A45/A46 TOLLBAR END IMPROVEMENT

FINAL REPORT

VOLUME 1

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A45/A46 TOLLBAR END IMPROVEMENTS

STUDY REPORT

VOLUME 1

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EXECUTIVE SUMMARY

1.0 INTRODUCTION

The Tollbar End Roundabout is a five-way intersection at the junction of:

- A46 Coventry Eastern Bypass which links the A45 to Junction 2 of the M6 to the north
- A45 London Road which links into the M45, 7 miles to the east
- A45 Stonebridge Highway on south side of Coventry connecting to Birmingham.
- Rowley Road / Siskin Drive providing access to Coventry Airport, Middlemarch Business Park and Baginton.
- B4110 London Road towards Coventry

The Tollbar End Improvement has been included in a list of schemes to be progressed alongside the original Target Programme of Improvements (TPI) that resulted from the Government's "A New Deal for Trunk Roads in England". The need for an improvement scheme for Tollbar junction was highlighted in the 1994 "A45 Scheme Identification Study" (SIS).

The aims of the commission were to:

- Identify the problems through a review of existing information and through the Steering Group forum.
- Undertake consultations with interested parties to fully define the problems and identify options for relieving them.
- Develop, assess and appraise measures in accordance with DMRB and GOMMMS guidance for presentation to the Steering Group forum and subsequent consideration by Government Office.
- Develop detailed proposals for taking forward to Public Consultation.
- Make a recommendation on a preferred option.

The commission includes an assessment of the road network in the vicinity of the Tollbar junction, including the A45/A46 Stivichall interchange to the west, and the A45 /A423 junction to the south east. The total length of the study area is approximately 4km.

2.0 SUMMARY OF EXISTING CONDITIONS

Interim improvement works at Tollbar junction were completed in June 2000 to signalise the junction. Traffic signal control is provided on three of the entries, these being both the A45 approaches and the A46 approach.

Controlled pedestrian facilities are provided at:

- A45 London Road entry and exit to junction.
- A45 Stonebridge Highway entry and exit to junction.
- A46 Coventry Eastern Bypass entry and exit to junction.
- Route through the island linking both A45 approaches.

Approximately 2½ km to the west of the Tollbar junction is the three level grade-separated A45/A46/A444/Leaf Lane junction. The interchange is a five-arm roundabout with an A46 to A444 underpass and an A45 east to west flyover. Pedestrian footbridges are provided linking Leaf Lane with Howes Lane and the A45.

The study area contains a mixture of land uses including:

- Residential/education areas to the north of the Tollbar junction and west of the Stivichall Interchange.
- Employment areas of Peugeot Ryton, Jaguar Whitley, Middlemarch Business Park, Coventry Airport and Stonebridge Industrial Estate.
- Retail at the Orchard Retail Park.
- Coventry Airport.
- Green space/recreational areas.

The A45, A46 within the study area are all currently Trunk Roads controlled by the Highways Agency. The A423 was de-trunked with effect from May 2001, whereupon Warwickshire became the highway authority. The respective local authorities control all other roads.

3.0 SUMMARY OF EXISTING DATA AVAILABLE AND NEW DATA COLLECTED

The most heavily trafficked routes are the A46 (T) and the A45 (T), with Average Annual Daily Totals (AADT) of over 54,000 vehicles (two way) on the A46 (T) Kenilworth Bypass and over 54,000 vehicles (two way) on the A45 (T) Stonebridge Highway.

The total flow at Tollbar junction is currently around 86000 (AADT), and 8000 vehicles per hour in the peak hours. The interim Tollbar improvement was designed for 2005

plus commitments. The junction appears not to be working as well as predicted in the assessment, probably due to restrained traffic transferring back to the junction after the completion of the Improvement.

Typically, heavy goods vehicles represent 7% of the AM peak traffic, 5% of the PM peak traffic and 8% of 12-hour traffic.

The major movements in the study area are:

- Between the A46 (south) and the A444 at Stivichall Interchange
- Between the A46 south of Stivichall Interchange to/from the A46 Coventry Eastern Bypass via the A45 Stonebridge highway, and
- Between the A46 south of Stivichall Interchange to/from the A45 London Road south of Tollbar junction via the A45 Stonebridge highway.

There are negligible delays on any routes in the off peak periods but delays were evident at the Tollbar End roundabout junction during both the peak periods, particularly the morning peak. Delays were most evident on the A45 (T) approaches and the A46 (T) approach. Delays at other junctions along the routes in the peak hours were sporadic and did not indicate any sustained capacity problems.

There are relatively low numbers of pedestrian/cycle crossing movements within the study area. The largest number of movements is at the Tollbar junction and is attributed to movements between the residential areas to the north of the Tollbar junction and the employment areas located on Rowley Road and Siskin Drive.

There are no significant accident problems at any of the links or junctions that were analysed, with the exception of Siskin Drive and the Stivichall roundabout junction, which have higher than predicted accident rates. The impact of the improvements to the Tollbar End Roundabout junction on highway safety cannot be assessed at this stage due to a lack of available data.

4.0 SUMMARY OF PLANNING, ENVIRONMENTAL AND OTHER FACTORS

- Baseline air quality and noise levels appear to be good.
- Much of the area is designated as Green Belt but is also built up around Tollbar junction, so improvements to Tollbar junction are unlikely to harm the landscape.
- Impact on the River Sowe and Baginton should be minimised.
- Adverse impact to a significant number of properties or community facilities as a result of any road improvements is unlikely.

- Impact on Schedule Ancient Monuments and listed buildings and their settings should be avoided.
- Impact on the three sites of Special Scientific Interest and the Local Nature Reserves should be avoided.
- Mitigation measures for wildlife including Badgers would be required.
- Improvements are unlikely to affect areas of public open space.
- Much of the existing agricultural land is not rated as good.
- Overall levels of pedestrian and cycle activity are low in the area.
- Existing bus provision is poor in the area.

Flight operations at Coventry Airport prohibit a flyover as an option. Further, the flight path envelope for take-off and landing, which encroaches on to Rowley Road needs to be taken into account as part of the scheme design.

5.0 SUMMARY OF DEVELOPMENT OF BASE YEAR AND FORECAST TRAFFIC MODEL

The design year for any future improvement is taken to be 2020.

A45 Stonebridge highway between the Tollbar and Stivichall junctions is likely to exceed its capacity in the 2020 design year. Stivichall interchange will also exceed its capacity.

Two scenarios have been considered, namely low growth and high growth between 2000 (year of survey) and 2020, both with committed development. The detailed assessment of options has been carried out using low growth only.

Committed development includes:

- Jaguar Whitley.
- Coventry Airport.
- Ryton residential.
- Middlemarch Business Park.
- Signalisation of Stivichall Interchange as part of the Jaguar Whitley

The total increase in traffic flow from these commitments represents an increase of over 12% in existing traffic flows. The background low growth in the opening year and design year is 5% and 23%. Committed development traffic has been added to overall traffic growth, resulting in an increase of around 35% on existing traffic. Traffic flows at Tollbar are thus predicted to be of the order of 11,000-12,000 vehicles per hour in the peak hour in year 2020.

6.0 SUMMARY OF ASSESSMENT OF OPTIONS CONSIDERED

The design criteria used for the design options is based on a 50mph speed limit.

- Option 1 (Underpass from A45 Stonebridge Highway to A46 and Tollbar Junction Enlarged) would be over capacity in 2020.
- Option 2 (Underpass from A45 Stonebridge Highway to A45 London Road and Tollbar Junction Enlarged), would be well over capacity in 2020.
- The Option 3 (At-Grade Links Between A45, A46, Siskin Drive) assessment indicates that the Tollbar junction would be well over-capacity in 2020.
- Option 4 (Underpass from Stonebridge Highway to A45 and New A46 Link Along Rowley Road), the 1992 proposal, would be well over-capacity in 2020.
- Option 5 (Loop Road to Tollbar plus Road Closures), is at capacity in the design year.
- Option 6 (Underpass From A45 Stonebridge Highway to A46, Tollbar junction Enlarged, and At-grade Links Between A45, A46, Siskin Drive) would be within capacity in 2020.
- Option 7 (Underpass From A45 Stonebridge Highway to A45 London Road, Tollbar Junction Enlarged, and At-grade Links Between A45, A46, Siskin Drive), would be within capacity in 2020.
- At Stivichall Roundabout some further entry widening and circulatory carriageway widening is proposed on top of that proposed for the Jaguar Whitley proposal to accommodate the predicted Low Growth traffic flows in 2020.

Options 1, 2, 6 and 7 all have grade-separation at both Stivichall and Tollbar junctions. The merge and diverge between Stivichall and A45/A46 Stonebridge Highway require an additional lane to accommodate the predicted weaving traffic flows between the two junctions. In the case of Options 3 and 5, which do not have grade-separation at Tollbar junction, it was proposed that the A45 mainline be reduced to a single lane through Stivichall underpass. The A45 Stonebridge Highway would be retained as a two-lane dual carriageway between Stivichall Interchange and Tollbar junction.

Options 1, 2 and 3 were rejected because the junctions would be congested in Year 2020 and thus failed to fulfil the HA requirements of delivering the capacity for the full design year period. Option 4 was rejected for the same reason but also because it is most damaging in environmental terms.

The following table summarises the environmental impact of the three remaining options:

	Option5	**Option 6**	**Option 7**
Landscape / Visual Impact,	mod adverse	mod adverse	mod adverse
Heritage	mod adverse	mod adverse	mod adverse
Biodiversity	slight adverse	slight adverse	slight adverse
Water Quality and Drainage	mod adverse	mod adverse	mod adverse
Townscape	neutral	neutral	neutral
Journey Ambience	medium	medium	medium.
Noise	net reduction	net reduction	net reduction
Air quality/greenhouse gases	***net reduction***	***net reduction***	***net reduction***
Accessibility	neutral	slight adverse	slight adverse
Integration,	***slight adverse***	***slight beneficial***	***slight beneficial***

For the Public Consultation exercise, Options 5, 6 and 7 were referred to as the Yellow, Green and Purple Options respectively.

7.0 SUMMARY OF PUBLIC CONSULTATION

At the Public Consultation and Exhibition the response rate was relatively poor (7% of those directly targeted). Around 90% thought that there would be a worsening of the traffic problem at Tollbar roundabout in future years and 92% thought that a junction improvement scheme was necessary.

The table below summarises the local preference for each option (in percent):

Option	Percent
Green Option 6	61
Purple Option 7	31
Yellow Option 5	8

It was evident from the additional comments made that:

- The Green Route (Option 6) is the most favoured option.
- The Yellow Route (Option 5) was not generally favoured.
- The link road across Brandon Lane was of concern.

8.0 SUMMARY OF REPORT ON ALTERNATIVE GREEN OPTION (OPTION 8)

A further report on a new option (Option 8, also called the Alternative Green Route) evolved to avoid, or minimise, the concerns raised about the impact of the proposed improvement options on A45 London Road and on Brandon Lane. Option 8, which is based on the Green

Route, removes the link road between the A45 London Road and the A46 Coventry Eastern Bypass.

A traffic assessment of Option 8 was carried out and the report concluded that the improvements would have sufficient traffic capacity up to about year 2016/2017, but not sufficient to accommodate the full 15 year design life to 2020.

The scheme option costs are shown below. It can be seen that the total scheme option costs, including improvements to Stivichall Interchange and A45 Stonebridge Highway, vary from £11.3 million (Option 3) to £34.1 Million (Green Option). Option 8 is estimated to be £21.5 million. The total scheme cost of Option 8, including land, is £25.0 million.

Summary of Cost Estimate of Options (£m)

	OPTION							
	1	**2**	**3**	**4**	**5 (Yellow)**	**6 (Green)**	**7 (Purple)**	**8**
Construction	17.9	13.1	7.8	27.2	10.6	26.4	21.6	21.5
Land	3.1	6.8	3.5	12.4	7.0	6.6	9.9	3.5
Total	21.0	19.9	11.3	39.6	18.0	34.1	32.4	25.0

The scheme economics have been calculated and are summarised below with the results of the economic assessments of the three routes that went forward to public consultation.

Summary of Economic Assessment Results (£m) *

	PVC	**PVB**		**NPV**		**BCR**	
		LG	**HG**	**LG**	**HG**	**LG**	**HG**
Option 5 (Yellow)	17.6	87.0	166.8	63.9	140.9	4.6	9.0
Option 6 (Green)	32.9	103.1	186.9	64.3	143.9	3.0	5.4
Option 7 (Purple)	31.5	108.3	129.0	70.4	88.2	3.2	3.8
Option 8 (Alt Green)	24.1	60.9	127.9	33.9	98.3	2.4	5.1

***** Economic Assessments have been extracted from the revised Economic Assessment Report RT7544/11, dated 29 July 2002.

The accident savings for each of the scheme options is shown in the table below. For comparison purposes, the results of the accident savings for the three routes that went forward to public consultation are also shown.

Summary of Accident Savings (£m) *

	PVB	
	LG	**HG**
Option 5 (Yellow)	-6.4	-7.1
Option 6 ***(Green)***	+2.8	+3.5
Option 7 (Purple)	+2.3	+2.8
Option 8 (Alt green)	+2.0	+2.9

***** Economic Assessments have been extracted from the revised Economic Assessment Report RT7544/11, dated 29 July 2002..

In environmental terms Option 8 (Alternative Green) has the following impact:

Landscape and Visual impact	slight negative.
Heritage of Historic Resources	slight adverse.
Biodiversity	***slight adverse.***
Water Quality and Drainage	slight adverse.
Townscape	neutral.
Journey Ambience	medium.
Noise	net reduction.
Air quality/greenhouse gases	net reduction.

9.0 CONCLUSIONS

Option 6 (Green Option) is considered to be the preferred option in terms of the overall traffic and highway performance of the options. It satisfies best the strategic requirements of the trunk road network in improving the A46 route between the M1 and M40. It has best scope to deliver the requirements of the Brief, and, in environmental terms, is as good as any of the three options presented to the public. Only in economic and cost terms does it perform less well than another option, namely Option 5 (Yellow Option).

Of the three options it is the one that was most preferred by the public. However, there are concerns about the link road between the A45 and A46 (and these concerns are common to all options at public consultation).

Option 8 (Alternative Green) has been considered as a compromise to provide a scheme that can be delivered on a reasonable timescale. It does not have the attributes of the preferred (Green) option in terms of the overall traffic, highway and economic performance, but it is cheaper, and, in environmental terms, it is superior.

10.0 RECOMMENDATION FOR OPTION TO BE TAKEN FORWARD FOR FURTHER DEVELOPMENT

Given that the requirements of the Brief are for a deliverable scheme that satisfies the needs of all parties, it is recommended that Option 8 (Alternative Green) be promoted as the Preferred Option.

