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HIGHWAYS AGENCY

LNMS EVALUATION REPORT

A66 Sadberge Grade Separated Junction

November 2005

ATKINS

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1. Introduction

BACKGROUND

1.1 The A66 Sadberge Grade Separated Junction (GSJ) Improvement Scheme opened in 2002. The scheme provided an improved access to the village of Sadberge for vehicles travelling westbound on the A66.

1.2 In conjunction with the proposed Long Newton Grade Separated Junction, the scheme completes the improvement from at grade priority junctions to full grade separation of all junctions on the A66 between Darlington and Middlesbrough.

Original PAR Document

1.3 The Project Appraisal Report (PAR) was produced by consultant Halcrow and was last updated in February 2001.

The Scheme

1.4 The scheme provided a compact grade separated junction linking A66 Dual carriageway with Middleton Road, south of Sadberge village. The existing priority junctions on the A66 west and east of the village were closed, including their associated central reserve gaps, and amended so as to allow only left in/left out movements. Figure 1.1 illustrates the new merge and diverge on the A66 westbound carriageway at Sadberge.

Figure 1.1 – New Merge/Diverge on the A66 at Sadberge (WB Carriageway)

1.5 Figure 1.2 shows the location of Sadberge and the scheme.

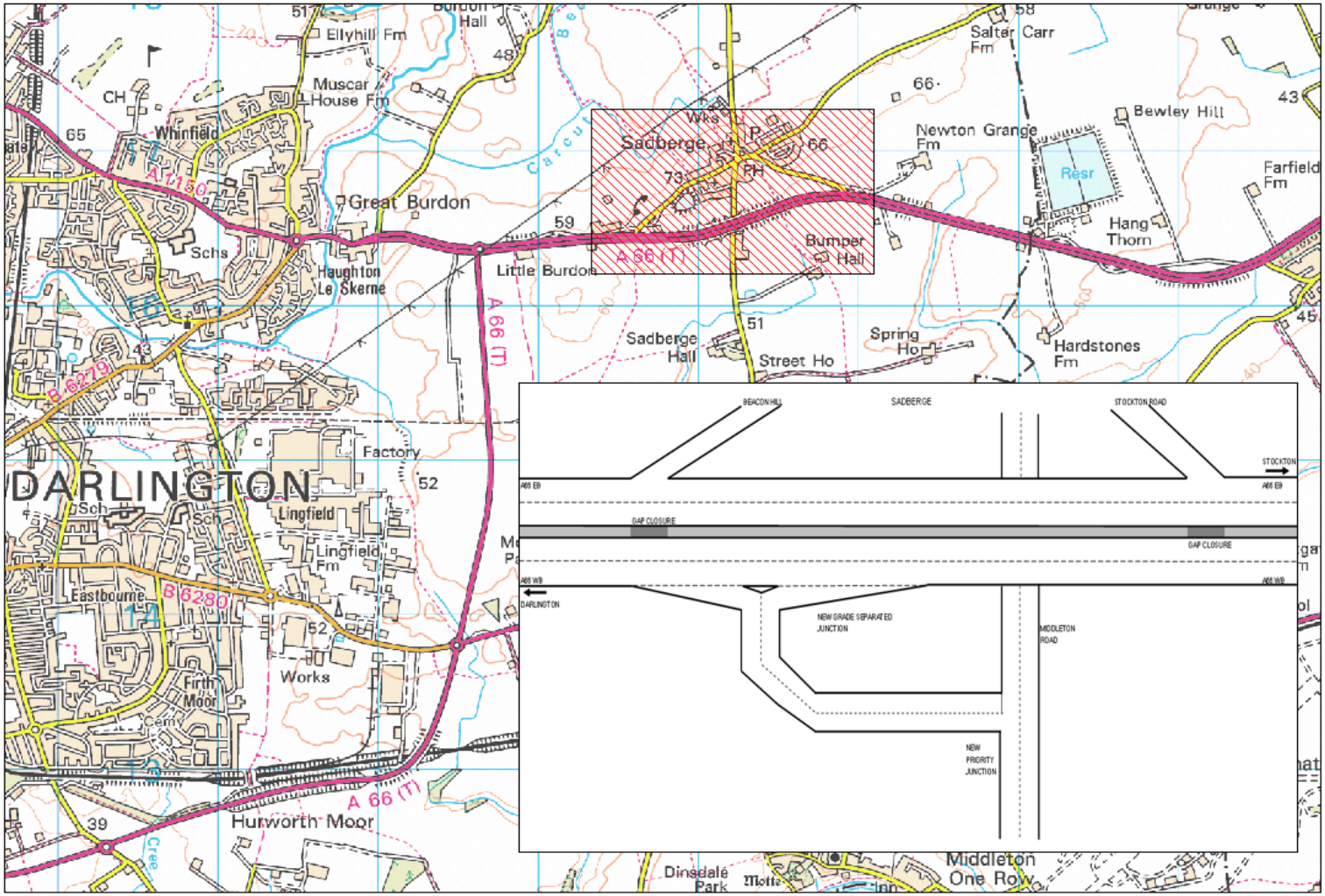

Figure 1.2 – A66 Sadberge Grade Separated Junction

1.6 Other elements of the scheme were:

- A new underpass for agricultural vehicles with associated alterations to the existing underpass beneath the A66;
- New traffic management measures within Sadberge to take account of the redistribution of traffic within the village. Such measures include gateway features, additional signing and lining, extension of speed limit, weight restrictions and extension of street lighting system.
- Minor alterations to kerb lines and new waiting restrictions are to be provided in the vicinity of the village green to accommodate the revised westbound bus route necessitated by the closure of the central reservation.

1.7 The primary problem identified within the PAR was the high rate of personal injury accidents occurring at the original at-grade junction. Safety problems were caused by right turn and U turn movements through the central reservation gaps on the A66. Over a five year period (1996 – 2000), there were a total of 17 personal injury accidents (28 casualties) at the two existing junctions serving Sadberge. Eleven of the accidents were associated with right turning movements at the junctions; i.e. heading from the A66 westbound carriageway into Sadberge including two U turn manoeuvres.

1.8 Other options considered were:

- Alternative grade separation junction layouts were considered and rejected due to operational or financial reasons.
- Minor works to the existing junctions, improved signing and reduced speed limits were rejected as being less effective in accident reduction by not eliminating right turns.

SCHEME OBJECTIVES

1.9 The scheme objective as detailed in the PAR is to reduce accidents on the section of the A66 through the elimination of right turn movements, and therefore was designated as a safety scheme.

PURPOSE OF THE REPORT

1.10 The Highways Agency has a requirement to carry out re-evaluations of trunk road schemes recently implemented by the Department of Transport. The purpose of these re-evaluations is to provide a back check of the levels of benefit accruing from new schemes and to determine how far the department achieves the objectives and benefits it claims from its road programme.

1.11 This report will initially undertake an assessment of the 'physical' impact of the scheme, namely:

- A comparison of the 'Before' and 'After' traffic volumes on the A66 to illustrate how traffic volumes have changed since the opening of the scheme; and

- The report will also outline the changes in accidents on the route since the scheme has been implemented and establish whether they have changed as predicted since the opening of the scheme.

