North Yorkshire County Council

Network Information and Compliance

The North Yorkshire Lane Rental Scheme Cost Benefit Analysis

CONSULTATION DRAFT

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EXECUTIVE SUMMARY

North Yorkshire County Council is a major investor of public resources and as such, should ensure that new developments or services make a positive contribution to the local economy and society.

Any new proposal should always answer these two basic questions:

- What are the specific outcomes sought?
- Will these outcomes deliver a positive benefit to the local economy and society?

A Cost Benefit Analysis (CBA) is a decision-making tool that helps provide assurance around these questions by quantifying all costs and benefits in monetary terms.

North Yorkshire County Council's Highways Team has been working on just such a new service and this CBA supports its introduction by demonstrating the positive financial outcome delivering its objectives will provide.

Minimising disruption is a key transport challenge for any Council and especially for a busy area like North Yorkshire.

The ability of people and goods to move freely around the highway network, meeting the needs of business, accessing essential services and for social and leisure purposes depends largely on the highway network operating effectively.

The proposed North Yorkshire Lane Rental Scheme tackles head-on one the major causes of disruption, developer, road and street works, collectively known as activities, in a robust and positive way and is a major opportunity to positively reduce disruption on the highway network.

The proposed North Yorkshire Lane Rental Scheme is designed to reduce the busy period volume and durations of activities and generally reduce the amount of activities undertaken at traffic-sensitive times by introducing a new Lane Rental Daily Charge.

The new Lane Rental Scheme is not intended to prevent activities necessary for the maintenance or improvement of the road network or the services running underneath it.

It is designed to introduce financial incentives to work at less disruptive times and more efficiently, completing works faster and delivering network operational effectiveness improvements.

Summary findings of the North Yorkshire Lane Rental Scheme Cost Benefit Analysis

Values based on 25 Year Operation of the proposed Scheme (2010 prices)

Value of benefits to economy and society	£26,450,638
Set-up and operating costs	£8,362,908
Financial benefit to the local economy from introducing the Scheme	£18,087,730
Benefit to Cost Ratio	**3.16**

INTRODUCTION

LANE RENTAL SCHEME OBJECTIVES

Brighton Traffic Management and Swift Argent were commissioned by North Yorkshire County Council (NYCC) in late 2023 to develop a road works Lane Rental Scheme known as the North Yorkshire Lane Rental Scheme (NYLRS), part of which includes the development of a detailed Cost Benefit Analysis (CBA).

The primary objective of the North Yorkshire Lane Rental Scheme is to incentivise activities on the most critical roads to be undertaken outside of traffic-sensitive times or reduce the duration of works if they are carried out during traffic-sensitive times.

Under a lane rental scheme, work promoters must pay daily charges to access the road when carrying out activities on the busiest roads at the busiest times.

Lane rental encourages promoters of activities to:

- Reduce the length of time taken to carry out the activities
- Improve planning, co-ordination and working methods
- Carry out more activities outside of peak times, for example, making greater use of weekend and out of hours working where the local environmental impact is acceptable
- Complete activities to the required standard first time reducing the need for the promoters of activities to return to the site to carry out remedial work

SCOPE OF WORK

The development of a detailed Cost Benefit Analysis is a requirement of the formal application to the Secretary of State for a Lane Rental Scheme.

The analysis assesses the impact of daily lane rental charges over the full range of required social and economic variables that have been specifically agreed in consultation with the UK Department for Transport (DfT).

An effective Cost Benefit Analysis is a mechanism to assess the benefits and costs of an investment both in terms of its overall viability and in relation to other options.

In this analysis, all benefits and costs are quantified in monetary terms and discounted over the length of the proposal to allow comparison on a common basis.

The output of the Cost Benefit Analysis is the presentation of a Benefit to Cost Ratio (BCR) with a scale of the Scheme benefits over costs and a Net Present Value (NPV) that is the sum total of the discounted benefits and costs.

The Government considers that schemes must focus specifically on those critical parts of the highway network where the costs of disruption caused by activities are greatest. This will ensure new schemes succeed in reducing disruption caused by activities whilst, at the same time, avoiding excessive costs being passed onto promotors. Authorities proposing lane rental schemes will need to show that they have taken an evidence-based approach to identify these critical parts of the network, which might include certain critical access points, critical routes such as bus routes and cycle lanes, junctions, pinch-points and heavily trafficked streets or parts of streets.

The DfT has said that it expects lane rental schemes to apply to between 5% and 10% of the highway authority's network. North Yorkshire County Council has identified and is proposing that 1,065 streets (7.27% of the network) are lane rental.

This report will identify the additional costs of operating the Scheme, which are to be met by the lane rental charges to Highway works, Utility works and Developers, against the value of the benefits it will deliver to the wider area of North Yorkshire.

It will identify the data used and the methodology undertaken to prepare the Cost Benefit Analysis and present the statutory outputs including the BCR and NPV of the Scheme.

REPORT STRUCTURE

After this introduction, the report is set out as follows:

- Section 3 Analysis and Context
- Section 4 Input Data
- Section 5 Delay Modelling
- Section 6 Lane Rental Scheme Operation
- Section 7 Financial Calculations
- Section 8 Statutory Outputs
- Section 8 North Yorkshire Lane Rental Scheme CBA Results

ANALYSIS AND CONTEXT

INTRODUCTION

This section presents the legislative and research context for the North Yorkshire Lane Rental Scheme Cost Benefit Analysis.

LEGISLATIVE CONTEXT

The legislative guidance used for this study is contained within:

- Guidance. Lane rental schemes: guidance for English highway authorities, Updated 17 March 2024
- Lane Rental Schemes Guidance for English Local Highway Authorities DfT July 2021
- WebTAG user and provider impacts (TAG Unit A1-3 May 2022)
- Department of Transport's (DfT) Halcrow study "Assessing the Extent of Streetworks and Monitoring Effectiveness of Section 74 in Reducing Disruption Volume 3 – Estimation of Cost of the Delay from Utilities' Street Works, June 2004"
- Chapter 8 of the Traffic Signs Manual DfT 2009
- Quadro User Manual July 2021
- Street Works (Charges for Occupation of the Highway) (England) Regulations 2012 ("the Regulations") made under Section 74A of NRSWA

Traffic Management Act 2004 and new roads and street works act 1991

The Traffic Management Act 2004 (TMA 2004) establishes the guidelines for street works. It has been in operation since April 2008 throughout the United Kingdom. The second edition states that any parties wishing to work on a road will require a Permit from the Highway Authority, who in turn will have additional powers to refuse or specify conditions associated with Permit permission for the overall efficiency of the operation of the road network.

The New Roads and Street Works Act 1991 (NRSWA) provides for financial incentives to reduce the disruption caused by street works. Authorities can levy “overrun charges” under section 74 of NRSWA where street works are not completed within an agreed, reasonable period. While these charges provide a strong incentive to avoid works overrunning beyond the end of the reasonable period, they do not provide a similar incentive to reduce durations or disruption to road users within the agreed reasonable period.

NRSWA also provides the legal basis for lane rental charges to be applied to street works but does not require lane rental schemes to impose charges in relation to highway works. However, highway works typically account for around 20% to 30% of all works in the street, also cause disruption and road users do not distinguish between different types of works. Therefore, the Government has decided to implement a clear principle of parity and will require lane rental charges to be applied to highway works on the same terms as to street works to maximise the overall benefits. This approach will also help local highway authorities deliver their network management duty.

WebTAG

WebTAG was first issued by the UK Department for Transport in 2003. It is based upon the ‘New Approach to Appraisal’ developed in the late 1990s and is an internet based multimodal guidance on appraising transport projects. WebTAG was updated in May 2022 to take into account the latest evidence for use in the economic case and value for money assessment of transport business cases. A list of the changes are below:

- TAG data book updated to March 2021 OBR long-term growth for use in appraisal and annual values for use in modelling
- Updates to Transport Business Case guidance to be published subsequent to this update; further review of TAG units planned
- TAG Unit A1.1 to be updated alongside new OBR forecasts that fixes the growth rate used to uprate appraisal values linked to GDP to the OBR long-term rate
- TAG Unit A1.1 updated to provide guidance on how analysts may look beyond 60 years to provide indicative analysis of potential impacts, for inclusion in business cases and value for money statements as sensitivity tests. Guidance is expanded to describe what uncertainties need to be taken into account
- Updated TAG data book with new OB values for use in appraisal at different stages in scheme development. The data set is also expanded in terms of dimensions to allow a more thorough analysis of costs
- Further research is mapped out on agglomeration, to be undertaken in 2021, leading to potential guidance changes thereafter
- Uncertainty toolkit published, allowing a more structured and thorough understanding of uncertainty presented in appraisal. This will continue to be developed through collaboration with stakeholders and TAG users
- Common analytical scenarios as part of a major update to the National Trip End Model (NTEM) data set, and its presentation in TEMPRO, is programmed for Autumn 2021. This will come with updated guidance in TAG Unit M4 on how scenario analysis, particularly using the common analytical scenarios, should be used to support appraisal
- Common analytical scenarios account for uncertainties brought about by COVID-19. Ahead of publication, sensitivity testing and explicit consideration of the impact of COVID-19 should continue to be reflected in appraisal

- Carbon values will be published in the TAG data book as a forthcoming change notification soon after these values are officially published
- Different fleet mix assumptions will be developed as part of the ongoing enhancements to environmental (carbon) appraisal in support of the Transport Decarbonisation Plan to be published soon after this route map documentation. They will be included in guidance through the common analytical scenarios

RESEARCH

Transport for London (TfL) and Kent County Council have been operating trial lane rental schemes successfully on parts of their road network since 2012 and 2013. Surrey County Council and West Sussex County Council have been operating lane rental schemes since 2021/22. Information on the trial schemes and the benefits they have delivered can be found here;

The Transport for London Lane Rental Scheme information web page.

https://tfl.gov.uk/info-for/urban-planning-and-construction/lane-rental-scheme#onthis-page-0

The Kent County Council Lane Rental Scheme information web page.

https://www.kent.gov.uk/roads-and-travel/highway-permits-and-licences/kent-lane-rental-scheme

HALCROW STUDY

In July 2004, Halcrow produced a report for the DfT on the impact of road works. The results shown in Table 1 below estimate an overall cost of disruption caused by Utility works in England in 2002/03 at £4.36 billion.

Table 1 Halcrow study results summary

Impact of Roadworks	Electric	Gas	Telco	Water	Total
Number of Roadworks (000s)	234	223	244	499	1200
Average cost (£000) per Roadworks	£5.30	£5.40	£2.20	£2.80	£15.70
Annual Roadwork Disruption cost (£bn)	£1.24	£1.20	£0.54	£1.40	£4.36

Source: Halcrow Group, quoted in DfT draft Permit Schemes Regulatory Impact Assessment (RIA), July 2007

IMPLICATIONS FOR NORTH YORKSHIRE LANE RENTAL SCHEME

Using the DfT sanctioned report, it is possible to get an idea for the likely implication of the North Yorkshire Lane Rental Scheme either using a ‘top down’ approach from the overall saving or a ‘bottom up’ calculation based upon the implied rate per road works.

From a top down perspective, with an estimated 2.12% of utility road works occurring in North Yorkshire and a 5% reduction in durations of works on streets associated with the Lane Rental Scheme, it may be expected to produce annual savings of £0.72m in 2002 prices or £1.21 million in 2010 prices. Shown in Table 2 below.

Table 2 Forecast Benefits – Top Down approach

Halcrow Study	£
Annual UK cost of roadworks (£bn)	£ 4.36
Proportion of roadworks in North Yorkshire	2.72%
Annual North Yorkshire cost of roadworks (£m)	£ 118.62
Annual North Yorkshire cost of Lane Rental roadworks (£m)	£ 14.49
Roadwork Reduction from Lane Rental Scheme	25%
Estimated Lane Rental Scheme saving (2002 prices) (£m)	**£ 0.72**
Estimated Lane Rental Scheme saving (2010 prices) (£m)	**£ 1.21**

However, working up from the actual number of Works in North Yorkshire and using the 'rule of thumb' estimate from the DfT report of £600 per works per day and an average duration of 6 days, the projected annual savings would be £0.43m in 2002 prices or £0.71m in 2010 prices.

