West Midlands Strategic Road Network Study – Report for the Highways Agency

Volume 1 - Final Report

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Executive Summary

Background to the study

This executive summary presents the findings of the study undertaken by Mott MacDonald (MM), JMP Consultants (JMP) and GVA Grimley for the Highways Agency (HA) in respect of the West Midlands Regional Spatial Strategy Phase Two Revision Draft – Preferred Option (RSS2). The overall study examines the implications of the RSS2 (December 2007) for the region's Strategic Road Network (SRN). It considers the capacity of the network to sustainably accommodate development planned within RSS2 and the likely impacts of a range of transport interventions for maintaining the efficient operation of the region's highways. The report represents the independent views of the consultants commissioned; it does not represent the formal position of the HA.

The Agency's original brief was to concentrate analysis on the proposed level of distribution of new housing and employment proposed in RSS2. However, the scope of work was revised when it was announced by the Government Office for the West Midlands (GOWM) that further growth options for the region were being developed. In response to a publication by the National Housing and Planning Advice Unit (NHPAU), which suggested that the West Midlands could accommodate more growth than that proposed in RSS2, GOWM commissioned Nathaniel Lichfield and Partners (NLP) to develop further housing options for the region. As such, the HA asked for two preliminary options that were being considered in the then emerging NLP study to be modelled and assessed.

What growth options and transport interventions have been tested?

Growth options

In recognition of the revised brief, this study drew on three different sets of predictions for growth within the region in order to test the capacity of the network against varying levels of future demand. These data sources were:

- National Forecasts (TEMPRO) - this data set represents the Government's estimates of land-use changes in the West Midlands. Considering that these figures do not include recent detailed regional information they are considered to represent the minimum anticipated level of future growth.
- West Midlands RSS2 – these are data assumptions and estimates taken from RSS2 itself including the proposal for 365,600 houses to be built in the West Midlands by 2026.
- NLP Study – two emerging spatial options that were being considered as part of this study for the region were modelled; Option 7 (medium growth – 45,600 units over and above the RSS2 total units distributed in the urban areas) and Option 9 (80,700 additional units across both urban and rural areas). These options were agreed with GOWM.

Transport interventions

As well as there being different possible scenarios for growth within the region, it was also acknowledged that there will be a range of improvement works undertaken on the transport network over the next twenty years. Therefore, it was considered necessary to test different levels of likely intervention on the SRN. Four different levels (or packages) of transport interventions were tested as outlined below:

- 'Do Minimum' – for the PRISM model this option considers the schemes that are currently being promoted through the Regional Funding Allocation (RFA) as well as any committed transport schemes within the West Midlands. It is expected that these schemes, at the very least, will be implemented in the short-medium term. The local models, however, do not contain the regional appraisal summary table (RAST) schemes listed in Appendix G.
- 'Do Something 1' – this transport scenario includes the provision of active traffic management schemes (ATM) on the West Midlands motorway box. Essentially this involves the utilisation of hard-shoulder running in times of peak traffic demand and supporting traffic management techniques.
- 'Do Something 2' – comprises 'Do Something 1' with the addition of measures considered in the Congestion Transport Innovation Fund (C-TIF) package. For the local models 'Do Something 2' also comprises the regional appraisal summary tables (RAST) schemes listed in Appendix G.
- 'Do Something 3' – involving 'Do Something 2' and also the introduction of road user charging (RUC) at key locations within the region.

Details of each scenario are set out in the main report.

The study's overall objectives

By testing the range of different growth assumptions and transport intervention packages the study has been able to meet the following overarching objectives:

- To identify the future scale and nature of the pressures on the region's SRN, assuming different levels of interventions and patterns of spatial development;
- To assess the capacity of the strategic transport networks and, in particular, to support the future development of the region as proposed in RSS2;
- To advise on the nature of any future policy or infrastructure interventions necessary to support the levels of growth being proposed; and
- To provide guidance on the prioritisation of investment required to meet the region's future transport needs.

The methodology adopted

In order to produce accurate forecasts of the impact on the SRN of the various growth and transport scenarios a 'twin track' approach was adopted, utilising two complementary models. The Policy Responsive Integrated Strategy Model (PRISM), developed by Mott MacDonald was used to look at the strategic network around the conurbation – primarily the motorways in and around the West Midlands. In addition to this local modelling on key parts of the SRN beyond the conurbation, at a district/county level, was undertaken by JMP Consultants to provide information for those

areas that are not covered in detail by PRISM. Both the strategic and local models test growth against network capacity and then produce forecasts of the following:

- Traffic volumes – the number of vehicles using a particular stretch of road per hour. This indicates how busy a road is or the extent to which it is a popular route.
- Link and node delays – link delays indicate the extent to which vehicles are 'held up' in their passage along sections of the road being analysed, measured in seconds per kilometre. In this study link delays are flagged when they are in excess of 30 seconds per kilometre. Node delays refer to a location on the network where vehicles are changing direction of travel and experience waiting times or queues at junctions. For the purposes of this study the models have indicated where node delays of greater than 60 seconds are likely.
- Link saturation – saturation provides a good indication of congestion along a given road. It is measured as a percentage of the road's total capacity. For example, a three lane motorway has a capacity of 5,700 vehicles per hour. If 5,000 vehicles per hour are using that route the saturation level is said to be 88%. For the purpose of this study, saturation levels of 80% and above are regarded as significant and worthy of consideration in order to ensure efficient operation of the SRN.

The following table shows the model runs that were undertaken to ensure that the full range of potential scenarios, and hence impact on the SRN, were considered.

Land Use Assumptions	Network Assumptions and Policies			
	RFA 'core' schemes	RFA and ATM schemes	RFA, ATM, Congestion-TIF and RAST schemes	RFA, ATM, Congestion-TIF and Road User Charging schemes
National Forecast (TEMPRO)	Do Minimum (TEMPRO)			
WM RSS2	Do Minimum RSS2	Do Something 1 RSS2	Do Something 2 RSS2	Do Something 3 RSS2
NLP Option 7	Do Minimum NLP7	Do Something 1 NLP7	Do Something 2 NLP7	Do Something 3 NLP7
NLP Option 9	Do Minimum NLP9	Do Something 1 NLP9	Do Something 2 NLP9	Do Something 3 NLP9

Each of the above scenarios was modelled for both AM and PM peak periods. RSS2 and TEMPRO growth options were modelled for both 2016 and 2026; NLP options were only modelled at 2026 as forecasts in the NLP study were only provided for this year.

Following the model runs GIS plots were produced to identify the forecast impacts on traffic volumes, link and node delays and saturation.

What are the current features of the SRN?

Before reporting on the forecasts for 2016 and 2026 it is worth noting that existing conditions on the SRN are not free from capacity pressures. Baseline data reveals that the network is already under some stress. The following tables show where demand is currently presenting some concerns:

Strategic analysis

Road	Traffic Volumes	Delays	Saturation
M5	Junction 6 to the intersection with the M6 – both directions (AM and PM)	Between junction 4a and 5, particularly around junction 4a – northbound (AM) and approach to M6 northbound (PM)	Junction 1 to 4 northbound and junction 1 to the intersection with the M6 (AM); and junction 4a to 5 (AM and PM)
M6	Junction 2 to 10a – both directions (AM and PM); junction 12 to 13 – northbound (PM)	Junctions 8 to 10a – eastbound (AM and PM)	The majority of the motorway between junctions 6 and 10a - both directions (AM and PM)
M40	Junction 14 to the intersection with the M42 – both directions (AM and PM)		
M42	Junction 1 to 10 – both directions (AM and PM)	At junctions 6 to 9 (AM)	The majority of the motorway between junctions 2 and 6 (AM); junction 3 to 6 (PM)
M54	Junction 5 to 6 – both directions (AM)		

Local analysis

Road	Traffic Volumes	Delays	Saturation
M5	Junction 5 mainline – both directions; junction 6 southbound mainline	Junction 5 on both off-slips (PM), northbound slip (AM); Junction 6 on northbound off-slips and A449 west approach (AM)	Southbound M5 link north of junction 6 and the northbound link at junction 5 (PM)
A5	From Emstrey Road roundabout to the M54 – both directions (AM), westbound (PM)		Some stress between A5/A49 (east of Shrewsbury) and the M54 (AM)
A38	Vast majority of the road between Weeford and the A50 (AM and PM)		
A46	Vast majority of the road between M40 junction 15 and M6 junction 2.		Some stress between the M40 and the M6; A435 to A422 Alcester Road (AM)
A49	Volumes are high in relation to the nature of the road.	A49 near Hereford shows significant delays, notably the A49/A438 New Market Street junction and A49/B4359 Newton Road junction	North of Hereford, southbound links into the city centre (AM); between A49/A4103 and A49/B4359 (AM); southbound link leaving Hereford from A49/A438 to A49/A465 (PM)

Findings – what are the impacts on the SRN?

Traffic volumes

The results of the model runs reveal that traffic volumes are likely to rise considerably up to 2016 and beyond to 2026. Even with the most conservative growth estimates (TEMPRO), many sections of three of the main radial routes on the approach to Birmingham (M5, M6 and M42) are likely to be carrying over 4,000 vehicles per hour during the morning peak by 2016; by 2026 the northern section of the M40 will also be carrying similar traffic volumes as will the A46 on the approach to Toll Bar End.

This picture is largely consistent for each of the growth options (TEMPRO, RSS2 and NLP 7 and 9) and for the various transport intervention packages (Do Minimum and Do Something 1, 2 and 3). Traffic volumes are likely to rise across all of the scenarios.

Delays

Much of the West Midlands strategic network (all of the M6 and M42 and large sections of the M5, M40 and M54) is already experiencing delays of up to 30 seconds per kilometre – and longer in some patches across the network. None of the growth/transport scenarios are likely to significantly increase delays on the strategic network, even where predicted growth is highest (NLP9) and interventions are fewest (Do Minimum). However, there are several areas of concern where, under virtually all scenarios tested, delays of well over 30 seconds per kilometre are expected Namely these are:

  - M5 – northbound between junctions 4a and 5 (AM)
  - M6 – eastbound junctions 2 to 3 (AM); 3 to 4 (PM); and junctions 8 to 10a (AM and PM)
  - M42 – westbound junctions 8 to 9 (AM); and at junctions 6 and 9 (AM) and junction 9 (PM)
  - A38 – both directions between Weeford and A50 (AM and PM)
  - A46 – between Toll Bar End and A428 (AM and PM)
  - A49 – northbound between Belmont Road and the City Centre (AM) and Roman Road and Priory Place (PM)

- If only the Do Minimum level of investment is made, delays already experienced on the M6 between junctions 8 and 10a will continue to be a problem, with further additional delays on the M6 and M42.

- If Do Something 1 is implemented delay reductions are likely on the M6 between junctions 8 and 10a, although new delays will emerge elsewhere on the M6 and also on the M42.

- Do Something 2 investment is not likely to improve delay on the M6, unlike Do Something 1, but no other delays additional to those already being experienced in 2001 are likely.

- Do Something 3 does emerge as the most effective mitigation package; only with NLP9 growth assumptions are delays on the M6 between 8a and 10 likely to persist.

- Each of the modelled scenarios reveals that there is likely to be a significant increase in local node delays scattered around the city centres, particularly in the AM peak.

- Distribution of delays is consistent across all sets of growth data (TEMPRO, RSS2, NLP7 and NLP9).

Saturation

Saturation of the SRN is already high along much of the M5, M6 and M42. All regional growth predictions are likely to see saturation increasing on a large part of the West Midlands SRN, with a substantial amount of it operating at over 80% capacity by 2026, regardless of the transport package that is implemented. The areas of the network that will be saturated under all scenarios are summarised below:

  - M5 – junctions 3 to 4 (AM) and 4a to 5 (AM and PM)
  - M6 – junctions 2 to 10a and 11 to 14 (AM and PM)
  - M40 – junction 13 to the intersection with the M42 (AM and PM)
  - M42 - junctions 1 to 8 (AM and PM)
  - M54 - junctions 2 to 4 (AM and PM)
  - A38 – both directions between Weeford and A50 (AM and PM)
  - A46 – around the A4177 and between the A452 and the A428 (AM and PM)
  - A49 – northbound between Belmont Road to the City Centre (AM) and southbound travelling into the City (PM)

- Different growth levels for the region will not make a substantial difference to saturation of the network; there will be a few more capacity concerns if NLP9 growth is realised but the difference is marginal.

- None of the mitigation packages will be wholly effective in curbing congestion on the SRN. Do Something 1 is likely to provide some improvements on the M5 and M42, compared to Do Minimum. The picture for Do Something 2, however, is mixed; the package is expected to lead to further benefits on the M5 with new benefits on A38, A46 and A49, but will yield fewer benefits than Do Something 1 in places on the M6 and M42.

- Do Something 3 is likely to induce most congestion improvements out of the various intervention options with further improvements on the M5 and fewer congested links on the M6 and M42.

- The M5, from junction 5 to the intersection with the M6, is the only motorway expected to see steady and progressive reductions in congestion as further transport investment is made. Elsewhere, successive levels of transport intervention will lead to more minimal and incremental improvements. Corridors are likely to respond to different intervention packages to different degrees, which indicates that a blanket approach to mitigation may not be as effective as a more tailored sub-regional approach.

What are the implications for the sub-regions?

It is important to consider the impacts of regional growth and the various transport packages on the SRN from a geographical perspective so that the spatial effects can be understood. Summarised below, therefore, are the main findings for the seven sub-regions that are featured in RSS2.

Birmingham, Black Country and Coventry City Region

M5 – junctions 1 to 3

- None of the regional growth options are likely to have any significant negative impacts on this stretch of the motorway, even with the Do Minimum package of transport investment.
- The severity of saturation levels will decrease as more transport interventions are implemented. As such, if 'Do Something 3' investment was implemented saturation levels in both directions, AM and PM, and for all growth scenarios will be below 80%.

M6 – junctions 4 to 10a

- There are already patches of fairly significant delays between junctions 8 and 10a in both the morning and evening peaks.
- In the AM, investment options Do Something 1 and Do Something 3 could have a beneficial impact reducing these delays for all growth options, with the exception of NLP Option 9.
- In the PM peak, Do Something 3 will again reduce delay periods between junctions 8 and 10a. The picture is consistent under all of the growth options.
- If only the Do Minimum level of investment is made delays will emerge in the PM peak between junctions 4a and 5. The Do Something intervention packages should prevent these delays from occurring.
- Junctions 4a to 5; 6 to 7; and 8 to 10a are already experiencing significant congestion which looks likely to be sustained under all growth scenarios, regardless of the level of transport investment.
- Do Something 1 transport investment is likely to be beneficial in preventing rises in congestion across other links, particularly between junctions 5 and 6.

M42 – junctions 3a and 7

- There are no serious link delays on these links in the 2001 base position. However node delays of over 60 seconds are present at junction 6 and junction 9 in the AM peak.
- Significant link delays are only predicted to be a problem in future years between junctions 4 and 5 in the morning peak – this will be the case with all of the different growth options.
- Do Something 1 could help to reduce delays, although its impact with NLP9 growth would be less effective.
- Junction delays at 6 and 9 are likely to require future attention.
- Saturation levels are already high between junctions 3a and 3 and 4 and 6 and will remain so regardless of growth or the mitigation measures implemented.
- Under all growth scenarios future congestion is forecast in the morning peak, westbound between junctions 6 and 7. In the evening this will only be the case if NLP7 and NLP9 growth is realised.

Telford

M54

- The south of Telford is dissected by a stretch of the M54. Strategic level forecasting does not report any significant impacts of regional growth on base level delays although congestion is expected to rise between junctions 2 and 4.

Coventry and Warwickshire

M6 – junctions 1 to 4

- According to the 2001 base, delays on this stretch of the M6 are minimal. However, by 2026 significant delays are expected eastbound between junctions 2 and 3, particularly in the morning peak. This will be the case for all growth/intervention combinations, with the exception of TEMPRO growth. In the evening peak, the delays will be witnessed between junction 3 and 4 eastbound.
- Saturation levels are already high eastbound between junctions 2 and 4 in the morning peak. This is likely to continue and become aggravated. By 2026, levels will be similarly high in the evening peak. This is the case for all growth/transport combinations.
- Saturation levels will be over 100% between junctions 2 and 4 for both the AM and PM peaks for all of the scenarios, which represents a considerable increase from the base position.
- There is some evidence to show that the mainline carriageway between Junction 1 and 2 will suffer increasing stress by 2026 under all growth scenarios.

M40 – junction 11 to the intersection with M42

- Significant delays are not presently experienced along this stretch and are unlikely to emerge under any scenarios.
- M40 saturation paints a different picture. It is already high northbound in the PM peak between junction 13 and the intersection with the M42. However, by 2026 saturation is likely to be over 80% from junction 13 northbound to the M42 intersection under all growth options, both AM and PM. The particular transport package adopted is not expected to have any differential reduction effects.

M42 – junctions 7 to 11

- The base position does not record any significant delays anywhere on this stretch.
- Future forecasts show that only westbound between junctions 8 and 9 in the morning peak is likely to experience problems. However, Do Something 2 and 3 would appear effective in addressing these delays.
- Saturation levels are not highlighted as particularly high in the 2001 base position. However, this is not predicted to remain the case.
- Under all growth/intervention combinations AM saturation will rise to over 100% in the morning peak between junctions 7 and 8 westbound.
- High levels of saturation will be witnessed between junctions 8 and 10, particularly in the AM, although Do Something 2 and 3 investments could help to limit these rises.

A46

- The A46 between the M6 and M40 suffers from existing stress in terms of link capacity and some junction delays. By 2016 delays at major junctions increase significantly under all growth scenarios with many links also at or over capacity.
- The effects of junction improvements on the corridor by 2026 mitigate many of the junction delays although some link capacities continue to be exceeded, particularly just north of the A4177 and between the junctions with the A452 and the A45.
- There are some significant local effects of NLP7 and NLP9 in terms of junction delay.

- The A46 to the south and west of the M40 does not have any significant existing delay or link capacity problems. The effects of the RSS2 growth forecasts indicate some localised junction delay to the north of Stratford-upon-Avon by 2026 as do NLP7 and NLP9.

Staffordshire and the North Staffordshire Conurbation

A38

- The A38 experiences link stress on a number of sections between Swinfen and Claymills as well as junction delay. The link and junction capacity issues will deteriorate further under the growth scenarios with sections immediately south of Burton and around Lichfield the worst. Even assuming the RFA scheme, there remain stress and capacity issues.

A50/A500/A449

- In the base year there are a number of sections and junctions on the A500 and A50 that are experiencing significant capacity issues and delays in both peak periods. Under the various growth options the extent of the delays and over capacity spreads to most of the parts of the A500 and A50 in Stoke. The transport interventions have, at best, a very marginal impact on the delays.
- Local capacity issues currently also occur at A50 Uttoxeter and A449. There are currently only limited delays on the remaining SRN in Staffordshire, with the exception of the urban A5 through Cannock. Under the various growth options the existing problems on the A50 and A449 will be exacerbated. In addition more localised problems are likely to arise on links and junctions on M6 Toll/A5 at Cannock and A5 at Tamworth.

Worcestershire

M5 – junctions 3 to 8

- The 2001 base position shows delays of between one and two minutes per kilometre between junctions 4a and 5 on the northbound carriageway in the morning peak. These are likely to intensify as the region grows, under all growth/transport intervention scenarios.
- Saturation levels northbound between junction 4a and 5, both AM and PM are already high; this will continue.
- M5 Junctions 5 and 6 have existing problems with excessive queuing on the slip. The most conservative estimate of growth (TEMPRO) indicates that queuing and delay will worsen at these junctions but the effects can be mitigated by proposed signalisation and merge and diverge improvements by 2026.
- The effects of RSS2 when compared to TEMPRO are not significant with some incremental increases in queuing at the junctions and saturation on the mainline. It is concluded that by 2026 certain sections of the mainline between M5 Junctions 5 and 7 will start to experience flow breakdown but this will occur even under the lowest TEMPRO growth assumption rather than as a result of RSS2 growth.

A46 Evesham

- There are no significant existing delay or congestion issues on the A46 around Evesham. The TEMPRO growth forecasts indicate increasing levels of stress in terms of link saturation by 2026 but at no point is the road capacity exceeded. However, there are expected to be localised junction delay issues.
- The effects of RSS2 when compared to TEMPRO are marginal with no material difference in terms of link saturation. A similar conclusion can be made for NLP7 and NLP9.

Herefordshire and Shropshire – the rural west

M54 – junctions 3 to 4

- No significant problems with delays are likely to emerge as a result of regional growth over the next two decades.
- However, saturation levels are expected to exceed 90% along the entire link – under all growth and transport investment options. This is a considerable increase from the 2001 base position.

A5

- South of Shrewsbury the A5 does not currently suffer from significant delay at junctions or over capacity on links.
- The major junctions all show signs of increased queuing and delay over the next two decades.
- The effects of RSS2, NLP7 and NLP9 are marginal when compared to TEMPRO
- Link saturation does not increase as significantly as junction delay indicating that the primary constraints in the corridor are junction based.

A49

- There are already significant delays in terms of queues and over capacity on links in Hereford City Centre.
- By 2016 under all growth scenarios levels of delay and link saturation are predicted to increase significantly both north and south of the City Centre. The inclusion of an Outer Distributor Road by 2026 provides some relief but there are still significant delays on tidal flows to and from the City Centre in peak periods.
- The effects of NLP7 and NLP9 are marginal.

Concluding observations

Considering both the local and strategic analysis of impacts of the various regional growth assumptions on the SRN, as summarised above, the following overall observations can be made:

- The level of anticipated development does not make a fundamental difference to congestion levels across the network. Demand on the SRN is expected to increase over the next two decades. However, this is will not be a direct result of the growth planned in RSS2. Traffic volumes and saturation are anticipated to rise irrespective of the revised strategy; many of these trends have already been identified in multi-modal studies that pre-date this report. The RSS2 options primarily reflect different spatial distributions of new housing stock as distinct from an increase in population or employment. The levels of change are also comparatively small when considered against existing population and through traffic levels.
- In terms of significant link delays, growth will tend not to give rise to many new problems on the network. There are recurrent patches of the network where delays are predicted (on the M5, M6 and M42) but these tend to be isolated areas rather than substantially affecting entire corridors. Elsewhere on the strategic network, delays of up to 30 seconds per kilometre may be encountered but they are not nearly as significant as the pinch points on the M5, M6 and M42 that have been outlined above. This conclusion can be drawn about each set of growth assumptions from TEMPRO through to NLP9 – there is not a discernible difference between their effects.

- Requiring more detailed consideration will be node delays. Several junctions across the SRN may suffer as a result of increased demand and, in addition, there are likely to be resulting impacts on local roads, particularly in and around city centres. These issues will certainly need closer consideration at a local level during the preparation of Core Strategies and Local Development Frameworks (LDFs).
- In terms of the transport intervention packages, there is not a large difference between the effectiveness of their mitigation measures. Do Something 3, which includes some road user charging, does emerge as most likely to contain or reduce negative impacts on the network, although its effectiveness is more limited with NLP 9 levels of growth. Do Something 1, which is the HA's ATM programme and Do Something 2, which would see the addition of some C-TIF schemes, are also expected to yield successes on some places across the network; their effectiveness tends to vary depending on the corridor in question and the time of day.
- It is important that it is understood that RSS2 cannot be considered to be solely responsible for causing volume, congestion and some delay increases and, therefore, the HA would remain aligned with Circular 02/07 by supporting the RSS2 Preferred Option. However, there must be a recognition that there is a residual need for regional investment to address existing demand and also that envisaged to occur under any of the regional development forecasts (from TEMPRO through to NLP9). Solutions are likely to require both public and developer funding. In addition, investment is not likely to be only required on the roads, but also in other modes of transport suggesting the need for a multi-agency, corridor management type approach to meet the region's future transport requirements.
- It is likely that an appropriate strategy to respond to forecast regional growth should not only be multi-modal in nature but should involve a blend of demand-side and supply-side and soft and hard mitigation measures. Supply-side mechanisms tend, by their nature, to offer only long-term solutions. A significant highway extension project, for example, could require a construction timescale of 10-15 years. As such, it seems that the majority of the RSS will have to be delivered without such a development. Public transport does offer another supply-side solution; however, again, enhancements to the West Midlands' rail and Metro network are unlikely to reach completion early in the RSS2's lifetime.
- On the demand side planning solutions could help in the medium term. Careful sustainable and accessibility planning could help to identify locations for development which will not result in a concomitant surge in travel demand; this could help to alleviate future pressure on the network. It is also worth highlighting 'soft' demand-side measures, which include solutions such as introducing flexible work patterns, sustainable travel plans and the increased use of ICT to reduce the need to travel. Such mechanisms are typically smaller, lower in cost, less controversial and have shorter lead-in times. They can comprise a short-term strategy, which could run alongside, for example, Do Something 1 investment. It is not easy to model the impacts of these soft measures, but qualitative research suggests that they yield considerable success in reducing motorway demand. A study for the Department for Transport (DfT) in 2004[1], predicted that an intensive ten-year smarter choices programme could cut urban peak-hour traffic by as much as 21%, with the potential for non-peak traffic levels to fall by 13%. The DfT estimates that for each £1 spent on these measures, there is £10 benefit from reduced congestion.[2]

[1] DfT written by Cairns et. al. '*Smarter Choices: Changing the way we* travel' (2004). This report was later used in the DfT's publications '*Making Smarter Choices'* (2005)
[2] Highways Agency News Release (659/SW/07) (November 2007)

- Necessary for the Highways Agency to consider going forward is the fact that a ‘one size fits all’ approach is unlikely to realise most network benefits. This study has highlighted the vagaries across the SRN in terms of how different corridors ‘react’ to different levels of investment. Whilst Do Something 3 appears as the most effective mitigation package overall, Do Something 1 and Do Something 2 result in uneven success. As such, an approach which works in one sub-region will not necessarily work in them all. Coupled with this issue is the expected rise in morning node delays scattered in and around some of the city centres.
- The evidence described above, means that there may well be a need for further assessment at a sub-regional level in order to enhance understanding of local consequences and consider a more tailored implementation strategy to mitigate the impact of background traffic growth. It is also worth noting that this study has given no consideration to phasing of development over the next two decades as the local information did not exist with which to do so. As this information becomes locally available, it will be necessary to integrate this with more detailed analysis at a sub-regional level.
- The locations for development under the NLP options in particular, are yet to be clarified at a level of detail which would enable local impacts to be considered. The options tested in this report are similar in scale to the eventual NLP options but are not exactly the same as the options in the final NLP report.

1 Introduction

1.1 This report presents the findings of the study undertaken by Mott MacDonald (MM), JMP Consultants (JMP) and GVA Grimley for the HA in respect of the West Midlands RSS2. This study examines the implications of the proposed strategy for the region and considers the likely impacts of a range of transport interventions for maintaining the efficient movement of people and goods on the Strategic Road Network (SRN) in support of the spatial strategy.

1.2 The study has involved:

i. Collection of data on future housing, employment and population growth;

ii. Option testing of alternative patterns and levels of spatial development and transport investment;

iii. An assessment of the capacity of the SRN to support the future development of the region as proposed by RSS2;

iv. Identification of future strategic policy or infrastructure interventions necessary to support the delivery of housing and employment; and

1.3 This Study represents the views of independent consultants working to a Project Brief agreed by the Highways Agency. The views set out in this report do not represent the formal position of the Highways Agency, which will submit its own representations on the Preferred Option in due course, having regard to this report and other relevant material considerations.

