Shropshire Council

SHREWSBURY NORTH WEST RELIEF ROAD

Forecast Report

TR003
DECEMBER 2017

DRAFT

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1 INTRODUCTION

1.1 BACKGROUND

1.1.1. WSP (formerly Mouchel) was commissioned by Shropshire Council (SC) in March 2017 to support an Outline Business Case (OBC) for the proposed North West Relief Road (NWRR) in Shrewsbury.

1.1.2. The Shrewsbury North-West Relief Road (NWRR) would provide a new single carriageway road in the north-west quadrant of Shrewsbury. Together with the A5 and A49 bypasses, the Oxon Link Road and the Battlefield Link Road, the NWRR would provide the missing link to provide a complete outer bypass of Shrewsbury.

1.1.3. The main effect of providing a NWRR would be to allow long distance through traffic to avoid the town completely and to relieve the ring road. It will also enable other journeys to transfer to more appropriate routes within the town's road hierarchy, thus releasing highway capacity by freeing-up road space on the north and west approaches to the town centre.

1.2 TRAFFIC MODELLING AND FORECASTING

1.2.1. A new traffic model was developed to assess the proposed Shrewsbury North West Relief Road (NWRR). The model was developed using the SATURN software for a base year of (2017), using data from a number of sources including mobile phone network data. The development and validation of the model to a 2017 base year is described in 'Shrewsbury NWRR, Local Model Validation Report' – Ref TR-002.

1.2.2. The 2017 model provided the basis for the development of traffic forecasts that are required for the opening year of the proposed scheme, 2022 and design year 2037, i.e. 15 after scheme opening.

1.2.3. The forecasts are required to assess the operational impacts of the scheme in terms of changes in traffic flows and delays and journey times in the areas affected by the Scheme. The forecasts are also required for the economic evaluation in support of the Outline Business Case (OBC) for the Scheme.

1.3 PURPOSE OF REPORT

1.3.1. This report details the development of the future year traffic model and methodology adopted for forecasting. It also presents the Do Minimum and Do Something forecasts.

1.3.2. The Do Minimum traffic forecasts described in this report represent the existing highway network with modification to represent proposals that are currently committed to be constructed within the forecast horizon. The Do-minimum provides a base line against which Shrewsbury North West Relief Road scheme is assessed. The proposal that forms the North West Relief Road Scheme is referred to as the Do Something scenario.

2 TRAFFIC MODEL

2.1 INTRODUCTION

2.1.1. A traffic model was required in order to assess the future levels of traffic on the existing and future highway network including the impacts of the proposed scheme.

2.1.2. The model has taken account of factors which affect travel demand such as population, housing and employment and the prediction of alternative highway network strategies.

2.1.3. Details of the development of the base year traffic model, including the data collection, model calibration and validation are included in the Local Model Validation Report.

2.2 MODEL SPECIFICATION

2.2.1. This section provides a brief description of the model specification. Further details of the model specification are provided in the Local Model Validation Report.

I) MODEL TIME PERIODS

2.2.2. An analysis of the traffic count data showed that 08:00 to 09:00 hours for AM peak and 17:00 to 18:00 hours for PM peak were consistently higher within the respective peak periods across all sites.

2.2.3. The model has therefore been developed to represent three distinct time periods for an average weekday in March 2017, as follows:

- AM peak hour (08:00-09:00)
- PM peak hour (17:00-18:00)
- Inter peak average hour (10:00-16:00)

II) VEHICLE TYPES AND TRIP PURPOSES

2.2.4. In order to represent differential demand responses, for example varying growth rates for different vehicle types, the model represents 5 different trip categories. These are as follows:

- Cars – Journey from home to work, and vice versa (“Commute”)
- Cars – Employers Business
- Cars – Other trip purposes
- Light Goods Vehicles
- Heavy Goods Vehicles (including Medium Goods Vehicles)

III) PASSENGER CAR UNIT FACTORS

2.2.5. The traffic assignment model requires trips to be specified in terms of passenger car units. For the purposes of developing the matrices PCU factors were applied as in accordance with standard practice as given in WebTAG.

Table 1 Vehicle PCU Factors

Vehicle Type	PCU Factor
Car	1.0
LGV	1.0
HGV	2.4

3 FORECASTING FUTURE TRAFFIC LEVELS

3.1 OVERVIEW

3.1.1. The forecast model comprises a process of predicting the future flows on roads in the study area and includes 3 main components:

- Estimate of future highway supply;
- Estimate of future travel demand; and
- A mechanism of assigning demand to the highway network.

3.1.2. The future highway networks represent the most likely highway supply for scheme opening year 2022 and design year 2037.

3.1.3. Future year demand forecasts were produced for the scheme opening year 2022 and design year 2037. The demand forecasts made use of local information on expected traffic generation from the proposed developments within Shrewsbury, constrained to the appropriate national and regional traffic growth estimates. The key forecasting assumptions were captured and reported in the Uncertainty Log, along with their associated level of uncertainty.

3.1.4. The demand forecasts feed into the future year highway assignment models which, using information on likely future travel costs, predict the traffic flows on highway links (in each time period) within the wider study area. This section details the development of traffic forecasts and presents the key assumptions and uncertainties underpinning them.

3.2 SCOPE OF FORECASTS

3.2.1. The forecasts presented in this report have been prepared for a scheme opening year of 2022 and design year of 2037. The forecasts are based upon a 'fixed demand' methodology that assumes no change in demand as a result of changes in travel costs arising from the Scheme..

3.2.2. A 'variable demand' modelling approach has been developed that takes account of the change in demand in response to the change in the costs of travel due to the inclusion of the Scheme.

3.2.3. The forecasts based upon a variable demand modelling approach are currently being prepared and will be included in an updated version of this report, which is due for release during January 2018.

3.2.4. Three forecasts scenarios have been prepared for opening and design years that includes a Core, Low growth and High growth forecasts. It should be noted that the forecast growth presented in sections 3.4 and 3.5 below and the traffic forecasts presented in Chapter 4 relate to the Core growth scenario only.

3.2.5. The Low and High growth forecasts combined with the variable demand will be reported in an updated version of this report in January 2018.

3.3 DO-MINIMUM FORECAST NETWORKS

3.3.1. The Do-minimum forecast networks represent the existing highway network and any schemes which are considered to be either committed or are expected to be implemented in the future. For any potential scheme it is necessary to establish when it is likely to be in place in order to include it in the appropriate forecast year network.

3.3.2. Do Minimum networks were created for the projected opening year of the Scheme, 2022 and for the design year 2037. Table 2 lists the highway schemes which were added to the 2017 base year model to create the forecast year Do-minimum networks. Their location is shown on Figure 1 below. All schemes identified were considered sufficiently certain to be incorporated in all sensitivity tests.

Table 2 Do-minimum Highway Network Schemes

Location	Base year coding	Future Years
Mytton Oak Rd next to Royal Shrewsbury Hospital	Single file traffic controlled by signals as eastbound lane was cut off due to roadworks	Eastbound lane restored and signals removed
Meole Brace Roundabout	Roundabout	Roundabout layout changed and traffic link added between Roman Road and the A5122 exit towards the A5 as part of Shrewsbury Integrated Transport Package
London Road A5064	Single file traffic controlled by signals as northbound lane was narrowed down due to roadworks	Northbound lane restored and signals removed
Chester St A528 (Between Cross St and Benbow Quay)	Capacity and speed limits reduced in both ways as southbound lane was narrowed down	Normal capacity and speed limits restored
Welshpool Road	Coded as single file traffic controlled by signals to simulate manual traffic control due to roadworks	Lane restored and signals removed
Shelton Road B4380	Single file traffic controlled by signals as Southbound lane was cut off due to roadworks	Southbound lane restored and signals removed
Frankwell Roundabout Exit - Copthorne Road	Due to roadworks, Frankwell Roundabout Exit though Copthorne Road was closed off	Exit restored
Chester St/ Castle Gates gyratory	Cruise speeds as surveyed in March 2017	Cruise speeds limited to 20mph throughout surrounding area associated with proposed 20mph zone extension in Shrewsbury Integrated Transport Package
English Bridge	Old Potts Way approach with 1 lane	Old Potts Way approach with 1 lane plus flare as recognised by Shrewsbury Integrated Transport Package
Coleham Roundabout	Coded as cross roads	Changed to mini-roundabout as recognised by Shrewsbury Integrated Transport Package
Readbrook Roundabout	Standart capacity roundabout	Approaches widened and capacity increased as recognised by Shrewsbury Integrated Transport Package
Churncote Roundabout - Welshpool Road	Welshpool road is linked to Churncote Roundabout	Through traffic from Welshpool Road was removed as part of OLR scheme
Between Churncote Roundabout and Holyhead	Without OLR Scheme	OLR scheme included

Figure 1 below shows the extent of the Do Minimum highway network, including all expected highway schemes, in the design year of 2037.

