FABER MAUNSELL | AECOM

Traffic and Economic Assessment

6 Traffic and Economic Assessment

6.1 Baseline Conditions

A review of the available data for the A32 was carried out to establish the extent of any additional traffic surveys to be undertaken. Faber Maunsell undertook a programme of traffic surveys in October 2008 including:

- Manual classified counts (MCCs) to establish current traffic volumes and vehicle proportions at key junctions;
- Automatic traffic counts (ATCs) to quantify variations in hourly and daily traffic demand;
- Journey time surveys (JTS) to define prevailing vehicle speeds along the key route at peak and off-peak times.

6.1.1 Traffic Flows

On the basis of the surveys undertaken, the equivalent annual average 24-hour, 7-day daily flows (AADT's) on the A32 in 2008 are:

- A32 north of junction with B4 (RS counter no. 619): **8,146 vehicles**
- A32 south of junction with B4 (FM temporary counter): **5,154 vehicles**
- A32 south of Kildrum Road junction (RS counter no. 666): **5,339 vehicles**

Historic data provided by Roads Service was examined to determine traffic growth trends and patterns. The data was sourced from a Roads Service permanent automatic traffic counter (No. 619) located on the A32 just north of the junction with the B4 Drumlish Road. Table 6.1 shows the historic AADT figures recorded from counter No. 619.

CP No.	7-Day AADT							
	2001	2002	2003	2004	2005	2006	2007	2008
619	7020	6770	6870	7720	7890	8240	8428*	8146*

Table 6.1 - A32 Historic 7-Day AADT (*figures calculated by FM from Roads Service survey data)

6.1.2 Traffic Growth

The historic information in Table 6.1 indicates an overall increase in traffic volumes of 16.0% between 2001 and 2008, with volumes generally increasing year on year. This equates to a 2.1% per annum growth in traffic.

In comparison to the National Road Traffic Forecasts [NRTF] the above traffic growth is higher than the 'High' NRTF rates, these being 14.4% for the period 2001-08 with a per annum growth rate of approximately 2.0%.

6.1.3 Heavy Goods Vehicles

The vehicle composition as determined from the surveys undertaken in October 2008 is shown in Table 6.2. This suggests that the proportion of HGVs is typically around 14-15% on the A32.

FM Site (Oct 2008)	Northbound			Southbound		
	Car	HGV	Bus	Car	HGV	Bus
A32 south of B4 junction	84.7%	13.8%	1.5%	83.1%	15.4%	1.5%

Table 6.2 - A32 HGV Percentages (7-day 24 hour)

6.1.4 Journey Times

Journey time surveys were carried out along the A32 for the proposed scheme length on Tuesday 7th October 2008. The journey time surveys were carried out in Northbound (Omagh) and Southbound (Dromore) directions during the AM, Off Peak and PM Peaks. The weather conditions ranged from damp to heavy rain conditions.

- The AM Peak recordings were taken during the period 0745-0900;
- The Off Peak recordings were taken during the period 1400-1500;
- The PM Peak recordings were taken during the period 1645-1800;

Various nodes were assigned as timing points along the A32, beginning (from North to South) at the Lisgarty Road junction and ending at the speed limit sign (on the Northern edge of Dromore). The details of these nodes are provided in Table 6.3.

NODE	DESCRIPTION
JE1	Lisgarty Road Junction
JE2	B4/A32 Junction
JE3	Farm Access (mid-way between the B4 and Capehill Road junction)
JE4	Capehill Road Junction
JE5	Shannaragh Road Junction
JE6	Kildrum Road Junction
JE7	Speed Limit Sign (on edge of Dromore Village)

Table 6.3 – Journey Time Nodes

Northbound

Over the whole day, the shortest journey time occurred in the AM Peak (02:30), with the longest journey time occurring in the PM peak (03:36). Overall, the average journey time ranged between 02:41 and 03:10.

Southbound

Over the whole day, the shortest journey time occurred in the Off Peak (02:24). The longest journey time also occurred in the Off Peak (04:00), however for part of this journey the survey vehicle followed a tractor. Overall, the average journey time speed ranged between 02:48 and 03:03.

