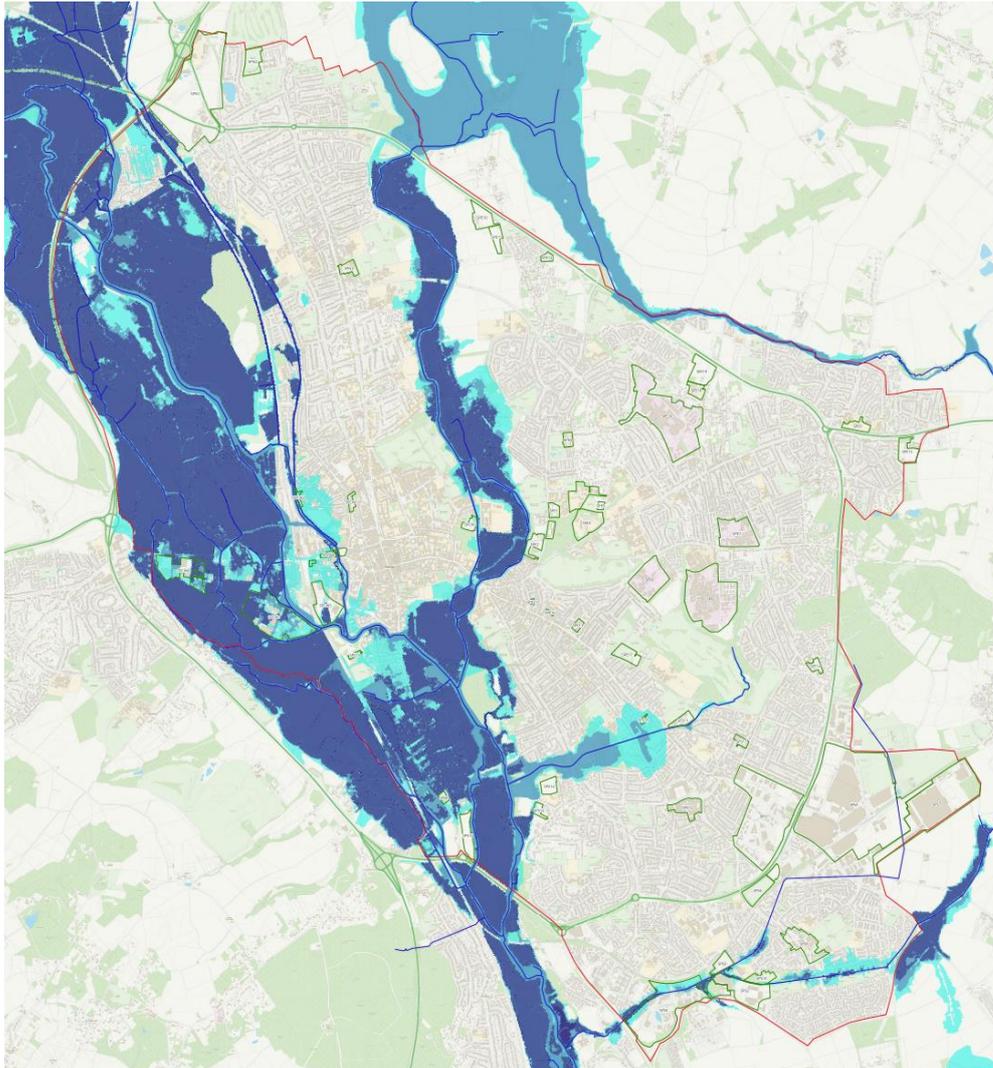


Figure 1: Flood Zones in Oxford – SFRA Level 1 update (2023)

1.4 Paragraphs 161-162 of the National Planning Policy Framework (NPPF) state that all plans should apply a sequential approach to determine the suitability of land for development in flood risk areas. The aim is to identify land for development that is in the lowest possible flood risk zone as far as is reasonably possible, taking into account all sources of flood risk and the current and future impacts of climate change. Additional guidance on how local authorities should apply the sequential approach and Sequential Test is provided in the National Planning Practice Guidance (PPG). This background paper illustrates how the sequential approach has been applied to the sites being considered for allocation in the Submission Draft Oxford Local Plan 2040. As part of the sequential approach, the Sequential Test is used to test if there are any reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding.

### **Sequential Test Methodology**

1.5 When developing site allocation policies, the Sequential Test should be applied if any of the potential sites are outside of Flood Zone 1. Before allocating sites in higher risk flood zones, it must be demonstrated that there are no reasonable alternative sites available in areas with a lower probability of flooding that would be appropriate to the type of development or land use proposed. When considering the allocation of sites beyond Flood

Zone 1, wherever possible the most vulnerable uses (such as police and ambulance stations and basements dwellings) should be located in the lowest flood risk areas and the least vulnerable uses (such as outdoor sports and recreation) should be located in the areas with a higher risk of flooding<sup>1</sup>. It is also important that within each flood zone, new development should be directed to the parts of the sites that have the lowest probability of flooding from all sources as indicated by the SFRA. The methodology in Figure 2 below was used to apply the sequential test.

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<sup>1</sup> Annex 3: Flood risk vulnerability classification (NPPF) (2023)

#### *Stage A: Identify the need for development*

To assess whether land is needed for development, and whether any land is needed beyond Flood Zone 1, it is important to identify the development needed to achieve the aims, objectives and strategy of the Submission Draft Oxford Local Plan 2040.

#### *Stage B: Identification of the fluvial flood risk of potential development sites*

This stage identifies all the reasonably available sites being considered for development at the Preferred Options stage and the flood risk zone for each site as determined by the SFRA (Level 1).

#### *Stage C: Application of the Sequential Test*

At this stage the potential development capacities of the proposed sites are estimated, and consideration is given to whether development needs can be met entirely in Flood Zone 1. Where there are insufficient sites available in Flood Zone 1 to meet identified development needs, sites in Flood Zone 2 are considered (with regard given to the flood risk vulnerability of proposed land uses). Only where there are insufficient sites available to meet development needs in Flood Zones 1 and 2 are sites in Flood Zone 3 considered (again with regard given to the flood risk vulnerability of proposed land uses). Where sites are proposed in Flood Zones 2 and 3, consideration is given to whether there are opportunities to swap 'less vulnerable' land uses proposed in low flood risk areas with 'more vulnerable' land uses proposed in higher flood risk areas.