Structure of the report

1.4 The remainder of this report is divided into a further five chapters.

1.5 Chapter 2 provides a background to the study, the Highways Agency's role and responsibilities and summarises the aims and objectives.

1.6 Chapter 3 gives an overview of transport policy context, together with detail of the RSS2 Preferred Option and Nathaniel Lichfield and Partners (NLP) Study.

1.7 Chapter 4 demonstrates the technical methodology adopted to undertake the study. It has been split into two parts; first, the strategic modelling methodology used by MM; and second the local network methodology adopted by JMP.

1.8 Chapter 5 discusses both strategic and local results and highlights any stress and capacity concerns on the network. Results are presented for the SRN in the West Midlands.

1.9 Chapter 6 contains the conclusions to this study, highlighting any pressure points and potential capacity problems and discussing possible courses of intervention for the Highways Agency.

2 Background

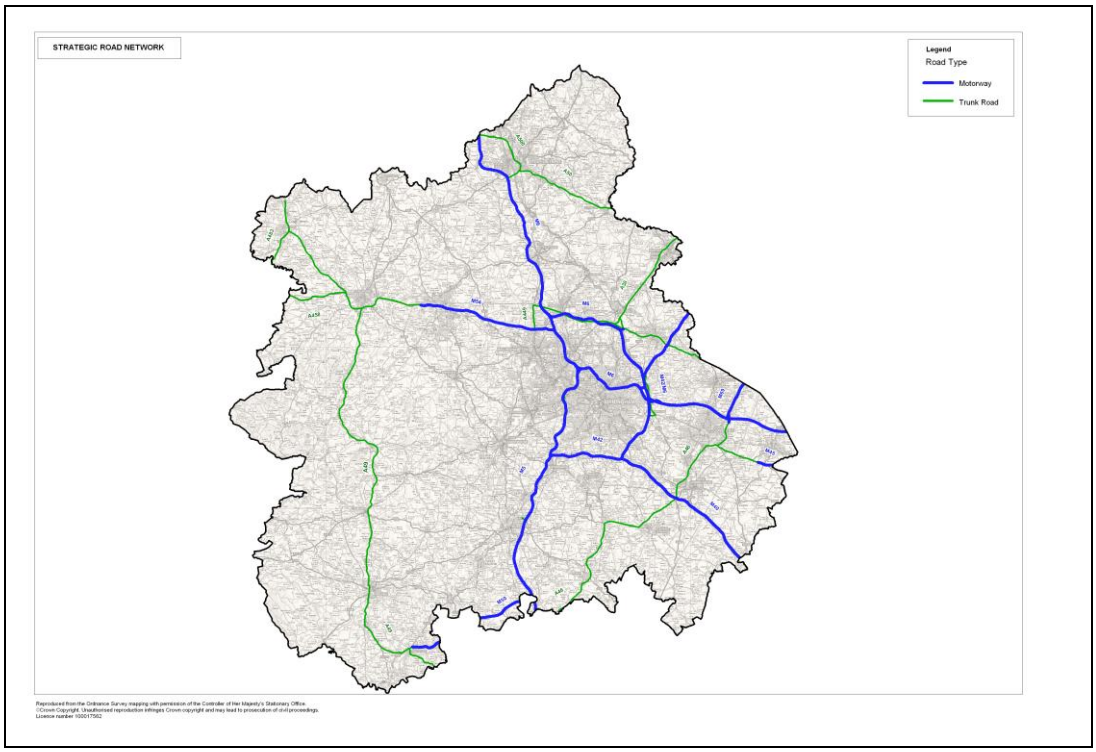
Introduction

2.1 In December 2007, the West Midlands Regional Assembly submitted the Phase Two Revision Draft - Preferred Option to the Secretary of State. Following its submission, the Highways Agency commissioned Mott MacDonald in association with JMP Consultants and GVA Grimley, to undertake a study of the transport and infrastructure implications arising from the Preferred Option, including the proposed level and distribution of new housing and employment land allocations across the West Midlands Region.

2.2 In August 2008, the scope of this work was further extended to inform consideration of the transport impacts of "Development of the Housing Options for the West Midlands in Response to the NHPAU Report" (Nathaniel Lichfield and Partners October 2008). This included additional modelling work to inform the consideration and development of alternative spatial options for accommodating higher housing numbers in the draft West Midlands Phase 2 Revision Preferred Option in response to the National Housing and Planning Advice Unit (NHPAU).

2.3 Although the Preferred Option has yet to be finalised, all the options considered in this Report will involve an increase in housing allocations over current RSS levels. This coupled with further employment growth, could increase the pressures on the SRN and it is likely that sections of the SRN will become heavily overloaded by the end of the RSS plan period in 2026. Figure 2.1 shows the West Midlands SRN.

Figure 2.1 West Midlands Strategic Road Network



2.4 It is against this background that this study has been commissioned to assess the likely transport impacts and it includes the following considerations:

- the alternative spatial options for accommodating the regions the Region's future housing needs;
- the re-assessment of the Region's strategic employment land designations and allocations;
- the identification of the number and broad location of regional warehousing and distribution facilities; and
- Further large-scale development in the Region's strategic network of centres.

Study aims and objectives

2.5 The Study has two principal aims:

i. To inform the Highways Agency's formal response to the Preferred Option.

ii. To assist in the development of the transport evidence base to underpin the preparation of Local Development Documents in the region.

2.6 In order to achieve these aims the key study objectives are to:

- Identify the future scale and nature of the pressures on the region's strategic road network assuming different levels of interventions and patterns of spatial development;
- Assess the capacity of the strategic transport network, and the SRN in particular, to support the future development of the region as proposed by the RSS Phase 2 Revision;
- Advise on the nature of any future policy or infrastructure interventions necessary to support the levels of growth being proposed; and
- To provide guidance on the prioritisation of investment required to meet the region's future transport needs.

Assessing Different Growth Scenarios

2.7 A key component of the study is the need to assess the transport implications of a range of alternative regional growth scenarios. These scenarios are based upon different assumptions about land-use changes including regional housing supply targets. The study tests three scenarios[3], drawing upon the following data:

- National forecasts (TEMPRO) – representing the Government's estimates of land-use changes in the West Midlands.

[3] A fourth element will be added to the study as an addendum at a later stage when the necessary data is available. This will look at the emerging proposals for development of Regional Logistic Sites (RLS) across the region. Broad RLS locations have been identified for the RSS2 Revision, to allow concentrated development of warehousing and distribution uses.

- West Midlands RSS2 – data assumptions and estimates taken from the Phase Two Revision, Preferred Option. The RRS2 sets a target of 365,600 new houses in the West Midlands by 2026.
- NLP Study – alternative levels of housing development and patterns of spatial distribution. Two of the higher growth options that NLP consulted upon during the development of alternative spatial options. The options, agreed with the Government Office for the West Midlands (GOWM) for assessment, were Option 7 (45,600 over and above those proposed in RSS2,distributed in the urban areas) and Option 9 (80,700 additional units across both urban and rural areas).

Assessing Different Network Development Scenarios

2.8 In order to assess the impacts of the growth scenarios (listed above) the study considers their likely impact against four different levels (or 'packages') of transport policy interventions and investment. These transport network scenarios, have been selected on the basis that they most accurately reflect established transport funding priorities and commitments. These include:

- Taking into consideration committed schemes funded through the Regional Funding Allocation (RFA) process and the Highways Agency's Major Schemes Programme (MSP) (formerly the 'Targeted Programme of Improvements' (TPI)
- The implementation of the above package of measures, plus the programme of active traffic management (ATM) schemes, essentially involving utilisation of the hard-shoulder and managed motorway techniques. This is explained further in Chapter 4 – Methodology.
- The implementation of the transport interventions identified under 1 and 2 above, together with a range of potential Congestion Transport Innovation Fund (C-TIF) interventions.
- All the above, plus the introduction of Road User Charging (RUC) in the region.

2.9 These transport scenarios are discussed in more detail in Chapter 4 – Methodology.

Study Outputs

2.10 The final report takes the outputs from the analysis of the transport impacts of different land use scenarios and packages of transport interventions, described above, and considers:

- The future scale and nature of the pressures on the region's transport networks.
- The capacity of the strategic transport, and the SRN in particular, to support the future development of the region as proposed by the various growth scenarios.
- The need for, scope and nature of any additional policy or transport interventions which might be required over the period of the RSS to support the delivery of the spatial strategy to ensure the safe and efficient operation of the strategic road network consistent with wider Government policy objectives.

3 Transport policy

Introduction

3.1 This section of the report summarises the national and regional policy context within which this study has been prepared. This includes discussion of the following:

- Transport issues, infrastructure and demand in the West Midlands
- The Highways Agency's organisational aims and objectives
- National transport policy and the strategic road network
- The West Midlands Regional Spatial Strategy and the Phase Two Revision (Preferred Option -December 2007)
- The region's sub-areas and their diverse economic and transport objectives
- The Nathaniel and Lichfield (NLP) Study (October 2008), which looked at further options for the West Midlands RSS in Response to the National Housing and Planning Advice Unit Report - (NLP October 2008)

Transport in the West Midlands – strategic context

3.2 The West Midlands comprises a diverse blend of cities, urban and rural areas. Birmingham is its central economic powerhouse, boasting a concentration of economic drivers including key business sectors, universities, and tourism assets. It competes on an international footing, acting as a gateway to the entire Region. Beyond the regional capital, the West Midlands contains great diversity among its other cities, larger shire towns, market towns and rural communities. Together, this network of places provides a strong attraction to current and potential residents of the Region looking for a high quality of life.

3.3 The West Midlands' central location puts the region at the heart of the country's transport network providing unrivalled connections to all parts of the UK and to international markets. It is home to important strategic transport links, particularly along the M6 and the West Coast Mainline. The Region's position relative to the UK motorway network, combined with high-speed rail connectivity and an international airport, are important assets which will sustain and accelerate further growth.

3.4 However, the West Midlands central location also generates enormous demands on the region's transport network from commuters, visitors and through traffic. Travel demand is expected to grow in the future, placing even greater pressure on transport infrastructure. This represents a major challenge for the West Midlands; balancing the needs of new housing and the economy against increasing levels of congestion on the region's strategic transport networks is a key issue now being considered as part of the ongoing RSS revision.

Highways Network

3.5 The West Midlands is at the centre of the national road network with important north-south road links via the M5, M6 and M40, with the M6 Toll providing relief to the M6 within the West Midlands conurbation. There are also good road links between the Region and the neighbouring East Midlands via the M69, M42 and A38. Congestion and journey time reliability are significant issues for the SRN, particularly around the conurbation. Despite proposed infrastructure investment these pressures are likely to increase with the growth in road-based freight and commuting trips.

Rail Network

3.6 The West Midlands rail network is key to the performance of the national system. Birmingham's New Street Station is a major hub in the UK's passenger rail network (including the West Coast Main Line and Cross Country routes), but currently suffers major capacity problems. As part of the recent rail High Level Output Statement (HLOS), the DfT has committed funding of £128m towards the rebuilding of New Street Station to meet current and future predicted levels of passenger demand. The new West Midlands Franchise operated by Govia London Midland is committed to increasing capacity and introducing new rolling stock on key commuter corridors into Birmingham and to providing new inter-regional services on the West Coast Mainline (M6 / M1 axis) from 2008. The West Coast franchise operated by Virgin Trains will increase frequencies on the West Midlands to London route in the same timeframe.

Airports

3.7 Two airports serve the region. A major airport at Birmingham provides domestic, European and intercontinental services and a smaller airport at Coventry provides European services.

3.8 Birmingham International Airport (BIA) is to the east of Birmingham, adjacent to M42 Junction 6 and close to the M6. BIA is a key national and regional asset, currently handling around 9 million passengers per annum (mppa) with forecasts suggesting that by 2030 it could attract between 32 and 40mppa. Such expansion would affect traffic flow on the M42 in particular. The Airport owners have stated their policy is to work closely with the Highways Agency to develop a robust strategy for improving surface access to the airport.

3.9 Coventry Airport previously served a specialist role within the region, catering for business aviation, airmail and some freight transportation. Proposals for a new terminal capable of handling up to 2 million passengers per annum were rejected by the Secretary of State following a Public Inquiry. The airport launched an appeal but this was also unsuccessful. Developments since then have seen the holiday firm Thomsonfly, the main carrier, end its operations at Coventry. The airport's business aviation and cargo operations are continuing.

Transport Policy and the Strategic Road Network

The role of the Highways Agency

3.10 The Highways Agency is an executive agency of the DfT, responsible for operating, maintaining and improving the Strategic Road Network (SRN) in England on behalf of the Secretary of State for Transport.

3.11 Currently there is a defined network of over 4,350 miles of motorway and major 'A' roads in England, which are the direct responsibility of the DfT, built, maintained and operated by the Highways Agency. The Highways Agency's motorways account for approximately 1 per cent of the total road length in England, but carry 20 per cent of all road traffic and 44 per cent of all heavy goods traffic.

3.12 As part of the 2007 Comprehensive Spending Review (CSR) a new performance management framework was introduced by Government. This included thirty two new cross-government Public Service Agreements (PSAs) setting out the Government's priority outcomes over the period 2008-2011.

3.13 Under this framework the DfT will lead on one PSA 'Deliver reliable and efficient transport networks that support economic growth.' The DfT's wider transport aims for the CSR period are also reflected in its four Departmental Strategic Objectives (DSOs). These are as follows:

- DSO1: To sustain economic growth and improved productivity through reliable and efficient transport networks.
- DSO2: To improve the environmental performance of transport and tackle climate change.
- DS03: To strengthen the safety and security of transport.
- DSO4: To enhance access to jobs, services and social networks, including for the most disadvantaged.

3.14 The Highways Agency has a major role to play in achieving the DSO objectives set out above and this is reflected in the Highways Agency's key aims which are to tackle unreliability, improve safety and provide better information to help road users make better decisions as they plan their journeys and travel ('Helping you with your Journey Highways Agency Business Plan 08-09').

3.15 The Business Plan recognises that achieving these aims will require continued efforts to mitigate the environmental impact of using, maintaining and improving the strategic road network, and by working with the Agency's business partners to tackle the adverse impacts of transport on climate, health and quality of life. These actions will also need to be complemented by efforts to improve journey time reliability by targeting resources at the most congested parts of the network at the busiest times. This includes the roll-out of innovative, demand-responsive forms of traffic management, including for example, the extension of hard-shoulder running on appropriate further sections of the motorways around Birmingham to tackle congestion and improve road safety.

Roads - Delivering Choice and Reliability (DfT, July 2008)

3.16 The Command Paper "Roads - Delivering Choice and Reliability" looks to both promote and inform the debate about how best to deliver the road capacity that will support the trips that people and businesses need to make, in the most sustainable, reliable way.

3.17 The report notes that increased affluence, more affordable motoring, changes to the structure of the UK economy, the pattern of land use and changes in the working population have all had a significant influence on the pattern of commuting trips and congestion. As identified by Eddington[4], the increases in congestion are concentrated in urban areas, and also appear on key inter-urban corridors and the areas around the UK's key international gateways. With 80 per cent of all delay caused by congestion occurring in cities, and traffic levels growing fastest on motorways, it is clear that these represent the two most urgent priorities.

3.18 Motorway traffic has grown faster over the last ten years than on any other type of road (27 per cent).This growth in traffic raises challenges for the environment including for roadside biodiversity, noise, local air quality and, nationally, on CO2 emissions and climate change.

3.19 The report advises that from a congestion perspective, it is not the growth in the total number of miles driven that matters so much as when and where that growth is happening. As the volume of traffic starts to approach the design capacity of a road, so we start to see breakdown in the traffic flow, resulting in stop-start conditions, delay and unpredictable journey times.

3.20 In order to respond to these challenges the report highlights the initiatives that the Highways Agency is rolling out to tackle congestion on the strategic road network. These include:

Better Management

- Traffic England /Transport Direct Websites
- Traffic Radio
- Variable Message Signing – traffic warnings/current travel times
- National and Regional Control Centres
- Traffic Officer Service

National Roads Programme

3.21 Over the next six years the Highways Agency intends to invest up to £6 billion in major improvements to the strategic road network in a programme that has an important role to play in supporting delivery of a wide range of priorities: supporting economic growth, improving inter-urban journey time reliability, supporting housing growth and enhancing road safety. As part of this process the Highways Agency will undertake a detailed scheme-by-scheme assessment for potential hard-shoulder running in place of planned widening and in additional locations where hard-shoulder running could alleviate known traffic pressures. This has the potential to deliver the majority of benefits of widening at a considerably lower cost and with fewer environmental impacts.

3.22 When deciding whether to increase road capacity to improve traffic flows and reduce congestion, the Highways Agency will take into account any impact that this will have on CO2 emissions from transport and build this into its plans to keep CO2 emissions within the carbon budgets set under the Climate Change Bill.

[4] DfT (2006): 'Eddington Transport Study'

3.23 The Command Paper also sets out details of those roads schemes which will open in the period 2008-09 to 2010-11 and those schemes being considered for implementation before 2014. In the West Midlands, schemes within the programme include:

- M40 Junction 15 – junction improvement (Longbridge Roundabout)

3.24 In addition to the Longbridge Roundabout scheme mentioned above, the Paper highlights the implementation of hard-shoulder running on the M6 around Birmingham, which is a scheme already planned to enter construction (subject to the completion of statutory processes and confirmation of value for money) during the next three years.

3.25 Other capacity options also being progressed by the HA, which may enter construction pre-2014 (again subject to statutory processes and value for money), are listed in the Command Paper. Significant for the West Midlands is motorway capacity enhancement (either widening or hard-shoulder running) between junctions 11a and 19 on the M6.

3.26 Those schemes not prioritised to enter construction prior to 2014 and other emerging pressures will be assessed as part of a further exercise to establish spending priorities for transport after 2014.

Regional Transport Funding Priorities and the Regional Funding Allocation

3.27 In the West Midlands the transport priorities across all modes are as follows:

- Birmingham New Street Station
- Birmingham International Airport - runway extension and surface access;
- M6/M5 capacity improvements and Motorway Box Active Traffic Management;
- Rail Freight Upgrades - Peterborough and Southampton to Nuneaton;
- Regional Rail Capacity, both for passengers services and strategic freight connections;
- Black Country ‘strategic transport spine’ (rapid transit);
- North Staffordshire Integrated Transport;
- New Growth Points/ Settlements of Significant Development;
- Development and implementation of Smarter Choices.

3.28 Regional Funding Allocations were introduced in 2005 and bring together capital financing for major transport schemes under the Local Transport Plan system and for major schemes on about two-thirds of the strategic road network managed by the Highways Agency. Schemes are currently being progressed in accordance with the advice provided by the regions in 2006.

Towards a Managed Motorway – Integrated Demand Management

3.29 The Highways Agency has adopted a philosophy based upon Integrated Demand Management. This is based upon three central tenets:

- Integrated Traffic Management: supply side mechanisms such as Active Traffic Management and Managed Motorways which use solutions such as variable speed limits, lane and incident management, ramp metering and hard-shoulder running to make the best possible use of the highway network

- Spatial Planning: demand side mechanisms to manage the process of development control to ensure consistency with the principles of Circular 2/2007 supported by measures such as travel plans and access management
- Influencing Travel Behaviour: measures such as voluntary travel plans and the promotion of alternative transport modes complement the first two approaches.

3.30 Ideally adopted strategies should encompass more than one of these approaches in order to derive added value from complementary solutions. Such solutions might include access management packages developed jointly by the Agency and by local authorities, high occupancy vehicle or tolled lanes, and area-wide travel plans which encompass both new and existing development.

Department of Transport Circular 02/2007: Planning and the Strategic Road Network

3.31 The Highways Agency is committed to delivering the Government's policies for economic growth and the development of sustainable communities, through the planning system.

3.32 Circular 02/2007 explains how the Highways Agency, on behalf of the Secretary of State for Transport, will participate in all stages of the planning process[5] to ensure national and regional aims and objectives can be aligned and met.

3.33 Through its involvement in the spatial planning process the Highways Agency will seek to promote Government transport policy, which is wherever possible:

" to look for alternatives to building new roads by reducing the impact of road users on each other and the environment, improving road performance through better network management and making smarter journey choices easier." [6]

3.34 The Circular also requires that:

"Any strategic road capacity constraint on sustainable economic development should be identified at the RSS stage. Where appropriate, measures to overcome such constraints should be promoted through the Regional Transport Strategy (RTS), although the presumption should be to give preference, where possible, to solutions other than the provision of new road capacity." [7]

3.35 The Highways Agency contributes to the revision of the RSS, including the integrated RTS, by advising on the ability of the strategic road network to support proposed land-use policies and proposals. This includes evaluating the impact of strategies on roads performance while also taking into account safety and environmental considerations. As part of this process the Highways Agency will provide advice and support for technical aspects of the strategies, such as traffic forecasting on the strategic road network or demand management.

3.36 The Highways Agency is also required to provide advice on the balance of risk to existing and future economic activity created by traffic congestion on the strategic road network. The Circular notes that under certain circumstances, RSSs (as approved by the Secretary of State for Communities and Local Government) may:

[5] This includes working with Government Offices, Regional Development Agencies, regional and local planning authorities, local highway/transport authorities, public transport providers and developers.
[6] Paragraph 8 Circular 02/2007
[7] Paragraph 8 Circular 02/2007

"include planning proposals which might increase traffic demands on the affected network above levels that would assure the efficient flow of traffic. In such circumstances, the RSS would need to make clear that development would be subject to mitigation measures agreed by the Agency being put in place to minimise the consequences on the strategic road network".[8]

3.37 The Circular also advises that there is a general presumption that there will be:

"no capacity enhancements on routes of strategic national importance purely to accommodate new developments (and these would be subject to environmental and deliverability considerations). Capacity enhancements should be identified in the RSS and would not normally be considered as a fresh proposal at the planning application stage."[9]

3.38 In general terms, Government policy is no longer to attempt to cater for unrestrained road traffic growth.[10] In working with developers the Highways Agency will expect to see proposals include ways to reduce the traffic impact of the development. The Circular states that:

"Developers can no longer expect that all the traffic they might produce will be allowed without restraint. This would lead to ever increasing congestion, which poses a threat to economic growth. Where new capacity and/or improvements are required, these will be considered on an individual basis and, where appropriate, incorporated into the Highways Agency's forward programme of works (which is assessed on affordability and priority)."[11]

Towards a Sustainable Transport System (TaSTS) – Supporting Growth in a Low Carbon World (DfT October 2007)

3.39 Circular 02/2007 is founded on an overall policy approach, which seeks wherever possible, to look for alternatives to building new roads. This approach is further strengthened and developed in 'Towards a Sustainable Transport System – Supporting Growth in a Low Carbon World' published by the Department of Transport in October 2007.

3.40 The Report sets out the Government's response to the Eddington Transport Study and the Stern Review of the Economics of Climate Change[12]. It also marks the beginning of a formal consultation programme leading to the proposed publication of a Transport White Paper and a Long Term Transport Plan.

3.41 The report proposes a new approach to the development of a longer term transport strategy. In particular, it highlights the need to improve the performance of the existing network, focusing on the most unreliable, congested and crowded sections in order to improve 'predictable-end-to-end journey times' for travel to work, and for domestic and international business trips and goods movement.

3.42 To reflect these policy objectives TaSTS proposes a new policy framework for considering the full range of transport policy options in order to identify those which offer the best value

[8] Paragraph 16 Circular 02/2007
[9] Paragraph 40 Circular 02/2007
[10] Paragraph 27 Circular 02/2007
[11] Paragraph 27 Circular 02/2007
[12] HM Treasury (2006): '*Stern Review of the Economics of Climate Change'*

for money, alongside other advantages, such as long term flexibility. This consideration should include the following types of actions:

- ***behavioural change*** for example, better information about carbon costs of different journeys or about different ways of getting to work or school can prompt people to change their travel patterns;
- ***getting better use out of existing infrastructure*** such as taking action to deal with incidents more quickly, which can help cut congestion; using new technology as in the M42 active traffic management pilot; or using new signalling systems to enable more or longer trains to travel on the same section of the track;
- ***Technology and innovation*** such as improving safety through better designed vehicles; cutting carbon emissions through new types of fuels and engines; or reducing congestion by providing real-time information to motorists and hauliers;
- ***Pricing signals*** for instance, road pricing can help cut congestion by reducing the number of non-essential car journeys at peak times;
- ***Regulation and enforcement*** for instance, the regulation of motor vehicles to ensure that they were properly maintained could improve safety and cut carbon emissions;
- ***Changes to public transport services*** ensuring service patterns reflect people's actual needs can improve accessibility and quality of public transport, as well as contributing to the carbon goal by promoting modal shift;
- ***Small infrastructure schemes which address a specific need*** for instance, rail passing loops, road junction improvements or remodelling streetscapes to promote walking and cycling; and
- ***Major infrastructure schemes***. To achieve the necessary improvements in transport planning, TaSTS sets out a four stage process to identify the best policies to meet well defined objectives:
  - i. Start by being clear on the policy goals and desired outcomes;
  - ii. Identify the key transport challenges drawing on detailed geographical analysis of pressures, and the improvements in performance sought, focusing on the 'whole journey' rather than particular stages or modes in a journey;
  - iii. Consider the full range of possible actions for meeting the challenges and delivering the improvements, including different modal options and policies for making more efficient use of existing capacity as well as small and larger capacity enhancements and packages of measures; and
  - iv. Prioritise limited public resources on those policies which most cost-effectively deliver Government's objectives, taking account of the full social, environmental and economic costs and benefits.

West Midlands Regional Spatial Strategy (RSS)

3.43 The West Midlands' original RSS was approved and published by the Secretary of State in June 2004, giving regional guidelines on development and investment until 2021 and beyond. Its overarching objective is to secure and create sustainable communities across the West Midlands.

3.44 Although approving the RSS, the Secretary of State placed a responsibility on the West Midlands Regional Assembly (WMRA) to undertake some revisions of the document, which were to be undertaken in three phases. The Phase Two Revision, the subject for this report was launched in 2005. It involved a substantive re-consideration of the RSS's policies on sustainable communities; housing provision; employment land; town and city centres; transport; and waste.

3.45 In December 2007 the WMRA submitted its Preferred Option of RSS2 to the Secretary of State for approval. It introduced new and amended planning policies for the region. The Phase Two Revision is particularly significant to the HA and the SRN due to the range of policies that have been revisited and the impact that these changes could have on transport needs and demand.

Details on the RSS2 Preferred Option

3.46 The West Midlands Regional Spatial Strategy is currently under review. Objections and representations on the draft revisions are due to be considered by a Panel appointed by the Secretary of State to undertake an 'Examination-in-Public' to be held in April – July 2009. Following the completion of the revision process the new West Midlands RSS will replace the existing document.

3.47 The Spatial Strategy can be summarised as enabling all parts of the region to meet their own needs, in a mutually supportive and sustainable way. It identifies the scale and distribution of new housing and priorities for the environment, transport, infrastructure, economic development, minerals, waste treatment and disposal. The Strategy also provides the longer term planning framework for the RES.

3.48 Most notably, included within the Revision is a re-examination of regional housing needs, which concludes that 365,000 new homes will be provided across the region over the next 20 years (up to 2026). The Metropolitan Urban Areas (MUAs) are designated to provide 46% of these new homes with Birmingham, Coventry and the Black Country expected to accommodate over 30,000, 50,000 and 60,000 new dwellings respectively. Elsewhere in the Region, significant growth is planned for Shropshire, Telford and Wrekin and South Worcestershire and Warwickshire. Also included are reviews of employment land designations, the provision of regionally significant employment and logistic sites and the West Midlands' strategic network of centres.

