

Route strategies: Option Assessment Report

Study Name	Midlands Study Area 16
Road / Junction Name	A46 – M5 to M40
Route	South Midlands
Local Authority/ies	Warwickshire County Council, Worcestershire County Council and Gloucestershire County Council
HE Region	Midlands

Document Control

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Reviewed by regional coordinators March 2017. Please ensure that comments in Annex F are reviewed.

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Table of Contents

1. Understanding the current situation	5
2. Understanding the future situation	16
3. Justification for intervention	18
4. Identifying objectives and defining geographic scope	20
5. Generating and assessing potential options	22
6 Better performing option(s) - costing	31
Annex A – Current Year Issues from the Stakeholder Evidence Base and HE Performance Metrics	32
Annex B – AQMA, NIA, STATS19 and Flooding Data Mapping	36
Annex C – Future Year Issues from the Stakeholder Evidence Base	38
Annex D - EAST based spreadsheets	40
Annex E – Cost Estimation – Scenario Assumptions	41
Annex F – Regional Coordinator Comments, March 2017	46

Purpose of this document

The purpose of this document is to:

- (i) Provide an understanding of the need for intervention for a specified study area, by looking at the current and anticipated future situation – key issues, challenges and opportunities; and develop clear objectives for the study area.
- (ii) Create a range of possible options and undertake an initial sift to identify “better performing options” which provide early indications that they will deliver the objectives for the study area, contribute towards HE strategic outcomes, be feasible and offer appropriate benefits and value for money.

In line with WebTAG this document is designed to lead proportionate analysis, whilst ensuring the need for intervention is clearly identified, and that the feasibility of options is appropriately tested. As we are at a very early stage, there will be an opportunity to refine the design and assumptions made and improve the levels of confidence if the option is progressed further.

PLACEHOLDER: DO NOT INCLUDE IN OAR DOCUMENTS UNTIL AVAILABLE.

One pager overview: Taking information from the whole OAR, EAST and ENV EAST, also costing tool and displaying as a one pager for use within the prioritisation stage.

██████████ and ██████████ to provide table layout and specification.

1. Understanding the current situation

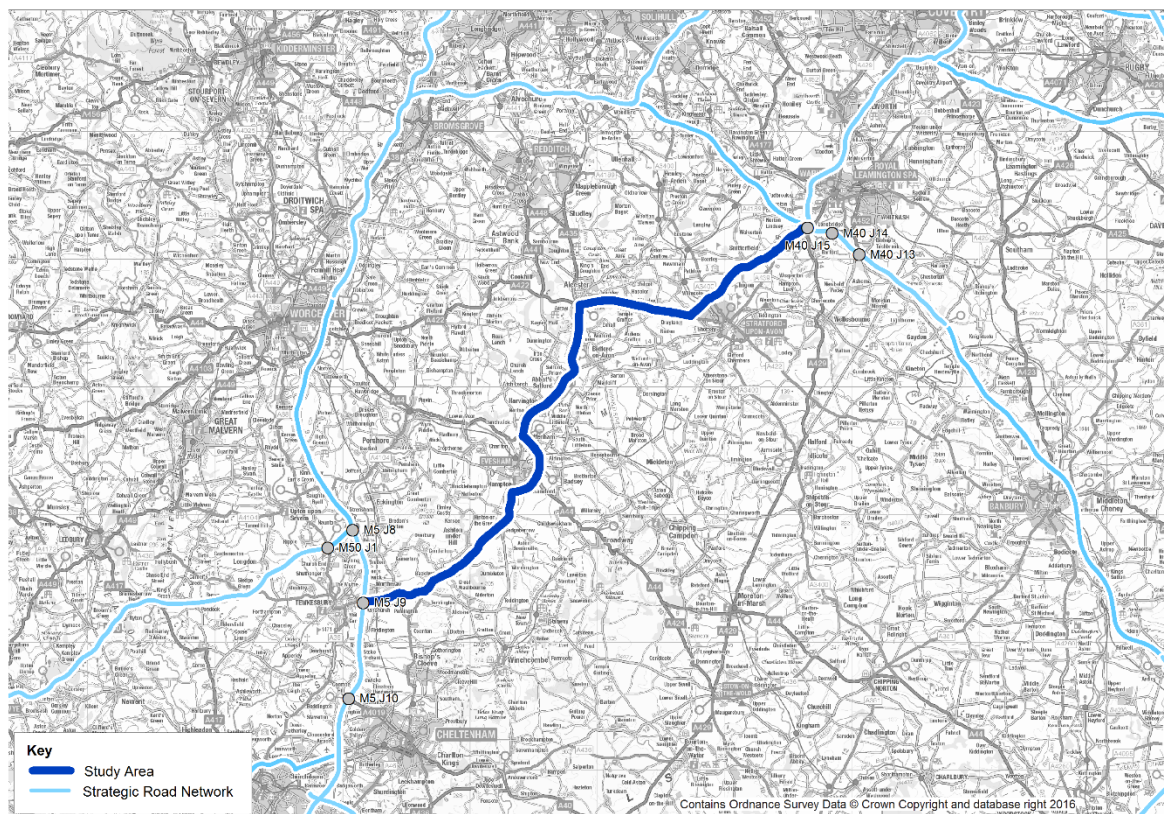
1.1 What are the current issues, challenges or opportunities?

Cross reference from the evidence provided from the Route Strategy team, and specify how the study meets the sifting criteria.

Location and Key Functions

- This study area includes the A46 from J9 of the M5 to J15 of the M40, including the junction. It is approximately 34 miles in length.
- The A46 is an important strategic link between the towns of the South Midlands Warwickshire, Worcestershire and North Gloucestershire and is an alternative to the Birmingham motorway box, especially during incidents. The route travels through the town of Ashchurch and also forms bypasses of the towns of Evesham and Stratford-upon-Avon.
- The A46 is a mix of single and dual carriageway standard sections with frequent direct accesses, un-signalised and signalised side road junctions and at-grade roundabouts providing local access to towns and villages.
- Areas of the route have large numbers of individual dwellings and small business with direct accesses off the A46, including around Ashchurch.

Figure 1.1: Study Area



Key Issues, Challenges and Opportunities

A comprehensive list of issues identified from the stakeholder evidence base is provided within Annex A, together with other supporting data. Mapping of Air Quality Management Areas (AQMAs), Noise Important Areas (NIAs) and STATS19 accident plots can be seen in Annex B. The

key issues (also considered to be challenges and opportunities), based upon a review of this information, are summarised in Table 1.1.

Based upon the issues identified, a R-A-G rating has been used which provides a high level and subjective overview of the current issues in relation to Highways England’s key themes. The theme of Safe and Serviceable Condition has been broken down into two themes to distinguish between evidence relating to safety and network conditions.

Table 1.1: Key Issue Summary

Key Issues	Economic Growth	Free flowing network (FFN)	Safe and secure network (SSN)	Serviceable condition	Improved Environment (IE)	Accessible & Integrated Network (AIN)
Significant congestion along the A46 corridor is likely to worsen with planned growth in the nearby areas.	✓	✓				
Congestion is known to occur on approaches to M5 junction 9 in peak times. Congestion at this junction and along the A46 and A483 causes queuing which backs onto the mainline.		✓			✓	
The environment for Ashchurch residents could be improved. Currently the quality of life for the residents living near the road is adversely affected by the traffic on it, this is exacerbated by a poor alignment and there numerous private accesses connecting to it.					✓	
The A46 along this corridor suffers from congestion and poor journey quality. The congestion is worse during peak hours, particularly in the southbound direction, and a key contributing factor is inconsistent carriageway standards.		✓			✓	
Congestion is created along the A46 corridor due to single carriageway and multiple at-grade junctions and points of access. This is particularly an issue in Alcester, Ashchurch, Marraway, Bishopton Roundabout, Stratford Bypass, Evesham Bypass, the A435 Teddington Hands Roundabout and Aston Cross. Delays at Aston Cross are also worsened by long inter-green lights, causing queues of up to one mile on the westbound approach to the Alexandra Way junction.		✓			✓	
Overtaking opportunities along the A46 corridor are limited, due to the single carriageway sections.		✓				
The section between Alcester and Stratford has collisions associated with congestion, with incident clusters at junctions and a high proportion of rear end shunts.		✓	✓			
Although research has shown a decrease in collisions on the A46, the majority are rear end shunts caused by congestion, at-grade junctions and local accesses. With the anticipated increase in congestion it is likely that collisions may increase. The A46 between M5 junction 9 and A44 (Twyford), A435 (Alcester) and Stratford is single carriageway which results in delay and		✓	✓			

collisions. Alleviating congestion on this stretch could alleviate queues and associated collisions on this stretch.						
An investigation was undertaken that found the following sites have collisions potentially connected to the presence of and / or layout of the lay-by. These lay-bys were located on the northbound carriageway in the following locations: <ul style="list-style-type: none"> To the south of Vale Services (north of Teddington Hands) Immediately to the south of A46 / Cheltenham Road Roundabout 			✓	✓		
Congestion leads to increased noise and air quality issues. There is an Air Quality Management Area (AQMA) within the local authority area of Stratford-upon-Avon District Council. The AQMA runs along the edge of the A46 forming a boundary to the urban area of Stratford-upon-Avon.		✓			✓	
There are existing severance issues for non-motorised users (NMUs) caused by the A46. These are between Billesley and Temple Grafton and near Snitterfield and Black Hill. Severance is caused by the A46 making it difficult/unpleasant for NMUs too. The mainline carriageway offers no facilities for cyclists and pedestrians.		✓	✓			✓
Poor resilience - limited opportunities for refuge, particularly within single carriageway sections of the corridor, and poor alternative routes.			✓			✓
Limited rail and public transport alternatives – a lack of public transport alternatives for A46 users especially to the south of Stratford-Upon-Avon. There is limited access to villages without use of car.						✓
There is current and future demand for NMU crossing points along the A46 at locations including: <ul style="list-style-type: none"> Between Billesley and Temple Grafton Between Snitterfield and Black Hill The southern end of the route in Ashchurch and Evesham, where there are accessibility and integration issues . There is a real demand for footways, cycleways and accessible bus services, towards the southern end of the route in Ashchurch and Evesham. Some bus stops along the A46 are unmarked and have no designated crossing facilities.			✓			✓
All the local authorities that this study area runs through have AQMAs within them. Although the A46 does not run through an AQMA boundary itself it runs close to a large AQMA covering Stratford-upon-Avon, a very small AQMA in Evesham and an AQMA in Tewkesbury.					✓	

1.2 Highways England Metrics.

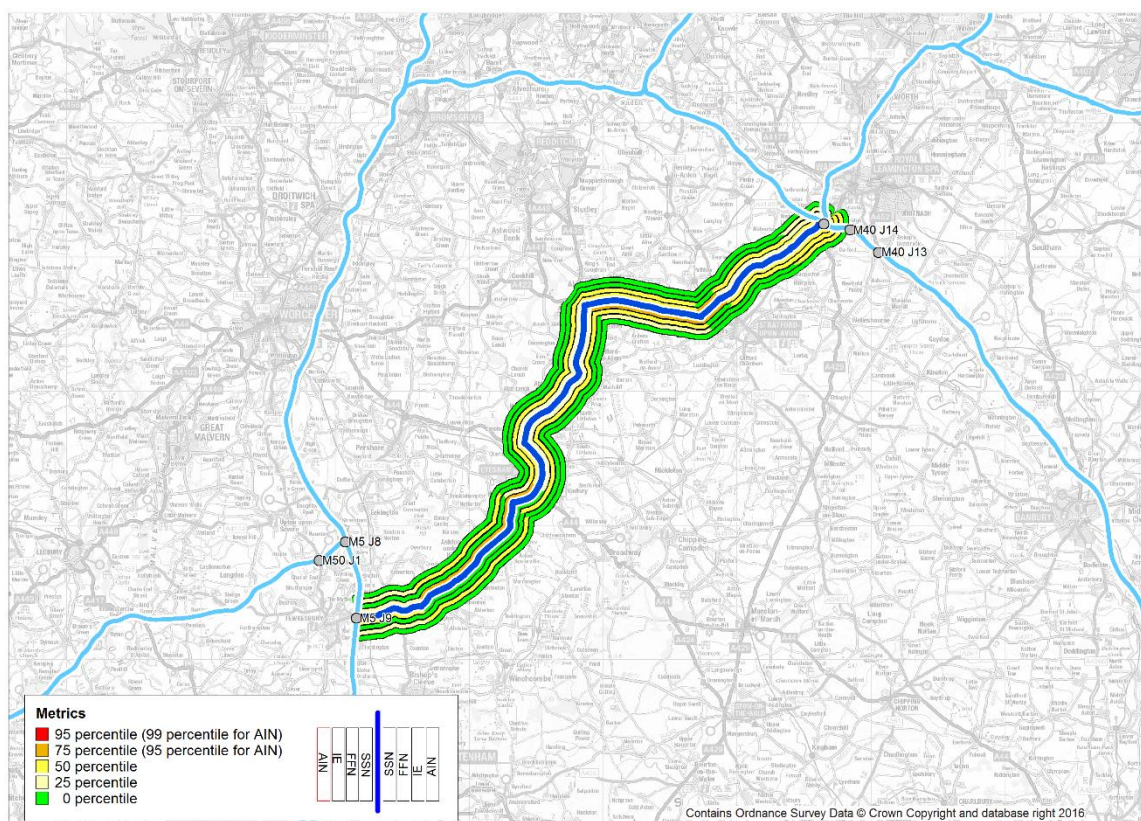
Provide an aggregation of the HE metrics for the entire study area

The evidence base for the OARs reported in 1.1 is supported by Highways England metrics for the four themes of Free Flow Network (FFN), Safe and Secure Network (SSN), Improved Environment (IE) and Accessible and Integrated Network (AIN). A more detailed description of these metrics is provided in Annex A.

