



Lancashire County Council

**A682 Centenary Way Viaduct Refurbishment
Scheme**

**Benefit Cost Analysis and Gross Value Added
Assessment Technical Note**

March 2015

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1

Introduction

1.1 Background

This report documents the findings of an economic assessment of the A682 Centenary Way Viaduct Refurbishment Scheme.

Jacobs were commissioned by Lancashire County Council to undertake an outline Benefit Cost Appraisal (BCA) and Gross Value Added (GVA) analysis of the scheme in order to assess the potential wider economic benefits that could be generated for residents and businesses in the locality.

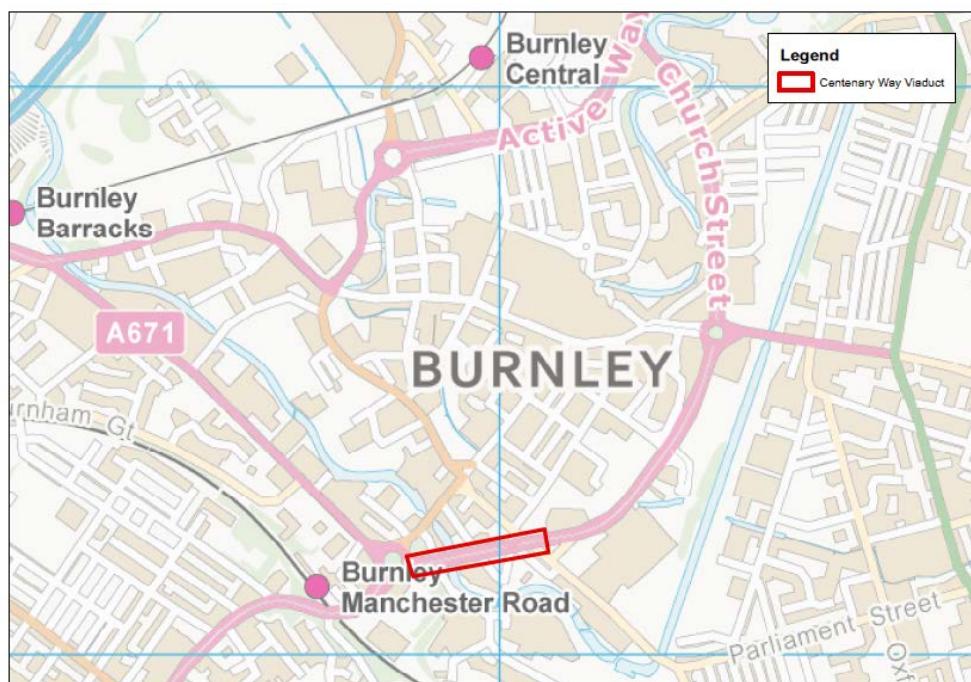
Whilst BCA is the traditional approach to assessing the merit of transport schemes, GVA analysis seeks to complement standard transport appraisals where these have already been produced. The wider economic impacts of the proposed transport schemes are particularly important to understand in terms of the potential benefits for the locality, and in the context of supporting the funding bid for the scheme as well as the Government's economic growth agenda.

1.2 Overview of Scheme

The Centenary Way Viaduct is located in Burnley, Lancashire and carries the A682 over various unclassified roads, car parks, private land, footways and the Leeds and Liverpool Canal. The Centenary Way viaduct is an integral part of the town centre road network, supporting movement into, out of and around Burnley. Its failure would therefore have serious implications for the town centre's economic performance and potential, and could deter new businesses from choosing to relocate to the area.

Figure 1-A illustrates the location of the scheme.

Figure 1-A Scheme Location



The bridge is currently closed to heavy construction and abnormal load vehicles, which usually require additional support vehicles to safely transport the goods they carry. These are classified as¹:

- having a weight of more than 44,000 kilograms;
- an axle load of more than 10,000 kilograms for a single non-driving axle and 11,500 kilograms for a single driving axle;
- a width of more than 2.9 metres;
- a length of more than 18.65 metres;

Without major intervention at this stage, a further weight restriction limiting the use of the bridge by all HGVs and PSVs will be required. The scheme presented here is to prevent further deterioration of the bridge and restore the route to its full carrying capacity alleviating pressure on surrounding alternative routes and supporting the development of the Burnley Pendle Growth corridor within the LTP objectives.

1.3 Overview of Approach

A BCA assessment has been undertaken to assess the transport user costs and benefits of the scheme, as well as the potential Marginal External Costs (MEC) of the scheme.

A separate Gross Value Added (GVA) assessment has been undertaken on the proposed development that the scheme supports, in order to assess the potential wider economic benefits that the transport scheme could generate.

The GVA calculation undertaken accords with both HM Treasury Green Book guidance, and the principles and procedures adopted in WebTAG, in line with a traditional BCA approach.

All GVA values presented are net figures (inclusive of locally orientated deadweight, displacement, leakage and substitution factors), and are considered in the context of regeneration phasing and profiles of development build-out. This ensures that GVA values presented comply with national best practice, only present the **additional** benefits thereby derived for UK Plc, and thus also focus on the **net change** in overall economic welfare at the national level.

