REPORT N^{O} 001

COVENTRY LOCAL PLAN

MODELLING REPORT

CONFIDENTIAL

DECEMBER 2015

WSP | PARSONS BRINCKERHOFF

COVENTRY LOCAL PLAN

MODELLING REPORT

Report (version)
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WSP | Parsons Brinckerhoff
One Queens Drive
Birmingham B5 4PJ

Tel: +44 (0)121 352 4700
Fax: +44 (0)121 352 4701
www.wspgroup.com
www.pbworld.com

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1 INTRODUCTION

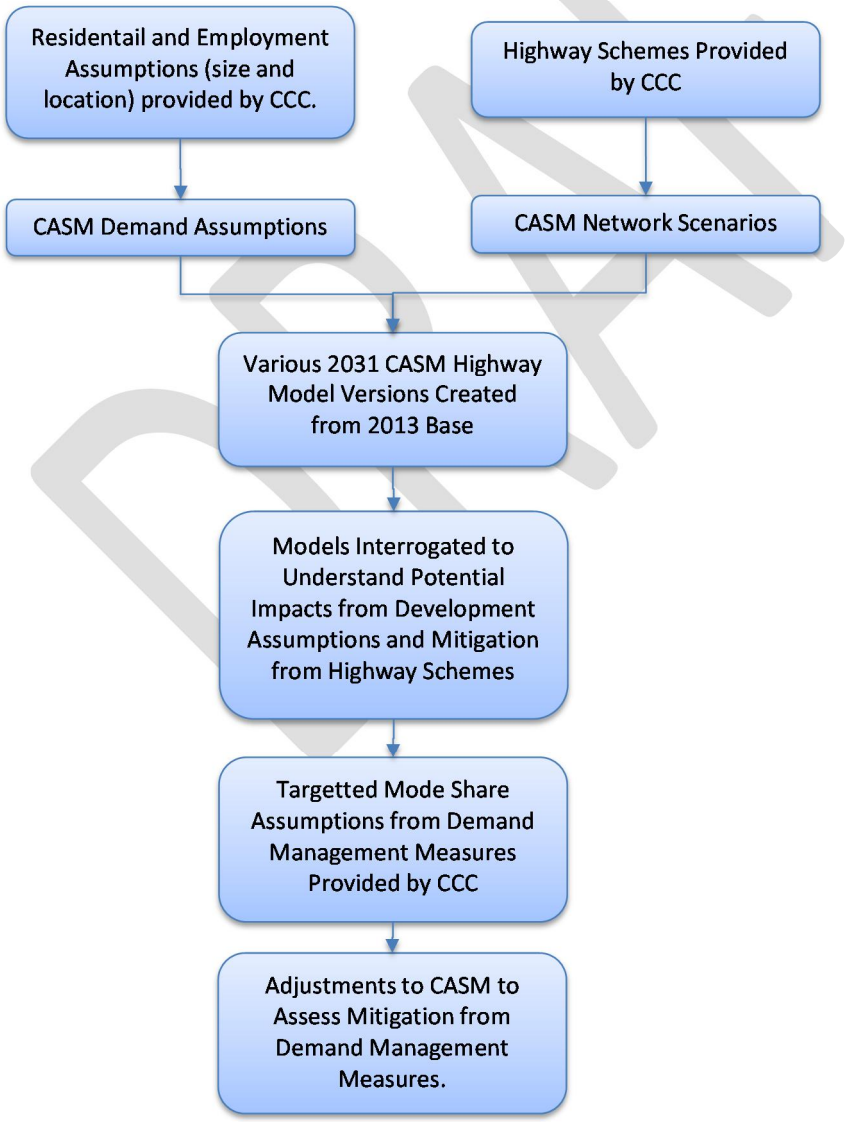
1.1 PURPOSE OF REPORT

This report provides the methodology and results from a transport modelling exercise to understand the potential highway network impacts from the emerging Coventry Local Plan development assumptions.

1.2 OVERVIEW OF STUDY

WSP | PB have utilised the Coventry Area Strategic Model (CASM), highway only, to undertake option testing of various demand and network scenarios. Figure 1.1 provides an overview of the project methodology.

Figure 1-1 Overview of Project Methodology



1.3 REPORT STRUCTURE

This report is set out as follows:

1. Coventry Local Plan Development Assumptions
2. Trip Generation Assumptions
3. Traffic Modelling Methodology
4. Modelling Results
5. Demand Management Mitigation

2 COVENTRY LOCAL PLAN DEVELOPMENT ASSUMPTIONS

This section sets out the spatial strategy promoted by Coventry City Council for the delivery of both housing and employment growth between 2013 and 2031.

2.1 RESIDENTIAL DEVELOPMENT

In total 333 residential development sites were identified for inclusion within the Coventry Local Plan ranging from 1 dwelling per site up to 5,500 dwellings per site. Table 2.1 sets out the locations for residential growth for the Local Plan Core Option and Table 2.2 identifies the additional housing for the High Growth Option.

Table 2-1 Local Plan Core Option Residential Assumptions

Category Development	Total
Within Coventry SHLAA and GB Sites	13,304
Keresley SUE	3,100
Walsgrave Hill Farm(Rugby) SUE	2,000
Walsgrave Hill Farm(Coventry) SUE	900
Eastern Green SUE	2,250
Kings Hill SUE	2,500
Outstanding Permissions	5,259
Under Construction	857
Local Plan Total	**30,170**

Table 2-2 Local Plan High Growth Option Residential Assumptions

Category Development	
Local Plan Total	30,170
Stratford 4 Modelled Zones	2000
Atherstone & Coleshill Split Equally	900
Nuneaton and Bedworth A444/A45 10 Modelled Zones	5,500
Rugby urban edge	1,000
Split in the zones equally between Warwick and Leamington	2,700
High Growth Total	**42,270**

Figure 2.1 illustrates the Coventry Local Plan Core Option Residential Spatial Strategy 2031

Figure 2-1 Residential Site Locations

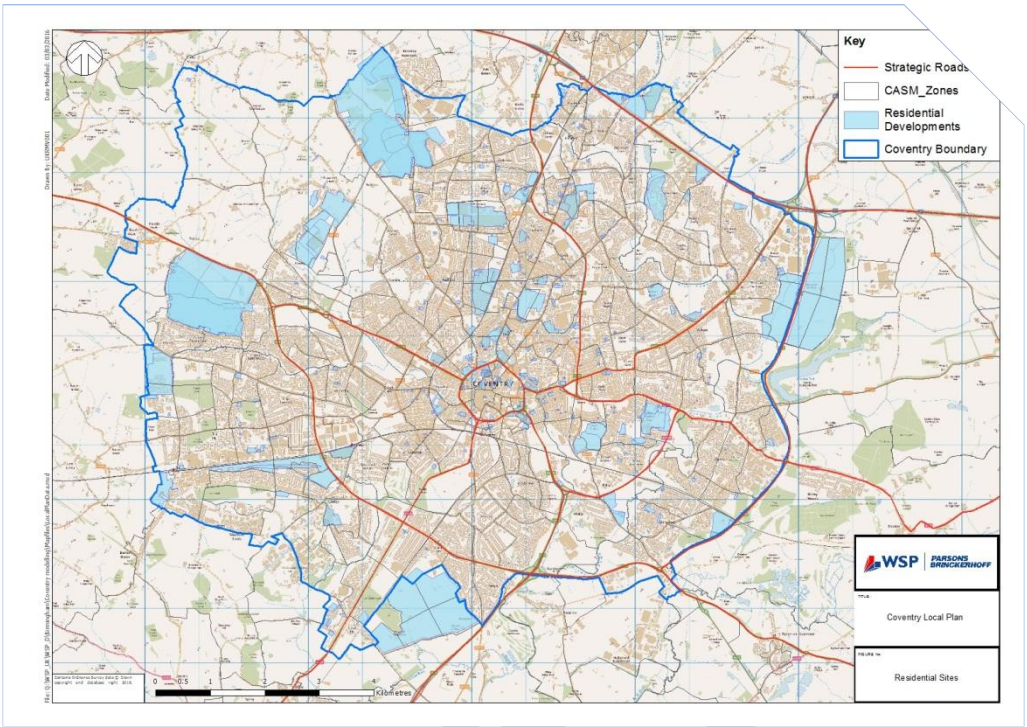
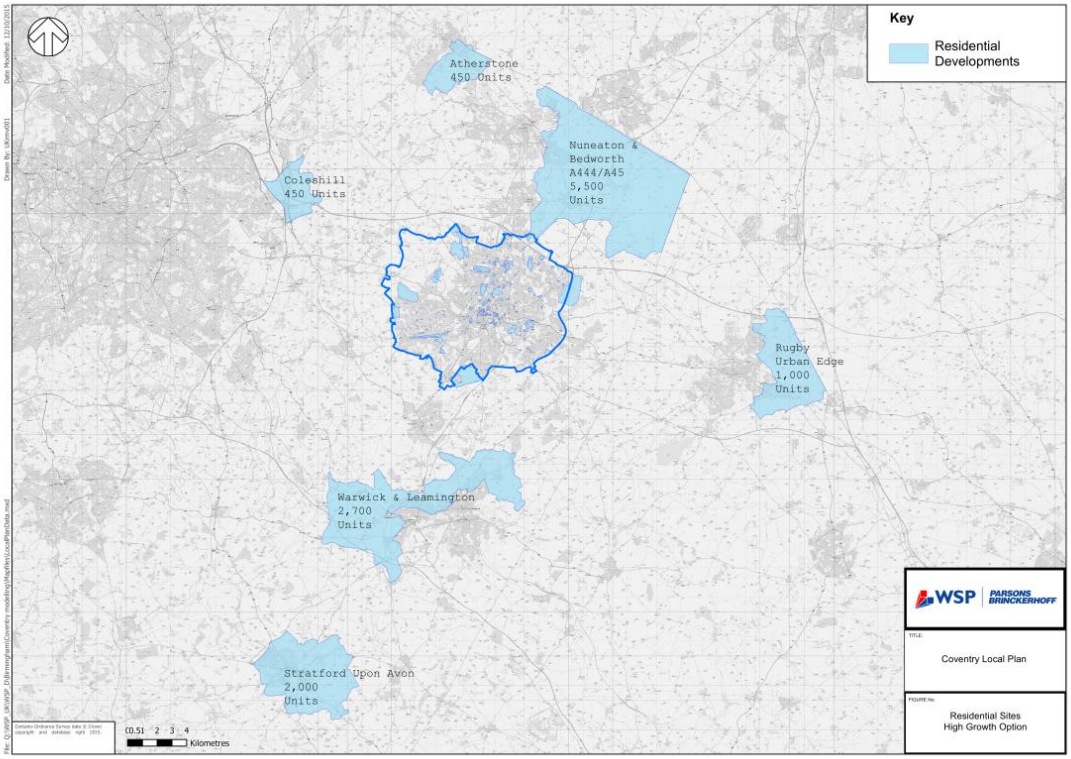


Figure 2.2 illustrates the Coventry Local Plan Residential High Growth Option 2013 – 2031

Figure 2-2 High Growth Residential Locations



2.2 EMPLOYMENT GROWTH

There are forecast to be an additional 48,100 jobs created as part of the Coventry Local Plan. The Options for growth are consistent for both the High Growth and the Preferred Option. Table 2.3 below identifies the sites and job creation numbers.