1.12 This is in turn followed the assessment of the scheme in accordance with the Post Opening Project Evaluation (POPE) methodology, which is being followed for the purpose of this study. This methodology aims to provide a method by which the forecast and outturn effects of a scheme can be evaluated on a common basis. This process ultimately presents two appraisals:

- Appraisal 1: The Original PAR assessment (including the original AST). This is a forecast of the cost/benefits of the scheme, usually calculated in accordance with PAR2 (1994 prices discounted at 6%).
- Appraisal 2: An Evaluation Summary Table (EST) based on outturn effects, but evaluated on precisely the same terms (version of the PAR document, present value year and discount rate) of the original assessment. The calculation is usually a simple pro-rate of the original assessment based on the outturn impact with regard to user benefits and scheme costs. The advantage of this assessment is that it is an outturn assessment that is directly comparable with the original PAR AST.

1.13 Following this introduction the report has been divided into five further sections as follows:

- Section 2 outlines existing data collation and new data collection;
- Section 3 outlines the scheme's impact and reports on traffic volume and accident changes attributable to the A66;
- Section 4 presents an assessment of predicted and outturn economic benefits using the POPE journey time methodology;
- Section 5 presents the original Appraisal Summary Table (AST) for the A66 Sadberge Grade Separated Junction, and then re-evaluates these predictions with an Evaluation Summary Table (EST); and
- Section 6 summarises the main conclusions from the evaluations and the limitations to use.

1.14 It is intended that the findings of this report will feed into a wider summary of the outcomes of the POPE process.

2. Data Collection

'BEFORE' SURVEYS

2.1 The PAR document submitted in support of the scheme was based upon the following data:

- Accident data for the years 1996 - 2000;
- Traffic Count Information; and,
- A COBA model of the proposed scheme.

'AFTER' SURVEYS

2.2 In the course of undertaking the LNM evaluation of the scheme, the following data was utilised.

Automatic Traffic Counts

2.3 Traffic count data from the following Highways Agency permanent count sites was obtained:

- A66/34 – 1756 A66, A1150, A135 West of Long Newton Eastbound;
- A66/34 – 1757 A66, A1150, A135 West of Long Newton Westbound;
- A66/34 – 3648 A66 A1150, A135 Great Burdon Westbound; and
- A66/34 – 3649 A66 A1150, A135 Great Burdon Eastbound.

Accident Data

2.4 Accident data was obtained from the Highways Agency area team for 01/03/1999 to 28/02/2004.

COBA

2.5 The original COBA files were obtained from Halcrow.

3. Scheme Impact

OVERVIEW

3.1 This section provides details of the outturn safety and traffic impacts of the scheme.

SAFETY

3.2 The original PAR assessment of the scheme forecast an opening year accident reduction of 2.2 accidents which capitalised over the 30-year evaluation period would provide a saving of 60 accidents at low growth and 68 at high growth.

3.3 The evaluation of the accident impact of the scheme was assessed using accident data for the period 1999 to 2004. This provided a total of 37 months pre-opening accident data, and 21 months post-opening accident data.

3.4 The analysis of the accident data focused on the four main junctions that comprise the scheme, as detailed in Table 3.1.

Table 3.1 – Accident Analysis

Junction	Junction Form		Observed Accidents Per Year	
	Pre-Opening	Post Opening	Pre-Opening	Post Opening
A66/Darlington Rd (W. of Sadberge)	All Movements At Grade Priority	Ebd. On/Off Only	2.3	0
A66/Stockton Rd (W. of Sadberge)	All Movements At Grade Priority	Ebd. On/Off Only	1.3	2.3
New Wbd. on/off slip with A66	-	Wbd. On/Off Only	-	0
New Local Junction with Middleton Rd	-	3-Arm Priority	-	0
Total			**3.6**	**2.3**

3.5 The analysis presented in Table 3.1 shows that in the first 21 months after opening the scheme has provided an accident reduction of 1.3 accidents per annum. However, examination of the A66/Stockton Road merge/diverge suggests that the accident record at this junction has deteriorated since the completion of the scheme, although these accidents are related to traffic entering leaving the A66 rather than with right-turning vehicles crossing the A66 central reserve as was previously the case.

3.6 The analysis in Table 3.1 was felt to not represent the true case, and as such further analysis of the accident records was undertaken in order to identify all accidents that were previously attributable to vehicles turning right across the central reserve. This further assessment identified that, of the 21 accidents occurring within the study area in the 37 months prior to the scheme, ten were directly related to right-turning traffic

using the central reserve gap. This translates into an annual total of 3.2 accidents all of which, it can be assumed, would be saved following the implementation of the scheme.

3.7 In summary, differing analysis of the same accident data before and after the scheme reveals that the actual number of accidents saved by the scheme is in the range 1.3 accidents per annum to 3.2 accidents per annum. The PAR forecast accident reduction of 2.2 accidents per annum lies close to the median point of this range.

3.8 Further detail of the analysis of accident data is presented in Annex A.

TRAFFIC FLOW

3.9 Information on traffic flows on the A66 at Sadberge are available from two sites located immediately to the east and to the west of the village (see Section 2). Data from the counter to the east of Sadberge show that the AADT on the A66 has increased from 27200 in 1998 to 29600 in 2003, an increase of 8.8%, or 1.8% per annum. Data from the counter to the west of Sadberge show that the AADT on the A66 has increased from 28400 in 1998 to 30000 2003, an increase of 5.6%, or 1.1% per annum. This level of growth seems relatively low, and does not appear to have been affected by the scheme.

3.10 Further detail of the analysis of traffic data is presented in Annex B.

3.11 There was no available traffic count data for either the new westbound merge/diverge, or the junction between the new slip road and Middleton Road.

4. Economic Evaluation

INTRODUCTION

4.1 This section assesses the level of economic benefits predicted for the scheme and compares these predictions with actual benefits accrued when considering actual traffic volume changes and actual journey time benefits. The re-evaluation, termed the Post Opening Project Evaluation (POPE) methodology, uses observed accident and link transit savings to provide an economic assessment of the performance of the scheme. This result is presented in the scheme Evaluation Summary Table (EST) (see Annex D) and is expressed in the same terms as the original evaluation (present value year of 1994, and discount rate of 6 per cent).

ACCIDENTS

4.2 The original Halcrow AST forecast an accident saving of 17 accidents over a five year period although this was contradicted within the PAR document which stated that 11 personal injury accidents were associated with right turn manoeuvres at the junction. A further six accidents occurred that did not involve right turning movements. Therefore for the purpose of this assessment we have assumed that Halcrow predicted that the scheme would save 11 personal injury accidents over a 5 year period and capitalised to 66 accidents over a 30 year assessment period is correct.

4.3 Section 3 presents Atkins analysis of the observed post-opening accident saving, which was in the range of 1.3 to 3.2 accidents per annum. These observed accident savings have in turn been used to forecast monetised accident benefits from the scheme, as detailed in Table 4.1. This table also presents the original PAR assessment of the scheme accident benefits.

Table 4.1 - POPE Comparison: Accident Benefits

	Opening Year Accident Saving	30 Year Accident Saving	30 Year Accident Benefits
Original Halcrow			
Low Growth	2.2	60	£2.233m
High Growth	2.2	68	£2.706m
POPE: Low Assessment			
Low Growth	1.3	35	£1.320m
High Growth	1.3	40	£1.599m
POPE: High Assessment			
Low Growth	3.2	87	£3.248m
High Growth	3.2	98	£3.936m

All costs and benefits are 1994 prices discounted to 1994 at 6%.

4.4 Table 4.1 illustrates that the POPE 'low assessment' of scheme accident benefits is in the range £1.320m to £1.599m, while the 'high assessment' is in the range £3.248m to £3.936m.

LINK TRANSIT BENEFITS

4.5 It was recognised within the PAR assessment that the scheme would have an impact on local traffic movements within the study area. However these changes were forecast to be relatively minor.