This is critical for incorporating a GVA value within an overall compliant WebTAG appraisal and the economic case (BCA) for progression of a transport scheme.

All values, whilst presented annually have also been presented in 2010 prices and values, discounted in line with Treasury and WebTAG standards.

1.4 Report Contents

This remainder of this report is structured as follows:

- *Cost Estimates;*
- *BCA Methodology;*
- *GVA Methodology;*
- *Results; and*
- *Summary & Conclusion.*

¹ Source: 'Transporting abnormal loads', accessed 12th November 2014:
<https://www.gov.uk/esdal-and-abnormal-loads/abnormal-loads>

2**Cost Estimates****2.1 Introduction**

This section of the report outlines the input preliminary cost estimates included in the assessment provided by the client.

2.2 Cost Estimates

Cost estimates were provided by Lancashire County Council in March 2015 and are summarised in Table 2-A.

Table 2-A Scheme Cost Estimate

Year	Construction	Design	Risk
2015	£1,450,000	£200,000	£71,500
Total	£1,721,500		
Total including Optimism Bias (6%)	£1,824,790		

The above costs include the following assumptions:

- Optimism Bias has been included as per guidance in TAG Unit A1.2, Optimism Bias uplift has been assumed at 6% in accordance with a fixed link at Stage 3.
- Costs occur in 2015, the opening year of the scheme.

3

BCA Methodology

3.1 Introduction

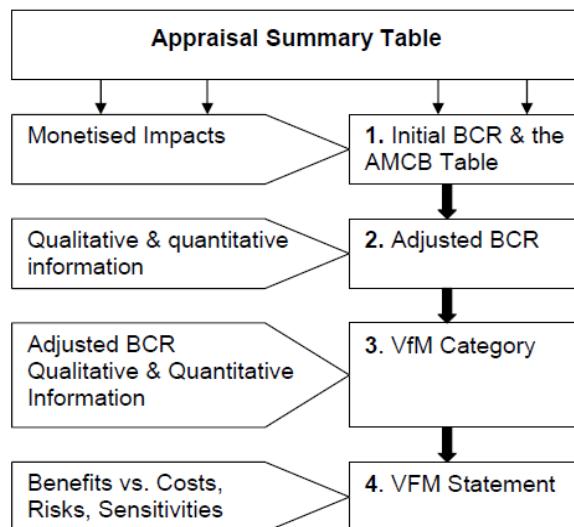
This section of the report outlines the methodology for quantifying transport user benefits arising from the proposed highway improvements of the scheme.

3.2 BCA and Value for Money

BCA is the traditional approach to quantifying the costs or benefits of a transport intervention. The output Benefit Cost Ratio (BCR) from the assessment is therefore a prominent input into how a scheme intervention is appraised as part of the Business Case submission and supporting documentation.

Figure 3-A illustrates how the outputs from the BCA feeds into the appraisal process and 'Value for Money (VfM)' categories.

Figure 3-A BCA & VfM²



Costs of the scheme have been provided by Lancashire County Council (the Client), as outlined in the previous section.

As per Department for Transport (DfT) guidance, the output BCR from the BCA determines the VfM category the scheme falls within, as defined below:

- poor VfM if the BCR is less than 1.0;
- low VfM if the BCR is between 1.0 and 1.5;
- medium VfM if the BCR is between 1.5 and 2.0;
- high VfM if the BCR is between 2.0 and 4.0; or
- very high VfM if the BCR is greater than 4.0.

² DfT (Dec 2013) *Value for Money Assessment: Advice Note for Local Transport Decision Makers*.

3.3 Quantification of Scheme Benefits

Scheme benefits have been derived from analysis of the existing traffic flows in the vicinity of the scheme, utilising observed traffic flows provided by Lancashire County Council.

Reviewing the provided traffic count information and possible Do Minimum re-routing scenarios highlighted that HGVs using the Centenary Way viaduct were not all likely to follow the same route through Burnley. Two possible routes were identified:

- Route A where traffic would leave or enter the A682 at the Yorkshire street roundabout; and
- Route B where traffic would continue north-south using the A682.
-

Each of these routes would require a different length of diversion route, as shown below.

