Appendix 9.1

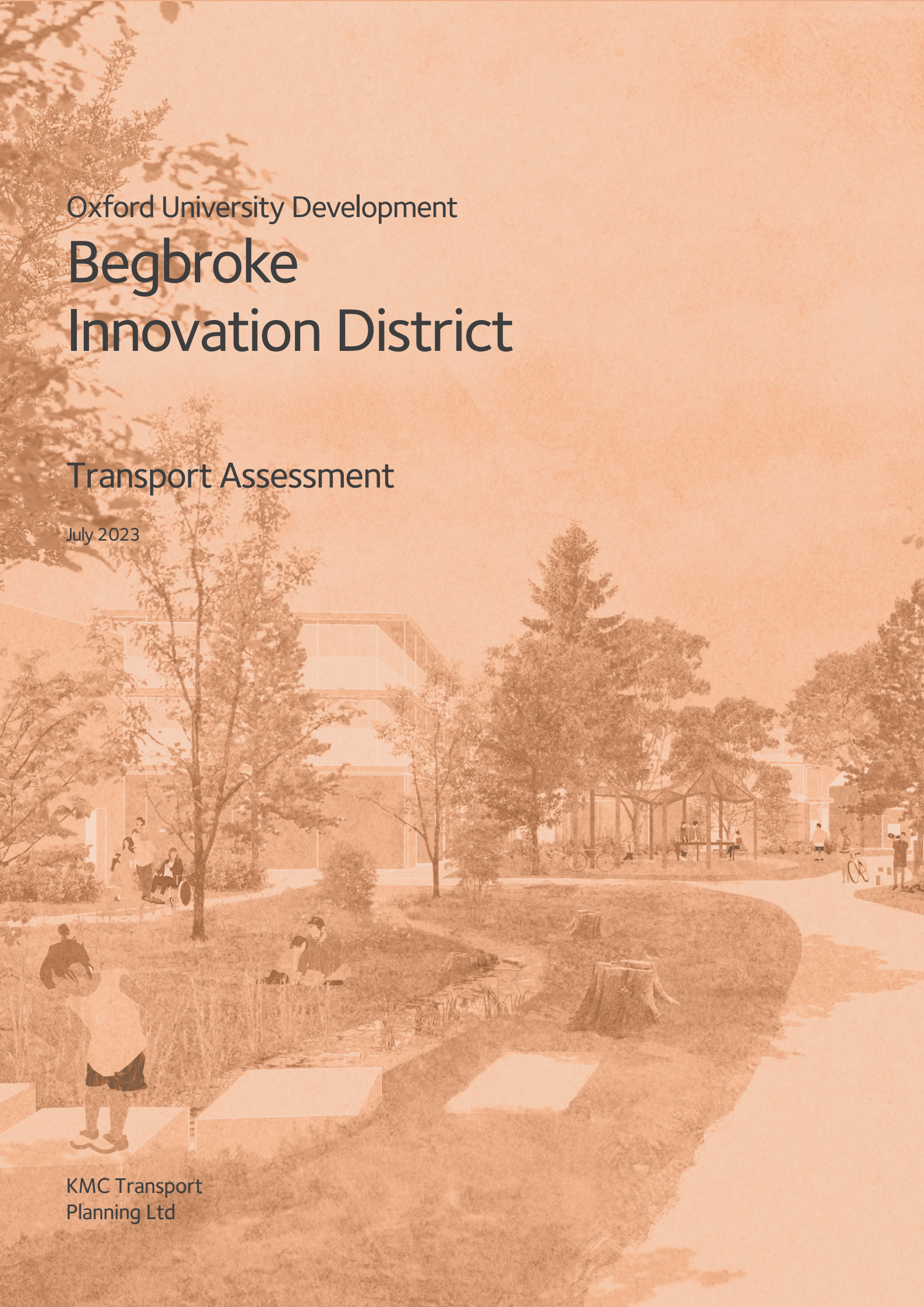
TRANSPORT ASSESSMENT

Oxford University Development

Begbroke Innovation District

Transport Assessment

July 2023



KMC Transport Planning Ltd

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1 INTRODUCTION

1.1 Background

1.1.1 KMC Transport Planning Ltd (KMC) has been appointed by Oxford Development Limited (OUD), a joint venture between the University of Oxford (OU) and Legal and General, to provide transport advice and prepare supporting technical documentation to accompany the outline planning application relating to the proposed development of Begbroke Innovation District (the Site). The Site forms part of the land that was allocated as part of the Cherwell Local Plan (Part 1) 2011-2031 Partial Review (referred to herein as the 'Partial Review Local Plan') under Policy PR8 in order to meet Oxford's unmet housing needs.

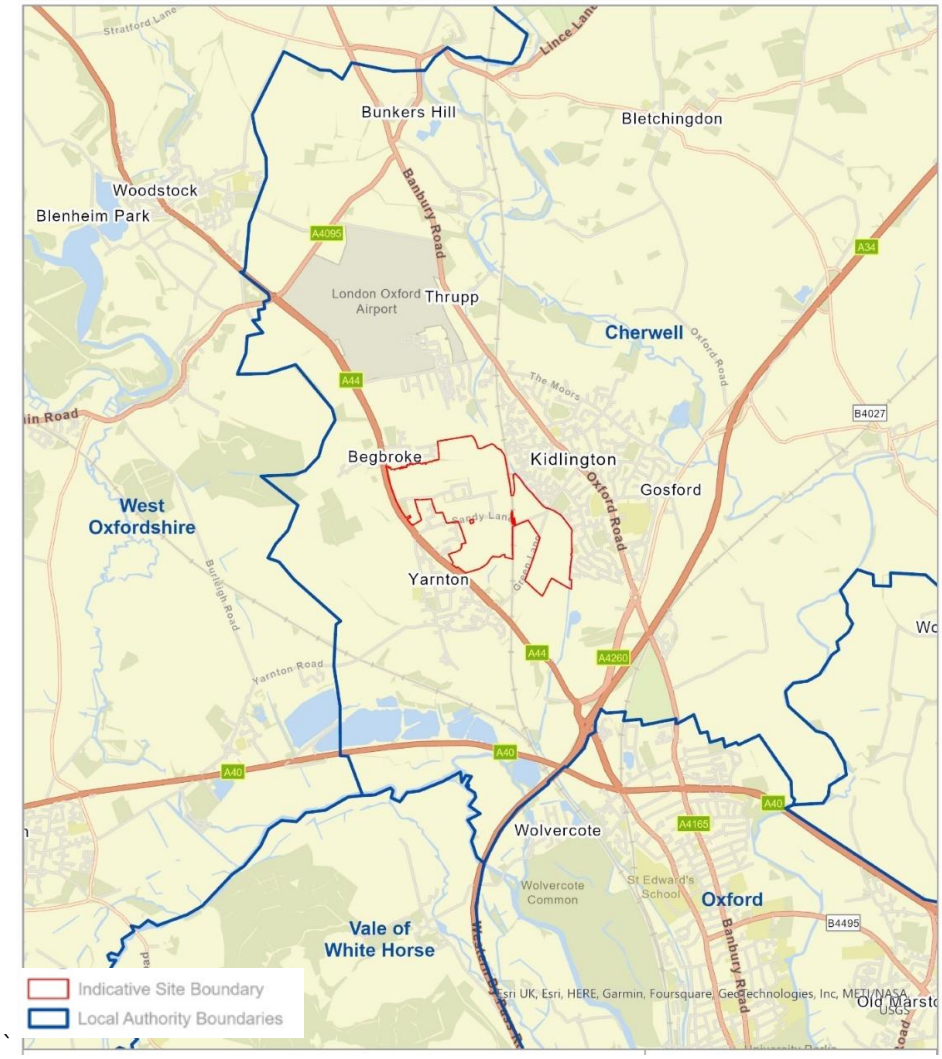
1.1.2 The circa 170 hectare (ha) site has been allocated within the Partial Review Local Plan as it is considered there are "*the 'ingredients' for a contemporary, higher density, environmentally responsible, landmark development, which marks a new approach along the A44 to Oxford and which becomes the connecting centre piece of the Partial Review's vision for the area.*"[1] From a transport perspective, the key ingredient is the *"opportunity to integrate an overarching sustainable transport strategy from the outset."*

1.2 The Site

1.2.1 The Site is bisected by the Oxford-Banbury railway line, with roughly two thirds lying to the west and one third to the east. The land to the east of the railway line, closer to Kidlington village, is not identified for built development and so the operational centre can be taken to be Begbroke Science Park. This is located circa 7.35km northwest of Oxford city centre, circa 1.25km west of Kidlington village centre and close to the villages of Yarnton and Begbroke. The existing Begbroke Science Park is situated in the northern portion of the Site, which accommodates laboratories, engineering facilities and administrative buildings, with the remainder of the Site predominantly agricultural land. An historical landfill site, known as Sandy Lane East, is located in the centre of the Site and is approximately 5.2ha in area. The Site location is shown in **Figure 1.1**.

[1] Paragraph 5.110 of the Cherwell Local Plan 2011-2031 Partial Review (2020)

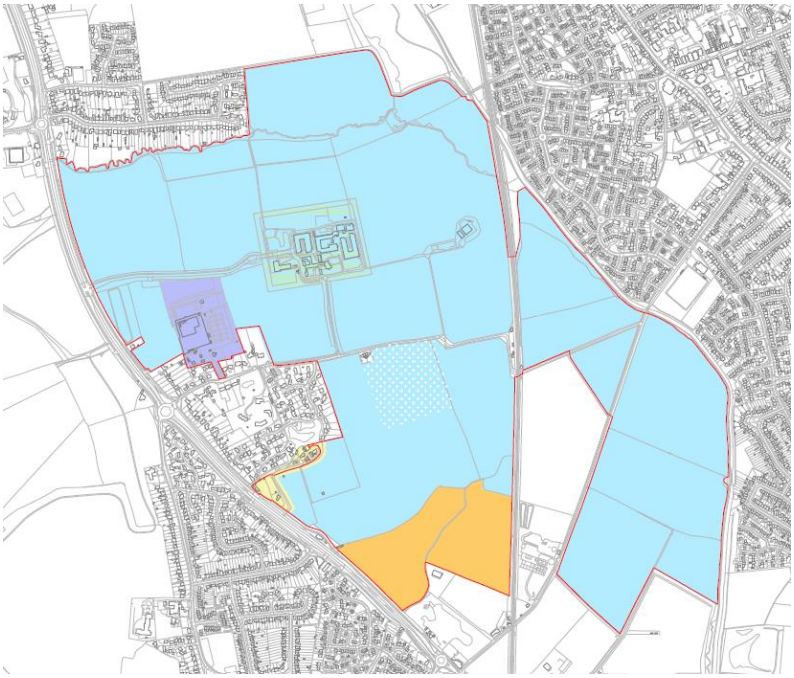
Figure 1.1: Site Location



1.2.2 Sandy Lane crosses the Site on an east-west alignment on an axis which is broadly midway across the Site, joining the A44 (Woodstock Road) to the west of the Site and Yarnton Road in Kidlington to the east of the Site. The Cherwell Valley railway line passes through the Site on an approximate north-south alignment and Oxford canal runs along the eastern boundary of the Site.

1.2.3 **Figure 1.2** illustrates the land ownership of the PR8 allocated site. The land owned by OUD, which forms the basis of this outline application for Begbroke Innovation District, forms the vast majority of the PR8 allocation and is identified in blue in **Figure 1.2**. The remaining PR8 allocation is formed of land owned by Hallam Land (identified in orange in **Figure 1.2**) and Newcore (identified in purple in **Figure 1.2**).

Figure 1.2: Land ownership of the PR8 allocated site



1.3 Overview of Proposals

1.3.1 An Innovation District is an *"area with networks of knowledge-producing organisations such as universities, research bodies, teaching hospitals, cultural institutions, and knowledge-intensive businesses. They bring together innovators, entrepreneurs, researchers, creatives, knowledge workers and investors to work together, to collaborate, compare and compete, creating the conditions for business growth."*[2]

1.3.2 However, research in Innovation Districts[3] has identified a need to create a stronger sense of place and vibrancy and that the right type of mix of residential accommodation, cafes, restaurants, retail, event spaces and opportunities for animation are important components to support interactions between people.

1.3.3 OUD's vision is aligned to this emerging thinking in Innovation Districts and seeks to develop a well-connected new community that provides much-needed housing and excellent new places for learning, leisure and work – generating a wide range of jobs and activities.

1.3.4 It is proposed to develop a residential-led mixed used development, which will include up to 215,000 sqm of residential floorspace (which has been equated to circa 1,800 homes for the purposes of this assessment), up to 155,000 sqm of flexible employment uses and supporting social, retail, leisure and community uses, including two primary schools, a secondary school and local centre.

[2] UK Innovation Districts and Knowledge Quarters, UK Innovation Districts Group, Arup

[3] UK Innovation Districts and Knowledge Quarters, UK Innovation Districts Group, Arup

1.3.5 The development is supported by a comprehensive sustainable transport strategy. OUD's plans for Begbroke Innovation District are to take a long-term, high-quality approach to placemaking. The development will deliver high levels of environmental sustainability, putting active travel and public transport at the top of the movement hierarchy. The development seeks to create a vibrant new community, while also building strong connections with the existing communities around it. Indeed, the Partial Review Local Plan recognises that the development has the ingredients to become *"the connecting centre piece of the Partial Review's vision for the area."*[4]

1.4 Engagement

1.4.1 The transport aspects of the proposed development have been subject to comprehensive pre-application discussions with Cherwell District Council (CDC), as local planning authority and Oxfordshire County Council (OCC), as local highway authority. In relation to transport, the pre-application engagement has included discussions on:

- Transport modelling;
- Development of the illustrative masterplan from a transport perspective;
- Active travel strategy both in terms of the masterplan design and connections to the wider area and off-site active travel improvements;
- Public transport strategy in terms of provision for public transport within the Site and strategy for improvements to public transport services and infrastructure;
- Street design; and
- Sandy Lane bridge and bridge across Oxford Canal.

1.4.2 In addition, a pre-application Scoping Opinion was published by CDC dated 27th January 2023 regarding an Environmental Impact Assessment for the development.

1.4.3 A series of Community Drop-in Exhibitions were undertaken in July 2022, November 2022, and March 2023 to get feedback on the emerging development proposals. A series of stakeholder workshops were also undertaken alongside the drop-in exhibitions. A final series of Community Drop-in Exhibitions were held in July 2023 to show the local communities what will be included in the outline planning application.

1.4.4 Design Review Panels were also held in November 2022 and May 2023. The Panel was made up of a number of nationally respected built and natural environment professionals who critiqued the emerging Begbroke Innovation District masterplan and identified where the design and strategy could be improved to achieve the best possible outcomes.

1.4.5 Transport related comments arising from the pre-application engagement have informed the design of the proposed development, the development of the Transport Strategy and assessment of the transport effects.

[4] Paragraph 5.110 of the Cherwell Local Plan 2011-2031 Partial Review (2020)

1.5 Purpose of Report

1.5.1 This Transport Assessment (TA) has been prepared by KMC to support the outline planning application for the Begbroke Innovation District, which forms a major part of the allocated PR8 site in the Partial Review Local Plan (land identified in blue in **Figure 1.2**).

1.5.2 This TA analyses the transport effects of the proposed development of Begbroke Innovation District once it is fully occupied as well as the cumulative transport effects of the PR8 allocated site, the other PR sites adopted in the Partial Review Local Plan and other relevant committed development as agreed with OCC.

1.5.3 This TA sets out the strategies for walking, wheeling, cycling, public transport and private vehicles in order to deliver sustainable development. From a transport perspective, the key objective of the proposed development is to achieve a low car mode share, with a preference for sustainable modes of transport. This TA details how this objective will be met at the proposed development.

1.5.4 There are a number of transport related control documents that support the outline planning application, which are:

- Framework Site Wide Travel Plan;
- Framework Construction Traffic Management Plan; and
- Framework Delivery and Servicing Plan.

1.5.5 The transport control documents sit alongside the other control documents, which are the Development Specification, Parameter Plans and Strategic Design Guide. The control documents along with a Planning Permission and Section 106 Agreement, would establish a framework within which future Development Area Briefs and Reserved Matters Applications would be prepared.

1.5.6 In addition to this TA and the transport control documents, there is as a Transport and Access Chapter of the Environmental Statement (ES).

1.5.7 This TA should be read in conjunction with all other documents submitted in the outline planning application.

1.6 Scope of Report

1.6.1 This TA is based upon 'Planning Practice Guidance: Travel Plans, Transport Statements, and Statements in Decision-Taking', published by the Department for Transport (DfT) in 2014 and OCC's 'Transport for New Developments: Transport Assessments and Travel Plans' also published in 2014. The remainder of this TA is structured as follows:

- Section 2: Policy Context and Guidance;
- Section 3: Existing Transport Conditions;
- Section 4: Future Transport Conditions;

- Section 5: Development Proposals;
- Section 6: Sustainable Transport Strategy;
- Section 7: Trip Generation, Distribution and Mode Share;
- Section 8: Transport Effects;
- Section 9: Approach to Decide and Provide; and
- Section 10: Conclusions.

2 POLICY CONTEXT AND GUIDANCE

2.1 Introduction

2.1.1 This section of the TA summarises the relevant national and local policy in the context of the Site and the proposed development at Begbroke Innovation District. The following national and local policy documents are of relevance:

2.1.2 National:

- National Planning Policy Framework (NPPF) (2021);
- Planning Practice Guidance: Travel Plans, Transport Statements, and Statements in Decision-Taking (2014);
- Manual for Streets;
- Sport England: Active Design (2023); and
- Local Transport Note (LTN) 1/20 Cycle Infrastructure Design (2020).

2.1.3 Local:

- Cherwell Local Plan Part 1 (2015);
- Cherwell Local Plan Part 1 Partial Review (2020);
- Oxfordshire Local Transport and Connectivity Plan (2022);
- Central Oxfordshire Travel Plan (2023);
- Oxfordshire County Council New Street Design Guide (2021);
- Oxfordshire County Council Transport for New Developments: Transport Assessments and Travel Plans (2014); and
- Oxfordshire County Council Parking Standards for New Developments (2022).

2.2 National Policy and Guidance

National Planning Policy Framework (2021)

2.2.1 The revised National Planning Policy Framework (NPPF) came into force in July 2021 and sets out the Government's planning policies for England and how these are expected to be applied. Section 9 of the NPPF sets out the national policy on promoting sustainable transport.

2.2.2 Paragraph 104 states that "*transport issues should be considered from the earliest stages of plan-making and development proposals, so that:*

- *the potential impacts of development on transport networks can be addressed;*
- *opportunities from existing or proposed transport infrastructure, and changing transport technology and usage, are realised – for example in relation to the scale, location or density of development that can be accommodated;*
- *opportunities to promote walking, cycling and public transport use are identified and pursued;*

- *the environmental impacts of traffic and transport infrastructure can be identified, assessed, and taken into account – including appropriate opportunities for avoiding and mitigating any adverse effects, and for net environmental gains; and*
- *patterns of movement, streets, parking, and other transport considerations are integral to the design of schemes and contribute to making high quality places."*

2.2.3 Paragraph 110 states that within new development it should be ensured that:

- *"Appropriate opportunities to promote sustainable transport modes can be – or have been – taken up, given the type of development and its location;*
- *safe and suitable access to the site can be achieved for all users;*
- *the design of streets, parking areas, other transport elements and the content of associated standards reflects current national guidance, including the National Design Guide and the National Model Design Code; and*
- *any significant impacts from the development on the transport network (in terms of capacity and congestion), or on highway safety, can be cost effectively mitigated to an acceptable degree."*

2.2.4 Paragraph 111 goes on to state that:

- *"Development should only be prevented or refused on highways grounds if there would be an unacceptable impact on highway safety, or the residual cumulative impacts on the road network would be severe."*

2.2.5 Paragraph 112 sets out the priorities for developments from a transport perspective. Of note is the need to "*give priority first to pedestrian and cycle movements, both within the scheme and with neighbouring areas." It goes on to note the importance of creating places that are "safe, secure and attractive – which minimise the scope for conflicts between pedestrians, cyclists and vehicles, avoid unnecessary street clutter, and respond to local character and design standards*."

2.2.6 The approach taken to the development of the Transport Strategy for Begbroke Innovation District has demonstrably adopted a sustainable, hierarchical approach, with active travel and public transport modes being considered and planned for first, and given greater emphasis and priority in the design process than has been given to the private car. This assessment recognises that there will be a need for some car use, and, more particularly, that deliveries and service activities will need to be undertaken by road to achieve a sustainable development. Therefore, the residual effects of road-based movement activity have been assessed and their impacts considered and mitigated where appropriate in line with the approach set out in NPPF.

2.2.7 The cumulative residual highway impacts that have been shown to arise cannot be considered severe in the context that meaningful alternative modes have been incorporated into the development proposals. This means that these trips are not reliant on car based travel, and so user choices are both created and can be encouraged to avoid excessive demand on the highway network. In addition, where appropriate, mitigation measures have been defined that are capable of offsetting these impacts to levels that are below what may be considered severe.

Planning Practice Guidance: Travel Plans, Transport Statements, and Statements in Decision-Taking (2014)

2.2.8 Following the withdrawal in October 2014 of The Department for Transport (DfT) 'Guidance on Transport Assessment' (March 2007), the DfT published the Planning Practice Guidance (PPG) suite of guidance, which is continually being updated. This guidance is intended to assist all stakeholders in determining whether an assessment may be required and, if so, what level and scope that assessment should include.

2.2.9 The PPG provides guidance on:

- whether a Transport Assessment or Transport Statement is required;
- when a Travel Plan is required;
- establishing a scope for the Transport Assessment and Travel Plan; and
- what information is to be included in the Transport Assessment and Travel Plan.

2.2.10 The scale and nature of the proposals at Begbroke Innovation District mean that a Transport Assessment and Travel Plan are required to support the application, and this approach was recognised by the Partial Review Local Plan. The scope of the Transport Assessment, and other supporting transport documents, was informed by the PPG, but also supported by a process of liaison and agreement with the relevant authorities during the preparation of the application. The wider consultation process that was undertaken was also used to inform the content and approach to this Transport Assessment.

Manual for Streets

2.2.11 In 2007 the DfT published Manual for Streets (MfS), which provided guidance on the design, construction and maintenance of residential streets based on a detailed appraisal of operational factors and the findings of empirical research.

2.2.12 For the purpose of MfS, a street is defined as a place in its own right, which, although it may well contain a highway, has important public realm function beyond the pure movement of traffic. Most highways in built-up areas can be considered as streets.

2.2.13 MfS aims to assist in the creation of streets that:

- *"help to build and strengthen the communities they serve;*
- *meet the needs of all users, by embodying the principles of inclusive design;*
- *form part of a well-connected network;*
- *are attractive and have their own distinctive identity;*
- *are cost-effective to construct and maintain; and*
- *are safe."*

2.2.14 The illustrative masterplan and the Access and Movement Parameter Plan have been designed in accordance with principles set out in MfS. The detailed design of the streets within the proposed development will form part of future reserved matters applications, and the streets

will be designed in accordance with the MfS design guidance, taking account of other relevant design guidance set out in this Section.

2.2.15 It is also noted that MfS should be considered as a starting point for good design, and that the principles it espouses should not be applied blindly, but should be interpreted in the light of new innovations and technologies. As an example, MfS pre-dates the widespread adoption of "wheeling" modes of personal transport, and so does not address the requirements and interactions of these users with others who may legitimately use a street. However, the hierarchical, sustainable and safety conscious principles that it sets out can be easily applied to design solutions in the context of these, and other, more recent innovations.

2.2.16 In common with best practice in terms of place-making, the MfS principles also make clear that thought should be given to potential future changes and trends, and that it may well be sensible to incorporate and allow for these in the design of streets now. Therefore, at Begbroke Innovation District, it is intended that the detailed designs of streets, as they come forward as part of reserved matters applications, will give consideration to maintaining resilience in the transport network, as far as possible.

Sports England: Active Design

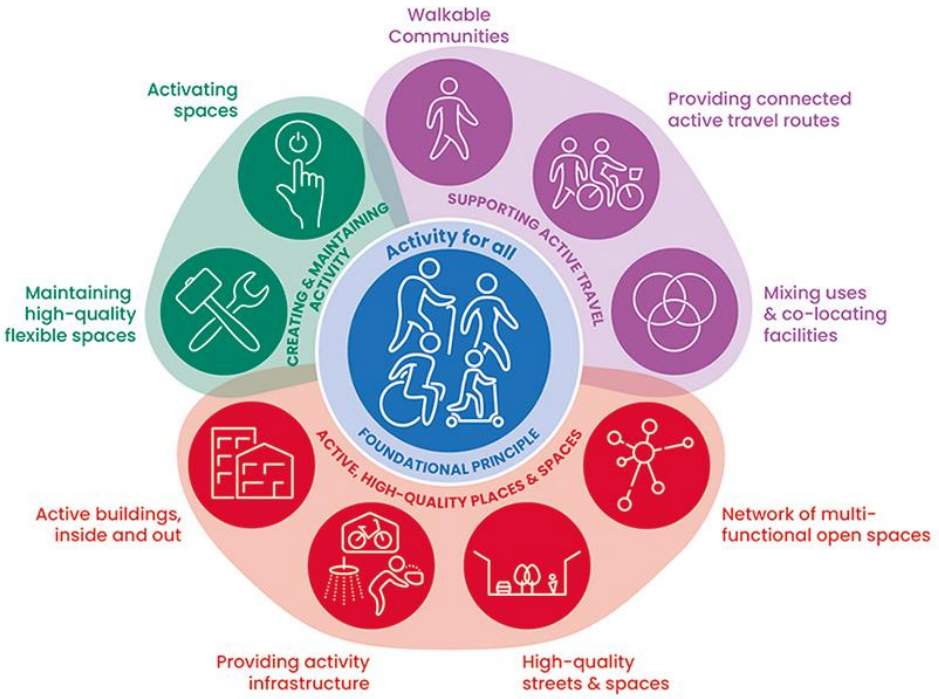
2.2.17 Active Travel England is the government's executive agency sponsored by the Department for Transport and responsible for making walking, wheeling and cycling the preferred choice for everyone to get around in England.

2.2.18 Active Travel England became a statutory consultee on the 1st June 2023 on all major planning applications that include 150 dwellings or more, building(s) (not exclusively residential) of 7,500 sqm internal floor space or more and sites where the overall development area is 5ha or more. Active Travel England will therefore be a statutory consultee for the outline application for Begbroke Innovation District.

2.2.19 Active Travel England will apply their latest 'Active Design' guidance (released by Sport England in May 2023, supported by Active Travel England and the Office for Health Improvements and Disparities) to consider developments that they are consulted on. The guidance provides a toolkit for developers, officers, and consultants to ensure that 'activity for all' is at the heart of new developments.

2.2.20 The guidance puts 'Activity for All' as the founding principle of good design, building upon this foundation with a further nine principles. **Figure 2.1** is an extract from the Active Design guidance and summarises the 10 active travel principles.

Figure 2.1: Active Travel England Design Principles



2.2.21 The application of these Active Design Principles at the Site will ensure that residents, employees and visitors will be able to lead healthier and more active lifestyles. Section 6 of this Transport Assessment summarises the overarching Transport Strategy for the proposed development and how it accords with the Active Design Principles.

Local Transport Note (LTN) 1/20 Cycle Infrastructure Design

2.2.22 LTN 1/20 'Cycle Infrastructure Design' was published by the Department for Transport in July 2020 and provides guidance to local authorities and developers on delivering high quality, cycle infrastructure including:

- planning for cycling;
- space for cycling within highways;
- transitions between carriageways, cycle lanes and cycle tracks;
- junctions and crossings;
- cycle parking and other equipment;
- planning and designing for commercial cycling;
- traffic signs and road markings; and
- construction and maintenance.

2.2.23 There are five core design principles which represent the essential requirements to achieve more people travelling by cycle or on foot, based on best practice both internationally and across the UK. Networks and routes should be Coherent; Direct; Safe; Comfortable and Attractive.

2.2.24 The illustrative masterplan has been designed in accordance with the core design principles set out in LTN1/20. The detailed design of the street design will form part of future reserved matters applications, and the cycle infrastructure will be designed in accordance with LTN1/20.

2.2.25 In addition, the government has more recently incorporated "wheeling"[5] into its active travel guidance, with measures contained in the 'Second Cycling and Walking Investment Strategy'[6] that make clear that other forms of personal mobility will be considered legitimate as part of active travel proposals. Therefore, these modes will also be considered, within the broad principles set out by LTN1/20 in respect of wheeling.

2.3 Local Policy and Guidance

Cherwell Local Plan 2011-2031 (Part 1) Partial Review (2020)

2.3.1 The Partial Review Local Plan forms an addendum to the Cherwell Local Plan 2011-2031 (adopted 2015) and provides a vision, objectives, and specific policies for delivering additional development to help meet Oxford's housing needs.

2.3.2 The Partial Review Local Plan has been prepared to meet a commitment Cherwell made to neighbour councils to provide a share of Oxford City's unmet housing needs by 2031 as Oxford City cannot fulfil these needs itself. Oxford City requires an additional 28,000 homes to be built between 2011-2031. In 2016, the Oxfordshire Growth Board decided on an apportionment of 14,850 homes to the district and city councils. Cherwell District was asked to consider the accommodation of 4,400 homes in addition to its existing Local Plan commitments (22,840 homes).

2.3.3 The Partial Review Local Plan seeks to ensure that developments proposed because of these needs are:

"Well connected to Oxford and supports the city's economy, universities, and its local employment base. In addition, growth must ensure that people have convenient, affordable, and sustainable travel opportunities to the city's places of work and to its services and facilities"

2.3.4 The Partial Review Local Plan allocated a number of sites, referred to as the Partial Review (PR) sites. The Site forms part of the PR8 site, which is the largest of the allocated sites. **Table 2.1** summarises the number of dwellings each of the PR sites was allocated for.

[5] Wheeling includes people who use wheelchairs and mobility scooters who may not identify with walking

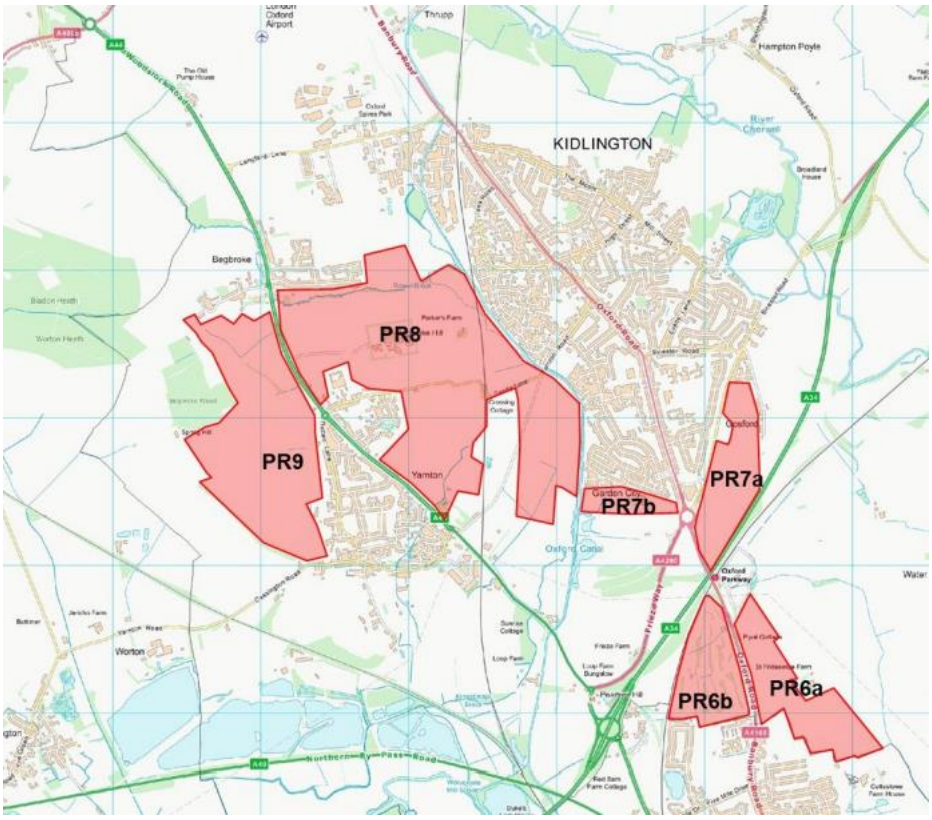
[6] Second Cycling and Walking Investment Strategy, DfT and Active Travel England, July 2022 and updated March 2023 (https://www.gov.uk/government/publications/the-second-cycling-and-walking-investment-strategy/the-second-cycling-and-walking-investment-strategy-cwis2)

Table 2.1: Allocated housing schedule for PR sites

Area	Allocated site	Number of dwellings
North Oxford	PR6a	680
	PR6b	670
	PR6c	Reserved for replacement golf course
Kidlington	PR7a	430
	PR7b	120
Begbroke/Yarnton	PR8	1,950
Yarnton	PR9	540
Total		**4,400**

2.3.5 **Figure 2.2** illustrates the location of the PR sites.

Figure 2.2: Location of Allocated PR Sites



2.3.6 From a transport perspective, the Partial Review Local Plan has nine measures that seek to respond to transport issues in the area (paragraph 5.61). These are listed below:

- *"Integrating the County Council's sustainable transport proposals into the planning of new development.*

- *Assisting with the implementation of Rapid Transit proposals and the delivery of new infrastructure and facilities for cycling, walking and wheelchair users.*
- *Reducing traffic impacts, including on air quality.*
- *Improving priority for pedestrians, cyclists, and wheelchair users.*
- *Helping improve connectivity between Kidlington, existing employment areas, Begbroke and Yarnton.*
- *Helping to achieve improvements to the routeing of traffic and traffic management.*
- *Improving the quality and usability of connections to Oxford.*
- *Planning for a more integrated network for pedestrian, cyclists, and wheelchair users.*
- *Helping to deliver sustainable transport improvements through the centre of Kidlington in a way that will achieve improvements to central Kidlington and the public realm."*

2.3.7 Notable in the above is the need to improve connectivity between Kidlington, existing employment areas, Begbroke and Yarnton. The development proposals for the Begbroke Innovation District seek to achieve this through a network of high-quality walk, wheeling and cycle routes through the Site.

2.3.8 The Site forms part of the land allocated under Policy PR8 of the Partial Review Local Plan. Paragraph 5.110 of the Partial Review Local Plan states that in the location of the PR8 site "*there are the 'ingredients' for a contemporary, higher density, environmentally responsible, landmark development which marks a new approach along the A44 to Oxford and which becomes the connecting centre piece of the Partial Review's vision for the area.*"

2.3.9 Amongst other important components, the Partial Review Local Plan considers that the PR8 allocation should be accompanied by fully integrated sustainable transport infrastructure and services. It must represent the "*best fit with the County Council's Oxford Transport Strategy, its proposal for rapid transit into Oxford, which contributes to achieving an overall modal shift in the proportion of commuters accessing Oxford by public transport rather than by car, in the delivery of cycling improvements along the A44 and in improving sustainable transport connections between Kidlington, Begbroke and Yarnton.*"

2.3.10 In summary, the PR8 allocation is expected to deliver 'a new urban neighbourhood on 190 hectares (ha) of land inclusive of the following:

- 1,950 dwellings (net) with 50% affordable housing;
- Reservation of 14.7 hectares of land for the potential expansion of Begbroke Science Park
- A secondary school with a four court sports hall available to the public;
- A 3-form entry primary school;
- A 2-form entry primary school, if required by the Education Authority;
- A local centre with between 350-500 sqm A1 retail, ancillary business development and/or financial and professional uses, a café or restaurant, and community building;
- Formal sports and play areas, nature conservation area and public open green space;
- Two points of vehicular access from the A44, including the use of the existing Science Park access road;

- Use of Sandy Lane as a 'green' pedestrian, cycle, and wheelchair route between the development and the built up area of Kidlington including the incorporation of a bridge or subway;
- Provision for a pedestrian, cycle, and wheelchair bridge across the Oxford Canal to facilitate connections to the allocated site at Stratfield Farm (Policy PR7b); and
- The reservation of 0.5 ha of land for a future railway halt/station.

2.3.11 Appendix 4 of the Partial Review Local Plan identifies infrastructure schemes that are intended to support the sustainable development of the PR sites.

2.3.12 Of relevance within the original Local Plan adopted in 2015 is Policy SLE4, which highlights the need for *'Improved Transport and Connections'*:

"The Council will support the implementation of the proposals in the Movement Strategies and the Local Transport Plan to deliver key connections, to support modal shift and to support more sustainable locations for employment and housing growth.

[…] All development where reasonable to do so, should facilitate the use of sustainable modes of transport to make the fullest possible use of public transport, walking and cycling. Encouragement will be given to solutions which support reductions in greenhouse gas emissions and reduce congestion. Development which is not suitable for the roads that serve the development and which have a severe traffic impact will not be supported."

Oxfordshire Local Transport and Connectivity Plan (2022)

2.3.13 OCC adopted the Local Transport and Connectivity Plan (LTCP) in July 2022, which is the fifth Local Transport Plan and outlines the long-term vision for transport in Oxfordshire up to 2050 and the polices required to deliver this.

2.3.14 The LTCP vision is to deliver a zero-carbon transport system in Oxfordshire that enables the county to thrive whilst protecting the environment and making it a better place to live for residents. The LTCP summarises the vision as:

"Our Local Transport Plan Vision is for a zero-carbon Oxfordshire transport system that enables all parts of the county to thrive. Our transport system will enable the county to be one of the world's leading innovation economies, whilst supporting clean growth, tackling inequality, and protecting our natural and historic environment. It will also be better for health, wellbeing, social inclusivity, and education. Our plan sets out to achieve this by reducing the need to travel and discouraging unnecessary individual private vehicle use through making walking, cycling, public and shared transport the natural first choice."

2.3.15 The Council plans to achieve this vision by reducing the need to travel, discouraging unnecessary individual private vehicle journeys, while making walking, cycling, public and shared transport the natural first choice for transport.

2.3.16 Three key headline targets have been set in the Oxfordshire LTCP to assist in the achievement of this vision, all containing equal weight. These are listed below:

- By 2030: Replace or remove 1 out of every 4 current car trips in Oxfordshire.
- By 2040: Deliver a zero-carbon transport network. Replace or remove one out of every three current car trips in Oxfordshire.
- By 2050: Deliver a transport network that contributes to a climate positive future.

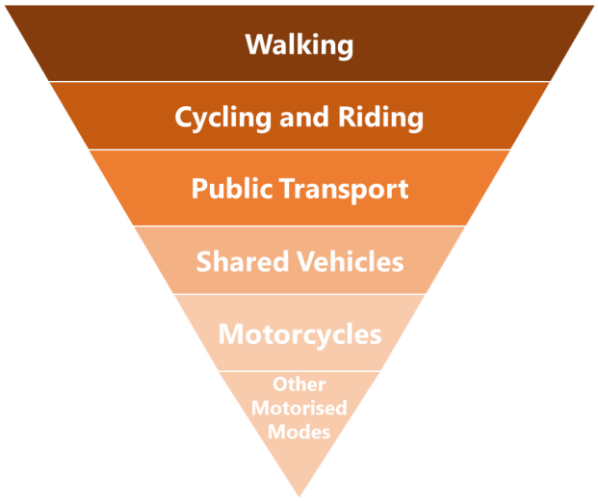
2.3.17 OCC aims to achieve the transport targets by the following measures:

- Promoting waking and cycling through new and upgraded physical infrastructure and community activation measures;
- Investment in strategic public transport networks and the provision of better and quicker bus and rail services;
- Improving multi-modal travel, including the development of mobility hubs where people can easily change between different forms of transport, so that a longer trip is not made by car;
- Improving road safety to create safe and attractive infrastructure for vulnerable road users, including people walking and cycling;
- Improving digital connectivity to support remote working and digital access to services; and
- Supporting transport innovations that will help us make walking, cycling, public and shared transport more attractive.

2.3.18 The LTCP also provides a number of transport related policies that will help deliver the Council's vision and respective targets. The key policies relevant to the proposed development are summarised below:

- Policy 1: Develop, assess, and prioritise transport schemes and policies according to the following transport user hierarchy shown in **Figure 2.3**

Figure 2.3: LTCP Transport User Hierarchy



- Policy 2: Develop comprehensive walking and cycling networks that are inclusive and attractive to the preferences and abilities of all residents in all towns and ensure all new developments have safe and attractive walking and cycling connections.
- Policy 5: Protect and enhance PROWs.
- Policy 8: Embed the Healthy Streets Approach to encourage walking and cycling.
- Policy 10: Support the creation of safe streets through traffic measures and encourage the use of filtered permeability in new developments to create safe and strategic walking and cycling routes.
- Policy 11: Work with schools to encourage walking and cycling.
- Policy 13: Support the application of the 20-minute neighbourhood concept to create walkable and vibrant neighbourhoods.
- Policy 15: Adopt a zero vision approach, which aims to eliminate all fatalities and severe injuries on Oxfordshire's roads and streets.
- Policy 16: Promote 20mph zones within the County.
- Policy 18: Improve the bus network within Oxfordshire and seek to make bus the natural first choice, giving it priority over the private car.
- Policy 21: Develop a detailed rail strategy that identifies potential future rail projects and opportunities.
- Policy 23: Support the development of mobility hubs in order to improve interchange opportunities, connectivity, and accessibility.
- Policy 24: Promote fibre broadband connectivity for all new residential developments to increase the ability to work from home, and support the creation of Local Community Hubs, thus reducing the need to travel.
- Policy 29: Ensure that all new development have appropriate and future proofed provision for EV charging infrastructure.
- Policy 31: Undertake network management, utilising emerging technologies, to maximise the ability to tackle congestion issues in the County.
- Policy 33: Ensure parking requirements for all modes of transport are considered, in line with the transport user hierarchy (Policy 1), taking measures to reduce and restrict car parking availability.
- Policy 36: Adopt a Decide and Provide approach to manage and develop the country's road network in the assessment of development proposals, and in planning policy development to support a site assessment.
- Policy 38: Manage, support, and monitor the use of micro mobility (e-scooters) to further complement Oxfordshire's active travel network.
- Policy 39: Support the delivery of zero emission shared cars and car clubs to reduce the dominance of private cars.
- Policy 40: Seek to ensure new infrastructure is future-proofed for use by connected and autonomous vehicles.

2.3.19 The Transport Strategy for Begbroke Innovation District has been developed with each of these elements in mind, with specific measures and facilities that respond directly to these policy objectives where it is appropriate for the development to provide them. Some of the requirements will form the design requirements for more detailed reserved matters applications

in due course (for example, the requirement for 20mph zones and provision for micro-mobility), whilst others are part of the over-arching proposals set out as part of the Transport Strategy and therefore incorporated as measures within this assessment (for example, the transport user hierarchy and support for mobility hubs).

Oxfordshire County Council Decide and Provide Guidance

2.3.20 In September 2022, OCC adopted the guidance on 'Implementing Decide and Provide: Requirements for Transport Assessments.'

2.3.21 As set out in Policy 36 of the LTCP, another significant element of realising these aims will be to make the shift from an approach to transport planning characterised as 'predict and provide' towards adopting a 'decide and provide' approach instead.

2.3.22 The Decide and Provide guidance details how the 'decide and provide' approach is to be implemented through the transport assessments (or transport statements) and infrastructure delivery mechanisms which accompany planning applications for proposed development.

2.3.23 The guidance is set out in three main parts:

- the guiding principles that underpin the decide and provide approach;
- how potential traffic impacts are to be modelled and how trip rates should be appropriately evidenced; and
- the process for implementing the decide and provide approach through transport assessments by modelling a range of plausible scenarios and monitoring and managing outcomes.

2.3.24 This TA has been prepared in accordance with the Decide and Provide guidance and the approach to Decide and Provide is set out in Section 9, and this has been undertaken in liaison with the highway authority as part of the scoping process.