Table 3 Forecast Benefits – Bottom up approach

Annual Number of Road Works	Total
Pre-scheme Number of Road Works	32,649
Pre-scheme Number of Lane Rental Works	2,372
Lane Rental Road Works after 5% reduction	1,779
Average Days Duration from Halcrow Study	6
Number of road work days saved	712
Total Cost at £600 per works per day (£ m) (2002 prices)	**£ 0.43**
Total Cost at £600 per works per day (£ m) (2010 prices)	**£ 0.71**

The figures above give an estimate of the upper and lower expectations from the NYLRS of between £0.71m and £1.21m in 2010 prices. Both methods do have a degree of uncertainty as they are based on sample national data which may not be a correct representation at a local level as this is dependent on the level of congestion.

On a heavily congested network this can increase exponentially.

Since the study was carried out, INRIX, a leading international provider of real-time traffic information, transportation analytics and connected driver services estimated the level of congestion in the UK as £13.1bn in 2013 prices or £11.7bn in 2010 prices, giving a value in North Yorkshire of £2.56m at a 5% reduction in durations.

INPUT DATA

INTRODUCTION

This section outlines the information sources and assumptions used in the North Yorkshire Lane Rental Scheme Cost Benefit Analysis. The Cost Benefit Analysis has been prepared with 2010 as the price base year for presentation values as set out in WebTAG.

COST BENEFIT ASSUMPTION

The objective of the North Yorkshire Lane Rental Scheme is a reduction in the disruption caused by activities through reduced busy time working and/or reduced works durations.

The central assumptions of the analysis is that the introduction of the Lane Rental Scheme will encourage works to be undertaken in off-peak times where there is less disruption on the most congested 7.27% of the network in the first year. This is based on the number of streets within North Yorkshire and the number of traffic-sensitive streets and the number of road works, the top 7.27% of critical streets that have 26% of overall works undertaken on them. The various assumptions are based on the evaluation of other Lane Rental Schemes are detailed further in the CBA.

DATA SOURCES

The Cost Benefit Analysis has been produced from four sources of information:

- Government guidance
- A completed Cost Matrix in a format provided by the DfT
- Local data provided by North Yorkshire County Council
- DfT Traffic Flow Data

Standard Cost Benefit Analysis assumptions and sensitivity factors have been used in line with recommendations in DfT's Annex C of TMA 2004 Decision-making and development (2nd edition).

The Local data provided by North Yorkshire County Council contained both the number of permits by type, traffic sensitive streets and specific information on the proposed North Yorkshire Lane Rental Scheme operations and costs.

DISCOUNT AND RISK FACTORS

The study uses the DfT recommended discount rate for assessment periods under 30 years of 3.5%.

The risk factors are applied to capital expenditure costs and are taken from standard values in Annex C of TMA 2004 Decision-making and development (2nd Edition) and shown in Table 4. An Optimism Bias of 30% has been applied to operational costs due to uncertainty.

Table 4 Discount and Risk Factors

CBA modelled variable	Rate
Discount Rate	3.5%
Risk Bias Factor	20%
Optimism Bias Factor	15%
Combined Risk-Optimism Bias Factor	38%

STATUTORY INFORMATION ASSOCIATED WITH LANE RENTAL SCHEMES

This study uses the guidance outlined in the Lane Rental Schemes Guidance for English Local Highway Authorities. The maximum charge per Lane Rental at traffic sensitive times is shown in Table 5 below.

Table 5 Maximum Lane Rental Charge

Maximum Lane Rental Charge Section 74A New Roads and Streetworks Act	
Work Type	**Works on Traffic Sensitive Streets**
Maximum Lane Rental Charge	£2,500

NORTH YORKSHIRE COUNTY COUNCIL DATA

North Yorkshire County Council supplied the following data and policy decisions:

- Policy data
- Road works Data

POLICY DATA

The policy decisions related to Lane Rental Scheme operation outlined in Table 6 below were obtained from North Yorkshire County Council.

Table 6 Operational Variables

CBA modelled variable	Period
Number of months to establish Lane Rental Scheme	1
Number of months to implement Lane Rental Scheme	1
Debtor days	30

ROAD WORKS DATA

North Yorkshire County council provided the information on the number of road works and shown on Table 7 below.

Table 7 Roadwork Totals

North Yorkshire Estimated Lane Rental Volumes		
Work Type	**Number**	**%**
Major	179	8%
Standard	308	13%
Minor	984	41%
		38%
Urgent	901	93%
Totals	2,372	
Utility Works	2,206	
Highway Works	166	7%

The table has been extracted from North Yorkshire Permit Scheme Evaluation reports prorated to the percentage of Lane Rental streets.

North Yorkshire County Council provided the information on the duration of works and shown on Table 8 below.

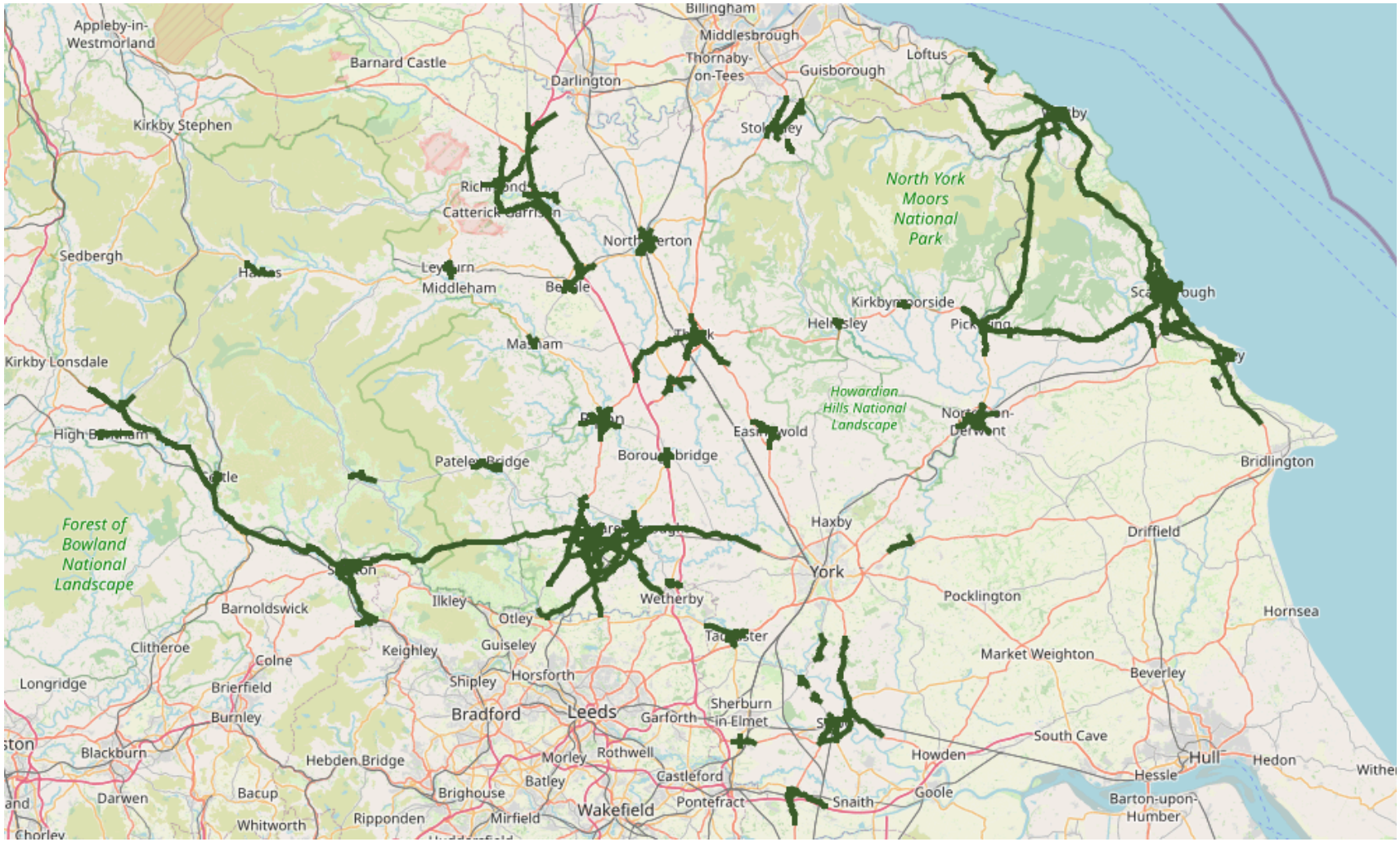
Table 8 North Yorkshire Average Duration of Works

North Yorkshire Year 3 Permit Evaluation Average duration of works by permit type by Promoter by Activity Type	
Work Type	**Total**
Major	17
Standard	9
Minor	3
Urgent	5

North Yorkshire County Council provided a list of Traffic Sensitive Streets, and a full list is attached in Appendix A.

A map of the North Yorkshire Traffic Sensitive streets is shown below on Figure 1 below.

Figure 1 North Yorkshire Traffic Sensitive Network



DFT DATA

The following data was obtained from the Halcrow Study, traffic management requirements and published traffic count data.

WORKS DATA

The Halcrow Study found that the average size of carriageway works is 2 metres width by 20 metres length. Data was collected from 25 authorities across the whole of England on permit notices and the percentages of notices by reinstatement category and excavation length is summarised on Table 9 below.

Table 9 Percentage of Notices by Reinstatement Category and Excavation Length

DfT Study Table 2 - Percentages of Notices by RC and Excavation Length Vol 3: Extents of Works and Monitoring Disruption						
RC		**10m**	**30m**	**50m**	**100m**	**200m**
RC 0-2	% of all works	16.3%	0.1%	1.0%	0.8%	1.0%
	% of RC 0-2	85%	1%	5%	4%	5%
RC 3-4	% of all works	70.0%	4.2%	2.6%	2.1%	1.7%
	% of RC 3-4	87%	5%	3%	3%	2%

Works require traffic management to keep workers safe and the requirements are detailed in Chapter 8 of the Traffic Signs Manual 2009 and is summarised in Table 10 below for different road types.

Table 10 Traffic Management for Street works

Traffic Management for Street works Traffic Signs Manual Chapter 8							
Road Type	**Single 30mph or less (m)**	**Single 40mph (m)**	**Single 50mph or more (m)**	**Dual 40mph or less (m)**	**Dual 50mph or 60mph (m)**	**Dual NS (m)**	**Dual NS Congested (m)**
Taper	50	80	100	100	150	200	200
Approach signs	45	110	450	300	800	1609	3218
Min vis to sign	60	60	75	60	75	120	120
End of works sign from end	30	45	45	45	90	90	90
Totals excl works	185	295	670	505	1115	2019	3628

The Halcrow study reported the daily cost of street works by road type and excavation length and is summarised in Tables 11 and 12 below.

Table 11 Daily Cost of Rural Works

DfT Study Table 4					
Daily Cost of Rural Works (£) by Reinstatement Category and Length					
Reinstatement Category	**Typical AADT**	**10m**	**50m**	**100m**	**200m**
0	<32,000	2,500	3,000	3,300	4,000
1	16000	7,850	9,050	10,250	11,000
2	12000	1,610	2,100	2,600	3,530
3	8000	780	970	1,200	1,625
4	4000	335	415	515	700

Table 12 Daily Cost of Urban Works

DfT Study Table 5 Daily Cost of Urban Works (£) by Reinstatement Category and Length					
Reinstatement Category	**Typical AADT**	**10m**	**50m**	**100m**	**200m**
0	40000	25,000	25,000	25,000	25,000
1	24000	9,000	12,000	15,000	17,000
2	16000	3,450	5,150	7,000	8,800
3	10000	385	535	710	1,025
4	6000	200	280	375	550

TRAFFIC DATA

Travel time is estimated using GPS data. The current service provider is CTrack/Inrix.