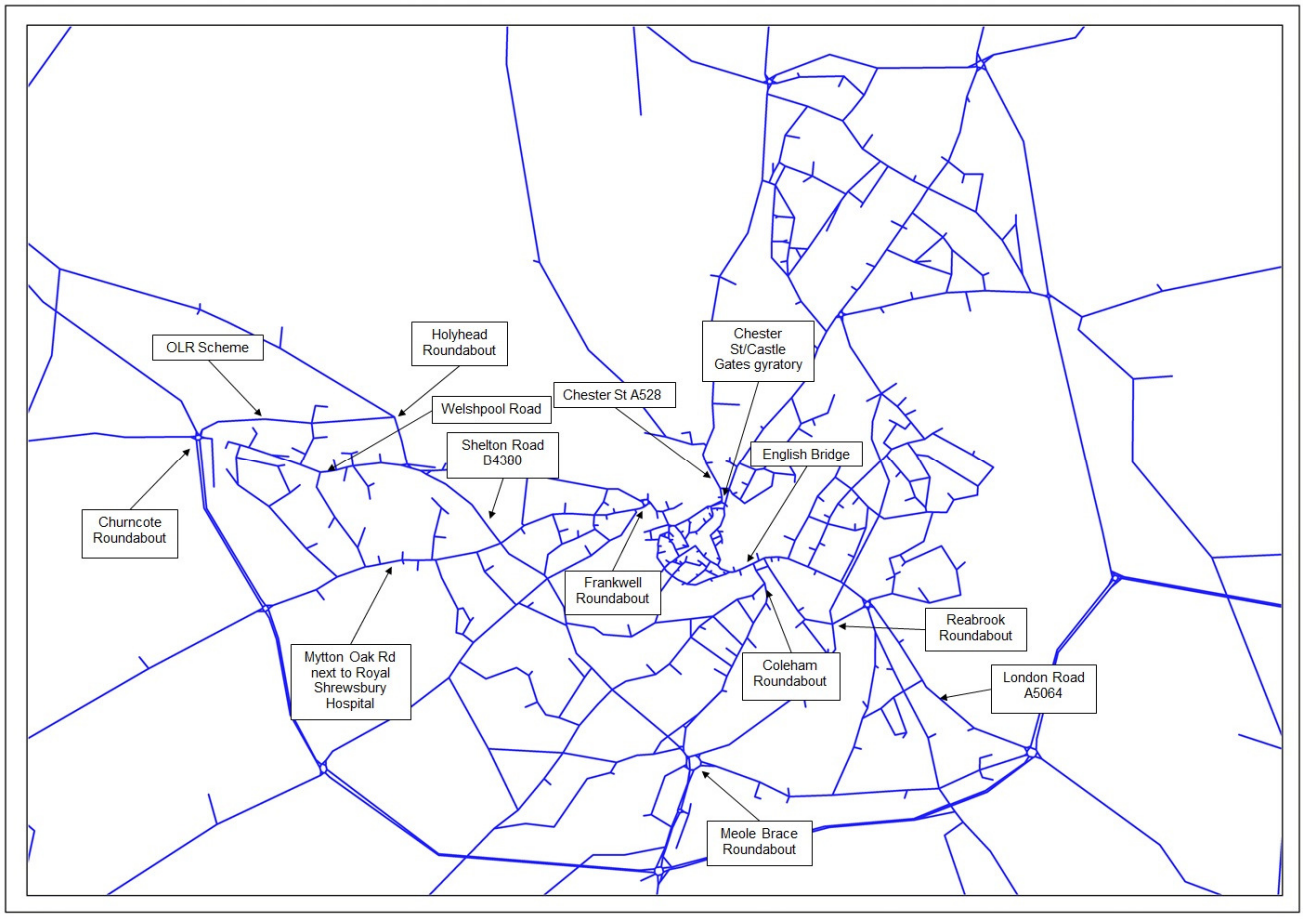


Figure 1 Location of Do-minimum highway network schemes

3.4 DEMAND FORECASTS

3.4.1. Whilst there are several potential contributors to uncertainty in traffic demand forecasts, the focus for forecasting future year for the Shrewsbury NWRR model has been:

- national uncertainties including demographic, economic and behavioural trends; and
- factors affecting local demand uncertainty.

3.4.2. The national uncertainty is associated with forecasting in the NTM, as reported through TEMPro, the Department for Transport's computer model for predicting future trip end totals. The factors under consideration include GDP growth, fuel prices, vehicle efficiency and other national trends.

3.4.3. To deal with uncertainty in highway models, WebTAG advises the use of an appropriate range about the core scenario TEMPro growth forecast of ±2.5% for traffic forecasts one year ahead of the model base year, rising with the square root of the number of years to ±15% for forecasts 36 years ahead. This approach has been adopted in the development of Low and High growth sensitivity tests. These will be reported in an updated version of this report that will describe the Variable Demand forecasts as noted in section 3.2 above.

3.4.4. The major consideration in assessment of uncertainty in local demand is the nature of development, together with its location, size and timing for becoming occupied. As with the supply side, details of prospective developments were collated from local planning authorities and captured within the Uncertainty Log, along with their prescribed level of uncertainty. Only those developments located within the core study area and

whose likelihood was assessed to be either 'near certain' or 'more than likely' were considered in the demand forecasts.

3.4.5. The Uncertainty Log is presented in Appendix A. All developments within the core study area, irrespective of their size, were considered. However in line with WebTAG guidance, only those developments assigned a likelihood level of 'near certain' or 'more than likely' were explicitly included in the demand forecasts.

3.4.6. The relatively small developments, comprising less than 100 residential units or less than 1,000 square metres of non-residential area were incorporated within the existing model zone structure. The more significant developments, namely those exceeding the above thresholds, were allocated to separate model zones.

3.4.7. The location of the significant developments and the model zones within which they are located are shown in Figure 2 below.

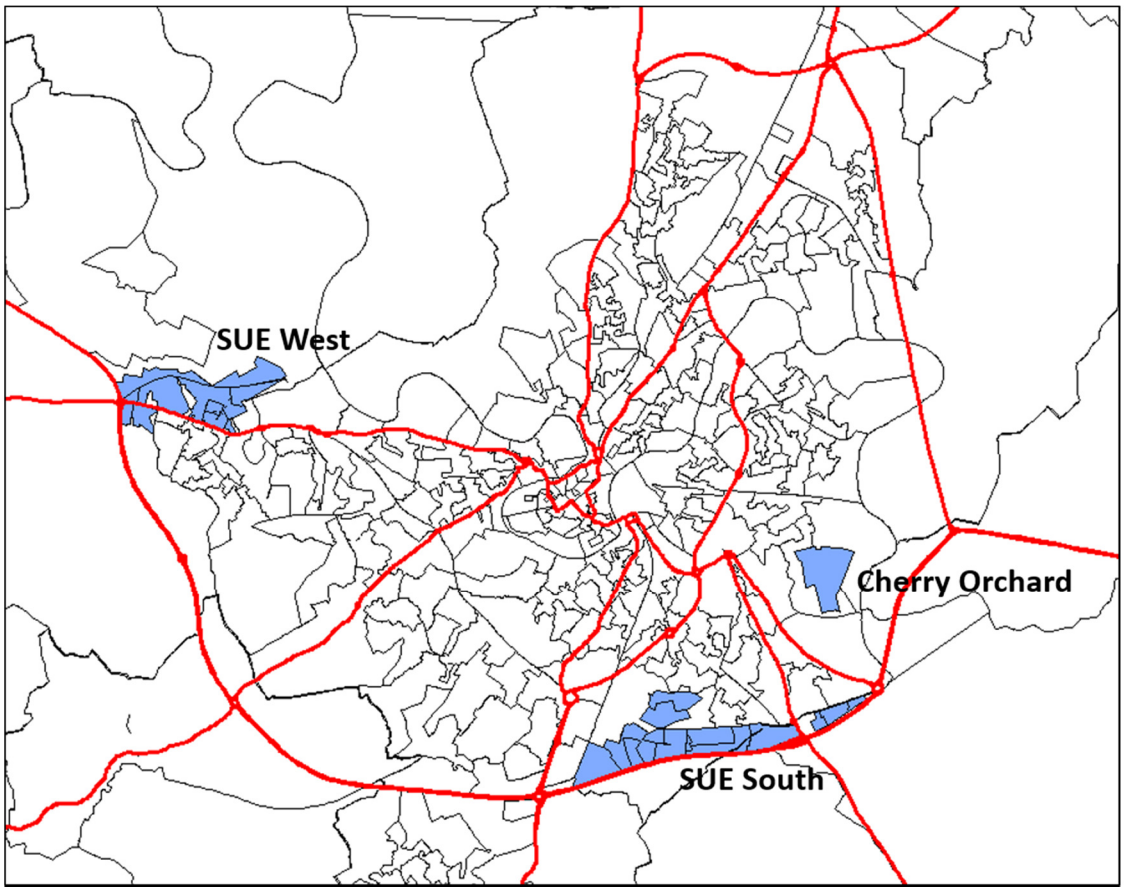


Figure 2 Location of significant Do-minimum land use changes

I. TEMPRO GROWTH

3.4.8. TEMPro (Trip End Modelling PROgram) is the Department for Transport's computer model for predicting future trip end totals and hence the growth in travel demand. The current version is NTEM 7.2 and this has been used in the development of demand forecasts for 2022 and 2037.

3.4.9. TEMPro takes input of various demographic data, largely from population census data, together with forecasts of housing, jobs and population. From this information it estimates other demographic data for the future, car ownership levels and ultimately trip end growth, by mode, purpose and by time period.

3.4.10. TEMPro growth for Shropshire was extracted at the finest TEMPro zone level comprising of 68 TEMPro zones in total. Outside of Shropshire, a single TEMPro growth factor corresponding to all of GB was used. Growth was extracted for car drivers, by time period and by journey purpose. The forecast change in trip ends across

different TEMPro journey purposes were combined to align with the model user classes. Growth factors for each model user class were then calculated accordingly. The growth factors were applied at individual traffic model zone level, matched to the 68 TEMPro zones, using a furnessing procedure.

3.4.11. A summary of the resultant TEMPro growth at a wider spatial level for Shrewsbury, Shropshire and GB is shown in Table 3 below.

Table 3 TEMPRO growth factors

TEMPRO growth	2017-2022			2017-2037		
Car commute trips	**AM**	**IP**	**PM**	**AM**	**IP**	**PM**
Shrewsbury	1.048	1.043	1.047	1.117	1.105	1.111
Shropshire	1.039	1.039	1.042	1.103	1.100	1.106
GB	1.052	1.043	1.044	1.136	1.112	1.113
Car business trips	**AM**	**IP**	**PM**	**AM**	**IP**	**PM**
Shrewsbury	1.052	1.049	1.051	1.127	1.122	1.128
Shropshire	1.044	1.045	1.046	1.111	1.115	1.121
GB	1.053	1.047	1.048	1.139	1.126	1.129
Car other trips	**AM**	**IP**	**PM**	**AM**	**IP**	**PM**
Shrewsbury	1.058	1.058	10.359	1.187	1.190	1.166
Shropshire	1.051	1.052	3.586	1.167	1.170	1.153
GB	1.061	1.058	1.635	1.187	1.186	1.168

3.4.12. In order to capture the localised impacts of land use developments contained within the Uncertainty Log, use was made of the Alternative Planning Assumptions facility in TEMPro, whereby growth associated with explicitly modelled new developments was taken into account. This involved:

- For each development identified in the Uncertainty Log, subtracting development, households and jobs from the relevant planning totals in TEMPro and generating new growth factors at TEMPro zonal level;
- Applying adjusted TEMPro factors to the base year demand matrices;
- Adding the new development trips to the relevant zones; and
- Computing adjustment factors to ensure that the overall level of growth across the study area is consistent with TEMPro.