Oxfordshire County Council New Street Design Guide (2021)

2.3.25 OCC adopted the 'Oxfordshire Street Design Guide' in September 2021. The guide aims to create:

"A place where streets, through integrated quality and design, lead to a greater economic and social wellbeing and improved health for its residents, creating an environment for health lifestyles, sustainable travel and a zero-carbon economy."

2.3.26 These standards have been prepared to ensure that new streets function in a practical and safe manner, while looking forwards to a future where the allocation of street space is reprioritised, and car ownership is reduced due to modal shift. In practical terms, the design guide needs to be applied in a way that builds on the idea of the "street as a place" that was initially explored in MfS. In this context, the relatively prescriptive criteria for hierarchies of streets may, in practice, need to be taken on a case-by-case basis to ensure that place-making as well as simply movement corridor demands are properly taken into account.

2.3.27 Creating high-quality streets and environment is dependent on meeting the following objectives:

- Prioritise sustainable and active travel to help reduce congestion - Design streets and places in a way that reduces car use while promoting sustainable active travel modes to help combat the climate emergency. This means creating streets that are linked, well connected, safe and attractive for walking and cycling;
- Provide a clear and permeable hierarchy of streets, routes and spaces which are inclusive and create safe and convenient ease of movement by all users;
- Ensure local services and facilities beyond the development are easily accessible by sustainable and active modes of travel;
- Built to last and to meet the County Council's maintenance needs;
- Understands and addresses the needs of all potential users to ensure inclusive design;
- Ensures a sufficient level of well-integrated and imaginative solutions for car and bicycle parking and external storage including bins;
- Take into account all relevant County Council/District Council Design Guides - including County Council School Design and Process documents in a holistic manner, ensuring streets are designed through multidisciplinary collaboration; and
- Be informed by a contextual analysis of the area.

2.3.28 The Oxford Street Design Guide also places a focus upon the creation of 'filtered permeability' using the user hierarchy guide, stating that:

"Walking and cycling routes must be direct, convenient, and well designed. When designing new developments, establishing the movement framework using the above user hierarchy will show the opportunities to create modal filters throughout the development"

2.3.29 Section 2 of the document examines general streetscape parameters categorised by different route types.

2.3.30 General design principles of Primary Streets include:

- 5.5m wide roads;
- 2m wide footways;
- Direct residential access permissible in both forward and reverse gear;
- Parallel on street parking bays where no driveways present with 0.5m buffer to protect cyclists;
- 2m cycle lane on the footway side of the on-street parking to avoid conflicts;
- Raised table or surface change to announce side road junction (at-grade for bus routes);
- Horizontal changes of direction to provide landscaping, parking, and traffic speed reduction opportunities; and
- Access to side roads: reduce junction geometry to a tracked minimum to help reduce vehicle speeds and provide better pedestrian environment.

2.3.31 Following from this, general design principles of Secondary Streets include:

- Appropriate carriageway width (approx. 5m);
- 2m wide footways;
- Pedestrian priority over minor junction;
- Wider carriageway at access point when directly off a primary routes;
- Direct residential access permissible;
- Informal planting to create horizontal deviation;
- Potential for surface changes of raised table treatment with side junctions;
- Private perpendicular parking permissible; and
- Verge or adopted visitor parking.

2.3.32 Oxford Street Design Guide section 3.1 states the need for high quality infrastructure for cycling, predominantly based upon LTN 1/20 (DfT, 2020). It is a requirement that all new development must be designed in line with LTN 1/20, where special attention should be given to cycle infrastructure set out in table 4.1 and 5.2 of LTN 1/20.

2.3.33 The Oxford Street Design Guide states that cycle parking provision, along with the quality and type, should be considered at the start of the development, in order to assist in the promotion of cycling as an active travel mode. Reference should be made to OCC's 'Cycling Design Standards' and Chapter 11 of LTN 1/20 (DfT, 2020) when considering cycle parking provision.

2.3.34 The Oxford Street Design Guide provides guidance on car parking provision for new developments, exploring which style of parking provides the most suitable provision ensuring the maximum benefits. This includes:

- On-plot;
- Rear Parking Court;
- On street; and
- Frontage parking.

2.3.35 The guide also considers school drop off areas, including what measures can be taken to provide the highest levels of convenience and safety. A key message from the guidance is that at the early stage of the planning process, it is encouraged that schools should be placed close to other amenities (e.g., sports centres, community centres etc). This makes it possible to share parking spaces for a brief period of time. Only if this is not feasible should dedicated drop off places be considered.

2.3.36 Regarding electric vehicle (EV) parking provision, The UK Government's 'Road to Zero Strategy' restricts the sale of fossil-fuelled cars from 2030 with all new cars and vans being fully zero emission from 2035 i.e., no plug-in hybrid electric vehicles (using batteries and diesel or petrol). Current predictions by OCC are that at least 1 in 5 cars on Oxfordshire's roads will be fully electric by 2030.

2.3.37 The Oxfordshire Street Design Guide includes requirements related to Electric Vehicle (EV) charging in section 3.2:

- All houses with on-plot parking should have a dedicated EV charging point;

- A minimum of 25% of unallocated spaces should be equipped with EV charging;
- A minimum of 25% of non-residential parking spaces should be equipped with EV charging;
- Smart chargers should be used (minimum 7kWh AC);
- Fast charging points recommended for most applications, with rapid only appropriate in some specific situations (e.g., some higher density housing, workplaces and for commercial vehicles); and
- EV provision should be accommodated at transport hubs, such as Park and Ride sites.

2.3.38 Further to this guidance, OCC has prepared the 'Oxfordshire Electric Vehicle Infrastructure Strategy' (OxEVIS), which sets out the policies and plans to realise OCC's vision for EV charging between now and 2040. This focusses more on public EV charging infrastructure to ensure that the changing needs of Oxfordshire are met more broadly across the County.

Oxfordshire County Council Transport for New Development: Transport Assessments and Travel Plans (2014)

2.3.39 OCC's Transport for New Development: Transport Assessments and Travel Plan sets out the thresholds for Transport Statements, Transport Assessments and Travel Plans and the scope of these planning documents. Appendix 1 of the guidance sets out the thresholds and based on this a Transport Assessment and Travel Plan is required to support the outline planning application for the Site.

Oxfordshire County Council Parking Standards for New Developments (2022)

2.3.40 OCC's 'Parking Standards for New Developments' was adopted in November 2022. This document replaces OCC's previous parking guidance 'Transport for New Developments Parking Standards for New Residential Developments' (2011), the Second Edition of OCC's Residential Road Design Guide (2015) and paragraph 2.4.1 of the Oxfordshire Cycling Design Standards (2017).

2.3.41 The parking standards within the adopted guidance should be used alongside OCC's Street Design Guide and secure by design provisions. The recently adopted parking standards seek to reduce the parking provision within new developments compared to the previous standards as the County Council considers that the mode of transportation people choose for their journeys is significantly influenced by the availability of parking, both at the source and the destination. It is important to strike the right balance between ensuring highway safety for all users, promoting active and sustainable transportation choices, and offering an appropriate volume and type of parking.

2.3.42 Paragraph 6.0 of the Revised 'Parking Standards for New Developments' outlines the residential car parking standards for Edge of Oxford City sites. These are sites that Local Plans will support in meeting Oxford's unmet housing needs. The relevant adopted parking standards for Edge of Oxford City site are summarised in **Table 2.2**.

Table 2.2: Edge of Oxford City Sites Car Parking Standards

Land Use		Maximum Parking Standard
Residential	1-2 bedroom dwelling	1 space per dwelling to be provided within the development site
	3 bedroom dwelling	Up to 2 spaces per dwelling to be provided within the development site
	4+ bedroom dwelling	2 spaces per dwelling to be provided within the development site
	Wheelchair accessible or adaptable houses and flats	1 space per dwelling to be provided within the curtilage of the dwelling (must be designed in accordance with Part M of Building Regulations
	Student accommodation	0 spaces per resident room. Operational parking and disabled parking to be considered on a case-
Use E – Commercial, business and services	Office, research and development and light industrial process	1 space per 45 sqm
	Food and drink (mainly in premises) i.e. restaurants and cafes	1 space per 10 sqm of public floor area
	Shops and retail	1 space per 30 sqm
Use F1 – Learning and non-residential institutions	Assembly and Leisure (indoor sport, recreation or fitness, gyms)	1 space per 30 sqm of public floor area
Use F2 – Local community	Shop no larger than 280 sqm (selling mostly essential foods and at least 1km from another similar shop), community hall, outdoor sport/recreation area, indoor or outdoor swimming pool, skating rink	1 space per 30 sqm

2.3.43 As part of the revised parking standards, all houses (including flats/apartments) should be provided with 1 electric vehicle (EV) charging point. Off-plot residential car parking provisions is to be provided with at least 25% active charging points for all parking spaces. Such infrastructure is to be provided in accordance with the Autonomous and Electric Vehicles Act (2018), Building Regulations Document S, and the government's ambitions on 'Smart EV Charging'.

2.3.44 'Active' charging points for electric vehicles for new non-residential development proposals are to be provided at a minimum level of 25% for all parking spaces with ducting provided at all remaining spaces to 'future proof' such spaces to be upgraded in the future.

2.3.45 In terms of visitor parking, developers are expected to take an approach that is consistent with national research which suggests, "that no special provision should be made for visitors where at least half of the parking provision associated with the development is unallocated. In other circumstances it may be appropriate to allow for additional demand for visitor parking of 0.2 spaces per dwelling" (DCL, 2007, Residential Car Parking Research). For some residential developments this approach may not necessarily be feasible. If this is the case, a maximum visitor parking level of 1 car parking space per every 5 residential units will be considered.

2.3.46 All development proposals will be expected to promote inclusive cycling, provision for cycles for disabled people and other needs (such as tricycles, cargo bikes, tandems, mobility scooters and adapted bicycles). Double decked or vertical cycle parking should not be used unless agreed by OCC in specific circumstances.

2.3.47 Parking facilities are required to be provided in accordance with LTN 1/20 standards. The minimum cycle parking standards are summarised in **Table 2.3** below.

Table 2.3: Minimum Cycle Parking Standards

Land Use		Minimum Cycle Parking Standard
Residential	All except sheltered/elderly housing or nursing homes	1 space per bedroom*
Use E – Commercial, business and services	Office, research and development and light industrial process	1 space per 100 sqm for staff and 1 space per 250 sqm for visitors
	Food and drink (mainly in premises) i.e. restaurants and cafes	1 space per 4 staff and 1 space per 25sqm for customers.
	Shops and retail	1 space per 50sqm for staff and 1 space per 50sqm for customers.
	Assembly and Leisure (indoor sport, recreation or fitness, gyms)	1 space 50 sqm or 1 per 30 seats capacity. Plus 1 space 5 per employees.
Use F1 – Learning and non-residential institutions	Education, gallery, museum, public library, public exhibition hall, place of worship, law courts	Staff provision 1 space per 20 staff. Student provision 1 space per 10 students.
Use F2 – Local community	Shop no larger than 280 sqm (selling mostly essential foods and at least 1km from another similar shop), community hall, outdoor sport/recreation area, indoor or outdoor swimming pool, skating rink	1 space per 50 sqm for staff and 1 space per 50 sqm for customers

*Based on LTN 1/20 Table 11-1

3 EXISTING TRANSPORT CONDITIONS

3.1 Introduction

3.1.1 In order to consider the implications of development in transport terms, it is important to consider the status of existing transport networks. The proposed development in combination with the other PR sites will fund improvements to transport networks, which will result in a step change in transport provision to the north of Oxford and this will be captured in other sections of this TA. The existing transport networks that are currently in place provide the 'building blocks' for any future transport strategy and are summarised in this section.

3.2 Walk and Cycle Networks

Walking Network

3.2.1 Footways are provided along the radial routes of the A44 and A4260, which connect Oxford with Woodstock and Kidlington, respectively. Along most of their length, these pedestrian routes benefit from verge separation from the adjacent carriageway, making them more comfortable for users. However, the route surfaces and widths are of a relatively poor standard and do not comply with the latest design standards.

3.2.2 No pedestrian facilities are provided along Sandy Lane, which takes the form of a narrow single carriageway road with a barrier-controlled level crossing. Begbroke Hill connects the A44 with the existing Begbroke Science Park and accommodates a shared footway/cycleway along its northern edge.

3.2.3 Limited formal east-west crossing opportunities are provided for pedestrians across the A44, which therefore creates a barrier to pedestrian permeability between the Site and origins/destinations further west. The following signal controlled and uncontrolled crossings are provided across the A44 corridor in the vicinity of the Site:

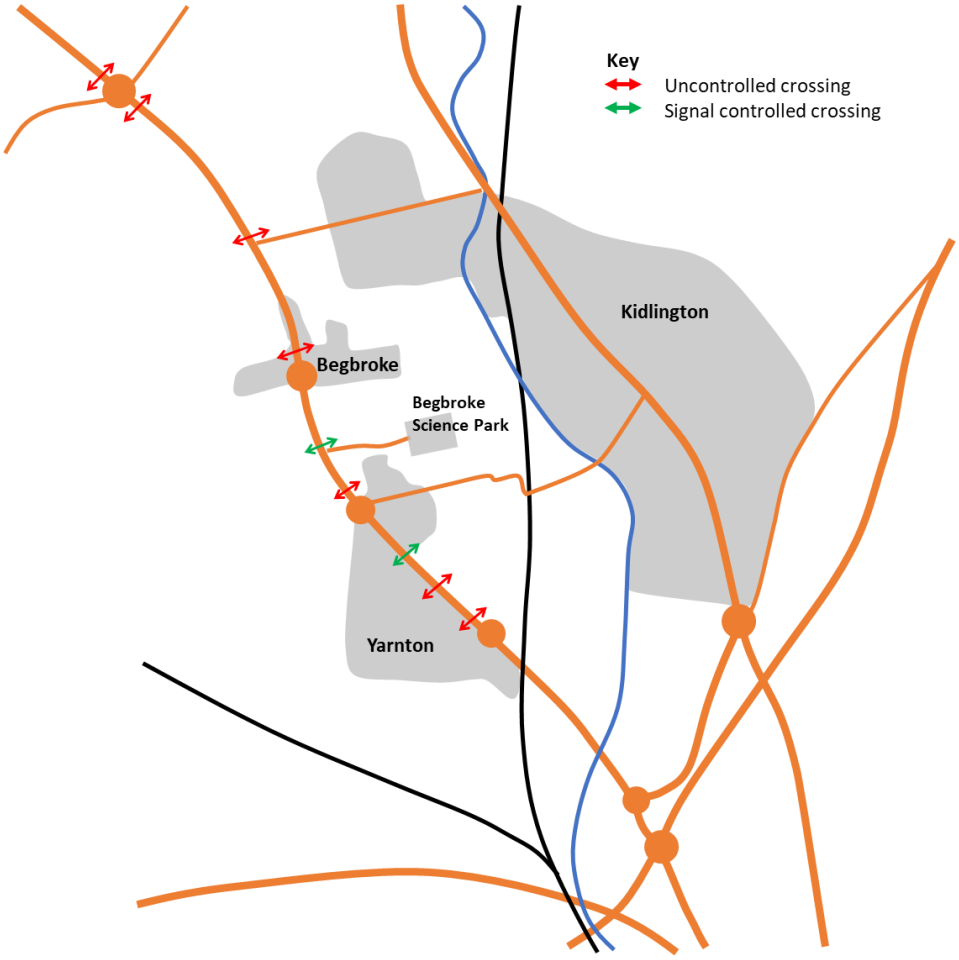
- Bladon roundabout: Uncontrolled pedestrian crossing points are provided across all arms of the Bladon roundabout at the junction of A44/A4095/Grove Road. The western and northern uncontrolled crossing points have recently been upgraded to include new surfacing and tactile paving.
- A44/Langford Lane: Uncontrolled pedestrian crossing points are provided across the northern and eastern arm of the three-arm signal-controlled junction. Pedestrians are required to cross the A44 in three movements (i.e. northbound carriageway, southbound carriageway and left turn filter lane). Dropped kerbs are provided at the crossings but with no tactile paving.
- A44/Spring Hill Road roundabout: Uncontrolled pedestrian crossing across the northern arm of the roundabout, which connects the eastern and western parts of Begbroke village to each other as well as providing a connection to the set of bus stops that serve the village. Dropped kerbs are provided at the crossings but with no tactile paving.

Pedestrians are required to cross both the A44 carriageway and the service road that runs parallel to the A44.

- A44/Begbroke Science Park: Staggered signalised pedestrian crossing facilities are provided across the A44 northern arm and Begbroke Science Park arm of the three-arm signalised junction. Dropped kerbs and tactile paving is provided on all crossing points of the junction.
- A44/Sandy Lane/Rutten Lane roundabout: Uncontrolled pedestrian crossing across the northern arm of the roundabout to enable pedestrians to access the set of bus stops on the A44 just to the north of Sandy Lane. Dropped kerbs are provided at the crossing but with no tactile paving. Pedestrians are required to cross both the A44 carriageway and the service road that runs parallel to the A44.
- A44/Gravel Pits Lane: A staggered signal-controlled pedestrian crossing is provided across the A44 connecting the east and west of Yarnton. The pedestrian crossing is in the vicinity of Gravel Pit Lane. Dropped kerbs and tactile paving are provided.
- A44/ BP and Shell Garages: Uncontrolled pedestrian crossing across the A44 mid-way between Sandy Lane and Cassington Road roundabouts to provide access between the BP and Shell garages, which also include a Spar and Budgens convenience shop. The crossing is of a poor quality and is sub-standard in all respects.
- A44/Cassington Road roundabout: Uncontrolled pedestrian crossing across the northern arm of the roundabout of A44/Cassington Road. Dropped kerbs are provided at the crossing but with no tactile paving.

3.2.4 **Figure 3.1** overleaf summarises the existing uncontrolled and signal-controlled crossings across the A44. There are currently only two signal-controlled crossing points across the A44 between Bladon roundabout and Pear Tree Interchange.

Figure 3.1: Location of existing pedestrian crossings along the A44 corridor



3.2.5 **Figure 3.2** illustrates the condition of the existing pedestrian crossing facilities along the A44 corridor based.

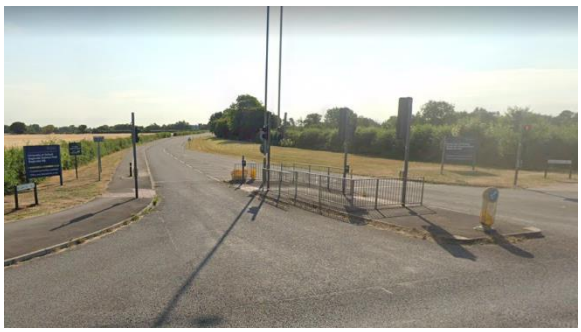
Figure 3.2: Existing pedestrian crossing facilities along the A44 corridor

Bladon roundabout (A44/A4095)

A44 / Langford Lane

A44/ Spring Hill Road, Begbroke

Begbroke Science Park



A44/Sandy Lane/Rutten Lane

A44/ Gravel Pit Lane

A44/ BP and Shell Garage

A44/ Cassington Road roundabout

Cycle Network

3.2.6 Within the vicinity of the Site, the A44 forms part of National Cycle Route (NCR) 5; a long-distance route that begins in Reading and follows the northern half of the Thames Valley cycle route as it crosses the Chiltern Hills on the way to Oxford and further west. Along the A44, NCR 5 accommodates traffic-free sections in both directions with shorter intervals of on-road route sections. Notwithstanding this, the traffic free sections are not currently in accordance with latest standards set out in LTN1/20 'Cycle Infrastructure Design'.

3.2.7 NCR 51 is another long-distance cycling route that begins in Oxford and routes to Bicester, Milton Keynes, and Bedford. Within the vicinity of the Site it routes along Kidlington High Street, through residential streets to the west of A4260 before joining the A4260 and routing through Kidlington roundabout and along Oxford Road. It bypasses Cutteslowe roundabout and routes

across a pedestrian/cycle bridge over the A40 and then through residential streets in Sunnymead and Summertown to access Oxford city centre, where the route terminates.

3.2.8 To the north corner of the Site, Begbroke Lane is a designated byway that can be used by cyclists, and this connects NCR 5 with NCR 51. **Figure 3.3** shows the national cycle network in the vicinity of the Site.

Figure 3.3: National Cycle Routes in vicinity of the Site

3.2.9 Along the eastern boundary of the Site, a canal towpath forms part of the 'Green Belt Way'; a 50 miles circular route through the Oxford green belt. The towpath is managed by the Canal and River Trust.

3.2.10 The Canal and River Trust guidance on cycling on towpaths[7] states that the majority of their tow paths are permissive paths rather than public rights of way (PRoW) and that cycling is permitted provided that care is taken for pedestrians, wildlife and the waterways.

3.2.11 The towpath along the Oxford Canal has been upgraded in phases. The first phase of the upgrade was undertaken in 2014 between Isis Lock by Rewley Road in Oxford city centre to Aristotle Lane. The Canal and River Trust in partnership with OCC has recently upgraded the section of towpath from Aristotle Lane to just north of A44. The Canal and River Trust plans to undertake further upgrades of the towpath in the vicinity of the Site.

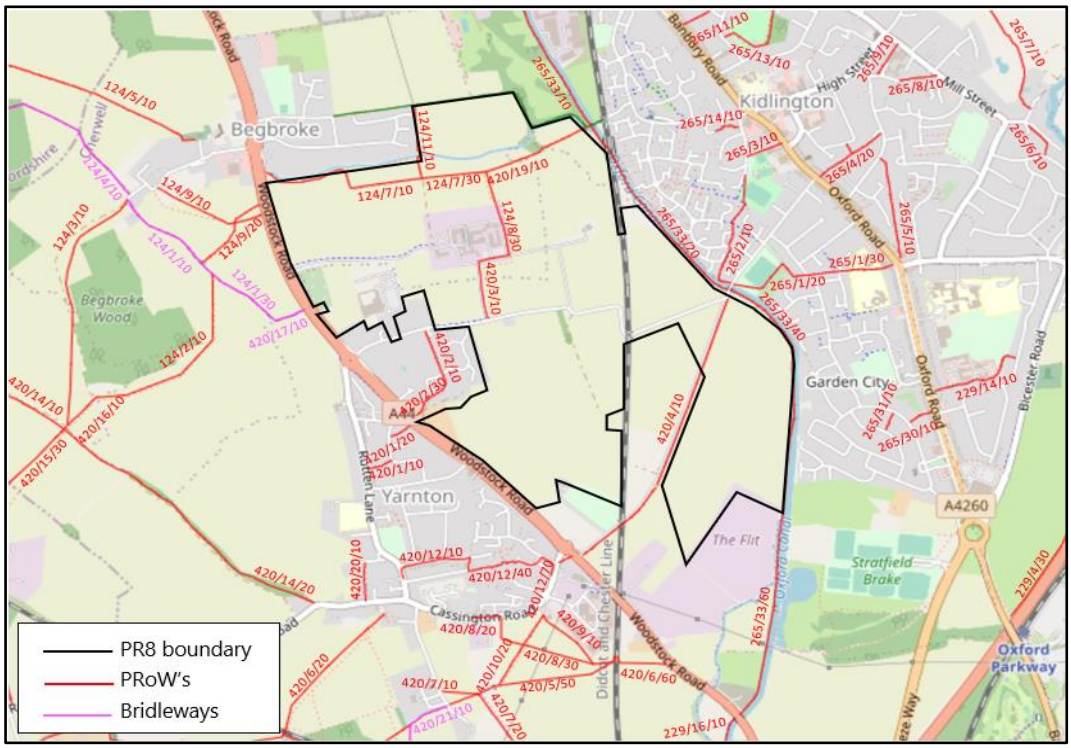
[7] https://canalrivertrust.org.uk/enjoy-the-waterways/cycling/cycling-faqs#:~:text=Is%20the%20towpath%20a%20public,to%20carry%20out%20maintenance%20work.

3.3 Public Rights of Way

3.3.1 A series of PRoW are provided within the Site. Immediately east of the existing Begbroke Science Park a public footpath follows a north-south orientation and connects Sandy Lane to the south with Rowel Brook to the north. Further public footpaths follow the general east-west alignment of Rowel Brook, in addition to crossing Rowel Brook and providing an onwards connection to Begbroke Lane, which is designated as a restricted byway.

3.3.2 Additional PRoWs are provided along Yarnton Lane to the south of the Site between the A44 and the canal towpath, through the village of Yarnton, and around the perimeter of Begbroke Wood to the west. The existing PROWs are illustrated in **Figure 3.4**.

Figure 3.4: Existing Public Right of Way Network



3.3.3 In conjunction with the existing walking and cycle network, the existing PRoWs provide connectivity to Begbroke, Yarnton and Kidlington as well as to the wider area.

3.4 Existing Walking and Cycling Catchments

Existing Walking Catchments

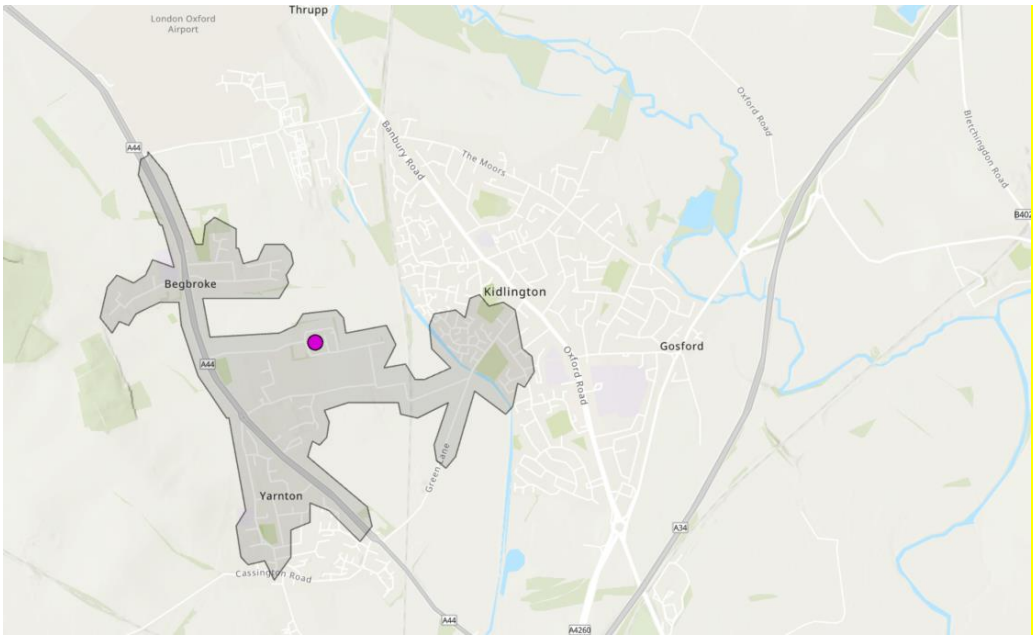
3.4.1 NPPF does not provide any specific guidance on walking distances. Manual for Streets (MfS) states that:

"Walkable neighbourhoods are typically characterised by having a range of facilities within 10 minutes' (up to about 800 m) walking distance of residential areas which residents may access comfortably on foot. However, this is not an upper limit and PPG13 states that walking offers the

greatest potential to replace short car trips, particularly those under 2 km." It should be noted that PPG13 is no longer current guidance and was replaced by the NPPF. However, this is still considered to be valid criteria for walking distances.

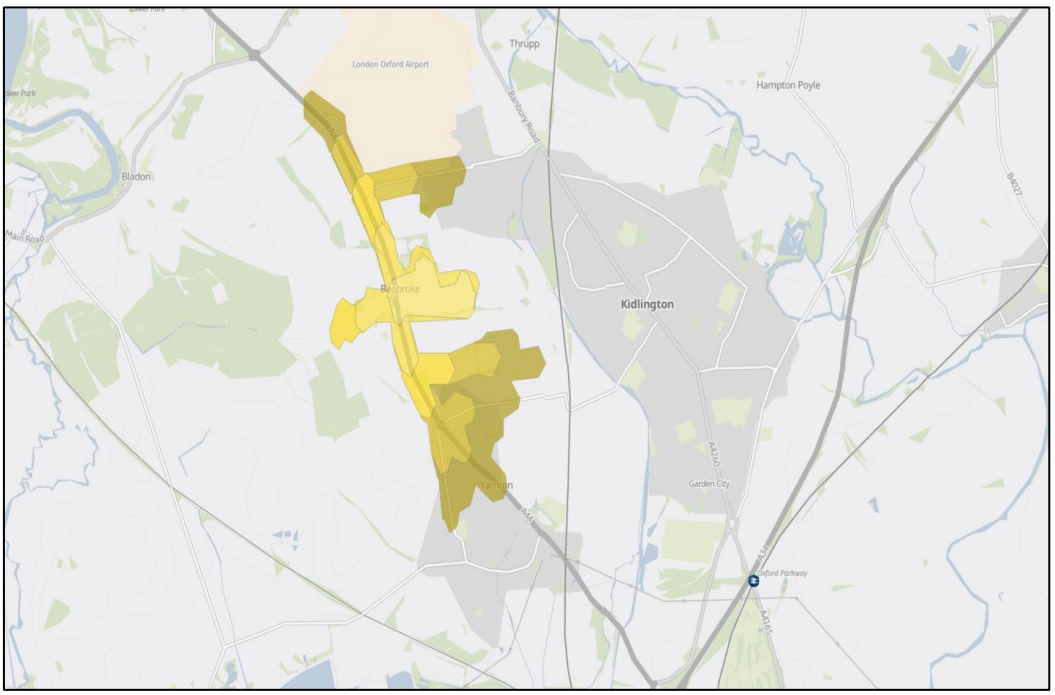
3.4.2 **Figure 3.5** illustrates the 2km walking catchment from the centre of the existing Site. It shows that pedestrians can walk to the centre of Begbroke, Yarnton and Kidlington within 2km.

Figure 3.5: Existing 2km isochrone from the Site



3.4.3 **Figures 3.6** to **3.8** show the existing 2km isochrone from the villages of Begbroke, Yarnton and Kidlington.

Figure 3.6: Existing 2km isochrones from Begbroke (400m increments)

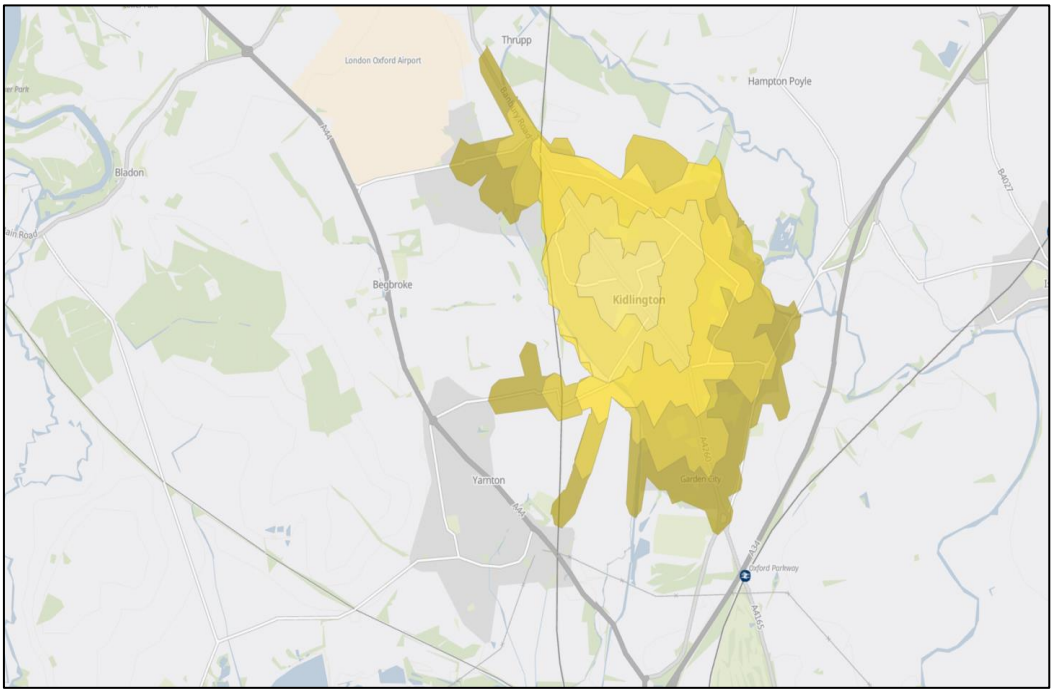


3.4.4 **Figure 3.6** illustrates the existing 2km walking isochrone from the centre of Begbroke village and shows that areas of Yarnton are accessible within 2km, as well as the existing services and facilities such as bus stops on the A44, Yarnton garden centre and the William Fletcher primary school in Yarnton. The limitations of the isochrone software are such that accessibility can only be measured via footways rather than PRoW provision, resulting in restrictions to the illustrated east-west connectivity to Kidlington village. However, as mentioned previously, the existing PRoW network connects via Sandy Lane, Rowel Brook, and Begbroke Lane, and in turn provides existing pedestrian access between the Begbroke village and Kidlington.

Figure 3.7: Existing 2km isochrones from Yarnton (400m increments)

3.4.5 **Figure 3.7** illustrates the existing 2km walking isochrone from the centre of Yarnton village and shows that walking connectivity is largely confined internally to the village, or towards rural areas.

Figure 3.8: Existing 2km isochrones for Kidlington (400m increments)



3.4.6 **Figure 3.8** illustrates the existing 2km walking isochrone for the settlement of Kidlington. While the whole of Kidlington is accessible from the centre within a 2km walking distance, connectivity outside the settlement is confined.

3.5 Existing Bus Network

Public Bus Services

3.5.1 There are no public bus services that serve the existing Begbroke Science Park. A map of the bus network is included in **Appendix A**. The S3 service which runs between Oxford and Chipping Norton routes along the A44 past the Site. Within the vicinity of the Site, the S3 service routes through Yarnton via Rutten Lane and along the Woodstock Road (A44) further north. The service has a 30-minute frequency from Monday to Saturday. A single NS3 (night) service runs once in a northbound direction, passing through Yarnton at approximately 01:00. In accordance with the bus timetable, it takes approximately 33 minutes on the S3 from Begbroke village to Oxford railway station. The existing bus service is summarised in **Table 3.1**.

Table 3.1: Existing Bus Services

Service / Operator	Route	Frequency (Peak)	
		Mon-Sat Daytime	Evening / Sunday
S3 Stagecoach	Oxford – Summertown – Yarnton – Begbroke – Woodstock- Chipping Norton	30 minutes	Hourly

3.5.2 The 'Sandy Lane' bus stop, located on the A44 circa 0.35km south of Begbroke Hill, is the closest bus stop in the vicinity of the Site that is served by the S3 service. The bus stop is flagged and benefits from infrastructure such as live timetable information, seating, shelter as well as cycle parking provision in the form of Sheffield stands.

3.5.3 The 'Royal Sun' bus stop is located circa 0.5km north of Begbroke Hill. The S3 also serves this bus stop. The bus stop is flagged, as well as being equipped with a shelter, seating and timetable information.

3.5.4 Access from Begbroke Science Park to these bus stops is made via Begbroke Hill, which has a shared pedestrian/cycle path along the northern side and the existing footways along both sides of the A44. Pedestrians would cross the A44 to access the northbound bus stop via the existing signal-controlled crossing at the A44/Begbroke Hill junction.

Begbroke Science Park Minibus

3.5.5 Oxford University currently funds a private minibus service between the Science Park and Oxford city centre, which is free of charge to all University members, Begbroke Science Park companies and visitors.

3.5.6 The minibus service operates between Oxford city centre (Broad Street) and Begbroke Science Park and calls at the Sherrington Road Science Area, Parks Road Materials Laboratory and Banbury Road outside BBC Oxford (as a request stop). The Broad Street stops are around a 15-minute walk from Oxford railway station.

3.5.7 The University currently operates 25 services per day between 07:10 and 19:10 hours, typically at 15 to 30 minute intervals. The minibus timetable service is available at Begbroke Science Park's website[8].

3.5.8 Additional taxis have, on occasions, been laid on to provide additional capacity in the later afternoon/early evening peak to meet demand.

Park and Ride

3.5.9 There are also 'Park and Ride' facilities nearby to the Site. The Peartree Park and Ride facility is located at the Peartree Interchange, the junction between the A44 and A34 to the south of the Site. It has 1,035 parking spaces and is served by route 300, which routes between Peartree and Redbridge Park and Ride facilities via Oxford city centre 5 times per hour (i.e. 12 minute frequency).

3.5.10 Oxford Parkway 'Park and Ride' (formerly referred to as Water Eaton) is located to the southeast of the Site and has 758 parking spaces. The Park and Ride facility is served by bus routes 2 and 2a and 700 services, providing frequent connections to Oxford city centre and John Radcliffe

[8] https://www.begbroke.ox.ac.uk/wp-content/uploads/2023/05/minibus-timetable-may-2023.pdf

hospital, respectively. Routes 2 and 2a have a 15 minute frequency and route 700 has a 30 minute frequency.

3.5.11 OCC is proposing to develop a new Park and Ride at Oxford Airport, which is summarised in Section 4.

3.6 Existing Rail Network

3.6.1 The nearest railway station to the Site is Oxford Parkway railway station located 2.5km south-east of the Site (as the crow flies), and adjacent to the Park & Ride facilities set out above.

3.6.2 The station is currently managed by Chiltern Railways and has a number of available facilities including a ticket office, self-service ticket machines, refreshment facilities, seating, public toilets, waiting rooms and shelters.

3.6.3 The station has an approximate 830-space car park located immediately east, with 18 accessible spaces available. Cycle parking is also provided, with 150 spaces in a dedicated parking area.

3.6.4 Oxford Parkway station is served by train services operated by Chiltern Railways between Oxford and London Marylebone.

3.6.5 The basic weekday daytime frequency of services to and from Oxford, High Wycombe, Beaconsfield, and London is every 30-minutes, with a similar frequency operating in the evenings and on Sundays. During the peak periods there are four peak period (07:00-09:00) trains to Oxford in the morning and 2 trains to London leaving after 07:00 and getting into London before or around 09:00.

3.6.6 The typical journey time to Oxford is around 8 minutes, with the typical journey time to London Marylebone being approximately 75 minutes.

3.6.7 Some of the services to London serve intermediate railway stations, such as Bicester Village (10 minutes), Haddenham & Thame Parkway (24 minutes), Princes Risborough (30 minutes), Saunderton (36 minutes), High Wycombe (42 minutes) Beaconsfield (49 minutes) and Gerrards Cross (55 minutes). To the south, Oxford Railway Station is the only station served.

3.6.8 **Table 3.2** provides a summary of existing rail services from Oxford Parkway Railway Station

Table 3.2: Oxford Parkway Railway Station Existing Rail Services and Frequency

Terminus	Operator	General Frequency (Peak)		Fastest Journey
		Mon-Sat daytime	Evening/Sunday	
Oxford	Chiltern Railways	3 per hour	3 per hour	6 minutes
London Marylebone	Chiltern Railways	3 per hour	3 per hour	62 minutes

3.6.9 Oxford railway station is the closest significant interchange station, and it is located within the city centre and is served by services operated by Great Western, Chiltern Railways and Cross Country services, providing direct connections to a range of stations including London Paddington, Reading, Didcot, Worcester, Banbury, Birmingham, and Manchester Piccadilly.

3.7 Existing Highway Network

3.7.1 The A44 passes immediately to the west of the Site and runs broadly north-south. The A44 is a single carriageway road with a 30mph speed limit as it passes through Woodstock. To the south of Bladon roundabout (junction of A44 / Grove Road) the A44 widens to a dual carriageway and is subject to the national speed limit. To the south of the Cassington roundabout.

3.7.2 To the south of the Site, the A44 forms a grade-separated junction with the A34 at Peartree Interchange before joining the Oxford ring road at its southernmost extent: a roundabout junction with the A40 referred to as the Wolvercote roundabout. Further north, the A44 serves destinations in Oxfordshire that include Woodstock and Chipping Norton.

3.7.3 Several key strategic routes intersect with the A44 close to the Site. To the south, the A4260 meets the A44 at Loop Farm roundabout. The A4260 takes the form of a dual carriageway subject to the national speed limit along its initial section (A4260 Frieze Way). Continuing northbound, the A4260 forms part of a five-armed roundabout with Bicester Road and Oxford Road (i.e. Kidlington roundabout), narrowing to a single carriageway with a speed limit reducing to 40mph and then 30mph as it continues towards the centre of Kidlington.

3.7.4 The A34 intersects the A44 at a grade-separated interchange. Locally, the A34 connects Oxford with the M40 and Bicester to the northeast and Abingdon to the southwest. The highway network of the county relies heavily on the A34 as a core strategic corridor that serves numerous different journey purposes, both locally and regionally, and hence it is particularly vulnerable to disruption due to incidents, because of the lack of alternative north-south routes for journeys both within and through the county.

3.7.5 In addition to supporting strategic connections, the A44 also provides points of access into the Site via Sandy Lane and Begbroke Hill.

3.7.6 Sandy Lane is a single carriageway road that connects the A44 to the west with Yarnton Road and Kidlington to the east. Approximately 1.2km east of the A44, Sandy Lane meets the Cherwell Valley Line (railway) at-grade, with the interaction managed by a half-barrier automatic level crossing. Further east of the level crossing, Sandy Lane becomes Yarnton Lane and crosses the Oxford canal into Kidlington via a single lane bridge with a 3-tonne weight limit. The bridge is sufficiently narrow, and with a pronounced hump that limits forward visibility, that it operates under shuttle working control by traffic lights to manage the conflict between vehicles crossing from either direction.

3.7.7 Begbroke Hill connects Begbroke Science Park with the A44 via a single carriageway road subject to a 30mph speed limit. It forms the eastern approach of a three-armed, signal-controlled junction with the A44.

3.7.8 North of the Site, Langford Lane connects the A44 with the A4260 to the west and east, respectively. It provides direct access to Oxford Airport as well as Oxford Technology Park. Like Begbroke Hill, it forms the eastern approach of a three-armed, signal-controlled junction with the A44. Langford Lane is a single carriageway subject to the national speed limit, which reduces to a 30mph speed limit on the approach to the Oxford Airport access.

3.8 Collision Analysis

A44 Corridor Collision Analysis

3.8.1 Personal injury Collision (PIC) data for the most recently available five year period has been obtained from OCC for a study area which covers the A44 corridor from, and including, Bladon roundabout to, and including, the Peartree Interchange as well as the A34 within the vicinity of Peartree Interchange. The data covers the period 01/01/2018 – 16/04/2023 which is the latest complete five years, and also includes the latest 2023 provisional data. The full PIC data is contained in **Appendix B.**

3.8.2 Between 2018-2023, a total of 56 incidents occurred within the A44 study area. **Table 3.3** contains a summary of the incidents by year and severity, as well as a summary of incidents involving vulnerable users.

Table 3.3: Summary of PIC data by Severity and Year

Year	Slight	Serious	Fatal	Total	Pedestrian	Cyclist	P2W
2018	8	1	1	10	1	1	3
2019	9	2	0	11	1	1	1
2020	10	2	0	12	0	3	0
2021	7	1	0	8	0	0	1
2022	14	0	1	15	1	0	1
2023	0	0	0	0	0	0	0
Total	48	6	2	56	3	5	6

Note: data only covers up to 16th April 2023

3.8.3 As shown in **Table 3.3**, the majority (86%) of PICs recorded across the A44 study area between 2018-2023 were classified as 'slight'. 11% of the total PICs were classified as 'serious' and 3% as 'fatal'.

3.8.4 **Table 3.3** shows that the number of PICs that involved a pedestrian casualty is 5%, involving a cyclist casualty is 9% and involving a motorcyclist is 11%. OCC's 'Road Traffic Collisions: Casualty Data Summary (2021)' outlines the county wide averages for the percentage of collisions involving vulnerable road users that occurred in Oxfordshire in 2021. Across Oxfordshire, 8.7% of collisions involved a pedestrian, 22.3% involved a pedal cycle and 12.7% involved a two-wheeled motor vehicle. Therefore, the percentage of PICs within the study area involving vulnerable road users are lower than county wide averages.