This data is generated through in-vehicle GPS units as part of the satellite navigation and stolen vehicle tracking services. The specific raw data used to derive the Department's journey time statistics consists of 10-second GPS location reports for these vehicles for the period during which their ignition is on.

As part of the service provided to the Department, CTrack/Inrix map these GPS location reports to the Ordnance Survey Integrated Transport Network, now the OS MasterMap Highways Network, and they use this information to reconstruct the routes taken by their customers as they move through the road network.

These reconstructed journeys, combined with the time stamps on the associated GPS location reports, allow CTrack/Inrix to estimate the time taken by these vehicles to traverse each ITN link. The data also allows journey times to be associated with a particular link direction if the ITN link in question can be traversed in either direction. Where the 10-second GPS location reports don't fall exactly on the start and end of each link, interpolation is used to estimate the time taken by the vehicles to complete each link.

The complete network for England consists of around 3.4 million separate 'links' and gives an extremely accurate dataset. Due to the huge amount of data collected the data is aggregated to every 15 minutes AGPS (Aggregated Global Positioning System Data).

The DfT have made available mapped data on the highway network for A roads and this is shown in Figure 2 below for North Yorkshire. The data shows a number of hotspots within North Yorkshire including Whitby, Scarborough, Northallerton, Harrogate and Skipton and is consistent with Lane Rental Streets in Figure 1.

North Yorkshire County Council have used this data and local knowledge of traffic flow and produced a list of the most congested streets on the network that represents 1,065 streets (7.27%) to geographically cover the most congested routes on the network. A list of streets is attached in Appendix C.

Traffic data was obtained from the DfT who monitor annual traffic flows for all authorities in the UK, Local 'A' road traffic data representing the most congested streets in North Yorkshire has been used and is listed in Table 13 to 22 below.

Figure 2 North Yorkshire Local 'A' Road Delay

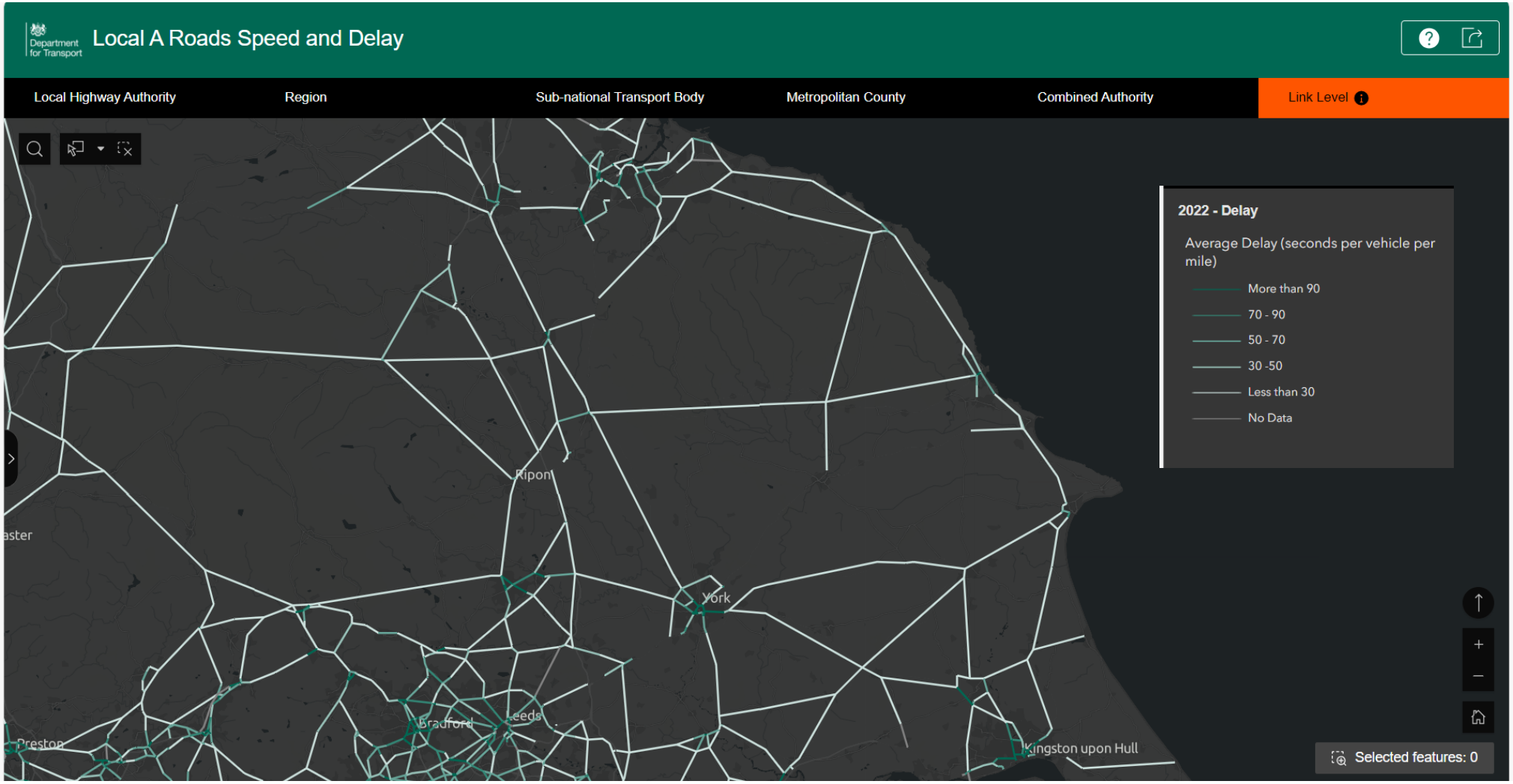


Table 13 DfT Traffic Flow Site Data 2022

North Yorkshire	DfT Traffic Flow Site Data 2022 (Sheet 1 of 8)											
Ref No	Road	Start Junction	End Junction	All Motor Vehicles	%Lights	%Heavy	% Car	% LGV	%OGV1	%OGV2	%PSV	Data Type
1	A6069	Gisburn St	A6131	8501	0.983	0.017	0.819	0.148	0.012	0.005	0.011	URBAN
2	A165	Field Lane, Scarborough	A64	8130	0.985	0.015	0.828	0.139	0.009	0.006	0.003	RURAL
3	A167	Junction with A61 and A167 (near Busby Stoop)	Junction where A167 Church Street and A167 Long Street meet (near Topcliffe, North Yorkshire)	2588	0.961	0.039	0.740	0.211	0.016	0.023	0.007	RURAL
4	A6108	King Street, Richmond	A6055	5352	0.971	0.029	0.819	0.127	0.024	0.005	0.017	RURAL
5	A172	A173	LA Boundary	6871	0.957	0.043	0.833	0.116	0.021	0.022	0.002	RURAL
6	A1041	LA Boundary	A645	7556	0.982	0.018	0.804	0.162	0.012	0.006	0.006	RURAL
7	A173	A172	LA Boundary	8145	0.985	0.015	0.820	0.154	0.010	0.005	0.007	RURAL
8	A59	A658	A1(M)	24390	0.950	0.050	0.775	0.168	0.024	0.026	0.002	RURAL
9	A167	Junction connecting A167 and Minor Road (SW of Hilltop Farm in Asenby, North Yorkshire)	Junction where A167 Church Street and A167 Long Street meet (near Topcliffe, North Yorkshire)	2737	0.980	0.020	0.812	0.156	0.015	0.005	0.004	RURAL
10	A162	A63(T)	A612 spur	11743	0.840	0.160	0.687	0.140	0.041	0.118	0.005	RURAL
11	A6131	Roundabout A629/A6131	A6069	15989	0.975	0.025	0.819	0.147	0.017	0.008	0.005	URBAN
12	A629	A6068	A6131	26826	0.961	0.039	0.816	0.136	0.020	0.019	0.004	RURAL
13	A59	A6040	A6055	10512	0.977	0.023	0.778	0.172	0.018	0.005	0.019	URBAN
14	A6108	A684	A6136	1525	0.984	0.016	0.770	0.182	0.010	0.006	0.011	RURAL
15	A167	Junction with A168/A167	Junction connecting A167 and Minor Road (SW of Hilltop Farm in Asenby, North Yorkshire)	1215	0.905	0.095	0.714	0.187	0.019	0.077	0.001	RURAL
16	A59	A6069	A65(T)	13842	0.929	0.071	0.779	0.142	0.031	0.040	0.003	RURAL
17	A170	A169	Box Hill, Scarborough	5955	0.981	0.019	0.787	0.167	0.013	0.007	0.008	RURAL
18	A6068	A629(T)	Old Hall Road	5241	0.924	0.076	0.774	0.144	0.038	0.037	0.001	URBAN
19	A1238	A63	Sandhill Lane, Selby	3211	0.982	0.018	0.825	0.131	0.012	0.007	0.010	URBAN
20	A645	LA Boundary	A19	3954	0.886	0.114	0.695	0.180	0.044	0.070	0.002	RURAL
21	A171	A169	B1416 Staksby Rd, Whitby	16154	0.968	0.032	0.811	0.140	0.015	0.016	0.005	URBAN
22	A168	A61	St James Drive, Northallerton	8030	0.966	0.034	0.801	0.155	0.017	0.017	0.003	RURAL
23	A167	A684	B1333	13094	0.976	0.024	0.829	0.135	0.016	0.008	0.005	URBAN
24	A6131	The Avenue	A65	14027	0.988	0.012	0.838	0.130	0.011	0.002	0.011	URBAN
25	A659	LA Boundary	A659 High St	3985	0.991	0.009	0.828	0.146	0.006	0.003	0.005	RURAL
26	A6108	Little Studley Rd	A61	3187	0.968	0.032	0.809	0.124	0.017	0.015	0.009	URBAN
27	A170	Box Hill	A171	6610	0.980	0.020	0.787	0.167	0.013	0.007	0.008	URBAN
28	A682	LA Boundary	A65	4854	0.931	0.069	0.738	0.141	0.016	0.052	0.000	RURAL
29	A169	A170	A171	5771	0.962	0.038	0.757	0.184	0.015	0.023	0.005	URBAN
30	A59	A1M roundabout	A168	16665	0.946	0.054	0.797	0.138	0.020	0.034	0.004	RURAL
31	A659	A64	A162	4797	0.946	0.054	0.788	0.143	0.021	0.032	0.008	URBAN
32	A162	A1(T)	A63	5862	0.987	0.013	0.796	0.179	0.008	0.005	0.001	RURAL
33	A658	A61	A661	13726	0.969	0.031	0.816	0.147	0.016	0.015	0.001	RURAL
34	A63	A19	A1041	13415	0.910	0.090	0.723	0.180	0.028	0.062	0.002	RURAL
35	A59	A65(T)	Stonecrop Drive, Harrogate	9397	0.926	0.074	0.737	0.182	0.019	0.055	0.002	RURAL

Table 16 DfT Traffic Flow Site Data 2022 (Sheet 2 of 8)