1.0 INTRODUCTION

1.1 White Young Green has been commissioned by the Highways Agency to identify deliverable options to improve the congestion and safety problems within the A45/A46 Tollbar End study area in the medium to long-term. The Tollbar End Improvement has been included in a list of schemes to be progressed alongside the original Target Programme of Improvements (TPI) that resulted from the Government's "A New Deal for Trunk Roads in England". The need for an improvement scheme for Tollbar junction was highlighted in the 1994 "A45 Scheme Identification Study" (SIS). The objectives of the commission are defined in the Study Brief as follows:

- Maintain and manage the road network in a cost-effective manner while making the best use of the existing network.
- To consider the effect of traffic growth on the A45 and A46 trunk roads, including the A45 section west of the roundabout to its junction with the A46 (south) and A45/A423 junction to the east.
- To consider alternative solutions. (Note: grade-separation of the A45 & A46 Tollbar roundabout was identified as a solution in the earlier SIS; the flight path leading to the nearby runway at Coventry Airport limits the height of any new works).
- To identify the most promising of these solutions, and develop them using Guidance on Methodology for Multi Model Studies (GOMMMS) leading to the selection for implementation of a preferred scheme.

1.2 The aims of this commission are to:

- Identify the problems through a review of existing information and through the Steering Group forum.
- Undertake consultations with interested parties to fully define the problems and identify options for relieving them.
- Develop, assess and appraise measures in accordance with DMRB and GOMMMS guidance for presentation to the Steering Group forum and subsequent consideration by Government Office.
- Develop detailed proposals for taking forward to Public Consultation.
- Make a recommendation on a preferred option.

1.3 Since being appointed in September 2000, the following work has been carried out:

Commissioning Report

- Setting up and meeting of the Steering Group comprising representatives from Highways Agency (HA), Government Office for West Midlands (GOWM), Coventry City Council (CCC), Warwickshire County Council (WCC), Coventry Chamber of Commerce, Coventry Airport and White Young Green (WYG).
- Submission of Commissioning Report and Quality Plan.

Options Report 1 (WYG Report No. 7544/3

- Review of existing data and identification of data collection needs. Data and documents reviewed included:
  - A45 Trunk Road Stonebridge to Thurlaston: Report on Scheme Identification Study (May 1992), Volume 1 and Volume 2 (drawings).
  - A45 Trunk Road Tollbar End to Stivichall: Environmental Assessment Stage 1 Report (February 1994).
  - A45/A46 Tollbar End Roundabout Proposed Signalisation: December 1998.
  - Carrying out and analysis of traffic surveys. (This is discussed in detail in the Traffic Data Collection Report - WYG Report No. 7544/4).
- Setting up and carrying out of Value Management Workshop which comprised Steering Group members and representatives of Warwickshire Wildlife Trust, Centro, Rugby Borough Council, Warwick District Council, Earl Craven Panel and the Environment Agency.
- Environmental Data Collection.
- Review of geotechnical, structural and environmental issues.
- Identification of problems and constraints in the study area and establishment of possible measures to take forward.

Options Report 2 (WYG Report No. 7544/8)

- Further meetings of the Steering Group.
- Review of the findings, following the Value Management Workshop No. 1.
- Review of data collected to date and further requirements to progress the project. Data and documents collected included:
  - Committed development information from local authorities.
  - A45/A46 Tollbar End Roundabout Proposed Signalisation: December 1998.
  - Topographical survey information adjacent to Tollbar.
  - Services information from the statutory undertakers.

- Preparation, calibration and validation of a SATURN traffic model to model base year flows. (This is discussed in detail in the Model Validation Report - WYG Report No. 7544/6).

- Preparation of SATURN model forecast year traffic flows for opening year of 2005, and design year of 2020. (This is discussed in detail in the Forecasting Report - WYG Report No. 7544/7).
- Traffic and economic assessment of possible options. (This is discussed in detail in the Economic Assessment Report - WYG Report No. 7544/11).
- Review of geotechnical, structural issues.
- Environmental assessment of possible options including, as far as possible, walkover surveys of the areas likely to be impacted upon.
- Evaluation of scheme options to take to Value Management Workshop No. 2.
- Identification of options to take to Public Consultation.

Public Consultation (WYG Report No. 7544/14)

- Description of the nature of the choice offered to the public.
- Documentation of the details of the alternative schemes that were presented.
- Record and interpretation the response received.

Option 8 Report (WYG Report No. 7544/15)

- Full assessment of Option 8 on the same lines as the Options Report 2.
- Consultation with main stakeholders and statutory consultees.

1.4 The following sections summarise the findings of those reports in chronological order.

2.0 SUMMARY OF EXISTING CONDITIONS

2.1 Introduction

2.1.1 The study area is shown on Figure 1. The total length of the study area is approximately 4km.

2.1 Study Area

2.2.1 Tollbar End Roundabout

The Tollbar End Roundabout is a five-way intersection at the junction of the A46 Coventry Eastern Bypass/A45 London Road/Rowley Road/A45 Stonebridge Highway and B4110 London Road. The A46 Coventry Eastern Bypass links the A45 to Junction 2 of the M6 to the north of the Tollbar End Roundabout, providing a route to the M69. The M6 connects directly to the M1 to the east and the northern areas of Birmingham to the west. The A45 London Road to the east links into the M45 some 7 miles from the Tollbar End Roundabout, which in turn connects to the M1 Junction 17. The A45 to the west loops around the southern side of Coventry and connects to the centre of Birmingham. The B4110 London Road leads northwest to Coventry City Centre. Rowley Road leads southwest providing access to Coventry Airport, Middlemarch Business Park and Baginton.

Works were completed in June 2000 to signalise the junction. Traffic signal control is provided on three of the entries these being both the A45 approaches and the A46 approach.

Controlled pedestrian facilities are provided at:

- A45 London Road entry and exit to junction.
- A45 Stonebridge Highway entry and exit to junction.
- A46 Coventry Eastern Bypass entry and exit to junction.
- Route through the island linking both A45 approaches.

2.2.2 Stivichall Interchange

Approximately 2½ km to the west of the Tollbar junction is the three level grade-separated A45/A46/A444/Leaf Lane junction. The interchange is a five-arm roundabout with an A46 to A444 underpass and an A45 east to west flyover. Pedestrian footbridges are provided linking Leaf Lane with Howes Lane and the A45.

2.2.3 Rowley Road/Siskin Drive

Immediately adjacent to the main Tollbar End junction is a smaller roundabout connecting Rowley Road and Siskin Drive. It is located to the south west of the A45/A46 roundabout, linked by a three lane dual carriageway approximately 30 metres in length. Siskin Drive provides access to Coventry Airport and the Middlemarch Business Park.

2.2.4 A45/A423 Interchange

To the south east of the Tollbar End junction, approximately 1 km away, is the A45/A423 Interchange and roundabout junction linking the A423 and A45 slip roads with the Peugeot Motor Company plant, a major employment site in the area.

2.2.5 A46 Coventry Eastern Bypass

The A46 is a primary distributor link between the A45 on the southern side of Coventry, and the M6 and M69 to the north east of the city. The road is a dual carriageway, each carriageway approximately 7.3 metres wide, with a number of junctions along the link that provide access into the City Centre and surrounding areas. The carriageways are separated by a solid central reserve with barriers. A “left out only” road joins the A46 Coventry Eastern Bypass southbound carriageway 50 metres north east of Tollbar End junction. This road provides an egress for 12 dwellings located to the east of the A45, London Road.

2.2.6 A45 London Road

This road is a major Trunk Road that acts a primary link between the M45/M1 Junction 17 and Birmingham. The A45 is a dual carriageway of 7.3m width. High-level street lighting is provided along this road. A petrol filling station and Toyota / Lexus dealership is located some 150 metres southeast from the Tollbar End Roundabout with direct access onto the A45 London Road. Access to the garage is by means of a “left in, left out” arrangement. A similar arrangement is located on the opposite carriageway for the petrol filling station. A “left in only” approach to the 12 dwellings mentioned in paragraph 2.2.5 is located some 90 metres from the exit of the roundabout on the A45 London Road.

2.2.7 Siskin Drive

Siskin Drive provides access to the Middlemarch Business Park, which comprises a number of industrial units (B2/B8), and offices (B1) on land adjoining Coventry Airport. Coventry Airport is also accessed via Siskin Drive.

2.2.8 Rowley Road

Running parallel to the A45 is Rowley Road, which links Siskin Drive to the B4115. This section of Rowley Road is single carriageway and serves the Stoneleigh trading estate and Baginton village. The road is a 7.3m wide single carriageway.

2.2.9 A45 Stonebridge Highway

This link forms the western section of the A45 between Tollbar End junction and Birmingham. The A45 is a two lane 7.3m wide dual carriageway. High-level street lighting is provided along this road. A footway/cycleway is provided on both sides of the road.

2.2.10 B4110 London Road

The B4110 links Tollbar junction into Coventry. In the vicinity of the Tollbar End Roundabout, the road is surrounded by a mixture of residential, retail and employment land uses. There are a number of garages on the western side of the road and a major new retail park (Orchard Retail Park) to the east. The remaining land is residential. The road is 10 metres wide with footways on either side. A bus stop and shelter are located on the north eastern side of the road 60 metres from the roundabout. A pedestrian crossing with refuge island is located on London Road close to the bus stop.

2.2.11 A423

The A423 between the Peugeot access and the A445 junction is a single carriageway road.

2.2.12 Speed limits within the study area are shown on drawing number P/7544/35/01/018.

2.2.13 The study area contains a mixture of land uses including:

- Residential/education areas to the north of the Tollbar junction and west of the Stivichall Interchange.
- Employment areas of Peugeot Ryton, Jaguar Whitley, Middlemarch Business Park, Coventry Airport and Stonebridge Industrial Estate.
- Retail at the Orchard Retail Park.
- Coventry Airport.
- Green space/recreational areas.

Existing land uses are shown on drawing number P/7544/35/01/019.

2.2.14 The study area lies within several Local Authority boundaries as shown on drawing number P/7544/35/01/020.

2.2.15 The A45, A46 within the study area are all currently Trunk Roads controlled by the Highways Agency. The A423 was de-trunked with effect from May 2001, whereupon Warwickshire became the highway authority. The respective local authorities control all other roads.

3.0 SUMMARY OF EXISTING DATA AVAILABLE AND NEW DATA COLLECTED

3.1 Introduction

3.1.1 The traffic surveys were carried out following an initial review of existing traffic data. The data collected included:

- Automatic Traffic Counts (ATC).
- Data from Permanent Automatic Traffic Counters.
- Classified Junction Turning Counts.
- Registration Plate Surveys.
- Journey Time Surveys.
- Queue Length Surveys.
- Pedestrian Movement Counts.
- Accident Analysis.

3.2 Summary of Motorised Traffic

3.2.1 The most heavily trafficked routes are the A46 (T) and the A45 (T), with Average Annual Daily Totals (AADT) of over 54,000 vehicles (two way) on the A46 (T) Kenilworth Bypass and over 54,000 vehicles (two way) on the A45 (T) Stonebridge Highway. Details of the annual average daily traffic are shown on drawing number P/7544/35/1/002.

3.2.2 The total traffic flow into the Tollbar junction, which is shown in detail on drawing number P/7544/35/01/003, is around 8,000 vehicles per hour in the peak hours. The Tollbar improvement completed last year was designed for 2005 plus commitments. The total flow at the junction is already close to the predicted 2005 flows. Furthermore, traffic flows on the A45 (east of Tollbar) have already exceeded the predicted 2005 flows in the AM peak hour. This is probably due to traffic restraint at the junction prior to the junction capacity improvement. The junction appears not to be working as well as predicted in the assessment. (ie. the junction capacity may have been over-estimated).

3.2.3 The hourly trends for all the ATC sites indicate that the morning peak hour is 08:00 to 09:00 and the evening peak hour is 17:00 to 18:00. The hour 10:00 to 11:00 was chosen to be representative of the inter peak hour. The hourly profile is typical of most urban areas.

3.2.4 Average monthly (two way) flow between 1997 and 1999 indicate that typically the peak months are March, July, September and October, with the lowest flows occurring in January, February and December. This profile is representative of typical monthly trends, although the flows in July are somewhat higher than would normally be expected.

3.2.5 Comparison of the annual traffic growth with figures from the NRTF 1997 growth forecasts shows that between 1997 and 1998 growth occurred at a rate comparable to central growth forecasts, whereas between 1998 and 1999 actual growth was in accordance with low growth forecasts. The average growth over the two year period was 0.91% per annum.

3.2.6 Analysis of the average monthly flows during 1999 revealed that the monthly total of two way flow for October 1999 was within approximately 1% of the average monthly flows for the year. This suggests that carrying out traffic surveys in October 2000 should give reasonable figures for the full year in this area.

3.2.7 Classified 12 hour counts were carried out at 11 junctions. Typically heavy goods vehicles represent 7% of the AM peak traffic, 5% of the PM peak traffic and 8% of 12 hour traffic. The largest percentage of HGV's (14.1% of 12 hour traffic) was recorded at the Siskin Drive/Rowley Road junction, due to the industrial nature of the area.

3.2.8 Comparison of the manual turning counts with the ATC data shows that the manual counts are representative of a typical daily sample. The manual counts confirmed that the major routes in the area are the A45 (T) Stonebridge Highway and A46 (T) and that the peak hours are 08:00 to 09:00 and 17:00 to 18:00.

3.2.9 Registration plate surveys were carried out between 07:00 and 19:00 on Tuesday 17 October 2000 in order to determine origin and destination of the travel patterns within the study area. Information from the registration plate surveys and classified counts have been used to derive Origin-Destination (OD) matrices for the AM peak (0800-0900), inter peak (1000-1100), PM peak (1700-1800) and 12 hour (0700-1900).

3.2.10 The desire line drawings prepared based on these matrices demonstrate that the major movements in the study area are:

- Between the A46 south of Stivichall Interchange to/from the A444.
- Between the A46 south of Stivichall Interchange to/from the A46 Coventry Eastern Bypass via the A45 Stonebridge highway, and

- Between the A46 south of Stivichall Interchange to/from the A45 London road south of Tollbar junction via the A45 Stonebridge highway.

3.2.11 Journey time surveys indicated that there are negligible delays on the routes surveyed in the off peak periods. However, delays were evident at the Tollbar End roundabout junction during both the peak periods, particularly the morning peak. Delays were most evident on the A45 (T) approaches and the A46 (T) approach.

3.2.12 Although some delays were experienced at other junctions along the routes in the peak hours, these delays were sporadic and did not indicate any capacity problems at the remaining junctions within the study area. The surveys revealed that the most congested period surveyed was the morning peak, with average journey times being longer for this time period than the other periods surveyed.