3.8.5 The PIC data has also been reviewed to identify any collision cluster locations and identify any common causation factors within clusters that could highlight any existing safety issues**. Table 3.4** summarises locations within the A44 study area where more than five PICs have occurred between 2018 – 2023.

Table 3.4: PICs at Study Area Junctions and Links

Junction/Link	Slight	Serious	Fatal	Total
A44 / A4095 'Bladon Roundabout'	5	1	1	7
A44 between Bladon Roundabout and Langford Lane	1	0	0	1
A44 / Langford Lane junction	2	1		3
A44 / Springhill Road / Fernhill Road Roundabout	3	0	0	3
A44 / Sandy Lane / Rutten Lane Roundabout	3	0	0	3
A44 / The Garth junction	1	0	0	1
A44 adjacent to Yarnton	4	0	0	4
A44 / Cassington Road Roundabout	2	0	1	3
A44 between A44/ Cassington Road Roundabout and 'Loop Farm Roundabout'	6	1	0	7
A44 / A4260 'Loop Farm Roundabout'	2	0	0	2
A44 /A34 'Peartree Roundabout'	8	1	0	9
A44 between Peartree Roundabout and A40	2	1	0	3
A34 approach to Peartree Roundabout (westbound)	5	1	0	6
A34 approach to Peartree Roundabout (eastbound)	4	0	0	4

3.8.6 Cluster location analysis shows that, of the 56 PICs, there were four links and junctions where five or more PICs occurred between 2018-2023, these were:

- A44 / A4905 'Bladon Roundabout'
- A44 between A44/Cassington Road Roundabout and 'Loop Farm Roundabout'
- A44 /A34 Peartree Interchange
- A34 approach to Peartree Interchange (westbound)

3.8.7 There have been seven collisions reported at the A44 / A4905 'Bladon Roundabout'. Five of these were classified as slight, one as serious and one as fatal.

3.8.8 There have been seven collisions reported on the A44 between Yarnton and 'Loop Farm Roundabout'. Six of these are classified as slight, and one as serious. These collisions occurred across a length of 1.5km, with three of the six collisions occurring at the A44 / Solar Farm junction.

3.8.9 A further nine collisions have occurred at the A44 / A34 Peartree Interchange. Eight of these collisions were classified as slight, with one serious PIC.

Wider Area Collison Analysis

3.8.10 Crashmap data has also been consulted to understand the safety conditions of the wider highway network, outside of the A44 study area for the latest available five year period (2017-2021).

3.8.11 On the A34 mainline, within the vicinity of the Site, two serious incidents were also recorded. These occurred in 2018 and 2019, respectively. Neither incident involved a vulnerable road user. Two fatal incidents were also reported, in 2017 and 2019 respectively. Of these, one involved a motorcycle and a goods vehicle while the other involved one car.

3.8.12 At the A4260 / A4165 Kidlington roundabout, located to the southeast of the Site, three serious incidents have been recorded between 2017-2021. These occurred in 2017, 2018 and 2018, respectively. Each incident is reported to have involved a pedal cycle.

3.8.13 Whilst all road traffic collisions are regrettable, the PIC data gives no indication of specific concerns relating to the level or nature/pattern of PICs in this large study area in relation to the proposed development. As outlined in Section 4 of this TA, future improvements to the highway network are likely to improve road safety.

3.9 Existing Travel Patterns

3.9.1 **Table 3.5** outlines the 2011 'Travel to Work' mode share (residents) for Cherwell 019 Middle Super Output Area (MSOA), where the Site lies, and displays this comparatively with the wider area.

Table 3.5: 2011 Travel to Work Census Data (Resident Population)

Mode	Cherwell 019 MSOA	Cherwell District	Oxfordshire
Car Driver	62%	66%	61%
Car Passenger	5%	6%	5%
Rail	1%	3%	3%
Bus	17%	6%	8%
Taxi	0%	0%	0%
Motorcycle	2%	1%	1%
Bicycle	7%	4%	8%
On Foot	6%	13%	13%
Other	0%	0%	0%
Total	100%	100%	100%

3.9.2 **Table 3.5** shows that circa 30% of all trips to work in Cherwell 019 are made by sustainable modes of travel. This is consistent with the wider Cherwell and Oxfordshire area.

3.9.3 **Table 3.6** summarises the 2011 'Travel to Work' mode share (day-time population) for Cherwell 019 MSOA.

Table 3.6: 2011 Travel to Work Census Data (Daytime Population)

Mode	Cherwell 019 MSOA	Cherwell District	Oxfordshire
Car Driver	81%	70%	63%
Car Passenger	4%	6%	5%
Rail	1%	1%	2%
Bus	5%	4%	8%
Taxi	0%	0%	0%
Motorcycle	1%	1%	1%
Bicycle	4%	4%	8%
On Foot	5%	14%	13%
Other	0%	0%	0%
Total	100%	100%	100%

3.9.4 **Table 3.6** shows that 15% of employment trips to Cherwell 019 are made by sustainable modes of travel, which is lower than the sustainable mode share for Cherwell and Oxfordshire.

3.9.5 Begbroke Science Park currently provides some 14,200 sqm of research and development floorspace, typically with between 500-700 people (staff, researchers/post-docs and employees) based at the Science Park on any one day. Outline permission was granted in September 2018 for a further 12,500 sqm of employment floorspace, which is currently being built out. A travel survey was undertaken for employees at the existing Begbroke Science Park to determine their mode share for the journey to work and the results are summarised in **Table 3.7** below and compared against the Cherwell 019 daytime population travel to work mode share.

Table 3.7: 2011 Travel to Work Census Data (Daytime Population)

Mode	Students/ Post Docs	University Staff	Non-University Staff	Cherwell 019
Car Driver	35%	48%	60%	81%
Car Passenger	0%	0%	0%	4%
Public Transport	53%	37%	30%	6%
Bicycle	7%	6%	10%	4%
On Foot	5%	9%	0%	5%
Other	0%	0%	0%	1%
Total	100%	100%	100%	101%

3.9.6 The results show that the existing Begbroke Science Park employees have a considerably lower car use for the journey to work than the surrounding area within Cherwell 019. It also shows that there is a range of propensity to travel to work by car at the existing Science Park for

students/post docs, university staff and non-university staff. The existing Site benefits from a high sustainable mode share, particularly by public transport, which includes the well-used University minibus service between the Begbroke Science Park and Oxford city.

4 FUTURE TRANSPORT CONDITIONS

4.1 Introduction

4.1.1 In order to understand the transport conditions likely to exist across the network as a future baseline case, (i.e. without the development) a review of the planned and committed transport infrastructure improvements has been undertaken. This review is summarised in this section. This section is subdivided into the following elements:

- Oxfordshire County Council's Transport Strategies;
- Oxfordshire County Council's funded improvements;
- Planned and potential rail improvements;
- Committed development transport improvements.

4.2 Oxfordshire County Council Transport Strategies

Central Oxfordshire Travel Plan

4.2.1 As set out in Section 2 of this TA, OCC adopted the Local Transport and Connectivity Plan (LTCP) in July 2022, which is the fifth Local Transport Plan and outlines the long-term vision for transport in Oxfordshire up to 2050 and the polices required to deliver this.

4.2.2 The adopted LTCP forms Part 1 of the LTCP process, and Part 2 of the process is to set out how the Part 1 LTCP policies will be implemented in specific areas (Area Travel Plans) and along specific transport corridors (Corridor Travel Plans).

4.2.3 In November 2022 OCC adopted the Central Oxfordshire Travel Plan (COTP), which is the first of the Area Travel Plans to have been adopted and sets out the transport strategy for the central Oxfordshire area to 2040. The COTP area is illustrated in **Figure 4.1** and includes the area to the north of Oxford and all of the PR sites.

Figure 4.1: Area of Central Oxfordshire Travel Plan

4.2.4 The COTP sets out a package of 22 actions, which are summarised as follows:

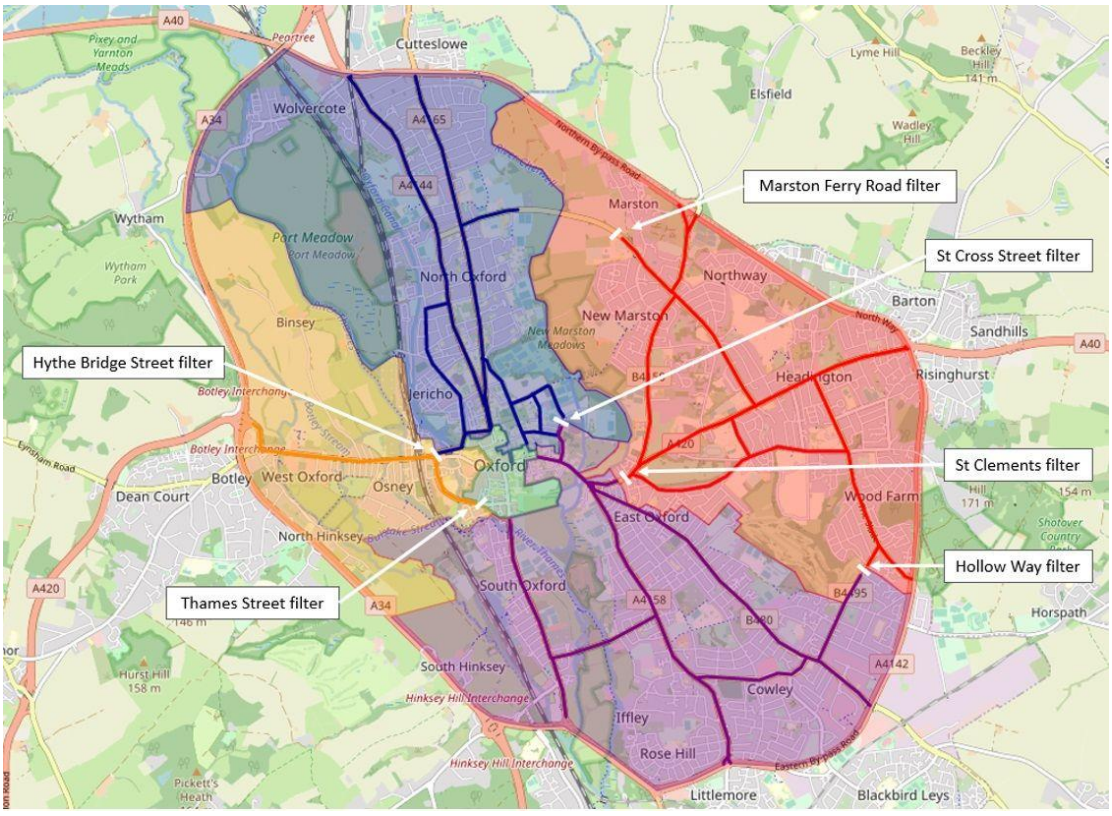
- Action 1 – Expanding upon the pilot scheme, develop proposals for a Zero Emission Zone for Oxford city centre.
- Action 2 – Develop proposals for a set of strategic traffic filters for locations across Oxford.
- Action 3 – A Workplace Parking Levy to cover businesses with 11 or more staff parking spaces in Oxford City Council's administrative area, within the Oxford ring road.
- Action 4 – Develop proposals for further Controlled Parking Zones (CPZ) across the city and to review eligibility and quantity of permits in existing CPZ areas.
- Action 5 – Support a case-by-case review of public parking provision across the area and a consolidation and/or a reduction in public parking provision where appropriate.
- Action 6 – Remove on-street public parking where necessary on corridors identified in the strategy as either being active travel Primary Routes (Quickways) or situated on core bus routes.
- Action 7 – Regularly review parking pricing to favour sustainable travel.
- Action 8 – Deliver a central Oxfordshire cycle network, consistent with the Oxfordshire Strategic Active Travel Network and the latest LCWIP plans.
- Action 9 – Deliver a wayfinding scheme across central Oxfordshire's active travel network.
- Action 10 – To help meet Vision Zero, deliver junction improvements for active travel users where there:
  - is a poor road safety record for those who are walking or cycling;
  - is insufficient dedicated infrastructure for those walking or cycling;
  - is significant severance for those walking and cycling.
- Action 11 – Deliver:
  - increased cycle parking at key destinations including for non-standard bikes;
  - a public hire cycle scheme including e-bikes, which could also include e-scooters.
- Action 12 – Deliver bus priority measures along key inter-urban bus routes and on key orbital routes in the Oxford area.
- Action 13 – Alongside partners, deliver a zero emission local bus fleet across the Oxford Smartzone area by 2024/25 and seek delivery of a fully zero emission bus fleet by 2035,
- Action 14 – Alongside partners, deliver:
  - Oxford Station enhancements;
  - a passenger rail service and two new passenger stations on the Cowley Branch Line;
  - local rail capacity and service frequency enhancements.
- Action 15 – Deliver a transport hub strategy for a network of transport hubs across Oxfordshire.
- Action 16 - Deliver a freight consolidation feasibility study and first / last mile delivery pilot.
- Action 17 – Deliver a safer lorry scheme pilot across central Oxfordshire.
- Action 18 - Develop and support implementation of a local toolkit of transport interventions that support the 20-minute neighbourhood approach and work to the principles of the healthy streets approach.
- Action 19 – Alongside partners, deliver a City Centre Movement Framework for Oxford.

- Action 20 - Deliver attractive tourist coach drop off and pick up facilities in the city centre and convenient lay over facilities, consistent with proposals in a City Centre Movement Framework.
- Action 21 – Deliver an e-scooter hire scheme across central Oxfordshire, subject to ongoing trial performance and national legislation.
- Action 22 - Deliver publicly accessible electric vehicle charging points across central Oxfordshire.

Traffic Filters

4.2.5 One of the CTOP actions is to implement traffic filters within Oxford (Action 2). Traffic filters are points on roads through which only certain types of vehicles (e.g., buses, taxis, and cycles) may pass. In November 2022 the County approved the implementation of six experimental traffic filters in Oxford, which are illustrated in **Figure 4.2**.

Figure 4.2: Proposed Location of Traffic Filters in Oxford



4.2.6 The purpose of the traffic filters is to target short journeys by cars and private vehicles, and so reduce overall traffic levels in Oxford. This is therefore also anticipated to result in improved bus times and reliability for all services between other districts and Oxford, including park and ride sites. As well as this, the proposed traffic filters are expected to:

- Make walking and cycling safer and more attractive for those living in and around Oxford, increasing the respective mode shares;
- Increase park and ride use;

- Improve road safety;
- Enable new and improved bus routes; and
- Support investment in modern buses.

4.2.7 There will be exemptions to the traffic filters, such as resident permit holders, blue badge holders and carers, and the traffic filters are expected to benefit these users in making their journey times quicker.

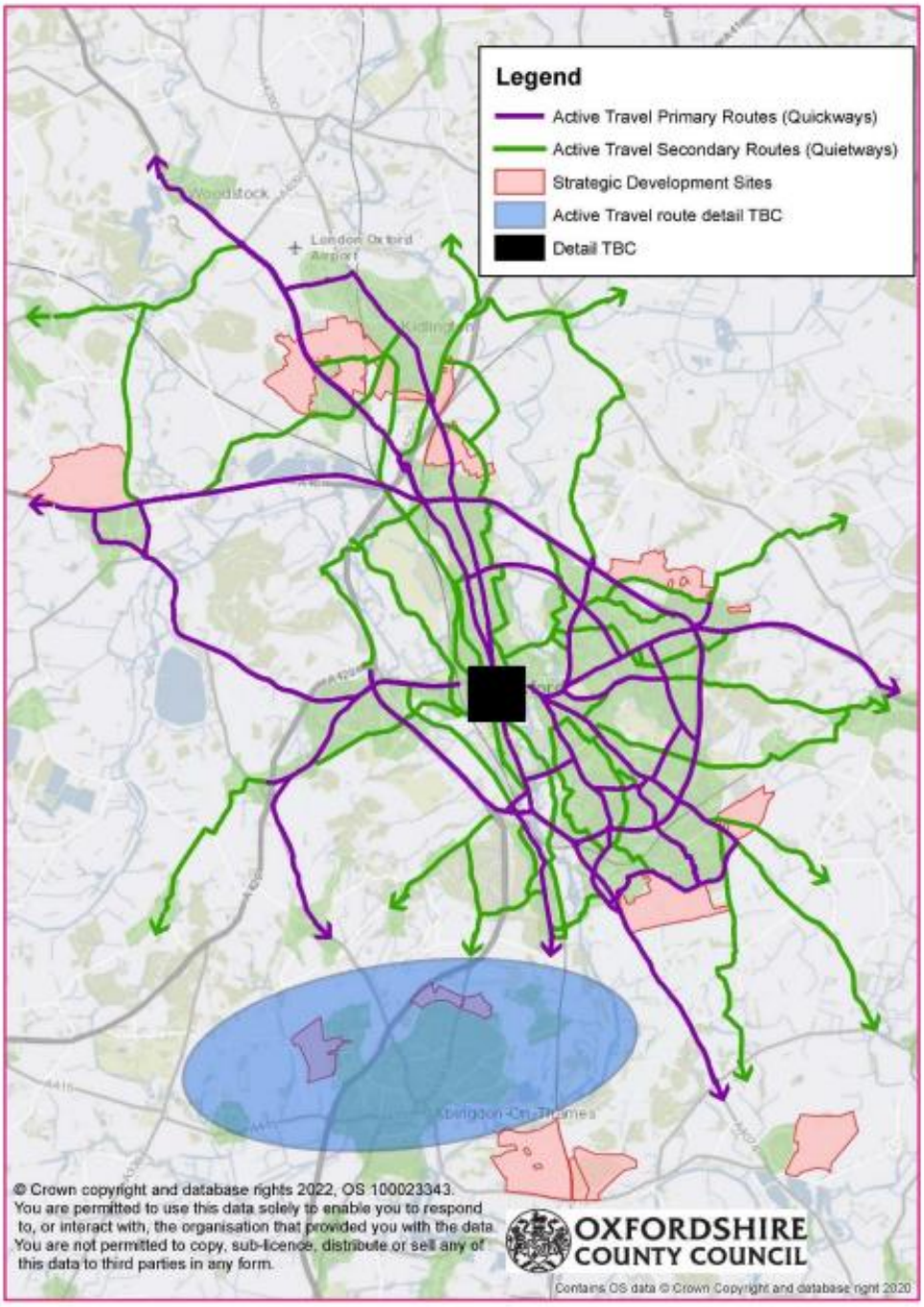
4.2.8 The proposed traffic filter scheme has been designed to ensure that all destinations within the city can be accessed by car but will lead to some journeys by car being longer and hence, it is hoped it will encourage these journeys to switch to more sustainable modes that should then be quicker and so more attractive. It will impact the level of traffic routing to and from Oxford and travelling within the city. The trial of the traffic filters is proposed to be undertaken once work to Oxford railway station has been completed by Network Rail in 2024. Given that the traffic filters are subject to a trial, they have not been assessed as part of this Transport Assessment and included in the traffic modelling for the PR sites, which is detailed in Section 8. This approach was agreed with OCC as part of pre-application scoping discussions.

Active Travel

4.2.9 Action 8 of the COTP sets out the network of active travel routes that are to be implemented. The network consists of a mixture of primary routes (Quickways), which form the core of the network and extend along main radial/ arterial transit corridors and secondary routes (Quietways), which offer a lower trafficked alternative route choice between key trip attractors and residential areas. **Figure 4.3** illustrates the proposed Active Travel Network to be delivered through the COTP. The A44, Langford Lane and A4260 are identified as Quickways and Sandy Lane, which routes through the Site, is identified as a Quietway.

4.2.10 Improvements to active travel along the A44 Quickway are being implemented by OCC as part of the North Oxford Corridor Improvements, which are detailed later in this Section. In addition, further improvements to active travel along the A44, Langford Lane and A4260 Quickways are to be implemented through developer funding from both the PR sites and other committed developments in the area. Sandy Lane is identified as a Quietway and Policy PR8 of the Partial Review Local Plan requires Sandy Lane to be closed to vehicular traffic and to be for active travel only.

Figure 4.3: COTP Active Travel Network

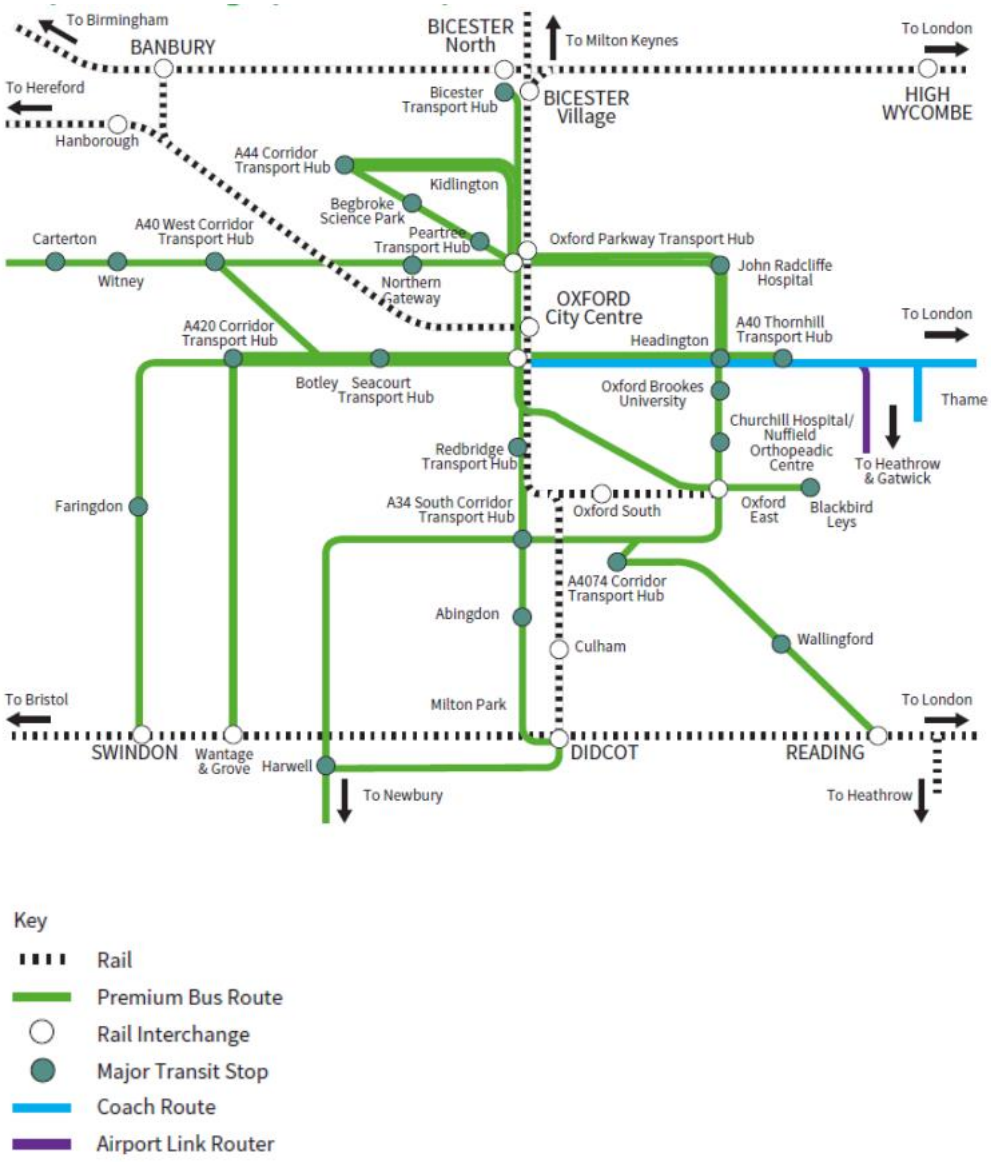


Public Transport

4.2.11 Action 12 of the COTP is to deliver enhancements to the public transport network, including bus priority measures along key corridors. **Figure 4.4** illustrates the proposed strategic public transport network for Oxford as set out in the COTP. It shows the A44 and A4260 as being premium bus route corridors, connected to Oxford city centre as well as John Radcliffe hospital and Headington to the east and Eynsham and Witney to the west. The network includes a series of proposed major transit stops and interchanges. Begbroke Science Park is identified as a major transit stop. Improvements to bus services and infrastructure are proposed to be funded /

delivered by the PR sites and committed developments to the north of Oxford and this has been included for within the transport modelling detailed in Section 8 of this TA.

Figure 4.4: Proposed Strategic Public Transport Network



4.2.12 Action 15 is to deliver a transport hub strategy, also known as mobility hubs. A transport hub is a recognisable place where people can interchange between modes of transport and access a range of shared and public transport services for part or all of their journey. Transport hubs can also include additional facilities such as shops and provide up to date travel information to both attract and benefit users. The COTP identifies a transport hub at Oxford airport as well as in the vicinity of Begbroke Science Park. As set out later in this TA, it is proposed to provide a transport hub (mobility hub) at the proposed development, which aligns with Action 15 of the COTP.

Kidlington Local Cycling and Walking Infrastructure Plan (LCWIP) (2021)

4.2.13 The Draft Kidlington LCWIP has been prepared by OCC to support the Kidlington and Gosford built-up area and is currently in draft format. The LCWIP identifies key destinations where people can walk and/or cycle in a particular area, including Begbroke and Yarnton, and makes suggestions for improving routes at these locations and between these locations. Section 2.5 of the LCWIP accounts for trips generated by future development areas (including PR8) given that these will increase demand for travel on foot and by bicycle. With regards to PR8, the LCWIP states: *"Once PR8 is complete many local trips will be internalised with the provision of primary and secondary trips alongside a local centre. In advance of these facilities coming forward, existing facilities in Kidlington will be a focus of walking and cycling for utility purposes."*

4.2.14 **Tables 4.1** and **Table 4.2** summarise the LCWIP measures related to walking and cycling respectively and of relevance to the walk/cycle catchment of the Site. Many of these improvements are either being incorporated into the masterplans for the PR sites or are included in the IDP in Appendix 4 of the Partial Review Local Plan, which is proposed to be funded by the PR sites.

Table 4.1: Kidlington LCWIP Walk Improvements

Location	Measure
General	Removal of restrictive barriers on footpath links. Improved management of vegetation on traffic free routes.
A44	Provision of safe crossing facilities
Yarnton Road / The Ridings	Provision of dropped kerbs at crossing points on the traffic free route between Yarnton Road and The Ridings (across Willesden Way, Chorefields, The Phelphs)
Yarnton Road	Sloped access to the canal from the canal bridge on Yarnton Road and measures to reduce traffic speeds in the interim period before the closure of the level crossing
Begbroke Lane	Visibility improvements for pedestrians walking towards Begbroke Lane from Partridge Close
Oxford Canal	Focus utility cycle trips to non-canal routes to create a pleasant and safer walking environment Widening and surfacing of canal towpath to enable wider access

Table 4.2: Kidlington LCWIP Cycle Improvements

Location	Measure
Kidlington Roundabout	Signalisation and provision of parallel routes on main arms connecting off road section and any future provision to the south of the roundabout.
Banbury Road, Kidlington	Measures to increase attractiveness of service road east of Banbury Road carriageway. 20mph speed limit. Additional tree planting. Reduced carriageway parking.

	Defined crossing area over Lyne Road. Clear transition to shared use path.
Langford Lane	20mph speed limit between junction with Banbury Road and roundabout junction with The Boulevard Clear transition to off-road cycle infrastructure All HGVs to route via A44 Shared use path to the west of The Boulevard to be 3.0m minimum to junction with A44. Speed reduction to 30mph between Evenlode Close and the A44.
Yarnton Road	Measures to increase the visibility of people walking and cycling as they cross from Morton Avenue to the traffic-free path. 20mph speed limit.
Sandy Lane	Closure of level crossing and installation of cycle/footbridge (being undertaken by Network Rail). Low level lighting. Vehicle access restrictions. 20mph speed limit within Begbroke.
Oxford Canal Towpath	Surface and width improvements to the north of Yarnton Road (improvements to the south being delivered separately). Formal access route to Langford Locks from towpath. Formal access route to Langford Lane from towpath. Ramped access from Yarnton Road to the towpath. New bridge over the canal as part of the development of PR8.
A44	3m shared use path Future shared use path to have priority over minor side access points Clear transition where shared use path merges onto service road areas
Yarnton	20mph speed limit within village

Oxfordshire Bus Service Improvement Plan (BSIP)

4.2.15 The Oxfordshire BSIP (updated October 2022) describes how OCC and local bus operators will achieve the overarching outcomes of the national bus strategy, which are to return bus use to pre-pandemic levels and to increase mode share still further in the future. The BSIP recognises forthcoming allocations, including the PR8 site.

4.2.16 The BSIP outlines plans for the construction of new bus lanes adjacent to the A44 and the improvement of bus frequencies along this route from 2 to 6 buses per hour.

4.2.17 Bus lanes funded with £15 million of Growth Deal monies are currently being constructed between Yarnton (Cassington Road) and the Pear Tree Interchange (A44 junction with the A34) as set out below as part of the North Oxford Corridor Improvements. Improvements to bus services and infrastructure are proposed to be funded / delivered by the PR sites and committed developments to the north of Oxford and this has been included for within the transport modelling detailed in Section 8 of this TA.

4.3 Oxfordshire County Council funded improvements

4.3.1 There are a number of major transport improvements that are being delivered by the County on the key corridors in the vicinity of the Site (i.e. A44, A4260 and A40).

North Oxford Corridor Improvements

4.3.2 The North Oxford Corridor improvements is a scheme by OCC consisting of several road improvement projects. The improvements are currently being implemented by OCC and are included in the transport modelling, which is detailed in Section 8 of this TA.

A44 Loop Farm Roundabout to Cassington Road

4.3.3 This scheme is currently being constructed and includes the following elements:

- New signalised toucan crossing on the A44 to the north of Cassington Road;
- Creation of a new parallel crossing on Cassington Road at the junction with the A44;
- New dedicated southbound bus lane;
- A new footpath on the eastern side of the A44;
- New continuous, and widened shared use pedestrian and cycle path on the western side of the A44;
- New and improved informal crossing facilities; and
- Improved street lighting and footway lightning for pedestrians.

A34 / A44 Peartree Interchange

4.3.4 This scheme is currently being constructed and includes the following elements:

- Creation of a new, dedicated, southbound bus lanes between Loop Farm Roundabout and Peartree Interchange;
- A new footpath on the eastern side of the A44;
- New continuous and improved shared use pedestrian and cycle path on the western side of the A44;
- Upgraded informal crossing facilities on Frieze Way;
- Development of signalised crossings on the Peartree Interchange;
- Additional lanes for traffic on the Peartree circulatory; and
- Improved street lighting.

A4260 / A4165 Kidlington Roundabout

4.3.5 This scheme has been designed and is due to be constructed shortly. It includes the following elements:

- Dedicated bus lanes on the Bicester Road (southbound) linking with the bus lane on the eastern section of Kidlington Roundabout and a revised arrangement on the Oxford Road;
- Frieze Way, Oxford Road South, and Bicester Road have new signalised crossing facilities;

- Speed limit reductions to 30mph on the Kidlington Roundabout and the approaches (additional changes, including along the remaining length of A4260 north of the roundabout, and on Banbury Road south of the roundabout toward Oxford are also being proposed alongside the main scheme); and
- Segregated pedestrian and cycle routes to connect to existing infrastructure;
- Improved street lighting.

4.3.6 The aim of these improvements to the North Oxford network are as follows:

- Improve access and connectivity into Oxford city centre;
- Improve bus journey times;
- Improve pedestrian and cycle connectivity;
- Create an inclusive, integrated, and sustainable transport network; and
- Support the expected growth across the Cherwell District by 2031.

A40 Improvements

4.3.7 OCC is providing investment to six major schemes, which will form the A40 improvements to the southeast of the Site. These schemes will address traffic and transport issues, resulting in improved transport links, improved journey times, more sustainable travel options and reduced emissions. The A40 improvements have been included in the transport modelling, which is detailed in Section 8 of this TA. The six schemes are described in **Table 4.3**.

Table 4.3: A40 Improvement Schemes

Scheme	Improvements
A40 dual carriageway extension	Increase road capacity by upgrading the A40 east of Witney from a single carriageway to a dual carriageway. Improve journey times along the A40. Allow easy access into Eynsham park and ride. Improve dedicated routes for walking and cycling.
Eynsham park and ride	Provision of a new 850 space park and ride in Eynsham, located on the A40 eastbound, providing easier access to frequent and reliable bus services into Oxford. Park and ride will benefit from 24 hour security, dedicated cycle storage, EV parking facilities and public toilets. Improved bus and cycle lanes on A40.
A40 integrated bus lanes	Widen the carriageway along a 6.5km strength of A40 to provide integrated bus lanes on A40. Provision of bus gates to provide priority to buses. New and improved walking and cycling routes parrel with new bus lanes.
A40 Duke's Cut	Realignment of road space to create an eastbound bus lane and two traffic lanes to link up the A40 Oxford North project and A40 integrated bus lanes projects. Improved southbound and northbound cycling and pedestrian routes into Oxford.

A40 Access to Witney	Addition of westbound slip roads at the A40 / B4022 Shores Green junction to improve access to Witney.
A40 Oxford north	Upgrades to A40 between the A34 overbridge and Wolvercote roundabout. New dedicated eastbound bus lane. Improved widened footpaths.

4.4 Planned and Potential Rail Improvements

Oxford Corridor Phase 2

4.4.1 The rail infrastructure at Oxford railway station is close to capacity and would be unable to accommodate the increase in services planned for 2024. To increase capacity, 'Oxford Corridor Phase 2' is currently being implemented by Network Rail and will provide a number of improvements:

- New platform with improved passenger facilities;
- New secondary station entrance on the western side of the railway to improve accessibility and passenger experience; and
- Closure of level crossings at Yarnton Lane and Sandy Lane, as well as creation of three high-speed crossovers at Oxford North Junction.

4.4.2 The Oxford corridor is a key freight route from the port of Southampton to the Midlands and the north. Increasing demand for rail freight services means more train paths are required. More trains on the line would increase the risk at two level crossings along the route at Sandy Lane and Yarnton Lane. To reduce level crossing risk, improve safety and reduce instances of misuse, Network Rail has decided that these level crossings need to be closed.

4.4.3 The level crossing closures would provide capacity for an additional two freight trains per hour, additional Birmingham to Oxford services, and increased maintenance access and safety improvements.

4.4.4 Separate to this outline application for Begbroke Innovation District, Network Rail is currently proposing that the Yarnton Lane level crossing is to be replaced with a pedestrian bridge and the Sandy Lane level crossing is to be replaced with a ramped cycle/pedestrian bridge. These proposals will be subject to a separate application(s), expected to be submitted in Autumn 2023 by Network Rail.

4.4.5 OUD is currently working with Network Rail to prepare an alternative design for a bridge over the railway that could accommodate cyclists, pedestrians and public transport vehicles. Further information on this is set out in Section 5 of the Planning Statement. To be clear, neither the Network Rail cycle/pedestrian bridge nor the alternative bridge design are part of the scheme for which planning permission is being sought. However, given that Sandy Lane is to be closed to vehicular traffic within Partial Review Local Plan policy and that Network Rail's application for

the closure of the level crossing is imminent, the modelling included in Section 8 of this TA includes the closure of Sandy Lane to through vehicular traffic.

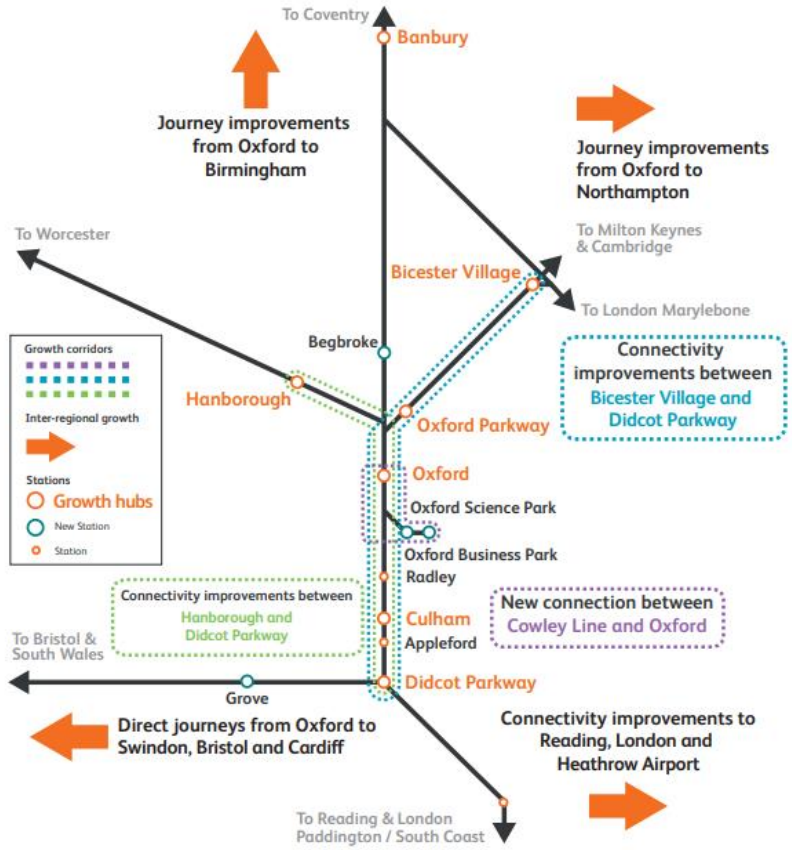
Oxford Rail Corridor Study (ORCS)

4.4.6 In June 2021, Network Rail published the Oxford Rail Corridor Study (ORCS), which assesses the impact of planned growth in jobs and housing on Oxfordshire's rail system and identifies the role that rail can play to support the delivery of that growth.

4.4.7 **Figure 4.5** is an extract from the ORCS that sets out proposed rail improvements required to support the delivery of the growth forecasts. It shows a new railway station at Begbroke and the report states that *"most passenger services should be extended across Oxford to link growth areas, rather than terminating at Oxford station."*

4.4.8 As part of the outline planning application for the Site, land is being safeguarded for a potential railway station at Begbroke Innovation District, which is set out in more detail in Section 6 as part of the Transport Strategy for the Site. However, no consideration has been given to a potential railway station in the mode share assumptions and trip generation forecasts for the Site.

Figure 4.5: ORCS Rail improvements to Support Growth



Cowley Branch Line

4.4.9 Oxford City Council has approved a £4.56 million package of funding for the detailed design and feasibility works required to reopen the Cowley Branch Line to passengers. Reopening the Cowley Branch Line to passengers has been identified as one of the major projects to transform Oxford within the Oxford Local Plan, the Oxfordshire Local Transport and Connectivity Plan and the Oxfordshire Rail Corridor Study.

4.4.10 The first proposed station would be next to the Oxford Science Park, Littlemore and the Ozone Leisure Complex – to be called Oxford South. The second proposed station, Oxford East, would be next to ARC Oxford (formerly Oxford Business Park), Oxford Retail Park and Blackbird Leys. Both stations would also be ideally located to serve new developments planned in South Oxfordshire adjacent to the Science Park and at the nearby Northfields site.

4.4.11 Given the current status of the Cowley Branch Line, it has not been considered within the assessment in this TA.

4.5 Committed Development Improvements

4.5.1 As part of committed developments being developed to the north of Oxford there are a series of transport improvements that are being delivered. These committed developments and associated infrastructure improvements have been included in the transport modelling, which is detailed in Section 8 of this TA.

Oxford Technology Park

4.5.2 Oxford Technology Park is a consented employment development located on Langford Lane, Kidlington. The consented scheme is for up to 38,394sqm of B-use employment space, comprising of 20,227sqm B1(a) office space, 4455sqm of B1(b) research and development space and 22,022 sqm of B8 warehousing space. The site will be served via a new single priority T-junction on Langford Lane, with a dedicated right turn lane into the site to limit queuing for straight ahead traffic. Active travel measures are also proposed, such as improved footways along Langford Lane and an informal crossing point with tactile paving across the new access.

North Oxford

4.5.3 Oxford North is a consented mixed use development located north-west of Wolvercote roundabout. The consented scheme is for 87,300m² of B1 employment, up to 480 dwellings, a hotel and up to 2,500m² of local retail uses. The site will be served via a new link road that is currently being constructed to connect the A44 with the A40 through the site. The link road will be connected at either end by two signalised junctions; one on the northern end with A44 Woodstock Road and one on the southern end with A40 Northern Bypass Road. Active travel and bus priority measures are also being delivered on the A44 between Wolvercote roundabout and Pear Tree Interchange.

5 OVERVIEW OF DEVELOPMENT PROPOSALS

5.1 Introduction

5.1.1 At this stage the development is being brought forward as a parameter based outline planning application with all matters reserved. This, by definition, means that there is flexibility in the way in which the proposals are brought forward through subsequent stages of the planning process. The outline application sets out parameters within which the reserved matters applications will come forward in the future. Included within the parameters are elements such as development quantum, building heights, development zones, green infrastructure and access and movement parameters.

5.1.2 Despite the outline nature of this application, an extensive level of design work has been undertaken to ensure that a comprehensive and viable illustrative masterplan can be developed in accordance with the parameters. The illustrative masterplan therefore represents one way, but not the only way, that the development might come forward.

5.1.3 This section of the TA therefore details the quantum of development that is being applied for as part of the outline planning application and the assumptions made within this TA to inform the assessment. This section also summarises the strategy for access, parking and servicing. Hence, for clarity, the assessment undertaken has been defined by the parameters contained in the Development Specification and Parameter Plans, and is not based purely on the illustrative masterplan.

5.1.4 The Transport Strategy that supports the proposed development, both in terms of the on-site movement principles and strategy and the off-site package of infrastructure improvements is set out in detail in Section 6 of this TA.

5.2 Development Quantum

5.2.1 The proposed development is summarised in **Table 5.1** below Further detail is provided in the Development Specification, which supports the outline planning application.

Table 5.1: Development Quantum

Land Use	Use Classes	Quantum (GEA)
Uses associated with the expansion of Begbroke Science Park	Classes B2, B8, E(g), and F1(a).	155,000 sqm
Residential	C3/C4/Sui Generis	215,000 sqm
Ancillary Supporting Uses		
Retail (including the sale of food and drink)	E(a), (b), (c)	3,500 sqm
Hotel	C1	10,000 sqm
Non-residential and leisure institutions, including nursery, medical	E(d), (e), and (f)	5,600 sqm

or health services, indoor sport or fitness facilities, and creches and/or nurseries.		
Halls and meeting places	F2(b)	1,200
Sui generis uses including (but not limited to) public houses, wine bars or drinking establishments	Sui generis	700
Open outdoor recreation, play and sport space	F2(c)	In accordance with the CDC Local Plan policy
Education facilities	F1(a)	Land safeguarded for 2no. primary schools and 1no. secondary school

5.2.2 With regards to the residential use, **Table 5.2** summarises the unit mix ranges.

Table 5.2: Residential Unit Mix Ranges

	Unit Size			
	Studio / 1 bedroom	2 bedroom	3 bedroom	4+ bedroom
Range	20-40%	30-40%	15-30%	5-20%

5.2.3 The precise unit mix, including the proportion of apartments, sharer accommodation and traditional housing will be defined through the submission of reserved matters applications. For the purposes of this Transport Assessment, it is anticipated that circa 1,800 homes would be delivered on the Site and this has formed the basis of the assessment of the transport effects of the proposed development.

5.2.4 The residential unit mix will comprise 20-40% studios/1-bedroom units, which for the purposes of this assessment have been assumed to be flats. Flats tend to have lower trip rates than houses and therefore in order to provide a robust assessment, it has been assumed that 25% of residential units will be flats, which is at the lower end of the 20-40% range.

5.2.5 For the purposes of this assessment, it has also been assumed that the 25% flats are all affordable, with the remaining 75% of residential units assumed to be market houses. This is considered to be robust, as it is expected that, overall, 50% of the residential units would be affordable homes.