A summary of the metrics at aggregate link level for the study area can be seen in Figure 1.2. The diagram shows that:

- There are sections which are in the worst 25% of national links for safe and secure network, particularly near Stratford and Northbound towards Evesham.

Figure 1.2: Metrics Summary



For Safe and Secure Network (SSN), Free Flow Network (FFN) and Improved Environment (IE):

Red - links within 95+ percentile nationally
 Orange – links within 75<95 percentile nationally
 Yellow – links within 50<75 percentile nationally
 Green – links within 0<50 percentile nationally

For Accessible and Integrated Network (AIN):

Red - links within the 99+ percentile nationally
 Orange – links within 95<99 percentile nationally
 Green – links within 0<95 percentile nationally

1.3 Current transport and other policies

Developing an understanding of existing policies which impact on the area and/or the transport sector

Transport policies/HE policies	Other policies
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This section provides a table of the Local Authorities and Local Enterprise Partnerships (LEPs) local to the study area and links to relevant national, regional and local policies.

Table 3.1: Local Authorities and LEPs

Local Authorities	Worcestershire County Council Warwickshire County Council Gloucestershire County Council
Combined Authorities	n/a
Local Enterprise Partnerships	Gloucestershire (GFirst) LEP Worcestershire LEP Coventry and Warwickshire LEP

Table 3.2: Policies

	Transport policies/HE policies	Other policies
National	<ul style="list-style-type: none"> Highways England's Strategic Business Plan 2015-2020 contains the objectives and performance outcomes for Highways England Highways England's Road investment strategy for the 2015 to 2020 road period set the strategy for RIS1 and beyond 	The Government's National Infrastructure Plan 2014 made the strong economic case for infrastructure investment.
Regional	<ul style="list-style-type: none"> Midlands Connect is working with the Midlands Engine and beyond to make the case for delivering nationally important transport investment in the Midlands. Its Emerging Strategy Report outlines the early stages of the transport strategy delivery planned for March 2017. 	Local Enterprise Partnerships (LEPs) have produced Strategic Economic Plan (SEPs): <ul style="list-style-type: none"> Coventry & Warwickshire LEP Strategic Economic Plan 2016 Worcestershire LEP Strategic Economic Plan (March 2014) Gloucestershire LEP Strategic Economic Plan (March 2014)
Local	Local Transport Plans (LTPs) set out how the transport system should be provided and local priorities. Gives a context to options for change to the SRN. <ul style="list-style-type: none"> Warwickshire LTP (2011-2026) Worcestershire Local Transport Plan (2017-2030) Gloucestershire Local Transport Plan (2015-2031) 	This study area crosses a number of boroughs/districts which each have a local plans providing the framework for development: <ul style="list-style-type: none"> Warwick District Local Plan (2011-2029) Core Strategy: Stratford-on-Avon District Council (adopted 2016) South Worcestershire Development Plan - Wychavon District Council (adopted 2016) The Joint Core Strategy is a partnership of the local authority areas of Gloucester City Council, Cheltenham Borough Council and Tewkesbury Borough Council. It was formed to create a strategic development plan to show how the area will develop during the period up to 2031.

1.4 Are there any other factors in understanding the current situation?

This section summarises any current highway schemes; other mode schemes and economic context issues in the area which may address some of the issues identified in sections 1.1 and 2.1 and affect the case for further intervention (section 3.1).

Major Highways England Schemes

Figure 1.4 shows that there are no Major Schemes within the study area however there are a range of relevant recent studies:

- A46 Corridor Study (M5 J9 to M6 J2) Baseline Assessment Report (Highways England, 2015): Sets out the existing issues and the implications of growth. The study was undertaken in order to identify a long term strategy to address the needs and function of the A46 between M5 Junction 9 and M6 Junction 2. This report provides a baseline assessment of the current operational characteristics of the A46 as a benchmark for the development of the future strategies.
- A46 Ashchurch Studies (M5 J9 -Teddington Hands): an investment strategy and preferred option for a scheme to take the A46 offline via design of a new Ashchurch bypass is required to ensure consistent and structured delivery is achieved in RIS 2 and beyond. The A46 (Ashchurch) Scoping Report (CH2M) assessed the level of improvement to A46/M5 J9 required to deliver planned growth arising from the Joint Core Strategy. This identified that an 'online solution' could not deliver the required growth. The A46 Ashchurch Optioneering Report (JMP) considered a set of options that will alleviate existing and future traffic issues on the A46 to provide a shortlist of strategic options.
- The A46 Ashchurch Optioneering Report (Highways England, 2016). In this study, seven corridors and nine junctions were identified for a long list. A number of key constraints informed the route selection including the existing traffic conditions within Ashchurch, engineering challenges such as existing structures/infrastructure, topography and flood plains, sustainability issues such as location of communities and areas with environmental designations and future development. The preferred option presented was a southern bypass with a new junction to the south of the M5 J9. The key objectives of this study included:
 - to address existing capacity issues on the A46 trunk road within Ashchurch and at the M5 Junction 9 (M5 J9)
 - to support development within Ashchurch, Evesham, and further afield, through providing improved infrastructure
 - to improve the strategic function of the A46 through improved and more consistent journey times
 - to provide a substantive strategic traffic alternative to use of the Birmingham Motorway Box (M5/M42/M6) route
- Highways England are currently in pre-application discussions over a new access from the A46 to the West of Wildmoor Roundabout.
- Additionally, improvement schemes at the southern two roundabouts on Evesham Bypass, associated with Vale Business Park extension and a housing development are also being discussed.

Other Highway Schemes

- The A46-A435-M5 J9 Study:
Highlights issues regarding congestion and limited technology, in addition to the route reaching the end of its design life in 2021, and a number of proposed developments in the

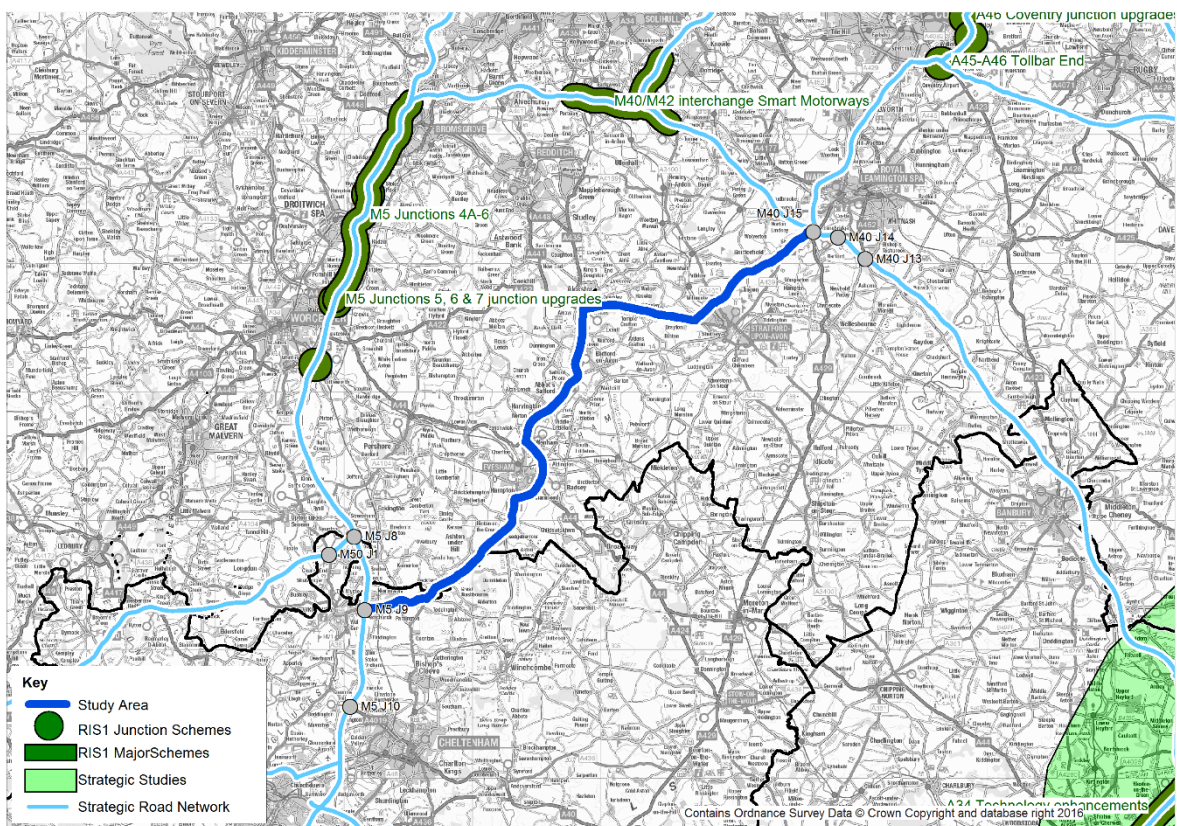
surrounding area. Suggestions for improvement include signalisation, route widening, improving active travel and extending J9 of the M5.

- The A46 Customer Experience Study (M5 J9 to M1 J21 including M69): Highlights issues such as congestion, safety concerns, the route's design life ending in 2021, improvements for vulnerable users and a number of developments planned in the surrounding area. The proposed solution is to undertake a study to assess the requirements and provide the best solution.
- The A46 Evesham Study A46 (A44 – A4184): Highlights issues such as congestion, safety concerns, limited technology, improvements for vulnerable users and a number of developments planned in the surrounding area. The proposed options include improving 5 junctions (widening, additional lanes), widening the carriageway along the current alignment or to create a new bypass to the east/west of Evesham.
- The A46 Stratford Upon Avon Study (A46, M40 J15 to A3400): Highlights issues such as congestion, safety concerns, flooding, the route's design life ending in 2021, improvements for vulnerable users and a number of developments planned in the surrounding area. The proposed options include junction widening, widening the carriageway and improvements to non-motorised user improvements.
- There are a number of developer led schemes within the various stages of the planning system for which the design and timing of delivery is affected by an evolving Local Plan process:
 - **M5 Junction 9** - Dedicated left turn slip road from the A46 westbound to the M5 southbound;
 - **M5 Junction 9 to Alexandra Way** - widening of the westbound approach to Alexandra Way, part of M5 Junction 9 and the upgrade of pedestrian and cycle facilities;
 - **Alexandra Way to Northway Lane** - Widening on the approaches to Northway Lane; and
 - **Pamington Lane Access improvements** - Localised widening, lengthening of the right turn stacking bay on A46, new signalised crossing facility and new bus stops.

Economic Context and Gateways

- At least 14,600 new homes required to be built across the Stratford-upon-Avon District by 2031.
- Within the Ashchurch area on the A46, adjacent to J9, 3300 jobs and up to 2100 homes on the existing MoD site.
- Existing housing areas in Evesham have expanded outwards towards the bypass, and further housing (which is partly occupied) currently under construction to the south west of the Badsey roundabout where around 300 dwellings have planning approval. In addition, over 1,000 houses are proposed around Evesham.
- There is also an Economic Opportunity Area near Evesham. Vale Park is a 59ha area available for mixed use employment - Food Enterprise Zone (not a formal EZ).

Figure 1.4: Study Area, RIS 1 Schemes and Strategic Studies



1.5 What are the constraints and opportunities which affect the area of the study? Please tick those that apply.

1.5.1 Environmental Constraints	Nature and description	Level of Constraint			How can it be overcome?				
		High	Medium	Low	Avoid (eg sensitive routing)	Mitigate-Physical	Mitigate-Timing	Compensate (eg habitat creation)	Cannot be overcome
Cultural heritage	11 Listed Buildings (Grade I and II*) within 1 km, 9 Scheduled Monument within 1km, 3 Park and Gardens (Grade I and II*) within 1km.	✓			✓				
Water pollution and flooding	12 Wholly and partially within Flood Zone 3b/a	✓			✓	✓			
Landscape	Low constraint			✓	✓				
Ecology	13 Wholly or partially within Ancient Woodland, 3 Wholly or partially within Local Nature Reserves, 9 Special Scientific Interest within 2km, 48 Ancient Woodland within 2km, 19 Local Nature Reserves within 2km.		✓		✓	✓	✓	✓	
Visual	31075 Residential Properties within 1.5km	✓			✓	✓			
Noise	4 Wholly or partially within Noise Important areas	✓			✓	✓			
Air pollution	1 Within an AQMA	✓							
Other (specify)									
1.5.2 Engineering Constraints	Nature and description			How can it be overcome?					
				Avoid (eg sensitive routing)	Mitigate-Physical	Other	Cannot be overcome		

Raised sections	Height range 20 to 100 Metres				
Structures	This information will be captured and inform the business case for lump sum and capital renewals				
Pavement					
Assets					
Terrain					
Rivers and Railways	4 railway, 3 medium/large rivers crossing and 1 canals				
Other (specify)					

1.5.3 Are there any legal or institutional constraints?

E.g. parking, public transport, commercial interests

None identified

1.5.4 Opportunities which could be realised	
Economic Growth: Opportunities to help facilitate economic growth.	The impact of any improvement scheme on economic growth will be analysed as part of the scheme appraisal process.
Environmental: Opportunities to tackle existing environmental challenges.	Environmental challenges and opportunities will be considered in the appraisal of any improvement scheme and, where necessary, mitigation measures will be identified.
Vulnerable road users and local/community access: Opportunities to take better account of the needs of communities, cyclist, pedestrians, equestrians.	The needs of vulnerable users will be considered in the design of any improvement scheme.
Customer Experience: Opportunities to give a better service to motorists.	Opportunities to provide a better service to motorists, such as improved messaging technology and facilities, will be identified as part of scheme development.
Safety: Opportunities to prevent the frequency or severity of accidents.	The design of any improvement scheme will analyse the impact on safety, and incorporate any measures necessary to reduce the number of incidents on the network.
Other (e.g. opportunities to make better use of assets or land)	The opportunity to improve the interface between the local and strategic road network, to improve the efficiency of the asset overall, will be a consideration of any improvement scheme.