#### *Stage D: Assess risk of flooding from other sources*

Information about sources of flooding other than fluvial flooding is acknowledged and the significance assessed. The Environment Agency has published information on the susceptibility of broad areas to surface water flooding, which are shown in the SFRA. Often this data is of lower quality and accuracy than that of fluvial flooding and it can inform the Sequential Test to a lesser degree.

#### *Stage E: The Exceptions Test*

Any proposals for the development of sites in Flood Zone 3a proposed for 'more vulnerable' uses such as housing will also require the Exception Test. The Exception Test will be carried out to inform the site allocations in the Draft Local Plan.

*Figure 2: Sequential Test Methodology (adapted from guidance within the NPPF and PPG)*

## 2. Stage A: Identifying the need for development

### **The Local Plan 2040 Spatial Strategy: amount and types of development**

2.1 Oxford's economy is a key driver in the wider Oxfordshire economy and the city plays a vital role in the regional and national economies. The universities and hospitals are key to the success of the knowledge economy in Oxford and many of the research and development locations are closely linked, with healthcare and innovation also being a major strength.

2.2 Significant population growth is expected over the plan period to 2040, however, the city's continuing housing crisis through the lack of housing availability, choice and affordability is a significant challenge for its future development. The housing crisis is having negative impacts on the ability of businesses and service providers to attract and retain staff. The housing crisis is also affecting the ability to maintain mixed and balanced communities. Key objectives of the Local Plan 2040 are to build on the city's economic strengths and to deliver as much housing as possible, all the while ensuring that the environment is central to everything we do, ensuring Oxford remains a pleasant place to live, work and visit, making best use of resources and protecting and enhancing the city's unique historic environment and green setting.

2.3 Oxford is generally a sustainable location for housing development as it is the employment and destination centre for the wider Oxfordshire area and provides key health, education, leisure, cultural, and community services. Oxford also has well established public transport and cycle networks.

2.4 The evidence base for the LP2040 assesses these needs for development in more detail. The Housing and Economic Needs Assessment (HENA) 2022 objectively assesses the housing need for Oxford and identifies an annual housing need figure of 1,344 new homes per annum. However, due to Oxford's intrinsic constraints (such as its tightly drawn administrative boundary, large areas of functional floodplain and significant heritage assets) there is not capacity to deliver this number of new homes within the city, so the LP2040 instead sets a constraint-based annual housing requirement of 9,612 homes over the plan period, or 481 dwellings per annum. Housing capacity in the city has been maximised in the local plan by making site allocations for housing, promoting the efficient use and development of land/ sites, including highest appropriate densities and building heights in appropriate locations and allowing an element of housing on all employment sites if suitable.

2.5 The need for employment sites is assessed in the Oxford Employment Land Needs Assessment (ELNA 2022 and 2023) as between 269,000 - 348,000sqm. The report concludes that existing planning commitments (based on extant permissions) will alone, not be sufficient to meet the city's future employment needs, for either office/ R&D and industrial/ warehousing. Therefore, it continues to be the case that through the new Local Plan, the city will need to identify potential further sources of employment floorspace supply beyond what is currently committed in quantitative terms. The Local Plan 2040 does not allocate any new sites for employment space but aims to support Oxford's economic growth by supporting the intensification and modernisation of existing employment sites and supporting the delivery of additional Class E uses (including employment uses) within the city and district centres.

### **Other uses**

2.6 In addition to delivering new homes and employment space, it is important that the Oxford Local Plan 2040 ensures that the infrastructure, services, and facilities needed to support new development and a growing population are in place. The Oxford Local Plan 2040 aims to focus town centre uses in our city and district centres. These are areas that are highly accessible mobility hubs and include a broad range of facilities including shops,

hospitality, community and leisure facilities. As most housing growth in Oxford will be delivered through small sites, there are limited opportunities for entirely new schools to be provided. The Oxford Local Plan 2040 therefore aims to support Oxfordshire County Council as the Education Authority to meet school provision requirements by growing existing schools. The Oxford Local Plan 2040 also aims to protect and enhance a network of multi-functional green spaces across Oxford.

## **The Local Plan 2036 Spatial Strategy: locating new development**

### **Previously Developed Land**

2.7 The Oxford Local Plan 2040 focuses on delivering new development by intensifying the use of previously developed land. This is not only best practice but is essential in a constrained urban environment like Oxford. The Plan seeks to identify sites that are underused (for example low-rise buildings and unused spaces, or sites in a use that does not make most efficient use of land, such as large surface-level car parks). The redevelopment of these sites will help to accommodate the development needs of the city in a sustainable and efficient way; locating new development alongside existing uses, facilities, and public transport connections.

2.8 The Oxford Local Plan 2040 strategy is to allow some development in Flood Zone 3b which is brownfield (previously developed land), either small-scale household extensions or redevelopment of sites that does not increase the footprint of the existing building within Flood Zone 3b. Very high standards of flood mitigation designed to demonstrably decrease flood risk compared to the current situation would be required to ensure that development would not reduce flood storage or lead to increased risk of flooding elsewhere and to ensure its occupants are not put at risk. Evidence would be required to demonstrate that any development would have a neutral or positive effect on water retention and storage. This approach has been developed with the Environment Agency and is explained further in Background Paper 9 (Flood Risk and Sustainable Drainage Systems).

### **Greenfield Sites**

2.9 The Oxford Local Plan 2040 aims to protect the majority of green spaces as evidence indicates they provide a variety of benefits (such as recreational and health, biodiversity provision, adaptation to climate change and improvements in air quality). A hierarchical approach has been taken to green spaces with those identified as 'core' receiving the strongest protections and their loss would not be deemed appropriate in any circumstances. Those identified as 'supporting' could be lost if it is reprovided elsewhere in the green infrastructure network, with all other spaces benefitting from protections which already exist through national policy and their loss would have to meet the tests for loss of open space as set out in paragraph 99 of the NPPF<sup>2</sup>. This approach acknowledges the demands on space that the city is constantly subject to and it recognises that to help meet the development needs of Oxford, some green spaces could potentially be reprovided in another part of the network, where a more fitting use can be demonstrated for the site.