5.3 Illustrative Masterplan

5.3.1 Extensive engagement has been undertaken at the pre-application stage to develop the illustrative masterplan for the Site, which is included as **Appendix C**.

5.3.2 The illustrative masterplan has been produced to illustrate one way in which high quality development can be achieved within the parameters and principles of the Development Specification, Parameter Plans and Strategic Design Guide. The illustrative masterplan is also used to demonstrate how the proposals can achieve key planning policy objectives whilst achieving a viable quantum and mix of uses across the Site.

5.3.3 Parameter Plan 01 – Development Zones and the Development Specification sets out three neighbourhoods within the Site, centred around a local centre. The neighbourhoods are referred to as Begbroke Hill (north-west), Parkers Farm (north-east) and Foxes Cover (south).

5.3.4 The Proposed Developments seeks to enable growth, with reduced reliance on the car and a more active and integrated community.

5.4 Access Strategy

5.4.1 In accordance with Policy PR8 of the Partial Review Local Plan, it is proposed that the Site will be served by two vehicular accesses as follows:

- Vehicular access will be taken from the existing signal controlled A44/Begbroke Hill access. The PR9 allocated site, which is to the west of the A44, is seeking outline planning consent for up to 540 dwellings and an elderly care facility and proposes to provide a fourth arm of the signalised A44/Begbroke Hill junction to provide vehicular access to the site. As part of the proposed PR9 access improvements, it is proposed to install direct (i.e. non-staggered) pedestrian crossing facilities across the A44 northbound and southbound arms as well as across the PR9 arm of the junction. The PR9 proposals also include changing the existing staggered pedestrian crossing across the Begbroke Hill arm from staggered to a direct crossing. The direct pedestrian crossings on each arm of the upgraded A44/Begbroke Hill junction would require pedestrians to cross in two phases but they would cross along the desire line.
- Vehicular access to the Site would also be provided via a new three arm signal-controlled junction on the A44 to the south of the Site, which is proposed to be delivered by Hallam Land as part of their development proposals. The land owned by Hallam Land forms part of the PR8 site and access to the southern part of the Site would be provided through the proposed Hallam Land development (referred to as the southern PR8 access).

5.4.2 From the northern access, Begbroke Hill will pass with an east-west orientation within the vicinity of the commercial element of the masterplan, close to the existing Begbroke Science Park. At its eastern extent, this vehicular route will terminate within the vicinity of the railway. In accordance with policy and as detailed in Section 6 of this TA, through vehicular access will not be provided for over the railway for general traffic.

5.5 Parking

Cycle Parking

5.5.1 Cycle parking within the Development will be provided in accordance with the minimum standards set out in OCC's 'Parking Standards for New Developments' (November 2022) or the appropriate policy of the reserved matters application for the specific phase.

5.5.2 Residential and employment cycle parking will be provided in secure locations using appropriate Secured by Design approved storage solutions. All provision will be convenient and secure for all occupiers and visitors and workplaces will be required to include showering, changing and storage areas for cycling equipment. Additional on-street visitor cycle parking will be provided.

5.5.3 The needs of Cargo bikes and bikes with child seats will also need to be met and will be designed for as there is an increasing uptake of these types of bikes. For the residential properties cycle parking could be provided within garages or secure cycle stores.

5.5.4 It is proposed that through Travel Plan Monitoring and Surveys, any cycle parking demand in excess of supply could be identified and strategies including shared use facilities or additional locations for cycle parking agreed through the proposed Transport Review Group (TRG), the remit of which is set out in the Framework Site-Wide Travel Plan.

Car Parking

5.5.5 Car parking within the development will be provided in accordance with the maximum standards set out in OCC's 'Parking Standards for New Developments' (November 2022) or the appropriate policy of the reserved matters application for the specific phase. This includes provision of accessible parking spaces and electric vehicle (EV) charging spaces. In accordance with the standards, it is proposed for roads within the Site to be fully controlled through the use of a Controlled Parking Zone (CPZ). The CPZ would be secured as part of reserved matters applications.

5.5.6 The proposed mix of uses allow a low car ownership model to be embraced. Residents (origin end of a trip) within the Site will have access to jobs and services in close proximity (either within the Site or within the surrounding area) meaning car ownership and dependency is reduced and the employment land uses (destination end of a trip) can be controlled through car parking at a level below the maximum parking standard.

5.5.7 In accordance with the Oxfordshire New Street Design Guide, it is expected that the residential parking will be provided in a mixture of on-plot and off-plot in shared parking areas. The mixture of on and off plot parking will allow for more flexibility in the parking strategy. As car dependency reduces, the level of overall provision within the Site can be balanced allowing opportunities to be opened up for using land set aside for car parking to be used more productively in the longer term e.g. amenity space. This allowance for re-purposing of land

offers greater sustainability benefits, as well as using the scarce land resource in a more effective and efficient way.

5.5.8 As part of the parking strategy for the Site, an EV car club scheme is proposed as part of the Mobility Hub. Collaborative Mobility (CoMo) research[9] shows that 1 car club car replaces 20 private cars.

5.6 Servicing and Refuse Strategy

5.6.1 The outline nature of the planning application is such that the specific details of the servicing and refuse strategy (i.e. access, street design, loading areas and refuse stores) are not determined and will be subject to later reserved matters submissions.

5.6.2 A Framework Delivery and Servicing Management Plan (DSMP) has been prepared to support the planning application. The control document provides a framework for individual DSMPs that would be developed for the various Phases of the Proposed Development and land use types as part of reserved matters applications. The approach sets out that such submissions should be supported by Phase-specific DSMPs.

5.6.3 Any DSMP submitted for approval as part of reserved matters applications must be substantially in accordance with the Framework DSMP which provides a framework for:

- The basis for the delivery and servicing strategy to be adopted;
- The requirements to accommodate delivery and servicing vehicle movements; and
- The ongoing management of deliveries and servicing.

5.6.4 The overarching servicing and delivery strategy for the development is based on:

- Residential refuse collection will occur on street from waste collection points situated around the Site;
- Residential delivery and servicing trips are accommodated on-street due to the low level of movement, and to make the most efficient use of land when considering other factors such as public realm and landscaping;
- Delivery and servicing vehicles for commercial uses will use specific bays situated in close proximity to or within those commercial units; and
- A method of control will prevent unauthorised vehicles from accessing parts of the Site such as pedestrian priority routes using appropriate design or physical methods of control.

[9] https://www.como.org.uk/documents/car-club-annual-report-key-findings-uk-2021

6 SUSTAINABLE TRANSPORT STRATEGY

6.1 Introduction

6.1.1 This section of the report details the overarching Transport Strategy for Begbroke Innovation District. The way in which people and vehicles move around the Begbroke Innovation District will be integral to the creation of a sustainable and liveable place. Careful consideration needs to be given to the interactions of different modes, the efficiency and capacity of networks, and how, through the creation of a connected place, the Begbroke Innovation District can grow and contribute sustainably to the benefit of the surrounding communities. These considerations – from the micro to the macro – have informed the transport strategy for the development.

6.2 A New Science / Technology Cluster and Implications on Travel Behaviour

6.2.1 The planned growth in housing and jobs to the north of Oxford will result in a new science/technology cluster there. The proximity of housing and jobs will provide the ability for people to travel more sustainably.

6.2.2 Begbroke Innovation District provides up to 155,000 sqm of employment floorspace in addition to the 14,200 sqm of floorspace at the existing Begbroke Science Park and the consented 12,500 sqm of additional floorspace currently being built out.

6.2.3 This is in addition to the Oxford Technology Park and Oxford North, which both have consent for employment floorspace. Oxford Technology Park has consent for 38,394 sqm of employment floorspace. Oxford North has consent for 87,300 sqm of employment floorspace as well as 480 dwellings, a hotel and A1-5 and community uses.

6.2.4 In total, there would be 307,394 sqm of science/tech floorspace to the north of Oxford, which equates to over 12,000 jobs. These jobs, accompanied by the committed and allocated housing to the north of Oxford, creates the ability to reduce travel distances between home and work and increases the opportunities for more sustainable travel.

6.3 A Sustainable New Community

6.3.1 The Begbroke Innovation District is uniquely placed to reduce private motorised travel through an integrated settlement pattern with a mix of housing, jobs, education and supporting community uses. Strategic scale development of this size has significant advantages in transport terms. Achieving a critical mass of people means that services, facilities and leisure opportunities can be provided on site meaning a significant amount of travel will occur only within the Site itself. Likewise, the proposed mix of housing and jobs provides the opportunity for people to live and work within walking distance.

6.3.2 The RTPI[10] has produced an evidence base to summarise the multiple co-benefits that can be achieved through planning integrated settlements. This work indicated that these urban forms

[10] https://www.rtpi.org.uk/research/2020/june/net-zero-transport-the-role-of-spatial-planning-and-place-based-solutions/

reduce the need to travel and facilitate public and active transport when compared to single use, dispersed developments, and thereby reduce overall vehicle use. There is a close relationship between residential density and accessibility, with larger local populations providing patronage for a wider range of local shops and services in convenient locations, within easy walking or cycling distance. Land use mix around public transport stops also helps to make high-frequency services financially viable and increases the number of public transport stops. This in turn improves accessibility across the entire network, creating a virtuous cycle that reduces car dependency, increases levels of public and active transport and reduces the number of physically inactive 'door to door' trips.

6.4 Walking and Cycling

People First

6.4.1 The proposals provide a strong foundation for pedestrian and cycle movement and connectivity across the Site, placing people not vehicles at the top of the movement hierarchy and the illustrative masterplan demonstrates that this can realistically be delivered across the Site. Active travel modes are to be prioritised above all other modes. They will be afforded with a permeable, high quality and fine grain network of walk and cycle routes. It will be easier to walk or cycle through the Site than by any other mode of transport.

6.4.2 Safe, connected walking routes are an essential part of any movement strategy as walking critically makes up the first and final part of every other journey and must therefore be planned for in this context. From the perspective of a cyclist, the most well documented challenges for those arriving by bicycle typically centre around the availability of high quality, legible, and safe cycle routes and secure cycle parking. Cycle parking will be provided at destinations throughout the Site in accordance with Oxfordshire's cycle parking standards and will be provided for all types of cycles, including tandems and cargo bikes.

Green Arteries

6.4.3 The streets will be designed for 20mph, which will enable cyclists to safely mix with traffic. However, through filtered permeability, a network of entirely car free streets and places will be created which will aim to allow pedestrians and cyclists to travel from the centre of a neighbourhood to the heart of the development with minimal crossings of vehicular trafficked streets. Where such

crossings are necessary, the active modes will always be provided with the priority over vehicles and provided with a level grade crossing.

6.4.4 Each neighbourhood will have a green corridor (referred to as the 'green arteries') running through the centre of it, which will create a high-quality traffic free corridor for people to move through and enjoy, whilst also offering opportunities for tranquillity and recreation in the heart of the neighbourhoods. It is only on the approach to the local centre that the green corridor would cross a low speed, trafficked street and pedestrians and cyclists would be given priority over vehicles at these locations.

Living Streets

6.4.5 Low speed roads will connect to a network of 'living streets', which will consolidate on-street parking at the end of the street to make space for more green and social spaces. The RTPI research[11] describes the concept of living streets as follows:

"Restricting vehicle access and removing on-street parking means children can play safely in the street. New trees, parklets and sustainable drainage features bring nature to every doorstep, with benefits to biodiversity and people's health and wellbeing. Previously tarmacked corridors lined by cars become green, social places with space for people to come together as a community, as well as playing a vital role in facilitating sustainable mobility within and outside of the neighbourhood."

Bridges

Rail Bridge

6.4.6 Policy PR8 within the Partial Review Local Plan requires Sandy Lane to be closed to vehicular traffic (other than direct access to properties on Sandy Lane) and through connectivity on Sandy Lane to become for pedestrians and cycling only.

6.4.7 As part of Oxford Phase 2, Network Rail is progressing a Transport and Works Act Order (TWAO) to close the Tackley, Sandy Lane and Yarnton Lane level crossings to support increased utilisation of this part of the rail network and to reduce risk. With regards to the Sandy Lane level crossing, which is within the Site, Network Rail is currently proposing to replace the level crossing with a ramped cycling and pedestrian bridge over the railway. An access only vehicle link road, with new access onto the A44 and improvements to Green Lane, is proposed to maintain access for residents and landowners to the east of the level crossings.

6.4.8 As a result of community representation for the Begbroke Innovation District, OUD recognises that not everyone can walk or cycle and therefore Oxford University appointed the OUD design team to design a pedestrian, cycle and public transport bridge, liaising with Network Rail on the design. Oxford University and OUD continue to work with Network Rail to enable Network Rail to deliver a bridge that would be suitable for active travel, but accommodating public transport

[11] https://www.rtpi.org.uk/research/2020/june/net-zero-transport-the-role-of-spatial-planning-and-place-based-solutions/

as well as vehicular access to the east of the railway for maintenance purposes. To be clear, should they come forward these proposals would be subject to a separate application by Network Rail and are not part of the Begbroke Innovation District for which outline planning permission is being sought.

6.4.9 The illustrative masterplan has incorporated a walk, cycle and public transport bridge over the railway into the scheme layout as shown in **Appendix C**. Parameter Plan 04 - Access and Movementprovides an indicative location for a bridge over the railway.

6.4.10 This work is ongoing and subject to approval, detailed design and funding discussions with Network Rail and the local authorities and could replace the current Network Rail proposal for the ramped cycle and pedestrian bridge. OUD will continue to liaise with Network Rail to seek for Network Rail to promote a separate planning application for the Oxford University designed pedestrian, cycle and public transport bridge.

Oxford Canal

6.4.11 Policies PR8 and PR7b within the Partial Review Local Plan require these two allocated sites to provide for a walk/cycle bridge over the Oxford canal and to provide a walk/cycle route from PR8, through PR7b to provide a connection to Kidlington and Oxford Parkway. Meetings have been held with the Canal and River Trust to understand their design requirements and a concept bridge has been designed as included in **Appendix D**. To be clear, the concept design of the Oxford Canal bridge included in **Appendix D** does not form part of the outline application for the Site. The proposed active travel route to Kidlington roundabout would tie into the improvements that are to be delivered by OCC at Kidlingtonroundabout as part of the North Oxford Corridor Improvements detailed in Section 4 of this TA.

6.4.12 Consideration is also being given to this bridge being capable for walk, cycle and public transport use, the potential benefits of which are discussed in the public transport section below.

6.4.13 At this stage OUD is seeking for obligations to be included in the S106 Agreements for both PR7b and PR8 to safeguard the walk, cycle and public transport bridge solution and for a feasibility study to be jointly undertaken by PR7b and PR8, in consultation with CDC, OCC and the Canal and River Trust, ahead of any reserved matters applications being submitted for either site. The feasibility study would consider the feasibility and deliverability of a multimodal pedestrian, cycle and public transport link along the safeguarded route.

Connecting Communities

6.4.14 Setting the tone for a scheme layout that prioritises active travel begins with providing gateways to the Site that are welcoming and safe. The design of the Begbroke Innovation District will ensure that infrastructure caters for all users and maximises inclusivity and reduces apprehension when using spaces and crossing roads, particularly where the internal road network meets the A44 corridor.

6.4.15 The Development seeks to deliver a highly legible and permeable network of walk, wheeling and cycle routes to connect into the surrounding communities of Yarnton, Begbroke and Kidlington as well as to Oxford Parkway and the existing and proposed cycle routes to Oxford city. This increased connectivity will help to realise the full benefit that the Begbroke Innovation District offers but also help to deliver a more pleasant and prioritised walk and cycle environment that connects communities.

6.4.16 As set out in Section 3, there are currently only two signal-controlled pedestrian crossing facilities across the A44 corridor between Pear Tree Interchange and Bladon roundabout. These are located at the A44/Begbroke Hill junction, which provides access to the Site and across the A44 south of Sandy Lane, connecting residents of Yarnton.

6.4.17 As part of the development of the PR sites, improvements will be jointly funded to the A44 and A4260 corridors for sustainable travel. OUD is currently liaising with OCC with respect to the design of improvements to the A44 corridor north of Cassington roundabout, which would tie into the improvements that have been delivered by OCC as part of the North Oxford Corridor Improvement scheme summarised in Section 3 of this report. This work is ongoing and will inform the legal agreements between OUD, CDC and OCC (i.e. S106 and/or S278 Agreements).

6.4.18 In respect to the A44, the following new or improved signal-controlled pedestrian/cycle crossings across the A44 are proposed to be provided by either OCC (through joint funding within S106 Agreements for each of the PR sites) or the PR sites (through S278 Agreements):

- **Begbroke village:** Currently there is no signal-controlled crossing over the A44 connecting the eastern and western parts of Begbroke village. Pedestrians are required to cross the corridor uncontrolled via sub-standard facilities. We understand that OCC is currently designing a signal-controlled crossing across the A44 at Begbroke village to provide a safe crossing across the A44.
- **Begbroke Hill:** as part of the PR9 development proposals, a fourth arm is to be provided to the existing Begbroke Hill signal-controlled junction and direct (i.e. not staggered) pedestrian and cycle crossing facilities provided across all arms of the junction to provide safe access between PR9 and PR8 and bus stops on the A44.
- **South of Begbroke Hill:** as part of the PR9 development proposals, a signal controlled direct (i.e. not staggered) pedestrian crossing is proposed to be provided across the A44 mid-way between Begbroke Hill and Sandy Lane.
- **Sandy Lane:** as part of the improvements to the A44, it is proposed to provide a signal-controlled crossing across the A44 at the junction with Sandy Lane. This would connect the Site to Yarnton.
- **Southern PR8 access:** as part of the proposed development of part of the PR8 site being brought forward by Hallam Land (referred to as the southern PR8 access), a signal controlled access is proposed with the A44, which includes signal controlled pedestrian and cycle crossings.
- **Cassington roundabout:** as part of the North Oxford Corridor Improvements currently being implemented by OCC, a signal-controlled pedestrian and cycle crossing is

proposed immediately to the north of the Cassington roundabout at the junction of A44 with Cassington road.

6.4.19 Pedestrians and wheelers / cyclists travelling to Begbroke would be able to route via the following:

- Along the pedestrian/cycle network within the Begbroke Innovation District, which will connect into Begbroke Lane to provide a traffic free route to Begbroke.
- Alternatively, pedestrians and cyclists would be able to travel between the Site and Begbroke via the proposed green artery through the Begbroke Hill neighbourhood to access the A44 and travel to Begbroke village.

6.4.20 Pedestrians and wheelers / cyclists travelling to Yarnton and PR9 would be able to route via the following:

- Begbroke Hill would be upgraded to provide upgraded pedestrian and cycle routes along both sides of the road. Pedestrians and cyclists would be able to travel along Begbroke Hill to the junction with the A44 and cross at the proposed signal-controlled crossings to access PR9 and Yarnton.
- Alternatively, pedestrians and cyclists would be able to route through the Site to Sandy Lane and cross the A44 at the proposed signal-controlled crossing at Sandy Lane.
- Pedestrians and cyclists would also be able to travel through the Site along the green artery through the Foxes Cover neighbourhood to the southern PR8 access and cross the A44 at the proposed signal-controlled junction to access Yarnton.

6.4.21 Pedestrians and wheelers / cyclists travelling to Kidlington would be able to route via the following:

- Along the upgraded and new traffic free routes through the Parker's Farm neighbourhood to access Roundham lock and onwards to Lyne Road, which connects to the local centre at High Street, Kidlington.
- Along Begbroke Hill or Sandy Lane and over the new Network Rail bridge and onwards to the existing Yarnton Lane canal bridge.
- Along the pedestrian/cycle route that will connect to the proposed bridge over the canal to PR7b and onwards to the southern part of Kidlington, Oxford Parkway and the wider city.

6.4.22 Cyclists and wheelers travelling to/from Oxford city would be afforded with a number of route options:

- Along the A44 and Woodstock Road via the upgraded active travel facilities.
- Along the canal, which the Canal and River Trust is proposed to upgrade along the Site boundary through developer funding, to connect into the already upgraded towpath to the south of the Site.

- Along the pedestrian/cycle route that will connect to the proposed bridge over the canal to PR7b and onwards to the city centre via the A4260, which is proposed to have active travel improvements along the corridor.

6.5 Public Transport

Mobility Hubs

Airport Mobility Hub

6.5.1 The Infrastructure Schedule in Appendix 4 of the Partial Review Local Plan identifies transport infrastructure schemes to support the growth identified in the Partial Review Local Plan and to facilitate a mode shift towards sustainable travel. As part of the Infrastructure Schedule, the County is seeking to develop a mobility hub at Oxford airport, which would intercept traffic further north along the A44 and transfer them to a range of sustainable transport at the proposed mobility hub. The County is seeking joint contributions from the PR sites and other relevant consented development to fund the Airport mobility hub.

Begbroke Innovation District Mobility Hub

6.5.2 In a time where transportation services, infrastructure, and amenities are evolving rapidly, mobility hubs present an opportunity to integrate different sustainable transportation options that enhance connectivity across the masterplan.

6.5.3 The Development Specification requires a Primary Mobility Hub to be provided with regard for the local centre. This will be accessible to the wider community including visitors, future employees and residents. It is envisaged to incorporate mobility measures such as bus stops, cycle parking, cycle hire, parking, car clubs, rapid electric vehicle charging, delivery lockers and travel information. It will sit alongside retail and cafes to provide an obvious destination for people. The precise design of the Primary Mobility Hub will form part of reserved matters applications.

6.5.4 The concept of Mobility Hubs has evolved from thinking and delivery in Europe and parts of North America. They are increasingly featuring in Transport Strategies for new developments and towns and cities in the UK. CoMo UK is a market leader on shared mobility solutions and has prepared a number of guidance documents on Mobility Hubs. They apply the following definition for a Mobility Hub:

"A mobility hub is a recognisable place with an offer of different and connected transport modes supplemented with enhanced facilities and information features to both attract and benefit the traveller."

6.5.5 In addition to the central Primary Mobility Hub within the local centre, there is the opportunity to provide smaller secondary Mobility Hubs within each of the neighbourhoods. The image provides an example of a small scale Mobility Hub within a new development near Exeter. The hub includes ebike hire, car club access, EV charging and is close to a bus stop.

6.5.6 The difference between Primary and Secondary Mobility Hubs is generally about the quantity of the facilities provided. The Primary Mobility Hub will have more cycle stands, more bikes available to hire, more car club spaces etc. The Primary Mobility Hub will also incorporate access to public amenities, such as toilets, as well as cafes and provide a place for site management activities. Should they be provided, Secondary Mobility Hubs would form part of the reserved matters applications.

6.5.7 The hubs will form the core of a larger area of influence (or catchment area) that benefits from the services provided. Residential and employment areas will be located within this catchment area to support the uptake of services offered. In addition to providing efficient and seamless integration of transportation options, the Mobility Hubs will also focus on user experience ensuring safety and security for all travellers, flexibility and resiliency to embrace technological innovations, and will address equity for all users.

Bus Priority

6.5.8 Within the Site, it is proposed to provide a traffic filter along the edge of the Central Park with only active travel and buses being able to route through the filter. This would provide priority of buses within the Site to ensure reliable journey times.

6.5.9 In addition, Policy within the Partial Review Local Plan assumes Sandy Lane to be closed to general traffic and to be for active travel only. As set out in the bridges section, OUD is seeking

for the rail bridge being progressed by Network Rail to be for active travel and public transport. Should this bridge come forward via a Network Rail planning application, it would provide a further traffic filter within the Site and priority for buses to route to/from Kidlington and the city.

6.5.10 As part of the North Oxford Corridor Improvements, a southbound bus lane is being installed along the A44 between Loop Farm roundabout and Cassington roundabout. As part of the Infrastructure Schedule included in Appendix 4 of the Partial Review Local Plan, the A44 corridor between Cassington roundabout and Bladon roundabout is to be improved for sustainable travel through developer funding, which would include bus priority along the A44. OUD is liaising with OCC to develop the sustainable travel proposals for the A44 and location and extent of additional bus priority.

Improvements to Bus Services

6.5.11 **Figure 6.1** illustrates the existing bus route S3, which provides a service between Chipping Norton and Oxford city (including Oxford railway station) and routes along the A44 past the Site, diverting through Yarnton village. It operates 2 services an hour, Monday – Saturday and 1 service an hour on Sundays.

6.5.12 As part of Appendix 4 of the Partial Review Local Plan, which sets out the transport infrastructure requirements for the PR sites, it is proposed for the S3 route to be increased to 4 buses per hour in each direction and for the route to run directly along the A44 without diverting through Yarnton. Appendix 4 of the Partial Review Local Plan requires PR8 and PR9 to jointly fund the S3 improved service.

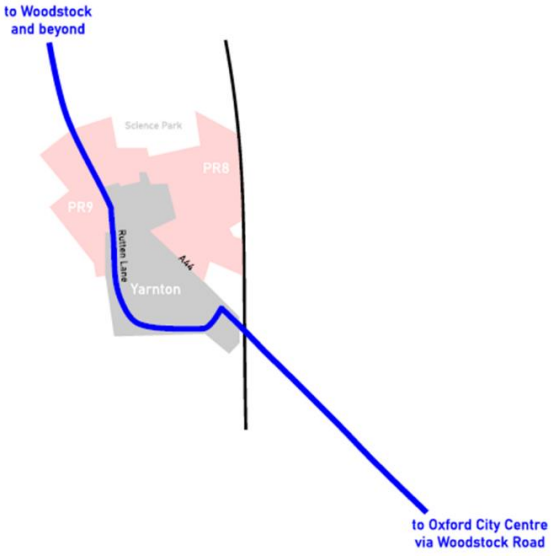
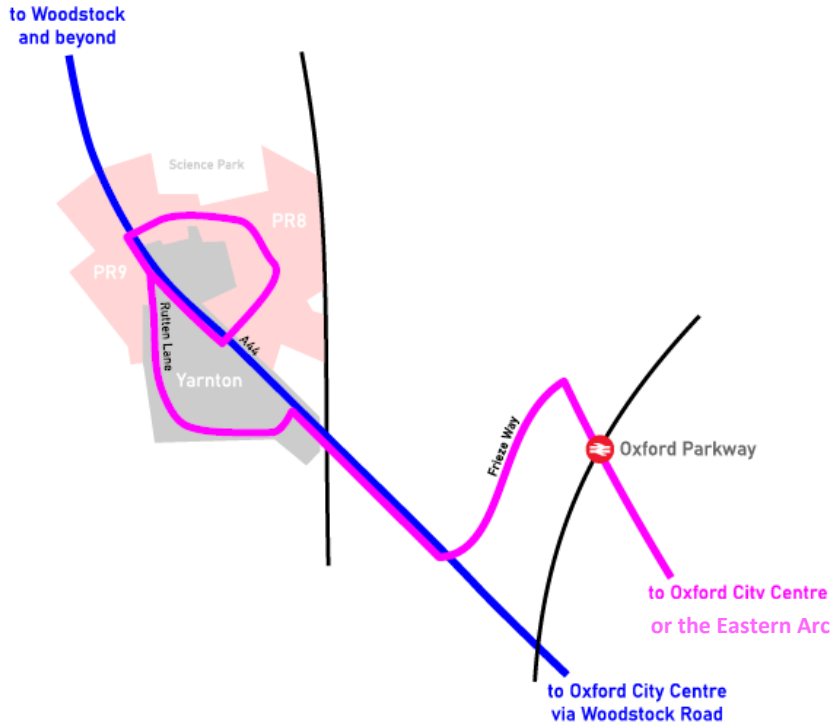


Figure 6.1: Existing S3 bus route along A44

6.5.13 In addition to the improved S3 service, OCC proposes for a new route to be introduced, which would route around the Begbroke Innovation District and Yarnton before routing along the A44 to Loop Farm roundabout and then along Frieze Way to Oxford Parkway and onwards to Oxford city or the Eastern Arc.

6.5.14 The new bus route, subject to agreement with OCC of the precise route, is illustrated in **Figure 6.2** below along with the proposed upgraded S3 service. The frequency of this new route is envisaged to be a half hourly service.

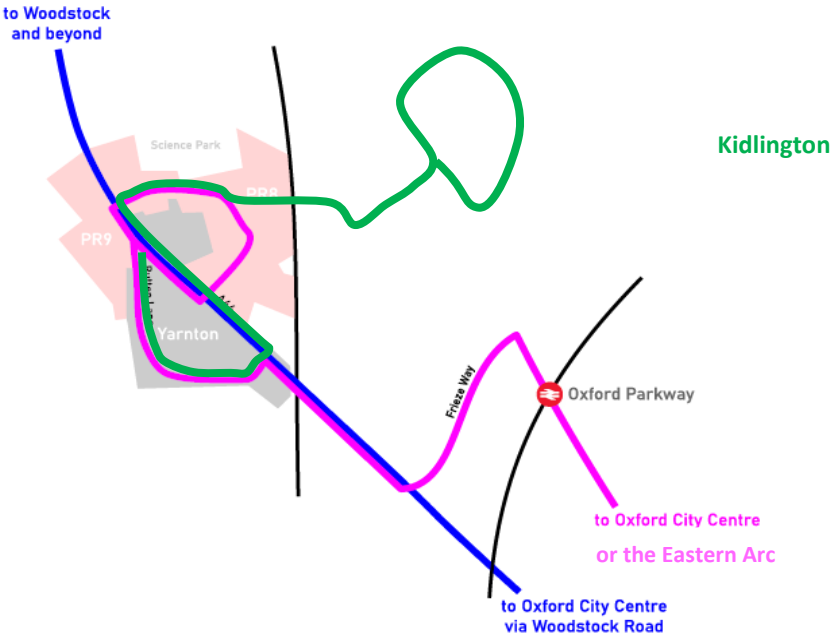
Figure 6.2: Oxfordshire County Council proposed bus routes to serve PR8 and PR9



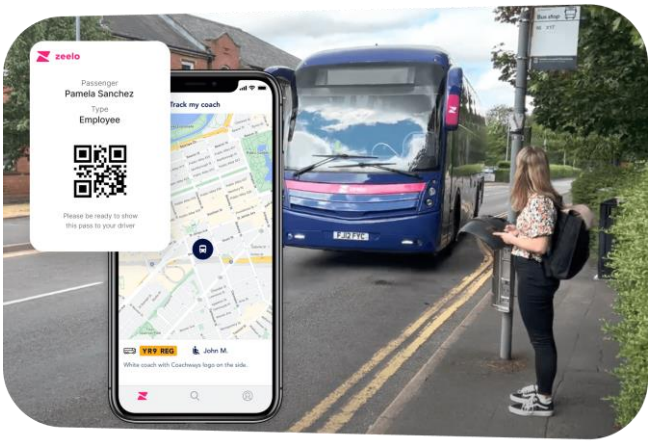
6.5.15 There is currently no bus service between Yarnton and Kidlington. Therefore, as part of the Begbroke Innovation District, it is proposed to provide a community bus service between Yarnton, Begbroke Innovation District and Kidlington.

6.5.16 **Figure 6.3** below illustrates the County Council's bus proposals with the proposed community bus in green (indicative routing at this stage, which is subject to detailed route planning). At this stage, the commitment is for a community bus to be funded by the development but the precise details of the route, vehicle type and timetable would need to be agreed with OCC.

Figure 6.3: Oxfordshire County Council proposed bus routes to serve PR8 and PR9 + community bus



6.5.17 Community bus services are evolving across the UK to include elements of demand responsiveness. The Herts Lynx service in Hertfordshire is an example of where demand responsive services are in place connecting villages to key towns and employment locations.



6.5.18 Operators such as Zeelo provide app-based technology which can benefit bespoke shuttle services and could be deployed at Begbroke Innovation District. The booking technology provides greater certainty of service and allows services to be adapted to meet demand.

6.6 Safeguarding for the Future

6.6.1 As stated earlier, Policies PR7b and PR8 of the Partial Review Local Plan requires PR7b and PR8 to provide for a new walk/cycle bridge over the canal, with PR8 providing a walk/cycle route between the new bridge and the PR8 site and PR7b providing a walk/cycle route through the PR7b site that would provide a connection to the southern part of Kidlington and Oxford Parkway.

6.6.2 There is potential for the new canal bridge to be for walk, cycle and public transport, which would provide a faster and far more direct route between Oxford Parkway and PR8 (i.e. circa 3km v 7km).

6.6.3 The benefits of safeguarding for this 'enhanced' canal bridge are:

- OCC's Local Transport and Connectivity Plan (LTCP) sets ambitious targets for mode shift and achieving a zero carbon transport network. It seeks to replace or remove 1 in 4 current car trips (25%) in Oxfordshire by 2030 and deliver zero-carbon transport network and replace/remove 1 in 3 current car trips (33%) in Oxfordshire by 2040. In order to achieve these targets, every possible step will need to be taken by OCC to deliver and safeguard for high quality sustainable travel choices across Oxford and the wider area.

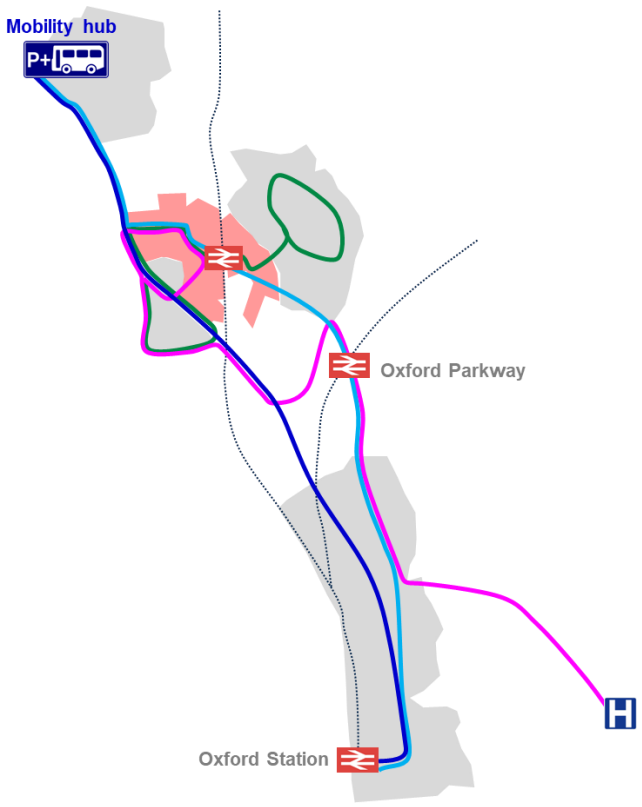
- A potential public transport route across the canal would provide an additional layer to the LTCP transport strategy for the north of Oxford area connecting allocated sites with Oxford Parkway via an off-road, direct sustainable travel corridor. It would be half the distance of the equivalent route by road, providing residents and employees with a fast connection to rail and onward to the city. It would not be an 'either/or' scenario whereby the improvements to bus priority being delivered along the A44 would be redundant, rather a public transport connection across the canal would complement and add to the sustainable transport choices north of Oxford.

- East-West Rail is in the process of being delivered and would provide a rail connection between Cambridge and Oxford via Bedford and Milton Keynes. Having a direct and fast connection between the allocated sites and Oxford Parkway, which would form part of East-West Rail, would open up the north of Oxford area to further opportunities both in terms of employment opportunities for local residents and attraction of employees for local businesses, including the Begbroke Innovation District.

6.6.4 The proposed mechanism for safeguarding for a potential multi-modal bridge over the canal has been set out in the bridges sub-section earlier in this section.

6.6.5 A plan showing the potential bus routes that could serve the Site should the canal bridge be delivered for public transport as well as walk and cycling is illustrated in **Figure 6.4** below.

Figure 6.4: Potential Bus Routes with a New Canal Bridge between PR8 and PR7b



Potential for a Railway Station

6.6.6 Policy PR8 of the Partial Review Local Plan requires the reservation of 0.5ha for a potential railway station within the PR8 site. A station at the Begbroke Innovation District would be on the Cherwell Valley Line, which runs between Didcot Parkway and Banbury via Oxford.

6.6.7 OUD commissioned SLC Rail to work with the design team to:

- determine the most appropriate location for a railway station within the masterplan;
- design concept railway station options based on current guidance; and
- input into the masterplan to ensure potential rail options have been safeguarded for.

6.6.8 OUD is seeking for the bridge over the railway to be designed to allow for walk, cycle and public transport. This would provide a multi-modal interchange with the potential railway station, should it come forward in the future.

6.6.9 A railway station does not form part of outline planning application for Begbroke Innovation District but OUD will continue to engage with Network Rail and Department for Transport on the potential for a railway station as the development progresses.

7 TRIP GENERATION AND DISTRIBUTION

7.1 Introduction

7.1.1 This section outlines the approach taken to derive multi-modal trip forecasts for the development proposals. It builds upon trip generation analysis completed by IMA Transport Planning in 2021 to support pre-application discussions for the Begbroke Innovation District with OCC.

7.1.2 Building upon the earlier trip forecasting approaches developed for the Site, the general framework within this assessment is as follows:

- Predict total person trips using TRICS or employment/education projections;
- Separate residential trips by trip purpose using the National Travel Survey (NTS);
- Apply reductions based on opportunities for internalisation within the Site and work-from-home (WFH) trends;
- Consider zones for origin-destination purposes;
- Identify destinations for each land use/trip purpose using 2011 Census data, Partial Review Local Plan allocations and areas of expected growth, locations of employer-linked sites, and location of existing facilities;
- Review opportunities for trips to be made by accessible forms of transport. This assessment considers existing and identified improvements to sustainable transport infrastructure, Census travel to work data, existing and emerging local transport policies, availability, and cost of parking, and potential links with other developments. Residual trips that could not be made sustainably are assumed to be made by car; and
- Apply factors to account for the principle of peak spreading, which is already observed across the County.

7.2 Peak Spreading

7.2.1 As traffic congestion increases, the proportion of daily traffic volumes that occur during peak hours is expected to decrease. This behavioural response is known as peak spreading: as congestion grows during the peak travel times, motorists may shift their departure time to a non-peak hour. As an aside, it is unknown whether the same phenomenon affects public transport usage, but it seems sensible to conclude that people may seek to shift their journey-making to the edges of the peak times if public transport capacity is low. In the post-pandemic world of changing work patterns and practices, it also seems probable that a much higher proportion of employers will be sympathetic to workers adopting more flexible work patterns where appropriate, and higher numbers of workers than ever before continue to work from home for a proportion of the time.

7.2.2 All of these effects have changed, and continue to change, the demand patterns that are seen on the wider transport network on a day to day basis.

7.2.3 The methodology used in this TA accounts for the principle of highway network peak spreading given that there is evidence of this trend already occurring on the surrounding highway network within Oxfordshire. To support this, two-way vehicle counts collected and reported by the Department for Transport (DfT) have been reviewed at six count sites within the vicinity of the Site at locations along the A44, A40, and A34. Data is provided on an annual basis, either collected anew or factored using rates calculated by DfT.

7.2.4 For the purposes of this exercise, data was analysed at each count site for the most recently available year ranging from 2019 to 2021. For the data reported during the COVID-19 pandemic, it is considered that the temporal spread of trips would not be impacted.

7.2.5 The two-way traffic volumes by peak period hour at each count site are presented in **Table 7.1** below. The overall spread of vehicle trips within both the AM and PM peak period is also calculated.

Table 7.1: DfT Two-Way Traffic Volumes & Peak Spreading Calculation

Time Period	A44 (Site 1)	A44 (Site 2)	A40	A34 (Site 1)	A34 (Site 2)	Total	Proportion
07:00-08:00	690	1,855	2,837	5,183	5,691	16,256	36%
08:00-09:00	814	1,929	2,499	4,900	5,350	15,492	34%
09:00-10:00	914	1,465	2,348	4,516	4,343	13,586	30%
AM	2,418	5,249	7,684	14,599	15,384	45,334	100%
15:00-16:00	1,123	2,066	2,762	5,519	5,180	16,650	33%
16:00-17:00	1,081	1,975	2,872	5,642	5,855	17,425	35%
17:00-18:00	1,015	1,893	2,687	5,402	5,263	16,260	32%
PM	3,219	5,934	8,321	16,563	16,298	50,335	100%

7.2.6 As presented, the spread of hourly trips on the highway network local to the Site within each peak period is relatively balanced with an AM peak of 36% of trips occurring between 07:00-08:00 and a PM peak of 35% of trips occurring between 16:00-17:00.

7.2.7 Aside from the derivation of total person trip rates, the following analysis presents trip forecasts for complete peak periods (AM: 07:00-10:00 and PM: 15:00-18:00) rather than peak hours. Peak hour results are only presented at the final stage following the application of the peak spreading factors outlined above in **Table 7-1**.

7.2.8 Note that peak spreading factors are only applied to car driver and car passenger trips as all other modes within the Oxfordshire conurbation are currently assumed to be less affected by congestion, which is the predominant motivation for trends towards peak spreading.

7.3 Total Person Trip Generation & Internalisation

7.3.1 This section outlines the methodology for calculating the total person trip generation for each of land use, as well as application of internalisation estimates.

Residential

7.3.2 Total person trip rates for 'Privately Owned' residential dwellings were extracted from the TRICS database based on the following parameters:

- Land Use: Residential
- Category: Houses Privately Owned
- Regions: England, excluding London

7.3.3 The Partial Review Local Plan policy for the PR8 allocation outlined an expectation that 50% of the total residential dwelling supply would be affordable housing. For this reason, additional total person trip rates have been extracted from TRICS for affordable rental dwellings, which typically show different trip-making behaviour when compared with privately owned residences.

7.3.4 Although TRICS offers multiple datasets comprising affordable housing trip rates, category 'D – Affordable/Local Authority Flats' was selected for this assessment given that it includes the largest sample size (n=5) for total person trip rates.

7.3.5 Both sets of total person trip rates are presented below in **Table 7.2**, whilst the full TRICS outputs are contained at **Appendix E**.

Table 7.2: Total Person Residential Trip Rates

Time Period	Privately Owned			Rental		
	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way
07:00-08:00	0.107	0.501	0.608	0.018	0.111	0.129
08:00-09:00	0.207	0.743	0.950	0.082	0.291	0.373
09:00-10:00	0.202	0.272	0.474	0.082	0.111	0.193
15:00-16:00	0.510	0.269	0.779	0.267	0.175	0.442
16:00-17:00	0.485	0.260	0.745	0.249	0.151	0.400
17:00-18:00	0.562	0.263	0.825	0.258	0.153	0.411
07:00-19:00	3.636	3.694	7.330	1.838	1.986	3.824

7.3.6 As set out in the Development Specification, the residential unit mix will comprise 20-40% studios/1-bedrooms, which, for the purposes of this assessment, have been assumed to all be flats. Flats tend to have lower trip rates than houses and therefore in order to provide a robust assessment, it has been assumed that 25% of residential units will be flats, which is at the lower end of the 20-40% range.

7.3.7 For the purposes of this assessment, it has also been assumed that the 25% flats are all affordable, with the remaining 75% of residential units assumed to be market houses. This is considered to be robust, as it is expected that, overall, 50% of the residential units would be affordable homes and it is expected that the affordable homes would generate less vehicle trips than the market houses.

7.3.8 Person trip rates extracted using the 'privately owned' selection parameter have been applied to the remaining 75% of units. The residential total person trip generation is outlined in **Table 7.3**.

Table 7.3: Total Person Residential Trip Generation

Time Period	Privately Owned			Rental			Total		
	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way
07:00-10:00	813	2,388	3,200	96	269	365	908	2,657	3,565
15:00-18:00	2,452	1,247	3,700	406	251	658	2,859	1,499	4,358
07:00-19:00	5,727	5,818	11,545	965	1,043	2,008	6,692	6,861	13,552

7.3.9 Using National Travel Survey (NTS) data, it has been possible to breakdown the total person residential trip generation by trip purpose by hour of the day. A summary of trip purpose distributions for the selected assessment periods is provided in **Table 7.4** below.