3.2.13 Manual queue length surveys, supplemented by further on site surveys, were carried out during the morning and evening peak periods at the Tollbar junction and Stivichall junctions. Severe queues were experienced on the A45 London Road approach to the Tollbar End Junction in the morning peak hour with queue lengths stretching beyond the junction with the A423, creating further queues on the A423 slip road for vehicles trying to enter the A45. These queue length observations, which are supported by the results of the journey time surveys, are primarily due to traffic volumes on the A45 London Road and A46 Coventry Eastern Bypass.

3.2.14 Queues and delays were encountered on the A46 Coventry Eastern Bypass approach to Tollbar roundabout in both peak periods, although the queues were of insufficient length to cause further queues or delays on the local highway network. The results of the journey time surveys confirm that delays are experienced on this approach during the peak periods.

3.2.15 It was noted from site observations that queues on the B4110 London Road blocked back beyond the roundabout junction with the Orchard Retail Park, creating delays at this junction, particularly in the evening peak period.

3.2.16 The surveys show that there are no problems with queuing on any of the approaches to the Stivichall roundabout junction in either of the peak periods. This is confirmed by the journey time survey results.

3.3 Pedestrian/Cyclists

3.3.1 Pedestrian/cycle counts were carried out between 07:00 and 19:00 at the same locations as the traffic counts. The surveys were undertaken to establish the main pedestrian/cycle routes within the area and where the main catchment areas for pedestrians are. The survey shows that there are relatively low numbers of pedestrian/cycle crossing movements within the study area. The largest number of movements is at the Tollbar junction and is attributed to movements between the residential areas to the north of the Tollbar junction and the employment areas located on Rowley Road and Siskin Drive.

3.4 Accidents

3.4.1 Personal Injury Accident data was obtained for the study area from WS Atkins, Warwickshire County Council and the West Midlands Joint Data Team for the time period between 1 January 1995 and 31 December 1999. However, data for the section of the A45 Trunk Road at the Tollbar End Roundabout junction was only available up to June 1999 and therefore the accident statistics for 1999 are incomplete.

3.4.2 There are no significant accident problems at any of the links or junctions that were analysed, with the exception of Siskin Drive and the Stivichall roundabout junction, which have higher than predicted accident rates. The impact of the improvements to the Tollbar End Roundabout junction on highway safety cannot be assessed at this stage due to a lack of available data.

3.5 Traffic Capacities

3.5.1 Link capacities for the urban roads within the study area were calculated in accordance with DRMB Advice Note TA 79/99 “Traffic Capacity of Urban Roads”. The results for the base year (2000), opening year (2005) and design year (2020) are shown in Tables 1a, 2a and 3a respectively. The capacity and flow figures shown are one-way hourly flows. The hourly link flows in the opening and design years were derived by applying NRTF central growth factors to the base year flows.

3.5.2 The ratio of flow to capacity figures in each table shows that all of the urban road links operate within capacity in the base, opening and design years, with the exception of the B4110 London Road, north of Tollbar junction, and the A45 (T), east of Stivichall Interchange, which both would operate over capacity in the design year (2020).

3.5.3 Link capacities for the rural roads within the study area were assessed in accordance with DMRB Advice Note TA 46/97 "Traffic Flow Ranges for Use in the Assessment of New Rural Roads". The Congestion Reference Flow (CRF), an estimate of the AADT flow at which a carriageway is likely to be "congested" in the peak periods on an average day, was calculated in accordance with Annex 4 of TA 46/97.

3.5.4 The comparison of AADT with CRF figures for each link in the base, opening and design years are shown in Tables 1b, 2b and 3b and Table 4 respectively. Applying NRTF central growth factors to the base year flows derived the figures for the AADT's in the opening and design years. The ratio of flow to CRF figures in each of the tables shows that all the rural road links within the study area operate within capacity in the base, opening and design years.

3.5.5 The CRF is a measure of the performance of a road link between junctions whilst the urban link capacity acknowledges that the capacity of junction is the major determination of link capacity. Therefore the capacities of the study area junctions have been assessed.

3.5.6 Capacity calculations for the years 2000 and 2005 were carried out for the Tollbar End Roundabout junction by W S Atkins Consultants Limited in December 1998 as part of their study into the proposed signalisation of the junction. The results indicated that the current signalised junction would operate within capacity in 2000 and will be at capacity in 2005. Results from the traffic surveys indicate that the junction is at capacity in 2000, which affects the link capacity of the A45 south, A423 and A46 Coventry Eastern Bypass.

3.5.7 Stivichall Interchange currently operates well within its capacity. The capacity of the proposed signalisation of this junction will be presented once the Highways Agency/Coventry City Council provides data on the proposed scheme.

3.5.8 Rowley Road/Siskin Drive roundabout has been assessed, using ARCADY, for the base year (2000), opening year (2005) and design year 2020. Central growth was applied to base flows to derive 2005 and 2020 flows. The results indicate that the junction will operate well within capacity. However, this assessment does not take into account the interaction with Tollbar junction for which the traffic surveys indicate that queues currently block back close to this junction in the AM peak and therefore as congestion increases at the Tollbar junction the operation of this junction will be affected.

3.5.9 The A423/Peugeot access roundabout has been assessed, using ARCADY, for the base (2000), opening (2005) and design year 2020. Central growth was applied to base flows to derive 2005 and 2020 flows. The results indicate that the junction will operate well within capacity. However, queues in the AM peak from the Tollbar junction are close to blocking back to this junction and therefore as congestion increases at the Tollbar junction the operation of this junction will be affected.

4.0 SUMMARY OF PLANNING, ENVIRONMENTAL AND OTHER FACTORS

4.1 Introduction

This section presents a summary of the results from the environmental assessments carried out for the study to identify environmental problems and constraints.

4.2 Air Quality Assessment

An initial assessment of local air quality problems and constraints was carried out in the Options 1 Report, and this was updated in the Options 2 Report. Details of existing air quality will be covered in Section 6.14.

4.3 Noise Assessment

An initial assessment of noise issues was carried out in the Options 1 Report, and this was updated in the Options 2 Report. Details of existing noise will be covered in Section 6.14.

4.4 Landscape Character and Features

4.4.1 Details of the Landscape features are shown on drawing number P/7544/35/01/030. No part of the study area is of intentional, national or regional value in landscape terms. The interest of the area is thus at a local level, where combinations of landform, land cover and characteristic features make one part of the area different to another.

4.4.2 The majority of the study area is urbanised, dominated by buildings on the southern outskirts of Coventry, the busy A45 and A46 trunk roads and intersections, the Peugeot/ Citroen car plant, the Middlemarch Business Park, Coventry Airport and trading estates. Two settlements lie within the study area, Baginton in the west and Ryton-on-Dunsmore to the east.

4.4.3 Despite this largely urbanised character, most of the study area lies within the West Midlands/Warwickshire Green Belt to the south of (and extending into) Coventry. This defines the open nature of the landscape, considered important to the setting of the City and to prevent its sprawl further south. Dominating features within the area including Stivichall junction, Coventry Airport and the Peugeot car plant lie within the Green Belt. Dominating features such as the Tollbar End junction, the Middlemarch

and Stoneleigh Business Parks and Ryton-on-Dunsmore to the east are excluded from the Green Belt.

4.4.4 Given the nature of land uses, which already lie within the Green Belt, any improvements to the A45/A46 are unlikely to be inappropriate or harmful to it.

4.4.5 Little evidence remains of the former agricultural use of the land although occasional remnants of gorse and healthy vegetation can be found, particularly in roadside verges. The area to the east of the Tollbar End junction is more arable, and there are no known characteristics that require particular consideration or protection. Road improvements may offer the opportunity for minor enhancement of these characteristics through appropriate highway corridor vegetation and strengthening of hedgerow boundaries.

4.4.6 The River Sowe is an important feature running through the City and around the western part of the study area. The setting of Baginton, on high ground above the River Sowe, is relatively undisturbed and worthy of protection from harmful development. Topography and existing land uses and features around Baginton would suggest that the only possible route option in this area is on land between the village and the grade- separated junction.

4.5 Visual Impact

4.5.1 The details of the Visual Impact features are shown on drawing number P/7544/35/01/030. Several properties are affected by the existing road layout. Visual impact to some could be reduced by road improvements that decrease the number of vehicles passing close by.

4.5.2 Adverse visual impact to a significant number of properties or important community facilities as a result of road improvements is unlikely. One or two isolated properties to the east of Tollbar End junction, between the A46 and A45/A423 could be affected, but mitigation measures should reduce impact. Similarly, any road improvements are likely to be some distance from houses on the A423.

4.5.3 Properties close to the grade-separated junction to the west of the study area are unlikely to be further affected by any road improvements, unless intervening vegetation is removed. Similarly, properties in Baginton are unlikely to be significantly adversely affected due to distance, intervening vegetation and other land uses on the northern edge of the village.

4.6 Cultural Heritage

4.6.1 The details of the Cultural Heritage sites are shown on drawing number P/7544/35/01/030. There are two statutory protected Scheduled Ancient Monuments in the study area, namely the Roman Fort at the Lunt and Baginton Castle. Direct impact on these through road improvement is unlikely, but improvements should also avoid impact on their setting. In particular, adverse impact to the setting of the Roman Fort at The Lunt, on high ground in Baginton, is possible but should be avoided. Similarly, direct impact and impact to the setting of Listed Buildings should be avoided. Baginton Bridge, the Lunt Cottages and Ryton Bridge are Listed Buildings.

4.6.2 A study of the Sites and Monuments Record has also revealed areas of remaining good Ridge and Furrow. This includes a large area of grassland between Baginton and the grade-separated junction. Although this is a diminishing resource and worthy of conservation for this reason alone, it should not be a constraint to development, which is in the public interest.

4.7 Ecology and Nature Conservation

4.7.1 The details of the Ecology and Nature Conservation areas is shown on drawing number P/7544/35/01/030. There are three statutory protected Sites of Special Scientific Interest (SSSI) and two Local Nature Reserves (LNR) in the study area. Further, there are two potential Regionally Important Geological Sites (RIGS) in the study area. Their location suggests they are unlikely to be affected. There are also a number of non-statutory sites important for nature conservation.

4.7.2 The rivers Avon and Sowe are known to include species protected under The Wildlife and Countryside Act 1981 and Habitats Directive, either within or close to the study area, in particular the native crayfish, water vole and otter. Mitigation measures must be agreed with English Nature to avoid harm to these species and their habitats.

4.7.3 There are a number of known badger setts in the study area, and works to these, if necessary, are strictly licensable by English Nature. Similarly, works likely to affect Great Crested Newts and other amphibians and reptiles will need prior approval from English Nature or the Department of the Environment, Food and Rural Affairs (DEFRA).

4.8 Water and Drainage

4.8.1 The River Avon, River Sowe and Sherbourne Brook are all designated *"main river"* by the Environment Agency. Therefore, any works both permanent and temporary in, over, under or within 8 metres of the top of either bank of the above watercourses require the prior formal consent of the Agency. Any works within the floodplain limits of these watercourses may also require the prior consent of the Agency.

4.8.2 If alterations take place which result in a loss of floodplain storage volumes due to the encroachment of road embankments, then the Agency would require a level for level, volume for volume floodplain compensation scheme. Flood flow routes will also have to be considered. Apart from this there should not be any raising of ground levels within the floodplain.

4.8.3 The A45 also crosses a number of unnamed brooks and streams. These are all designated *"ordinary watercourse"*, and each of their floodplains will need to be considered in the same manner.

4.8.4 The Environment Agency is in general opposed to the culverting of watercourses because of the adverse ecological, flood defence and other effects that could arise. Wherever practical the Agency will seek to have culverted watercourses restored to open channels. However, in certain situations culverting may be unavoidable, such as where roads cross watercourses, and in such cases alternatives such as open span bridges or diversion of the watercourse should be considered. Culverts should be restricted to the minimum necessary, and mitigating environmental enhancements 2included in any proposal.

4.8.5 The Environment Agency has a duty to promote conservation and biodiversity and enhance natural beauty and amenity. This applies to the approval of any formal consents required from the Agency. Consents may therefore be withheld unless conservation requirements are adequately satisfied.

4.8.6 There are a number of statutory and non-statutory sites of ecological interest, and protected species, in the study area. Wherever possible the improvement works should take place within the framework of existing natural features and should not detract from or damage existing wildlife corridors. In this way they will not have a detrimental effect on the character of the river banks or riverside landscape, or which significantly affects the wildlife value of the river corridors.

4.8.7 Any new bridges and significant culverts or break in the river corridor must incorporate safe mammal passes/ walkways together with associated mammal proof fencing to reduce mammal access to carriageways. These should meet with Environment Agency approval.

4.8.8 The area in general is subject to low flow issues in summer. The wetland site at Brandon Marsh in the NE corner of the study area will need to be protected to ensure no alterations in the flow regime occurs. The Environment Agency is concerned with the protection of groundwaters, and in so doing it defines those parts of the aquifers (major, minor and non-aquifer) which are considered to form the catchments to public water supplies (and certain other private supplies) as Source Protection Zones (SPZ). These are subdivided into Inner, Outer and Total Catchment, and relate purely to groundwater flow below the water table. These zones will need protecting from pollution.

4.8.9 Outside the major aquifer the majority of the study area lies on a minor aquifer of high vulnerability.

4.8.10 The Environment Agency require a contamination survey to determine whether the proposed improvement route(s) will encounter contaminated land. If this proves to be the case, a remediation strategy/risk assessment for the proposals will need to be completed.

4.8.11 Any drainage from roundabouts/road junctions should be provided with a pollution trap to enable containment of contaminated water in the event of an accident/spill at these high risk locations.

4.8.12 Given the type of hard surface catchment it is important to recognise the potentially polluting nature of the highway drainage, which may contain environmentally damaging contaminants such as oils, organic matter, or toxic metals etc. It is essential that any proposed highway drainage/storm water discharge to the River Sowe/Avon, is via an appropriate Sustainable Urban Drainage (SUD) system. Ideally this should incorporate retention pools, an element of biological treatment and a means of bunding potential highway pollution arising from normal storm-event ingress or accidental spills etc.

4.9 Land Use

4.9.1 The areas of common land, Public Open Space (POS) and allotments within the study area are shown on drawing number P/7544/35/01/021. This shows that there

are only a few areas of common land and POS within the study area, particularly adjacent to the main road corridors.

4.9.2 The agricultural classification of land within the study area is shown on Drawing No. P/7544/35/01/022. This shows that the majority of the land within the study area is classified by the Ministry of Agriculture, Fisheries and Food as urban or non-agricultural land, with the exception of a parcel of land to the west of Stonebridge Trading Estate, between Rowley Road and the A45 Stonebridge Highway, which is classified as Grade 3a land. The Agricultural Land Classification system has five grades of rating with Grade 3a being rated as good agricultural land.

