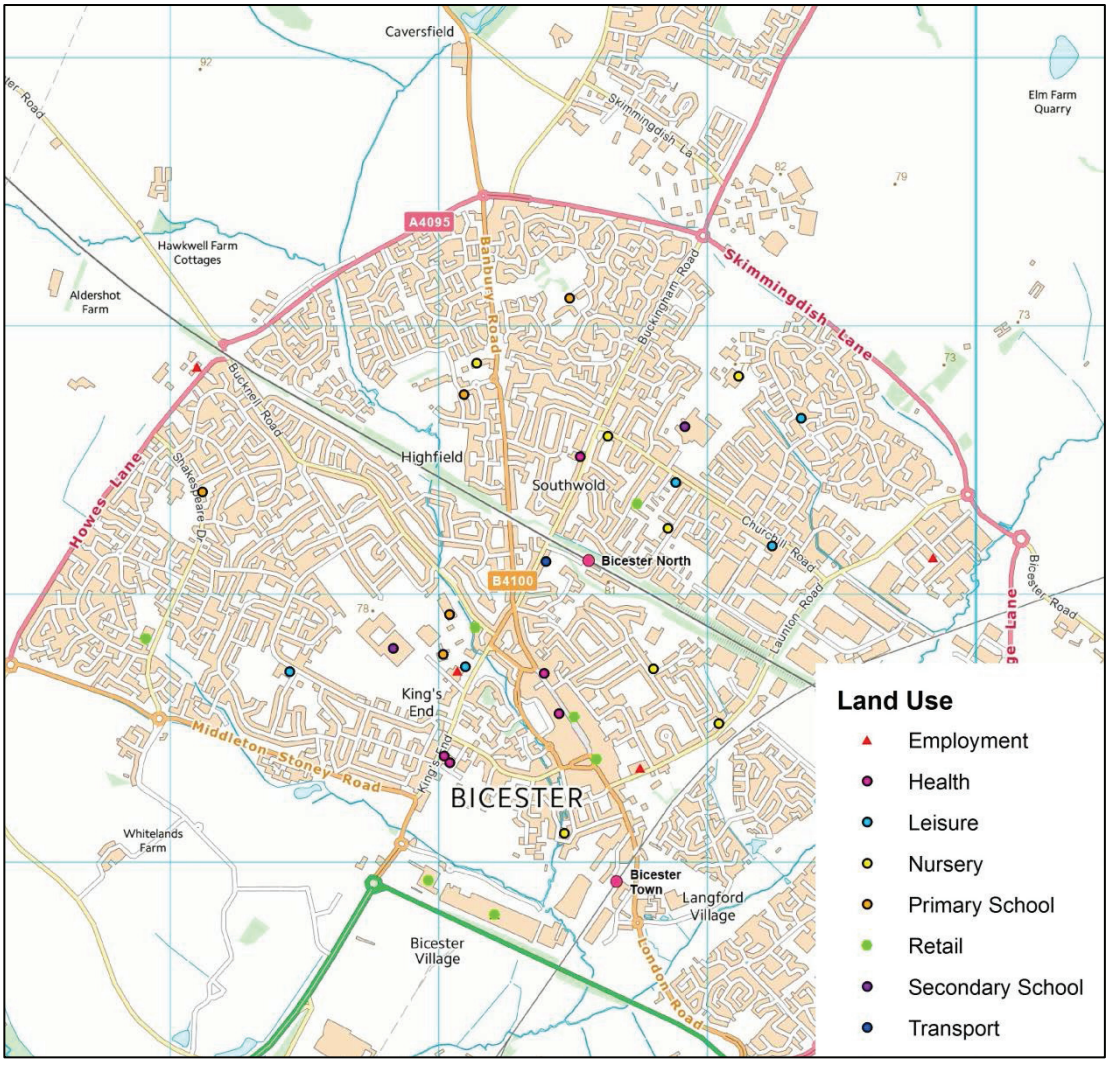
7 Accessibility

7.1 Context

The development proposal seeks to provide good accessibility to jobs, education, shopping, community, and health facilities by being easily reached by public transport, cycle or on foot. This relates to the facilities provided within the Masterplan and external accessibility within Bicester.

It is widely accepted (such as in former guidance PPG13 – Transport) that reasonable walking and cycling distances to facilities are 2km and 5km respectively. Figure 7.1 illustrates the location of the site in relation to the proposed and existing employment, retail, education and leisure opportunities.

Figure 7.1: Location of Bicester Land Uses



BioRegional has undertaken an assessment of modal accessibility to key facilities within the land north of the railway. The assessment is included in this chapter with acknowledgement of their work in informing the connectivity of the Masterplan and the Application 1 development.

Accessibility levels are coded by BioRegional as follows:

Has achieved viable alternative to driving

Majority of homes have achieved a viable alternative to driving

Has not achieved a viable alternative to driving

7.2 Internal Connections

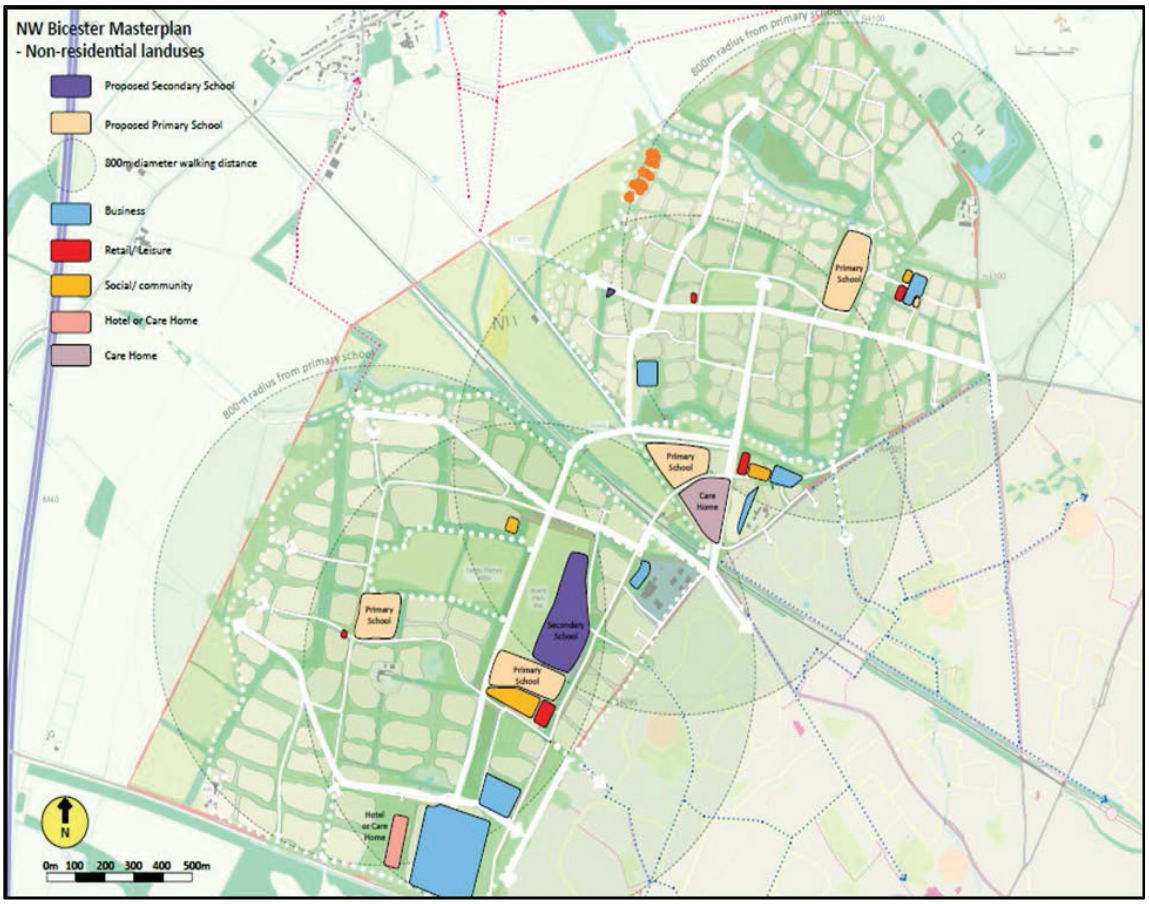
7.2.1 Walking to Primary schools

All houses are within 800m as the crow flies to either of the primary schools on the eastern side of the masterplan.

The majority of housing plots and all of the highest density areas are within 800m of primary schools when using the on-road or off-road routes. However, plots to the NW edge of the development are beyond this 800m distances and are between 900-1000m.

A finer detail of footpaths between housing plots may produce a reduced time in these areas. The number of homes outside of the 800m walkability zone is unlikely to be significant due to the expected density layout.

Figure 7.2: 800m walkability zone to primary schools (homes outside of the zone are coloured orange)



7.2.2 Cycling to primary schools

The large majority of housing plots are within 800m of a primary school, this means an estimated cycle time of 3 minutes, which offers a viable alternative to driving. Housing plots on the NW rural edge are 900-1000m away; this increases journey time to 4 minutes, but still offers a good alternative to driving.

7.2.3 Walking to local centre

All of the housing plots are with 800m or a ten-minute walk of the Home Farm local centre, the small local shop located in the centre of the development and the facilities co-located with the extra care village. These distances and times could be improved once the detailed layout of the scheme is determined includes the footpaths and cut-throughs.

7.2.4 Cycling to local centre

Similarly to walking all of the housing plots are within an 800m/ 3 minute cycle ride of a local shop.

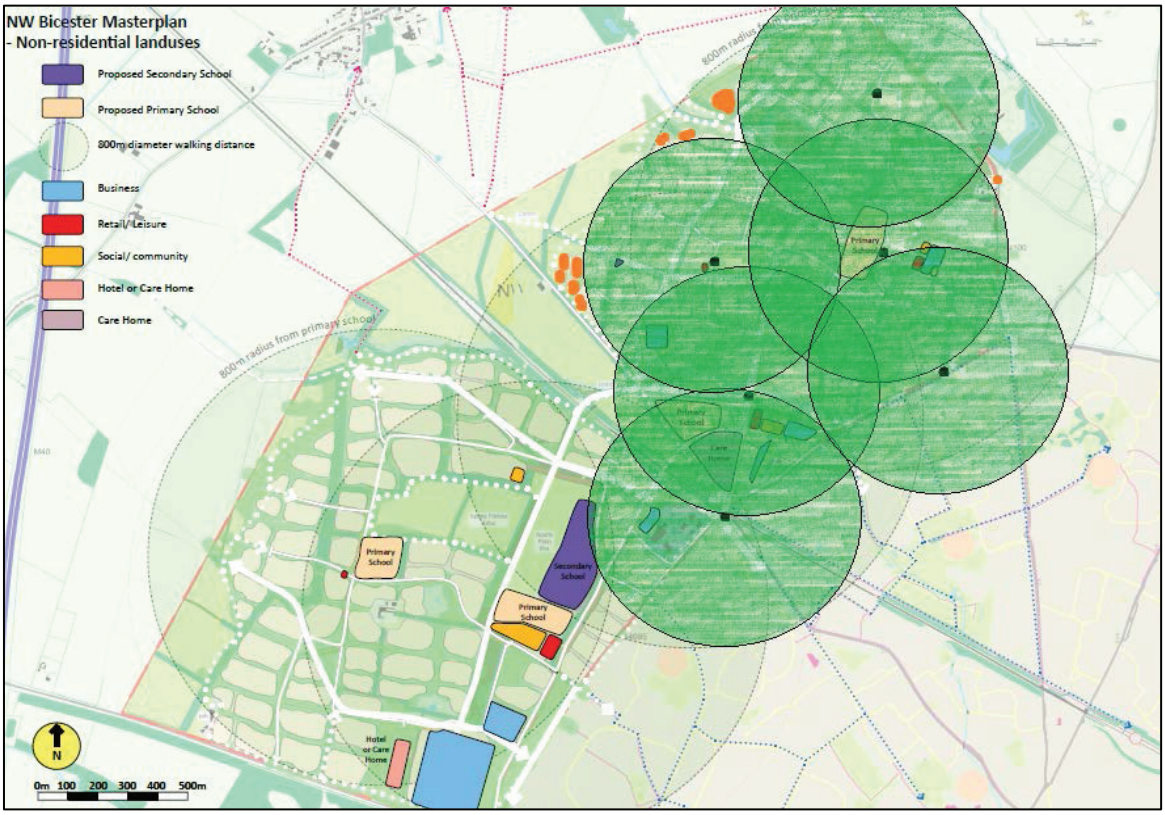
Cycling does offer a real alternative to driving. This is accomplished by the fact that many cyclists will use direct, dedicated cycle routes rather than the elongated road network. Drivers will also have an additional 30 seconds to access parking spaces. Cycling is also free and therefore saves on fuel costs and any additional parking charges that could be in force.

7.2.5 Walking to bus stops

The bus loop on the northern side of the railway is 4600m in length with bus stops approximately 800m apart. The actual locations of the bus stops was unknown at the time of the assessment but an assumption has been made that a stop will be located by the central gateway, primary school/extra care, Home Farm primary school/local centre, Exemplar development and on Lords Lane.

Figure 7.3 demonstrates a 400m radius from bus stops. The large majority of housing plots are within a 400m walking distance, however, there are some plots towards the NW edge of the development and close to the Exemplar phase that are between 600-800m away. However, the actual number of homes affected would be minimal due to the expected lower density in these areas thus there is still a good level of accessibility to bus stops.

Figure 7.3: 400m walkability zone to bus stops (homes outside of the zone are coloured orange)



7.2.6 Walking and cycling to secondary school

Housing plots, towards the Exemplar and in the NW edge of the development are approximately 1600-1800m away from the secondary school; this is 19-21 minutes' walk or a 6-minute cycle ride. The majority of the highest density plots are within 1400m or a 16 minute walk / 5.5 minute cycle.

Driving has an approximate journey time of 5 minutes and with it, fuel and parking costs as well as potential issues with traffic and car parking. When compared to driving, cycling offers a viable alternative to driving, whilst walking is suitable for those closest to the central gateway and underpass or those who would enjoy a longer walk.

7.3 Connections to external destinations

7.3.1 Walking and Cycling

Journey times for walking would not be considered viable as an alternative means of transport to the town centre except for the more able seeking an active journey. The town centre is between 30-50 minutes' walk and Bicester North Station has times ranging from 20-40 minutes and Bicester Town Station from 30-55 minutes.

Walking to both existing secondary schools is some distance and is not likely to be considered unless residents lived very close to Lords Lane. From here Hyder would

comment that the journey time of 20 minutes is within the IHT guidelines[6] on acceptable walking distance of 2km (25 minutes).

Cycling does offer a viable alternative to driving to all the external destinations within the town. Most homes are within 15 minutes of all Bicester destinations. The most northerly or easterly homes are some 17-18 minutes cycling time to Bicester Village, Bicester Town Station and the Launton Road industrial estate.

Cycling is also free. This is highly attractive when compared to parking charges at both stations and the town centre (£7 before 10am, £4.50 after 10am and £1.70 for 3 hours respectively).

Journey times for cycling are surprisingly faster than driving in some situations, especially in the case of the town centre where the time to park in the multi-storey car park is taken into account and where there are good cycle parking facilities.

Cycling times to other destinations are only slightly longer than driving (please see below) and when parking charges, parking time and potential traffic issues are considered it does make cycling a viable option in most cases.

- Additional 2-5 minutes to Bicester North Station
- Additional 3-7 minutes to Bicester Town station
- Additional 5-10 minutes to Launton Road
- Additional 3-7 minutes to Bicester Village
- Additional 2-7 minutes to either existing secondary schools

7.3.2 Bus connections

The eastern bus loop is 4600m with an approximate journey time of 6 minutes. 6 bus stops are estimated on this loop with a minute stop at each, meaning a total loop time of 12 minutes.

Table 7.1 below provides the journey times to and from the town centre by bus from different points on the eastern side of the masterplan and the comparable journey by car. The timings take into account approximate walking and waiting times to bus stop and car parking time in the town centre. Figure 7.4 provides the locations used for the bus assessment on the east side of the masterplan.