Table 7.4: Residential Trip Purpose by Time Period

Time Period	Employment	Education	Leisure	Shopping	Total
07:00-08:00	67.2%	19.8%	10.0%	3.0%	100.0%
08:00-09:00	37.1%	51.4%	7.3%	4.2%	100.0%
09:00-10:00	41.6%	10.0%	26.3%	22.1%	100.0%
15:00-16:00	23.4%	47.0%	17.7%	11.9%	100.0%
16:00-17:00	46.4%	11.2%	27.5%	15.0%	100.0%
17:00-18:00	55.5%	5.2%	27.3%	12.0%	100.0%
07:00-19:00	40.5%	14.5%	25.3%	19.7%	100.0%

Source: NTS Table NTS0502, 2019

7.3.10 These proportions have been applied to the total person trip totals in **Table 7.3** and the breakdown by trip purpose is presented in **Table 7.5**.

Table 7.5: Residential Person Trip Generation

Time Period	Employment			Education			Leisure			Shopping		
	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way
AM Peak Period	407	1,263	1,669	261	897	1,158	140	309	449	101	188	289
PM Peak Period	1,203	622	1,825	596	322	918	691	361	1,052	369	194	563
07:00-19:00	2,713	2,782	5,495	972	996	1,968	1,691	1,734	3,425	1,316	1,349	2,664

7.3.11 The following subsections discuss residential trip purpose internalisation and Work-From-Home (WFH) reductions, as well as other relevant steps in deriving external residential person trips.

Residential to Employment

7.3.12 It is common practice to consider the "internalisation" of trips that may be made within a large, mixed use development site. Of course, it should be recognised that people don't live their lives making decisions based on the planning system, of which they are typically unaware, and so the principle of "internalisation" really relates to peoples' propensity to want to live and work in close proximity. For some people this is a key lifestyle driver, and so it results in a demonstrable likelihood that some proportion of employees will choose to live closer to where they work – and hence, in the case of Begbroke Innovation District, to be likely to both live and work within the site boundary. There is some evidence to suggest that this proportion may be higher among younger people, but this has not been included in this assessment.

7.3.13 Therefore, the internalisation of residential to employment trips has been estimated using 2011 Census origin-destination data. Census data for UK towns with locational characteristics and employed populations like that of the planned development were reviewed with the aim of calculating the level of residential-employment internalisation that they benefit from.

7.3.14 As a starting point, towns were selected if they were located within a similar distance of a larger city or town, as the Site sits relative to Oxford. At its simplest, travel distance to significant employment opportunities has a considerable impact on the willingness of an employee to travel for work or, conversely, work closer to home.

7.3.15 Secondly, of the towns selected, none had a reported employed population greater than 7,000 people. Towns with employment opportunities significantly higher than the employment total projected for the Site (circa. 5,500 employees) may result in a skewed estimate of internalisation.

7.3.16 In total, origin-destination datasets for 16 towns were extracted from the 2011 Census. This data outlined the following:

- 1) the total number of 'workers' that live within each town, and
- 2) the number of 'workers' that live and work within the same town, i.e., a subset of (1).

- The existing level of internalisation for each of the selected towns was then calculated by dividing (2) by (1).

7.3.17 **Table 7.6** shows the selected towns and the corresponding population totals and calculations, whilst the overall internalisation rate is also calculated as a weighted average. For reference, the total population of each town is also referenced.

Table 7.6: Residential to Employment Internalisation of Existing Towns

Town	Nearest City	Total Pop.	Internal Working Pop.	Total Working Pop.	Internalisation
Waterbeach	Cambridge	6,014	739	2,777	26.6%
Cottenham	Cambridge	6,543	353	2,758	12.8%
Swallowfield	Reading	6,715	259	2,773	9.3%
Willingham	Cambridge	6,877	321	3,029	10.6%
Sawston	Cambridge	7,145	539	3,206	16.8%
Ampthill	Bedford	7,175	489	2,881	17.0%
Cambourne	Cambridge	7,185	379	3,278	11.6%
Princes Risborough	High Wycombe	8,101	530	2,898	18.3%
Haddenham	Aylesbury	8,105	387	3,085	12.5%
Cranfield	Bedford	8,312	643	2,915	22.1%
Wendover	Aylesbury	8,334	814	3,193	25.5%
Shefford	Bedford	10,017	922	4,309	21.4%
Thame	Oxford	11,561	1,599	5,021	31.8%
Kidlington	Oxford	12,142	528	5,310	9.9%
Flitwick	Bedford	13,234	1,021	6,002	17.0%
Wantage	Oxford	16,981	1,790	7,505	23.9%
Total		144,441	11,313	60,940	18.6%

7.3.18 An average internalisation rate of 18.6% is observed across the sample towns. On this basis, a reduction of 18.6% has been applied to the residential-employment total person trips resulting in a proportion of 81.4% travelling externally to the Site by all modes. Or in other words, it is assumed that 18.6% of people who choose to live on the Site will also work on the Site.

7.3.19 It is important to note that 2011 Census origin-destination data excludes Work-From-Home (WFH) employees from the dataset summarised above, given that this would not constitute a 'trip'. Therefore, the trip generation methodology applies a further reduction to residential-employment person trips to account for a WFH reduction.

7.3.20 One of the many things that the Covid-19 pandemic has shifted is the previously sacrosanct perceptions around employees' abilities to work from home and remain as productive as in the

workplace. Employers saw that employees could work effectively from home in many types of jobs, and moreover that there were lifestyle benefits to this that many enjoyed. The trend has therefore been that WFH activity has now become embedded – either wholly or in part, in many workplaces. Some employers have also noted that this effect has a beneficial effect for them, as they can reduce the office space they need and so reduce overhead costs.

7.3.21 This means that travel patterns for future occupants of the Site are likely to be less centred around the employers workspace, be more flexible on a day-to-day basis, and so will change with employers and employees striking a balance between pre-pandemic working in the office and a more flexible WFH culture. As a result, a greater number of employees are embracing a homeworking lifestyle either permanently or through a hybrid arrangement.

7.3.22 In December 2022, Cherwell District and Oxford City Councils published a Housing and Economic Needs Assessment (HENA) to inform their individual Local Plans. The HENA was intended to provide an integrated evidence base to identify the appropriate level and distribution of housing and employment over the period to 2040. As part of this evidence base, the role of home-based working was considered and incorporated into commuting calculations. At paragraph 7.4.31, the following assumptions were outlined:

'[…] 20% of workers are fully remote, 30% are hybrid with a mix of home and workplace working (set to 2 days of homeworking a week), and 50% are fully workplace based'

7.3.23 For the purposes of this assessment, a further reduction of 20% has been applied to residential-employment trips to account for future WFH activities. This excludes consideration of employees who would operate using a hybrid arrangement, which would otherwise result in a further reduction in external trip generation, but by not taking account of this it therefore strengthens the robustness of the assessment.

7.3.24 Combining internalisation and WFH reductions (18.6% + 20.0%), the proportion of "non-external" residential-employment trips is calculated at 38.6%.

Residential to Education

7.3.25 The residential to education trip purpose has been further divided between primary, secondary, and Higher Education.

7.3.26 In pre-application advice received in December 2022, OCC outlined the expectations for the development of on-site education facilities. OCC has built flexibility into their assumptions and advice by requiring two primary education facilities to be incorporated into the development proposals. This provision comprises 1 x 3 Form Entry (3FE) and 1 x 2FE primary school, which would accommodate a combined 1,050 pupils.

7.3.27 With regards to secondary education, OCC's view is that the Site would accommodate a 900-place secondary school. As a worst-case assumption, the secondary school would accommodate an upper limit of 1,100 pupils allowing for reserve capacity for a further 200 pupils.

7.3.28 Mentioned previously, this methodology forms an update to trip forecasting work completed by IMA Transport Planning in 2021 to support pre-application discussions with OCC. At that time, OCC provided school population estimates using their PopCal model for the proposed primary and secondary school facilities within the development based on projected housing numbers. For this TA, these previous estimates have been pro-rated to reflect the latest proposals to deliver circa 1,800 residential units. On this basis, 489 secondary-aged pupils are expected to live on-site.

7.3.29 Finally, using 2011 Census data, it is estimated that 271 students living on-site will be in Higher Education.

7.3.30 These pupil estimates form a starting point for weighting the residential to education trip generation by the appropriate education tiers. In doing this, consideration has been given to escort trips in additional to the travel of pupils themselves. Most primary school education trips are likely to be escorted, some secondary education trips would be escorted, and higher education trips are likely to all be unescorted. The overall proportion of education trips for each category have been weighted to allow for education escort trips. The 2019 dataset indicates that on average 96% of primary school and 57% of secondary school trips are escorted. The resulting weighted proportion of education trips is as follows:

- Primary School – 66%
- Secondary School – 25%
- Higher Education – 9%

7.3.31 With regards to internalisation, it was assumed that 90% of primary school trips would remain internal to the Site. The remaining 10% would travel to external education locations, with 10% of pupils attending the primary school arriving from off-site. This is considered robust given that OCC has driven the capacity for primary education facilities to accommodate 1,050 pupils with the expectation that this will match the projected population requirement on-site, i.e., 100% of primary school pupil trips are actually expected to remain internal.

7.3.32 Similarly, it was assumed that, even allowing for some parental choice, the proposed secondary school would be predominantly attended by those living on-site as well as pupils living within neighbouring allocations such as Yarnton (PR9), allowing those trips to remain internal. Like the primary school, 10% of secondary school pupils living on-site have been assumed to travel off-site to other schools. With no Higher Education facilities proposed within the Site, all students are expected to travel off-site.

7.3.33 These assumptions are also reflected in the methodology for determining trips to the Site from off-site pupils, discussed later. For all education trips, no adjustments have been made to account for carpooling between pupils. With lower vehicle occupancy rates assumed, this analysis is considered to be additionally robust.

Residential to Leisure

7.3.34 It is proposed to internalise 20% of residential to leisure trips. The residential to leisure trip purpose includes the following based on National Travel Survey (NTS) definitions:

- Social or entertainment: Visits to meet friends, relatives, or acquaintances, both at someone's home or at a pub, restaurant; all types of entertainment or sport, clubs, and voluntary work, non-vocational evening classes, political meetings.
- Holidays or day trips: Trips (within GB) to or from any holiday (including stays of 4 or more nights with friends or relatives), or trips for pleasure (not otherwise classified as social or entertainment) within a single day.
- Just Walk: Walking trips for pleasure or exercise along public highways and rights of way, including taking the dog for a walk and jogging.

7.3.35 The Control Documents for the scheme require that any masterplan must deliver a highly legible and permeable network of walk and cycle routes throughout the Site – and the illustrative masterplan shows one way that a comprehensive network could be achieved. In delivering a more pleasant and prioritised walk and cycle environment, future residents are more likely to remain within the Site and internalise leisure trips for the purpose of, as examples, pleasure, exercise, or dog walking.

7.3.36 Particularly with the forecast trend towards WFH, future residents remaining at home during the workday will be able to take advantage of greater flexibility to take shorter, more frequent breaks that may allow employees to enjoy time outside. This indicates a trend towards more localised, leisure trips contained to the Site.

7.3.37 Furthermore, many community amenities will be provided on-site including sports pitches and assembly spaces. These amenities are intended to serve the local community and will provide opportunities to partake in numerous leisure activities, whilst remaining on-site. Given this, a significant portion of trips relating to social or entertainment activities are expected to remain internal to the Site.

7.3.38 Finally, intrinsic to the holistic design of any future masterplan will be the requirement to create a sense of community within the Site. A development of this size, complemented by a wealth of community facilities, will foster relationships such that many leisure trips to visit friends, relatives, or acquaintances are also expected to remain internal to the Site.

7.3.39 Overall, an internalisation rate of 20% for residential to leisure trips is considered robust.

Residential to Shopping

7.3.40 The proposal for a local centre within the Site resulted in the assumption that 5% of all residential to shopping trips would remain internal.

External Residential Person Trips

7.3.41 **Table 7.7** presents a summary of external residential person trips generation by the Site during both peak and daily periods. A full breakdown of the external person trips by residential trip

purpose is provided in **Appendix F** along with the broader total person trip generation calculations.

Table 7.7: External Residential Person Trip Generation

Journey Purpose	AM Peak Period			PM Peak Period			07:00-19:00		
	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way
Resi to Work	250	776	1,026	739	382	1,121	1,667	1,709	3,376
Resi to Leisure	112	247	359	553	288	841	1,353	1,387	2,740
Resi to Shopping	86	160	246	314	165	479	1,118	1,146	2,265
Resi to Education	47	160	207	106	58	164	174	178	352
Total	**494**	**1,344**	**1,838**	**1,712**	**893**	**2,605**	**4,312**	**4,421**	**8,733**

Employment

Commercial & Academic

7.3.42 To forecast employment trips, a blended employee density rate of 1 full-time equivalent (FTE) employee per 28 sqm GEA has been assumed.

7.3.43 This is extracted from Section 6.20 (p.110) of the 'Greater Cambridge Employment Land and Economic Development Evidence Study' prepared in November 2020 on behalf of South Cambridge District Council (SCDC) and Cambridge City Council (CCC). The purpose of this evidence was to review the economic development and land needs of both SCDC and CCC.

7.3.44 The rate of 1 FTE employee per 28 sqm GEA was derived for R&D (E(g)(ii)) uses calculated with Cambridgeshire-based sites including West Cambridge and the Genome Campus. Both Cherwell District and Oxford City Councils have adopted this same rate in their shared HENA document (published December 2022), acknowledging the similarities between Oxfordshire's and Cambridgeshire's science-based economies.

7.3.45 Furthermore, rather than adopt the existing employment ratio, this rate of 1 FTE employee per 28 sqm GEA is considered more reflective of the proposed employment uses, which will offer state-of-the-art employment facilities and accommodate the latest in terms of modern working practices. It is therefore considered a robust and appropriate estimate of the likely employee density for the Site.

7.3.46 The proposed commercial floorspace will comprise R&D uses, inclusive of laboratory and office floorspace. Anecdotally, it is understood from the University of Oxford that the division of this space between laboratory and office spaces is generally in the range of 60:40 or 70:30. Typically, employees working in the laboratories are also the same employees working within the office space, with the exception of a small number of administrative employees.

7.3.47 In this case, the number of employees could effectively be calculated using only the floor area of the land use with the highest employee density - typically office has a higher employee density that laboratory space. Although the development schedule is yet to be refined to this point, office floor area may comprise 30-40% of the overall commercial area based on the University's experience and the resulting employee total would be considerably lower than the figures derived for use in this assessment.

7.3.48 Finally, OCC's transport assessment to support the Partial Review Local Plan assumed a ratio of 1 employee per 41 sqm for B type development aligning with the Homes & Community Employment Density Guide 2015, which indicates an average employee density for R&D of 1 employee per 40-60 sqm. If a ratio of 1 employee per 41 sqm were used, it would lower the person trip generation by more than 30%.

7.3.49 In combination, this reasoning further reinforces the robustness of the assumptions outlined in this methodology. With 155,000 sqm GEA of employment floorspace proposed, the revised ratio of 1 FTE employee per 28 sqm would result in the Site accommodating 5,536 employees.

7.3.50 The breakdown of non-university (commercial) and university employees follows the same assumption for the overall floor area, i.e., 75% commercial floorspace and 25% university floorspace. Of the university employees (25%), 12.4% and 12.6% were assumed to be students/post-docs and university staff, respectively. These resulting employee totals are as follows:

- 4,152 non-university (commercial) employees
- 696 university employees
- 688 students/post-docs

7.3.51 Following this, employment person trip rates were calculated from existing Begbroke Science Park (BSP) trip data using the following approach:

- Calculated vehicle trip rates (assuming a floor area of 14,200 sqm GEA for the existing BSP) from vehicle survey counts undertaken at the Woodstock Road / Begbroke Hill in June 2017 (undertaken prior to the pandemic and construction of the consented development at Begbroke Science Park).
- Applied existing BSP car driver mode share proportions from a 2018 BSP travel survey to the vehicle trip rates to derive person trip rates (per 100 sqm).
- Calculated person trip generation by applying the proposed floor area (155,00 sqm GEA) to the person trip rates.
- Adjust person trip generation to account for linked (internalised residential to employment) trips and the propensity for employees to WFH.
- Divide the employment external person trip generation between non-university (commercial) and university employees based on the calculated ratios of the non-university/university employees.

7.3.52 The resulting employment external person trip generation with a breakdown by employee-type is presented in **Table 7.8**. The full calculation can be seen in **Appendix G**.

Table 7.8: External Employment Person Trip Generation

Time Period	Student/Post-Doc			Uni. Staff			Commercial			Total		
	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way
AM Peak Period	463	63	527	469	64	533	2,797	383	3,180	3,729	511	4,240
PM Peak Period	61	346	408	62	351	413	368	2,092	2,461	491	2,790	3,281
07:00-19:00	817	806	1,624	828	817	1,645	4,936	4,870	9,806	6,582	6,493	13,075

Primary & Secondary School Staff

7.3.53 School staff person trips were calculated based on pupil: staff ratios contained within the TRICS database for primary and secondary schools in England. The calculated ratios were as follows:

- 6.91 pupils per staff member for primary schools
- 7.67 pupils per staff member for secondary schools

7.3.54 With an on-site primary school capacity of 1,050 pupils, this results in 152 primary school staff. For a secondary school capacity of 1,100 pupils, this equates to 143 secondary school staff. All staff trips are assumed to arrive in the AM peak period and depart during the PM peak period. All trips are assumed to be external to the Site. The resulting external person trip generation for school staff is presented in **Table 7.9**.

Table 7-9: External School Staff Person Trip Generation

Time Period	Primary School Staff			Secondary School Staff			Total		
	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way
AM Peak Period	152	0	152	143	0	143	296	0	296
PM Peak Period	0	152	152	0	143	143	0	296	296
07:00-19:00	152	152	304	143	143	286	295	295	590

Education

Primary Education – Off-Site Pupils

7.3.55 The Site will accommodate 1 x 3 Form Entry (3FE) and 1 x 2FE primary school with a combined capacity for 1,050 pupils. It has been assumed that 10% of primary school places will be filled by pupils travelling from off-site. Once again, this is considered robust given that OCC has driven the capacity for primary education facilities to accommodate 1,050 pupils with the expectation that this will match the projected population requirement on-site, i.e., 100% of primary school pupil trips are actually expected to remain internal.

7.3.56 Person trip rates have been calculated from the number of primary school person trips generated by the Site and applied to the off-site demand (including escort trips), resulting in the primary school person trip generation summarised in **Table 7.10**.

Table 7.10: External Primary School Pupil Person Trip Generation

Time Period	Arr.	Dep.	2-Way
AM Peak Period	116	34	150
PM Peak Period	42	77	119
07:00-19:00	129	126	255

Secondary Education – Off-Site Pupils

7.3.57 The proposed secondary school will accommodate 1,100 pupils. Based on OCC PopCal estimates, 489 secondary-aged pupils are expected to live on-site. Additionally, it is assumed that the school will be attended by pupils living within neighbouring allocations including Yarnton (PR9), allowing those trips to remain internal. Internal trips were assumed to be made on-foot or by bicycle and only trips travelling to the school from further afield may need to use alternative, vehicular modes. Like the primary school, 10% of secondary school pupils living on-site were assumed to travel off-site to other schools.

7.3.58 For the secondary school, trip rates have been calculated from the number of secondary school person trips generated by PR8 and applied to the off-site demand from Yarnton (PR9) and further afield. The results of this are presented in **Table 7.11**.

Table 7.11: External Secondary School Pupil Person Trip Generation

Time Period	PR9 to Site			Other Off-Site to Site			Total		
	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way
AM Peak Period	81	24	105	394	115	508	475	138	613
PM Peak Period	29	54	83	142	262	403	171	316	486
07:00-19:00	90	88	178	438	427	864	528	515	1,042

Hotel

7.3.1 The proposed development will include a hotel with an approximate floor area of 10,000 sqm. As a starting point, total person trip rates were extracted for hotels from the TRICS database. These are presented are **Table 7.12** below along with the resulting total person trip generation. No internalisation has been assumed for the proposed hotel use.

Table 7.12: External (and Total) Person Hotel Trip Rates (per 100 sqm) & Trip Generation

Time Period	Trip Rates			Trip Generation		
	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way
AM Peak Period	1.258	1.658	2.916	126	166	292
PM Peak Period	1.465	1.302	2.767	147	130	277
07:00-19:00	4.958	4.970	9.928	496	497	993

Summary

7.3.1 **Table 7.13** presents the proposed internalisation rates. Following this, **Table 7.14** outlines the weekday peak period external person trip generation for the proposed development.

Table 7.13: Internalisation Rates

Land Use / Trip Purpose	Internal	WFH	Total
Residential to Employment	18.6%	20.0%	38.6%
Residential to Leisure	20.0%	-	20.0%
Residential to Shopping	15.0%	-	15.0%
Residential to Primary School	90.0%	-	90.0%
Residential to Secondary School	90.0%	-	90.0%
Residential to Higher Education	0.0%	-	0.0%
Off-Site to BSP	-	20.0%	20.0%
Off-Site to Education (Staff)	-	-	-
Off-Site to Primary School	-	-	-
Off-Site to Secondary School*	17.1%	-	17.1%

*Assumes 17.1% of off-site secondary school trips will originate within PR9

Table 7.14: External Total Person Trip Generation

Land Use / Trip Purpose	AM Peak Period			PM Peak Period		
	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way
Residential to Employment	250	776	1,026	739	382	1,121
Residential to Leisure	112	247	359	553	288	841
Residential to Shopping	86	160	246	314	165	479
Residential to Education	47	160	207	106	58	164
Off-Site to BSP	3,729	511	4,240	491	2,790	3,281
Off-Site to Education (Staff)	295	0	295	0	295	295

Off-Site to Primary School	116	34	150	42	77	119
Off-Site to Secondary School	394	115	508	142	262	403
Total	126	166	292	147	130	277

7.4 Trip Distribution

7.4.1 Following the derivation of external person trips, the next step taken was to determine origin-destination patterns on a zonal basis. Zones at Middle Super Output Area (MSOA) scale were reviewed for Cherwell and Oxford. Zones were expanded to full districts to cover travel patterns to/from Vale of White Horse, West Oxfordshire, and South Oxfordshire. All origins and destinations outside of Oxfordshire are considered as one zone.

7.4.2 The methodology for deriving and applying individual origin-destination patterns to each land use or trip purpose are summarised in the following section. The complete distributions by zone are included at the end of this section, whilst a detailed set of calculations are included in **Appendix H**.

Residential

Residential to Employment

7.4.3 As a starting point, 2011 census data was extracted for travel to work destinations for Cherwell 017 MSOA; north Kidlington within the district of Cherwell. Given the existing density of residents within this MSOA, it was considered a more appropriate comparator of resident to employment travel patterns for the proposed development.

7.4.4 Building from this 2011 baseline, adjustments were made to the travel to work distribution to account for the effect of planned employment growth on the likely distribution of employment trips from the Site.

Residential to Education

7.4.5 The predicted education person trips will be split between primary school, secondary school and further education trips. Based on the analysis outlined previously, residential to education trips will be weighted as follows: 66% primary education, 25% secondary education, and 9% Higher Education.

7.4.6 The distribution of the 10% external primary education trips has been split equally between local schools within 2 miles of the Site; William Fletcher Primary School, St Thomas More Catholic Primary School, and Edward Field Primary School.

7.4.7 The distribution of the 10% external secondary education trips has been split equally between the closest existing facilities to the Site; The Marlborough School (3.4 miles), Gosford Hill School (1.7 miles), Cherwell School (4.5 miles), and The Swan School (5.5 miles).

7.4.8 In terms of Higher Education, the main destination is assumed to be University of Oxford sites within the city (75%) as well as Oxford Brookes (25%).

Residential to Leisure

7.4.9 It has been assumed, for assessment purposes, that Oxford city centre will be the focus of leisure trips from the Site given the wide range of leisure facilities located there.

7.4.10 Remaining trips will be distributed widely across Oxford and Cherwell. Given that a high proportion of leisure trips are visiting friends and that it is not possible to predict where these trips may be destined, each assessed destination area has been assumed to have at least 1% of leisure trips associated with it. Areas which are closer to the Site and/or have a specific leisure destination such as Ferry Leisure Centre in MSOA Oxford 002 have a higher assumed percentage allocated (between 2%-5%). To account for holidays and day trips a total of 5% of leisure trips have been assumed to have a destination outside of Oxfordshire.

Residential to Shopping

7.4.11 Similar to leisure, it is expected that Oxford city centre will be the main focus of shopping trips. Cherwell zones close to the Site with retail destinations have also had a higher proportion of shopping trips allocated to them given the convenience, particularly for food retail, of shopping locally. With regards to other zones, those offering a higher density of retail outlets have been allocated 1-5% of the total distribution for this trip purpose.

Employment

Commercial & Academic

7.4.12 The distribution of employment trips originating off-site has been based upon postcode data extracted from a 2015 Begbroke Science Park staff travel survey, which has then been adjusted to account for planned housing growth based on Local Plan allocations.

Primary & Secondary School Staff

7.4.13 The distribution of school staff trips originating off-site is based upon 2011 census travel to work data for a daytime population travelling to Cherwell 017 MSOA (north Kidlington). As before, the higher density of daytime commuters to this MSOA when compared with Begbroke itself, was considered a more appropriate comparator of employee travel patterns for the proposed development. The 2011 census data was then adjusted to account for planned housing growth based on Partial Review Local Plan allocations.

Education

Primary Education – Off-Site Pupils

7.4.14 It is assumed that the Site would serve a primary school catchment extending to the Cherwell 019 MSOA, within which the development sits, and neighbouring Cherwell 017 and Cherwell 018

MSOAs forming north and south Kidlington, respectively. On this basis, pupil trips originating off-site have been assumed to distribute equally from these three MSOAs.

Secondary Education – Off-Site Pupils

7.4.15 Secondary school trips travelling from PR9 to the Site are considered effectively to be internal trips. Beyond the Site and PR9, off-site secondary school trips are assumed to distribute predominantly from the local MSOA (Cherwell 019) as well as neighbouring MSOAs in Kidlington. A smaller portion of secondary school trips are expected to originate in north Oxford city and West Oxfordshire.

7.4.16 In arriving at these assumptions, competing secondary school facilities have been accounted as well as travel distance.

Hotel

7.4.17 Given the nature of the proposed hotel use, it is assumed that no patrons of the hotel would live locally. All trips are therefore assumed to originate from outside of Oxfordshire as a worst-case. This is considered robust given that hotel employees, which will form part of the overall trip generation, are likely to live within a reasonable commuting distance.

Summary

7.4.18 The resulting distribution of residential trips by purpose to destinations is presented first in **Table 7.15**, whilst origins of non-residential trips to the Site are presented in **Table 7.16**.

Table 7.15: Destinations of Residential Trips by Trip Purpose from the Site

Area	Emp.	Leisure	Shopping	Primary Ed.	Secondary Ed.	Higher Ed.	Total Ed.
Internal	38.6%	20.0%	15.0%	59.8%	22.3%	0.0%	82.1%
Oxford 001	4.4%	0.8%	1.0%	-	-	-	0.0%
Oxford 002	1.2%	2.5%	3.0%	-	-	-	0.0%
Oxford 003	1.4%	1.7%	0.0%	-	0.3%	-	0.3%
Oxford 004	0.1%	0.8%	0.0%	-	0.2%	-	0.2%
Oxford 005	0.1%	0.8%	0.0%	-	-	-	0.0%
Oxford 006	3.3%	0.8%	0.0%	-	-	-	0.0%
Oxford 007	0.3%	0.8%	0.0%	-	-	-	0.0%
Oxford 008	8.3%	42.1%	35.0%	-	-	6.6%	6.6%
Oxford 009	1.7%	1.7%	5.0%	-	-	-	0.0%
Oxford 010	1.7%	0.8%	0.0%	-	-	2.2%	2.2%
Oxford 011	0.5%	0.8%	0.0%	-	-	-	0.0%

Oxford 012	0.2%	0.8%	0.0%	-	-	-	0.0%
Oxford 013	2.7%	0.8%	0.0%	-	-	-	0.0%
Oxford 014	0.2%	0.8%	0.0%	-	-	-	0.0%
Oxford 015	0.8%	0.8%	2.0%	-	-	-	0.0%
Oxford 016	0.5%	0.8%	2.0%	-	-	-	0.0%
Oxford 017	0.5%	0.8%	3.0%	-	-	-	0.0%
Oxford 018	0.1%	0.8%	0.0%	-	-	-	0.0%
Cherwell 017	4.2%	2.5%	12.0%	-	-	-	0.0%
Cherwell 018	1.1%	2.5%	2.0%	2.3%	-	-	2.3%
Cherwell 019	8.2%	1.7%	19.0%	4.3%	0.6%	-	5.0%
Rest of Cherwell	6.6%	4.2%	1.0%	-	-	-	0.0%
South Oxfordshire	1.4%	1.7%	0.0%	-	-	-	0.0%
Vale of White Horse	3.4%	1.7%	0.0%	-	-	-	0.0%
West Oxfordshire	4.4%	1.7%	0.0%	-	1.3%	-	1.3%
Out of Oxfordshire	4.2%	4.2%	0.0%	-	-	-	0.0%
Total	100.0%	100.0%	100.0%	66.5%	24.8%	8.8%	100.0%

Table 7.16: Origins of Non-Residential Trips to the Site

Area	Primary Ed.	Secondary Ed.	School Staff	Employment	Hotel
Internal	0.0%	17.1%	0.0%	0.0%	0.0%
Oxford 001	-	2.5%	1.0%	1.2%	0.0%
Oxford 002	-	1.7%	0.8%	2.9%	0.0%
Oxford 003	-	-	0.2%	3.5%	0.0%
Oxford 004	-	-	0.5%	3.0%	0.0%
Oxford 005	-	-	0.5%	0.0%	0.0%
Oxford 006	-	-	0.5%	0.0%	0.0%
Oxford 007	-	-	0.7%	0.0%	0.0%
Oxford 008	-	-	0.2%	6.1%	0.0%
Oxford 009	-	-	0.2%	1.0%	0.0%
Oxford 010	-	-	0.2%	0.0%	0.0%
Oxford 011	-	-	0.5%	3.6%	0.0%
Oxford 012	-	-	0.3%	1.9%	0.0%
Oxford 013	-	-	0.6%	6.6%	0.0%

Oxford 014	-	-	0.2%	0.9%	0.0%
Oxford 015	-	-	0.7%	1.0%	0.0%
Oxford 016	-	-	1.0%	0.0%	0.0%
Oxford 017	-	-	0.8%	0.0%	0.0%
Oxford 018	-	-	0.5%	0.0%	0.0%
Cherwell 017	33.3%	18.7%	14.0%	2.7%	0.0%
Cherwell 018	33.3%	18.7%	8.3%	1.9%	0.0%
Cherwell 019	33.3%	29.0%	14.9%	9.4%	0.0%
Rest of Cherwell	-	0.0%	19.7%	11.5%	0.0%
South Oxfordshire	-	-	3.9%	6.3%	0.0%
Vale of White Horse	-	-	6.9%	14.8%	0.0%
West Oxfordshire	-	12.4%	16.3%	12.9%	0.0%
Out of Oxfordshire	-	-	6.4%	8.8%	100.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

7.5 Mode Share

7.5.1 The Site is uniquely placed to reduce private motorised travel through a compact settlement pattern with high levels of density, efficient land use mixes, and excellent accessibility through permeable transportation networks. Detailed within the supporting Transport Strategy, the Site will be supported by a transportation mitigation package including off-site measures creating high-quality, sustainable travel corridors between PR8, Oxford, and Kidlington amongst other locations. In combination, the willingness of future residents, visitors, and employees to travel via sustainable modes will increase, whilst the reliance on private vehicles will diminish.

7.5.2 This section considers the methodology used in arriving at the mode share assumptions in this assessment for each land use / trip purpose. In all instances, this assessment considered existing and identified improvements to sustainable infrastructure, census travel to work data, existing and emerging local transport policies, availability, and cost of parking, and potential links to other developments. Opportunities were first reviewed for trips to be made by accessible forms of transport and residual trips that could not be made sustainably were assumed to be made by car.

7.5.3 A detailed list of the mode shares applied to each distribution zone for each land use/trip purpose is contained at **Appendix I**. This includes notes on the professional judgement used in each case to adjust from a census baseline data point.

7.5.4 **Table 7.17** and **Table 7.18** presents the overall AM and PM peak period external mode share proportions established for each land use/trip purpose. Following this, **Table 7.19** outlines the weekday peak period external vehicle trip generation for the proposed development.

Table 7.17: External Mode Share (AM Peak Period)

Land Use / Trip Purpose	Walk	Cycle	PT	Car Driver	Passenger	Total
Residential to Employment	10.5%	15.9%	29.0%	38.9%	5.8%	100.0%
Residential to Leisure	5.4%	16.7%	45.8%	26.9%	5.3%	100.0%
Residential to Shopping	10.8%	14.6%	30.7%	38.2%	5.8%	100.0%
Residential to Education	17.9%	26.0%	27.5%	15.2%	13.4%	100.0%
Off-Site to BSP	6.8%	21.1%	21.0%	46.8%	4.3%	100.0%
Off-Site to Education (Staff)	15.1%	24.4%	16.3%	41.1%	3.1%	100.0%
Off-Site to Primary School	47.5%	12.8%	7.5%	16.7%	15.5%	100.0%
Off-Site to Secondary School	44.8%	18.8%	17.3%	9.9%	9.2%	100.0%
Off-Site to Hotel	0.0%	0.0%	50.0%	46.9%	3.1%	100.0%

Table 7.18: External Mode Share (PM Peak Period)

Land Use / Trip Purpose	Walk	Cycle	PT	Car Driver	Passenger	Total
Residential to Employment	10.5%	15.9%	29.0%	38.9%	5.8%	100.0%
Residential to Leisure	5.4%	16.7%	45.8%	26.9%	5.3%	100.0%
Residential to Shopping	10.8%	14.6%	30.7%	38.2%	5.8%	100.0%
Residential to Education	17.9%	26.0%	27.5%	15.2%	13.4%	100.0%
Off-Site to BSP	6.8%	21.1%	21.0%	46.8%	4.3%	100.0%
Off-Site to Education (Staff)	15.1%	24.4%	16.3%	41.1%	3.1%	100.0%
Off-Site to Primary School	47.5%	12.8%	7.5%	16.7%	15.5%	100.0%
Off-Site to Secondary School	44.8%	18.8%	17.3%	9.9%	9.2%	100.0%
Off-Site to Hotel	0.0%	0.0%	50.0%	46.9%	3.1%	100.0%

Table 7.19: External Vehicle Trip Generation

Land Use / Trip Purpose	AM Peak Period			PM Peak Period		
	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way
Residential to Employment	97	302	399	287	149	436
Residential to Leisure	30	67	97	149	78	226
Residential to Shopping	33	61	94	120	63	183
Residential to Education	7	24	31	16	9	25
Off-Site to BSP	1,745	239	1,984	230	1,305	1,535
Off-Site to Education (Staff)	121	0	121	0	121	121

Off-Site to Primary School	19	6	25	7	13	20
Off-Site to Secondary School	39	11	50	14	26	40
Off-Site to Hotel	59	78	137	69	61	130
Total	2,151	787	2,938	891	1,824	2,716

7.5.5 Following this, the peak spreading factors outlined previously in Table 7-1 have been applied to these external peak period vehicle trip totals to derive peak hour outputs. Consistent with the network peak hours that have been established as part of a separate exercise by Vectos Microsim, the external vehicle trip generation for the AM peak (08:00-09:00) and PM peak (17:00-18:00) is presented in **Table 7.20**.

Table 7.20: External Vehicle Trip Generation (Peak Hour)

Land Use / Trip Purpose	AM Peak Hour (08:00-09:00)			PM Peak Hour (17:00-18:00)		
	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way
Residential to Employment	33	103	136	93	48	141
Residential to Leisure	10	23	33	48	25	73
Residential to Shopping	11	21	32	39	20	59
Residential to Education	2	8	11	5	3	8
Off-Site to BSP	596	82	678	74	422	496
Off-Site to Education (Staff)	41	0	41	0	39	39
Off-Site to Primary School	7	2	9	2	4	6
Off-Site to Secondary School	13	4	17	5	8	13
Off-Site to Hotel	20	27	47	22	20	42
Total	735	269	1,004	288	589	877

8 TRANSPORT EFFECTS

8.1 Introduction

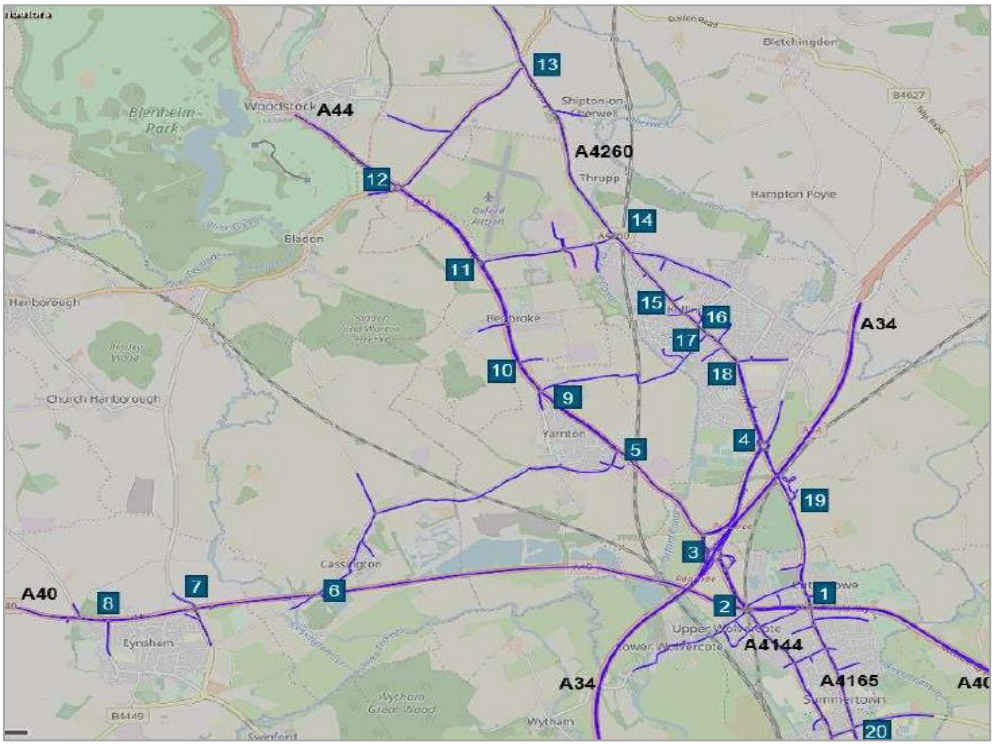
8.1.1 As agreed with OCC, the North Oxford VISSIM model has been used to assess the stand alone transport effects of the proposed development as well as the cumulative impact of development generated traffic from the PR sites and other committed development.

8.2 Local Model Validation Report

8.2.1 OCC provided the Local Model Validation Report (LMVR) that was prepared to support the North Oxford VISSIM model. The LMVR provides an overview of the development, calibration, and validation of the 2018 Base North Oxford VISSIM model.

8.2.2 The North Oxford VISSIM model is a micro-simulation model representing a large study area. The model is primarily formed of four key corridors including a 7km section of the A34 corridor, an 11km section of the A40 corridor, an 11km section of the A44-A4144 corridor and a 12km section of the A4260-A4165 corridor. The model extent is shown in **Figure 8.1** below.

Figure 8.1 North Oxford VISSIM Model Extent



8.2.3 The VISSIM model has been developed using the specifications shown in **Figure 8.2** below.

Figure 8.2: North Oxford VISSIM Model Specifications

Base Year:	2018
Modelled Scenarios:	AM and PM Base year.
Assignment:	Dynamic
Modelled Time Periods:	06:30 – 10:30 and 14:30 – 18:30
Warm Up Period:	A 30 minute (1800 simulation second) warm up period has been modelled to ensure that the traffic conditions in the model are realistic at the start of the evaluation period. AM between 06:30 – 07:00 and PM between 14:30 – 15:00.
Evaluation Period:	A three-hour evaluation period has been used for the purposes of model calibration. Individual hours of 07:00 – 08:00, 08:00 – 09:00 and 09:00 – 10:00 have been assessed. For the PM peak individual hours of 15:00 – 16:00, 16:00 – 17:00 and 17:00 – 18:00 have been assessed. The validation of the model is representative of a single hour 08:00 – 09:00 (AM) and 17:00 – 18:00 (PM)
Cool Down Period:	A 30 minute (1800 simulation second) cool down period has been modelled to ensure the accuracy of the model results and that all demands during the evaluation period are loaded onto the network. AM between 10:00 – 10:30 and PM between 18:00 – 18:30.
Vehicle Types:	The following vehicle types have been modelled - Light vehicles – comprising cars and light goods vehicles (LGV); and - Heavy vehicles – comprising of OGV1 and OGV2. - Buses – specified routing, timetables and bus stops for each service number.
VISSIM Version:	10.00-12

8.3 Modelling Parameters

8.3.1 The Partial Review Local Plan runs to 2031. The PR sites are expected to be constructed and completed during this period up to 2031, albeit OUD's element of PR8 is expected to be completed shortly after, by 2033. Therefore, the future horizon period establishes local highway network conditions, taking into account any appropriate background traffic growth, consented development traffic and PR site traffic upon full completion.

8.3.2 This section summarises the assumptions with regards to traffic growth and committed development, which have informed the Future Year Reference Case model, when all of the PR sites are completed. In addition, this section summarises the model scenarios and the traffic and infrastructure that is included within each scenario.

Model Scenarios

8.3.3 The following sets out the inclusions contained within each modelled scenario. For each scenario is a modelled AM and PM peak period. The AM simulates 06:30-10:30 with the 07:00-10:00 period assessed hourly, and the PM simulates 14:30-18:30 with the 15:00-18:00 period assessed hourly:

- 2018 Base (as provided by OCC)
- Future Year Reference Case (assumed to be 2033 when all PR sites will be complete)

        - Includes all committed developments as described in the Vectos Microsim Forecasting Report (**Appendix J**), with background traffic forecasting methodology as described in the Capping Discussion Note (**Appendix K**).
    - Future Year Do-Something (Proposed Development) Low Mode Shift
        - As above for the Future Year Reference Case, with background demands adjusted in line with low mode shift assumptions as set out in the Mode Shift Discussion Note (**Appendix L**) + OUD proposed Begbroke Innovation District demands.
    - Future Year Do-Something (Proposed Development) Medium Mode Shift
        - As above for the Future Year Reference Case, with background demands adjusted in line with medium mode shift assumptions as set out in the Mode Shift Discussion Note (**Appendix L**) + OUD proposed Begbroke Innovation District demands.
    - Future Year Do-Something (Proposed Development) High Mode Shift
        - As above for the Future Year Reference Case, with background demands adjusted in line with high mode shift assumptions as set out in the Mode Shift Discussion Note (**Appendix L**) + proposed Begbroke Innovation District demands.
    - Future Year Do-Something (Proposed Development + PR Sites) Low Mode Shift
        - As above for the Future Year Reference Case, with background demands adjusted in line with low mode shift assumptions as set out in the Mode Shift Discussion Note (**Appendix L**) + Proposed Development + PR sites traffic demand.
    - Future Year Do-Something (Proposed Development + PR Sites) Medium Mode Shift
        - As above for the Future Year Reference Case, with background demands adjusted in line with medium mode shift assumptions as set out in the Mode Shift Discussion Note (**Appendix L**) + Proposed Development + PR sites traffic demand.
    - Future Year Do-Something (Proposed Development + PR Sites) High Mode Shift
        - As above for the Future Year Reference Case, with background demands adjusted in line with high mode shift assumptions as set out in the Mode Shift Discussion Note (**Appendix L**) + Proposed Development + PR sites traffic demand.

8.3.4 **Table 8.1** summarises what is included within each of the modelled scenarios.