North Yorkshire	DfT Traffic Flow Site Data 2022 (Sheet 2 of 8)							
					2-way/1-way/bus lane	Speed Limit (mph)	Road Class	
Ref No	Road	Start Junction	End Junction	Type				RC
1	A6069	Gisburn St	A6131	S2AP	2-WAY	30	8	3
2	A165	Field Lane, Scarborough	A64	S2AP	2-WAY	60	1	3
3	A167	Junction with A61 and A167 (near Busby Stoop)	Junction where A167 Church Street and A167 Long Street meet (near Topcliffe, North Yorkshire)	S2AP	2-WAY	60	1	4
4	A6108	King Street, Richmond	A6055	S2AP	2-WAY	60	1	4
5	A172	A173	LA Boundary	S2AP	2-WAY	60	1	3
6	A1041	LA Boundary	A645	S2AP	2-WAY	60	1	3
7	A173	A172	LA Boundary	S2AP	2-WAY	60	1	3
8	A59	A658	A1(M)	S2AP	2-WAY	60	1	1
9	A167	Junction connecting A167 and Minor Road (SW of Hilltop Farm in Asenby, North Yorkshire)	Junction where A167 Church Street and A167 Long Street meet (near Topcliffe, North Yorkshire)	S2AP	2-WAY	60	1	4
10	A162	A63(T)	A612 spur	S2AP	2-WAY	60	1	2
11	A6131	Roundabout A629/A6131	A6069	S2AP	2-WAY	30	10	2
12	A629	A6068	A6131	S2AP	2-WAY	60	1	1
13	A59	A6040	A6055	S2AP	2-WAY	30	9	3
14	A6108	A684	A6136	S2AP	2-WAY	60	1	4
15	A167	Junction with A168/A167	Junction connecting A167 and Minor Road (SW of Hilltop Farm in Asenby, North Yorkshire)	S2AP	2-WAY	60	1	4
16	A59	A6069	A65(T)	S2AP	2-WAY	60	1	2
17	A170	A169	Box Hill, Scarborough	S2AP	2-WAY	60	1	4
18	A6068	A629(T)	Old Hall Road	S2AP	2-WAY	30	9	4
19	A1238	A63	Sandhill Lane, Selby	S2AP	2-WAY	60	10	4
20	A645	LA Boundary	A19	S2AP	2-WAY	60	1	4
21	A171	A169	B1416 Staksby Rd, Whitby	S2AP	2-WAY	30	10	2
22	A168	A61	St James Drive, Northallerton	S2AP	2-WAY	60	1	3
23	A167	A684	B1333	S2AP	2-WAY	30	9	2
24	A6131	The Avenue	A65	S2AP	2-WAY	40	10	2
25	A659	LA Boundary	A659 High St	S2AP	2-WAY	60	1	4
26	A6108	Little Studley Rd	A61	S2AP	2-WAY	30	10	4
27	A170	Box Hill	A171	S2AP	2-WAY	30	7	4
28	A682	LA Boundary	A65	S2AP	2-WAY	60	1	4
29	A169	A170	A171	S2AP	2-WAY	30	10	4
30	A59	A1M roundabout	A168	S2AP	2-WAY	60	1	1
31	A659	A64	A162	S2AP	2-WAY	30	9	4
32	A162	A1(T)	A63	S2AP	2-WAY	60	1	4
33	A658	A61	A661	S2AP	2-WAY	60	1	2
34	A63	A19	A1041	S2AP	2-WAY	60	1	2
35	A59	A65(T)	Stonecrop Drive, Harrogate	S2AP	2-WAY	60	1	3

Table 17 DfT Traffic Flow Site Data 2022 (Sheet 3 of 8)

North Yorkshire	DfT Traffic Flow Site Data 2022 (Sheet 3 of 8)											
				All Motor Vehicles								
Ref No	Road	Start Junction	End Junction		%Lights	%Heavy	% Car	% LGV	%OGV1	%OGV2	%PSV	Data Type
36	A65	A682	A59	7898	0.938	0.062	0.759	0.170	0.018	0.045	0.004	RURAL
37	A659	A162	A659 Kirkgate	9251	0.979	0.021	0.845	0.115	0.013	0.007	0.007	URBAN
38	A59	LA Boundary	A56	5423	0.932	0.068	0.767	0.145	0.019	0.049	0.002	RURAL
39	A167	A684	B6271 Yafforth Rd	7474	0.961	0.039	0.819	0.133	0.025	0.014	0.003	URBAN
40	A171	B1416 Stakesby Rd	A174	17930	0.968	0.032	0.811	0.140	0.015	0.016	0.005	URBAN
41	A165	LA Boundary	A1039	9738	0.950	0.050	0.781	0.153	0.032	0.019	0.007	RURAL
42	A6055	Off ramps	A6136 Catterick	3522	0.928	0.072	0.767	0.153	0.054	0.017	0.006	RURAL
43	A1041	Abbot's Rd	A63	16917	0.986	0.014	0.848	0.131	0.009	0.005	0.001	RURAL
44	A6055	Knaresborough	A1(M) J48	5552	0.962	0.038	0.789	0.162	0.017	0.021	0.002	RURAL
45	A168	St James Drive	A167	10735	0.972	0.028	0.807	0.158	0.012	0.016	0.002	URBAN
46	A59	A168	LA Boundary	15642	0.942	0.058	0.775	0.161	0.026	0.032	0.002	RURAL
47	A171	Eskdale Rd	A174	14844	0.973	0.027	0.804	0.150	0.014	0.013	0.011	URBAN
48	A684	LA Boundary	A6108	1162	0.985	0.015	0.742	0.169	0.013	0.002	0.007	RURAL
49	A165	A1039 Scarborough Road	Near Scarborough Rail Station	13168	0.982	0.018	0.812	0.151	0.012	0.006	0.015	URBAN
50	A684	A6108	A1 spur	3454	0.944	0.056	0.727	0.211	0.022	0.035	0.003	RURAL
51	A1039	A165	A165	8435	0.991	0.009	0.849	0.127	0.007	0.002	0.008	URBAN
52	A171	A165	Eskdale Rd, Whitby	7457	0.964	0.036	0.754	0.182	0.017	0.020	0.009	RURAL
53	A661	A658	A59	19902	0.963	0.037	0.851	0.100	0.021	0.015	0.006	URBAN
54	A61	A59	A6108	13092	0.931	0.069	0.721	0.194	0.028	0.041	0.005	RURAL
55	A6055	Catterick Bridge	Roundabout at A6108 and A6055 (near Bertham House, North Yorkshire)	4104	0.858	0.142	0.639	0.211	0.046	0.096	0.005	RURAL
56	A6055	A684	Roundabout	7155	0.931	0.069	0.779	0.142	0.026	0.044	0.002	RURAL
57	A171	A170	A64	18970	0.987	0.013	0.839	0.131	0.007	0.006	0.010	URBAN
58	A63	A1(M)	A162	19254	0.819	0.181	0.628	0.188	0.047	0.134	0.001	RURAL
59	A684	A167	Mowbray Rd	12080	0.964	0.036	0.816	0.141	0.019	0.017	0.002	URBAN
60	A174	B1416 Love Lane	A171	7173	0.991	0.009	0.839	0.130	0.009	0.000	0.010	URBAN
61	A59	A6055	A658	7854	0.971	0.029	0.810	0.150	0.018	0.011	0.006	URBAN
62	A61	A61 Stammergate	A170	9280	0.981	0.019	0.790	0.176	0.013	0.007	0.002	URBAN
63	A174	LA Boundary	B1416 Love Lane, Whitby	2960	0.989	0.011	0.833	0.144	0.008	0.003	0.001	RURAL
64	A167	Junction where A168 slip road meets A167 Long Street (just before the A168 Dual Carriageway passes over A167)	Junction where A167 Church Street and A167 Long Street meet (near Topcliffe, North Yorkshire)	3966	0.957	0.043	0.747	0.200	0.031	0.012	0.004	RURAL
65	A63	A1041	A19	15318	0.940	0.060	0.759	0.171	0.019	0.041	0.001	RURAL
66	A6108	Little Studley Rd, Ripon	A684	2871	0.968	0.032	0.809	0.124	0.017	0.015	0.009	RURAL
67	A684	A1 spur	A167	11010	0.953	0.047	0.780	0.160	0.024	0.023	0.008	RURAL
68	A61	A6108	A1	11539	0.915	0.085	0.751	0.151	0.030	0.056	0.005	RURAL
69	A658	A661	A59	18658	0.935	0.065	0.764	0.163	0.029	0.036	0.003	RURAL
70	A6069	A6131	Kingsway	5637	0.985	0.015	0.814	0.167	0.014	0.002	0.001	URBAN

Table 18 DfT Traffic Flow Site Data 2022 (Sheet 4 of 8)

North Yorkshire	DfT Traffic Flow Site Data 2022 (Sheet 4 of 8)							
Ref No	Road	Start Junction	End Junction	Type	2-way/1-way/bus lane	Speed Limit (mph)	Road Class	RC
36	A65	A682	A59	S2AP	2-WAY	30	1	3
37	A659	A162	A659 Kirkgate	S2AP	2-WAY	30	9	3
38	A59	LA Boundary	A56	S2AP	2-WAY	60	1	4
39	A167	A684	B6271 Yafforth Rd	S2AP	2-WAY	30	8	4
40	A171	B1416 Stakesby Rd	A174	S2AP	2-WAY	30	7	2
41	A165	LA Boundary	A1039	S2AP	2-WAY	60	1	3
42	A6055	Off ramps	A6136 Catterick	S2AP	2-WAY	60	1	4
43	A1041	Abbot's Rd	A63	S2AP	2-WAY	40	1	1
44	A6055	Knaresborough	A1(M) J48	S2AP	2-WAY	60	1	4
45	A168	St James Drive	A167	S2AP	2-WAY	30	9	3
46	A59	A168	LA Boundary	S2AP	2-WAY	40	1	1
47	A171	Eskdale Rd	A174	S2AP	2-WAY	40	9	2
48	A684	LA Boundary	A6108	S2AP	2-WAY	60	1	4
49	A165	A1039 Scarborough Road	Near Scarborough Rail Station	S2AP	2-WAY	30	10	2
50	A684	A6108	A1 spur	S2AP	2-WAY	30	1	4
51	A1039	A165	A165	S2AP	2-WAY	30	9	3
52	A171	A165	Eskdale Rd, Whitby	S2AP	2-WAY	60	1	3
53	A661	A658	A59	S2AP	2-WAY	30	9	2
54	A61	A59	A6108	S2AP	2-WAY	60	1	2
55	A6055	Catterick Bridge	Roundabout at A6108 and A6055 (near Bertham House, North Yorkshire)	S2AP	2-WAY	40	1	4
56	A6055	A684	Roundabout	S2AP	2-WAY	60	1	3
57	A171	A170	A64	WS2+1	2-WAY	30	8	2
58	A63	A1(M)	A162	S2AP	2-WAY	60	1	1
59	A684	A167	Mowbray Rd	S2AP	2-WAY	30	9	3
60	A174	B1416 Love Lane	A171	S2AP	2-WAY	30	9	4
61	A59	A6055	A658	S2AP	2-WAY	30	9	4
62	A61	A61 Stammergate	A170	S2AP	2-WAY	30	9	3
63	A174	LA Boundary	B1416 Love Lane, Whitby	S2AP	2-WAY	60	1	4
64	A167	Junction where A168 slip road meets A167 Long Street (just before the A168 Dual Carriageway passes over A167)	Junction where A167 Church Street and A167 Long Street meet (near Topcliffe, North Yorkshire)	S2AP	2-WAY	30	1	4
65	A63	A1041	A19	S2AP	2-WAY	60	1	1
66	A6108	Little Studley Rd, Ripon	A684	S2AP	2-WAY	60	1	4
67	A684	A1 spur	A167	S2AP	2-WAY	30	1	2
68	A61	A6108	A1	S2AP	2-WAY	60	1	2
69	A658	A661	A59	S2AP	2-WAY	60	1	1
70	A6069	A6131	Kingsway	S2AP	2-WAY	30	9	4

Table 19 DfT Traffic Flow Site Data 2022 (Sheet 5 of 8)

