TECHNICAL NOTES

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Executive Summary

1. Technical Note 6 has been prepared by Peter Brett Associates (PBA) on behalf of the Homes and Communities Agency and Oxford City Council, to summarise the Site Access Options testing work undertaken to date for the Barton Land Development, Oxford.

2. Barton Land, a 36 hectare gross area greenfield site, is located approximately 6km to the north-east of Oxford City Centre and west of the existing Barton Estate, immediately to the north of the A40 Oxford Bypass. Oxford City Council promoted this site for residential development through the Core Strategy of the Local Development Framework in 2009, for which preliminary work considering the potential options for access to the site was undertaken in July 2009 as part of Peter Brett Associates' Preliminary Transport Technical Appraisal Report. Following the inclusion of this development opportunity in the City's Core Strategy, this site is now being promoted through the Area Action Plan process.

3. This note also responds to the discussions held with Oxfordshire County Council at the Transport Matters Meeting on 26th January 2010 when the scope of the Area Action Plan supporting technical work was discussed and agreed. It follows on from Peter Brett Associates' four Technical Notes submitted to Oxfordshire County Council between February and May 2010. These Technical Notes set out the proposed person trip rates, person trip generation and vehicular trip distribution, base mode share and target mode shift for the Barton Land Development.

4. For the purposes of providing a reasonable robust assessment to inform this Area Action Plan analysis, an initial mode shift target away from Car Driver mode of 10% has been assumed – acknowledging that this would be the subject of further analysis at a later date. This mode shift target of 10% set out in Technical Note 5 is predicated upon the provision of good pedestrian, cycle and public transport connectivity across the A40 into Headington to assist in achieving this mode shift. This strategy is encouraged by Oxfordshire County Council and the local Rights of Way Officer, particularly given the potential to promote further mode shift beyond the 10% assumed in this assessment. The precise means of delivering this connectivity may not have been stated in detail within this note.

5. Whilst the vehicle trip generation used to assess the site access options within this Technical Note assumes enhanced pedestrian, cyclist and public transport connectivity will be provided for each option, the precise form of this enhanced connectivity is yet to be confirmed. This would be informed in part by the adopted vehicular access strategy. On this basis, given that the precise form of connectivity with Northway has yet to be defined in detail for each access option, the impact of this connectivity has not been assessed as part of this note – albeit this would need to be considered at a later date. Should good pedestrian, cycle and bus connectivity not be provided, the assessment would need to be reviewed.

6. This note considers the development-generated vehicle trip assignment - including for 10% mode shift - with the following potential site access arrangements:

Option 1- no vehicular access to or across the A40 – i.e., all Barton Land traffic assigns through Barton Estate and the Headington Roundabout;

Option 2 - an at-grade signal controlled junction on the A40 – with all vehicle movements limited to between the Barton Land Development and the A40 only. A bus-only link within this junction would allow pedestrians, cyclists and buses to travel directly between the Barton Land Development and Northway, these movements would be controlled with rising bollards and selective vehicle detection. A speed limit of 40mph on the A40 would need to be implemented to enable the scheme to be delivered;

Option 3 - an at-grade left in - left out junction to the A40. This option would not require the introduction of a speed limit on the A40, but the implementation of a speed limit would reduce the left in – left out deceleration lane and merge lane length requirements;

7. Whilst not assessed within this note, another form of access to the Barton Land Development could be via a grade separated bus-only bridge across the A40 between Northway and the Barton Land Development. This could be delivered in conjunction with a pedestrian and cyclist bridge across the A40 into Headington or alternatively, facilities for pedestrians and cyclists could be provided within the verges of the bus-only bridge. Similarly, a further option, the provision of an All Vehicle bridge link across the A40 between Northway and the Barton Land Development, was considered but was discounted at this stage due to a minimal number of trips being attracted to this route, with these trips - being predominantly local in nature – being better catered for by non-car modes.

8. This note also:

i) reviews the person trip generation analysis in Peter Brett Associates' Technical Note 5 in detail (to include the two-form Primary School);

ii) reviews the vehicular trip generation in Peter Brett Associates' Technical Note 5 in detail (to include the two-form Primary School);

iii) updates the vehicular trip distribution in Tables 5, 6, 7 and 8 of Peter Brett Associates' Technical Note 5 to identify specifically the movements to the John Radcliffe Hospital;

iv) establishes the 2026 Future Year Do Minimum and Do Something traffic flows, synthesised from 2007 Base and 2026 Forecast year highway model flows from Oxfordshire County Council's Central Oxfordshire Model and observed 2007 flows at the Headington Roundabout. This applies a methodology agreed with the highway authorities previously set out in Peter Brett Associates' Technical Note 2.

9. Junction capacity assessments have been undertaken at the Headington Roundabout and for each of the various Site Access option junctions, for the future year (2026) Do Minimum scenario and for each of the three Site Access options. From these assessments it has been concluded that:

i) all of the site access junctions assessed would operate within capacity in the future year (2026);

ii) whilst some arms of the Headington Roundabout may become marginally more congested in some of the Options considered, overall, capacity would not be exceeded at this junction during both peak hours in the future year (2026) for all site access scenarios;

iii) the difference in terms of junction operation between the three Site Access options is minimal.

10. Of the three Site Access options tested, it is noted that:

    i) Option 2 - the at-grade signal controlled junction – assists the site in delivering mode shift by providing better priority for pedestrians, cyclists and public transport over general vehicular traffic for local trips;

    ii) the option that impacts most upon the existing Barton Estate would be Option 1 – No Vehicular Access to the A40;

    iii) the option that impacts least upon the existing Barton Estate would be Option 2 – At-grade signalised junction.

11. Whilst in capacity assessment terms there appear to be no reasons why any one of the three site access options could not be progressed, each option provides differing levels of benefits and disbenefits both in terms of existing travel patterns and delay to the A40, and future travel patterns.

12. Options 2 and 3 provide additional benefits over and above Option 1, mainly in terms of the potential to extract to some degree some existing vehicular trips and development-generated vehicular trips from the Headington Roundabout, by providing an alternative means of access to the Barton Land Development. Option 2 would also potentially reduce the need for existing residents at Barton to travel via the Barton Estate to reach the A40.

13. Whilst Options 1 and 3 would have a minimal impact in terms of delay on the A40, Option 2, the at-grade signalised junction, would deliver direct bus priority to Northway, enhance direct pedestrian and cyclist connectivity between the Barton Land Development and Northway, and would enable some restriction to vehicle movements in and out of the Barton Land Development.

14. On this basis, it is concluded that Option 2 would deliver more benefit than the other two site access options in terms of the extraction of existing and development-generated trips from the Barton Estate and the Headington Roundabout, and in terms of potential to provide further pedestrian and cycle connections across the A40, promoting non-car accessibility to the rest of the City and from the City to the countryside.

1. Introduction

1.1 This Technical Note has been prepared by Peter Brett Associates on behalf of the Homes and Communities Agency and Oxford City Council, to summarise the Site Access Options testing work undertaken to date for the Barton Land Development, Oxford in support of the Area Action Plan (AAP) process. It sets out the options for vehicular access to the Barton Land Development and summarises the results of preliminary capacity assessments undertaken for each site access design for the future forecast year (2026). This work informs an initial assessment of the feasibility and benefits associated with each option.