3.4.13. Table 4 below shows the resulting household and employment projections for 2022 and 2037 after subtracting the household and employment projections associated with the identified developments.

3.4.14. Table 4 shows that the identified developments constitute a growth of 3,408 households and 7,791 jobs in Shrewsbury between 2017 and 2022 and a growth of 5,019 households and 9,246 jobs between 2017 and 2037.

Table 4 TEMPRO Alternative planning assumptions for Shrewsbury

Year	TEMPRO Planning Assumptions				Development Assumptions	
	Original		Alternative			
	HH's	Jobs	HH's	Jobs	HH's	Jobs
2017	42,941	58,076	42,941	58,076	0	0
2022	44,653	59,204	41,245	51,413	3,408	7,791
2037	49,656	61,711	44,637	52,465	5,019	9,246

3.4.15. The resultant TEMPRO growth factors, based on these alternative assumptions, are presented in Table 5 below. These are presented separately for the development zones within Shrewsbury and the rest of the zones within Shrewsbury, as well as for Shropshire and rest of GB.

Table 5 TEMPRO Alternative planning assumptions growth factors

TEMPRO growth	2017-2022			2017-2037		
Car commute trips	**AM**	**IP**	**PM**	**AM**	**IP**	**PM**
Shrewsbury devpt zones	0.961	0.934	0.907	0.994	0.939	0.918
Other Shrewsbury zones	1.049	1.043	1.047	1.119	1.106	1.111
Shropshire	1.039	1.039	1.042	1.103	1.100	1.106
GB	1.052	1.043	1.044	1.136	1.112	1.113
Car business trips	**AM**	**IP**	**PM**	**AM**	**IP**	**PM**
Shrewsbury devpt zones	0.948	0.910	0.915	0.971	0.927	0.919
Other Shrewsbury zones	1.053	1.049	1.051	1.130	1.122	1.128
Shropshire	1.044	1.045	1.046	1.111	1.115	1.121
GB	1.053	1.047	1.048	1.139	1.126	1.129
Car other trips	**AM**	**IP**	**PM**	**AM**	**IP**	**PM**
Shrewsbury devpt zones	0.960	0.941	9.494	1.030	1.009	0.973
Other Shrewsbury zones	1.059	1.059	10.275	1.189	1.191	1.167
Shropshire	1.051	1.052	3.586	1.167	1.170	1.153
GB	1.061	1.058	1.635	1.187	1.186	1.168

3.4.16. It should be noted that growth factors derived in this way were calculated and applied purely for the TEMPro zones containing one or more of the developments identified in the Uncertainty Log. For all other zones, unadjusted TEMPro growth factors were used.

3.4.17. A final adjustment was applied to zones within Shrewsbury without any explicit development located within them, to ensure that the overall demand in Shrewsbury was controlled back to TEMPro growth, in line with WebTAG guidance.

II. GOODS VEHICLE GROWTH

3.4.18. There are no available local data to support the calculation of HGV and LGV growth forecasts at the trip end level. Future LGV and HGV growth factors were derived in accordance with DfT WebTAG guidance (TAG Unit M4). The DfT's Road Transport Forecasts for the growth in goods vehicle kilometres in England were used: (https://www.gov.uk/government/publications/road-transport-forecasts-2013).

3.4.19. The forecast growth of freight vehicle km has been used to estimate growth in goods vehicle demand relative to the base year and is presented in Table 6 below.

Table 6 Growth Factors for LGV and HGV demand estimates

Year	Vehicle km growth	
	LGV	HGV
2017	1.00	1.00
2022	1.13	1.03
2037	1.48	1.11

3.4.20. It should be noted that some of the employment land use developments (namely B2 and B8 land uses) identified in the Uncertainty Log are predicted to generate relatively high volumes of goods vehicle trips. The total volume of goods vehicles generated by these developments is in excess of the expected growth in goods vehicle traffic based on national RTF presented above.

3.4.21. To maintain a robust assessment, it was assumed that this generation would wholly account for the growth in goods vehicle trips associated with these specific zones and hence no additional growth was applied to these specific development zones.

3.4.22. The goods vehicle trip generation to and from these development zones is presented in Table 9 below, both in terms of absolute numbers and as growth factors relative to 2017 levels. Although this relatively high level of goods vehicle growth was applied only to the relevant development zones, because of the relatively low baseline volume of goods vehicles within the study area in 2017, across the matrix as a whole, this resulted in a notably higher overall growth in goods vehicle trips relative to national RTF growth forecasts.

3.4.23. The growth in goods vehicle trips for all other zones not explicitly affected by the development in Uncertainty Log has been maintained at the level consistent with RTF growth presented in Table 6.

III. DEVELOPMENT TRIP GENERATION

3.4.24. Development trip estimates were calculated by applying trip rates obtained from the TRICS database to the development totals recorded in the Uncertainty Log. To ensure robust estimates, a proportion of goods vehicle trips was calculated and applied separately for B2 and B8 land use developments only. It was assumed that residential developments would only generate car trips.

3.4.25. The resulting trip generation associated with the developments presented in the Uncertainty Log is shown for Cars, LGV's and HGV's in Tables 7, 8 and 9 respectively. These tables present the trip generation both in terms of total volume of traffic generated by the combined development sites and as a growth factor relative to the 2017 base year within these zones only.

Table 7 Car Vehicle Growth associated with developments in Uncertainty Log

Car Vehicle Generation (PCUs)	AM 2022	IP 2022	PM 2022	AM 2037	IP 2037	PM 2037
Additional PCUs generated	3374	1360	2712	4423	1796	3645
Growth factor relative to 2017	1.44	1.25	1.37	1.57	1.33	1.49

Table 8 Light Goods Vehicle Growth associated with developments in Uncertainty Log

Light Goods Vehicle Generation (PCUs)	AM 2022	IP 2022	PM 2022	AM 2037	IP 2037	PM 2037
Additional PCUs generated	298	126	210	391	162	283
Growth factor relative to 2017	1.38	1.20	1.35	1.50	1.26	1.47

Table 9 Heavy Goods Vehicle Growth associated with developments in Uncertainty Log

Heavy Goods Vehicle Generation (PCUs)	AM 2022	IP 2022	PM 2022	AM 2037	IP 2037	PM 2037
Additional PCUs generated	247	78	193	349	98	273
Growth factor relative to 2017	1.67	1.17	2.01	1.95	1.21	2.44

3.4.26. As noted above, the growth factors appear high, particularly for HGVs. This is due mainly to a combination of a relatively low baseline volume of HGV traffic combined with the significant quantum of proposed development for Shrewsbury, and specifically B2 and B8 land use in case of HGVs.

IV. FUEL AND INCOME ADJUSTMENTS

3.4.27. TEMPro produces forecasts for future demand assuming that there are no changes between the relative costs of each mode of transport and there are no effects of income growth (beyond that represented through car ownership). For this reason, when TEMPro forecasts are used in highway only models, the trip ends need adjustming to take account of the expected future changes in fuel price and income, both which are considered to have an overall impact on future highway demand flows.

3.4.28. Table 10 shows the adjustment factors for fuel and income. These were taken from WebTAG Unit M4 and adjusted to the base year of 2017. The combined effect of income and fuel cost was calculated and applied as a single factor to all car trips.

Table 10 Fuel and Income adjustment factors for forecast years

Year	Adjustment Factors		
	Income	Fuel Cost	Combined
2017	1.00	1.00	1.00
2022	1.01	1.00	1.01
2037	1.05	1.01	1.06

3.4.29. The forecast growth of private vehicles is summarised in Table 13 in section 3.5 below.

3.5 FORECAST GROWTH - SUMMARY

3.5.1. The trip end growth forecasts were used to factor the base year trip matrices using growth factors for each time period, trip purpose, and vehicle type. An iterative Furness process was applied to alternately factor row and column totals to match the target trip end totals. An adjustment factor was applied to make the target row and column totals equal to ensure the Furness process would converge.

3.5.2. Table 11 below shows the resulting hourly matrix totals for each purpose, vehicle category and time period for base year, opening and design year.

Table 11 Summary of Matrix Totals

		Cars			Goods Vehicles		
Year	Time Period	Commute	Business	Other	LGV	HGV	Total
2017	AM	21,960	6,450	19,671	4,165	1,527	53,773
	IP	4,309	5,580	27,328	3,435	1,300	41,952
	PM	11,685	6,058	29,169	3,403	779	51,094
2022	AM	23,235	6,844	21,008	4,804	1,810	57,700
	IP	4,535	5,900	29,171	3,851	1,398	44,854
	PM	12,326	6,417	31,014	3,883	988	54,628
2037	AM	26,114	7,718	24,630	5,980	2,062	66,502
	IP	5,051	6,636	34,278	4,800	1,506	52,272
	PM	13,747	7,235	35,960	4,820	1,142	62,903

3.5.3. The proportions of vehicle types and trip purposes based on the trip totals for the model matrices are presented in Table 12.

Table 12 Vehicle Proportions (percentage of total trips)

		Cars			Goods Vehicles		
Year	Time Period	Commute	Business	Other	LGV	HGV	Total
2017	AM	41%	12%	37%	8%	3%	100%
	IP	10%	13%	65%	8%	3%	100%
	PM	23%	12%	57%	7%	2%	100%
2022	AM	40%	12%	36%	8%	3%	100%
	IP	10%	13%	65%	9%	3%	100%
	PM	23%	12%	57%	7%	2%	100%
2037	AM	39%	12%	37%	9%	3%	100%
	IP	10%	13%	66%	9%	3%	100%
	PM	22%	12%	57%	8%	2%	100%

3.5.4. Table 12 shows that commuter trips are predominant during the AM period and are lower during the inter peak period and PM period. Other purpose trips are predominant during the inter peak period. The proportions of HGVs are higher during the inter peak period and lowest during the PM period. The proportions of each trip purpose remain similar at each of the forecast years.

3.5.5. Table 13 shows the growth of the separate vehicle types and trip purposes for each forecast year. In general, the highest growth levels are predicted for LGVs. However as noted in section 3.4 above, the growth in HGVs is also predicted to be relatively high. This is due to the relatively high quantum of B2 and B8 development planned for Shrewsbury which is expected to generate goods vehicle traffic in the study area.

3.5.6. Growth is generally consistent between each time period, with the exception of commuting trips which have higher growth rates in the inter peak than the AM and PM peaks.