2. Understanding the future situation

2.1 What are the future challenges in this area?

Cross reference to the evidence provided by the Route Strategy team as appropriate.

A comprehensive record of future year issues identified from the stakeholder evidence base is provided within Annex C. The key future year challenges have been identified based upon a review of this information and are outlined in Table 2.1.

Based upon issues identified, a R-A-G rating has been used which provides a high level and subjective overview of the future year issues in relation to Highways England's key themes. It is assumed that existing issues would persist into the future.

Table 2.1: Key Future Issues

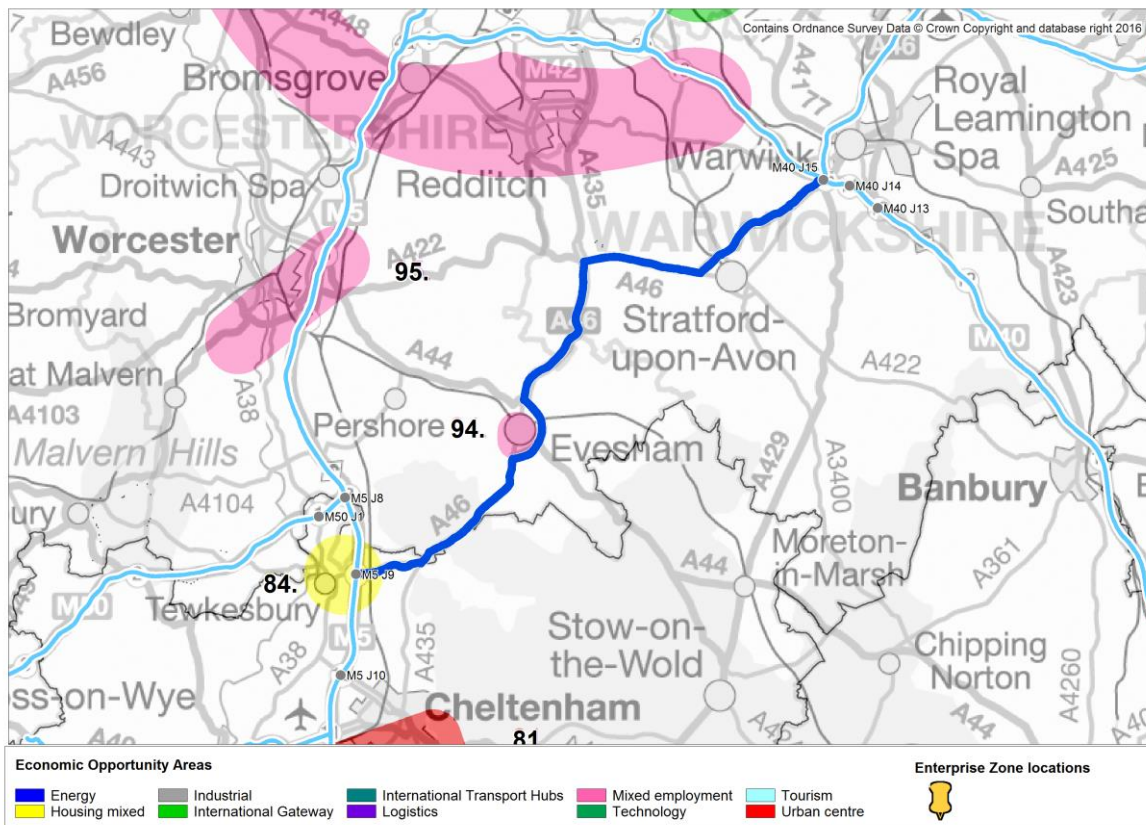
Key Issues	Economic Growth	Free flowing network (FFN)	Safe and secure network (SSN)	Serviceable condition	Improved Environment (IE)	Accessible & Integrated Network (AIN)
<p>Impacts of future growth will exacerbate existing congestion issues. Future developments are being proposed in Ashchurch and Evesham, in addition to a number of others within Warwickshire.</p> <p>Future growth including housing and business developments will increase the demand on the A46, which is likely to worsen the existing congestion problems. The areas which are most likely to have an impact include:</p> <ul style="list-style-type: none"> • Developments in Ashchurch • Developments in Evesham, including a proposed extension to Vale Business Park (EOA 94) • Developments in Stratford • Housing development at Cheltenham Road. 	✓	✓				
<p>A number of key housing and employment allocations are proposed along the A46 study area.</p> <p>Impacts of future growth could exacerbate issues, putting a considerable strain on this section of the SRN, increasing demand on the road network especially in areas that are already experiencing stress.</p> <p>This includes the following developments:</p> <ul style="list-style-type: none"> • Gloucestershire: 33,500 new homes and 44000 new jobs by 2031. <ul style="list-style-type: none"> ○ Including 2720 new houses in Ashchurch. ○ Potentially a further 20000 – 35000 houses are anticipated in the Ashchurch/Tewkesbury/Cheltenham area. 	✓	✓				

- Worcestershire: 32,500 new homes and 49,000 new jobs by 2021.
- Two employment sites (18 hectares each) planned on the A46 in the vicinity of Stratford on Avon.
 - Modelling of the preferred growth strategy for Stratford predicts a growth of 2% to 6% on key road junctions, with the biggest impact on the current A46 Stratford Northern Bypass.

Continued demand for footways, cycleways and accessible bus services, towards the southern end of the route in Ashchurch and Evesham.

Worsening severance for NMUs from increasing traffic levels in study area.

Figure 2.1: Economic Opportunity Areas (as per emerging Highways England Strategic Economic Plan) and Enterprise Zone Sites



2.2 Are any additional constraints likely in the future?

3. Justification for intervention

3.1 What are the consequences of doing nothing?

The following issues will remain or get worse without intervention:

- Congestion will worsen as future developments attract more traffic to the area. If congestion worsens too much, it may discourage developers investing in the area, which could impact on the local economy. It would be difficult to deliver Ashchurch growth and other Joint Core Strategy growth without improvements along the A46.
- The worsening congestion will also exacerbate queues at junctions (particularly at at-grade junctions and roundabouts). This will be experienced particularly on the Evesham and Stratford bypasses, between Alcester and Stratford and between Beckford and Evesham. As a result of the current congestion issues, background growth and the added pressure from proposed developments in Ashchurch, as identified in the Local Plan, existing issues will be exacerbated in the future. Increased journey times will make the A46 a less desirable alternative to the M5/M42/M6.
- Collision risk may increase as a consequence of congestion. Furthermore, driver frustration could be caused due to congestion and single carriageway sections creating limited overtaking opportunities.
- There could be an increase in adverse environmental impacts due to an increase in traffic, for those living adjacent to the corridor (for example Aston Cross, Ashchurch).
- Severance for NMUs could be created or worsened where it already exists, particularly in locations where there are no controlled crossing points. This could get worse as traffic increases on the A46, making it difficult for people to cross the A46.

3.2 Underlying Causes

Briefly outline any known information relating to the causation of the challenge.

Without further investigation into each of the issues identified, the cause of many of the issues contained within Annex A cannot be confirmed. However, it is assumed at this stage that the cause of the key issues are as follows:

- Existing traffic congestion on the A438/A46/M5 J9 corridor, queuing on the A46 to M5 J9 is due to poor performance of A46 resulting in traffic queuing back along the M5 mainline (as stated in South Midlands Route Strategy, 2014). Growth will exacerbate the existing issues.
- Congestion also on A46 Stratford and Evesham bypasses, which is worst in peak hours.

3.3 Stakeholder input:

A snapshot of the stakeholders who have provided evidence/information against locations within this study area (Refer to [RS Evidence Tracker](#) and [Transport Focus customer research](#))

It should be noted that comments from all stakeholders at who attended the Highways England run stakeholder workshops are recorded as Highways England. Organisations listed are those that submitted evidence via the online tool.

DfT (Ministers)		Businesses	
Sub National Transport Bodies	<ul style="list-style-type: none"> • Midlands Connect 	Transport Provider	

LEP	<ul style="list-style-type: none"> • GFirst LEP • Worcestershire LEP • Coventry and Warwickshire LEP 	MP	
LA	<ul style="list-style-type: none"> • Warwickshire County Council • Worcestershire County Council • Gloucestershire County Council 	Transport Focus	✓
Parish Council		Customer	
NGO/Lobbyist	<ul style="list-style-type: none"> • Cycling UK 	Highways England	<ul style="list-style-type: none"> • Highways England Area 9 Asset Manager

4. Identifying objectives and defining geographic scope

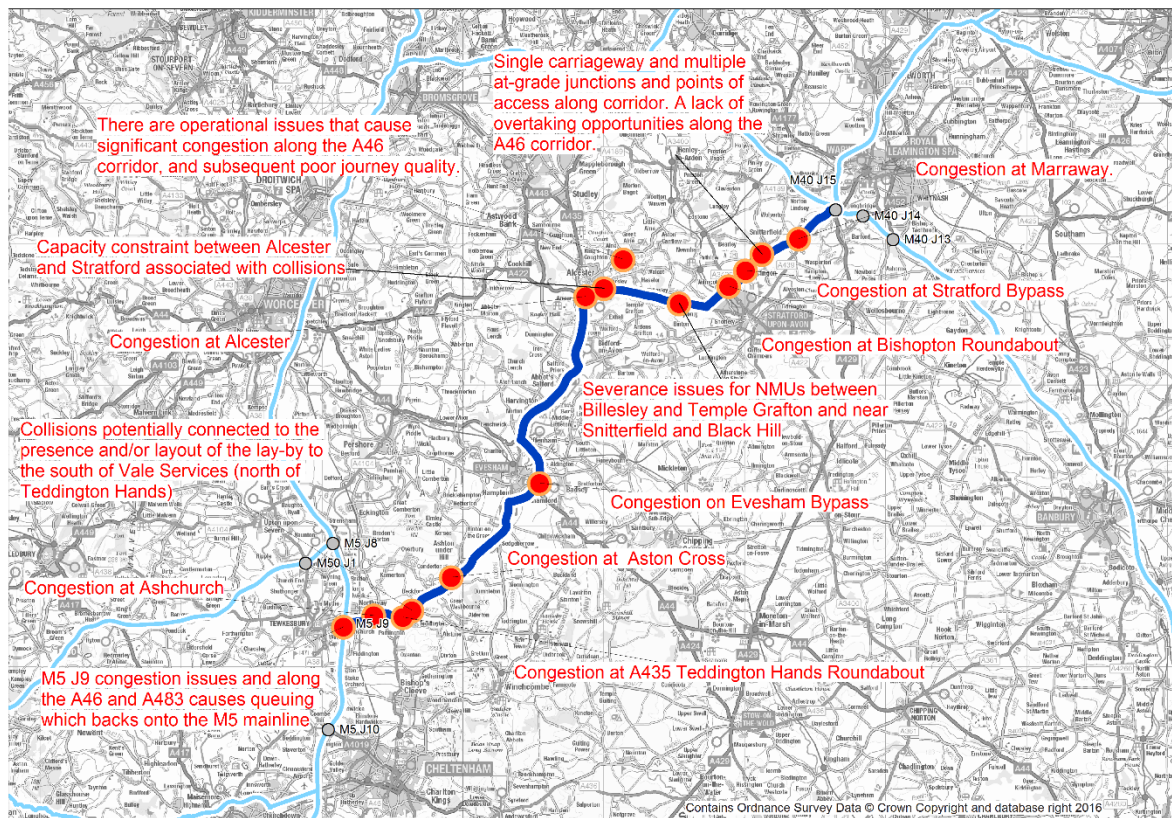
4.1 Objectives?	
What objectives will an intervention seek to achieve and how?	
Objective	Please provide a narrative for each objective (If objective does not apply, please write N/A)
Making the network safer	<ul style="list-style-type: none"> To minimise the risk of collisions caused by congestion through improvements to the study corridor mainline and junctions.
Improving user satisfaction	<ul style="list-style-type: none"> Improve journey reliability across the study corridor by improving journey consistency through reducing congestion on the mainline and junctions.
Supporting the smooth flow of traffic	<ul style="list-style-type: none"> Reduce delays due to congestion, particularly on the constrained single lane carriageways and at-grade roundabouts and junctions along the A46.
Encouraging economic growth	<ul style="list-style-type: none"> Ensure that the network can facilitate the anticipated growth across the corridor particularly in Ashchurch, Evesham and Stratford.
Delivering better environmental outcomes	<ul style="list-style-type: none"> Ensure that environmental issues are not exacerbated for those living adjacent to the A46 corridor.
Helping cyclists, walkers, and other vulnerable users of the network	<ul style="list-style-type: none"> Reduce severance by providing safe and accessible crossing points on the A46 along the Evesham bypass and between Evesham and Teddington Hands and between Billesley and Temple Grafton, and near Snitterfield and Black Hill.
Achieving real efficiency	<ul style="list-style-type: none"> Increase the capacity of existing infrastructure to improve the flow of traffic and improve journey reliability
Keeping the network in good condition	N/A

4.2 Geographic scope of study area

What areas/locations will be included? How does this relate to key origins and destinations?

Figure 4.1 shows the locations of the key issues which need to be addressed in order to improve the performance of the study area.

Figure 4.1: Identified Key Issues



4.3 Size of the prize

The 'size of the prize' represents the economic value that would be realised if traffic on the Strategic Road Network were allowed to travel at free-flow speeds. While for many schemes this will represent a significant proportion of the anticipated benefits, there may be additional benefits that are not currently being calculated; by undertaking measures such as increasing lane capacity, raising speed limits, safety improvements, wider economic impacts or decongestion benefits on the local road network. It is also highly probable that any intervention would have an economic impact on links outside of the study area. As a consequence, the size of the prize for each investment option will differ on a case-by-case basis due to the intervention type, the scale of the intervention, and its location within the study area. Therefore, each intervention option requires judgment on its particular characteristics in order to identify its size of the prize.