Table 2-3 Employment Assumptions

Site Name	GFA (sqm)	Job Creation
Eastern Green	36,000	2,500
Parkside Technology Park	7200	500
Friargate	300,000	15,000
City Centre South	10,000	1000
CW Gateway	450,000	10,000
Ansty Park and Phase 2	620,400	10,000
Coventry University Expansion	14,500	100
Warwick University Expansion	7,200	500
ProLogis Keresley	720,000	500
Browns Lane _ Lyons Park	146,000	3,000
Whitley Business Park	72,000	5,000
Total	2,383,300	48,100

Figure 2.3 illustrates the Coventry Local Plan Employment Spatial Strategy 2013-2031

Figure 2-3 Employment Site Locations

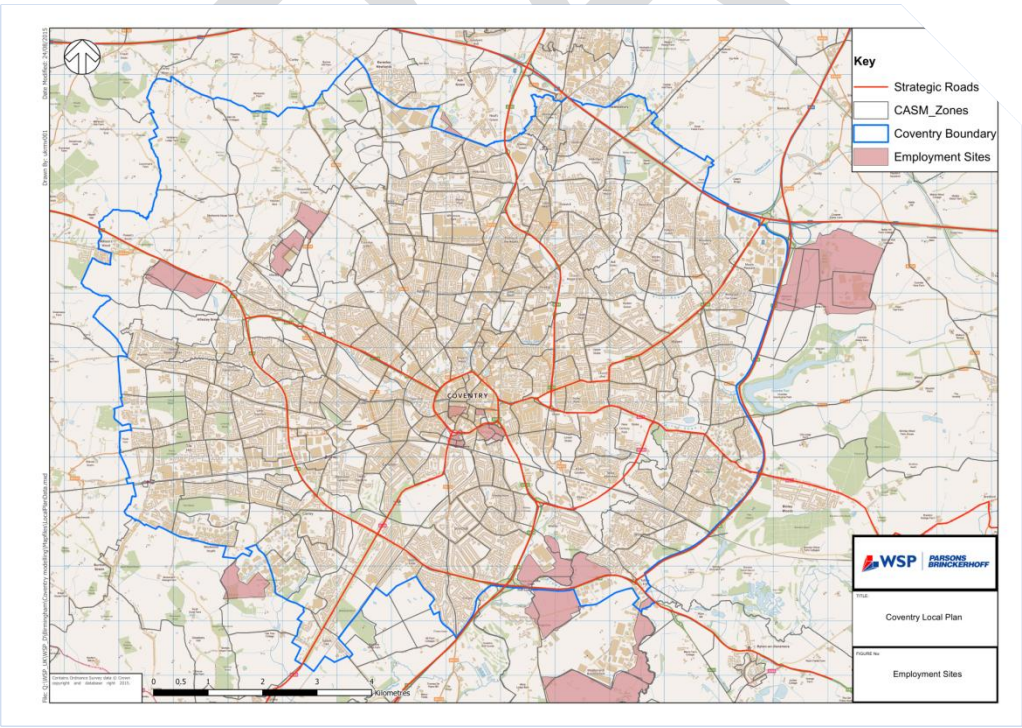
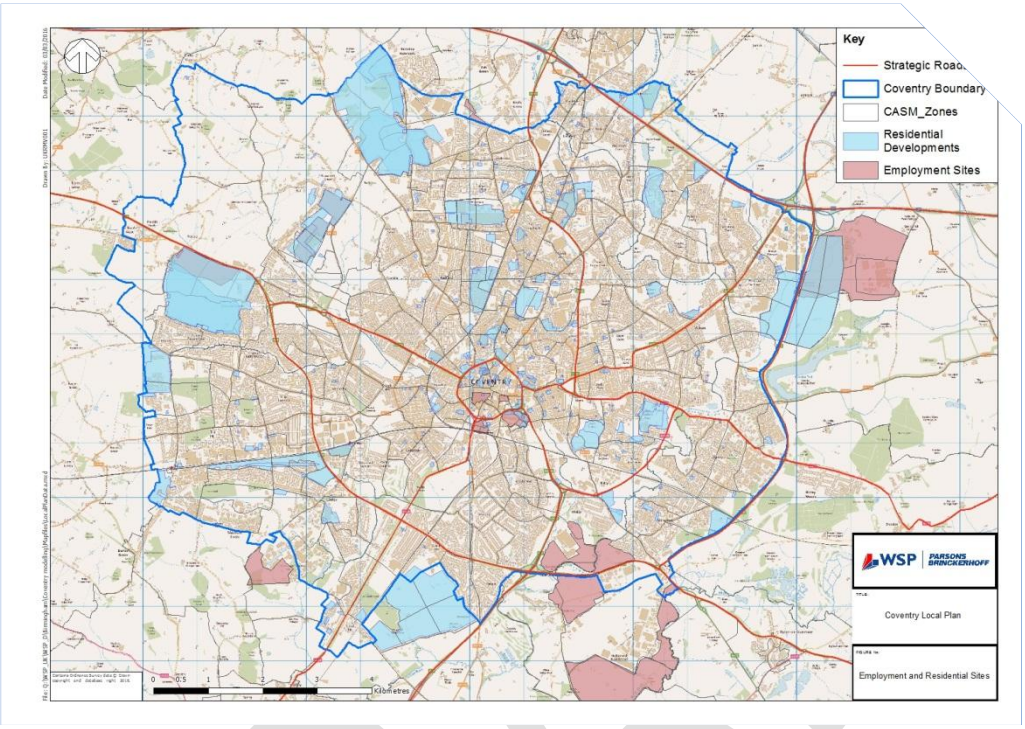


Figure 2.4 shows the Total Coventry Local Core Option (Residential and Employment sites) 2031

Figure 2-4 Employment and Residential Site Locations



3 TRIP GENERATION

3.1 METHODOLOGY

The residential and employment growth assumptions outlined in the previous chapter were converted into vehicle trips using the rates from the TRICS database for the purposes of traffic modelling. These trip totals were then applied to the Coventry Area Strategic Model (described in Section 4 below). This section provides information on the trip rates chosen and what they generated when applied to the employment and residential assumptions.

It should be noted that the development of the demand scenarios described below should be considered a 'worst case' assessment for the number of vehicles generated by Local Plan assumptions for a number of reasons:

1. It assumes that in 2031 trip making behaviour will be the same as today. I.e. there has been no adjustment for any 'peak spreading' effects. Evidence from West Midlands' cordon counts and the 1,500 point survey shows that Coventry has the most concentrated 'peak' of all the regional centres. In the future, as congestion increases, it is reasonable to expect that some people will alter their journey time so that it lies outside of the traditional 8-9am and 5-6pm peak. It is also a more than feasible that more people will be home workers, for part of the week at least, in the future. The census journey to work data has shown a large increase between 2001 and 2011 in this activity and employers are becoming more flexible in this regard.

2. No adjustment has been made for higher than average public transport use. As the full nested demand model was not available at the time of this study (see Section 4.1 below), the highway only model was used. It was not therefore possible to assess the performance of significantly enhanced public transport, in line with that expected from new Sprint routes and the proposed 'clover-leaf' bus route arrangement. This analysis will come later as the full demand model will come available to use.
3. No adjustment has been made to account for policies being put forward in the Local Plan which aim to switch more short journeys to walking and cycling.

Despite these limitations it was felt that the demand assessment represented a robust analysis of what the worst possible impacts on the road network could be. This in turn helps to focus the Local Plan on strategies and investment decisions which will mitigate these impacts.

3.2 TRIP GENERATION RATES

RESIDENTIAL DEVELOPMENTS

Table 3.1 below illustrates the TRICS rates chosen for use in the modelling to represent trip generation from residential developments

Table 3-1 TRICS Residential Trip Rates

TRIP RATE for Land Use 03 - RESIDENTIAL/A - HOUSES PRIVATELY OWNED									
Calculation Factor: 1 DWELLS									
Count Type: VEHICLES									
			ARRIVALS			DEPARTURES			TOTALS
	No.	Ave.	Trip	No.	Ave.	Trip	No.	Ave.	Trip
Time Range	Days	DWELLS	Rate	Days	DWELLS	Rate	Days	DWELLS	Rate
00:00-01:00									
01:00-02:00									
02:00-03:00									
03:00-04:00									
04:00-05:00									
05:00-06:00									
06:00-07:00									
07:00-08:00	21	135	0.075	21	135	0.268	21	135	0.343
08:00-09:00	21	135	0.152	21	135	0.39	21	135	0.542
09:00-10:00	21	135	0.155	21	135	0.189	21	135	0.344
10:00-11:00	21	135	0.132	21	135	0.175	21	135	0.307
11:00-12:00	21	135	0.17	21	135	0.152	21	135	0.322
12:00-13:00	21	135	0.178	21	135	0.161	21	135	0.339
13:00-14:00	21	135	0.161	21	135	0.158	21	135	0.319
14:00-15:00	21	135	0.166	21	135	0.18	21	135	0.346
15:00-16:00	21	135	0.28	21	135	0.204	21	135	0.484
16:00-17:00	21	135	0.293	21	135	0.181	21	135	0.474
17:00-18:00	21	135	0.338	21	135	0.204	21	135	0.542
18:00-19:00	21	135	0.242	21	135	0.188	21	135	0.43
19:00-20:00									
20:00-21:00									
21:00-22:00									
22:00-23:00									
23:00-24:00									

EMPLOYMENT DEVELOPMENT

Table 3.2 to 3.5 overleaf illustrate the TRICS rates chosen for use in the modelling to represent trip generation from employment developments.