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[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/1182995/NPPF\\_Sept\\_23.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1182995/NPPF_Sept_23.pdf)

2.10 An updated Green Belt Assessment (2023) has been undertaken to inform the Oxford Local Plan 2040. Of the 19 sites that were assessed, nearly all were found to have a moderate-high or high negative impact on the Green Belt if they were to be removed. The negative impacts their removal would have on remaining Green Belt are not considered to be outweighed by the need for housing. Therefore, none of these sites are proposed for removal from the Green Belt and the City Council do not consider that exceptional circumstances exist to justify a review of the Green Belt boundaries through the Oxford Local Plan 2040.

### **Oxford City Centre and District Centres**

2.11 The Oxford Local Plan 2040 seeks to focus town centre uses in our city and district centres. These are areas that are highly accessible mobility hubs and include a broad range of facilities including shops, hospitality, community and leisure facilities.

## **3. STAGE B: IDENTIFICATION OF THE FLOOD RISK OF POTENTIAL DEVELOPMENT SITES**

3.1 The sites for potential site allocations have been identified and assessed through a multi-stage process. The starting point was the HELAA (which incorporates Calls for Sites and other sources of sites). Sites have then been tested and refined via assessments including Sustainability Appraisal, testing deliverability, and testing against the plan strategy and objectives. This three-stage site assessment process resulted in 93 sites that were considered suitable and were considered further for allocation in the OLP2040.

3.2 The level of flood risk on each of these sites has been assessed using the flood zone maps prepared as part of the SFRA. The table in Appendix 1 to this Background Paper lists each site with its level of identified flood risk. It should be noted that flood zones are not mutually exclusive because they overlap. Any area that is in Flood Zone 3b is also in Flood Zone 3a and Flood Zone 2, and any land in Flood Zone 3a is also in Flood Zone 2. This is important when calculating the percentage of a site within any given flood risk zone. For example, a site that is 5% in Flood Zone 3b, 15% in Flood Zone 3a and 5% in Flood Zone 2 would be 20% Flood Zone 3a and 25% Flood Zone 2 and as such considered as being Flood Zone 3a for the purposes of the sequential test<sup>3</sup>.

3.3 Sites are classed as being within the highest risk flood zone present on the site. However, for the purpose of the sequential test, if the proportion of the site in the highest risk Flood Zone is less than 20%, it has been classed as being within the next lowest area of flood risk that covers more than 20% of the site. This approach was agreed with the Environment Agency for the Sequential Test in plan making for the Oxford Local Plan 2036 and confirmed again with the Environment Agency for the OLP2040. It is considered that the conditions that justified the bespoke approach to the Sequential Test in the Local Plan 2036

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<sup>3</sup> The percentages presented for each flood zone in Appendix 1 have been calculated to account for the mutual overlap of flood zones.

still very much remain, and therefore the approach is clearly still a justified and appropriate response to Oxford's situation.

3.4 This is different to the approach used to assess whether a site-specific Flood Risk Assessment is required to accompany a planning application, or for identifying whether the Exceptions Test needs to be passed for a planning application, where the formal classification of the site will remain as the area of highest Flood Risk found on the site.

## 4. STAGE C: APPLICATION OF THE SEQUENTIAL TEST

### **Calculating potential housing capacities on sites in the Submission Draft Oxford Local Plan 2040**

4.1 At Stage A it was identified that Oxford has a very high need for new housing and that one of the objectives of the Oxford Local Plan 2040 is to deliver homes to meet housing needs in the city. Where sites have been identified to be allocated for residential uses, or for a mix of uses that includes residential, an estimate of the housing capacity as assessed in the HELAA (2023) is provided in Appendix 1. It should be noted that the figures presented in Appendix 1 do not take into account housing from windfall sites (116 dwellings per annum). Also note that some sites in Appendix 1 have either already commenced construction or have been built out.

4.2 Student accommodation and care homes are also counted in the housing land supply. Where sites have been allocated or developed for student accommodation, the number of student rooms is divided by 2.5 (the national ratio set out in the Housing Delivery Test<sup>4</sup>) to provide the "dwelling equivalent" figure, whilst self-contained accommodation under Use Class C3 is counted as 1:1. For care homes, the dwelling equivalent figure is reached by dividing the number of rooms by the national ratio of 1.8<sup>5</sup>.

### **Estimating the amount of housing that could be delivered in each flood zone and comparison with Local Plan housing requirements**

4.3 Appendix 1 lists the potential sites by flood risk zone. Figure 3 summarises the information in Appendix 1 and shows the quantum of housing development that can be provided on sites in Flood Zone 1, and whether this provides enough housing to meet the housing requirement, or whether sites in higher risk areas need to be considered.

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<sup>4</sup> <https://www.gov.uk/government/publications/housing-delivery-test-2021-measurement/housing-delivery-test-2021-measurement-technical-note>

<sup>5</sup> *ibid*

Flood Zone	Cumulative capacity of sites considered for allocation in the Local Plan 2040 (Appendix 1)	Cumulative capacity from identified sites across the flood zones
Flood Zone 1	6557	6,657
Flood Zone 2	553	7,210
Flood Zone 3a	12	7,222
Flood Zone 3b (brownfield)	759	7,981

Figure 3: Potential capacity from identified sites per flood zone

4.4 The number of new homes that could be delivered on sites in Flood Zone 1 is estimated to be around 6,657 dwellings, which would not meet the housing requirement of 9,612 need, as identified at Stage A. So the next step is to consider the capacity within Flood Zones 1 and 2 combined. The number of new homes that are expected to be delivered in Flood Zone 2 is 553, giving a cumulative total of 7,210 dwellings which would also not meet Oxford's housing requirement. Therefore, the next step is to consider sites in Flood Zone 3a to help meet the housing need. There are 12 dwellings expected to be delivered from sites in Flood Zone 3a, leading to a cumulative total of 7,222. The final step is to consider brownfield sites in Flood Zone 3b (see Background Paper 9a on Flood Risk to explain the approach to brownfield FZ3b). This is necessary due to the limited number of sites that are available in Oxford and the significant housing need. This brings the cumulative total from identified sites to 7,981 dwellings.