The 'size of the prize' in this study area is estimated to be £277M.

5. Generating and assessing potential options

The purpose of this section is to document the range of alternative measures or intervention options generated that are likely to achieve the objectives identified in section 4. It is important that as wide a range of options as possible are considered. At least one alternate modal option must be considered in line with the requirements of the National Networks – National Policy Statement.

5.1 What are the options?

What types of intervention could address the challenges and seize the opportunities? Options should consider integrated solutions, which may include solutions on local roads and other modes of transport. Options should also consider potential maintenance, operational and small scheme solutions. Innovative options are also encouraged.

Option Number	Option Name	Objective	Brief Description	Next steps
MID16_01	M5 Junction 9 Improvements	Economic growth, free flow of traffic, safety, user satisfaction.	This option will seek to improve conditions at M5 J9 through one or a combination of the following schemes <ul style="list-style-type: none"> • Fully signalise M5 J9 - Signalise the A46 approach to the roundabout, all signals could be linked together along with Alexandra Way junction and Shannon Way to take advantage of platooning of vehicles. • Widening of the circulatory carriageway from 2 to 3 lanes. • Extend J9 south and realign A46 to south of Natton, re-joining existing alignment by Teddington Hands junction (A435). • Extend south facing slip at J9 of M5, and realign A46. • Dedicated left turn slip road from the A46 westbound to the M5 southbound at J9. 	Take forward to shortlisting assessment
MID16_02	Sustainable transport improvements on A46	Environmental, vulnerable users	Sustainable transport improvements to existing active travel crossings, and identify potential new (or missing links) segregated cycle routes between communities.	Passed to NMU workstream
MID16_03	A46 Strategic Study	All	A study to review the existing route and assess the requirements of the route based on planned growth and long term aspirations.	Strategic study
MID16_04	A46 Evesham Junction improvements	Economic growth, free flow of traffic	Widen the entry flares to the 5 junctions, increase junction size and add additional lanes to the circulatory carriageway on the roundabouts to increase capacity and reduce congestion and delay. Widen the current A46 single carriageway section to dual carriageway, around the eastern side of Evesham.	Take forward to shortlisting assessment

MID16_06	Stratford Northern Bypass grade separation	Economic growth, free flow of traffic, safety, user satisfaction.	Stratford Northern Bypass grade separation of A46/A422 junction and A46/A3400 (Bishopton) junction.	Take forward to shortlisting assessment
MID16_07	Alcester to Stratford Widening	Free flow of traffic, economic growth.	Widen to 10m with right turn lanes or possibly dual, in order to reduce delays and collisions and improve access to developments off A46 in Stratford area and at Long Marston.	Take forward to shortlisting assessment
MID16_08	A46 westbound widening at M5 J9	Safety, environmental, vulnerable users	Widening of the westbound A46 approach to Alexandra Way, part of M5 Junction 9 and the upgrade of pedestrian and cycle facilities.	Passed to schemes under £10m in value workstream
MID16_09	A46 widening between Alexandra Way and Northway Lane	Free flow of traffic, safety	Widening of the A46 on the approaches to the Northway Lane junction (near Ashchurch for Tewksbury Rail Station).	Passed to schemes under £10m in value workstream
MID16_10	A46 stacking bay, crossing and bus stop improvements opposite Pamington Lane	Free flow of traffic, safety, efficiency	Localised widening of the stacking bay opposite Pamington Lane, lengthening of the right turn stacking bay on A46, new signalised crossing facility and new bus stops.	Passed to schemes under £10m in value workstream
MID16_11	Vale Business Park A46 access	Economic growth	Vale Business Park – 20 hectares of mixed use employment requires the provision of new direct access off the A46, to the south of Evesham	Discuss with local authority
MID16_12	Bishopton Junction signalisation and widening	Free flow of traffic	Signalisation and widening of Bishopton Junction (Stratford) to provide additional capacity.	Passed to schemes under £10m in value workstream
MID16_13	A46 Marraway Roundabout Improvement Scheme	Free flow of traffic	It is proposed that a grade separated junction is implemented as part of a scheme	Passed to schemes under £10m in value workstream

MID16_14	Evesham Bypass	Free flow of traffic, economic growth, safety, efficiency	The creation of a new bypass to the west of Evesham would allow local vehicles to use the existing A46 whilst long-distance commuters use the new bypass, which will be to expressway standard.	Take forward to shortlisting assessment
MID16_15	A46 Offline Improvement M5 J9 to Teddington Hands Roundabout	Free flow of traffic, economic growth.	In order to maintain the current level of service for journeys along the A46 between Teddington Hands roundabout and M5 Junction 9, an off-line improvement to the A46 would become necessary prior to 2026 even if it is assumed that a significant online improvement was already in place.	Take forward to shortlisting assessment
MID16_16	A46 Billesley/Binton/Red Hill improvements	Free flow of traffic, safety	A46 Billesley/Binton/Red Hill junction, safety and capacity improvements.	Passed to schemes under £10m in value workstream
MID16_17	A46 Online Upgrade	Economic growth, free of flow of traffic, safety	Online A46 dualling (M5 J9 to M40 J15). Upgrade existing infrastructure where possible. Dualling along sections of the route where widening is possible.	Take forward to shortlisting assessment
MID16_18	Bidford to Stratford link	Economic growth, free flow of traffic	The current A46 has a 'dog-leg' between Evesham and Stratford where it travels north to Alcester as opposed to being direct to Stratford. This significantly decreases journey times due to the extra distance, and additionally the section between Alcester and Stratford is mainly single carriageway. - Creation of new Bidford to Stratford link - Improvements to current junction at Bidford with A46 - Improvements to junction where the new link will join the remaining A46 at Stratford	Take forward to shortlisting assessment
MID16_19	Public Transport Infrastructure Provision	All	Improvements to bus priority measures, improved bus frequency and links and improved rail service frequency.	Potential public transport improvements study

5.2 How were the options generated?

e.g. stakeholder input, previous studies/schemes

A workshop was held between representatives of Highways England Operations Directorate Asset Development Team, Major Projects, and Traffic Officer Service at which the identified objectives were discussed along with the available potential options to address these. Where options exist the reference documents from which the details have been summarised are referenced within Section 5.1; where the issue generating the objective is insufficiently well defined as to permit the identification of an option in the absence of further examination a study is proposed.

5.3 EAST Summary (see Annex D for further details of each option)								
Option Number	Total Cost Estimate (£)	Expected “size of the prize” category	Implementation Timetable	EIA Y/N	DCO Y/N	Air Quality Risk H/M/L	To what extent does the option meet the objectives as described in Section 4? (score 0-5)	Justification - Provide a narrative explaining what this option would achieve and why it has or has not been taken forward to the option costing stage.
MID16_01	£10-99m	Junction improvement so no SoP identified, although it is expected that the option will reduce junction delays, promote economic growth and improve safety.	6+ years	Y	Y	M	5	The evidence collected has identified that congestion is known to occur at Junction 9 on approaches in peak times. Congestion at this junction and along the A46 and A483 causes queuing which backs onto the mainline. This impacts on the performance and safety of the motorway junction itself. With the anticipated housing growth in close proximity to junction 9, enhancements will help to support the free flow of traffic to encourage and facilitate growth. This option has scored the highest mark against economic growth, free flow of traffic, efficiency and safety objectives. Due to the requirements to improve capacity and operation performance, the scheme to fully signalise M5 J9 and widening the circulatory carriageway from 2 to 3 lanes will be taken forward for costing.
MID16_04	£10-99m	Junction improvement so no SoP identified, although it is expected that the option will reduce junction delays and promote economic growth.	6+ years	Y	Y	M	5	The evidence collected has identified that Evesham experiences congestion on Evesham Bypass as a result of the single carriageway, at-grade junctions and the high number of local trips. This section does not currently support the long term strategic needs of the A46. This option will provide widening and junction improvements to reduce congestion and delay. As Evesham has planned growth, this option has scored the highest mark against encouraging growth objective as well as supporting the free flow of traffic and achieving real efficiency. This option will be taken forward for costing.

MID16_06	£10-99m	The estimated SoP value for the section (AL3713, AL2731, AL3714, AL3715) is £49M so, allowing for potential safety and economic benefits, it is expected that the SoP will be roughly equal to or lower than to the cost.	6+ years	N	N	M	5	The evidence collected has identified that congestion is created along the A46 corridor due to single carriageway and multiple at-grade junctions and points of access. This is an issue in along the Stratford Bypass. As a result of the current congestion issues, background growth and the added pressure from proposed developments as identified in the Local Plan, existing issues will be exacerbated in the future. This option will seek to address such issues by the grade separation the 2 major junctions on the Stratford Bypass. This option has scored the highest mark against economic growth, free flow of traffic and efficiency objectives and will be taken forward for costing.
MID16_07	£10-99m	The estimated SoP value for the section (AL3712, AL3713) is £38M so, allowing for potential safety and economic benefits, it is expected that the SoP will be roughly equal to or lower than the cost.	6+ years	N	N	M	4	This option will seek to widen or possibly dual the existing carriageway in order to reduce delays and collisions. The option will also improve access to developments off A46 in Stratford area and at Long Marston. Whilst this scheme has the potential to improve mainline performance, the OAR has identified that a primary reason for congestion along the A46 is the at-grade roundabouts. This scheme does not consider enhancements to the at-grade roundabouts in close proximity and therefore, congestion and delays are likely to occur. Due to the scale of impact, this option will not be taken forward for costing.
MID16_14	£100-249m	The estimated SoP value for the bypass and adjacent section (AL3721, AL3722, AL3723, AL3724, AL2652, AL2653) is £85M so, even	10+ years	Y	Y	H	4	This option would see the creation of a new bypass to the west of Evesham which would seek to allow local vehicles to use the existing A46 whilst long-distance commuters use the new bypass, which will be to expressway standard. The evidence has identified that improvements are required to the existing Evesham Bypass but does not identify a new bypass as a solution. Whilst the aim of the new bypass would be to separate short and long distance commutes, the option does not identify how this will be managed. A new bypass has

		allowing for potential safety and economic benefits, it is expected that the SoP will be less than the cost.						the potential to generate new journeys and therefore the impact on economic growth and free flow of traffic is uncertain. Due to the scale of impact, this option will not be going forward for costing.
MID16_15	£100-249m	The estimated SoP value for the section (AL3717, AL3718) is £40M so, even allowing for potential safety and economic benefits, it is expected that the SoP will be less than the cost.	6+ years	Y	Y	H	5	The evidence has identified that Significant congestion was identified at M5 Junction 9 particularly on the A46 westbound approach from Teddington Hands. Highways England undertook a study in March 2012 to investigate delay and safety problems on the A46 between M5 Junction 9 and Teddington Hands due to a spate of collisions. This option will provide an off-line improvement to the A46 to reduce delays and improve safety. This option has scored the highest mark against economic growth, free flow of traffic and safety objectives. This option will be taken forward for costing.
MID16_17	£100-249m	The estimated SoP value for the whole section is £277M so allowing for potential safety and economic benefits, it is expected that the SoP will be roughly equal to, or greater than the cost.	6+ years	Y	Y	H	4	This option will seek to upgrade existing infrastructure where possible, dualling along sections of the route where widening is possible. Previous work undertaken has identified that capacity improvements would not be possible through Ashchurch due to the amount of direct accesses, land constraints and the dwellings/businesses that would need to be demolished. With this in mind, the scheme failed to score the highest mark against any HE Study Objectives and its scale of impact is limited. This option will not be taken forward for costing.
		The estimated SoP value for the section (AL3712,						This option will see the creation of a new Bidford to Stratford link to provide a more direct journey between Evesham and Stratford. Whilst this scheme has the potential to improve journey times

MID16 _18	£100- 249m	AL3713, AL3719, AL3720) is £83M so, even allowing for potential safety and economic benefits, it is expected that the SoP will be roughly equal to or less than the cost.	6+ years	Y	Y	H	4	between the destinations, the evidence has not identified this option as a solution to reduce congestion between Evesham and Stratford. This option has not been identified as a potential solution to alleviate demand on the network between Alcester and Stratford. The scheme will only improve journey reliability for a small section of the study corridor therefore its scale of impact is limited. This option will not be taken forward for costing.
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6 Better performing option(s) - costing

6.1 Better performing option			
Option name/identification	MID16_01 - M5 Junction 9 Improvements		
	Minimum	Most Likely	Maximum
Capital Expenditure – Base Cost Estimate (@ Q1 2016) (inclusive of risk, inflation and portfolio risk)	£ 2,535,263	£ 11,060,740	£ 37,648,758
Operational Expenditure – Base Cost (@ Q1 2016)	£ 1,026,057	£ 2,791,503	£ 6,156,031
Scenario (Produced from costing tool)	See Annex E		

6.1 Better performing option			
Option name/identification	MID16_04 - A46 Evesham Bypass Junction Improvements		
	Minimum	Most Likely	Maximum
Capital Expenditure – Base Cost Estimate (@ Q1 2016) (inclusive of risk, inflation and portfolio risk)	£ 6,240,650	£ 38,182,442	£ 166,121,518
Operational Expenditure – Base Cost (@ Q1 2016)	£ 1,766,237	£ 3,987,882	£ 9,455,108
Scenario (Produced from costing tool)	See Annex E		