Table 3-2 B1 Business Park Rates

TRIP RATE for Land Use 02 - EMPLOYMENT/B - BUSINESS PARK									
Calculation Factor: 100 sqm									
Count Type: VEHICLES									
			ARRIVALS			DEPARTURES			TOTALS
	No.	Ave.	Trip	No.	Ave.	Trip	No.	Ave.	Trip
Time Range	Days	GFA	Rate	Days	GFA	Rate	Days	GFA	Rate
00:00-01:00									
01:00-02:00									
02:00-03:00									
03:00-04:00									
04:00-05:00									
05:00-06:00									
06:00-07:00									
07:00-08:00	7	28530	0.627	7	28530	0.11	7	28530	0.737
08:00-09:00	7	28530	1.539	7	28530	0.192	7	28530	1.731
09:00-10:00	7	28530	0.709	7	28530	0.215	7	28530	0.924
10:00-11:00	7	28530	0.215	7	28530	0.167	7	28530	0.382
11:00-12:00	7	28530	0.288	7	28530	0.24	7	28530	0.528
12:00-13:00	7	28530	0.316	7	28530	0.403	7	28530	0.719
13:00-14:00	7	28530	0.353	7	28530	0.371	7	28530	0.724
14:00-15:00	7	28530	0.248	7	28530	0.306	7	28530	0.554
15:00-16:00	7	28530	0.228	7	28530	0.406	7	28530	0.634
16:00-17:00	7	28530	0.271	7	28530	0.811	7	28530	1.082
17:00-18:00	7	28530	0.16	7	28530	1.256	7	28530	1.416
18:00-19:00	7	28530	0.063	7	28530	0.428	7	28530	0.491

Table 3-3 B1 Office Rates

TRIP RATE for Land Use 02 - EMPLOYMENT/A - OFFICE									
Calculation Factor: 100 sqm									
Count Type: VEHICLES									
			ARRIVALS			DEPARTURES			TOTALS
	No.	Ave.	Trip	No.	Ave.	Trip	No.	Ave.	Trip
Time Range	Days	GFA	Rate	Days	GFA	Rate	Days	GFA	Rate
00:00-01:00									
01:00-02:00									
02:00-03:00									
03:00-04:00									
04:00-05:00									
05:00-06:00									
06:00-07:00									
07:00-08:00	8	9856	0.44	8	9856	0.02	8	9856	0.46
08:00-09:00	8	9856	0.68	8	9856	0.075	8	9856	0.755
09:00-10:00	8	9856	0.454	8	9856	0.079	8	9856	0.533
10:00-11:00	8	9856	0.254	8	9856	0.152	8	9856	0.406
11:00-12:00	8	9856	0.15	8	9856	0.126	8	9856	0.276
12:00-13:00	8	9856	0.137	8	9856	0.113	8	9856	0.25
13:00-14:00	8	9856	0.126	8	9856	0.118	8	9856	0.244
14:00-15:00	8	9856	0.08	8	9856	0.117	8	9856	0.197
15:00-16:00	8	9856	0.107	8	9856	0.36	8	9856	0.467
16:00-17:00	8	9856	0.098	8	9856	0.577	8	9856	0.675
17:00-18:00	8	9856	0.043	8	9856	0.682	8	9856	0.725
18:00-19:00	8	9856	0.036	8	9856	0.119	8	9856	0.155

Table 3-4 B2 Industrial Park Vehicular Trip Rates

TRIP RATE for Land Use 02 - EMPLOYMENT/D - INDUSTRIAL ESTATE									
Calculation Factor: 100 sqm									
Count Type: VEHICLES									
			ARRIVALS			DEPARTURES			TOTALS
	No.	Ave.	Trip	No.	Ave.	Trip	No.	Ave.	Trip
Time Range	Days	GFA	Rate	Days	GFA	Rate	Days	GFA	Rate
00:00-01:00									
01:00-02:00									
02:00-03:00									
03:00-04:00									
04:00-05:00									
05:00-06:00									
06:00-07:00									
07:00-08:00	16	18151	0.337	16	18151	0.105	16	18151	0.442
08:00-09:00	16	18151	0.408	16	18151	0.213	16	18151	0.621
09:00-10:00	16	18151	0.314	16	18151	0.246	16	18151	0.56
10:00-11:00	16	18151	0.267	16	18151	0.259	16	18151	0.526
11:00-12:00	16	18151	0.274	16	18151	0.291	16	18151	0.565
12:00-13:00	16	18151	0.265	16	18151	0.294	16	18151	0.559
13:00-14:00	16	18151	0.275	16	18151	0.289	16	18151	0.564
14:00-15:00	16	18151	0.269	16	18151	0.252	16	18151	0.521
15:00-16:00	16	18151	0.243	16	18151	0.298	16	18151	0.541
16:00-17:00	16	18151	0.214	16	18151	0.36	16	18151	0.574
17:00-18:00	16	18151	0.112	16	18151	0.346	16	18151	0.458
18:00-19:00	16	18151	0.063	16	18151	0.123	16	18151	0.186

Table 3-5 B8 Warehousing and Storage Vehicular Trip Rates

TRIP RATE for Land Use 02 - EMPLOYMENT/F - WAREHOUSING (COMMERCIAL)									
Calculation Factor: 100 sqm									
Count Type: VEHICLES									
			ARRIVALS			DEPARTURES			TOTALS
	No.	Ave.	Trip	No.	Ave.	Trip	No.	Ave.	Trip
Time Range	Days	GFA	Rate	Days	GFA	Rate	Days	GFA	Rate
00:00-01:00									
01:00-02:00									
02:00-03:00									
03:00-04:00									
04:00-05:00									
05:00-06:00									
06:00-07:00									
07:00-08:00	2	56183	0.046	2	56183	0.018	2	56183	0.064
08:00-09:00	2	56183	0.031	2	56183	0.017	2	56183	0.048
09:00-10:00	2	56183	0.045	2	56183	0.018	2	56183	0.063
10:00-11:00	2	56183	0.017	2	56183	0.018	2	56183	0.035
11:00-12:00	2	56183	0.015	2	56183	0.022	2	56183	0.037
12:00-13:00	2	56183	0.025	2	56183	0.022	2	56183	0.047
13:00-14:00	2	56183	0.106	2	56183	0.059	2	56183	0.165
14:00-15:00	2	56183	0.025	2	56183	0.069	2	56183	0.094
15:00-16:00	2	56183	0.022	2	56183	0.042	2	56183	0.064
16:00-17:00	2	56183	0.021	2	56183	0.047	2	56183	0.068
17:00-18:00	2	56183	0.016	2	56183	0.04	2	56183	0.056
18:00-19:00	2	56183	0.013	2	56183	0.028	2	56183	0.041

SUMMARY

In summary, Table 3.6 sets out the AM and PM Peak Hour Vehicular Trip Rates by land use type are as follows:

Table 3-6 Summary of Trip Generation Rates Used

Land Use Type	AM Arrivals	AM Departures	Total AM	PM Arrivals	PM Departures	Total PM
C3 Residential	0.152	0.39	0.542	0.338	0.204	0.542
B1 Business Park	1.539	0.192	1.731	0.16	1.256	1.416
B1 Office	0.68	0.075	0.755	0.043	0.682	0.725
B2 Industrial Estate	0.408	0.213	0.621	0.112	0.346	0.458
B8 Warehousing	0.031	0.017	0.048	0.016	0.04	0.056

Using the above rates the total trip generation for the explicitly modelled residential sites in CASM are shown in Table 3.7 below. Table 3.8 then shows the same information for the additional residential sites included in the 'High Growth' scenario and Table 3.9 shows the total trip generation for the employment sites.

Table 3-7 Core Option Residential Vehicle Trips

Coventry Local Plan "Core Option"	Modelled Vehicle Trip Generation	
	AM Peak 0800-0900	PM Peak (1700-1800)
Within Coventry SHLAA and GB Sites	7,211	7,211
Keresley SUE	1,680	1,680
Walsgrave Hill Farm(Rugby) SUE	1,084	1,084
Walsgrave Hill Farm(Coventry) SUE	488	488
Eastern Green SUE	1,220	1,220
Kings Hill SUE	1,355	1,355
Outstanding Permissions	2,850	2,850
Under Construction	464	464
Residential Core Option Total	**16,352**	**16,352**

Table 3-8 High Growth Option Residential Vehicle Trips

Coventry Local Plan "High Growth Option"	Modelled Vehicle Trip Generation	
	AM Peak 0800-0900	PM Peak (1700-1800)
Local Plan Total	16,352	16,352
Stratford 4 Modelled Zones	1,084	1,084
Atherstone & Coleshill Split Equally	488	488
Nuneaton and Bedworth A444/A45 10 Modelled Zones	2,981	2,981
Rugby urban edge	542	542
Split in the zones equally between Warwick and Leamington	1,463	1,463
Residential High Growth Total	**22,910**	**22,910**

Table 3-9 Employment Vehicle Trips

Employment Sites	Modelled Vehicle Trip Generation	
	AM Peak 0800-0900	PM Peak (1700-1800)
Eastern Green	288	207
Parkside Technology Park	85	60
Friargate	2265	2,025
City Centre South	76	68
CW Gateway	3,600	2,586
Ansty Park & Phase 2	4,963	3,565
Coventry University Expansion	109	98
Warwick University Expansion	85	60
Pro Logis Keresley	2,408	2,311
Browns Lane Lyon Park	1,168	839
Whitley Business Park	241	231
Employment Total	**15,288**	**12,049**

4 TRAFFIC MODELLING METHODOLOGY

4.1 OVERVIEW

The Coventry Area Strategic Model (CASM) has been used to assess the traffic impacts from the Local Plan residential and employment assumptions. CASM has been developed in 2015 as a replacement for the old Coventry Strategic model on the back of Highways England's M6 Junction 2-4 Smart Motorways project.

CASM consists of:

- CASM Highway Model
- CASM Public Transport Model
- CASM Demand Model

Although the full CASM suite is a full four-stage strategic model because it is still in development the full nested four-stage model was not available for this project. Each element of CASM is complete and has been signed off by the HE, but its nested forecasting function was not available for this assessment. As such we have made use of just the CASM Highway Model and built a specific future year Reference Case model relevant to the Coventry Local Plan Core Option and High Growth Option.

CASM Hwy has a base year of 2013, which has been signed off as fit for purpose by the HE's TAME team. Although the full LMVR for CASM is not yet available a technical note has been provided as part of the evidence which sets out the calibration/validation results. This note has been signed off by the HE.

For the purposes of this project a bespoke 2031 'Do-Minimum' has been produced. This section outlines our modelling method in detail, but broadly speaking has been done by applying trip generation rates to development sites, growing areas outside of Coventry by NTEM/TEMPRO rates, distributing new traffic according to adjacent zones and assigning the highway model.

4.2 DEMAND ASSUMPTIONS

The following sets out how the traffic demand for the 2031 scenarios were developed:

- The threshold chosen for explicitly modelled sites was anything over 100 dwellings or 100 jobs in size would be explicitly modelled.
- Overall growth in employment and housing was not constrained to NTEM v6 via TEMPRO within Coventry; because Local Plan assumptions were higher than TEMPRO, although was used for areas adjacent to the district. Annex B sets out the comparisons between TEMPRO and planned growth.
- Trip generation for each explicitly modelled site, plus additional growth has been created using TRICS data for housing and employment broken down into B1, B2 and B8 uses; as described in Section 3.
- The distribution of trips to/from each new development have been copied from near-by zones in CASM Hwy. The CASM base year distribution was developed using the updated PRISM model prior matrix as a starting point (which included 2011 RSI and household travel survey data) and then adding in the 2011 census journey to work data before a final round of matrix estimation.