4.6 Within the PAR assessment link transit benefits were evaluated using a COBA model of the study area. This forecast that there would be link transit dis-benefit of £0.077m at low growth, and a benefit of £0.568m at high growth.

4.7 For the POPE evaluation new turning count data on the local network in Sadberge was not collected, hence no re-evaluation of link transit benefits has been undertaken. However it is felt that the absence of the dis-benefit to local traffic would not alter the main thrust of the economic evaluation of the scheme.

SCHEME COST

4.8 The Total Current Project Cost was £0.952m, excluding VAT (or £1.119 including VAT), at 2001 quarter 1 prices.

4.9 The outturn cost (2003) of the scheme was £944,726 (including preparation and site supervision). This figure was provided by the project sponsor for the scheme. In the absence of more detailed information it is assumed that the value excludes VAT.

4.10 Table 4.2 presents the conversion of the outturn cost to the present value year of 1994. This illustrates that the outturn scheme cost was 28% below the forecast value.

Table 4.2 - Conversion of Outturn Cost to Present Value Cost

	Cost (1)	RPI (2003) (2)	RPF (2003) (3)	RPI (1994) (4)	Discount Factor (2003) (5)	Present Value Cost ((4*3*1)/2)*5
Original PAR	£951,650	-	-	**-**	-	**£609,357**
Actual Outturn	£944,726	181.3	0.99	**144.1**	**0.592**	**£440,077**

All Present Value Costs are in 1994 prices discounted to 1994 at 6%. Average RPI's and RPF's used.

SUMMARY

4.11 Table 4.3 presents a summary of the original PAR and POPE economic evaluation of the scheme. The assessment is expressed in terms of 1994 prices, discounted to 1994 at 6 per cent, and the methodology used is in accordance with PAR2.

Table 4.3 - POPE Comparison: Summary

	Original PAR Worksheets		POPE: Low Assessment		POPE: High Assessment	
	Low	High	Low	High	Low	High
Accidents	£2.233m	£2.706m	£1.320m	£1.599m	£3.348m	£3.936m
Journey Time	£0.107m	£0.775m	£0.107m	£0.775m	£0.107m	£0.775m
VOC	-£0.184m	-£0.207m	-£0.184m	-£0.207m	-£0.184m	-£0.207m
PVB	£2.156m	£3.274m	£1.243m	£2.167m	£3.171m	£4.504m
PVC	£0.609m	£0.609m	£0.440m	£0.440m	£0.440m	£0.440m
NPV	£1.547m	£2.644m	£0.803m	£1.727m	£2.731m	£4.064m
BCR	3.54	5.37	2.83	4.93	7.21	10.24

All costs and benefits are 1994 prices discounted to 1994 at 6%.

4.12 The main points to note are:

- Analysis of the observed accident data for the period following the opening of the scheme demonstrates that the scheme is forecast to provide an accident benefit in the range of £1.243m to £4.504m;
- Due to the lack of post opening count data and insignificant levels of predicted vehicle operating costs and journey time benefits/disbenefits it was assumed Halcrow's forecast was correct;
- The outturn scheme cost was 28 per cent lower than forecast;
- The net present value of the scheme is positive, and is approximately 10% higher than forecast; and,
- The benefit cost ratio is 38 percent higher than forecast.

4.13 Overall the scheme continues to represent good value for money, with greater than predicted benefits together with a lower than forecast scheme cost.

5. Summary of Appraisal and Evaluation Summary Tables

INTRODUCTION

5.1 In order to fully evaluate the effects of the new grade separated junction, Atkins has undertaken a review of the original PAR document prepared by Halcrow. The Appraisal Summary Table (AST) from this document, which summarises the predicted impact of the scheme under the five objectives of environment, safety, economy, accessibility and integration, is presented as Annex C in this report.

5.2 The Atkins review focused on:

- The main body of the PAR document itself; and,
- The Appraisal Summary Table (AST) from the PAR.

5.3 Each of these is dealt with in turn below.

PAR DOCUMENT

5.4 The main points to note from the PAR document of the A66 Sadberge Grade Separated Junction are as follows.

Environment

5.5 The PAR states that it was not considered necessary to undertake full assessments but it instead presented detail extracted from the public inquiry evidence. In addition the PAR states that 'as the scheme is a road safety scheme costing less than £1m and requiring less than 1 hectare of land to construct there is no requirement to publish an environmental statement when the Draft Highway Orders were published in January 1999'.

5.6 However from the public inquiry evidence the following points were noted:

- The proposed scheme, by virtue of reduced traffic flows, would result in a slight reduction of noise and vibration and a slight improvement in air quality for residents of Darlington Road and Stockton Road.
- The increased traffic flow on Middleton Road would result in a slight increase in noise and vibration and reduction in air quality for residents of that road.
- Calculations of road traffic noise show that the noise increase at the closest property to the road would be around 1.4dBA, such an increase is barely perceptible.
- Three properties on Middleton Road, which overlook the site of the proposed junction, would experience visual intrusion through the construction of the highway embankment. Selective planting of trees and shrubs would help to minimise any such impact.
- The proposals would have no significant effect on water quality.

Safety

5.7 PAR identified that of the 17 personal injury accidents that occurred between 1996 and 2000 eleven were associated with right turning movements at the junctions.

5.8 Of the 17 accidents four were of serious severity and the remaining 13 were slight (a severity index of 23.5.)

5.9 The 17 accidents over the five year period equated to a personal injury accident rate of 3.4 Personal injury accidents a year. When compared to the national average accident rate (COBA manual) of 1.6 PIA a year it is clear that the scheme location has an average accident rate of double that for comparable roads.

5.10 The PAR predicts that the scheme will save 1.7 accidents a year.

Economy

5.11 The proposed junction improvements were forecast to cause a slight increase in journey times.

5.12 Economy impacts were assessed using COBA 10. This showed that the impact on trunk road through traffic is insignificant. The values stated were:

- Time saving benefits – link transit was -£0.358m high growth and -£0.250m low growth.
- junction delay was £1.133m high growth and £0.357m low growth; and
- Vehicle operating costs - -£0.207m high growth and -£0.184m low growth.

Accessibility

5.13 The PAR stated that there is no significant effect on accessibility for non-motorised users, however there will be redistribution of traffic within Sadberge. This redistribution will improve the safety and environment for pedestrians and others on Darlington Road and Stockton Road. But increased traffic on Middleton Road would have a detrimental effect although, overall, traffic flows remain relatively low.

5.14 The PAR stated that a full assessment of the effect on access to public transport is not considered necessary, as the passenger numbers involved are very low. However the public inquiry evidence presented suggests the following:

- The elimination of right turning movements at the existing junctions serving the village has implications in terms of accessibility for public transport. Whilst west to east buses would not be affected, east to west buses, unable to access the village at the eastern end, would be required to leave the A66 via the new junction, joining Middleton Road northbound to access the village. Buses would then need to turn around at the village green, stopping at a new bus stop, before returning southbound on Middleton Road, and rejoining the A66 via the new junction.
- Alterations would have to be made to current parking arrangements in the vicinity of the village green, including the possibility of parking restrictions, to ensure that sufficient space will be available to allow buses to manoeuvre at all

times. In addition the opportunity would be taken to improve accessibility for disabled persons onto buses by means of raised footpaths.