3.49 RSS2 seeks to focus the majority of new development within the MUAs of Birmingham/Solihull, the Black Country, Coventry and the North Staffordshire conurbation, more development opportunities will be created to retain and attract people and investment. In other parts of the Region, where necessary, new development will be focused in and adjacent to towns which are most capable of balanced and sustainable growth to complement the role of the MUAs. In particular, the following ten areas have been designated as Settlements of Significant Development (SSDs) – Burton-on-Trent, Hereford, Nuneaton/Bedworth, Redditch, Rugby, Shrewsbury, Stafford, Telford, Warwick/Leamington and Worcester. In each case, the aim will be to meet local and sub-regional economic and social needs in the most sustainable way without attracting investment or migration from the MUAs. In support of this objective, the need to resolve existing transport infrastructure problems is highlighted as a key issue for the RSS.

3.50 In addition to the SSDs set out in the RSS, the Government has provisionally designated a number of locations across the West Midlands as New Growth Points as part of its aim to ensure an adequate supply and choice of good quality housing. In response to the 2004 Barker Review, the Government invited local authorities to apply to become Growth Points; they had to commit to deliver at least 500 new houses per year plus include plans for new jobs, town centre regeneration, and higher design and environmental standards.

3.51 The West Midlands Growth Points are:

- Birmingham and Solihull (within the Birmingham, Coventry and Black Country City Region)
- Coventry (within the Birmingham, Coventry and Black Country City Region)
- Telford (within the Birmingham, Coventry and Black Country City Region)
- East Staffordshire – Burton-on-Trent
- Hereford
- Shrewsbury and Atcham
- Worcester
- Black Country and Sandwell
- Stafford

Regional Transport Strategy (RTS)

3.52 The West Midlands Regional Transport Strategy (RTS) sits within RSS2. The RTS provides the regional framework for regional and local transport planning within the West Midlands by:

- Ensuring better integration between transport policies and priorities and the wider WMRSS policies
- Contributing to the economic ambitions of the Region as set out in the West Midlands Economic Strategy
- Steering the development of Local Transport Plans and Local Development Documents.

3.53 A major transport challenge for the Region is balancing the needs of new housing and the economy against increasing levels of congestion on the strategic network. As a consequence a cross cutting theme of the RTS in the West Midlands is the need to manage the increasing demand for travel. In order to address this the RTS, within RSS2, proposes a coherent package of measures including:

- measures to reduce the need to travel
- provision of good quality, well designed walking and cycling facilities
- promotion of travel awareness initiatives
- a significant improvement in public transport
- well-designed park and ride facilities
- better public management of public and private car parking

- appropriate demand management measures
- better management of transport networks

3.54 RSS/RTS Policy T12 “Priorities for Investment” sets out a wide-ranging programme of investment to improve accessibility and mobility across the West Midlands Region, in support of the Spatial Strategy. These will be reviewed as part of the process of considering the WMRSS Phase Two Revision Preferred Option and will reflect both the emergence of new transport priorities arising through the RSS Revision process and progress made in implementing existing priorities as set out in the West Midlands Transport Delivery Plan (2007).

The West Midlands’ Sub–Regions

3.55 The West Midlands is a diverse region with various sub-regions with their own transport and economic objectives. The characteristics of each of the sub-regions are summarised below.

Birmingham, Coventry and the Black Country City Region

3.56 Birmingham, Coventry and the Black Country City Region contains a large part of the Region’s economy and has the potential for significantly increasing its economic performance. The continued development of Birmingham as a Global City has an important role to play in this process. Birmingham’s 20-year vision is to secure long-term sustainable growth in its population through the delivery of several large-scale regeneration and development initiatives around the City Centre and its hinterlands.

3.57 Solihull plays a pivotal role within the region and is host to Birmingham International Airport (BIA), the National Exhibition Centre (NEC) and two Regional Investment Sites (Birmingham and Blythe Valley Business Parks). The Black Country Sub-region is composed of the four Black Country local authorities of Dudley, Sandwell, Walsall and Wolverhampton. The area has strong economic and transport linkages both with Birmingham and with the surrounding areas of South Staffordshire and Telford. As the traditional industrial heartland of the region the Black Country has in recent decades failed to attract the investment that is driving economic growth elsewhere within the region.

Key investment priorities in the sub-area include:

- Promoting Birmingham as a Global City and supporting the development of the city centre Masterplan and maximising the benefit of the BIA, NEC and the International Convention Centre (ICC) as prime assets for the region.
- Promoting and Developing Birmingham Science City, and the connection of Birmingham City University, Aston University and Birmingham University into knowledge transfer and business development.
- Emphasising the importance of New Street Station and BIA as gateways for the Region, and the key part that they play in linking goods, people and services to markets.
- Improving transport and accessibility both to and through the city region including the redevelopment of Birmingham New Street and the development of extended public transport networks to reduce congestion on the Region’s existing transport infrastructure.

- Targeting the most deprived areas of the sub-region, including the city centre, Eastern and North West Birmingham, and North Solihull.
- Diversifying the economy by attracting more knowledge-based industries.
- Developing the four strategic centres (Wolverhampton, Walsall, West Bromwich and Brierley Hill) and creating four Employment Land Investment Corridors as the focus for new employment and economic restructuring in the Black Country.
- Creating new housing development along public transport corridors (served by rail, Metro and quality bus services) within the Black Country to address issues of low demand and social polarisation.
- Capitalising on the low carbon agenda.[13]

Telford

3.58 Telford is the largest urban area in the West Midlands Region, outside of the MUAs. Telford is part of the wider Birmingham, Black Country and Coventry City Region. As the former new town's infrastructure was designed for much larger population than at present, there is considerable potential for further growth. This is reflected in its designation as a New Growth Point.

3.59 Telford's function is generally that of a freestanding, self contained, employment area with localised travel to work and migration links to Shrewsbury rather than significant longer distance commuting patterns with Birmingham and the Black Country.

3.60 Key investment priorities in the sub-area include:

- The development of Telford as a new Growth Point.
- Further development of the Wolverhampton-Telford Technology Corridor and building on the area's strengths in business clusters to increase the levels of employment in technology-driven, knowledge based firms.
- Meeting the needs of new, growing and incoming businesses by ensuring an appropriate supply of serviced land and premises.
- Transforming Telford Town Centre to provide a vibrant heart to the town and its district centres.
- Support for transport and technological infrastructure to overcome barriers to access services and opportunities

Coventry and Warwickshire

3.61 Coventry forms part of the Birmingham City region but also has strong economic and social ties with Warwickshire and Solihull. Coventry has aspirations for growth and is a 'New Growth Point' but the city also recognises the importance of its Regeneration Zones to improving the overall quality of life for its residents.

3.62 With Coventry at its centre, the sub-region has strong structural and functional relationships running in a corridor from Nuneaton/Bedworth through, Coventry, to Warwick/Leamington Spa. Within this North-South Corridor, there are significant contrasts

[13] Summary of investment priorities derived from the RSS Phase Two Revision - Draft Preferred Option (Dec 2008) and "Connecting to Success - The West Midlands Economic Strategy" (Dec 2008)

between the less prosperous areas to the north and wealthier areas to the south. This is reflected in strong growth pressures along the M40 corridor and to the east and south of Coventry. The Coventry, Solihull and Warwickshire area is also crossed by an east west transport axis to the west through Coventry to Rugby in the east where the town acts as a 'gateway' with the East Midlands and the South East Region.

3.63 Key Investment priorities in the sub-area include:

- Developing the assets of the business base in the sub-region, in particular those linked to high technologies, digital technologies, high value added engineering and manufacturing, and the creative industries.
- Focusing on vibrant city and town centres supporting the development of Nuneaton Town Centre and Coventry City Centre along with the smaller Market Towns.
- Promoting the importance of Stratford Upon Avon and the role it plays in the visitor economy and in creating a positive image for the region.
- Creating the conditions for sustainable communities by regenerating the most deprived communities in the sub-region.
- Maximising the employment and enterprise opportunities created by the close proximity of the Coventry, Solihull & Warwickshire High Technology Corridor and the Coventry and Nuneaton Regeneration Zone.

Staffordshire and the North Staffordshire Conurbation

3.64 Due to the decline of the County's traditional industries a number of settlements are designated Local Regeneration Areas (i.e. Biddulph, Burton, Cannock, Leek, Rugeley, Stafford and Tamworth) where the aim is to improve the longer term economic prospects of the towns. Burton-upon-Trent is the major town within East Staffordshire, an area currently experiencing a significant period of re-structuring. This is reflected in its designation as one of the 'New Growth Points' in the West Midlands and offers the opportunity for longer term growth and prosperity.

3.65 Within Staffordshire, the North Staffordshire conurbation is made up of the combined communities of the City of Stoke-on-Trent and Newcastle-under-Lyme and is centrally located midway between regional centres of Birmingham and Manchester with functional relationships with adjoining authorities and centres in both the West Midlands and North West regions. The decline of the North Staffordshire traditional industries has led to a collapse in the local economy with major implications for the housing market in the area which is characterised by low demand and low prices.

3.66 The need to restructure the inner core through extensive regeneration and diversification is a major challenge. The North Staffordshire Regeneration Partnership together with RENEW, the North Staffordshire Housing Market Renewal Pathfinder, have key roles to play in ensuring that essential economic, environmental, housing and transport investment is co-ordinated.

3.67 Key investment priorities in the sub-area include:

- To increase the number of high value added companies in Staffordshire, particularly in the North Staffs Regeneration Zone.
- Diversifying the economy and maximising opportunities in the knowledge base through targeted investment to physically develop Keele and Staffordshire Universities.
- Developing Staffordshire as a unique and diverse tourism destination which attracts international interest and continues to be a profitable growth sector.
- Major investment to develop and create a strong and vibrant city centre in Stoke-on-Trent, and linked to this a new University Quarter.
- Making Staffordshire a residential location of choice, aligning and connecting areas of major housing with economic regeneration.
- Promoting and investing in the physical assets of Staffordshire to develop vibrant and sustainable town centres, market towns and surrounding rural villages.
- Addressing economic inclusion by increasing employment rates in the most deprived communities and groups.

Worcestershire

3.68 Worcestershire shares with South Warwickshire the same key sub-regional housing market characteristics of high prices, high demand and acute affordability problems. Worcestershire has experienced significant economic change and the towns of Kidderminster and Redditch and the city of Worcester have been identified as Local Regeneration Areas where the aim is to improve their longer term economic prospects.

3.69 In the past, the North of the County (e.g. Redditch, Bromsgrove, and Droitwich) saw rapid residential growth. Today growth is now intended to be focused in 'Settlements of Significant Development' which represent towns that are capable of balanced and sustainable growth. Within Worcestershire, two such locations have been designated – Worcester City and Redditch. The historic cathedral city of Worcester forms one of the West Midlands 'New Growth Points' and will act as a sub-regional focus for longer term growth in the County. Further development in the County will be focused within other larger settlements and market towns acting as strategic locations for housing and employment growth.

3.70 Key investment priorities in the sub-area include:

- Building on the area's strengths in business clusters to increase the levels of employment in technology-driven, knowledge based firms.
- Revitalising the industrial estates to ensure that an abundant supply of serviced employment land fully meets the requirements of the market/and or employment sectors targeted for growth.
- Meeting the needs of new, growing and incoming businesses in market towns and cities by ensuring an appropriate supply of serviced land and premises.
- Enhance the role of the sub-region's hierarchy of cities and shire towns, larger towns such as Kidderminster and Redditch and Market towns as sustainable settlements providing access to employment, skills development, enterprise support, housing and services.

- Support for investment in transport and technological infrastructure to overcome barriers to access to services and opportunities.

Shropshire and Herefordshire - the Rural West

3.71 The Counties of Shropshire and Herefordshire make up the Rural West of the region. Compared to the rest of the West Midlands, the population of the Rural West is sparse and generally accommodated in a range of different sized settlements in the form of the two sub-regional centres of Hereford and Shrewsbury, market towns, villages and hamlets.

3.72 The Rural West has suffered economically as traditional rural industries and services have declined. A key challenge therefore is to secure a rural renaissance of both key settlements and the areas of countryside which surround them as recognised by the designation of a Rural Regeneration Zone over much of the area.

3.73 The cathedral city of Hereford and Shrewsbury both act as a sub-regional centres for an extensive surrounding hinterland. In both cases there are significant limits on the existing transport capacity, which will need to be overcome if each centre is to accommodate major new development as 'Settlements of Significant Development'.

3.74 Outside of both of these centres development will be focused within key market towns acting as strategic locations for balanced housing and employment growth.

3.75 Key investment priorities in the sub-area include:

- Building on the area's strengths in business clusters to increase the levels of employment in technology-driven, knowledge based firms.
- Revitalising the industrial estates to ensure that an abundant supply of serviced employment land fully meets the requirements of the market/and or employment sectors targeted for growth.
- Meeting the needs of new, growing and incoming businesses in market towns and cities by ensuring an appropriate supply of serviced land and premises.
- Enhance the role of the sub-region's hierarchy of cities and shire towns, larger towns and market towns as sustainable settlements providing access to employment, skills development, enterprise support, housing and services.
- Support for investment in transport and technological infrastructure to overcome barriers to access to services and opportunities.
- Developing business investment in skills through links with major developments such as the Edgar Street Grid.

Nathaniel Lichfield and Partners Study

3.76 In July 2007 the Government announced its commitment to delivering 2 million new homes by 2016 and 3 million new homes by 2026[14]. In order to achieve its target of 2 million new homes by 2016, the Government is seeking through the current round of RSS reviews to identify additional land for housing development across each of the English regions.

[14] Homes for the Future: More Affordable, More Sustainable – The Housing Green Paper (July 2007)

3.77 In light of these plans, the Government took the view that the West Midlands proposed contribution of 365,600 new dwellings by 2026 was not high enough to help meet the overall national target. As such, GOWM commissioned NLP to produce some options for higher levels of growth than those proposed in RSS2. NLP used, as a base, a report published by the National Housing and Planning Advice Unit (NHPAU) in June 2008, which suggested that the West Midlands could accommodate between 12,300 and 80,700 dwellings up to 2026 in addition to the 365,600 already proposed in RSS2. Taking these figures as a starting point, NLP developed nine options (two based on 12,300 additional houses; five based on an additional 46,500 houses; and two based on 80,700 additional units) each with different patterns of distribution throughout the region. It undertook extensive consultation on and appraisal of these nine options, testing them in terms of their physical impact, delivery risks and performance against RSS, Planning Policy Statement 3 (PPS3)[15], and the Housing Green Paper. The assessment also involved a Sustainability Appraisal, a Habitats Regulation Assessment and engagement with stakeholders (including local authority representatives, other agencies, developers and infrastructure providers).

3.78 As a result of the above analysis, three potential scenarios emerged as possible housing scenarios for the West Midlands[16]. These are briefly summarised below; more detail can be found in Appendix E:

- South East Focus – a further 51,500 housing units (an extra 2,575 per annum) above the RSS2 figures, supplying 417,100 net additional dwellings in the West Midlands up to 2026.
- Spreading Growth – a further 54,000 housing units (an extra 2,700 per annum) above the RSS2 figures, supplying 419,600 net additional dwellings in the West Midlands up to 2026.
- Maximising Growth – a further 80,000 housing units (an extra 4,000 per annum) above the RSS2 figures, supplying 445, 600 net additional dwellings in the West Midlands up to 2026.

3.79 The NLP study concludes, therefore, that there is scope to identify additional land for housing in the West Midlands; it is considered that the region could support between 50,000 and 80,000 more houses above the 365,600 already mentioned in the RSS2 Revision.

3.80 It should be noted that the options modelled for this study were agreed with GOWM prior to the final publication of the NLP study. As such two out of the original nine options were assessed (Option 7 and Option 9) rather than any of the three final scenarios that were developed. This was due to the time at which the study was commissioned – the final three scenarios were not available at this point. The details of Option 7 and 9 are summarised in the two tables below:

[15] PPS 3 (2006) underpins the delivery of the Government's strategic housing policy objectives

Table 3.1 NLP Option 7 details and distribution

Location	Local Authorities in Area of Search	Indicative number of additional units
Medium Urban Extensions		
Birmingham South	Birmingham	c. 2.500
Birmingham East	Birmingham	c. 2.500
Birmingham/Solihull	Birmingham/Solihull	c. 2.500
Warwick	Warwick	c. 2.500
Redditch	Redditch/ Bromsgrove/ Stratford	c. 3,000
Black Country	Black Country Authorities	c. 2,000
Worcester	Worcester/ Wychavon/ Malvern Hills	c. 3,000
North Staffs	Newcastle/ Stoke-on-Trent	c. 2,000
Cannock	Cannock Chase/ South Staffordshire	c. 2,000
Stafford	Stafford/South Stafford	c. 3,000
Telford	Telford & Wrekin	c. 3,000
Rugby	Rugby	c. 3,000
Urban-based growth		
North Staffs	Newcastle/ Stoke-on-Trent	c. 2,200
Black Country	Black Country Authorities	c. 8,360
Birmingham	Birmingham	c. 6,600
Total NHPAU MID		**46,500**

Table 3.2 NLP Option 9 details and distribution

Location	Local Authorities in Area of Search	Indicative number of additional units
Medium Urban Extensions		
Birmingham South	Birmingham	c. 5.000
Birmingham East	Birmingham	c. 5.000
Birmingham/Solihull	Birmingham/Solihull	c. 10,000
Warwick	Warwick	c. 10,000
Redditch	Redditch/ Bromsgrove/ Stratford	c. 5.000
Telford	Telford & Wrekin	c. 10,000
Black Country	Black Country/ South Staffordshire/ Bromsgrove	c. 5.000
Burton on Trent	East Staffordshire	c. 5.000
North Staffs	Newcastle/ Stoke-on-Trent	c. 5.000
Rugby	Rugby	c. 5.000
Worcester	Worcester/ Wychavon/ Malvern Hills	c. 5.000
Cannock	Cannock Chase/ South Staffordshire	c. 5.000
Additional Rual Provision for Affordability		
Shropshire	All	c. 1,900
Herefordshire	All	c. 1,200
Worcestershire	Malvern, Wychavon, Wyre Forest	c. 1,900
Total NHPAU HIGH		**80,700**

4 Modelling Methodology

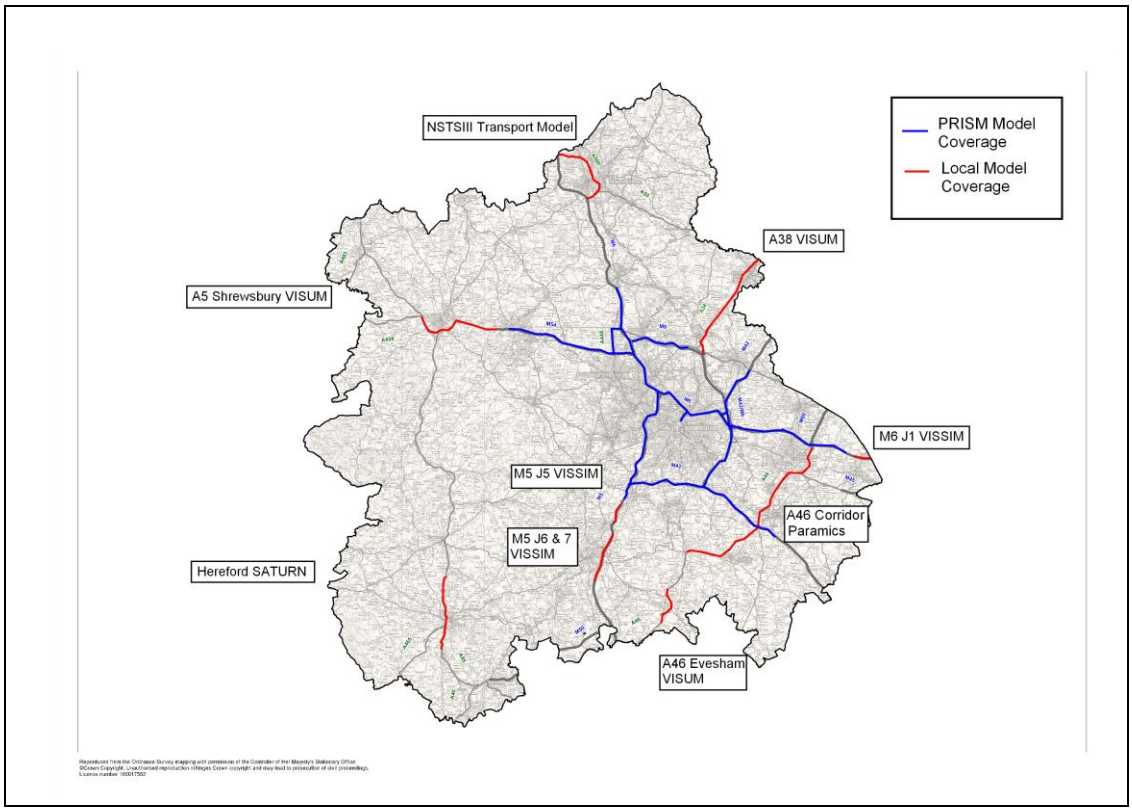
Introduction

4.1 As explained above in Chapter 1, the objective of this study is to assess the impact on the SRN, taking into consideration different assumptions of housing growth and land-use and the various options for network development in the West Midlands.

4.2 In order to produce accurate forecasts of the impact on the SRN of the above scenarios, a 'twin track' modelling approach was adopted, utilising the West Midlands Policy Responsive Integrated Strategy Model (PRISM) transport model (Mott MacDonald) and complemented by additional modelling at the district/county level (JMP Consultants) for those areas that are not covered in detail by PRISM.

4.3 Figure 4.1 shows the model location and coverage for PRISM and the local models.

Figure 4.1 Model Locations



4.4 The PRISM and regional methodologies are provided in more detail below. Data and network assumptions are explained towards the end of this chapter.

PRISM

What is PRISM and what does it do?

4.5 PRISM was developed between 2002 and 2004 by Mott MacDonald and Rand Europe on behalf of the seven West Midlands (WM) Metropolitan Authorities, the WM Chief Engineers and Planning Officers Group (CEPOG) core support team, the Highways Agency and CENTRO (the West Midlands Passenger Transport Executive). Its central components are: linked to a disaggregate travel demand model. The latter models variety of travel behaviour decisions, including.

- **Network model**: Detailed representation of the highway and public transport (PT) networks in the West Midlands.
- **Demand model**: Detailed representation of the travel behavioural responses of individuals in the West Midlands, including car ownership, PT travel pass ownership, trip frequency and choices on destination, mode the time of day to travel. These individual responses are dependent not only on external stimuli (policy interventions), but also personal socio-economic characteristics which are derived from the land use inputs provided in the model.
- **Control shell**: Programming set-up which executes and controls the model "runs" by calling different elements of the model when a particular intervention or policy is to be tested.
- **Output and analysis modules**: Spreadsheet and GIS based analysis tools have been developed to assess the outputs of the model runs in line with Government guidance.

4.6 As a transport model, PRISM requires certain inputs to be fed in to enable it to generate transport impact assessments. The primary inputs are:

- **Demand inputs** - the size and type of travel demand generators e.g. housing, employment, land-use projections. For this study this demand inputs are based on TEMPRO, RSS2, and NLP data.
- **Supply inputs** - the extent of existing networks and capacity of transport infrastructure). For this study, the supply inputs are, therefore, the Do Minimum and Do Something options 1, 2 and 3 as highlighted in Table 4.2 below.

4.7 By matching the demand for travel to the available network supply, PRISM is able to produce geographically detailed information on traffic flows, journeys delays, congestion levels and link road saturation.

Model coverage

4.8 PRISM divides the West Midlands into nearly 900 model zones (discrete spatial areas). These zones are categorised as 'internal', 'intermediate' and 'external'.

- **Internal zones:** The **574** internal zones are those situated within the West Midlands conurbation, which comprises seven metropolitan authorities[17]. On average, there are three zones per electoral ward, increasing in the denser parts of Birmingham to about five zones per ward. Data on population, employment and schools has been collected for these. All travel modes and demand responses (such as demand for work, business and education trips) are covered.
- **Intermediate zones:** The rest of the West Midlands region, outside of the conurbation, is segmented into **286** intermediate zones. In the intermediate area all demand responses are covered to the same extent as the metropolitan area. The highway and rail networks are comprehensive, but only bus routes that have one of their end points within the metropolitan area are represented.
- **External zones:** By virtue of the West Midlands' central geographical location its transport networks do not just serve local and regional traffic, but also national traffic flows. As such, within PRISM the rest of the country is represented by about **30** zones, which inevitably are quite large. The model does not reflect any responses to local policy for these zones. Neither does it represent the full demand for travel from these external zones, nor alternative mode or destination choices. The relative coarseness of representation would mean that information for these areas should only be considered for comparative purposes between alternate scenarios.

4.9 The detail with which PRISM operates is clearly most concentrated, and the data finest, within the conurbation itself. This is largely because residents within metropolitan boroughs are the principal users of transport facilities in the area and they will be most affected by and responsive to alternative transport infrastructure developments.

Local models

Introduction

4.10 The need for additional modelling stems from the following;

- Certain areas of interest to the Highway Agency are not well-represented in the PRISM model, as they are at the periphery of the modelled area.
- The impacts on a number of key motorway and trunk road junctions are required and the PRISM model does not provide sufficiently detailed modelling of such junctions

Available Models

4.11 The following local models were available to test the impacts of the different RSS2 options on the operation of the Strategic Road Network.

- Hereford Model – this is a SATURN highway model covering the town of Hereford and its immediate environs. The A49 Trunk Road runs through Hereford and so any impact on these routes is of interest to the Highways Agency.
- A5 Shrewsbury Model – this is a VISUM model covering the A5 Shrewsbury bypass between M54 Junction 7 to the east and the A5/A458 junction to the west. As many of the junctions on the A5 are at-grade, the impacts of additional traffic using the key radial routes into Shrewsbury on the operation of A5 need to be assessed.

[17] The seven metropolitan authorities are Birmingham, Coventry, Dudley, Sandwell, Solihull, Walsall and Wolverhampton.

- A46 Evesham – this is a VISUM model covering the town of Evesham. The A46 Trunk Road forms the eastern bypass of the town.
- A46 Models – there are two PARAMICS microsimulation models covering the A46; one covers the town of Stratford and the A46 to the west and north of Stratford whilst the other covers the section of the A46 between M6 junction 2 and M40 junction 15.
- A38 (Lichfield to A50) – this is a VISUM model covering the A38 and associated junctions.

4.12 The following microsimulation models are available to test the impacts on operation of selected motorway junctions

- M6 Junction 1 – this is a VISSIM model covering the signalised roundabout at junction1 of the M6
- M5 Junctions 6 and 7 – this is a VISSIM model covering junctions 6 and 7 of the M5, together with the intervening stretch of the M5 itself
- M5 Junction 5 – this is a VISSIM model covering the dumb-bell roundabouts at junction 5 of the M5

4.13 The following model was not made available to JMP for this study, however the outputs of the model were made available. The model was run by the City of Stoke-on-Trent Council to test the highway impacts of the Core Spatial Strategy which is in line with RSS assumptions for the region.

- North Staffordshire Transport Study Phase III (NSTSIII) Transport Model – a CUBE model covering the city of Stoke-on-Trent and the Borough of Newcastle-Under-Lyme. The model includes the A50 and A500 Trunk Roads. The model also covers the M6 Motorway, but the traffic flows on the motorway are only representative of trips that originate or terminate within the modelled area. Through trips are not included, and so modelled flows on the motorway are stated to be much lower than the observed flows.