6.1 Better performing option			
Option name/identification	MID16_06 - A46 Stratford-upon-Avon Grade Separated Junctions		
	Minimum	Most Likely	Maximum
Capital Expenditure – Base Cost Estimate (@ Q1 2016) (inclusive of risk, inflation and portfolio risk)	£ 10,188,929	£ 75,701,884	£ 243,252,987
Operational Expenditure – Base Cost (@ Q1 2016)	£ 4,624,018	£ 14,974,570	£ 38,743,377
Scenario (Produced from costing tool)	See Annex E		

6.1 Better performing option			
Option name/identification	MID16_15 - A46 offline improvement – M5 J9 to Teddington Hands Roundabout		
	Minimum	Most Likely	Maximum
Capital Expenditure – Base Cost Estimate (@ Q1 2016) (inclusive of risk, inflation and portfolio risk)	£ 42,174,982	£ 232,266,096	£ 683,010,509
Operational Expenditure – Base Cost (@ Q1 2016)	£ 23,223,804	£ 59,353,671	£ 111,149,962
Scenario (Produced from costing tool)	See Annex E		

Annex A – Current Year Issues from the Stakeholder Evidence Base and HE Performance Metrics

Current Year Issues

Economic Growth	Evidence Ref
Impacts of future growth (particularly Ashchurch and Warwickshire) will exacerbate existing congestion issues.	<i>CMac048</i>
Existing queues and delay at roundabouts will increase with growth and developments in the Evesham area.	<i>CMac034</i>
Proposed developments within the Evesham area, including housing, and a proposed extension to Vale Business Park, will exacerbate congestion issues in the future.	<i>CMac048</i>

Free Flowing Network	Evidence Ref
The A46 along this corridor suffers from congestion and poor journey quality.	<i>tz054sy</i>
Congestion issues on the Evesham bypass at at-grade junctions between A4184 and A44 and where the A46 and A44 merge for a section. Congestion particularly occurs during peak times. Particularly bad in the southbound direction.	<i>3a04va0 8o054xl gl054hf ji0549 x0054r9 CMac048 8l044rc</i>
Congestion issues on the A46 between junction with the A435 (Teddington Hands roundabout) and the A44 between Beckford and Evesham.	<i>zu054du</i>
Significant congestion issues on the A46 corridor from the junction with A435 (Teddington Hands roundabout through Ashchurch and M6 J2 at peak times, partly due to at grade junctions and capacity constraints. The route is single carriageway (with constraint of a bridge crossing the railway) and congestion at all junctions results in queuing onto M5 at J9. Significant congestion on the A46 corridor through Ashchurch and M5 J9 at peak times.	<i>CMac048 CMac132 CMac131 CMac019 KD30036a</i>
Congestion issues and delays at Marraway and Bishopton roundabouts on Stratford Bypass.	<i>CMac048 AS10051a AS10052a</i>
A46 between Alcester and Stratford is single carriageway which results in delay and collisions.	<i>CMac017</i>
At-grade junctions along Evesham Bypass can cause congestion during peak times.	<i>CMac048</i>
Delays at Marraway and Bishopton roundabouts on Stratford Bypass.	<i>CMac048 KD90048</i>
Peak period delay through Warwickshire, particularly on approaches to and north of the A45.	<i>CMac048</i>
Congestion Hotspots - including Ashchurch, Evesham Bypass and Stratford Bypass.	<i>CMac048</i>
Lack of overtaking opportunities - Opportunities for overtaking along single carriageway sections are limited.	<i>CMac048</i>
Significant congestion was identified at M5 Junction 9 particularly on the A46 westbound approach from Teddington Hands. Teddington Hands to north of Evesham experiences congestion on Evesham Bypass is a result of the single	<i>CMac048</i>

carriageway, at-grade junctions and the high number of local trips. This section does not currently support the long term strategic needs of the A46.	
Highways England (Area 9) have commissioned a number of studies that conclude that M5 Junction 9 and the A46 will not be able to cope with the level of proposed development in the area.	<ul style="list-style-type: none"> • A46 Corridor Study (M5 J9 to M6 J2) • A46 Scoping Study
Although the A438 through Tewkesbury is not part of the SRN, any traffic problems at M5 Junction 9 and the A46 do have a knock on impact on the A438 and the town centre.	KD90028
Existing and forecast congestion at A46 Bishopton, Marraway, Teddington Hands and Wildmoor junction. The area is exposed to increasing development pressures with the committed western relief road which connects directly with this junction and the proposed south western link road placing further pressures on the A46 corridor.	KD90062 AS10051a AS10052a KD90052 KD90049

Safety	Evidence Ref
Capacity constraint between Alcester and Stratford which is single carriageway with delay and collisions.	CMac017
Accident numbers have reduced over the period 2002 to 2011, however, clusters are found at junctions.	CMac048
<p>An investigation was undertaken that found the following sites have collisions potentially connected to the presence of and / or layout of the lay-by. These lay-bys were located on the northbound carriageway in the following locations:</p> <ul style="list-style-type: none"> • To the south of Vale Services (north of Teddington Hands) Immediately to the south of A46 / Cheltenham Road Roundabout 	CMac048
<p>Highways England undertook a study in March 2012 to investigate delay and safety problems on the A46 between M5 Junction 9 and Teddington Hands. The key findings were:</p> <ul style="list-style-type: none"> • Queues of approximately one mile observed on the westbound approach to the Alexandra Way junction, through Northway Lane and on the westbound approach to the Aston Cross junction in the AM Peak. <p>A collision analysis revealed that 36 collisions (October 2005 to September 2010) had occurred along this section of the A46 with two collisions deemed to be outside of the study area. Of these collisions, 35 were regarded as slight and one as serious. The majority of the collisions were rear end shunts.</p>	CMac048
Peak hour queues currently extend for a significant distance either side of J9, with resulting impacts on the performance and safety of the motorway junction itself. This impacts vehicles exiting the M5 resulting in stacking traffic on the slip lanes. This is an issue especially for northbound traffic during the PM peak.	KD90028

Serviceable Condition	Evidence Ref
No issues identified	

Improved Environment	Evidence Ref
No issues identified	

Accessible and Integrated Network	Evidence Ref
There is a demand for NMUs to cross the A46 between Billesley and Temple Grafton. This is currently difficult, resulting in a severance issue.	bm04qwr

There is an existing severance issue on the A46 near Snitterfield and Black Hill where it is difficult/unpleasant for NMU's to travel between the two locations (and further on towards Hampton Lucy).	<i>hp04q8p</i>
Inconsistent carriageway standards - The corridor comprises of a mix of single and dual carriageway sections, and at-grade and grade separated junctions. Capacity is reduced where the carriageway is not of a consistent standard.	<i>CMac048</i>
Poor resilience - Limited opportunities for refuge and poor alternative routes, particularly within single carriageway sections of the corridor.	<i>CMac048</i>
Limited rail and public transport alternatives – A lack of public transport alternatives for A46 users especially to the south of Stratford-Upon-Avon.	<i>CMac048</i>
There is a real demand for footways, cycleways and accessible bus services, towards the southern end of the route in Ashchurch and Evesham. Some bus stops along the A46 are unmarked and have no designated crossing facilities.	<i>CMac048</i>
There are limited crossing points for pedestrians and cyclists over the M5. At the moment they cross at the motorway junction. Recent improvements delivered as part of the Government's Pinch Point investment programme have made an improvement, but as demand at this junction increases a long-term solution does need to be found to remove the risk of an incident and to increase mode share by cycling and walking.	<i>KD90028</i>

HE Performance Metrics

The evidence base for the OARs, reported for this study area in section 1.2, is based upon data supporting the four themes listed below. Many (although not all) of the metrics and their definitions can be found in the Operational Metrics Manual. This data was supplemented by the extensive stakeholder engagement exercise for which the feedback is listed above.

Metrics within the Safe and Serviceable Network (SSN) theme focus on previous incident data (STATS19), regional safety reports (that state the riskiest links on the SRN) and identify those links on the network most vulnerable to flooding.

Metrics within the Free Flow Network (FFN) theme focus on average vehicle speeds and delays on the network, journey time reliability, locations where at grade junctions interrupt the flow of traffic, locations where incident clearance times are particularly slow, locations where lane-drops occur, locations where the network is particularly busy but where traffic management provision is limited (lack of VMS), links where the journey quality is deemed as unacceptable, and focuses on non-smart motorways where the average vehicle speed is dramatically lower than the road's speed limit.

Metrics within the Improved Environment (IE) theme focus on areas where there is a high population density next to a particularly busy stretch of road, taking into account the implications for both air quality and noise issues for the local community. They also consider the visual severity measure to identify locations where the network could be considered particularly disruptive to the local environment.

Finally, metrics within the Accessible and Integrated Network (AIN) theme focus on locations where the SRN provides vital access to other transport networks such as airports, ports and principal rail stations (including HS2). It's recognised that this metric does not consider accessibility to and from the local road network from the SRN but this is a limitation of the data sets currently available to Highways England.

The Supporting Economic Growth theme was supported using findings from the Strategic Economic Growth Plan.

Annex B – AQMA, NIA, STATS19 and Flooding Data Mapping

Figure B1: AQMA areas

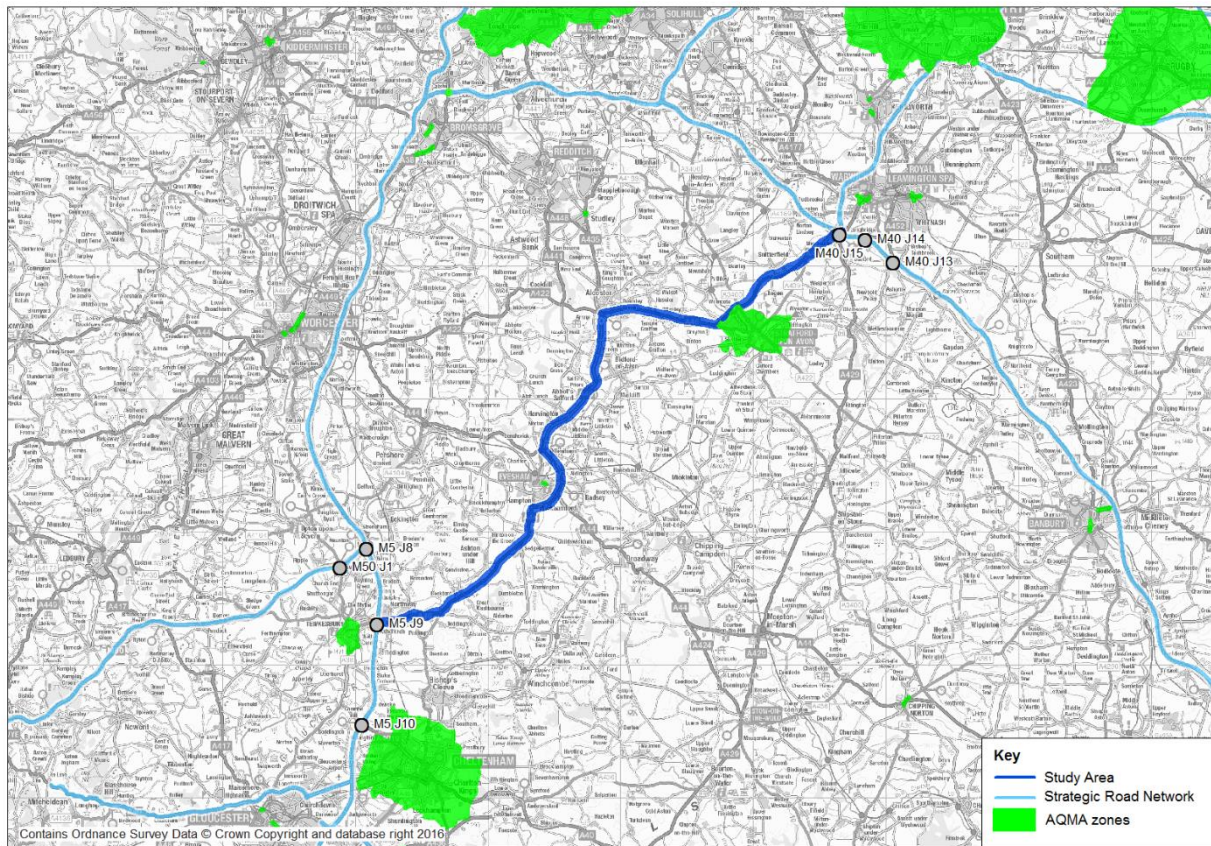


Figure B2: NIA areas

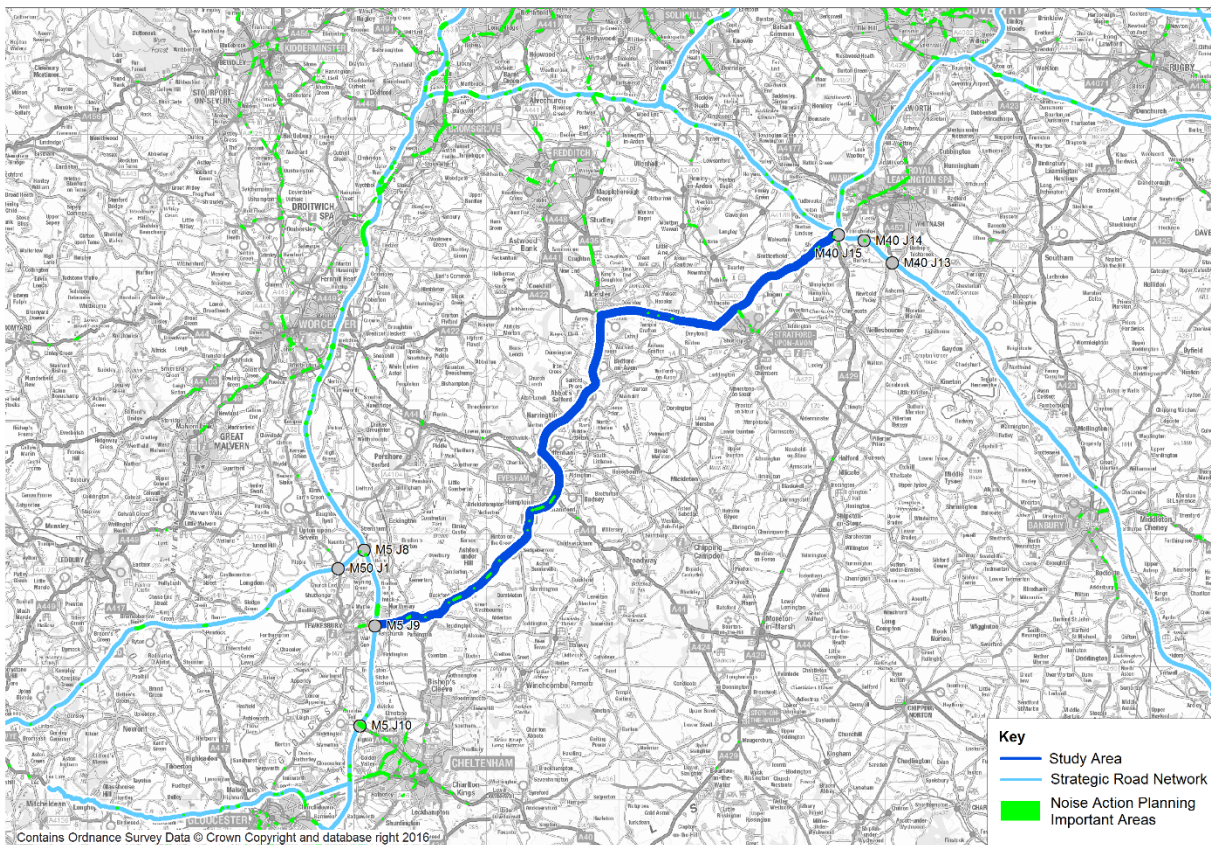


Figure B3: Accident locations (from STATS19 data 2013-2015)