- The changes to bus provision would result in the loss of the east to west service to Beacon Hill. However, it is possible that eastbound buses could be scheduled to reach the village centre to enable westbound passengers picked up at Beacon Hill to continue their journey on the westbound service without significant delay.
- Traffic management measures are to be provided within Sadberge to take account of the redistribution of traffic within the village. Such measures include gateway features, additional signing and lining, extension of speed limit, weight restrictions and extension of street lighting system.

Integration

5.15 The PAR predicts that in terms of integration the scheme will be moderately beneficial. It bases this on the following statements:

- Beneficial to local transport strategy; (Darlington Local Plan)
- Beneficial to regional transport strategy; (Provisional Tees Valley Transport Strategy)
- Beneficial to national transport strategy; (A New Deal for Transport: Better for Everyone)
- Beneficial to national land use strategy;

Appraisal Summary Table (AST)

5.16 The main points to note from the AST of the A66 Sadberge Grade Separated junction are:

Environment

- Properties along Stockton Road and Darlington Road will experience a slight reduction in noise. Properties along Middleton Road will experience a slight increase in noise.
- 28 properties would experience an increase in noise whilst 51 properties would experience a decrease in noise, which equates to 23 properties experiencing a net decrease in noise.
- Subjective assessment made regarding air quality that there will be a slight improvement in on Darlington Road and Stockton Road but some slight deterioration on Middleton Road.
- A new lighted junction on a rising embankment will be visually intrusive to three properties on Middleton Road.

Safety

- The closure of the central reservation gaps at the two existing junctions will eliminate right turning movements and the cause of 17 accidents in the period 1996 – 2000.
- Therefore the AST predicts a saving of 17 accidents of which 4 are serious and 13 are slight. Subjectively this was assessed as being a large positive.

- This is contradictory to what is stated in the PAR where of the 17 accidents, 11 were directly attributable to the gaps in the central reservation. For the purposes of our evaluation we will assume that 11 accidents were saved over the five year period, not 17.

Economy

- The AST states that there would be a slight overall increase in journey times and therefore VOCS, this was subjectively assessed as being slightly negative.

Accessibility

- Elimination of the right turning facility will significantly affect westbound buses causing them to access the village via Middleton Road. This would result in the loss of this service to Beacon Hill.
- Provision of a new agricultural underpass results in the scheme causing no severance.

Integration

- Neutral

OUTTURN EFFECTS

5.17 In order to assess the actual or outturn effects of the opening of the scheme, we have produced an Evaluation Summary table (EST), which mirrors the appearance of the AST, and includes details of the actual sub objectives that have been evaluated. The EST is presented in Annex D.

5.18 Section three discussed the economy and safety impacts of the scheme. This section concentrates on the other three impacts included in the AST, namely

- **Environmental Impacts** such as noise, local air quality, landscape, biodiversity, heritage and water;
- **Accessibility Impacts** such as change in access to public transport, severance within communities and impact on pedestrian and other modes; and
- **Integration** measured by how the scheme accords with policy.

5.19 The assessments that follow are all subjective assessments from members of the evaluation team.

5.20 The following reiterates the statements that accompanied these impacts before providing photographic evidence that the mitigating measures have been implemented.

Environment

Noise - Properties along Stockton Road and Darlington Road will experience a slight reduction in noise. Properties along Middleton Road will experience a slight increase in noise. 28 properties would experience an increase in noise whilst 51 properties would experience a decrease in noise, which equates to 23 properties experiencing a net decrease in noise.

5.21 Without being able to obtain significant traffic counts for the local road network it is assumed that the predictions contained in the PAR and AST hold true. Hence the scheme is assumed to have provided a decrease in noise for 23 properties (there was no evidence of new build/additional properties on a visit to the site). The same is assumed to hold true for local air quality.

5.22 Landscape - A new lighted junction on a rising embankment will be visually intrusive to three properties on Middleton Road. Selective planting of trees and shrubs would help to minimise any such impact.

5.23 From a visit to the site it was apparent that the new lighted junction would be visually intrusive to three properties on Middleton Road. It was also apparent that selective planting had been provided although even with 'full' growth of the planting, the planting would not obscure the raised lighting. Figure 5.1 shows a photo of the raised junction.

Figure 5.1 – A66 Sadberge GSJ

Accessibility

Accessibility Access to Public Transport - Elimination of the right turning facility will significantly affect westbound buses causing them to access the village via Middleton Road. This would result in the loss of this service to Beacon Hill.

5.24 This statement is agreed with and the westbound bus service to Beacon Hill has indeed been lost. A bus turning circle has also been provided in Sadberge as shown in Figure 5.2.

Figure 5.2 – Bus turning Circle in Sadberge

Accessibility Community Severance - Provision of new agricultural underpass results in the scheme causing no severance

5.25 Figure 5.3 is a photo of the new agricultural underpass beneath the scheme.

Figure 5.3 – Photo of Scheme and New Agricultural Underpass

5.26 As the new agricultural underpass has been provided it is assumed that the scheme causes no community severance.

Pedestrians and Others - Traffic management measures are to be provided within Sadberge to take account of the redistribution of traffic within the village. Such measures include gateway features, additional signing and lining, extension of speed limit, weight restrictions and extension of street lighting system.

5.27 All of the measures mentioned above will improve the accessibility for pedestrians and others. On a visit to the site it was apparent that all such measures have been implemented. Figure 5.4 shows one of the gateways on the entry to the village to Sadberge.

Figure 5.4 – Gateway on Stockton Road Entry to Sadberge

5.28 With the provision of traffic management measures it is apparent that the redistribution of traffic will not have a negative impact on pedestrians and others and as a result can be assumed to be neutral.

6. Conclusions

6.1 The main points to note from this evaluation of the A66 Sadberge Grade Separated Junction are:

Safety

6.2 The scheme has delivered an annual saving of 11 accidents every five years although the following points should be noted:

- The closure of the central reservation gap removed the cause of 11 accidents over a five year period;
- There are no accidents at the new merge/diverge on the A66;
- There are no accidents at the junction between the merge/diverge and Middleton Road;

6.3 Pre opening there was an accident rate of 0.303 personal injury accidents per million vehicle kilometres whilst post opening this fell to 0.150 personal injury accidents per million vehicle kilometres. Hence post opening the likelihood of an accident on the route has approximately halved, although you are more likely to have an accident than on an average stretch of road.

Traffic Volumes

6.4 The scheme hasn't attracted any additional traffic onto the route.

Journey Times

6.5 Due to the lack of suitable count data and the insignificant journey time and vehicle operating cost values predicted pre opening, it was assumed that the scheme delivered the same amount of journey time and vehicle operating costs disbenefit as was predicted pre opening.

Scheme Costs

6.6 The scheme was built at 28% less cost than predicted.

Economic Evaluation – POPE Method

6.7 The scheme provides exactly the same accident and journey time benefits that were forecast as well as exactly the same vehicle operating cost disbenefits that were forecast. The PVC is less than forecast resulting in a greater NPV than forecast and a greater benefit cost ratio.

Overall

6.8 The scheme appears to have been a success and has delivered more benefit than predicted (as a result of lower than predicted cost).

6.9 The scheme should be re-evaluated in future years when more post opening data is available. This will enable more robust conclusions to be drawn.

Annex A –Analysis of Accident Data

The original Halcrow PAR and AST forecast that the scheme would provide significant accident savings. In order to evaluate whether these forecast savings have occurred or will occur, Atkins has undertaken an initial evaluation of accident savings accrued post opening.

It is usual for accident savings to be evaluated at least three years after opening in order to get a fair reflection of the changes accidents in the vicinity of the scheme. Therefore this evaluation should be considered to be an initial view based upon 22 months of available data.