4.14 A summary of the local models is presented in Table 4.1 below.

Table 4.1 Summary of Local models

Model	Software	Base Year	Modelled Periods
Hereford	SATURN	2005	AM Peak, PM Peak
A5 Shrewsbury	VISUM	2007	AM Peak, PM Peak
A46 Evesham	VISUM	2008	AM Peak, PM Peak
A46	PARAMICS	2007	AM Peak, PM Peak
A38 Lichfield to A50	VISUM	2007	AM Peak, PM Peak
M6 Junction 1	VISSIM	2006	AM Peak, PM Peak
M5 Junction 5	VISSIM	2006	AM Peak, PM Peak
M5 Junctions 6 and 7	VISSIM	2006	AM Peak, PM Peak
NSTSIII	CUBE	2007	AM Peak, PM Peak

Drawbacks and Limitations of Models

4.15 The effect of RSS2 was tested by modelling key areas within the West Midlands. A total of 11 models have been used. As described above the strategic models that have been developed for RSS2 include PRISM, Hereford, A46 Corridor, Evesham, A38 and A5. The micro-simulation models that have been developed are for M6 Junction 1 and M5 Junctions 5, 6 and 7.

4.16 Strategic modelling and micro-simulation, irrespective of the software, has drawbacks and limitations. Below is a general overview of the possible drawbacks of transport models:

- The success or failure of any model is dependent on the data used for building the model. If sufficient data is not used when building the base, then the forecast models may produce inaccurate or strange results. It is for this reason that the initial model development requires thought on the location and type of data needed.
- One of the common drawbacks of modelling is the computer run time required for running models. This is more apparent with micro-simulation models, which are generally more detailed than strategic models.
- The selection of geographic areas (zones) that should be modelled needs careful selection. Generally it is not possible to model all roads, and this is one of the drawbacks when selecting zones, as trips tend to feed onto a few key locations. Zones are selected based on the location being a significant generator or attractor of trips.

4.17 The limitation of using strategic models over micro-simulation is that the level of detail in the transport network is much less. The parameters that are used in micro-simulation also allow for driver behaviour and lane changing to be modelled. This along with visual representation of vehicles allows for the user to define hotspots at key junctions.

4.18 Certain areas were modelled strategically because it is impractical to use micro-simulation to model relatively large areas. The time that goes into building and running micro-simulation models can be significantly longer than strategic models.

4.19 In terms of the models used for RSS2, the local junction simulation models are limited as they only show the impact at those junctions. They do not look into the impact at other junctions affected.

4.20 The limitation of the strategic models is that they are generally not coded in a high level of detail. However, the impact that RSS2 has on the SRN is apparent as this has been modelled in detail.

Study Approach

4.21 In order to assess the impact on the SRN of different levels of housing growth and the various options for network development, a full range of potential scenarios had to be modelled. These scenarios are shown in Table 4.2 below:

Table 4.2 Modelled Scenarios

Land Use Assumptions	Network Assumptions and Policies			
	RFA 'core' schemes	**RFA and ATM schemes**	**RFA, ATM, Congestion-TIF and RAST schemes**	**RFA, ATM, Congestion-TIF and Road User Charging Schemes**
National Forecast (TEMPRO)	Do Minimum (TEMPRO)			
WM RSS2	Do Minimum RSS2	Do Something 1 RSS2	Do Something 2 RSS2	Do Something 3 RSS2
NLP Option 7	Do Minimum NLP7	Do Something 1 NLP7	Do Something 2 NLP7	Do Something 3 NLP7
NLP Option 9	Do Minimum NLP9	Do Something 1 NLP9	Do Something 2 NLP9	Do Something 3 NLP9

4.22 The models were run for each of land-use / transport policy combinations specified above. For the TEMPRO and RSS2 runs two future year scenarios were run, which were 2016 and 2026 to correspond with RSS and RSS2 timeframes. It was assumed that half of the development proposals implied by the 2026 forecasts would be in place by 2016. For the NLP scenarios, only 2026 was modelled as this in the only year within the study for which growth forecasts are provided. Scenarios were modelled for both the AM peak and PM peak periods.

The NLP scenarios

4.23 It is important to be clear about the NLP growth forecasts that were modelled for this study. As mentioned above, this study has looked at two of the options that the NLP consulted on in preparation of its final three scenarios (that are highlighted above in section 2.2). The options, chosen and agreed by GOWM and NLP and subsequently modelled for the study, were Options 7 and Options 9. These are briefly summarised below.

NLP – Option 7

4.24 Option 7 is classified as 'medium growth', which is premised on the assumption that the region could support an additional 46,500 units to those specified in RRS2. The pattern of growth distribution is around the urban areas – see Table 3.1 above for details on the distribution of these units.

NLP – Option 9

4.25 Option 9 is a 'high growth' proposal, based on 80,700 extra units, over and above RSS2 figures, by 2026. Distribution of these houses encompasses both urban and rural locations, with particularly large growth suggested for Birmingham/Solihull; Warwick and Telford. Precise numbers and allocation across the districts can be found in Table 3.2 above.

Demand data

PRISM

4.26 The PRISM modelling exercise uses detailed land use information, including employment, number and types of households and population trends and looks at the impacts of policies on different social groupings. PRISM then forecasts the impacts of socio-economic and demographic developments on travel patterns within the region. Accurate information on future land use is critical in estimating the trips generated and, subsequently, the impacts on the regional network.

4.27 As such, the first key step in the overall study process was the collection of detailed land–use information. This information was largely collected from Local Planning Authorities (LPAs) as they are required to set out how they intend to meet the housing, employment, office and retail requirements proposed by the RSS2 Preferred Option as part of their own Local Development Documents (LDDs). From this information a series of projections for future household and employment growth within each PRISM zone was generated and used as the basis for forecasting future patterns of travel demand across the region.

4.28 This section of the report summarises the land use information gathered from a combination of desktop research and meetings with LPAs and WMRA. It should be noted, however, that in some instances LPAs were not able to provide sufficiently detailed enough information on the likely spatial distribution of future development within their administrative areas. In such cases certain assumptions had to be made, which have been discussed in detail in "Land-use Information and Assumptions Summary Note", June 2008.

Population data

4.29 Population targets for this study were provided by the respective districts. The district figures were then distributed on a pro rata basis to PRISM zone level. Population figures can be found in Appendix F.

Housing data

4.30 The aggregate level information available for housing growth was taken from the RSS2 Preferred Option (Policy CF3 – Level and Distribution of New Housing Development), which states an overall target for additional houses in the West Midlands of 365,600 by 2026. The distribution of these housing growth tables is set out in Appendix H.

4.31 The RSS2 figures are only broken down as far as the district level. In order to distribute these housing numbers into PRISM zones for the study, information on present completions and commitments, contained with the Single Site Completion Survey 2007, was used. This data is available at PRISM zone level for several districts. In cases where there gaps in the completion and commitments information, the aggregate figures from the LPA Annual Monitoring Reports (AMRs) were used. This helped to adjust the remaining housing targets into PRISM zones.

Employment data and planning data

4.32 The main sources of aggregate level information available for employment growth that was used for this study were the RSS2 Preferred Option policies PA6A (Employment Land Provision); PA12A (Comparison Retail Floorspace Requirements 2006-2026) and PA13A (Development Requirements 2006-2026[18]). These employment requirements are identified by reference to hectares of land and square metres of floorspace, which were then converted to provide the number of new jobs created using standard DCLG employment density rates.

4.33 It should be noted, however, that adjustments were made to the RSS2 so that the overall increases in employment at a district level were kept in line with TEMPRO (national) forecasts. In terms of distribution of those jobs within the district, however, this was aligned with proportional distribution proposed with RSS2.

4.34 RSS2 and TEMPRO employment growth figures, and their district-wide distribution can be found in Appendix H.

Local models

4.35 For the local models on the periphery of the PRISM modelled area (A5 Shrewsbury, A46 Evesham and Hereford), future matrices were derived by using TEMPRO to obtain growth factors for the Do-Minimum 1, and TRICS trip generation factors were applied to the RSS2 land use information to generate the Do-Minimum 2 production and attraction totals. The furnessing process was used for the Do-Minimum 2 in order to take account of the revised trip end totals.

4.36 For RSS2, the housing allocation that would impact the model was determined by using journey time isochrones to estimate the proportion of trips generated by each land use allocation that would pass through the modelled area. For allocations within 30 minutes travel time of the modelled area, 100% of trips were assumed to pass through the modelled area.

4.37 For the A38 VISUM model, cordoned matrices were derived from the PRISM model itself. Such matrices represent the demand for highway travel taking into account changes in land use that occur in and around the model. Factors were calculated from the cordoned matrices and applied to the VISUM base model to generate the future model.

Microsimulation Junction Models

4.38 For the VISSIM and PARAMICS microsimulation models, a similar method to that used for the A38 VISUM model was used.

[18] The indicative long term land requirement provided in the RSS2 Preferred Option refers to a 15 year period. However, after further discussions with WMRA, it has been agreed to use this as the 20 year forecasts for the RSS2 period to avoid any over optimistic forecasts.

North Staffordshire Transport Study Phase III model

4.39 The testing of this model was done by Stoke-on-Trent City Council. Due to the age of the 1999 base-year of the NSTSIII transport model it was first necessary to carry out a validation of the forecast 2007 base year of assessment. This was to ensure that the model is robust for the traffic impact assessment of the Core Spatial Strategy or to at least identify potential weaknesses in the model which needed to be borne in mind in the interpretation of the modelled outputs. In order to gauge the impacts of the different land-use and transport policies on the North Staffordshire highway network, the following methodology was undertaken;

- Estimate number of trips associated with committed developments (i.e. with planning permission) to be implemented post 2007;
- Add the estimate number of trips identified within the proposed LDF/RSS
- Each committed and proposed development site to be modelled as an explicit new zone within the transport model
- The distribution of trips to/from the developments is based on the trip distributions of adjacent traffic zones in the NSTSIII transport model.
- Carry out the network assignment.

Transport Network Data

4.40 As specified in Table 4.2 above, this study looks at four different levels of network development, which have been classified as 'Do Minimum', and 'Do Something' – options 1, 2 and 3. The Do Something options are different types of mitigation measures that could be used to tackle the negative impacts of predicted growth in the region. It should be noted that not all of these schemes have been approved, but have been, and still are being, considered as ways in which to tackle network pressures in the region.

4.41 Each level of intervention is described in more detail below to highlight the transport network data inputs which were fed into the model. Appendix G includes full details of all the schemes included in each transport network scenario.

Do Minimum

4.42 The 'Do Minimum' or 'core' scenario represents the minimum level of network investment that will be made by 2016 and 2026.

4.43 **PRISM -** For the strategic modelling it consists of all transport schemes that have been implemented since 2001 and measures that are identified under the WM RFA. All of the schemes in the Do Minimum scenario either have approval, provisional approval or are expected to gain approval in the near future. These schemes are listed in Appendix G.

4.44 **Local models –** Given the more detail nature of the local models it was agreed that Local Network Management Scheme (LNMS) and committed developer funded schemes through S278 would be included in the local models in addition to the above RFA schemes.

Do Something 1

4.45 **PRISM -** In addition to the implementation of the RFA schemes included in the Do Minimum option above, the first 'Do Something' scenario assumes the implementation of highway-only interventions largely involving the expansion of Active Traffic Management (ATM) measures across the WM motorway box with the addition of some Controlled Motorway (CM) schemes. Table 4.3 below highlights which ATM schemes have been included in the 2016 and 2026 'Do Something' model runs.

Table 4.3 ATM Phase 1 and 2 rollout on the WM Motorway Box

Section	Proposed Scheme	Year
M40 (J16 – M42)	CM	2009
M40 (M42 – J16)	Do Nothing	-
M42 (J7-9)	CM	2009
M42 (J9-7)	ATM	2009
M6 (J4a-5)	ATM	2010
M6 (J5-4a)	ATM	2010
M6 (J4-4a)	CM	2010
M6(J4a-4)	ATM	2009
M6 (J8W-10a)	ATM	2011
M6(J10a-J8W)	CM	2011

4.46 A further expansion of the ATM scheme across the rest of the motorway box to include M5 J1-J4, M6 J5-J8 and M42 J1 to J3a is also planned post 2011 as part of Phase 3 to Phase 5 of the ATM rollout. Although the status of the funding for Phase 3 to 5 is not yet confirmed, it has been assumed that these schemes will also be in place by 2016. Finally it was agreed to include within the Do Something 1 option an additional scheme on the M54 (Junction 1 – M6 T), which is currently being tested by the HA.

ATM

4.47 **Local models –** The ATM schemes included as part of Do Something 1 do not generally have any network impact on the local models although there are some local impacts on the areas close to the conurbation.

Do Something 2

4.48 **PRISM** - The 'Do Something 2' scenario assumes the additional implementation of a package of multi-modal measures (Bus Rapid Transit (BRT); train; bus; highway and metro), referred to in this study as C-TIF measures. The exact schemes which are included for modelling purposes are listed in Appendix G[19].

4.49 **Local models** – It was agreed that the Do Something 2 scenario reflected aspirational or likely schemes that might be implemented within the study horizons. These include HA Regional Appraisal Summary Table (RAST) schemes, which impact upon some of the local models, but do not have committed funding.

[19] The inclusion of smarter choices was originally suggested in Do Something 2. However it was decided not to proceed with modelling this as the methodology for doing so is currently under review by the DfT.

Do Something 3

4.50 **PRISM** - The final scenario, adds demand management schemes, to the package of mitigation measures. It assumes all of the schemes mentioned above plus road user charging for accessing Birmingham, Wolverhampton and Coventry City Centres and short-hop motorway trips (introduced for getting on and off the motorway on the M6, junctions 5 and 10, and the M5, junction 2). The short hop policy was included in this scenario as a possible way in which to curb motorist using the motorway for local/inter-urban trips in the West Midlands metropolitan area. A maximum of £5 daily charge was assumed for the purposes of the model.

4.51 **Local models** - The road user charging proposals do not generally have any network impacts upon the local models although there are some local impacts on the areas close to the conurbation.

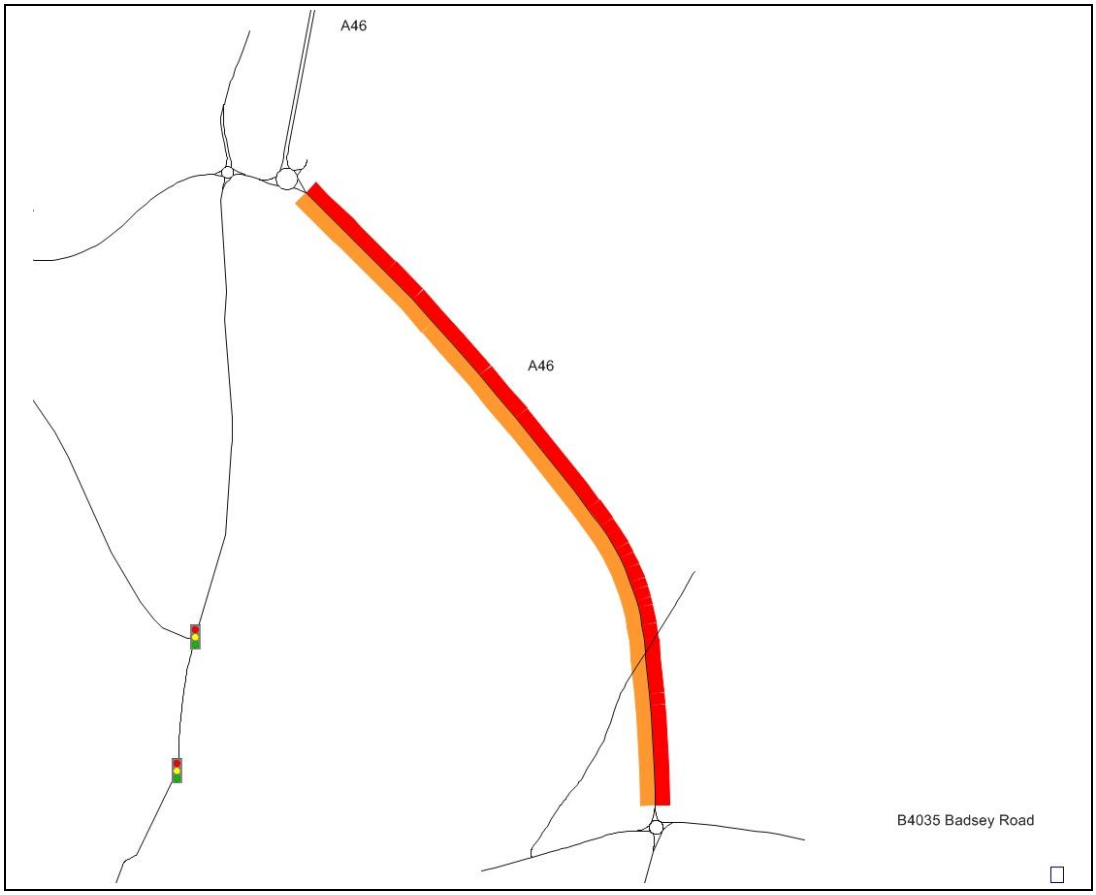
Model Outputs

4.52 By testing each different demand input (land-use / housing assumptions) with each different supply input (transport intervention assumptions), models are able to identify how the SRN will perform in future against a series of network wide congestion level indicators for different forecast years. The indicators that were used for this study were traffic volumes; journey time and node delays; and link saturation. A definition of each of these indicators is provided below:

Traffic Volumes

4.53 This refers to the number of vehicles travelling along a particular stretch of road, per hour. This indicator provides a measure of how 'busy' a road is or the extent to which it is a popular route. Outputs are provided not as an average for the whole road that is being analysed, but disaggregated so that the number of vehicles per hour are shown for a particular link, in a given direction (e.g. northbound / southbound or eastbound / westbound). A 'link' is simply the stretch between two junctions. For example, the adjacent figure shows the link between B4035 and A44 of the A46. The different colours highlight different traffic volumes.

Figure 4.2 Example of a "Link"



4.54 For this study the following classification bands for vehicles numbers have been used:

- > 4000 vehicles[20]
- 2,000 to 4,000
- 1,000 to 2,000
- 500 to 1,000
- < 500

Link and node delays

4.55 Link delays indicate the extent to which vehicles are 'held up' in their passage along sections of the road being analysed. Delays are measured in terms of seconds per kilometre; in this study link delays are flagged for an area of concern when they are in excess of 30 seconds per kilometre. The full range of classification bands employed to highlight severity follow below:

[20] The upper limit or 4,000 was used as a benchmark, as this represents approximately 75% of the full capacity of a three-lane motorway.

- > 120 seconds
- 60 to 120
- 30 to 60
- 1 to 30
- No delay

4.56 'Node' refers to a location on network where vehicles are changing their direction of travel, which is typically at a junction between two roads. Modelling node delays, therefore, permits an understanding of unintended waiting times at junctions. Node delays are measured in terms of seconds – for the purposes of this study, node delays of greater than 60 seconds have been highlighted.

4.57 Both link and node delays area useful way by which to identify pressure points on the network.

Link saturation

4.58 Saturation is used to provide an indicator of congestion along sections of the road network. Explained simply, saturation is the volume of traffic on a given road divided by the road's capacity. Road capacity is affected by the number of lanes, the speed limit and the vehicles mix. For example, a single lane carriageway with a 30 mile per hour speed limit has a designated capacity of 1150 vehicles per hour, whilst a three lane motorway has a capacity of 5,700 vehicles per hour.

4.59 All of the above outputs are presented for each modelled scenario and for each modelled time-period (2016/2026; AM/PM) on GIS plots and in summary tables.

5 Results

Introduction

5.1 Within this section of the report, a detailed examination of each of the model outputs for the scenarios highlighted in Table 4.2 above has been undertaken. Analysis concentrates on the strategic road network in the region and provides a summary of key changes to operation between the various scenarios; they focus on where volumes, delays and saturation are particularly high and specify where most impact is likely to be felt. The results have been divided into two sections with the first looking at the PRISM model area and the other looking at the local model findings with the results described spatially by sub-region.

5.2 The results section identifies the future potential pressures on the network and assesses the capacity of the network to accommodate future development as proposed by the various growth scenarios. GIS plots that highlight the levels of Flows, Saturation and Delay experienced on the regional network in each scenario are provided in Appendix A, and accompanied by tables that summarise the findings in Appendix B.

5.3 The results have been grouped under the different growth forecasts that are proposed for the West Midlands – TEMPRO; RSS2; NLP Option 7 and NLP Option 9. These forecasts are then tested in turn against the various levels of transport interventions. Analysis includes strategic and regional foci with model results for 2016 and 2026, for both the AM and PM peak periods.

5.4 It should be noted that the commentary below for the PRISM model network is restricted to a summary of key changes to operation of the road network from the 2001 baseline position whilst the local models refer to a variety of baseline positions depending on when they were built (they are described in Table 4.1); it focuses on where volumes, delays and saturation are particularly high and specifies where most impact is likely to be felt, in comparison to the baseline position.

5.5 More detailed PRISM and Local Model findings are presented in Appendix C and Appendix D respectively.

PRISM Model Area

Baseline situation

5.6 As a premise for identifying potential impacts on the transport network, it was necessary to develop a clear picture of its present characteristics. 2001, PRISM's base year, was taken as the baseline position for this study and used as a reference point for discussion of changes to the network's operation for the 2016 and 2026 modelled scenarios. The issues featured below highlight broad traffic trends for 2001, for both AM and PM peak periods.

Traffic volumes

5.7 A look at traffic volumes and flows on the regional network for the base year shows that a large share of the motorway corridors witness in excess of 2,000 vehicles per hour in both directions of travel. Vehicle numbers tend to be highest on the approach to and around Birmingham. Particularly busy stretches during both the AM and PM periods include:

- M5 – junction 6 to the intersection with the M6, in both directions (AM and PM)
- M6 – junction 2 to 10a in both directions (AM and PM); junction 12 to 13 northbound (PM)
- M40 – junction 14 through to the intersection with the M42 (AM and PM)
- M42 – junction 1 to 10, in both directions (AM and PM)
- M54 – junction 5 to 6, in both directions (PM)

Delays

5.8 In terms of journey time delays, the 2001 position indicates few significantly problematic areas (delays over 60 seconds) on the regional network. In the AM peak period the most lengthy delays are experienced on the M5 between junction 4a and 5 northbound (particularly around junction 4a), at junctions 6 and 9 on the M42 and between junctions 8 – 10a on the M6. PM delays largely mirror those in the morning, although delays on the M5 are far less significant than those experienced in the morning.

Saturation

5.9 The network saturation for the base year shows that there are already several links throughout the region with levels of over 100%, with more operating at close to capacity. Below is a brief summary of those links operating at over 80% saturation either during the AM or PM peak hours:

- M5 – junction 1 to 4, northbound and junction 1 to the intersection with the M6 (AM); junctions 4a to 5 (AM and PM)
- M6 – the majority of motorway between junctions 2 to 10a
- M42 – the majority of the motorway between junctions 2 and 6 in the AM peak and 3 and 6 in the PM peak.

Traffic Volumes

5.10 Before an in-depth look at the impacts of various regional growth options on delays and congestion is undertaken, it is worth drawing some general conclusions about the consequences for traffic volumes on the strategic network by both 2016 and 2026. The reason for stating these findings at the outset is that there are overwhelming similarities between the forecasts produced.

5.11 As explained above, the baseline position already shows the strategic network to be busy for both the AM and PM peaks. However, forecasts for 2016, even under the most conservative TEMPRO growth targets, show that increases to over 4,000 vehicles per hour can be expected in the following motorway sections:

- M5: AM – southbound junction 2 to 4 and north and southbound at junction 6; PM – north and southbound at junction 5 and 6, and northbound at junction 7 and junction 4a to the intersection with the M6.
- M6: AM and PM - junctions 11 to 14, both directions. PM – southbound at Junction 1.
- M40: AM - southbound junctions 13 to 14; PM – junction with the M42 to junction 14

- M42: AM – westbound junctions 1 to 3 and eastbound 6 to 8; PM – westbound junctions 7 to 9 and eastbound 1 to 3 and 9 to 10

5.12 The following trunk road sections have been highlighted as exceeding 3000 vehicles per hour can in 2016 under TEMPRO growth targets:

- A5 - From Emstrey Roundabout until M54 in both directions shows flows greater than 2000 veh/hr in the AM peak. In the PM peak the flows are only greater than 2000 veh/hr travelling westbound on this section.
- A38 - In the AM peak period the vast majority of the A38 between Weeford and A50 experiences flows greater between 3000 veh/hr in both directions. In the 2016 PM peak the southbound links are shown to exceed 3000 veh/hr.
- A46 - In the AM peak period northbound section of the A46 from A452 until Toll Bar End experiences flows greater than 3000 veh/hr. In the PM peak the northbound section from A429 until A45/A444 shows flows greater than 3000 veh/hr.

5.13 As such, by 2016 virtually all of the modelled strategic motorway network will be experiencing over 4,000 vehicles per hour in the busiest morning and evening periods. This includes all of the M5 (north of junction 7); the M6 (junctions 1 – 14); the M42 (junctions 1 to 9). Traffic on the M40 north of junction 13 is also predicted to be heavy with well over 2,000 vehicles per hour. When slightly higher levels of regional growth are factored in – the RSS2 and both NLP forecasts – southbound on the M69 from junction 1 into Coventry will also be exceeding 4,000 vehicles per hour. The A5, A38 and A46 Trunk roads are also experiencing relatively high flows in 2016.

5.14 By 2026, traffic volumes on the certain links will have increased further, with no expected reductions under any scenario, either AM or PM. Therefore, the essential message is that, regardless of the level of housing and employment growth in the West Midlands, traffic volumes on the strategic network are likely to increase with all the arterial routes into Birmingham being required to accommodate more traffic – in most cases over 4,000 vehicles per hour in the peak periods.

TEMPRO Forecasts

5.15 The following section discusses the findings from the model runs which used TEMPRO as the data source for growth forecast in the region.

Do Minimum - TEMPRO

Delays

5.16 Under the Do Minimum 1 scenario, it is expected that the impact on delays across the West Midlands strategic network will be minimal by 2016 in the AM peak. Isolated impacts will be felt on the M5, M6 and on the M42. Delays on the M6 between junctions 8 and 10a, which are already a feature of the 2001 network, are likely to persist.

5.17 By 2026, one or two more lengthy link delays (more than one minute per kilometre) are likely to emerge, notably on the M5 (northbound, junctions 4a – 5) and the M6 (additional delay northbound between junctions 4a and 5).

5.18 Most noticeable for both 2016 and 2026 AM forecasts are the additional local delays, in around city centres and on A-roads, compared to the 2001 picture. By 2016, node delays of more than 60 seconds will have risen considerably. They will be concentrated in and

around Birmingham, Wolverhampton and Coventry; by 2026 this picture remains plus even further delays are expected in and around Dudley and Walsall.

5.19 Again, in the evening peak, impacts on delay times by both 2016 and 2026 are minor, and generally less severe than the AM peak. The most significant impacts, compared to 2001, are visible on the M6 (between junctions 3 and 4 and 4a and 5). In the PM peak, forecasts also show the emergence of far fewer local node delays. A few more will be visible in Birmingham by 2016 and 2026, but the difference from 2001 will be marginal.

Saturation

5.20 In the morning peak by 2016 and 2026 the vast majority of the M5 between junction 5 and its intersection with the M6, the M6 itself and the M42 between junctions 1 and 10 are forecast to be operating at over 80% saturation, with many links at over 100% capacity. By 2026, saturation is also predicted to be high north of junction 13 on the M40.