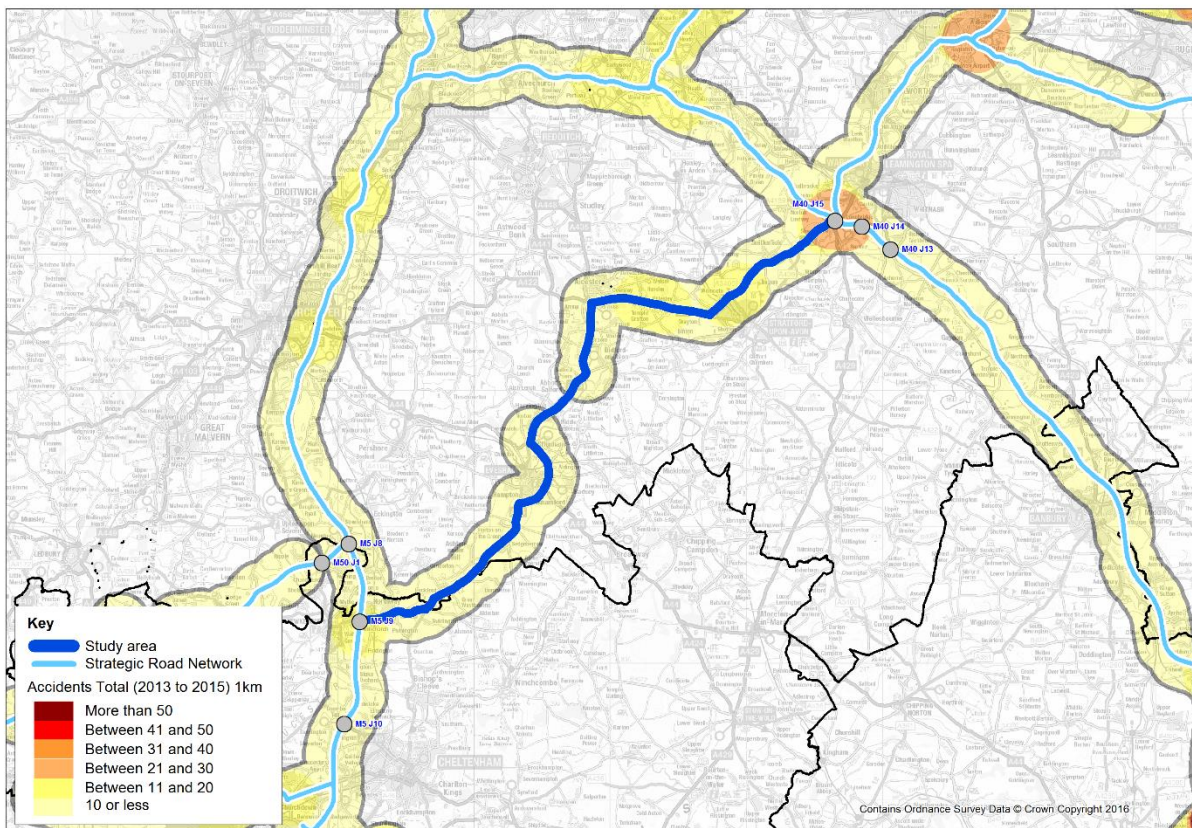
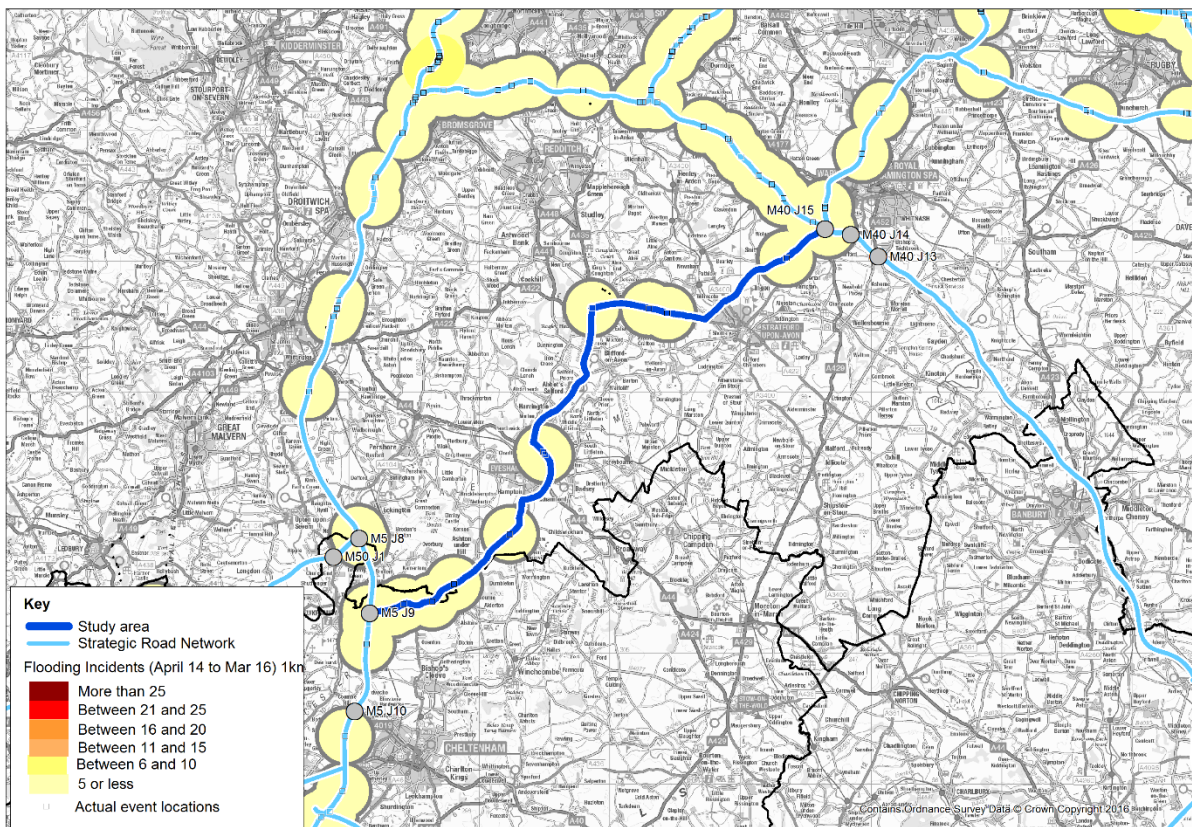


Figure B4: Flooding Incidents



Annex C – Future Year Issues from the Stakeholder Evidence Base

Economic Growth	Evidence Ref
<p>Impacts of future growth will exacerbate existing congestion issues. Future developments are being proposed in Ashchurch and Evesham, in addition to a number of others within Warwickshire.</p> <p>Future growth including housing and business developments will increase the demand on the A46, which is likely to worsen the existing congestion problems. The areas most likely to be impacted in this way include:</p> <ul style="list-style-type: none"> • Developments in Ashchurch • Developments in Evesham, including a proposed extension to Vale Business Park 	<p>CMac048 CMac034</p>
A46 between A435 (Alcester) and Stratford is single carriageway which results in delay and collisions. Alleviating congestion on this stretch could alleviate queues and associated collisions on this stretch.	tz054sy
Future growth including housing and business developments will increase the demand on the A46, which is likely to worsen the existing congestion problems.	CMac048 CMac034
Potential to make better use of the A46, enabling wider Midlands movements and providing resilience to the Motorway Box.	tz054sy
Free Flow Network	Evidence Reference
A46 between A435 (Alcester) and Stratford is single carriageway which results in delay and collisions. Alleviating congestion on this stretch could alleviate queues and associated collisions on this stretch.	tz054sy
Future growth including housing and business developments will increase the demand on the A46, which is likely to worsen the existing congestion problems.	CMac048 CMac034
Safety	Evidence Reference
Although research has shown a decrease in collisions on the A46, the majority are rear end shunts caused by congestion. With the anticipated increase in congestion it is likely that collisions may increase.	CMac048
Serviceable Condition	Evidence Reference
No issues identified	
Improved Environment	Evidence Reference
No issues identified	
Accessible and Integrated Network	Evidence Reference
<p>There is current and future demand for NMU crossing points along the A46. At locations including:</p> <ul style="list-style-type: none"> • Between Billesley and Temple Grafton • Between Snitterfield and Black Hill • The southern end of the route in Ashchurch and Evesham 	<p>hp04q8p bm04qwr CMac048</p>
There is also demand for better access to public transport, including a lack of public transport alternatives (both rail and bus) for A46 users especially to the south of Stratford-Upon-Avon and the southern end of the route in Ashchurch and Evesham.	CMac048

Some bus stops along the A46 are currently unmarked and have no designated crossing facilities. In order for the public to use these services they need to be accessible.	
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Annex D - EAST based spreadsheets

Option Assessment Framework Category			Option 1	Option 4	Option 6	Option 7	Option 14	Option 15	Option 17	Option 18
Strategic Fit	Regional and Local	Scale of impact	5	4	4	2	3	4	3	3
		Fit with wider transport and government objectives	4	4	4	4	4	4	4	4
		Fit with other objectives	5	5	5	4	4	5	4	4
	Highways England Objectives	Encouraging economic growth	5	5	5	3	4	5	4	4
		Making the network safer	5	4	4	3	3	5	4	4
		Keeping the network in good condition								
		Supporting the smooth flow of traffic	5	5	5	3	4	5	4	4
		Delivering better environmental outcomes	4	4	4	3	2	2	2	2
		Helping cyclists, walkers and other vulnerable users of the network								
		Improving user satisfaction	4	4	4	3	4	4	4	4
		Achieving real efficiency	5	5	5	4	2	2	4	2
		Economic	Air Quality	Air quality risk	3	3	3	3	5	5
	VFM	Expected "size of the prize" category	1	2	2	4	3	2	3	3
Financial Case	Capital and revenue costs	Outturn cost to implement	1	2	2	1	2	2	2	2
Delivery Case	Delivery Case	Implementation timetable	2	2	2	2	2	2	2	2
		DCD	5	5	1	1	5	5	5	5
		EIA	5	5	1	1	5	5	5	5
		Practical feasibility	4	4	4	4	3	3	1	3

Annex E – Cost Estimation – Scenario Assumptions

This table provides more information of the assumptions used to develop minimum, most likely, and maximum costing scenarios.