[6] Guidelines for Providing Journeys on Foot, IHT 2000

Figure 7.4: Locations for Bus Assessment

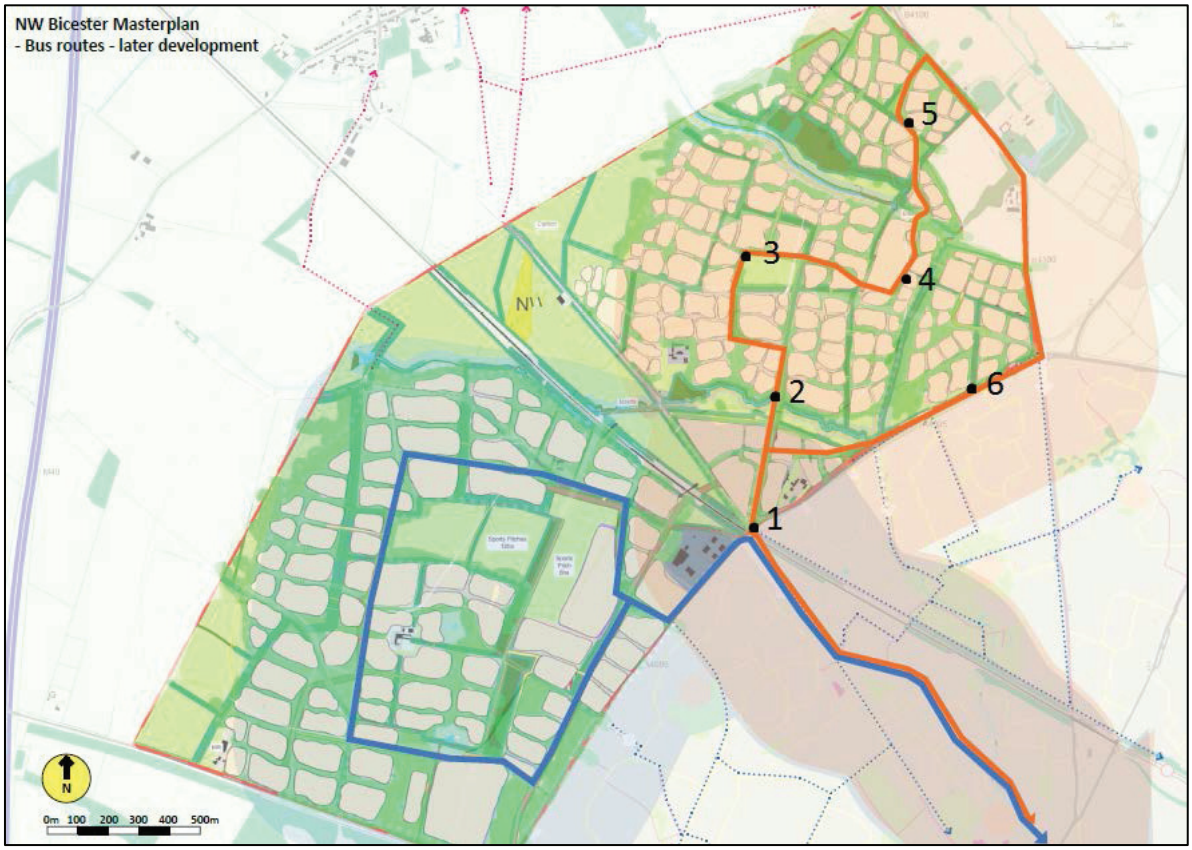


Table 7.1: Assessment of Bus Journeys from Locations in the Application 1 Development

Location	Journey to Town	Journey from town	Journey by car	Assessment
1	5 min walk to BS 5 min wait 6 min bus time **16 minutes**	5 min wait 6 min bus time 5 min walk home **16 minutes**	1 min walk to car 4 min car journey 5 min parking time **10 minutes**	
2	10 min walk to BS 5 min wait 6 min bus time **21 minutes**	5 min wait 7 min bus time 5 min walk home **17 minutes**	1 min walk to car 5 min car journey 5 min parking time **11 minutes**	
3	5 min walk to BS 5 min wait 14 min bus time **24 minutes**	5 min wait 7.5 minute bus time 5 min walk home **17.5 minutes**	1 min walk to car 5 min car journey 5 min parking time **11 minutes**	
4	5 min walk to BS 5 min wait 12.5 min bus time **22.5 minutes**	5 min wait 10.5 min bus time 5 walk home **19.5 minutes**	1 min walk to car 4 min car journey 5 min parking **10 minutes**	
5	5 min walk to BS 5 min wait 10.5 min bus time **20.5 minutes**	5 min wait 12 min bus time 5 min walk home **22 minutes**	1 min walk to car 5 min car journey 5 min parking **11 minutes**	
6	5 min walk to BS 5 min wait 8 min bus time **18 minutes**	5 min wait 6 min bus time 10 min walk home **21 minutes**	1 min walk to car 4 min car journey 5 min parking **10 minutes**	

The following comments are made by BioRegional on accessibility by bus:

Location 1: Houses are within 400m of the central gateway and will have the same journey to and from town. The bus journey could be a viable alternative to driving when car parking and the availability of real time bus information are considered.

Location 2: Residents may walk further to the central gateway to catch the bus to the town centre, or they could stay on the bus around the entire bus loop. They will have a shorter, direct journey on their return. Bus timings are 10 minutes longer on the way to the town centre (if we assume a longer walk to the central gateway) and 6 minutes longer on the return journey than driving.

Location 3: Residents will have a longer bus journey on way to town but a shorter journey on way back. Bus times are 13 minutes longer on the way to the town centre and 6.5 minutes longer on the return journey compared to driving.

Location 4: Residents will have a slightly longer bus journey time into the town centre but a slightly shorter journey on their return. Times are 12.5 minutes longer on the way to the town centre (residents could walk to the bus stop on Lords Lane on the journey into town, which would reduce the time difference) and 9.5 minutes longer on the return compared to driving.

Location 5: Residents will have a slightly shorter journey into town than their return journey. Times are 9.5 longer on the way to the town centre and 11 minutes longer on the return journey compared to driving.

Location 6: Residents will have a shorter journey into town than on their return; however, they could disembark at the central gateway and walk further home. Bus times are 8 minutes longer on the way to the town centre and 11 minutes longer on the return journey (if we assume a longer walk from the central gateway).

The bus journey (to and from the town centre) from locations 2,3,4,5 and 6 are, on average 9.5 minutes longer than driving, however these times could be reduced with the introduction of real time information and highest density areas located close to bus stops.

The private car journeys may also be longer if drive time due to delay, the car parking time and the time to walk to the car increases. There is currently no charge for the town centre car park (up to 2 hours), if this was to change this would influence modal choice.

7.4 Summary

This chapter demonstrates that walking, cycling and buses provide a viable alternative to driving in the majority of instances. A wide range of facilities within the development can be accessed within acceptable walking times and existing facilities located within Bicester can be accessed within acceptable journey distances and times by cycling and by bus, in comparison to the car. Measures that are proposed such as real time information, careful placing of bus stop locations, lowest densities further from bus stops and also potentially car parking charges at destinations will all be factors in influencing people to travel on foot, cycle or bus and in achieving ‘green’ scores for accessibility rather than ‘amber’.

8 Trip and Traffic Generation

8.1 Introduction

This chapter details the trip generation methodology that has been applied in order to forecast the volume of trips by all modes as well as vehicular traffic to be generated by the proposed Application 1 development.

The methodology used for the 6,000 homes for NW Bicester has been applied to the quantum of development for the Application 1 development (shown in Table 6.1). The NW Bicester Masterplan Access and Travel Strategy, together with its Appendices 5 and 6 on trip rates and traffic generation, provide more detail on the approach.

8.2 Trip Rates

The TRICS database (v6.11.2) has been used as the basis for trip rates. The database allows the user to customise a number of parameters to only include surveys which correspond as far as possible with conditions at the proposed development. It should be noted that:

- Multi-modal surveys have been used;
- The trip rates in this note refer to **total person trip rates** (i.e. the **total** trips that would be generated by each land use including those generated by car, public transport, walking, cycling etc.); and
- The trip rates derived are for the AM peak (08:00-09:00), PM peak (17:00-18:00) and 12 hour (07:00-19:00) assessment periods which will be considered in the assessment.

The parameters used when developing the trip rates are shown in each of the TRICS extracts provided in Appendix 8.1. It should be noted that TRICS has its limitations in that no sites are available of similar size and complexity to NW Bicester.

It was agreed with OCC that 'mean' average total person trips from the development would be used for non-residential land uses with two trip rates for residential for comparison as follows:

(1) an 85th%ile total person trip rate for residential as this was requested by OCC (although the set of data gives a significantly higher total person rate than other consented developments in Bicester have used and higher than the trips made by Bicester households known from the 2010 household travel survey) and

(2) an average total person trip rate which is more in line with local consented developments and the surveyed trips of Bicester residents from the Bicester Household Survey 2007/2010.

The higher, 85th%ile trip rates for residential have been used in the traffic impact assessment to provide a worst case, whilst the comparative traffic generation using the average 'mean' trip rates are also provided.

8.2.1 Mean Average Trip Rates

Table 8.1-8.3 show the 'Mean' Average multi modal total person trips rates for all land uses in the Application 1 development. This includes a full list of trip rates although not all uses are included in the Application 1 development.

Table 8.1: Summary of AM Peak Hour 'Mean' Average Multi Modal People Trip Rates

Land Use	Unit	Mean Arrivals	Mean Departures	Total
Residential – Privately Owned	Per unit	0.237	0.821	1.058
Residential – Affordable Housing *	Per unit	0.190	0.657	0.846
Residential – Care Home	Per resident	0.125	0.119	0.244
Children's Nursery	Per pupil	0.416	0.227	0.643
Primary School	Per pupil	1.311	0.330	1.641
Secondary School	Per pupil	0.965	0.049	1.014
B1 Office Business Park / Eco Business Centre	Per 100 sqm GFA	2.084	0.308	2.392
B2 Industrial Units	Per 100 sqm GFA	0.617	0.322	0.939
B8 Storage and Distribution	Per 100 sqm GFA	0.038	0.019	0.057
Local Shops	Per 100 sqm GFA	11.432	10.587	22.019
Community Hall/Multi Faith Centre	Per 100 sqm GFA	1.068	0.519	1.587
Library/Visitor Centre	Per 100 sqm GFA	2.273	0.593	2.866
Doctors Surgery	Per 100 sqm GFA	7.286	3.700	10.986
Dental Surgery	Per 100 sqm GFA	4.019	0.609	4.628
Sports Centre	Per 100 sqm GFA	0.885	0.557	1.442
Fitness Centre	Per 100 sqm GFA	0.884	1.207	2.091

*Note that results from the National Travel Survey suggest that 20% fewer trips are made by residents of affordable housing. It is thus proposed that a factor of 0.80 is applied to the privately owned housing rates.

Table 8.2: Summary of PM Peak Hour 'Mean' Average Multi Modal People Trip Rates

Land Use	Unit	Mean Arrivals	Mean Departures	Total
Residential – Privately Owned	Per unit	0.605	0.369	0.974
Residential – Affordable Housing *	Per unit	0.484	0.295	0.779
Residential – Care Home	Per resident	0.074	0.119	0.193
Children's Nursery	Per pupil	0.180	0.314	0.494
Primary School	Per pupil	0.021	0.045	0.066
Secondary School	Per pupil	0.029	0.072	0.101
B1 Office Business Park / Eco Business Centre	Per 100 sqm GFA	0.292	2.094	2.386
B2 Industrial Units	Per 100 sqm GFA	0.145	0.482	0.627
B8 Storage and Distribution	Per 100 sqm GFA	0.019	0.046	0.065
Local Shops	Per 100 sqm GFA	9.863	10.042	19.905
Community Hall/Multi Faith Centre	Per 100 sqm GFA	1.802	0.950	2.752
Library/Visitor Centre	Per 100 sqm GFA	3.953	8.103	12.056
Doctors Surgery	Per 100 sqm GFA	3.516	5.353	8.869
Dental Surgery	Per 100 sqm GFA	0.244	5.481	5.725
Sports Centre	Per 100 sqm GFA	2.839	2.341	5.180
Fitness Centre	Per 100 sqm GFA	3.836	2.256	6.092

Table 8.3: Summary of 12-hour 'Mean' Average Multi Modal People Trip Rates

Land Use	Unit	Mean Arrivals	Mean Departures	Total
Residential – Privately Owned	Per unit	4.107	4.369	8.476
Residential – Affordable Housing *	Per unit	3.286	3.495	6.781
Residential – Care Home	Per resident	1.767	1.823	3.590
Children's Nursery	Per pupil	1.801	1.796	3.597
Primary School	Per pupil	2.449	2.409	4.858
Secondary School	Per pupil	1.623	1.606	3.229
B1 Office Business Park / Eco Business Centre	Per 100 sqm GFA	8.818	8.729	17.547
B2 Industrial Units	Per 100 sqm GFA	4.655	4.783	9.438
B8 Storage and Distribution	Per 100 sqm GFA	0.514	0.536	1.050
Local Shops	Per 100 sqm GFA	113.601	112.206	225.807
Community Hall/Multi Faith Centre	Per 100 sqm GFA	19.932	16.325	36.257
Library/Visitor Centre	Per 100 sqm GFA	65.218	65.218	130.436
Doctors Surgery	Per 100 sqm GFA	66.616	66.728	133.344
Dental Surgery	Per 100 sqm GFA	35.688	34.712	70.400
Sports Centre	Per 100 sqm GFA	18.471	15.245	33.716
Fitness Centre	Per 100 sqm GFA	21.322	18.297	39.619

8.2.2 Residential 85th%ile Trip Rates

The 85th%ile total person trip rates for residential are included in Table 8.4 below.

Table 8.4: Residential Trip Rates 85%ile

Residential Person Trips	Unit	Mean Arrivals	Mean Departures	Total
AM Peak – Privately Owned	Per unit	0.384	1.058	1.442
AM Peak – Affordable Housing *	Per unit	0.307	0.846	1.154
PM Peak – Privately Owned	Per unit	0.778	0.517	1.295
PM Peak – Affordable Housing *	Per unit	0.622	0.414	1.036
12 Hour – Privately Owned	Per unit	4.843	5.939	10.782
12 Hour – Affordable Housing *	Per unit	3.874	4.751	8.626

8.3 Trip Generation Methodology

Appendix 6 of the NW Bicester Masterplan Access and Travel Strategy sets out the proposed methodology for calculating the number of trips generated by each land use for the full NW Bicester development. The trip rates as set out above and the mode share and containment principles as set out in Chapter 6 of this TA have been used to calculate the number of internal and external trips by each mode for each land use proposed in the Application 1 development.

In summary, the following methodology has been applied.

8.3.1 Residential

- Person trip rates have been obtained from the TRICS database (as in Tables 8.1-8.4);
- Residential trip generations by journey purpose have been identified from the National Travel Survey (2008/12, Table NTS0502) and applied to the number of person trips;
- Assumptions have been made in relation to the internalisation of trips within North West Bicester, external within Bicester and external outside Bicester (see Table 8.5 in the containment and linked trips section);
- The number of internal, external within Bicester and external to Bicester person trips by purpose has been calculated using the National Travel Survey proportions and the internalisation assumptions. The number of person trips by mode has been established using the total number trips by distance and purpose and the 2031 target mode split (Table 8.7);
- The traffic generation to and from the site in the AM and PM peak period is based on the number of car driver trips with an additional allowance for bus movements.

8.3.2 Employment

The site will include B1, B2 and B8 employment uses. The following methodology has been used to calculate the number of trips:

- Person trip rates were used as in Tables 8.1-8.3;
- The B2 trip rate was used for mixed B2/B8 developments to represent a worst case where the proportion of each is not known;
- The number of internal and external trips has been estimated from assumptions regarding containment of trips (Table 8.6);
- Internal trips have been excluded from total trips as they are double counted with trips made by residents;
- The 2031 target mode split for external trips within and outside Bicester has been applied to the respective number of person trips by each mode.

8.3.3 Education

The following methodology has been applied to calculate the number of trips from the proposed primary and secondary schools:

- Person trip rates have been obtained from the TRICS database (as in Tables 8.1-8.3);
- The number of internal and external trips has been estimated from assumptions regarding containment of trips (Table 8.6);
- Internal trips have been excluded from total trips as they are double counted with trips made by residents;
- The 2031 target mode split for external trips within and outside Bicester has been applied to the respective number of person trips by each mode.

8.3.4 Community, Health and Care, Retail and Leisure

The following methodology has been used to calculate the number of trips generated by community, health and care uses:

- Person trip rates have been obtained from the TRICS database (as in Tables 8.1-8.3);
- The number of internal and external trips has been estimated from assumptions regarding containment of trips (Table 8.6);
- An estimate of the proportion of trips which are linked to other land uses has been made and the trip generation has been reduced accordingly (Table 8.6);
- Internal trips have been excluded from total trips as they are double counted with trips made by residents;
- The 2031 target mode split for external trips within and outside Bicester has been applied to the respective number of person trips by each mode.

8.3.5 Containment and Linked Trips

As set out in Section 6.3 the target level of containment is for at least 35% of trips to be within NW Bicester and 60% to be within Bicester as a whole (i.e. 40% or less travelling outside of Bicester). The individual assumptions in relation to containment for resident trips are set out in Table 8.5 and for other land uses in Table 8.6.

