

# **A303 Stonehenge Improvement Scheme Review**

## **Partial Solutions A303/A344 Junction Closure**

**September 2007**

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# 1 Introduction

The post-2004 Public Inquiry review of the A303 Stonehenge Improvement has been carried out in two stages. Stage 1 was completed in January 2006 with publication of the *A303 Stonehenge Improvement, Scheme Review – Stage 1 Report*. Stage 2 involved further assessments of the options for improvement and included a public consultation, culminating in the *A303 Stonehenge Improvement, Scheme Review – Stage 2 Report*.

The review included options for 'Partial Solutions' on the A303 in the vicinity of Stonehenge. In order to understand more fully the effects of the Partial Solutions on the operation of the A303 and the local road network, it was clear that a more detailed analysis based on up-to-date traffic information was needed. Fresh traffic surveys were carried out in the autumn of 2006 and a new traffic model has been produced, to provide the basis for further and more robust analytical work.

The first step in this further work was to model today's (2006) traffic flows and then to apply growth factors to assess the future traffic consequences of leaving the existing road network largely as it is (the Do-Minimum situation). Following this, the consequences of closing the A303/A344 junction were analysed as the starting point for a Partial Solution. This report examines how the new model forecasts differ from those previously produced, and presents the predicted effects of closing the A303/A344 junction.

The assessments in this report rely wholly on the new traffic model developed using the autumn 2006 traffic data which should more accurately represent future traffic volumes. A Scheme Opening Year of 2012 and Design Year of 2027 (fifteen years after opening) have been adopted, instead of the equivalent years previously adopted for the Stonehenge Improvement Review (2008 and 2023) which are now unachievable.

## 2 Methodology

### 2.1 The SATURN Traffic Model

#### 2.1.1 Survey Data

Previous traffic assessment work on the A303 Stonehenge Improvement scheme, including that for the 2004 Public Inquiry and for the post-inquiry review, was undertaken using a SATURN traffic model that was developed for a base year of 2000 and was fit for the purpose of assessing the overall effects of the full improvement scheme. That model was based on origin-destination surveys of travel patterns that were undertaken in 1994 and 1997. However, given the age of the data and the limitations of the model for analysing the local traffic network at a detailed level, junction by junction, it was determined that the effects of the Partial Solutions identified as part of the scheme review could be more robustly analysed using remodelled up-to-date traffic data.

Accordingly fresh surveys were undertaken in October 2006, comprising roadside interviews, manual classified junction turning counts and journey time surveys. Nine roadside interview surveys were undertaken, in approximately the same locations as those used to develop the previous traffic model. The survey sites are shown on Figure 2.1 and listed below:

- (i) A303 Berwick Down
- (ii) Stonehenge Road, south of A303
- (iii) A360 west of Airman's Corner
- (iv) B3086 north of Airman's Corner
- (v) A360 south of Longbarrow Crossroads
- (vi) A345 north of Countess Roundabout
- (vii) A3028 Bulford Bridge
- (viii) A303 east of Countess Roundabout
- (ix) A345 south of Countess Roundabout

A total of 19 junction turning counts were undertaken, including all of the key junctions in the study area. The locations of these counts are shown on Figure 2.2.

Journey time surveys were also carried out using the same routes that were surveyed in 2000 and used to validate the previous model. These routes, which include the A303, are shown on Figure 2.3.

#### 2.1.2 Form of Model

In addition to the new surveys, it was considered advisable to change the modelling approach thus securing a more robust analysis of the scheme review partial options. The previous SATURN model was a 12-hour link-based model, with no representation of either junction operation or capacity restraint on links (through, for example, speed-flow relationships). Route choice within the model, therefore, was based entirely upon fixed times along each link, regardless of the volume of traffic using the link. Although based on directly observed journey times within the area of interest, this represents a potential weakness of the forecasts generated by the model if links are at different levels of saturation. A link operating close to its capacity at present, for example, may only need a small amount of additional traffic in the future for journey speeds to drop significantly, whereas a link well below its current capacity can carry greater volumes of additional traffic without vehicle speeds being significantly affected.

Junction operation can also be an important factor in determining route choice. Generally this is more of an issue in urban areas with dense networks, where junctions have a much greater

influence than links on the overall capacity of the network. While the Stonehenge model is predominantly rural in nature, particularly along the A303 corridor of interest, there are areas of urban development within the model network. Additionally there are two particular junctions on the A303 (Longbarrow Crossroads and Countess Roundabout) where congestion is a material factor.

The issue of junction operation becomes especially important in the consideration of the Partial Solutions, as some options include relatively minor modifications to critical junctions such as Longbarrow Crossroads and Countess Roundabout. It is therefore essential to be able to model the impacts of these proposals on the operation of the junctions.

A form of congested assignment modelling, in which junction operations can be explicitly represented within the model and the effect of different options on route choice can be more accurately represented, was therefore considered appropriate for the more detailed analysis of the Partial Solutions. This has led to the development of three separate time-period models, compared with the previous 12-hour model. The time periods modelled are the morning peak hour (08:00-09:00), the average inter-peak hour within the period 10:00-16:00, and the evening peak hour (17:00-18:00).

In each case, five different vehicle classes are modelled, in order to take account of varying values of time and the potential for variable trip matrix assessment using the Department for Transport's DIADEM model. The vehicle classes modelled are:

- Cars – Commuting
- Cars – Employers' Business
- Cars – Other Purposes
- Light Goods Vehicles
- Heavy Vehicles

Base year matrices for each time period were developed from the roadside interview data, with unobserved movements being taken from the previous model. The modelled base years for all three time periods have been validated against the standard criteria set by the Department for Transport, both for link volumes and journey times.

The SATURN model network was also extended from the previous version, in order to provide traffic with more options on the routes used to enter the study area. This provides traffic with greater flexibility to switch between routes, particularly those from the north, depending upon changes made to the network within the study area. Because of the potential capacity restraint issues associated with some of the options being considered, this flexibility was considered important to allow the proper assessment of the impact of these options.

The model network now extends to the M4 at Bristol in the north-west, as well as the A36/A4/A46 route through Bath. It also extends to the A419 at Cirencester in the north, to the M3 at Basingstoke in the east and the M3/M27 junction at Southampton in the south-east. To the south-west it extends as far as Mere on the A303, while to the south it incorporates the city of Salisbury and the area immediately to the south.

### **2.1.3 Forecasting**

Previous assessment work on the A303 Stonehenge Improvement scheme was focused on two forecast years: 2008 as a projected scheme opening year and 2023 as the 'design' year (15 years after opening). 2008 is no longer feasible as a scheme opening year and, with the development of a new traffic model, it was clearly appropriate to take a more realistic opening year, of 2012, with a corresponding design year of 2027.

For car trips, growth factors to the forecast years were derived from the Department for Transport's TEMPRO computer program, with separate factors obtained by trip purpose and

time period. Low and high growth figures were derived following the methodology outlined in the TEMPRO guidance to take account of uncertainty in future traffic growth. As TEMPRO only considers growth in car trips, the matrices for light goods and heavy vehicles were factored to the forecast years using low and high growth National Road Traffic Forecasts (NRTF).

Proposals for committed new developments in the local area were considered separately. Four such developments are listed in the Salisbury District Council Local Plan:

- (i) Boscombe Down residential (550 houses)
- (ii) Porton Road (Solstice Park) employment (18 hectares)
- (iii) Boscombe Down Research Park (7 hectares)
- (iv) Durrington residential (120 houses)

As the Local Plan period runs up to 2011, it was assumed that all of these developments would be in place by the opening year of 2012. Beyond this period, additional development at Boscombe Down (650 houses) and Solstice Park (24 hectares) is envisaged, and it was assumed that these would be fully developed by the design year of 2027.

Trip rates for each of these developments were obtained from the TRICS trip generation database, based on existing developments of similar types and sizes elsewhere in the country. In previous assessment work on the A303 Stonehenge Improvement scheme, average trip rates for new developments were used in the low growth trip matrices, and 85<sup>th</sup> percentile trip rates were used in the high growth trip matrices, and these rates were used again in this latest analysis. The distribution of trips from the new developments was based on that used in the previous SATURN model.

The development trips were added to the factored base year trips, and the overall matrices were then controlled using a Furness matrix factoring procedure, so that, for car trips, the overall growth in the numbers with an origin or destination in the Salisbury district equated to that predicted by TEMPRO. Again, this is consistent with the methodology used for the previous SATURN model, and accords with the advice given in the TEMPRO guidance. Table 2.1 below shows the growth in the overall trip matrix totals from the 2006 base year.

**Table 2.1 Trip matrix growth from 2006**

	AM Peak		Inter Peak		PM Peak	
2006 Base	12834		9162		12801	
	Low	High	Low	High	Low	High
2012	14050 +9.47%	15841 +23.43%	10004 +9.19%	11460 +25.08%	14008 +9.43%	16025 +25.09%
2027	16273 +26.80%	20464 +59.45%	11768 +28.44%	14983 +63.53%	15946 +24.57%	20236 +58.08%

Traffic forecasting with the Stonehenge SATURN traffic model uses a variable trip matrix approach, in accordance with the current Department for Transport guidelines embodied in WebTAG. The variable response modelled allows some variation in the distribution of trips depending upon the relative zone-to-zone travel costs between the existing network and an improved scenario, thus allowing for the potential of induced travel resulting from a network improvement.

The variable trip matrix approach has been modelled using the Department for Transport's DIADEM software, which links with the SATURN model to estimate the changes in travel demand in response to the cost of travel.

## 2.2 VISSIM Traffic Model

A local VISSIM model has also been built as a stand-alone entity, but one which can interact with the much larger SATURN model. It covers the A303 between Yarnbury Castle in the west and Folly Bottom in the east, the A360 between Longbarrow Crossroads and Airman's Corner and the A344 between Airman's Corner and its junction with the A303 at Stonehenge Bottom. Its purpose is to assist with the analysis of traffic impacts at a detailed junction level, especially at Longbarrow Crossroads and Countess Roundabout.

AM and PM base models have been built using the October 2006 traffic counts as inputs, and validated to journey times and queues. A sensitivity test has also been run with August 2006 flows, and successfully validated to August queue data.

Following this, an interface has been set up using EXCEL, which will take changes in flow from the strategic SATURN model, and feed these into the VISSIM model to test the effect on the main junctions. The model has been built with static routing, as any route choice, and/or diversion, will already have been taken account of in the SATURN assignment.