1.2 Previous preliminary work considering the potential options for access to the site was undertaken in July 2009 as part of Peter Brett Associates' Preliminary Transport Technical Appraisal Report, prepared to inform the development of a transport strategy for the Barton Land Development proposals within the Core Strategy of the Local Development Framework. This report considered in outline terms the following options for vehicular access to the Barton Land Development:

- at-grade signal controlled junction to the A40;
- at-grade left in left out junction to the A40;
- at-grade signal controlled roundabout;
- all-vehicle access bridge across the A40;
- bus-only access bridge across the A40;
- access via Barton Estate.

1.3 Peter Brett Associates' Technical Note 6 builds upon the previous initial technical work undertaken last year, and responds to the comments from Oxfordshire County Council made at the Transport Matters Meeting on 26th January 2010 when the scope of the Area Action Plan technical work was discussed and agreed. Technical Note 6 considers the following site access arrangements:

Option 1 - no direct vehicular access to or across the A40 – all Barton Land traffic travels through Barton;

Option 2 - an at-grade signalised junction on the A40 – with all vehicle movements limited to between the Barton Land Development and the A40 only. A bus-only link within this junction would allow pedestrians, cyclists and buses to travel directly between the Barton Land Development and Northway (see Drawing No. 22485 / 013 in Appendix 1).A bus-only link within this junction would allow pedestrians, cyclists and buses to travel directly between the Barton Land Development and Northway, these movements controlled with rising bollards and selective vehicle detection. A speed limit of 40mph on the A40 would need to be implemented to enable the scheme to be delivered;

Option 3 - an at-grade left in - left out junction to the A40 - This option would not require the introduction of a speed limit on the A40, but the implementation of a speed limit would reduce the left in – left out junction deceleration lane and merge lane length requirements.

1.4 A further access option for the site would be a pedestrian, cyclist and bus-only access bridge across the A40. The assignment of development-related private vehicle trips for this option would be the same as Option 1 above, i.e., where there is no direct vehicular access to or across the A40. The benefits of each of the options are considered within this Technical Note, and set out in the conclusions of this note. Similarly, a further option, the provision of an All Vehicle bridge link across the A40 between Northway and the Barton Land Development, was considered but was discounted at this stage due to a minimal number of trips being attracted to this route, with these trips - being predominantly local in nature – being better catered for by non-car modes.

1.5 Following the issue of the Preliminary Transport Technical Appraisal Report in 2009, and the Transport Matters Meeting on 26th January 2010, Peter Brett Associates LLP has since submitted a series of Technical Notes to Oxfordshire County Council setting out technical work undertaken to date. The Technical Notes submitted to Oxfordshire County Council are:

i) Technical Note 2 - 'Summary of proposed methodology to assess the traffic impact from Barton Land Development, to inform the Area Action Plan' – submitted 19th February 2010;

ii) Technical Note 3 – 'Calculation of Person Trip Rates' – submitted 4th March 2010;

iii) Technical Note 4 – 'Outline Travel Demand Management Strategy – submitted 5th May 2010;

iv) Technical Note 5 – 'Trip distribution, base mode share, proposed mode shift and future mode share at the Barton Land Development' – submitted 5th May 2010.

1.6 To ensure a robust assessment of site access options, further work has been undertaken to the person trip analysis, and the trip distribution / mode share analysis following the submission of these Technical Notes. This further detailed work is set out in the following sections.

1.7 The initial mode shift target of 10% set out in Technical Note 4 is predicated upon the provision of good pedestrian, cycle and public transport connectivity across the A40 into Headington to assist in achieving this mode shift – options including providing this enhanced pedestrian, cycle, and bus-only provision via a bridge or an at-grade traffic signal controlled crossing within a new access junction are still being considered. Whilst it has been assumed that good pedestrian, cycle and public transport connections will be provided as part of all three of the access options, the detail of how this will be provided for each option has not been considered in detail as part of this note. Nevertheless, the principle of providing enhanced connectivity between Barton and Northway is supported by Oxfordshire County Council, particularly given the potential to promote a mode shift target beyond the 10% assumed in this assessment.

1.8 The work reported in Technical Note 6 has been prepared to advise the Area Action Plan process. Further, more detailed, Transport Assessment work would be undertaken as necessary in support of any future planning application, and will be scoped at the appropriate time with the highway authorities.

2. Development Proposals and Person Trip Generation

2.1 The masterplan proposals for Barton Land Development used for the purposes of this study are for:

- 981 residential dwellings;
- a two-form entry primary school;
- neighbourhood centre assumed to consist of small retail units.

2.2 Since the issue of Peter Brett Associates' Technical Note 5 in May, a revised assessment of person trip generation from the site has been undertaken, based on the proposals set out above. This revised assessment now includes the trips generated by the Primary School, not considered in this original assessment reported in Technical Note 5. The total number of person trips generated at the Barton Land Development set out in Technical Note 6 therefore supersedes those originally presented in Peter Brett Associates' Technical Note 5.

Residential

2.3 The person trips associated with the residential units were calculated using person trip rates extracted from TRICS 2010(a) v. 6.5.1. These person trip rates are identified in Table 2 of Peter Brett Associates Technical Note 3, and the person trip generation is summarised in Table 1 of this Technical Note.

Neighbourhood Centre

2.4 As the Neighbourhood Centre would have minimal draw from the external highway network (reflecting the PPS 6 / draft PPS 4 definition that this land use would 'include a range of small shops of a local nature, serving a small catchment'), the neighbourhood centre is assumed to generate no external trips. This has therefore been excluded from the person trip assessment for the site.

Primary School

2.5 To provide a robust assessment, the total person trip generation for the Primary School was calculated on the basis that the two-form entry primary school will provide the maximum 420 school places (assuming 30 students in each form for each of the seven years throughout the primary school).

2.6 Given the size of the school relative to the number of dwellings proposed on-site, it is likely that there will be trips to the primary school that do not originate within the Barton Land Development – although some of these trips could still be relatively local trips from the adjacent Barton Estate and Headington areas. For the purposes of providing a robust assessment, it has been assumed that half of the school places, 210, will be taken by children living outside the Barton Land Development, the remaining 210 pupils located within the Barton Land Development, i.e., internal trips.

2.7 In addition, as well as the pupil journeys to school, the National Travel Survey suggests that around 85% of pupil journeys are escorted by an adult. These escort journeys made by adults were added into the person trip assessment to provide a reasonable assessment of trip generation. Reference has been made to person trip rates in the TRICS 2010(a) v 6.5.1 database for Primary Schools to define the temporal distribution of these trips. This also reflects that not all peak hour school-based movements occur between 0800 and 0900, and that similarly, the majority of the departures from the school would normally be spread across several hours, i.e. 1500 – 1700, outside of the network PM peak which occurs between 1700 and 1800.

2.8 The total person trip generation for the Barton Land Development during the AM and PM peaks is summarised in Table 1 by land use type.