5.21 In terms of comparing this to the 2001 AM base the M6 (junctions 10a – 14) M5, M40 and M42 (junctions 1 – 3) are the links expected to see significant saturation increases by 2016 and 2026.

5.22 The PM congestion forecast differs very little from that for the AM. However, two notable exceptions are the congestion levels on the M6 between junctions 11 to 14 and on the M40, which are likely to be slightly higher than the morning peak. This also represents a very clear departure from 2001 conditions.

RSS2 Forecasts

5.23 This section of the report considers the impacts on the West Midlands road network of the growth targets set out in RSS2.

Do Minimum – RSS2

Delays

5.24 As with the forecasts for TEMPRO data, in the RSS2 Do Minimum scenario, delays on the major motorway corridors are expected to be fairly minimal by 2016, with only a couple of notable new link delays – again dotted on the M5 (junction 4a to 5 northbound), with persistent delays on the M6 between junctions 8 and 10a. The situation for the M6 is similar in the PM peak, although traffic is predicted to be less heavy on the M5 links. One link on the M42 (westbound between junctions 8 and 9), however is likely to witness traffic increases. This was the same as in TEMPRO Do Minimum scenario.

5.25 By 2026, morning users of the M6 are likely to be witnessing more delays, with links between junctions 3 and 10a largely experiencing delays per kilometre of above 30 seconds; the situation is similar in the PM peak. These delays mark a departure from the 2001 base picture, and also the TEMPRO 2026 forecasts.

5.26 Again mirroring TEMPRO results, morning node delays in the city centres and on some A-roads are expected to multiply. By 2016 node delays of over 60 seconds are likely to emerge in and around the Birmingham conurbation and Wolverhampton. This situation is aggravated by 2026, with delays in Birmingham and Wolverhampton centres intensifying.

Saturation

5.27 In terms of congestion levels, increases are expected on the entire main corridor compared to the 2001 base position, for both AM and PM time periods. The pattern differs very little to the TEMPRO Do Minimum forecasts, with saturation levels reaching well over 80% along the M5 (north of junction 5, particularly in the PM peak period), M6 (between junctions 2 and 10a, again more noticeable in the PM peak); the M40 (junctions 13 to the intersection with the M42) and patches of the M54, from junction 4 eastwards.

5.28 By 2026, further saturation impacts will be minor, with the exception of a few increases on the M5; M6 and M54. Whilst differences with the 2001 are marked, results from the RSS2 forecasts are virtually identical to the TEMPRO forecasts.

Do Something 1 – RSS2

Delays

5.29 Under Scenario Do Something RSS2, in the morning peak there will be negligible impacts on the strategic road network in the West Midlands. There are only predicted to be a small handful of problematic links (where delays exceed 120 seconds) on the M5, M6, M42 – most of these are already highlighted in the base position. It is also worth noting that delay periods between junctions 8 and 10a on the M6 are likely to decrease as compared by 2001 and also the RSS2 Do Minimum scenario. This AM peak picture is expected to remain broadly constant for 2026.

5.30 By 2016 in the PM peak period, unlike the AM situation, the link delays between junctions 8 and 10a of the M6 will not have subsided. In addition, increased delay periods will have crept in between junctions 2 and 4 of the same motorway, which are forecast to get slightly worse by 2026. However, in the other areas that were problematic in the morning peak (namely the M5 and M42) PM delays are likely to be less severe, albeit still worse than the 2001 figures.

5.31 In terms of AM node delays, again they are likely to rise; by 2016, node delays over sixty seconds will have increased and will be dotted around Birmingham, Walsall and Wolverhampton, with further increases by 2026. In the PM peak, city centre node delays will also increase, particularly around Birmingham, but their levels will neither vastly outweigh those for 2001, or will they come close to the AM node delay tallies. This picture is not different from the modelled results for the RSS2 Do Minimum scenario.

Saturation

5.32 In the morning peak, by 2016 the situation remains similar to other scenarios discussed with several links on the M5, M6, M40 and the M42 operating at over 100% capacity. Increases from the 2001 position are most notable on the M6 and between junctions 1 and 3 on the M42; however, it is also worth highlighting some expected decreases in saturation levels on the M42 between junctions 5 and 6. This represents an improvement not only from the 2001 position but also from the RSS2 Do Minimum option.

5.33 By 2026, saturation levels across all of the motorway corridors are likely to have witnessed further increases in the morning peak. In particular nearly all of the M6 from junction 1 through to junction 14 will be operating at over 80% capacity; M54 saturation levels will also see a particularly steep rise between junctions 2 and 4. Congestion in this stretch is likely to be more than that under the Do Minimum RSS2 option.

5.34 In the PM peak period, by both 2016 and 2026, there are few marked difference to conditions that will be experienced in the morning.

5.35 One key finding from looking at the difference between the RSS2 Do Minimum and Do Something 1 options is that saturation under the latter scenario is likely to see quite significant decreases on the M5.

Do Something 2 – RSS2

Delays

5.36 By 2016 in the morning peak for the RSS2 Do Something 2 scenario, there is expected to be very little departure from delays experienced on the 2001, with the exception of the links that are identified as a problem under virtually all scenarios - the M5 northbound between junctions 4a and 5. The 2026 situation is broadly consistent, with the addition of a few more delays on the M6 between junctions 2 and 4 and the emergence of delays of over 60 seconds eastbound on the M42 between junctions 4 and 5. It is worth pointing out that, whereas under RSS2 Do Something 1 there is expected to be a reduction of delays in the morning on the M6 between junction 8 and 10a, this is not the case for the Do Something 2 option.

5.37 Like all modelled scenarios, node delays of more than 60 seconds are likely to become more numerous. Far more 'sticking points' are forecast for the local/regional network by 2016, with notable increases north and north-west of Birmingham city centre. Again, these are set to multiply by 2026.

5.38 PM delay periods, in comparison to 2001 and the RSS2 Do Minimum option, are also unlikely to be significantly impacted by either 2016 or 2026. A few new node delays over 60 seconds are likely, particularly by 2026, but the impacts are not substantial.

Saturation

5.39 Like the other RSS2 scenarios, compared to 2001, in the morning peak there will be increases on most of the motorway corridors in the strategic network. New sections of motorway network likely to be experiencing saturation levels above 80% by 2016 are very similar to those for RSS2 Do Something 1 and RSS Do Minimum.

5.40 Also in the same way, there are certain sections of the M6 and, particularly the M5 and the M42 that are likely to witness a decrease in saturation levels by 2016. However, these are largely expected to have returned to 2001 base levels.

5.41 In the PM peak period, despite a few very minor reductions in saturation levels between 2001 and 2016, the picture is largely one of increasing congestion. 2026 PM saturation will be broadly consistent with 2016 but some further increases will be evident on the M40, M42 and M54.

5.42 Looking for differences with RSS2 Do Minimum and RSS2 Do Something 1, there are few; however, under RSS2 Do Something 2 congestion levels on the M54 are expected to be slightly better – albeit they will still be markedly higher than 2001.

Do Something 3 – RSS2

Delays

5.43 The impact on AM delays across the West Midlands network in 2016 will again be minimal. Under this scenario only the link between junctions 4a and 5 northbound on the M5 is

expected to witness new delays over 120 seconds. A couple of links eastbound on the M42 will witness minor increases, which is also the case between junction 2 and 4 on the M6. Significantly, however, the M6 is expected to experience some significant reductions in delays between junctions 7 and 10 during the morning peak period. By 2026, the delay picture along the main motorway corridors will remain largely unaltered.

5.44 By 2016 node delays, as with the other RSS2 scenarios investigated, are expected to increase, particularly around Birmingham, Coventry and Wolverhampton with intensifications by 2026.

5.45 In the PM peak, there will hardly be any negative impacts in terms of delays on the strategic network by 2016, by 2026 there will only be that are common to all other scenarios (M5, junction 4a to 5; and M6 junction 2 to 4).

5.46 It is worth noting that by 2016, as with some other RSS2 scenarios, in the PM peak delay on the M6 between junctions 8 and 10a (the most problematic stretch in 2001) will reduce considerably. Although delay times will creep up between junctions 8 and 9 by 2026, these are not expected to reach 2001 levels.

Saturation

5.47 In comparison to the 2001 morning peak, impacts on saturation levels under scenario Do Something 3 RRS2 show decreases on many motorway corridors on the strategic network. By 2016 congestion generally falls across the M5 between junction 5 and the intersection with the M6, between some links on the M42 and between junctions 5 and 10a on the M6. The picture is mixed though, as elsewhere on the M6 and M42 saturation levels increase, which is also the case for the M40 and M54 (between junctions 2 and 4).

5.48 By 2026 the overall AM picture is one of increased saturation, compared to both the 2016 and 2001 forecasts. The vast majority of the M6 (junctions 1-14), the M42 between (junctions 1-10) and the M54 (junctions 1 – 4) are forecast to be operating at over 80% saturation with all major motorways, having links that are likely to be operating at over 100% capacity by 2026.

5.49 In the PM peak under Do Something 3 RSS2 forecasts are very similar.

5.50 Looking across the four modelled scenarios for RSS2 data, it is worth noting that saturation levels show an incremental decline on the M5 as more investment is made. Trends will be explored further in the conclusions section.

NLP Option 7 Forecasts

5.51 The modelled results contained within this section look at the impact of the growth assumed by NLP Option 7. The Strategic Analysis that follows considers only 2026 forecasts, as the NLP concentrated exclusively on this year. The Regional Analysis considers both 2016 and 2026 forecasts where applicable

Do Minimum - NLP7

Delays

5.52 With the level of housing growth assumed under NLP Option 7 and the Do Minimum level of investment is made, by 2026 AM delays are expected to increase slightly on certain areas of the West Midlands network. During the AM peak over and above the new delays

consistently predicted for the M5 (junctions 4a to 5); (M42 (junctions 4 to 5, 8 to 9), additional delays could be expected along several M6 links.

5.53 Furthermore, as with the other Do Minimum scenarios, no improvements to delay times are expected across the network. Node delays will also witness an increase, especially in Birmingham and Wolverhampton

5.54 PM delay times do not differ greatly from those for the morning peak, although a slight reduction is expected on the M5 (between junctions 4a and 5 northbound). In terms of PM node delays bear more resemblance to the 2001 base position.

Saturation

5.55 By 2026, both AM and PM, much of the West Midlands strategic network will be experiencing saturation levels of 80% or above, which is a marked difference from 2001. Particular increases will be evident on the M5 north of junction 5; the M6 between 11 and 14, 2 and 4 (southbound); M42 between junctions 1 and 3.

Do Something 1 - NLP7

Delays

5.56 With NLP7 Do Something 1 transport investment, again the impact on delays across the West Midlands network by 2026 will be minimal. In the AM peak, increased delays are forecast in the usual spots on the M5 and M42. Further delays, additional to those experienced in 2001, will only be found on the M6 junctions 2-4. There are, however, expected to be reductions in delays on the M6 between junctions 8 and 10a. Not only does this represent an improvement from 2001, but also from the NLP7 Do Minimum option.

5.57 AM node delays are numerous; the increase is similar to that likely to be experienced for NLP7 Do Minimum. However, with Do Something 1, they are scattered slightly more throughout the north-west, rather than being concentrated in Birmingham and Wolverhampton.

5.58 In the PM peak, changes from the AM forecast are again minimal. Conditions on the M5 are expected to be better than the morning peak, but the AM improvements on the M6 junctions are not expected to be as great in the evening. Worth noting is that the PM picture is virtually identical to that for NLP7 Do Minimum, although node delays are likely to be slightly more numerous – concentrated very much in Birmingham.

Saturation

5.59 As is forecast for most other scenarios, by 2026, under this scenario (both AM and PM) much of the West Midlands strategic road network is expected to be saturated at levels of 80% or more, with noticeable increases from 2001; there will be aggravated congestion on all motorways. Several stretches on the M6 and M42 will have over 100% saturation levels. It is worth noting though, that congestion is less when compared to the NLP7 Do Minimum scenario – particularly on the M5 and M54.

Do Something 2 - NLP7

Delays

5.60 The impact on delays (both AM and PM) under NLP7 Do Something 2 hardly deviates at all from the NLP7 Do Minimum scenario, which is explained above. In the morning peak, the only slight improvements from Do Minimum are on a couple of links between junctions

8 to 10a of the M6 and junction 4 to 5, eastbound on the M42. The only PM differences between NLP7 Do Minimum and Do Something 2 are slight improvements on the M40 where it joins the M42 and where the M6 and M42 converge around junctions 4a and 8 respectively.

5.61 The AM node delays rise to a similar extent as those for the NLP7 Do Minimum and Do Something 1 options; these are distributed fairly evenly around the north-west of Birmingham.

5.62 As is the case for other PM scenarios, PM node delays are far fewer than during the AM peak, although still expected to be more numerous than in 2001.

Saturation

5.63 In terms of saturation, the Do Something 2 results for NLP (both AM and PM), show very little difference from those modelled for NLP7 Do Something 1; as predicted for other scenarios, much of the West Midlands strategic road network is expected to be saturated at levels of 80% or more, with noticeable increases from 2001. Regional Analysis

Do Something 3 - NLP7

Delays

5.64 Assuming NLP Option 7 growth targets and Do Something 3 investment, as is commonly the case, there will be very few impacts on link delays on West Midlands strategic network by 2026. In the AM peak, the persistently mentioned delays on the M5 are likely to be realised. Elsewhere some eastbound sections of the M42 will witness more delays than in 2001, as will junctions 2 to 4 and 11 to 12 on the M6. However, as with some of the other modelled scenarios, the M6 is also likely to benefit from reduced delays between junctions 8 and 10a. The PM peak bears the hallmarks of the AM peak, the only differences between them being some minor upward fluctuations on the M6 and some downwards fluctuations on the M5.

5.65 As is the case for all other scenarios, 2026 morning node delays will be far more numerous that in 2001. There is likely to be a steep increase in node delays over 60 seconds, with significant rises expected in Birmingham, Wolverhampton, Coventry, Walsall and Dudley. The situation is predicted to be far less severe in the evening.

Saturation

5.66 Saturation levels under the NLP7 Do Something 3 (both AM and PM) demonstrate similar trends to those for Do Something 1 and 2.

NLP Option 9 Forecasts

5.67 The modelled results contained within this section look at the impact of the growth assumed by NLP Option 9.

Do Minimum - NLP9

Delays

5.68 Assuming NLP9 growth targets are realised, the impact on delays between 2001 and 2026, even with Do Minimum transport investment, will be minor. Interestingly both AM and PM delay patterns mirror those for the Do Minimum option for NLP7. Essentially, on the strategic network, there are no predicted additional link delays under this higher NLP growth scenario – likely to be due to the pattern of urban/rural distribution of the additional units. 2026 AM node delays also replicate those of the NLP7 Do Minimum scenario.

Saturation

5.69 Similarly to the picture for delays, NLP9 Do Minimum saturation forecasts (both AM and PM) for 2026 are identical to those for NLP7 Do Minimum; congestion is expected to show considerable increases on all of the main motorway corridors compared to 2001, so that the majority of the network is operating at over 80% saturation. There is only one noticeable difference between NLP9 and NLP7 Do Minimum options – westbound between junctions 1 and 2 on the M42 in the AM peak, saturation is likely to be more pronounced under NLP9 than NLP7.

Do Something 1 - NLP9

Delays

5.70 Once again, rather than describing the NLP9 impacts from scratch, it is worth making reference to NLP7 Do Something 1 results, as the difference between the forecasts are minimal.

5.71 As with NLP7 and all other modelled scenarios, under NLP9 Do Something 1, there are likely to be few impacts on delays on the strategic road network by 2026. In the AM peak, the only divergence from, NLP7 Do Something 1 forecasts, is slightly increased delay periods between 8 and 9 southbound on the M6 (although delays are still less severe than 2001). The number and scattering of node delays is also virtually identical.

5.72 For the PM peak, variation between NLP7 and NLP9 Do Something 1 scenario forecasts is negligible.

5.73 In terms of node delays in the PM peak, similarly to NLP 7 there is likely to be an 80% increase in delay points over 60 seconds, with a cluster forming in Birmingham city centre.

Saturation

5.74 By 2026, as with every other scenario considerable congestion increases across the network are expected. With NLP9 Do Something 1, much of the strategic network will be operating at over 80% capacity by 2026, representing a marked increase from the 2001 base. There are no differences in terms of saturation predictions to those for NLP7 Do Something 1.

5.75 It is also worth comparing here, NLP9 Do Something 1 against the NLP9 Do Minimum scenario to get some flavour about the impact of different levels of investment when the highest housing growth numbers are applied. It is noticeable that with the addition of hard-shoulder running to the RFA schemes, there would be some minor reductions in congestion on the M5, the M6 and the M42. However, the picture is not uniform as between junctions 4 and 6 on the M42 and 2 and 3 westbound on the M54 Do Something 1 investment is likely to yield higher saturation than for Do Minimum.

Do Something 2 - NLP9

Delays

5.76 Under Scenario Do Something 2, NLP9 growth targets impact on delays, relative to 2001, will be fairly marginal in the AM peak, with a few isolated increases on the M5, the M42 (eastbound junctions 4 – 5) and the M6 (junctions 2 to 4 and 12 – 13). The picture is much the same as that for NLP7 Do Something 2; the only detectable differences being that for NLP9 there are slightly higher delay predictions eastbound between junctions 2 and 3 of the M42 and eastbound between junctions 8 and 9 on the M6. AM node delays, as tends to be the case for every scenario, will see marked increases.

5.77 The PM link delays, again, are consistent with those for NLP7 Do Something 2 – only westbound junction 2 to 3 on the M6 is likely to suffer higher saturation levels than those for NLP7.

Saturation

5.78 By 2026 with Do Something 2 transport investment, there will be no difference between NLP7 and NLP9 saturation levels, according to modelled results. Both will have witnessed saturation level increases, compared to 2001. The only notable differences are in the PM forecasts, which predict slighter higher congestion for NLP9 on the M5, southbound between junctions 3 and 4 and the M54 eastbound between junctions 2 and 3.

Do Something 3 - NLP9

Delays

5.79 Presuming NLP9 levels of housing growth and Do Something 3 levels of investment, there will be little impact on delays the network by 2026, compared to 2001. There is no divergence between the PM Do Something 3 scenarios of NLP7 and NLP9; there are only small AM differences comprising longer delay periods under NLP9 on the M42 eastbound between junctions 4 and 5 and the M6 southbound between junctions 12 and 13. Node delay patterns also remain consistent between Do Something 3 for NLP7 and NLP9.

Saturation

5.80 Finally, saturation forecast for both AM and PM NLP9 Do Something 3 are entirely consistent with predictions for NLP7 Do Something 3. The only noticeable difference is slightly reduced PM saturation rates for NLP9 growth on the M40 southbound between junctions 15 and the junctions with the M42 and the northbound on the M5, junctions 2 to 3.

Local Model Analysis

Coventry & Warwickshire

Baseline Situation

Delays

5.81 No significant delay is highlighted on the A46 in Stratford or on the A46 corridor between M40 and M6. M6 Junction 1 also shows no significant delay in the base year.

Saturation

5.82 The A46 corridor between M40 and M6 shows several links experiencing stress but no links that exceed capacity. In Stratford the section of the A46 between A435 and A422 Alcester Road shows stress is in the AM peak only.

5.83 There are no stress or capacity issues highlighted at M6 Junction 1 in the base year.

TEMPRO Forecasts

Delays

5.84 In 2016 significant delays are highlighted on the A46 in Coventry between Toll Bar End and A428 in both peak periods. Significant delay is also predicted on the southbound section from M6 to B4082 in the AM peak and between A45/A444 and Toll Bar End in the PM peak. In 2026 significant delays continue to be experienced on the A46 between Toll Bar End and A428 in both peak periods and between A45/A444 and Toll Bar End in the 2026 PM peak.

5.85 In 2016 and 2026 the A46 in Stratford continues to highlight only minimal delay. M6 Junction 1 also experiences no significant delay in either year.

Saturation

5.86 The vast majority of the A46 corridor between M40 Junction 15 and M6 Junction 2 is shown to experience stress in 2016 and 2026, with many links exceeding capacity. In both years the most stressed sections lie between A429 and A428, with almost all of these links exceeding capacity by 2026.

5.87 In Stratford the section of the A46 between A435 and A422 shows stress in the 2016 AM peak. In 2026 almost all the northbound links between A46/A435 and A46/A439 (with the exception of the link between A422 Alcester Road and A3400 in the AM peak) shows stress in both peak periods.

5.88 There are no stress or capacity issues highlighted at M6 Junction 1 in the base year.

RSS2 Forecasts

Do Minimum RSS2

Delays

5.89 In 2016 significant delays are experienced on the A46 corridor between M40 and M6 in the PM peak only. This delay occurs on the northbound link between A45/A444 and A428. In 2026 it is again only in the PM peak when significant delays are experienced. In 2026 this occurs on the northbound section between A45/A444 and B4082 and southbound from M6 Junction 2 to B4082.

5.90 In 2016 the A46 in Stratford continues to highlight no significant delay. However, in the 2026 AM peak the stretch of A46 between A422 and A4300 is now shown to experience significant delays.

5.91 M6 Junction 1 experiences no significant delay in either assessment year.

Saturation

5.92 The vast majority of the A46 corridor between M40 Junction 15 and M6 Junction 2 is now shown to experience stress in 2016 and 2026, with many links exceeding capacity. In both years the most stressed sections lie between A429 and A428, with almost all of these links exceeding capacity in 2026.

5.93 In Stratford the section of the A46 between A435 and A422 shows stress in the 2016 and 2026 AM peak. In the 2026 PM peak the northbound links between A422 Alcester Road and A3400, and southbound from A3400 to A422 now predict stress.

5.94 In the 2016 and 2026 PM peaks stress is predicted on the M6 mainline travelling southbound at Junction 1

Do Something 1 – RSS2

Delays

5.95 In 2016 AM peak significant delays are predicted on the A46 travelling northbound from Toll Bar End to A428. In the 2016 PM peak the northbound section between A45/A444 and A428 experiences significant delays. In 2026 the PM peak predicts the most delay, with the northbound section from A45/A444 until B4207 all highlighting significant delays. In the 2026 AM peak only the southbound A46 from M6 Junction 2 to B4082 experiences long delays; this stretch is also highlighting delay in the PM peak.

5.96 In 2016 the A46 in Stratford experiences no delays. However, in the 2026 AM peak the A46 from A422 to A4300 is now experiencing significant delay.

5.97 In 2016 and 2026 M6 Junction 1 experiences only minimal delay.

Saturation

5.98 In 2016 the majority of the A46 corridor between M40 Junction 15 and M6 Junction 2 is showing stress and several links exceed capacity. The most stressed sections lie on the stretch between A452 and A428 in both directions. In 2026 the A46 corridor continues to exhibit high levels of stress in both peak periods with all northbound sections of the A46 from M40 Junction 15 until A428 far exceeding capacity.

5.99 In 2016 and 2026 the A46 in Stratford between A435 and A422 continues to show stress in the AM peak. However, in the PM peaks the northbound section between A3400 and A439 is now also highlighting stress in both years.

5.100 In 2016 there continues to be no stress or capacity issues highlighted at M6 Junction 1. By 2026 the M6 mainline travelling southbound at Junction 1 is showing signs of stress in the PM peak.

Do Something 2 – RSS2

Delays

5.101 In 2016 AM peak significant delays are experienced on the A46 travelling northbound from Toll Bar End to A428. In the 2016 PM peak the northbound section between A45/A444 and B4082 experience significant delays. In 2026 it is on these same sections where the delay is predicted.

Saturation

5.102 In 2016 the majority of the A46 corridor between M40 Junction 12 and M6 Junction 2 is showing stress and several links exceed capacity. The most stressed sections lie on the stretch between A452 and A428 in both directions. In 2026 the majority of the corridor continues to be stressed and several more sections are now shown to exceed capacity in both peak periods. In 2026 almost all the northbound sections are over capacity.

Do Something 3 – RSS2

Delays

5.103 In the 2016 AM peak there is no significant delay highlighted on the A46 corridor between M40 and M6. However, in the 2016 PM peak delays are predicted on the northbound section between Toll Bar End and B4082. In 2026 AM peak there are significant delays now highlighted on the northbound link from Toll Bar End to A428. In the 2026 PM peak the northbound sections from A45/A444 to B4082 are showing significant delays.

5.104 In 2016 and 2026 M6 Junction 1 experiences only minimal delay.

Saturation

5.105 In 2016 the majority of the A46 corridor between M40 Junction 12 and M6 Junction 2 is showing stress and several links exceed capacity. The most stressed sections lie on the stretch between A452 and A428 in both directions. In 2026 the majority of this corridor continues to be stressed and several more sections are now shown to exceed capacity in both peak periods. In 2026 AM peak all links between A429 and A428 exceed capacity. In 2026 PM peak almost all the northbound sections are over capacity.

5.106 There continue to be no stress or capacity issues highlighted at M6 Junction 1.

NLP Option 7 Forecasts

Do Minimum – NLP7

Delays

5.107 In 2026 the A46 corridor between M40 Junction 15 and M6 Junction 2 only predicts significant delays in the PM peak. This delay occurs on the northbound section between A45/A444 and B4082 and on the southbound from M6 Junction 2 to B4082.

5.108 In 2026 the A46 in Stratford predicts significant delay on the stretch between A422 and A4300 in the AM peak.

Saturation

5.109 In 2026 the vast majority of the A46 corridor between M40 Junction 15 and M6 Junction 2 is showing stress and many links now exceed capacity in both peak periods with almost all the northbound sections exceeding capacity.

5.110 In Stratford the section of the A46 between A435 and A422 shows stress in the 2026 AM peak. In the 2026 PM peak the northbound links between A422 Alcester Road and A3400 and southbound from A3400 to A422 now predict stress.

Do Something 1 – NLP7

Delays

5.111 In 2026 AM peak there is no significant delay predicted on the A46 corridor by Coventry. However in the 2026 PM peak the northbound section from A45/A444 until B4207 all highlight significant delay, as does the southbound stretch is from M6 Junction 2 until the B4082.

5.112 The A46 in Stratford from A422 to A4300 experiences significant delay in the 2026 AM peak.

5.113 In 2026 M6 Junction 1 experiences only minimal delay.

Saturation

5.114 In 2026 the majority of theA46corridor between M40 Junction 15 and M6 Junction 2 is showing stress and several links exceed capacity in both peak periods, with all the northbound sections from M40 Junction 15 until A428 greatly exceeding capacity.

5.115 In 2026 the A46 northbound in Stratford between A435 and A422 shows significant stress in the AM peak. In the 2026 PM peak the entire stretch of the A46 travelling southbound from M40 until A435 is highlighting significant stress.

5.116 By 2026 the M6 mainline travelling southbound at Junction 1 is showing signs of stress in the PM peak.

Do Something 2 – NLP7

Delays

5.117 In the 2026 AM peak there is no significant delay predicted on the A46 corridor between M40 Junction 15 and M6 Junction 2. However in the 2026 PM peak the northbound section from A45/A444 until B4207 all continue to highlight significant delay, as does the southbound stretch from M6 Junction 2 until the B4082.

Saturation

5.118 In 2026 the majority of the A46 corridor between M40 Junction 12 and M6 Junction 2 is showing stress and many links exceed capacity in both peak periods; with almost all the northbound sections over capacity.