DEMAND CHANGES

Table 4.1 presents the change in vehicle demand in the whole CASM Hwy model between 2013 and 2031 following the application of the development trip generation and general traffic growth assumptions:

Table 4-1 Total CASM Highway Demand Changes

	2013 AM Peak	2031 Cov Local Plan AM Peak	2031 Cov Local Plan High Growth AM Peak	2013 PM Peak	2031 Cov Local Plan PM Peak	2031 Cov Local Plan High Growth PM Peak
Cars	460,466.47	538,242.32	544,800.42	475,435.47	554,827.13	561,385.30
HGVs	29,041.46	33,140.56	33,140.56	19,259.22	21,977.59	21,977.59
LGVs	56,737.05	86,943.62	86,943.62	45,855.02	70,268.01	70,268.01
Total	**546,245**	**658,326**	**664,885**	**540,550**	**647,073**	**653,631**

This equates to a total increase of 21% in the AM Peak and 20% in the PM. However, when cordoning CASM to only look at Coventry's network there is a more significant increase in travel demand, as shown in Table 4.2. On Coventry's roads growth is around 42% in the AM and 37% in the PM peak; for the 'High Growth' option these figures rise to increases to 46% and 40%.

Table 4-2 Cordoned Coventry Network CASM Highway Demand Changes

	2013 AM Peak	2031 Cov Local Plan AM Peak	2031 Cov Local Plan High Growth AM Peak	2013 PM Peak	2031 Cov Local Plan PM Peak	2031 Cov Local Plan High Growth PM Peak
Cars	71,633.94	102,046.37	104,841.62	77,973.34	106,361.18	109,729.43
HGVs	4,511.95	5,213.81	5,447.69	2,970.23	3,392.48	3,414.94
LGVs	7,040.05	10,909.34	10,850.47	5,899.30	9,032.67	9,216.30
Total	**83,185.93**	**118,169.52**	**121,139.79**	**86,842.87**	**118,786.33**	**122,360.67**

The following maps demonstrate the where the growth in trip generation has occurred within the CASM model. The maps show the total demand in each CASM zone (origins and destinations); the maps provided include:

- 2013 AM Peak and PM Peak
- 2031 Coventry Local Plan Core Scenario AM and PM Peak
- 2031 Coventry High Growth Option AM and PM Peak