Table 8.1: Summary of Assessment Scenarios

Scenario	Traffic				Infrastructure				Mode Shift
	Base Traffic	Committed Development	Begbroke Innovation District	Other PR Sites	OUD Accesses	Growth fund improvements	Sandy Lane closure	Local Plan Infrastructure	Mode Shift in background traffic
2018 Base	✓								
Future Year Reference Case	✓	✓				✓	✓		
Future Year Reference Case + Begbroke Innovation District	✓	✓	✓		✓	✓	✓	✓	Low
									Medium
									High
Future Year Reference Case + Begbroke Innovation District + PR Sites	✓	✓	✓	✓	✓	✓	✓	✓	Low
									Medium
									High

Committed Development

8.3.5 Section 3 of the Vectos MicroSim Forecasting report (**Appendix J**) sets out the assumptions in terms of committed development which have been included within the model. These were agreed with OCC as part of the initial scoping exercise and have been updated as part of this updated VISSIM modelling exercise to reflect comments from OCC (i.e. refinements to assumptions for Eynsham Garden Village trip generation and addition of a proposed development in Woodstock, which are set out in **Appendix J**).

8.3.6 It was agreed not to include vehicular trips forecast to be generated by other allocated sites in Oxford City or South Oxfordshire within the Future Year Reference Case model as these sites have the same status as the PR sites at the time of preparing the model (i.e., they are allocated but do not have planning consent). Unlike the committed development sites, the allocated sites do not have agreed trip generation, distribution, access strategies and transport mitigation, which can be included in the VISSIM model. Including traffic generated by Local Plan allocated sites within the Future Year Reference Case model without any mitigation is not considered appropriate or in accordance with Planning Policy Guidance paragraph 42-014-20140306, which states that *"It is important to give appropriate consideration to the cumulative impacts arising from other committed development (ie development that is consented or allocated where there is a reasonable degree of certainty will proceed within the next 3 years)."*

PR Sites Trip Generation

8.3.7 The traffic generation associated with each of the PR sites is summarised in Section 4 of the Vectos MicroSim Forecasting report (**Appendix J**). The trip generation has been derived for each of the PR sites based on their location, opportunity for trips to be undertaken via active modes and public transport, and likely internalisation of trips. The proposed trip rates for PR8 have been agreed with OCC in advance and applied to the other PR sites, taking account of site-specific factors. The trip generation associated with the proposed quantum of development for the PR sites has been modelled based on their individual outline applications that have either been submitted or are forthcoming. PR6b is yet to fix the quantum of development to be applied for and therefore the trips associated with the allocated quantum of development for PR6b have been modelled.

8.3.8 Section 4 of the Vectos MicroSim Forecasting report **(Appendix J**) also identifies the proposed site access arrangements for each of the PR sites.

8.3.9 Section 5 of the Vectos MicroSim Forecasting report (**Appendix J**) presents a summary of the peak period input demands for both the committed development and the PR sites.

Traffic Growth

8.3.10 The Forecast Capping Discussion Note (**Appendix K**) sets out the methodology for assessing traffic growth and its application in the Future Year Forecast Model. In summary:

- Analysis and interpolation of the trends observed within the historic traffic data for the study area (2000 – 2017) revealed that, should the trends be projected forward, traffic levels would fall within the AM and PM peak hours by 2031 (Partial Review Local Plan year) relative to 2017 levels.
- Comparison of the historic traffic trends (2000 and 2017) relative to housing delivery over that period revealed that the reduction in traffic volumes was accompanied by an increase in housing provision, which demonstrates that increased housing levels will not necessarily mean an increase in traffic volumes.

8.3.11 Therefore, in order to reflect these trends within the traffic modelling, the Future Year Reference Case has been derived whereby total growth within the model, following the assignment of the committed development demands, remains at 0%.

8.3.12 The application of capping in the manner set out within the Capping Forecast Note (**Appendix K)** allows for realistic forecasts to be derived for assignment within the model such that the network capacity is not exceeded prior to any PR sites coming forward, as clearly that would not be a realistic position given the findings of the trend analysis which points to a steady decline in peak hour and daily traffic volumes.

8.3.13 The resultant traffic figures assigned within the VISSIM model also align to some extent with OCC's adopted Local Transport and Connectivity Plan (LTCP). Continued application of increases

in traffic volumes through the model forecasting would represent a significant failure in OCC's adopted policy approach.

Interventions in the Future Year Modelling Scenarios

8.3.14 The following committed and planned infrastructure schemes and those planned to address growth elsewhere, have been included within the Future Year Reference Case:

- Infrastructure associated with Oxford North committed development;
- A40 HIF2 scheme improvement works;
- North Oxford Corridor schemes including sustainable travel improvements to:
  - Peartree Interchange, Loop Farm roundabout and Cassington roundabout;
  - A44 between Pear Tree Interchange and Cassington roundabout; and
  - Kidlington roundabout.

Testing of the Infrastructure Delivery Plan Interventions

8.3.15 In 2015, OCC and its partners began Connecting Oxfordshire, a transformation of how people travel to and within Oxford, as part of their plan to create a less congested, less polluted city and county.

8.3.16 In allocating the PR sites, CDC and OCC had due regard to this strategy and the approach to delivering growth, which is predicated on the assumption that wholesale increases in road capacity is no longer a sustainable or acceptable option. It was established that the A44 and A4260 corridors were well placed to deliver growth in a sustainable manner due to:

- Their proximity and connections with Oxford;
- Them being served by high frequency bus services;
- There being an existing cycle network that encourages a relatively high proportion of cycle trips to be completed; and
- Access to local pedestrian infrastructure.

8.3.17 In addition to this it was recognised that there are opportunities to build upon and enhance the current sustainable transport networks to ensure their use is prioritised and maximised. These measures were developed by OCC having regard to its Strategic Transport Assessment (STA) and were included in the Infrastructure Delivery Plan (IDP) in Appendix 4 of the Partial Review Local Plan. They include:

- A Park and Ride at London-Oxford airport and expansion of Water Eaton Park and Ride (although it is understood that the latter is no longer proposed);
- Public transport priority improvements along the A44 corridor;
- Enhanced public transport services along the A44 corridor;
- Pedestrian and cycle improvements along the A44 with signalised crossings;
- Closure of Sandy Lane to through traffic and enhancements to assist its use by pedestrian and cyclists connecting between the A44 corridor and Kidlington; and
- Cycle superhighway along the A4260 and Oxford Road towards Oxford city centre.

8.3.18 The works set out in the IDP of the Partial Review Local Plan provide a sustainable transport network to support the proposed allocations through limiting the need to travel by car and offering a genuine choice of transport modes.

8.3.19 The range of mitigation measures included within the IDP have be tested within the model. The Vectos MicroSim Mode Shift Assessment Discussion Note (**Appendix L**) sets out the assumptions that have been applied to the demands within the VISSIM model to replicate the expected effects of changes in travel behaviour arising from the delivery of enhancements to the sustainable and active travel networks. The note considers demand adjustments for:

- Delivery of Park and Ride;
- Active Modes;
- Cycle corridor improvements; and
- Bus corridor improvements.

8.3.20 To assist with understanding which measures may be a priority, the note identifies the level of adjustment made at each stage of assessment. This will help to establish the extents of the IDP schemes that are specifically required to offset the increases in vehicle trips associated with the PR sites.

8.3.21 **Table 8.2** summarises the infrastructure identified in the IDP in Appendix 4 of the Partial Review Local Plan which has been included within the modelled mode shift mitigation strategy. Schemes that have been omitted from the list are either due to them not being necessary to mitigate the impacts of the PR sites, or are no longer being pursued by OCC, such as the expansion of the Water Eaton Park and Ride.

Table 8.2: Summary of IDP Mitigation included in the VISSIM Modelling

Ref	Scheme	Comment*
1	Potential for new rail halt at Begbroke	Land reserved in masterplan for PR8
3	Park and Ride at Oxford airport	Mode shift accounted for in model
4a	Improved bus lanes on A4165 between Kidlington roundabout and past new housing sites	Included in Oxford Road improvement promoted by PR6a and 6b
6c	A44 southbound bus lane between Spring Hill Road junction and Pear Tree Interchange.	Southbound bus lane between Cassington roundabout and Pear Tree Interchange included in the model as part of the growth fund scheme. A44 corridor north of Cassington roundabout currently being designed by OUD in consultation with OCC and the other PR sites.

7	4 buses per hour between Oxford and Begbroke	Limited mode shift accounted for in model
8d	Upgrade of outbound bus stop on A4165 opposite Parkway	As part of mitigation package
9	Cycle superhighway along the A4260/A4165 to/from Oxford Parkway	Design work progressing as part of PR6a application.
10	Pedestrian and cycle improvements linking Kidlington, Begbroke and Yarnton: Potential closure of Sandy Lane to form green cycle/pedestrian route linking A44 and the A4260.	Active travel improvements linking A44 to Kidlington provided for in PR8 site master planning and bridge being progressed by Network Rail as part of Oxford Phase 2
12	Walking/cycling/wheelchair accessibility from land at Stratfield Farm (PR7b) to key facilities on the A4165, including proposed sporting facilities at PR7a	Included in site master planning of PR7b
13	New public bridleways suitable for pedestrians, all weather cycling, wheelchair use and horse riding and connecting with existing public rights of way network	Included in site master planning
14	Walking/cycling/ wheelchair accessibility from PR7b to PR8, including suitable crossing over the Oxford Canal	Included in site master planning of PR7b and PR8
15	New public bridleway / green link connecting PR7b with PR8 across Oxford canal and exploration of links with the wider PRoW east of A4165	
16	Wheelchair accessible pedestrian / cycle bridge over Oxford canal linking PR7b to PR8	Included in site master planning of PR7b and PR8
17	Sandy Lane – pedestrian and cycle new link over railway	Included in PR8 site master planning. To be applied for by Network Rail as part of closure of level crossing
17a	Sandy Lane ped/cycle railway bridge	Included in site master planning – PR8. To be applied for by Network Rail as part of closure of level crossing
18	Kidlington roundabout provision of ped/cycle crossing at roundabout	Growth fund scheme included
19	Connectivity from PR9 to local facilities within Yarnton	Included in PR9 site master planning
20	New walk and cycle routes from PR9 through Yarnton	Included in PR9 site master planning
21	Cycle and pedestrian improvements on A44, including ped/cycle crossing facilities	Included but extent and design of works to be agreed.
23	Reduction of speed limit and pedestrian/cycle crossing at key locations along A44 from Sandy Lane to Cassington Rd	Included
24	Footpaths / cycleways within all proposed development sites that link new development to existing and proposed networks	Included in site master planning for all PR sites
25	Pedestrian/cycle / wheelchair accessibility from PR6a to Water Eaton Park / Oxford Parkway	Included in PR6a site master planning

26	Ped/cycle/wheelchair accessibility from PR6b to employment opportunities at Oxford Northern Gateway	Routes through PR6b to be included in site master planning
27	Upgrade existing footbridge over railway linking PR6b to Northern Gateway	Subject to land ownership and liaison with stakeholders, including Network Rail
28	Ped/cycle/wheelchair accessibility across A4165 from PR6b to PR6a	Included in proposed design of upgrades to A4165 Oxford Road set out in PR6a application
29	Footway along southbound carriageway of Bicester Road	Included in PR7a site master planning
30	Ped/cycle/wheelchair accessibility to Oxford Parkway across to Bicester Road and to formal sports pitches on site	Included in PR7a site master planning
31	Vehicular spine route through PR8 capable of being used by buses	Included in PR8 site master planning
32	Highway works to Kidlington roundabout to enable site access for PR7b	Included in PR7b site master planning
33	Ped/cycle bridges over railway and Oxford Canal	Provided for in site master planning PR8/PR7b but subject to liaison with stakeholders

**It should be noted that notwithstanding the inclusion within the modelling of the interventions listed in Table 8.1, the direct delivery of individual infrastructure measures will be confirmed as part of the relevant PR site application(s). Equally, the funding of the proposed interventions that are not being delivered by each of the respective PR sites via inclusion within individual masterplans and/or Section 278 Agreements is to be agreed using a charging mechanism that accords with the usual requirements of Regulation 122 of the CIL Regulations.*

8.4 Begbroke Innovation District Modelling Outcomes

8.4.1 The VISSIM modelling was submitted to OCC in November 2022, which was reviewed by Pell Frischmann on behalf of OCC. It was agreed that some revisions were necessary to the modelling and **Appendix M** includes a note prepared by Vectos Microsim on behalf of the PR sites documenting the changes that were made to the model.

8.4.2 This section provides a summary of the following modelling outcomes for the Future Year Reference Case + Begbroke Innovation District when compared against the Future Year Reference Case:

- Network statistics across the network;
- Queue lengths and delay, including Level of Service assessment for the following junctions:
    - A44/ Cassington Road Roundabout;
    - Pear Tree Interchange;
    - Loop Farm Roundabout;

- Wolvercote Roundabout;
- Cutteslowe Roundabout; and
- Kidlington Roundabout.

- Journey time information for the following routes:
  - Route 1: A34 within the model extents either side of the Pear Tree Interchange;
  - Route 2: A40 between Wolvercote Roundabout and River Cherwell;
  - Route 3: A44 / A4144 corridor between Oxford Airport and Staverton Road;
  - Route 4: A4260 / A4165 corridor between the A4095 and Linton Road;
  - Route 5: Upper Campsfield Road;
  - Route 6: Langford Lane between A44 Woodstock Road and A4260 Banbury Road;
  - Route 7: Frieze Way; and
  - Route 8: Bicester Road.

Network Statistics

Vehicle Trips in Network

8.4.3 **Table 8.3** below identifies the active number of vehicles in the modelled network, the total number of vehicle trips completed and the latent demand (number of vehicles not able to enter the network) for the Future Year Reference Case and Future Year Reference Case + Begbroke Innovation District in the AM and PM 3 hour peak periods.

Table 8.3: Vehicles in Network (AM and PM 3 hour peak periods)

		2018 Base	Future Year Reference	Future Year Reference + Begbroke Innovation District		
				Mode Shift (Low)	Mode Shift (Medium)	Mode Shift (High)
Vehicles Active in the Network	AM Peak Period	2,126	2,177	2,073	2,050	1,989
	PM Peak Period	2,803	2,439	2,483	2,396	2,340
Vehicle Trips Completed	AM Peak Period	48,889	48,891	47,317	46,377	46,094
	PM Peak Period	50,229	50,400	49,099	48,448	48,150
Latent Demand at End of Simulation	AM Peak Period	1	25	25	14	26
	PM Peak Period	2	125	260	236	214
Total Input Vehicle Numbers	AM Peak Period	51,016	51,093	49,415	48,441	48,109
	PM Peak Period	53,034	52,964	51,842	51,080	50,704

8.4.4 **Table 8.3** shows the latent demand remains consistently low in the AM and PM peak periods, which demonstrates that the vehicle demand in the "with Begbroke Innovation District" scenarios can continue to travel through the network during the peak periods.

Vehicle Delay

8.4.5 **Table 8.4** below identifies the delay for all vehicles travelling within and through the network for the Future Year Reference and "with Begbroke Innovation District" scenarios in the AM and PM 3 hour peak periods.

Table 8.4: Vehicle Delay (Seconds)

		2018 Base	Future Year Reference	Future Year Reference + Begbroke Innovation District		
				Mode Shift (Low)	Mode Shift (Medium)	Mode Shift (High)
Average delay per vehicle in the network	AM Peak Period	169	187	-3	0	-19
	PM Peak Period	202	144	+9	+6	+2
Overall delay per vehicle (including time off network)	AM Peak Period	171	189	-2	+1	-18
	PM Peak Period	203	153	+15	+8	+4

8.4.6 **Table 8.4** shows that the "with Begbroke Innovation District" scenarios average vehicle delay in the AM 3 hour peak period changes by -19 to +1 seconds per vehicle compared to the Future Year Reference Case, depending on the level of mode shift. In the PM 3 hour peak period the average vehicle delay increases by +2 to +15 seconds per vehicle in the "with development" scenarios compared to the Future Year Reference Case, depending on the level of mode shift. Overall, the results demonstrate that Begbroke Innovation District will have a negligible effect on vehicle delay, which demonstrate clear compliance with NPPF paragraph 111 of avoiding severe impacts on the road network.

Average Vehicle Speeds

8.4.7 **Table 8.5** below summarises the average vehicle speeds (in mph) for all scenarios in the AM and PM 3 hour peak periods.

Table 8.5: Average Vehicle Speeds (mph)

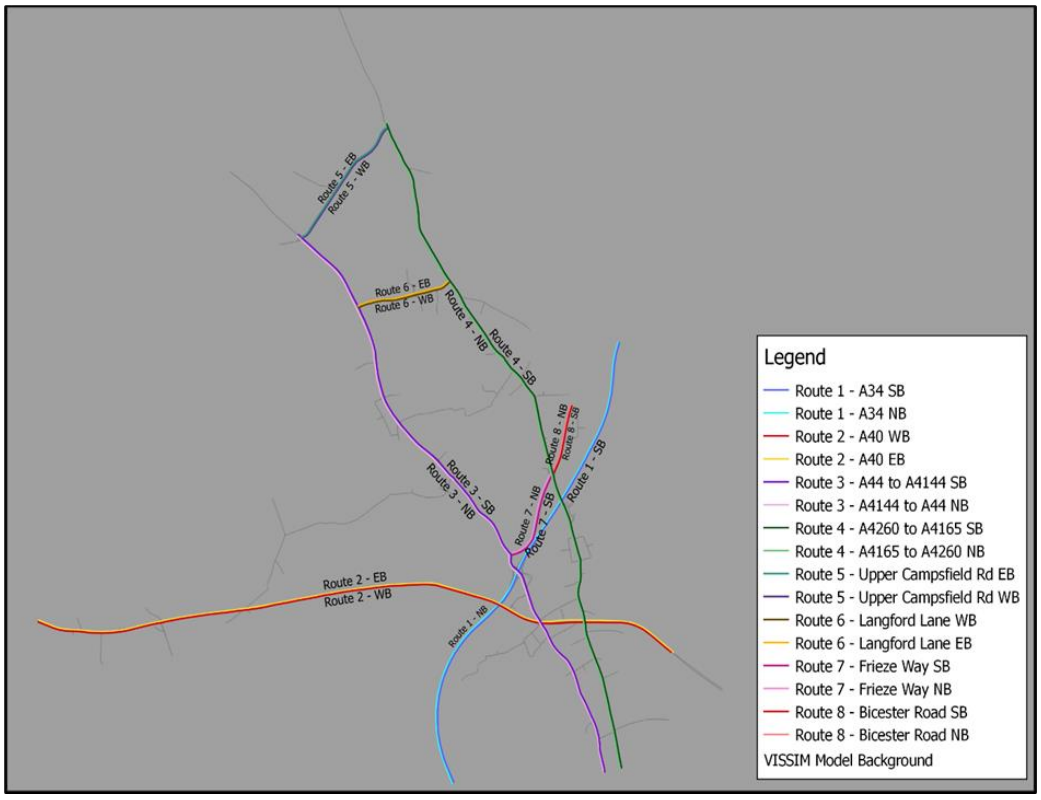
		2018 Base	Future Year Reference	Future Year Reference + Begbroke Innovation District		
				Mode Shift (Low)	Mode Shift (Medium)	Mode Shift (High)
Average Vehicle Speeds (mph)	AM Peak Period	27	26	27	27	28
	PM Peak Period	25	29	28	29	29

8.4.8 **Table 8.5** shows that in the "with Begbroke Innovation District" scenarios, there is forecast to be negligible impact on average vehicle speeds across the network compared to the Future Year Reference Case.

Journey Times

8.4.9 Journey times along key corridors within the modelled network have been assessed. **Figure 8.3** below summarises the eight journey time routes that have been analysed within the model. Each journey time route has been analysed in each direction for each of the modelled hours within the AM and PM peak periods.

Figure 8.3: Journey Time Routes



8.4.10 **Table 8.6** below summarises the forecast Future Year Reference Case journey times for the journey time routes in the AM peak period as well as the forecast change in journey times along the routes for the "with Begbroke Innovation District" scenarios.

Table 8.6: Forecast Change in Journey Times AM Peak Period (seconds)

Route			07:00-08:00				08:00-09:00				09:00-10:00			
			Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District		
				Low	Med	High		Low	Med	High		Low	Med	High
1	A34	NB	323	+1	+1	+1	319	+2	+1	+2	323	+2	+2	-171
		SB	323	0	0	+1	318	+2	+4	+4	322	+2	+1	-228
2	A40	EB	1954	+2	+8	+5	1,034	-18	+3	-18	1,000	+22	+42	-910
		WB	768	+25	+31	+8	1,121	-317	-327	-325	783	-7	-10	-474
3a	A44 Staverton Rd – PR8/PR9 Access	NB	632	+36	-42	+27	679	+194	+292	+48	657	+244	+303	-551
		SB	725	-9	-16	-14	1,096	-2	-35	-38	927	-60	-119	-819
3b	A44 PR8/PR9 Access – Oxford Airport	NB	160	+23	+54	+13	172	+91	+191	+39	164	+103	+175	-69
		SB	228	+24	+19	+10	269	+17	-24	-18	210	+49	+16	-147
4	A4260	NB	1,177	+10	-13	-4	1,311	+43	+22	+30	1,274	+31	+100	-1239
		SB	1,418	-98	-110	-108	2,000	-533	-426	-471	1,393	-110	-12	-1325
5	A4095	EB	155	+2	+2	3	204	-1	-2	0	157	+2	-2	-80
		WB	129	-6	-6	-8	132	-39	-44	-46	126	-11	-12	-123
6	Langford Lane	EB	162	-3	-2	-5	175	-6	-10	-13	167	-6	-10	-80
		WB	151	+1	-1	0	154	+1	0	0	150	+3	-2	-99
7	Frieze Way	NB	62	0	0	0	63	+1	0	+1	63	0	+1	-19
		SB	115	-1	-2	-2	127	-16	-24	-26	433	-162	-284	-412
8	Bicester Road	NB	39	0	0	0	39	0	0	0	40	0	0	+14
		SB	58	-5	-4	-6	52	-2	-4	-4	56	-5	-7	+51

8.4.11 The following conclusions are drawn from the journey time analysis in **Table 8.6:**

- Between 07:00-08:00 the journey times are forecast to increase by less than 60 seconds with all levels of mode shift in the "with development" scenario for all routes compared to the Future Year Reference Case, with some routes seeing journey time savings as a result of the small mode shift in background traffic.

- Between 08:00-09:00 the journey times are forecast to increase by no more than 60 seconds with all levels of mode shift in the "with development" scenario for all routes compared to the Future Year Reference Case, with the exception of A44 northbound.
    - The A44 northbound between Staverton Road and PR8 access (Begbroke Hill) sees increases in journey time in the model of +48 to +292 seconds depending on the level of mode shift.
    - The A44 northbound between PR8 access (Begbroke Hill) and Oxford Airport sees increases in journey time in the model of +39 to +191 seconds, depending on the level of mode shift.
- Between 09:00-10:00 the journey times are forecast to increase by no more than 60 seconds with all levels of mode shift in the "with development" scenario for all routes compared to the Future Year Reference Case, with the exception of the A44 northbound and the A4260 northbound.
    - The A44 northbound between Staverton Road and PR8 access (Begbroke Hill) sees changes in journey time in the model of -551 to +303 seconds, depending on the level of mode shift.
    - The A44 northbound between PR8 access (Begbroke Hill) and Oxford Airport sees changes in journey time in the model of -69 to +175 seconds, depending on the level of mode shift.
    - The A4260 northbound sees changes in journey time in the model of -1,239 to +100 seconds, depending on the level of mode shift.

8.4.12 **Table 8.7** summarises the journey times for the various routes in the PM peak period.

Table 8.7: Forecast Change in Journey Times PM Peak Period (seconds)

Route			15:00 – 16:00				16:00 – 17:00				17:00 – 18:00			
			Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District		
				Low	Med	High		Low	Med	High		Low	Med	High
1	A34	NB	317	+2	+1	+1	316	+1	+1	+2	314	+1	0	+1
		SB	312	+2	+2	+2	314	+2	+1	0	313	+1	+3	+3
2	A40	EB	1,003	+11	0	+4	1,033	-5	-13	-6	967	+4	-12	-7
		WB	740	+6	+6	+5	742	+5	+5	+3	756	+9	+5	+10
3a	A44 Staverton Rd – PR8/PR9 Access	NB	650	-2	-3	-6	691	-10	-10	-24	725	-12	-23	-38
		SB	692	+18	+19	+20	939	+32	+36	+31	689	+20	+11	+7
3b	A44 PR8/PR9 Access – Oxford Airport	NB	164	+8	+8	+8	171	+8	+8	+6	192	+5	+3	-1
		SB	189	+24	+23	+23	201	+179	+168	+156	208	+264	+281	+230
4	A4260	NB	1,217	-28	-36	-42	1,211	-17	-18	-26	1,240	-17	-30	-29
		SB	1,228	+4	+3	-2	1,319	+24	+7	+2	1,243	+24	+13	0
5	A4095	EB	134	0	0	0	141	+1	0	+2	147	+5	+3	+2
		WB	131	+3	+1	-2	132	+3	+3	+2	133	0	0	-2
6	Langford Lane	EB	153	+1	-2	-2	160	0	-1	-2	162	0	-2	-4
		WB	147	+2	+1	+2	154	0	0	+1	155	+2	+3	+1
7	Frieze Way	NB	63	0	-1	-1	65	-1	-1	-1	65	-1	-1	-1
		SB	91	+3	+3	+3	97	+2	+1	0	97	+1	0	+2
8	Bicester Road	NB	38	0	0	+1	37	0	0	0	38	0	0	0
		SB	43	0	0	0	44	+1	0	0	44	+1	0	0

8.4.13 The following conclusions are drawn from the journey time analysis in **Table 8.7**:

- Between 15:00-16:00 the journey times are forecast to increase by less than 60 seconds with all "with development" scenarios for all routes compared to the Future Year Reference Case.
- Between 16:00-17:00 the journey times are forecast to increase by no more than 60 seconds with all "with development" scenarios for all routes compared to the Future Year Reference Case, with the exception of A44 southbound between Oxford Airport and the PR8 access (Begbroke Hill). The A44 southbound sees increases in journey time in the model of +156 to +179 seconds, depending on the level of mode shift.

- Between 17:00-18:00 the journey times are forecast to increase by no more than 60 seconds with all "with development" scenarios for all routes compared to the Future Year Reference Case, with the exception of A44 southbound between Oxford Airport and the PR8 access (Begbroke Hill). The A44 southbound sees increases in journey time in the model of +230 to +281 seconds, depending on the level of mode shift.

8.4.14 It can be seen from the journey time results that the "with Begbroke Innovation District" scenarios see some decreases and some increases in journey times in the model when compared against the Future Year Reference Case. The level of decrease / increase in journey time depends on the level of mode shift of background traffic.

Queues

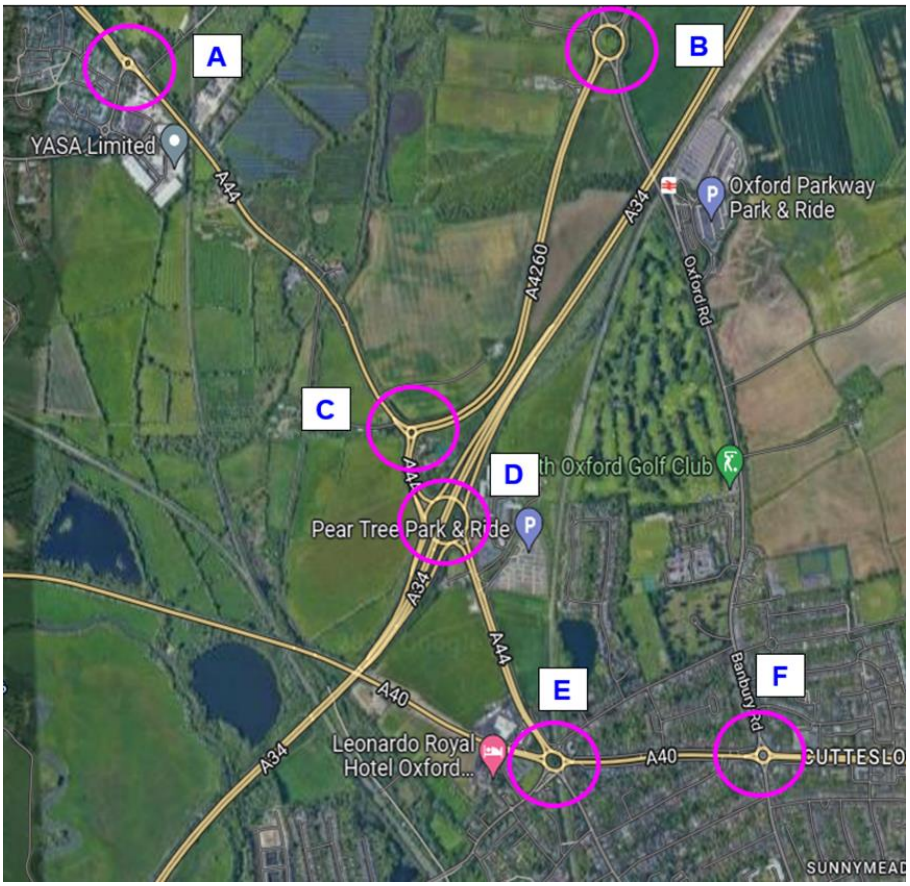
8.4.15 For the purposes of this section, queues have been reported for the scenarios outlined below to show the forecast change in average queue lengths at each junction:

- Future Year Reference Case (morning and evening peak period); and
- Future Year Reference + Begbroke Innovation District (morning and evening peak period).

8.4.16 This has been undertaken at the six key junctions as shown in **Figure 8.4**:

- A - Woodstock Road/Cassington Road;
- B - Oxford Road/Bicester Road roundabout;
- C - Loop Farm Roundabout;
- D - Peartree Roundabout;
- E - Wolvercote Roundabout; and
- F - Cutteslowe Roundabout.

Figure 8.4: Junctions within Queue Analysis



8.4.17 The average queue results in metres for each junction between the times of 07:00-10:00 and 15:00-18:00 is summarised in this section. A red/amber/green comparison of queue lengths is provided to understand the effect of the proposed development based on the criteria set out in **Table 8.8**. It should be noted that the red/amber/green criteria are arbitrary ranges and are not linked to planning policy tests or any guidance on traffic modelling. It simply provides a pictural illustration of the proportionate range of increases in queuing at the junctions.

Table 8.8: Queue Length Criteria

	Colour Coding
Queue increases less than or equal to 50m	
Queue increase more than 50m, up to 100m	
Queue increase more than 100m, up to 150m	
Queue increases by greater than 150m	

8.4.18 For the purposes of this section the queue differences between the DS scenarios and Future Reference Case the for the AM and PM peak periods have been summarised for each junction within the study area.

A44/Cassington Road

8.4.19 **Tables 8.9** and **8.10** below summarise the forecast change in average queue lengths at the A44/Cassington Road roundabout in the AM and PM peak periods respectively.

Table 8.9: A44/Cassington Road Change in Average Queue Length (m) AM Peak

Arm	07:00-08:00				08:00-09:00				09:00-10:00			
	Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District		
		Low	Med	High		Low	Med	High		Low	Med	High
A44 SE Approach	1	+1	0	0	1	+6	+30	0	0	+2	+26	0
Cassington Rd Approach	1	+2	+2	+2	2	+16	+27	+3	1	+60	+88	+1
A44 NW Approach	16	+1	+2	0	13	+4	+1	+2	21	-1	-12	-15

8.4.20 **Table 8.9** shows that overall, there will be negligible changes in queuing on this junction in the AM peak period. The largest increase in queues in the model is on Cassington Road during the hour of 09:00-10:00, which sees increases of +1 to +88m (15 vehicles), depending on the level of mode shift.

Table 8.10: A44/Cassington Road Change in Average Queue Length (m) PM Peak

Arm	15:00-16:00				16:00-17:00				17:00-18:00			
	Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District		
		Low	Med	High		Low	Med	High		Low	Med	High
A44 SE Approach	0	0	0	0	0	0	0	0	0	0	0	0
Cassington Rd Approach	0	0	0	0	0	0	0	0	2	+1	0	0
A44 NW Approach	2	+6	+6	+6	3	+9	+8	+8	9	+15	+15	+12

8.4.21 **Table 8.10** shows that overall, there will be negligible changes in queuing on this junction in the PM peak period.

Oxford Road/Bicester Road roundabout

8.4.22 **Tables 8.11** and **8.12** below summarise the forecast change in average queue lengths at the Oxford Road/Bicester Road roundabout in the AM and PM peak periods respectively.

Table 8.11: Oxford Road/Bicester Road Change in Average Queue Length (m) AM Peak

Arm	07:00-08:00				08:00-09:00				09:00-10:00			
	Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District		
		Low	Med	High		Low	Med	High		Low	Med	High
A4260 Oxford Rd Approach	8	-4	-4	-5	2	3	2	4	12	+1	-5	-3
Bicester Rd Approach	4	-1	-1	-2	3	-1	-1	-1	3	-1	-2	-2
Oxford Rd Approach	4	0	0	0	5	0	0	0	5	0	0	0
Frieze Way Approach	1	0	0	0	1	+1	+1	+1	1	0	0	0
Oxford Rd	2	0	-1	0	1	0	0	0	1	0	0	0
Bicester Rd Approach	0	0	0	0	0	0	0	0	0	0	0	0

8.4.23 **Table 8.11** demonstrates that there would be a negligible change in queue length in the AM peak period at the junction of Oxford Road/Bicester Road.

Table 8.12: Oxford Road/Bicester Road Change in Average Queue Length (m) PM Peak

Arm	15:00-16:00				16:00-17:00				17:00-18:00			
	Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District		
		Low	Med	High		Low	Med	High		Low	Med	High
A4260 Oxford Rd Approach	6	0	4	+1	12	+3	-1	+2	15	+6	+2	+2
Bicester Rd Approach	0	0	0	0	1	0	0	0	1	0	0	0
Oxford Rd Approach	7	0	-1	-1	8	-1	-1	-1	8	0	-1	-1
Frieze Way Approach	1	0	0	0	2	0	0	0	2	0	0	0
Oxford Rd	1	0	0	0	1	0	0	0	1	0	0	0

Bicester Rd Approach	0	0	0	0	0	0	0	0	0	0	0	0

8.4.24 **Table 8.12** demonstrates that there would be a negligible change in queue length in the PM peak period at the junction of Oxford Road/Bicester Road.

Loop Farm Roundabout

8.4.25 **Tables 8.13** and **8.14** below summarise the forecast change in average queue lengths at Loop Farm roundabout in the AM and PM peak periods respectively.

Table 8.13: Loop Farm Roundabout Change in Average Queue Length (m) AM Peak

Arm	07:00-08:00				08:00-09:00				09:00-10:00			
	Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District		
		Low	Med	High		Low	Med	High		Low	Med	High
A44 north-west approach	5	+5	-2	+1	36	-22	-28	-29	196	-87	-167	-131
A4260 Frieze Way	8	-1	-2	-2	16	-6	-11	-13	93	-42	-74	-52
A44 southern approach	3	+1	+2	+1	2	+4	+5	+3	1	+1	+1	+1

8.4.26 **Table 8.13** shows that overall, the model forecasts a reduction in queuing at this junction in the AM peak period as a result of the small shift in mode of travel.

Table 8.14: Loop Farm Roundabout Change in Average Queue Length (m) PM Peak

Arm	15:00-16:00				16:00-17:00				17:00-18:00			
	Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District		
		Low	Med	High		Low	Med	High		Low	Med	High
A44 north-west approach	2	+1	+1	+1	9	+5	+16	+8	7	+6	+2	+4
A4260 Frieze Way	1	+1	+1	+1	1	+1	+1	+1	2	+1	0	0
A44 southern approach	2	0	0	0	5	+3	+3	+1	7	+2	-1	0

8.4.27 **Table 8.14** demonstrates that there would be a negligible change in queue length in the PM peak period at the junction.

Peartree Interchange

8.4.28 **Tables 8.15** and **8.16** below summarise the forecast change in average queue lengths at Peartree Interchange in the AM and PM peak periods respectively.

Table 8.15: Peartree Interchange (A44/A34) Change in Average Queue Length (m) AM Peak

Arm	07:00-08:00				08:00-09:00				09:00-10:00			
	Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District		
		Low	Med	High		Low	Med	High		Low	Med	High
A34 South	11	+1	+1	+1	15	0	0	0	10	-1	-1	-1
A44 Woodstock West	17	-1	-1	-1	63	-8	-14	-14	127	-10	-20	-10
A34 North	11	+4	+4	+5	25	+4	+1	+4	37	0	-1	0
Oxford Peartree Services	3	+2	+3	+1	65	+5	+4	+2	170	+2	+3	+2
A44 Woodstock East	9	+2	+2	+2	13	+3	+4	+3	10	+2	+2	+2

8.4.29 **Table 8.15** demonstrates that there would be a negligible increase in queue length in the AM peak period at the Peartree Interchange.

Table 8.16: Peartree Interchange Change in Average Queue Length (m) PM Peak

Arm	15:00-16:00				16:00-17:00				17:00-18:00			
	Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District		
		Low	Med	High		Low	Med	High		Low	Med	High
A34 South	9	-1	-1	-1	11	0	0	0	10	0	+1	0
A44 Woodstock West	10	+2	+2	+2	12	+1	+1	+2	14	+3	+3	+1
A34 North	5	+3	+3	+3	4	+4	+1	+6	4	+11	+9	+4

Oxford Peartree Services	0	-1	-1	-1	0	-6	-4	-8	0	-3	-7	-9
A44 Woodstock East	19	0	0	0	39	0	0	0	41	0	0	-1

8.4.30 **Table 8.16** demonstrates that there would be a negligible increase in queue length in the PM peak period at the Peartree Interchange.

Wolvercote Roundabout

8.4.31 **Tables 8.17** and **8.18** below summarise the forecast change in average queue lengths at Wolvercote roundabout in the AM and PM peak periods respectively.

Table 8.17: Wolvercote Roundabout Change in Average Queue Length (m) AM Peak

Arm	07:00-08:00				08:00-09:00				09:00-10:00			
	Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District		
		Low	Med	High		Low	Med	High		Low	Med	High
A44 northern arm	19	-5	-6	-5	16	-7	-7	-7	17	-4	-2	-3
Five Mile Drive	1	0	-1	-1	0	0	0	0	1	-1	-1	-1
A40 eastern arm	20	+26	+32	+9	45	-5	-8	-17	23	+3	+2	-3
A4144	11	+1	+1	+1	17	+1	-2	+2	12	0	-3	+3
Godstow Rd	1	0	0	0	1	0	0	0	1	0	0	0
A40 western arm	21	-3	-2	-2	35	-3	+2	-5	26	0	+7	-1

8.4.32 **Table 8.17** demonstrates that there would be a negligible increase in queue length in the AM peak period at the Wolvercote roundabout.

Table 8.18: Wolvercote Roundabout Change in Average Queue Length (m) PM Peak

Arm	07:00-08:00				08:00-09:00				09:00-10:00			
	Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District		
		Low	Med	High		Low	Med	High		Low	Med	High
A44 northern arm	18	+9	+15	+13	18	+17	+15	+18	17	0	0	-3
Five Mile Drive	0	0	0	0	0	0	0	0	0	0	0	0
A40 eastern arm	18	-1	-1	0	18	-1	-1	-2	19	0	-1	0
A4144	26	-2	-3	-4	27	-3	-5	-6	49	-14	-16	-21
Godstow Rd	1	0	0	0	1	0	0	0	4	0	-2	-2
A40 western arm	26	0	-4	-4	52	-17	-20	-21	15	0	-1	-2

8.4.33 **Table 8.18** demonstrates that there would be a negligible increase in queue length in the PM peak period at Wolvercote roundabout.

Cutteslowe Roundabout

8.4.34 **Tables 8.19** and **8.20** below summarise the forecast change in average queue lengths at Wolvercote roundabout in the AM and PM peak periods respectively.

Table 8.19: Cutteslowe Roundabout Change in Average Queue Length (m) AM Peak

Arm	07:00-08:00				08:00-09:00				09:00-10:00			
	Future Year R20ef	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District		
		Low	Med	High		Low	Med	High		Low	Med	High
A4165 north arm	29	-15	-16	-17	502	-486	-488	-489	27	-15	-15	-17
A40 east arm	16	-1	-1	-1	345	-327	-327	-328	26	-10	-8	-9
A4165 south arm	4	0	-1	-1	18	-6	-6	-10	9	+2	+1	-1
A40 west arm	17	-5	-4	-4	36	-24	-25	-24	10	0	-1	-1

8.4.35 **Table 8.19** demonstrates that there would be a negligible increase in queue length in the AM peak period at Cutteslowe roundabout. The modelling forecasts reductions in queues, particularly on the A4165 north arm and A40 east arm. The queuing in the AM peak is forecast to decrease as there is a reduction in southbound movements due to the mitigations from the IDP package, which is expected to result in more people using other modes than the car. This would reduce the number of vehicles on A4165, which would reduce the number of instances of A40 traffic giving way to A4165 traffic.

Table 8.20: Cutteslowe Roundabout Change in Average Queue Length (m) PM Peak

Arm	15:00-16:00				16:00-17:00				09:00-10:00			
	Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District		
		Low	Med	High		Low	Med	High		Low	Med	High
A4165 north arm	5	0	0	0	7	+1	+1	0	8	+2	+1	0
A40 east arm	19	-2	-2	0	17	-1	-1	+2	18	0	-1	-1
A4165 south arm	12	-6	-7	-7	9	-2	-3	-4	15	-6	-7	-8
A40 west arm	19	+7	+3	+5	21	+3	+3	+1	20	+2	-1	0

8.4.36 **Table 8.20** demonstrates that there would be a negligible increase in queue length in the PM peak period at Cutteslowe roundabout.

Summary

8.4.37 In summary the addition of Begbroke Innovation District and a small mode shift in background traffic as a result of improved sustainable transport infrastructure would provide an overall negligible impact on queuing at junctions within the study area and in some locations there would be improvements. As a result, it is considered that there will not be a severe residual cumulative impact from a queuing perspective.

Level of Service

8.4.38 Level of service (LOS) plots provide a qualitative measure of the operation of a junction based on the identified traffic scenarios. The LOS can be predicted as a measure of delay on each arm of the junction or across the junction as a whole. **Table 8.21** below defines the LOS by six levels ranging from level A to level F.

Table 8.21: Level of Service (LOS) Analysis

LoS	Signalised Intersection	Non-Signalised Intersection
LOS A	Delay < 10 s or no volume	
LOS B	>10s to 20s	>10s to 15s
LOS C	>20s to 35s	>15s to 25s
LOS D	>35s to 55s	>25s to 35s
LOS E	>55s to 80s	>35s to 50s
LOS F	>80s	>50s

8.4.39 The peak time operation (08:00-09:00 and 17:00-18:00) has been considered in detail across the junctions contained in the traffic model. A LOS of C or above is unlikely to affect journey reliability and the delay is unlikely to be discernible from daily variations in overall journey times.

8.4.40 The off-site junctions that are forecast to have a LOS of D or below, following the introduction of the package of mitigation, are indicated below. The identified junctions represent those that potentially have a residual highway impact.

8.4.41 The comparison has also identified where the LOS improves following the introduction of the package of mitigation, demonstrating that the development impact has been mitigated. However, the comparison has identified the junctions where the LOS also worsens, and these are identified below in **Table 8.22.**

Table 8.22: LOS by Junction Comparison

Junction	09:00-09:00				17:00-18:00			
	Future Year Ref	Future Year Ref + Begbroke Innovation District			Future Year Ref	Future Year Ref + Begbroke Innovation District		
		Low	Med	High		Low	Med	High
A40/B4449	E	F	E	E	F	F	E	F
Banbury Road/The Moors	D	F	F	F	C	C	C	C
Langford Lane/Banbury Road	E	E	F	F	C	C	C	C
Banbury Road/Moreton Road	E	D	D	D	D	E	D	D
B449/Harnborough Road	C	F	E	E	A	A	A	A
A44 /Sandy Lane Roundabout	C	F	F	E	C	D	D	C

8.4.42 The model forecasts negligible changes to LOS across the majority of junctions across the network. At six junctions there is forecast to be a reduction in LOS, which varies depending on the level of mode shift. These junctions already operate with delay, which is forecast to increase slightly during one of the peak periods for each of the junctions.