Because VISSIM has been validated using turning movements, whereas SATURN uses link counts, the flows in the two models will not necessarily be exactly the same on each link, but should be of the same magnitude. The greater accuracy is required in the VISSIM model to test more robustly the effect of traffic changes on the various junctions. Another difference is that, whereas flows in SATURN are link flows, VISSIM counts the number of vehicles that pass through the junction – such that the queued vehicles have to be added to this count, in order to get back to the total link flow.

Each scenario (Do-Minimum or improvement options) will be analysed through assignment in VISSIM, and results obtained for flows, journey times and queues for comparison with the base situation.

The queues quoted in the tables are averages of 5 minute maximum queues - therefore absolute maximums may be longer than these.

## 3 Existing and Do-Minimum Traffic Results

### 3.1 Introduction

For the years of 2012 and 2027, a set of Do-Minimum forecasts have been produced. While these exclude any options for the A303 Stonehenge Improvement scheme, they include other network changes that are considered likely to come about. In this case, such network changes are those associated with the committed development proposals. For the 2012 forecasts, these comprise:

- Amesbury Link Road, from A345 (Stock Bottom) to Boscombe Road, to serve the Boscombe Down residential development
- Internal access roads to serve the Solstice Park developments, together with a new roundabout access onto Porton Road
- New roundabout on the A345 Netheravon Road to serve the Durrington residential development.

The Do-Minimum network for 2027 also includes some additional internal access roads in Solstice Park to cater for the developments proposed.

In order to allow comparison with forecasts produced previously for the scheme, the results from the peak hour models have been factored and combined into Annual Average Daily Traffic (AADT) forecasts. The factoring processes involved are as follows:

(i) Previous Traffic Model

12-hour forecasts obtained from the traffic model for an average June weekday were factored to AADT levels based on observed automatic traffic count (ATC) data obtained from the permanent count site on the A303 east of Longbarrow Crossroads. Although the model base year was 2000, the ATC data for that year was incomplete, and a factor was obtained from the 2001 data. For the purpose of deriving the 2003 AADT figures that were presented in the Environmental Statement for the A303 Stonehenge Improvement, a further factor was applied to expand from 2000 AADT figures to 2003.

(ii) New Traffic Model

Data for 2006 from two permanent ATC sites (A303 east of Longbarrow Crossroads and A303 east of Countess) were used to obtain an average set of factors to convert to AADT. Each of the three modelled time periods was expanded from the average October hour to the annual average for the relevant time period (07:00-10:00 for the morning peak, 10:00-16:00 for the inter-peak and 16:00-19:00 for the evening peak). These were then added to produce an annual average 12-hour flow, and a single factor from the same data set applied to expand this to AADT.

### 3.2 Traffic on the Network

Figure 3.1 reproduces the 2003 AADT flows that were presented in the 2003 Environmental Statement, together with the Do-Minimum forecasts in use at that time for 2008 and 2023. By comparison, Figure 3.2 shows 2006 base year AADT flows produced by the new SATURN traffic model, together with the forecasts for 2012 and 2027.

It can be seen that the base 2006 AADT flows show little increase from the 2003 flows used in the Environmental Statement, and in some cases are actually lower. It must be remembered first and foremost that we are dealing with two different models – the previous model had no capacity limitations in assigning traffic to different routes, and no effects of junction delays.

Consequently, although both were validated to their respective base years, it is not surprising that differences arise in the forecasts produced.

An additional consideration is the method that was used in the previous model to estimate AADT flows. Although the factor to expand from 12-hour to annual flows was based on observed data (albeit not that in the 2000 base year), the factor to take the 2000 data forward to 2003 for use in the Environmental Statement was not. The observed AADT east of Longbarrow Crossroads in 2002 was 22620, and based on 9 months' data for 2003 (and factoring from 2002 data to the full year), the actual AADT in 2003 actually fell slightly, to 22520. This implies that the 2003 AADT figures shown in Figure 3.1 are around 4% higher than the values indicated by the current data.

The 2006 AADT flows given in Figure 3.2 were derived from factors obtained from two ATC sites at Longbarrow Crossroads and Countess Roundabout. Because this represents an average of two sites, the 'modelled' AADT flow at these two locations will differ from the observed. So, whilst the modelled AADT east of Longbarrow Crossroads of 24600 is 4.3% above the observed, the modelled AADT east of Countess Roundabout of 29300 is 2.1% below the observed.

The observed 2006 AADT east of Longbarrow Crossroads was 23589, which implies a growth rate from the observed 2003 level (22520) of about 1.5% per annum. The growth in AADT during the late 1990s was running at about 4.5% per annum until a slight drop in 1999. This was followed by growth up to 2002 of about 2.8% per annum followed by another slight drop in 2003. Over relatively recent years at least, the figures show that, while the trend of traffic growth on the A303 remains upward, the rate of growth has been gradually declining.

In comparing the previous forecast AADT flows with those produced by the new traffic model, clearly account has to be taken of the different forecast years that have been used. There have also been changes to the basis of the growth factors, both as a result of updates to the TEMPRO forecasts and changes in the development proposals in the local area. Nevertheless, the AADT flows on the western sections of the A303 do show a logical consistency in the respective forecasts for 2008, 2012, 2023 and 2027.

However, on the eastern sections, to the west and east of Countess Roundabout, the 2012 forecasts produced by the new model have reduced to about the level previously predicted for 2008, while the new 2027 forecasts are lower than those previously predicted for 2023. The main cause for this can be seen in the forecasts for the A344, between Airman's Corner and Stonehenge Bottom. Whereas the forecasts from the previous model show that this link, in common with all other locations across the network, was predicted to have consistent levels of growth in traffic, the new model indicates that traffic levels on this road are likely to fall in the future.

The explanation for this lies in the continual growth in traffic using the A303, and its effect on the capacity of the Stonehenge Bottom junction, particularly during the morning peak period. Current traffic volumes on the A303 are already beyond the theoretical link capacity predicted by the default speed-flow relationships used in the Department for Transport's COBA program, which form the basis for those used in the new SATURN traffic model. This does not mean that traffic necessarily comes to a standstill, but it does mean that speeds reduce, with more frequent breakdowns in the smooth flow of traffic, and, crucially, fewer gaps in the traffic. The SATURN model therefore predicts that the capacity for traffic emerging from the A344 onto the A303 at Stonehenge Bottom will gradually decrease as the volume on the A303 increases.

In consequence, the journey time via the A344 will increase, and the rate of increase is likely to be much higher once demand exceeds capacity. As a result, traffic using the A344 will start to transfer to alternative routes that offer a faster journey time. The obvious alternative route would be the A360/A303 via Longbarrow Crossroads, but this junction too has limited capacity to absorb the traffic, and is predicted to have increasing congestion problems. We might also note here that whatever traffic does divert to this route will exacerbate the capacity problem at Stonehenge Bottom by further increasing the flow along the A303.

As a result of the capacity limitations at Longbarrow Crossroads, Figure 3.2 clearly shows that diversions away from the A344 onto the A360 are exceeded by the traffic volume diverting onto The Packway, which shows noticeable increases in traffic volumes, especially by 2027.

It is also worth pointing out that if a north-south screenline (a line across the network, along which traffic is counted on each link severed) is taken through the three links to the east of Longbarrow Crossroads, Airman’s Corner and Rolleston Camp, then the total volume of traffic predicted by the new model is consistent with earlier forecasts from the previous model. The 2008 forecasts previously totalled 37,100 at low growth and 42,700 at high growth. Corresponding forecasts now produced for 2012 are 40,100 and 44,300. Previous forecasts for 2023 were 45,300 and 57,400, while the totals in 2027 are now 44,700 and 51,600.

On the A345 and A360 routes to the south of the A303, it is noticeable that the revised traffic volumes forecast for 2012 and 2027 are lower than those previously produced for 2008 and 2023. This results from an absence of growth in observed traffic levels on both routes between 2000 (which formed the basis of the previous forecasts) and 2006 (the basis of the revised forecasts). The previous forecasts would have allowed for a general level of traffic growth in the area over this period, in line with standard national and local forecasts. On these routes, however, this growth has not occurred in practice.

The A344 between Airman’s Corner and the A303 is essentially a through route, in that there is nothing on this route to which vehicles require access, with one exception: Stonehenge itself – or more specifically, the Visitor Centre on the north side of the road. The SATURN model includes this as a separate zone, with traffic demand based on an observed count at the access in October 2006. Inevitably in the morning peak hour the demand for access to the Visitor Centre is very low, whilst it is at its maximum during the inter-peak, with a lower but not insignificant volume during the evening peak (mostly departures from the site). This traffic is by definition “captive” to the A344, in that it does not have the option to choose an alternative route as a result of increasing congestion (although it does have the option of changing the direction of approach or departure).

Table 3.1 below illustrates the contribution that the Visitor Centre makes to the AADT traffic volumes on the A344, and how this varies as traffic growth builds up. This shows that, at present, the Visitor Centre traffic makes up about 8% of traffic on the western section of the A344 and about 16% of the eastern section. These proportions gradually increase over time, however, as demand for the Visitor Centre continues while other traffic on the road diverts to alternative routes as congestion increases.

**Table 3.1 Visitor Centre traffic**

		2006	2012		2027	
			Low	High	Low	High
<b>West of Visitor Centre</b>	AADT Total	6300	6200	5600	5300	3500
	AADT Visitor Centre	500	500	500	500	700
	Visitor Centre %	7.9%	8.1%	8.9%	9.4%	20.0%
<b>East of Visitor Centre</b>	AADT Total	6900	6800	6400	5900	4000
	AADT Visitor Centre	1100	1000	1300	1100	1200
	Visitor Centre %	15.9%	14.7%	20.3%	18.6%	30.0%

In comparing the previous forecasts in Figure 3.1 with the new AADT forecasts in Figure 3.2, one other feature of note is the decline in traffic using the A360 to the west of Airman’s Corner. The estimated AADT for 2003 at this location was 13100 vehicles, whereas that for 2006 has reduced to 9600. As noted above, the 2003 AADT figures were based on year 2000 modelled flows with a factor applied to account for assumed traffic growth. The observed 12-hour flow for an average June weekday in 2000 at this location was 8702 vehicles, while that for an average weekday in October 2006 was 8148 vehicles. From the ATC data on the A303, average

June flows were about 5.9% above those for October, and applying this factor to the October flow on the A360 would convert it to a June equivalent of 8629, indicating that there has been no growth since 2000. Consequently, as actual traffic growth from 2000 to 2003 was lower than anticipated, previous estimates of 2003 AADT flows at this location were slightly over-estimated. This follows through both onto the A344 and to the A360 through Longbarrow Crossroads.