Table 1 – Total Person Trip Generation – Barton Land Development

Land Use	AM Peak (0800 - 0900)			PM Peak (1700 – 1800)		
	In	Out	Total	In	Out	Total
Primary School (including escort trips)	756	245	1,001	18	35	53
981 Residential Units	260	901	1,161	636	389	1,025
Total	**1,016**	**1,146**	**2,162**	**654**	**424**	**1,078**

3. Base Mode Share

Residential Mode Share

3.1 As detailed in Peter Brett Associates' Technical Note 5, the preliminary assessment of vehicular trip generation from the development used average mode share data from selected output areas in Barton and Headington as a proxy for the likely base mode share for the Barton Development. This mode share is reproduced in Table 2.

Table 2 – Mode Share for selected output areas in Barton and Headington – 2001 Census

Mode	Home	Bus	Taxi	Car Driver	Car Pass.	Motorcycle	Bicycle	Foot	Other	Total
Average Mode Share – All Selected Output areas	6.9%	20.7%	0.9%	41.7%	5.0%	1.5%	13.0%	9.5%	0.7%	100%

Source: Table 2 of Peter Brett Associates' Technical Note 5 - 'Trip distribution, base mode share, proposed mode shift and future mode share at the Barton Land Development' – submitted to Oxfordshire County Council - 5th May 2010.

3.2 The Barton and Headington output area mode share set out in Table 2 of this Technical Note and Tables 2 and 4 of Technical Note 5 includes Home Working. As home working does not generate physical trips, the mode share in Table 2 above has been revised to exclude home working, and is summarised in Table 3. This revised mode share has been subsequently applied to the residential person trip generation summarised in Table 1, the revised base mode share and subsequent total trip generation for the 981 dwellings is summarised in Table 3. This supersedes the person trip generation in Peter Brett Associates' Technical Note 5.

Table 3 – Total person trip generation by mode (981 Residential Dwellings) - AM and PM peaks

	Bus	Taxi	Car Driver	Car Pass.	Motorcycle	Bicycle	Foot	Other	Total
Residential Base Mode Share (Excl. Home)	22.3%	0.0%	44.8%	5.4%	1.6%	14.0%	10.2%	1.7%	100.0%
Trip Generation – 981 Residential Units									
AM Peak (0800 - 0900)	259	0	521	62	18	162	119	20	1161
PM Peak (1700 -1800)	229	0	459	55	16	144	105	18	1025

Primary School Mode Share

3.3 The majority of trips to the school during the peak hour would be made by pupils and pupil escorts. As such, to determine an appropriate base mode share for pupil trips to and from the primary school, reference was made to mode share data provided by Oxfordshire County Council for primary schools in north Oxford. For journeys to the primary school that originate within the Barton Land Development, the mode share of journey to school trips less than 0.5km was used as a proxy for the likely base mode share. For journeys to the primary school that originate outside the Barton Land Development, the mode share for trip lengths greater than 0.5km was used. These two mode shares are summarised in Table 4.

3.4 This person trip analysis has been prepared to consider in initial terms peak hour movements, to assess impact during the peak periods. A more detailed analysis will be undertaken in due course considering all person trip movements across the day. As such, other data sources would be used to inform the modal choice for the off-peak movements involving the higher percentage of staff and deliveries.

Table 4 – Base Mode Share for Primary School Trips – Pupils Only (i.e. excluding escort trips) – Oxfordshire County Council Survey Data

Mode	Coach / Bus	Car	Car Share	Cycle	Walk	Other	Total
Average mode share of primary school trips greater than 0.5km in length.	3.0%	19.2%	4.0%	10.9%	61.6%	1.3%	100.0%
Average mode share of primary school trips less than 0.5km in length.	1.4%	8.1%	1.2%	5.6%	83.3%	0.4%	100.0%

Source: Oxfordshire County Council School Survey Data.
Note: Faith Foundation schools were excluded from the mode share analysis due to their typically larger catchment areas

3.4 Any journey to school trip originating within the Barton Land Development to the Barton Land primary school would be identified both as a departure trip from a residential unit, and a corresponding arrival trip at the school. To avoid double counting, these trips between housing at Barton Land and the Primary School have been identified for the morning and evening peak periods of 0800 – 0900 and 1700 – 1800 and netted out of both the primary school and housing total trip generations. These linked internal trips are summarised in Table 5.

Table 5 – Total Internal Trip Generation related to Primary School (including escort trips) – AM and PM Peaks

Mode	Coach / Bus	Car	Car Share	Cycle	Walk	Other	Total
AM Peak (08.00 – 09.00)	7	17	18	32	398	3	475
PM Peak (1700 – 1800)	0	2	3	0	0	0	5

3.5 Due to the application of trip rate data from different sources with different associated primary school provision, the total number of internal walk trips generated by the school (398 trips) was greater than the number of walk trips from housing (118 trips). To avoid a negative number of walk trips in this development, for the purposes of this assessment it has been assumed that circa 50% of the 118 walk trips generated by the Barton Land Development housing are internal. Taking this into account, the resultant total external trip generation by mode for the Barton Land Development is summarised in Table 6 reflecting these adjustments.

Table 6 – Total External Trip Generation – Full Barton Land Development (981 Dwellings + Primary School – including escort trips)

	Bus	Car Driver	Car Pass.	Motorcycle	Bicycle	Foot	Other	Total
AM Peak (0800 – 0900)								
Primary School	24	137	72	0	92	191	11	527
981 Dwellings	251	504	44	18	131	59	18	1025
Total External	**275**	**640**	**116**	**18**	**223**	**250**	**29**	**1552**
PM Peak (1700 – 1800)								
Primary School	0	18	23	0	0	6	0	47
981 Dwellings	229	458	53	16	144	104	16	1020
Total External	**229**	**476**	**76**	**16**	**144**	**110**	**16**	**1067**

Note - Minor rounding differences may exist

4. Mode Shift and Target Mode Share

4.1 As set out in Peter Brett Associates Technical Note 5 and earlier in the Preliminary Transport Technical Appraisal Report, in the absence of any formal local policy on mode shift for new developments in Oxfordshire, for the purposes of this assessment an initial target of 10% mode shift away from car drivers has been assumed. Whilst this is considered a reasonable target at this early stage of the assessment process, other mode shift targets may be sought. This is to be discussed and agreed with Oxfordshire County Council as part of later technical work supporting a future planning application for the Barton Land Development.

4.2 As detailed in Peter Brett Associates' Technical Note 4, the travel demand management strategy for the Barton Land Development focuses strongly on the ability to provide enhanced pedestrian, cycle, and public transport connectivity across the A40 into Headington and Northway. For the purposes of this assessment, it has been assumed that this enhanced connectivity would be provided as part of the Barton Land Development proposals, albeit the detail of how this will be provided is yet to be agreed.

4.3 Building upon the initial mode shift analysis set out in Peter Brett Associates Technical Note 5, this 10% mode shift target from car driver mode share has been applied to the revised number of external trips in Table 6. The results are summarised in Table 7 for the AM peak i.e. the peak period with the highest person trip generation. These "mode shifted" results are compared to the observed mode shares in the Census output areas surrounding the proposed Barton Land Development.