4.9.3 Existing land uses in the area are shown on drawing number P/7544/35/01/019.

4.9.4 Not shown on this drawing is the full take-off and landing flight path envelope of Coventry Airport, which encroaches over part of Rowley Road on land owned by Exel and Coventry CC. The development of any option, particularly any realignment of Rowley Road will need to consider the current and future requirements of Coventry Airport.

4.10 Pedestrians, Cyclists and Public Transport

4.10.1 The pedestrian and cyclist routes within the study area, as well as the main community facilities, (eg. schools, shops, post offices), are shown on drawing number P/7544/35/01/023. The results from the pedestrian counts and the classified manual traffic counts show that the levels of pedestrian and cycle movements within the area are low. The roads in the study area do not sever residential access from community facilities but do sever communities from recreational facilities.

4.10.2 The Warwickshire Local Transport Plan (LTP) 2000 includes policies that require pedestrian and cyclist audits to be carried out on all changes to the highway network, including improvements (Policies W3 and C2).

4.10.3 Two of the recorded injury accidents at the Tollbar End junction between 1 January 1995 and 30 June 1999 involved cyclists, with no accidents involving pedestrians. Both of the accidents involving cyclists occurred prior to the signalisation of the roundabout. Signalisation of the Tollbar End Roundabout included for the provision of controlled crossings on both the A45 approaches and the A46 approach of the junction and segregated footways/cycleways on each of the approaches.

4.10.4 SUSTRANS are developing a national network of cycle routes, which will include a route that passes north-south across Stivichall Interchange. The scheme is committed to opening by 2005 and will need to be taken into account should any improvements to the junction be proposed. Footbridges are provided at the Stivichall Interchange linking Leaf Lane, Howes Lane and the A45 Stonebridge Highway.

4.10.5 Existing Public Transport services are shown on drawing number P/7544/35/01/024. Frequency of services is very low and is summarised below as:

- Service 539 1 bus every 2 hours (Monday to Saturday daytime only)
- Service 21A 1 bus every 30 mins (Monday to Friday AM & PM peak periods only)
- Service A1 1 bus every hour (Monday to Saturday day time only)
- Service 580 1 bus every hour (Monday to Saturday day time only)
- Service X64 1 bus every 2 hours (Monday to Saturday day time only)

4.11 Summary of Planning Factors

4.11.1 For the purposes of the study the following documents have been referred to:

- Regional Planning Guidance (RPG) for the West Midlands.
- Coventry Development Plan deposit Draft 1998 and Public Local Inquiry changes.
- Warwickshire Structure Plan Deposit draft 1999 and EIP.
- Warwick District Council Local Plan Adopted April 1995.
- Rugby Borough Local Plan Adopted June 1997.
- Warwickshire Local Transport Plan 2000.
- West Midlands Local Transport Plan 2000.

4.11.2 Details of the Planning Factors are shown in Appendix A. The currently proposed land uses are shown on drawing number P/7544/35/01/25. Those with planning permission are:

- Jaguar Whitley employment site.
- Middlemarch Business Park.
- Ryton residential development.
- Coventry Airport expansion.

4.11.3 It was agreed with the HA that the effects of the following developments, which are outside of the study area, will be within the limits of general traffic growth:

- Birmingham Northern Relief Road.
- Marconi Development (M6 Junction 2).
- Cawston Housing.
- Coton Housing (M6 Junction 1).
- M40 Junction 15 Longbridge Roads Based Study.
- M1 Junction 19 Roads Based study.
- BT mast site M1 Junction 18.

4.12 Summary of Geotechnical Factors

4.12.1 This review has indicated that at Tollbar End junction (which is within Mercia Mudstone), a deep excavation would be required to construct any underpass measures. However, excavations are likely to be affected by groundwater flows, which would then affect the stability of excavations. It can be expected that a large amount of Mercia Mudstone would have to be removed.

4.12.2 The site area has not been undermined and no mining related subsidence is expected.

4.13 Summary of Structural Factors

4.13.1 A review of the existing structures has indicated that:

- The majority of significant highway structures that would be affected by improvement schemes are situated in the vicinity of the Stivichall Interchange. Any major modifications for this interchange are likely to have a significant structural impact.
- There are no significant structures at the Tollbar End Roundabout but there are existing bridges within 500m of the roundabout on the A45 to the south and a culvert on the A46 to the east of the roundabout. In particular, there is a major bridge over the River Avon on the A45.
- At the A45/A423 junction to the south of Tollbar End Roundabout, there is a major bridge supporting the A423 slip road, which will constrain any modifications to this junction.
- Any modification to the A444 north of Stivichall Interchange will be constrained by the bridges supporting the access road to the Jaguar Plant.
- Four bridges cross the electrified railway lines in the north-eastern corner of the site and provide constraints on works in this area.

5.0 SUMMARY OF DEVELOPMENT OF BASE YEAR AND FORECAST TRAFFIC MODEL

5.1 Introduction

5.1.1 The Study Area is shown in Figure 1. Two scenarios have been considered, namely low growth and high growth between 2000 (Base year - year of survey) and 2020, both with committed development. The detailed assessment of options has been carried out using low growth only, which is explained in Section 6.

5.2 Committed Development

5.2.1 Committed development includes:

- Jaguar Whitley (102,000 sq m of employment plus other facilities.
- Coventry Airport (terminal buildings to handle 1 million passengers per year).
- Ryton residential (112 dwellings).
- Middlemarch Business Park (22,000 sq m of employment development).

5.2.2 These developments are shown on Figure 2. The total increase in traffic flow from these commitments represents an increase of over 12% in existing traffic flows on the network between Stivichall roundabout and Tollbar roundabout.

5.3 Overall Traffic Growth

5.3.1 Traffic growth has been assessed using TEMPRO 3.1 (the current version at the time of the assessment) for cars and NRTF factors for all other vehicles. The overall normal traffic growth in the opening year and design year is shown in Table 5 below:

Table 5 - NRTF Traffic Growth

	Low	**High**
2005	5%	10%
2020	23%	41%

5.3.2 Committed development traffic has been added to overall traffic growth, resulting in an increase of around 35% on existing traffic. Traffic flows at Tollbar are thus predicted to be of the order of 11,000-12,000 vehicles per hour in the peak hour in year 2020.

5.3.3 Although realistic in national growth terms, this is a very substantial increase in traffic and is likely to cause substantial problems on the local road network outside the remit of this study.

5.4 Traffic Model Development

5.4.1 The first stage of the development of the traffic model comprised the preparation, calibration and validation of a traffic model to model base year flows. This is discussed in detail in the Model Validation Report (MVR – WYG Report No. 7544/6). This has been structured based on Annex H of the Study Brief and follows the guidelines stated in The Design Manual for Roads and Bridges (DMRB) Volume 12a.

5.4.2 Annex H of the brief states the MVR shall serve two broad purposes; first it shall summarise the accuracy of the base data from which forecasts are to be prepared. Second, it shall demonstrate that the model accurately reproduces an existing, independently observed situation. The first of these have been commented upon in the "Traffic Data Collection Report" (WYG Report No. 7544/4). The second item is discussed in detail in the MVR and summarised in the following paragraphs.

5.4.3 The SATURN 10 suite of computer programmes was used to assign the matrices to the Tollbar network. SATURN is a traffic assignment model developed by WS Atkins and The Institute for Transport Studies at The University of Leeds. The network representation is made up of links and junctions and traffic demands enter the network at origins and leave at destinations.

5.4.4 The study area depicting the zoning system is as shown in Figure 3. Zones represent entry/exit points to the network (eg. A45 east, Leaf Lane, etc) or specific land use areas within the study area (eg. Middlemarch Industrial Estate, Coventry Airport, Peugeot factory, etc). The zones are as follows:

- Zone 1 - A46 (south).
- Zone 2 - Howes Lane.
- Zone 3 - A45 (west) eastbound.
- Zone 4 - Leaf Lane.
- Zone 5 - A444.
- Zone 6 - London Road.
- Zone 7 - A46 (east).
- Zone 8 - A45 (south).
- Zone 9 - Peugeot Factory.
- Zone 10 - A423 Oxford Road.

- Zone 11 - Middemarch Industrial Estate/Coventry Airport.
- Zone 12 - Rowley Drive Industrial Estate.
- Zone 13 - Baginton.
- Zone 14 - Brandon Lane.
- Zone 15 - A45 (west) westbound.

5.4.5 The modelled road network is also shown in Figure 3. The network corresponds with the network studied in the "Traffic Data Collection Report". The network as represented in SATURN is shown in Figure 3.

5.4.6 Base year (2000) trip matrices have been derived for three-modelled time periods, namely AM peak hour, PM peak hour and inter peak hour. For the purposes of the model, the matrices were aggregated in the following groups:

- Light vehicles (cars and LGV's).
- Heavy vehicles (OGV1, OGV2 and buses).
- Total vehicles.

5.4.7 The relationship between the simulated and observed trips within the matrix has been shown to have good correlation by the following tests:

- The trip matrix is checked by comparing total flows assigned across screen lines with independent traffic counts (link flow validation).
- Traffic flows assigned to each link and to each turning movement at junctions are compared with traffic counts (turning floor validation).
- Modelled journey times over routes through the study area are compared with mean observed values.
- The models ability to replicate the existing travel pattern in terms of queues and delays is commented upon.

5.4.8 The link flow validation was found to be reasonable since the percentage differences all fall within 10% except in the westbound direction in the off peak hour. The Base Year link flows validation (Figure 4 of the MVR) is reproduced as Figure 4 of this report.

5.4.9 The turning link flow validation was also found to be to be reasonable as the synthesised flows tied within the required statistical boundaries.

5.4.10 Comparison between modelled and observed journey times for the three main routes namely the A45 to A45, A46 to A46 and the A46 to A46 via Rowley Road was carried

out. Generally, they compare well with the delays observed on the journey time surveys. It should be noted that, under congested conditions, delay times increase asymptotically and close correlation between observed and simulated times is almost impossible to achieve. There is only one time which is outside the 15% criteria in both peak hours. The only delay that is consistently under estimated is along the Rowley Road route, on which the total flow is relatively small.

5.4.11 For the queuing pattern validation, the queuing pattern was compared with the observed data. Generally, these compare well with those described in the "Traffic Data Collection Report". It should be noted that the interpretation of a queue is variable - is it stationary vehicles, or vehicles travelling at 5mph or less with a headway of lees than 10 metres, or vehicles travelling at 10mph or less with a headway of less than 15 metres? Correlation is therefore difficult. Again, it should be noted that under congested conditions, queues increase asymptotically, so close correlation is made even more problematic. The fit between observed and simulated is considered reasonably balanced, bearing in mind that the observed queues were maximum queues and modelled queues are average queue lengths.

5.4.12 In summary, the overall quality of the validation of the Tollbar SATURN Model compares favourably and produces a robust comparison with the observed base situation. It can be summarised as follows:

- The SATURN model, has converged to a satisfactory degree within a reasonable and practical number of iterations.
- The validation of the trip matrices against screenline counts meets DMRB Vol12a requirements.
- The correlation between the observed and modelled flows on links throughout the network is very good taking into account the scale and magnitude of the model and that peak hour flows in congested conditions have been used in the validation of the peak period models.
- The correlation between observed and modelled turning movements at key junctions again meets DMRB Vol 12a requirements bearing in mind that this is a very demanding validation criterion for traffic models.
- The model reproduces observed journey times in accordance with the guidelines stated in the DMRB Volume 12a and hence to a satisfactory degree of accuracy, comparable with the journey time data collected.
- The pattern of queues accords reasonably well with the observed queues.

5.5 Forecast Traffic Model

5.5.1 Following the model validation, the future year traffic model was derived to test alternative proposed junction improvements. The forecasts are based on the local model for the years 2005 and 2020. The years represent the anticipated opening and design years of the proposed improvement.

5.5.2 The forecasting work has been carried out in accordance with the requirements of the Design Manual for Roads and Bridges Volume 12a (DRMB12a) and Annex I of the study brief.

5.5.3 The agreed approach has been to apply National Road Traffic Forecasts (NRTF) high growth and low growth factors to all vehicles except cars and to apply National Trip End Model Forecasts (TEMPRO) to cars. The 2000 matrix was segregated into different vehicle classes, ie. cars, LGV, OGV1, OGV2, PSV, etc. based on surveyed percentages. Each vehicle type was then factored independently as follows:

- Cars have been factored using TEMPRO (V3.1) database - average of North Warwickshire, Rugby and Coventry districts.
- The remaining vehicle types have been factored using 1997 NRTF values.

5.5.4 It was further agreed that traffic generated by committed developments, or contained in the Local Plan would be additional to normal traffic growth in the area.

5.5.5 Traffic growth for Zones 4, 5 and 6 (routes to and from Coventry) has been fixed to 10% to reflect the limited scope for traffic growth, given the limited capacity of the network, and the suggested traffic growth in the West Midlands Local Transport Plan of 1% per annum. The remaining growth comes from committed developments referred to above.

5.5.6 Zero traffic growth has been assumed for Zone 11 (Middlemarch Business Park), since there is little or no scope for further traffic growth once the committed development is in place. (Committed development has been taken into account separately).

5.5.7 It was agreed that overall traffic growth for the study should reflect local/national growth rates. Therefore, the reduction in traffic due to reduced growth factors in Zones 4, 5, 6 and 11 would be offset by an increase in traffic by increased traffic growth applied equally to all other zones.

5.5.8 The committed developments identified, which are shown on Figure 2, include Jaguar Whitley with changes to Stivichall junction, Coventry Airport expansion, Ryton on Dunsmore housing, and Middlemarch Business Park expansion.

5.5.9 Trip generation and distribution details for Jaguar Whitley were provided by the Highways Agency. Trip generation and distribution details for the other sites have been derived, and these are shown in Appendix B. No information on the programmed completion of these commitments is available. It has been assumed all the commitments will be operational by 2020 and that 50% will be functional by 2005, the scheme opening year.

5.5.10 The only committed highway improvement is the signalisation of Stivichall Interchange as part of the Jaguar Whitley committed development.

5.5.11 The total number of committed trips for each peak period is as:

- 1607 trips in the morning peak hour.
- 1473 trips in the evening peak hour.

5.5.12 The total traffic growth for the peak periods is as summarised in Table 6. The predicted overall average future year matrix used to assess the Tollbar options is 8.7% higher than NRTF normal growth.