It is also noticeable that traffic volumes at the eastern end of The Packway, to the west of its junction with the A345, are considerably higher than previously forecast. This is a reflection of the changes in observed traffic volumes at this point. The manual traffic count at the A345 junction in June 2000 recorded a two-way traffic volume of 6377. The equivalent count in October 2006 recorded 10141 vehicles. In the absence of any evidence of substantial through movements on this route at present, the implication is that the traffic volumes generated by the Larkhill area has increased significantly in recent years.

The link capacity of greatest concern is that of the single carriageway section of the A303. Based on the observed proportion (13%) of heavy vehicles using the trunk road, the formulae for the standard speed-flow curves defined in the COBA program suggests a one-way capacity of about 1250 to 1350 vehicles per hour. From the automatic count data, it is clear that there are occasions, particularly during the summer months, when this capacity is already exceeded and queues occur. For modelling purposes, therefore, an 'ultimate one-way capacity' for the A303 single carriageway section has been set to 1600 vehicles per hour to reflect the maximum observed hourly flows, in order to avoid excessive and unrealistic diversions away from the route as traffic growth continues.

Nevertheless, with the assumed levels of growth in traffic, there are sections of the A303 where this ultimate capacity figure is reached. In this respect, the most vulnerable section is between Stonehenge Bottom and the dual carriageway west of Countess Roundabout, as this section carries the highest volume of traffic. In 2012, even at low growth, this link is at capacity for eastbound traffic in the morning peak hour and for westbound traffic in the evening peak hour. This situation shows no material change by 2027, mainly because the A303 single carriageway through Stonehenge Bottom and the existing junctions at Countess and Longbarrow are unable to pass greater volumes of traffic.

This means that growth in AADT forecasts on this section of the A303 is due mainly to growth in the inter-peak periods, together with a small amount of growth in the non-tidal direction in the peak hours. Consequently, whilst in the 2006 base year, the average two-way inter-peak hourly traffic flow on this section is about 80% of the two-way peak hour flow, by 2027 the proportion is predicted to increase to 89-95% (low-high growth).

This suggests two broad conclusions: first, that the capacity of the single carriageway A303 and the junctions at Longbarrow Crossroads and Countess Roundabout will become increasingly important in restricting the operation of traffic on the A303; and second, given the model analysis is based on an average October weekday, it is likely that congestion problems currently observed, for example in the summer months, will become an increasingly common experience at all times of the year.

### **3.3 Traffic Impacts at Selected Junctions**

#### **3.3.1 Introduction**

To better understand the potential traffic impacts at selected junctions, the existing and Do-Minimum data from SATURN has been entered into the VISSIM model. This section presents and discusses the results of this analysis, comparing the 2006 base year with the 2012 and 2027 future years (the assumed opening and design years respectively for the A303/A344 junction closure) on the basis that the existing network remains substantially unchanged.

The model shows that at an average October 2006 weekday peak hour level, queues at Longbarrow Crossroads, the A303/A344 junction at Stonehenge Bottom, and at Countess Roundabout are all relatively short.

### 3.3.2 Impacts in 2012 (opening year)

#### 2012 AM Peak

By 2012, traffic has greater difficulty in accessing the A303 from the A344 because of the increased flow on the A303, so whilst the queues on the A344 remain relatively unchanged, the flows reduce as traffic diverts to other routes, particularly to The Packway and some to the A360 via Longbarrow Crossroads. Table 3.2 below shows the 2012 AM peak results at Countess Roundabout, the A303/A344 Y-junction, Longbarrow Crossroads and Airman's Corner.

**Table 3.2 Entry flows and queue lengths for Do-Minimum 2012 AM Peak**

Location		2006 Base		Do-Minimum 2012 AM Peak			
				Low Growth		High Growth	
		Flow (vph)	Queue (m)	Flow (vph)	Queue (m)	Flow (vph)	Queue (m)
Airman's Corner	B3086 North	131	3	66	3	71	3
	A344 East	132		115		111	
	A360 South, left turn	131	0	111	0	148	0
	A360 South, right turn	63	12	63	15	102	15
	A360 West	613	1	591	2	615	3
Longbarrow Crossroads	A360 North	312	14	370	33	399	57
	A303 East	881	41	931	48	1028	65
	A360 South	369	14	372	15	459	22
	A303 West	910	31	1058	40	1093	57
A303/A344 junction	A344 North, left turn	414	44	282	34	279	37
	A303 East, right turn	136	15	126	18	122	17
	A303 East, straight	877		945		1025	
	A303 West, left turn	1	0	0	0	0	2
	A303 West, straight	976		1183		1211	
Countess Roundabout	A345 North	725	59	796	54	846	56
	A303 East	892	45	1077	50	1197	73
	A345 South	553	34	590	47	614	77
	A303 West	1381	72	1456	111	1411	190

At both Airman's Corner and at Longbarrow Crossroads, the forecast increases in traffic have little effect on junction operation, with limited effects on queue lengths, indicating that there is sufficient capacity to accommodate the increased flows, at both low and high growth levels.

At Countess Roundabout in the low growth scenario, queues are not significantly different in 2012 from those that occur already in 2006. Under high growth it is noticeable that the queues increase, on the A303 West in particular to 190m from 72m in 2006, due to the greater volume of traffic circulating the roundabout. Whilst under the low growth assumptions this junction seems to operate within capacity in 2012, under high growth assumptions the longer queues indicate that the junction is approaching or at capacity.

#### 2012 PM Peak

At the A303/A344 junction, in the 2012 PM peak, the flows along the A303 again increase, as shown in Table 3.3 below. This leaves less capacity for the A344 traffic to join the A303,

causing flows at this approach to reduce. Consequently, as traffic diverts to alternative routes, the queues at this location remain relatively unchanged from 2006.

**Table 3.3 Entry flows and queue lengths for Do-Minimum 2012 PM Peak**

Location		2006 Base		Do-Minimum 2012 PM Peak			
				Low Growth		High Growth	
		Flow (vph)	Queue (m)	Flow (vph)	Queue (m)	Flow (vph)	Queue (m)
Airman's Corner	B3086 North	106	14	152	16	208	18
	A344 East	362		329		195	
	A360 South, left turn	216	1	236	11	392	17
	A360 South, right turn	58	10	49	8	68	13
	A360 West	275	2	315	2	307	1
Longbarrow Crossroads	A360 North	241	9	311	14	398	28
	A303 East	1047	32	1078	38	1261	55
	A360 South	475	25	516	34	579	70
	A303 West	686	32	727	40	874	120
A303/A344 junction	A344 North, left turn	180	17	198	19	151	16
	A303 East, right turn	363	32	328	29	240	29
	A303 East, straight	1049		1088		1271	
	A303 West, left turn	10	0	15	0	13	0
	A303 West, straight	814		930		1107	
Countess Roundabout	A345 North	658	31	629	26	675	31
	A303 East	1313	51	1644	78	1694	100
	A345 South	662	100	661	207	680	193
	A303 West	984	53	1114	83	1248	106

At Longbarrow Crossroads, the level of increasing flow from the A303 East, together with the proportion of right-turning traffic to the A360 North, begins to extend the queues on the A303 West entry to the roundabout, from 32m in 2006 to 120m (at high growth). Some of the increasing flow and right-turning traffic will be that which remains on the A303 rather than waiting for a gap at Stonehenge Bottom to turn right onto the A344. Even so, apart from the increased queue on the A303 West, the queue lengths at Longbarrow Crossroads indicate that the junction is otherwise operating within its capacity. The same conclusion can be drawn for Airman's Corner, where there is little queuing.

At Countess Roundabout, flows along the A303 increase, leading to reduced opportunities for the entry movements from the A345 South, where queues increase from 100m in 2006 to around 200m for both low and high growth. The queues are also beginning to increase on the A303 entries, indicating that the junction is operating close to its capacity.

### 3.3.3 Impacts in 2027 (design year)

#### 2027 AM Peak

By 2027, the issues noted above in 2012 have been compounded by greater traffic growth, as can be seen in the comparison between Tables 3.2 earlier and 3.4 below for the AM peak hours.

In the AM peak, flows on the A344 would generally drop further, due to the flow increases on the A303 making it increasingly difficult for the A344 traffic to join the A303 and so causing it to divert. Vehicles queuing on the A344 North entry would move very slowly in 2027 as the length and frequency of gaps on the A303 reduces. As a result even relatively short queues on the A344 North entry would cause long delays. In the high growth scenario, due to higher levels

of congestion elsewhere on the network, flows and queues on the A344 North increase relative to the low growth scenario, as there are fewer opportunities for traffic to transfer elsewhere.

**Table 3.4 Entry flows and queue lengths for Do-Minimum 2027 AM Peak**

Location		2006 Base		Do-Minimum 2027 AM Peak			
				Low Growth		High Growth	
		Flow (vph)	Queue (m)	Flow (vph)	Queue (m)	Flow (vph)	Queue (m)
Airman's Corner	B3086 North	131	3	59	2	85	3
	A344 East	132		58		73	
	A360 South, left turn	131	0	193	0	282	0
	A360 South, right turn	63	12	67	13	64	14
	A360 West	613	1	472	1	579	1
Longbarrow Crossroads	A360 North	312	14	344	112	325	647
	A303 East	881	41	1065	59	1177	59
	A360 South	369	14	477	28	679	59
	A303 West	910	31	1151	103	1033	436
A303/A344 junction	A344 North, left turn	414	44	134	22	193	72
	A303 East, right turn	136	15	56	12	76	26
	A303 East, straight	877		1089		1181	
	A303 West, left turn	1	0	1	2	1	25
	A303 West, straight	976		1389		1550	
Countess Roundabout	A345 North	725	59	828	53	805	193
	A303 East	892	45	1211	59	1467	99
	A345 South	553	34	604	77	649	164
	A303 West	1381	72	1453	228	1341	881

At the A360 North approach to Longbarrow Crossroads, the queues increase to 112m in low growth and 647m in high growth, from 14m in 2006, as a result of increased traffic flows through this junction. Queues on the A303 West entry also change significantly rising from 31m in 2006 to 103m with low growth and 436m with high growth. This is due to the increased flow on this entry and the additional right-turning traffic, from the A303 East to the A360 North, causing delays to eastbound traffic. In these conditions, the junction has reached (or is very close to) capacity and would often suffer from considerable congestion. Potential at-grade improvements within the highway boundaries would do little to relieve this congestion and previous analysis has indicated that a grade-separated solution would be needed to address satisfactorily the congestion problems here.