The PAR examined accidents between 1996 and 2000. During this period of 5 years, 17 PIA's occurred, of which 4 serious and 13 slight.

For the purpose of this evaluation the accident assessment was revisited to assess the pre and post opening accident record for 5 years from 01/03/1999 to 28/02/2004 (as this was the data set the managing agent made available).

Figure A1 provides an indicative plan of the location of accidents on the A66 in the vicinity of the scheme for the period March 1st 1999 to February 28th 2004, while Table A1 summarises this data.

Table A1 – Selected Accidents on the A66

Year	Slight	Serious	Fatal	Total	AADT
1999 (part)	1	1	-	2	28400
2000	3	-	-	3	27900
2001	15	-	-	15	28600
2002	5	-	-	5	28800
2003	4	-	-	4	29600
2004	1	-	-	1	-
Total	29	1	-	30	-
Pre Opening (37 months)	20	1	-	21	0.568 acc per month
Post Opening (21 months)	9	-	-	9	0.429 acc per month

From Table A1 it can be seen that the number of accidents varied between years. In the first full year after opening there were 4 accidents (2003) whilst in the last full year pre opening (2001) there were 15 accidents. When examining accidents per month there were on average 0.568 accidents pre opening and 0.429 accidents a month post opening.

Figure A1 shows that pre opening the accidents in the vicinity of the junction were generally concentrated around the two junctions whilst post opening the accidents seem to be concentrated around the Stockton Road/A66 junction and no accidents have occurred in the vicinity of the new grade separated junction.

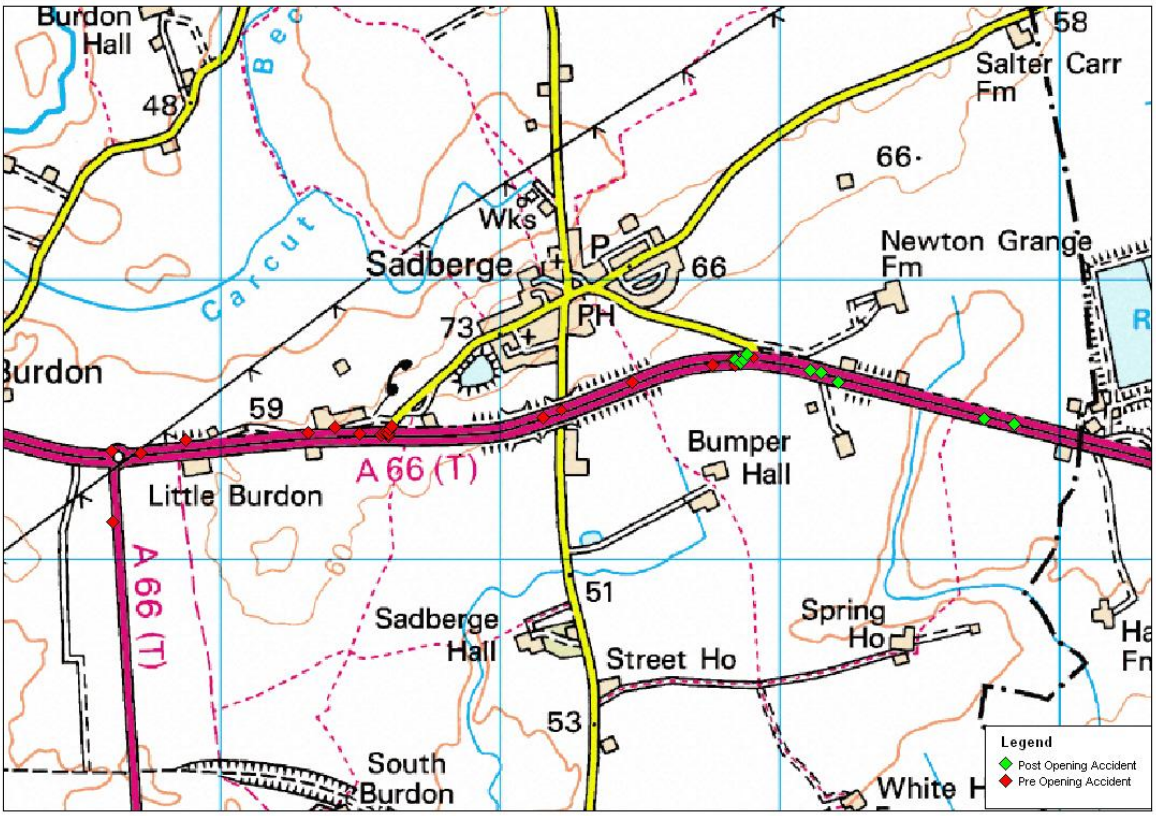

Figure A1 – Accidents within the Vicinity of the junction

Of the 21 accidents that occurred in the 37 months pre opening at least 10 were directly attributable to the junctions and gaps in the central reservation. Interestingly in the 21 months post opening 2 accidents were caused by u turn accidents in the central reservation just to the east of the Sadberge junctions. In the past these two vehicles may have used the junctions at Sadberge to perform their manoeuvre.

From examination of the accident data the new grade separated junction has alleviated accidents to the south and west of Sadberge but there still seems to be an accident problem to the east of Sadberge.

Darlington Road/A66 intersection

In the 37 months pre opening there were 7 accidents at the intersection between Darlington Road and the A66 whilst in the 21 months post opening there were no accidents at the junction. Therefore the scheme appears to have alleviated accidents at this junction.

Figure A2 shows the location of the Darlington Road/A66 Intersection, as well as Stockton Road/A66 intersection and the new merge/diverge on the westbound carriageway at A66 intersection.

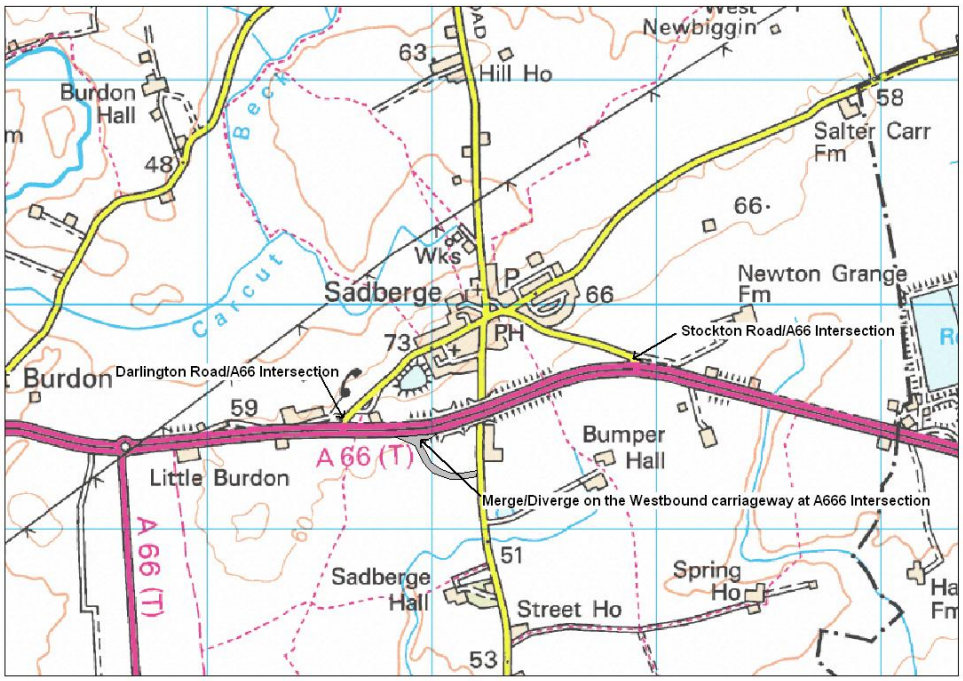

Figure A2 – Location of Major Junctions

Stockton Road/A66 intersection (location shown on Figure A2)

In the 37 months pre opening there were 4 accidents at the intersection of Stockton Road and the A66 whilst in the 21 months post opening there were 4 accidents at the same location. The scheme appears to have increased the rate of accident occurrence at this junction.