#### **Potential to locate more vulnerable uses on lower flood risk sites**

4.5 Sites in Flood Zone 1 are suitable for all types of development and can be said to pass the sequential test. If allocations are needed on sites outside of Flood Zone 1, another important part of the sequential test is identifying whether sites in lower flood risk zones where less vulnerable uses are proposed that could be swapped to sites in higher flood risk zones so that the more vulnerable uses could be accommodated on sites of the lowest flood risk.

4.6 Appendix 1 shows the flood risk vulnerability classification of proposed uses for sites in Flood Zone 1. It shows that the majority of the preferred uses for sites in Flood Zone 1 are more vulnerable uses (mostly residential development). Where a less vulnerable use is the preferred use, consideration is given as to whether a more vulnerable use (especially residential development) could be accommodated instead, especially given the pressing need for housing.

## **5. STAGE D: ASSESS RISK OF FLOODING FROM OTHER SOURCES**

5.1 The PPG states that, for the purposes of applying the NPPF, flood risk should be interpreted of as a combination of the probability and the potential consequences of flooding from any source, now or in the future<sup>6</sup>. Sources include from rivers and the sea, directly from rainfall on the ground surface and rising groundwater, overwhelmed sewers and drainage systems, and from reservoirs, canals and lakes and other artificial sources. Within each flood zone, surface water and other sources of flooding also need to be taken into account in applying the sequential approach to the location of development.

5.2 The Flood Zones identified in the SFRA and subsequently applied in Appendix 1 are based on flood risk from fluvial sources. The SFRA identifies fluvial sources as the primary source of flood risk in Oxford in terms of both flooding extent and the number of properties at risk. However, it is important that the risk of flooding from other sources is also considered (although data for other flood risk sources may not be as reliable).

5.3 In addition to fluvial flood risk, the SFRA also considers:

- Ordinary watercourses
- Surface water flooding
- Reservoir flooding
- Oxford canal
- Ground water flooding, and
- Sewers and drainage systems.

- Ordinary watercourses

These include most watercourses that are not designated as a main river and include but are not limited to other rivers, streams, ditches and drains etc. These watercourses are not included in the existing hydraulic models for Oxford. To assess flood risk from these watercourses, the Environment Agency's flood maps are used, although their surface water mapping has to be used in conjunction with their fluvial mapping, as the latter does not typically show flood extents for catchments less than 3km<sup>2</sup>. It should be noted that not all the conveyance area of ordinary watercourses is explicitly modelled nor structures such as culverts in most cases. Therefore, the mapping usually provides a conservative assessment of the flood risk from ordinary watercourses and should not be used as definitive mapping.

- Surface water flooding

This type of flooding is often the result of high peak rainfall intensities and insufficient capacity in the sewer network. Surface water flooding is a significant flood risk in an urban area like Oxford due to the high proportion of impermeable surfaces that cause a significant increase in runoff rates and consequently the volume of water that flows into the sewer network.

Although managing the risk of flooding from surface water is the responsibility of Lead Local Flood Authority (in this case Oxfordshire County Council), the Environment Agency have produced the updated Flood Map for Surface Water (uFMfSW) under their strategic role in

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<sup>6</sup> <https://www.gov.uk/guidance/flood-risk-and-coastal-change#planning-and-flood-risk> - Paragraph: 001  
Reference ID: 7-001-20220825

England. This combines the Environment Agency's nationally produced surface water flood mapping and appropriate locally produced maps from the County Council. The map is intended to be the best single source of information on surface water flooding, incorporating the latest Environment Agency modelling techniques and local data. Some caution is required though, as the SFRA indicates that there are some assumptions and limitations involved with the data, therefore the maps should only be used at the strategic planning level. However, all sites greater than 1 hectare or in Flood Zone 2 or above will be required to produce a site-specific Flood Risk Assessment to assess the risk from surface water flooding at the detailed planning application stage.

- Reservoir flooding

In 2021, the Environment Agency published updated maps showing the flood risk associated with reservoirs. Dam breach and flood modelling techniques were used to produce a new national set of reservoir flood maps for England. The maps show two flooding scenarios, including a 'dry-day' and a 'wet-day'. The 'dry-day' scenario predicts the flooding that would occur if the dam or reservoir failed when rivers are at normal levels. The 'wet day' scenario predicts how much worse the flooding might be if a river is already experiencing an extreme natural flood. Three reservoirs have been identified which could impact Oxford City; one in Banbury and two in Farmoor.

The modelled extents tend to lie along the River Thames and River Cherwell. The two Farmoor reservoirs impact the River Thames whilst the Banbury Flood Alleviation Scheme impacts the River Cherwell and River Thames downstream of the confluence between the two watercourses. Areas affected within the Thames floodplain include parts of Wolvercote, New Botley, Osney, Grandpont and New Hinksey. Areas affected within the Cherwell floodplain include limited parts of Summertown, New Marston, Headington, St Clements and Iffley.

Whilst these areas are shown to be at risk, reservoir failure is a rare event with a very low probability of occurrence. Current reservoir regulation, which has been further enhanced by the Flood and Water Management Act 2010, aims to ensure that all reservoirs are properly maintained and monitored to detect and repair any problem. Therefore, the risk of reservoir flooding should not influence the site allocations process.

- Oxford Canal

Given the proximity of the Oxford Canal to other watercourses in Oxford city centre, flooding from the canal should be recognised as a potential risk. However, the Canal and River Trust have recorded no historical breaches or incidents of overtopping within the city limits.

- Ground water flooding

This type of flooding is defined as the emergence of groundwater at ground level. There are limited local data with respect to groundwater flooding. However, for a strategic level assessment of the potential for groundwater flooding, the British Geological Survey UK Geoviewer has been used to determine the bedrock across the study area, with the Landis Soils map used to determine the soils present. There is a lack of reliable data relating

to groundwater flooding and therefore it is difficult to make any site-specific judgements on this issue alone.