Figure 3-B Route A: Do Something Route

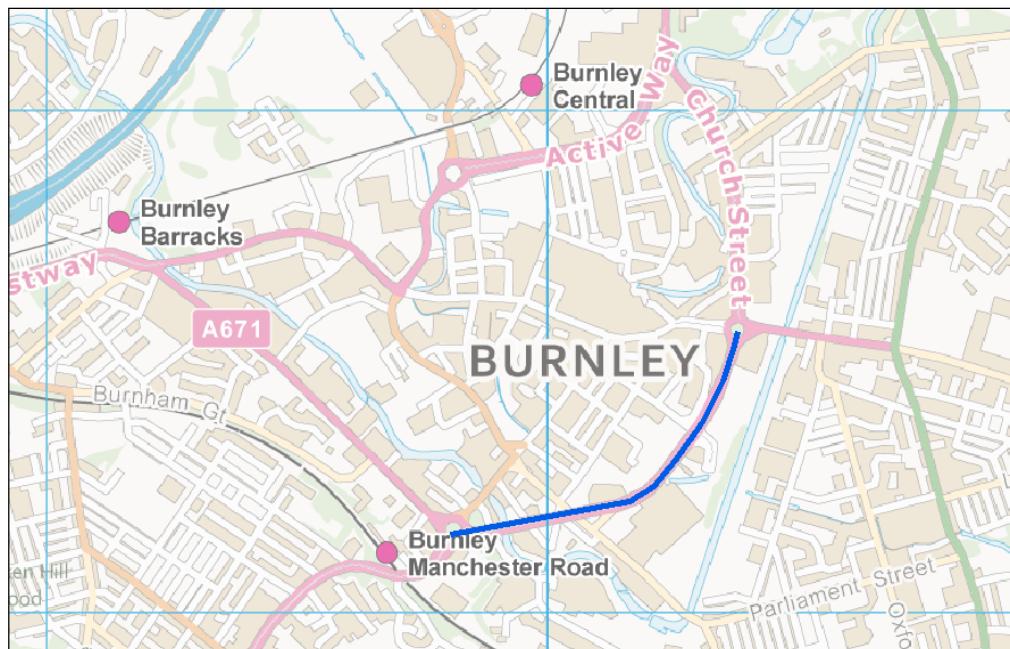


Figure 3-C Route A: Do Minimum Route

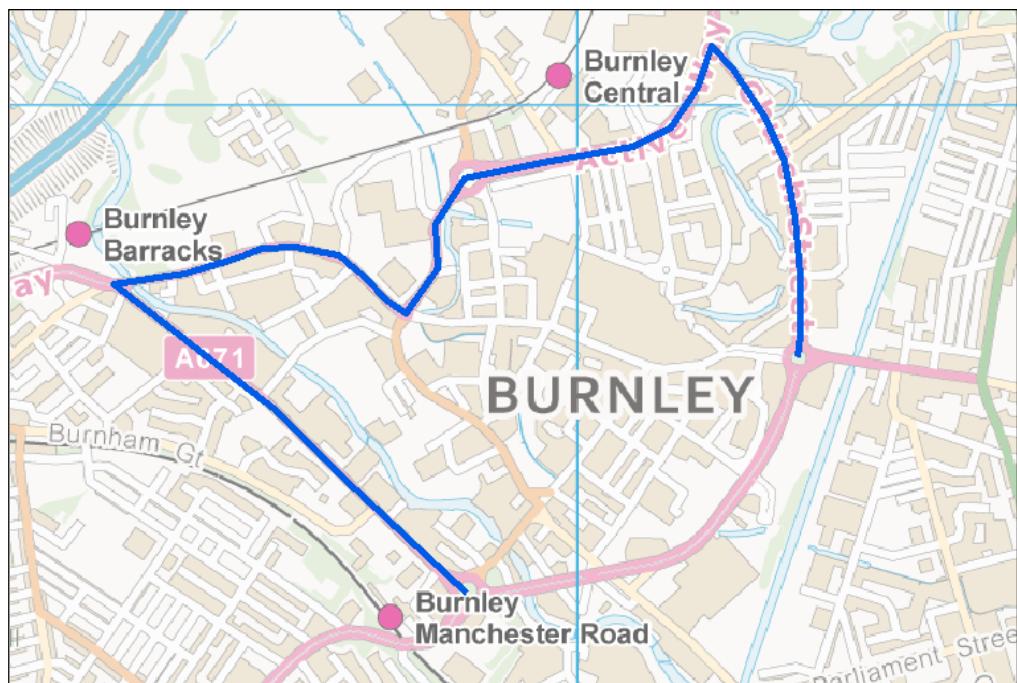


Figure 3-D Route B: Do Something Route

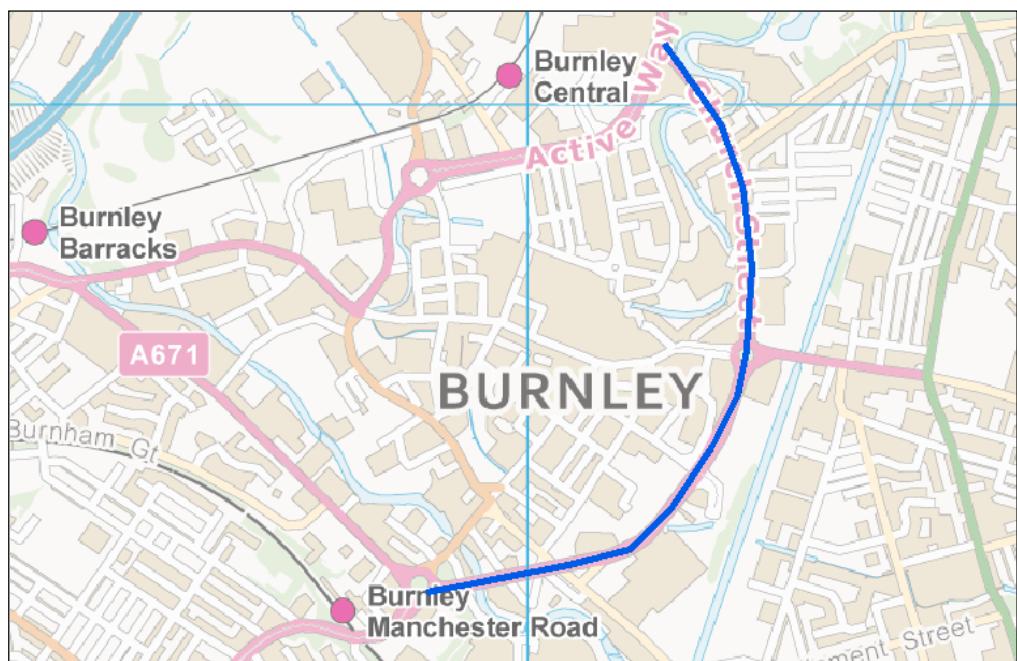
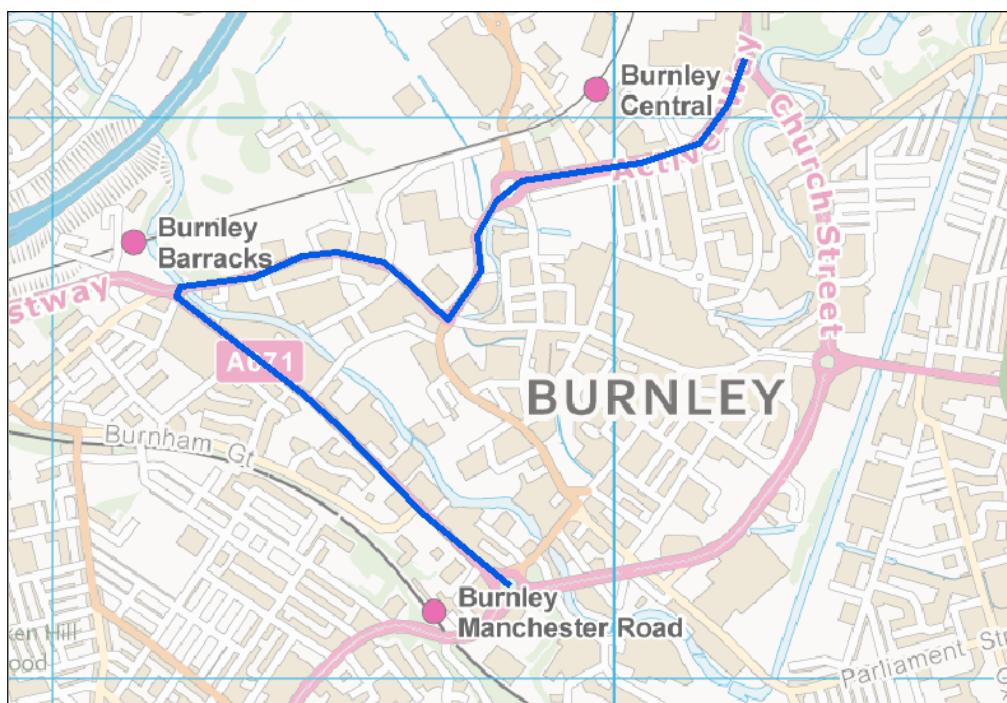


Figure 3-E Route B: Do Minimum Route



The two-way traffic counts, undertaken in 2012, were interrogated to calculate the number of heavy vehicles (OGV1, OGV2 and PSV) currently utilising each route in the AM peak, inter-peak average and PM peak hours. No seasonality factor was applied due to the lack of a full year of count data.

The Strat-e-gis software package, which allows the interrogation of traffic data supplied by Trafficmaster plc, was used to analyse average travel times for each route during selected time periods. Travel time benefits were calculated from the change between the DM and DS scenarios using WebTAG Values of Time.

Additional Marginal External Cost (MEC) benefits such as air quality, noise, congestion, infrastructure and accident costs have been calculated using the change in vehicle kilometres saved between the DM and DS scenario, utilising the methodology outlined in WebTAG Unit A5.4 '*Marginal External Costs*'.

As the available traffic count data was for 2012, this was then growthed using Road Traffic Forecasts 2013 (RTF13) increase in delay factors (for the North West, "Other Urban" road type) to the 2016 opening year and 2031 design year of the scheme.