Element	Sub Element	Minimum Scenario	Most Likely Scenario	Maximum Scenario
New Signalisation	Partial Gyratory Upgrade	Replacement of Traffic Light Heads	Removal of traffic light heads and poles, re locating existing, additional 2 new light heads and poles, partial upgrade to controller, commissioning	Removal of traffic light heads and poles, re locating existing, additional 4 new light heads and poles, upgrade to controller & software, commissioning
New Signalisation	Full Gyratory upgrade incl. Pedestrian Crossing	Replacement of Traffic Light Heads and a Single Pelican crossing	Removal of traffic light heads and poles, re locating existing, additional 2 new light heads and poles, partial upgrade to controller, commissioning and Toucan crossings at 2 locations on the gyratory	Removal of traffic light heads and poles, re locating existing, additional 4 new light heads and poles, upgrade to controller & software, commissioning and Pegasus crossings at 4 locations on the gyratory including mid-point refuges
New Signalisation	T Junction	Replacement of Traffic Light Heads	Removal of traffic light heads and poles, re locating existing, additional 1 new light heads and poles, partial upgrade to controller, commissioning	Removal of traffic light heads and poles, re locating existing, additional 4 new light heads and poles, upgrade to controller & software, commissioning & re phasing
New Signalisation	Pedestrian crossing	Single Pelican crossing	Toucan crossings at 2 locations on the gyratory	Pegasus crossings at 4 locations on the gyratory including mid-point refuges
New Slips	One Lane + Hard strip	In good ground conditions, road at grade, 100% material available for re use, over the edge drainage to full length of draining edge. No RRS. Road construction 330mm thick, no capping	In moderate to good ground conditions, 50% cut and fill with 50% material available for re use, drainage to full length of draining edge to channel and 300mm inline carrier drain. RRS to half of the length. Road construction 330mm thick, 50% length requires capping	in poor ground conditions, scheme 100% in fill with no material available for re use, ground stabilisation and reinforced earth walls required, drainage to full length of draining edge - channel and 900mm inline attenuation /carrier drain. RRS to the full length. Road construction 330mm thick, 100% length requires capping
New Slips	One Lane + Hard strip	In good ground conditions, road at grade, 100% material available for re use, over the edge drainage to full length of draining edge. No RRS. Road construction 330mm thick, no capping	In moderate to good ground conditions, 50% cut and fill with 80% material available for re use, drainage to full length of draining edge to channel and 300mm inline carrier drain. RRS to half of the length. Road construction 330mm thick, 50% length requires capping. 20% of the edge requires formal retaining structure - RC wall	In poor ground conditions, scheme 100% in cut with no material available for re use - 5% U2 material, drainage to full length of draining edge - channel and 900mm inline attenuation /carrier drain. RRS to the length. Road construction 330mm thick, 100% length requires capping. 80% of the edge requires formal retaining structure - RC wall
Widening of Gyratory	Half a lane	In good ground conditions at grade with 100% material uncontaminated. Replacement of existing Kerb + Gully and associated drainage. New full depth pavement construction but no works to adjoining running surfaces.	In moderate to good ground conditions in fill with 70% material uncontaminated. Replacement of existing Kerb + Gully with combined drainage system and associated drainage. New full depth pavement construction, overlay of surface course to existing running surfaces.	In poor ground conditions in fill with 0% material uncontaminated. Replacement of existing Kerb + Gully with combined drainage system and 900mm attenuation drainage. New full depth pavement construction, plus full depth reconstruction to existing running surfaces. Replacement of Comms.
Widening of Gyratory	Half a lane	In good ground conditions at grade with 100% material uncontaminated. Replacement of existing Kerb + Gully and associated drainage. New full depth pavement construction but no works to adjoining running surfaces.	In moderate to good ground conditions in fill with 70% material uncontaminated. Replacement of existing Kerb + Gully with combined drainage system and associated drainage. New full depth pavement construction, overlay of surface course to existing running surfaces. 20% of edge requires formal retaining structure - Reinforced earth	In poor ground conditions in fill with 0% material uncontaminated. Replacement of existing Kerb + Gully with combined drainage system and 900mm attenuation drainage. New full depth pavement construction, plus full depth reconstruction to existing running surfaces. Replacement of Comms. 50% of the edge requires formal retaining structure - Reinforced earth
Widening of Gyratory	Half a lane	in good ground conditions, road at grade, 100% material available for re use, Replacement of existing Kerb + Gully and associated drainage. New full depth pavement construction but no works to adjoining running surfaces. No RRS. Road construction 330mm thick, no capping	In moderate to good ground conditions in cut with 70% material uncontaminated. Replacement of existing Kerb + Gully with combined drainage system and associated drainage. New full depth pavement construction, overlay of surface course to existing running surfaces. 20% of the edge requires formal retaining structure - RC wall	In poor ground conditions in fill with 0% material uncontaminated. Replacement of existing Kerb + Gully with combined drainage system and 900mm attenuation drainage. New full depth pavement construction, plus full depth reconstruction to existing running surfaces. Replacement of Comms. 50% of the edge requires formal retaining structure - RC wall
Widening to Approaches	Half a lane	In good ground conditions, road at grade, 100% material available for re use, over the edge drainage to full length of draining edge. No RRS. Road construction 330mm thick, no capping	In moderate to good ground conditions, 50% cut and fill with 50% material available for re use, drainage to full length of draining edge to channel and 300mm inline carrier drain. RRS to half of the length of road. Road construction 330mm thick, 50% length requires capping	In poor ground conditions, scheme 100% in cut with no material available for re use - 5% U2 material, drainage to full length of draining edge - channel and 900mm inline attenuation /carrier drain. RRS to the length.

Element	Sub Element	Minimum Scenario	Most Likely Scenario	Maximum Scenario
				Road construction 330mm thick, 100% length requires capping. 80% of the edge requires formal retaining structure - RC wall
Resurfacing	Gyratory & 4 Slips	Overlay of existing surface with 30mm thin surface course	Mill and inlay of existing surface with 40mm thin surface course. 30% of area 60mm binder and 40mm surface course and 10% area Full depth reconstruction, 330mm of bitumen products	Mill and inlay of full depth of pavement construction including sub base renewal. 200mm sub base and 330mm bitumen products
Collector Distributor Lanes	One Lane + Hard strip	In good ground conditions, road at grade, 100% material available for re use, over the edge drainage to full length of draining edge. No RRS. Road construction 330mm thick, no capping	In moderate to good ground conditions, 50% cut and fill with 50% material available for re use, drainage to full length of draining edge to channel and 300mm inline carrier drain. RRS to half of the length. Road construction 330mm thick, 50% length requires capping	in poor ground conditions, scheme 100% in fill with no material available for re use, ground stabilisation and reinforced earth walls required , drainage to full length of draining edge - channel and 900mm inline attenuation /carrier drain. RRS to the verge and RCB splitter island for the full length. Road construction 330mm thick, 100% length requires capping
Collector Distributor Lanes	One Lane + Hard strip	In good ground conditions, road at grade, 100% material available for re use, over the edge drainage to full length of draining edge. No RRS. Road construction 330mm thick, no capping	In moderate to good ground conditions, 50% cut and fill with 80% material available for re use, drainage to full length of draining edge to channel and 300mm inline carrier drain. RRS to half of the length. Road construction 330mm thick, 50% length requires capping. 20% of the edge requires formal retaining structure - RC wall	In poor ground conditions, scheme 100% in cut with no material available for re use - 5% U2 material, drainage to full length of draining edge - channel and 900mm inline attenuation /carrier drain. RRS to the verge and RCB splitter island for the length. Road construction 330mm thick, 100% length requires capping. 80% of the edge requires formal retaining structure - RC wall
Structures	Structures to be demolished	During a 12 hour shut down period of the road, steel structure removed by crane. Limited demolition of bank seat foundations	During a 24 hour shut down of the road, composite structure, demolished using traditional plant and equipment, Bank seat foundations and two piers	During a full weekend closure of the road, pre stressed structure requiring hydrodemolition and traditional plant and equipment. RC abutment wall and central carriageway pier including re surfacing and reconstruction of new central reserve
Structures	No of New Major Overbridges	PCC concrete deck with bank seat foundations. Structure is single span and requires no ramps in fill.	Composite bridge deck with bank seat foundations. Structure is single span and includes new approach ramps in fill with standard bank profiles	Pre stressed gateway structure with RC piled abutments, RC wing walls and a central pier. Approach ramps are over steep and require reinforced earth retaining structures
Structures	No. of New NMU Overbridges	Narrow PCC concrete overbridge requiring no access ramps	Steel trussed overbridge with zigzag access ramps and steps, pad foundations	Gateway structure - architectural design in steel, piled foundations and ornate access ramps also on piled foundation
Structures	No. of New NMU underbridges	PCC Bridge deck supported on RC walls, single span, spread foundations. Limited earthworks to approaches. No contaminated material. Structure spans a single carriageway	Composite bridge deck with bank seat foundations. Structure is single span and includes new approach in cut with standard bank profiles, 5% material contaminated U2, structure spans Dual carriageway	Pre stressed structure with RC piled abutments, RC wing walls and multiple piled foundation piers. 10% material contaminated U2, structure spans rail or river / floodplain
Structures	No. of New Major Underbridges	PCC Bridge deck supported on RC walls, single span, spread foundations. Limited earthworks to approaches. No contaminated material. Structure spans a single carriageway	Composite bridge deck with bank seat foundations. Structure is single span and includes new approach in cut with standard bank profiles, 5% material contaminated U2, structure spans Dual carriageway	Pre stressed structure with RC piled abutments, RC wing walls and multiple piled foundation piers. 10% material contaminated U2, structure spans rail or river / floodplain
Structures	No. of Widened Overbridges	Pier protection to the abutment	Pier Protection to the central piers (infill) and abutments	Temporary propping / jacking of structure, demolition of abutments and piers, reconstruction in widened location
Structures	No. Widened Underbridges	Widening of PCC structure, demolition of deck, laying new PCC beam on existing abutment and re construction of surface and edge using PCC Parapet, Single short span	Widening of composite structure, hydrodemolition of deck, extension of steelwork from existing beams, reformation of stitched bridge deck, parapet and finishes. Single span underbridge	Widening of pre stressed structure requiring hydrodemolition of existing edge, extension of abutments, new piers and stitching to existing structure.
Structures	No. Widened NMU Overbridges	Pier protection to the abutment	Pier Protection to the central piers (infill) and abutments	Temporary propping / jacking of structure, demolition of abutments and piers, reconstruction in widened location
Structures	No. Widened NMU Underbridges	Widening of PCC structure, demolition of deck, laying new PCC beam on existing abutment and re construction of surface and edge using PCC Parapet, Single short span	Widening of composite structure, hydrodemolition of deck, extension of steelwork from existing beams, reformation of stitched bridge deck, parapet and finishes. Single span underbridge	Widening of pre stressed structure requiring hydrodemolition of existing edge, extension of abutments, new piers and stitching to existing structure.

Element	Sub Element	Minimum Scenario	Most Likely Scenario	Maximum Scenario
Structures	No of New Major Overbridges	PCC concrete deck with bank seat foundations. Structure is single span and requires no ramps in fill.	Composite bridge deck with bank seat foundations. Structure is single span and includes new approach ramps in fill with standard bank profiles	Pre stressed gateway structure with RC piled abutments, RC wing walls and a central pier. Approach ramps are over steep and require reinforced earth retaining structures
Structures	No. of New NMU Overbridges	Narrow PCC concrete overbridge requiring no access ramps	Steel trussed overbridge with zigzag access ramps and steps, pad foundations	Gateway structure - architectural design in steel, piled foundations and ornate access ramps also on piled foundation
Structures	No. of New NMU underbridges	PCC Bridge deck supported on RC walls, single span, spread foundations. Limited earthworks to approaches. No contaminated material. Structure spans a single carriageway	Composite bridge deck with bank seat foundations. Structure is single span and includes new approach in cut with standard bank profiles, 5% material contaminated U2, structure spans Dual carriageway	Pre stressed structure with RC piled abutments, RC wing walls and multiple piled foundation piers. 10% material contaminated U2, structure spans rail or river / floodplain
Structures	No. of New Major Underbridges	PCC Bridge deck supported on RC walls, single span, spread foundations. Limited earthworks to approaches. No contaminated material. Structure spans a single carriageway	Composite bridge deck with bank seat foundations. Structure is single span and includes new approach in cut with standard bank profiles, 5% material contaminated U2, structure spans Dual carriageway	Pre stressed structure with RC piled abutments, RC wing walls and multiple piled foundation piers. 10% material contaminated U2, structure spans rail or river / floodplain
Structures	No. of Widened Overbridges	Pier protection to the abutment	Pier Protection to the central piers (infill) and abutments	Temporary propping / jacking of structure, demolition of abutments and piers, reconstruction in widened location
Structures	No. Widened Underbridges	Widening of PCC structure, demolition of deck, laying new PCC beam on existing abutment and re construction of surface and edge using PCC Parapet, Single short span	Widening of composite structure, hydrodemolition of deck, extension of steelwork from existing beams, reformation of stitched bridge deck, parapet and finishes. Single span underbridge	Widening of pre stressed structure requiring hydrodemolition of existing edge, extension of abutments, new piers and stitching to existing structure.
Structures	No. Widened NMU Overbridges	Pier protection to the abutment	Pier Protection to the central piers (infill) and abutments	Temporary propping / jacking of structure, demolition of abutments and piers, reconstruction in widened location
Bypass / New Link Road	D3M	Carriageway construction in flat terrain, moderate to good ground conditions with 0.5% of material being classified as U2, 5% being U1A and 100% of suitable material re-useable. Earthworks is a cut and fill balance. Earthwork batters 1:3 RRS to 25% of the verge and TCB to a soft Central Reserve. Balanced drainage solution with over the edge drainage and ditches to balancing ponds. Pavement construction is 0% on capping with 200mm sub base and 330mm bitumen products. No linear comms to the scheme.	Carriageway construction in undulating terrain, moderate to good ground conditions with 2% of material being classified as U2, 10% being U1A and 50% of suitable material re-useable. Earthworks is a cut and fill balance. Earthwork batters 1:3 RRS to 25% of the verge and RCB to a hardened Central Reserve. Balanced drainage solution in linear channel with supporting carrier drainage, attenuation - balancing ponds. Pavement construction is 50% on capping with 200mm sub base and 330mm bitumen products. Linear comms to the scheme.	Carriageway construction in Hilly terrain, poor ground conditions with 5% of material being classified as U2, 20% being U1A and 10% of suitable material re-useable. Earthworks is an un balanced fill, 60% of fill required as import. Earthwork batters 1:2 and 25% of the length requires stabilisation measures. RRS to 100% of the verge and RCB to a hardened Central Reserve. Balanced drainage solution in linear channel with supporting carrier drainage, attenuation -in pipe 900mm. Pavement construction is 100% on capping with 300mm sub base and 330mm bitumen products. Linear comms to the scheme.
Bypass / New Link Road	S2	Carriageway construction in flat terrain, moderate to good ground conditions with 0.5% of material being classified as U2, 5% being U1A and 100% of suitable material re-useable. Earthworks is a cut and fill balance. Earthwork batters 1:3 RRS to 25% of the verge. Balanced drainage solution with over the edge drainage and ditches to balancing ponds. Pavement construction is 0% on capping with 200mm sub base and 330mm bitumen products. No linear comms to the scheme.	Carriageway construction in undulating terrain, moderate to good ground conditions with 2% of material being classified as U2, 10% being U1A and 50% of suitable material re-useable. Earthworks is a cut and fill balance. Earthwork batters 1:3 RRS to 25% of the verge. Balanced drainage solution in linear channel with supporting carrier drainage, attenuation - balancing ponds. Pavement construction is 50% on capping with 200mm sub base and 330mm bitumen products. Linear comms to the scheme.	Carriageway construction in Hilly terrain, poor ground conditions with 5% of material being classified as U2, 20% being U1A and 10% of suitable material re-useable. Earthworks is an un balanced fill, 60% of fill required as import. Earthwork batters 1:2 and 25% of the length requires stabilisation measures. RRS to 100% of the verge. Balanced drainage solution in linear channel with supporting carrier drainage, attenuation - in pipe 900mm. Pavement construction is 100% on capping with 300mm sub base and 330mm bitumen products. Linear comms to the scheme.
New Link Road Associated Junctions	New Link Road Associated Junctions	Grade Separated junction with junction structure being a simply supported PCC underbridge. Structure is single span on RC walls. Approach ramps in cut with standard batter profiles, Ground conditions good with 2% U2 material. Drainage to all ramps being Kerb & gully and associated drainage, drainage to circulatory kerb and gully and associated carrier drainage. RRS to 50% of approach ramps	Grade Separated junction with junction structure being a composite overbridge. Structure is single span on bank seat foundations. Approach ramps on fill with standard batter profiles, Ground conditions good to moderate with 5% U2 material. Drainage to all ramps being channel and associated drainage, drainage to circulatory combined kerb and associated carrier drainage. RRS to 50% of approach ramps	Grade Separated junction with junction structure being a pre stressed overbridge. Structure is multiple span on piled foundations and RC abutments. Approach ramps on fill with steepened batter profiles requiring reinforced earth retaining structures, Ground conditions poor with 10% U2 material. Drainage to all ramps being channel and 900mm