Do Something 3 – NLP7

Delays

5.119 In 2026 AM peak there is no significant delay highlighted on the A46 corridor by Coventry. However, in the 2026 PM peak the northbound section from A45/A444 until B4207 highlight significant delay. The southbound stretch from M6 Junction 2 until the B4082 is also showing delay in this period.

5.120 In 2026 M6 Junction 1 experiences only minimal delay.

Saturation

5.121 In 2026 the majority of the A46 corridor between M40 Junction 12 and M6 Junction 2 is shown to be stressed and many sections are now shown to exceed capacity in both peak periods. In 2026 AM peak all links between A429 and A428 exceed capacity. In 2026 PM peak almost all the northbound sections are over capacity.

5.122 In 2026 the M6 mainline travelling southbound at Junction 1 is showing signs of stress in the PM peak.

NLP Option 9 Forecasts

Do Minimum – NLP9

Delays

5.123 In 2026 it is only in the PM peak when significant delays are experienced on the A46 corridor by Coventry. The 2026 PM peak delay occurs on the northbound section between A45/A444 and B4082 and southbound from M6 Junction 2 to B4082.

5.124 In 2026 the stretch of A46 in Stratford between A422 and A4300 is shown to experience significant delays in the AM peak.

5.125 In 2026 M6 Junction 1 highlights only minimal delay.

Saturation

5.126 In 2026 the vast majority of theA46 corridor between M40 Junction 15 and M6 Junction 2 is showing stress and many links exceed capacity in both peak periods. In 2026 almost all the northbound sections are over capacity.

5.127 In 2026 the A46 in Stratford highlights stress in the AM peak northbound between A435 and A422. In 2026 PM peak almost all the links between A46/A435 and A46/A439 (with the exception of the northbound link between A422 Alcester Road and A3400) are showing stress.

5.128 In the 2026 PM peak, stress is predicted on the M6 mainline travelling southbound at Junction 1.

Do Something 1 – NLP9

Delays

5.129 In 2026 the AM peak predicts no significant delay on the A46 by Coventry. However in the 2026 PM peak the northbound section from A45/A444 until B4207 all highlight significant delay, as does the southbound stretch from M6 Junction 2 until the B4082.

5.130 In 2026 AM peak the A46 in Stratford from A422 to A4300 experiences significant delay.

5.131 In 2026 the M6 Junction 1 experiences only minimal delay.

Saturation

5.132 In 2026 the majority of theA46 corridor between M40 Junction 15 and M6 Junction 2 is showing stress and several links exceed capacity in both peak periods, with all northbound sections of the A46 from M40 Junction 15 until A428 greatly exceeding capacity.

5.133 In 2026 the A46 northbound in Stratford between A435 and A422 shows stress in the AM peak. In the 2026 PM peak the whole of the southbound A46 from M40 until A435 is stressed.

5.134 In 2026 the M6 mainline travelling southbound at Junction 1 is showing signs of stress in the PM peak.

Do Something 2 – NLP9

Delays

5.135 In the 2026 AM peak there is no significant delay predicted on the A46 corridor between M40 Junction 15 and M6 Junction 2. However in the 2026 PM peak the northbound section from A45/A444 until B4207 all continue to highlight significant delay, as does the southbound stretch from M6 Junction 2 until the B4082.

Saturation

5.136 In 2026 the majority of the A46 corridor between M40 Junction 12 and M6 Junction 2 is stressed and several more sections are shown to exceed capacity in both peak periods. In 2026 almost all the northbound sections are over capacity.

Do Something 3 – NLP9

Delays

5.137 In the 2026 AM peak there is no significant delay highlighted on the A46 corridor between M40 Junction 15 and M6 Junction 2. In the 2026 PM peak the northbound section from A45/A444 until B4207 highlights significant delay. The southbound stretch from M6 Junction 2 until the B4082 is also now showing delay in this period.

5.138 In 2026 M6 Junction 1 experiences only minimal delay.

Saturation

5.139 In 2026 the majority of theA46 corridor between M40 Junction 12 and M6 Junction 2 is showing stress and several links exceed capacity in both peak periods. In 2026 AM peak all links between A429 and A428 exceed capacity. In 2026 PM peak almost all the northbound sections are over capacity.

5.140 In 2026 the M6 mainline travelling southbound at Junction 1 is showing signs of stress in the PM peak.

Staffordshire and the North Staffordshire Conurbation

Baseline Situation

Traffic volumes

5.141 The A38 corridor between Weeford and the A50 experiences flows between 2000 and 3000 veh/hr on most sections during both AM and PM peak periods. .

5.142 The A500 by Stoke-on-Trent currently experiences high volumes of traffic; both AM and PM peak periods indicate that significant parts of A500 network are nearing capacity which will result in traffic growth being severely constrained in the future years.

5.143 The M6 mainline between Junction 13 (Stafford South) and Junction 14 (Stafford North) regularly experiences heavy traffic flows with congestion rising notably within both weekday peak periods.

Delays

5.144 No significant delay is highlighted on the A38 corridor between Weeford and the A50.

5.145 In the base year the A500 shows a number of junctions that already experience significant delays. In both the AM and PM peaks, these are A53/A500, A527/A500 and A34/A500 Junctions. In the PM peak the A50/A500 junction also suffer from delays.

5.146 The A50 in both directions to the north of Uttoxeter operates with severe congestion and results in significant delay in both peak periods. Queuing is particularly pronounced on all A50 approaches to the two at-grade roundabouts namely the A50 / B5030 / A518 Ashbourne Road, and the A50 / A518 Derby Road junctions.

5.147 The A5 in Tamworth, between M42 Junction 10 and Mile Oak, currently experiences queuing and delays at junctions during peak periods. Queuing occurs at the junctions during the traditional AM and PM weekday peak periods, and is a particular issue at Ventura Park during the Saturday peak period. On occasion the junction queues impact upon the mainline carriageway and is a safety concern.

5.148 The A5 in Cannock is urban in character, currently experiencing significant queuing and delays during peak periods. The route was declared an AQMA (Air Quality Management Area) in July 2006, as a result of vehicle emissions.

5.149 The A5 between Gailey and M6 Junction 12 exhibits severe queuing on the A5 westbound approach to the A449 / A5 Gailey Roundabout during the AM peak period. However, it is not yet at the level where it threatens the operation downstream.

5.150 M6 Junction 12 currently operates well within capacity. M6 Junction 13 generally operates within current reserve capacity with no major queues or delays on any of the approach arms. M6 Junction 14 currently operates at full capacity with the main issue being the heavy queuing on the northbound off-slip. These queues on occasion extend back to the M6 mainline.

5.151 M54 junctions 1 and 2 suffer from periodic congestion in the peak hours. Severe congestion and delay occur on the eastbound off-slip in both peak periods at Junction 1. Heavy queuing has been observed on the westbound off-slip at Junction 2 as a result of the A449 bound traffic exiting from the southbound exit arm.

5.152 The A449 between M54 Junction 2 and Gailey experiences severe queuing during the PM peak. This is most notably on the A449 southbound approach to the A5 / A449 Gailey at-grade roundabout.

Saturation

5.153 Approximately half of the links on the A38 corridor are showing signs of stress in the base year AM peak. The level of stress is not quite as high in the PM peak but there are still several areas highlighting stress.

5.154 Most of the links on the A50 (T) and A500 (T) corridors are showing signs of stress in the base year AM peak. The level of stress is not quite as high in the PM peak but there is one section which is nearing capacity. In AM peak the section between A53/A500 and A500/A527 exceeds capacity.

TEMPRO Forecasts

Delays

5.155 By 2016 the A38 corridor from Weeford to the A50 is predicting significant delays in the AM peak, most notably on the southbound section from A5132 to Claymills, and on the sections by Swinfen and Weeford. By 2026 significant delays are experienced on the majority of the southbound links in both peak periods.

5.156 It is predicted that the existing congestion problem will increase at the A53/A500, A527/A500 and A34/A500 junctions in the future years under this scenario.

Saturation

5.157 In 2016 the majority of the A38 corridor from Weeford Junction to the A50 is now predicting stress in both peaks. However, it is in the AM peak where levels are at their highest, with several southbound links now exceeding capacity; most notably around Swinfen and Weeford. In 2026 almost the entire corridor is stressed and major capacity issues are highlighted in both peak periods. In the 2026 AM peak all the southbound links are shown to exceed capacity.

5.158 It is predicted that the operational efficiency of the A50 and A500 trunk roads will deteriorate by 2016 and even further again by 2026 as the flows increase.

RSS2 Forecasts

Do Minimum RSS2

Delays

5.159 In 2016 the A38 corridor now predicts significant delays in the AM peak with almost all the southbound sections affected as well as the northbound sections by Barton Turn and Branston. In 2026 significant delays are now predicted on the majority of the A38 Corridor in both peak periods.

5.160 The A50/A500, A52 Shelton Old Road/A500 Junction, A53 Etruria Rd/A500 Junction, A527 Porthill Rd/A500 junctions are predicted to experience significant worsening in operation and an increase in delays in both 2016 and 2026. In addition to the previously listed junctions, the A34 Stone Rd/A500 and A34 Talke Rd/A500 Junctions are predicted to experience significant delays by 2026.

Saturation

5.161 In 2016 the majority of the A38 corridor from Weeford Junction to the A50 is now predicting stress in both peaks. In the 2016 AM peak almost all southbound links are now shown to exceed capacity. The PM peak predicts few links that exceed capacity however almost all are stressed, with the northbound links showing the highest levels of saturation. In 2026 almost the entire corridor is stressed and major capacity issues are highlighted in both peak periods. In the 2026 AM peak all the southbound links are shown to exceed capacity.

5.162 In 2016 the section of the A500 between A52 and A53 is predicted to be at capacity. For the 2016 PM peak the section of the A500 between A50 and A53 is predicted to be over capacity. In both 2026 AM and PM peak, the operational efficiency of the A50 and A500 is predicted to deteriorate further.

Do Something 1 – RSS2

Delays

5.163 In 2016 the A38 corridor from Weeford to the A50 predicts significant delays in the AM peak, most notably on the northbound section between Swinfen Roundabout and Branston however the southbound corridor also experience significant delay on several links. The 2016 PM peak predicts considerably less delay than in the AM peak, highlighting significant delay only on the southbound links between Hilliard's Cross and the A5127 junction, between A5132 and Claymills and at Swinfen Roundabout. In 2026 significant delays are now predicted on the majority of the A38 Corridor in both peak periods.

5.164 In addition to the junctions mentioned in the DM RSS2 scenario, the A5045 Shelton New Rd/A500 Junction is also predicted to experience increased delay under this scenario by 2016. By 2026 the performances of the junctions on A500 will continue to deteriorate.

Saturation

5.165 In 2016 the majority of the A38 corridor is now predicting stress in both peaks. In the AM peak almost all southbound links are now shown to exceeding capacity. The 2016 PM peak predicts few links that exceed capacity however almost all are stressed, with the northbound links showing the highest levels of saturation. By 2026 almost the entire southbound corridor exceeds capacity in both peak periods. In the 2026 AM a large proportion of the northbound links are also shown to exceed capacity

5.166 In 2016 the section of the A500 between A50 and A53 is predicted to be over capacity. In both 2026 AM and PM peak, the operational efficiency of the A50 and A500 is predicted to deteriorate further.

Do Something 2 – RSS2

Delays

5.167 In 2016 and 2026 the A38 predicts significant delays around Swinfen Roundabout, Weeford Junction, and by Claymills in both peak periods. In 2026 additional delays are also predicted on the A38 southbound from A50 to Branston in both peaks and northbound from Claymills to A5132 in the AM peak.

5.168 Do Something 2 scenario is predicted to have a negligible delay impact on A50 and A500 when compared to Do Something 1.

Saturation

5.169 In 2016 AM peak the majority of the A38 corridor is now predicting stress, with several links exceeding capacity, most notably most notably around Swinfen and Weeford to the south. In the 2016 PM peak there are few links that exceed capacity however approximately half the links are predicting stress. In 2026 the majority of the A38 is still stressed and many sections exceed capacity, most notably at Swinfen and Weeford junctions and on the southbound links between A50 and Branston.

5.170 Do Something 2 is predicted to have a negligible saturation impact on A50 and A500 when compared to Do Something 1.

Do Something 3 – RSS2

Delays

5.171 In 2016 the A38 corridor predicts significant delays around Swinfen Roundabout in both peak periods. In the 2016 AM there are also delays highlighted on the southbound stretch between the A50 and Branston and also on the A38 by Weeford. In 2026 significant delays are predicted at the same locations.

5.172 Do Something 3 scenario will have a negligible delay impact on A50 and A500 as compared to Do Something 1.

Saturation

5.173 In 2016 AM peak approximately half of the links on the A38 corridor between Weeford Junction and the A50 are still predicting stress. However, unlike in the base many links exceed capacity, most notably most notably around Swinfen and Weeford junction. In the 2016 PM peak there are also many links that are predicting stress but that are still below capacity. In 2026 the majority of the A38 is still stressed and many sections exceed capacity in both peak periods. Again, the stressed links are predicted on the A38 at Swinfen and Weeford junction and now also on the southbound links between A50 and Branston.

5.174 Do Something 3 scenario will have a negligible saturation reduction on A50 and A500 mainlines as compared to Do Something 1.

NLP Option 7 Forecasts

Do Minimum – NLP7

Delays

5.175 It is expected that the A50 and A500 Junctions operating conditions will deteriorate marginally over the conditions observed in the Do Minimum RSS2 scenario.

Saturation

5.176 It is expected that the A50 and A500 Junctions operating conditions will deteriorate marginally over the conditions observed in the Do Minimum RSS2 scenario.

Do Something 1 – NLP7

Delays

5.177 It is expected that the A50 and A500 Junctions operating conditions will deteriorate marginally over the conditions observed in the Do Something 1 RSS2 scenario.

Saturation

5.178 It is expected that the A50 and A500 Junctions operating conditions will deteriorate marginally over the conditions observed in the Do Something 1 RSS2 scenario.

Do Something 2 – NLP7

Delays

5.179 It is expected that the A50 and A500 Junctions operating conditions will deteriorate marginally over the conditions observed in the Do Something 2 RSS2 scenario.

Saturation

5.180 It is expected that the A50 and A500 Junctions operating conditions will deteriorate marginally over the conditions observed in the Do Something 2 RSS2 scenario.

Do Something 3 – NLP9

Delays

5.181 It is expected that the A50 and A500 Junctions operating conditions will deteriorate marginally over the conditions observed in the Do Something 3 RSS2 scenario.

Saturation

5.182 It is expected that the A50 and A500 Junctions operating conditions will deteriorate marginally over the conditions observed in the Do Something 3 RSS2 scenario.

NLP Option 9 Forecasts

Do Minimum – NLP9

Delays

5.183 The majority of the A38 corridor from Weeford to the A50 predicts significant delays by 2026 and in both peak periods.

5.184 It is expected that the A50 and A500 Junctions operating conditions will deteriorate marginally over the conditions observed in the Do Minimum NLP7 scenario.

Saturation

5.185 In 2026 almost the entire A38 corridor from Weeford to the A50 exceeds capacity in both peak periods. In the 2026 AM peak all the southbound links are shown to exceed capacity and in the PM peak all the northbound links are over capacity.

5.186 It is expected that the A50 and A500 Junctions operating conditions will deteriorate marginally over the conditions observed in the Do Minimum NLP7 scenario.

Do Something 1 – NLP9

Delays

5.187 The majority of the A38 corridor from Weeford to the A50 predicts significant delays by 2026 and in both peak periods.

5.188 It is expected that the A50 and A500 Junctions operating conditions will deteriorate marginally over the conditions observed in the Do Something 1 NLP7 scenario.

Saturation

5.189 In 2026 almost the entire southbound A38 corridor between Weeford and A50 exceeds capacity in the PM peak period. In the AM peak period a large proportion of the northbound links are also shown to exceed capacity.

5.190 It is expected that the A50 and A500 Junctions operating conditions will deteriorate marginally over the conditions observed in the Do Something 1 NLP7 scenario.

Do Something 2 – NLP9

Delays

5.191 In 2026 the A38 Corridor between Weeford and A50 predicts significant delays around Swinfen Roundabout, Weeford Junction, and by Claymills in both peak periods. Additional delays are also predicted on the A38 southbound from A50 to Branston in both peaks and northbound from Claymills to A5132 in the AM peak.

5.192 It is expected that the A50 and A500 Junctions operating conditions will deteriorate marginally over the conditions observed in the Do Something 2 NLP7 scenario.

Saturation

5.193 In 2026 the majority of the A38 corridor is stressed and many sections exceed capacity, most notably at Swinfen and Weeford junctions and on the southbound links between A50 and Branston.

5.194 It is expected that the A50 and A500 Junctions operating conditions will deteriorate marginally over the conditions observed in the Do Something 2 NLP7 scenario.

Do Something 3 – NLP9

Delays

5.195 On the A38 Corridor, the 2026 AM peak shows that the vast majority of the southbound links are now experiencing delay, as are the northbound sections from Claymills to A5132, Swinfen to A5127, and from Barton Turn to Branston. In the 2026 PM peak delays are highlighted on the southbound links from A50 to Barton Turn and from Hilliard's Cross to Swinfen Roundabout, and on the northbound links from Weeford to Wall Island and Claymills to A5132. Delays are more prominent in the 2026 AM peak.

5.196 It is expected that the A50 and A500 Junctions operating conditions will deteriorate marginally over the conditions observed in the Do Something 3 NLP7 scenario.

Saturation

5.197 In 2026 the majority of the A38 is stressed and many sections exceed capacity in both peak periods. The stressed links are predicted on the A38 at Swinfen and Weeford junction and now also on the southbound links between A50 and Branston.

5.198 It is expected that the A50 and A500 Junctions operating conditions will deteriorate marginally over the conditions observed in the Do Something 3 NLP7 scenario.

Worcestershire

Baseline Situation

Traffic volumes

5.199 M5 Junction 5 mainline shows flows greater than 4000 veh/hr in PM peak in both directions. Junction 6 southbound mainline to the north of the junction indicates flows greater than 4000 veh/hr in both peak periods.

Delays

5.200 The M5 Junction 5 base shows significant delays on both off-slips in the PM peak and on the northbound slip in the AM peak. In the PM peak the delays are shown to result in queues on the southbound off-slip that impact on the operation of the M5 mainline.

5.201 The M5 Junction 6 base shows significant delays on the northbound off-slips and on the A449 West approach in the AM peak. However, the queues on this off-slip do not reach back to the M5 mainline. The PM peak does not highlight any significant delays. There are also no significant delays highlighted at M5 Junction 7 in either peak period.

5.202 No significant delay is highlighted on the A46 in Evesham, Stratford, or on the corridor between M40 and M6. The A5 in Shrewsbury, the A38 corridor, and M6 Junction 1, also show no significant delay.

Saturation

5.203 There is no stress shown on the M5 mainline between Junction 5 and Junction 7 or on any of the strategic roads at these junctions in the base AM peak. In the PM peak the southbound M5 link north of Junction 6 and the northbound link at junction 5 show minor levels of stress.

5.204 There is no stress highlighted in the base year on the A46 in Evesham. However, the A46 corridor between M40 and M6 shows several links experiencing stress but no links that exceed capacity. In Stratford the section of the A46 between A435 and A422 Alcester Road shows stress is in the AM peak.

TEMPRO Forecasts

Delays

5.205 In 2016 and 2026 the A46 in Evesham and M5 Junction 7 experience no significant delay.

5.206 In 2016 significant delays are observed at M5 Junction 5 on the southbound off-slip in both peak periods, and are extremely high in the PM peak. The queues on the southbound off-slips have a major impact on the mainline throughout the PM peak. However, the significant delays observed in the base year on the northbound off-slips are no longer present in 2016 due to the inclusion of the committed scheme and signalisation of the northbound off-slip. In 2026 significant delays are observed on the southbound off-slip and result in major queues that reach back to the mainline.

5.207 In the 2016 AM peak M5 Junction 6 delays have worsened on baseline conditions, with both off-slips now predicting significant delays. The delays on the A449 West approach are also considerably worse in this period. As a result, the throughput at Junction 6 is now a concern in the AM peak. The PM peak continues to show no significant delay however, the northbound off-slip delays are considerably higher than in base. Despite these conditions queues do not reach the mainline in either of the 2016 peak periods. In 2026 AM peak significant delays continue to be experienced on both off-slips and on the A449 West approach at Junction 6. At this time the maximum queue lengths are now reaching back to the M5 mainline. In the 2026 PM peak the delay is now significant on the northbound off-slip.

Saturation

5.208 In 2016 AM peak the M5 mainline at Junction 6 predicts stress in both directions. In the 2016 PM peak stress is highlighted on M5 in both directions at Junction 5 and Junction 6 and also on the A44 West travelling westbound from Junction 7. In the 2026 AM peak the M5 mainline at junction 6 and Junction 7 predicts stress in both directions. The A449 West westbound at Junction 6 is also highlighting stress. In the 2026 PM peak the M5 is stressed at Junction 5, Junction 6 and Junction 7, and has now exceeded capacity on the northbound link south of Junction 6. The A44 West travelling westbound from Junction 7 is also stressed in 2026 PM peak.

5.209 In 2016 the A46 in Evesham begins to predict stress on several links in both periods. Stress is most prominent on the northbound links in the 2016 AM peak. In 2026 stress is highlighted on the majority of the A46 around Evesham with the northbound sections most stressed in the AM peak and the southbound links most stressed in the PM peak.

RSS2 Forecasts

Do Minimum RSS2

Delays

5.210 Significant delays are observed at M5 Junction 5 on the southbound off-slip in both 2016 peak periods, and are extremely high in the PM peak. The queues on the southbound off-slips continue to have a major impact on the mainline throughout the PM peak. However, the significant delays observed in the base year on the northbound off-slips are no longer present due to the inclusion of the committed scheme and signalisation of the northbound off-slip. In 2026 the significant delays predicted on the southbound off-slip result in major queues that reach back to the M5 mainline in both peak periods.

5.211 In 2016 M5 Junction 6 still shows significant delays on A449 West in the AM peak but no longer highlights significant delay on the northbound off-slip, as per the baseline position. In the 2016 PM peak the northbound off-slip now highlights significant delay. The length of these delays is considerably longer than in the base year. It should be noted however that the queues on the off-slips do not reach the mainline in 2016. In 2026 significant delays are experienced on both off-slips and on the A449 West at Junction 6 in both peak periods. In 2026 the delays result in queues that reach back to the M5 on both off-slips in the AM peak and on the northbound off-slip in the PM peak.

5.212 In 2016 and 2026 the A46 in Evesham continues to highlight minimal delay, as does M6 Junction 1 and M5 Junction 7. In 2026, there are predicted to be capacity issues with the junctions on the A46 around Evesham. This has been verified using ARCADY models of the junctions.

Saturation

5.213 In 2016 AM peak additional stress is predicted on the southbound M5 at Junction 6. In the 2016 PM peak significant stress is highlighted on the M5 in both directions at Junction 6 and Junction 5 and on the A44 West westbound at Junction 7. In the 2026 AM peak the M5 mainline at junction 6 and Junction 7 predicts stress in both directions. The A449 West westbound at Junction 6 is also highlighting stress. In the 2026 PM peak the M5 is stressed at Junction 5, Junction 6 and Junction 7, and has now exceeded capacity on the northbound link south of Junction 6. The A44 West at Junction 7and the A449 West at Junction 6 are also stressed in the 2026 PM peak.

5.214 In 2016 the A46 in Evesham begins to predict stress on several links in both periods. Stress is most prominent on the northbound links in the 2016 AM peak. In 2026 stress is highlighted on the majority of the A46 around Evesham with the northbound sections most stressed in the AM peak and the southbound links most stressed in the PM peak.

Do Something 1 – RSS2

Delays

5.215 In 2016 and 2026 M6 Junction 1 and M5 Junction 7 continue to experience minimal delay.

5.216 Significant delays are observed at M5 Junction 5 on the southbound off-slip in both 2016 peak periods, and are extremely high in the PM peak. The queues on the southbound off-slips continue to have a major impact on the mainline throughout the PM peak. However, the significant delays observed in the base year on the northbound off-slips are no longer present due to the inclusion of the committed scheme and signalisation of the northbound off-slip. By 2026 significant delays continue to be observed on the southbound off-slip that results in major queues that reach back to the M5 mainline.

5.217 In 2016 M5 Junction 6 continues to show significant delays on A449 West and the northbound off-slip in the AM peak. However, the delays on the A449 West have increased considerably on the baseline position. In the PM peak M5 Junction 6 continues to experience no significant delays. Queues on the off-slips do not reach the mainline in either period. In 2026 significant delays are now experienced on both off-slips and in both peak periods. The A449 West continues to experience severe delays in the 2026 AM peak. This results in queues reaching back to the mainline on both off-slips in the 2026 AM peak.

Saturation

5.218 In 2016 AM peak additional stress is predicted on the M5 southbound at Junction 6. In the 2016 PM peak significant stress is highlighted on the M5 in both directions at Junction 5 and Junction 6, and also on the westbound A44 West at junction 7. In the 2026 AM peak the M5 mainline at junction 6 and Junction 7predicts stress in both direction. The A449 West westbound at Junction 6 is also highlighting stress and is shown to exceed capacity. In the 2026 PM peak the M5 is stressed at Junction 5, Junction 6 and Junction 7, and has now exceeded capacity on the northbound link south of Junction 6. The A44 West at Junction 7and the A449 West at Junction 6 are also stressed in the 2026 PM peak.

Do Something 2 – RSS2

Delays

5.219 In 2026 there are no longer any significant delays at Junction 6. This is a direct result of the inclusion of the highway improvements associated with the 'Do Something 2' scheme changes at this junction.

Saturation

5.220 In the 2026 AM peak the M5 mainline at junction 6 and Junction 7predicts stress in both direction. The A449 West westbound at Junction 6 is also highlighting stress. In the 2026 PM peak the M5 is stressed at Junction 5, Junction 6 and Junction 7, and has now exceeded capacity on the northbound link south of Junction 6. The A44 West at Junction 7and the A449 West at Junction 6 are also stressed in the 2026 PM peak.

Do Something 3 – RSS2

Delays

5.221 Significant delays are observed at M5 Junction 5 on the southbound off-slip in both 2016 peak periods, and are extremely high in the PM peak. The queues on the southbound off-slips continue to have a major impact on the mainline throughout the PM peak. However, the significant delays observed in the base year on the northbound off-slips are no longer present due to the inclusion of the committed scheme and signalisation of the northbound off-slip. By 2026 significant delays continue to be observed on the southbound off-slip that results in major queues that reach back to the M5 mainline.

5.222 In 2016 M5 Junction 6 continues to show significant delays on A449 West and the northbound off-slip in the AM peak. However, the delays on the A449 West have increased considerably on the baseline position. In the PM peak M5 Junction 6 continues to experience no significant delays. Queues on the off-slips do not reach the mainline in either period. In 2026 there are no longer any significant delays at Junction 6. This is a direct result of the inclusion of the highway improvements associated with the 'Do Something 2' scheme changes at this junction.

Saturation

5.223 In 2016 AM peak additional stress is predicted on the M5 southbound at Junction 6. In the 2016 PM peak significant stress is highlighted on the M5 in both directions at Junction 5 and Junction 6. In the 2026 AM peak the M5 mainline at junction 6 and Junction 7predicts stress in both direction. The A449 West westbound at Junction 6 is also highlighting stress. In the 2026 PM peak the M5 is stressed at Junction 5, Junction 6 and Junction 7, and has now exceeded capacity on the northbound link south of Junction 6. The A44 West at Junction 7and the A449 West at Junction 6 are also stressed in the 2026 PM peak.