Table 8.5: Containment of Resident Trips by Journey Purpose

Journey Purpose	Internal Trips in NWB (%)	External Trips in Bicester (%)	External Trips outside Bicester (%)
Commuting	10	30	60
Business	10	30	60
Education	65	15	20
Shopping	30	30	40
Other services	50	20	30
Visiting friends and relatives (VFR)	15	30	55

Table 8.6: Containment and Linked Trip Assumptions for Non-Residential Trips

Land Use	Internal Trips within NWB (%)	Total Trips within Bicester (including internal to NWB) (%)	Percentage Linked Trips (%)
Primary School	85	95	-
Secondary School	75	95	-
Employment	10	30	-
Retail & Leisure	60	70	30
Community, Health & Care	60	70	30

8.4 Target Mode Share

The target mode share which has been applied was discussed in Chapter 6. Table 8.7 sets out the target modal share for 2031 which has been applied to the trips by all modes to derive vehicle trips.

Table 8.7: Target Mode Share

	2031 PPS Target All Trips		2031 Internal Trips		2031 External Trips Within Bicester		2031 External Trips Outside of Bicester	
	% by mode	Total Car/ Non Car	% by mode	Total Sustainable/ Not sustainable	% by mode	Total Car/ Non Car	% by mode	Total Car/ Non Car
Car driver	40%	50%	7%	14%	35%	52%	57%	77%
Car passenger	10%		7%		17%		20%	
Bus passenger	10%	50%	1%	86%	5%	48%	11%	23%
Bicycle	10%		10%		10%		7%	
Walk	30%		75%		33%		5%	
Total	100%		100%		100%		100%	

8.5 Trip Generation

The methodology set out above has been used to calculate the multi-modal trips for the Application 1 development. The following sections provide the calculated trip generation from the Application 1 development using the 85th%ile trip rate for residential as a worst case for the purposes of assessment.

8.5.1 Internal Trips within NW Bicester

Table 8.8 sets out the trips by mode that are anticipated to remain within the NW Bicester development.

Table 8.8: Internal Trips within NW Bicester

Mode	AM peak (08:00 to 09:00)			PM Peak (17:00 to 18:00)			12 Hour (07:00 to 19:00)		
	IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT	TOTAL
Car driver	29	80	109	35	23	58	276	338	614
Car passenger	29	80	109	35	23	58	276	338	614
Bus passenger	4	11	16	5	3	8	39	48	88
Bicycle	42	115	156	50	33	83	394	483	876
Walk	312	860	1173	375	250	625	2953	3621	6573
Total	416	1147	1564	501	333	833	3937	4828	8765
Mode Share (% Car)			14%			14%			14%

Source: Land North of the Railway (23/06/14) - Tab Summary TripGen 85th DQ

8.5.2 External Trips within Bicester

Table 8.9 sets out the number trips by mode that are anticipated to be external to the NW Bicester development but remain within Bicester.

Table 8.9: External Trips within Bicester

Mode	AM peak (08:00 to 09:00)			PM Peak (17:00 to 18:00)			12 Hour (07:00 to 19:00)		
	IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT	TOTAL
Car driver	113	206	319	187	133	320	1211	1442	2654
Car passenger	55	100	155	91	65	156	588	701	1289
Bus passenger	16	29	46	27	19	46	173	206	379
Bicycle	32	59	91	54	38	91	346	412	758
Walk	107	195	301	177	125	302	1142	1360	2502
Total	323	590	913	535	380	915	3461	4121	7582
Mode Share (% Car)			52%			52%			52%

Source: Land North of the Railway (23/06/14) Tab Summary TripGen 85th DQ

8.5.3 External Trips outside of Bicester

Table 8.10 sets out the number trips by mode that are anticipated to involve origins or destinations outside of Bicester.

Table 8.10: External Trips outside of Bicester

Mode	AM peak (08:00 to 09:00)			PM Peak (17:00 to 18:00)			12 Hour (07:00 to 19:00)		
	IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT	TOTAL
Car driver	243	521	764	514	373	887	3006	3640	6646
Car passenger	85	183	268	180	131	311	1055	1277	2332
Bus passenger	47	101	147	99	72	171	580	702	1283
Bicycle	30	64	94	63	46	109	369	447	816
Walk	21	46	67	45	33	78	264	319	583
Total	426	915	1341	902	654	1556	5274	6386	11660
Mode Share (% Car)			77%			77%			77%

Source: Land North of the Railway (23/06/14) - Tab Summary TripGen 85th DQ

8.5.4 Trip Containment

Table 8.11 summarises the number of trips from the development anticipated to be within the NW Bicester development or external to the site but within Bicester. It can be seen that the level of containment varies in the peak hours, with more trips being contained in the morning peak due to the influence of education trips, and less in the evening peak due to employment trips. Overall for the 12 hour period, 58% of trips are anticipated to be contained in Bicester. This is slightly lower than the target of 60%, but leads to a robust estimate of external trips for the impact analysis.

In addition the proportion of trips within the site is also slightly lower than target at 31%, also giving a robust assumption on trips on the external highway network.

Table 8.11: Containment of Trips for Application 1 Development

	AM peak (08:00 to 09:00)			PM Peak (17:00 to 18:00)			12 Hour (07:00 to 19:00)		
	IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT	TOTAL
CONTAINMENT									
Within NWB	416	1147	1564	501	333	833	3937	4828	8765
Within Bicester	323	590	913	535	380	915	3461	4121	7582
Outside of Bicester	426	915	1341	902	654	1556	5274	6386	11660
Total	1165	2652	3817	1938	1367	3304	12672	15335	28007
Within NWB			41%			25%			31%
Within Bicester			24%			28%			27%
Total Containment			65%			53%			58%

Table 8.12 summarises the containment of trips by each mode. It can be seen that car trips are forecast to be predominately outside of Bicester, with 67% of trips. This is a robust assumption given that the Bicester Household Survey 2010 found that only 52% of trips were to destinations outside of Bicester – although this is of resident trips only. Moreover the percentage of bus passenger trips outside of Bicester is 73% reflecting the usage of services such as the X5 to travel to longer distance destinations.

In contrast, 68% of walking trips are internal to the development and 36% of cycling trips.

Table 8.12: Containment of Trips by Mode (12 Hour Trips)

Mode	Internal to NW Bicester		Within Bicester		External to Bicester		Total Trips
	No.	%	No.	%	No.	%	
Car driver	614	6.2%	2654	26.8%	6646	67.0%	9914
Car passenger	614	14.5%	1289	30.4%	2332	55.1%	4235
Bus passenger	88	5.0%	379	21.7%	1283	73.3%	1749
Bicycle	876	35.8%	758	30.9%	816	33.3%	2451
Walk	6573	68.1%	2502	25.9%	583	6.0%	9659
Total	**8765**	**31.3%**	**7582**	**27.1%**	**11660**	**41.6%**	**28007**

8.5.5 Total Trips by All Modes

The total trips by all modes generated by the Application 1 development are set out in Table 8.13. It can be seen that the overall mode share forecast using this methodology is 51% in the 12 hour period, i.e. just above the target to be aimed at of 50%.

Table 8.13: Application 1 Development Total Trips by All Modes

Mode	AM peak (08:00 to 09:00)			PM Peak (17:00 to 18:00)			12 Hour (07:00 to 19:00)		
	IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT	TOTAL
Car driver	385	808	1193	736	529	1265	4493	5420	9914
Car passenger	169	364	533	306	219	525	1919	2316	4235
Bus passenger	67	142	209	131	94	225	793	957	1749
Bicycle	104	238	342	167	117	284	1109	1342	2451
Walk	440	1101	1541	597	408	1005	4359	5300	9659
Total	1165	2652	3817	1938	1367	3304	12672	15335	28007
Mode Share (% Car)			45%			54%			51%

8.5.6 Total Vehicle Trips

Table 8.14 outlines the total vehicle trips generated by the Application 1 development of NW Bicester.

Table 8.14: Total Vehicle Trips

	AM peak (08:00 to 09:00)			PM Peak (17:00 to 18:00)			12 Hour (07:00 to 19:00)		
	IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT	TOTAL
Internal	29	80	109	35	23	58	276	338	614
External in Bicester	113	206	319	187	133	320	1211	1442	2654
External outside Bicester	243	521	764	514	373	887	3006	3640	6646
TOTAL	385	808	1193	736	529	1265	4493	5420	9914

Source: Land North of the Railway (23/06/14) – Tab Summary TripGen 85th DQ

8.5.7 Total Vehicle Trips by Land Use

Table 8.15 sets out the overall trip generation of the proposed development, broken down by land use. It can be seen that the majority of trips are related to the residential land use.

Table 8.15: Total Traffic Generation by Land Use

	AM peak (08:00 to 09:00)			PM Peak (17:00 to 18:00)			12 Hour (07:00 to 19:00)		
Land Use	IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT	TOTAL
Residential (85th)	283	781	1064	722	480	1201	4125	5058	9183
Education	52	13	66	1	2	3	98	96	194
Employment	40	7	47	6	40	46	180	179	360
Retail and Leisure	7	7	14	6	6	12	70	70	140
Community, Health and Care	2	1	3	2	1	3	19	17	36
Total	385	808	1193	736	529	1265	4493	5420	9914

Source: Land North of the Railway – Tab "Summary by Land Use DQ"

8.6 Trips with Average Trip Rate

For comparison, the number of residential trips that would be generated using the lower, average total person trip rates is shown in Table 8.16 for all modes. The overall number of trips is 80% of the 85th%ile rate over the 12 hour period.

Table 8.16: Total Trip Generation with Average Trip Rate

Mode	AM peak (08:00 to 09:00)			PM Peak (17:00 to 18:00)			12 Hour (07:00 to 19:00)		
	IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT	TOTAL
Car driver	277	633	910	576	392	968	3866	4083	7950
Car passenger	120	285	405	240	162	401	1650	1743	3393
Bus passenger	48	111	159	102	70	172	682	720	1402
Bicycle	72	186	257	130	86	216	952	1006	1958
Walk	289	858	1147	466	296	762	3723	3945	7668
Total	806	2073	2879	1515	1005	2520	10873	11497	22371
Mode Share (% Car)			45%			54%			51%

8.7 Summary

The trip rates used for the traffic generation of the Development are based on 85th%ile rates which represent similar vehicle generations to other proposed developments in the town without the mix of land uses and range of sustainable travel provision. Moreover the assumptions for containment and mode share which have led to the vehicle traffic generations for the Application 1 development are higher than targets. Taken together the trip rates, mode share and containment assumptions provide a worst case/ robust basis for the assessment of impact.

9 Traffic Modelling

9.1 Introduction

The number of traffic movements forecast to be generated by the development (as set out in Chapter 8) has been modelled by White Young Green on behalf of A2 Dominion using the County's Bicester Saturn Model. This assigns the traffic generation to the road network. The model is also being used to test various scenarios for the whole town's development on behalf of Oxfordshire County Council as part of the Local Plan evidence base and as discussed in Chapter 3, is considered to provide the best available tool for assessing the impact of NW Bicester.

The modelling has been undertaken for the full 6,000 homes. It has been agreed with OCC that the difference in traffic generation between the Application 1 development and the full NW Bicester can then be used to quantify the traffic impact of the application level of development on links and junctions, as a full assessment has taken place on the full development.

9.2 Model Scenarios

The modelling has used 2031 as the opening year for the full development of NW Bicester, whilst it is recognised that build-out of the master plan development will take longer. The upper trajectory of housing delivery within a 25 year timescale is for 4,062 homes by 2031 and 6,000 by the end of 2039 (13016 NW Bicester V4_05-05-14). However, the use of 2031 for the Opening Year is the approach taken as this fits with the end date of the Local Plan and is the best available basis for assessment and represents a worst case.

The following scenarios have been assessed:

1) Base Year 2012.

2) Reference Case 2031 – this includes full development of the town including developments beyond 2031 but not NW Bicester (with the exception of the permitted Exemplar development). This gives visibility on predicted traffic patterns in the town without NW Bicester, for comparison.

3) Full Development 2031 – 85th%ile Trip Rates with level crossing removed – this scenario includes NW Bicester as well as all other developments as per the Local Plan in the town.

4) Full Development 2031 – 85th%ile Trip Rates with level crossings removed and a SE Link Road – this scenario assesses whether a link road in the SE of Bicester influences the level and distribution of impacts of the NW Bicester compared to not having a SE Link Road.

5) Full Development 2031 - Average Trip Rates with level crossing removed – this scenario uses the lower total person trip rates for residential land use as the basis for the traffic generation for NW Bicester.

The Technical Note by WYG detailing the modelling assumptions is attached as Appendix 9.1.

9.3 Scenario for Traffic Assessment

It was agreed in discussion with Oxfordshire County Council (OCC) that the 2031 Full NW Bicester Development (85th%ile) with no SE Link Road represented the most appropriate scenario for the assessment of the full development and the design of the road link and junctions. This enables an understanding of the impacts without strategic road improvements elsewhere in the town. The issues regarding the SE link road are however discussed later in this chapter.

The 85th%ile NW Bicester vehicle trip rate is higher than that used in the submission for both the SW Bicester development or Graven Hill development in the AM peak hour as well as higher than used for Graven Hill in the PM peak hour. It is considered that these trip rates represent a development which has similar traffic generation to other developments in the town. Use of this modelling scenario for assessing the development therefore provides a view of what would happen to the road network if the development is similar to other developments in the town. It avoids the need to consider how traffic would be accommodated if the modal shift targets are not met.

It has also been agreed that the 2031 Full NW Bicester Development (average trip rates) with no SE Link Road scenario provides an appropriate basis for comparison, giving the level of traffic that could be anticipated to result if the sustainable travel targets are achieved for NW Bicester. The Highways Agency have identified that this target scenario is considered to be the most appropriate traffic generation level for assessing the impact on the motorway junctions and monitoring would thereafter be put in place to ascertain whether the targets are being met.

9.4 Initial Modelling March 2014 & Iterative Modelling April/May 2014

The results of the modelling of the main scenarios identified two notable features of the Full Development (85th%ile) scenario:

- The usage of the A4095 NW Strategic Link Road appeared not to be maximised with traffic increasing significantly on the radial routes (Middleton Stoney Road, Banbury Road and Buckingham Road);
- A large amount of traffic using Banbury Road and the junction with the A4095; and
- Increases in traffic were observed through adjacent residential areas.

The results were discussed with Cherwell DC (CDC) and OCC and it was agreed that further model runs would be undertaken including two potential mitigation measures (each tested separately):

1. Changing the speed limit on the proposed new Howes Lane/ Lord's Lane link from 30mph to 40mph; and
2. Introducing traffic calming measures to the Shakespeare Drive area. This tested a one way north to south from the old Howes Lane into Shakespeare Drive and 20mph on Shakespeare Drive, Blenheim Drive and West Street, to see in principle what benefits traffic calming would bring, although details of what might be implemented would be for further discussion.

At the same time as undertaking the model runs above, minor changes were made to the modelling details of the Banbury Road/ A4095 junction as the Saturn outputs seemed to be suggesting there was more than expected capacity.

It was concluded from the modelling undertaken that there were benefits in introducing minor modifications to the proposals for NW Bicester compared to the original modelling results. The results showed slightly higher impact of the traffic calming on the use of the new route than the speed limit change. The traffic calming introduction with a one way section would increase traffic on Middleton Stoney Road but significantly reduce traffic on Shakespeare Drive at the northern end. The change of the new link to a 40mph route was considered to represent a detrimental impact on the principles of the NW Bicester Masterplan and the ability to integrate the development with the existing residential areas of the town.

At a meeting with OCC and CDC on 8th May 2014 it was agreed that the scenario for testing of the traffic impact would incorporate the traffic calming principles but not change the design speed of the Howes Lane/ Lord's Lane Link Road. The revised scenario with the traffic calming is therefore the basis of further assessment, with 85th%ile trip rates and average trip rates.