Table 13 Matrix Growth – 2017 to 2022 and 2037

Year	Time Period	Cars			Goods Vehicles		Total
		Commute	Business	Other	LGV	HGV	
2017 to 2022	AM	1.06	1.06	1.07	1.15	1.19	1.07
	IP	1.05	1.06	1.07	1.12	1.08	1.07
	PM	1.05	1.06	1.06	1.14	1.27	1.07
2017 to 2037	AM	1.19	1.20	1.25	1.44	1.35	1.24
	IP	1.17	1.19	1.25	1.40	1.16	1.25
	PM	1.18	1.19	1.23	1.42	1.47	1.23

3.6 ASSIGNMENT MODEL

3.6.1. The future trip demand matrices were assigned to the highways network and an equilibrium process applied which enabled the traffic to seek alternative routes according to cost between each origin and destination. This is designed to represent drivers' choice of routes.

3.6.2. Each trip matrix was assigned separately (by user class and time period) as the values of time and vehicle operating costs used in the assignment vary by vehicle type and trip purpose. The assignment parameters were a combination of time and operations costs (mainly fuel) and were calculated using WebTAG guidance.

3.6.3. The assignment parameters are presented in Tables 14 and 15 below for time and vehicle operating costs respectively.

Table 14 Assignment Parameter – Values of Time (pence per minute per vehicle)

Year	Time Period	Cars			Goods Vehicles	
		Commute	Business	Other	LGV	HGV
2017	AM	20.55	30.65	14.18	21.66	50.58
	IP	20.89	31.41	15.11	21.66	50.58
	PM	20.62	31.09	14.85	21.66	50.58
2022	AM	22.21	33.11	15.32	23.40	54.65
	IP	22.57	33.93	16.32	23.40	54.65
	PM	22.28	33.59	16.04	23.40	54.65
2037	AM	29.83	44.49	20.58	31.44	73.42
	IP	30.32	45.59	21.93	31.44	73.42
	PM	29.94	45.13	21.55	31.44	73.42

Table 15 Assignment Parameters – Vehicle Operating Costs (pence per km)

Year	Cars			Goods Vehicles	
	Commute	Business	Other	LGV	HGV
2017	5.53	12.07	5.53	12.61	47.10
2022	5.44	11.96	5.44	12.70	51.01
2037	5.28	11.73	5.28	12.86	55.60

4 TRAFFIC FORECASTS

4.1 FORECAST TRAFFIC PATTERNS

4.1.1. As noted in section 3.2 above, the forecasts presented in this section are based on the Core growth scenario and have been prepared on the assumption that overall demand will not vary with changes to travel costs. The low and high forecasts in conjunction with variable demand will be presented in an updated version of this report.

4.1.2. The forecast year trip matrices were assigned to the future year Do-minimum network to show the effects of traffic growth without the Proposed Scheme. The trip matrices were then assigned to the Do-something networks to show the predicted flows on the scheme and the traffic relief to other roads in the network, principally the inner ring road.

4.1.3. Detailed traffic flows are presented and discussed in Section 4.2 below.

4.1.4. Table 16 below summarises the changes in traffic levels between the 2017 base and the future Do-minimum scenario for each forecast year and Table 17 summarises the changes between the Do-something and Do-minimum.

Table 16 Growth in Vehicle KM and Vehicle Hours 2017 to 2037

Time Period	PCU km		PCU hours	
	2017-2022	2017-2037	2017-2022	2017-2037
AM	123998	475988	1862	8246
IP	94211	362229	1070	4921
PM	108117	432383	1385	7102

Table 17 Change in Vehicle KM and Vehicle Hours between Do-minimum and Do-something

Time Period	PCU km		PCU hours	
	2022	2037	2022	2037
AM	-2694	-3958	-338	-462
IP	-1847	-2392	-125	-181
PM	-2090	-2302	-241	-474

4.1.5. Table 17 shows that there are net reductions in both total network travel time and distance as a result of the Scheme. This indicates that drivers on average will save both time and distance by using the proposed Scheme and experience relief on existing routes caused by drivers diverting to the scheme.

4.2 TRAFFIC FORECASTS

4.2.1. The daily traffic forecasts based upon the Core growth scenario are presented in Figure 3 for 2022 opening year and Figure 4 for the 2037 design year (15 years after the scheme opening). Traffic forecasts for the AM Peak, Inter-peak and PM peak periods are presented in Appendix B.

4.2.2. The traffic forecasts in Figures 3 and 4 are expressed in Annual Average Daily flow Totals (AADT) and show directional flows. The top box shows the predicted Do Minimum flow (i.e. without the proposed scheme) the second box shows the Do Something flow (expressed as the absolute flow change compared to the Do Minimum) and the third box shows the percentage change in flow between the Do Something and Do Minimum.

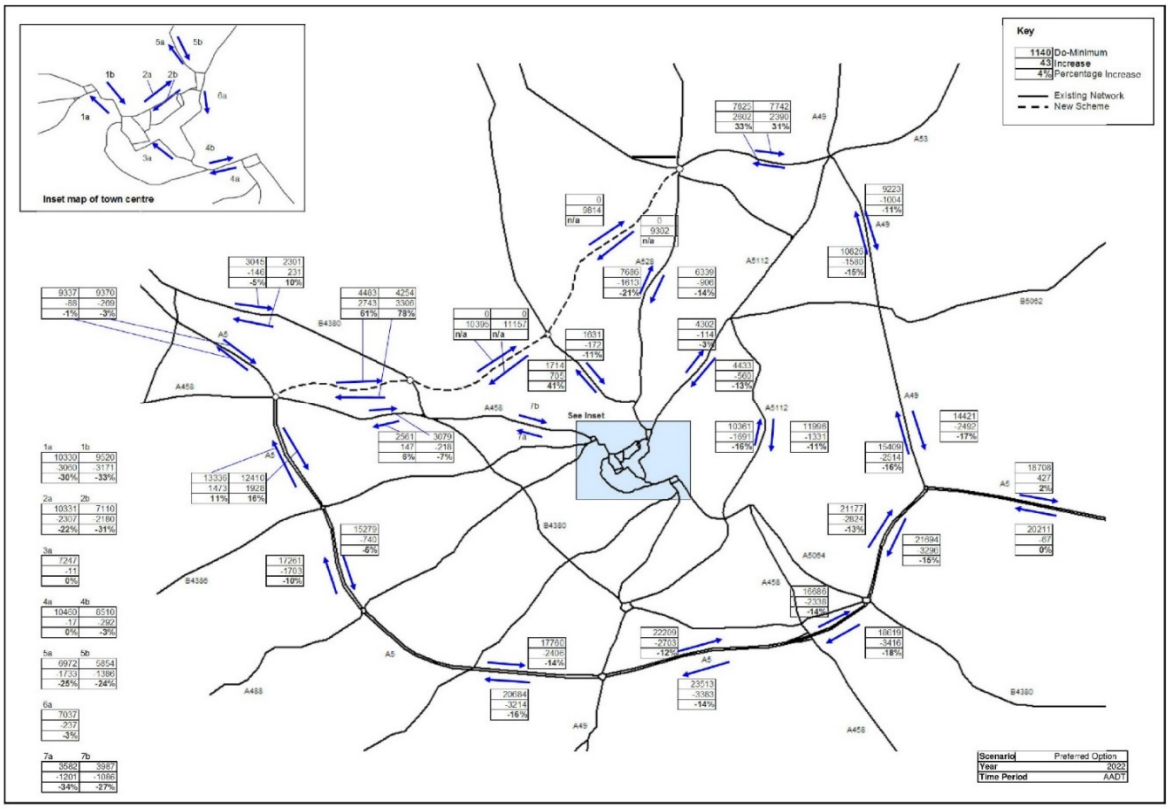


Figure 3 2022 Forecasts (AADT)

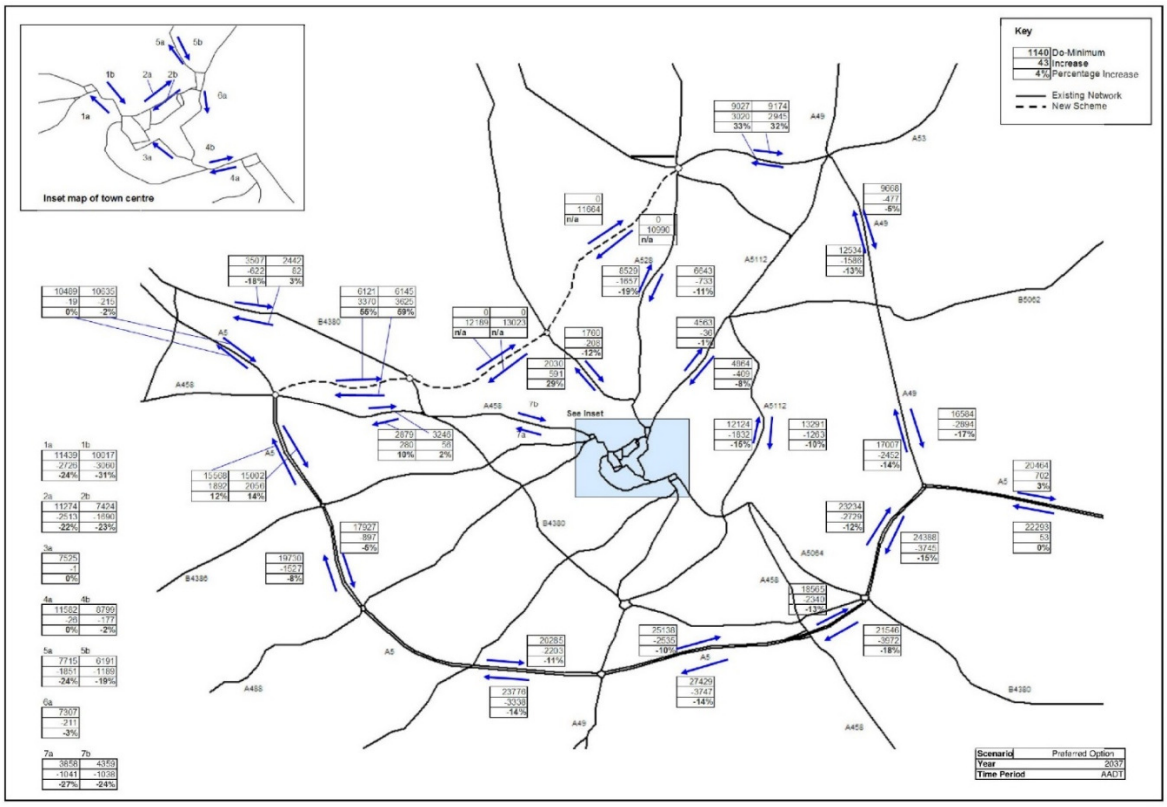


Figure 4 2037 Forecasts (AADT)

4.2.3. An analysis of the 2022 daily forecast flows presented in Figure 3 highlights the following:

- Forecast flows on the North West Relief Road are predicted to range between 19,100 vpd between B5067 and A528 and 21,600 between B4380 and B5067
- Flows on the Oxon Link Road (i.e between Churncote Roundabout and B4380) at the eastern end of the scheme are predicted to increase by 70% from 8,700 vpd in the Do Minimum to 14,700 on completion of the NWRR
- Flows on A5 between B4386 and Churncote Roundabout increase by 17% as a result of the NWRR
- Flows on the A5 (outer ring road) are significantly reduced as a result of the NWRR, with a reduction of 8% between B4386 and A488, a reduction of around 15% on the southern section between A488 and A49
- Flows on the A49 (western section of outer ring road between A5 and A53) are reduced by 15%
- There are flow reductions on A528 and A5112 to the north of Shrewsbury of 8% and 13% respectively
- The NWRR results in a flow reduction of 30% on A458 Smithfield Road and on Welsh Bridge, immediately north of Shrewsbury town centre.