Table 7 – Estimated mode shift and future mode share for Barton Land Development – based on AM Peak trips

Person Trip Generation	Bus	Car Driver	Car Pass.	Motor-cycle	Bicycle	Foot	Other	Total (Incl Home)
Base Mode Split (trips)	275 (17.7%)	640 (41.3%)	116 (7.5%)	19 (1.2%)	223 (14.4%)	250 (16.1%)	29 (1.8%)	1552 (100%)
Shift in trips								
Primary School	-	-13	-7	-	+10	+10	-	-
Housing	+22	-53	+9	-	+3	+7	-	+12
TOTAL	**+22**	**-67**	**+2**	**-**	**+14**	**+17**	-	**+12**
Estimated future mode split (trips)	297	574	118	19	236	267	29	1540
Future Mode Share	19.3%	37.3%	7.7%	1.2%	15.3%	17.4%	1.9%	-
Range in surrounding output areas	12.8% - 29.7%	31.3% – 51.4%	0.0% - 14.1%	0.0% - 4.5%	7.0% - 24.2%	2.1% - 23.4%	0.0% - 2.1%	--

Note – Change in total movements reflects the increase in home working "trips".
– Some minor rounding differences may exist.

4.3 The figures quoted in Table 7 reflect an initial assessment of how the 10% mode shift target could be achieved. Further work would be undertaken at a later date to define the potential for car-based trips from the site to shift following the confirmation of an agreed accessibility strategy for the Barton Land Development. A survey of travel patterns would also be undertaken during the early stages of the development. This survey would help to derive a base mode share specific to the Barton Land Development, and allow a site-specific target mode share to be set.

5. Distribution of vehicular trips

5.1 For the purpose of assessing the capacity of the various Site Access junctions, an assessment has been made of the distribution of the development generated vehicular trips across the network. In defining the distribution of these external vehicular trips, reference has been made to the distribution of journey to work trips from the output areas from which the base mode share was derived. This distribution was summarised in Tables 5, 6 and 7 in Peter Brett Associates' Technical Note 5. This distribution has been revised specifically to identify the distribution of trips to and from the John Radcliffe Hospital, and from the BMW Group Plant at Cowley without including these trips again in their respective output wards. The distribution in this Technical Note therefore supersedes that contained in Peter Brett Associates' Technical Note 5. This revised distribution is summarised in Table 8.

Table 8 –Distribution of base car driver journeys to work from the Barton Land Development

Distribution of Development Related Trips	
Key Employers	
John Radcliffe Hospital	2.6%
BMW Group Plant, Cowley	6.0%
Sub-total	**8.6%**
Journeys to work within Oxford	
Headington	5.5%
Carfax	4.2%
Barton and Sandhills	3.8%
Lye Valley	1.2%
Churchill	6.0%
Other Destinations within Oxford	28.0%
Sub-total	**48.7%**
Journeys to work outside Oxford	
Vale of White Horse	10.7%
South Oxfordshire	8.7%
Cherwell	7.0%
West Oxfordshire	4.5%
Wycombe	1.8%
Aylesbury Vale	1.5%
Other Destinations outside Oxford	8.6%
Sub-total	**42.7%**
Total	**100%**

Note – Some minor rounding differences may exist
Trips to and from John Radcliffe and BMW Group Plant were removed from individual ward totals to prevent double counting.

6. Trip Assignment

6.1 Oxfordshire County Council commented at the Transport Matters Meeting in January 2010 that they considered the Central Oxfordshire Transport Model would not report accurately the assignment of the Barton Land Development, as existing congestion in the model network could suppress the modelled trip generation from the Barton Land Development. On this basis, it was agreed to assign manually vehicular trips from the Barton Land Development to the destinations set out above for each of the three site access options. The impact of the Barton Land Development site on local trip assignment is considered for each site access option below.

6.2 Trips to each of the destinations set out in Table 8 have been assigned manually through the Headington Roundabout and Site Access junction as applicable. Details of how these trips have been assigned are contained in Appendix 2.

6.3 These development generated flows through each junction were added to the base flows on the network in the future year to inform the capacity assessment of the junctions. These 'Do Minimum' base flows are shown on Figure 1. Further information on how the future year flows have been derived is explained later in this note.

6.4 It is anticipated that only a small number of vehicles travelling between the Barton Land and Barton and Sandhills ward will assign via the Headington Roundabout (less than one two-way movement every 3 minutes). For the purposes of this assessment, it is assumed that these few trips identified to Barton and Sandhills will not assign via the Headington Roundabout, but will assign to destinations within the Barton Estate.

6.5 The assignment through the three Site Access options are considered in detailed below.

Option 1 – No Vehicular Access to the A40

6.6 In this scenario, it has been assumed that all vehicular traffic entering and exiting the Barton Land Development will travel via the existing Barton Estate to the Headington Roundabout. Details of how these trips were assigned are contained in Appendix 2. This assignment is shown on Figure 2.

6.7 This vehicle trip assignment would be the same if the bus-only bridge option across the A40 into Northway were to be provided. All vehicular trips from the development would have to assign via Headington Roundabout and the existing Barton Estate.

Option 2 – At-grade signalised junction

6.8 For the purposes of this assessment it is necessary to define the following elements:

- the number of trips to and from the Barton Land Development that will use the access;
- the number of existing car-based trips made by residents of the Barton Estate that will reassign away from Headington Roundabout to travel via the site access.

6.9 For new residents at the Barton Land Development, the results of an initial manual journey time assessment suggest that travel via the site access is around 1 minute faster than travelling via the Barton Estate. On this basis, all development traffic (excluding that travelling within the Barton and Sandhills area) has been assigned through the site access. Further information on the methodology of how this traffic has been assigned is contained in Appendix 2. The assignment of these development related trips is shown on Figure 3.

6.10 For existing residents at Barton, the results of this initial journey time assessment show that the journey time travelling through the site access and via the Barton Land Development is not significantly shorter than travelling via the Headington Roundabout. On this basis it has been assumed that 50% of the existing trips currently travelling on the A40 (W) that travel to or from Bayswater Road would reassign through the at-grade signalised junction. Figure 5 shows this reassignment of existing trips. The provision of an at-grade signalised junction at this location has the potential to extract existing trips currently travelling through the Headington Roundabout, and the Barton Estate to destinations elsewhere. This would provide some mitigation of the impact of the development proposals on the Headington Roundabout.

Option 3 – At-grade left in left out junction.

6.11 As for the previous option, it was necessary to define both how many trips from the Barton Land Development would assign via the site access and how many existing trips to or from the existing Barton Estate may reassign through the new access junction.

6.12 Given the arrangement of the junction, vehicular traffic wishing to travel north on the A40 (NW) would have the following choice:

- travel via the Barton Estate and travel through Headington Roundabout;
- travel left out of the site access and travel through Headington Roundabout.

6.13 An initial journey time assessment of these two routes suggests that the journey times between the two routes are not significantly different (less than 1 minute difference). On this basis, it has been assumed that 50% of the Barton Land Development traffic will travel via Barton Estate / Headington Roundabout, and the remaining 50% will travel via the site access and the A40. This assignment is also assumed for the existing Barton Estate residents. The assignment of Barton Land Development flows is summarised on Figure 4 and the reassignment of existing residents is shown on Figure 5.

6.14 This option also has the potential to extract some existing trips currently travelling through the Headington Roundabout to the existing Barton Estate, but only from the north-west only. Whilst providing some benefit over and above Do Nothing (Option 1), this option would not reduce the number of trips travelling through the Barton Estate to the same extent as an all movement junction, i.e. the at-grade signalised junction (Option 2). .