NLP Option 7 Forecasts

Do Minimum – NLP7

Delays

5.224 By 2026 significant delays are observed on the southbound off-slip at M5 Junction 5 that results in major queues that reach back to the M5 mainline.

5.225 In 2026 significant delays are experiences on both off-slips and on the A449 West at M5 Junction 6 in both peak periods. This results in queues reaching back to the mainline on both off-slips in the 2026 AM peak.

5.226 In 2026 the A46 in Evesham continues to highlight only minimal delay.

Saturation

5.227 In 2026 AM peak stress is highlighted on the M5 in both directions at Junction 6 and Junction 7 and on the A449 west at Junction 6. In the 2026 PM peak the full M5 corridor between Junction 5 and Junction 7 highlights stress, as does the A449 West at Junction 6 and the A44 West at Junction 7.

Do Something 1 – NLP7

Delays

5.228 Significant delays are observed at M5 Junction 5 on the southbound off-slip in both 2026 peak periods that reach back to the M5 mainline.

5.229 In 2026 significant delays are experienced at M5 Junction 6 on both off-slips in the AM peak and on the northbound off-slip in the PM peak. The A449 West experiences severe delays in the 2026 AM peak and also in the PM peak. Queues reach back to the mainline on both off-slips in the 2026 AM peak.

5.230 In 2026 M5 Junction 7 experience only minimal delay.

Saturation

5.231 In the 2026 AM peak the M5 mainline at junction 6 and Junction 7predicts stress in both direction. The A449 West westbound at Junction 6 is also highlighting stress and is shown to exceed capacity. In the 2026 PM peak the M5 is stressed at Junction 5, Junction 6 and Junction 7, and exceeds capacity on the northbound link south of Junction 6. The A44 West at Junction 7and the A449 West at Junction 6 are also stressed in the 2026 PM peak.

Do Something 2 – NLP7

Delays

5.232 In 2026 M5 Junction 7 continues to experience minimal delay

5.233 In 2026 there are no longer any significant delays at Junction 6. This is a direct result of the inclusion of the highway improvements associated with the 'Do Something 2' scheme changes at this junction.

Saturation

5.234 In the 2026 AM peak the M5 mainline at junction 6 and Junction 7 predicts stress in both directions. The A449 West westbound at Junction 6 is also highlighting stress. In the 2026 PM peak the M5 is stressed at Junction 5, Junction 6 and Junction 7, and has now exceeded capacity on the northbound link south of Junction 6. The A44 West at Junction 7and the A449 West at Junction 6 are also stressed in the 2026 PM peak.

Do Something 3 – NLP7

Delays

5.235 Significant delays are observed at M5 Junction 5 on the southbound off-slip in both 2026 peak periods, and are extremely high in the PM peak. This results in major queues that reach back to the M5 mainline.

5.236 In 2026 there are no longer any significant delays at M5 Junction 6. This is a direct result of the inclusion of the highway improvements associated with the 'Do Something 2' scheme changes at this junction.

Saturation

5.237 In the 2026 AM peak the M5 mainline at junction 6 and Junction 7 predicts stress in both directions. The A449 West westbound at Junction 6 is also highlighting stress. In the 2026 PM peak the M5 is stressed at Junction 5, Junction 6 and Junction 7, and has now

exceeded capacity on the northbound link south of Junction 6. The A44 West at Junction 7 and the A449 West at Junction 6 are also stressed in the 2026 PM peak.

NLP Option 9 Forecasts

Do Minimum – NLP9

Delays

5.238 In 2026 significant delays are observed at M5 Junction 5 on the southbound off-slip in both peak periods, and results in major queues that reach back to the M5 mainline.

5.239 In 2026 significant delays are experiences on both off-slips and on the A449 West at M5 Junction 6 in both peak periods. This results in queues reaching back to the mainline on both off-slips in the 2026 AM peak.

5.240 In 2026 the A46 in Evesham highlights only minimal delay, as does M5 Junction 7.

Saturation

5.241 In the 2026 AM peak stress is highlighted on the M5 in both directions at Junction 6 and Junction 7 and on the A449 west at Junction 6. The northbound mainline and the A449 West is shown to exceed capacity. In the 2026 PM peak the full M5 corridor between Junction 5 and Junction 7 highlights stress, as does the A449 West at Junction 6 and the A44 West at Junction 7. In the 2026 PM peak the M5 exceeds capacity at Junction 6 and Junction 7.

5.242 By 2026 the majority of the A46 in Evesham is highlighting stress; most notably on the section from 'The Link' to Broadway Road in the 2026 AM peak, and between A44 and B4035 in the 2026 PM peak. However, in neither year do any links exceed capacity.

Do Something 1 – NLP9

Delays

5.243 Significant delays are observed at M5 Junction 5 on the southbound off-slip in both 2026 peak periods that results in major queues that reach back to the M5 mainline.

5.244 In 2026 significant delays are experienced on both off-slips in both peak periods. The A449 West experiences severe delays in the 2026 AM and PM peak. Queues reach back to the mainline on both off-slips in the AM peak.

5.245 In 2026 M5 Junction 7 experiences only minimal delay.

Saturation

5.246 In the 2026 AM peak the M5 mainline at junction 6 and Junction 7 predicts stress in both directions with the northbound mainline at Junction 6 exceeding capacity. The A449 West westbound at Junction 6 is also highlighting stress and is shown to exceed capacity. In the 2026 PM peak the M5 is stressed at Junction 5, Junction 6 and Junction 7, and has exceeded capacity on the northbound links at Junction 6 and Junction 7. The A44 West at Junction 7and the A449 West at Junction 6 are also stressed in the 2026 PM peak.

Do Something 2 – NLP9

Delays

5.247 In 2026 M5 Junction 7 continues to experience minimal delay.

5.248 In 2026 there are no longer any significant delays at Junction 6. This is a direct result of the inclusion of the highway improvements associated with the 'Do Something 2' scheme changes at this junction.

5.249 In 2026 there are no longer any significant delays at Junction 6. This is a direct result of the inclusion of the highway improvements associated with the 'Do Something 2' scheme changes at this junction.

5.250 In 2026 M5 Junction 7 continues to experience only minimal delay.

Saturation

5.251 In the 2026 AM peak the M5 mainline at junction 6 and Junction 7predicts stress in both direction. The A449 West westbound at Junction 6 is also highlighting stress. In the 2026 PM peak the M5 is stressed at Junction 5, Junction 6 and Junction 7, and has now exceeded capacity on the northbound link south of Junction 6. The A44 West at Junction 7and the A449 West at Junction 6 are also stressed in the 2026 PM peak.

5.252 In the 2026 AM peak the M5 mainline at junction 6 and Junction 7predicts stress in both direction and exceeds capacity on the northbound link at Junction 6. The A449 West westbound at Junction 6 is also highlighting stress. In the 2026 PM peak the M5 is stressed at Junction 5, Junction 6 and Junction 7, and exceeds capacity on the northbound link south of Junction 6. The A44 West at Junction 7 and the A449 West at Junction 6 are also stressed in the 2026 PM peak.

Do Something 3 – NLP9

Delays

5.253 Significant delays are observed at M5 Junction 5 on the southbound off-slip in both 2026 peak periods, and are extremely high in the PM peak. In both periods this results in major queues on the southbound off-slip that reach back to the M5 mainline.

5.254 In 2026 there are no significant delays at Junction 6. This is a direct result of the inclusion of the highway improvements associated with the 'Do Something 2' scheme changes at this junction.

5.255 In 2026 M5 Junction 7 experiences only minimal delay.

Saturation

5.256 In the 2026 AM peak the M5 mainline at junction 6 and Junction 7 predicts stress in both directions; with the northbound mainline at junction 6 exceeding capacity. The A449 West westbound at Junction 6 also highlights stress. In the 2026 PM peak the M5 is stressed at Junction 5, Junction 6 and Junction 7, and exceeds capacity on the northbound links at Junction 6 and Junction 7. The A44 West at Junction 7 and the A449 West at Junction 6 are also stressed in the 2026 PM peak.

Shropshire and Herefordshire – the Rural West

Baseline Situation

Delays

5.257 The A5 around Shrewsbury shows no significant delay. In the base year the A49 near Hereford highlights several links and junctions that experience significant delays; most notably on the links surrounding the A49/A438 New Market Street junction and A49/B4359 Newtown Road junction.

Saturation

5.258 The A5 around Shrewsbury shows signs of stress on the sections between A5/A49 (to the east of Shrewsbury) and the M54, most notably in the AM peak period. However, no links exceed capacity.

5.259 The A49 north of Hereford highlights stress on the southbound links travelling into the city centre in the AM peak between A49/A4103 Roman Road and A49/B4359 Newtown Road. In the PM peak significant stress is highlighted on the southbound links leaving Hereford, from A49/A438 Newmarket Street to A49/A465 Belmont Road Junction.

TEMPRO Forecasts

Delays

5.260 In Shrewsbury the A5/A49 junction, A5/Emstrey Road roundabout, and A5/A49 Hereford road junction begin to show delays in both 2016 peak periods and by 2026 all show significant delays in both peak periods.

5.261 In 2016 the levels of delay on the strategic network by Hereford are predicted to increase, particularly in the PM peak on the northbound route between Newtown Road Junction and A49 Holmer Road/Priory Place. By 2026 the delays on the A49 are significantly higher than baseline in the AM peak between Belmont Road Junction and the city centre.

Saturation

5.262 In 2016 and 2026 the A5 in Shrewsbury continues to predict stress on the same sections between A49 and M54 as in the base year.

5.263 The strategic network around Hereford is predicting considerably higher levels of stress in 2016 and several links are now shown to exceed capacity. In the 2016 AM peak the A465 eastbound is over capacity and in the PM additional stress is predicted on the A49 southbound links to the north of the city centre. In 2026 stress levels are again considerably higher than in the base year and several links are shown to exceed capacity, most notably in the PM peak. In the 2026 PM peak the A49 southbound travelling into the city centre highlights several links that exceed capacity, as do the northbound links from Belmont Road Junction into the centre in the AM peak.

RSS2 Forecasts

Do Minimum RSS2

Delays

5.264 In Shrewsbury the A5/A49 junction, A5/Emstrey road roundabout, and A5/A49 Hereford road junction show delays in 2016 peak periods. It is also these junctions that are highlighting significant delays on the A5 in 2026.

5.265 In 2016 the A49 travelling northbound into Hereford city centre from A49/B4399 Holme Lacy Road Junction experiences significantly higher delays in the AM peak than in the base year. This is also the case on the northbound section of the A49 between Newtown Road Junction and A49 Holmer Road/Priory Place in the PM peak. In 2026 the delays are shown to increase significantly on base year in the AM peak on the northbound section between Belmont Road Junction and the city centre. In the 2026 PM peak significant increases are highlighted on the A49 in both directions immediately north of the city centre.

Saturation

5.266 In 2016 and 2026 the A5 near Shrewsbury continues to only predict stress on the sections between A49 and M54.

5.267 The A49 in Hereford is predicting marginally higher numbers of stressed links in 2016 than in the base year however several links are now predicted to exceed capacity. In the 2016 AM peak the northbound section between A49/A465 Belmont Road and A49/B4399 Holme Lacy road is shown to exceed capacity. In the 2016 PM peak there are additional southbound links predicting stress on the stretch of A49 just south of A49/B4359 Newtown Road until A49/A438 Newmarket Street. In 2026 PM peak the A49 travelling southbound into the centre of Hereford highlights several links that exceed capacity as do the northbound links in the AM peak from Belmont Road Junction into the centre. In the 2026 AM peak the southbound sections north of A49/A4103 Roman Rd are now also shown to experience stress.

Do Something 2 – RSS2

Delays

5.268 In 2026 AM peak the delays on the A49 by Hereford are shown to increase significantly on the northbound sections between Belmont Road Junction and the City Centre. In the 2026 PM peak significant increases are highlighted on the A49 leaving the town centre. However, the Outer Distributor Road will result in reduced delays at junctions on the A49 through the City Centre.

Saturation

5.269 In 2026 the strategic network around Hereford is predicting considerably higher levels of stress than in the base year and several links are shown to exceed capacity. In the 2026 PM peak the southbound A49 into the centre of Hereford highlights several links that exceed capacity as do the northbound links from Belmont Road Junction into the centre in the AM peak. In the PM peak the majority of the northbound A49 from the city centre until A49/Roman Rd Junction is also predicting stress. The Outer Distributor Road will provide some relief to the levels of stress on the existing A49 for vehicles travelling towards the city centre from both the north and the south.

NLP Option 7 Forecasts

Do Minimum – NLP7

Delays

5.270 On the A5 around Shrewsbury the A5/A49 junction, A5/Emstrey Road roundabout, and A5/A49 Hereford Road junction all indicate significant delays by 2026.

Saturation

5.271 By 2026 the A5 in Shrewsbury continues to predict stress on the sections between A49 and M54.

NLP Option 9 Forecasts

Do Minimum – NLP9

Delays

5.272 On the A5 around Shrewsbury the A5/A49 junction, A5/Emstrey Road roundabout, and A5/A49 Hereford Road junction all indicate significant delays by 2026.

5.273 In 2026 AM peak the delays on the A49 travelling northbound into the Hereford city centre continue to be significant. As are the delays highlighted on the A49 immediately north of the city centre.

Saturation

5.274 By 2026 PM peak the eastbound sections between A49 and Emstrey Roundabout and the A5 west of the A458 are now highlighting stress. However, there are still no links that exceed capacity.

5.275 In 2026 the strategic network around Hereford is predicting considerably high levels of stress. In the 2026 PM peak the southbound A49 into the centre of Hereford highlights several links that exceed capacity as do the northbound links from Belmont Road Junction into the centre in the AM peak. The links between A49/Roman Rd Junction and A49 Holmer Road/Priory Place are also shown to exceed capacity in the 2026 AM peak.

Do Something 2 – NLP9

Delays

5.276 In 2026 AM peak the delays on the A49 by Hereford are shown to have increased significantly on the northbound sections between Belmont Road Junction and the city centre. In the 2026 PM peak significant increases are highlighted on the A49 leaving the city centre. However, the Outer Distributor Road implemented in DS scenario will help reduce the traffic flows on the A49 and hence reduce the delay experienced by traffic travelling towards the town centre.

Saturation

5.277 In 2026 the strategic network around Hereford is predicting considerably higher levels of stress than in the base year and several links are shown to exceed capacity. In the 2026 PM peak the southbound A49 into the centre of Hereford highlights several links that exceed capacity as do the northbound links from Belmont Road Junction into the centre in the AM peak. In the PM peak the majority of the northbound A49 from the city centre until A49/Roman Rd Junction is also predicting stress.

5.278 As mentioned previously, the Outer Distributor Road will provide some reliefs in the level of stress on the A49 for vehicles travelling towards the town centre.

6 Concluding observations

6.1 This concluding section presents the overall findings and implications of the different growth forecasts, focusing on where pressure points could form on the network and where highway capacity could be reached.

6.2 First traffic volume trends on the strategic network are considered, which is followed by a discussion of the potential impacts of each of the growth options and then a consideration of the effectiveness of the various transport intervention packages. This chapter then looks at the consequences of all of the different scenarios on each of the West Midlands' sub-regions to highlight geographical distribution of growth impacts. Finally it draws together some suggestions about the approach that the HA might like to adopt towards RSS2 in respect of its impact on the SRN.

Traffic volumes

6.3 It is worth stating at the outset to this Chapter that traffic volumes are likely to rise considerably over the next decade or so, up to 2016 and beyond to 2026. Even with the most conservative growth estimates (TEMPRO), many sections of the three main radial routes (M5, M6 and M42) on the approach to Birmingham are likely to be carrying over 4,000 vehicles per hour during the morning peak by 2016. These high traffic volumes are already experienced on motorways around Birmingham City Centre, but by 2016 the busy stretches start far further out of the City. Further increases in traffic are expected by 2026, again more geographically distant from Birmingham City Centre, by which time the northern section of the M40 is also expected to be carrying over 4,000 vehicles per hour. The northbound section of the A46 is also worth mentioning, as volumes are likely to exceed 4,000 vehicles per hour on the approach to the A45 and Toll Bar End.

6.4 This picture is largely consistent using, TEMPRO, RSS2, NLP7 and NLP9 growth assumptions.

6.5 In addition, there is only a modest difference in terms of traffic volumes between Do Minimum and the three Do Something transport intervention options. The key messages are as follows:

- Traffic flows on the strategic network are already high, both in the AM and PM peaks.
- Volumes are expected to increase by 2016, and further still by 2026.
- There is little divergence in predicted traffic volumes across the different growth assumptions or the various levels of transport interventions. Traffic volumes rise across all scenarios.

PRISM Findings

Implications of TEMPRO forecasts

Where are the pressure points?

6.6 TEMPRO levels of growth, even with Do Minimum intervention, are unlikely to have a large impact in terms of delays on the strategic network. Isolated links on the M5, M42 and the A46 just north of the A4177 are likely to be the places that experience most delays. In addition, junction 6 of the M42, leading to Birmingham Airport and the National Exhibition Centre, and sections of the M6 southbound between junctions 8 and 9 and around junction 10a are likely to cause over 120 second delays, but this is largely the same as the 2001 baseline position.

6.7 It is also worth noting that, in terms of the more local effects, there is likely to be an increase in node delays in city centres, particularly in Birmingham, Wolverhampton and Coventry. These will be more severe in the morning peak than the evening.

Could capacity of the network be exceeded?

6.8 The light scattering of delay periods across the network suggests that accommodating the levels of growth forecast by TEMPRO data will not pose the SRN any fundamental strategic problems. However, saturation data for the M5, M6, M40 and shows that several stretches of the motorway will be running at over capacity by 2026; some of these motorway sections are already congested according to the base position but there will be marked increases to congestion, particularly on the M5 north of junction 5.

Key messages on TEMPRO forecasts

- Minimal marginal impact on strategic link delays
- Growth in AM node delays expected on the local network
- Vast majority of M5, M6 and M42 in the West Midlands SRN will be operating at over 80% capacity.

Implications of RSS2 growth targets

Where are the pressure points?

6.9 Assuming realisation of the growth that is forecast by the RSS2 Preferred Option, the situation is similar to that of TEMPRO findings; it is unlikely that the regional road network will see significant sections of journey delays. Even with the minimum level of investment, the delay locations differ very little from those in 2001, or those with TEMPRO levels of growth. Under all levels or transport intervention, the same isolated sections of over 60 second delays will be experienced on the M5 (junctions 4a-5 northbound); M6 (eastbound junctions 2 to 3) and northbound on the A46 just north of the A4177.

6.10 It is also worth noting the persistent delays between junctions 8 and 10a on the M6, with Do Minimum and Do Something 2 investment packages. As such, in the case of RSS2 forecasts, progressive levels of investment will not necessarily lead to progressive reductions in delays. With Do Minimum and Do Something 2 transport investment, it is likely that a few more serious delays will be a feature of the network (on the M6 and the M42). Options Do Something 1 and 3 however, are likely to lead to reductions in delays on the M6. Therefore, overall the pattern is slightly mixed.

6.11 Again, localised node delays are expected to occur in and around Birmingham, Wolverhampton and Coventry in the AM peak, with RSS2 growth forecasts. This is far less the case in the PM peak.

Could capacity of the network be exceeded?

6.12 It is unlikely that the levels of growth forecast in the RSS2 will pose significant strategic problems to the regional network; particularly should investment above the 'Do Minimum' level be implemented.

6.13 Using RSS2 data and assuming Do Minimum transport intervention, saturation levels on the strategic network are likely to bear a resemblance to those under TEMPRO. With RSS2 data, therefore, large sections of the M5, M6, M40, M54 and the southern part of the M42 will be operating in excess of 80% capacity.

6.14 When testing RSS2 data against the four modelled transport intervention scenarios, what became evident was that saturation on the M5 is expected to show incremental improvements as steadily more investment is made. However, in the same way as the data for delays, it is not universally the case that progressive levels of transport interventions lead to a positive impact on saturation levels across the network. In fact, withstanding the M5, the differences between the four levels of intervention are very slim; the only notable divergence between them is some improvements when Do Something 3 is implemented. Under this scenario, for example, saturation reductions are likely on the M6 (junctions 6 to 10a) and on the M42 (junctions 8 to 10).

Key messages on RSS2 forecasts

- Minimal marginal impact on strategic link delays
- Distribution of delays very similar to that for the TEMPRO forecasts
- Local node delays, as with the TEMPRO predictions, are expected to grow substantially in the AM peak
- Do Something 3 emerges as the most effective transport package at accommodating RSS2 growth levels. However, progressive levels of intervention will not necessarily lead to progressive improvements, either for delays or saturation. In the case of delays, for example, Do Something 1 seems to 'perform' better than 'Do Something 2'.
- Overall, however, the impacts of the different the levels of investment are marginal.

Implications of NLP7 findings

Where are the pressure points?

6.15 It is not expected that the impact on delays from NLP7 levels of growth will represent a significant departure from those for TEMPRO or RSS2. As such, there is unlikely to be a significant increase in delays on the strategic network compared to the 2001 position, even with the minimum level of investment. Only the small sections of the M5, M6, M42 and A46 that are consistently mentioned would witness any significant delays (over 60 seconds) in the event of NLP7 growth.

6.16 Interesting to note is that, in the same way as the results for RSS2, Do Something 1 and 3 are likely to result in fewer delays on the M6 than the Do Minimum and Do Something 2 options. With Do Something 3 in particular, delays across the strategic network, in both the AM and PM peaks are likely to be negligible.

6.17 The same story as that for TEMPRO and RSS2 growth assumptions can be told about node delays. It is likely that there will be more of an impact on localised roads, in and around the city centres, than there will be on the strategic network. PM delays will be far fewer than the AM peak, although still higher than the 2001 base position.

Could capacity of the network be exceeded?

6.18 Assuming NLP7 levels of growth, the network is likely to be experiencing high levels of saturation across the strategic network by 2026; this differs little from the situation expected for TEMPRO and RSS2 levels of growth.

6.19 In exactly the same way as the forecast scenario for RSS2, as increased levels of transport intervention are made, the M5 is likely to benefit in terms of reduced saturation levels. Junctions 8 to 10a on the M6 will also see improvements under Do Something 3. However, elsewhere on the strategic network, the levels of intervention have little differential effects on saturation for NLP7.

Key messages on NLP7 forecasts

- Minimal impact on strategic link delays
- Distribution of delays very similar to that for the TEMPRO and RSS2 forecasts
- Local node delays, as with the TEMPRO and RSS2 predictions, are expected to grow substantially in the AM peak
- Successive levels of transport intervention will have minimal incremental impacts, but the picture largely remains consistent
- NLP7 levels of growth are unlikely to pose more capacity concerns for the strategic network than RSS2 forecasts

Implications of NLP9 findings

Where are the pressure points?

6.20 NLP9 is the highest growth scenario tested for this study. There are still likely to be very few additional delays on the strategic network compared to 2001. The picture is much the same as that for all of the other regional growth forecast options (TEMPRO, RSS2 and NLP7), with isolated delays forecast on the M5, M6, M42 and the A46 by 2026, for both the AM and PM peak periods.

6.21 One divergence that is worth noting, however, are the different AM conditions under Do Something 3. Whereas for RSS2 and NLP7, AM delays are likely to see reductions on the M6 between junctions 8 and 10a, NLP9 is expected to prevent the release of these benefits. NLP9 growth is also predicted to give rise to delays, westbound on the M42 between junctions 8 to 9. This would not be the case for either the RRS2 or NLP7 scenarios.

6.22 It is worth noting that PM delay pictures are more consistent with the RSS2 and NLP7. Node delay patterns also replicate the findings for the other growth scenarios, with an intensification of localised delays surrounding the city centres in the AM peak.

Could capacity of the network be exceeded?

6.23 The delay forecasts show that the capacity of the strategic network is unlikely to face significant challenges even assuming the realisation of NLP9 target growth in the region. In the same way as the other forecasts, saturation levels are expected to be high by 2026. Progressive transport interventions will reduce congestion on the M5, with some Do Something 3 improvements on the M6 and M42; there are very few differences between the four sets of regional growth data.

Key messages on NLP9 forecasts

- Minimal marginal impact on strategic link delays
- Distribution of delays very similar to that for the TEMPRO, RSS2 and NLP7 forecasts
- If NLP9 growth is realised, the Do Something 3 transport intervention is unlikely to be able to release as many delay reductions as would be witnessed with RSS2 and NLP7 growth.
- Local node delays, as with the TEMPRO, RSS2 and NLP7 predictions, are expected to grow substantially in the AM peak
- Successive levels of transport intervention will have only minimal impacts on network capacity; saturation levels remain broadly consistent across all four options
- NLP9 levels of growth are likely to pose a few more capacity concerns for the strategic network than RSS2 and NLP7, but the difference is marginal

Effectiveness of mitigation measures

Delays

6.24 As has been implied in discussions above, there is not a particularly marked difference in the effectiveness of the four levels of possible transport investment. There are very few areas of the network that exhibit delays of over 30 seconds per kilometre, however there are isolated areas of concern on the network where, under virtually all of the scenarios, significant strategic delays are likely: These are:

- M5 – northbound between junctions 4a and 5 (AM peak)
- M6 – between junctions 2 and 3, eastbound (AM peak); junctions 3 to 4, eastbound (PM); junctions 8 to 10a (AM and PM)
- M42 – westbound junctions 8 to 9 (AM); at junctions 6 and 9 (AM and PM) and junction 9 (PM)

6.25 Under the Do Minimum scenario there are not expected to be any improvements on the base position by 2026. Across each of the growth forecasts that were tested, delays between junctions 8 to 10a on the M6 will continue to be a problem in both the AM and PM peaks. In addition, there will be new delay periods of over 60 seconds on the M6, junctions 4a to 5 (PM) and on the M42, eastbound between junctions 4 and 5 and westbound between junctions 8 and 9 (AM).

6.26 In contrast with this, Do Something 1 interventions would yield some delay reductions on the M6 – particularly between junctions 8 and 10a in the morning peak and between junctions 8 and 9 in the evening. These M6 improvements would be witnessed under any level of growth, from TEMPRO through to NLP9 targets. A few additional delays are likely to emerge on the strategic network, should this level of investment be employed; these would be between junctions 2 and 3 on the M6 (PM) and junctions 8 and 9 on the M42 (AM and PM).

6.27 Do Something 2, interestingly, is not likely to release the same benefits on the M6 in terms of reducing the delay periods between junctions 8 and 10a. These are likely to persist under all four growth scenarios, both AM and PM. However, elsewhere on the network, no further delays are predicted to emerge.

6.28 Do Something 3 emerges fairly clearly as the most effective mitigation package in terms of reducing the delays on the strategic network under all growth options. Only with NLP9 growth targets are delays predicted to be felt between junctions 8 and 10a on the M6, and this is just for the morning peak. There are no other forecast delays to note apart from the emergence of some isolated hold ups on the M42. However, this is only for RSS2 and NLP9 growth scenarios.

6.29 Noticeable for all of the scenarios modelled was the proliferation of local node delays in and around the City Centres in the AM. None of the interventions packages seem likely to be able to mitigate their emergence; the picture was consistent across the board,

Saturation

6.30 In terms of saturation, there are a large number of links that are expected to be operating at well over 80% capacity by 2026, under every growth scenario, regardless of the level of transport intervention. These are summarised below

- M5 – junctions 3 to 4 (AM) and 4a to 5 (AM and PM)
- M6 – junctions 2 to 10a and 11 to 14 (AM and PM)
- M40 – junctions 13 to the intersection with the M42 (AM an PM)
- M42 – junctions 1 to 8 (AM and PM)
- M54 – junctions 2 to 4 (AM and PM)

6.31 Given the degree to which the network will be saturated by 2026, the mitigation packages do not seem wholly effective in curbing congestion on the strategic network. However, there are some points that are worth making when the levels of intervention are compared against each other.