Element	Sub Element	Minimum Scenario	Most Likely Scenario	Maximum Scenario
				attenuation drainage, drainage to circulatory combined kerb and 900mm attenuation carrier drainage. RRS to 100% of approach ramps
New Link Road Associated Junctions	New Link Road Associated Junctions	Grade Separated junction with junction structures being simply supported PCC underbridges. Structure is single span on RC walls. Approach ramps in cut with standard batter profiles, Ground conditions good with 2% U2 material. Drainage to all ramps being Kerb & gully and associated drainage, drainage to circulatory kerb and gully and associated carrier drainage. RRS to 50% of approach ramps	Grade Separated junction with junction structures being composite overbridges. Structure is single span on bank seat foundations. Approach ramps on fill with standard batter profiles, Ground conditions good to moderate with 5% U2 material. Drainage to all ramps being channel and associated drainage, drainage to circulatory combined kerb and associated carrier drainage. RRS to 50% of approach ramps	Grade Separated junction with junction structures being pre stressed overbridges. Structure is multiple span on piled foundations and RC abutments. Approach ramps on fill with steepened batter profiles requiring reinforced earth retaining structures, Ground conditions poor with 10% U2 material. Drainage to all ramps being channel and 900mm attenuation drainage, drainage to circulatory combined kerb and 900mm attenuation carrier drainage. RRS to 100% of approach ramps
New Link Road Associated Junctions	New Link Road Associated Junctions	Grade Separated junction with junction structure being a simply supported PCC underbridge. Structure is single span on RC walls. Approach ramps in cut with standard batter profiles, Ground conditions good with 2% U2 material. Drainage to all ramps being Kerb & gully and associated drainage, drainage to circulatory kerb and gully and associated carrier drainage. RRS to 50% of approach ramps	Grade Separated junction with junction structure being a composite overbridge. Structure is single span on bank seat foundations. Approach ramps on fill with standard batter profiles, Ground conditions good to moderate with 5% U2 material. Drainage to all ramps being channel and associated drainage, drainage to circulatory combined kerb and associated carrier drainage. RRS to 50% of approach ramps	Grade Separated junction with junction structure being a pre stressed overbridge. Structure is multiple span on piled foundations and RC abutments. Approach ramps on fill with steepened batter profiles requiring reinforced earth retaining structures, Ground conditions poor with 10% U2 material. Drainage to all ramps being channel and 900mm attenuation drainage, drainage to circulatory combined kerb and 900mm attenuation carrier drainage. RRS to 100% of approach ramps
New Link Road Associated Junctions	New Link Road Associated Junctions	Grade Separated junction with junction structure being a simply supported PCC underbridge. Structure is single span on RC walls. Approach ramps in cut with standard batter profiles, Ground conditions good with 2% U2 material. Drainage to all ramps being Kerb & gully and associated drainage, drainage to circulatory kerb and gully and associated carrier drainage. RRS to 50% of approach ramps	Grade Separated junction with junction structure being a composite overbridge. Structure is single span on bank seat foundations. Approach ramps on fill with standard batter profiles, Ground conditions good to moderate with 5% U2 material. Drainage to all ramps being channel and associated carrier drainage. RRS to 50% of approach ramps	Grade Separated junction with junction structure being a pre stressed overbridge. Structure is multiple span on piled foundations and RC abutments. Approach ramps on fill with steepened batter profiles requiring reinforced earth retaining structures, Ground conditions poor with 10% U2 material. Drainage to all ramps being channel and 900mm attenuation drainage, drainage to circulatory combined kerb and 900mm attenuation carrier drainage. RRS to 100% of approach ramps
New Link Road Associated Junctions	New Link Road Associated Junctions	Roundabout with kerb and gully drainage with associated carrier drainage, no RRS, no splitter islands	Conventional roundabout, combined kerb drainage with associated carrier drainage. RRS to 50% of the gyratory 50% of approaches have splitter islands	Hamburger roundabout. Combined kerb drainage and in pipe 900mm attenuation drainage. Splitter islands to all approaches, central roundabout is raised with chevrons
New Link Road Associated Junctions	New Link Road Associated Junctions	Re lining of the existing carriageway permits the acceleration and deceleration zones. Limited amount of kerb realignment to suit new configuration	Short acceleration / deceleration zone with new kerb and gully drainage, full depth construction of widened carriageway. 50% of existing carriageway in the works area Mill and inlay of surface course	Long acceleration and deceleration zones require retaining solutions, Gabion wall retaining structures. Combined Kerb drainage to new edge, RRS to zones and new full depth reconstruction of 50% of carriageway in the vicinity of the works. Remaining 50% mill and inlay of surface course
Technology	ALR	Smart Motorway to IAN 161, ERAs at grade, re use of 30% of existing superstructures, no superspan structures, no upgrade to existing carriageway edge,	Smart Motorway to IAN 161, ERAs in moderate cut and fill locations, re use of 10% of existing superstructures, Superspan structures for intermediate gantries, all other cantilevered, re use of 20% of existing VMS, upgrade to carriageway edge - 50% length combined kerb drainage, 20% hard shoulder Full depth reconstruction	Smart Motorway to IAN 161, ERAs in moderate cut and fill locations, re use none of existing superstructures, Superspan structures for intermediate gantries & gateways, all other cantilevered, re use of none of existing VMS, upgrade to carriageway edge - 100% length combined kerb drainage, Hard shoulder - full depth reconstruction for length
Technology	CM	Smart Motorway to IAN 161, ERAs at grade, re use of 30% of existing superstructures, no superspan structures, no upgrade to existing carriageway edge,	Smart Motorway to IAN 161, ERAs in moderate cut and fill locations, re use of 10% of existing superstructures, Superspan structures for intermediate gantries, all other cantilevered, re use of 20% of existing VMS, upgrade to carriageway edge - 50% length combined kerb drainage, 20% hard shoulder Full depth reconstruction	Smart Motorway to IAN 161, ERAs in moderate cut and fill locations, re use none of existing superstructures, Superspan structures for intermediate gantries & gateways, all other cantilevered, re use of none of existing VMS, upgrade to carriageway edge - 100% length combined kerb drainage, Hard shoulder - full depth reconstruction for length
Technology	Expressways	Technology only. Upgrade of message signs, ERAs added, new VMS, junction numbering, above ground incident detection, and CCTV at every ERA.	Upgrade D2 with grade separated junction, new technology along length of scheme, inclusion of steel barrier in central reservation where not already in central reservation, plus upgrades in minimum scenario.	Upgrade S2 to D2AP with grade separated junction, new technology along length of scheme, new steel barrier in central reservation to cover entire length, plus upgrades in minimum scenario.
Technology	VMS	Replacement of existing VMS with new MS4 Signage, one new VMS every 5km. No upgrade to existing comms networks	New VMS (MS4) signage to scheme at 2km intervals, new Comms laid in trench for scheme length, 50% of the VMS foundations require retaining solutions	New VMS (MS4) signage to scheme at 1km intervals, new Comms laid in trench for scheme length, 100% of the VMS foundations require retaining solutions

Element	Sub Element	Minimum Scenario	Most Likely Scenario	Maximum Scenario
Technology	MIDAS only	Relaying of MIDAS loops within surface course, reconnection to existing network	Installation of new MIDAS loops, outstations and linear comms every 1km	Installation of RADAR detection MIDAS including outstations and linear comms every 500metres
RCB		RCB to Central Reserve, existing reserve tarmac, drainage required to 20% of length	RCB to Central Reserve, replace soft median with subbase and tarmac surface (100mm), Drainage required to 40% of the carriageway, re use of existing cross carriageway drainage system	RCB to Central Reserve, replace soft median with full depth construction (to enable traffic running)), Drainage required to 60% of the carriageway, in pipe attenuation and new cross carriageway drainage
RBS - Widening	Cost Per Lane for Widening	Symmetrical widening, no works to central reserve, minimum M+I to the remaining carriageway, intermittent and limited verge RRS, Drainage to new edge, no motorway comms or road lighting provision. No widening to structures	Widening including both Symmetrical and Asymmetrical alignment, M+I of the remaining carriageways, replacement of verge drainage & Channel, 50% new Single Sided RRS, new motorway comms. NO widening to structures, No RCB to Central Reserve	Urban trunk road widening scheme, Symmetrical widening through an urban environment. Limited land take necessitates the use of significant retaining and earthwork solutions, and high proportion of FDR to degraded surface, upgrade of drainage both sides with attenuation pipes. Demo of structures and gantries, No RCB on hardened central reserve, No M+I of all existing carriageway, no new structures
RBS - Widening	Cost Per lane for Resurfacing	Resurfacing of half a lane, 30mm thin surface course mill and inlay	Resurfacing of a full lane with 40mm of thin surface course mill and inlay, 25% of the area will be full depth reconstruction (tarmac products only)	Resurfacing of a full lane with 40mm thin surface course and 60mm binder course, mill and inlay. 50% of the area full depth reconstruction 330mm tarmac and 200mm sub base
RBS - Widening	New Centre Hardened Reserve	A 2m wide central reserve with sub base of 150mm, Base and Binder course of 60mm and a thin surface course of 30mm. Earthworks consider 20% of the material to be excavated to be classified as U2, 25 % of the existing drains are to be removed. Formal Drainage channel for 25%. RCB to form Central barrier	A 3.5m wide central reserve with sub base of 200mm, Base and Binder course of 100mm and a thin surface course of 40mm. Earthworks consider 40% of the material to be excavated to be classified as U2, 5% of the volume is for soft spots, filled with imported material, 50 % of the existing drains are to be removed. Formal drainage channel for 50%. RCB to form Central barrier	A 5.0m wide central reserve with sub base of 300mm, Base and Binder course of 280mm and a thin surface course of 40mm (full depth construction). Earthworks consider 60% of the material to be excavated to be classified as U2, 10% of the volume is for soft spots, filled with imported material, 100% of the existing drains are to be removed. Formal drainage channel and in pipe attenuation (900mm) for 75%. RCB to form Central barrier
Structures	No. of Underbridges to be Demolished	Half of structure worked on at a time, steel structure removed by crane. Limited demolition of bank seat foundations	Half a structure worked on at a time, composite structure, demolished using traditional plant and equipment, Bank seat foundations and two piers	Half a structure worked on at a time, pre stressed structure requiring hydrodemolition and traditional plant and equipment. RC abutment wall and central carriageway pier including re surfacing and reconstruction of new central reserve
Structures	No. Bridges requiring Pier Protection	Excavation and formation of foundation for RCB to be laid, 100m of RCB, standard height,	Excavation and formation of foundation for RCB to be laid, 300m of RCB, standard height,	Excavation and formation of foundation for RCB to be laid, 500m of RCB, double height,
Structures	No. Bridges requiring Pier Strengthening	Excavation, formation of foundations, structural concrete infill to bridge pier (2 nr piers, 2m high) extending for 15m	Excavation, formation of foundations, structural concrete infill to bridge pier (2 nr piers, 3m high) extending for 20m	Excavation, formation of foundations, structural concrete infill to bridge pier (2 nr piers, 4m high) extending for 30m
Structures	No. Bridges requiring Abutment Protection	Excavation and formation of foundation for RCB to be laid, 100m of RCB, standard height,	Excavation and formation of foundation for RCB to be laid, 300m of RCB, standard height,	Excavation and formation of foundation for RCB to be laid, 300m of RCB, standard height,
Structures	No. Bridges requiring Parapet Strengthening	Removal and replacement of containment barrier	Structural Modification of existing parapet and total replacement of containment barrier	Demolition of existing parapet edge by Hydrodemolition, stitching on of new strengthened parapet c/w double height containment barrier

Annex F – Regional Coordinator Comments, March 2017

Ref	Source of Comment (name or group)	Date	Report (all or state which)	Page Number (if applicable)	Comment	Date added to tracker
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