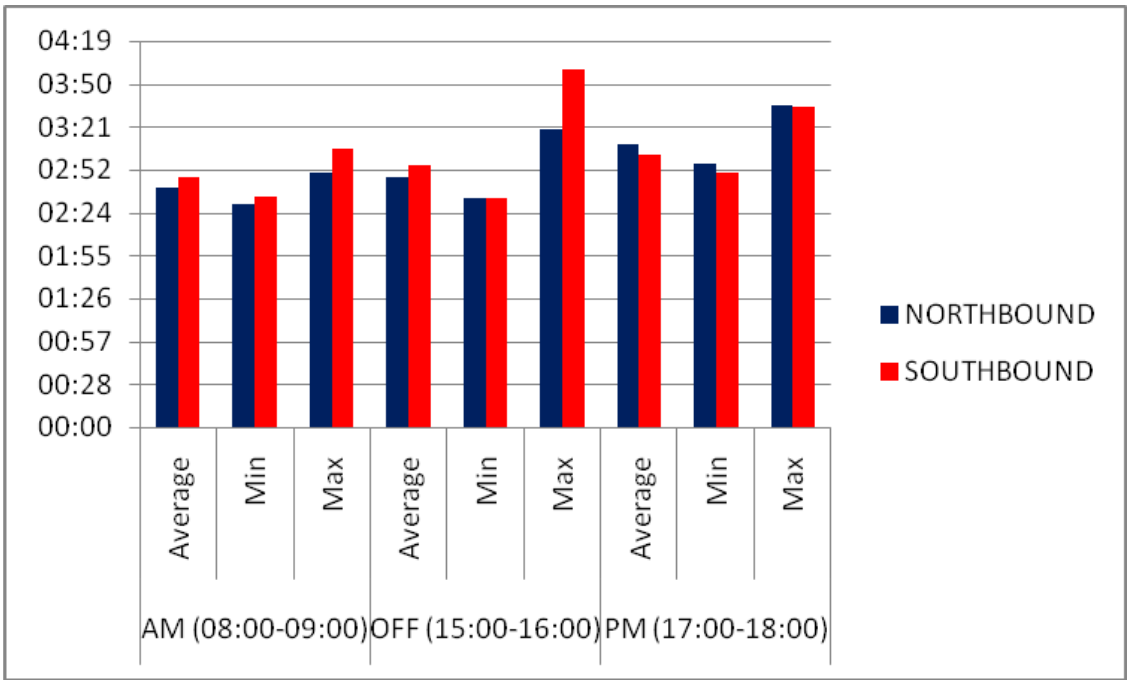

Figure 6.1 – Journey Times on Existing A32 within Study Area

6.1.5 Traffic Speeds

Speeds were determined from the above journey time surveys.

Northbound

Over the whole day, the highest speed for the whole journey occurred in the AM Peak (54.4mph) and the lowest speed occurred in the PM Peak (37.7mph). Overall, the average speed ranged between 43.0mph and 50.5mph.

The slowest northbound section of the route in all of the three peak periods surveyed was found to be just after Capehill Road (where the road is particularly twisty). Average speeds along this section were found to range between 36.0 and 45.0 mph.