4.2.4. An analysis of the daily forecast flows for the 2037 design year presented in Figure 4 highlights the following:

- Forecast flows on the North West Relief Road are predicted to range between 22,700 vpd between B5067 and A528 and 25,200 between B4380 and B5067. This represents an increase of between 15 and 20% compared to opening year forecast flows.
- Flows on the Oxon Link Road (i.e between Churncote Roundabout and B4380) at the eastern end of the scheme are predicted to increase by approximately 60% from 12,300 vpd in the Do Minimum to 19,300 on completion of the NWRR
- Flows on A5 between B4386 and Churncote Roundabout increase by 13% as a result of the NWRR
- Flows on the A5 (outer ring road) show a similar pattern of relief to the opening year forecasts with the NWRR resulting in a reduction of 6% between B4386 and A488, and a reduction of between 12% and 15% on the southern section between A488 and A49
- Flows on the A49 (western section of outer ring road between A5 and A53) are reduced by between 9 and 15%
- There are flow reductions on A528 and A5112 to the north of Shrewsbury of around 15% and 5% respectively
- The NWRR results in a flow reduction of 25% on A458 Smithfield Road and on Welsh Bridge, immediately north of Shrewsbury town centre.

4.3 JOURNEY TIMES

4.3.1. The impact of the Shrewsbury NWRR on journey times was derived from the 2037 Do-minimum and Do-something traffic forecasts.

4.3.2. Table 18 below compares the morning peak journey times for a journey between the A5/A458 Churncote Roundabout to the west of Shrewsbury and the A49/A53 Battlefield Roundabout to the north, using different routes, both with and without the NWRR, in the design year 2037:

- Via the outer bypasses
- Via the distributor ring road
- Via the town centre
- Via the rat-runs in the north-west sector
- Via the NWRR

Table 18 Impact of NWRR on journey times in 2027 between Churncote and Battlefield (minutes)

Route	2037 a.m. Do Min	2037 a.m. with NWRR	Time saving (min) a.m.	2037 p.m. Do Min	2037 p.m. With NWRR	Time saving (min) p.m.
Bypasses (EB)	17.8	15.2	2.6	16.5	14.5	2.0
Bypasses (WB)	15.8	14.8	1.0	16.9	13.7	3.2
Distributor ring (EB)	23.1	22.1	1.0	21.9	21.1	0.8
Distributor ring (WB)	22.2	21.8	0.4	22.4	21.5	0.9
Town centre (EB)	23.7	20.9	2.8	22.5	21.1	1.4
Town centre (WB)	23.0	20.4	2.6	24.3	20.5	3.8
NW Rat runs (EB)	16.8	17.8	1.0	16.1	16.6	0.5
NW Rat runs (WB)	16.5	16.3	0.2	17.4	17.1	0.3
NWRR (EB)	-	6.8	-	-	5.7	-
NWRR (WB)	-	5.7	-	-	6.1	-

4.3.3. The results presented in Table 18 demonstrate that:

- Journey time between Churncote and Battlefield will be dramatically shorter on the Shrewsbury NWRR (typically 6 minutes) than on any of the alternative routes (about 16 minutes on the bypasses or rat-runs, and about 22 minutes on the distributor ring or town centre routes. People driving the full length of the NWRR will typically save at least 10 minutes on their journey.
- The NWRR will also cause a reduction in journey times along a number of existing routes. The largest reductions (between 1.4 and 3.8 minutes) are forecast on the routes leading into, through and out of the town centre. On other routes including the distributor ring road, outer bypass and rural lanes, the time savings range between 0.2 and 3.2 minutes.

4.3.4. It is noted that although these time savings are smaller than those experienced by traffic diverting to the NWRR, they are still significant because these benefits are available to all users of these roads, in total a greater number than those using the NWRR. These time savings that are spread over a wider area and involve a larger number of trips, are an important indirect benefit of the NWRR.

5 SUMMARY AND CONCLUSIONS

5.1 SUMMARY

5.1.1. This report describes the procedure for the development of future traffic flows for the Shrewsbury North West Relief road that will be used to support the economic appraisal and Outline Business Case for the scheme.

5.1.2. The forecasts have been developed from a 2017 Base Year traffic model that was built using a series of data sources including mobile phone network data.

5.1.3. The forecasts take account of the most recent projections of future traffic growth derived from TEMPro that was published in July 2016 that takes take account of the latest forecasts of population and employment and car ownership to provide estimates of trip ends.

5.1.4. Forecasts have been prepared for a core scenario and sensitivity tests involving lower and higher growth. However, the forecasts presented in this report are based upon the core scenario only.

5.1.5. It should also be noted that the forecasts do not take into account of changes in demand as a result of changes in travel costs resulting from the Scheme. Forecasts are currently being prepared using 'variable demand' procedures and together with the lower and higher growth forecasts, will be reported in an update to this report.

5.1.6. Forecasts were prepared for the anticipated opening years, (2022) and design year (2037). The forecast overall traffic growth for the period 2017 to 2022 is 7% and between 2017 and the design year traffic is forecast to growth by 25%.

5.2 CONCLUSIONS

5.2.1. The traffic forecasts presented in Chapter 4 demonstrate that the NWRR, by providing a direct route from the A5/A458 north west of Shrewsbury to A49/A53 north east of Shrewsbury would provide significant relief to the outer ring road, typically reducing traffic by 25%.

5.2.2. There would also be significant reductions on the A528 to the north of Shrewsbury and A458 Smithfield Road and Welsh Bridge, immediately north of the town centre.

5.2.3. The relief in traffic on the outer ring road would provide lead to a significant reduction in congestion and delays at the major junctions on the A5 and A49 to the south and west of Shrewsbury.

5.2.4. The scheme will lead to a significant reduction in journey times. Journey time between Churncote and Battlefield will be dramatically shorter on the Shrewsbury NWRR (typically 6 minutes) than on any of the alternative routes (about 16 minutes on the bypasses or rat-runs, and about 22 minutes on the distributor ring or town centre routes.

5.2.5. People driving the full length of the NWRR will typically save at least 10 minutes on their journey,

5.2.6. The NWRR will also cause a reduction in journey times along a number of existing routes. The largest reductions (between 1.4 and 3.8 minutes) are forecast on the routes leading into, through and out of the town centre. On other routes including the distributor ring road, outer bypass and rural lanes, the time savings range between 0.2 and 3.2 minutes.