Merge/Diverge on the Westbound Carriageway at A66 Intersection (location shown on Figure A2)

In the 21 months post opening no accidents were recorded at the intersection between the new merge and diverge and the A66. However this only applies to the trunk road and not the intersection between the A66 and Middleton Road.

Because the scheme included gap closures in the central reserve then it can be assumed that as these gap closures have taken place then the scheme has alleviated between two accidents a year (11 accidents occurred over a 5 year period pre opening 1996 - 2000) and three accidents a year (10 accidents over 37 months 01/03/99 – 12/04/02).

Although the new scheme has alleviated accidents on the trunk road it may have added accidents onto local road network. This is because the scheme included a new junction between the A66 slips (A66 merge/diverge on westbound carriageway at Sadberge) and Middleton Road. Figure A3 is a photo of this new priority junction.

Figure A3 – New Priority Junction on Local Road Network at Middleton Road

Darlington Borough Council were approached for the provision of accident data for this junction. Atkins were informed in correspondence dated 4th October 2004 that no accidents had occurred at this junction since its construction.

Accident Severity

Pre opening there was only one accident of a severity greater than slight in the vicinity of the scheme, whilst post opening there were no accidents of a severity of greater than slight. Therefore it could be argued that the scheme has reduced the severity of accidents although this will need to be examined in greater detail in future.

Accident Rate

Table A2 shows the accident rate per million vehicle kilometres.

Table A2 – Accident Rate

Year	Length of road (km)	Average Flow (AADT)	No. of accidents	Accident Rate (PIA/MVKM)
2001	1.4	28600	5	0.890
2002	1.4	29400	13	0.333
Average Pre Opening	1.4	28600	14	0.303
Average Post Opening	1.4	30000	4	0.150
COBA Default Accident Rate - Modern D2 Roads with HS				0.079
COBA Default Accident Rate - Older D2 Roads				0.104

From Table A2 it can be seen that the accident rate has dropped post opening when compared with pre opening values. Pre Opening there was an average accident rate of 0.303 accidents a year, whilst since the opening of the new junction there was approximately half the amount of accidents a year with an average post opening accident rate of 0.150. When both of these figures are compared with the COBA default accident rates for a) modern D2 roads with HS and b) Older D2 roads it is clear that this stretch of route still exhibits an above average accident rate.

The main points to note from the safety section are:

- Of the 21 accidents that occurred in the 37 months pre opening at least 10 were directly attributable to the junctions and gaps in the central reservation;
- Because the scheme included gap closures in the central reserve then it can be assumed that as these gap closures have taken place then the scheme has alleviated between two accidents a year (11 accidents occurred over a 5 year period pre opening 1996 - 2000) and three accidents a year (10 accidents over 37 months 01/03/99 – 12/04/02).
- No accidents occurred over the 21 months post opening both at the new grade separated schemes junction with the trunk road or the local road network;

Annex B –Analysis of Traffic Flow Data

Traffic Volume Changes by Route Section

Figure B1 shows year on year changes (5 day average) in traffic flow at two locations in close proximity to the new grade separated junction at Sadberge. These two locations are the Highways Agency permanent monitoring sites at Great Burdon and West of Long Newton.

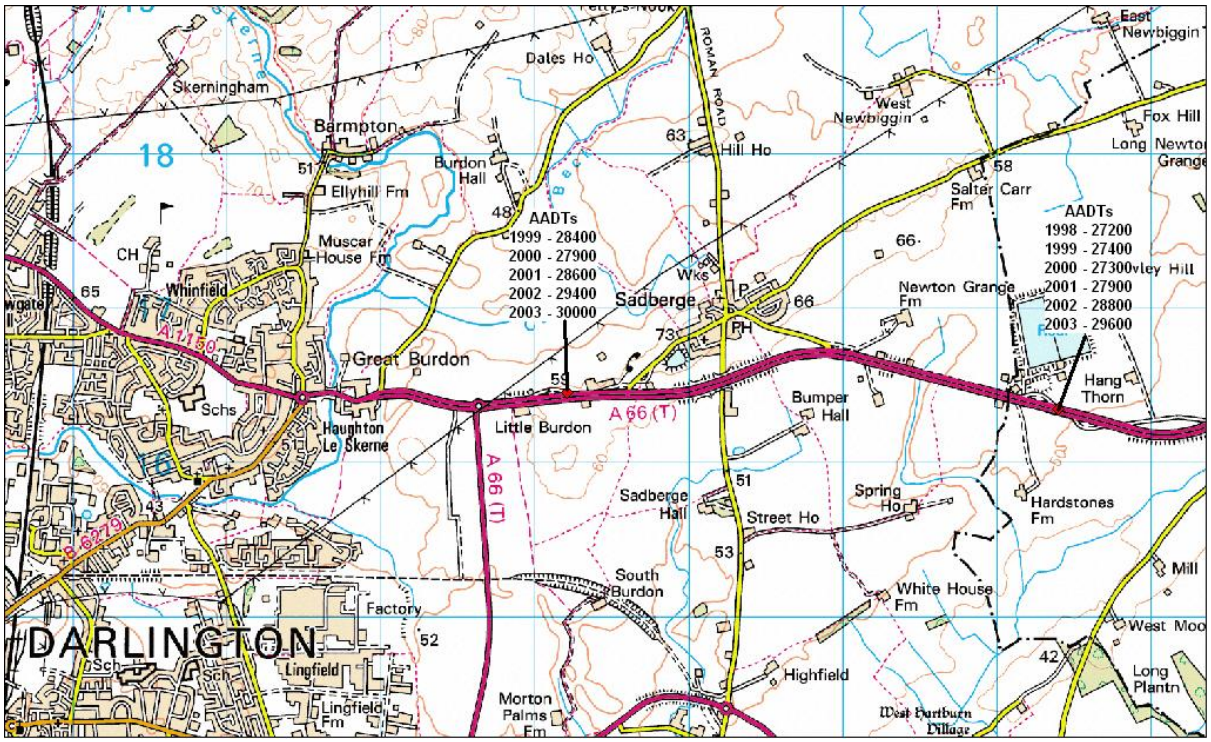

Figure B1 - Traffic Volume Changes in the proximity of the A66 at Sadberge

From Figure B1 it is apparent that traffic flow has grown at both locations. This growth is at levels below what is expected from NRTF. The A66 west of Sadberge carries the slightly greater flow.

Traffic Growth

Figure B2 presents a bar chart of traffic flow by month at Long Newton and Figure B3 presents a bar chart of traffic flow by month at Great Burdon. The count sites are located in the positions shown in Figure B1. It should be noted that when there is no flow, this is where there were problems with the permanent counters.

The red hashed line represents the opening date and the flow is split between carriageways.