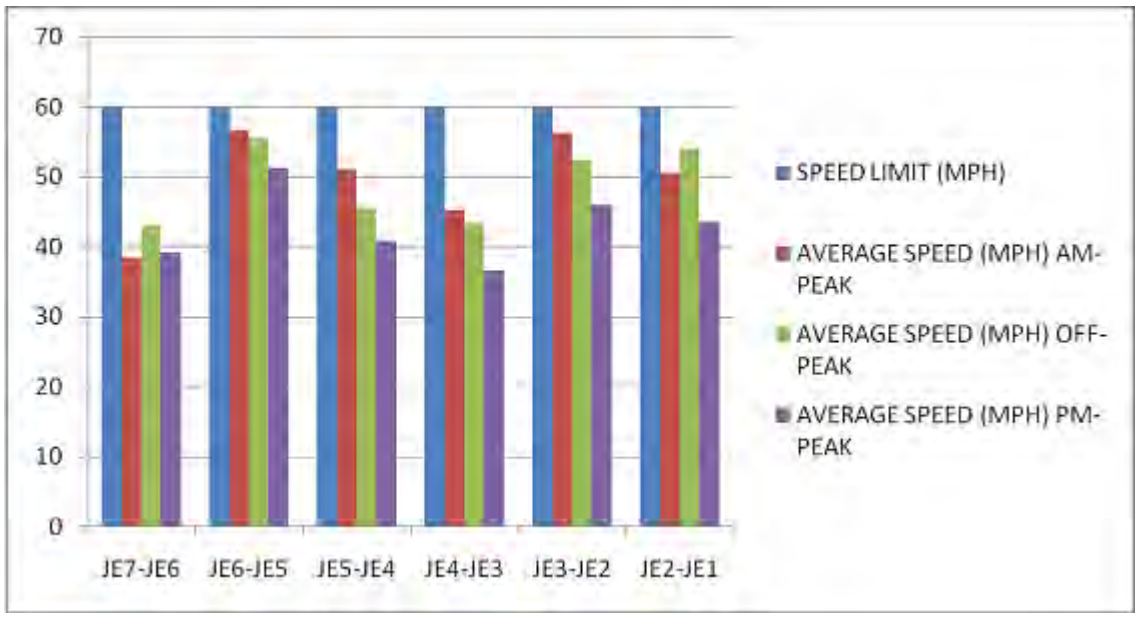

Figure 6.2 – Northbound Journey Time Speeds

Southbound
Over the whole day the highest speed occurred in the Off peak (52.9mph) and the lowest speed also occurred in the Off peak (34.0mph). Overall, the average speed ranged between 44.6mph and 48.6mph.

The slowest southbound section of the route in all of the three peak periods surveyed was found to be between Capehill Road and Shannaragh Road. Average speeds along this section were found to range between 39.0 and 44.0 mph.

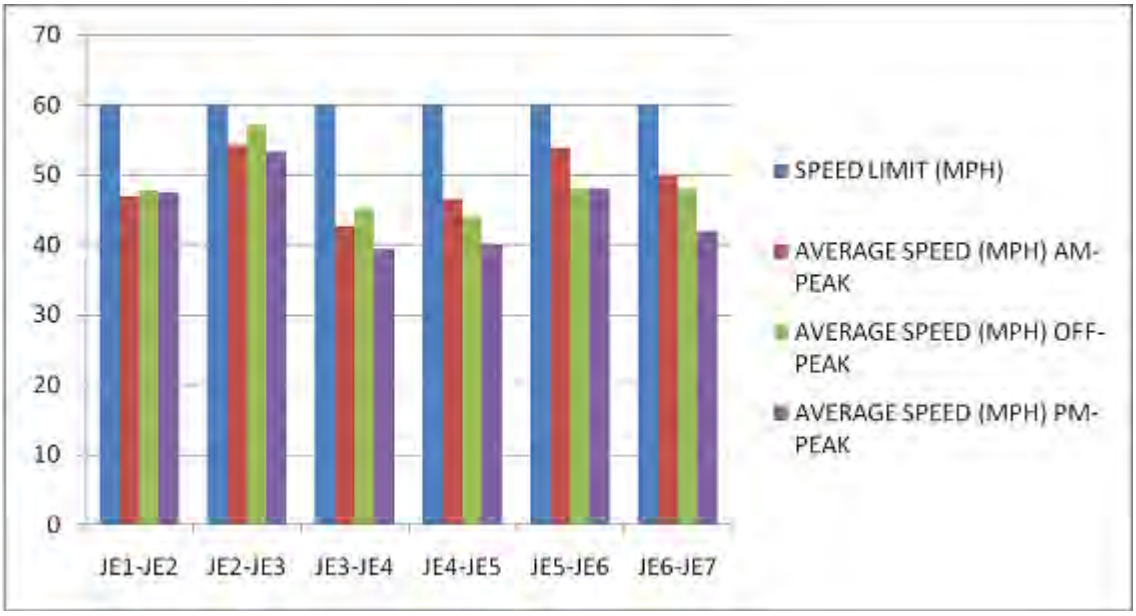

Figure 6.3 – Southbound Journey Time Speeds

6.2 Traffic Modelling

6.2.1 Options Considered

Junction Strategy
A key point of focus for the Shannaragh realignment is the existing conditions at three minor road junctions located along the A32 within the study area. These junctions are between the A32 and Capehill Road, Cavan Road and Derrynaseer Road. These three junctions are located within very close proximity and at their location the horizontal alignment is particularly sub standard. This results in poor visibility for traffic undertaking turning manoeuvres at the junctions.

As part of the realignment scheme it is proposed to revise the junction arrangement at this location. This will provide the opportunity to rationalise the number of junctions along the A32 itself which will have a knock-on capacity and safety benefit.