Appendix A

UNCERTAINTY LOG

The table below lists the developments considered in the forecast scenarios

Location	Op Year	Land Use	Size	Unit
Shropshire Stone & Granite, Station Road, Baschurch, SY4 2BQ	2020-21	Residential	50	D.U.
Off of Station Road, Baschurch	2022	Residential	40	D.U.
Rear of Medley Vale, Prescot Road, Baschurch	2022	Residential	40	D.U.
North of Milford Road, Baschurch	2022	Residential	30	D.U.
Off of the Wheatlands, Baschurch	2022	Residential	26	D.U.
Adjacent to 2 Moorland Cottages, Station Road, Baschurch	2022	Residential	11	D.U.
Adjacent to Tawnylea, Prescot Road, Baschurch.	2022	Residential	10	D.U.
Prescot Equestrian Centre, Prescot Road, Baschurch, SY4 2DR	2022	Residential	7	D.U.
West of Battlefield Rd	2020-22	Residential	100	D.U.
North of Mayfiled Close, Shrewsbury	2022	Residential	16	D.U.
At rear of 21 Hanley Lane, Bayston Hill, Shrewsbury, SY3 0JN	2022	Residential	13	D.U.
South of Holyhead Road, Bicton, Shrewsbury	2018-20	Residential	85	D.U.
West side of Welshpool Road, Bicton Heath, Shrewsbury, SY3 8HA	2022	Residential	27	D.U.
West of Shrewsbury Road, Bomere Heath, Shrewsbury	2022	Residential	34	D.U.
Former Shelton Hospital, Somerby Drive, Shrewsbury, SY3 8DN	2018-2021	Residential	179	D.U.
67 Mytton Oak Rd, Shrewsbury, SY3 8UQ	2022	Residential	9	D.U.
Salop Music Centre, St Michaels Street, Shrewsbury, SY1 2DE	2022	Residential	24	D.U.
Old Bush Inn, 141 Abbey Foregate, Shrewsbury, SY2 6AP	2022	Residential	8	D.U.
Prospect House, Belle Vue Road, Shrewsbury, SY3 7NR	2022	Residential	34	D.U.
Timberline, Old Coleham, Shrewsbury, SY3 7BP	2022	Residential	21	D.U.
South of Holcroft Way, Cross Houses, Shrewsbury	2022	Residential	40	D.U.
Adjacent to Holcroft Way, Cross Houses, Shrewsbury	2022	Residential	30	D.U.
West of The Bell, Cross Houses, Shrewsbury	2022	Residential	6	D.U.
Ditherington Flaxmill	2020-23	Residential	120	D.U.
Bromfield, 66 Spring Gardens, Shrewsbury, SY1 2TE	2022	Residential	9	D.U.
South of Dorrington, Main Road, Dorrington, Shrewsbury	2022	Residential	11	D.U.
North of A458, Ford, Shrewsbury	2022	Residential	25	D.U.
Mytton Mill, Forton Heath, SY4 1HA	2022	Residential	12	D.U.
West of Bryn Road, The Mount, Shrewsbury	2022	Residential	20	D.U.
Opposite Ellesmere Drive, Ellesmere Road	2018-19	Residential	60	D.U.
West of Ellesmere Road, southern end	2018-19	Residential	39	D.U.
Greenfields Nurseries, Ellesmere Road, Shrewsbury, SY1 3PA	2022	Residential	9	D.U.
Off of Greenfields Recreation Ground, Falstaff Street, Shrewsbury	2022	Residential	8	D.U.
North of Station Road, Hadnall	2022	Residential	32	D.U.
South of Hermitage Farm, Shrewsbury Road, Hadnall	2022	Residential	28	D.U.
West of school, Hanwood	2022	Residential	29	D.U.
West of Caradoc View, Hanwood, Shrewsbury	2022	Residential	20	D.U.
West of Longden Rd	2018-21	Residential	135	D.U.
Off of Washford Road, Shrewsbury	2022	Residential	6	D.U.
North west of Montford Bridge, Montford, Shrewsbury	2022	Residential	8	D.U.
North west of Montford Bridge, Montford, Shrewsbury	2022	Residential	7	D.U.
Opposite The Crescent, Nesscliffe, Shrewsbury	2022	Residential	39	D.U.
Opposite The Crescent, Nesscliffe, Shrewsbury	2022	Residential	26	D.U.
East of Wilcot Lane, Nesscliffe, Shrewsbury	2022	Residential	17	D.U.
West of The Gables, Nesscliffe, Shrewsbury	2022	Residential	15	D.U.
West of Nesscliffe Hotel, Nesscliffe, Shrewsbury	2022	Residential	10	D.U.
Land South of Mytton Oak Road, Bowbrook / Radbrook	2018-22	Residential	289	D.U.
Radbrook Centre, Radbrook Road, Shrewsbury SY3 9BJ	2020-23	Residential	120	D.U.
Radbrook Campus, College Gardens, Shrewsbury	2019-20	Residential	45	D.U.
Off of Shillingston Drive, Berwick Grange, Shrewsbury	2018-22	Residential	162	D.U.
The Shrewsbury Club, Sundorne Road, Shrewsbury	2022	Residential	18	D.U.

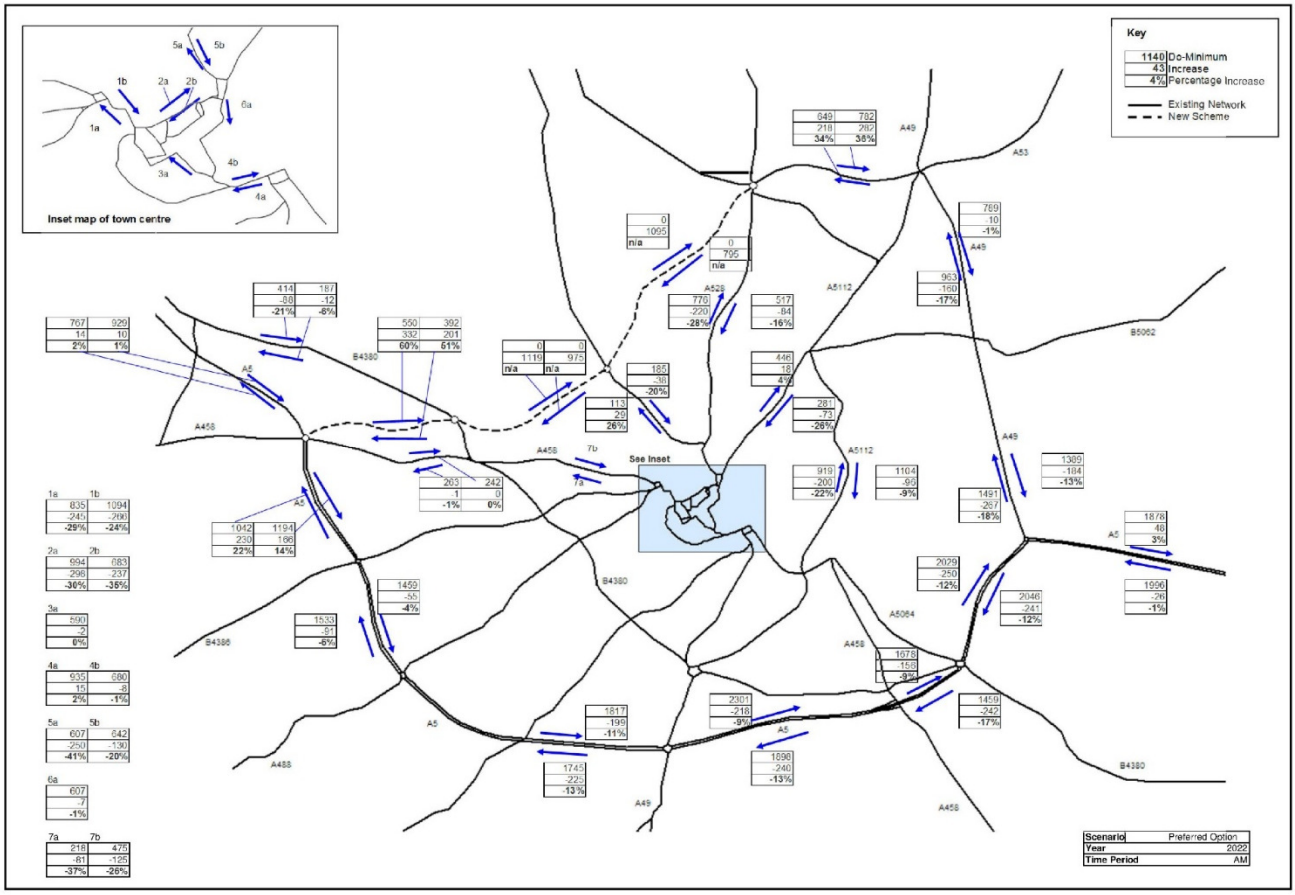
SUE South Phase 2, South of Oteley Road	2019-25	Residential	550	D.U.
SUE South Phase 1, Sutton Grange, Oteley Road, Shrewsbury, SY2 6QL	2018-23	Residential	203	D.U.
SUE South Phase 3, Weeping Cross, south of Oteley Rd	2018-22	Residential	159	D.U.
Barker Street, Shrewsbury	2020-25	Residential	217	D.U.
Princess House, The Square, Shrewsbury	2019-20	Residential	50	D.U.
Agriculture House, 5 Barker Street, Shrewsbury, SY1 1QJ	2022	Residential	24	D.U.
Agriculture House, 5 Barker Street, Shrewsbury, SY1 1QJ	2022	Residential	10	D.U.
East of Woodcote Way	2022	Residential	34	D.U.
Fir Tree Day Nursery, 281 Monkmoor Road, Shrewsbury, SY2 5TF	2022	Residential	8	D.U.
Lees Farm, Walcott, Telford, TF6 5ER	2022	Residential	6	D.U.
Crown House, 2 St Marys Street, Shrewsbury	2022	Residential	15	D.U.
28 Castle Street, Shrewsbury, SY1 2BQ	2022	Residential	6	D.U.
SUE West, north of Welshpool Rd	2024-2030	Residential	454	D.U.
SUE West	2019-24	Residential	296	D.U.
Weir Hill Farm / Robertsford House, Preston St	2019-26	Residential	600	D.U.
Rear of the Old Vicarage, Dorrington	2020	Residential	15	D.U.
Off Forge Way, Dorrington	2021	Residential	15	D.U.
Land North of London Road	2019-26	Residential	48	D.U.
Off Knights Way, SY1 3FE	2021	Employment	11580	Net sqm
Plot 8a, Battlefield Enterprise Park, Knights Way	2021	Employment	1950	Net sqm
Plot 3.1a, Battlefield Enterprise Park, Knights Way	2021	Employment	2788	Net sqm
Units 1 and 2 The Haughmond Business Centre, March Way, Shrewsbury, SY1 3BB	2021	Employment	602	Net sqm
Plot 19, Vanguard Way	2021	Employment	367	Net sqm
Reflexion Care Group Limited Unit 5, Hussey Road, Battlefield Enterprise Park, SY1 3TE	2021	Employment	120	Net sqm
Adjoining Network House, Badgers Way, Bicton Heath	2021	Employment	550	Net sqm
5 Darwin Court, Bicton Heath, Shrewsbury, SY3 5AL	2021	Employment	135	Net sqm
Flax Mill, St Michaels Street, SY1 2SZ	2021	Employment	17000	Net sqm
Flax Mill, St Michaels Street, SY1 2SZ	2021	Employment	7760	Net sqm
Flax Mill, St Michaels Street, SY1 2SZ	2021	Employment	2160	Net sqm
Former Wheatland Services Ltd, A458, Ford	2021	Employment	3800	Net sqm
Niblett Limited, The Depot, Lower Edgebold	2021	Employment	167	Net sqm
Former Cattlemarket / Park & Ride, Battlefield Rd / Harlescott Lane, Harlescott	2021	Employment	3245	Net sqm
Unit H And J, Arrow Point Retail Park, Brixton Way, SY1 3GB	2021	Employment	1858	Net sqm
Off Harlescott Lane, SY1 3AN	2021	Employment	2431	Net sqm
Bearing Man Ltd, BML House, Harlescott Lane, SY1 3AY	2021	Employment	473	Net sqm
Haughton Farm, Haughton	2021	Employment	504	Net sqm
SUE South, South of Oteley Road	2021	Employment	55200	Net sqm
SUE South Phase 3, Shrewsbury Business Park, SY2 6FG	2021	Employment	36800	Net sqm
SUE South Phase 2, Shrewsbury Business Park, SY2 6FG	2021	Employment	15929	Net sqm
SUE South Phase 1, Plot 10, Shrewsbury Business Park, SY2 6FG	2021	Employment	3951	Net sqm
South Block Rowan House, Sitka Drive, Shrewsbury Business Park, SY2 6LG	2021	Employment	327	Net sqm
Frankwell Quay Warehouse, Frankwell Quay, SY3 8LJ	2021	Employment	520	Net sqm
Unit 4, Monkmoor Trading Estate, Monkmoor Road, Shrewsbury, SY2 5TZ	2021	Employment	251	Net sqm
Wheatley Farm, Astley	2021	Employment	709	Net sqm
Battlefield Road West	2021-26	Employment	22500	Net sqm
Battlefield Road East	2021-26	Employment	8000	Net sqm
Shrewsbury SUE West	2026-31	Employment	28800	Net sqm
Shrewsbury SUE West	2026-31	Employment	16800	Net sqm
Shrewsbury SUE West	2026-31	Employment	2400	Net sqm