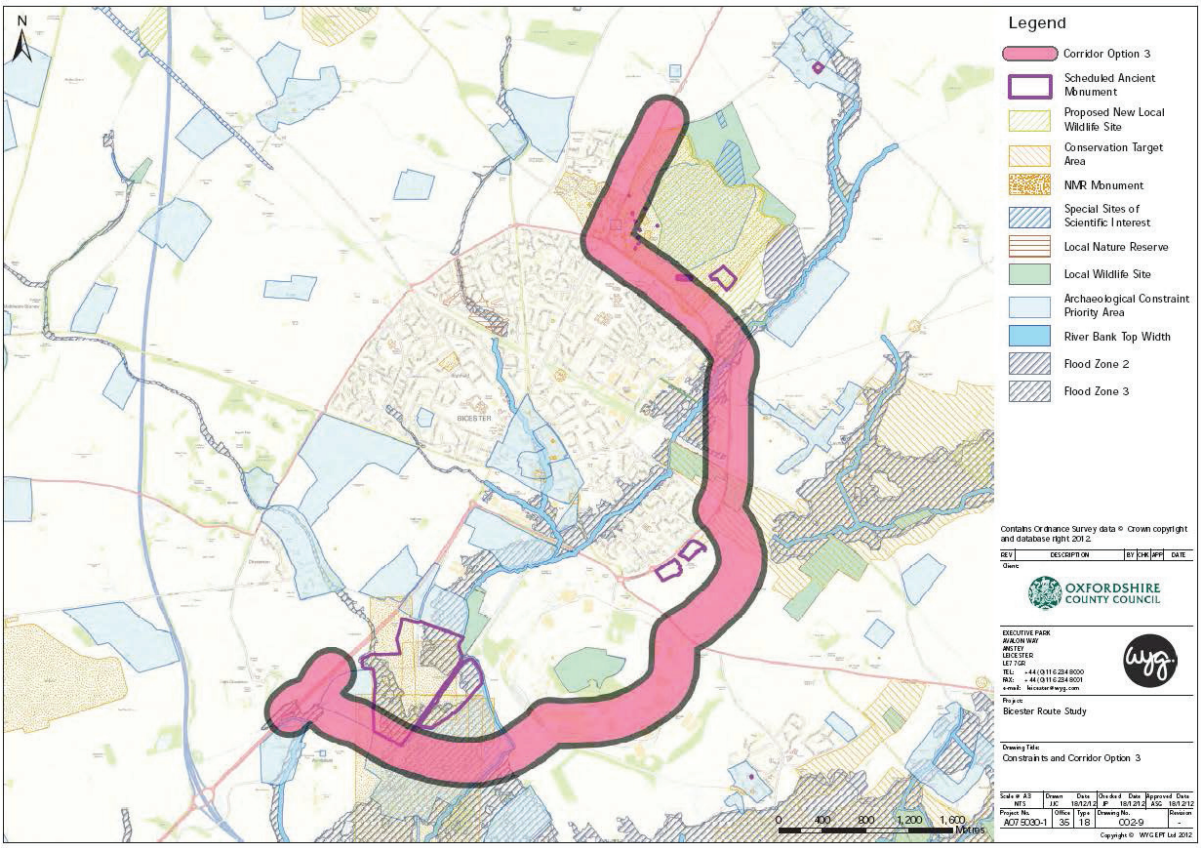
9.5 SE Link Road

A traffic modelling scenario has also been provided which assesses the full NW Bicester (85th%ile) traffic with the introduction of a SE Link Road (as set out in the OCC Bicester Peripheral Routes Study).

Figure 9.1 below shows the indicative route for improvement included in the modelling (the highest performing option in the Peripheral Route Study report was selected whilst recognising that there is not a preferred route). This indicates an improved eastern peripheral road from the A4421 Buckingham Road/ Skimmingdish Lane junction to the Gavray Drive junction and an offline improvement around the Graven Hill development and connecting to the A41 Oxford Road.

The implications of the SE Link Road are discussed further in the following traffic impact and mitigation chapters.

Figure 9.1: SE Link Road Option for Traffic Modelling



9.6 Model Outputs

The results of the Saturn modelling are discussed in Chapter 10 Traffic Impact, but for reference the Bicester Saturn Model outputs are included in appendices. The outputs for the NW Bicester development relate to the full Masterplan development and use the 85th%ile trip rate traffic generation.

Appendix 9.2 contains the Saturn plots showing link flow demand for each of the scenarios, as follows:

- Appendix 9.2a – Base Year 2012 AM Peak
- Appendix 9.2b – Base Year 2012 PM Peak
- Appendix 9.2c – Reference Case 2031 AM Peak
- Appendix 9.2d – Reference Case 2031 PM Peak
- Appendix 9.2e – NW Bicester full development 2031 AM Peak
- Appendix 9.2f – NW Bicester full development 2031 PM Peak

Appendix 9.3 contains the Saturn plots showing the difference between the scenarios as follows:

- Appendix 9.3a - NW Bicester full development scenario minus the Reference Case AM Peak
- Appendix 9.3b - NW Bicester full development scenario minus the Reference Case PM Peak

10 Traffic Impact

10.1 Introduction

This chapter considers the traffic impact on the road network following the completion of the proposed development. For the purposes of this assessment an Opening Year of 2031 has been assessed as this is the available year of the Bicester Saturn Model and the end year of the Cherwell Local Plan, thus meeting the criteria of Circular 02/13.

As discussed in the previous chapter, the modelling work has been undertaken on the full 6,000 homes development. The proportion of traffic generated by the Application 1 development in relation to the overall masterplan has been calculated as 38.14% in the AM peak hour, 41.48% in the PM peak hour and 39.48% in the 12 hour period.

These percentages have been applied to cordon, link and junction flows to identify and assess the impact of the Application development on Reference Case 2031 traffic levels as agreed with OCC and CDC in a meeting on 8th May 2014 and set out in the Scoping Note (see Appendix 1.1).

10.2 Cordon Flows

The twelve cordon locations around Bicester were identified in Chapter 3. The Bicester Saturn Model has provided forecast flows for each scenario and these have been factored by the proportion of traffic generation anticipated from the Application 1 development.

In the 2031 Reference Case (no NW Bicester), a 29% growth in traffic entering and leaving Bicester in the AM peak hour and 31% in the PM peak hour is anticipated by the model, giving 12,282 trips in the AM peak hour and 12,657 in the PM peak hour. Notably in the Reference Case the movements become more 'tidal' with a higher movement inbound in the AM peak and outbound in the PM peak.

In the 2031 with development scenario with the Application 1 development using the 85th%ile trip rates, a further 3.5% growth in the AM peak hour and 2.8% growth in the PM peak hour in traffic entering and leaving Bicester is anticipated by the model, in addition to other traffic growth. In total 420 trips in the AM and 352 trips in the PM entering or leaving Bicester appear to be related to NW Bicester, as this is the level of increase above the Reference Case in 2031.

The traffic generation of the Application 1 development is estimated as 1210 vehicles in the AM Peak and 1282 in the PM peak. The proportion of the NW Bicester traffic generation which makes trips external to Bicester can therefore be estimated as 35% in the AM peak and 27% in the PM peak. The model is therefore forecasting a containment level in 2031 following build out of the Application 1 development higher than the containment target of "less than 40% of trips to be outside of Bicester" (see Chapter 4) although it is low compared to the 52% by car estimated to be outside of Bicester from the Bicester Household Survey 2010. It should be noted that the percentages crossing the cordons are for the peak hours however rather than all day as with the household survey thus it only provides an indication of containment of traffic.

It can be seen from Tables 10.1 and 10.2 that minor increases are anticipated at the majority of cordon locations, with the exception of:

- Wendlebury Road, east of the M40;
- Ardley Road, north of Bucknell;
- Middleton Road, west of Bucknell; and
- B4030 Middleton Stoney Road.

Table 10.1: Change in Cordon Traffic Flows AM Peak

Reference	Name	AM Base Year 2012	AM 2031 No NWB	AM 2031 with Applic 1 Dev	Change in Flow
1	A41 E of M40	2415	2764	2775	0.40%
2	Wendlebury Road, E of M40	331	450	482	7.12%
3	A41, E of A4421 junction	2141	3096	3092	-0.14%
4	Bicester Road, E of A4421 junction	663	421	407	-3.26%
5	A4421 Buckingham Road, N of Skimmingdish Lane Junction	1311	1780	1848	3.81%
6	Fringford Road, N of Caversfield	74	99	101	1.54%
7	B4100 Banbury Road, N of Bainton Road junction	1117	1353	1404	3.81%
8	Ardley Road, N of Bucknell	207	349	403	15.52%
9	Middleton Road, W of Bucknell	27	32	141	339.65%
10	B4030 Middleton Stoney Road, NW of NWB access	556	522	610	16.80%
11	A4095, W of Chesterton	287	805	827	2.70%
12	Green Lane, W of Chesterton	407	611	622	1.87%
	TOTAL	9536	12282	12712	3.50%

Table 10.2: Change in Cordon Traffic Flows PM Peak

Reference	Name	PM Base Year 2012	PM 2031 No NWB	PM 2031 with Applic 1 Dev	Change in Flow
1	A41 E of M40	2602	3043	2959	-2.77%
2	Wendlebury Road, E of M40	207	254	246	-3.27%
3	A41, E of A4421 junction	2378	3018	3039	0.70%
4	Bicester Road, E of A4421 junction	617	580	592	2.07%
5	A4421 Buckingham Road, N of Skimmingdish Lane Junction	1132	1641	1657	0.96%
6	Fringford Road, N of Caversfield	112	188	190	1.32%
7	B4100 Banbury Road, N of Bainton Road junction	1186	1599	1613	0.88%
8	Ardley Road, N of Bucknell	195	533	542	1.63%
9	Middleton Road, W of Bucknell	12	30	212	605.66%
10	B4030 Middleton Stoney Road, NW of NWB access	655	642	803	25.01%
11	A4095, W of Chesterton	204	568	583	2.70%
12	Green Lane, W of Chesterton	360	561	574	2.29%
	TOTAL	9660	12657	13009	2.78%

10.3 Link Impact Analysis

The change in flows on the assessed links (as identified in Chapter 3) based on the anticipated generation of the traffic from the Development has been calculated.

Table 10-3 shows the predicted link flows with and without the Development in 2031. The percentage change on each link in the different time periods is then identified.

It can be seen that for many of the links, the increase as a result of the Application 1 Development over the scenario without the development is minor. There are a number of links however which show an increase in traffic flow of more than 10% in line with the assessment in the ES traffic and transport chapter which are:

- Middleton Stoney Road, west of Howes Lane
- Bucknell Road, south of Howes Lane
- Banbury Road, north and south of Lord's Lane
- Buckingham Road, south of Skimmingdish Lane
- Shakespeare Drive, south of Howes Lane and east of Middleton Stoney Road
- M40 J10 northbound slip road
- Ardley Road, east of B430
- The Approach, west of Bucknell Road
- Ardley Road, north of Bucknell
- Middleton Road, west of Bucknell

Middleton Stoney Road, north west of NW Bicester also shows an increase of 17% in the AM peak and 25% in the PM peak but this in reality will be the same traffic increase as the rest of Middleton Stoney Road as there is no development within Application 1 with access from this link.

Mitigation will be considered for the links in Chapter 11.

Table 10-3 Application 1 (Land North of Railway) Development Flows

Link Ref	Link Description	2031 Future Baseline/ Reference Case Flows		Application 1 Flows		2031 Future Baseline with Application 1 Flows		Percentage Change	
		AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
1	A41 northbound, N of M40 J9	1510	1575	21	-24	1531	1551	1%	-2%
2	A41 southbound, N of M40 J9	1242	1269	-6	22	1236	1291	0%	2%
3	A41 Oxford Rd, S of A41 junction	4324	4016	122	132	4446	4148	3%	3%
4	Vendee Drive, W of A41 junction	757	989	25	88	782	1077	3%	9%
5	A41, N of Pingle Drive	2229	2235	91	94	2320	2329	4%	4%
6	Middleton Stoney Rd, W of Kings End	966	1158	21	78	987	1236	2%	7%
7	Middleton Stoney Rd, W of Howes Lane	519	642	347	408	866	1050	67%	64%
8	Howes Lane, N of Middleton Stoney Rd	1075	1198	-53	-125	1022	1073	-5%	-10%
9	Howes Lane, E of Shakespeare Drive	1077	1173	50	18	1127	1191	5%	2%
10	Lords Lane, E of Bucknell Road	1391	1409	-90	-84	1301	1325	-6%	-6%

Link Ref	Link Description	2031 Future Baseline/ Reference Case Flows		Application 1 Flows		2031 Future Baseline with Application 1 Flows		Percentage Change	
11	Lords Lane, W of Banbury Road	1384	1448	-88	-139	1296	1309	-6%	-10%
12	Bucknell Road, N of Lords Lane	257	432	-45	-112	212	320	-18%	-26%
13	Bucknell Road, S of Howes Lane	516	932	77	33	593	965	15%	4%
14	Banbury Road, N of Lords Lane	1522	1755	50	201	1572	1956	3%	11%
15	A4095 E of Banbury Road	2106	2163	8	53	2114	2216	0%	2%
16	Banbury Road, S of A4095	764	929	126	109	890	1038	17%	12%
17	Buckingham Road, S of Skimmingdish Lane	1258	1252	148	115	1406	1367	12%	9%
18	Queens Avenue, S of Bucknell Road	1998	2109	47	114	2045	2223	2%	5%
19	A41 E of A41 Oxford Road	3505	3447	98	113	3603	3560	3%	3%
20	A4421 Neunkirchen Way	1849	1938	59	88	1908	2026	3%	5%
21	A41, E of London Road roundabout	1969	1632	23	28	1992	1660	1%	2%
22	A4421, E of Skimmingdish Lane	2154	2453	58	134	2212	2587	3%	5%
23	Shakespeare Drive, S of Howes Lane	138	85	54	53	192	138	39%	62%
24	M40 J10 northbound off slip road	759	523	114	72	873	595	15%	14%
25	Ardley Road (E of B430)	364	532	48	9	412	541	13%	2%
26	M40 J10 southbound on slip road (from A43)	565	240	13	-3	578	237	2%	-1%
27	B430 M40 over bridge	2376	2579	11	79	2387	2658	0%	3%
28	A4095 N of Chesterton	1076	976	42	33	1118	1009	4%	3%
29	Shakespeare Drive, E of Middleton Stoney Road	950	873	71	145	1021	1018	7%	17%
30	The Approach, W of Bucknell Road	401	507	153	86	554	593	38%	17%
31	A41 East of Pioneer Road	3075	3009	4	25	3079	3034	0%	1%
23	Bicester Road, E of A4421 junction	421	580	-14	12	407	592	-3%	2%
33	A4421 N of Skimmingdish Lane	1780	1641	68	16	1848	1657	4%	1%
34	Fringford Road, N of Caversfield	99	188	2	2	101	190	2%	1%
35	B4100 Banbury Road, N of Bainton Road	1353	1599	51	14	1404	1613	4%	1%
36	Ardley Road, N of Bucknell	349	533	54	9	403	542	16%	2%
37	Middleton Road, W of Bucknell	32	30	109	182	141	212	340%	606%

Link Ref	Link Description	2031 Future Baseline/ Reference Case Flows		Application 1 Flows		2031 Future Baseline with Application 1 Flows		Percentage Change	
38	B4030 Middleton Stoney Road, NW of NWB	522	642	88	161	610	803	17%	25%
39	Green Lane, W of Chesterton	611	561	11	13	622	574	2%	2%
40	Wendlebury Road, E of M40	450	254	32	-8	482	246	7%	-3%
41	M40 northbound (mainline only), S of J9	4001	4310	12	1	4013	4311	0%	0%
42	M40 southbound (mainline only), S of J9	4387	4077	1	1	4388	4078	0%	0%
43	M40 northbound (mainline only), S of J10 / N of J9	5786	6269	119	63	5905	6332	2%	1%
44	M40 southbound (mainline only), S of J10 / N of J9	5398	4693	16	-2	5414	4691	0%	0%
45	M40 northbound (mainline only), N of J10	5243	6053	11	0	5254	6053	0%	0%
46	M40 southbound (mainline only), N of J10	5877	5133	6	5	5883	5138	0%	0%

10.4 Junction Impact Analysis

Turning movements on junctions across the Bicester town network have been extracted from the Bicester Saturn Model for each scenario. In total this comprises 32 junctions of which 10 are new or replacement junctions proposed as part of the NW Bicester Masterplan and to be delivered by the various developments with Application 1 delivering three new/ replacement junctions. Figure 3.10 at the rear of the document shows the location of the junctions.

Discussions with Oxfordshire County Council and the Highways Agency on 8th May 2014 led to agreement that the change in turning movements should be analysed for all of the junctions as shown in Figure 3.10.

The percentage impact of the Application 1 development on existing junction turning movements has been calculated by apportioning the traffic generation of traffic from Application 1 over that forecast for the full Masterplan through the Saturn modelling.

The following junctions show an increase of close to or more than 5% on the Reference Case 2031 in the AM peak:

- Field Street/ Bucknell Road;
- Banbury Road/ Field Street;
- B4100/ Caversfield unnamed road;
- Howes Lane/ Middleton Stoney Road;
- Middleton Road/ Bainton Road.

The following junctions show an increase of close to or more than 5% (a figure typically used for junctions as potentially being significant) on the Reference Case 2031 in the PM peak:

- A41 Oxford Road/ London Road;

- Middleton Stoney Road/ Kings End;
- A4421 Skimmingdish Lane/ A4095;
- B4100/ Caversfield unnamed road;
- Howes Lane/ Middleton Stoney Road;
- Middleton Road/ Bainton Road.