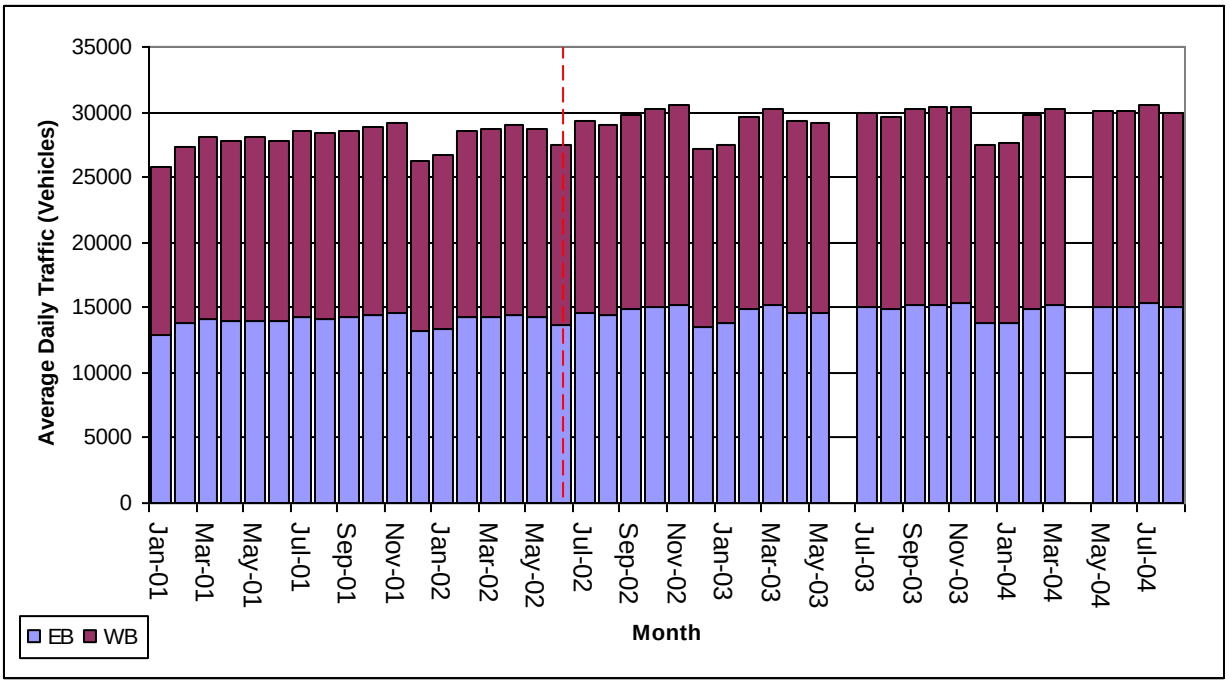

Figure B2 – Monthly Variation in Traffic at Long Newton

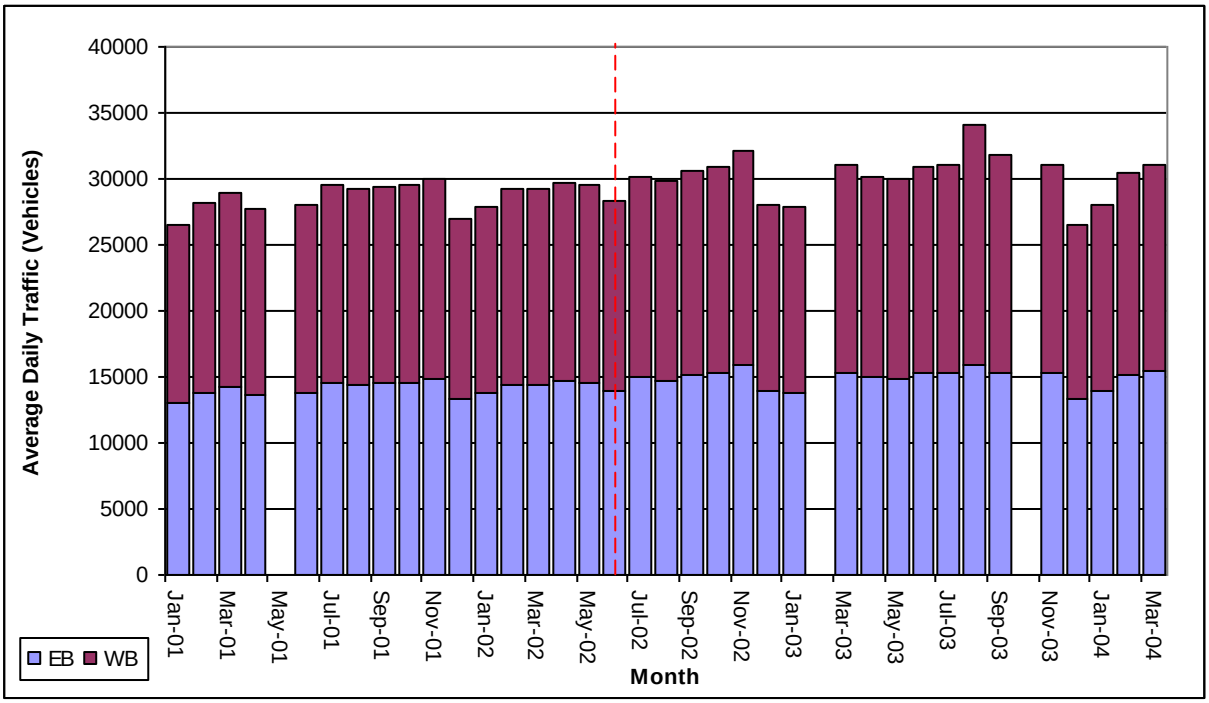

Figure B3 – Monthly Variation in Traffic at Great Burdon

Figures B2 and B3 show that there hasn't been any significant additional traffic attracted to the A66 as a result of the new scheme, the growth appears to be at or below NRTF levels. It is also apparent, from examining Figures B2 and B3 that traffic flows are reasonably consistent throughout the year and are not affected by seasonality to any significant levels.

In summary the main points to note from the traffic flow section is that:

- The scheme has not significantly affected traffic growth on the trunk road;

Annex C - Original Scheme AST

Original AST

Proposal name		Sadberge compact, single quadrant loop, grade separated junction, 220m in length, width between 7.9m and 10.7m	Current Cost £0.952m Date Feb 2001	
PROBLEMS		Safety problems caused by right turn and U turn movements through the central reservation gaps on the A66 at the junctions with the C51 and unclassified 55.18 which are accesses to the village of Sadberge. (A66 traffic flows 28,500 AADT and 11% HGV's)		
OTHER OPTIONS		A) Minor works in the vicinity of the junction; B) Conventional slip roads off the A66 onto the C38; C) Alternative compact grade separated junction positions between A66 and C38; D) Full compact grade separated junction linking A66 and C38 (2 loop roads); E) Roundabout(s) on the existing junctions; F) Compact grade separated junction between A66 and C38 coupled with roundabout at A66/C51 junction.		
OBJECTIVES		QUALITATIVE IMPACTS	QUANTITATIVE MEASURE	ASSESSMENT
ENVIRONMENT	Noise	Properties along Stockton Road and Darlington Road will experience a slight reduction in noise. Properties along Middleton Road will experience a slight increase in noise	No. properties experiencing: - Increase in noise 28 - Decrease in noise 51	23 properties experience net decrease in noise
	Local air quality	There will be a slight improvement on Darlington Road and Stockton Road but some slight deterioration on Middleton Road.	No assessment made	Subjective – a net improvement in the village – slightly positive
	Landscape	A new lighted junction on rising embankment will be visually intrusive to three properties on Middleton Road.	Not Applicable	3 properties will experience high visual intrusion
	Biodiversity	Flat, single crop arable land will be replaced by pavement with associated verges and embankments, grassed and planted with trees and shrubs thereby creating a more diverse habitat for flora and fauna. An existing hedge and ditch would be lost.	Not Applicable	neutral
	Heritage	No scheduled ancient monuments or archaeological sites. However, Middleton Road, being an old Roman Road will require archaeological monitoring within the site of the new junction. Some test pits will be necessary before start of construction	Not Applicable	Discovery of any archaeological resource would be a positive improvement
	Water	No significant effect on water quality	Not Applicable	Neutral
SAFETY	-	Closure of the central reservation gaps at the two existing junctions will eliminate right turning movements and the cause of 17 accidents in the period 1996-2000	Accidents Deaths Serious Slight 17 0 4 13	Subjective assessment – large positive
ECONOMY	Journey times & Veh. op. costs	There would be a slight overall increase in journey times and therefore VOC's	No assessment made	Subjective assessment – slightly negative
	Cost		£951,650 (2001 prices)	
	Journey time reliability	Traffic flows will be reduced on Darlington Road and Stockton Road but increased on Middleton Road. No significant impact on stress levels.	No assessment made	Subjective neutral assessment
	Regeneration	No significant effect	No assessment made	No
ACCESSIBILITY	Pedestrians and others	Reduced traffic on Darlington Road and Stockton Road will improve safety and environment for pedestrians. Increased traffic flow will do the reverse on		Neutral