Appendix B

FORECAST FLOWS

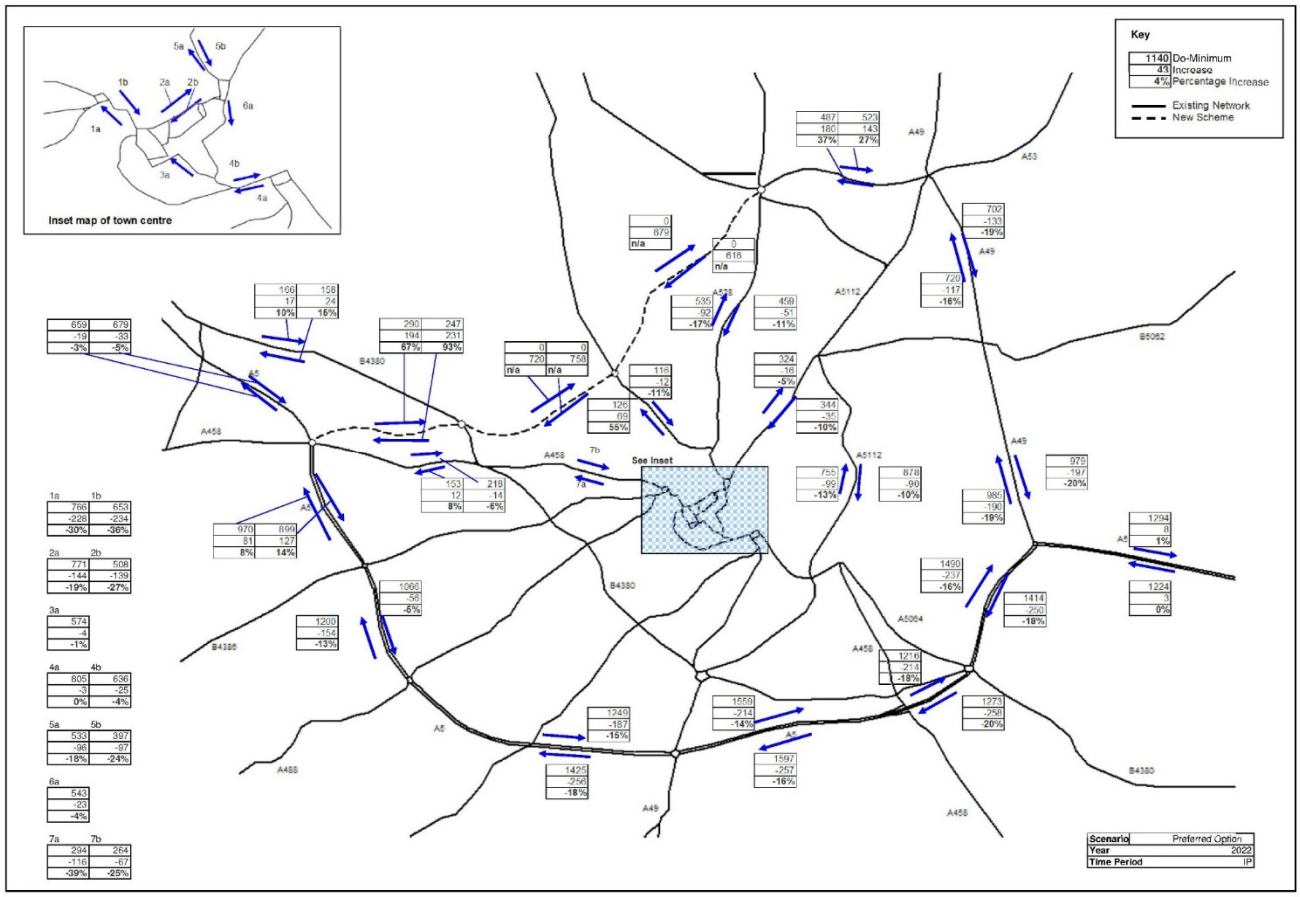
Appendix B.1

2022 FORECASTS (AM)


Key
1140 Do-Minimum
43 Increase
4% Percentage Increase
Existing Network
New Scheme
Inset map of town centre
See Inset
Scenario Preferred Option
Year 2022
Time Period AM

Appendix B.2

2022 FORECASTS (IP)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4% Percentage Increase
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New Scheme
Inset map of town centre
See Inset
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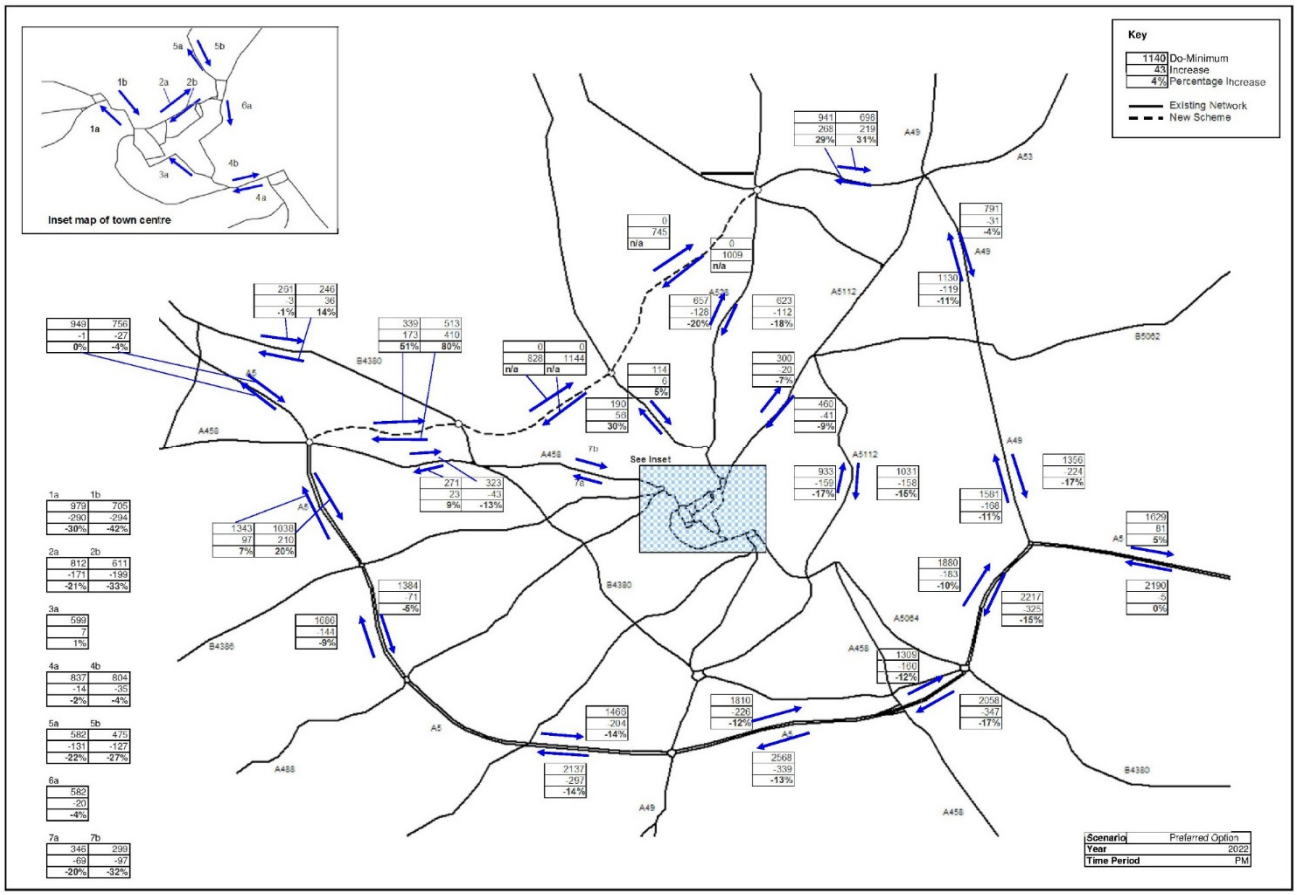
Year 2022
Time Period IP