Table 10.3: Change in Junction Turning Movements AM Peak

Junction	Description	Base Year 2012	Reference Case 2031 No NWB	With Application 1 Dev 2031	% Change
Existing Junctions					
J1 - 10005	M40 Junction 9	1228	1530	1552	1.43%
J1 - 10010	M40 Junction 9	3913	3728	3760	0.86%
J1 - 10185	M40 Junction 9	2559	2650	2669	0.73%
J1 - 10190	M40 Junction 9	3869	3460	3465	0.14%
	Total M40 Junction 9	**11569**	**11368**	**11446**	**0.69%**
J2	A41/ Vendee Drive	2804	3761	3853	2.45%
J3	A41 Oxford Rd/ A41	3237			
J3 - 22205			3817	3933	3.03%
J3 - 22206			2427	2483	2.33%
J3 - 22207			2491	2523	1.29%
	Total A41 Oxford Road/ London Road		**8735**	**8939**	**2.34%**
J4	A41 Oxford Rd/ Pingle Drive	1899	2581	2672	3.53%
J5	Middleton Stoney Rd/ Kings End	1888	2728	2805	2.84%
J6	Field Street/ Bucknell Rd	1612	2749	2876	4.63%
J6B	Queens Avenue/ St John Street	1188	2478	2554	3.06%
J7	Banbury Rd/ Field St	2154	2377	2526	6.29%
J8	A41/ A4421/B4100	3533		0	
J8 - 22270			2508	2574	2.65%
J8 - 22271			2467	2534	2.71%
J8 - 22272			1454	1468	1.00%
J8 - 22273			1967	1993	1.30%
J8 - 22274			2203	2245	1.90%
	Total A41/ A4421/ B4100 Junction		**10599**	**10814**	**2.03%**
J9	A4421/ Peregrine Way	1536	2151	2222	3.28%
J10	Charbridge Lane/ Gavray Drive	1108	3278	3397	3.64%
J11	A4421/ Bicester Road	1668	3551	3655	2.94%
J12	A4421/ Launton Road	1969	3680	3783	2.80%
J13	Skimmingdish Lane/ Buckingham Rd	2665	3620	3713	2.57%
J14	B4100 Banbury Road/ A4095 Lord's Lane	2284	2888	2936	1.66%
J16	B4100/ Caversfield	1210	1773	1905	7.45%
J19	Lord's Lane/ Bucknell Road	1128	1585	1160	-26.80%
J20	Howes Lane/ Bucknell Road	1215	1704	1420	-16.67%
J23	Howes Lane/ Middleton Stoney Rd/ Vendee Dr	1481	1973	2288	15.97%
J26	M40 Junction 10, western rbt	2287	2477	2498	0.86%
J27	M40 Junction 10, south eastern rbt	2185	3752	3757	0.12%
J28	M40 Junction 10, northern rbt	3185	3487	3498	0.31%
J29	Middleton Road/ Bainton Road	265	451	544	20.67%

Table 10.4: Change in Junction Turning Movements PM Peak

Junction	Description	Base Year 2012	Reference Case 2031 No NWB	With Application 1 Dev 2031	% Change
Existing Junctions				0	
J1 - 10005	M40 Junction 9	1518	1570	1548	-1.38%
J1 - 10010	M40 Junction 9	4069	3370	3361	-0.27%
J1 - 10185	M40 Junction 9	2509	2177	2200	1.04%
J1 - 10190	M40 Junction 9	3664	3063	3099	1.19%
	Total M40 Junction 9	**11760**	**10180**	**10208**	**0.28%**
J2	A41/ Vendee Drive	2675	4142	4084	-1.39%
J3	A41 Oxford Rd/ A41	3133			
J3 - 22205			3339	3663	9.70%
J3 - 22206			2230	2373	6.42%
J3 - 22207			2416	2482	2.73%
	Total A41 Oxford Road/ London Road		**7985**	**8518**	**6.68%**
J4	A41 Oxford Rd/ Pingle Drive	2056	2624	2705	3.10%
J5	Middleton Stoney Rd/ Kings End	2021	2839	2964	4.40%
J6	Field Street/ Bucknell Rd	1709	2977	3084	3.59%
J6B	Queens Avenue/ St John Street	1734	2853	2940	3.06%
J7	Banbury Rd/ Field St	2042	2635	2691	2.11%
J8	A41/ A4421/B4100	3817			
J8 - 22270			2025	2298	13.46%
J8 - 22271			2081	2314	11.18%
J8 - 22272			2400	2023	-15.69%
J8 - 22273			2255	2163	-4.07%
J8 - 22274			2008	2135	6.30%
	Total A41/ A4421/ B4100 Junction		**10769**	**10932**	**1.52%**
J9	A4421/ Peregrine Way	1959	2435	2394	-1.69%
J10	Charbridge Lane/ Gavray Drive	1350	3718	3665	-1.42%
J11	A4421/ Bicester Road	1779	4068	3967	-2.48%
J12	A4421/ Launton Road	2161	4447	4241	-4.64%
J13	Skimmingdish Lane/ Buckingham Rd	2748	3669	3902	6.35%
J14	B4100 Banbury Road/ A4095 Lord's Lane	2461	3145	3257	3.58%
J16	B4100/ Caversfield	1284	1904	2177	14.32%
J19	Lord's Lane/ Bucknell Road	1247	1806	1298	-28.11%
J20	Howes Lane/ Bucknell Road	1215	1704	1395	-18.13%
J23	Howes Lane/ Middleton Stoney Rd/ Vendee Dr	1455	2032	2374	16.81%
J26	M40 Junction 10, western rbt	1650	2817	2886	2.45%
J27	M40 Junction 10, south eastern rbt	2247	2857	2979	4.29%
J28	M40 Junction 10, northern rbt	2379	3095	3180	2.73%
J29	Middleton Road/ Bainton Road	252	606	683	12.70%

10.5 Summary

This chapter has provided an overview of the percentage impacts of the Application 1 development on cordon flows, link flows and junction turning movements.

Assessment of how the development is anticipated to impact on network capacity is set out in Chapter 11, together with proposals for mitigation.

11 Network Capacity Assessment and Mitigation

11.1 Overview

The traffic impact of the Application 1 development was set out in Chapter 10. This is based on the traffic generation of the land north of the railway.

An assessment of the capacity of the network to accommodate the full NW Bicester 6,000 homes development has been undertaken and is the focus of this chapter. As such it provides context for Application 1. This includes detailed assessments of a range of junctions. The impact of additional traffic on proximate communities has been considered, together with the strategic impacts on the east side of Bicester and the motorway junctions. Highway and other improvements required to mitigate the overall impacts are discussed. The analysis and mitigation discussion in this chapter addresses the areas in turn as below.

Proposed Highway Infrastructure and Junctions:

- A4095 Strategic NW Link Road;
- NW Bicester access junctions;

Existing Network:

- Town network off-site junctions;
- Bucknell village;
- Shakespeare Drive area;
- Caversfield village;
- Eastern peripheral route; and
- M40 J9 and J10.

A summary of the potential mitigation and/or contributions to wider improvements is provided at the end of the chapter. It is recognised that there is a need for further work on improvements in conjunction with OCC, noting that the package of overall Bicester transport improvements is currently being confirmed by OCC for the Local Plan and this has not been available to fully inform mitigation for the NW Bicester development. Therefore, an addendum will be submitted once this information on the wider improvements has been issued by OCC.

It is envisaged that the developer of the Application 1 development will be responsible for meeting a proportionate level of this package of mitigation.

It should be emphasised that the Reference Case 2031 traffic is included in each case which includes all committed and planned developments up to and beyond the Local Plan level. The need for mitigation if the other growth was not taking place needs to be taken into account when considering appropriate measures.

11.2 A4095 Strategic NW Link Road

It is proposed that the NW Bicester development will deliver a new A4095 NW Strategic Link Road for Bicester which will address traffic movement and highway constraint issues which have long been an issue for the town. The link road will provide a new, straight underpass of the railway line, removing the constraint of the skewed bridge and

junctions on each side. It will connect to the B4030 Vendee Drive, providing a continuous good standard link from the A41 to the B4100 Banbury Road.

11.2.1 Link Capacity

The proposed Strategic NW Link Road is designed as a 7.3m wide single carriageway route, with a speed limit of 30mph, no frontage access and limited access points. The capacity of the link has been assessed in relation to DMRB Vol 5.1 TD 79/99 road types. It is considered that it would be a UAP2 good standard single carriageway.[7]

This category of road has a capacity of 1470 vehicles in one direction, with the main direction assumed to represent 60% of two way traffic. The two-way capacity is therefore 2450. The link road is forecast to carry the level of traffic as set out in Table 11.1 in each scenario. This demonstrates that the new link provides adequate capacity for the forecast traffic flows with full traffic growth and all Bicester development traffic to meet existing deficiencies plus accommodated planned growth.

Table 11.1: Strategic NW Link Road Forecast Traffic 2031 Full Development

Ref.	Description	2031 Full Development	
		AM	PM
8	New Link, North of Middleton Stoney Rd	935	896
9	New Link, East of Shakespeare Drive	1209	1216
10	New Link, East of Bucknell Road	1155	1206
11	Lords Lane, West of Banbury Road	1152	1112

11.2.2 Junction Capacity

Junction assessments of all the proposed new junctions on the new Strategic NW Link Road have been undertaken using standard industry software (LinSig3, Arcady, Picady) for the full 6,000 home development and designed accordingly.

Some of these junctions would not be implemented as part of Application 1, nor be impacted by traffic movements, but are included in this section to provide a complete analysis.

The results are reported in Tables 11-2 to 11-3, below. This includes the Howes Lane/ Middleton Stoney Road roundabout as it will be revised to accommodate the new link. The junctions are reported in consecutive order from the Howes Lane/ Middleton Stoney Road junction in the west to the junction of the new link with the old Lord's Lane in the east.

[7] http://www.dft.gov.uk/ha/standards/dmrb/vol5/section1/ta7999.pdf

Table 11-2: Revised Howes Lane/ Middleton Stoney Road Roundabout with Development 2031 ARCADY model results (J23)

	AM		PM	
	RFC	Queue	RFC	Queue
B4030 Northwest	0.76	3.1	0.712	2.4
Howes Lane	0.601	1.5	0.722	2.5
Middleton Stoney Road	0.585	1.4	0.678	2.1
B4030 Vendee Drive	0.716	2.5	0.565	1.3

RFC = Ratio of Flow to Capacity. 0.85 or less means it is operating within capacity.

Table 11-3: Proposed Site Access (Junction 22) with Development 2031 LinSig model results

	AM		PM	
	DoS	Queue	DoS	Queue
New Link Road(W)	42.0%	6.8	34.3%	5.3
Site Access	26.8%	1.1	42.2%	1.9
New Link Road(E)	65.0%	9.5	55.6%	9.2

DoS = Degree of Saturation (90% or less means it is operating within capacity)

Table 11-4: Proposed Site Access (Junction 30) with Development 2031 LinSig model results

	AM		PM	
	DoS	Queue	DoS	Queue
Site Access	16.8%	0.7	0%	0
New Link Road East	43.8%	6.5	43.8%	6.5
New Link Road West	47.2%	7.2	41.3%	6

Table 11-5: Proposed Site Access (Junction 21) with Development 2031 LinSig model results

	AM		PM	
	DoS	Queue	DoS	Queue
Site Access	69.2%	11.9	47.1%	5.6
New Link Road East	69.6%	11.4	72.9%	14
Access to Bicester	43.2%	6.3	72.5%	9.6
New Link Road West	61.4%	10.1	42.2%	6.8

Table 11-6: Proposed Site Access/ Busway (Junction 31) with Development 2031 LinSig model results

	AM		PM	
	DoS	Queue	DoS	Queue
Site Access	79.2%	10.3	69.3%	8.7
New Link East	42.5%	6.8	69.3%	12.8
Busway	1.1%	0.1	1.1%	0.1
New Link West	80.2%	20.4	69.1%	14.6

Table 11-7: Proposed New Link/ Lord's Lane (Junction 18) with Development 2031 LinSig model results

	AM		PM	
	DoS	Queue	DoS	Queue
Site Access	59.8%	4.6	72.4%	7.2
Lord's Lane East	51.6%	6.2	74.3%	12.8
New Link Road West	59.8%	10	43.4%	5.7

The modelling for the proposed junctions along the A4095 NW Strategic Link Road predicts that all junctions will operate well under capacity with all the proposed growth of the town as well as the full NW Bicester development flows. The modelling output files are included in Appendix 11.1.

11.3 NW Bicester Access Junctions

The NW Bicester development will be served by five junctions from the existing road network: two from Middleton Stoney Road, one from Lord's Lane and two from Banbury Road. These have been modelled with the full NW Bicester development. As with the new link junctions, some of these junctions would not be provided or impacted upon as a result part of Application 1 but are included in this section to provide a complete analysis.

11.3.1 Exemplar Site Junctions

The junctions proposed for the Exemplar development will be subject to additional traffic from an increase in the Reference Case 2031 flows on the B4100 Banbury Road together with additional NW Bicester traffic from the eastern side of the Masterplan. The southern access junction (15) is shown to be over capacity as a priority junction with the full Masterplan development, largely due to the volume of traffic on Banbury Road leading to delays for traffic turning out of the development, with a queue of approximately 72 vehicles developing within the site.

Table 11-8: Exemplar Site Southern Access with Development 2031 PICADY model results (J15)

	AM		PM	
	RFC	Queue	RFC	Queue
B4100 South	-	-	-	-
Southern Access	0.698	2	**2.683**	**71.84**
B4100 North	0.016	0	0.639	1.65

Table 11-9: Exemplar Site Northern Access with Development 2031 PICADY model results (J32)

	AM		PM	
	RFC	Queue	RFC	Queue
B4100 South	-	-	-	-
Northern Access	0.578	1.34	**0.865**	**5.07**
B4100 North	0.016	0.02	0.067	0.07

Given the capacity of the priority junction to accommodate the full NW Bicester development traffic, alternative junction configurations have been examined. A signalised junction appears to provide the best performance, while also providing good pedestrian facilities across the junction. Tables 11-10 and 11-11 show the results from the LINSIG modelling of a signalised junction at this location. This demonstrates that a signalised junction would provide sufficient capacity to accommodate the forecast traffic flows. Detailed testing of the priority junction layout has indicated it could accommodate 75% of the full Development traffic before requiring an upgrade to a signalised junction layout. As such it will not be required until a point in time towards the end of the build out of the development..

Table 11-10: Exemplar Site Southern Access Signalised Junction, with full Development 2031 LinSig results AM Peak

	Full Development	
	DoS	Queue
A4100 North	54.6%	9.7
Side Road	58.1%	4.5
A4100 South	59%	7.0

Table 11-11: Exemplar Site Southern Access Signalised Junction, with full Development 2031 LinSig results PM Peak

	Full Development	
	DoS	Queue
A4100 North	45.5%	6.7
Side Road	64.9%	4.1
A4100 South	0.834	8.5

11.3.2 Lord's Lane/ Site Access/ Germander Way

A proposed four arm traffic signalised junction as a replacement to the priority junction at Germander Way has been modelled and operates well within capacity. The results from LinSig are shown in Table 11-12.

Table 11-12: Lord's Lane/ Site Access/ Germander Way with Development 2031 LinSig model results (J17)

	AM		PM	
	DoS	Queue	DoS	Queue
A4095 West	72.8%	13.2	50.2%	7.8
A4095 East	33.5%	4.5	51.8%	8.2
Germander Way	73.0%	0.4	15.3%	0.4
New Site Access	70.6%	5.3	34.2%	1.5

11.3.3 Middleton Stoney Road Site Access

Two junctions have been modelled as priority junctions with right turning facilities for the full Masterplan on Middleton Stoney Road, to the north-west of Howes Lane. Both operate well within capacity.

Table 11-13: Site Access South from Middleton Stoney Road with Development 2031 PICADY model results (J24)

	AM		PM	
	RFC	Queue	RFC	Queue
B4030 West	-	-	-	-
New Development Access	0.139	0.16	0.35	0.53
B4030 East	0.29	0.4	0.056	0.06

Table 11-14: Site Access North from Middleton Stoney Road with Development 2031 PICADY model results (J25)

	AM		PM	
	RFC	Queue	RFC	Queue
B4030 West	-	-	-	-
New Development Access	0.649	1.8	0.492	0.96
B4030 East	0.388	0.6	0.447	0.83

11.4 Town Network Off-Site Junctions

11.4.1 Overview

The methodology for off-site junctions has been to consider the impact of the full NW Bicester development on a number of key junctions and areas of the town, as agreed with OCC. It is expected that any mitigation required will then be agreed for the full NW Bicester Masterplan and apportioned to the individual applications in relation to the scale of traffic generation, the level of impact of NW Bicester on the junctions and the in combination effects arising from planned growth.

On the basis of the discussion with OCC a number of other junctions in the town have been assessed (as listed in Table 11.15) in the future year 2031 with and without the full 6,000 NW Bicester development.

Table 11-15: Town Network Off-Site Junctions

Ref.	Description
J6	Field Street/ Bucknell Rd/ Banbury Road
J13	A4421 Skimmingdish Lane/ Buckingham Rd
J14	B4100 Banbury Road/ A4095 Lord's Lane
J16	B4100/ Caversfield unnamed road
J19	Lord's Lane/ Bucknell Road
J20	Howes Lane/ Bucknell Road

It is important to note that in each case the full growth of Bicester is included – all committed and planned development in the Reference Case 2031 and then the full 6,000 home NW Bicester development is added to the Reference Case for the full NW Bicester scenario in 2031. As such this is the worst case of maximum development.