Summary

8.4.43 The modelling shows that Begbroke Innovation District would have a negligible effect on average delay per vehicle within the network and average speed of vehicles travelling through the network. Journey times are forecast to increase by less than 60 seconds across all routes and time periods as a consequence of Begbroke Innovation District with the exception of localised increases in journey times on A44 northbound and southbound in the AM and PM peak periods respectively. The modelling shows that there would be journey time savings on some parts of the network. The changes in journey time do not result in a discernible increase in vehicle delay across the network. The modelling also shows that the Begbroke Innovation District would have a negligible effect on queuing at junctions.

8.4.44 In summary, the Begbroke Innovation District cannot be regarded as having either a severe impact on the highway network or an unacceptable impact on highway safety which would otherwise give rise to grounds for objection in line with paragraph 111 of the NPPF.

8.5 Begbroke Innovation District and PR Sites in Combination Modelling Outcomes

8.5.1 This section provides a summary of the "in combination with PR sites" modelling outcomes (i.e. Future Reference Case + Begbroke Innovation District + the PR sites compared against the Future Reference Case).

Network Statistics

Vehicle Trips

8.5.2 **Table 8.24** below identifies the active number of vehicles in the modelled network, the total number of vehicle trips completed and the latent demand (number of vehicles not able to enter the network) for all "in combination with PR sites" scenarios in the AM and PM 3 hour peak periods.

Table 8.24: Vehicles in Network (AM and PM 3 hour peak periods)

		2018 Base	Future Year Reference	Future Year Ref + Begbroke Innovation District + PR sites		
				Mode Shift (Low)	Mode Shift (Medium)	Mode Shift (High)
Vehicles Active in the Network	AM Peak Period	2,126	2,177	2739	2521	2260
	PM Peak Period	2,803	2,439	3227	3145	3025
Vehicle Trips Completed	AM Peak Period	48,889	48,891	50,989	50,182	50,152
	PM Peak Period	50,229	50,400	52,840	52,321	52,091
Latent Demand at End of Simulation	AM Peak Period	1	25	47	90	40
	PM Peak Period	2	125	199	38	23
Total Input Vehicle Numbers	AM Peak Period	51,016	51,093	53,775	52,793	52,452
	PM Peak Period	53,034	52,964	56,226	55,504	55,139

8.5.3 **Table 8.24** shows that despite there being more vehicles in the network in the "in combination with PR sites" scenarios compared to the Future Year Reference scenario, the latent demand remains consistently very low and in the PM peak period it reduces in the "in combination with PR sites" high and medium mode share scenarios compared to the Future Year Reference scenario. This demonstrates that the vehicle demand in the "in combination PR sites" scenarios can travel through the network during the peak periods.

Vehicle Delay

8.5.4 **Table 8.25** below identifies the delay for all vehicles travelling within and through the network for all scenarios in the AM and PM 3 hour peak periods.

Table 8.25: Vehicle Delay (Seconds)

		2018 Base	Future Year Reference	Future Year Ref + Begbroke Innovation District + PR sites		
				Mode Shift (Low)	Mode Shift (Medium)	Mode Shift (High)
Average delay per vehicle in the network	AM Peak Period	169	187	250	226	194
	PM Peak Period	202	144	199	193	187
Overall delay per vehicle (including time off network)	AM Peak Period	171	189	253	230	197
	PM Peak Period	203	153	211	196	190

8.5.5 **Table 8.25** shows that the "in combination with PR sites" scenarios average vehicle delay in the AM 3 hour peak period increases by +7 to 63 seconds per vehicle compared to the Future Year Reference Case, depending on the level of mode shift. In the PM 3 hour peak period the average vehicle delay increases by +43 to 55 seconds per vehicle in the "in combination with PR sites" scenarios compared to the Future Year Reference Case. Overall, the results demonstrate that following the introduction of the package of measures included within the IDP the impact of the PR sites will not result in a severe impact on vehicle delay.

Average Vehicle Speeds

8.5.6 **Table 8.26** below summarises the average vehicle speeds (in mph) for all scenarios in the AM and PM 3 hour peak periods.

Table 8.26: Average Vehicle Speeds (mph)

		2018 Base	Future Year Reference	Future Year Ref + Begbroke Innovation District + PR sites		
				Mode Shift (Low)	Mode Shift (Medium)	Mode Shift (High)
Average Vehicle Speeds (mph)	AM Peak Period	27	26	23	25	26
	PM Peak Period	25	29	26	26	26

8.5.7 **Table 8.26** shows that in the "in combination with PR sites" scenarios, there is negligible impact on average vehicle speeds across the network compared to the Future Year Reference Case.

Journey Times

8.5.8 Journey times along key corridors within the modelled network have been assessed. **Figure 8.3** below summarises the eight journey time routes that have been analysed within the model. Each

journey time route has been analysed in each direction for each of the modelled hours within the AM and PM peak periods.

8.5.9 **Table 8.27** below summarises the forecast Future Year Reference Case journey times for the journey time routes in the AM peak period as well as the forecast change in journey times along the routes for the "in combination with PR sites" scenarios (i.e., Future Year Reference Case + PR sites + PR sites).

Table 8.27: Forecast Change in Journey Times AM Peak Period (seconds)

Route			07:00-08:00				08:00-09:00				09:00-10:00			
			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites		
				Low	Med	High		Low	Med	High		Low	Med	High
1	A34	NB	323	+1	+1	+1	319	+3	+1	+2	323	+4	+3	+1
		SB	323	0	+1	+1	318	+3	+4	+4	322	+3	+2	+3
2	A40	EB	1954	+29	+41	+7	1,034	+30	+26	-11	1,000	+421	+167	-3
		WB	768	+36	+41	+48	1,121	-113	-227	-271	783	+68	+1	-5
3a	A44 between Staverton Rd and PR8/PR9 access	NB	632	+65	+47	+44	679	+212	+210	+94	657	+390	+198	+78
		SB	725	+106	+81	+44	1,096	+423	+301	+159	927	+388	+422	+41
3b	A44 between PR8/PR9 access and Oxford Airport	NB	160	+30	+28	+29	172	+29	+32	+30	164	+59	+49	+28
		SB	228	+58	+42	+36	269	+30	+13	+17	210	+52	+52	+45
4	A4260	NB	1,177	+30	+48	+24	1,311	+99	+37	+47	1,274	+416	+67	+32
		SB	1,418	-36	-17	-49	2,000	-270	-286	-336	1,393	+133	+22	-5
5	A4095	EB	155	-8	+7	-10	204	-38	+42	-45	157	-10	-5	-4
		WB	129	+2	+4	+2	132	+1	-1	-2	126	0	0	+1
6	Langford Lane	EB	162	0	-5	-2	175	-6	-8	-11	167	+4	-7	-10
		WB	151	0	-1	0	154	+1	-1	-1	150	+3	+1	0
7	Frieze Way	NB	62	0	+1	0	63	0	+1	+1	63	0	+1	+1
		SB	115	-2	-4	-1	127	+6	-12	-4	433	+270	+293	-106
8		NB	39	+30	+28	+30	39	+29	+28	+29	40	+30	+30	+30

	Bicester Road	SB	58	+25	+23	+22	52	+27	+28	+25	56	+58	+23	+19

8.5.10 The following conclusions are drawn from the journey time analysis in **Table 8.27:**

- Between 07:00-08:00 the journey times are forecast to increase by less than 60 seconds with all levels of mode shift in the "in combination with PR sites" scenarios for all routes compared to the Future Year Reference Case, with the exception of A44 northbound between Staverton Road and PR8/PR9 access (ranging between +44 and +65 seconds) and A44 southbound between Staverton Road ad PR8/PR9 access (ranging between +44 and +106 seconds) depending on the level of mode shift.
- Between 08:00-09:00 the journey times are forecast to increase by no more than 60 seconds with all levels of mode shift in the "in combination with PR sites" scenario for all routes compared to the Future Year Reference Case, with the exception of A44 north and southbound, and the A4260 northbound.
    - The A44 northbound between Staverton Road and PR8/PR9 Access sees increases in journey time of +94 to +212 seconds and the A44 southbound sees increases of +159 to +423 seconds.
    - The A4260 northbound sees increases in journey time of +37 to +99 seconds.
    - There are also forecast to be some journey time savings on routes, most notably on the A4260 southbound (-270 to -336 seconds) and the A40 westbound (-113 to -271 seconds) depending on level of mode shift.
- Between 09:00-10:00 the journey times are forecast to increase by no more than 60 seconds with all levels of mode shift in the "in combination with PR sites" scenario for all routes compared to the Future Year Reference Case, with the exception of the A44 northbound and southbound, A40 eastbound and westbound, the A4260 northbound and southbound and Frieze Way southbound.
    - The A44 northbound between Staverton Road and PR8/PR9 Access sees increases in journey time of +78 to +390 seconds and the A44 southbound sees increases of +41 to +422 seconds.
    - The A4260 northbound sees increases in journey time of +32 to +416 seconds and the A4260 southbound sees changes in journey time of -5 to +133 seconds.
    - The A40 eastbound sees changes in journey time of -3 to +421 seconds and the A40 westbound sees changes in journey time of -5 to +68 seconds.
    - Frieze Way southbound sees changes in journey time of -106 to +293 seconds.
- It is clear from the results that a small increase in mode shift between medium and high mode shift scenarios (e.g. 0.62% to 0.75% depending on the hour, as set out in the Mode Shift Discussion Note **Appendix C**) would have a relatively material effect on journey time.

8.5.11 **Table 8.28** summarises the journey times for the eight routes in the PM peak period.

Table 8.28: Forecast Change in Journey Times PM Peak Period (seconds)

Route			07:00-08:00				08:00-09:00				09:00-10:00			
			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites		
				Low	Med	High		Low	Med	High		Low	Med	High
1	A34	NB	317	+2	+3	+2	316	+2	+3	+2	314	+3	+3	+4
		SB	312	+4	+3	+2	314	+2	0	0	313	+2	+3	+2
2	A40	EB	1003	+12	+32	+26	1033	+15	+19	+9	967	+17	+18	+18
		WB	740	+15	+16	+18	742	+8	+17	+18	756	+16	+19	+20
3a	A44 between Staverton Rd and PR8/PR9 access	NB	650	+11	+5	+1	691	+30	+21	+5	725	+38	+10	-9
		SB	692	+63	+46	+55	939	+330	+288	+266	689	+789	+800	+731
3b	A44 between PR8/PR9 access and Oxford Airport	NB	164	+24	+24	+24	171	+29	+27	+25	192	+34	+26	+25
		SB	189	+30	+28	+27	201	+61	+47	+58	208	+78	+54	+34
4	A4260	NB	1217	+20	+18	+4	1211	+37	+31	+24	1240	+61	+57	+38
		SB	1228	+47	+44	+41	1319	+116	+111	+80	1243	+149	+134	+143
5	A4095	EB	134	+2	+2	0	141	-1	0	-3	147	-3	-1	-2
		WB	131	+2	0	0	132	+8	+8	+7	133	+15	+20	+14
6	Langford Lane	EB	153	+1	0	-1	160	+10	+8	+3	162	+46	+43	+43
		WB	147	+2	+2	+4	154	0	0	+1	155	+2	0	+3
7	Frieze Way	NB	63	0	-1	0	65	0	-1	0	65	0	0	-1
		SB	91	+4	+3	+4	97	+1	+1	+2	97	+1	+2	+3
8	Bicester Road	NB	38	+29	+31	+29	37	+29	+28	+29	38	+31	+29	+30
		SB	43	+23	+23	+24	44	+25	+25	+24	44	+30	+28	+28

8.5.12 The following conclusions are drawn from the journey time analysis in **Table 8.28**:

- Between 15:00-16:00 the journey times are forecast to increase by less than 60 seconds with all "in combination with PR sites" scenarios for all routes compared to the Future Year Reference Case, with the exception of A44 southbound between Staverton Road and PR8/PR9 Access (+46 to +63 seconds), depending on the mode shift.

- Between 16:00-17:00 the journey times are forecast to increase by no more than 60 seconds with all "in combination with PR sites" scenarios for all routes compared to the Future Year Reference Case, with the exception of A44 southbound and A4260 southbound.
    - A44 southbound between Staverton Road and PR8/PR9 access forecasts increases in journey time of +266 to +330 seconds.
    - A4260 southbound forecasts increases in journey time of +80 to +116 seconds.
- Between 17:00-18:00 the journey times are forecast to increase by no more than 60 seconds with all "in combination with PR sites" scenarios for all routes compared to the Future Year Reference Case, with the exception of A44 southbound and A4260 northbound and southbound.
    - The A44 southbound between Staverton Road and PR8/PR9 access forecasts increases in journey time of +731 to +800 seconds and the A44 southbound between Oxford Airport and PR8/PR9 Access sees increases of +34 to +78 seconds.
    - A4260 southbound sees increases in journey time of +134 to +149 seconds and the A4260 northbound sees increases of +38 to +61 seconds.

8.5.13 It can be seen from the journey time results that the model forecasts some increases in journey times, focussed primarily along the A44 and A4260 corridors. The level of increase in journey time ranges depending on the level of mode shift of background traffic. There are also some forecast journey time savings.

8.5.14 With regards to the A44 corridor, a southbound bus lane is currently being constructed by OCC between Loop Farm roundabout and Cassington roundabout and therefore bus journey times will not be impacted on this section of the corridor. As part of the package of transport improvements in Appendix 4 of the Partial Review Local Plan, it is proposed to provide further bus priority and active travel improvements along the A44 between Cassington roundabout and Spring Hill Road, which would further mitigate bus journey time impacts. The modelling presented in this section of the TA does not include a southbound bus lane on the A44 between Cassington roundabout and Spring Hill Road. Whilst OUD is supportive of reallocating road space for sustainable modes, it would require further mode shift to buses than this assessment has provided for.

8.5.15 As stated earlier, the modelling of the "in combination" effects of the PR sites does not take account of the LTCP schemes being implemented by OCC and the resultant targeted mode shift of 25% reduction of car trips by 2030. As such, with the implementation of LTCP transport schemes beyond the infrastructure being brought forward by the PR sites, there would be expected to be a further reduction in journey times along the key routes within the modelled area.

Queues

8.5.16 For the purposes of this section, queues have been reported for the scenarios outlined below to show the forecast change in average queue lengths at each junction:

- Future Year Reference Case + Growth Fund schemes (Morning and evening peak period)
- Future Year Do Something (DS) (Morning and evening peak period)

8.5.17 This has been undertaken at the six key junctions as shown in **Figure 8.4**:

- A - Woodstock Road/Cassington Road;
- B - Oxford Road/Bicester Road roundabout;
- C - Loop Farm Roundabout;
- D - Peartree Roundabout;
- E - Wolvercote Roundabout; and
- F - Cutteslowe Roundabout.

The average queue results in metres for each junction between the times of 07:00-10:00 and 15:00-18:00 is summarised in this section. A red/amber/green comparison of queue lengths is provided to understand the cumulative effect of the PR sites within each scenario based on the criteria set out in **Table 8.7**. It should be noted that the red/amber/green criteria are arbitrary ranges and are not linked to planning policy tests or any guidance on traffic modelling. It simply provides a pictural illustration of the proportionate range of increases in queuing at the junctions.

A44/Cassington Road

8.5.18 **Tables 8.29** and **8.30** below summarise the forecast change in average queue lengths at the A44/Cassington Road roundabout in the AM and PM peak periods respectively.

Table 8.29: A44/Cassington Road Change in Average Queue Length (m) AM Peak

Arm	07:00-08:00				08:00-09:00				09:00-10:00			
	Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites		
		Low	Med	High		Low	Med	High		Low	Med	High
A44 SE Approach	1	0	0	0	1	0	0	0	0	0	0	0
Cassington Rd Approach	1	+3	+2	+4	2	+4	+5	+8	1	+2	+2	+3
A44 NW Approach	16	+147	+125	+76	13	+270	+265	+201	21	+162	+224	+98

8.5.19 **Table 8.29** shows that overall, there will be negligible changes in queuing on this junction in the AM peak period except for the north-west approach to the roundabout which the model forecasts an average increase in queues ranging from +76m (13 vehicles) to +270m (47 vehicles) in the AM peak period depending on the hour and level of mode shift.

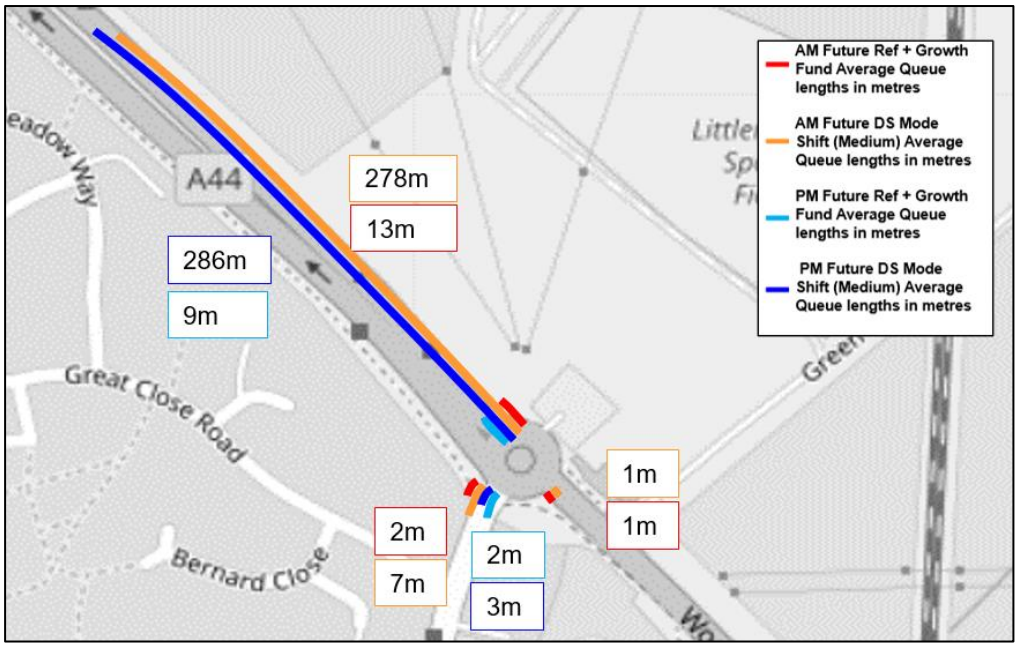
Table 8.30: A44/Cassington Road Change in Average Queue Length (m) PM Peak

Arm	15:00-16:00				16:00-17:00				17:00-18:00			
	Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites		
		Low	Med	High		Low	Med	High		Low	Med	High
A44 SE Approach	0	0	0	0	0	0	0	0	0	0	0	0
Cassington Rd Approach	0	0	0	0	0	0	0	0	2	+2	+1	+1
A44 NW Approach	2	+51	+37	+32	3	+211	+194	+173	9	+277	+277	+277

8.5.20 **Table 8.30** shows that overall, there will be negligible changes in queuing on this junction in the PM peak period except for the north-west approach to the roundabout which the model forecasts an average increase in queues ranging from +32m (6 vehicles) to +277m (48 vehicles) in the AM peak period depending on the hour and level of mode shift.

8.5.21 The analysis shows that the queue does not block back to any junctions in the AM and PM peak periods and is relatively short lived and is therefore not considered to have a severe impact on the network. This is demonstrated by the queue lengths for the AM (0800-0900) and PM (1700-1800) peak hours shown on **Figure 8.5**, which compares the "in combination with PR sites" medium mode shift queue lengths with the Future Year Reference Case queue lengths.

Figure 8.5: A44/Cassington Road queue lengths in the AM and PM peak hours (0800-0900 and 1700-1800)



Oxford Road/Bicester Road roundabout

8.5.22 **Tables 8.31** and **8.32** below summarise the forecast change in average queue lengths at the Oxford Road/Bicester Road roundabout in the AM and PM peak periods respectively.

Table 8.31: Oxford Road/Bicester Road Change in Average Queue Length (m) AM Peak

Arm	07:00-08:00				08:00-09:00				09:00-10:00			
	Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites		
		Low	Med	High		Low	Med	High		Low	Med	High
A4260 Oxford Rd Approach	8	-4	-2	-3	2	+3	+5	+6	12	-1	+3	-7
Bicester Rd Approach	4	+2	+2	+1	3	+3	+3	+3	3	+19	+1	-1
Oxford Rd Approach	4	+1	+1	+1	5	+1	+1	+1	5	0	0	0
Frieze Way Approach	1	0	0	0	1	0	+1	+1	1	0	0	0
Oxford Rd	2	0	+1	0	1	1	+1	+1	1	0	0	0
Bicester Rd Approach	0	0	0	0	0	0	0	0	0	0	0	0

8.5.23 **Table 8.31** demonstrates that there would be a negligible increase in queue length in the AM peak period at the junction of Oxford Road/Bicester Road.

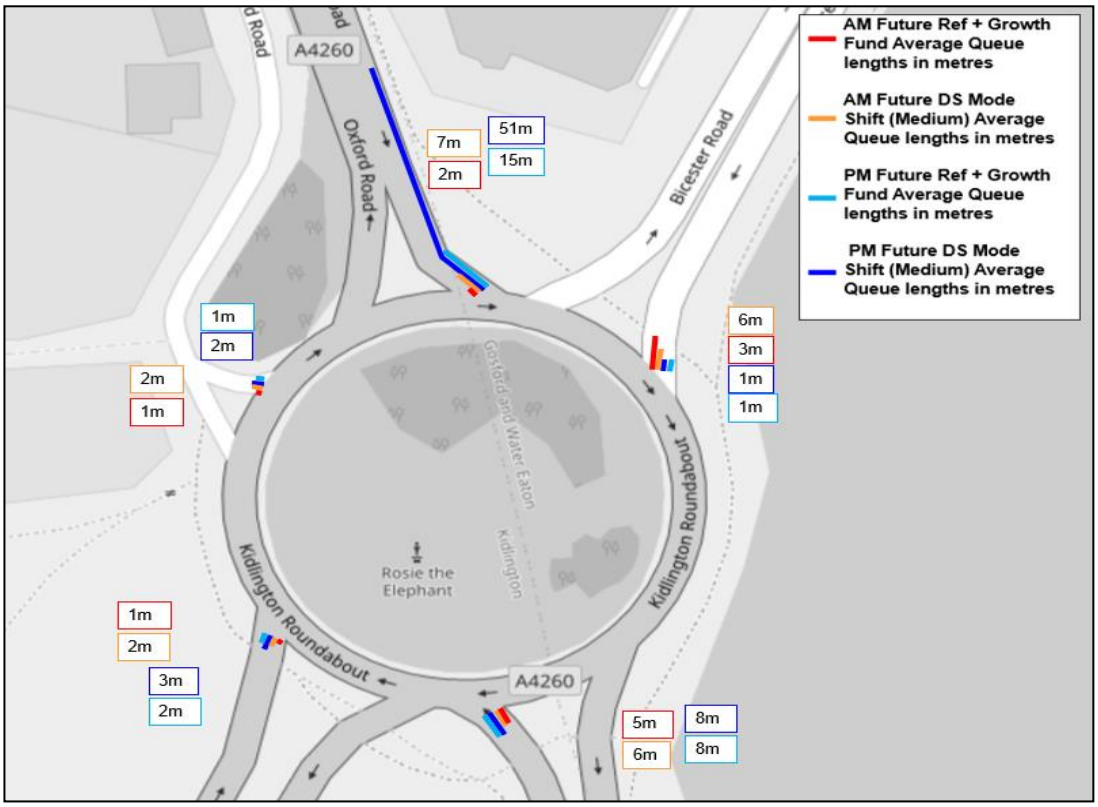
Table 8.32: Oxford Road/Bicester Road Change in Average Queue Length (m) PM Peak

Arm	15:00-16:00				16:00-17:00				17:00-18:00			
	Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites		
		Low	Med	High		Low	Med	High		Low	Med	High
A4260 Oxford Rd Approach	6	+7	+4	+9	12	+32	+26	+18	15	+47	+36	+58
Bicester Rd Approach	0	0	0	0	1	0	0	0	1	0	0	0
Oxford Rd Approach	7	0	0	0	8	0	0	0	8	0	0	0
Frieze Way Approach	1	0	0	0	2	0	0	0	2	0	0	0

Oxford Rd	1	0	0	0	1	0	0	0	1	0	0	0
Bicester Rd Approach	0	0	0	0	0	0	0	0	0	0	0	0

8.5.24 **Table 8.32** shows that in the PM peak period there are no changes in queue lengths on all arms except the A4260 Oxford Road approach, consisting of an increase in queue ranging between +4m (1 vehicle) to +58m (10 vehicles). It should be noted that these queues do not block back to any key junction. This is demonstrated by the queue lengths for the AM (0800-0900) and PM (1700-1800) peak hours shown on **Figure 8.6** which compares the "in combination with PR sites" medium mode shift queue lengths with the Future Year Reference Case queue lengths.

Figure 8.6: Oxford Road/Bicester Road Roundabout Average Queue lengths (0800-0900 and 1700-1800)



Loop Farm Roundabout

8.5.25 **Tables 8.33** and **8.34** below summarise the forecast change in average queue lengths at Loop Farm roundabout in the AM and PM peak periods respectively.

Table 8.33: Loop Farm Roundabout Change in Average Queue Length (m) AM Peak

Arm	07:00-08:00				08:00-09:00				09:00-10:00			
	Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites		
		Low	Med	High		Low	Med	High		Low	Med	High
A44 north-west approach	5	-2	+5	0	36	+38	-2	-3	196	+241	+173	-78
A4260 Frieze Way	8	+1	0	+1	16	+14	-3	+2	93	+52	+52	-26
A44 southern approach	3	+3	+4	+2	2	+7	+15	+4	1	+1	+1	+1

8.5.27 **Table 8.33** shows that overall, there will be negligible changes in queuing on this junction in the AM peak period except for the A44 NW approach to the roundabout which the model forecasts an average increase in queues ranging from -3m to +241m (42 vehicles) in the AM peak period depending on the hour and level of mode shift. It can be seen in the 0900-1000 hour that the small difference in mode shift between the medium and high scenarios would have a significant effect on queuing on the A44 north-west approach to the junction.

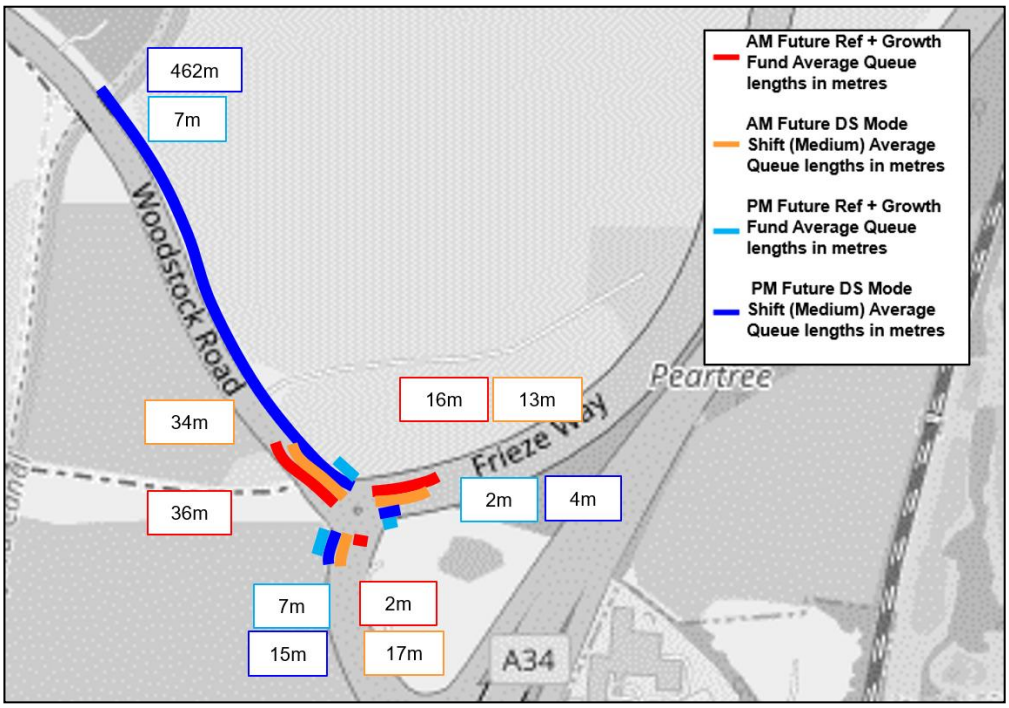
Table 8.34: Loop Farm Roundabout Change in Average Queue Length (m) PM Peak

Arm	15:00-16:00				16:00-17:00				17:00-18:00			
	Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites		
		Low	Med	High		Low	Med	High		Low	Med	High
A44 north-west approach	2	+4	+4	+4	9	+546	+560	+437	7	+263	+455	+350
A4260 Frieze Way	1	+2	+2	+2	1	+1	+2	+1	2	+2	+2	+3
A44 southern approach	2	+2	+2	+1	5	+10	+9	+8	7	+10	+9	+5

8.5.28 **Table 8.34** shows that the addition of the development would result in negligible changes in queues across the junction in the PM peak period with the exception of the A44 north-west approach, which the model forecasts to experience an increase in queue length ranging from +4m (1 vehicle) to +560m (99 vehicles) depending on the hour and level of mode shift. As shown in **Figure 8.7**, the increase in queuing on the A44 north-west approach does not result in

blocking back to the Cassington Road roundabout. Likewise, buses would not be impacted as OCC has recently implemented a southbound bus lane on this section of the A44. As such the impact of the development at this junction is not anticipated to have a severe residual cumulative impact or introduce a road safety issue.

Figure 8.7: Loop Farm Roundabout Average Queue lengths (0800-0900 and 1700-1800)



Peartree Interchange

8.5.29 **Tables 8.35** and **8.36** below summarise the forecast change in average queue lengths at Peartree Interchange in the AM and PM peak periods respectively.

Table 8.35: Peartree Interchange (A44/A34) Change in Average Queue Length (m) AM Peak

Arm	07:00-08:00				08:00-09:00				09:00-10:00			
	Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites		
		Low	Med	High		Low	Med	High		Low	Med	High
A34 South	11	+4	+4	+3	15	+5	+8	+5	10	+3	+2	+2
A44 Woodstock West	17	0	+1	0	63	+12	-6	-19	127	+23	+52	-41
A34 North	11	0	0	0	25	+9	+12	+9	37	+21	+19	+1
Oxford Peartree Services	3	+1	+2	0	65	+5	+10	-5	170	+13	+15	-3

A44 Woodstock East	9	+13	+11	+7	13	+14	+19	+9	10	+11	+17	+7

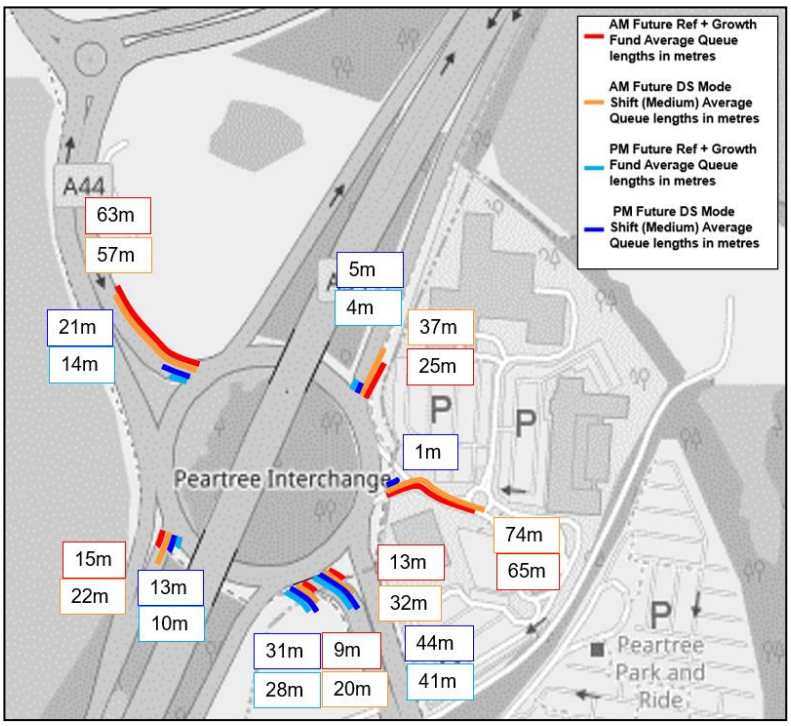
8.5.30 **Table 8.35** demonstrates that there would be a negligible increase in queue length in the AM peak period at the Peartree Interchange.

Table 8.36: Peartree Interchange Change in Average Queue Length (m) PM Peak

Arm	15:00-16:00				16:00-17:00				17:00-18:00			
	Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites		
		Low	Med	High		Low	Med	High		Low	Med	High
A34 South	9	+1	+1	+1	11	+2	+2	+2	10	+3	+2	+2
A44 Woodstock West	10	+6	+5	+6	12	+3	+4	+3	14	+10	+7	+5
A34 North	5	0	0	0	4	0	0	0	4	0	+1	0
Oxford Peartree Services	0	0	0	0	0	0	0	0	0	+1	+1	+1
A44 Woodstock East	19	+2	0	-1	39	+3	+1	-6	41	+16	+2	-8

8.5.31 **Table 8.36** demonstrates that there would be a negligible increase in queue length in the PM peak period at the Peartree Interchange. **Figure 8.8** below illustrates the queue lengths in the AM and PM peak hours.

Figure 8.8: Peartree Interchange Average Queue Lengths (0800-0900 and 1700-1800)



Wolvercote Roundabout

8.5.32 **Tables 8.37** and **8.38** below summarise the forecast change in average queue lengths at Wolvercote roundabout in the AM and PM peak periods respectively.

Table 8.37: Wolvercote Roundabout Change in Average Queue Length (m) AM Peak

Arm	07:00-08:00				08:00-09:00				09:00-10:00			
	Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites		
		Low	Med	High		Low	Med	High		Low	Med	High
A44 northern arm	19	-3	-4	-3	16	-6	-6	-7	17	-5	-6	-5
Five Mile Drive	1	-1	-1	-1	0	0	0	0	1	0	-1	-1
A40 eastern arm	20	+43	+56	+63	45	+82	+43	+13	23	+109	+33	+16
A4144	11	+2	+1	-1	17	+5	+4	0	12	+4	+2	-2
Godstow Rd	1	0	0	0	1	0	0	0	1	+6	0	0
A40 western arm	21	+6	+5	-1	35	+25	+18	0	26	+209	+95	+2

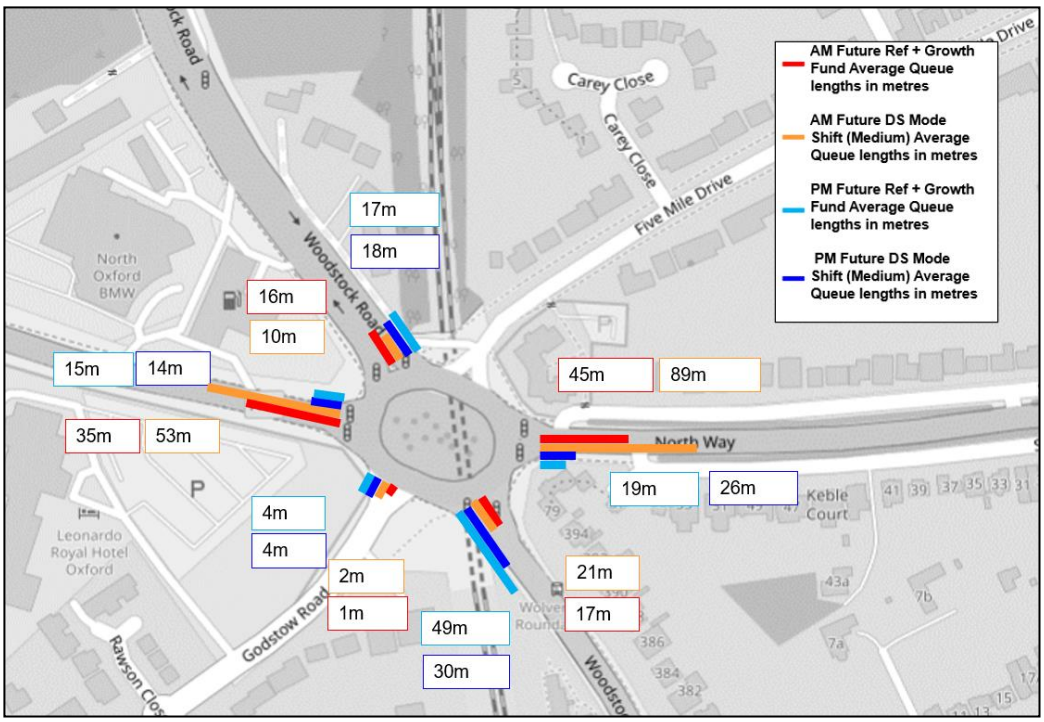
8.5.33 **Table 8.37** demonstrates that there would be a negligible increase in queue length in the AM peak period at the Wolvercote roundabout with the exception of the A40 east and west arms. The model forecasts the A40 eastern arm to experience an increase in queue length ranging from +13m (3 vehicles) to +109m (19 vehicles) depending on the hour and level of mode shift. The model forecasts the A40 western arm to experience an increase in queue length ranging from -1m to +209m (36 vehicles) depending on the hour and level of mode shift. It can be seen that in the hour of 0900-1000 the small difference in mode shift between the low and high scenarios would have a significant effect on queuing on the A40 western arm. The queuing does not result in blocking back to adjacent junctions and only materialises in the "in combination with PR sites" low mode shift scenario in one hour. As such the cumulative impact of the PR sites at this junction is not anticipated to have a severe residual impact or introduce a road safety issue.

Table 8.38: Wolvercote Roundabout Change in Average Queue Length (m) PM Peak

Arm	07:00-08:00				08:00-09:00				09:00-10:00			
	Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites		
		Low	Med	High		Low	Med	High		Low	Med	High
A44 northern arm	18	+8	+8	+16	18	+7	+9	+23	17	-1	+1	-3
Five Mile Drive	0	0	0	0	0	0	0	0	0	0	0	0
A40 eastern arm	18	+7	+6	+6	18	+7	+7	+6	19	+10	+7	+7
A4144	26	-10	-11	-12	27	-9	-8	-10	49	-22	-19	-27
Godstow Rd	1	+1	0	0	1	0	0	0	4	+1	+1	0
A40 western arm	26	-2	+6	-2	52	-14	-12	-21	15	+1	-2	-2

8.5.34 **Table 8.38** demonstrates that there would be a negligible increase in queue length in the PM peak period at Wolvercote roundabout. **Figure 8.9** below illustrates the queue lengths in the AM and PM peak hours.

Figure 8.9: Wolvercote Average Queue lengths (0800-0900 and 1700-1800)



Cutteslowe Roundabout

8.5.35 **Tables 8.39** and **8.40** below summarise the forecast change in average queue lengths at Wolvercote roundabout in the AM and PM peak periods respectively.

Table 8.39: Cutteslowe Roundabout Change in Average Queue Length (m) AM Peak

Arm	07:00-08:00				08:00-09:00				09:00-10:00			
	Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites		
		Low	Med	High		Low	Med	High		Low	Med	High
A4165 north arm	29	-8	-11	-12	502	-376	-467	-473	27	+58	-2	-7
A40 east arm	16	0	+1	0	345	-122	-239	-274	26	+6	-9	-9
A4165 south arm	4	+2	+2	0	18	+47	+15	-2	9	+515	+23	+8
A40 west arm	17	-5	-5	-4	36	-25	-25	-24	10	-2	-2	-1

8.5.36 **Table 8.39** demonstrates that there would be a negligible increase in queue length in the AM peak period at Cutteslowe roundabout with the exception of the A4165 south arm. The modelling forecasts reductions in queues, particularly on the A4165 north arm and A40 east arm.

The queuing in the AM peak is forecast to decrease as there is a reduction in southbound movements due to the mitigations from the IDP package, which is expected to result in more people using other modes than the car. This would reduce the number of vehicles on A4165, which would reduce the number of instances of A40 traffic giving way to A4165 traffic.

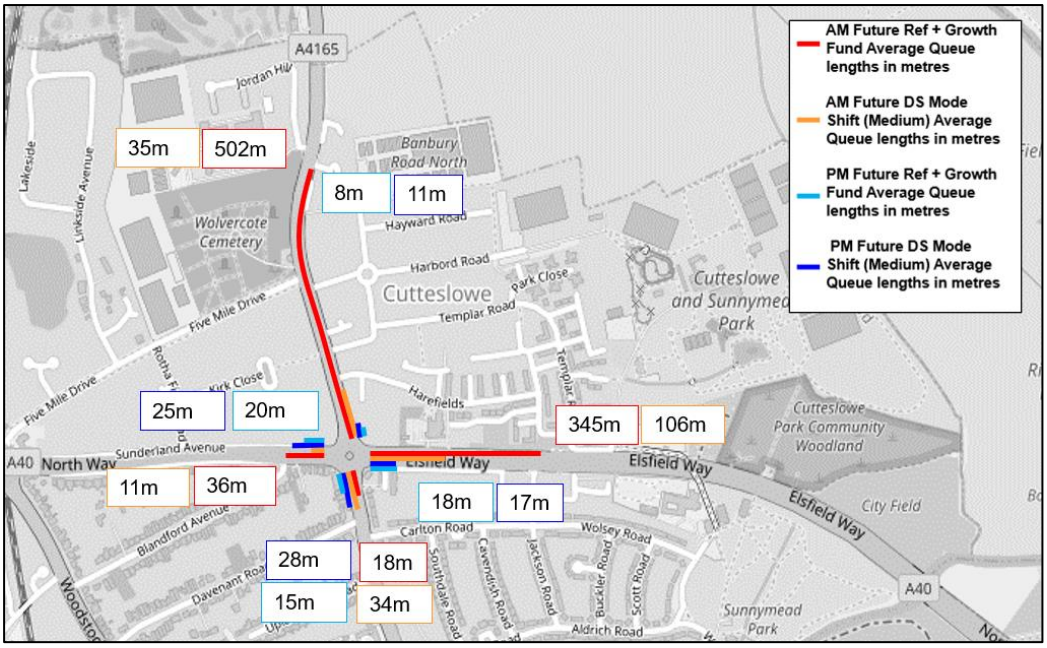
8.5.37 The model forecasts the A4165 south arm to experience an increase in queue length ranging from -2m to +515m (90 vehicles) depending on the hour and level of mode shift. It can be seen that in the hour of 0900-1000 the small difference in mode shift between the low and high scenarios would have a significant effect on queuing on the A4165 south arm. The queuing does not result in blocking back to adjacent junctions and only materialises in the "in combination with PR sites" low mode shift scenario in one hour. As such the cumulative impact of the PR sites at this junction is not anticipated to have a severe residual impact or introduce a road safety issue.

Table 8.40: Cutteslowe Roundabout Change in Average Queue Length (m) PM Peak

Arm	15:00-16:00				16:00-17:00				09:00-10:00			
	Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites		
		Low	Med	High		Low	Med	High		Low	Med	High
A4165 north arm	5	+2	+2	+2	7	+3	+2	+2	8	+4	+3	+4
A40 east arm	19	-1	-2	-1	17	0	0	-1	18	+1	-1	0
A4165 south arm	12	+2	-1	-1	9	+6	+3	+3	15	+22	+13	+7
A40 west arm	19	+3	+7	+5	21	0	+3	+1	20	+6	+5	+4

8.5.38 **Table 8.40** demonstrates that there would be a negligible increase in queue length in the PM peak period at Cutteslowe roundabout. **Figure 8.10** below illustrates the queue lengths in the AM and PM peak hours.