Given the characteristics of the area, a number of indicative alignment options have been considered. More consideration will be given during Stage 2 of the appraisal process before the development of a particular realignment design. However, the following discusses the salient issues with the proposed junction revision.

Taking consideration of the ATC and turning count data recorded, the more trafficked of the three roads is Cavan Road, followed by Capehill Road and then Derrynaseer Road. HGVs make up approximately one in five vehicles on both Cavan Road and Derrynaseer Road. On Capehill Road this figure is approximately one in ten vehicles. There are three times as many movements between Capehill Road and Cavan Road as there are between Derrynaseer Road and Cavan Road.

In its simplest form, it is recommended that a ‘staggered’ priority arrangement is provided, linking Cavan Road with Capehill Road. Such an arrangement is shown in Figure 6.4.

Derrynaseer Road could either be stopped up or linked directly to Capehill Road. This would reduce the number of junctions with the A32 from three to two. Whilst stopping up Derrynaseer Road is not ideal as it would trigger diversions, the level of lengthy diversions is considered to be nominal.

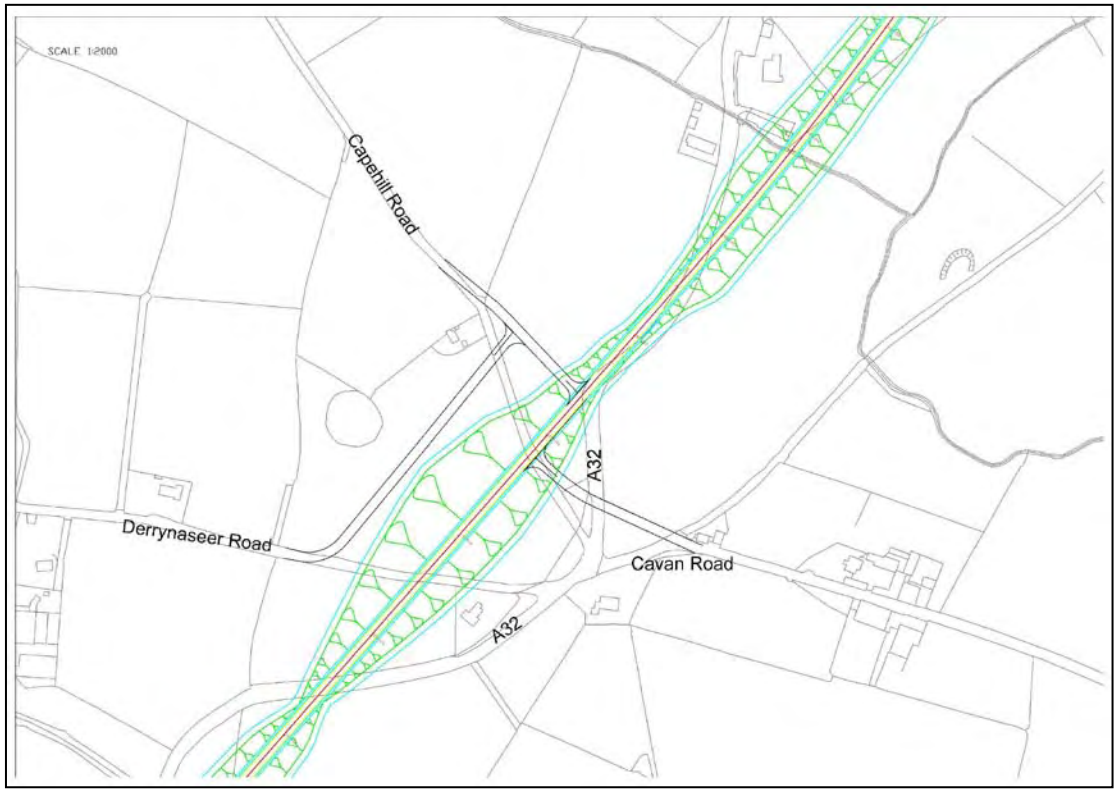

Figure 6.4 – Potential Staggered Junction Layout

As a further development from a simple 'staggered' junction arrangement, implementation of an overbridge across the A32 would potentially have capacity and safety benefits as it would reduce the number of junctions with the A32 further to just one. This type of junction arrangement is shown in Figure 6.5.