At Airman's Corner, although there are some changes in traffic flows and in the distribution of turning movements, the junction is still within capacity with no major constraints on its operation.

With low growth, there would be a noticeable increase in flows at Countess Roundabout compared to 2006, with the roundabout operating at capacity. The biggest increase in queue length would be on the A303 West entry, to 228m from 72m in 2006. This would increase even further under high growth to 881m, demonstrating the degree of stress on the roundabout and the extent to which different flows and turning movements under these circumstances are capable of generating long queues and delays. Under high growth the queues on the other entry arms would also start to build significantly.

**2027 PM Peak**

Table 3.5 below shows the 2027 PM peak results.

At the A303/A344 junction, flows along the A303 would increase relative to the equivalent 2012 flows, and consequently right turns from A303 East onto the A344 would become more difficult, reducing further to 261 and 168 vehicles respectively under the low and high growth scenarios. Despite fewer right turns from the A303 East in 2027, the queue length remains relatively unchanged as the right turning traffic has less opportunity to find a suitable gap. Similarly, traffic from the A344 reduces further as a result of increased traffic along the A303, to 142 vehicles under the low growth scenario and to 82 vehicles under the high growth scenario, but again the queues remain relatively unchanged as long waiting times result in traffic seeking alternative routes.

These impacts are also felt at Longbarrow Crossroads, where the queues increase, particularly on the A303 West and A360 South approaches. This is caused by the higher demand volumes from the east, coupled with increased circulating flows through the roundabout, including the right-turning movements to the A360 North. Under these circumstances the results show that the roundabout would be operating at capacity in the high growth scenario.

**Table 3.5 Entry flows and queue lengths for Do-Minimum 2027 PM Peak**

Location		2006 Base		Do-Minimum 2027 PM Peak			
				Low Growth		High Growth	
		Flow (vph)	Queue (m)	Flow (vph)	Queue (m)	Flow (vph)	Queue (m)
Airman's Corner	B3086 North	106	14	209	8	270	9
	A344 East	362		263		171	
	A360 South, left turn	216	1	268	1	452	1
	A360 South, right turn	58	10	59	11	168	25
	A360 West	275	2	266	2	300	2
Longbarrow Crossroads	A360 North	241	9	368	25	531	52
	A303 East	1047	32	1236	53	1386	69
	A360 South	475	25	561	70	596	291
	A303 West	686	32	862	65	899	427
A303/A344 junction	A344 North, left turn	180	17	142	16	82	12
	A303 East, right turn	363	32	261	33	168	21
	A303 East, straight	1049		1223		1392	
	A303 West, left turn	10	0	16	1	10	0
	A303 West, straight	814		1054		1055	
Countess Roundabout	A345 North	658	31	600	27	764	38
	A303 East	1313	51	1703	132	1670	213
	A345 South	662	100	641	347	630	459
	A303 West	984	53	1188	104	1119	122

At Countess Roundabout, generally higher volumes of traffic arriving at the junction under both growth scenarios leads to longer queues at all approaches except on the A345 North in low growth. The higher circulating flows through the roundabout in the high growth scenario lead to reduced capacity at the A303 East entry to the roundabout and consequently some rerouting of traffic. In these circumstances the junction is operating at its capacity under both high and low growth.

### 3.4 Summary

In summary, the 2006 base traffic volumes are slightly lower than might have been expected from the estimated 2003 AADT figures that were presented in the 2003 Environmental Statement, mainly because the growth in traffic on the A303 has slowed in recent years. Although the A303 single carriageway sections and its junctions within the study area are known to suffer congestion problems at peak holiday times, the model results indicate that on an average October weekday, congestion levels are currently relatively low.

The spare capacity available, however, is generally limited. The anticipated growth in traffic to 2012 would put increasing pressure both on the single carriageway link capacity of the A303 and at some of the junctions, in particular Countess Roundabout, where long queues would start to develop at peak times.

The capacity available for traffic leaving and entering the A344 at Stonehenge Bottom would also reduce as traffic volumes on the A303 increase, creating long delays and causing traffic to seek alternative routes. Traffic volumes on the A344 would therefore tend to reduce significantly as time goes on. The ready alternative via Longbarrow Crossroads would also quickly lose capacity as congestion builds up via the A360/A303, so The Packway between Shrewton and Durrington becomes an attractive alternative route, with corresponding increases predicted in traffic volumes.

Across the four junctions analysed, we see that there would be lengthy queues building at Longbarrow Crossroads and Countess Roundabout beyond 2012. In the Do-Minimum scenario, with high growth, Longbarrow Crossroads is likely to reach capacity around 2015 in the AM peak, but in the PM peak it is likely to remain within capacity for longer. With low growth, capacity is likely to be reached between 2020 and 2023 in the AM peak, and later in the PM peak, where the tidality of flows enables more balanced use of the roundabout.

Countess Roundabout operates within or close to capacity in 2012 with low growth, but by 2027 capacity is reached, particularly in the PM peak, which is reflected by long queues and traffic taking alternative routes. Under low growth, capacity is likely to be reached from around 2015 onwards. Under high growth, the roundabout operates at or close to capacity from 2012 onwards.

At both Countess Roundabout and Longbarrow Crossroads, previous analysis has shown that grade-separated solutions would be needed to address satisfactorily the congestion at these junctions.

## 4 Scheme Description of A303/A344 Junction Closure

The design and construction of the works required for the closure of the A303/A344 junction, together with the short section of the A344 itself between the A303 and the car park entrance to the existing Visitor Centre, would be relatively simple. Successful completion of the Statutory Process would not be so simple however, particularly with the potential opposition of Wiltshire County Council (WCC) to such a proposal. This Chapter will consider only design and construction issues – Chapter 8 will consider the progression of the scheme through the statutory process.

The proposed scheme (refer to Figure 4.1) would comprise the closure of the A303/A344 junction, plus, ideally, closure of the redundant section of the A344 from east of the existing Visitor Centre car park entrance down to the A303. The redundant carriageway would be regraded to marry into adjacent ground levels and grassed over, with the possibility of a new footpath created between the A303 and the Visitor Centre. A turning head would be provided at the new termination of the A344, and the highway boundary fencing alongside the A303 would be extended across the line of the existing A344.

The construction sequence would be for the existing kerbs and bituminous layers to be removed along the redundant section of the A344. The granular layers of the pavement would be left in place, to avoid disturbing any as-yet undiscovered archaeological remains. The carriageway area would then be built-up with suitable fill (perhaps partially made up of the kerbs and bituminous layers previously removed, which could be crushed for this purpose), to about 300mm below adjoining ground levels either side of the existing A344. Where the A344 joins the A303 on embankment, part of the existing embankment could be removed leaving enough to give an acceptable width and gradient for the footpath. The whole area would then be topsoiled and seeded with chalk downland grasses and wild flowers typical of the area.

Details of the scheme beyond the highway boundary with the A303 would have to be developed in coordination and agreement with WCC as the highway authority for the A344.

The cost of closing the A303/A344 junction and the short section of the A344 is estimated to be c.£750k (at Q2 2006 prices). Chapter 8 presents the costs in more detail.

An inevitable consequence of the A344 closure would be a change in traffic movements at Airman's Corner. At present, the main traffic movement through the junction is along the A360/A344 which is the priority route through the staggered crossroads junction layout. With the closure of the A344 at the A303, the main traffic movement at Airman's Corner would change to a predominance of movements between the A360 West and the A360 South. This would mean that the junction layout would have to be altered to accommodate safely the new priority movement. Again such work would have to be developed in partnership and agreement with WCC.

Options for such improvements at Airman's Corner have been considered in earlier stages of the Stonehenge Improvement scheme. These were discussed previously with WCC, on the understanding that the Council would develop and construct its own proposal for amending the layout at Airman's Corner in the aftermath of the A303 Stonehenge Improvement, following the planned relocation of the Visitor Centre to Countess East and following the complete closure of the A344 from the existing Visitor Centre all the way back to Airman's Corner, something the Council were intending to pursue in agreement with English Heritage and the National Trust in accordance with the objectives of the World Heritage Site Management Plan.

There are options for amending the layout at Airman's Corner that could be constructed within existing highway land. Cost estimates for these are between c.£250k and c.£500k (at Q2, 2006). However, there are also options that would involve the compulsory acquisition of adjacent land, with the costs in the region of c.£700k (Q2, 2006 prices). Further work would be needed to determine the best solution for Airman's Corner. If it were determined that the best solution entailed the compulsory acquisition of land, this would require the statutory process to be

pursued, with the publication of Compulsory Purchase Order(s), and would increase the preparation costs, dependent on whether or not a public inquiry would be needed.

## 5 Traffic Assessment of A303/A344 Junction Closure

### 5.1 Introduction

The closure of the A303/A344 junction was the starting point for the Partial Solutions assessed as part of the A303 Stonehenge Improvement Scheme Review, post-2004 Public Inquiry. The closure has been considered as a means of reducing environmental impact at Stonehenge (where the A344 runs immediately adjacent to the Stones) and on grounds of safety.

Previous investigation of this closure, using the previous traffic model with older traffic data, indicated that the major impact would be a very large increase in congestion at Longbarrow Crossroads. This Chapter reassesses the traffic effects of closure with the new data.

It is assumed that the Stonehenge Visitor Centre would remain in its current position for the purposes of this analysis.

### 5.2 Traffic Network

The natural alternative route for traffic currently using the A344, in the event of the road being closed at its junction with the A303, is via the A360 at Longbarrow Crossroads, and this effectively is what was shown by the previous model. However, the lack of capacity restraint in the previous model (either on links or at junctions) means that the optimum diversion route for this traffic was not necessarily selected.

As noted in the previous chapter, AADT traffic forecasts on the A344 show a decline from the 2006 base, due to increasing congestion on the A344 at its junction with the A303. Table 5.1 compares link flows in each of the modelled time periods for the base year and Do-Minimum future-year forecasts at three locations: the A344 west of the A303, the A360 north of the A303, and The Packway east of Rollestone Camp.