- Sewers and drainage systems (Thames Water)

Sewer flooding often occurs because of an existing drainage system having insufficient capacity to drain rainfall, consequently causing the release of water at manholes. Sewer flooding can also occur should there be a fault/failure at an existing drainage system. The SFRA retains the assumption that the surface water flood risk from the surface water sewer network in Oxford is low. It is suggested that foul sewer flooding is primarily a result of operational issues such as sewer blockages, although there are areas where sewers are overloaded during significant rainfall events. There is insufficient data available to assess the flood risk resulting from sewers and drainage systems to individual sites.

## 6. STAGE E: THE EXCEPTIONS TEST

6.1 The Exception Test, as set out in paragraph 164 of the NPPF<sup>7</sup> (2023), is a method to demonstrate and help ensure that flood risk to people and property will be managed satisfactorily, while allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available.

6.2 There are two parts to the Exceptions Test:

- i. It must be shown that the development would provide wider sustainability benefits to the community that outweigh the flood risk; and
- ii. It must be shown that development will be safe for its lifetime, taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall. A SFRA (Level 2) is required to inform this assessment.

6.3 The PPG<sup>8</sup> sets out when the Exception Test should be applied. Figure 4 below is taken from the PPG<sup>8</sup> and illustrates that development of sites in Flood Zone 3a proposed for more vulnerable uses such as housing will require an Exceptions Test. In addition, where previously developed sites in Flood Zone 3b are proposed, an exceptions test will also be required. The Level 2 SFRA includes more detailed site-specific analysis and mapping to indicate whether a site is likely to be able to pass the Exceptions Test. This has been done for all sites which are allocated in Flood Zones 2 or 3, and indicates that all those sites are likely to pass the Exceptions Test as applicable at the planning application stage.

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[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/1182995/NPPF\\_Sept\\_23.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1182995/NPPF_Sept_23.pdf)

<sup>8</sup> <https://www.gov.uk/guidance/flood-risk-and-coastal-change#para79>

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	X	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	X	X	X	✓ *

Key:

✓ Exception test is not required

X Development should not be permitted

Figure 4: Flood risk vulnerability and flood zone ‘incompatibility’

## 7. Conclusion

7.1 This paper sets out the Sequential approach and Sequential Test that has been applied to the site allocations in the OLP2040, in order to direct development to the areas of lowest flood risk possible, in accordance with national planning policy.

7.2 The physical constraints in Oxford, and the lack of new sites for new development, mean that it has not been possible to direct all site allocations to Flood Zone 1: There are site allocations, including for residential development in higher flood risk zones. This is particularly the case where there is existing development on brownfield sites which – if redeveloped – could offer wider sustainability benefits. In those instances, additional flood risk assessment would be required at the planning application stage and mitigation measures applied accordingly, to minimise risk as far as possible.

## Appendix 1

HELAA ref	Site	Site area (ha)	Proportion of site within flood zone			Flood zone for sequential test	Proposed use	Flood risk vulnerability classification of proposed use	Opportunities to swap allocation to a use with a different vulnerability?	Potential site housing capacity*
			%2	%3a	%3b					
<b>Flood Zone 1</b>										
1	Northern Gateway (Oxford North)	45.48	0	0	0	1	Mixed use - housing and employment	Mix of more vulnerable and less vulnerable uses	Majority of site is already under construction, and part of the allocation is already for a more vulnerable use.	500
2a2	Barton Park – Phase 2	2.29	0	0	0	1	Housing	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	92
2a3	Barton Park – Phase 3	6.43	7	5	5	1	Housing	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1, and already under construction.	207
2a4	Barton Park – Phase 4	7.43	2	1	1	1	Housing	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	342
006b	Banbury Road University Sites - Parcel B (formerly part of 006 Banbury Road University Sites)	0.52	0	0	0	1	Student accommodation	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	52

HELAA ref	Site	Site area (ha)	Proportion of site within flood zone			Flood zone for sequential test	Preferred use	Flood risk vulnerability classification of proposed use	Opportunities to swap allocation to a use with a different vulnerability?	Potential site housing capacity*
			%2	%3a	%3b					
<b>Flood Zone 1</b>										
9	Blackbird Leys Central Area	6.54	0	0	0	1	Mixed use – housing, retail and commercial	Mix of more vulnerable and less vulnerable uses	Part of the allocation is already for a more vulnerable use. The site is located within Blackbird Leys district centre. The Local Plan 2040 strategy is to encourage a range of uses in district centres to support their vitality and viability as ss	
12	Churchill Hospital	22.74	0	0	0	1	Mixed use - hospital related uses and other development including employment and housing subject to operational uses of the hospital	More vulnerable	Allocation already for more vulnerable uses in Flood Zone 1.	51
14	Templars Square Shopping Centre	3.86	0	0	0	1	Mixed use development including housing and town centre uses	Mix of more vulnerable and less vulnerable uses	Part of the allocation is already for a more vulnerable use. The site is located within Cowley centre district centre. The Local Plan 2040 strategy is to encourage a range of uses in district centres to support their vitality and viability as sustainable hubs for local communities.	350

HELAA ref	Site	Site area (ha)	Proportion of site within flood zone			Flood zone for sequential test	Preferred use	Flood risk vulnerability classification of proposed use	Opportunities to swap allocation to a use with a different vulnerability?	Potential site housing capacity*
			%2	%3a	%3b					
<b>Flood Zone 1</b>										
16	Cowley Marsh Depot, Marsh Road	1.71	0.5	0	0	1	Housing (and relocating depot to alternative site)	More vulnerable	Allocation already for a more vulnerable site in Flood Zone 1.	80
17	Crescent Hall	0.96	0	0	0	1	Student accommodation	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	29 (net gain)
18	Diamond Place and Ewert House	1.73	0	0	0	1	Housing, employment and student accommodation	Mix of more vulnerable and less vulnerable uses	Part of the allocation is already for a more vulnerable use. The site is located within Summertown district centre. The Local Plan 2040 strategy is to encourage a range of uses in district centres to support their vitality and viability as sustainable hubs for local communities.	180
20a	Elsfield Hall	0.76	0	0	0	1	Housing	More vulnerable	N/A – already built out during plan period	26
24	Government Buildings and Harcourt House (023 + 024)	2.37	0	0	0	1	Mixed use academic development to include residential accommodation for staff and students	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	70
26	Jesus College Sports Ground (Herbert Close)	0.55	0	0	0	1	Postgraduate accommodation	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	26
27	John Radcliffe Hospital	27.75	0	0	0	1	Hospital related uses and employer-linked affordable housing	More vulnerable	Allocation already for more vulnerable uses in Flood Zone 1.	618