North Yorkshire	DfT Traffic Flow Site Data 2022 (Sheet 5 of 8)											
Ref No	Road	Start Junction	End Junction	All Motor Vehicles	%Lights	%Heavy	% Car	% LGV	%OGV1	%OGV2	%PSV	Data Type
71	A170	A61, Thirsk	A169, Pickering	8486	0.965	0.035	0.786	0.159	0.019	0.016	0.005	RURAL
72	A162	A162 spur	A659	6834	0.954	0.046	0.813	0.121	0.016	0.030	0.004	RURAL
73	A63	A162	A1238	10604	0.948	0.052	0.787	0.148	0.021	0.031	0.001	RURAL
74	A171	Barmoor Lane	A165	6448	0.962	0.038	0.732	0.205	0.017	0.021	0.008	RURAL
75	A1041	A63	Abbot's Rd, Selby	18092	0.981	0.019	0.828	0.143	0.012	0.007	0.005	URBAN
76	A59	Stonecrop Drive, Harrogate	A61	12775	0.942	0.058	0.785	0.144	0.020	0.038	0.005	URBAN
77	A645	A1041(T)	LA Boundary	7444	0.917	0.083	0.725	0.184	0.018	0.065	0.002	RURAL
78	A61	A658	Fulwith Rd, Harrogate	12821	0.971	0.029	0.836	0.117	0.021	0.008	0.014	RURAL
79	A168	A168 spur	A6055	3075	0.934	0.066	0.775	0.146	0.033	0.033	0.004	RURAL
80	A684	Mowbray Rd, Northallerton	A19	10883	0.964	0.036	0.816	0.141	0.019	0.017	0.002	RURAL
81	A65	A6131	A59	14837	0.932	0.068	0.797	0.119	0.027	0.041	0.001	RURAL
82	A167	A61	A684	3202	0.975	0.025	0.790	0.175	0.016	0.009	0.002	RURAL
83	A645	A19	LA Boundary	4563	0.796	0.204	0.638	0.151	0.023	0.181	0.002	RURAL
84	A6055	Silver Street, Richmond	Barracks Bank, Richmond	1636	0.964	0.036	0.798	0.123	0.019	0.018	0.031	RURAL
85	A6131	A6069	The Avenue	12752	0.988	0.012	0.838	0.130	0.011	0.002	0.011	URBAN
86	A165	A1039W	A1039 SE	9459	0.970	0.030	0.794	0.160	0.017	0.013	0.003	RURAL
87	A659	A659 Kirkgate	A64	6257	0.975	0.025	0.830	0.123	0.020	0.005	0.009	URBAN
88	A61	A61 Kings Rd	A59	18037	0.985	0.015	0.848	0.123	0.007	0.008	0.008	URBAN
89	A63	A19(T)	Sand Lane	10327	0.943	0.057	0.758	0.175	0.016	0.041	0.003	URBAN
90	A65	A59(T)	A6131	10423	0.900	0.100	0.754	0.132	0.035	0.065	0.000	RURAL
91	A63	Sand Lane, Selby	LA Boundary	9303	0.943	0.057	0.758	0.175	0.016	0.041	0.003	RURAL
92	A1238	Sandhill Lane	A19	3966	0.989	0.011	0.853	0.122	0.010	0.002	0.009	URBAN
93	A167	A168	A684	13313	0.974	0.026	0.861	0.110	0.013	0.014	0.002	URBAN
94	A6040	A61	A61	21928	0.986	0.014	0.853	0.125	0.010	0.005	0.005	URBAN
95	A169	A64(T)	A170	11733	0.959	0.041	0.790	0.157	0.019	0.021	0.006	RURAL
96	A61	A61 Parliament St	A6040	12174	0.985	0.015	0.890	0.084	0.012	0.003	0.009	URBAN
97	A165	A171	Cleveland Avenue	12272	0.992	0.008	0.834	0.144	0.007	0.001	0.004	URBAN
98	A65	A59	A6069	6812	0.936	0.064	0.797	0.123	0.028	0.036	0.007	RURAL
99	A61	Fulwith Rd	A6040	16322	0.972	0.028	0.828	0.134	0.018	0.010	0.007	URBAN
100	A6069	Kingsway, Skipton	A65	4437	0.964	0.036	0.819	0.143	0.030	0.005	0.000	RURAL
101	A1246	A1 spur Dish Hill Flyover	A63 Pollums House Farm	4654	0.980	0.020	0.761	0.189	0.011	0.009	0.003	RURAL
102	A167	B6271 Yafforth Rd, Northallerton	LA Boundary	6733	0.961	0.039	0.819	0.133	0.025	0.014	0.003	RURAL
103	A65	A6069	LA Boundary	8456	0.953	0.047	0.793	0.149	0.021	0.026	0.003	RURAL
104	A171	A169	LA Boundary	5964	0.922	0.078	0.706	0.205	0.032	0.046	0.006	RURAL
105	A61	A1	A167	6416	0.936	0.064	0.735	0.185	0.019	0.044	0.002	RURAL
106	A65	A687	A682	8947	0.948	0.052	0.770	0.160	0.020	0.033	0.003	RURAL
107	A171	A170	Barmoor Lane	12946	0.975	0.025	0.812	0.149	0.014	0.011	0.009	URBAN
108	A661	LA Boundary	A658	10144	0.987	0.013	0.815	0.160	0.008	0.004	0.007	RURAL

Table 20 DfT Traffic Flow Site Data 2022 (Sheet 6 of 8)

North Yorkshire	DfT Traffic Flow Site Data 2022 (Sheet 6 of 8)							
Ref No	**Road**	**Start Junction**	**End Junction**	**Type**	**2-way/1-way/bus lane**	**Speed Limit (mph)**	**Road Class**	**RC**
71	A170	A61, Thirsk	A169, Pickering	S2AP	2-WAY	60	1	3
72	A162	A162 spur	A659	S2AP	2-WAY	40	1	3
73	A63	A162	A1238	S2AP	2-WAY	60	1	2
74	A171	Barmoor Lane	A165	S2AP	2-WAY	60	1	3
75	A1041	A63	Abbot's Rd, Selby	S2AP	2-WAY	30	9	2
76	A59	Stonecrop Drive, Harrogate	A61	S2AP	2-WAY	40	10	3
77	A645	A1041(T)	LA Boundary	S2AP	2-WAY	60	1	3
78	A61	A658	Fulwith Rd, Harrogate	S2AP	2-WAY	60	1	2
79	A168	A168 spur	A6055	S2AP	2-WAY	60	1	4
80	A684	Mowbray Rd, Northallerton	A19	S2AP	2-WAY	60	1	2
81	A65	A6131	A59	S2AP	2-WAY	60	1	1
82	A167	A61	A684	S2AP	2-WAY	60	1	4
83	A645	A19	LA Boundary	S2AP	2-WAY	60	1	4
84	A6055	Silver Street, Richmond	Barracks Bank, Richmond	S2AP	2-WAY	60	1	4
85	A6131	A6069	The Avenue	S2AP	2-WAY	30	9	3
86	A165	A1039W	A1039 SE	S2AP	2-WAY	60	1	3
87	A659	A659 Kirkgate	A64	S2AP	2-WAY	30	9	4
88	A61	A61 Kings Rd	A59	S2AP	2-WAY	30	8	2
89	A63	A19(T)	Sand Lane	S2AP	2-WAY	30	10	3
90	A65	A59(T)	A6131	S2AP	2-WAY	60	1	2
91	A63	Sand Lane, Selby	LA Boundary	S2AP	2-WAY	40	1	3
92	A1238	Sandhill Lane	A19	S2AP	2-WAY	30	10	4
93	A167	A168	A684	S2AP	2-WAY	30	9	2
94	A6040	A61	A61	WS2+1	2-WAY	30	8	1
95	A169	A64(T)	A170	S2AP	2-WAY	60	1	2
96	A61	A61 Parliament St	A6040	S2AP	1-WAY	30	8	3
97	A165	A171	Cleveland Avenue	S2AP	2-WAY	30	7	3
98	A65	A59	A6069	S2AP	2-WAY	60	1	3
99	A61	Fulwith Rd	A6040	S2AP	2-WAY	30	7	2
100	A6069	Kingsway, Skipton	A65	S2AP	2-WAY	60	1	4
101	A1246	A1 spur Dish Hill Flyover	A63 Pollums House Farm	S2AP	2-WAY	60	1	4
102	A167	B6271 Yafforth Rd, Northallerton	LA Boundary	S2AP	2-WAY	60	1	3
103	A65	A6069	LA Boundary	S2AP	2-WAY	60	1	3
104	A171	A169	LA Boundary	S2AP	2-WAY	60	1	4
105	A61	A1	A167	S2AP	2-WAY	60	1	3
106	A65	A687	A682	S2AP	2-WAY	60	1	3
107	A171	A170	Barmoor Lane	S2AP	2-WAY	30	7	3
108	A661	LA Boundary	A658	S2AP	2-WAY	60	1	2

Table 21 DfT Traffic Flow Site Data 2022 (Sheet 7 of 8)

North Yorkshire	DfT Traffic Flow Site Data 2022 (Sheet 7 of 8)											
Ref No	Road	Start Junction	End Junction	All Motor Vehicles	%Lights	%Heavy	% Car	% LGV	%OGV1	%OGV2	%PSV	Data Type
109	A162	LA Boundary	A1 spur Dish Hill Flyover	16066	0.929	0.071	0.736	0.168	0.014	0.056	0.001	RURAL
110	A684	A6108	A6108	8396	0.969	0.031	0.783	0.167	0.014	0.017	0.004	URBAN
111	A59	A56	A6069	16337	0.946	0.054	0.793	0.136	0.017	0.037	0.003	RURAL
112	A61	A167	A61 Millgate	14287	0.988	0.012	0.833	0.143	0.010	0.002	0.002	URBAN
113	A61	A61 Market Place	A61 Long St	6840	0.985	0.015	0.794	0.181	0.012	0.003	0.002	URBAN
114	A61	A61 Millgate	A170	7183	0.988	0.012	0.793	0.182	0.010	0.002	0.003	URBAN
115	A687	LA Boundary	A65	1588	0.948	0.052	0.735	0.188	0.023	0.030	0.002	RURAL
116	A170	A19(T)	A61	9212	0.959	0.041	0.736	0.212	0.023	0.018	0.002	URBAN
117	A6040	A61	A59	14865	0.986	0.014	0.844	0.135	0.010	0.003	0.003	URBAN
118	A6068	LA Boundary	Old Hall Road	7887	0.946	0.054	0.754	0.182	0.028	0.027	0.005	RURAL
119	A629	A6131	A65	13389	0.930	0.070	0.745	0.178	0.029	0.041	0.002	RURAL
120	A658	A659	A61	13592	0.968	0.032	0.824	0.134	0.022	0.010	0.005	RURAL
121	A63	A1238	A19	6828	0.924	0.076	0.746	0.169	0.036	0.040	0.002	RURAL
122	A61	A6040	A61 Kings Rd	11289	0.990	0.010	0.862	0.115	0.007	0.003	0.007	URBAN
123	A6136	A6108	A6055 Catterick Road	10645	0.960	0.040	0.808	0.138	0.018	0.022	0.007	URBAN
124	A6055	A6055 Catterick Road	A6055 Leeming Lane	6912	0.925	0.075	0.745	0.173	0.039	0.036	0.002	RURAL
125	A172	A19(T)	A173	7076	0.958	0.042	0.779	0.170	0.019	0.023	0.003	RURAL
126	A65	LA Boundary	A687	8669	0.953	0.047	0.740	0.186	0.020	0.028	0.005	RURAL
127	A6069	A59	Gisburn St, Skipton	4959	0.981	0.019	0.840	0.129	0.011	0.007	0.009	RURAL
128	A59	A61	A6040	16514	0.977	0.023	0.833	0.137	0.012	0.011	0.003	URBAN
129	A165	A1039	A1039	12119	0.966	0.034	0.813	0.141	0.022	0.012	0.005	RURAL
130	A1039	A165 Muston	A64 Staxton	5748	0.965	0.035	0.792	0.155	0.020	0.015	0.008	RURAL
131	A56	LA Boundary	A59	10642	0.953	0.047	0.781	0.160	0.019	0.028	0.007	RURAL
132	A61	LA Boundary	A658	13912	0.978	0.022	0.863	0.104	0.015	0.008	0.006	RURAL
133	A61	A61 Stammergate	A168	5542	0.965	0.035	0.788	0.162	0.026	0.009	0.003	URBAN
134	A629	LA Boundary	A6068	27268	0.941	0.059	0.783	0.153	0.032	0.027	0.002	RURAL
135	A163	A19	LA Boundary	3146	0.936	0.064	0.718	0.197	0.027	0.037	0.010	RURAL
136	A166	LA Boundary	LA Boundary	10233	0.943	0.057	0.749	0.171	0.021	0.035	0.005	RURAL
137	A162	A1 main route	A162	5862	0.987	0.013	0.796	0.179	0.008	0.005	0.001	RURAL