Figure 4-1 AM Peak 2013

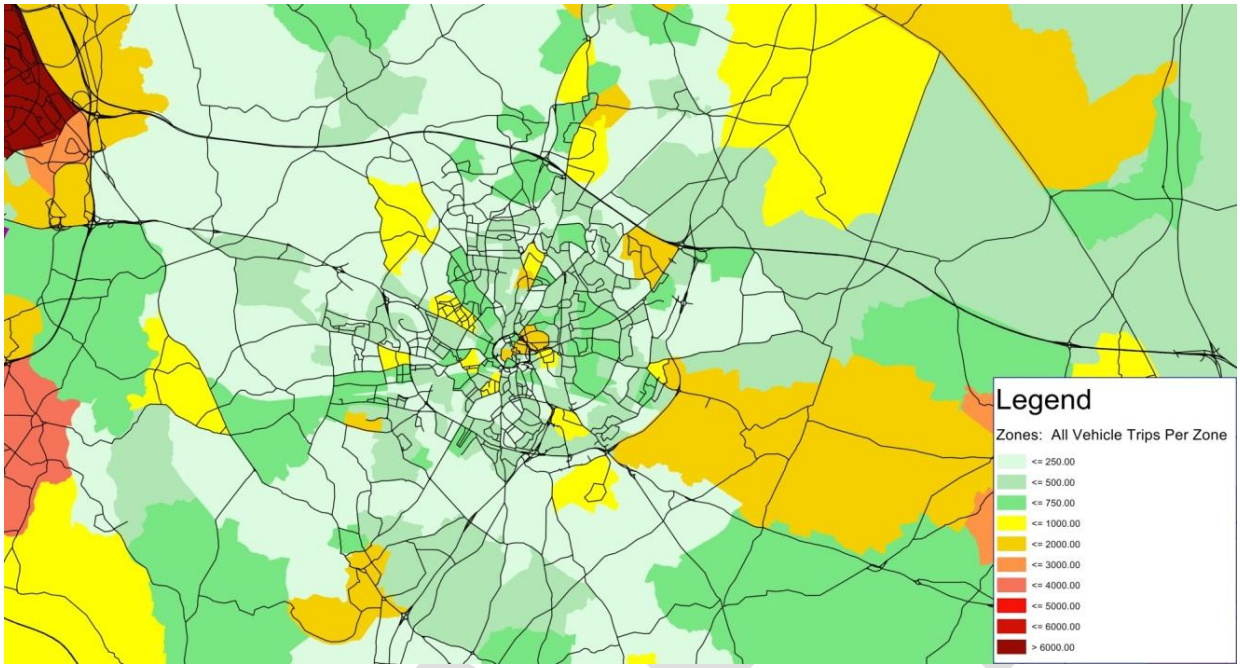


Figure 4-2 AM Peak 2031 Coventry Local Plan Core Scenario 2031

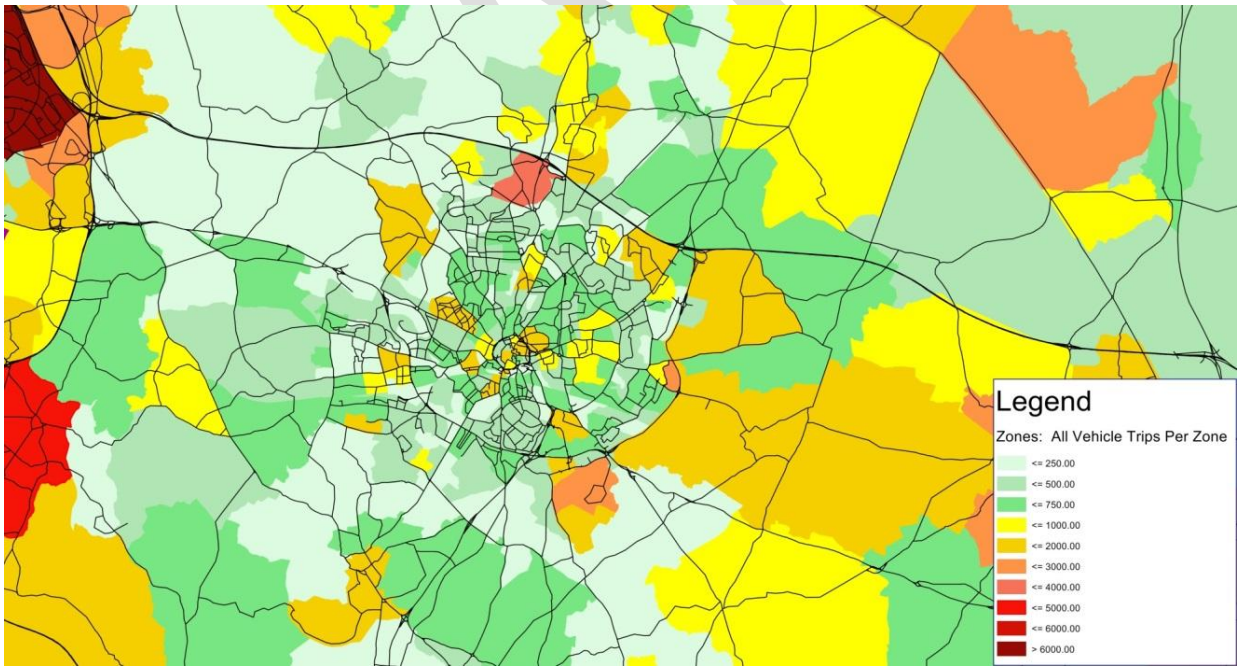


Figure 4-3 AM Peak 2031 Coventry Local Plan High Growth Option

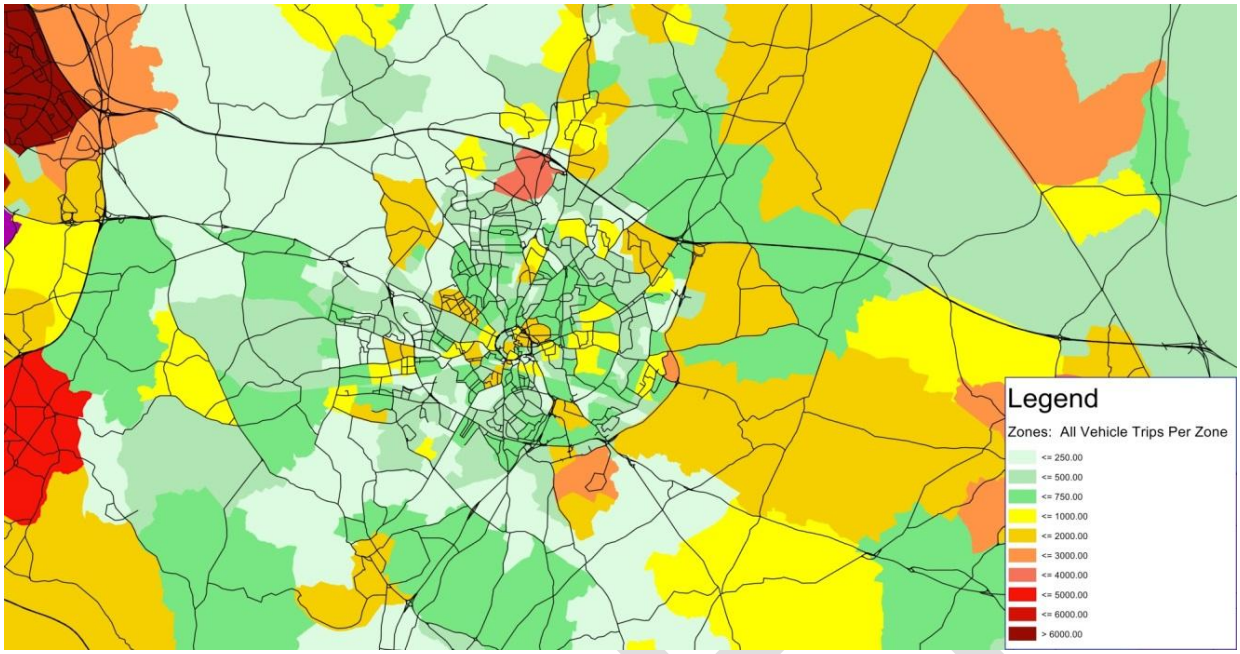


Figure 4-4 PM Peak 2013

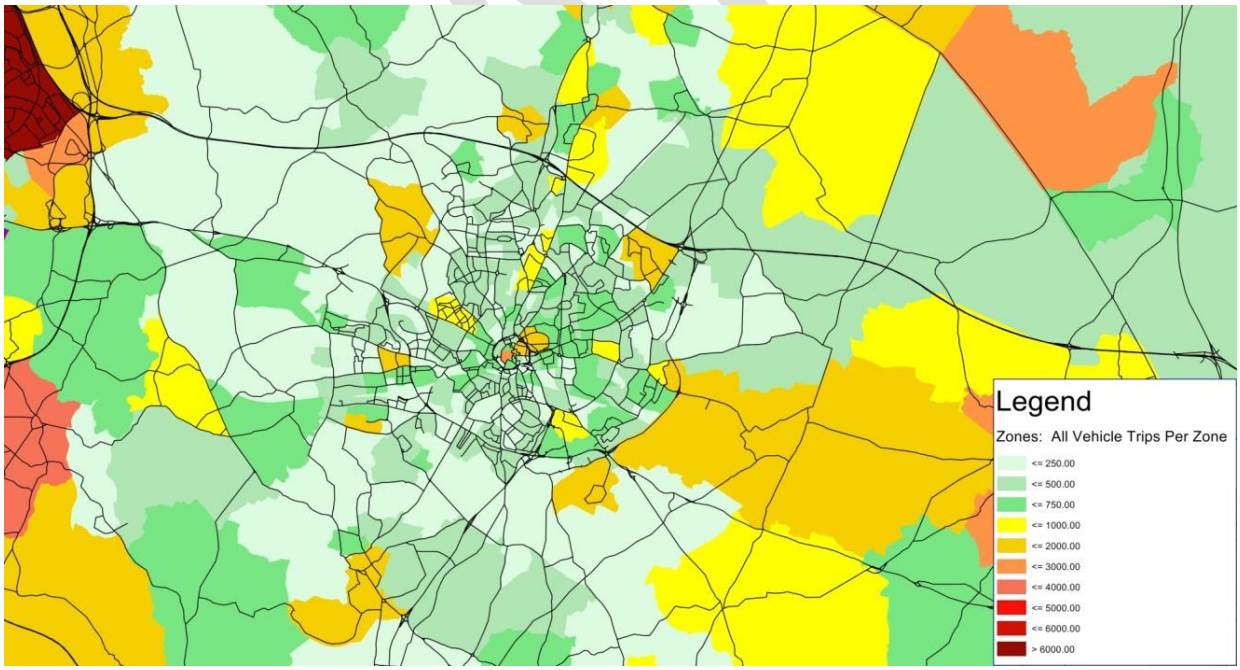


Figure 4-5 PM Peak 2031 Coventry Local Plan Core Scenario

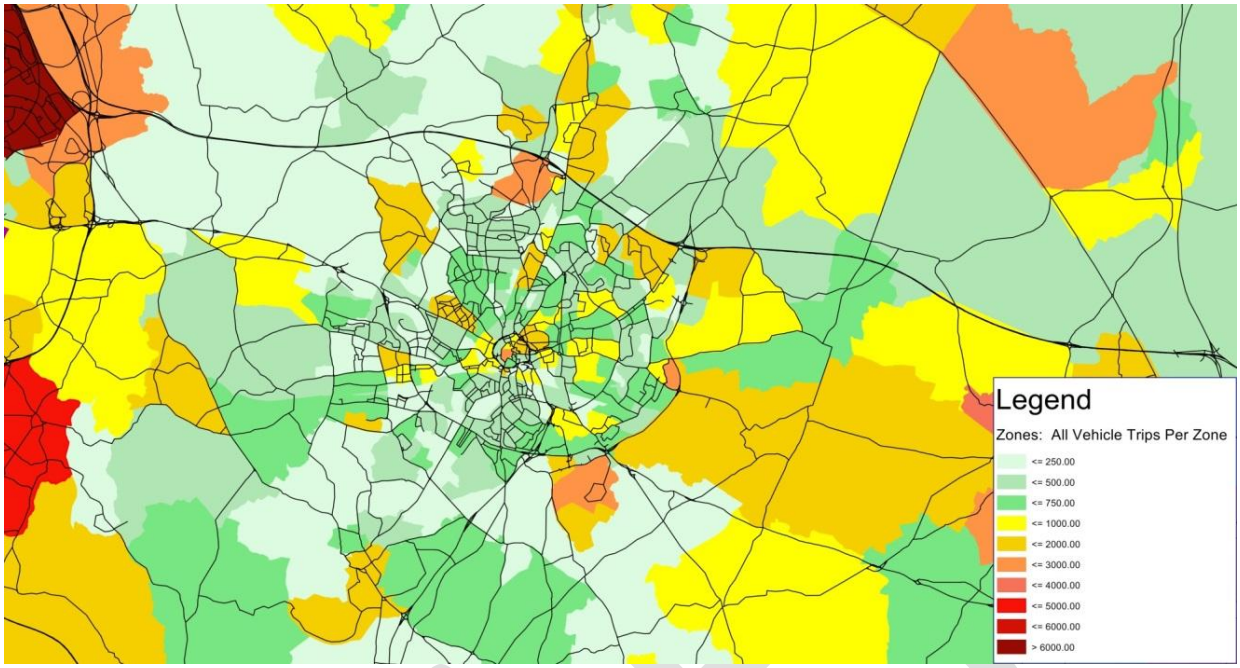
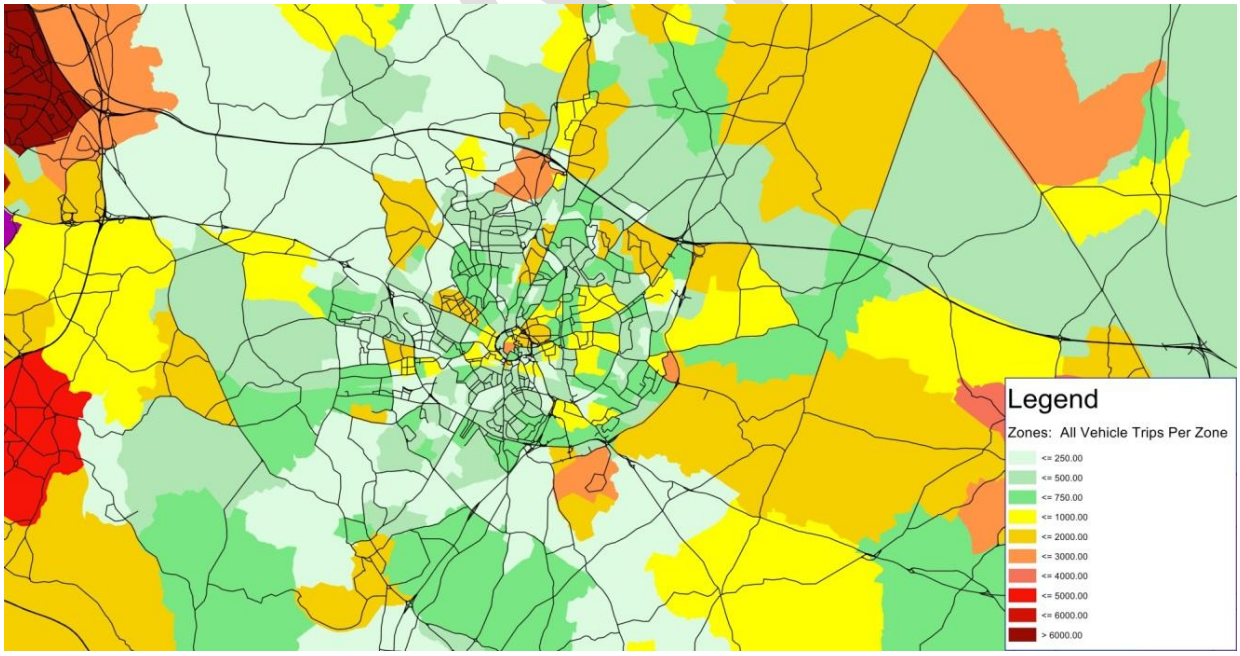


Figure 4-6 PM Peak 2031 Coventry Local Plan High Growth Option



MATRIX DEVELOPMENT

In order to develop the 2031 models matrices had to be developed for each of the four demand segments in the model. The four demand segments in CASM are:

- Car (Work)
- Car (Non-Work)

- Heavy Goods Vehicles (HGV)
- Light Goods Vehicles (LGV)

As previously explained, the distribution of traffic for new zones or new developments was taken from appropriate adjacent/nearby zones. The proportion of work and non-work car trips was copied from the 2013 model and HGVs/LGVs were globally growthed using National Road Traffic Forecasts (NRTF).

4.3 HIGHWAY NETWORK CREATION

A 'Do-Minimum' network was developed using schemes either built or committed post 2013 (the base year of the model). Figure 4.7 sets out the Coventry Highway Schemes classified as Near Certain/More than likely in an uncertainty log, these are also set out in more detail in Table 4.3. It should be noted that additional capacity enhancement schemes outside of the study area were also coded in from work to complete CASM forecasting for Highways England.

Figure 4-7 Location of Do-Minimum Highway Schemes

Table 4-3 Do Minimum Highway Schemes

Coventry Do Minimum Highway Schemes
1. A46 Expressway (M40 to M6): A45/A46 Tollbar End
2. A46 Binley Woods Roundabout Signalisation
3. A45 Kenilworth Road
4. A45 Sir Henry Parkes Road
5. Gibbett Hill Stoneleigh Road Warwick University (Stoneleigh Road/Kenilworth Road)
6. Ansty A4600 Schemes

Coventry Do Minimum Highway Schemes
7. Hickley Road/ Woodway Lane
8. Hinckley Rd. Brade Drive
9. A444 North-South Connectivity: A444 Whitley Interchange / Leaf Lane
10. A46 Expressway (M40 to M6): A46 / A4177 Stanks capacity improvement scheme
11. City Centre First: Friargate Bridge (Ring Road J6)
12. A45 Broad Lane
13. A46 Expressway (M40 to M6): A46/A428 & Sowe Valley Link Road (Walsgrave) Grade separations
14. New Keresley Link
15. Grade Separated Junction connecting Eastern Green to the A45

Two further highway network scenarios were developed – 'Do Something 1 and 2'. Do-Something 1 included some additional schemes over and above the Do-Minimum which were deemed by Coventry City Council as being necessary to facilitate specific developments; whereas Do-Something 2 includes a range of schemes which are deemed to be necessary to facilitate the whole quantum of development from the Local Plan.

The Do-Something networks illustrated in Figures 4.8 and 4.9 described in detail in Tables 4.4 and 4.5.

Figure 4-8 Do Something 1 Highway Schemes

Table 4-4 Do Something 1 Highway Schemes

Coventry Do Something 1 Highway Schemes
1. A46 Expressway (M40 to M6): A45/A46 Tollbar End
2. A46 Binley Woods Roundabout Signalisation
3. A45 Kenilworth Road
4. A45 Sir Henry Parkes Road
5. Gibbett Hill Stoneleigh Road Warwick University (Stoneleigh Road/Kenilworth Road)
6. Ansty A4600 Schemes
7. Hickley Road/ Woodway Lane
8. Hinckley Rd. Brade Drive
9. A444 North-South Connectivity: A444 Whitley Interchange / Leaf Lane
10. A46 Expressway (M40 to M6): A46 / A4177 Stanks capacity improvement scheme
11. City Centre First: Friargate Bridge (Ring Road J6)
12. A45 Broad Lane

Coventry Do Something 1 Highway Schemes
13. A46 Expressway (M40 to M6): A46/A428 & Sowe Valley Link Road (Walsgrave) Grade separations
14. New Keresley Link Road
15. Grade Separated Junction connecting Eastern Green to the A45
16. “Whitley South” Development Link and Stoneleigh Junction

Figure 4-9 Do Something 2 Highway Schemes

Table 4-5 Do Something 2 Highway Schemes

Coventry Do Something 2 Highway Schemes
1. A45 Leamington Road
2. A45 Tile Hill Junction
3. A444 Holbrook Way
4. A444 Foleshill Road
5. A444 Bell Green Road
6. A444 Binley Road
7. Paragon Scheme
8. Stoneleigh and Access to Kings Hill

Coventry Do Something 2 Highway Schemes
9. Keresley Link
10. Smart Motorways M6 J2 to J4

5 MODELLING RESULTS

5.1 INTRODUCTION

This section sets out the following results in the form of outputs from the Coventry Local Plan VISUM Model.