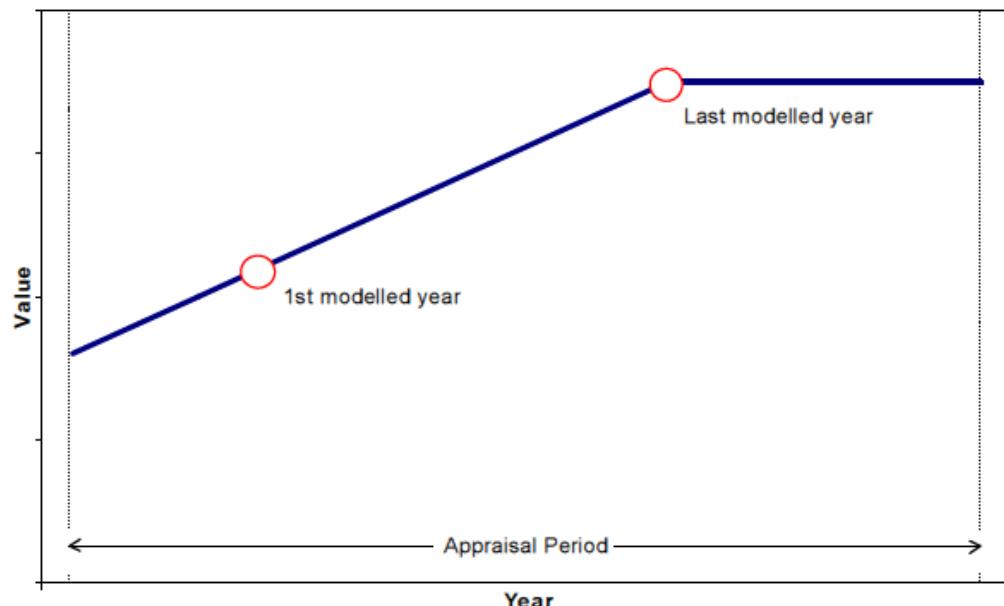
Assumptions included in the individual assessments are outlined in Table 3-A.

Table 3-A Individual Scheme Assumptions

Do Minimum	Do Something
Route A DM distance of 2.720km	Route A DS distance of 0.777km
Route B DM distance of 2.132km	Route B DS distance of 1.343km
All HGVs on Centenary Way have been split between routes A and B only.	
The proportion of HGVs that would use Route A and Route B in both a northbound and southbound direction have been estimated based upon existing classified traffic counts. See Appendix B for further details.	
Traffic Growth and Growth in Delay has been estimated using RTF13 values for the North West, Other Urban Roads as forecast in the National Traffic Model.	
Benefits calculated for an annualisation period of 300 days (Monday – Saturday, covering the operating period of most HGV and PSV traffic).	

3.4 Forecasting Benefits over the Appraisal Period

Time savings for the opening and forecast years have been monetised for an AM, IP and PM time period, using standard WebTAG values of time (VoT) based on vehicle and journey purpose splits, as outlined in WebTAG guidance. The benefits have then been factored up to an annual period to produce a yearly benefit for the scheme (for the opening and forecast years) and interpolated and projected over a standard 60-year appraisal period as illustrated in Figure 3-F.

Figure 3-F Interpolation and projection of benefits


Benefits have then been discounted to 2010 values, as outlined in standard Treasury Green Book appraisal methodology. The cost of the scheme has then been compared with the projected benefits over 60 years to produce the overall BCR, as outlined in the following results section.

4

GVA Methodology

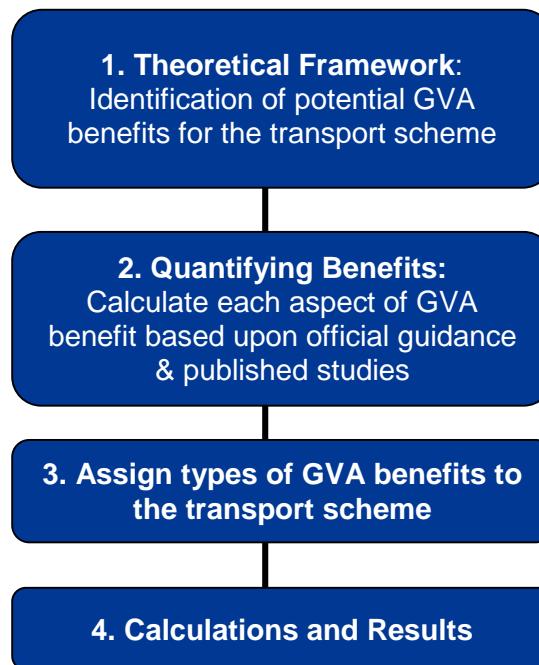
4.1 Introduction

This section of the report outlines the methodology used to quantify the potential GVA benefits associated with the scheme.

4.2 Methodology

The analysis of potential GVA benefits has been undertaken in the following stages, as summarised by Figure 4-A below.

Figure 4-A Theoretical Framework



4.3 Theoretical Framework

The GVA analysis seeks to complement standard transport appraisals. The wider economic impacts of the proposed transport schemes are particularly important to understand in terms of the potential benefits for the locality and the Government's economic growth agenda.

GVA measures the total value of goods and services; i.e. economic activity. In its simplest terms, it is therefore GDP at a local/regional level, minus indirect taxation.

There are usually three ways to measure GVA; via an output approach, an income approach, or an expenditure approach. All three methods should provide the same value in theory; however, in a transport context it is very difficult to determine what the expenditure or additional goods produced directly from a transport scheme will be.

Thus, in a transport context, almost all valuations of GVA across the locality are based on an income approach, as we are able to quantify the amount of new development ‘unlocked’, the net additional jobs created from the introduction of a transport scheme or the productivity uplifts of the scheme.