Table 22 DfT Traffic Flow Site Data 2022 (Sheet 8 of 8)

North Yorkshire	DfT Traffic Flow Site Data 2022 (Sheet 8 of 8)							
Ref No	**Road**	**Start Junction**	**End Junction**	**Type**	**2-way/1-way/bus lane**	**Speed Limit (mph)**	**Road Class**	**RC**
109	A162	LA Boundary	A1 spur Dish Hill Flyover	D2AP	2-WAY	70	2	1
110	A684	A6108	A6108	S2AP	2-WAY	30	9	3
111	A59	A56	A6069	S2AP	2-WAY	60	1	1
112	A61	A167	A61 Millgate	S2AP	2-WAY	30	9	2
113	A61	A61 Market Place	A61 Long St	S2AP	2-WAY	30	9	4
114	A61	A61 Millgate	A170	S2AP	1-WAY	20	8	4
115	A687	LA Boundary	A65	S2AP	2-WAY	20	1	4
116	A170	A19(T)	A61	S2AP	2-WAY	40	9	3
117	A6040	A61	A59	S2AP	2-WAY	30	8	2
118	A6068	LA Boundary	Old Hall Road	S2AP	2-WAY	30	1	3
119	A629	A6131	A65	S2AP	2-WAY	60	1	2
120	A658	A659	A61	S2AP	2-WAY	40	1	2
121	A63	A1238	A19	S2AP	2-WAY	60	1	3
122	A61	A6040	A61 Kings Rd	S2AP	2-WAY	30	8	3
123	A6136	A6108	A6055 Catterick Road	S2AP	2-WAY	30	10	3
124	A6055	A6055 Catterick Road	A6055 Leeming Lane	S2AP	2-WAY	40	1	3
125	A172	A19(T)	A173	S2AP	2-WAY	60	1	3
126	A65	LA Boundary	A687	S2AP	2-WAY	60	1	3
127	A6069	A59	Gisburn St, Skipton	S2AP	2-WAY	60	1	4
128	A59	A61	A6040	S2AP	2-WAY	30	7	2
129	A165	A1039	A1039	S2AP	2-WAY	40	1	2
130	A1039	A165 Muston	A64 Staxton	S2AP	2-WAY	30	1	4
131	A56	LA Boundary	A59	S2AP	2-WAY	60	1	2
132	A61	LA Boundary	A658	S2AP	2-WAY	60	1	2
133	A61	A61 Stammergate	A168	S2AP	2-WAY	30	9	4
134	A629	LA Boundary	A6068	D2AP	2-WAY	70	2	1
135	A163	A19	LA Boundary	S2AP	2-WAY	60	1	4
136	A166	LA Boundary	LA Boundary	S2AP	2-WAY	60	1	2
137	A162	A1 main route	A162	S2AP	2-WAY	30	1	4

INPUT DATA

DELAY MODELLING METHODOLOGY

The estimation of delay is detailed in the Halcrow study. Two methods of measurement are listed

- (a) live site measured method
- (b) modelling techniques to replicate works on the ground

The measured method is described as a restricted illustrative example of the impact at works and a general model is more industry recognised as the more robust technique that can be audited and validated.

There are three types of modelling software that can be used to model delay at works namely;

- QUADRO – models queues and delays at road works
- SATURN – macro assignment
- VISSIM – micro simulation

The Halcrow study stated in Section 2.1 that on evaluation there were inconsistencies with the latter two types and that QUADRO would give the most consistent results although it is suited more to rural locations with little diversion routes but it is able to model the additional delay on diversion routes when the maximum queuing delay on the main route is exceeded.

QUADRO is able to appraise individual works that are planned in the future on different types of road by modelling the delay experienced by road users, quantify the delay and estimate the cost of the delay.

The software is able to calculate and convert delays into monetary figures as detailed in WebTAG Unit 3.5.6. with assumptions in regard to valuation of time, operating costs and accidents.

Users are required to input base link specific details including network classification, traffic flows, road type characteristics and any diversion routes. Works details including site length, works type such as lane closures and shuttle working. The latest version QUADRO 2021 version 4 release July 2021 has been used for this CBA.

THE VALUATION OF COSTS IN QUADRO

THE VALUATION OF TIME

QUADRO calculates the delays at works and translates these into monetary figures using standard values of time.

The latest values are provided in WebTAG Unit A1.3 and is shown in Table 23 and 24 below. QUADRO converts the resource cost to market price to be consistent with the Economic Efficiency of the Transport System (TEE) table. The market price is calculated by multiplying the resource value by (1 + *t*) where *t* is the average rate of indirect taxation in the economy.

Table 23 WebTAG - Value of Time by Mode and Trip Purpose

Table A 1.3.1: Values of Working (Employers' Business) Time by Mode (£ per hour, 2010 prices, 2010 values)			
Mode	**Resource Cost**	**Perceived Cost**	**Market Price**
Car driver	14.86	14.86	17.69
Car passenger	14.86	14.86	17.69
LGV (driver or passenger)	10.52	10.52	12.52
OGV (driver or passenger)	12.13	12.13	14.43
PSV driver	11.94	11.94	14.21
PSV passenger	8.42	8.42	10.02
Taxi driver	11.50	11.50	13.68
Taxi / Minicab passenger	14.86	14.86	17.69
Rail passenger	24.52	24.52	29.18
Underground passenger	8.42	8.42	10.02
Walker	8.42	8.42	10.02
Cyclist	8.42	8.42	10.02
Motorcyclist	14.86	14.86	17.69
Average of all working persons	16.19	16.19	19.27
Values of Non-Working Time by Trip Purpose (£ per hour, 2010 prices, 2010 values)			
Trip Purpose	**Resource Cost**	**Perceived Cost**	**Market Price**
Commuting	8.36	9.95	9.95
Other	3.82	4.54	4.54

Table 24 WebTAG - Value of Time per Vehicle per hour

Table A 1.3.5: Market Price Values of Time per Vehicle based on distance travelled (£ per hour, 2010 prices and 2010 values)								
Vehicle Type	**Journey Purpose**	**Weekday**					**Weekend**	**All Week**
		7am – 10am	**10am – 4pm**	**4pm – 7pm**	**7pm – 7am**	**Average**		
Car	Work	20.00	20.49	20.29	20.67	20.32	23.23	20.53
	Commuting	11.27	11.45	11.31	11.48	11.35	12.01	11.40
	Other	7.78	8.28	8.14	8.11	8.13	9.63	8.66
	Average Car	11.33	10.67	10.88	11.03	10.95	10.29	10.79
LGV	Work (freight)	15.02	15.02	15.02	15.02	15.02	15.77	15.02
	Commuting & Other	8.92	8.92	8.92	8.92	8.92	12.41	9.72
	Average LGV	14.29	14.29	14.29	14.29	14.29	15.37	14.39
OGV1	Working	14.43	14.43	14.43	14.43	14.43	14.43	14.43
OGV2	Working	14.43	14.43	14.43	14.43	14.43	14.43	14.43
PSV (Occupants)	Work	15.90	16.23	17.01	16.99	16.37	14.87	16.00
	Commuting	22.39	7.85	31.48	43.04	19.43	7.36	16.45
	Other	44.44	50.92	39.78	34.52	45.58	51.76	47.10
	Total	82.72	75.00	88.27	94.55	81.37	73.99	79.55

THE VALUATION OF VEHICLE OPERATING COSTS

QUADRO calculates the vehicle operating costs (VOC) incurred by traffic with and without works.

VOC may increase during works if speeds are reduced or a long diversion route. The effects of temporary blockages caused by accidents are solely assessed on journey time and operating costs are not calculated. As the resource cost of fuel, fuel efficiency and fleet composition

change independently, the relationship of resource cost (per kilometre) to market prices changes annually.

The programme is informed of changes in tax rates over time and are shown in Tables 25 to 27 below.

Values for 2010 VOC are shown in Table 28 below.

Carbon emissions are considered in terms of the change in the equivalent tonnes of carbon Table 29 and estimated from fuel consumption Table 30 below.

Table 25 Taxation Rates Base

TAXATION RATES (%)					
FUEL	AVERAGE	FUEL		NON-FUEL	
TYPE	FINAL	FINAL	INTER	FINAL	INTER
PETROL	19	339.7	274.2	20	0
DIESEL	19	310.1	249.1	20	0

Table 26 Changes to Taxation Rates % Petrol

CHANGES TO TAXATION RATES (%) PETROL						
AVERAGE	FUEL		NON-FUEL		FROM	TO
FINAL	FINAL	INTER	FINAL	INTER	YEAR	YEAR
0	-9.87	-10.41	0	0	2002	2003
0	-9.73	-10.32	0	0	2003	2004
0	-19.56	-20.88	0	0	2004	2005
0	-11	-11.94	0	0	2005	2006
0	0.63	0.69	0	0	2006	2007
0	-18.64	-20.19	0	0	2007	2008
0	29.04	36.78	0	0	2008	2009
0	-16.11	-20.38	0	0	2009	2010
0	-13.72	-18.56	0	0	2009	2010
0	-3.34	-3.85	0	0	2010	2011
0	-1.94	-2.24	0	0	2011	2012
0	-1.6	-1.85	0	0	2012	2013
0	0.53	0.62	0	0	2013	2014
0	0.81	0.95	0	0	2014	2015
0	1.19	1.39	0	0	2015	2016
0	0.98	1.14	0	0	2016	2017
0	0.79	0.92	0	0	2017	2018
0	0.61	0.71	0	0	2018	2019
0	0.43	0.49	0	0	2019	2020
0	0.25	0.29	0	0	2020	2021
0	0.25	0.28	0	0	2021	2022
0	0.29	0.34	0	0	2022	2023
0	0.35	0.4	0	0	2023	2024
0	0.31	0.36	0	0	2024	2025
0	0.36	0.42	0	0	2025	2026
0	0.31	0.35	0	0	2026	2027
0	0.32	0.36	0	0	2027	2028
0	0.32	0.37	0	0	2028	2029
0	0	0	0	0	2030	2099

Table 27 Changes to Taxation Rates % Diesel

CHANGES TO TAXATION RATES (%) DIESEL						
AVERAGE FINAL	FUEL		NON-FUEL		FROM YEAR	TO YEAR
	FINAL	INTER	FINAL	INTER		
0	-7.7	-8.16	0	0	2002	2003
0	-8.4	-8.95	0	0	2003	2004
0	-23.5	-25.18	0	0	2004	2005
0	-9.53	-10.44	0	0	2005	2006
0	3.85	4.26	0	0	2006	2007
0	-27.29	-29.85	0	0	2007	2008
0	37.84	48.13	0	0	2008	2009
0	-10.45	-14.64	0	0	2009	2010
0	-16.24	-21.43	0	0	2009	2010
0	-4.42	-5.14	0	0	2010	2011
0	-3.49	-4.09	0	0	2011	2012
0	-1.56	-1.84	0	0	2012	2013
0	0.54	0.64	0	0	2013	2014
0	0.81	0.96	0	0	2014	2015
0	1.2	1.41	0	0	2015	2016
0	0.98	1.15	0	0	2016	2017
0	0.79	0.93	0	0	2017	2018
0	0.62	0.73	0	0	2018	2019
0	0.45	0.53	0	0	2019	2020
0	0.26	0.3	0	0	2020	2021
0	0.26	0.3	0	0	2021	2022
0	0.31	0.36	0	0	2022	2023
0	0.35	0.41	0	0	2023	2024
0	0.32	0.38	0	0	2024	2025
0	0.35	0.41	0	0	2025	2026
0	0.34	0.39	0	0	2026	2027
0	0.32	0.37	0	0	2027	2028
0	0.32	0.38	0	0	2028	2029
0	0	0	0	0	2030	2099