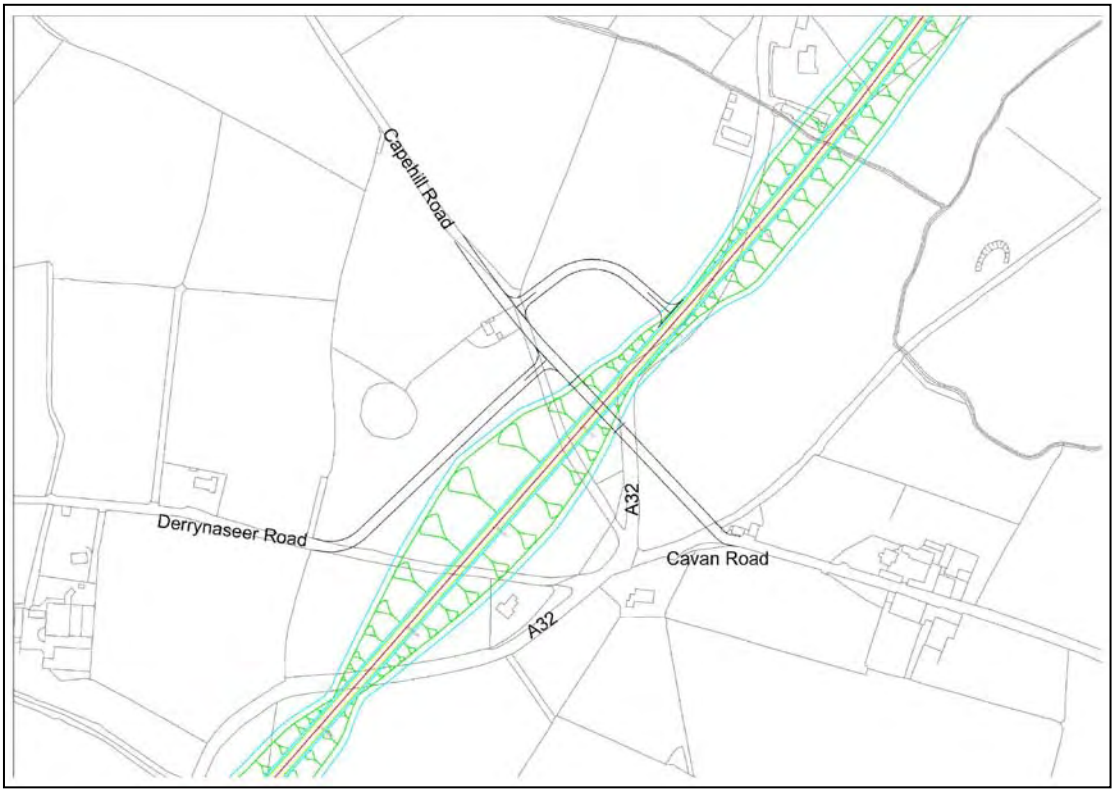

Figure 6.5 – Potential Overbridge Layout

However, an overbridge option would have inevitable cost and design implications. Given the budgetary constraints of the scheme it would be unlikely that the additional costs generated by an overbridge, as opposed to an at grade junction arrangement, would be able to be accommodated. Therefore an overbridge junction arrangement was determined to be unfeasible and as such it will not be developed further.

TD 42 states that a simple junction arrangement, without the provision of dedicated right turn facilities, can be used "for new rural junctions…when the design flow in the minor road is not expected to exceed about 300 vehicles 2-way AADT, and that on the major road is not expected to exceed 13,000 vehicles 2-way AADT." Recorded traffic flows on the A32 at Shannaragh are significantly less than 13,000 and as a result it will be the traffic flows on the minor roads which will determine the junction arrangement required. Of the minor roads that join the A32 at Shannaragh, Cavan Road is the only road which has a 2-way AADT in excess of, or expected to exceed, 300. Therefore any junction arrangement, in a new alignment, between the Cavan Road and A32 will need to be designed to incorporate dedicated turning facilities in the form of a Right Turn Ghost Island (RTGI).

Alignment Strategy Options

S2, WS2 and WS 2+1 alignment strategies were initially considered as possible realignment strategies. Preliminary work has shown that a WS 2+1 strategy is not feasible at this location and in particular when considered against the requirements of TD 70/ 08. Therefore for economic assessment purposes, only S2 and WS2 alignment strategy options have been considered.

6.2.2 Spreadsheet Model

In order to provide future year traffic flows for the scheme, a spreadsheet-based model has been developed, with the extents defined as Kildrum Road to the south and the A32/ B4 Drumlish Road junction to the north.