7. Derivation of Future Year Flows

7.1 As set out in the Transport Matters Meeting in January 2010 and detailed in Peter Brett Associates' Technical Note 2, it was agreed that the Future Year Do Minimum flows would be synthesised by:

i) obtaining the 2007 Base highway model flows from Oxfordshire County Council's Central Oxfordshire Model;

ii) obtaining the 2026 Future Year Do Something highway model flows also from the Central Oxfordshire Model;

iii) obtaining the 2026 Barton Land Development highway model flows by select zone analysis from the Central Oxfordshire Model;

iv) synthesising a 2026 Do Minimum scenario by subtracting the Central Oxfordshire Model Barton Land flows from the 2026 Do Something model flows;

v) obtain the additional flows due to growth and other development by subtracting the 2007 Base model flows from the 2026 Do Minimum scenario flows obtained in (4) above;

vi) add the additional model flows due to growth and development from (5) above to the observed 2007 flows to create the 2026 Do Minimum Manual Assessed Flows.

7.2 Whilst future strategic planning proposals around Oxfordshire are now uncertain following recent Government announcements, to provide a robust assessment the 2026 Do Minimum Flows include flows generated by the Southern Development Area to the south of Oxford, acknowledging that this situation may change in the future.

7.3 These 2026 Do Minimum Flows are shown on Figure 1.

7.4 The 2026 Do Something flows have been synthesised by adding the Barton Land Development flows assessed in the above sections to the 2026 Do Minimum Manual Assessed Flows.

8. Junction Capacity Assessments

8.1 As agreed with the County Council, three site access options have been considered within this report:

Option 1 - no direct vehicular access to or across the A40 – all Barton Land traffic travels through Barton Estate;

Option 2 - an at-grade signalised junction on the A40 – accommodating bus-only movements between Barton and Headington – shown on Drawing No. 22485 / 013 in Appendix 1;

Option 3 - an at-grade left in - left out junction to the A40 – shown in Appendix 4.6 of the Preliminary Transport Technical Appraisal Report, and contained in Appendix 1 of this Technical Note;

8.2 Junction capacity assessments have been undertaken of the various site access arrangements and Headington Roundabout using the Transport Research Laboratory's TRANSYT 11.0 and PICADY 4.0 programs.

8.3 All the junction capacity assessments (excluding the Do Minimum) assume a 10% mode shift away from private car for the Barton Land Development.

2026 Do Minimum Flows

8.4 A Do Minimum assessment of the Headington Roundabout has been undertaken using the 2026 Do Minimum flows on Figure 1 to provide a baseline against which the impact of each option at this junction can be compared.

8.5 The results of this Do Minimum Assessment is summarised in Table 9, the computer output and a node link diagram is contained in Appendix 3.

Table 9 - Summary of results of Junction Capacity Assessment of Headington Roundabout using TRANSYT 11.0 – 2026 Do Minimum

Arm	Link	AM Peak (0800 – 0900)		PM Peak (1700-1800)	
		Degree of Sat (%)	Mean Max Queue	Degree of Sat (%)	Mean Max Queue
London Road (W)	**Entry**				
	11	60	3	82	6
	12	66	7	78	9
	Circulatory				
	13	53	1	69	3
	14	66	2	64	3
	15	78	6	75	6
	16	77	17	78	17
A40 (NW)	**Entry**				
	21	90	12	89	12
	22	74	8	91	14
	23	88	12	81	10
	Circulatory				
	24	31	2	59	4
	25	47	3	52	5
	26	46	4	59	4
Bayswater Road (N)	**Entry – Give-way**				
	31	32	2	27	2
	Circulatory				
	32	20	0	23	0
	33	20	0	23	0
	34	8	0	6	0
A40 (E)	**Entry**				
	41	67	6	36	3
	42	89	18	91	20
	Circulatory				
	43	40	3	30	3
	44	38	2	29	3
	45	46	4	33	3
A4142 (S)	**Entry**				
	51	91	18	74	12
	52	72	8	63	7
	Circulatory				
	53	43	4	27	2
	54	39	3	24	2
	55	16	2	17	2
Total Random and Oversaturated Delay (pcu-hr/hr)		60.7		61.3	
Cycle Time		50 secs		50 secs	

Degree of Sat – Degree of Saturation – the theoretical capacity of an arm is assumed to be reached at 100%, although increased levels of queuing and delay would normally occur beforehand
Mean Max Queue – Mean Maximum End of Red Period Queue (measured in vehicles)

8.6 The results of the TRANSYT Assessment summarised in Table 9 show that all links at the Headington Roundabout would operate within capacity in the Future Year Do Minimum scenario.

8.7 In several cases, the mean maximum queues reported in the TRANSYT output file are considered not to provide a realistic representation of the queues, this reflecting a fault in the TRANSYT program of reporting as maxima, "instantaneous" queues that arrive and dissipate in minimal time – sometimes in less than one second. This occurs due to the way that TRANSYT models and reports queues - TRANSYT models platoons of traffic moving around a junction as a vertical stack of traffic. As a result, if a platoon of traffic moving around the circulatory reaches a stopline as the green aspect starts (or indeed, sometimes during the actual green aspect), TRANSYT reports all this vertical stack of traffic at that stopline as a queue. In reality, vehicles are moving around the circulatory, causing no permanent blocking back at the junction.

8.8 The queue lengths for selected circulatory arms are summarised in Table 10 alongside the queue limit for that link.

Table 10 – Summary of queue lengths reported in TRANSYT output – 2026 Do Minimum Flows.

Link No.	Queue Limit	AM Peak (0800 – 0900)	PM Peak (1700 – 1800)
		Queue (Vehs)	Queue (Vehs)
13	2	1	**3**
15	3	**6**	**6**
24	4	2	4
25	4	3	**5**
26	4	4	4
43	2	**3**	**3**
44	2	2	**3**
45	2	**4**	**3**
53	3	**4**	2

8.9 These reported queue lengths would suggest that blocking would occur within the junction circulatory, and that the junction would be unlikely to be able to accommodate the Future Year Do Minimum traffic flows. However, a detailed review of the Queue Graph and arrival profiles option within TRANSYT for these links suggest that this is not the case. A detailed review of the queuing profile within this junction is included in Appendix 5.

8.10 It is concluded that whilst the Headington Roundabout experiences increased congestion in the 2026 Do Minimum future year, it still operates allowing traffic to circulate at the junction without obstructing junction exits.

<u>Option 1 – No Vehicular Access to the A40</u>

8.11 As set out earlier in this note, this option assumes no at-grade vehicular access to the A40 or any vehicular connections across the A40 between Headington and the Barton Land Development.

8.12 The capacity of the Headington Roundabout has been reassessed to define the potential impact of this access option on the operation of the Headington Roundabout. The Barton Land Development flows shown on Figure 2 were added to the 2026 Do Minimum Flows on Figure 1 and used to reassess the capacity of the Headington Roundabout. The results of this assessment would also apply if a bus-only bridge were to be provided over the A40 between the Barton Land Development and Northway.