		Middleton Road. Some increased journey times due to changed westbound bus route.		
	Access to public transport	Elimination of the right turning facility will significantly affect westbound buses causing them to access the village via Middleton Road. This would result in the loss of this service to Beacon Hill.		Moderately negative
	Community severance	Provision of new agricultural underpass results in the scheme causing no severance.		Neutral
INTEGRATION	-	The scheme is not mentioned in the Darlington BC Local Plan, it is in their LTP		Neutral
Version of January 2001		Cost benefit analysis: low	PVB £3.226m, PVC £0.686m, NPV £2.540m, BCR 4.704	
		Cost benefit analysis: high	PVB £5.107m, PVC £0.686m, NPV £4.422m, BCR 7.447	

Note: This Table reproduces the AST of the PAR document, all costs and benefits are in 1994 prices, discounted to 1994 at 6%.

Annex D - Atkins EST

Atkins EST

Proposal name		Sadberge compact, single quadrant loop, grade separated junction, 220m in length, width between 7.9m and 10.7m		
PROBLEMS		Safety problems caused by right turn and U turn movements through the central reservation gaps on the A66 at the junctions with the C51 and unclassified 55.18 which are accesses to the village of Sadberge. (A66 traffic flows 28,500 AADT and 11% HGV's)		
OTHER OPTIONS		G) Minor works in the vicinity of the junction; H) Conventional slip roads off the A66 onto the C38; I) Alternative compact grade separated junction positions between A66 and C38; J) Full compact grade separated junction linking A66 and C38 (2 loop roads); K) Roundabout(s) on the existing junctions; L) Compact grade separated junction between A66 and C38 coupled with roundabout at A66/C51 junction.		
OBJECTIVES		QUALITATIVE IMPACTS	QUANTITATIVE MEASURE	ASSESSMENT
ENVIRONMENT	Noise	Properties along Stockton Road and Darlington Road will experience a slight reduction in noise. Properties along Middleton Road will experience a slight increase in noise Due to the re routing of small amounts of traffic this is assumed to be the case	No. properties experiencing: - Increase in noise 28 - Decrease in noise 51	23 properties experience net decrease in noise – Assumed to be correct
	Local air quality	There will be a slight improvement on Darlington Road and Stockton Road but some slight deterioration on Middleton Road. Due to the re routing of small amounts of traffic this is assumed to be the case	No assessment made	Subjective – a net improvement in the village – slightly positive Assumed to be correct
	Landscape	A new lighted junction on rising embankment will be visually intrusive to three properties on Middleton Road. Assessed on site visit to be visually intrusive to three properties. Due to only three properties being affected this is assumed to be a slight negative impact	Not Applicable	3 properties will experience high visual intrusion Slight Negative
	Biodiversity	Flat, single crop arable land will be replaced by pavement with associated verges and embankments, grassed and planted with trees and shrubs thereby creating a more diverse habitat for flora and fauna. An existing hedge and ditch would be lost.	Not Applicable	Neutral Not Assessed
	Heritage	No scheduled ancient monuments or archaeological sites. However, Middleton Road, being an old Roman Road will require archaeological monitoring within the site of the new junction. Some test pits will be necessary before start of construction. Unclear as to whether test pits were dug before construction	Not Applicable	Discovery of any archaeological resource would be a positive improvement Unsure as to whether this happened
	Water	No significant effect on water quality	Not Applicable	Neutral Not Assessed
SAFETY	-	High POPE Assessment: Closure of the central reservation gaps at the two existing junctions will eliminate right turning movements and the cause of 17 accidents in the period 1996-2000 Low POPE Assessment: The cause of 11 accidents over the period 1996 – 2000 were the central reservation gaps at Sadberge, as these have now been closed it is assumed that the scheme will save 11 accidents every five years.	POPE Low: 35 to 40 accidents saved POPE High: 78 to 98 accidents saved	POPE Low: £1.320m to £2.599m POPE High: £3.348m to £3.396m

		The Scheme hasn't caused any accidents at its immediate vicinity or at its priority junction with the local road network (Middleton Road). Therefore the scheme is assumed to be large positive.		
ECONOMY	Journey times & Veh. op. costs	There would be a slight overall increase in journey times and therefore VOC's Assumed to be correct due to the rerouting of traffic therefore a slight negative	No assessment made	LOW PVB £-0.77m HIGH PVB £0.568m
	Cost		£0.440m	PVB £0.440m
	Journey time reliability	Traffic flows will be reduced on Darlington Road and Stockton Road but increased on Middleton Road. No significant impact on stress levels. Assumed to be correct due to re routing of traffic	No assessment made	Subjective neutral assessment Neutral
	Regeneration	No significant effect	No assessment made	No No Assessment
ACCESSIBILITY	Pedestrians and others	Reduced traffic on Darlington Road and Stockton Road will improve safety and environment for pedestrians. Increased traffic flow will do the reverse on Middleton Road. Some increased journey times due to changed westbound bus route. Mitigating measures have been provided		Neutral Neutral
	Access to public transport	Elimination of the right turning facility will significantly affect westbound buses causing them to access the village via Middleton Road. This would result in the loss of this service to Beacon Hill. Although mitigating measures have been provided the loss of the service to Beacon Hill has caused this to be assessed as slightly negative.		Moderately negative Slight negative
	Community severance	Provision of new agricultural underpass results in the scheme causing no severance. The mitigating measure has been provided (the new agricultural underpass)		Neutral Neutral
INTEGRATION	-	The scheme is not mentioned in the Darlington BC Local Plan, it is in their LTP		Neutral Not Assessed
Version of January 2001		Cost benefit analysis: Low POPE Assessment	LOW PVB £1.243m, PVC £0.440m, NPV £0.803m, BCR 2.83 HIGH PVB £2.167m, PVC £0.440m, NPV £1.727m, BCR 4.93	
		Cost benefit analysis: High POPE Assessment	LOW PVB £3.171m, PVC £0.440m, NPV £2.731m, BCR 7.21 HIGH PVB £4.504m, PVC £0.440m, NPV £4.064m, BCR 10.24	

All costs and benefits are in 1994 prices discounted to 1994 at 6%