On the instructions of Roads Service it was considered that the Shannaragh scheme itself would not induce traffic to transfer from the B4 onto the A32, and therefore the use of a spreadsheet model was considered reasonable for assessment purposes.

MCC and ATC data from the October 2008 surveys was used in order to produce a set of 'Base' traffic flows for the existing road network. In addition, consideration of any additional traffic attributable to nearby committed developments was considered following liaison with Planning Service in Omagh.

Historic traffic growth on the A32 was examined in order to produce a suitable growth factor for traffic up to the opening year of 2013. Flows were therefore produced for the opening year, for both the full 24 hour period (7-day) as well as the weekday peak periods.

6.3 Economic Assessment

6.3.1 Costs & Benefits Considered

The economy objective is concerned with improving the economic efficiency of transport. It was developed from the principles of the Government's White Paper *A New Deal for Transport*. Congestion and unreliability of journeys add to the costs of business, undermining competitiveness, particularly in towns and cities.

The economic efficiency of suggested indicative alignment options within the route corridor has been assessed. The purpose of the economic appraisal of these indicative options is to compare the costs and benefits of the range of options.

The economy objective has 5 sub-objectives:

- To get good value for money in relation to impacts on public accounts;
- To improve transport economic efficiency for business users and transport providers;
- To improve transport economic efficiency for consumer users;
- To improve reliability;
- To provide beneficial wider economic impacts.

The economic assessment of a transport scheme is based on a comparison of the total benefits generated by the scheme with its total associated costs. The following three elements were considered in the comparison of the options:

- **The impacts of indicative alignment options on road accidents in the study area**. Estimated using COBA 11.7 methodology and changes in traffic levels forecast by the traffic assignment model;
- **The impacts of indicative alignment options on travel times and costs** for trips affected by the schemes together with the associated impacts on revenue and indirect tax levels: estimated using the COBA program;
- **The capital costs** associated with each indicative option. An allowance was also made for optimism bias.

Broad estimates of the costs for each of the indicative alignment options were made using recognised unit rates and factors.

Forecast costs and calculated benefits were combined to produce an overall estimate of the balance of the costs and benefits of the scheme over a 60-year appraisal period (2013 – 2072).

The following sections outline the approaches used to estimate the value of each of the three elements of the scheme's costs and benefits.

Assessment of Safety Impacts

The impact of the indicative alignment options on the number of accidents in the study area was estimated using COBA 11.7 methodology for calculating combined link and junction accident numbers and costs.

The estimated value of impacts for the forecast years was in turn converted into an estimated Net Present Value (NPV) of accident savings in 2002 prices and values over a 60-year appraisal period (2013 – 2072).

Assessment of Travel Times and Costs
Within the COBA program, the benefits experienced by road users are split broadly into two categories:

Consumer User Benefits: Benefits for those road users who are not travelling on the road for primarily business purposes (typically commuting or non-work purposes)

Business User Benefits: Benefits for those road users who are travelling on the road primarily for business purposes (e.g. to meetings or road haulage).

Within COBA each user is assigned a 'value of time' whereby, when a highway improvement is provided, the user enjoys a 'consumer surplus', i.e. in this case they travel along a section of road in a shorter amount time, and therefore save money. This surplus or benefit is summed for all of the respective road users over the whole period of assessment and the total benefits calculated. Typically 'value of time' is much higher for business users in comparison to consumer users, and therefore business users benefit most from any such improvement.

Other Impacts Calculated
The other impacts calculated within the COBA program are detailed below:

Private Sector Provider Impacts: Benefits for those in the private sector who operate on the road network (typically bus services).

Accident Benefits: Benefits in terms of reduced number and severity of accidents in monetary terms.

Emissions Benefits: Benefits in terms of the equivalent tonnes of carbon released as a result of implementing a highway scheme (estimated from fuel consumption).

Change to Indirect Tax Revenues: Change in tax revenues to central government due to changes in fuel economy etc.

Assessment of Capital Costs
The capital costs, based on unit rates, were estimated for two indicative options; one S2 and one WS2. Both assessed options followed the same centreline path, with the only difference being the width of the carriageway, and both also utilised a simple staggered junction layout. Capital costs for the assessed alignment options are shown in Table 6.4.