8.13 The results of this assessment are summarised in Table 11.

Table 11 - Summary of results of Junction Capacity Assessment of Headington Roundabout using TRANSYT 11.0 – 2026 Do Something – Option 1 No Vehicular Access to A40

Arm	Link	AM Peak (0800 – 0900)		PM Peak (1700-1800)	
		Degree of Sat (%)	Mean Max Queue	Degree of Sat (%)	Mean Max Queue
London Road (W)		**Entry**			
	11	70	4	82	6
	12	66	7	84	11
		Circulatory			
	13	57	2	71	4
	14	75	3	78	9
	15	78	6*	71	6
	16	84	18	86	16
A40 (NW)		**Entry**			
	21	88	12	93	15
	22	70	7	86	12
	23	83	10	76	9
		Circulatory			
	24	45	3	68	5
	25	49	3	56	5
	26	48	4	62	4
Bayswater Road (N)		**Entry – Give-way**			
	31	59	5	41	3
		Circulatory			
	32	20	0	23	0
	33	20	0	23	0
	34	8	0	6	0
A40 (E)		**Entry**			
	41	73	7	45	4
	42	89	18	91	20
		Circulatory			
	43	45	2	33	2*
	44	43	2	31	2*
	45	60	5	39	3*
A4142 (S)		**Entry**			
	51	95	23	89	17
	52	72	8	75	8
		Circulatory			
	53	46	4	25	2
	54	43	4	23	2
	55	28	3	24	3
Total Random and Oversaturated Delay (pcu-hr/hr)		70.6		70.1	
Cycle Time		50 secs		50 secs	

Degree of Sat – Degree of Saturation – the theoretical capacity of an arm is assumed to be reached at 100%, although increased levels of queuing and delay would normally occur beforehand
Mean Max Queue – Mean Maximum End of Red Period Queue (measured in vehicles)

8.14 The inclusion of the Barton Land Development Option 1 flows marginally increases the levels of delay experienced on some arms of the junction, particularly the A40 (E) circulatory in the AM peak and the London Road (W) circulatory in the PM peak, although the results in Table 10 show that this junction would operate within capacity in the future year period. .

8.15 As was the case for the 2026 Do Minimum scenario, the mean maximum queues reported in the TRANSYT output file are considered not to provide a realistic representation of the queues. The queue lengths for selected circulatory arms are summarised in Table 12 alongside the queue limit for that link.

Table 12 – Summary of queue lengths on selected circulatory arms of Headington Roundabout – 2026 Do Something – Option 1 – No Vehicular Access to A40.

Link No.	Queue Limit	AM Peak (0800 – 0900) Queue (Vehs)	PM Peak (1700 – 1800) Queue (Vehs)
13	2	**3**	**4**
15	3	**6**	**6**
24	4	3	**5**
25	4	3	**5**
26	4	**-**	
43	2	**-**	
44	2	**5**	2
45	2	**4**	**3**
53	3	**4**	2
54	3	**4**	2
54	2	**3**	**3**

8.16 The reported queues on the circulatory links in bold in Table 12 suggest that blocking would occur within the junction circulatory, and that the junction would be unlikely to be able to accommodate the Future Year Do Minimum traffic flows. However, a detailed review of the Queue Graph and arrival profiles option within TRANSYT for these links suggest that this is not the case. A detailed review of the queuing profile within this junction is included in Appendix 5.

8.17 The results of this review indicate that whilst the inclusion of the Barton Land Development Flows increases delay on several arms of the Headington Roundabout, it operates within capacity in the future year with the Option 1 access arrangement and the circulatory queues do not block across other exits of the roundabout.

Option 2 – At-grade signalised junction

8.18 To assess the provision of an at-grade signalised junction on the A40, capacity assessments were undertaken of the Site Access junction (as shown on Drawing No. 22485 / 013 in Appendix 1) and at Headington Roundabout.

8.19 In order to deliver bus priority at this junction, it has been assumed that the signals controlling the bus lane would be linked to a selective vehicle detection system which would detect buses approaching the junction, and activate the bus aspects of the signal cycle. As shown on Drawing No. 22485 / 013, the straight ahead bus lane will share the same green aspect with the left and right turns out of the Site Access. As such, a bus-only stage has not been specifically modelled within the TRANSYT assessment. The pedestrian and cyclist green signal aspects would only display at times during the junction cycle when no traffic is using that route, requiring the pedestrian / cyclist to wait for a green signal at each crossing point - no necessary additional time for a pedestrian phase has been included in the TRANSYT assessment, due to the adverse impact on capacity along the A40. It is assumed that this at-grade junction would offer a further crossing facility for pedestrians and cyclists, albeit not as convenient.

8.20 The Barton Land Development flows on Figure 3 were added to the 2026 Do Minimum Flows on Figure 1 incorporating the reassignment effects shown on Figure 5 to provide 2026 Future Year Do Something flows. The results of the junction capacity assessments of the A40 - Site Access and the Headington Roundabout are summarised in Tables 13 and 14.

Table 13 - Results of Junction Capacity Assessment of the A40 – Site Access at-grade signalised junction – 2026 Do Something Flows.

Arm	Link No.	AM Peak (0800 – 0900)		PM Peak (1700 – 1800)	
		Degree of Sat (%)	Mean Max Queue	Degree of Sat (%)	Mean Max Queue
A40 (NW)	11 and 12 – Straight and Left	74	25	87	35
Site Access Road	13 – Right Turn	56	3	33	2
	14 – Left Turn	56	5	22	2
A40 (SE)	15 – Right Turn	57	3	79	5
	16 – Straight	64	18	59	15
Total Random and Oversaturated Delay (pcu-hr/hr)		15.1		17.5	
Cycle Time		65 secs		65 secs	

Degree of Sat – Degree of Saturation – the theoretical capacity of an arm is assumed to be reached at 100%, although increased levels of queuing and delay would normally occur beforehand
Mean Max Queue – Mean Maximum End of Red Period Queue (measured in vehicles)

8.21 The results in Table 13 show that the proposed at-grade signalised junction would operate well within capacity in the future year.

8.22 The largest queues at the junction are experienced on the A40 arms, with a maximum queue of 35 vehicles on the A40 (NW) arm in the PM peak. This equates to a queue of approximately 134m in each lane. The length of this queue is a function of the high flow on the A40 - whilst the A40 (NW) arm is on a red signal for only 30 seconds, a queue accumulates quite quickly. Nevertheless, the Queue Graphs in TRANSYT show that all vehicles queuing on the A40 arms of the junction clear within the next green period. Copies of the computer output are contained in Appendix 4.