**Table 5.1 Modelled link flows, Do-Minimum**

		A344, West of A303		A360, North of A303		The Packway, East of Rollestone	
<b>AM Peak</b>		Eastbound	Westbound	Southbound	Northbound	Eastbound	Westbound
2006		338	241	386	204	345	196
2012	Low	247	253	391	238	437	203
	High	228	245	435	301	533	245
2027	Low	108	117	376	325	566	238
	High	147	149	474	406	669	299
<b>Inter Peak</b>		Eastbound	Westbound	Southbound	Northbound	Eastbound	Westbound
2006		174	200	172	185	108	120
2012	Low	175	199	168	186	107	110
	High	197	227	192	204	124	128
2027	Low	194	249	180	195	118	160
	High	116	137	309	316	220	263
<b>PM Peak</b>		Eastbound	Westbound	Southbound	Northbound	Eastbound	Westbound
2006		240	451	165	247	203	290
2012	Low	262	437	232	264	201	406
	High	207	307	317	445	287	515
2027	Low	194	342	298	307	225	479
	High	110	223	465	545	438	626

The 2006 traffic volumes on the A344 show a peak hour tidality, with the give-way movements at the A303 junction operating within capacity. By 2012, however, the growth in traffic levels on the A303 means that gaps for the give-way movements from the A344 become less frequent, leading to a significant increase in delays at the junction. As a result, vehicles in the morning and evening peak hours begin to seek alternative routes, resulting in a decreased volume of traffic using the A344 at peak times. In the evening peak, this effect is only noticeable at high growth levels, while the inter-peak is also not noticeably affected. By 2027, however, the decrease becomes even more pronounced in both morning and evening peak periods, and the inter-peak also shows evidence of decreasing traffic at high growth.

Table 5.1 indicates that as much, if not more, traffic transfers to The Packway as to the A360/A303 route via Longbarrow Crossroads. This arises because the capacity of the Longbarrow Crossroads junction comes under increasing pressure, particularly by 2027, so that the resulting delays are sufficient for the diverted traffic to seek another alternative.

Overall, the closure of the A303/A344 junction would have less impact on the network than might be expected, because a significant proportion of the traffic that would have been affected by the closure will have already transferred to another route.

Figure 5.1 shows the predicted AADT traffic volumes that would result from the closure of the A303/A344 junction, and Table 5.2 below shows the equivalent figures to those in Table 5.1 earlier, but with the junction closed.

**Table 5.2 Modelled link flows, A303/A344 junction closed**

		A344, West of A303		A360, North of A303		The Packway, East of Rollestone	
AM Peak		Eastbound	Westbound	Southbound	Northbound	Eastbound	Westbound
2006		338	241	386	204	345	196
2012	Low	-	-	427	281	459	190
	High	-	-	407	377	584	220
2027	Low	-	-	415	392	580	218
	High	-	-	561	509	683	293
Inter Peak		Eastbound	Westbound	Southbound	Northbound	Eastbound	Westbound
2006		174	200	172	185	108	120
2012	Low	-	-	304	312	142	169
	High	-	-	340	348	163	195
2027	Low	-	-	329	334	156	194
	High	-	-	430	404	209	286
PM Peak		Eastbound	Westbound	Southbound	Northbound	Eastbound	Westbound
2006		240	451	165	247	203	290
2012	Low	-	-	368	611	224	448
	High	-	-	504	644	286	553
2027	Low	-	-	446	537	231	541
	High	-	-	550	620	372	661

The net impact of the junction closure is variable, as might be expected in congested conditions where changes in traffic volumes can have differential impacts on junction delays and on the capacity of different turning movements over a fairly wide area. In general, however, the junction closure naturally transfers a greater volume of traffic to the A360 alternative via Longbarrow Crossroads than to The Packway. This includes the traffic destined for the Stonehenge Visitor Centre that may find the A360 via Longbarrow Crossroads a more convenient route to the Visitor Centre than The Packway, despite any congestion difficulties.

As a result, the AADT forecasts shown in Figure 5.1 indicate a substantial increase in traffic using the A360/A303 route via Longbarrow Crossroads compared with the Do-Minimum. The A360 south of Airman’s Corner shows an increase in AADT of 66% (low growth) to 49% (high

growth) at 2012 and 54% (low growth) to 24% (high growth) at 2027. Percentage increases on the A303 east of Longbarrow are lower because of the much higher base level of traffic, but even here the increase at 2012 is 13-17%, with 7-12% at 2027.

The closure of the A303/A344 junction means that the volume of traffic on the A303 between Longbarrow Crossroads and Stonehenge Bottom is the same as that to the east of Stonehenge Bottom, thus extending the length of single carriageway that is already close to its capacity at peak times. There would be a small reduction in traffic using the A303 to the east of Stonehenge Bottom, as some vehicles that would have travelled via the A344 transfer to a route other than the A360, mainly The Packway. But with the closure of the A344 junction, traffic on the A303 between Stonehenge Bottom and Longbarrow Crossroads would increase by 13-17% at 2012 compared with the Do-Minimum, and the peak hour one-way flows would be 90-95% of the assumed link capacity of 1600 vehicles/hour. This would rise to 93-97% by 2027, with traffic volumes 7-12% higher than the Do-Minimum forecasts on this section. Under these conditions, breakdowns in the flow of traffic and resulting congestion and queuing would be expected to become regular occurrences from 2012 onwards.

When considering possible improvements to the A303 past Stonehenge to ease these increased flows, there is insufficient land within existing highway boundaries to widen the road. Any widening of the A303 along its existing alignment would require land acquisition and a bigger footprint within the World Heritage Site. The assessment of the options for improving the A303 has been presented in the A303 Stonehenge Improvements Scheme Review – Stage 2 Report. If these options are not to be pursued, the A303 would remain as it is for the foreseeable future, with the traffic flows ultimately being constrained by the capacity of the existing single carriageway. Future traffic growth would cease when capacity is reached, which would probably be around 2012 at peak times and perhaps around 2030 between the peaks.

Closure of the A303/A344 junction will transfer A344 traffic onto alternative routes. While some traffic will divert to The Packway, most will continue via Airman's Corner, transferring to the A360 via Longbarrow Crossroads. This means that there would be significant increases in right and left turning movements at Airman's Corner, but the reduction in straight through traffic (i.e. those vehicles previously using the A344) means that there is little effect on the overall capacity of the junction.

Nevertheless, it should be noted that there would be a general imbalance of flows at Airman's Corner, in that the priority movements would be much less than those movements where vehicles are required to give-way. This could have safety implications if drivers making the latter movements become used to making the turn without any delay, particularly on the left turn from A360 South to A360 West, which is facilitated by a slip road with a generous radius.

Notwithstanding the capacity limitations of the A303 single carriageway past Stonehenge, relatively minor improvements to the capacity of the Longbarrow Crossroads junction have been analysed to test whether they would be beneficial. These incorporate an additional westbound lane on the A303 approach from the east into the roundabout, designed to separate traffic turning right onto the A360 from the main westbound flow, together with a widening of the circulatory carriageway to accommodate three lanes of traffic. The improvements also include an additional southbound lane on the A360 approach dedicated to traffic turning left onto the A303. The impact of these capacity improvements is to attract some additional traffic back onto the A360/A303 route via Longbarrow Crossroads from alternatives such as The Packway. This would amount to an additional 1200-1500 AADT on the A360 at 2012, rising to 1800-2400 AADT at 2027. The attracted traffic would, however, use up the capacity created by the improvements, so that there would be little discernible improvement in the operation of the junction.

## 5.3 Traffic Impacts at Selected Junctions

### 5.3.1 Introduction

As described in Section 3.3.1 for the Do-Minimum scenario, to understand better the potential traffic impacts of closing the A303/A344 junction, the Do-Minimum and Do-Something data from the SATURN model has been entered into the VISSIM model. This section presents and discusses the results of this analysis for the effects of the A303/A344 junction closure in the assumed opening year of 2012 and design year of 2027.

### 5.3.2 Impacts in 2012 (opening year)

#### 2012 AM Peak

In the AM peak, the closure of the A303/A344 junction causes little change to queue lengths at Airman's Corner, as shown in Table 5.3 below, despite large increases in turning traffic between the A360 South and the A360 West.

**Table 5.3 Entry flows and queue lengths resulting from A344 junction closure 2012 AM Peak**

Location		Do-Minimum 2012 AM Peak				Closure of A344, 2012 AM Peak			
		Low Growth		High Growth		Low Growth		High Growth	
		Flow (vph)	Queue (m)	Flow (vph)	Queue (m)	Flow (vph)	Queue (m)	Flow (vph)	Queue (m)
Airman's Corner	B3086 North	66	3	71	3	45	2	40	2
	A344 East	115		111		4		4	
	A360 South, left turn	111	0	148	0	178	0	244	0
	A360 South, right turn	63	15	102	15	61	13	64	13
	A360 West	591	2	615	3	410	0	403	0
Longbarrow Crossroads	A360 North	370	33	399	57	395	120	359	199
	A303 East	931	48	1028	65	972	52	1093	69
	A360 South	372	15	459	22	410	20	488	25
	A303 West	1058	40	1093	57	1104	70	1134	157
Countess Roundabout	A345 North	796	54	846	56	825	53	916	52
	A303 East	1077	50	1197	73	1041	48	1160	71
	A345 South	590	47	614	77	595	42	615	80
	A303 West	1456	111	1411	190	1359	111	1389	173

At Longbarrow Crossroads, queues on the A360 southbound (North) arm increase from 33m to 120m with low growth and from 57m to 199m at high growth. This is mainly due to increased traffic on the roundabout itself, as the flows on the A360 North remain fairly constant. The high flows on the A303 in both directions reduce the opportunity for traffic from the A360 North to enter the roundabout. Under high growth assumptions, long queues are also starting to build on the A303 West entry, so the roundabout is operating at (or close to) capacity.

The closure of the A303/A344 junction causes little change to queue lengths at Countess Roundabout. Along the A303, the flows reduce slightly, with a slight increase on the A345 North – this is likely to be caused by traffic diverting to avoid the increased levels of congestion at Longbarrow Crossroads and along the A303 past Stonehenge.

#### 2012 PM Peak

In the PM peak at Airman's Corner, despite the changing distribution of flows as shown in Table 5.4 below, the lengths of queues again do not change significantly from the Do-Minimum scenario.