Table 6 - Total Traffic Growth Including Commitments

	NRTF Total Growth		**Modelled Growth**		**% Difference**	
	2000-2005	**2000-2020**	**2000-2005**	**2000-2020**	**2000-2005**	**2000-2020**
Low	1.062	1.247	1.115	1.355	5.0%	8.7%
High	1.113	1.440	1.161	1.535	4.3%	6.6%

5.5.13 The 2005 and 2020 matrices have been assigned to the existing road network. For assessment purposes, the improvements to the proposed network are based on 2020 low growth assumptions. The predicted design year (2020) traffic flows at Tollbar are shown in Figure 5.

6.0 SUMMARY OF ASSESSMENT OF OPTIONS CONSIDERED

6.1 Initial Assessment - Value Management Workshop No. 1

6.1.1 A one-day workshop was held on 24 November 2000. The workshop was facilitated by Capital Value and Risk (CVR) Limited and a separate report was prepared by CVR.

6.1.2 The workshop addressed the following issues:

- Identification of problems.
- Confirmation of study objectives.
- Identification of potential solutions.
- Initial assessment of the solutions.
- Agreement on solutions to take forward and develop.

6.1.2 Appendix C contains extracts from the CVR report, which summarises the workshop findings.

6.1.3 Based on the findings from the Value Management workshop (VM) and subsequent discussions with the Steering Group, the measures taken forward are summarised as follows:

- Do Minimum - Minor improvements to the existing Tollbar junction.
- At-Grade Solutions - Links to relieve Tollbar junction.
- The 1992 Proposal - This is described in Section 6.7.
- Grade-Separation at Tollbar junction - A45 or A46 Underpass.
- Widening of A45 Stonebridge Highway.
- Signalisation and improvement of Stivichall Junction.
- Other Measures - generally non-highway based solutions.

6.2 Non-Highway Based Options

6.2.1 Other measures, generally non-highway based solutions that have been considered are:

- Divert/manage peak hour traffic - spreading the load over the day.
- Stagger Employment centres/school hours.
- Restrict development that increases traffic at Tollbar End, particularly cars.
- Restrain workplace car parking.

- Park and Ride facility located towards Ryton/Peugeot.
- Develop Rail links - City to Peugeot/Airport?
- Expand Bus services - City to Middlemarch/Ryton?
- Restrict local road access to the roundabout.

6.2.2 Whilst action on a number of these may be acceptable and be able to contribute to traffic reduction in the future, it is clear that, alone, they cannot provide a long-term solution.

6.2.3 Further, many of the non-highway based options referred to in Appendix C have been ruled out, since they are outside the scope of the Highways Agency powers and therefore are recommended to the respective Local Authorities for action. One Option (22) has been ruled out, since it is likely to meet with local opposition due to the adverse impact on access to nearby properties.

6.3 Traffic/Highway Design Philosophy

6.3.1 In broad terms, the Tollbar junction requires traffic relief of at least 30% (or 30% increase in capacity, or mixture of relief/capacity improvement) to achieve the "status quo".

6.3.2 It was evident in the review of the work to date and the initial stages of the assessment of the proposed schemes that one of the issues that needed to be addressed was the design speed to be adopted. There are currently a mixture of speed limits in the area, as shown on drawing number 7544/35/01/018. It should be further noted that the A45 400 metres to the west of Stivichall interchange becomes 40mph.

6.3.3 It was agreed that an overall design speed based on a 50mph speed limit would be reasonable. The design criteria used for the design options is therefore based on a 50mph speed limit.

6.3.4 Assessments have been carried out of the proposals promoted in the Options 1 Report. Further options have then been considered because the original options did not achieve the required capacity.

6.3.5 Several junction assessments have been carried out using standard software packages TRANSYT, LINSIG and ARCADY. The results from TRANSYT are quoted in terms of percentage degree of saturation (% degsat). The results from LINSIG are quoted in terms of percentage reserve capacity for the whole junction (%RC). The

results from ARCADY are quoted in terms of Reference Flow Capacity Ratio (RFC). Generally, the assessments try to achieve the following targets:

TRANSYT: 90% degsat or better
LINSIG: 0% RC or better
ARCADY: 0.85 RFC or better

6.3.6 It should be stated at this stage that, as far as the appraisal of junction capacity is concerned, all the options have been tested using low growth traffic predictions only. It was evident from the work that all improvement options considered would be operating at or above capacity in all cases with low growth. Any assessment at high growth would therefore only determine the degree of overload achieved with each option. An estimate of the degree of overload has therefore been estimated based on the low growth appraisal of junction.

6.3.7 An assessment of the A45 Stonebridge Highway (Tollbar and Stivichall junctions) has been carried out. In summary, it was evident that, with low growth traffic flows, the existing slip roads to and from Stivichall interchange on the A45 Stonebridge Highway would be over capacity with only two lanes on the main line A45. Further, the slip roads from any grade separation at Tollbar would also be over capacity with only two lanes on the main line A45. Given the relatively short weaving distance (1.5km) between Stivichall Interchange and Tollbar, all options with Tollbar grade-separated incorporate widening of Stonebridge Highway to 3 lanes in each direction. Options with Tollbar junction at-grade only incorporate a three lane widening from Stivichall to around 1km east of the interchange.

6.4 Option 1 (Underpass from A45 Stonebridge Highway to A46 and Tollbar Junction Enlarged) (Figure 6)

6.4.1 The main benefit of this option is that it removes the major movement (A45/A46 to A46) from Tollbar, which represents up to 30% of the total traffic. Design Year traffic flows are shown on Figure 13.

6.4.2 The underpass radius is 360 metres, so is one step below desirable minimum design standard for 50mph speed limit. This is acceptable within the constraints, provided that forward visibility of 160 metres is achieved, which is sufficient for a route constructed to 50mph.

6.4.3 The underpass is required to be in tunnel for a substantial length to achieve the alignments for the slip road into the (reconfigured) Tollbar junction. Construction is

likely to be difficult and expensive, with traffic management likely to be complicated. Some land is required for the scheme but there does appear to be scope to avoid expensive land and property acquisition.

6.4.4 Since the underpass is in tunnel, there is an opportunity to retain the existing pedestrian/cycle routes across the Tollbar junction.

6.4.5 An assessment of the reconfigured junction at Tollbar has been carried out using the TRANSYT software programme. The results are summarised in Table 7. This indicates that the Tollbar junction would be over capacity in 2020 with low traffic growth. In the AM peak hour, the B4110 London Road and A45 London Road approaches are over-capacity. In the PM peak hour, the London Road approach is over-capacity.

Table 7 - Option 1 - Tollbar Junction Traffic Capacities

Approach	Degree of Saturation	
	AM	**PM**
A45 Stonebridge Highway	82%	64%
B4110 London Road	108%	77%
A46 Coventry Eastern Bypass	***	***
A45 London Road	148%	97%
Siskin Drive	***	***
Rowley Road	***	***

Degrees of saturation denoted with asterisks are Give Ways. The intergreens on the other junctions are set to allow the Give Ways to discharge at capacity.

6.5 Option 2 (Underpass from A45 Stonebridge Highway to A45 London Road and Tollbar Junction Enlarged) (Figure 7)

6.5.1 It removes the second major movement (A45/A46 to A45) from Tollbar, which represents up to 25% of the total traffic. Design Year (2020) traffic flows are shown on Figure 14.

6.5.2 The route is in accordance with desirable minimum design standards for 50mph speed limit.

6.5.3 The route would pass beneath the new bridges, which could be designed to incorporate the existing pedestrian/cycle routes across the Tollbar junction, albeit on a revised alignment. Construction is likely to be difficult, with a severe impact on the

operation of the junction. There is scope to avoid expensive property acquisition is limited.

6.5.4 An assessment of the reconfigured junction at Tollbar has been carried out and the results are summarised in Table 8. This indicates that the Tollbar junction would be well over capacity in 2020 on most approaches during both peak periods.

Table 8 - Option 2 - Tollbar Junction Traffic Capacities

	AM	**PM**
A45 Stonebridge Highway	108%	105%
B4110 London Road	***	***
A46 Coventry Eastern Bypass	110%	112%
A45 London Road	84%	85%
Siskin Drive	***	***
Rowley Road	***	***

Degrees of saturation denoted with asterisks are Give Ways. The intergreens on the other junctions are set to allow the Give Ways to discharge at capacity.

6.6 Option 3 (At-Grade Links Between A45, A46, Siskin Drive) (Figure 8)

6.6.1 It reduces traffic at Tollbar junction by removing several movements. The volume of traffic removed from Tollbar is dependent on the extent of improvement and can vary from around 20% to 30% with additional restrictions and links. Design Year traffic flows are shown on Figure 15.

6.6.2 This option provides an alternative route between the A46 and A45/A423 east of Tollbar, and would be relatively easy and inexpensive to construct. The issues of impact of a new link are discussed in subsequent sections.

6.6.3 An assessment of the existing junction at Tollbar has been carried out. The results are summarised in Table 9. This indicates that the Tollbar junction would again be well over-capacity in 2020 on all signalised approaches during both peak periods.

Table 9 - Option 3 - Tollbar Junction Traffic Capacities

	AM	PM
A45 Stonebridge Highway	120%	105%
B4110 London Road	***	***
A46 Coventry Eastern Bypass	97%	108%
A45 London Road	120%	111%
Siskin Drive	***	***

Degrees of saturation denoted with asterisks are Give Ways. The intergreens on the other junctions are set to allow the Give Ways to discharge at capacity.

6.6.4 The new junctions on to the network have been assessed and the results are summarised in Table 10. It can be seen that the new junctions on the A45 and A46 are just over capacity in the Design Year.

Table 10 - New Junction Capacities

	AM	PM
A46/Link Road	-9%	8%
A45/Link Road	1%	-5%
Middlemarch/Link Road	.520	.672

6.7 Option 4 (Underpass from Stonebridge Highway to A45 and New A46 Link Along Rowley Road) (Figure 9)

6.7.1 This is the 1992 proposal originally prepared by Rendell Palmer Tritton for the Highways Agency.

6.7.2 It removes the second major movement from Tollbar, but only the A45/A45 movement (not the A46/A45 movement). This option removes only 15% of total traffic from Tollbar. As a result, by inspection of the traffic implications it is evident that traffic at Tollbar junction will be substantially higher than the capacity of the proposed junction. Therefore, no further assessment has been carried out.

6.7.3 Construction is likely to be difficult and would be the most expensive of all options considered. Furthermore, land would be required and there is little scope to avoid expensive acquisition. It was proposed that this option is not proceeded with any further.

6.8 Option 5 (Yellow) (Loop Road to Tollbar plus Road Closures) (Figure 10)

6.8.1 This proposal was not promoted at the Workshop No 1. This promotes the closure of the "side roads" into Tollbar, leaving only A45/A46 traffic through Tollbar junction.

6.8.2 This would remove up to around 35% of traffic from the Tollbar junction. Design Year traffic flows are shown on Figure 16. To operate at maximum overall efficiency links from Tollbar junction into Middlemarch/Rowley Road, and to the B4110 London Road are left open, but the links into Tollbar junction are closed. This simplifies operational problems by removing the uncontrolled movements on to the existing Tollbar junction.

6.8.3 The link between the B4110 and Rowley Road can just be achieved without raising the level of the A45 Stonebridge Highway, by diverting the route to the south to give sufficient length to achieve the standard gradient.

6.8.4 Tollbar junction (existing layout) is at capacity, as summarised in Table 11.

Table 11 -Option 5 (Yellow Option) - Tollbar Junction Traffic Capacities

	AM	**PM**
A45 Stonebridge Highway	77%	81%
B4110 London Road	-	-
A46 Coventry Eastern Bypass	88%	86%
A45 London Road	90%	69%
Siskin Drive/Rowley Road	-	-

6.8.5 The capacity of the new junctions is summarised in Table 12. The proposed A45 traffic signal junction is slightly over-capacity in the AM peak hour. The proposed A46 traffic signal junction is at capacity in both peak hours. The proposed Siskin Drive (Middlemarch) roundabout is well within capacity. The proposed Rowley Road/Siskin Drive roundabout is slightly over capacity but this could be improved with small geometric improvements to the proposed roundabout junction.

Table 12 - Option 5 (Yellow Option) - New Junction Capacities

	AM	**PM**
A46 Link Road	3%	0%
A45 Link Road	-3%	10%
Middlemarch/Link Road Rdbt	0.452	0.691
Rowley Road/Siskin Drive	0.933	0.967

6.9 Option 6 (Green) (Underpass From A45 Stonebridge Highway to A46, Tollbar junction Enlarged, and At-grade Links Between A45, A46, Siskin Drive) (Combined Option 1 and 3) (Figure 11)

6.9.1 This option was derived because Options 1 and 3 did not have sufficient traffic capacity to accommodate the predicted 2020 (Low Growth) traffic flows. The main benefit of this option is that it removes around 50% of the traffic from the at-grade Tollbar junction. Design Year traffic flows are shown on Figure 17.

6.9.2 An assessment of the reconfigured junction at Tollbar is summarised in Table 13. This indicates that the Tollbar junction would be at capacity in 2020 with low traffic growth.

Table 13 - Option 6 (Green Option) - Tollbar Junction Traffic Capacities

Approach	Degree of Saturation	
	AM	PM
A45 Stonebridge Highway	79%	65%
B4110 London Road	86%	75%
A46 Coventry Eastern Bypass	36%	33%
A45 London Road	87%	43%
Siskin Drive	75%	61%
Rowley Road	83%	87%

6.9.3 The results of the assessment of the new junctions are summarised in Table 14. It can be seen that the new junction on the A45 is just over-capacity in the PM peak hour in the Design Year.

Table 14 - Option 6 (Green Option) - New Junction Capacities

	AM	PM
A45 Link Road	9.5%	-2%
Middlemarch/Link Road	0.332	0.671

6.10 Option 7 (Purple) (Underpass From A45 Stonebridge Highway to A45 London Road, Tollbar Junction Enlarged, and At-grade Links Between A45, A46, Siskin Drive) (Combined Option 2 and 3) (Figure 12)

6.10.1 This option was derived because options 2 and 3 did not have sufficient traffic capacity to accommodate the predicted 2020 (Low Growth) traffic flows. This option removes around 45% of the traffic from the at-grade Tollbar junction. Design Year traffic flows are shown on Figure 18.

6.10.2 An assessment of the reconfigured junction at Tollbar are summarised in Table 15. This indicates that the Tollbar junction would be within capacity in 2020 with low traffic growth. The only approach that is in excess of 90% is the A46 westbound approach in the AM peak hour (95%).