6.32 If the Do Minimum level of investment is made on the strategic network there are several areas, other than those mentioned in the list above, in which, congestion is likely to be felt. This includes the M5, from its intersection with the M6 down to junction 4, the M6 between junctions 5 and 6 and the M42, junctions 8 to 9 (AM and PM) and 9 to 10 (PM).

6.33 The overall picture for Do Something 1 represents a slight improvement on that for Do Minimum, with less congestion predicted on the M5 in the PM peak between junctions 2 and 4. In addition, the link between junction 5 and 6 of the M42 is not expected to witness high congestion levels if Do Something 1 intervention was implemented.

6.34 With Do Something 2, the picture is mixed. Further improvements could be expected on the M5 in the AM peak (but not in the PM peak, where some saturation increases could be experienced). Do Something 2 could also be expected to minimise congestion on the M42 between junctions 8 and 9. However, elsewhere on the network (M6, junctions 5 to 6 (PM) and M42, junctions 9 to 10 (AM)) could have higher congestion rates than those experienced under Do Something 1.

6.35 Generally speaking, as might be expected, Do Something 3 is likely to see less saturation than that predicted for the other levels of intervention. The M5 will see further reductions in congestion between junctions 4 and the intersection with M6; by 2026 levels are expected to be below those of 2001. Benefits are also likely for the M42 between junctions 8 and 10, for which saturation is expected to fall below 80%.

Key findings

- As successive levels of transport intervention were tested, there was not a marked difference in their effectiveness at tackling delays and saturation of the SRN
- Under all levels of intervention the impact on delays, compared to the 2001 position, is minimal; there will not be many link delays on the SRN regardless of the level of transport investment
- In terms of saturation, despite the level of transport intervention implemented, a large number of links across the SRN will be operating at over 80% capacity by 2026.

Delays:

- Do Minimum: will result in no reduction in delays compared to 2001. New link delays will emerge on the M6 and M42.
- Do Something 1: improvement on Do Minimum investment; reduced delays on the M6 under all growth scenarios plus only a couple of new link delays.
- Do Something 2: no expected improvements on the M6, but no new link delays elsewhere on the network.
- Do Something 3: most effective at minimising link delays.

Saturation:

- Do Minimum: will result in congestion on stretches of M5, M6 and M42 that will not be experienced under other intervention options.
- Do Something 1: represents a slight improvements on Do Minimum, with less congestion on the certain links on the M5 and M42.
- Do Something 2: some further M5 saturation improvements in the morning peak only; elsewhere on the network the impact is minimal, including some slight upward, as well as downward, fluctuations.
- Do Something 3: most effective package of measures, leading to further M5 reductions and fewer congested links on the M42.

Local Model Findings

Implication of RSS2 Forecasts

6.36 The modelling results can be categorised into three headings based on the scale of the impact between the three scenarios. These are as follows, 1) both the Do Minimum (TEMPRO) and Do Minimum RSS2 having an insignificant impact on the SRN, 2) Do Minimum (TEMPRO) showing capacity concerns and the Do Minimum RSS2 showing a marginal deterioration, and 3) Do Minimum RSS2 showing a significant deterioration when compared to Do Minimum (TEMPRO). The results are provided below:

6.37 The impact of RSS2 on the SRN is marginal in the following areas:

- A46 Evesham
- M6 Junction 1
- M5 Junction 7

6.38 In the Do Minimum (TEMPRO) scenario, some sections of the SRN are operating at capacity and delays are significant. The locations that are marginally worse on the SRN in the Do Minimum RSS2 scenario are as follows:

- M5 Junctions 5 and 6
- A49 Hereford
- A46 Warwickshire
- A5 Shrewsbury

6.39 The A38 is the only location that shows a significant deterioration as a result of RSS2.

Implications of NLP Forecasts

6.40 Using a similar basis as the previous section, the results have been summarised into 3 headings. These are as follows, 1) both the Do Minimum RSS2 and Do Minimum NLPs having an insignificant impact on the SRN, 2) Do Minimum RSS2 showing capacity concerns and Do Minimum NLPs showing a marginal deterioration, and 3) Do Minimum NLPs showing a significant deterioration when compared to Do Minimum RSS2. The results are provided below:

6.41 The impact of NLP on the SRN is marginal on the following:

- M6 Junction 1

6.42 In the Do Minimum RSS2 scenario, some sections of the SRN are operating at capacity and delays are significant. The locations that are marginally worse in the NLP scenario are as follows:

- M5 Junctions 5, 6 and 7
- A49 Hereford

6.43 The locations where NLP results in a significant deterioration are as follows:

- A5 Shrewsbury
- A38 Staffordshire
- A46 Warwickshire
- A46 Evesham

Effectiveness of Mitigation Measures

6.44 This section of the conclusion compares the Do Something RSS2 scenarios to the Do Minimum RSS2 scenario, and highlights the most effective scenario that improves the RSS2 conditions. Details of the transport interventions are provided in Appendix G.

6.45 Some locations, such as the around A5 Shrewsbury and the A46 around Evesham, do not have any transport interventions planned in the Do Something scenarios. Therefore, these locations are not discussed in this section. The results are provided below:

6.46 The positive impact of Do Something 1 RSS2 (Productivity TiF) is shown in the following area:

- M5 Junction 6 and 7

6.47 Do Something 2 RSS2 provides betterment over Do Something 1 RSS2/Do Minimum RSS2 in the following areas:

- A38 Staffordshire
- A46 Warwickshire
- A49 Hereford
- M5 Junction 6 and 7

6.48 Do Something 3 RSS2 provides betterment over Do Something 2 RSS2/ Do Something 1 RSS2/Do Minimum RSS2 in the following locations:

- M5 Junction 6 and 7

6.49 None of the Do Something scenarios provides betterment on the Do Minimum RSS2 for the following locations:

- M5 Junction 5
- M6 Junction 1

6.50 To summarise the effectiveness of mitigation measures, it is apparent that the transport interventions on the A38 in Staffordshire improve the capacity in Do Something 2 RSS2.

6.51 The A46 in Warwickshire does show an improvement in delay following the Do Something 2 interventions described in Appendix G, although there is still some stress on the network around Coventry in 2026.

6.52 The implementation of additional signalisation and improved merge/diverge on the M5 at Junction 6 and 7 leads to a considerable improvement in capacity and operation.

What are the implications for the sub regions?

Birmingham, Coventry and the Black Country

M5

6.53 The M5, junctions 1 to 3, passes through the south west of the Birmingham and Black Country sub-region. In terms of delays, there are unlikely to be any significant negative impacts on this stretch of the motorway, even with the Do Minimum package of transport investment.

6.54 All growth options, however, will lead to increases in M5 saturation. These will be particularly noticeable northbound in the AM peak between junctions 2 and 3 and southbound on the PM peak between junctions 1 and 2. However, in both of these cases the severity of saturation levels will decrease as more transport interventions are implemented. As such, with 'Do Something 3' investment, across all links saturation levels in both directions, AM and PM, and for all growth scenarios will be below 80%. In the AM peak, Do Something 2 will be effective at limiting congestion between the M6 and junction 2, whilst Do Something will offer a reduction of delay only between junction 1 and the intersection with the M6. Do Minimum investment alone will have no discernible beneficial impacts on limiting saturation.

M6

6.55 A large part of the M6 runs through the north of this sub-region – from junctions 4 to 10a. There are already patches of delays between junctions 8 and 10a in both the morning and evening peaks. In the AM, investment options Do Something 1 and Do Something 3 could have a beneficial impact, reducing the length of these delays considerably. This will be the case for all of the growth options with the exception of NLP Option 9. If this level of regional growth is realised, delays between junctions 8 and 10a will persist.

6.56 In the PM peak, Do Something 3 will again reduce delay periods between junctions 8 and 10a. However, the other transport mitigation measures look likely to be less effective and are not expected to have any impact on delays experienced. The picture is consistent under all of the growth options.

6.57 Another stretch of the M6 which is likely to see the emergence of delays in the PM peak, if only the Do Minimum level of transport investment is made, is between junctions 4a and 5. However, all of the Do Something intervention packages should prevent these delays occurring.

6.58 In terms of saturation of the M6, particularly congested areas are expected along several links. Junctions 4a to 5; 6 to 7; and 8 to 10a are already experiencing significant congestion which looks likely to be sustained under all growth scenarios, regardless of the level of transport investment. Saturation may also reach over 80% between junctions 4 and 4a under some growth/intervention combinations. This could also be the case between junctions 5 and 6 with all growth predictions, particularly in the PM peak. On this link of the motorway it would appear that Do Something 1 would be the most effective mitigation measure in stifling saturation growth.

M42

6.59 The M42, between junctions 3a and 7, curves through the south west of the Birmingham and Black Country sub-region and lies to the west of Coventry; 2001 base results show no serious link delays. In terms of future forecasts, significant link delays are only predicted to emerge between junctions 4 and 5 in the morning peak. The picture is broadly consistent for all of the different growth options. Do Something 1 would appear to make some impact on reducing delays, although its impact with NLP9 growth would be less effective. It is worth noting, however, that delays at certain junctions are likely to require future attention; this is particularly the case at junction 6.

6.60 Saturation levels are already high between junctions 3a and 3 and 4 and 6 and they will remain so regardless of growth or the mitigation measures implemented. Under all growth scenarios congestion is also expected to creep up in the morning peak, westbound between junctions 6 and 7. In the evening neither TEMPRO nor RSS2 growth assumptions will pose particular saturation problems for the network. When NLP7 and NLP9 growth assumptions are applied, however, delays between 6 and 7 can be expected.

Telford

M54

6.61 The south of Telford is dissected by a stretch of the M54. Strategic level forecasting does not report any significant impacts of regional growth on base level delays. However, congestion is expected to rise between junctions 2 and 4.

Coventry and Warwickshire

M6

6.62 The north of the Coventry and Warwickshire sub-region is dissected by the M6, junctions 1 to 4. 2001 base delays on this motorway are minimal. In the morning peak junctions 2 to 3 are forecast to see saturation increases on the eastbound carriageway. Only with TEMPRO growth assumptions will these not materialise; otherwise, delays are likely regardless of the transport package employed. In the evening, there are some delays between these junctions, but these will be far less severe than in the morning. It will be the eastbound carriageway, between junctions 3 and 4, which is likely to experience significant delay periods in the PM peak. Again, this is case for all growth/transport combinations.

6.63 The picture is virtually identical under all of the different scenarios in terms of M6 saturation. It will be at levels of over 100% between junctions 2 and 4, both directions for both the AM and PM peaks. This represents a considerable increase from the base position.

6.64 The local analysis shows that there is little or no existing queuing and delay on M6 Junction 1 and the mainline operates well within capacity at this location. The effects of the TEMPRO and RSS2 growth scenarios are similar with little effect on queuing and delay at the junction but some indication of increasing stress on the mainline carriageway southbound although this only appears by 2026 rather than 2016. The effects of NLP7 and NLP9 are minimal.

M40

6.65 The M40 enters the south east of Coventry and Warwickshire, cutting across the sub-region until it meets the M42. Significant delays are not presently experienced along this stretch and are unlikely to emerge under any of the scenarios, with the exception of instances of northbound delays between junction 16 and the intersection with the M42. However, these are only likely to occur in the PM peak with Do Minimum investment and only for NLP7 and NLP9 growth targets.

6.66 M40 saturation, on the other hand, is likely to be at over 80% northbound from junction 13 to the M42 intersection under all growth options. The level of transport intervention is not expected to have any differential reduction effects.

M42

6.67 A significant section of the M42 (junctions 7 to 11) cuts through the north of the Coventry and Warwickshire sub-region. The base position does not record any significant delays anywhere on this stretch. Future forecasts show that only the link between 8 and 9 on the westbound carriageway is likely to experience problems, primarily in the morning peak. The case is consistent across all growth options. However, Do Something 2 and 3 would appear to be effective in mitigating these delays. It is worth noting, however, that delays at certain junctions are likely to require future attention; this is particularly the case at junction 9.

6.68 Saturation levels on the Coventry and Warwickshire section of the M42 are not highlighted as particularly high in the 2001 base position. However, this is not predicted to remain the case. Under all growth/intervention combinations saturation will be over 100% in the morning peak between junctions 7 and 8 westbound. Between junctions 8 and 9 saturation will also be over 100% if only Do Minimum or Do Something 1 investment is made; the larger intervention packages (Do Something 2 and 3), on the other hand, could mitigate these steep saturation increases. Finally westbound between junctions 9 and 10, saturation levels can be expected to reach 100% in most scenarios in the morning peak. For this link, however, Do Something 3 would be effective in limiting this rise.

A46

6.69 The existing situation on the A46 corridor between the M6 and M40 indicates several areas of link stress but not as significant junction delay. By 2016 and continuing to 2026, delays at major junctions increase significantly under all growth scenarios with many links at or over capacity also. The effects of junction improvements on the corridor by 2026 are generally positive with some significant improvements in delays at junctions but link capacities continue to be exceeded along the corridor, especially north of the A4177 and between the junctions with the A452 and the A45. The differences between RSS2 and TEMPRO growth forecasts are marginal but there are some significant local effects of NLP7 and NLP9 in terms of junction delays along the corridor.

6.70 The A46 to the south and west of the M40 does not have any significant delay or link capacity problems. By 2016 and increasingly by 2026 a number of links show signs of stress although there is no indication that any of the links are over capacity. The effects of RSS2 growth forecast also indicate some localised junction delay to the north of Stratford upon Avon. The impacts of NLP7 and NLP9 are not significant but the results do indicate some localised junction delays to the north of Stratford upon Avon.

Staffordshire and North Staffordshire Conurbation

6.71 The A38 experiences link stress on a number of sections between Swinfen and Claymills as well as junction delay. The link and junction capacity issues will deteriorate further under the growth scenarios with sections immediately south of Burton and around Lichfield the worst. Even assuming the RFA scheme, there remain stress and capacity issues.

6.72 In the base year there are a number of sections and junctions on the A500 and A50 that are experiencing significant capacity issues and delays in both peak periods. Under the various growth options the extent of the delays and over-capacity spreads to most parts of the A500 and A50 in Stoke. The transport investments have, at best, a very marginal impact on the delays.

6.73 Local capacity issues currently also occur at A50 Uttoxeter and A449. There are currently only limited delays on the remaining SRN in Staffordshire, with the exception of the urban A5 through Cannock. Under the various growth options the existing problems on the A50 and A449 will be exacerbated. In addition more localised problems are likely to arise on links and junctions on M6 Toll/A5 at Cannock and A5 at Tamworth.

Worcestershire

M5

6.74 The M5, between junctions 3 and 8 cuts through the centre of the Worcestershire sub-region. According to the 2001 base position, link delays of between one and two minutes per kilometre are already felt between junctions 4a and 5 on the northbound carriageway in the morning peak. These are likely to intensify as the region grows over the next two decades, with delays of over two minutes expected under all growth/transport intervention scenarios.

6.75 Saturation levels between junction 4a and 5 are already high. Strategic forecasts show that this will continue under all of the tested scenarios.

6.76 M5 Junctions 5 and 6 have existing congestion problems with excessive queuing on the slip roads. M5 Junction 7 does not have any significant existing congestion problems. There are no existing saturation problems on the mainline carriageway between Junctions 5 and 7. The most conservative estimate of growth (TEMPRO) indicates that queuing will worsen at M5 Junctions 5 and 6 by 2016 although the worst of the queuing at Junction 5 is mitigated to a certain extent by a committed signalised improvement scheme. The queuing at Junction 6 becomes progressively worse up to 2026 as does the level of saturation on the mainline M5 between Junctions 5 and 7 with some sections exceeding capacity. The delays at M5 Junction 6 are mitigated by a proposed signalisation and merge and diverge improvements by 2026. M5 Junction 7 does not experience any significant delay up to 2026. The effect of RSS2 when compared to TEMPRO though is not significant with some incremental increases in queuing at the junctions and saturation on the mainline.

6.77 It can be concluded, therefore, that the mainline section of the M5 between Junctions 5 and 7 will start to experience flow breakdown on certain sections but that this is the result of general traffic growth as opposed to RSS2 related growth. There will also be some local junction delays by 2026, although these are partly mitigated at Junctions 5 and 6 by a combination of traffic signals and proposed improvements to merges and diverges.

A46

6.78 There are no significant existing delay or congestion issues on the A46 around Evesham. The TEMPRO growth forecasts indicate increasing levels of stress in terms of link saturation by 2026 but at no point is the road capacity exceeded. The effects of RSS2 when compared to TEMPRO are marginal with no material difference in terms of link saturation. A similar conclusion can be made for NLP7 and NLP9.

Herefordshire and Shropshire – the rural west

M54

6.79 A very small part of the M54, between junctions 3 and 4 runs through the east of Shropshire. In terms of delays no significant problems (delays of over one minute per kilometre) are likely to result with regional growth over the next two decades. Saturation levels, however, are expected to exceed 90% along the entire link by 2026 – under all growth and transport investment options. This represents a considerable increase from the 2001 base position.

A5

6.80 The A5 to the south of Shrewsbury does not currently suffer from significant delay at junctions or over-capacity on links although there is some AM peak stress on links to the east of Shrewsbury. By 2016 the major junctions on the A5 all show signs of increased queues and delays with significant queues and delays by 2026. This is the case for all growth scenarios. Link saturation does not increase as significantly indicating that the primary constraints in the corridor are junction based. The effects of RSS2 and also NLP7 and NLP9 are marginal when compared to TEMPRO although results from the NLP9 analysis indicate a more significant effect on link saturation to the southwest of Shrewsbury.

A49

6.81 The A49 through Hereford is already suffering from significant delay in terms of queues and over capacity links. By 2016 under all growth scenarios levels of delay and link saturation are predicted to increase significantly both north and south of the City Centre. The inclusion of an Outer Distributor Road by 2026 provides some relief but there are still significant delays on tidal flows to and from the City Centre in peak periods. The effects of NLP7 and NLP9 are marginal.

Concluding observations

6.82 The preceding sections within this chapter discuss the future scale and nature of the pressures on the region's strategic network for the different levels of intervention and spatial distribution. The following overall observations can be made in relation to the remaining three study objectives.

Assessment of the capacity of the SRN to support the future development of the region as proposed by the RSS2 Revision

6.83 The level of anticipated development does not make a fundamental difference to congestion levels across the network. Demand on the SRN is expected to increase over the next two decades. However, this will not be a direct result of the growth planned in RSS2. Traffic volumes and saturation are anticipated to rise irrespective of the revised strategy; many of these trends have already been identified in multi-modal studies that pre-date this report. The RSS2 options primarily reflect different spatial distribution of new housing stock as distinct from an increase in population or employment. The levels of change are also comparatively small when considered against existing population and through traffic levels.

6.84 In terms of significant link delays, RSS2 growth will tend not to give rise to many new problems on the network. There are recurrent patches of the network where delays are predicted (on the M5, M6 and M42) but these tend to be isolated areas rather than substantially affecting entire corridors. Elsewhere on the strategic network, delays of up to 30 seconds per kilometre may be encountered but they are not nearly as severe as the pinch points on the M5, M6 and M42 that have been outlined above. Furthermore, this conclusion can be drawn about each set of growth assumptions, from TEMPRO through to NLP9 – there is not a discernible difference between their effects.

6.85 Requiring more detailed consideration will be node delays. Several junctions across the SRN may suffer as a result of increased demand and, in addition, there are likely to be resulting impacts on local roads, particularly in and around city centres. These issues will certainly need closer consideration at a local level during the preparation of Core Strategies and Local Development Frameworks (LDFs).

6.86 It should be noted that the locations for development under the NLP options in particular, are yet to be clarified at a level of detail which would enable local impacts to be considered. The options tested in this report are similar in scale to the eventual NLP options but are not exactly the same as the options in the final NLP report.

Advice on the nature of any future policy or infrastructure necessary to support levels of growth being proposed

6.87 In terms of the transport intervention packages, there is not a large difference between the effectiveness of their mitigation measures. Do Something 3, which includes some road user charging, does emerge as most likely to contain or reduce negative impacts on the network, although its effectiveness is more limited with NLP 9 levels of growth. Do Something 1, which is the HA's ATM programme, and Do Something 2, which would see the addition of some C-TIF schemes, are also expected to yield successes on some places across the network; their effectiveness tends to vary depending on the corridor in question and the time of day.

6.88 It is important that it is understood that RSS2 cannot be considered to be solely responsible for causing volume, congestion and some delay increases and, therefore, the HA would remain aligned with Circular 02/07 by supporting the RSS2 Preferred Option. However, there must be a recognition that there is a residual need for regional investment to address existing demand and also that envisaged to occur under any of the regional development forecasts (from TEMPRO through to NLP9). Solutions are likely to require both public and developer funding.

6.89 In addition, this investment is not likely to be only required on the highway network, but also in other modes of transport, suggesting the need for a multi-agency, corridor management type approach to meet the region's future transport requirements.

6.90 It is likely that an appropriate strategy to respond to forecast regional growth should not only be multi-modal in nature but should involve a blend of demand-side and supply-side and soft and hard mitigation measures. Supply-side mechanisms tend, by their nature, to offer only long-term solutions. A significant highway extension project, for example, could require a construction timescale of 10-15 years. As such, it seems that the majority of the RSS will have to be delivered without such a development. Public transport does offer another supply-side solution; however, again, enhancements to the West Midlands' rail and Metro network are unlikely to reach completion early in the RSS2's lifetime.

6.91 On the demand side planning solutions could help in the medium term. Careful sustainable and accessibility planning could help to identify locations for development which will not result in a concomitant surge in travel demand; this could help to alleviate future pressure on the network. It is also worth highlighting 'soft' demand-side measures, which include solutions such as introducing flexible work patterns, sustainable travel plans and the increased use of ICT to reduce the need to travel. Such mechanisms are typically smaller, lower in cost, less controversial and have shorter lead-in times. They can comprise a short-term strategy, which could run alongside, for example, Do Something 1 investment. It is not easy to model the impacts of these soft measures, but qualitative research suggests that they yield considerable success in reducing motorway demand. A study for the DfT in 2004*21*, predicted that an intensive ten-year smarter choices programme could cut urban peak-hour traffic by as much as 21%, with the potential for non-peak traffic levels to fall by 13%. The DfT estimates that for each £1 spent on these measures, there is £10 benefit from reduced congestion.*22*

6.92 Necessary for the Highways Agency to consider going forward is the fact that a 'one size fits all' approach is unlikely to realise most network benefits. This study has highlighted the vagaries across the SRN in terms of how different corridors 'react' to different levels of investment. Whilst Do Something 3 appears to be most effective mitigation package overall, Do Something 1 and Do Something 2 result in uneven success. As such, an approach which works in one sub-region will not necessarily work in them all. Coupled with this issue is the expected rise in morning node delays scattered in and around some of the city centres.

6.93 The evidence described above, means that there may well be a need for further assessment at a sub-regional level in order to enhance understanding of local consequences and consider a more tailored implementation strategy to mitigate the impact of background traffic growth. It is also worth noting that this study has given no consideration to phasing of development over the next two decades as the local information did not exist with which to do so. As this information becomes locally available, it will be necessary to integrate this with more detailed analysis at a sub-regional level.

[21] DfT written by Cairns et. al. '*Smarter Choices: Changing the way we* travel' (2004). This report was later used in the DfT's publications '*Making Smarter Choices'* (2005)
[22] Highways Agency News Release (659/SW/07) (November 2007)

Guidance on the prioritisation of investment required to meet the region's future transport needs

6.94 Prioritisation of investment could look to this report, in which the forecast pressure and capacity pinch points across the network are flagged up, to identify the places on the regional network where attention needs to be focused. There are recurrent pressure points on the SRN, under all growth scenarios, which provides a good starting point for investment.

6.95 However, the strategy will need also to be guided by the forthcoming refresh of the New Approach to Appraisal (NATA), which is likely to influence spending decisions, and, particularly, the TaSTS assessment process introduced by the DfT. This requires the following objectives to be taken into account when planning transport investment:

- Maximising the overall competitiveness and productivity of the national economy
- Reducing transport emissions of CO2 and other greenhouse gases
- Contributing to better health and life-expectancy through reducing risk of death, injury or illness and promoting travel modes that are beneficial to health
- Improving quality life for transport users and non-transport users
- Promoting greater equality of transport opportunity for all citizens

6.96 Within the context of this latest government guidance, the consultants involved in preparing this report (GVA, JMP and MM) will work together with the Highways Agency in order to develop appropriate solutions, both regional and sub-regional, to the challenges presented in this report.

Glossary

AM Peak - The AM peak falls between 08:00 and 09:00 hours

PM Peak - The PM peak falls between 17:00 and 18:00 hours

AMR – Annual Monitoring Reports

ATM – Active Traffic Management

AWM – Advantage West Midlands

Base – The situation on the road network when the model was built

Capacity – The maximum flow on a section of road usually expressed in vehicles per hour

CEPOG - Chief Engineers and Planning Officers Group

CENTRO - the West Midlands Passenger Transport Executive

CM - Controlled Motorway

C-TIF - Congestion Transport Innovation Fund

CUBE – Strategic transport modelling software

DCLG – Department of Communities and Local Government

DfT – Department for Transport

Forecast – Prediction of future trends by analysing existing information

GOWM – Government Office for West Midlands

Growth - The increase in the number of vehicles over a period of time.

HA – Highways Agency

LDD - Local Development Documents

Link - The section of road between two junctions

Node - Junction

Link and Node delays - Link delays indicate the extent to which vehicles are 'held up' in their passage along sections of the road being analysed. Node delays reflect delays at junctions.

Link Saturation - Saturation is the volume of traffic on a given road divided by the road's capacity

LNMS - Local Network Management Scheme

LPA – Local Planning Authorities

MM – Mott MacDonald

NHPAU - National Housing and Planning Advice Unit

NLP study – Nathaniel Lichfield and Partners study

NLP study Option 7 – Nathaniel Lichfield and Partners study 7 (45,600 additional units distributed in the urban areas)

NLP study Option 9 – Nathaniel Lichfield and Partners study 9 (80,700 additional units across both urban and rural areas).

NSTSIII - North Staffordshire Transport Study Phase III Transport Model

PARAMICS – Microsimulation modelling software

PRISM - Policy Responsive Integrated Strategy Model

PT – Public Transport

RFA - Regional Funding Allocation

RLS – Regional Logistics Sites

RSS – Regional Spatial Strategy

RSS2 - West Midlands Regional Spatial Strategy Phase Two Revision

RTS – Regional Transport Strategy

RUC – Road User Charging

SATURN – Strategic transport modelling software

SRN – Strategic Road Network. A motorway or trunk road, maintained by the Highways Agency

TaSTS – Towards a Sustainable Transport System. DfT policy document

Traffic Volumes – the number of vehicles travelling along a particular stretch of road, per hour. This indicator provides a measure of how 'busy' a road is or the extent to which it is a popular route.

TRIPS – Strategic transport modelling software

TEMPRO – Trip End Model Presentation Program

VISSIM - Microsimulation modelling software

VISUM – Strategic transport modelling software

WM – West Midlands

WMRA - West Midlands Regional Assembly