Assessed Option	Cost Estimates (including 44% OB)		
	Land	Construction	TOTAL
S2	£726	£7,244	**£7,970**
WS2	£781	£9,059	**£9,840**

Table 6.4 - Estimated 2008 Costs for Indicative Alignment Options (£000s)

A full breakdown on the cost estimates shown in Table 6.4 is provided in Appendix C.

Allowance for Optimism Bias
In line with the guidance on appraisal and evaluation given in HM Treasury's Green Book, an allowance was also applied to costs to account for optimism bias. Optimism bias is defined as the systematic tendency for project appraisers to underestimate their scheme's cost (and therefore overestimate the strength of its economic case). In line with this guidance, the cost estimates for all options have been uplifted by 44%, and 10% for lands, to allow for optimism bias.

6.3.2 The COBA Analysis

The COBA (Cost Benefit Analysis) program compares the costs of providing road schemes with the benefits derived by road users (in terms of time, vehicle operating costs and accidents), and expresses the results in terms of a monetary valuation.

The COBA Version 11 Revision 7 was used for the assessment. The essence of COBA is that the travel cost for each component (link and junction) of the network is calculated separately according to the flows and turning movements assigned to it. The individual link and junction

costs that are time, vehicle operating costs and accidents are summarised to yield the total costs over the network.

The benefits are calculated for the assessment period of 60 years, which is in accordance with Department for Transport's website for guidance on the conduct of transport studies - Transport Analysis Guidance (TAG), and are balanced against the construction and maintenance costs over the same period.

Environmental effects such as noise, changes in air quality, visual intrusion and severance are not evaluated in the COBA assessment.

Carrying out a road scheme normally results in a stream of costs – followed by a stream of benefits associated with the improved flow of traffic. This information must be compared to arrive at an understanding of the overall worth of the scheme. However they cannot simply be added as if they occurred simultaneously. Cost and benefits arising in different years are therefore expressed in terms of their 'present value' i.e., their value in a given year. This is called the present value year and in the COBA programme this is taken to be 2002.

The Net Present Value (NPV) of any scheme can be calculated by subtracting the Present Value of Costs (PVC) from the Present Value of Benefits (PVB). This figure is expressed as a 2002 price discounted from the current year to 2002. A positive NPV indicates that the benefits of the proposed scheme outweigh the costs indicating that a scheme is potentially economically viable.

The assessment period was 2013 to 2072. 2013 is assumed to be the year of opening, while 2072 is assumed to be the final assessment year. These assumptions result in a 60-year assessment period, in accordance with current Government guidance (TAG).

COBA Inputs

- Annual Average Daily Traffic AADT (7-day) 2013 has been used for the traffic flow input;
- Default accident data;
- Daily turning movement proportions at each junction;
- Link and junction details for the Do-Minimum and Do-Something scenarios.

Construction and land costs have been input into multiples of £1,000 at 2008 Q3 prices. COBA calculates the equivalent costs in the present year value and allocates them to the correct year.

The 2013 AADT (7-day) flows are:

- A32 north of B4 junction – 9,433 vehicles;
- A32 south of B4 junction – 6,244 vehicles;
- A32 south of Kildrum Road junction – 6,548 vehicles.

COBA Results

The Net Present Value (NPV) for each of the two appraised options is given in Table 6.5. It should be noted that the cost estimates used within the COBA assessments include 44% Optimism Bias, with a further 10% for lands, however this percentage should reduce as the proposed scheme moves through the appraisal process.

Assessed Option	Total Cost (£K)	NPV (£K)	BCR
S2	£7,970	£1,493	1.222
WS2	£9,840	£592	1.071

Table 6.5 - COBA Analysis Results Summary

Consideration of Table 6.5 suggests that each of the proposed solutions have a positive economic performance. The best performing solution, producing a positive BCR, is an S2 alignment strategy.

For the 'WS2' option, the additional cost associated with providing a wider carriageway leads to it producing a BCR lower than the S2 option. Table 6.6 presents the COBA results for each indicative option in more detail.

From Table 6.6 it is apparent that the additional accident benefits generated by the indicative WS2 strategy option do not result in a better overall economic performance than the S2 strategy option due to the significantly higher PVCs associated with providing the additional carriageway width.