Table 14 - Summary of results of Junction Capacity Assessment of Headington Roundabout using TRANSYT 11.0 – 2026 Do Something – Option 2 At-Grade Signalised Junction (including public transport priority)

Arm	Link	AM Peak (0800 – 0900)		PM Peak (1700-1800)	
		Degree of Sat (%)	Mean Max Queue	Degree of Sat (%)	Mean Max Queue
London Road (W)		**Entry**			
	11	70	4	96	12
	12	66	7	78	9
		Circulatory			
	13	54	1	63	2
	14	67	2	75	8
	15	78	6	75	5
	16	79	17	82	17
A40 (NW)		**Entry**			
	21	85	11	86	11
	22	73	9	95	18
	23	92	16	90	13
		Circulatory			
	24	36	2	59	4
	25	54	3	52	5
	26	52	5	59	4
Bayswater Road (N)		**Entry – Give-way**			
	31	31	2	25	1
		Circulatory			
	32	21	0	24	0
	33	21	0	24	0
	34	9	0	7	0
A40 (E)		**Entry**			
	41	67	6	34	3
	42	92	21	89	19
		Circulatory			
	43	45	3	34	3
	44	43	2	32	3
	45	49	4	34	3
A4142 (S)		**Entry**			
	51	95	23	80	14
	52	72	8	63	7
		Circulatory			
	53	46	4	29	2
	54	43	4	26	2
	55	12	1	13	1
Total Random and Oversaturated Delay (pcu-hr/hr)		69.3		72.8	
Cycle Time		50 secs		50 secs	

Degree of Sat – Degree of Saturation – the theoretical capacity of an arm is assumed to be reached at 100%, although increased levels of queuing and delay would normally occur beforehand
MMQ – Mean Maximum End of Red Period Queue (measured in vehicles)

8.23 The inclusion of the Barton Land Development Option 2 flows marginally increases the total levels of delay experienced at this junction when compared to the Do Minimum scenario, although the results in Table 14 show that this junction would operate within capacity in the future year period. The Barton Land Option 2 flows increase the level of delay on the circulatory arms of the roundabout compared with the Do Minimum scenario, although the entry arm delays for A40(NW), Bayswater Road and A40(E) arm decrease due to traffic reassigning away from the Headington Roundabout to travel through the new site access junction. In terms of overall queuing delay at the junction, this option produces lower levels of delay than Option 1 for the AM peak, and marginally higher levels of delay in the PM peak – a function of the tidality of the flows in these two peak periods.

8.24 As was the case for the 2026 Do Minimum scenario, the mean maximum queues reported in the TRANSYT output file are considered not to provide a realistic representation of the queues. The queue lengths for selected circulatory arms are summarised in Table 15 alongside the queue limit for that link.

Table 15 – Summary of queue lengths on selected circulatory arms of Headington Roundabout – 2026 Do Something – Option 2 – At-grade signalised junction

Link No.	Queue Limit	AM Peak (0800 – 0900) Queue (Vehs)	PM Peak (1700 – 1800) Queue (Vehs)
14	2	2	**8**
15	3	**6**	**5**
25	4	3	**5**
26	4	**5**	4
43	2	**3**	2
45	2	**4**	**3**
53	3	**4**	2
54	3	**4**	2

8.25 The reported queues on the circulatory links in bold in Table 15 suggest that blocking would occur within the junction circulatory, and that the junction would be unlikely to be able to accommodate the Future Year Do Something Option 2 traffic flows. However, a detailed review of the Queue Graph and arrival profiles option within TRANSYT for these links suggest that this is not the case. A detailed review of the queuing profile within this junction is included in Appendix 5.

8.26 The results of this review indicate that whilst the inclusion of the Barton Land Development Option 2 flows increase the overall level of delay at the Headington Roundabout, some arms experience improvements in delay as traffic is removed from the roundabout and reassigns through the site access junction. The Headington Roundabout operates within capacity in the future year with the Option 2 At-grade signalised junction site access arrangement, and the circulatory queues do not block across other exits of the roundabout.

<u>Option 3 – At-grade left in left out junction</u>

8.27 To assess the impact of the provision of an at-grade left in left out junction on the A40, capacity assessments were undertaken of the site access junction (shown in Appendix 4.6 of the Preliminary Transport Technical Appraisal Report, and contained in Appendix 1) and at the Headington Roundabout.

8.28 The Barton Land Development flows (including 10% mode shift), shown in Figure 4, were added to the 2026 Do Minimum Flows, on Figure 1, incorporating the reassignment effects shown on Figure 5 to provide 2026 Future Year Do Something Option 3 flows. The results of the junction capacity assessments of the site access and Headington Roundabout are summarised in Tables 16 and 17 and the computer output is contained in Appendix 4 and 3 respectively.

Table 16 – Summary of results of junction capacity assessment of at-grade left in left out junction – 2026 Do Something Flows (including 10% Mode Shift)

Movement	AM Peak (0800 – 0900)		PM Peak (1700 – 1800)	
	RFC	Mean Max Queue	RFC	Mean Max Queue
Site Access – A40 (E)	0.598	1	0.274	0
A40 (NW) – Site Access	0.000	0	0.000	0
Inclusive Queuing Delay (mins/veh)	0.03		0.01	

RFC – Ratio of Flow to Capacity – the theoretical capacity of an arm is assumed to be reached at 0.85
MMQ – Mean Maximum Queue (measured in vehicles)

8.29 The results in Table 16 show that the at-grade left in left out junction would operate well within capacity in 2026 with the Barton Land Development in place.

Table 17 - Summary of results of Junction Capacity Assessment of Headington Roundabout using TRANSYT 11.0 – 2026 Do Something – Option 3 At-Grade Left in Left out junction

Arm	Link	AM Peak (0800 – 0900)		PM Peak (1700-1800)	
		Degree of Sat (%)	Mean Max Queue	Degree of Sat (%)	Mean Max Queue
London Road (W)	**Entry**				
	11	70	4	82	6
	12	66	7	84	11
	Circulatory				
	13	54	2	68	3
	14	77	3*	79	4
	15	78	6*	71	6
	16	84	18	86	16
A40 (NW)	**Entry**				
	21	85	11	85	10
	22	71	8	93	15
	23	93	16	87	12
	Circulatory				
	24	47	3*	65	4
	25	52	4*	54	5
	26	50	5*	59	4
Bayswater Road (N)	**Entry – Give-way**				
	31	47	4	34	2
	Circulatory				
	32	21	0	24	0
	33	21	0	24	0
	34	9	0	6	0
A40 (E)	**Entry**				
	41	73	7	45	4
	42	89	18	91	20
	Circulatory				
	43	45	2	33	2
	44	43	2	31	2
	45	59	5	38	3
A4142 (S)	**Entry**				
	51	95	23	89	17
	52	73	8	75	8
	Circulatory				
	53	47	4	25	2
	54	43	4	23	2
	55	27	2	23	2
Total Random and Oversaturated Delay (pcu-hr/hr)		73.0		71.1	
Cycle Time		50 secs		50 secs	

Degree of Sat – Degree of Saturation – the theoretical capacity of an arm is assumed to be reached at 100%, although increased levels of queuing and delay would normally occur beforehand
MMQ – Mean Maximum End of Red Period Queue (measured in vehicles)

8.30 The inclusion of the Barton Land Development Option 3 flows marginally increases the total levels of delay experienced at this junction when compared to the Do Minimum scenario, although the results in Table 17 show that all links of the Headington Roundabout would still operate within capacity in the Future Year Do Something Option 3 scenario. In terms of overall delay at the junction, this option produces higher levels of delay in the AM peak than Options 1 and 2, primarily due to the increase in u-turning movements on the busiest arm of the roundabout. In the PM peak, this option produces a lower level of delay than Option 2, the at-grade signalised junction, due to the lower number of u-turning movements in this peak.

8.31 As was the case for the 2026 Do Minimum scenario, the mean maximum queues reported in the TRANSYT output file are considered not to provide a realistic representation of the queues. The queue lengths for selected circulatory arms are summarised in Table 18 alongside the queue limit for that link.