As a result, there are three key mechanisms by which transport schemes produce GVA benefits; based on the number of new jobs created, the enhanced productivity of existing jobs and the direct cost savings brought about by a transport scheme, as summarised below:

1) More jobs = Additional wages = greater GVA

2) Higher productivity = Higher profits = greater GVA

3) Direct cost savings = greater GVA

In the case of the first mechanism, transport acts as an enabler of growth by allowing additional jobs to be accommodated in a certain location thanks to enhanced transport links and transport capacity. These jobs are therefore not created by the transport scheme itself, but are supported by the increase in accessibility facilitated by the scheme; i.e. the jobs and GVA benefits are (to varying proportions) **dependent³** on the transport scheme.

In the case of the second mechanism, transport can make existing jobs more productive by reducing journey times, enhancing connectivity and productivity. This applies both to car and freight movements.

The reason for this is that a reduction in journey times increases the accessibility of the employment area, which may lead to a better match in terms of labour supply and demand, allowing greater efficiencies to be made through agglomeration tendencies of entrenched economic actors.

On the freight side, lost time is not just driver values of time, but has a wider economic impact in the production process.

Direct cost savings in terms of travel also provide benefits to residents and businesses.

4.4 GVA Benefit Quantification

Unlike standard transport appraisals, there is not a single methodology for estimating the impacts of a scheme on GVA, employment, or similar measures of the performance of the real economy. In contrast, methodologies vary considerably across studies.

Almost all methods reviewed have particular strengths and weaknesses, and thus there is no single definition of what GVA is or how it should be quantified.

³ “Dependent development” for housing is defined using the WebTAG definition as follows:

“New housing is dependent on the provision of some form of transport scheme if, with the new housing, but in the absence of any transport scheme, the transport network would not provide a reasonable level of service on the highway networks to existing and/or new users.”

In this context, a bespoke methodology has been developed based on the above definition and consistent theoretical framework for assessing additional economic benefits. This ensures that the scheme is subject to a standard process and quantification of benefits; albeit using local variations in GVA per job, and local transport capacity constraints overcome.

Not all elements of GVA benefits are applicable for every type of scheme. The following elements were considered appropriate for the A682 Centenary Way Viaduct Refurbishment Scheme and have subsequently been assessed:

- **Productivity Impacts**
- **Direct Cost Savings**

No other GVA benefits have been calculated as part of this assessment.

GVA benefits which arise from productivity benefits (as a result of reduced journey times) are quantified and forecast by estimating productivity uplifts (via agglomeration and effective density changes) for affected transport users in the labour market.

The annual benefits obtained in the GVA analysis have been forecast over a 60 year period to be consistent with WebTAG guidance and to ensure consistency with the BCA outputs derived, and which already incorporate user benefits of the scheme, and associated cost savings.

A 2% per annum GVA growth rate has been applied up to 2046 (the first 30 years of the scheme, from 2016 to 2046) in line with WebTAG and the WebTAG databook (November 2014, v1.3b release) guidance on forecast real increases in productivity over time.

The benefits over the 60-year period have then been discounted using a 3.5% discount rate for the first 30 years and then a 3% discount rate for the next 30 years, as defined in WebTAG, and in line with Treasury Green Book guidance.

5

Results

5.1 Introduction

This section presents the results from the BCA and GVA analysis.

5.2 BCA Results

Table 5-A outlines the outputs of the Benefit Cost Analysis for the scheme.

Table 5-A Scheme Benefits

	Benefits
Noise	£9,372
Local Air Quality	£192
Greenhouse Gases	£27,520
Journey Quality (Congestion)	£971,708
Physical Activity	£0
Infrastructure Maintenance	£5,655
Accidents	£487,318
Economic Efficiency: Consumer Users (Commuting & Other)	£3,107,887
Economic Efficiency: Business Users and Providers	£2,846,369
Wider Public Finances (Indirect Taxation Revenues)	-£119,043
Present Value of Benefits (PVB)	£7,336,978
Broad Transport Budget	£1,420,578
Present Value of Costs (PVC)	£1,420,578
Net Present Value (NPV)	£5,916,400
Benefit to Cost Ratio (BCR)	5.2

With a **BCR of 5.2**, the A682 Centenary Way Viaduct Refurbishment Scheme could deliver 'Very high' value for money, as outlined in DfT guidance.

Outputs from the BCA assessment are included in Appendix A.

5.3 GVA Results

The results of the GVA assessment undertaken produce various GVA measures which are defined in Table 5-B. The preferred and most useful measure is likely to be the undiscounted, annual GVA benefits for the locality.

Table 5-B GVA Measures

GVA measure	Explanation
Total GVA benefits over 60 years (undiscounted)	60-year values are provided over the lifetime of the scheme and which align with the same period of analysis associated with traditional transport appraisals. This figure shows the total 60 year GVA benefits undiscounted in 2010 prices.
Annual GVA benefits averaged over 60 years (undiscounted)	An annual GVA benefit averaged over 60 years is also presented. This is presented in 2010 prices and is undiscounted.
Total GVA benefits over 60 years (discounted)	This figure shows total benefits discounted over 60 years in 2010 prices. Discounting takes into account the effect of inflation at 3.5% for the first 30 years, and then 3% for the remaining 30 years.
Annual GVA benefits in 2010 (discounted)	An annual GVA benefit averaged over 60 years is also presented. This is presented in 2010 prices and is discounted.