HELAA ref	Site	Site area (ha)	Proportion of site within flood zone			Flood zone for sequential test	Preferred use	Flood risk vulnerability classification of proposed use	Opportunities to swap allocation to a use with a different vulnerability?	Potential site housing capacity*
			%2	%3a	%3b					
<b>Flood Zone 1</b>										
28a	Kassam Stadium and Ozone Leisure Complex	8.48	6	1	1	1	Housing led development with public open space, with some commercial leisure	Mix of more vulnerable, less vulnerable and water compatible uses	Allocation already for a more vulnerable use in Flood Zone 1. (Housing led development).	275
28b	Overflow carpark at Kassam Stadium site	2.29	6	4	4	1	Housing led development with public open space	Mix of more vulnerable, and water compatible uses	Allocation already for a more vulnerable use in Flood Zone 1.	77
29	Land North Littlemore Mental Health Centre	3.72	0	0	0	1	Housing	More vulnerable	N/A – already built out during plan period.	114
31	Manor Place	1.24	12	3	3	1	Housing and student accommodation	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	43
32	Lincoln College Sports Ground	2.34	0	0	0	1	Housing	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	26
38a1	Thornhill Park	1.46	0	0	0	1	Housing led mixed use development	More vulnerable	N/A – already built out during plan period.	134
38a2	Thornhill Park (wider site)	3.39	0	0	0	1	Housing led mixed use development including hotel, employment and commercial uses	Mix of more vulnerable, and water compatible uses	Allocation already for a more vulnerable use in Flood Zone 1. (Housing led development).	402

HELAA ref	Site	Site area (ha)	Proportion of site within flood zone			Flood zone for sequential test	Preferred use	Flood risk vulnerability classification of proposed use	Opportunities to swap allocation to a use with a different vulnerability?	Potential site housing capacity*
			%2	%3a	%3b					
<b>Flood Zone 1</b>										
39	Northfield Hostel, Sandy Lane West	0.7	0	0	0	1	Housing	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	61
42	Nuffield Orthopaedic Centre (NOC)	8.38	0	0	0	1	Intensification of site but focus is on JR site and presently no plans for development of NOC within plan period.  Site is not available for residential.	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	0 <sup>9</sup>
43	Old Road Campus	6.41	0	0	0	1	Economic – retain for employment/research	Less vulnerable	No – landowner has no intention to develop this site for housing	0
49	Oxford University Press Sports Ground, Jordan Hill	3.66	0	0	0	1	Housing and public open space	Mix of more vulnerable, and water compatible uses	Allocation already for a more vulnerable use in Flood Zone 1. (Housing led development).	90
54	Ruskin College Campus	1.86	0	0	0	1	Academic institutional uses, student accommodation and housing development	Mix of more vulnerable and less vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	28

<sup>9</sup> A small number of sites are listed with a capacity of zero, this is because it is a hospital site with a site allocation supporting residential development, but the health trust does not yet have firm enough plans to estimate a capacity that could be accommodated alongside the primary operational hospital uses for the site; or the site allocation policy involves a grouping of several nearby HELAA sites, but does not set out a split for the residential numbers across the sites pending more detailed design consideration. In those instances, the HELAA apportions the entire housing number against one of the sites and correspondingly has zero against the other sites that fall within that site allocation area to avoid double counting.



HELAA ref	Site	Site area (ha)	Proportion of site within flood zone			Flood zone for sequential test	Preferred use	Flood risk vulnerability classification of proposed use	Opportunities to swap allocation to a use with a different vulnerability?	Potential site housing capacity*
			%2	%3a	%3b					
<b>Flood Zone 1</b>										
61	Union Street Car Park and 159 – 161 Cowley Road	0.47	0	0	0	1	Housing	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	75
62	University of Oxford Science Area & Keble Road Triangle	12.43	0	0	0	1	Academic and research uses only	Less vulnerable	No - landowner has no intention to develop this site for housing.	0
63	Warneford Hospital	8.78	0	0	0	1	Housing including key worker housing and hospital and medical related B1a and B1b	More vulnerable	Allocation already for more vulnerable uses in Flood Zone 1.	70
64	Warren Crescent	0.37	0	0	0	1	Housing	More vulnerable	N/A - already built out during plan period	10
65	West Wellington Square	0.88	0	0	0	1	Mixed use including housing, student accommodation and academic institutional	Mix of more vulnerable and less vulnerable uses	Allocation already for a more vulnerable use in Flood Zone 1.	18

HELAA ref	Site	Site area (ha)	Proportion of site within flood zone			Flood zone for sequential test	Preferred use	Flood risk vulnerability classification of proposed use	Opportunities to swap allocation to a use with a different vulnerability?	
			%2	%3a	%3b					
<b>Flood Zone 1</b>										
75 (a and b)	Oxford Railway Station and Becket Street Car Park	2.56	1	0	0	1	Economic	Less vulnerable	No – masterplan work indicates landowner intention is to prioritise delivery of the station redevelopment, no intention to deliver housing.	0
81	Worcester Street Car Park	0.52	12	12	12	1	Mixed use – housing and economic	Mix of more vulnerable and less vulnerable uses	Allocation already for a more vulnerable use in Flood Zone 1.	59
95a2	Between Towns Road (including 17, 17b and Cowley Cons Club)	0.32	0	0	0	1	Student accommodation	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	76 net gain
98	Workshops Lanham Way	0.24	0	0	0	1	Housing	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	10
104	Former Iffley Mead Playing Field	2.04	0	0	0	1	Housing	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	84
107	St Frideswide Farm	3.95	0	0	0	1	Housing	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	134
112a1	Hill View Farm	3.52	0	0	0	1	Housing	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	159
112b1	Land West of Mill Lane	1.99	0	0	0	1	Housing	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	80
113	Redbridge Paddock	3.64	3	1	1	1	Housing	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	200