Table 28 WebTAG – Non-Fuel Resource Vehicle Operating Costs

Table A 1.3.14: Non-Fuel Resource Vehicle Operating Costs (2010 prices and 2010 values)			
Vehicle Category		Parameter Values	
		a1 p / km	b1 p / hr
Car	Work Petrol	4.966	135.946
	Work Diesel	4.966	135.946
	Work Electric	1.157	135.946
	Non-Work Petrol	3.846	0.000
	Non-Work Diesel	3.846	0.000
	Non-Work Electric	1.157	0.000
LGV	Work	7.213	47.113
	Work Electric	2.170	47.113
	Non-Work	7.213	0.000
	Non-Work Electric	2.170	0.000
OGV1	Work	6.714	263.817
OGV2	Work	13.061	508.525
PSV	Work	30.461	694.547

Table 29 WebTAG – Carbon dioxide emissions per litre of fuel burnt / kWh used

Table A 3.4: Carbon Values, £ per Tonne of CO2e (2010 prices)			
Year	**Low**	**Central**	**High**
2010	83.64	167.28	250.92
2011	84.91	169.83	254.74
2012	86.21	172.41	258.62
2013	87.52	175.04	262.56
2014	88.85	177.71	266.56
2015	90.21	180.41	270.62
2016	91.58	183.16	274.74
2017	92.97	185.95	278.92
2018	94.39	188.78	283.17
2019	95.83	191.65	287.48
2020	97.29	194.57	291.86
2021	99.11	198.22	297.33
2022	100.62	201.24	301.86
2023	102.15	204.30	306.46
2024	103.71	207.41	311.12
2025	105.29	210.57	315.86
2026	106.89	213.78	320.67
2027	108.52	217.04	325.55
2028	110.17	220.34	330.51
2029	111.85	223.70	335.54
2030	113.55	227.10	340.65
2031	115.28	230.56	345.84
2032	117.04	234.07	351.11
2033	118.82	237.64	356.46
2034	120.63	241.26	361.88
2035	122.46	244.93	367.39
2036	124.33	248.66	372.99
2037	126.22	252.45	378.67
2038	128.15	256.29	384.44
2039	130.10	260.19	390.29
2040	132.08	264.16	396.23
2041	134.06	268.12	402.18
2042	136.07	272.14	408.21
2043	138.11	276.22	414.33
2044	140.18	280.37	420.55
2045	142.29	284.57	426.86
2046	144.42	288.84	433.26

Table 30 WebTAG – Fuel consumption parameter values

Table A 1.3.8:	Fuel consumption parameter values (litres per km, 2015)			
	Parameters			
Vehicle Category	**a**	**b**	**c**	**d**
Petrol Car	0.45195	0.09605	-0.00109	7.24599E-06
Diesel Car	0.48191	0.06909	-0.00066	5.23793E-06
Petrol LGV	0.34435	0.19309	-0.00303	1.95736E-05
Diesel LGV	0.46348	0.11328	-0.00163	1.38355E-05
OGV1	2.69628	0.14306	-0.00103	1.12932E-05
OGV2	5.66560	0.29422	-0.00195	1.16192E-05
PSV	3.36019	0.29525	-0.00321	2.35400E-05
	Energy consumption parameter values (kWh per km, 2015)			
Electric Car	0.219			
Electric LGV	0.233			
Electric OGV1				
Electric OGV2				
Electric PSV				

THE VALUATION OF ACCIDENTS

Additional accidents may be expected in works and there are two types of cost incurred the cost of delay and the direct cost.

The direct cost includes the casualty, damage to property, insurance administration, police time and an allowance to damage only accidents. QUADRO calculates these values on the network using DfT standard values for average personal injury accidents on various types of road.

Values of most elements are proportional to national income and for 2010 are shown in Table 31 and 32 below. Accident values increase in line with GDP as shown in Table 33 below. Accident rates are calculated with and without works, combined link and junction rates are used in QUADRO,

Table 34 shows accident rates for 15 road types without works. Local data can be used only if available for both the without and with works in this CBA these default values are used.

Table 35 shows the number of casualties per accident.

Table 31 WebTAG – Cost per Casualty

Cost per Casualty	
Severity	**Cost £**
Fatal	1,647,558
Serious	184,053
Slight	14,160

Table 32 WebTAG – Cost per Accident

Cost per Accident							
Severity	Insurance Admin	Damage to Property			Police Cost		
		Urban	Rural	Motorway	Urban	Rural	Motorway
Fatal	288	7,519	12,753	16,222	16,762	17,213	17,414
Serious	179	4,030	5,814	13,842	1,851	2,311	2,440
Slight	109	2,377	3,854	7,003	479	656	547
Damage	52	1,700	2,541	2,442	35	20	17

Table 33 WebTAG – Accident Growth Rates

Annual Rates of Growth of Accident Values	
Range of Years	Growth Rate (% p.a.)
2010 - 2011	0.61
2011 - 2012	0.80
2012 - 2013	1.25
2013 - 2014	2.21
2014 - 2015	1.81
2015 - 2016	1.43
2016 - 2017	1.53
2017 - 2018	1.05
2018 - 2019	1.12
2019 - 2020	0.11
2020 - 2021	0.11
2021 - 2022	1.50
2022 - 2023	1.50
2023 - 2024	1.50
2024 - 2025	1.50
2025 - 2026	1.50
2026 - 2027	1.50
2027 - 2028	1.50
2028 - 2029	1.50
2029 - 2030	1.50
2030 - 2031	1.50
2031 - 2032	1.50
2032 - 2033	1.50
2033 - 2034	1.50
2034 - 2035	1.50
2035 - 2036	1.50
2036 - 2037	1.50
2037 - 2038	1.50
2038 - 2039	1.50
2039 - 2040	1.50
2040 - 2041	1.50
2041 - 2042	1.50
2042 - 2043	1.50
2043 - 2044	1.50
2044 - 2045	1.50
2045 - 2046	1.50
2046 - 2047	1.50

Table 34 WebTAG – Accident Without Works

Combined Link / Junction: Accident Rates and Change Factors 2009 Base				
Road Type	Speed Limit (mph)	Accident Rate	Beta Factor	Road Description
1	50/60/70	0.08	0.956	Motorways
2	50/60/70	0.067	0.956	Motorways
3	50/60/70	0.079	0.956	Motorways
4	30/40	0.532	0.959	Modern S2 Roads
4	>40	0.244	0.955	Modern S2 Roads
5	30/40	0.532	0.959	Modern S2 Roads with HS
5	>40	0.244	0.955	Modern S2 Roads with HS
6	30/40	0.863	0.959	Modern WS2 Roads
6	>40	0.163	0.955	Modern WS2 Roads
7	30/40	0.863	0.959	Modern WS2 Roads w. HS
7	>40	0.163	0.955	Modern WS2 Roads w. HS
8	30/40	0.863	0.959	Older S2 A Roads
8	>40	0.244	0.955	Older S2 A Roads
9	30/40	0.559	0.951	Other S2 Roads
9	>40	0.233	0.933	Other S2 Roads
10	30/40	0.553	0.967	Modern D2 Roads
10	>40	0.107	0.956	Modern D2 Roads
11	30/40	0.599	0.967	Modern D2 Roads with HS
11	>40	0.072	0.956	Modern D2 Roads with HS
12	30/40	0.599	0.967	Older D2 Roads
12	>40	0.107	0.956	Older D2 Roads
13	30/40	0.62	0.951	Modern D3+ Roads
13	>40	0.123	0.946	Modern D3+ Roads
14	30/40	0.62	0.951	Modern D3+ Roads w. HS
14	>40	0.123	0.946	Modern D3+ Roads w. HS
15	30/40	0.62	0.951	Older D3+ Roads
15	>40	0.123	0.946	Older D3+ Roads

Table 35 WebTAG – Casualties per Personal Injury Accident (PIA)

Combined Link / Junction: Casualty Rates					
Road Type	Speed Limit (mph)	Casualties per PIA			Road Description
		Fatal	Serious	Slight	
1 – 3	50 / 60 / 70	0.020	0.1230	1.455	Motorways
4 – 8	30 / 40	0.009	0.132	1.176	S2 A Roads
4 – 8	>40	0.038	0.238	1.3	S2 A Roads
9	30 / 40	0.007	0.134	1.132	Other S2 Roads
9	>40	0.026	0.222	1.218	Other S2 Roads
10 – 15	30 / 40	0.009	0.112	1.238	Dual Carriageways
10 – 15	>40	0.025	0.151	1.297	Dual Carriageways

DELAY MODELLING IN QUADRO

ELEMENTS OF DELAY

The delay at works are made up of a number of elements that include the reduce running speeds through the site, traffic signal control for shuttle working, insufficient capacity causing queuing and diversion and are calculated by the General Delay Sub-Model.

Accidents and breakdowns can cause further delay and will depend on location, amount of width and time of day and if alternative routes are available and are calculated by the Incident Delay Sub-Model.

THE GENERAL DELAY SUB-MODEL

This model is run in each direction and for the four day types Monday to Thursday, Friday, Saturday and Sunday for each hour, the remaining queue is added to the following hour.

The assumption is that regular drivers would travel on the route that minimises the journey time. A driver may minimise journey time by diverting to an alternative before the work site and re-join past the site or divert the route completely.

If traffic is not expected to divert at a particular site and instead queue this implies there are unattractive routes. It can be found that a specification of a diversion route can be particularly difficult and QUADRO is able to be run with a maximum queuing delay.

For the purpose of the CBA this has been used, sample run data is included in the QUADRO manual for different types of road for maximum queuing delay and shown on Table 36 below. Once the maximum queue time is exceeded drivers will divert to a route and assumed that this would equal the journey time through the work site.

Table 36 Max-Q-Delay

Typical Max-Q-Delay QUADRO	
Type of Road	**Max-Q-Delay (mins)**
S2	5
WS2	5
D2AP	10
D3AP	15

THE INCIDENT DELAY SUB-MODEL

If a breakdown or accident occurs within the site length this will restrict the capacity further.

Unlike the General Model drivers will not divert as this would not be a common event. This model is not run for shuttle working sites as it is assumed that the obstruction would be speedily removed.

This sub model is run twice once for breakdown and once for accidents. The sub model assumes that breakdowns occur at a rate shown in Table 37 below. Accident Rates were tabled earlier in Section 4.2.

Table 37 Breakdown Rates

Default Breakdown Rates QUADRO	
Vehicle Type	**Rate (vkm)**
Light	10 per 10^6
Heavy	5 per 10^6

TRAFFIC INPUT

NETWORK AND ROUTE TYPE DESCRIPTION

For each of the work sites certain characteristics are required by QUADRO including the length of the works site, adjoining sections up and downstream of the site (both directions) and the diversion route.

For the purpose of this CBA the diversion length is not modelled as the maximum queue delay method has been used.

The main route is considered to be consistent along its length and no flow variations. A road class is specified as shown on Table 38 below to calculate a speed/flow relationship with default values shown on Table 39 and 40.

For each road class the user is able to input geometric parameters such as road width, hilliness, accesses along route, visibility, for the purpose of this CBA, typical values have been applied as set out in Table 41 below. The work site type is defined by the number of lanes open or shuttle working as shown on Table 42 below that selects a default capacity.

QUADRO contains values for average duration of incidents and are shown on Table 43 below.