Appendix B.3

2022 FORECASTS (PM)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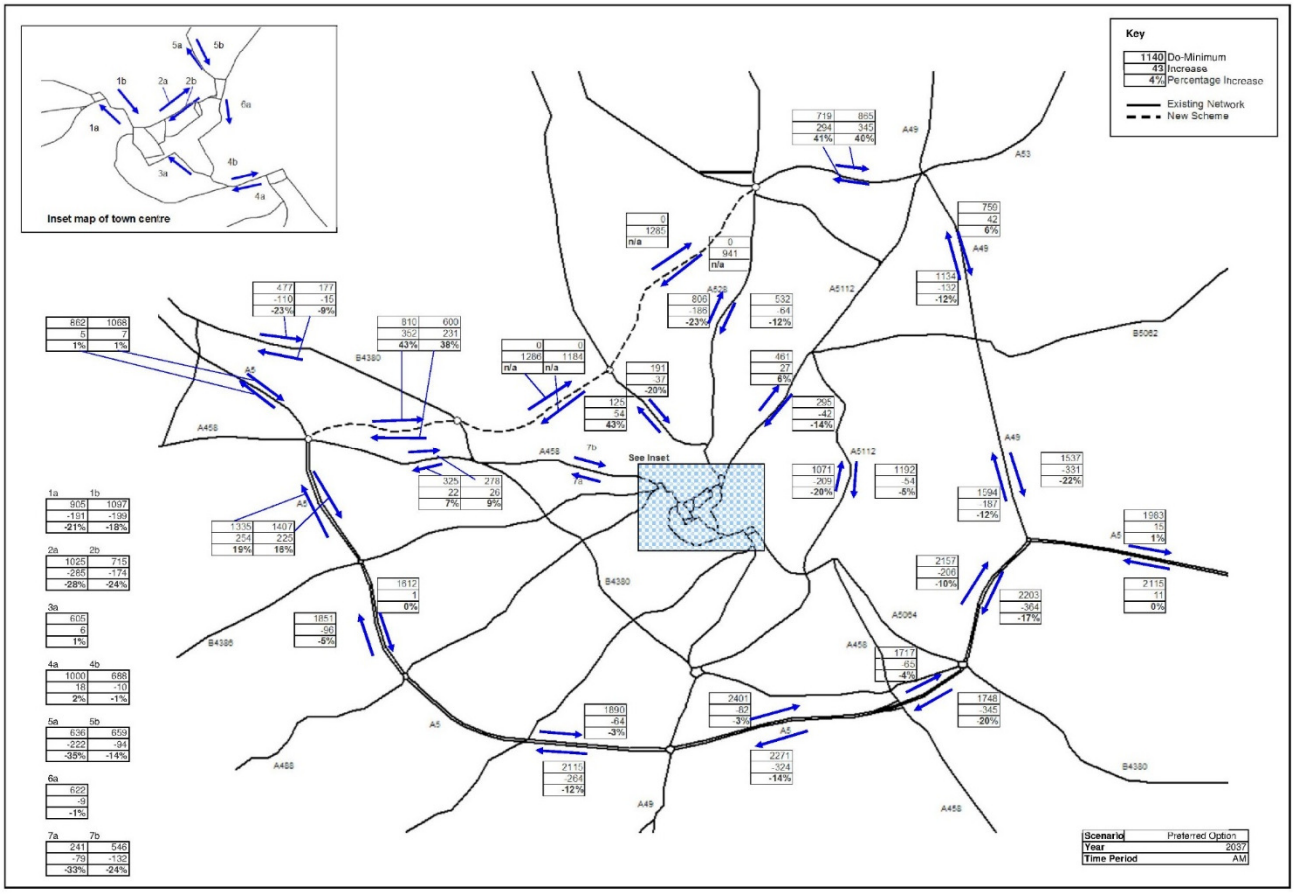
4% Percentage Increase
Existing Network
New Scheme
Inset map of town centre
See Inset
Scenario Preferred Option
Year 2022
Time Period PM

Appendix B.4

2037 FORECASTS (AM)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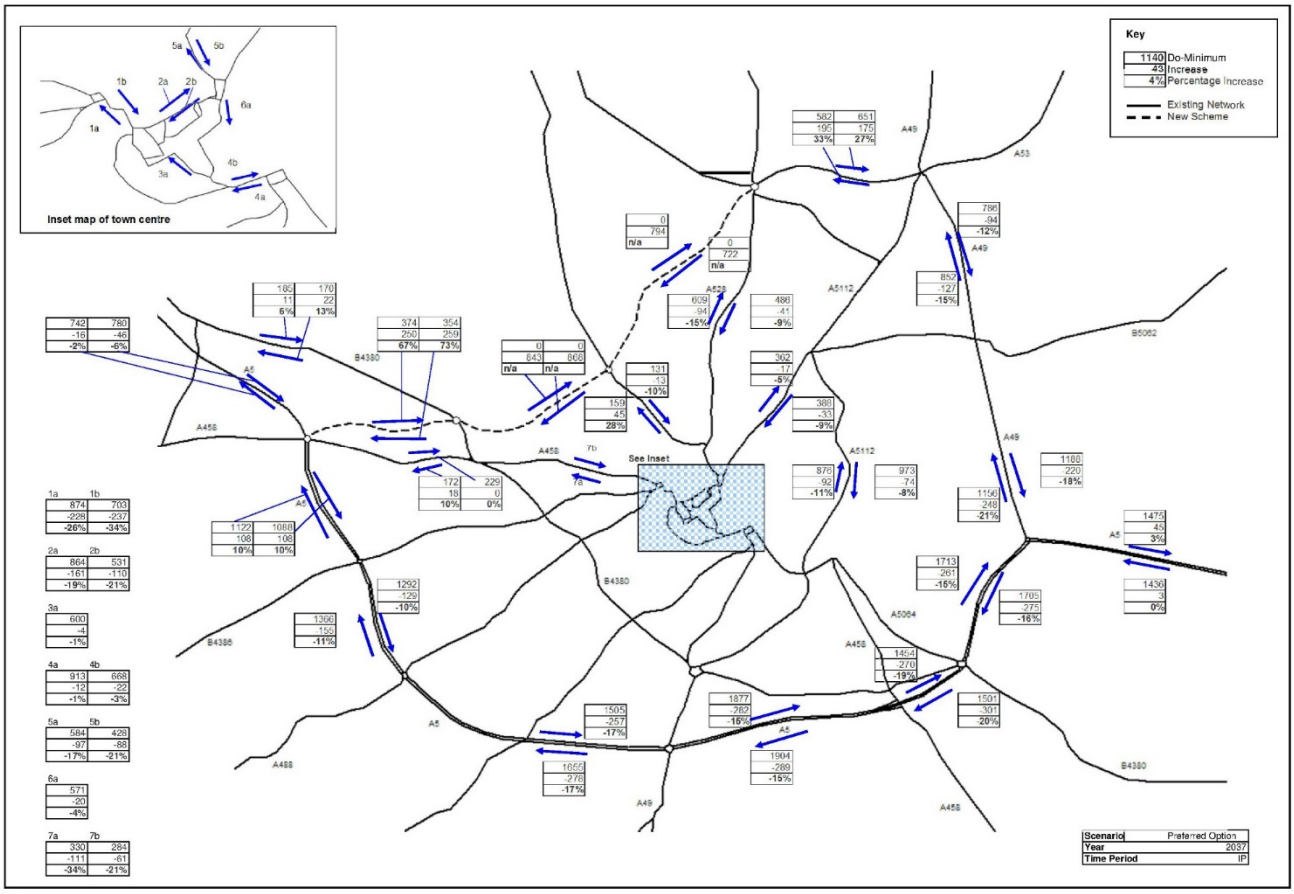
Year 2037
Time Period AM

Appendix B.5

2037 FORECASTS (IP)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New Scheme
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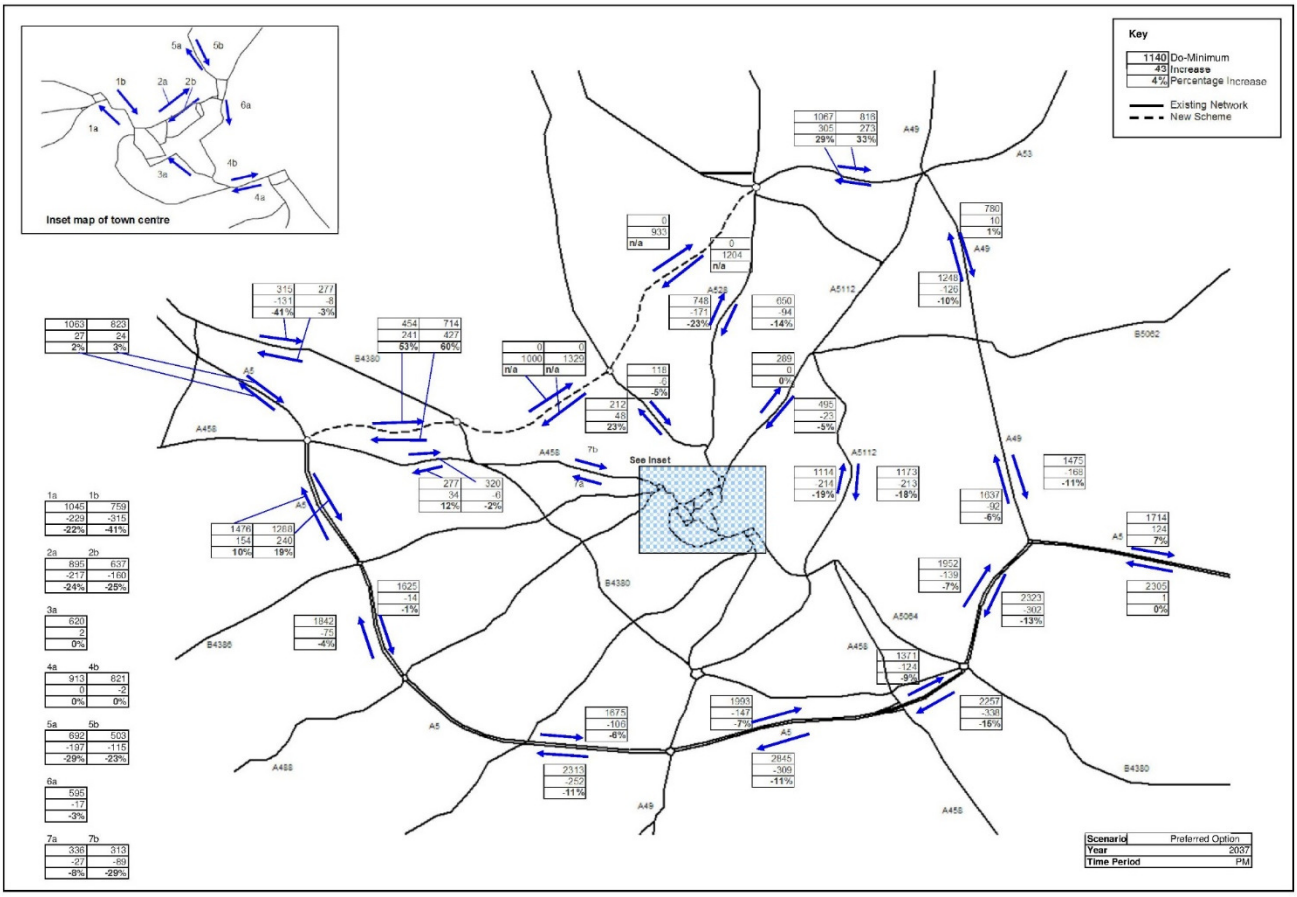
See Inset
Scenario Preferred Option
Year 2037
Time Period IP

Appendix B.6

2037 FORECASTS (PM)


Key
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45 Increase
4% Percentage Increase
Existing Network
New Scheme
Inset map of town centre
See Inset
Scenario Preferred Option
Year 2037
Time Period PM
A5
A49
A458
A5112
A5064
B4380
B5062
A53

Export House
Cawsey Way
Woking, Surrey
GU21 6QX

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