The results of the GVA analysis are presented in Table 5-C. It should be noted that the preferred annual measure GVA is highlighted in the final column.

Table 5-C GVA results

Scheme Cost	Undiscounted total GVA (60 yrs, 2010 prices)	Annual GVA (2010 prices undiscounted)	Discounted total GVA (60 yrs, 2010 prices)	Annual GVA (2010 prices discounted)
£2,837,500	£14,579,171	£242,986	£4,828,543	£80,475.72

Given an investment of **£1.7m**, this would be returned within **21 years** of the scheme opening, based on an average return of **£80,475** in GVA uplift per annum in discounted 2010 costs, or within **7 years** of the scheme opening, based on an average return of **£242,986** in GVA uplift per annum in undiscounted prices.

This represents an average over the appraisal period of the scheme and given the profiling of benefits, may not be recouped until several years hence of the estimated return periods outlined above.

6

Summary & Conclusion

6.1 Summary

This report presents the results of the BCA and GVA analysis undertaken for the A682 Centenary Way Viaduct Refurbishment Scheme.

These assumptions have been interpolated between the 2016 opening year and 2031 design year for the schemes, in line with current DfT spending commitments. Standard WebTAG and Treasury Green Book approaches have been used to undertake the benefit cost appraisal, discounted to 2010 prices over a standard 60 year appraisal period.

The BCA analysis has shown that the scheme would provide benefits to existing transport users, reducing journey times and where applicable, marginal external cost savings.

In the absence of a singly recognised and adopted methodology for estimating potential GVA benefits, the GVA analysis has been undertaken using an evidence-led, theoretically consistent framework approach, based on available studies and parameters, as well as collaborative working with the Client.

The analysis has quantified the potential GVA benefits that would be generated by the scheme. The results from the analysis, presented in this report, indicate that the scheme will have a positive impact on the local economy by supporting HGV freight movements within Burnley by avoiding the need to use the diversion route in the case of the viaduct being closed to HGVs.

6.2 Conclusion

The A682 Centenary Way Viaduct Refurbishment Scheme could deliver '**very high**' value for money, based on a traditional transport BCR of **5.2**.

The scheme will also generate additional GVA benefits for the local economy. A net GVA benefit over the appraisal period of approximately **£80,000** per annum averaged over a 60-year appraisal period has been calculated based on locally adjusted GVA values (in 2010 discounted prices). Over the full 60 year assessment period, the total 2010 discounted benefits amount to **£4.8 million**.

Appendix A BCA Assessment Results

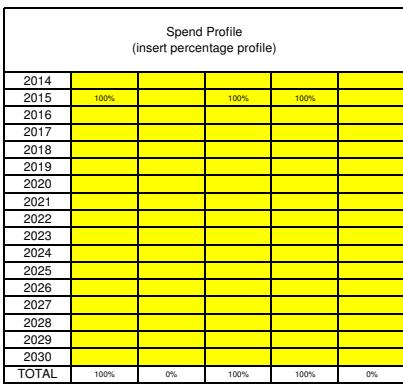
Appendix B HGV Routing Plans

Scheme Comparison: Centenary Way Maintenance Improvement Scheme	PVB	£7,336,978
Scheme Description:	PVC	£1,420,578
Maintenance of the Centenary Way bridge structure to support continued use by HGV and PSV traffic, which would otherwise have to divert around this route if a weight restriction were to be imposed.	NPV	£5,916,400
	BCR	5.165

Estimation of Discounted Scheme Costs

Scheme Costs	Construction	Land	Preparation	Risk	Maintenance	TOTAL
	£1,537,000		£212,000	£75,790		£1,604,790
					Pre OB	£1,721,500

Assessment Parameters	Scheme Cost Estimate Year	2015
	Scheme Cost Discount Factor	3.5%
	Inflation Factor	0.0%
	Discount Factor (0-30 years)	3.5%
	Discount Factor (31-75 years)	3.0%
	Discount Factor (76-125 years)	2.5%
	Discount Factor (126+ years)	2.0%



Applying the methodology below produces the discounted scheme cost (PVC):-

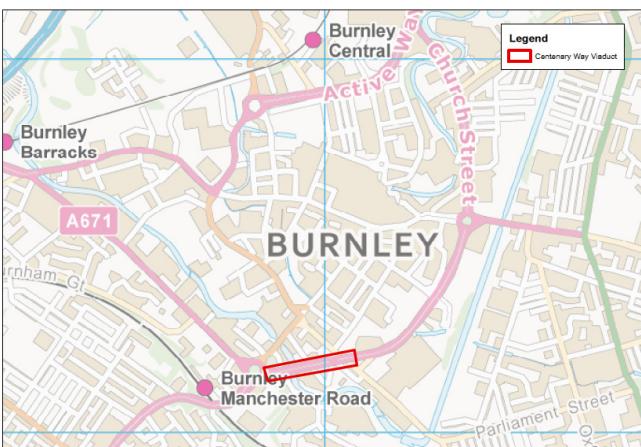
- a) Assume the Construction costs are spread evenly over the construction period (assumed to be 2 years)
 - b) Assume land is bought in the first year of construction
 - c) All costs are in undiscounted Q2 prices, so need to be converted to undiscounted 2010 prices using the industry-standard method of GDP deflation
 - d) All costs discounted to 2010 N.B.
 - e) All costs need to be converted to Market Prices N.B.