**Table 5.4 Entry flows and queue lengths resulting from A344 junction closure 2012 PM Peak**

Location		Do-Minimum 2012 PM Peak				Closure of A344, 2012 PM Peak			
		Low Growth		High Growth		Low Growth		High Growth	
		Flow (vph)	Queue (m)	Flow (vph)	Queue (m)	Flow (vph)	Queue (m)	Flow (vph)	Queue (m)
Airman's Corner	B3086 North	152	16	208	18	171	11	218	14
	A344 East	329		195		38		54	
	A360 South, left turn	236	11	392	17	533	0	555	0
	A360 South, right turn	49	8	68	13	56	3	115	19
	A360 West	315	2	307	1	184	0	279	0
Longbarrow Crossroads	A360 North	311	14	398	28	372	28	517	67
	A303 East	1078	38	1261	55	1410	46	1475	73
	A360 South	516	34	579	70	493	57	476	79
	A303 West	727	40	874	120	841	124	808	302
Countess Roundabout	A345 North	629	26	675	31	614	24	676	31
	A303 East	1644	78	1694	100	1610	71	1685	94
	A345 South	661	207	680	193	668	161	661	216
	A303 West	1114	83	1248	106	1110	80	1168	108

The flows through Longbarrow Crossroads increase between the A36 North and the A303 East as a result of closing the A344. The increased right-turning movement in particular from the A303 East reduces the opportunity for traffic from the A303 West approach to enter the roundabout, causing long queues to build, especially in the high growth scenario, when the junction would be operating at capacity.

At Countess Roundabout, the closure of the A344 has little impact on either flows or queues.

### 5.3.3 Impacts in 2027 (design year)

By 2027, there is considerable traffic growth along the entire network with higher levels of congestion and consequently fewer opportunities for traffic to transfer to alternative routes. This results in generally higher volumes of traffic, and consequently longer queues, at all of the assessed junctions when compared with the equivalent results for 2012.

#### **2027 AM Peak**

Table 5.5 below shows the predicted traffic flows and queues resulting from the A344 junction closure in the 2027 AM Peak.

At Airman's Corner, the queues are relatively short with low growth. However, with the A303/A344 junction closed in the high growth scenario, queues on the A360 North approach to Longbarrow Crossroads extend back as far as Airman's Corner, impeding the operation of this junction. Once this happens, queues start to build-up on the A360 approaches to Airman's Corner.

At Longbarrow Crossroads, closure of the A344 junction would cause queues along the A360 North to increase considerably from the Do-Minimum situation (from 112m to 256m with low growth and from 647m to 976m with high growth). Under both growth scenarios, traffic entering the junction from this approach only marginally increases as a result of the A303/A344 junction closure, so the increase in queuing is due to the roundabout itself operating at capacity. There is also a noticeable increase in queue length on the A303 West under the high growth scenario (from 436m to 654m), although the entry flow actually reduces slightly. This tends to

confirm that, by 2027, the roundabout is at capacity, whether or not the A344 junction is closed, and any additional traffic simply contributes towards longer queues on the approaches.

**Table 5.5 Entry flows and queue lengths resulting from A344 junction closure 2027 AM Peak**

Location		Do-Minimum 2027 AM Peak				Closure of A344, 2027 AM Peak			
		Low Growth		High Growth		Low Growth		High Growth	
		Flow (vph)	Queue (m)	Flow (vph)	Queue (m)	Flow (vph)	Queue (m)	Flow (vph)	Queue (m)
Airman's Corner	B3086 North	59	2	85	3	46	2	26	10
	A344 East	58		73		3		2	
	A360 South, left turn	193	0	282	0	243	0	247	0
	A360 South, right turn	67	13	64	14	72	16	28	79
	A360 West	472	1	579	1	402	0	472	77
Longbarrow Crossroads	A360 North	344	112	325	647	359	256	339	976
	A303 East	1065	59	1177	59	1106	58	1247	65
	A360 South	477	28	679	59	483	32	605	53
	A303 West	1151	103	1033	436	1116	161	987	654
Countess Roundabout	A345 North	828	53	805	193	892	54	771	190
	A303 East	1211	59	1467	99	1197	69	1447	107
	A345 South	604	77	649	164	607	76	640	271
	A303 West	1453	228	1341	881	1419	201	1300	515

At Countess Roundabout, with the low growth scenario, there are relatively small changes in the flows and queues, and the junction generally seems to operate around capacity in both the Do-Something and the Do-Minimum scenarios. However, in the high growth scenario, there is a significant decrease in the queue length on the A303 West approach (from 881m in Do-Minimum to 515m in Do-Something), and an increase in the queue length on the A360 South approach (from 164m to 271m). This is a reflection of the roundabout operating at full capacity, and the diverted A344 traffic seeking other routes to avoid the congestion on the A303 between Longbarrow and Countess.

**2027 PM Peak**

Table 5.6 below shows the predicted flows and queues resulting from the A344 junction closure in the PM peak.

The northwest-bound traffic diverted from the closed A344 would cause an increase in traffic approaching Airman's Corner from the south. There is also a small increase in traffic turning right from the A360 West. Despite the changes, there are no long queues and the junction remains within capacity.

Closure of the A344 causes an increase in the east to north movements at Longbarrow Crossroads, causing long queues to build up on the A303 West approach (199m in low growth and 475m in high growth). Otherwise, the difference in the flows and queues at Longbarrow are a reflection of the roundabout operating at capacity (particularly under high growth) and some traffic from the A360 South seeking alternative routes to avoid the increasing congestion.

**Table 5.6 Entry flows and queue lengths resulting from A344 junction closure 2027 PM Peak**

Location		Do-Minimum 2027 PM Peak				Closure of A344, 2027 PM Peak			
		Low Growth		High Growth		Low Growth		High Growth	
		Flow (vph)	Queue (m)	Flow (vph)	Queue (m)	Flow (vph)	Queue (m)	Flow (vph)	Queue (m)
Airman's Corner	B3086 North	209	8	270	9	248	8	216	12
	A344 East	263		171		42		51	
	A360 South, left turn	268	1	452	1	465	0	521	0
	A360 South, right turn	59	11	168	25	77	17	140	21
	A360 West	266	2	300	2	189	0	318	4
Longbarrow Crossroads	A360 North	368	25	531	52	459	48	566	78
	A303 East	1236	53	1386	69	1408	72	1490	168
	A360 South	561	70	596	291	479	85	526	154
	A303 West	862	65	899	427	927	199	909	475
Countess Roundabout	A345 North	600	27	764	38	575	24	770	36
	A303 East	1703	132	1670	213	1738	136	1635	203
	A345 South	641	347	630	459	655	309	606	459
	A303 West	1188	104	1119	122	1201	135	1199	177

At Countess Roundabout, no major changes in flows and queues would occur as a consequence of the A303/A344 junction closure. This is because the junction is at full capacity in the Do-Minimum scenario, and there is no spare capacity for any additional traffic wishing to pass through this roundabout

## 5.4 Summary

In summary, the closure of the A303/A344 junction would have the following traffic impacts:

- From 2012 and beyond the congestion at Longbarrow Crossroads would become worse, particularly on the A303 West and A360 North approaches to the roundabout. The effect of the A344 closure would probably be to accelerate by two or three years the time the junction reaches capacity. The congestion could not be satisfactorily addressed by at-grade solutions, whether or not the A303/A344 junction is closed.
- Traffic volumes on the single carriageway section of the A303 to the east of Longbarrow Crossroads would increase, causing more frequent breakdowns in flow and regular incidences of congestion and queues.
- There would be some further transfer of traffic to The Packway between Shrewton and Durrington as an alternative to the congested A360/A303 route.
- At Airman's Corner, while the junction would remain within capacity, the main traffic movement would become that between the A360 West and the A360 South. This would mean that the junction layout should be modified for safety reasons to accommodate the changed turning priorities.
- The closure of the A344 junction makes little difference to the flows or queues at Countess Roundabout, as A303 traffic is limited by the capacity of the single carriageway section past Stonehenge and congestion at Longbarrow Crossroads. The roundabout continues to operate much as it would in the Do-Minimum scenario.

## 6 Economic Assessment of A303/A344 Junction Closure

The economic assessment has been undertaken using TUBA (Transport Users Benefit Appraisal), a programme developed to undertake economic appraisal for multi-modal transport studies. TUBA completes a matrix-based appraisal, taking trip, time and distance matrices from the SATURN model and disaggregating them by vehicle type, purpose and person type. The scheme costs are input as appropriate. TUBA does not calculate benefits due to changes in accident costs and therefore COBA has been used for this purpose. The results of the economic appraisal using TUBA are shown in Table 6.1, the accident benefits from COBA are shown in Table 6.2, and the combined assessment results are shown in Table 6.3.

It is evident from Table 6.1 that the A303/A344 junction closure results in a negative Present Value Benefit (PVB), or disbenefit, under both low and high growth assumptions. The closure of the junction results in an overall increase in travel time and vehicle operating costs, which are key elements of consumer and business user benefits. Table 6.1 shows, however, that the scheme disbenefits at high growth are slightly less than those at low growth. High growth traffic on the Do-Minimum network results in vehicles experiencing greater difficulty exiting the A344 to the A303 at Stonehenge Bottom resulting in the transfer of more trips away from the A344. Therefore closing the A303/A344 junction has slightly less of an impact under high growth than under low growth.

The construction cost and indirect taxation are the key elements of Central Government funding, which is itself the sole component of the Present Value of Costs (PVC). The PVC is greater for high growth than low growth. The scheme cost of £750,000 is fixed, thus the variability in PVC is due to indirect taxation. The level of indirect taxation refers to the taxation levied on goods and services and therefore includes excise duties and VAT. For this scheme the indirect taxation is related to travel costs (the extent of disbenefit of the transport system); in other words the greater the travel cost, the greater the indirect taxation. Indirect taxation takes the form of revenue and is represented in TUBA as a negative value. There are greater revenues with low growth scenarios because the costs (disbenefits) are greater in the high growth scenarios and in this case the revenues at low growth are sufficient to outweigh the construction cost to produce an overall negative PVC.

The Net Present Value (NPV) is between -£23.2m and £-22.4m over the 60 year assessment period. The Benefit to Cost Ratio (BCR) is shown to be extremely large at low growth, which results from the combination of a negative PVB with a negative PVC, and consequently as the TUBA Guidance notes, this BCR value is meaningless.

**Table 6.1 Summary of economic assessment (Without accident costs)**

A344 Junction Closure (Do-Something)		Low Growth (£'000)	High Growth (£'000)
Consumer User Benefits		-10,817	-10,141
Business User Benefits		-12,364	-11,892
Private Sector Provider Impacts		0	0
Other Business Impacts		0	0
Accident Benefits		n/a	n/a
Carbon Benefits		-72	-24
Net present Value of Benefits (PVB)		-23,253	-22,057
Local Government Funding		0	0
Central Government Funding	- Investment Costs	565	565
	- Indirect Tax Revenues	-590	-206
Net present Value of Costs (PVC)		-25	359
Net present Value (NPV)		-23,228	-22,416
Benefit to Cost Ratio (BCR)		930.13	-61.44

NOTE: Values discounted to 2002 prices.