Each of the junctions is discussed in turn in the following sections. Where capacity issues are identified, potential mitigation is discussed.

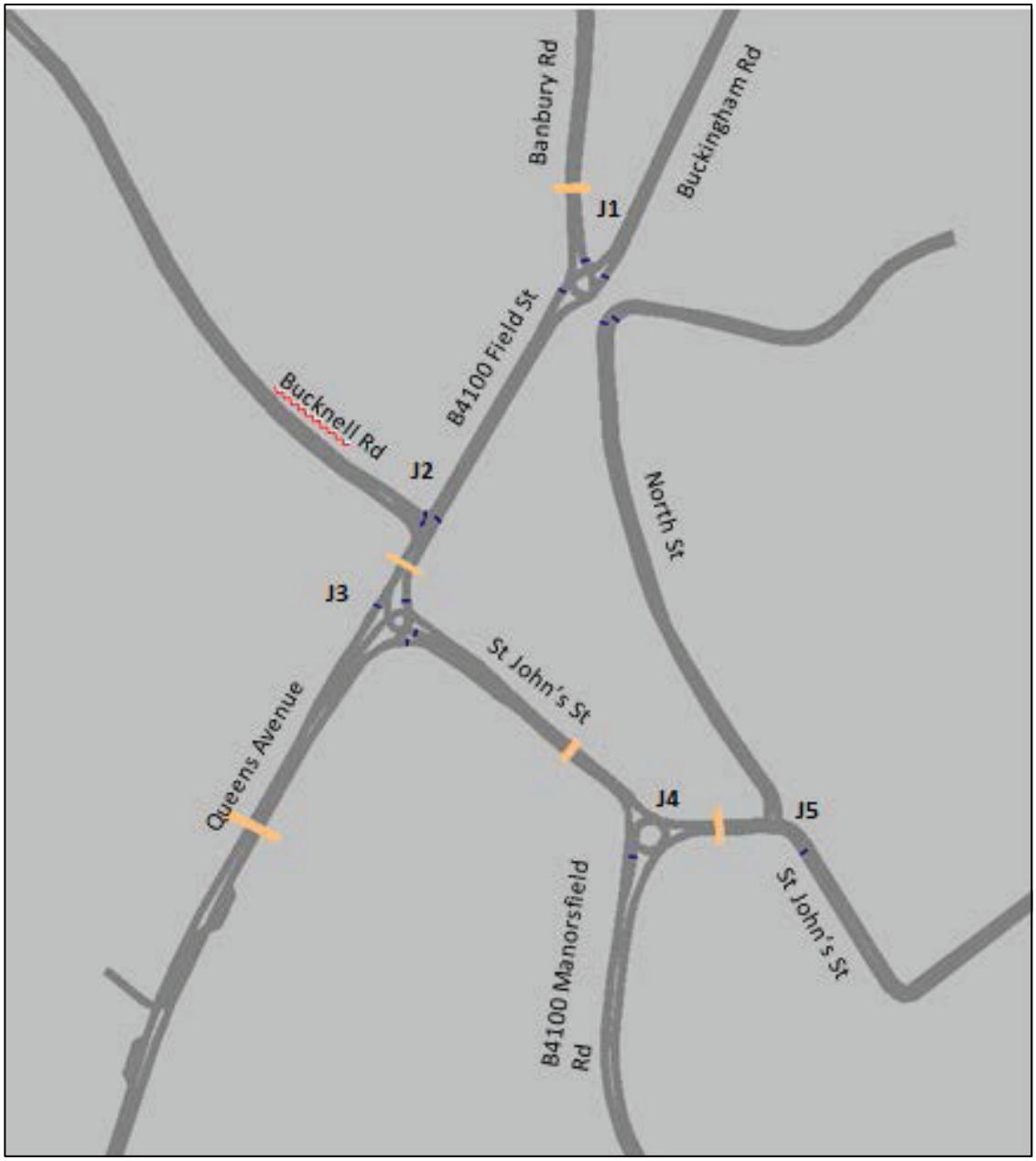
11.4.2 Town Centre Junctions (including J6)

For assessment of the town centre junctions of Field Street, Banbury Road, Bucknell Road and Manorsfield Road, which are all in close proximity, Hyder has had access to the County's Vissim model developed for the recent town centre improvements.

The Vissim model has been used to assess the impact of the full NW Bicester development on five junctions in the town centre and enable solutions to be investigated to accommodate traffic growth. Figure 11-1 shows the extent of the town centre model with the existing layout as recently implemented.

The Vissim model has been used to test the Reference Case 2031 and the full NW Bicester Development 2031. The traffic flows tested in each scenario are included in Appendix 11.3.

Figure 11-1: Town Centre Vissim Model Network



To provide the context to the town centre modelling, substantial increases in traffic in the Reference Case 2031 are forecast by the Bicester Saturn Model. For example the Field Street/ Bucknell Road junction is expected to increase by 70.5% from the Base Year 2012 to the Reference Case 2031 in the AM peak and 74.2% in the PM peak. The full NW Bicester development leads to a further 12.1% on the Reference Case in the AM peak and 8.6% in the PM peak. The modelled traffic flows are therefore 91.2% higher in the AM peak and 89.2% in the PM peak at this particular junction but only a minor proportion are related to NW Bicester.

The results show that in the Reference Case 2031 there is an overall delay of vehicles across the network of 275 hours and 293 hours for the AM and PM peak hours respectively. In the full NW Bicester Development scenario, overall delays increase to 303 hours and 313 hours respectively. The delays per vehicle are set out in Tables 11-16 and 11-17 on each link.

Tables 11-16 and 11-17 show the queues and delays on links in the AM and PM peak hours, comparing the full NW Bicester development flows to the Reference Case in 2031. It can be seen that with the Reference Case there are substantial queues particularly in the AM peak hour on Buckingham Road (24 vehicles) and Bucknell Road (49) and in the PM peak hour on Banbury Road (106 vehicles), Buckingham Road (42), Bucknell Road (51) and Manorsfield Road (27). With the full NW Bicester development, queues increase particularly on Banbury Road (to 108 vehicles) and Manorsfield Road (to 41 vehicles) in the AM peak but show improvement on some links in the PM peak (e.g. a reduction on Banbury Road from 106 to 85 vehicles).

Table 11-16: Comparison of Reference Case 2031 and Full NW Bicester Development Vissim Model Results – Vehicle Queues and Delay per Vehicle – AM Peak Hour

		Reference Case 2031		Full NW Bicester 2031	
Road Name	**Mvt**	**Queue (veh)**	**Delay (s)**	**Queue (veh)**	**Delay (s)**
Banbury Road	Left	1	5	108	5
Banbury Road	Right	1	17	108	17
Buckingham Road	Right	24	4	38	4
Buckingham Road	Straight	24	12	38	12
B4100 Field Street	Left	0	1	0	1
B4100 Field Street	Straight	0	1	0	1
Bucknell Road	Left	49	17	52	17
Bucknell Road	Right	48	59	52	59
B4100 Field Street	Right	8	17	10	17
B4100 Field Street	Straight	9	10	10	10
Queens Avenue	Left	1	0	1	0
Queens Avenue	Straight	1	2	1	2
B4100 Field Street	Left	1	2	1	2
B4100 Field Street	Straight	1	2	1	2
St John's Street	Right	1	9	10	9
St John's Street	Left	0	3	0	3
Queens Avenue	Right	0	5	2	5
Queens Avenue	Straight	1	8	10	8
St John's Street EB	Straight	0	0	0	0
St John's Street EB	Right	0	1	0	1
St John's Street WB	Straight	0	3	4	3
St John's Street WB	Left	0	2	4	2
B4100 Manorsfield Road	Right	0	1	40	1
B4100 Manorsfield Road	Left	0	1	41	1
North Street	Left	0	0	17	0
North Street	Right	0	1	17	1
St John's Street EB	Right	0	0	18	0
St John's Street EB	Straight	0	1	0	1
St John's Street WB	Left	0	0	0	0
St John's Street WB	Straight	0	0	0	0

Table 11-17: Comparison of Reference Case 2031 and Full NW Bicester Development Vissim Model Results – Vehicle Queues and Delay per Vehicle – PM Peak Hour

		Reference Case 2031		Full NW Bicester 2031	
Road Name	Mvt	Queue (veh)	Delay (s)	Queue (veh)	Delay (s)
Banbury Road	Left	106	8	85	5
Banbury Road	Right	106	29	85	20
Buckingham Road	Right	42	13	42	5
Buckingham Road	Straight	42	28	42	17
B4100 Field Street	Left	0	1	0	1
B4100 Field Street	Straight	0	2	0	1
Bucknell Road	Left	51	20	51	14
Bucknell Road	Right	51	63	51	56
B4100 Field Street	Right	13	36	12	22
B4100 Field Street	Straight	13	13	12	10
Queens Avenue	Left	1	0	1	0
Queens Avenue	Straight	1	2	1	2
B4100 Field Street	Left	1	3	1	2
B4100 Field Street	Straight	1	2	1	1
St John's Street	Right	5	8	6	9
St John's Street	Left	0	2	0	3
Queens Avenue	Right	1	15	1	9
Queens Avenue	Straight	10	17	10	10
St John's Street EB	Straight	0	2	0	2
St John's Street EB	Right	0	2	0	2
St John's Street WB	Straight	2	9	2	8
St John's Street WB	Left	2	3	2	3
B4100 Manorsfield Road	Right	26	9	29	4
B4100 Manorsfield Road	Left	27	15	29	9
North Street	Left	2	0	3	0
North Street	Right	2	6	3	3
St John's Street EB	Right	3	0	3	0
St John's Street EB	Straight	0	3	0	1
St John's Street WB	Left	0	0	0	0
St John's Street WB	Straight	0	0	0	0

Given the forecast delays on the network in both the full NW Bicester development and the Reference Case in 2031, various signalised junction options have been looked at for the town centre.

The first option consisted of signalising both Bucknell Road/ Field Street and St John's St/Field Street junctions including pedestrian crossings on all arms and a short reservoir to allow traffic turning from the centre of the junction. The alignment of both Bucknell Road and St John's St is staggered by about 20 metres.

The results of the LinSig model showed that the internal reservoir was full and the junction did not function effectively. The lack of space on Bucknell Road does not allow much flexibility with the junction layout particularly for the movement of buses and HGV's out of Bucknell Road. As a consequence of these movements the stop lines had to be located a long way away from the centre of the junction and the intergreens have increased greatly at this junction. A reduction of 60% of the traffic flows was needed to keep the degree of saturation flow under 100%.

A second signalised option was tested which included the removal of the internal reservoir and model the junction with one controller and with all round pedestrian crossings. This option did not perform as well as the first option with a longer and higher degree of saturation on each approach. The traffic would have to be more than 60% less in order for it to work.

These two options were tested in Vissim and it was observed that the model would get congested 15 minutes into the model running time instead of 45 minutes for the existing model. On this basis it was concluded that the existing arrangements perform better than signalised alternatives.

A sensitivity test has been undertaken to assess the level of traffic that can be accommodated before queuing becomes unacceptable with the existing layout. A reduction of 40% of the full NW Bicester scenario flows would be needed to maintain acceptable levels of traffic delays (or approximately 35% on the Reference Case flows). The overall delay per vehicles drops to 71 hours and 133 hours with this reduction in the AM and PM peak hours. Based on the Bucknell Road/ Field Street junction flows, this indicates that the existing arrangements could operate with an additional 14.8% traffic in the AM peak and 13.5% in the PM peak. As such the full NW Bicester development traffic could be accommodated in the town centre if the other traffic growth was not included.

The analysis shows that alternative layouts do not offer a better solution to accommodate all of the traffic growth in the town centre compared to the new layout that are forecast by 2031, and that the majority of the additional traffic is due to other developments rather than the full NW Bicester scheme. Moreover, the Application 1 development would have a relatively minor impact on the town centre by itself, representing only 39.5% of NW Bicester traffic in the 12 hour period, giving 4.6% growth on the Reference Case in the AM peak and 3.6% in the PM peak at the Bucknell Road/ Field Street junction for example.

The impact on bus movements of increased delays is an area for concern and solutions to be developed will need to focus on those improvements which will benefit bus movements.

The potential issues in the town centre highlight the need to achieve a high share of trips by sustainable modes for NW Bicester but also other developments in the town. There is a need to consider town centre movements in the context of studies for the eastern peripheral routes and wider development of the town and this will be further discussed with OCC once the current work for the Local Plan is made available.

11.4.3 A4421 Skimmingdish Lane/ Buckingham Road (J13)

The A4421 Skimmingdish Lane junction is a four arm roundabout to the north of Bicester. Tables 11-18 and 11-19 below show the ARCADY modelling results of this junction with Base Year, Reference Case and full NW Bicester development flows in the AM and PM peak hours. A scheme of minor modifications to increase the capacity of the junction has been agreed as part of the Exemplar development. The scheme involves widening to the eastern and northern arms to incorporate three lane entries, along with increasing the western arm approach to provide wider lanes. The modelling for 2031 incorporates these changes.

Table 11-18: A4421 Skimmingdish Lane/ Buckingham Road ARCADY model results AM Peak Hour (J13)

	Base Year 2012		Reference Case 2031		With Full Development 2031	
	RFC	Queue	RFC	Queue	RFC	Queue
A4421 Skimmingdish Lane	0.375	0.6	0.353	0.5	0.438	0.8
Buckingham Road	0.215	0.3	0.557	1.3	0.707	2.4
A4095 West	0.764	3.2	0.867	6.3	**1.007**	37.9
A4421 North	0.541	1.2	0.881	7.0	**0.933**	11.4

Table 11-19: A4421 Skimmingdish Lane/ Buckingham Road ARCADY model results PM Peak Hour (J13)

	Base Year 2012		Reference Case 2031		With Full Development 2031	
	RFC	Queue	RFC	Queue	RFC	Queue
A4421 Skimmingdish Lane	0.802	4	**0.953**	16.2	**1.175**	251.2
Buckingham Road	0.393	0.7	0.810	4.1	**0.979**	20.0
A4095 West	0.341	0.5	0.285	0.4	0.400	0.7
A4421 North	0.479	0.9	0.688	2.2	0.751	3.0

The ARCADY modelling results of the existing layout show the model predicted to operate over capacity in both the AM and the PM Reference Case in 2031 with the A4421 North operating over capacity in the AM peak with a queue length of 7 vehicle and the A4421 Skimmingdish Lane approach predicted to operate in the PM peak with a queue of 16 vehicles.

The modelling with the full NW Bicester development leads to an increase in delays with the A4095 West and A4421 North approaches operating over capacity in the AM peak with queue lengths of 38 and 11 vehicles respectively. In the PM peak model the A4421 Skimmingdish Lane approach and Buckingham Road are predicted to operate over capacity with a predicted queue length of 251 vehicles and 20 vehicles respectively.

Given the capacity issues consideration has been given to junction modifications which would be able to accommodate the traffic volumes indicated.

To improve capacity at the A4095/ A4421 Skimmingdish Lane junction an initial proposal has been modelled to demonstrate the type of junction arrangement that would be required to accommodate the level of flow generated in future years. Two junction designs were tested; a crossover type signal controlled junction and a signalised roundabout.

A signalised roundabout appears to provide adequate capacity at the location for forecast traffic demands. This would require an increase in the diameter of the roundabout from 49m to approximately 75m in order to include sufficient internal reservoirs. To achieve this is likely to require land outside of the highway boundary.

A signalised junction was tested, and would be similar in scale to that proposed for the B4100 Banbury Road/ A4095 junction (Junction 14 in Figure 3.10), however the junction failed to provide adequate capacity for forecast demand at this location.

The proposed minor modifications to the junction configuration gives a capability to support an increase over the base year flows before it is over-capacity and therefore further improvements may not be needed until the medium term. For context, the issues at this junction are exacerbated by the NW Bicester development flows but the increase in traffic as part of the Reference Case in 2031 is already substantial at 36% in the AM peak hour and 34% in the PM peak hour. This compares to a 6.7% increase from the full NW Bicester development in the AM peak hour and 15.3% in the PM peak hour. As such the NW Bicester development could be accommodated if the cumulative impacts of all other growth in the town were not being taken into account.

The junction forms part of the eastern peripheral route being considered for improvement by OCC. Any improvements required for the junction need to be brought forward in the wider context of the eastern peripheral route. It is proposed that further dialogue with the County Council on appropriate solutions for this junction and the timing of improvements once the current work for the Local Plan is made available.

11.4.4 A4095/ B4100 Banbury Road (J14)

The A4095/ B4100 Banbury Road junction is a four arm roundabout to the north of Bicester. Tables 11-20 and 11-21 show the ARCADY modelling results of this junction with Base Year, Reference Case and full NW Bicester development flows.