COBA Element	S2 Option	WS2 Option
Consumer User Benefits *(£K)*	£2,775	£2,775
Business User Benefits *(£K)*	£3,276	£3,276
Private Sector Provider Impacts *(£K)*	£23	£23
Accident Benefits *(£K)*	£2,137	£2,785
Emissions Benefits *(£K)*	£16	£16
Present Value of Benefits (PVB)	£8,228	£8,876
Present Value of Costs (PVC)	£6,734	£8,284
Net Present Value (NPV)	£1,493	£592
Benefit to Cost Ratio (BCR)	1.222	1.071

Table 6.6 – Detailed COBA Results

6.3.3 Other

It can be seen from Table 6.6 that the COBA result for the scheme, although positive, is low. However economics is only one of five key government objectives which are assessed in determining the suitability of a scheme with the other four being integration, accessibility, environment and safety. Completion of the scheme at Shannaragh will improve access to the new Erne Hospital in Enniskillen and therefore the benefits which the scheme will provide in terms of improved overtaking, especially for emergency ambulance, reduced journey times and increased journey ambiance will form a significant part of the assessment of the scheme.

6.3.4 Reliability

This sub-objective summarises the proposal's impact on the objective to improve journey time reliability for transport users, including both passengers and freight.

For journeys by private road vehicles (including road goods vehicles), it is reasonable to expect travellers to be aware of the average journey time, including variations caused by factors such as different traffic conditions at different times of the day. Thus reliability should be measured in terms of the unpredictable variability in travel times about these averages, measured by the standard deviation of travel time.

At this early stage in the appraisal process, reliability is assessed on a qualitative rather than quantitative basis based on measured and estimated journey times.

6.3.5 Journey Time Improvement

The existing variability of journey times and speeds recorded during the surveys (see sections 6.1.3 and 6.1.4) indicates poor journey reliability and vehicle speeds for what is a de-restricted 'A' road.

The realignment of the A32 at Shannaragh will improve journey times and reliability of journeys along the route via an improved road alignment which will enable increased vehicle speeds. In addition, the junction strategy discussed above has been undertaken to determine a solution that will reduce delays for turning traffic and improve safety for road users over what is currently provided.

6.3.6 Wider Economic Benefits

This section provides a discussion of the linkages between transport and economic activity that are believed to operate. Transport is a key driver of economic development, whereby transport investments can, in particular, affect the location and pattern of economic activity. This sub-objective will be considered with a qualitative assessment of the wider economic benefits for a road scheme of this type.

The proposed realignment of the A32 at Shannaragh, in tandem with the other improvements along the A32, will collectively enhance the attractiveness of the existing A32 trunk road. The improvements at Shannaragh will directly reduce journey times between Omagh and both Dromore and Enniskillen, making the route more attractive to use.

One part of the benefits delivered by transport improvements is normally in the form of time savings to travellers. The value of time savings is measured by the willingness to pay for them. For travel outside of work, this is the value that travellers put on their time. These benefits to transport users are sometimes transferred to others. In theory, the time savings to firms will lead them to reduce prices and increase output – passing benefits on to those who buy its products. Time savings for commuters and others in an area might make this area more attractive to live in – so benefits are passed on to house and landowners.

In summary, the wider economic impacts of a road scheme are determined by the improved local and strategic accessibility it may provide. In terms of strategic accessibility, the proposed scheme will improve links between the major towns of Omagh and Enniskillen, as well as enhancing the attractiveness of this area of Co. Tyrone in general. In terms of local accessibility, it is intended that the scheme will maintain as much access to the immediate vicinity as possible, taking consideration of observed travel demands.

One of the disbenefits of any of the realignment options will be severance of farmlands and the destruction of fertile farming land. Mitigation measures to counter this should be considered in Stage 2.

6.4 Summary of Economy for each option

The economic Appraisal of the four indicative alignment options for the two possible alignment strategies is summarised in table 6.7.

Economy Sub Objective	Option Assessed	
	S2	WS2
COBA BCR	1.222	1.071
COBA NPV (£K)	£1,493	£592
Reliability	Slight Beneficial	Slight Beneficial
Wider Economic Impact	Slight Beneficial	Slight Beneficial
Public Accounts (PVC, £K)	£6,734	£8,284

Table 6.7 - Summary of Economy Sub-Objectives for each Option

By examining each of the economy sub-objectives it can be seen that, in terms of economic efficiency, the S2 option provides the best cost - benefit ratio. The S2 alignment strategy performs better economically than the WS2 alignment strategy due to its significantly lower cost.