Table 18 – Summary of queue lengths on selected circulatory arms of Headington Roundabout – 2026 Do Something – Option 3 – At-grade Left in Left out junction

Link No.	Queue Limit	AM Peak (0800 – 0900)	PM Peak (1700 – 1800)
		Queue (Vehs)	Queue (Vehs)
13	2	2	**3**
14	3	3	**4**
45	4	**6**	**6**
25	4	**5**	**5**
45	2	**4**	**3**
53	2	**4**	2
54	3	**4**	2

8.32 The reported queues on the circulatory links in bold in Table 18 suggest that blocking would occur within the junction circulatory, and that the junction would be unlikely to be able to accommodate the Future Year Do Something Option 3 traffic flows. However, a detailed review of the Queue Graph and arrival profiles option within TRANSYT for these links suggest that this is not the case. A detailed review of the queuing profile within this junction is included in Appendix 5.

8.33 The results of this review indicate that whilst Headington Roundabout is operating within capacity in the future year with the Option 3 At-grade left in left out Site Access arrangement, the circulatory queues do not block across other exits of the roundabout.

9. Conclusions

9.1 Technical Note 6 has been prepared to:

i) review the person trip generation and analysis in Technical Note 5 to include the two-form Primary School;

ii) review the vehicular generation in Technical Note 5 to include the two-form Primary School;

iii) update the vehicular trip distribution in Tables 5, 6, 7 and 8 of Technical Note 5 to correct for previous double counting of John Radcliffe Hospital Workers in the ward totals;

iv) detail the 2026 Future Year Do Minimum and Do Something flows, using a methodology agreed with the highway authorities previously;

v) undertake junction capacity assessments.

9.2 Junction capacity assessments have been undertaken at the Headington Roundabout and at the various Site Access option junctions, for the future year (2026) Do Minimum scenario and for each of the three Site Access options. It has been concluded that:

i) all of the site access junctions assessed would operate below capacity in the future year (2026);

ii) the At-grade signalised junction (Option 2) would operate within capacity during both peak hours in the future year (2026). Whilst the mean maximum end of red period queues would extend to 35 vehicles, this reflects the volume of movement on the A40 rather than a long red aspect: it is further noted that these queues clear within the next green time;

iii) the At-grade Left In – Left Out junction (Option 3) would operate within capacity during both peak hours in the future year (2026), and have minimal impact upon the A40;

iv) the Headington Roundabout would also operate within capacity during both peak hours in the future year (2026) for all site access scenarios;

v) although the circulatory queues reported at the Headington Roundabout appear to be longer than the available queuing space, upon review it is considered that these reflect instantaneous queues, or occur at times within the cycle when any excess queue would not interfere with other movements;

vi) at the Headington Roundabout, the difference in terms of junction delays between the three Site Access options is minimal.

9.3 The relative benefits and disbenefits associated with each site access option are summarised in Table 19.

Table 19 – Site Access Options – Benefits and Disbenefits

Option	Benefits	Disbenefits
Option 1 No vehicular access to A40	▪ No direct delay impact on the A40 ▪ No speed reduction required on the A40 ▪ Full compatibility with bus-only bridge option ▪ Weakest vehicle connectivity to the Development - would complement the relative attractiveness of non-car modes	▪ Increased volume of traffic travelling through Barton Estate with associated environmental impact and potential for increased vehicle – pedestrian / cyclist conflict through the Barton Estate ▪ Need for a bus-only bridge to deliver direct bus connectivity to Northways – increased cost and environmental impact ▪ No pedestrian / cyclist crossing provided at at-grade junction, reducing connectivity ▪ Greatest impact on Headington Roundabout
Option 2 At-grade signalised junction	▪ Least impact upon Headington Roundabout, maximising reassignment of existing trips away from the Headington Roundabout ▪ Least impact upon the existing Barton Estate, maximising reassignment of existing trips through the Barton Estate ▪ Potential to incorporate additional pedestrian / cycle crossing facilities within the junction design; ▪ Ability to deliver direct bus priority to Northway ▪ Ability to restrict trips in and out of Barton Land Development by signal control	▪ Increase in delay for vehicles travelling on A40 ▪ Provision of a new junction produces some additional road safety risk
Option 3 At-grade left-in left-out junction	▪ Reassignment of some existing trips from the Headington Roundabout ▪ Reassignment of some existing trips through the Barton Estate ▪ Minimal impact on A40 in terms of delay ▪ Full compatibility with bus-only bridge option	▪ Increased u-turning manoeuvres at Headington Roundabout, increasing delays ▪ Some increased volume of traffic travelling through Barton Estate with associated Environmental impact and potential for increased vehicle – pedestrian / cyclist conflict through the Barton Estate ▪ Provision of a new junction produces some additional road safety risk. ▪ Need for a bridge to deliver direct bus connectivity to Northways ▪ No pedestrian / cyclist connectivity provided at at-grade junction, reducing connectivity

9.4 Of the three Site Access options tested, it is noted that:

i) Option 2 - the at-grade junction – assists the site in delivering mode shift by providing better accessibility for pedestrians, cyclists and public transport over general vehicular traffic for local trips supporting the overall transport strategy and associated travel demand management strategy for the site;

ii) the option that impacts most upon Barton Estate would be Option 1 – No Vehicular Access to the A40, as all the proposed Barton Land trips would be assigned through the village, and no existing Barton Estate trips would be reassigned elsewhere;

iii) the option that impacts least upon Barton Estate would be Option 2 – At-grade signalised junction, as the majority of Barton Land trips would be assigned directly to the A40, along with the greatest number of existing Barton Estate trips;

9.5 Whilst in capacity assessment terms, there appear to be no reasons why any one of the three Site Access options could not be progressed, each option provides differing levels of benefits, both in terms of existing travel patterns and delay on the A40, and future travel patterns.

9.6 Options 2 and 3 provide additional benefits over and above Option 1, mainly in terms of the potential to extract to some degree some existing vehicle trips and development-generated vehicle trips from the Headington Roundabout, by providing an alternative means of access to the Barton Land Development. Option 2 would also potentially extract existing residents at Barton travelling via the Barton Estate to reach the A40.

9.7 Whilst Options 1 and 3 would have a minimal impact in terms of delay on the A40, Option 2, the at-grade signalised junction, whilst having the greatest impact in terms of delay on the A40, would deliver direct bus priority to Northway, enhance direct pedestrian and cyclist connectivity between the Barton Land Development and Northway, and the signals would enable some restriction on the number of vehicular trips travelling in and out of the Barton Land Development.

9.8 Furthermore, all Options provide support for the travel demand management strategy for the site by not providing a connection for cars between the Barton Land Development and Headington and Northway. This lack of connection for cars between the Barton Land Development and Northway and Headington means there would be a greater opportunity to prioritise pedestrian and cycle connections over the A40 and therefore seek more ambitious mode shift targets.

9.9 On this basis, it is concluded that all options are viable in capacity terms, but the level of additional benefits from each option varies. At this stage it is considered that Option 2 would deliver more benefit than the other three site access options in terms of the extraction of existing and development-generated trips from the Barton Estate and the Headington Roundabout, and in terms of potential to provide further pedestrian and cycle connections across the A40.

FIGURES

APPENDICES

APPENDIX 1

APPENDIX 2

APPENDIX 3

APPENDIX 4

APPENDIX 5