- Modelled Zone trip totals (generators and attractors)
- Levels of Service and Queue Plots
- Flow Difference Diagrams
- Results Statistics

5.2 HIGHWAY NETWORK PERFORMANCE

This section looks at the performance of the highway network under the scenarios described above. The following analysis has been undertaken:

- Junction Level of Service and Queues
- Total network flows
- Flow differences between scenarios

The following network and demand scenarios have been assessed:

Scenario Name	Demand and Network Assumptions
2013 Base Year	Calibrated and validated 2013 base year model.
2031 Do-Minimum	Demand created using method described in Tables 3.7 and 3.9 above. Network created using only schemes listed in Figure 4.2 and Table 4.3.
2031 Do-Something 1	Demand created using method described in Tables 3.7 and 3.9 above. Network created using schemes listed in Table 4.3 and Table 4.4.
2031 Do-Something 2	Demand created using method described in Tables 3.7 and 3.9 above. Network created using schemes listed in Table 4.3, Table 4.4 and Table 4.5.
2031 High Growth Option	Demand created using method described in Tables 3.7, 3.8 and 3.9 above. Network created using schemes listed in Table 4.3, Table 4.4 and Table 4.5.

TOTAL NETWORK TRAFFIC

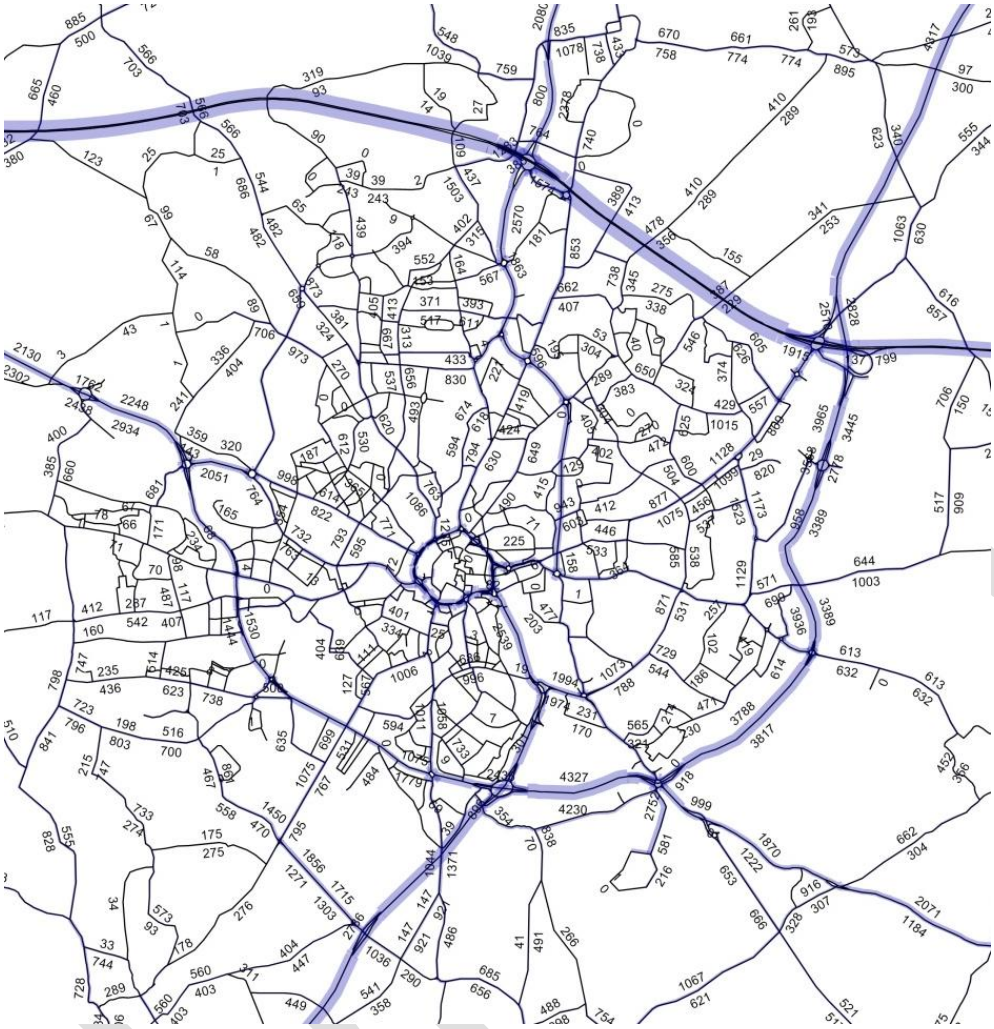
The figures below provide total traffic flow on the network in 2013 and 2031.

Figure 5-1 Base Year 2013 AM Peak Traffic Flows

Figure 5-2 Local Plan Core Option 2031 AM Peak Traffic Flows

Figure 5-3 Base Year 2013 PM Peak Traffic Flows

Figure 5-4 Local Plan Core Option 2031 Peak Traffic Flows



JUNCTION QUEUES AND LEVEL OF SERVICE

What follows are a series of plots from CASM which present the Level of Service for junctions and length of queues. Level of service is a measure of the operation of a junction from CASM; under congested peak period conditions it would be expected that a junction could be said to be operating at 'acceptably' up to LOS D or E. Those junctions which demonstrate LOS F are where capacity has been significantly exceeded and more detailed investigations are required.

Appendix A provides plots for all scenarios, demonstrating junction LOS and queues; Figures 5.5 to 5.8 below illustrate the change from 2013 to 2031 for the AM and PM peaks. The plots demonstrate how the 'Do-Minimum' network performance improves when the 'Do-Something 2' schemes are included.