Table 15 - Option 7 (Purple Option) - Tollbar Junction Traffic Capacities

Approach	Degree of Saturation	
	AM	PM
A45 Stonebridge Highway	69%	83%
B4110 London Road	84%	66%
A46 Coventry Eastern Bypass	95%	87%
A45 London Road	83%	51%
Siskin Drive	66%	73%
Rowley Road	69%	71%

6.10.3 The results of the assessment of the new junctions are summarised in Table 16. It can be seen that the new junctions on the A45 and A46 are just over capacity in the PM peak hour in the Design Year.

Table 16 - Option 7 (Purple Option) - New Junction Capacities

	AM	PM
A45 Link Road	2%	-6%
Middlemarch/Link Road	.332	.670

6.11 Stivichall Roundabout Improvement, plus On Line Widening of A45/A46 to Siskin Drive (Formerly Option 26 in Options Report 1) (Figures 6, 7, 8, 10, 11, 12 refer)

6.11.1 This scheme is proposed to be complementary with the Tollbar improvement options. By itself, it does not remove traffic from Tollbar. Improvements to Stivichall, including traffic signals, plus some entry widening is already proposed as part of the Jaguar Whitley development. The earlier work on the predicted impact (in year 2016) and consequent proposed improvements of the Jaguar Whitley development on Stivichall interchange falls short of what is now required. This is substantially due to the higher base traffic flows recorded in 2000 in the initial stages of this commission. Some further entry widening and circulatory carriageway widening is now proposed to accommodate the predicted Low Growth traffic flows in 2020. The predicted traffic capacity of the junction is shown in Table 17. The junction is just over-capacity in the AM peak hour.

Table 17 - Proposed Stivichall Junction Traffic Capacities

Approach	Degree of Saturation	
	AM	PM
A45 West	92%	62%
Leaf Lane	77%	49%
A444	82%	72%
A45 East	73%	81%
A46 South	94%	89%

6.12 Summary

6.12.1 There is scope to design these schemes without recourse to departures in standard, on the assumption that the speed is reduced to 50mph. In the case of Option 6 (Green Option), relaxations on the A46 underpass will be required to achieve this.

6.12.2 A Preliminary Stage Safety Audit has been carried out on the three options and details are shown in Appendix K. These indicate that the three options do not have any features that would result in the scheme designs being fatally flawed.

6.12.3 The improvements proposed should improve the existing accident problem at Stivichall, which was outlined in Section 3.4.

6.12.4 For Options 1, 2, 6 and 7, which have grade-separation at both Stivichall and Tollbar junctions, the merge and diverge between Stivichall and A45/A46 Stonebridge

Highway require an additional lane to accommodate the predicted weaving traffic flows between the two junctions.

6.12.5 In the case of Options 3 and 5, which do not have grade-separation at Tollbar junction, it is proposed that the A45 mainline is reduced to a single lane through Stivichall underpass. The A45 Stonebridge Highway would be retained as a two-lane dual carriageway between Stivichall Interchange and Tollbar junction.

6.12.6 Promoted Options

Options 5 (Yellow), 6 (Green) and 7 (Purple) were found to deliver the full scheme capacity for the required period so were promoted for further consideration. These options were presented in the Public Consultation, which is reported in Section 7.

6.12.7 Rejected Options

Options 1, 2 and 3 were rejected because the junctions would be congested in Year 2020 and thus failed to fulfil the HA requirements of delivering the capacity for the full design year period. Option 4 was rejected for the same reason but also because it is most damaging in environmental terms. Although they were rejected for traffic reasons, a partial assessment of these rejected options is outlined in Sections 6.13 to 6.15.

6.13 Scheme Option Costs and Economics

6.13.1 The scheme costs and economics are detailed in the Economic Assessment Report (EAR - WYG Report No. 7544/11). These are summarised on to the Appraisal Summary Tables (AST's), which are shown in Appendix D. The following sections are a brief resume of the details in the EAR and the AST's.

6.13.2 The scheme option costs are shown in Table 18. It can be seen that the construction costs range from £7.8 million (Option 3) to £27.2 million (Option 6 - Green Option). All estimates incorporate improvements to Stivichall Interchange and, where appropriate, A45 Stonebridge Highway. All costs are at mid 2001 prices. The total scheme costs, including land, range from £11.3 million (Option 3) to £39.6 million (Option 6 - Green Option). Details of the cost estimates are shown in Appendix E.

Table 18 - Summary of Cost Estimate of Options (£m)

	OPTION						
	1	**2**	**3**	**4**	**5 (Yellow)**	**6 (Green)**	**7 (Purple)**
Construction	17.9	13.1	7.8	27.2	11.0	27.5	22.5
Land	3.1	6.8	3.5	12.4	7.0	6.6	9.9
Total	21.0	19.9	11.3	39.6	18.0	34.1	32.4

6.13.3 Scheme economics were calculated using TUBA (Transport User Benefit Appraisal) to compare travel time-savings and vehicle operating cost savings of the preferred schemes with the construction costs in both high growth and low growth situations. Construction delay savings of each scheme were appraised using JUICE (Junction User Interface Cost Evaluation). The present value of costs (PVC) and total benefits, the net present value (NPV) and benefit cost ratio (BCR) are detailed in Appendix F and summarised in Table 19. It can be seen that although there are higher benefits with Options 6 (Green Option) and 7 (Purple Option), the lower cost of Option 5 (Yellow Option) results in the latter scheme having a better benefit cost ratio.

Table 19 - Summary of Economic Assessment Results (£m)

	PVC	**PVB**		**NPV**		**BCR**	
		LG	**HG**	**LG**	**HG**	**LG**	**HG**
Option 5 (Yellow)	17.6	87.0	166.8	63.9	140.9	4.6	9.0
Option 6 ***(Green)***	32.9	103.1	186.9	64.3	143.9	3.0	5.4
Option 7 (Purple)	31.5	108.3	129.0	70.4	88.2	3.2	3.8

6.13.4 The accident savings for each of the scheme options are shown in Appendix F. There is a predicted risk of overall accident increase with Option 5 (Yellow), compared with a predicted decrease with Options 6 and 7. A summary of the predicted accident savings over a 30 year period are shown in Table 20.

Table 20 - Summary of Accident Savings (£m)

	PVB	
	LG	**HG**
Option 5 ***(Yellow)***	-6.4	-7.1
Option 6 ***(Green)***	+2.8	+3.5
Option 7 ***(Purple)***	+2.3	+2.8

6.14 Construction Implications

6.14.1 Improvements will be required to both the Tollbar End Roundabout, the Stivichall Interchange - the three level grade separated junction connecting A45/A46/A444 and Leaf Lane, 2.5km to the west of Tollbar End. Details of the construction implications of the 7 options considered to date are shown in Appendix G. In summary, all options can be constructed, albeit that all underpass options will require very careful phasing.

6.14.2 The development of any option, particularly any realignment of Rowley Road will need to consider the current and future requirements of Coventry Airport, whose full take-off and landing flight path envelope encroaches over part of Rowley Road.

6.15 Environmental Assessment

6.15.1 An assessment was carried out using the methodology for assessing the impact of route options "Guidance on the Methodology for Multi-Modal Studies" (GOMMMS). Details of the findings are summarised in Appendix D, the Appraisal Summary Tables. The following is a very brief resume of the findings of the 3 preferred options.

6.15.2 Landscape and Visual Effects

In landscape and visual terms, preference should be given to Option 6 (Green), then the Option 7 (Purple) and the Option 5 (Yellow). Any of these options are likely to be acceptable if mitigation measures are designed at an early stage.

6.15.3 Heritage of Historic Resources

Options 5, 6 (Green) and 7 (Purple) do not present any archaeology problems of significance to preclude development. However, they could impact on the remains of Ryton Bridge, a listed building, which should be avoided if possible.

Further surveys may be required if proposals to widen Stivichall Junction, common to all options, were likely to impact on a possible ring ditch to the south.

6.15.4 Biodiversity

All preferred options would directly affect Warwickshire and Coventry Ecosites, including the River Avon corridor. Limiting widening of the A45 Stonebridge Highway to 3 lanes in part only could avoid existing vegetation alongside the road. Option 5 (Yellow) would therefore be preferable to Options 6 (Green) and 7(Purple). Grade-separation of the new link road junction at the A46, east of Tollbar End with Options 6 (Green) and 7 (Purple) should avoid the Willenhall Wood Local Nature Reserve, west of the A46.

6.15.5 Water Quality and Drainage

Given the close proximity of the River Avon, River Sowe and Sherbourne Brook, all options could potentially affect water quality and drainage to some extent. The A45/A46 link road in the Options 5 (Yellow), 6 (Green) and 7 (Purple) will cross a small part of the River Avon floodplain, requiring compensation measures and Environment Agency approval.

6.15.6 Townscape

The area is predominantly urban/urban edge where an assessment of landscape and visual impact is more appropriate. Consequently, the overall assessment of the impact of each of the options on Townscape is *neutral*. Each option can be well designed to:

- Compliment the landscape and built elements of the highway to reflect the scale, character and pattern of the local townscape and community through which it passes;
- Incorporate measures for mitigation to ensure that the scheme will blend in well with surrounding townscape features and elements;

- Cater for the needs and amenity of the public living/working in or utilising areas within or adjacent to the highway, including pedestrians, cyclists and those using public transport and local facilities;
- Avoid conflict with government policy towards protection of the local townscape which is not designated as being of national or local high quality.

6.15.7 Journey Ambience

Overall impact of all other options will be *medium.* For drivers able to avoid the Tollbar End roundabout, journey ambience will be increased but this will be offset by the new junctions. The A45/A46 link road (common to Options 5 (Yellow), 6 (Green) and 7 (Purple)) will provide views of the countryside to the east.

6.15.8 Noise

Of the three promoted options, the preferred option from a noise perspective is the Option 7 (Purple), or Option 6 (Green), which is only very slightly worse.

6.15.9 Air Quality/Greenhouse Gases

In terms of air quality, Option 6 (Green) is preferred followed by Option 7(Purple), with Option 5 (Yellow) last of the three.

6.15.10 Integration

With all options there is scope for the improvement of public transport routes, particularly between the B4110 London Road and Middlemarch Business Park. As shown, Option 6 (Green) and Option 7 (Purple) have a slight beneficial impact on public transport, and Option 5 (Yellow) has a slight adverse impact on public transport.

6.5.11 Severance

There is scope with all options for the enhancement of cycle routes along the A45 Stonebridge Highway/A45 London Road/A46 Coventry Eastern Bypass routes, between the B4110 London Road and Middlemarch Business Park, and at crossing points over Stonebridge Highway, and this will be reviewed as part of the stage. Option 5 (Yellow Option) as shown has a neutral impact on cycle and pedestrian routes, and Options 6 and 7 (Green and Purple Options) have a slight adverse impact on cycle and pedestrian routes.

6.16 Value Management Workshop No. 2

6.16.1 A second one-day Value Management Workshop was held to consider the promoted and rejected options. Details of the findings of the workshop are shown in Appendix H. The workshop was divided into three groups (A, B and C) to consider all the options and their views on each is presented in a tabular format as follows:

	Option 1	Option 2	Option 3	Option 4	Option 5 (Yellow)	Option 6 (Green)	Option 7 (Purple)
A							
B							
C							

Probable
Possible
No chance

6.16.2 It was agreed that Options 5, 6 and 7 would be taken forward. These were presented at public consultation as the Yelllow, Green and Purple Options respectively.

7.0 SUMMARY OF PUBLIC CONSULTATION

7.1 Consultation Process

7.1.1 Options 5, 6 and 7 were presented for public consultation as the Yellow, Green and Purple Options respectively.

7.1.2 A Public Consultation Exercise took place, starting in November 2001, and concluding in February 2001. The Consultation Document composed a Brochure and a Questionnaire (see Appendix I).

7.1.3 Approximately 2,100 copies of the Consultation Document were distributed to residents in the area around A56/A46 Tollbar End on 7 November 2001. The closing date for responses was Friday, 15 February 2002.

7.1.4 A Public Exhibition was held at the Chace Hotel, London Road, Coventry, and was open to the public on Thursday, 15 November 2001 (3.00 pm - 9.00 pm), and Friday, 16 November 2001 (10.00 am - 8.00 pm). A preview for Local Authority members, officers and other stakeholders was held at 11.00 am on Thursday, 15 November.

7.1.5 The Exhibition display featured a total of 13 boards. These were as follows:

Board 1 - Introduction
Board 2 - Improvement Exhibition
Board 3 - The Problem
Board 4 - Tollbar Map
Board 5 - Proposed Options - A board of text introducing the 3 options
Boards 6, 7 and 8 providing details for the Green, Purple and Yellow Options
Board 9 - Rejected Options
Board 10 - Traffic - before and after traffic flows for each option (2000 and 2020 flows)
Board 11 - Environmental Constraints
Board 12 - Environmental Impact - text describing the impact of each option
Board 13 - What Happens Next?

7.2 Response to Public Consultation

7.2.1 146 questionnaires and 14 separate letter/submissions (only 7% of those sent out) were received. The results of the analysis are shown in Appendix I. 83% of the responses received were from “local” respondents.

7.2.2 Of local respondents (those living in South East Coventry), 91% thought that there would be a worsening of the traffic problem in future years and 92% thought that a junction improvement scheme was necessary at Tollbar Roundabout.

7.2.3 The table below summarises the local preference for each option (in percent):

Option	Percent
Green	61
Purple	31
Yellow	8

7.2.4 Non local (those outside South East Coventry), views on the scheme options were generally similar. The table below summarises the non-local preference for each option (in percent):

Option	Percent
Green	73
Purple	18
Yellow	9

7.2.5 It was evident from the additional comments made that the Yellow Route was not favoured, and the link road across Brandon Lane was of concern. The full list of additional comments is shown in Appendix I.

7.2.6 Responses from the authorities are summarised below.

Warwickshire County Council

- Indicate a preference for the green option, subject to issues raised by Brandon Parish Council.
- Further consideration be given to severance and heavy goods vehicle routes issues in connection with the proposed A46/A45 link road.
- Further consideration be given to the signalised junction and the A45 London Road and the safety concerns raised by Warwickshire Police.

Coventry CC

The recommendations from the Cabinet Member (Environmental Services) meeting of 24 January 2002 were as follows:

- The Green Option should be developed further for implementation.
- Further investigation into improvement of pedestrian and cycle facilities at Tollbar End Roundabout. To improve access to sites such as Middlemarch Business Park.

- The Council believes that a more radical solution may be required once the Traffic Impact of the future expansion of Coventry Airport of the development potential of land around the airport have been fully considered.

Brandon and Bretford Parish Council

- In favour of the Green Option, but feel that link road from A45 to A46 should be omitted from scheme.

Baginton Parish Council

- The Council discussed the options at its January 2002 meeting, the conclusion was that the Green Option provided the best solution to the traffic problems at Tollbar End Roundabout.