The case for closing the A303/A344 junction at Stonehenge Bottom has never been based on improving journey times. On the contrary, it has always been recognised that closing the junction could increase traffic problems elsewhere, particularly at Longbarrow Crossroads. The case for closure rests fundamentally on the wish to improve the setting to Stonehenge (in accordance with the UK commitment to close the A344 across The Avenue, made to the World Heritage Committee when the site was inscribed on the World Heritage List in 1986), together with the wish to address the poor safety record of the junction, which has worsened in recent years.

In the five years up to 2002, a total of six personal injury accidents occurred at the junction (1.2/year), all of them involving slight injuries. In the following four years up to 2006, however, 17 accidents occurred (4.25/year), with one being a fatal accident and two involving serious injuries. Whilst it is too early to say whether this amounts to a permanent change in the trend, the difference nevertheless is quite pronounced. It may result from the increasing growth in traffic on the A303, which forces the minor road traffic to accept smaller gaps in the flow, and may also be contributed to by the layout of the junction, which does not accord with modern design standards and generally allows little margin for driver error.

It is evident from Table 6.2 below that the Do-Something scheme results in fewer accidents than the Do-Minimum in both low and high growth scenarios. Indeed, the closure of the A303/A344 junction provides accident benefits of between £10.0m and £12.5m over the 60 year assessment period. Although many links and junctions for the Do-Something scheme demonstrate a slight increase in accidents (compared with the Do-Minimum) due to increased traffic flows, these increases are offset by the elimination of accidents at the A303/A344 junction. Accident savings also accrue on the A344 link between Stonehenge Bottom and Airman's Corner, and also on the B390 between Shrewton and the A36, as the closure of the A344 discourages the use of the B390 as a short cut between the A36 and the A303. Instead traffic would tend to remain on the A36 in order to gain access to the A303.

**Table 6.2 Summary of accident benefits**

		Number of Accidents (over 60 years across the whole network)			Costs (£'000)
		Links	Junctions	Total	
Low Growth	Do-Minimum	32042	1692	33733	2,000,582
	Do-Something	31966	1574	33540	1,990,588
	Benefits	75	118	193	9,993
High Growth	Do-Minimum	39656	2249	41905	2,463,636
	Do-Something	39605	2066	41672	2,451,107
	Benefits	50	183	233	12,530

The level of accident benefits presented in Table 6.2 stem from the relatively poor accident record at the A303/A344 junction in the five years from 2002, as noted above. Prior to that the record was better, and tests using the previous five-year record at this junction reduced the accident benefits to £6.5m (low growth) and £8.4m (high growth). Whilst the use of the most recent up-to-date record is always preferable, if the future trend was to be a lower accident rate, the actual benefits achieved by closing the junction could be less than predicted in Table 6.2.

The accident benefits are combined with the TUBA assessment results to form an overall assessment in Table 6.3. While the accident benefits bring some improvement in the overall PVB, they are not sufficient to outweigh the traffic disbenefits, and the total PVB remains negative in both low and high growth scenarios. Table 6.3 also shows a negative NPV of between -£13.3m and -£9.9m, compared to an NPV of between -£23.2m and -£22.4m without the inclusion of accident benefits. As with Table 6.1, the large BCR at low growth results from the fact that both PVB and PVC are negative, and is therefore meaningless.

**Table 6.3 Summary of economic assessment (Including accident costs)**

<b>A344 Junction Closure (Do-Something)</b>		<b>Low Growth (£ '000)</b>	<b>High Growth (£ '000)</b>
Consumer User Benefits		-10,842	-10,141
Business User Benefits		-12,364	-11,892
Private Sector Provider Impacts		0	0
Other Business Impacts		0	0
Accident Benefits		9,993	12,530
Carbon Benefits		-72	-24
Net present Value of Benefits (PVB)		-13,285	-9,527
Local Government Funding		0	0
Central Government Funding	- Investment Costs	565	565
	- Indirect Tax Revenues	-590	-206
Net present Value of Costs (PVC)		-25	359
Net present Value (NPV)		-13,260	-9,886
Benefit to Cost Ratio (BCR)		531.40	-26.54

NOTE: Values from TUBA and COBA discounted to 2002 prices.

These results are summarised in the Assessment Table at Appendix A.

## **7 Environmental Assessment of A303/A344 Junction Closure**

### **7.1 Introduction**

A brief assessment of the predicted significant environmental effects of the A303/A344 junction closure is set out below. The baseline information is drawn from existing studies carried out previously for the A303 Stonehenge Improvement Environmental Statement and the A303 Stonehenge Improvement, Scheme Review – Stage 1 and Stage 2 Reports.

In addition to the closure of the A344 junction with the A303 at Stonehenge Bottom, the assessment assumes that the existing bituminous layers of the A344 would be taken up and the contours restored with a grass surface across the entire width of the road between the A303 and the car park entrance to the existing Visitor Centre. The assessment also assumes that a new right-of-way in the form of a public footpath would be established from the edge of the A303 to the end of the closed section of the A344 at the existing Visitor Centre entrance.

### **7.2 Assessment**

#### **7.2.1 Cultural Heritage**

The closure of the A344 would allow The Avenue to be seen as a whole without the existing severance caused by the road and would improve the setting of Stonehenge by allowing a better appreciation of its relationship to other monuments such as the King Barrows and the Cursus. On its own the removal of the road would not provide a large benefit because of the continued presence of the existing Visitor Centre and the intrusive chain link fence along the boundary past the Heelstone. In the event that English Heritage were able to review their plans for the Visitor Centre and relocate it further away from Stonehenge, then the closure of the A344 could pave the way for greater benefits resulting from an opening up of views and unfettered access around the Stones north of the A303. The removal of the A344 across The Avenue is also a formal commitment made at the time of inscription of the World Heritage Site (WHS) in 1986 by the UK government to UNESCO's World Heritage Committee.

#### **7.2.2 Landscape**

Closure of this junction should allow removal of the A344 east of the entrance to the existing Visitor Centre, but the benefit would be limited as long as the existing Visitor Centre and associated facilities remain in place. In visual terms, the adverse effects of traffic on the A303 past Stonehenge would increase in views to the south, while removing traffic from the A344 east of the existing Visitor Centre would benefit views to the north. The surface of the A344 is set below existing ground levels, so is not evident from most of the area around Stonehenge, and the traffic levels are relatively low so that the visual benefits of the proposal would not be significant. However, as described above in Para 7.2.1, it would pave the way for future, greater benefits.

#### **7.2.3 Townscape**

Although traffic would increase to a degree on The Packway through Larkhill and on roads in parts of Amesbury, in particular on Countess Road North, the levels would not be sufficient to be considered significant in terms of their townscape effects.

#### **7.2.4 Biodiversity**

No significant change

### **7.2.5 Noise**

There would be a substantial decrease in noise levels to the north of Stonehenge and a slight decrease to the south, overall a slight beneficial effect. This is because the benefits of removing the traffic on the A344 are greater to the north, nearest the Stones, whereas to the south of the Stones the amount of traffic on the A303 would mask those benefits. Changes in traffic flows on other roads (including through Larkhill and along Countess Road) as a result of the scheme would not produce any significant change in noise.

### **7.2.6 Air Quality**

Changes in traffic flows as a result of the scheme would not be sufficient to produce a significant change in air quality. Traffic on the network is predicted to increase significantly with time even in the Do-Minimum situation. As the A303 becomes congested, so traffic will tend to divert to minor roads through villages and settlements, and flows on the A344 will reduce. Therefore closure of the A344 junction would have little impact on other routes compared with the Do-Minimum.

### **7.2.7 Water Environment**

No significant change

### **7.2.8 Severance and Rights of Way**

Visitors to the Stones and other ramblers would have the benefit of the new footpath created along the closed section of the A344. Elsewhere increased traffic flows through Larkhill and in parts of Amesbury would make it slightly harder to cross the road at certain times of day. There would be no other changes to the rights-of-way network around Stonehenge and therefore overall there would be no significant change.

## **7.3 Summary**

The environmental effects are summarised in an assessment table included at Appendix A.

The main benefits of closing the A303/A344 junction and removing the section of the A344 east of the existing Visitor Centre, would be a noise reduction on the northern side of the Stones and a modest cultural heritage benefit from the removal of the A344 where it crosses The Avenue on its approach to Stonehenge. This closure of the A344 would open the way to greater landscape and cultural heritage benefits if English Heritage were to pursue relocation of the Visitor Centre and removal of the chain link fence past the Heelstone. Removal of the A344 across The Avenue would also meet the UK government's commitment made at the time of inscription of the World Heritage Site.

## 8 Scheme Development

### 8.1 Introduction

This chapter considers issues associated with the possible future development of the scheme and its progression through the statutory process.

The A303/A344 junction closure would only progress as a stand-alone option if the Secretary of State decided not to proceed with the Published Scheme proposals for the A303 Stonehenge Improvement. In that event, the junction closure would be an option for improving safety at this location and could facilitate the removal of the A344 from across the line of The Avenue on its approach to the Stones, thereby enabling the Government to meet its commitment to UNESCO's World Heritage Committee (see Para 7.2.1).

### 8.2 Stakeholders and their Views

The full extent of the junction closure, particularly the length of A344 to be closed beyond the highway boundary with the A303 and associated improvements at Airman's Corner, would have to be the subject of discussion and agreement with Wiltshire County Council (WCC). However, WCC has previously opposed the proposed closure of the junction without a simultaneous upgrading of the A303 through the WHS to a dual two lane carriageway. WCC restated this position in response to the 2005 public consultation: "*WCC re-states its existing policy to oppose closure of the A344 at Stonehenge until the A303 is improved to dual carriageway standard*".

No other organisation objected to the closure of the junction in response to the 2005 consultation, though three non-local individual respondents did, one due to potential impacts on cyclists and the other two in support of WCC's policy.

A total of 185 individual respondents expressed a view that the A303/A344 junction should be closed, mostly on the grounds of safety. Of these, 53 were local respondents and 133 non-local respondents. Many of these responses were prompted by campaigns led by Heritage Action (114) and the Stonehenge Alliance (20) action groups. (The *A303 Stonehenge Improvement, Scheme Review – Stage 2 Report* contains more details.)