Figure 5-5 AM Peak 2031 Coventry Local Plan Core Scenario Do-Minimum Network

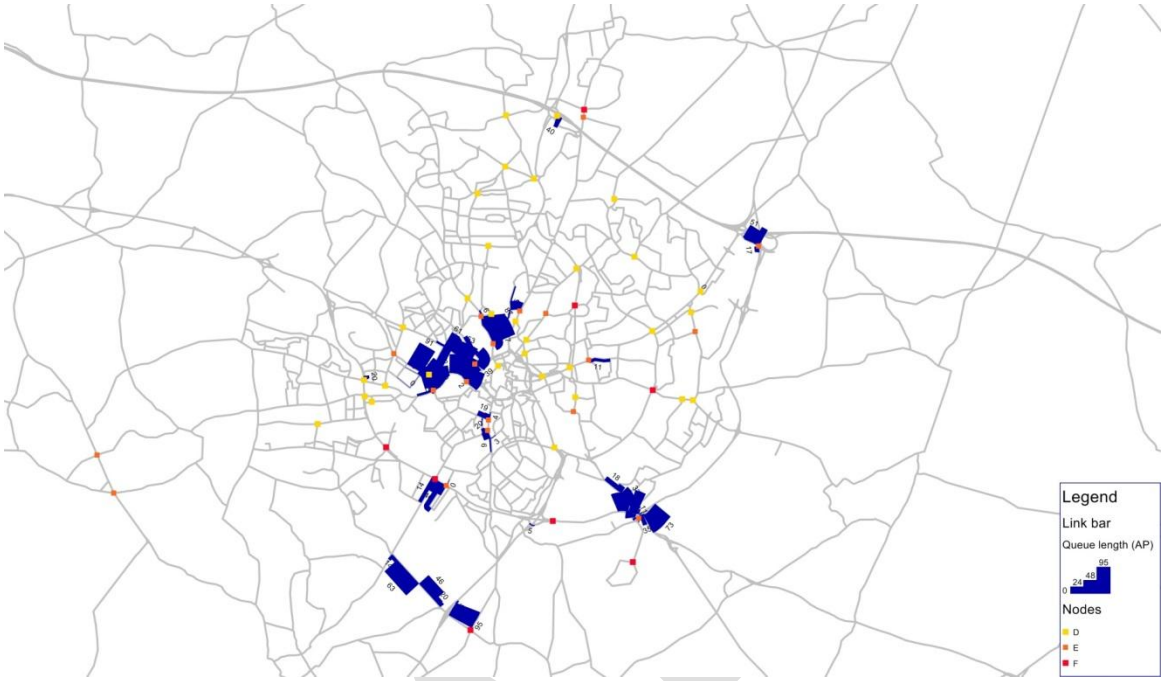


Figure 5-6 AM Peak 2031 Coventry Local Plan Core Scenario Do-Something 2 Network

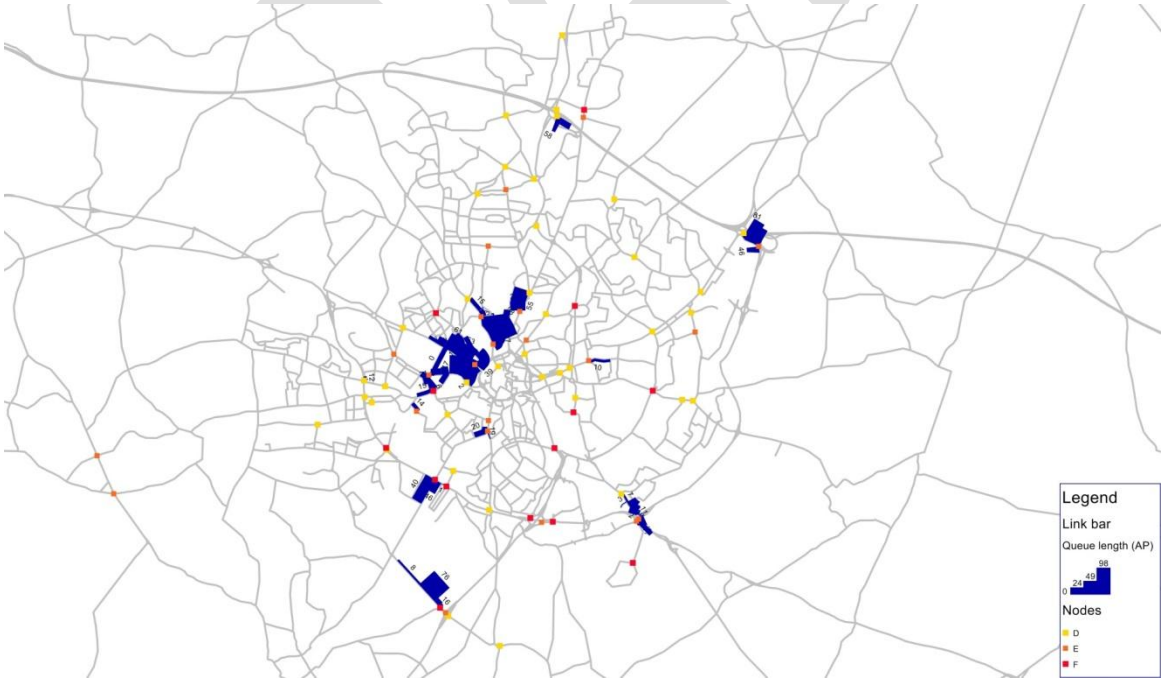


Figure 5-7 PM Peak 2031 Coventry Local Plan Core Scenario Do-Minimum Network

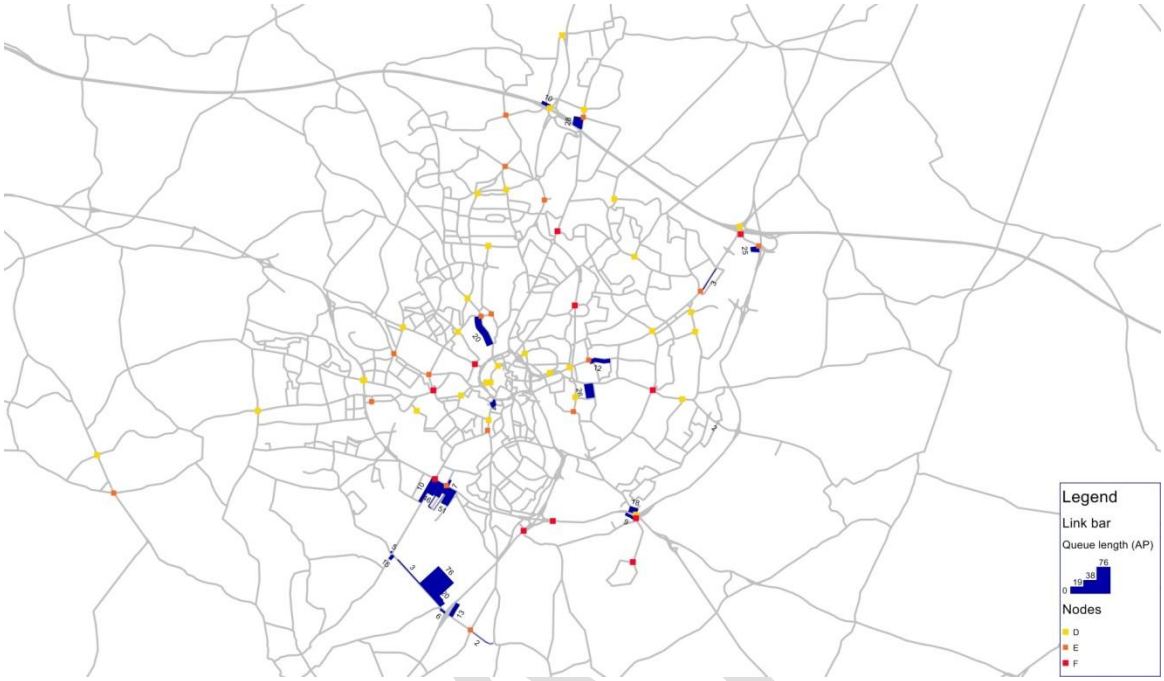
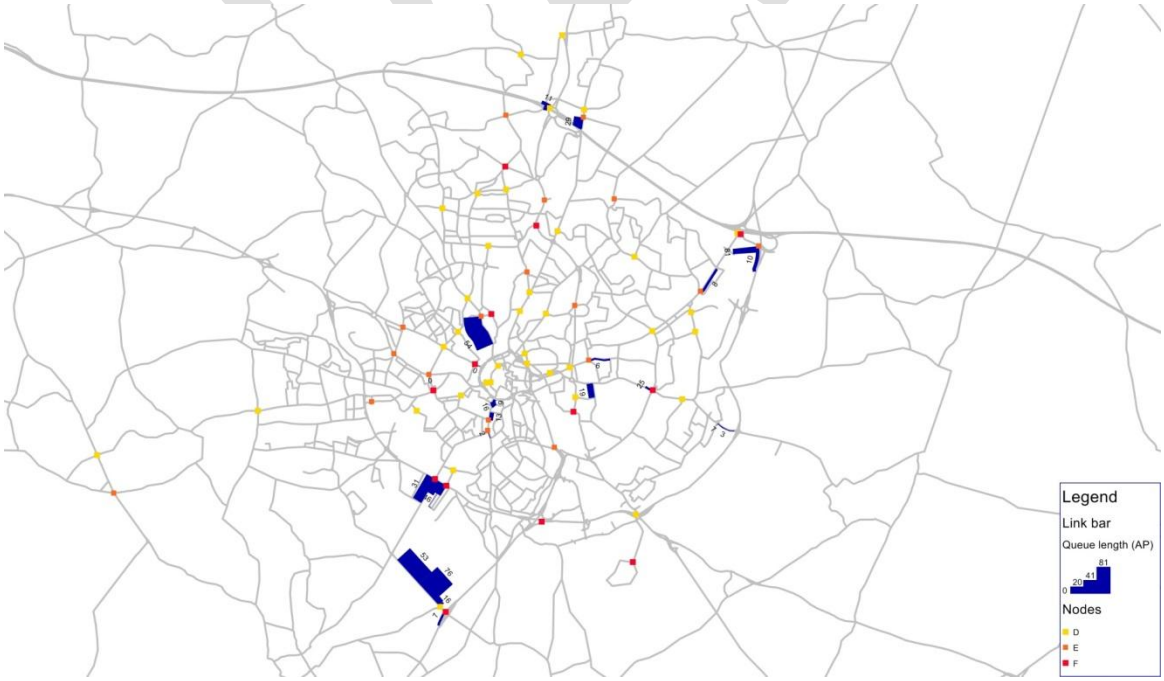


Figure 5-8 PM Peak 2031 Coventry Local Plan Core Scenario Do-Something 2 Network



TRAVEL TIME, DISTANCE AND DELAY

Table 5-1 AM Peak Total Travel Time, Distance and Delay (Coventry Cordoned Area)

AM PEAK	Total Vehicle Kilometres		Total Vehicle Travel Time (hours)		Total Vehicle Delay (hours)	
Base Year (2013)	770,155	-	13,272		1,837	
Do Min (2031)*	1,063,302	38.1%	22,781	71.6%	5,410	194.5%
DS 1 (2031)	1,061,375	37.8%	23,247	75.2%	5,125	179.0%
DS 2 (2031)	1,089,950	41.5%	23,526	77.3%	4,661	153.7%
DS 2 (2031) - High Growth Option	1,108,091	43.9%	24,393	83.8%	5,032	173.9%

*Note: the AM peak 'committed only' scenario did not fully converge

The above table demonstrates that 42% more demand (as described in Table 4.2 above) equates to a very similar increase in vehicle kms travelled, yet around 75% more total travel time. This difference is due to what appears at first to be a significant increase in delay.

However, when examining the same information on a 'per vehicle' basis (as per Table 5.2) then it can be seen that whilst delays have increased they are still at a level which an equivalent of less than 3 minutes per vehicle across the network; an increase of just 1.4 minutes per vehicle trip from 2013. This demonstrates that overall the network is resilient to the increase in demand and that any significant delays occur only at isolated locations.

Both tables also illustrate that delays decrease as the new schemes are introduced on the Do Something scenarios by 14% per vehicle across the network.

Table 5-2 AM Peak per Vehicle Travel Time, Distance and Delay (Coventry Cordoned Area)

	Average Vehicle Km per vehicle	***Average Vehicle Travel time (hr) per vehicle***	***Average Vehicle Delay (hr) per vehicle***
Base Year (2013)	9.26	0.160	0.022
Do Min (2031)	9.00	0.193	0.046
DS 1 (2031)	8.99	0.197	0.043
DS 2 (2031)	9.18	0.198	0.039
DS 2 (2031) - High Growth Option	9.15	0.201	0.042

The additional schemes show increases in vehicle KM and travel time but reductions in delays from the 'committed only' network. This is effectively showing that accessibility across the network has improved with the introduction of the new schemes.

When the High Growth scenario additional demand is included then the network statistics show an increase but still lower than the 'do-minimum' scenario. Demonstrating that the addition of the schemes to the network provides sufficient capacity to accommodate further demand before the network performance deteriorates to a level below the 'Do-minimum'.

The data in Tables 5.3 and 5.4 show an equivalent picture for the PM peak.

Table 5-3 PM Peak Total Travel Time, Distance and Delay (Coventry Cordoned Area)

PM PEAK	Total Vehicle Kilometres		Total Vehicle Travel Time (hours)		Total Vehicle Delay (hours)	
Base Year (2013)	807,250	-	13,840		1,872	
Do Min (2031)	1,098,426	36.1%	23,033	66.4%	4,618	146.6%
DS 1 (2031)	1,093,387	35.4%	23,461	69.5%	4,594	145.4%
DS 2 (2031)	1,126,930	39.6%	24,224	75.0%	4,174	122.9%
DS 2 (2031) - High Growth Option	1,145,968	42.0%	25,146	81.7%	4,429	136.5%

Table 5-4 PM Peak per Vehicle Travel Time, Distance and Delay (Coventry Cordoned Area)

	Average Vehicle Km per vehicle	*Average Vehicle Travel time (hr) per vehicle*	*Average Vehicle Delay (hr) per vehicle*
Base Year (2013)	9.30	0.159	0.022
Do Min (2031)	9.25	0.194	0.039
DS 1 (2031)	9.21	0.198	0.039
DS 2 (2031)	9.43	0.203	0.035
DS 2 (2031) - High Growth Option	9.37	0.206	0.036

6 DEMAND MANAGEMENT MITIGATION

6.1 LOCAL PLAN TARGETS AND ASPIRATIONS

The Local Plan transport chapter sets two aspirations for travel behaviour change in Coventry over the next 15 years:

- That 'peak spreading' and increased home working will mean that 10% of car commuting traffic will be removed from the current one hour peak period.
- That a package of measures to promote sustainable transport use (such as high quality public transport, investment in cycle infrastructure and travel behaviour change campaigns targeting short distance trip making) will achieve a 10% shift from single occupancy car use at peak times. CCC's targets for mode share changes for all trip purposes are set out in Table 6.1.

Table 6-1 Targeted 10% Reduction in Single Occupancy Car Use

Mode of Travel	Current (2011) Mode share	2031 Target Mode Share	% Change in Mode Share
Car Driver	44.6%	34.6%	-10%
Car Passenger	16.8%	17.8%	+1%
Cycle	1.8%	3%	+1.2%
Walk	26.6%	29.5%	+2.9%
Bus	8.9%	11.2%	+2.3%
Train	0.8%	1.5%	+0.7%
Other / increased home working	0.7%	2.4%	+1.7%
Total	**100%**	**100%**	

Figures taken from the 2011 West Midlands Household Travel Survey, identifying all trip purposes undertaken by Coventry residents during the AM peak period.