Rugby Borough Council

- Preference should be given to the Green Option.
- Concerned that Brandon Lane is severed in all options.
- Future development uses along A46 corridor should not be disadvantaged.

Warwick District Council

No comments.

Wolston Parish Council

- Delighted that an improvement is carried out.
- Concerned about the impact of the link road on Brandon Lane.

Earl Craven Divisional Panel

- Delighted that progress is being made on developing proposals.
- Concerns over the impact on Brandon Lane.

Warwickshire Wildlife Trust

- Number of wildlife sites of nature conservation importance (WS/SINC) which could be affected. The option of leaving Stonebridge Highway as a two lane dual carriageway needs to be considered.
- New link from the A45 to Siskin Drive runs alongside the river Avon and its construction will have an impact on the river, its flood plain and associated wildlife.
- Access into Brandon Lane will be affected which could be detrimental to the running of Brandon Marsh Nature Centre,
- Trust feels it would be premature to select a preferred option prior to the completion of a full Environmental Impact Assessment.

Environment Agency (EA)

The EA did not express a preference for any of the proposed options. They did however, make the following comments:

- If floodplain compensation works can be undertaken to show that there would be no loss of floodplain storage then the EA have no objection.
- Consideration needs to be given to the design of any new bridge crossings or extensions to existing bridges.
- The EA have no objections to the use of the River Sowe and River Avon flood models to check the bridge requirements.
- Consideration should be given to mammal passes and other conservation enhancement features.
- Recommend an early meeting to discuss matters.

A meeting has been held with the EA and they are generally satisfied that their requirements can be met with the improvements proposed.

Countryside Agency (CA)

- The CA did not show any preference , or indeed pass any comment (favourable or otherwise) about the 3 options.

English Nature (EN)

- EN confirmed that there were no statutory conservation sites affected by the proposals, but they would be interested in details of the impact on protected species.

English Heritage (EH)

- EH could not confirm whether there were any scheduled ancient monuments that require their involvement. The EH thought it unlikely that any objection would be raised.

Road Haulage Association (RHA)

- The RHA support the Green Option, although they would rather see a grade separated junction where the A45/A46 link meets the A45.

8.0 SUMMARY OF REPORT ON ALTERNATIVE GREEN OPTION (OPTION 8)

8.1 Introduction

8.1.1 It was evident from the feedback from the public consultation exercise that there were concerns about the proposed link road between the A45 Coventry Eastern Bypass and the A45 London Road.

8.1.2 Alternative Green Option (Option 8) has evolved to avoid, or minimise the concerns raised about the impact of the proposed improvement options on A45 London Road and on Brandon Lane. Alternative Green Option (Option 8) removes the link road between the A45 London Road and the A46 Coventry Eastern Bypass. A copy of the proposal is shown on Figure 19.

8.1.3 A traffic assessment of the Alternative Green Option (Option 8) was carried out in January/February 2002, and the findings were submitted in report form to the Highways Agency in February 2002 as the Traffic Appraisal of Option 8 (WYG Report No. 7544/13). The report concluded that the improvements would have sufficient traffic capacity up to about year 2016/2017, but not sufficient to accommodate the full 15 year design life to 2020.

8.1.4 This initial appraisal of the traffic capacity of the Alternative Green Option (Option 8) was accepted by the Highways Agency as a reasonable compromise approach and worthy of further work to appraise the scheme up to the same detail as those in the Options Report 2. At the same time it was agreed that further consultations with the stakeholders should take place. This further work, including further design, an environmental/GOMMMS assessment, and consultation findings is the subject of this section.

8.2 Traffic Assessment of Alternative Green Option (Option 8)

8.2.1 In the traffic assessment, two configurations for the Alternative Green Option (Option 8) were considered, one with the Siskin Drive approach connecting on to Tollbar (Option 8A) and one with the Rowley Road approach connecting on to Tollbar (Option 8B). The preferred layout (Siskin Drive approach connecting on to Tollbar), is shown on Figure 19 (Option 8A).

8.2.2 The main benefit of this option is that it removes the major movement (A45/A46 to A46) from Tollbar, which represents up to 30% of the total traffic and a minor movement between the A45 and Siskin Drive, representing 3% of the total traffic flow.

In addition it gives vehicles from Middlemarch Business Park an alternative egress to Siskin Drive. Further, Tollbar roundabout traffic movements can be better controlled, since there would be only two uncontrolled approaches on to the Tollbar junction (Siskin Drive and A46 slip road), and these would have a traffic signal controlled access in advance of them.

8.2.3 Predicted traffic flows in year 2020 are shown on Figure 20. Option 8A offers two alternative routes from Middlemarch Industrial Estate, but has been tested assuming that all vehicles from Middlemarch Business Park would use the new link and the A45 London Road to reach Tollbar junction.

8.2.4 An assessment of the proposed signalised roundabout has been carried out using TRANSYT. The results are summarised in Table 21 below. The outcome is that the Tollbar junction is just over capacity on all three signalised approaches in the AM peak hour and on the B4110 London Road in the PM peak hour.

Table 21 - Option 8A - Tollbar Junction Traffic Capacities

	AM	**PM**
A45 Stonebridge Highway	92%	73%
B4110 London Road	98%	93%
A46 Coventry E Bypass***	51%	44%
A45 London Road	95%	75%
Siskin Drive***	35%	36%
Rowley Road	-	-

Those approaches denoted with asterisks are Give Ways. The intergreens on the other junctions are set to allow the Give Ways to discharge within capacity. Rowley Road is exit only from Tollbar, so no Give Way is required.

8.2.5 A further assessment of Option 8A has been carried out to examine the “life” of the junction. The junction would reach capacity (Degree of saturation of 90%) by year 2016 /2017. It should be possible with some adjustment to lane usage to improve the capacity of the junction, but it is unlikely that the full 2020 design capacity could be achieved.

8.3 Highway Assessment of Alternative Green Option (Option 8)

8.3.1 The underpass radius is 360 metres, so is one step below desirable minimum design standard for 50mph speed limit. This is acceptable within the constraints, provided that forward visibility of 160 metres is achieved, which is sufficient for a route constructed to 50mph.

8.3.2 The underpass is required to be in tunnel for a substantial length to achieve the alignments for the slip road into the (reconfigured) Tollbar junction. Construction is likely to be difficult and expensive, with traffic management likely to be complicated. Some land is required for the scheme but there does appear to be scope to avoid expensive land and property acquisition.

8.3.3 Since the underpass is in tunnel, there is an opportunity to retain the existing pedestrian/cycle routes across the Tollbar junction.

8.3.4 The link road between the A45 and Siskin Drive can be relatively easily constructed. The land between the A45 and Siskin Drive is relatively flat, so there should be no major earthworks, and there are no major development structures that would be affected.

8.4 Scheme Costs and Economics of Alternative Green Option (Option 8)

8.4.1 The same approach used in the EAR has been adopted in this report. The costs and economics derived for the Alternative Green Option (Option 8) are summarised on to the Appraisal Summary Tables (AST's), which are shown in Appendix J. The following sections summarise the scheme cost estimate and the economic assessment.

8.4.2 The scheme option costs are shown in Table 22. For comparison purposes, the scheme costs of the other are also shown. It can be seen that the construction costs of the Alternative Green Option (Option 8) is estimated to be £21.5 million, including improvements to Stivichall Interchange and A45 Stonebridge Highway. The total scheme cost, including land, is £25.0 million. Details of the cost estimates are shown in Appendix J.

Table 22 - Summary of Cost Estimate of Options (£m)

	OPTION							
	1	**2**	**3**	**4**	**5 (Yellow)**	**6 (Green)**	**7 (Purple)**	**8**
Construction	17.9	13.1	7.8	27.2	11.0	27.5	22.5	21.5
Land	3.1	6.8	3.5	12.4	7.0	6.6	9.9	3.5
Total	21.0	19.9	11.3	39.6	18.0	34.1	32.4	25.0

8.4.3 The scheme economics have been calculated using TUBA. The present value of costs (PVC) and total benefits (PVB), the net present value (NPV) and benefit cost ratio (BCR) are detailed in Appendix J.

8.4.4 The construction delay savings of each scheme have been appraised using JUICE. The present value disbenefits are detailed in Appendix J.

8.4.5 The results of the TUBA and JUICE assessments are summarised in Table 23, along with the results of the economic assessments of the three routes that went forward to public consultation. It can be seen that the benefits are lower, but the scheme is cheaper, so the benefit cost ratio is of the same order as that of the Green Option.

Table 23 - Summary of Economic Assessment Results (£m)

	PVC	PVB		NPV		BCR	
		LG	HG	LG	HG	LG	HG
Option 5 (Yellow)	17.6	87.0	166.8	63.9	140.9	4.6	9.0
Option 6 ***(Green)***	32.9	103.1	186.9	64.3	143.9	3.0	5.4
Option 7 (Purple)	31.5	108.3	129.0	70.4	88.2	3.2	3.8
Option 8 (Alt Green)	24.1	60.9	127.9	33.9	98.3	2.4	5.1

NB: PVC (or present value of costs) are less than actual costs (Table 22 refers), since they are discounted back to 1998, the common assessment year for all economic assessments.

8.4.6 A summary of the predicted accident savings over a 30 year period are shown in Table 24. For comparison purposes, the results of the accident savings for the three routes that went forward to public consultation are also shown. There is a predicted overall accident saving with Alternative Green Option (Option 8) of over £2 million.

Table 24 - Summary of Accident Savings (£m)

	PVB	
	LG	HG
Option 5 (Yellow)	-6.4	-7.1
Option 6 ***(Green)***	+2.8	+3.5
Option 7 (Purple)	+2.3	+2.8
Option 8 (Alt Green)	+2.0	+2.9

8.5 Construction Implications

8.5.1 Construction implications are detailed in Section 6.13. The implications for the Alternative Green Option (Option 8) are similar to those for the Green Option (Option 6).

8.6 Geotechnical Considerations

8.6.1 Construction implications are detailed in Section 4.12. The implications for Alternative Green Option (Option 8) are similar to those for Green Option.

8.7 Construction Methodology

8.7.1 Given the high traffic levels already using Tollbar junction and the restricted nature of the site, construction methods that minimise the impact on traffic flows are essential. The cut-and-cover tunnel itself will consist of a retained cutting with a roof installed. The least disruptive method of constructing this type of structure will be by means of a so-called “top down” method, ie. using contiguous concrete bored pile walls or diaphragm walling to create the walls of the tunnel and those of the approach cutting and then casting a concrete slab for the tunnel roof before excavating the material between the walls to form the tunnel and the cutting.

8.7.2 The majority of new construction between the A45 and Siskin Drive can be undertaken without affecting traffic on the existing highway network, the only disruption occurring during construction of the tie-ins.

8.7.3 Alternative Green Option (Option 8) will involve some widening to Ryton Bridge over the River Avon. A reinforced concrete extension to the east is likely to be the preferred solution.

8.8 Environmental Assessment

8.8.1 Introduction

The impact assessment is shown in Appendix J. covering:

- Landscape, biodiversity, heritage, water, townscape, physical fitness, journey ambience.
- Noise, air quality, and greenhouse gases.

The impact of all these separate assessments are covered in the GOMMMS assessment, which is also included in Appendix J. This report includes the Appraisal Summary Tables, setting out clearly and concisely the key impacts on each of the objectives.

This section summarises the key conclusions of these assessments.

8.8.2 Landscape and Visual Effects

Landscape and Visual impact of Alternative Green Option (Option 8) would be **slight adverse** because:

- it does not quite fit the landform and scale of the landscape;
- although not very visually intrusive, it will impact on certain views into and across the area;
- it cannot be completely mitigated for because of the nature of the improvement.

Alternative Green Option (Option 8) would be an acceptable solution with little landscape and visual impact above that already resulting from the existing situation.

8.8.3 Heritage of Historic Resources

The assessment of solution options for the Options Report 2 included a report of an archaeological survey and assessment by John Samuels Archaeological Consultants. From this assessment it can be concluded that the Alternative Green Option (Option 8) is likely to impact on the remains of Ryton Bridge, a listed building. Widening of the A45 to the east of the bridge, which has been undertaken during previous widening, will limit any direct physical impact on the historic resource to **slight adverse**.

Alternative Green Option (Option 8) is unlikely to present any archaeology of significance to preclude development.

8.8.4 Biodiversity

Alternative Green Option (Option 8) would be an acceptable solution with a **slight adverse** impact on biodiversity. As is always the case when assessing ecological impact of development proposals, walkover surveys should be repeated to ensure that assessment of potential impacts, particularly protected species, is as up to date as possible.

8.8.5 Water Quality and Drainage

Widening of the Ryton Bridge and River Sowe bridge with Alternative Green Option (Option 8) could potentially affect water quality and drainage. However, impact on river floodplains will be **slight** and, assuming effective mitigation, risk of harm to the water environment should be **slight**.

The River Avon is designated a "main river" at this location. The formal approval of the Environment Agency would be required for the necessary floodplain compensation scheme due to the raising of ground levels to accommodate the Siskin Drive to A45 (east) link road.

Following agreement of flood compensation measures, Alternative Green Option (Option 8) is likely to be an acceptable solution subject to details regarding the disposal of surface water and the possible incorporation of best practice drainage techniques, such as Sustainable Urban Drainage Systems (SUDS).

8.8.6 Townscape

The overall assessment of the impact of the Alternative Green Option (Option 8) on Townscape is **Neutral**. Alternative Green Option (Option 8) can be well designed in the detailed design stage to:

- compliment the landscape and built elements of the highway to reflect the scale, character and pattern of the local townscape and community through which it passes;
- incorporate measures for mitigation to ensure that the scheme will blend in well with surrounding townscape features and elements;
- cater for the needs and amenity of the public living/working in or utilising areas within or adjacent to the highway, including pedestrians, cyclists and those using public transport and local facilities;
- avoid conflict with government policy towards protection of the local townscape which is not designated as being of national or local high quality.

8.8.7 Journey Ambience

As with the assessment of impact on journey ambience of the previous seven options, "Traveller View from the Road" and "Traveller Stress" are used in this assessment as a broad brush estimate of journey ambience.

Assuming Journey Ambience with the 'do-minimum' situation is low, the assessment of impact of the Alternative Green Option (Option 8) is **medium**. For drivers using the underpass and avoiding Tollbar End junction, “traveller stress” will be reduced and thus journey ambience increased.

8.8.8 Noise

Of the three promoted options at Public Consultation the preferred option in terms of noise was reported as the Purple Option, or the Green Option, which was only slightly worse in terms of noise than the Purple Option. Both schemes showed a net improvement in terms of population affected.