N.B. It is assumed that Preparation and Supervision costs are included within the above costs
N.B. Optimism Bias only applied to Construction costs, not Land

Estimation of Total Scheme Benefits Over Appraisal Period

Economic Efficiency of the Transport System (TEE)												
<u>Non-business: Commuting</u>		ROAD					Business					
<u>User benefits</u>		ALL MODES		CAR		BUS & COACH		RAIL		OTHER	User benefits	
TOTAL	£0	Car	LGV	£0	£0	£0	£0	£0	£0	£0	£0	£0
Travel time	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0
Vehicle operating costs	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0
User charges	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0
Maintenance	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0
NET NON-BUS BENS:	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0
Business												
<u>User benefits</u>												
Travel time											£2,846,369	£0
costs											£0	£0
User charges											£0	£0
Construction &											£0	£0
Subtotal											£2,846,369	£0
Goods Vehicles	Business Cars & LCVs											
Passengers												
Freight												
Passengers												
£2,846,369	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0
Non-business: Other												
<u>User benefits</u>												
TOTAL	ALL MODES	ROAD	CAR	LGV	BUS & COACH	RAIL	OTHER					
Travel time	£0	£0	£0	£0	£0	£0	£0					
Vehicle operating costs	£3,107,887	£0	£0	£0	£0	£0	£0					
User charges	£0	£0	£0	£0	£0	£0	£0					
Maintenance	£0	£0	£0	£0	£0	£0	£0					
NET NON-BUS BENS: OTHER	£3,107,887	£0	£0	£0	£0	£0	£0					
Private sector												
<u>Revenue</u>											£0	£0
Operating costs											£0	£0
Investment costs											£0	£0
Grant/subsidy											£0	£0
Subtotal											£0	£0
Impacts												
contributions											£0	£0
NET BUSINESS											£2,846,369	£0
TOTAL												
Present Value of Transport Economic Efficiency Benefits (TEE)												
								£5,954,257				

Scheme Location: Centenary Way, Burnley



Public Accounts (PA) Table	
Local Government Funding	
Revenue	-
Operating Costs	-
Investment Costs	-
Developer and Other Contributions	-
Grant/Subsidy Payments	-
NET IMPACT	£0

Central Government Funding: Transport	
Revenue	-
Operating costs	-
Investment Costs	-
Developer and Other Contributions	£1,420,578
Grant/Subsidy Payments	-
NET IMPACT	£1,420,578

Central Government Funding: Non-Transport
Indirect Tax Revenues £0

Analysis of Monetised Cost and Benefits (AMCB) Table	
Noise	£9,372

Local Air Quality	£192
Greenhouse Gases	£27,520
Journey Quality (Congestion)	£971,708
Physical Activity	-
Infrastructure Maintenance	£5,655
Accidents	£487,318
Economic Efficiency: Consumer Users (Commuting)	£0
Economic Efficiency: Consumer Users (Other)	£3,107,887
Economic Efficiency: Business Users and Providers	£2,846,369

Present Value of Benefits (PVB)	£7,336,978
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Broad Transport Budget	£1,420,578
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Present Value of Costs (PVC)	£1,420,578
<i>OVERALL IMPACTS</i>	

Net Present Value (NPV) £5,916,400

Number of vehicles Re-Routing From Viaduct

NB	104
SB	193

NORTHBOUND

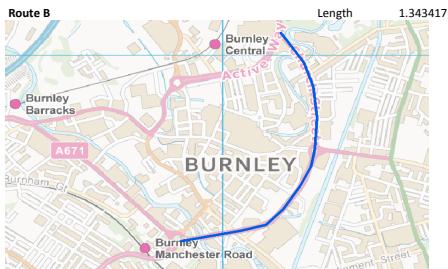
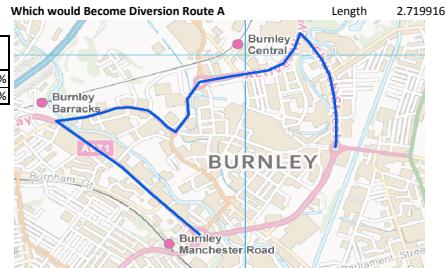
Number on Centenary way (A)	137
Number on Church Street (B)	86
Number Turning to York St (C=A-B)	51
Percentage turning to York Street	37%
Assume same percentage of Viaduct Flow Turn off to York Street	39
Therefore number carrying on North	65

SOUTHBOUND

Coming from North (A)	115
Number on Centenary Way (B)	269
Coming from York St (C = B-A)	154
Number turning to Tescos/Burnley Centre (D)	76
% turning to Tescos/Burnley Centre (D/B)	28%
Therefore same percentage of C turn off (E)	44
Number from York Street Carrying onto Viaduct	110
Therefore number from North Carrying onto Viaduct	83



Vehicles travelling this route in this direction	Percentage
NB	39
SB	110



Vehicles travelling this route in this direction	Percentage
NB	65
SB	83