(Note. minor variations due to rounding)

6.2 IMPACTS ON NETWORK PERFORMANCE

The above targets are taken from the transport chapter of CCC's local plan. Unfortunately the full multi-modal version of CASM was not available to this study, and hence the ability for public transport to achieve the desired increases cannot be modelled at this time. However, there are a number of responses CCC are targeting that cannot be modelled using a conventional transport model; such as a shift to walking / cycling, a shift to the 'shoulder' peaks and increased home working.

In order to provide an indication of the mitigation achieving these targets will provide a version of the CASM highway model was run with the following demand reductions (using the Core LP demand scenario and the Do-Something 2 network):

- 4.5% of all non-work car trips (i.e. 10% of commuters who make up 45% of non-work car trips in the AM peak – taken from the household travel survey)
- A further 10% of all car trips (work and non-work) removed

The results of this run show queues and junction performance much improved from the 'worst case' demand scenario described earlier. Figures 6.1 and 6.2 show how queues and level of service at junctions improves if the demand management measures succeed in reducing car trips. Only the AM peak model has been run as an illustration of what the demand management measures may be able to achieve on the network if they are successful in meeting traffic reduction targets.

Figure 6-1 Core Option Demand, Do-Something 2 Network – AM Peak Queues and Junction LOS

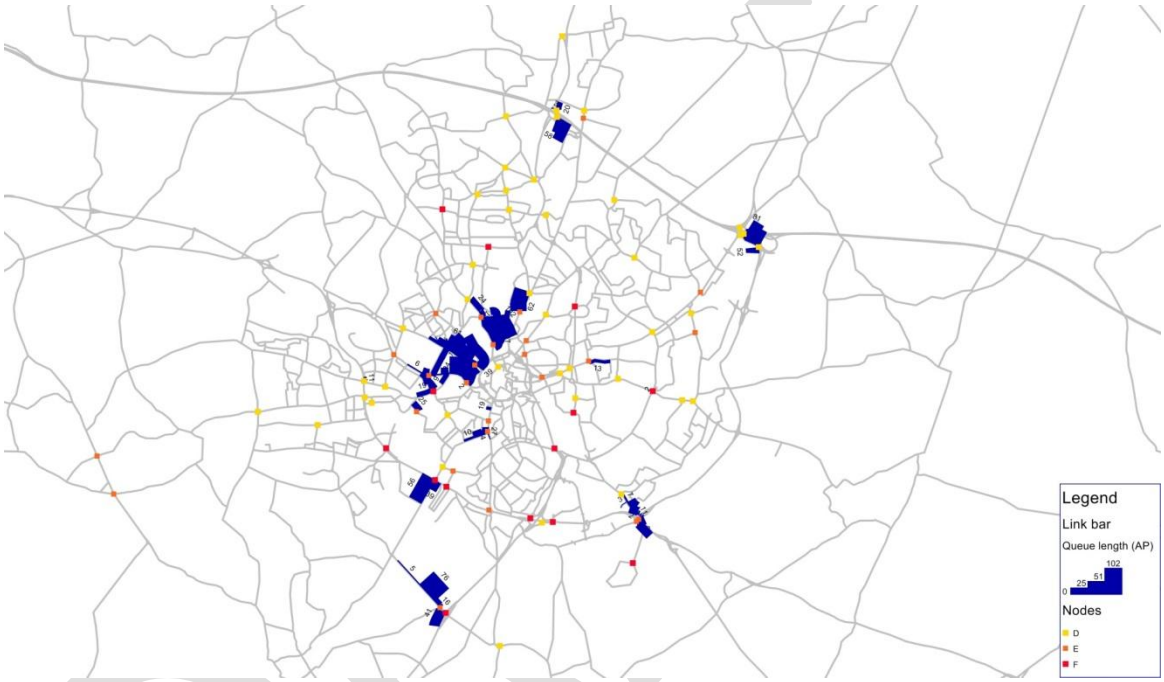


Figure 6-2 Demand Management Mitigation Option Demand, Do-Something 2 Network – AM Peak Queues and Junction LOS

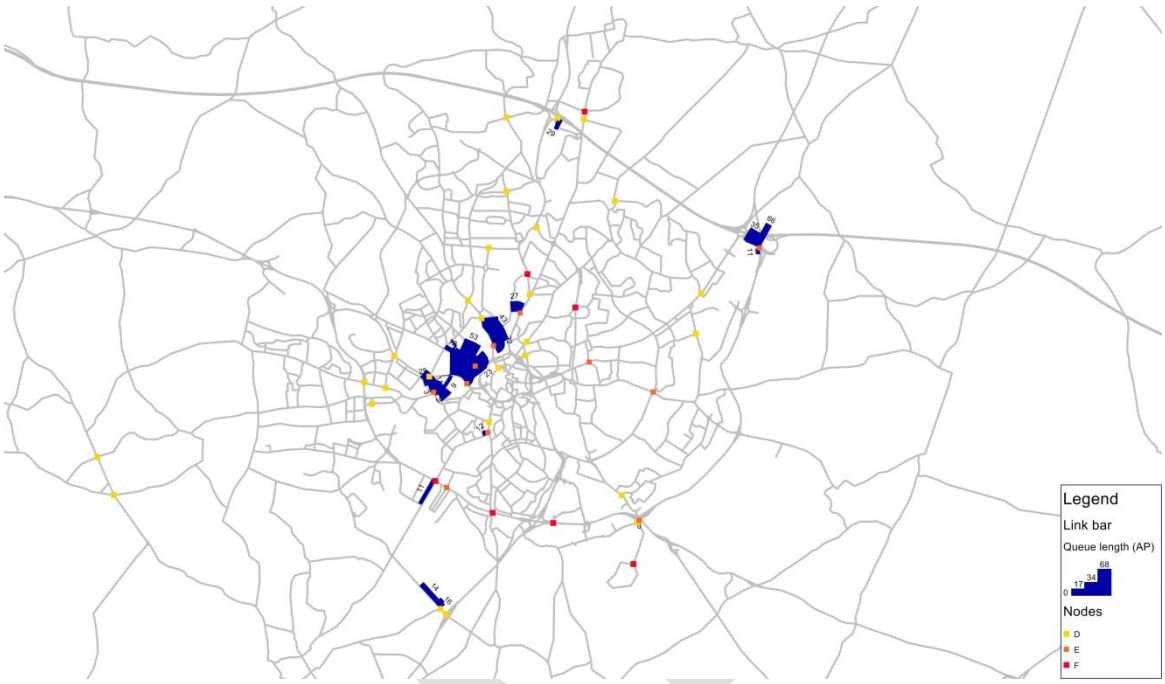


Table 6.2 illustrates the impacts the demand management measures may have on total network performance. It can be seen that with the mitigation in place per vehicle travel time reduces significantly, as does per vehicle delay.

Table 6-2 Per Vehicle Network Statistics for all AM Peak Modelled Options (Coventry Cordon)

	Average Vehicle Km per vehicle	***Average Vehicle Travel time (hr) per vehicle***	***Average Vehicle Delay (hr) per vehicle***
Base Year (2013)	9.26	0.160	0.022
Do Min (2031)	9.00	0.193	0.046
DS 1 (2031)	8.99	0.197	0.043
DS 2 (2031)	9.18	0.198	0.039
DS 2 (2031) – Core Option MITIGATION	**9.31**	**0.179**	**0.029**
DS 2 (2031) - High Growth Option	9.15	0.201	0.042

7 MODEL VERSIONS

7.1 MODEL FILE VERSIONS AND LOCATION

The model versions used for this work are documented in the table below

Table 7-1 Model File Versions and Location

MODEL	LOCATION OF VERSION FILE
AM Base Year	L:\70001991 - CSW WMHA Coventry\D Design and Analysis\Transportation\VISUM\CASM Model Files\Base Year\HAM\Runs\CASM_2013_v88_AM\Issued to Jacobs\CASM_2013_AM_Final.ver
PM Base Year	L:\70001991 - CSW WMHA Coventry\D Design and Analysis\Transportation\VISUM\CASM Model Files\Base Year\HAM\Runs\CASM_2013_v88_PM\Issued to Jacobs\CASM_2013_PM_Final.ver
AM Do Min	L:\70001991 - CSW WMHA Coventry\D Design and Analysis\Transportation\VISUM\CASM Model Files\Future Year\HAM\Run\AM Cov Local Plan 2031 Do Min\Cov_LocalPlan_2031_DM_v4.16_without_WhitleyStoneleigh_TB_AM_Assgnd.ver
PM Do Min	L:\70001991 - CSW WMHA Coventry\D Design and Analysis\Transportation\VISUM\CASM Model Files\Future Year\HAM\Run\PM Cov Local Plan 2031 Do Min\Cov_LocalPlan_2031_DM_v4.16_without_WhitleyStoneleigh_TB_PM_Assgnd.ver
AM Do Something 1	L:\70001991 - CSW WMHA Coventry\D Design and Analysis\Transportation\VISUM\CASM Model Files\Future Year\HAM\Run\AM Cov Local Plan 2031 Do Min\Cov_LocalPlan_2031_DM_v4.16_AM_TB_Assigned.ver
PM Do Something 1	L:\70001991 - CSW WMHA Coventry\D Design and Analysis\Transportation\VISUM\CASM Model Files\Future Year\HAM\Run\PM Cov Local Plan 2031 Do Min\Cov_LocalPlan_2031_DM_v4.16_PM_TB_sigv2_Assigned.ver
AM Do Something 2_ core matrix	L:\70001991 - CSW WMHA Coventry\D Design and Analysis\Transportation\VISUM\CASM Model Files\Future Year\HAM\Run\AM Cov Local Plan 2031 DS\Cov_LocalPlan_2031_DS_v6_AM_core_TB_Assigned.ver
PM Do Something 2_core matrix	L:\70001991 - CSW WMHA Coventry\D Design and Analysis\Transportation\VISUM\CASM Model Files\Future Year\HAM\Run\PM Cov Local Plan 2031 DS\Cov_LocalPlan_2031_DS_v6_PM_core_TB_sig2_Assigned.ver
AM Do Something 2_ HGO matrix	L:\70001991 - CSW WMHA Coventry\D Design and Analysis\Transportation\VISUM\CASM Model Files\Future Year\HAM\Run\AM Cov Local Plan 2031 DS\Cov_LocalPlan_2031_DS_v6_AM_TB_HGO_Assigned.ver
PM Do Something 2_ HGO matrix	L:\70001991 - CSW WMHA Coventry\D Design and Analysis\Transportation\VISUM\CASM Model Files\Future Year\HAM\Run\PM Cov Local Plan 2031 DS\Cov_LocalPlan_2031_DS_v6_PM_TB_HGO_Assigned.ver

Appendix A

TRAFFIC MODEL OUTPUT PLOTS