HELAA ref	Site	Site area (ha)	Proportion of site within flood zone			Flood zone for sequential test	Preferred use	Flood risk vulnerability classification of proposed use	Opportunities to swap allocation to a use with a different vulnerability?	Potential site housing capacity*
			%2	%3a	%3b					
<b>Flood Zone 1</b>										
114d	Marston Paddock	0.83	0	0	0	1	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	40	
117	Land surrounding St Clement's Church	2.31	7	5	5	1	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	40	
120	Unipart Group	30.63	0	0	0	1	Less vulnerable	No - established employment site, no landowner intention to develop residential.	0	
124	Slade House	1.3	0	0	0	1	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	50	
HELAA ref	Site	Site area (ha)	Proportion of site within flood zone			Flood zone for sequential	Preferred use	Flood risk vulnerability classification	Opportunities to swap allocation to a use with a different vulnerability?	Potential site housing

						test		of proposed use		capacity*
			%2	%3a	%3b					
<b>Flood Zone 1</b>										
173	Bayards Hill Primary School Part Playing Fields	1.96	0	0	0	1	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	30	
234	Jesus College Playing Field - North	2.53	0	0	0	1	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	0 (site is coming forward jointly with HELAA ref 32, therefore total capacity given on that site)	

HELAA ref	Site	Site area (ha)	Proportion of site within flood zone			Flood zone for sequential test	Preferred use	Flood risk vulnerability classification of proposed use	Opportunities to swap allocation to a use with a different vulnerability?	Potential site housing capacity*
			%2	%3a	%3b					
<b>Flood Zone 1</b>										
289	Sandy Lane Recreation Ground	5.15	0	0	0	1	Mix of more vulnerable and water compatible uses	Allocation already for a more vulnerable use in Flood Zone 1. The provision of open-air sports relates to the retention of the majority of the existing recreation ground, which is needed in this location and could not be re-provided elsewhere.	300	
341	William Morris Close Sports Ground	1.24	0	0	0	1	More vulnerable	N/A – already built out during plan period	86	

HELAA ref	Site	Site area (ha)	Proportion of site within flood zone			Flood zone for sequential test	Preferred use	Flood risk vulnerability classification of proposed use	Opportunities to swap allocation to a use with a different vulnerability?	Potential site housing capacity*
			%2	%3a	%3b					
<b>Flood Zone 1</b>										
356	276 Banbury Road	0.35	0	0	0	1	Less vulnerable	N/A – hotel already built out during plan period	0	
384	Jowett Walk (east)	1.09	0	0	0	1	More vulnerable	N/A – already built out during plan period	27	
389	Land at Meadow Lane	1.57	13	4	3	1	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	29	
401	Littlemore House (formerly Littlemore Park (SAE Institute))	2.45	0.5	0	0	1	Less vulnerable	No - established employment site, with no intention to develop for housing.	0	

HELAA ref	Site	Site area (ha)	Proportion of site within flood zone			Flood zone for sequential test	Preferred use	Flood risk vulnerability classification of proposed use	Opportunities to swap allocation with a more vulnerable use?	Potential site housing capacity*
			%2	%3a	%3b					
<b>Flood Zone 1</b>										
428	Rectory Centre	0.21	0	0	0	1	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	21	
439	Oxford Brookes University Marston Road Campus	1.18	0	0	0	1	Less vulnerable	No – established Oxford Brookes campus with no intention to develop for housing.	0	
440	1 Pullens Lane	0.42	0	0	0	1	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	11	

HELAA ref	Site	Site area (ha)	Proportion of site within flood zone			Flood zone for sequential test	Preferred use	Flood risk vulnerability classification of proposed use	Opportunities to swap allocation with a more vulnerable use?	Potential site housing capacity*
			%2	%3a	%3b					
<b>Flood Zone 1</b>										
448	Macclesfield House (Oxford Centre for Innovation) and Registry Office, Tidmarsh Lane	0.25	0	0	0	1	Less vulnerable	No - established employment site, with no intention to develop for housing.	0	
463	Ruskin Field	4.5	0	0	0	1	Housing	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	20
467	Edge of Playing Fields, Oxford Academy	0.58	0	0	0	1	Housing/ employer-linked housing	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	20
497	MINI Plant Oxford	69.9	0	0	0	1	Economic (retain for employment use, with possible intensification)	Less vulnerable	No – established employment site, with landowner confirming retention for this use.	0
560	Headington Hill Hall and Clive Booth Student Village	10.05	0	0	0	1	Student accommodation	More vulnerable	N/A - already under construction.	229 net gain
574	Manzil Way Resource Centre	0.75	0	0	0	1	Health facilities/ housing/ employer-linked housing	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	10
579	ROQ Site	4.29	0	0	0	1	Academic institutional	Less vulnerable	No - landowner has no intention to develop this site for student accommodation or other housing.	0

HELAA ref	Site	Site area (ha)	Proportion of site within flood zone			Flood zone for sequential test	Preferred use	Flood risk vulnerability classification of proposed use	Opportunities to swap allocation with a more vulnerable use?	Potential site housing capacity*
			%2	%3a	%3b					
<b>Flood Zone 1</b>										
587	ARC Oxford (formerly Oxford Business Park)	35.4	0	0	0	1	Economic (intensification of existing site)	Less vulnerable	No – established employment site, with landowner confirming retention for this use.	0
590	Pear Tree Farm	2.03	0	0	0	1	Housing	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	122
593	Knights Road	2.25	7	0.05	0.05	1	Housing	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	80
597	Northgate House, 13 – 20 Cornmarket Street	0.96	0	0	0	1	Mixed – academic, student accommodation and commercial uses	Mix of more vulnerable and less vulnerable uses	N/A – already built out during plan period	29 net gain
599	Former Murco Garage, Between Towns Road	0.26	0	0	0	1	Housing	More vulnerable	N/A – already built out during plan period	38
600	Student Castle, Osney Lane	0.91	0.5	0	0	1	Student accommodation	More vulnerable	N/A – already built out during plan period	206 net gain
601	Former Jack Russell Pub, 21 Salford Road	0.18	0	0	0	1	Housing	More vulnerable	N/A – already built out during plan period	16
602	Halliday Hill/ Westlands Drive	0.34	0	0	0	1	Housing	More vulnerable	Allocation already for a more vulnerable use in Flood Zone 1.	15
HELAA ref	Site	Site area (ha)	Proportion of site within flood zone			Flood zone for sequential test	Preferred use	Flood risk vulnerability classification of proposed use	Opportunities to swap allocation with a more vulnerable use?	Potential site housing capacity*
			%2	%3a	%3b					
<b>Flood Zone 1</b>										