Figure 8.10: Cutteslowe Roundabout Average Queue lengths (0800-0900 and 1700-1800)



Summary

8.5.39 In summary the addition of the PR sites and their mitigation provide an overall negligible impact at junctions within the study area. Where queuing does increase, this is anticipated to be an infrequent occurrence or does not block back to any key junction or is adequately mitigated by the on-going delivery of the Growth Fund works. As a result, it is considered that there will not be a severe residual cumulative impact from a queuing perspective.

Level of Service

8.5.40 Level of service (LOS) plots provide a qualitative measure of the operation of a junction based on the identified traffic scenarios. The LOS can be predicted as a measure of delay on each arm of the junction or across the junction as a whole. **Table 8.41** below defines the LOS by six levels ranging from level A to level F.

Table 8.41: Level of Service (LOS) Analysis

LoS	Signalised Intersection	Non-Signalised Intersection
LOS A	Delay < 10 s or no volume	
LOS B	>10s to 20s	>10s to 15s
LOS C	>20s to 35s	>15s to 25s
LOS D	>35s to 55s	>25s to 35s
LOS E	>55s to 80s	>35s to 50s
LOS F	>80s	>50s

8.5.41 The peak time operation (08:00-09:00 and 17:00-18:00) has been considered in detail across the junctions contained in the traffic model. A LOS of C or above is unlikely to affect journey reliability and the delay is unlikely to be discernible from daily variations in overall journey times.

8.5.42 The off-site junctions that are forecast to have a LOS of D or below, following the introduction of the package of mitigation, are indicated below. The identified junctions represent those that potentially have a residual highway impact.

8.5.43 The comparison has also identified where the LOS improves following the introduction of the package of mitigation, demonstrating that the development impact has been mitigated. However, the comparison has identified the junctions where the LOS also worsens, and these are identified below in **Table 8.42.**

Table 8.42: LOS by Junction Comparison

Junction	09:00-09:00				17:00-18:00			
	Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites		
		Low	Med	High		Low	Med	High
Loop Farm Roundabout	C	C	C	C	B	D	D	D
First Turn/Woodstock Road	C	D	D	C	D	D	D	D
A40 / Eynsham Road / Cassington Road	D	D	D	D	D	D	E	D
Langford Lane/Banbury Road	F	E	F	F	C	D	D	D
Banbury Road/Moreton Road	E	E	E	E	D	E	E	E
B449/Harnborough Road	C	D	D	D	A	A	A	A
A44 /Sandy Lane Roundabout	C	F	F	F	C	E	E	D
A44/Begbroke	A	D	D	D	A	D	D	D
A44/Cassington Road	B	F	F	F	B	F	F	F
A40/Sunderland Avenue	D	F	E	D	B	C	C	C

8.5.44 In order to identify the potential impact of the PR sites, the delay across the individual approach arms at those junctions where the LOS is forecast to worsen has been reviewed, as indicated in **Table 8.43. Table 8.43** summarises the change in delay on each arm of the junctions in the "in combination with PR sites" scenarios compared to the Future Year Reference Case.

Table 8.43 Change in delay (seconds) at these junctions

Junction	Arm	09:00-09:00				17:00-18:00			
		Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites			Future Year Ref	Future Year Ref + Begbroke Innovation District + PR sites		
			Low	Med	High		Low	Med	High
Loop Farm Roundabout	A44 South arm	6	+8	+11	+4	10	+5	+4	+2
	A44 North-west arm	19	+9	+1	+1	16	+41	+45	+42
	A4260 Frieze Way	40	+6	-10	-4	10	+2	+2	+4
	Total	**65**	**+23**	**+2**	**+1**	**36**	**+48**	**+51**	**+48**
First Turn / Woodstock Road	A4144 North	12	+1	-1	-2	8	0	+1	0
	First Turn	12	-1	0	-3	15	-4	-2	-3
	A4144 South	30	+6	+5	+3	39	+6	+6	+2
	Total	**54**	**+6**	**+4**	**-2**	**62**	**+2**	**+5**	**-1**
A40 / Eynsham Road / Cassington Road	A40 West	53	+6	+3	-1	53	+1	+8	+5
	A40 East	52	-9	-11	44	+5	+1	+4	+2
	Eynsham Rd	47	-2	-2	-1	46	+2	+3	0
	Total	**152**	**-5**	**-10**	**-10**	**148**	**-1**	**+11**	**+2**
Langford Lane/A4260 Banbury Road	Banbury Rd South	58	0	+2	+2	23	0	+1	0
	Banbury Rd North	179	-47	+16	+16	16	+2	+2	-1
	Langford Lane	18	-2	-2	-2	25	+29	+29	+28
	Total	**255**	**-49**	**+16**	**+16**	**64**	**+31**	**+32**	**+30**
A4260 Banbury Road/ Moreton Road	Marston Ferry Rd	46	+4	+2	+3	51	+8	+9	+4
	Banbury Rd South	41	+1	+1	+1	47	+3	+2	0
	Banbury Rd North	113	-78	-107	-33	67	+32	+22	+24
	Moreton Rd	62	+7	+2	+5	66	+13	+18	+2
	Total	**262**	**-66**	**-32**	**-24**	**231**	**+56**	**+51**	**+30**
B449 / Harnborough Road	B449 North	11	+1	+3	+3	2	0	0	0
	Harnborough Rd	47	+14	+29	+34	4	+1	+1	+1
	B449 South	19	+7	+12	+15	3	0	0	0
	Total	**77**	**+22**	**+44**	**+52**	**9**	**+1**	**+1**	**+1**

A44/Sandy Lane/Rutten Lane Roundabout	A44 South	21	+100	+88	+52	16	+1	0	+1
	A44 North	30	+20	+19	+22	21	+57	+41	+23
	Rutten Lane	6	+11	+8	+9	8	+3	+2	0
	Total	**57**	**+131**	**+115**	**+83**	**45**	**+61**	**+43**	**+24**
A44 / Begbroke Innovation District /PR9	A44 South	4	+39	+48	+49	5	+27	+27	+27
	A44 Road North	6	+46	+37	+40	6	+29	+22	+19
	Begbroke	20	+30	+30	+30	24	+108	+49	+51
	North Access	-	+41	+41	+40	-	+31	+32	+32
	Total	**30**	**+156**	**+156**	**+159**	**35**	**+195**	**+130**	**+129**
A44/ Cassington Road	A44 South	6	-1	-1	-2	4	-1	-1	-1
	A44 North	18	+189	+184	+135	16	+182	+188	+182
	Cassington Road	11	-10	+12	+12	14	+4	+3	+2
	Total	**35**	**+198**	**+195**	**+145**	**34**	**+185**	**+190**	**+183**
A40/ Sunderland Avenue	A40 West	28	+25	+13	+4	14	+5	+3	+3
	Sunderland Avenue	-	-	-	-	-	-	-	-
	Total	**28**	**+25**	**+13**	**+4**	**14**	**+5**	**+3**	**+3**

Loop Farm Roundabout

8.5.45 The results show that in the AM peak hour the model forecasts an increase in total delay at the Loop Farm roundabout of 2 seconds in the "in combination with PR sites" scenario (medium mode shift) compared to the Future Year Reference Case, indicating that the impact of development will be indiscernible. In the PM peak hour the total delay across the junction increases by 51 seconds, with a delay of 45 seconds forecast on the A44 north-west arm in the peak hour period. The increases on A44 south and A4260 Frieze Way arms are negligible.

First Turn / Woodstock Road

8.5.46 The results show that the model forecasts that the AM and PM peak hours will see an increase in delay of between 4 and 5 seconds across the entire junction in the "in combination with PR sites" scenario (medium mode shift), indicating that the impact of PR sites at this junction will be negligible.

A40 / Eynsham Road / Cassington Road

8.5.47 In the AM peak hour, the entire junction is forecast to see a decrease in delay in the "in combination with PR sites" scenario (medium mode shift) compared to the Future Year

Reference Case of 10 seconds. In the PM peak hour the junction is forecast to see an increase of 11 seconds in delay in the "in combination with PR sites" scenario (medium mode shift) compared to the Future Year Reference Case.

Langford Lane/Banbury Road

8.5.48 The total increase in delay at the junction is forecast to be 16 seconds in the AM peak hour and 32 seconds in the PM peak hour in the "in combination with PR sites" scenario (medium mode shift) compared to the Future Year Reference Case. Overall, this is a minimal impact at this junction.

Banbury Road/Moreton Road

8.5.49 In the AM peak hour, the total delay reduces across the entire junction by 32 seconds in the "in combination with PR sites" scenario (medium mode shift) compared to the Future Year Reference Case. In the PM peak hour, the total delay is forecast to increase across the junction by 51 seconds with the increases predicted on the Banbury Road (north) and Moreton Road arms being 22 and 18 seconds, respectively. The increases in delay on Banbury Road (south) and Marston Ferry Road is negligible. Overall, this is a minimal impact at this junction in the PM peak hour.

B449/Harnborough Road

8.5.50 The total increase in delay at the junction is forecast to be 44 seconds in the AM peak hour and 1 second in the PM peak hour in the "in combination with PR sites" scenario (medium mode shift) compared to the Future Year Reference Case. In the AM peak hour, the increase in delay is primarily experienced on the Harnborough Road arm, where there is forecast to be a 29 second delay increase. The impact on the other arms is negligible. Overall, there is considered to be a minimal impact on delays at this junction.

Woodstock Road/Sandy Lane/Rutten Lane Roundabout

8.5.51 There is forecast to be an increase in the total junction delay of 115 seconds in the AM peak hour in the "in combination with PR sites" scenario (medium mode shift) compared to the Future Year Reference Case. In the PM peak the increase in the total delay is forecast to be 43 seconds. There is forecast to be a delay of 88 seconds on Woodstock Road (south) arm in the AM peak hour and the impact across the Woodstock Road (north) arm and Rutten Lane during this period is negligible. In the PM peak hour, there is forecast to be an increase of 41 seconds on Woodstock Road (north). The increase on Woodstock Road (south) and Rutten Lane is negligible.

Woodstock Road/Begbroke

8.5.52 The total increase in delay at the junction is forecast to be 156 seconds in the AM peak hour and 130 seconds in the PM peak hour in the "in combination with PR sites" scenario (medium mode shift) compared to the Future Year Reference Case. However, there is a maximum of 49 seconds

increase in delay on any one arm in the weekday peak hours in the "in combination with PR sites" scenario (medium mode shift), which is not considered to be a severe impact.

Woodstock Road/Cassington Road

8.5.53 The total increase in delay at the junction is forecast to be 195 seconds in the AM peak hour and 190 seconds in the PM peak hour in the "in combination with PR sites" scenario (medium mode shift) compared to the Future Year Reference Case. The majority of the delay in the AM and PM peak hours materialises on the A44 northern arm (i.e. southbound movement) as it is at this location that southbound traffic is required to merge from two lanes to one lane.

A40/Sunderland Avenue

8.5.54 The total increase in delay at the junction is forecast to be 13 seconds in the AM peak hour and 3 seconds in the PM peak hour in the "in combination with PR sites" scenario (medium mode shift) compared to the Future Year Reference Case, which would have a negligible effect on the junction.

8.6 Site Access Capacity Assessment

Begbroke Hill Access Junction

8.6.1 In addition to the microsimulation modelling, a stand-alone LinSig model has been developed for the Begbroke Hill access to the Begbroke Innovation District. The model includes the proposed alterations to the junction to provide access to the proposed PR9 site as well as the forecast traffic associated with the PR sites. The access improvements are to be brought forward by PR9 as part of their outline planning application.

8.6.2 The proposed modifications to the access being put forward by PR9 align with the PR9 Development Brief (November 2021), which shows a fourth arm being added to the existing A44/Begbroke Hill junction. The consultation responses from OCC on the PR9 application have required direct pedestrian and cycle crossings to be provided across all arms of the A44/Begbroke Hill/PR9 junction in order to provide sustainable connectivity between PR9 and PR8 and minimise the severance of the A44 corridor on local communities.

8.6.3 LinSig is a tool that enables the capacity of a junction to be determined and consider the effects of traffic on that capacity. The model outputs provide queue lengths and delay to traffic. The key metric in respect of capacity is the Practical Reserve Capacity (PRC) of the junction which equates to a percentage, of residual capacity against a practical operation of 90% of capacity.

8.6.4 Degree of Saturation (% Sat) results are available for each arm and each lane at the junction, providing an indication of the capacity of each as an individual link. A degree of saturation of 100% on a link indicates that forecast traffic flows are equal to its capacity on an average day – and hence some instability could be expected on a day to day basis with performance at this level, as traffic volumes fluctuate and vary.

8.6.5 A summary of the LinSig modelling for the Begbroke Hill site access junction with the proposed PR9 modifications are presented in **Table 8.44**. The LinSig output report is provided in **Appendix N**.

Table 8.44: Begbroke Innovation District Northern Site Access LinSig modelling results

Arm		AM peak hour (0800 to 0900)			PM peak (1700 to 1800)		
		Queue (PCU)	Delay (s/pcu)	DoS (%)	Queue (PCU)	Delay (s/pcu)	DoS (%)
1/1	A44 North (ahead and left)	29.6	16.3	98.6%	14.9	5.3	74.8%
1/2	A44 North (ahead)	32.9	18.1	99.1%	16.2	5.8	76.1%
1/3	A44 North (right)	-	-	99.1%	-	-	76.1%
2/1	Begbroke Hill (left)	3.5	2.3	44.9%	10.0	6.8	81.5%
2/2	Begbroke Hill (ahead and right)	-	-	44.9%	-	-	81.5%
3/1	A44 South (ahead and left)	26.5	9.4	89.5%	17.5	6.6	82.4%
3/2	A44 South (ahead)	19.3	12.4	0%	17.0	7.7	80.9%
3/3	A44 South (right)	-	-	97.9%	-	-	78.7%
4/1	PR9 access (left)	0.6	0.4	13.6%	0.3	0.1	4.9%
4/2	PR9 access (ahead and right)	-	-	13.6%	-	-	0%
		PRC -10.1%			**PRC 9.3%**		

8.6.6 The modelling results indicate that the junction is expected to operate well within capacity during the PM peak hour with a positive PRC. For the AM peak, all arms are forecast to operate with a DoS below 100%. The PRC reflects that several arms are forecast to operate above 90% thereby limiting the reserve capacity, while still operating within theoretical maximum capacity. In accordance with OCC's transport strategy and associated mode shift targets towards sustainable travel, the approach has been to maximise sustainable connectivity across the A44 corridor and manage vehicular demand through the junction but not take a 'predict and provide' approach to junction design.

Hallam Land Site Access

8.6.7 The Site is also proposed to be accessed from a new signal controlled junction to be delivered by Hallam Land as part of their forthcoming application for residential development, which forms

part of the PR8 allocation. OUD has been liaising with Hallam Land during the pre-application stage, including their transport consultant with regards to the junction design and capacity assessment. As part of Hallam Land's outline planning application, their Transport Assessment will include an assessment of the proposed A44 signal controlled site access, which will include traffic generated by the PR8 allocated site as a whole and not just vehicular traffic generated by the Hallam Land proposed development.

8.7 Summary

8.7.1 Overall across the modelled peak periods and network, the modelling shows that vehicles are able to travel through the network with latent demand continuing to remain low (i.e. vehicles not able to enter the network).

8.7.2 Across the network the model forecasts a negligible effect on vehicle speed when compared with the Future Reference Case.

8.7.3 Where queuing increases at junctions, this is not of a magnitude that would result in a material effect on the highway network. For example, no junctions are blocked as a result of Begbroke Innovation District in combination with the PR sites and the mitigation coming forward.

8.7.4 Where the Level of Service of junctions has worsened as a result of the in combination effects of Begbroke Innovation District and the PR sites, further assessment has been undertaken on each arm of the junction. The detailed assessment identifies that there are no residual effects which would be considered severe.

8.7.5 The works set out in the IDP of the Local Plan provide the basis for the development of a sustainable transport network which will support the proposed PR sites allocations through limiting the need to travel by car and offering a genuine choice of transport modes in accordance with the NPPF.

8.7.6 A range of mitigation measures included within the IDP have be tested within the model and it is evident that the provision of active travel opportunities and public transport interventions, along with changes in travel behaviour arising from the delivery of enhancements to the sustainable and active travel networks will mitigate the impacts arising from the PR sites.

8.7.7 Given that the modelling undertaken makes no allowance for the ambitious reductions in background traffic set out in the Council's adopted LTCP and therefore the results presented are arguably a 'worst case', it is concluded that subject to the appropriate apportionment of contributions towards the infrastructure identified as being necessary to mitigate the cumulative impact of the PR sites, the Begbroke Innovation District cannot be regarded as having either a severe impact on the highway network or an unacceptable impact on highway safety which would otherwise give rise to grounds for objection in line with paragraph 111 of the NPPF.

9 APPROACH TO DECIDE AND PROVIDE

9.1 Introduction

9.1.1 OCC's LTCP, adopted in July 2022, outlines a clear vision to deliver a net-zero Oxfordshire transport and travel system by 2040 as well as reducing private vehicle use, and prioritising walking, cycling, and public transport.

9.1.2 In order to achieve this, the LTCP sets out the changes that will be needed to OCC's transport and travel system. This multi-pronged approach sets out the reshaping of the way places are connected, and infrastructure is upgraded and reconfigured in order to achieve these aspirations. The approach includes the forthcoming area transport strategies and transport corridor strategies, OCC's new Parking Standards for New Developments (2022), the OCC Street Design Guide (2021), and a shift from an approach to transport planning characterised as 'predict and provide' towards adopting a 'decide and provide' approach instead.

9.1.3 The recently approved OCC guidance 'Implementing Decide and Provide: Requirements for Transport Assessments' (September 2022) sets out how the transport assessment process needs to be adapted to help facilitate the 'decide and provide' approach, but also recognises that this is only one part of working towards and adopting this new approach to transport planning. The OCC guidance is broken down into three subsections:

- Part One - Guiding Principles;
- Part Two - Transport Modelling, Evidencing Trip Rates, and Document Updates; and
- Part Three - Implementing 'Decide and Provide' within Transport Assessments.

9.1.4 This section of the TA summarises how the proposed development and associated transport strategy and impact assessment accords with OCC's 'decide and provide' guidance.

9.2 Compliance with the Decide and Provide Guidance

Part One – Guiding Principles

9.2.1 The OCC Decide and Provide guidance sets out that:

'… the 'decide and provide' approach to transport planning decides on a preferred vision of the future and then provides the means to work towards that whilst also accommodating uncertainty about the future. This offers the opportunity for more positive transport planning and will help to implement the LTCP transport user hierarchy by considering walking, cycling and public transport upfront.

9.2.2 This approach is captured in LTCP Policy 36 (2022a, p.106), which states that: We will:

a. Only consider road capacity schemes after all other options have been explored.

b. Where appropriate, adopt a decide and provide approach to manage and develop the county's road network.

c. Assess opportunities for traffic reduction as part of any junction or road route improvement schemes.

d. Require transport assessments accompanying planning applications for new development to follow the County Council's 'Implementing 'Decide & Provide': Requirements for Transport Assessments' document.

e. Promote the use of the 'decide and provide' approach in planning policy development to support site assessment'

9.2.3 The guidance sets out that planning policy supports the 'decide and provide' approach, including National Planning Policy Framework (NPPF), local plans for the districts of Oxfordshire and the Oxfordshire LTCP.

9.2.4 The traffic modelling undertaken for the proposed development and the cumulative impacts of the PR sites supports the approach of considering walking, wheeling, cycling and public transport ahead of any capacity improvements.

Part Two – Transport Modelling, Evidencing Trip Rates, and Document Updates

9.2.5 This part of the Decide and Provide guidance sets out the assumptions that should be made for:

- permitted, committed, and planned growth;
- the suitability of various evidentiary sources;
- the consideration of the long-term effects of Covid-related transport impacts;
- the relationship between car parking provision and trip rates;
- the applicability of the car trip reduction targets in the LTCP;
- how this document should inform the evidence base for local plans; and
- the requirement for periodic updates to the document.

9.2.6 With regards to permitted, committed and planned growth, the guidance states that *"a scoping exercise will need to be undertaken to ensure that transport assessments (and transport statements) take appropriate account of permitted, committed, and planned growth which will generate traffic impacts on the area of the highway network also impacted by the proposed development."*

9.2.7 OUD and the PR sites have engaged with OCC over a number of years to agree the scope of the modelling including the model software, study area and assumptions for permitted, committed and planned growth.

9.2.8 With regards to evidence sources, the Forecasting Note and Forecast Capping Note included in **Appendices J** and **K** set out the proposed approach to traffic growth for the Future Year Reference Case based on various sources of evidence, including historic traffic data, housing projections and NTEM. The active travel and public transport mode shift assumptions set out in

the Mode Shift Note included in **Appendix L** align with the infrastructure set out in Appendix 4 of the Partial Review Local Plan and provide a scenario which shows how the PR site interventions are likely to help towards OCC reaching their LTCP targets. Likewise, the trip rates and modal share for the proposed development have been based on TRICS data, local Census data, the destination of trips and ability to access facilities by active travel and public transport, both now and in the future, as well as future travel habits.

9.2.9 With regards to Covid related transport effects, the historic traffic trends analysis that has informed the traffic growth did not include traffic data during the Covid pandemic and therefore any traffic effects of the pandemic have not been accounted for by the traffic modelling.

9.2.10 With regards to the relationship between car parking and trip rates, providing car and cycle parking in line with the latest OCC 'Parking Standards for New Developments' (2022) will form part of the wider transport strategy for the proposed development to encourage modal shift by providing improvements to sustainable and active modes, demand management measures, and master planning.

9.2.11 The LTCP includes the following targets for replacing or removing car trips across the County:

9.2.12 By 2030:

- Replace or remove 1 out of every 4 current car trips in Oxfordshire.
- Increase the number of cycle trips from 600,000 to 1 million cycle trips per week: and
- Reduce road fatalities or life changing injuries by 50%.

9.2.13 By 2040:

- Deliver a net-zero transport network; and
- Replace or remove an additional 1 out of 3 car trips in Oxfordshire.

9.2.14 By 2050:

- Deliver a transport network that contributes to a climate positive future; and
- Have zero, or as close as possible, road fatalities or life-changing injuries.

9.2.15 The LTCP mode shift targets have not been included in the traffic modelling for the proposed development and cumulative impact assessment of the PR sites. If the LTCP targets are realised (i.e., 25% mode shift away from the car by 2030) through a wider set of interventions currently being planned by the County, then the network will operate significantly better than predicted through the modelling that is summarised in Section 8 of this TA. It is OUD's intention that the development should be sustainable, and it will work with the authorities to seek to achieve these objectives, and, in this context, the assessment set out in this TA should be considered a worst case assessment, of the highest likely traffic impact scenario that could be envisaged from the development, always assuming that OCC's policy position is realised.

Part Three: Implementing 'Decide and Provide' within Transport Assessments

9.2.16 Part three of the 'decide and provide' guidance identifies three stages - identifying accessibility characteristics; scenario testing; and monitoring and managing outcomes.

Identifying accessibility characteristics

9.2.17 The proposed development site has been allocated based on its existing and future sustainable characteristics and is therefore well located to existing settlements and facilities. The proposed development will bring forward a range of facilities and measures, both internally and externally which will facilitate internalisation of trips, reducing the need to travel and ensure that as many residual trips as possible are catered for by active travel and public transport modes.

Scenario testing

9.2.18 The 'decide and provide' guidance requires scenario testing to be undertaken. Separate to the VISSIM modelling exercise summarised in Section 8 of this TA, alternative scenarios, which include the PR sites, have been tested within the following workstreams:

- The strategic modelling work which supported the Partial Review Local Plan, and which identified the infrastructure package included within Appendix 4. This modelling was based on highly robust trip rates, which did not consider aspects such as mode shift or internalisation of trips. It also included traffic growth in background traffic and committed developments; and
- Additional strategic modelling which is currently being undertaken by OCC to test implications of the LTCP and implementation of the Central Oxfordshire Travel Plan.

9.2.19 As part of the VISSIM modelling exercise summarised in Section 8 of this TA, a number of scenarios have been tested. Scenario testing has been undertaken on the level of mode share that may be achieved for the background traffic as a result of the proposed infrastructure being brought forward to the north of Oxford (i.e. low, medium and high mode shift scenarios).

Monitoring and managing outcomes

9.2.20 The OCC 'decide and provide' guidance requires a Monitoring and Evaluation Plan (MEP) to be secured and implemented through the Travel Plan as part of the S106 agreement.

9.2.21 In accordance with the guidance, the MEP will record how the trip generation and mode share of the site evolves over time. The survey specification will need to be agreed with OCC and should employ the TRICS Standard Assessment Methodology or similar.

9.2.22 The proposed development is committed to monitoring trips into and out of the Site over a number of years through an MEP, secured through the Travel Plan.

10 SUMMARY AND CONCLUSIONS

10.1 Summary

10.1.1 KMC is appointed by OUD to provide transport advice and prepare supporting technical documentation to accompany the outline planning application relating to the proposed development of Begbroke Innovation District.

10.1.2 The land owned by OUD, which forms part of this outline application for Begbroke Innovation District, forms the vast majority of the PR8 allocation within the Partial Review Local Plan. OUD has coordinated with the adjoining PR8 land owners to ensure that the PR8 proposals are brought forward on a comprehensive basis, especially with regard to transport infrastructure and connectivity.

10.1.3 It is proposed to develop a residential-led mixed used development, which will include up to 215,000 sqm of residential floorspace (which has been equated to circa 1,800 homes for the purposes of this assessment), up to 155,000 sqm of flexible employment uses and supporting social, retail, leisure and community uses, including two primary schools, a secondary school and local centre.

10.1.4 Strategic scale development of this size has significant advantages in transport terms. Achieving a critical mass of people means that services, facilities and leisure opportunities can be provided on site meaning a significant amount of travel will only need to occur within the Site itself. Likewise, the proposed mix of housing and jobs provides the opportunity for people to live and work within walking distance.

10.1.5 The development is supported by a comprehensive sustainable transport strategy. OUD's plans for Begbroke Innovation District are to take a long-term, high-quality approach to placemaking.

10.1.6 The parameters that have been assessed, and which will be used to develop a future masterplan for the Site, seek to reduce the need to use a car and provide a strong foundation for pedestrian, wheeling, cycle and public transport connectivity across the site. Pedestrians, wheelers and cyclists will be afforded with a permeable and high-quality network of routes. It will be easier to walk or cycle through the site than by any other mode of transport. Low speed roads will connect into a network of 'living streets', which will provide space for play, recreation and biodiversity.

10.1.7 Pedestrian and cycle improvements are proposed to link Begbroke Innovation District with the surrounding communities of Yarnton, Begbroke and Kidlington as well as to Oxford Parkway and to Oxford city. New pedestrian crossings are proposed across the A44 and off-site improvements to active travel infrastructure along the A44 and A4260 corridors is proposed to be jointly funded by the PR sites and other committed developments. In accordance with part 13 of Policy PR8, land has also been safeguarded in the southeast of the Site to provide for a future canal bridge that would connect to land at Stratfield Farm (allocated by Policy PR7b). Detailed proposals would be prepared in consultation with the third-party landowner(s), the Canal and

Rivers Trust, CDC and OCC at a future date. The intention would be to deliver a high quality connection through to Oxford Parkway.

10.1.8 The Council's Local Plan policy requires Sandy Lane to be closed to through vehicular traffic to become for pedestrians, wheeling and cycling only. Network Rail are proposing to install a ramped cycling and pedestrian bridge in its place. OUD has been working closely with Network Rail to explore the potential for delivering a bridge over the railway that would replace the level crossing, and provide connectivity for cyclists, pedestrians and public transport vehicles. This work with Network Rail is ongoing and as such does not form part of this Application. Land has been safeguarded, however, to ensure that such a bridge could be delivered in the future.

10.1.9 Oxfordshire County Council is seeking to bring forward a mobility hub at Oxford airport, which is intended to intercept traffic from further north along the A44 and offer users a range of sustainable transport modes to complete journeys into the Oxford conurbation area. It is proposed for the existing S3 bus service to be increased to 4 buses per hour in each direction and for the route to run directly along the A44 without diverting through Yarnton. In addition, a new bus route is proposed, which is expected to serve Yarnton, Begbroke Innovation District and Oxford Parkway. The improvements to the bus services are expected to be jointly funded by the PR sites and other committed development in the area, through financial contributions set out in S106 Agreements.

10.1.10 There is currently no bus service between Yarnton and Kidlington and therefore, as part of the Begbroke Innovation District, it is proposed to provide a community bus service between Yarnton, Begbroke Innovation District and Kidlington.

10.1.11 In accordance with policy, the Control Documents, and any subsequent masterplan that is developed, will safeguard land for a potential railway station to come forward in the future. Whilst a railway station does not form part of the outline planning application, OUD will continue to engage with Network Rail and the Department for Transport on the potential for a railway station as the development progresses.

10.1.12 These transport improvements will benefit residents, employees and visitors of the proposed development as well as the wider community and enable more trips to be made by sustainable modes.

10.1.13 To assess the cumulative impacts of the PR sites, OCC requested that the North Oxford VISSIM model be used to identify the impacts of the PR sites and test the infrastructure interventions identified in the IDP. The North Oxford VISSIM model is a micro-simulation model representing a large study area. The model is primarily formed of four key corridors including a 7 km section of the A34 corridor, an 11 km section of the A40 corridor, an 11 km section of the A44-A4144 corridor and a 12 km section of the A4260-A4165 corridor.

10.1.14 The assessment of the proposed development and cumulative PR site impacts is in accordance with OCC's 'decide and provide' guidance, whereby the transport vision for the proposed development has been set out alongside an evidence base for multi-modal trip generation, distribution and traffic growth. A range of scenarios have been tested on the level of mode share

that may be achieved for the background traffic as a result of the proposed infrastructure being brought forward to the north of Oxford.

10.2 Conclusions

10.2.1 Appendix 3 of OCC's adopted LTCP sets out guidance for new developments to complement the 'decide and provide' approach. **Table 10.1** below demonstrates the compliance of the proposed development with the OCC guidance on 'Connectivity between new developments and existing settlements.'

Table 10.1: Compliance with LTCP Guidance on Connectivity between New Developments and Existing Settlements

Objective	Approach to meeting objective within Begbroke Innovation District
Plan at an early stage and deliver direct and safe connections which prioritise access on foot, bike or bus to/from neighbouring settlements and places of employment, retail, education and leisure facilities. This includes improving existing cycling and walking infrastructure that link the development to neighbouring communities and avoid severance, particularly where communities are located next to major roads.	The pedestrian, wheeling and cycle network within the development provides links to the surrounding communities. Funding is to be provided by the PR sites and other committed development towards active travel improvements to the A44 and A4260 corridors. New active travel crossings will be provided across the A44 as part of these improvements.
Roads and junctions (including signals and roundabouts) connecting to developments need to prioritise walking, cycling and public transport from the outset so that there is sustainable access for residents and businesses.	The proposed accesses to the development prioritise sustainable travel to improve connectivity across and along the A44. Bus priority measures are also proposed along the A44 corridor.
New roads and junctions need to be futureproofed in line with the Innovation Framework.	As part of the Reserved Matters applications, OUD will consult with OCC with regards to the design of infrastructure and safeguarding for innovation.
New roads should be designed in accordance with DfT's 'Manual for Streets', Oxfordshire County Councils Street Design Guide and Oxfordshire County Councils Walking and Cycling Design Guides.	As part of the Reserved Matters applications the streets will be designed in accordance with Manual for Streets and OCC guidance.
New streets should be designed in accordance with the Healthy Streets Approach, LTN 120 and the Department for Transports Inclusive Mobility.	As part of the Reserved Matters applications the streets will be designed in accordance with Healthy Streets, LTN1/20 and Inclusive Mobility as well as Active Travel England Design Principles.
Implement traffic calming measures including 20 mph limits on sustainable routes to new developments to ensure safety.	Joint funding by the PR sites and other committed developments is to be secured through S106 Agreements to implement a package of sustainable transport infrastructure improvements along the A44 and A4260 corridors, which will seek to induce a mode shift towards active travel and public transport.

Excellent access to interchanges with other transport networks such as rail and park and ride hubs need to be designed and delivered early in the development.	A mobility hub is proposed within the local centre to be provided as part of the proposed development. In addition, land has also been safeguarded in the southeast of the Site to provide for a future canal bridge that would connect to land at Stratfield Farm (allocated by Policy PR7b. Detailed proposals would be prepared in consultation with the third-party landowner(s), the Canal and Rivers Trust, CDC and OCC at a future date. The intention would be to deliver a high quality connection through to Oxford Parkway railway station.
Plan ahead for future sustainable links where there are potential development extensions.	The transport strategy has sought to future proof and safeguard for future sustainable links. For example: - The Development Specification safeguards for a potential railway station at Begbroke Innovation to come forward in the future, and this safeguarding would need to be a part of any future masterplan for the Site that was developed. - OUD has been working closely with Network Rail to explore the potential for delivering a bridge over the railway that would replace the level crossing, and provide connectivity for pedestrians, wheelers, cyclists and public transport. This work with Network Rail is ongoing and does not form part of this Application. This would provide a multi-modal interchange with the potential railway station, should it come forward in the future. - The Development Specification provide for a walk, wheeling and cycle bridge over the canal to connect to PR7b. Consideration is also being given to the potential for the bridge to accommodate public transport to connect to Oxford Parkway and onwards to the city centre.
Consider measures for deliveries to be deployed in a sustainable way e.g. freight consolidation to reduce impacts of larger vehicles in residential areas.	The Framework Delivery and Servicing Management Plan sets out the approach to manage servicing throughout the Site.

10.2.2 **Table 10.2** below demonstrates the compliance of the proposed development with the OCC guidance on 'Connectivity within the new development', 'access to local facilities, services and employment', 'access to communal spaces, including green or blue spaces.'

Table 10.2: Compliance with LTCP Guidance for within the New Developments

Objective	Approach to meeting objective within Begbroke Innovation District
Connectivity within the new development	
Comprehensive networks for cycling, walking and public transport which offer direct, continuous and uninterrupted routes to facilities need to be delivered in Phase 1 of the development.	The Control Documents require the provision of green corridors within each neighbourhood within the proposed development, which would provide an off-road active travel route to connect to the local centre. In addition, a permeable and high quality network of walk, wheeling and cycle routes will be provided throughout the Site.
Spatial planning should aim to deliver well connected, walkable 20-minute neighbourhoods with facilities within the development that reduce the need for travel.	All residents will live well within 20 minutes' walk of all local facilities provided within the proposed development, including the local centre, community facilities, schools and mobility hub.
Walking and cycling routes should be safe (consider surveillance, sight lines, lighting, segregation), convenient (consider directness, design speeds, minimise need to stop or divert), well landscaped, and designed to provide an inclusive street environment that meets the needs of people from early to later life.	Low speed roads will connect into a network of 'living streets', which will provide space for play, recreation and biodiversity.
Wayfinding should be installed to promote movement on foot/by bike and needs to be designed to encourage residents to use active travel for short trips.	The Strategic Design Guide requires all parts of the urban landscape within the Site legible and easy to navigate through. Wayfinding will be installed to further support the active travel strategy for the Site.
Filtered permeability and low traffic neighbourhoods should be included, making cycling and walking routes more direct and attractive than using a car.	Filtered permeability will be provided as part of the development through measures including: - the proposed green corridors through the neighbourhood; - the bus gate adjacent to Central Park to provide a continuous sustainable travel route through the Site; and - provision for sustainable travel only over the railway and canal.
Ensure the needs of those walking, including older or disabled residents, are fully considered, such as the need for shade and shelter (e.g. trees), gradients and seating for rest on the way.	Infrastructure within the Site will be designed in accordance with relevant standards for inclusive mobility, including appropriate gradients of routes, provision of step free access and rest areas in the shade.
Provide mobility hubs in a range of locations and sizes in order to improve interchange opportunities, connectivity and accessibility.	A mobility hub is proposed to be provided within the local centre.
Walking and cycling infrastructure should be designed to deliver LCWIP targets for modal shift	Tables 4.1 and 4.2 of this TA summarise the Kidlington LCWIP measures. Many of these improvements are either being incorporated into the masterplans for the PR sites or are included in the IDP in Appendix 4 of the

	Partial Review Local Plan, which is proposed to be funded by the PR sites.
Access to local facilities, services and employment	
Create easy access on foot/by bike to facilities within and close to the development that enable social interaction and reduce the need to travel.	A network of active travel routes is proposed through the Site, which would link the neighbourhoods to proposed local amenities.
Provide effective digital connectivity to enable home working and include flexible work/office space.	Provision will be made for virtual mobility as part of the proposed development to not only enable people to work flexibly but also to enable other activities to be undertaken virtually to reduce the need to travel.
Cycle parking that meets our best practice requirements (Appendix 5) and considers different users and types must be built into all new developments as the first consideration so that it is at least as easy to use a cycle as use a car.	Cycle parking will be provided in accordance with OCC minimum standards and for a range of types of cycles, including cargo bikes.
Parking should be provided in accordance with Oxfordshire County Councils parking standards.	Car parking will be provided in accordance with the maximum OCC standards.
Developments should be designed so that pavement parking does not occur.	A Controlled Parking Zone will be implemented in accordance with OCC guidance as part of Reserved Matters applications.
Where car parking is provided, an effective network of EV charging should be included following standards set out in OEVIS and access provided to an electric car club.	EV charging will be provided in accordance with OCC parking standards.
Provide suitable parking for motorcycles that meets our best practice requirements.	Motorcycle parking will be provided in accordance with relevant standards.
Limit car spaces for each household, including consideration of car free developments and encourage provision of well-designed parking courtyards with good surveillance.	A network of 'living streets' are proposed to be provided, which will consolidate parking to the end of the street and provide space for play, recreation and biodiversity.
Consider the allocation of visitor parking spaces that can be used flexibly during the master planning stage.	As part of the Reserved Matters applications the approach to visitor parking will be agreed with OCC.
Restrict non-residential parking to a minimum, consider implementation of complementary parking restrictions and design so that they can be easily repurposed for other uses.	As part of the Reserved Matters applications the approach to employment parking provision will be agreed with OCC, which will consider the potential for employment parking to be repurposed over time as travel behaviour changes.
Provide frequent, reliable and easily accessible public transport to local facilities, employment and nearby town centres.	A mobility hub is proposed within the development. Improvements to existing and new bus services are proposed to be jointly funded by the PR sites, which will serve the proposed development.
Create a positive bus environment, including real-time information at stops, accessible, safe and well-lit bus shelters which facilitate modal interchange by providing cycle parking at key bus stops.	A mobility hub is proposed within the development within the vicinity of the local centre, which will provide high quality bus facilities and facilitate modal interchange.

10.2.3 In conclusion, this TA has assessed the potential transport impacts of the development parameters that have been defined for the Site as part of the outline planning application. It demonstrates that the proposed development provides the opportunity for more positive and integrated transport and land use planning through the implementation of a meaningful transport modal hierarchy. It sets out how people travelling within, to and from the Site will be able to meet their mobility needs through healthier, higher capacity and sustainable ways.

10.2.4 The assessment has demonstrated that, with the implementation of a package of sustainable measures, traffic convenience will remain broadly similar when comparing the forecast situation "with development" to the future baseline situation without it. The network will remain less convenient during the commuter peak compared with otherwise, with some roads potentially experiencing longer journey times but congestion and vehicle speeds across the network as a whole will remain broadly the same as without the development. Bus priority measures will ensure that buses are not impacted by peak period congestion and this will become an attractive and reliable form of transport.

10.2.5 Given that the assessment undertaken makes no allowance for the ambitious reductions in background traffic set out in the Council's adopted LTCP and therefore the results presented are arguably a 'worst case', it is concluded that subject to the appropriate apportionment of contributions towards the infrastructure identified as being necessary to mitigate the cumulative impact of PR development, the Begbroke Innovation District cannot be regarded as having either a severe impact on the highway network or an unacceptable impact on highway safety which would otherwise give rise to grounds for objection in line with paragraph 111 of the NPPF.

Appendix A

Map of Bus Network

Oxford SmartZone

valid from **11th April 2023**

S3 S7 to Woodstock and Chipping Norton

S4 to Banbury

S5 to Bicester

S6 to Faringdon and Swindon

E1 to Eynsham

S1 to Witney and Carterton

H2 S2 to Witney and Cheltenham

33 to Abingdon and Didcot

S9 to Wantage

63 63S to Southmoor and Longworth

H5 to Bicester

11 to Garsington, Chalgrove and Watlington

46 to Great Milton

280 X8 to Thame and Aylesbury

45 to Berinsfield and Abingdon

X40 to Wallingford and Reading

35 to Abingdon

Terminating at Osney Island: 4A 33 63 63S 400 E1 S6 S9

Terminating at Oxford Rail Station: 1 5 14 280 400 S1 S3 S7 X2 X8

ST1 to Harwell Campus

X1 to Abingdon and Wantage

X2 to Abingdon, Milton Park & Didcot

X3 to Abingdon

X32 to Didcot, Harwell Campus & Wantage

34 to Abingdon & Harwell Campus

Langford Lane

Airport

S7

Begbroke

2 2A 700

Kidlington

Banbury Road

Mill Street

Grovelands

King's Arms

Gosford

Woodstock Road

S3

Yarnton

A44

Garden City

Oxford Parkway Park&Ride

2 2A 700

Pear Tree Park&Ride

300

2 2A 700 S4 S5 S7

Cutteslowe

A40

H2 S2

S1

Wolvercote

6

J.K. Field Station

ST2

Wytham

6 300 S1 S2 S3 ST2

Summertown

14 700 H2

Marston Ferry Road

Marston Village

14

JR Hospital H

10 14 H2 H5 ST2 X3 X32 100 700

Barton Park

8 X3 H5

Barton

Crematorium

Northway

14

New Marston

X3

100 Semester only

Marston Road

JR Hospital

Headington

London Road

Wornflete Road

400

A40

Thornhill Park&Ride

400 700

14

Risinghurst

NOC ST2

Brookes University

Headington Hill

Morrell Avenue

Churchill Hospital

15 700

15

Wood Farm

Wheatley Campus

400

Littleworth

46

Wheatley

Asda

Ashurst Court

Horspath Road Industrial Estate

Horspath

Turning Circle

Horspath Rd

Hollow Way

Cowley

10 100 U5

Cowley Road

Magdalen Bridge

3 3A X40 ST1

Iffley Road

Donnington Bridge

46

Florence Park

Templars Square

5A

Garsington Rd

Eastern Bypass

11X

BMW

Lidl

Unipart House

Barns Road

Bodley Road

Rose Hill

3 45

Rose Hill

Redbridge Park&Ride

300

35

Eastern Bypass

Littlemore

Minchery Farm

Science Park

3A 45

Kassam Stadium

Pegasus Rd

Field Avenue

3A

Greater Leys

Blackbird Leys

1 5 3A 10 100

Kennington

Heyford Hill

X40

Sandford

3A 45 X40

Hinksey Hill

X1

Bagley Wood

A34

Abingdon Road

11X 34 35 46 300 X1 X2 X3 X32 ST1

Seacourt Park&Ride

400

A420 (Minns Ind. Estate)

Rail Station

St Giles

City Centre

Elms Parade

Botley Road

Osney Island

Dean Court (Nobles Lane)

Dean Court

63

Botley

4A 63S

Elms Rise

Harcourt Hill

400

Westminster Way

Cumnor Hill

Cumnor

33 63 63S S9

Bear & Ragged Staff

Kenilworth Road

Woodstock Road

Banbury Road

Redbridge Park&Ride

Sugworth Lane

Sugworth Crescent

Sandford-on-Thames

Appendix B

Personal Injury Collision Data