Table 11-20: A4095/ B4100 Banbury Road ARCADY model results AM Peak Hour (J14)

	Base Year 2012		Reference Case 2031		With Full Development 2031	
	RFC	Queue	RFC	Queue	RFC	Queue
B4100	0.478	0.9	0.704	2.3	0.709	2.4
A4095 (East)	0.441	0.8	0.605	1.5	0.634	1.7
Banbury Road	0.365	0.6	0.436	0.8	0.602	1.5
A4095 (West) Left	0.102	0.1	0.216	0.3	0.125	0.1
A4095 (West) Ahead Right	0.636	1.7	0.778	3.4	**1.061**	**56.5**

Table 11-21: A4095/ B4100 Banbury Road ARCADY model results PM Peak Hour (J14)

	Base Year 2012		Reference Case 2031		With Full Development 2031	
	RFC	Queue	RFC	Queue	RFC	Queue
B4100	0.402	0.7	0.553	1.2	0.654	1.9
A4095 (East)	0.555	1.2	0.794	3.8	0.897	8.1
Banbury Road	0.351	0.5	**1.038**	**31.4**	**1.543**	**229.0**
A4095 (West) Left	0.144	0.2	0.314	0.5	0.184	0.2
A4095 (West) Ahead Right	0.791	3.7	0.849	5.2	0.871	6.1

The ARCADY modelling results of the existing layout show the junction operating over capacity in the PM peak hour Reference Case 2031 on the Banbury Road approach with queues of up to 31 vehicles. With the full NW Bicester development flows the A4095 (West) arm operates over capacity with predicted queues of up to 57 vehicles and in the PM peak Banbury Road operates significantly over capacity with queues predicted of 229 vehicles.

To improve capacity at the A4095/ B4100 Banbury Road junction a theoretical arrangement has been developed to demonstrate the type of junction arrangement that would be required to accommodate the level of flow generated in future years either with or without the NW Bicester development. This would involve a traffic signalised junction as a potential replacement to the existing roundabout.

A layout would need to incorporate two lanes on both the A4095 approaches with flares at junction to provide four lanes. The B4100 approach would be one lane widening to three lanes at the stop-line and the Banbury Road approach would be one lane widening to two at the stop-line. There would need to be widening to two lanes on exit from the roundabout on Banbury Road north of the junction. The feasibility of this in terms of accommodation within the highway boundary and providing footways will be the subject of more detailed consideration. Table 11.22 shows the LinSig modelling results of this junction with AM and PM peak full NW Bicester development flows.

Table 11-22: Banbury Road/ A4095 Junction Possible Layout Results with Full NW Bicester Development flows (results show highest values per lane for each approach)

	AM Peak		PM Peak	
	DoS	Queue	DoS	Queue
B4100	77.3%	8.7	74.3%	7.9
A4095 (East)	72.4%	4.9	88.0%	7.7
Banbury Road	58.9%	4.5	86.6%	10.8
A4095 (West)	75.3%	6.9	75.5%	5.4

The LinSig modelling results of the possible junction layout show the model operating under capacity in both the AM and PM peak hours with the full NW Bicester development flows. The B4100 has the highest degree of saturation (DoS) in the AM peak with a DoS of 77.3% with a corresponding queue length of 9 PCUs (passenger car units). The A4095 (East) has the highest degree of saturation in the PM peak with a DoS of 88.0% with a corresponding queue length of 8 PCUs.

The modelling assessment has indicated that the existing junction would be capable of accommodating 33% of the increase in traffic, in the AM peak period. However, any more than 33% of the development traffic would cause the junction to become over-capacity. At that point the replacement of the existing roundabout with traffic signals potentially offers a solution to accommodate further growth.

11.4.5 B4100 Banbury Road / Caversfield (J16)

The junction of the B4100 with the unnamed road to Caversfield has been assessed given the increase in traffic flows on the B4100 at this location together with the existing cluster of accidents in the vicinity of the junction. The results for the Reference

Case and full NW Bicester development scenario models are shown in Tables 11-23 and 11-24, below, for the AM and PM peak periods, respectively.

Table 11-23: B4100 Banbury Road/ Caversfield PICADY Model Results AM Peak (J16)

	Reference Model		Full Development	
	RFC	Queue	RFC	Queue
A4100 North	-	-	-	-
Side Road	0.391	0.63	0.32	0.5
A4100 South	0.099	0.2	0.2	0.5

Table 11-24: B4100 Banbury Road/ Caversfield PICADY Model Results PM Peak (J16)

	Reference Model		Full Development	
	RFC	Queue	RFC	Queue
A4100 North	-	-	-	-
Side Road	0.704	2.3	1.268	78.9
A4100 South	0	0	0.167	0.05

The junction operates satisfactorily in both scenarios in the AM peak period, however it becomes over-capacity in the PM peak period, with a queue of approximately 79 vehicles indicated on the side road. Given that the side road is a narrow, effectively single-track road and there is an existing accident issue at the junction, there is a need for mitigation. As part of the Exemplar development the speed limit is to be reduced to 40mph on this section of Banbury Road which should bring some benefit to the road safety issues. Physical improvements are likely to prove difficult given the presence of properties to the north of the junction and on the west side of Banbury Road. Signalisation might be an option but may not be appropriate without extensive traffic calming prior to the junction. There is a need for discussion with OCC on appropriate improvements which may include wider traffic management measures to minimise the amount of additional traffic using the side road and to improve safety at the junction. Traffic impacts on Caversfield are considered later in this chapter.

11.4.6 Howes Lane/ Lord's Lane/ Bucknell Road (J19 and J20)

The existing junctions near to the railway of Howes Lane and Lord's Lane with Bucknell Road are in close proximity and are therefore discussed together. With the introduction of the new A4095 NW Strategic Link Road the existing junctions close to the railway will provide for local access rather than the route for through traffic. The roundabout junction of Lord's Lane and Bucknell Road will be replaced with a priority junction.

The modelling results are presented below, firstly for the existing junctions in the Base Year and Reference Case 2031 (with no A4095 Strategic NW Link Road) and secondly for the revised junctions with the link road and full development.

Existing Junctions in the Base Year and Reference Case 2031

The results demonstrate that the junctions perform acceptably in the Base Year but the Howes Lane/ Bucknell Road junction is close to capacity. There are consented developments which will have an impact on this junction. Allowing for the growth in traffic included in the Reference Case in 2031, the priority junction of Howes Lane and Bucknell Road becomes significantly over-capacity, causing queues of 176 vehicles along the A4095 Howes Lane. This situation demonstrates the need for an improvement in this area to accommodate future traffic without the NW Bicester development. Given the constraints of alignment of the railway in this location, various past studies have always led to the same conclusion: that a new under-pass of the railway is required.

Table 11-25 A4095 Lord's Lane/ Bucknell Road ARCADY Model Results: AM Peak

	Base Model		Reference Model	
	RFC	Queue	RFC	Queue
Lord's Lane	0.292	0.4	0.195	0.2
Bucknell Road South	0.453	0.8	0.64	1.8
Bucknell Road North	0.107	0.1	0.121	0.1

Table 11-26 A4095 Lord's Lane/ Bucknell Road ARCADY Model Results: PM Peak

	Base Model		Reference Model	
	RFC	Queue	RFC	Queue
Lord's Lane	0.196	0.2	0.419	0.7
Bucknell Road South	0.64	1.8	0.661	1.9
Bucknell Road North	0.114	0.1	0.134	0.2

Table 11-27 A4095 Howes Lane/ Bucknell Road PICADY Model Results: AM Peak

	Base Model		Reference Model	
	RFC	Queue	RFC	Queue
Bucknell Road South	-	-	-	-
Howes Lane	0.598	1.47	1.011	19.4
Bucknell Road North	0.675	2.27	1.061	54.96

Table 11-28 A4095 Howes Lane/ Bucknell Road PICADY Model Results: PM Peak

	Base Model		Reference Model	
	RFC	Queue	RFC	Queue
Bucknell Road South	-	-	-	-
Howes Lane	0.805	3.94	1.878	176.4
Bucknell Road North	0.711	2.56	1.137	101.05

Proposed Junctions with A4095 Strategic NW Link Road

Tables 11-29 and 11-30 show the results of modelling the Howes Lane and Lord's Lane junctions with the full development traffic in 2031. As described above, in the full development scenario, this pair of junctions is bypassed to the north by the new link road, and both junctions become priority junctions, forming a staggered priority

junction. The link road results in a significant volume of traffic being removed from these junctions and they are therefore well within capacity in this scenario.

Table 11-29: Howes Lane/ Bucknell Road/ Lord's Lane PICADY Model Results AM Peak

	Full Development	
	RFC	Queue
Bucknell Road South	0.401	0.67
Howes Lane	0.499	0.99
Bucknell Road North	-	-
Lord's Lane	0.272	0.37

Table 11-30: Howes Lane/ Bucknell Road/ Lord's Lane PICADY Model Results PM Peak

	Full Development	
	RFC	Queue
Bucknell Road South	0.515	1.05
Howes Lane	0.287	0.4
Bucknell Road North	-	-
Lord's Lane	0.32	0.47

In conclusion, the provision of the new link mitigates impacts of the Reference Case and the full NW Bicester development at this location, giving sufficient capacity to accommodate growth.

11.5 Bucknell Village

The link flow analysis demonstrates that whilst base year traffic flows are low, there is anticipated to be an increase in traffic on links to and from Bucknell in both the Reference Case and with the full NW Bicester development in 2031.

Table 11-31 summarises the link flows on the routes to and from the village in each scenario. It can be seen that in the Reference Case, an increase in PM peak hour traffic using Bucknell Road is forecast of 125%, as well as Bainton Road (118%) and Ardley Road (62%). With the full NW Bicester development in 2031, a reduction of traffic using Bucknell Road is shown as a result of the route becoming less direct, but further increases are forecast on other routes. It should be noted that the percentage increases are very large given the very low base flows, particularly on Middleton Road and the traffic increases should be seen in that context.

Table 11-31: Bucknell Village Link Flows

Link	Base Year		Reference Case 2031		% Increase of Ref Case over Base Year		With NW Bicester 2031		% Increase of NW Bicester over Ref Case	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Bucknell Road, south of Bucknell	247	192	257	432	4	125	149	186	-40	-3
Bainton Road, west of B4100	110	157	240	254	118	62	422	351	76	38
Ardley Road, north of Bucknell	207	195	364	532	76	173	507	564	39	6
Middleton Road, west of Bucknell	27	12	35	30	30	150	317	468	806	1460

The ES traffic and transport chapter identifies that Middleton Road west of Bucknell is anticipated to experience an adverse impact on pedestrian amenity and severance, due to the percentage increase in traffic over a low baseline figure.

It is considered likely that the Bicester Saturn Model does not fully take account of the difficult alignment of Bainton Road as an access to the village and may be over-predicting traffic movements. Nonetheless it is recognised that the NW Bicester development is in close proximity to the village and the routes westwards towards J10 of the M40/ south to the A34 via the village may be used to an extent by Development traffic.

The diversion of Bucknell Road as part of the Development proposal reduces traffic on the link and will also help to reduce accident issues south of the village. In order to further minimise impacts in the village it is proposed to introduce traffic calming measures, the nature and extent of which will be agreed with OCC and the Parish Council. It is recognised that the traffic forecast on these links would then use other routes, but the aim would be for traffic to use the more appropriate links to and from the development than the minor roads through Bucknell.

11.6 Shakespeare Drive Area

Chapter 9 identified that the Bicester Saturn Model scenario used for the assessment incorporated traffic calming measures to the Shakespeare Drive area. This tested a one way north to south from the old Howes Lane into Shakespeare Drive and 20mph on Shakespeare Drive, Blenheim Drive and West Street, to see in principle what benefits traffic calming would bring, although details of what might be implemented would be for further discussion.

The link flows at either end of Shakespeare Drive and on The Approach (as key links within the area) in each scenario are shown in Table 11-32. It can be seen that there are increases in traffic on the links forecast with the Reference Case in 2031. The full

NW Bicester development adds to traffic on the links. This demonstrates that the traffic calming and one way access between Shakespeare Drive and the old Howes Lane is important to restrict traffic movements as far as possible.

Table 11-32: Shakespeare Drive Area Link Flows

Link	Base Year		Reference Case 2031		With NW Bicester 2031	
	AM	PM	AM	PM	AM	PM
Shakespeare Drive, S of Howes Lane	142	152	138	85	280	212
Shakespeare Drive, E of Middleton Stoney Road	611	455	950	873	1135	1222
The Approach, W of Bucknell Road	320	243	401	507	801	715

The increase in traffic in the area could impact on pedestrian severance and amenity. However, it is proposed that measures are introduced in the area to mitigate impacts on pedestrians and cyclists which may include speed reduction measures (build outs for example), widened footways/ cycle route and crossing points. These measures in combination should minimise the traffic routeing through the area and provide good conditions for walkers and cyclists.

The Bicester Saturn Model tested a one way entrance into Shakespeare Drive from the old Howes Lane. Consultation ahead of the application submission indicated that a one way out of Shakespeare Drive might be favoured by local residents and Councillors, giving them access to the new link road. It was also identified that there are side roads to Shakespeare Drive where additional traffic calming measures might need to be considered, should traffic routeing through them increase and issues emerge.

11.7 Caversfield Village

The increase in traffic on the unnamed road to Caversfield has highlighted that there may be impacts that require further assessment on the links within the village. As such, the link flows for Skimmingdish lane, Fringford Road and the unnamed road have been extracted for the various scenarios and are included in Table 11-33 below. It can be seen that the percentage increases in traffic are large, given the relatively low base flows. The Reference Case 2031 gives rise to the larger percentage increases, with the full NW Bicester development adding a further 30% in the AM peak to Skimmingdish Lane and 55% to the unnamed road. The modelling forecasts these flows because of delays at the junctions on the A4095, B4100 and A4421 leading to traffic re-routeing through minor roads. As such, improvements to capacity of these junctions should reduce the impact on Caversfield.

In order to minimise increases in traffic through Caversfield however, it is proposed to introduce traffic calming measures, the nature and extent of which will be agreed with OCC and the Parish Council.

Table 11-33: Caversfield Link Flows

Link	Base Year		Reference Case		% Increase on Base Year		Full NW Bicester		% Increase on Ref Case	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Skimmingdish Lane	96	100	529	261	451	161	687	266	30	2
Fringford Road (S of Skimmingdish Ln)	170	58	394	193	132	233	490	142	24	-26
Fringford Road (N of Skimmingdish Ln)	74	112	99	188	34	68	104	195	5	4
Unnamed Road	93	98	423	153	355	56	655	179	55	17

11.8 Eastern Peripheral Route

The Bicester Peripheral Routes Study was produced in January 2014 on behalf of OCC. The need for improvements to the peripheral routes around the town to facilitate growth was recognised and various options were examined, leading to the conclusion that an improvement to the eastern peripheral route from the A4421 Skimmingdish Lane/ Buckingham Road junction to the A41 including a SE Link Road would offer most benefits. The County Council is currently developing proposals as part of the Local Plan work.

In terms of the relationship to NW Bicester, it is acknowledged there will be an increase in traffic on the east side of the town. The traffic modelling for NW Bicester has been undertaken assuming no SE link road or improvements to the eastern side of Bicester (beyond that for the level crossings) in order to be able to separately identify the impact of NW Bicester. Figures 11-2 and 11-3 shows the change in traffic movements on the east side of the town with NW Bicester compared to the Reference Case in the AM and PM peak hour. The green shows an increase in traffic and the blue shows a reduction. The full NW Bicester development is forecast to increase traffic levels above the Reference Case in 2031 by approximately 320 vehicles on Charbridge Lane (the largest increase) in the AM peak. In the PM peak a similar level of increase is experienced on Skimmingdish Lane.

Figure 11-2: Difference in Traffic Flow of full NW Bicester Development over Reference Case 2031, AM Peak

Figure 11-3: Difference in Traffic Flow of full NW Bicester Development over Reference Case 2031, AM Peak

To provide context to the changes, Table 11-4 shows the link flow on Charbridge Lane in each scenario. It can be seen that there is a very large growth in traffic in the Reference Case compared to the Base Year of 210% in the AM peak and 181% in the PM peak. The full NW Bicester development adds 9.7% in the AM peak and leads to a reduction in the PM peak of 5.2%. This demonstrates that the need for improvements to the eastern peripheral route is driven by other developments as part of the Reference Case, with NW Bicester slightly exacerbating the AM peak issues and alleviating the PM peak issues at this location.

Table 11-4: Traffic Flow on Charbridge Lane, by Scenario

Base Year 2012		Reference Case 2031				With Full NW Bicester 2031			
AM	**PM**	**AM**	**% Incr. on Base Year**	**PM**	**% Incr. on Base Year**	**AM**	**% Incr. on Ref Case**	**PM**	**% Incr on Ref Case**
1023	1286	3176	210	3613	181	3485	9.7	3424	-5.2

A traffic modelling scenario has been provided which assesses the full NW Bicester (85th%ile) traffic with the introduction of a SE Link Road (as set out in the OCC Bicester Peripheral Routes Study).