Additionally a number of public and private bodies also supported the closure of the A344 or the A303/A344 junction, either as a short-term measure or as a permanent solution to the traffic, safety, or archaeological problems through the WHS. These groups include the National Trust and they and several others, such as the Council for British Archaeology (CBA), Friends of the Earth (South West England), the International Council on Monuments and Sites UK (ICOMOS-UK), Road Block, the Avebury Society and Transport 2000, suggested one or more further measures, such as the implementation of low-cost traffic management measures at Longbarrow Crossroads and Countess Roundabout and the implementation of speed limits and other traffic calming measures along the A303 through the WHS.

Although few people expressed opposition to the A344 closure, this is perhaps not surprising as this was not an option being proposed in its own right for consultation. However, 946 (86%) of local respondents and 3,275 (91%) of non-local respondents did express support for a whole scheme solution between Amesbury and Berwick Down. Whether this would translate into opposition to a scheme involving just the closure of the A344/A303 junction is not clear. It is possible to speculate that the communities at Larkhill and Amesbury (particularly along Countess Road North) would be concerned about *any* additional volumes of traffic that would tend to use the roads through those communities. That could include the MOD in Larkhill who have a major presence in that community. The emergency services (such as the fire brigade based in Amesbury) have also previously expressed concerns about their ability to gain ready access to villages such as Shrewton in the event of the A344 being closed without accompanying improvements to the A303.

The other stakeholder who would be significantly affected by the decision on the A303 Stonehenge Improvement is English Heritage. The existing planning consent for EH's proposed new Visitor Centre at Countess East would fall away because the planning conditions could not be satisfied if the Published Scheme were not to proceed. EH would therefore have to consider their position in that event, as this would provide a new basis for a review of the World Heritage Site Management Plan and for determining the way forward, including proposals for relocating the Visitor Centre or for improving the existing facilities. The outcome would influence the extent to which any closure of the A344 junction could help to bring about heritage benefits for Stonehenge.

It is not possible to make a conclusive statement as to how people would respond if the A303/A344 junction closure was made the subject of consultation, other than to say that whilst there would certainly be support for the closure, it is also probable that there would be a significant level of opposition, including the likelihood of a statutory objection from WCC as the local highway authority.

### **8.3 Development Process**

If the outcome of the review of the A303 Stonehenge Improvement is not to proceed with the Published Scheme, the A344 junction closure is an option that could receive further consideration. In that circumstance, the likely way forward would be to consider options for closing the junction (together with other low-cost measures on the A303 and interacting network) through discussion with key stakeholders like WCC and EH before holding a public consultation into the selected option(s).

The outcome of the public consultation would be a 'preferred' option which could be developed further to the stage when an Environmental Statement and draft Orders would be published for the closure of the A303/A344 junction, together with any other associated works that were judged to be necessary or beneficial. That would mark the start of the statutory process which could lead to a public inquiry if there were objections to the proposals, depending on the nature of the objections. The scope of the proposals being promoted through the statutory process would depend on the extent to which it had proved possible to reach agreement with key stakeholders on what should be done. In the absence of such agreement it is possible that a decision could be made not to proceed with the proposals, either before public consultation, or before embarking on the statutory process. Otherwise, the issues could be debated at a public inquiry, leaving a final decision on the way forward to be informed by the views expressed at the Inquiry and by the recommendations of an independent Inspector.

Given the history on this project, the extent of stakeholders' involvement and the heritage issues that would arise from this proposal, it is highly likely that a public inquiry would be needed. Even though the closure of the junction is in itself a relatively small-scale proposal, it could raise potential issues in the context of the World Heritage Site and adjacent local communities that could lead to the Inquiry running for some weeks. Following the Inquiry and receipt of the Inspector's report, Ministers would then be in a position to decide whether or not the closure should proceed.

If the decision was to proceed, construction would follow. The actual construction period would be short, a matter of weeks or months at the most, with the actual timescale dependent again on the scope/scale of the proposals being taken forward in partnership with WCC and EH.

### **8.4 Programme**

A notional programme on the basis of the development process outlined above is summarised in Table 8.1 below.

**Table 8.1 Possible programme for development of A303/A344 junction closure option**

Item	Date
Outcome of Stonehenge Review	Jan 08
Public Consultation	Sept – Nov 08
Preferred Option announced	Feb 09
Environmental Statement/Draft Order(s) published	June 09
Announcement of Public Inquiry (if needed)	Sept 09
Start of Public Inquiry	Mar 2010
Ministers Decision/Inspector's Report published	Nov 2010
Start of Works	March 11
Completion	April 11

From the above programme, it can be seen that the earliest likely date for achieving the closure of the A303/A344 junction would be Spring 2011.

## 8.5 Scheme Costs

The development of this scheme (see Chapter 4) would take in the order of 40 months from start to completion of construction, at an estimated cost of c.£750k (at Q2, 2006 prices), as shown in Table 8.2 below.

**Table 8.2 Build-up of scheme costs**

Item	Cost Estimate £
Construction costs	350,000
Preliminaries	65,000
Utilities	10,000
<b>Total construction estimate</b>	<b>£425,000</b>
Planning and supervision	100,000
<b>Base Works estimate</b>	<b>£525,000</b>
Optimism Bias	175,000
Inflation to scheme completion	50,000
<b>Budget</b>	<b>£750,000</b>

These costs are indicative only; they assume the option for closing the A344 as described in Chapter 4 and the notional programme summarised in Table 8.1 above. There is of course scope for the works proposals to change in discussion with key stakeholders and for the programme to change. Also, with the likely degree of stakeholder and public involvement, there is scope for the preparation costs to increase significantly, even to exceed the construction cost. Any such changes would in turn change the basis of the cost estimate, but the overarching principle of this proposal would be to implement a low-cost measure on the A303 adjacent to Stonehenge.

## 9 Conclusions

Notionally, the proposal to close the A344 at its junction with the A303 appears to be relatively straightforward, with a ready alternative route via the A303/A360 available to accommodate the affected traffic movements. However, the traffic analysis that has been undertaken indicates that the A303 through the study area has capacity constraints, the effects of which should be taken into consideration when evaluating the proposal. The particular constraints are:

- The single carriageway section of the A303 between Longbarrow Crossroads and the start of the existing dual carriageway east of Stonehenge Bottom
- The junctions at Longbarrow Crossroads and Countess Roundabout.

At present, although the A303 through the study area is known to suffer congestion at weekends and at holiday times, at other times congestion levels are relatively low. However, by 2012 in the Do-Minimum scenario (in which the A344 junction remains open), the following would generally be evident:

- Traffic growth on the A303 means that the single carriageway section past Stonehenge is likely to be operating at capacity at average peak times. This will make it increasingly difficult for traffic to turn out of or into the A344 at Stonehenge Bottom, leading to less traffic using the A344 and, potentially, more accidents at the junction.
- Some A344 traffic may transfer to the A360/A303 via Longbarrow Crossroads, but increasing congestion on the A303 is likely to lead to more traffic using The Packway between Shrewton and Durrington.
- While Longbarrow Crossroads would still be operating within capacity, Countess Roundabout would be under more stress and approaching its capacity at peak times.

By 2027 (again in the Do-Minimum) the following would be evident:

- The single carriageway section of the A303 would be operating at capacity for prolonged periods, causing even more A344 traffic to seek alternative routes.
- At Longbarrow Crossroads, with higher levels of traffic growth, the roundabout would be operating at capacity and long queues would build up in the morning and evening peak periods. Even with low growth, the roundabout would be reaching capacity in the morning peak, though the evening peak would create less queuing.
- Countess Roundabout would have reached its capacity in the morning and evening peaks, with the queues getting longer depending on the volumes of traffic seeking to pass through the junction.

The closure of the A303/A344 junction at Stonehenge Bottom would result in additional traffic transferring to the A360/A303 (via Longbarrow Crossroads), with some also transferring to The Packway. The following effects would arise:

- The single carriageway section of the A303 past Stonehenge would be under greater stress, with more frequent breakdowns in the smooth flow of traffic and a higher incidence of congestion and queuing traffic.
- Longbarrow Crossroads would experience greater levels of congestion, particularly on the A303 West and the A360 North approaches to the roundabout, with the junction reaching capacity two or three years ahead of when it would reach capacity in the Do-Minimum scenario.
- At Airman's Corner, the main traffic movement would become that between the A360 West and the A360 South. This would mean that the junction layout should be modified for safety reasons to accommodate the changed turning priorities.

- The closure of the A344 would make little difference to the operation of Countess Roundabout.

The closure of the junction would remove a hazardous junction, reducing accidents at that location, but these may be partially offset by additional accidents elsewhere arising from the diverted traffic and increasing congestion.

The environmental benefits of simply closing and removing the A344 between the A303 and the existing car park entrance to the Stonehenge Visitor Centre are generally modest. However, the closure would accommodate the removal of the A344 where it crosses The Avenue on its approach to Stonehenge, thereby enabling the UK Government to fulfil its commitment to UNESCO's World Heritage Committee. In addition, the closure could lead to greater cultural heritage and landscape benefits if English Heritage were to pursue the relocation of the existing Visitor Centre and removal of the chain link fence past the Heelstone.

The proposed closure of the A344 at its junction with the A303 is a scheme that is proposed on environmental and safety grounds, and those reasons remain valid. Nevertheless, its implementation would aggravate the congestion problems that will arise along this section of the A303 as a result of the general growth in traffic.

A summary of the key results of this assessment are presented in the Assessment Table at Appendix A.

## Glossary of Acronyms

AADT	Annual Average Daily Traffic
AM	Morning, 00:00hrs to 12:00hrs
ATC	Automatic Traffic Count
BCR	Benefit Cost Ratio
COBA	Cost Benefit Analysis (software)
DIADEM	Dynamic Integrated Assignment and Demand Modelling
DMRB	Design Manual for Roads and Bridges
ECI	Early Contractor Involvement
EXCEL	Microsoft spreadsheet software
NPV	Net Present Value
NRTF	National Road Traffic Figures
OAT	Option Assessment Table
PM	Afternoon 12:00hrs to 24:00hrs
PVB	Present Value of Benefits
PVC	Present Value of Costs
Q2	Second Quarter of the financial year
SAR	Scheme Assessment Report
SATURN	Simulation and Assignment of Traffic to Urban Road Networks (software)
TEMPRO	Trip End Model Presentation Program (software)
TRICS	Trip Rate Information Computer System (software)
TUBA	Transport Users Benefit Appraisal
UNESCO	the United Nations Educational, Scientific and Cultural Organisation
VISSIM	Software for detailed modelling of urban traffic flows
Vph	Vehicles per hour
WCC	Wiltshire County Council
WHC	World Heritage Site