603a1	Gibbs Crescent (formerly Gibbs Crescent and Simon House #603)	0.87	2	0	0	1	Housing	More vulnerable	N/A – already under construction	62
603a2	Simon House (formerly Gibbs Crescent and Simon House #603)	0.09	0	0	0	1	Housing	More vulnerable	N/A – already under construction	30
<b>Total in Flood Zone 1</b>										<b>6,657</b>

HELAA ref	Site	Site area (ha)	Proportion of site within flood zone			Flood zone for sequential test	Preferred use	Flood risk vulnerability classification of proposed use	Opportunities to swap allocation with a more vulnerable use?	Potential site housing capacity*
			%2	%3a	%3b					
<b>Flood Zone 2</b>										
008a	Bertie Place Recreation Ground	0.67	33	8	5	2	Housing	More vulnerable	Allocation already for a more vulnerable use.	30
11	Canalside Land, Jericho	0.49	74	12	10	2	Mixed use including housing	Mix of more vulnerable, less vulnerable and water compatible uses	Allocation already for a more vulnerable use.	18
13	Court Place Gardens, Iffley Village	3.89	42	16	15	2	Housing	More vulnerable	N/A – already under construction	35
70	Island Site (Park End Street/Hythe Bridge Street)	0.63	23	6	3	2	Mixed use including employment, commercial and housing	Mix of more vulnerable and less vulnerable uses	Allocation already includes more vulnerable use. May be able to adjust layout across the sites.	0 (site is coming forward jointly with HELAA ref 81, therefore total capacity given on that site)

HELAA ref	Site	Site area (ha)	Proportion of site within flood zone			Flood zone for sequential test	Preferred use	Flood risk vulnerability classification of proposed use	Opportunities to swap allocation to a use with a different vulnerability?	Potential site housing capacity*
			%2	%3a	%3b					
<b>Flood Zone 2</b>										
76	Oxpens	6.3	31	19	18	2	Mixed use including, commercial, business and service and housing including student accommodation	Mix of more vulnerable and less vulnerable uses	Allocation already includes more vulnerable use. Large site may be able to adjust layout.	450
516	474 Cowley Road (Former Powell's Timber Yard)	0.34	100	0	0	2	Housing	More vulnerable	Allocation already for a more vulnerable use.	20
588	Oxford Science Park (whole site)	26.51	22	7	7	2	Economic	Less vulnerable	No – established employment site, with landowner confirming retention for this use.	0
624	Land south of Frideswide Square	0.26	100	0	0	2	Mixed use – part of a wider scheme that includes this site	Mix of more vulnerable and less vulnerable uses	Allocation already includes more vulnerable use. May be able to adjust layout across the sites.	0 (site is coming forward jointly with HELAA ref 81, therefore total capacity given on that site)
<b>Total in Flood Zone 2</b>										<b>553</b>

HELAA ref	Site	Site area (ha)	Proportion of site within flood zone			Flood zone for sequential test	Preferred use	Flood risk vulnerability classification of proposed use	Opportunities to swap allocation to a use with a different vulnerability?	Potential site housing capacity*
			%2	%3a	%3b					
<b>Flood Zone 3a</b>										
607b	Botley Road Retail Units	7.76	82	36	19	3a	Economic/commercial use	Less vulnerable	Allocation is for less vulnerable uses.	0
613	Sites adjacent to the east of Osney Bridge, to the north and south of Botley Road (includes #414 River Hotel & 1-3 Botley Road & #458 4 to 8 Botley Road)	0.3	71	21	3	3a	Mixed use including housing	Mix of more vulnerable and less vulnerable uses	Existing vulnerable uses on the site. May be able to adjust layout across the sites via redevelopment.	12
<b>Total in Flood Zone 3a</b>										<b>12</b>

HELAA ref	Site	Site area (ha)	Proportion of site within flood zone			Flood zone for sequential test	Preferred use	Flood risk vulnerability classification of proposed use	Opportunities to swap allocation to a use with a different vulnerability?	Potential site housing capacity*
			%2	%3a	%3b					
<b>Flood Zone 3b</b>										
2a1	Barton Park – Phase 1	7.31	28	23	23	3b	Housing	More vulnerable	N/A – already built out during plan period	59
34	Littlemore Park, Armstrong Rd	6.24	31	22	22	3b	Housing	More vulnerable	N/A – already under construction	273
67	Wolvercote Paper Mill	4.94	44	36	36	3b	Mixed use – housing led	Mix of more vulnerable and less vulnerable uses	N/A – already built out during plan period	180
586	Osney Mead (whole site)	17.8	86	57	35	3b	Mixed use including employment, academic, student accommodation, employer-linked housing and market housing.	Mix of more vulnerable and less vulnerable uses	Large site may be able to adjust layout using sequential approach within site.	247
607a	135-137 Botley Road	1.11	100	100	34	3b	Economic	Less vulnerable	Allocation is for less vulnerable uses.	0
<b>Total in Flood Zone 3b</b>										<b>759</b>

\*There are sites included in the potential capacity which have been completed since 01 April 2020. The portion of any site that has been completed after this date has been included in the capacity calculation to ensure this aligns with the same base date as the housing need identified in the HENA. During this site identification process, there are some sites that would have commenced construction, thereby not needing to be allocated in the Local Plan