Figures 11-4 and 11-5 illustrate the change in traffic flow anticipated by the Bicester Saturn Model by introducing the SE Link Road with the full development of the NW Bicester Masterplan. Those routes in blue are where a reduction is forecast, green routes are where an increase is forecast between the scenarios. It should be noted that the changes are not specifically related to the NW Bicester traffic but provide the comparison between total traffic movements with and without the SE Link Road.

In summary, the **AM Peak** the main changes with the introduction of a SE Link Road are traffic reductions on:

- A41 Oxford Road and London Road as an alternative route is provided to the SE (1581 vehicles);
- Middleton Stoney Road (approximately 200 vehicles);
- Charbridge Lane (221 vehicles);
- Launton Road (245 vehicles);
- Minor reductions on Bucknell Road, Banbury Road and Buckingham Road and (notably) the new Howes Lane/ Lord's Lane link.

Increases in traffic flow are forecast on Vendee Drive (228 vehicles) and Queens Avenue.

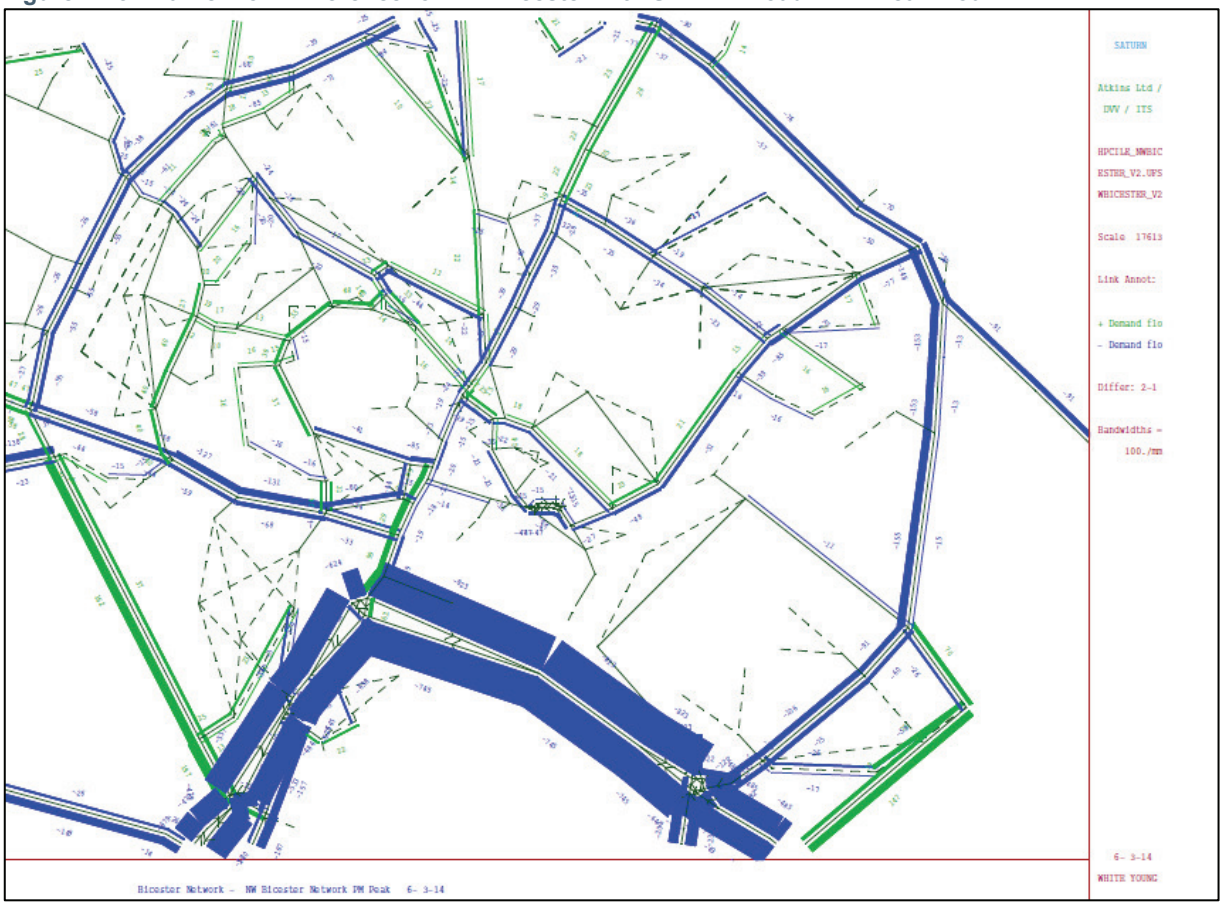
Figure 11-4: Traffic Flow Difference for NW Bicester with SE Link Road – AM Peak Hour

In summary, the **PM Peak** the main changes with the introduction of a SE Link Road are traffic reductions on:

- A41 Oxford Road and London Road as an alternative route is provided to the SE (1568 vehicles);
- Middleton Stoney Road (approximately 200 vehicles);
- Charbridge Lane (166 vehicles);
- Skimmingdish Lane (133 vehicles);
- Minor reductions on part of Buckingham Road, Launton Road and (notably) the new Howes Lane/ Lord's Lane link.

Increases in traffic flow are forecast on Vendee Drive (199 vehicles) and parts of Queens Avenue.

Figure 11-5: Traffic Flow Difference for NW Bicester with SE Link Road – PM Peak Hour



The flow changes give an indication of locations where there could be benefits. It is recognised that improvements are needed to the eastern peripheral route of Bicester to accommodate planned growth and that there is a relationship between the capacity of the network on the east side to traffic issues in other areas discussed in previous sections – notably traffic movements in the town centre and on the NW side of the town in the vicinity of the NW Bicester development.

However it is clear that the need for improvements is not brought about by the NW Bicester development. A2 Dominion will support OCC in developing the solutions for the eastern peripheral route and will make appropriate contributions to improvements that recognise the proportion of traffic arising from NW Bicester as well as the delivery by A2 Dominion of substantial infrastructure improvements elsewhere in the town.

11.9 M40 Junctions 9 and 10

The NW Bicester development will also impact on the strategic road network with respect to Junctions 9 and 10 of the M40. It is notable that the traffic using J9 appears to diminish in both the Reference Case and with NW Bicester compared to the Base Year, whereas traffic using J10 increases, particularly in the PM peak. These effects are likely to be due to the increase in delays anticipated as a result of traffic growth on the A41 and J9, leading to traffic choosing alternative routes (i.e. routeing to J10). This highlights the fact that traffic modelling is responsive to capacity issues. If improvements are introduced in any particular location or measures introduced to deter traffic then traffic patterns are likely to alter. This could mean for example that an improvement at J9 could reduce the traffic travelling north-west to J10.

An over-arching discussion on the approach to the motorway junctions has been undertaken by the County Council as part of the consideration of the Cherwell Local Plan and the NW Bicester team have been party to these discussions. The modelling results have been provided to the Highways Agency and these are being used as part of information to examine the need for future investment in the network (post Phase 2 for J9 and the J10 pinch point scheme).

The analysis for the full NW Bicester development of percentage impact of NW Bicester traffic on Junctions 9 and 10 of the M40 is contained in Appendix 7 to the Masterplan Access and Travel Strategy. In summary, NW Bicester traffic gives an increase of 1.8% above the Reference Case at J9 in the AM peak and 0.7% in the PM peak. At J10, the increase in the AM peak at the western roundabout is 3.3%, south east roundabout 0.3% and northern roundabout 0.8%. In the PM peak the impacts at J10 are higher with 5.9% at the western roundabout, 10.3% at the south east roundabout and 6.6% at the northern roundabout. A capacity assessment has not been undertaken as the Highways Agency are considering the impact of growth as a whole at J9 and J10. A2 Dominion will engage in dialogue with the Highways Agency together with OCC on future improvements and this may include a proportionate contribution if schemes are brought forward.

11.10 Summary of Full NW Bicester Mitigation

The network capacity and potential mitigation discussion in this chapter leads to a number of proposals for mitigation and/or contributions towards wider infrastructure for the full NW Bicester development. The following are measures to directly mitigate the impact of NW Bicester:

- Signalisation of the Exemplar southern access junction;
- Replacement of the B4100 Banbury Road / A4095 roundabout with traffic signals;
- Traffic management measures on the B4100 Banbury Road/ Caversfield unnamed road to reduce traffic levels and accident issues;
- Traffic calming measures in Bucknell and Caversfield to reduce through traffic;
- Measures to further reduce through traffic and assist walkers and cyclists in the Shakespeare Drive area;

The following strategic improvements have been identified to which NW Bicester would anticipate contributing towards in a manner proportionate to the impact. This package will be reviewed once the OCC work for the Local Plan is available but includes:

- The A4095 NW Strategic Link Road;
- Town centre access improvements;
- Modifications to the A4421 Skimmingdish Lane/ A4095 junction;
- Improvements to the eastern peripheral route;
- Improvements to the M40 J9 and J10.

All of the above are subject to discussion and agreement with the County Council.

In proposing these elements of mitigation, the NW Bicester development will be helping OCC to deliver a number of aspects of the LTP3, notably:

- Increasing capacity at the Howes Lane / Bucknell Road junction and approaches;

- Increasing capacity at Junction 9 of the M40 and supporting plans to improve Junction 10;
- Delivering a strategic perimeter route around the town is the key component of this strategy;
- Providing measures to reduce congestion through the central corridor (from Kings End (B4030) to the 3-arm Field Street, Buckingham Road and Banbury Road roundabout);
- Improvements to the Buckingham Road / A4221 junction; and
- South East Link Road.

11.11 Promoting Sustainable Travel

It is important to note that the analysis contained in this Chapter is based on the 85th%ile trip rates for residential, which effectively represent a level of traffic which might be expected if the development is similar to other developments in the town. Whereas the aim is that the traffic levels would be more aligned to the average trip rates, which are lower given the emphasis on sustainable travel to meet the modal shift targets of PPS1.

A crucial means of mitigating traffic impacts will be to achieve modal share and containment targets, through the access and travel strategy set out in Chapter 6. The strategy for sustainable travel measures is fully detailed in the Framework Travel Plan. The Access and Travel Strategy and the Framework Travel Plan include a range of off-site measures for walking, cycling and public transport together with softer measures to promote sustainable travel and travel awareness.

The implementation of these measures would support the following policies of the LTP3:

- Enhancing pedestrian, cycle and public transport links to the two railway stations, in particular Bicester Town Station.
- Improving Bicester's bus services along key routes
- Providing improved public transport infrastructure
- Securing green links between proposed development sites on the outskirts of the town and existing Public Rights of Way, providing a series of leisure / health walks.

11.12 Application 1 Mitigation

The Application 1 development represents 39.5% of the overall impact of the NW Bicester development over a 12 hour period. The issues and mitigation described in this chapter relates to the forecast situation with all other growth in Bicester as well as the full NW Bicester development. As such the mitigation required for Application 1 if considered by itself is lesser in scale. It is anticipated that a proportionate contribution towards these measures will be made as part of Application 1.

12 Summary and Conclusions

12.1 Overview

This Transport Assessment has been prepared to support the planning application submitted for Application 1: Land North of the Railway which forms part of the NW Bicester development.

The assessment has considered the current situation with regards to sustainable travel modes, the highway network, traffic conditions and road safety in the vicinity of the application site.

12.2 The Proposed Development

The proposed development provides a mixed use development of up to 2,600 homes (including extra care housing), a primary school plus extension to the Exemplar primary school, employment, shopping, leisure, and social and community facilities. As such the development in itself provides the opportunity for a high level of locally based trips by walking or cycling and accessibility analysis demonstrates that sustainable modes provide realistic alternatives to the car for many journeys.

The Development layout includes good connections for walking and cycling within the site and from the site as well as a frequent bus service between the Development and the town centre and rail station(s). The Development will therefore benefit from a high level of connectivity to the wider NW Bicester development as well as the rest of the town. The mix of land uses and provision for sustainable modes, together with travel plan measures to encourage 'smarter choices' will enable the targets for mode share and travel set out in the Supplement to PPS1 to be achieved.

12.3 Walking and Cycling Connections

The improvements to and/ or contributions to support off-site walking and cycling links of particular relevance in providing good connectivity to and from the Application 1 development are as follows:

- Upgrade of the route alongside the railway from Lord's Lane to Banbury Road as a surfaced cycleway and footpath;
- Improvements along Banbury Road, some of which are being delivered as part of the Exemplar development;
- Minor improvements to the existing cycleway on the south side of Lord's Lane to remove vegetation that impacts on feelings of personal security for users;
- Improvements to the routes through Bure Park to encourage their use as leisure walking and cycling routes.

Improvements to routes will be further investigated in conjunction with Oxfordshire County Council and will form part of discussions regarding the s106 for Application 1.

12.4 Bus Connections

A frequent bus service is proposed between the Application 1 development and the town centre, aiming to provide six services per hour by full occupation of the

Application 1 development subject to viability at that point in time, with a minimum of four per hour. In the early phases of the Application 1 development the service would use Banbury Road and travel through the Exemplar development, but as the site builds out there will be a loop from Bucknell Road via a busway into the development and returning on Lord's Lane.

12.5 Sustainable Travel Initiatives

A crucial means of mitigating traffic impacts will be to achieve modal share and containment of trips targets, and this will also help the NW Bicester vision to be achieved. The strategy for sustainable travel measures is fully detailed in the Framework Travel Plan and summarised also in Chapter 6 but includes support for a car club, promotion of electric vehicles and cycling promotion and support as well as a management and monitoring structure to give confidence that targets can be achieved.

12.6 Traffic Forecasts

Forecasts of traffic arising from the Development have been made using trip rates which effectively assume the traffic generation will be the same as other developments in the town, with the entire NW Bicester master plan (6,000 new homes) being completed by 2031. This traffic generation has been used at the request of OCC as the basis for assessing traffic impact, whilst the Development may give rise to a lower level of traffic generation given the land use mix of the overall Masterplan the provision for other modes. As such the worst case has been assessed.

The Development forms a part of the overall NW Bicester Masterplan and the approach taken to traffic impact has been to assess the full NW Bicester development on the basis that any mitigation can be developed as a whole and then apportioned to the Application 1 Development based on the scale of traffic impact.

The traffic modelling has been undertaken using the Bicester Saturn Model for 2031. This includes an agreed Reference Case for 2031 which includes all committed and planned developments in the town – as such it is the maximum growth scenario. In the scenario with the NW Bicester development, much of the traffic impact across the network arises from the other developments with NW Bicester representing only a proportion of traffic increase.

12.7 Network Capacity Impact and Mitigation

The scope of the traffic assessment was agreed with the County Council and the town centre network has been examined, but with a detailed focus on a number of key areas. A summary of the potential mitigation and/or contributions to wider improvements is provided below. It is recognised that there is a need for further work on improvements in conjunction with OCC, noting that the package of overall Bicester transport improvements is currently being confirmed by OCC for the Local Plan and this has not been available to fully inform mitigation for the NW Bicester development. Therefore, an addendum will be submitted once this information on the wider improvements has been issued by OCC.

The following are measures to directly mitigate the impact of NW Bicester:

- Signalisation of the Exemplar southern access junction;
- Replacement of the B4100 Banbury Road / A4095 roundabout with traffic signals;

- Traffic management measures on the B4100 Banbury Road/ Caversfield unnamed road to reduce traffic levels and accident issues;
- Traffic calming measures in Bucknell and Caversfield to reduce through traffic;
- Measures to further reduce through traffic and assist walkers and cyclists in the Shakespeare Drive area;

The following strategic improvements have been identified to which NW Bicester would anticipate contributing towards in a manner proportionate to the impact. This package will be reviewed once the OCC work for the Local Plan is available but includes:

- The A4095 NW Strategic Link Road;
- Town centre access improvements;
- Modifications to the A4421 Skimmingdish Lane/ A4095 junction;
- Improvements to the eastern peripheral route;
- Improvements to the M40 J9 and J10.

All of the above are subject to discussion and agreement with the County Council.

12.8 Conclusion

The provision of the mitigation measures and/ or a proportionate contribution to measures will address the impacts of the NW Bicester on the road network as well as support improvements to the town's infrastructure. The Application 1 development on land north of the railway will support the measures in proportion to the scale and traffic impact of the development as part of the NW Bicester Masterplan. The measures supported will assist the County Council in addressing a range of town wide transport issues which are identified in LTP3.

The provision of high quality sustainable travel infrastructure, together with the travel planning measures to promote sustainable travel will ensure that the PPS1 targets are met. This will help make the vision for NW Bicester a reality.

It is concluded that there are no transport reasons why the development should not be granted consent.