The noise assessment on the Alternative Green Option (Option 8) indicates that a population of 326 would be likely to be annoyed by the noise. This is a net reduction in population of 65, which is marginally better than the Purple Option, so Alternative Green Option (Option 8) is the best option in terms of noise relief.

8.8.9 Air Quality/Greenhouse Gases

At the Public Consultation, the preferred option in terms of air quality and greenhouse gases was the Green Option (Option 6) followed by the Purple Option (Option 7) with the Yellow Option (Option 5) last of the three.

The assessment of Alternative Green Option (Option 8) indicates that 222 properties would benefit from improved air quality and 40 would experience worse air quality. There is therefore a net 182 properties experiencing an improvement. This compares with a net worsening in air quality for all three options shown at the Public Consultation.

The weight of greenhouse gases from Alternative Green Option (Option 8) has been estimated to be around 5500 tonnes per annum. This is of the order of half to two thirds the amount produced by the three options shown at the Public Consultation.

8.8.10 Integration

The Alternative Green Option (Option 8) is considered to have a similar impact to Option 6 (Green), which has a slight beneficial impact on public transport.

8.8.11 Severance

The Alternative Green Option (Option 8) is considered to have a similar impact to Option 6 (Green), which has a slight adverse impact on cycle and pedestrian routes.

8.9 Consultation Response on Alternative Green Option (Option 8)

8.9.1 33 Consultation letters were sent out to interested parties (19 national, 13 local) of the suggested Alternative Green Option (Option 8).

A list of the consultees is shown in Appendix J. Of those consultees, the following have responded (copies of their responses are shown in Appendix J):

- Coventry City Council.
- Rugby Borough Council.
- Countryside Agency.
- English Nature.
- Baginton Parish Council.
- Brandon and Bretford Parish Council.
- Consignia.
- Road Haulage Association.
- English Heritage.
- [redacted] (Baginton Parish Councillor and Warwickshire District Councillor).
- [redacted] (Baginton Parish Councillor).

8.9.2 Coventry City Council (CCC) have registered concern about the longer term development of Coventry Airport and suggests that the link road between the A45 and A46 should be retained as a potential second phase. CCC add that there should be a second public consultation, in view of the scale of change of the proposal.

8.9.3 Baginton Parish Council who were supportive of the Green Option but were divided over the impact of the Alternative Green Option (Option 8). [redacted]

8.9.4 The Countryside Agency did not pass a view on the Alternative Green Option (Option 8) (or on any of the 3 publicised options).

8.9.5 The Environment Agency (EA) has yet to respond on Alternative Green Option (Option 8). (It did respond to the Green, Purple and Yellow options, none of which were given preference, but several comments on each were made.)

8.9.6 English Nature confirmed that no statutory conservation sites are affected by the proposals, but stated that they would be interested in details of the impact on protected species.

8.9.7 English Heritage stated that they do not have access to details on the location of scheduled Ancient Monuments, but thought it unlikely that, given the locations, any objections would be raised.

8.9.8 Rugby BC confirmed that the Alternative Green Option (Option 8) satisfies their concern about Brandon Lane and that, since the Green Route is favoured by the Council, Alternative Green Option (Option 8) is supported by the Council.

8.9.9 The Road Haulage Association confirmed that of the three options shown at public consultation, they still preferred the Green Route but that they support the Option 8 proposal.

8.9.10 Consignia confirmed that they still prefer the Purple Route to the Alternative Green Option (Option 8), since it presents least operational difficulties for Royal Mail.

8.9.11 [redacted] acknowledges the benefit of the removal of the Brandon Lane link, but is concerned about traffic movements through Baginton. He suggests that the link road from Siskin Drive to Rowley Road should be removed to discourage westbound movements from A45/Middlemarch Business Park through Baginton.

8.9.12 [redacted] is concerned about traffic movements through Baginton, and suggests [redacted] that the westbound link road between Siskin Drive and Rowley Road should be closed off.

8.9.13 Brandon and Bretford PC stated that Alternative Green Option (Option 8) addresses the issues that they had previously raised. They are happy to give Alternative Green Option (Option 8) their support.

8.9.14 Warwickshire Police have concerns about the short distance between the A423 slip road on the A45 and the proposed new junction on the A45 from Siskin Drive. The distance from the end of the A423 slip road to the proposed traffic signal junction is 240 metres. There is no formal design criteria for “weaving” along these sections of road but with adequate advance direction and warning signing, it would be possible to accommodate weaving traffic (A45 into Siskin Drive and A423 to straight on lane of A45).

8.10 Summary of Alternative Green Option (Option 8)

8.10.13 Alternative Green Option (Option 8) does not fulfil all the traffic requirements in that it does not have a full design life of 15 years. It does, however, achieve a design life up to around 2016/2017.

There is scope to design the scheme without recourse to departures in standard, on the assumption that the speed limit through Tollbar is reduced to 50mph. Relaxations on the A46 underpass will be required to achieve this.

A Preliminary Stage Safety Audit has been carried out and details are shown in Appendix K. These indicate that the proposed Options do not have any features that would result in the scheme designs being fatally flawed.

9.0 CONCLUSIONS

9.1 An extensive traffic data collection exercise was undertaken. This has identified that:

- The total flow at Tollbar junction itself is around 8000 vehicles per hour in the peak hours. The Tollbar improvement, completed in year 2000, was designed for 2005 plus commitments. The junction appears not to be working as well as predicted in the assessment, probably due to traffic restraint at the junction prior to the junction capacity improvement, that the junction capacity may have been over-estimated.
- A45 Stonebridge highway between the Tollbar and Stivichall junctions is likely to exceed its capacity in the 2020 design year.
- All other junctions and links in the study are likely to operate within capacity at the 2020 design year although congestion at Tollbar junction may cause blocking back on adjacent links and junctions.
- Stivichall and Rowley Road/Siskin Drive junctions have higher than expected accident rates.

9.2 Baseline air quality and noise levels appear to be good. Much of the area is designated as Green Belt but is also built up around Tollbar junction and therefore any improvements to the Tollbar junction are unlikely to harm the landscape. Impact on the River Sowe and Baginton should be minimised. Adverse impact to a significant number of properties or community facilities as a result of any road improvements is unlikely. Impact on Schedule Ancient Monuments and listed buildings and their settings should be avoided. Impact on the three sites of Special Scientific Interest and the Local Nature Reserves should be avoided. Mitigation measures for wildlife including Badgers would be required.

9.3 Improvements are unlikely to affect areas of public open space. Much of the existing agricultural land is not rated as good. Overall levels of pedestrian and cycle activity are low in the area. Existing bus provision is poor in the area.

9.4 The flight path for Coventry Airport prohibits a flyover as an option.

9.5 There are important geotechnical issues to consider particularly for grade separation at Tollbar junction.

9.6 The majority of significant highway structures that would be affected by any improvements are located at Stivichall Interchange.

9.7 In assessing the scheme options, it was evident that, even with low growth traffic flows, the existing slip roads to and from Stivichall interchange on the A45 Stonebridge Highway would be over capacity with only two lanes on the main line A45. Further, the slip roads from any grade separation at Tollbar would also be over capacity with only two lanes on the main line A45. Given the relatively short wearing distance (1.5km) between Stivichall Interchange and Tollbar, all options with Tollbar grade-separated incorporate widening of Stonebridge Highway to 3 lanes in each direction. Options with Tollbar junction at-grade only incorporate a three lane widening from Stivichall to around 1km east of the interchange.

9.8 Options 5, 6 and 7 (the Yellow, Green and Purple Options respectively - see text for details) deliver the full scheme capacity for the required period so were promoted for further consideration. Options 1, 2 and 3 were rejected because the junctions would be congested in Year 2020 and thus fail to fulfil the HA requirements of delivering the capacity for the full design year period. Option 4 was rejected for the same reason but also because it was most damaging in environmental terms.

9.9 Of the three promoted options, Options 6 and 7 have scope to reduce traffic noise. The preferred option from a noise perspective is Option 7, followed by Option 6, which is only very slightly worse. Option 5 would increase noise levels overall. Of the rejected options, Option 3 has most scope to reduce traffic noise.

9.10 In terms of air quality, Option 6 was preferred followed by Option 7, with Option 5 last of the three.

9.11 For the Public Consultation exercise, Options 5, 6 and 7 were referred to as the Yellow, Green and Purple Options respectively.

9.12 At the Public Consultation and Exhibition the response rate was relatively poor (7% of those directly targeted). Around 90% thought that there would be a worsening of the traffic problem at Tollbar roundabout in future years and 92% thought that a junction improvement scheme was necessary.

9.13 It was evident from the additional comments made that:

- The Green Route (Option 6) is the most favoured option.
- The Yellow Route (Option 5) was not generally favoured.
- The link road across Brandon Lane was of concern.

9.14 A further report on a new option (Option 8, referred to also as Alternative Green Option) evolved to avoid, or minimise, the concerns raised about the impact of the proposed improvement options on A45 London Road and on Brandon Lane. Option 8, which is based on the Green Route, removes the link road between the A45 London Road and the A46 Coventry Eastern Bypass.

9.15 A traffic assessment of Option 8 has been carried out and the report concluded that the improvements would have sufficient traffic capacity up to about year 2016/2017, but not sufficient to accommodate the full 15 year design life to 2020.

9.16 The scheme option costs are shown below. It can be seen that the total scheme option costs, including improvements to Stivichall Interchange and A45 Stonebridge Highway, vary from £11.3 million (Option 3) to £34.1 Million (Green Option).

Summary of Cost Estimate of Options (£m)

	OPTION							
	1	**2**	**3**	**4**	**5 (Yellow)**	**6 (Green)**	**7 (Purple)**	**8**
Construction	17.9	13.1	7.8	27.2	10.6	26.4	21.6	21.5
Land	3.1	6.8	3.5	12.4	7.0	6.6	9.9	3.5
Total	21.0	19.9	11.3	39.6	18.0	34.1	32.4	25.0

9.17 The results of the economic assessment are summarised below. It can be seen that the benefit - cost ratio of Option 8 is similar to Option 6 (Green).

Summary of Economic Assessment Results (£m)

	PVC	**PVB**		**NPV**		**BCR**	
		LG	**HG**	**LG**	**HG**	**LG**	**HG**
Option 5 (Yellow)	17.6	87.0	166.8	63.9	140.9	4.6	9.0
Option 6 (Green)	32.9	103.1	186.9	64.3	143.9	3.0	5.4
Option 7 (Purple)	31.5	108.3	129.0	70.4	88.2	3.2	3.8
Option 8 (Alt Green)	24.1	60.9	127.9	33.9	98.3	2.4	5.1

9.18 The accident savings for each of the scheme options is shown in the table below. For comparison purposes, the results of the accident savings for the three routes that went forward to public consultation are also shown.

Summary of Accident Savings (£m)

	PVB	
	LG	**HG**
Option 5 (Yellow)	-6.4	-7.8
Option 6 ***(Green)***	+2.8	+3.5
Option 7 (Purple)	+2.3	+2.8
Option 8 (Alt Green)	+2.0	+2.9

9.19 Landscape and Visual impact of Option 8 would be **slight adverse**. The impacts of Options 5, 6 and 7 are all classified as **moderate adverse**.

9.20 Heritage of Historic Resources - Impact of Option 8 will be **slight adverse.** The impacts of Options 5, 6 and 7 are all classified as **moderate adverse.**

9.21 In terms of biodiversity the impacts of Options 5, 6, 7 and 8 would be an acceptable solution with a **slight adverse** impact.

9.22 In terms of Water Quality and Drainage, Option 8 impact will be **slight adverse.** The impacts of Options 5, 6 and 7 are all classified as **moderate adverse**.

9.23 The impact of Options 5, 6, 7 and 8 on Townscape is **Neutral**.

9.2.4 Assuming Journey Ambience with the “do-minimum'” situation is low, the assessment of impact of Options 5, 6, 7 and 8 is **medium**.

9.2.5 In terms of noise, Option 8 will result in a net reduction in noise impact and Options 6 and 7 have **scope to reduce traffic noise**. Of the four promoted options, the preferred option from a noise perspective is Option 8.

9.26 In terms of air quality/greenhouse gases, Options 5, 6, 7 and 8 will result in a **net reduction in impact.** Of the four promoted options, in terms of air quality, the preferred option is Option 8.

9.27 In terms of accessibility Options 6, 7 and 8 were found to be **slightly beneficial** and Option 5 was found to be slight adverse.

9.28 In terms of integration, Options 5, 6, 7 and 8 were found to be **slightly beneficial**.

10.0 RECOMMENDATION FOR OPTION TO BE TAKEN FORWARD FOR FURTHER DEVELOPMENT

10.1 Option 6 (Green Option) is considered to be the preferred option in terms of the overall traffic and highway performance of the options. It satisfies best the strategic requirements of the trunk road network in improving the A46 route between the M6 and M40. It has best scope to deliver the requirements of the Brief, and, in environmental terms, is as good as any of the three options presented to the public. Only in economic and cost terms does it perform less well than another option, namely Option 5 (Yellow Option).

10.2 Of the three options it is the one that was most preferred by the public. There is little doubt that a route based on the A46 underpass is the most deliverable option of the three options proposed.

10.3 However, there are concerns about the link road between the A45 and A46 (and these concerns are common to all options) that may well delay the project due to local (and possibly national) opposition to this element of the scheme. Given that the scheme is programmed for opening, perhaps optimistically, in 2005, this is unlikely to be achieved with the recorded and latent opposition.

10.4 Option 8 has been considered as a compromise to provide a scheme that can be delivered on a reasonable timescale. It does not have the attributes of the preferred (Green) option in terms of the overall traffic, highway and economic performance, but it is cheaper, and, in environmental terms, it is superior. It should also be very possible to deliver the scheme to a reasonable programme.

10.5 The outstanding objections to the scheme (Coventry City Council, plus several landowners) revolve around the potential the scheme to accommodate future development in the area. It has been demonstrated that Option 8 can deliver up to year 2016/2017, taking into account currently approved commitments. It is not the remit of the project to account for future, unknown development. Indeed if additional capacity were built into the scheme, the chances are that developers would take the opportunity to develop and absorb any surplus traffic capacity. Conversely, future developments would need to assess – and provide as necessary - infrastructure to accommodate development generated traffic in line with development control policy.

10.6 Given that the requirements of the Brief are for a deliverable scheme that satisfies the needs of all parties, it is recommended that Option 8 is promoted as the Preferred Option.

10.7 Further consideration needs to be given to the improvement of public transport routes, particularly between the B4110 London Road and Middlemarch Business Park. Consideration also needs to be given to the enhancement of cycle routes along the A45 Stonebridge Highway / A45 London Road / A46 Coventry Eastern Bypass routes, between the B4110 London Road and Middlemarch Business Park, and at crossing points over Stonebridge Highway.