Table 38 Road Classes

QUADRO Road Classes	
Road Class	**Description**
Class 1	Rural single carriageway
Class 2	Rural all-purpose dual 2 lane carriageway
Class 3	Rural all-purpose dual 3 or more lane carriageway
Class 4	Motorway (urban or rural), dual 2 lanes
Class 5	Motorway (urban or rural), dual 4 or more lanes
Class 6	Motorway (urban or rural), dual 3 lanes
Class 7	Urban road, Central, single or dual carriageway
Class 8	Urban road, Non-central, single or dual carriageway
Class 9	Small town road, single or dual carriageway
Class 10	Suburban Main Road, single carriageway
Class 11	Suburban Main Road, dual carriageway

Table 39 Default minimum speeds QUADRO

Road Class	Minimum speed (kph)
Classes 1 to 6	45
Class 7	25
Class 8	15
Class 9	30
Class 10	25
Class 11	35

Table 40 Default Speed/flow Parameters QUADRO

CLASS	LIGHT-V kph	GRAD-A reduction (kph) per 1000 veh	GRAD-B reduction (kph) per 1000 veh	HEAVY-V kph	GRAD-A reduction (kph) per 1000 veh	GRAD-B reduction (kph) per 1000 veh	CHANGE Factor or vph per lane	MINS Kph	Qc vph per lane
1	72.1	15	50	78.2	5.2	5.2	1920	45	2400
2	108	6	33	86	0	0	1080	45	2100
3	115	6	33	86	0	0	1080	45	2100
7	64.5	30	30	64.5	30	30		25	800
8	39.5	30	30	39.5	30	30		15	800
10	70	10	45	64	10	45	1200	25	1500
11	80	10	45	74	10	45	1200	35	1500

Table 41 Default Geometric Parameters QUADRO

CLASS	TYPE	DESCRIPTION	CWID	HILLS	DEVEL	INT	BEND	MAXS	SWID	VWID	JUNC	VIS	AXS
1	RURAL	Single Carriageway	7.3	15			75	96	0	1	0.6	200	
2	RURAL	Dual 2 lanes	14.6	15			30	113					
3	RURAL	Dual 3 lanes	22	15			30	113					
7	URBAN	Non-central	10	15	70								
8	URBAN	Central	11	15		4.5							
10	URBAN	Suburban Single	10	15		0.8		64					30
11	URBAN	Suburban Dual	14.6	15		0.8		64					30

Table 42 Work Types

QUADRO Work Types	
Works Type	**Description**
0	No lanes open in this direction
1	One lane open in this direction
2	Two lanes open in this direction
3	Three lanes open in this direction
4	Four lanes open in this direction
5	Five lanes open in this direction
9	Shuttle working
10	If layout features contra-flow working

Table 43 Incident Duration

Default Breakdown and Accident Durations in QUADRO		
Type of Road	**Breakdown Duration (mins)**	**Accident Duration (mins)**
Motorway	25	30
Single and Dual AP	40	45

VARIATION IN TRAFFIC FLOW

Traffic flows vary by hour, day, week and month and different type of vehicles.

QUADRO calculates user costs daily and normally for a 7-day week using the four day types. For the purpose of this CBA, AADT flows have been used and QUADRO converts this to Annual Average Hourly Traffic (AAHT) to generate an hourly flow profile.

The QUADRO model uses directional flow as each direction is modelled separately.

Two-way input flows are split by tidal behaviour for example the direction into town in the morning peak and the direction is specified by the user.

VEHICLES IN WORK TIME AND VEHICLE OCCUPANCIES

QUADRO considers the disaggregation of time spent in work and non-work mode for each vehicle type.

The National Travel Survey (NTS) showed the average car mileage in work mode, commuting mode and non-working mode and are further disaggregated by average hourly percentages.

Averages for weekdays and weekends, vehicles and journey types are shown on Table 44 below.

Table 44 WebTAG – Trip Proportions

Table A 1.3.4:		Proportion of travel in work and non-work time						
Mode / Vehicle Type & Journey Purpose		Weekday					Weekend	All Week
		7am – 10am	10am – 4pm	4pm – 7pm	7pm – 7am	Average	Average	Average
		Percentage of Distance Travelled by Vehicles						
Car	Work	16.5	16.5	11.8	12.9	14.8	3.5	12.1
	Commuting	44.1	11.8	41.3	38.5	31.2	7.9	25.5
	Other	39.5	71.7	46.9	48.6	53.9	88.6	62.5
LGV	Work (freight)	88	88	88	88	88	88	88
	Non – Work	12	12	12	12	12	12	12
OGV1	Work	100	100	100	100	100	100	100
OGV2	Work	100	100	100	100	100	100	100
		Percentage of Distance Travelled by Occupants						
Car	Work	13.7	11.7	9.4	10.4	11.5	2.2	8.6
	Commuting	36.1	8.1	32.1	30.1	23.5	4.4	17.7
	Other	50.2	80.2	58.5	59.5	65	93.4	73.7
PSV	Work	1.4	1.7	2.3	2.3	1.8	0.5	1.5
	Commuting	18.4	6.5	25.9	35.4	16	6.1	13.5
	Other	80.2	91.9	71.8	62.3	82.2	93.4	85

Table A 1.3.4:		Proportion of trips made in work and non-work time						
Mode / Vehicle Type & Journey Purpose		Weekday					Weekend	All Week
		7am – 10am	10am – 4pm	4pm – 7pm	7pm – 7am	Average	Average	Average
		Percentage of Vehicle Trips						
Car	Work	7	7.2	5.1	4.3	6.2	2	5.3
	Commuting	38.3	11.3	32.6	28.8	25.2	8.4	21.3
	Other	54.7	81.5	62.3	66.9	68.6	89.6	73.4
LGV	Work (freight)	88	88	88	88	88	88	88
	Non – Work	12	12	12	12	12	12	12
OGV1	Work	100	100	100	100	100	100	100
OGV2	Work	100	100	100	100	100	100	100
		Percentage of Person Trips						
Car	Work	5.3	5.1	3.9	3.4	4.7	1.3	3.8
	Commuting	31	8.4	25.8	23.7	19.7	6	16.1
	Other	63.6	86.5	70.3	72.8	75.6	92.7	80.1
PSV	Work	2.1	1.7	2.6	3.1	2	1	1.9
	Commuting	25.6	7.2	33.5	46.3	19.6	10.6	18
	Other	72.3	91.1	64	50.6	78.4	88.4	80.1

SITE SPECIFIC QUADRO INPUT DATA

SAMPLE SITE DATA

From the North Yorkshire DfT traffic count data 128 sites were selected as locations that represent lane rental site traffic flows. Some DfT sites represent a number of lane rental streets, traffic data for each of the 1,065 (7.27%) lane rental streets is shown on Tables 13 to 22.

For each site, data files were created, and works were run for the site lengths carried out with the Halcrow Study 10, 30, 50, 100 and 200 metres.

Data for hourly traffic flows was obtained from North Yorkshire with 115 sites identified with daily flows in neutral months that were summarised for peak and off peak hours.

In total 2,055 outputs were created and are provided in Appendix C. The Daily Cost of all sites was averaged for Rural and Urban roads by RC and excavation length and is shown on Table 44 below.

The number of samples used for the CBA is required to be proportioned to the actual number of works and statistically confident in the data.

The number of samples used for each work type are shown on Table 45 below with the percentages matching the proportions of actual works shown in Table 7. This has been statistically verified at a 95% confidence level with a confidence interval of 5%. A confidence interval within +/- 5% is considered to be reliable.

The samples used for the CBA were selected by ranking the sites by impact and making the average cost of sites selected close to the mean. The sample sites were also proportioned by excavation length so that the percentages match the Halcrow study and are shown on Table 46 below.

The sample sites average duration for each work type was matched to the North Yorkshire predicted behavioural change in duration discussed later in the report. High and Low cost forecasts were derived, for High the highest duration of days was applied to the highest ranking site by impact, for Low the highest duration of days was applied to the lowest ranking site by impact. The average of the two forecasts was used to obtain the Total Delay of Works. Summarised impacts are provided in Appendix D.

Table 45 North Yorkshire Delay Modelling Daily Cost of Works

North Yorkshire							
Daily Cost of Lane Rental Street Works (£) by Data Type and Length							
Data Type	Typical AADT	Average AADT	10m	30m	50m	100m	200m
Rural	20,000	8,830	3,224	3,224	4,818	5,052	6,478
Urban	26,667	11,300	728	1,268	2,237	4,435	7,248
Average	23,334	10,065	1,976	2,246	3,528	4,744	6,863

Table 46 North Yorkshire Work Samples

North Yorkshire	Street Work Samples	
Work Type	**Sample Size**	**%**
Major	25	8%
Standard	43	13%
Minor with Excavation	137	41%
Urgent	126	38%
Totals	**331**	

Table 47 North Yorkshire Delay Modelling Percentage of Works by RC and Excavation Length

North Yorkshire	CBA Percentages of Works by RC and Excavation Length					
	10m	**30m**	**50m**	**100m**	**200m**	**Total Samples**
Sample Nos	281	2	17	13	16	331
Sample %	84.9%	0.6%	5.1%	3.9%	4.8%	
Halcrow Study %	84.7%	0.7%	5.2%	4.2%	5.2%	

MONETIZED COSTS AND BENEFITS

The socio-economic benefits shown for the opening year in summary on Table 48.

The statutory guidance on reliability benefits achieved from a reduction in the variability in travel times for road users is provided by WebTAG Unit 3.5.7, which recommends a mark-up on travel time-savings for urban roads of between 10% to 20%.

Recent research from Transport for London (TfL) GPS data for inner and central London estimated an uplift figure of 22% for changes in the mean journey time (Modelling journey time variability to assist in designing a journey time variability performance indicator for the transport for London Road Network, Jonathan Turner 2008). This supports the use of the upper end value of 20% for this study and is included as a reliability adjustment in the monetized costs and benefits.

The User Benefits are proportioned between consumer and business users for Vehicle Operating Cost and Travel Time Cost.

The QUADRO rates demonstrate much higher incidents of accidents within road works. With a slight increase in durations with shorter days at off-peak times there is a minor increase in accidents but this is a very low level and will not impact on casualties.

Table 48 North Yorkshire Monetized Costs and Benefits

North Yorkshire Sample Sites QUADRO Results Summary			
Delay Modelling Totals			
	Total Impact	**Consumer Vehicle Operating Cost**	**Consumer Travel Time Cost**
High	£ 1,935,687	£ 97,132	£ 927,466
Low	£ 1,197,471	£ 62,225	£ 566,182
Average	£ 1,566,579	£ 79,678	£ 746,824
	Business Vehicle Operating Cost	**Business Travel Time Total**	**PSP Bus & Coach Operating Cost**
High	£ 78,177	£ 597,984	£ 61,113
Low	£ 46,296	£ 358,742	£ 41,094
Average	£ 62,237	£ 478,363	£ 51,103
	Total Business	**Accident Cost**	**Carbon**
High	£ 815,004	-£ 257	£ 136,723
Low	£ 499,469	-£ 153	£ 93,725
Average	£ 657,236	-£ 205	£ 115,224

LANE RENTAL SCHEME OPERATION

INTRODUCTION

This section assesses the process tasks required to establish and operate the North Yorkshire Lane Rental Scheme. It will consist of the following sections:

- Volumes and Charges, presentation of anticipated Lane Rental applications by work type
- Scheme Costs, presentation of staff costs associated with the Lane Rental Scheme

VOLUMES AND CHARGES

The estimated number of works for Lane Rental by type was extracted from North Yorkshire Permit Scheme Evaluation Reports. Total Permits prorated to the percentage of Lane Rental streets and is shown on Table 49 below.

Table 49 Lane Rental Work Volumes

North Yorkshire Lane Rental Work Volumes		
Work Type	**Number**	**%**
Major	179	8%
Standard	308	13%
Minor with Excavation	984	41%
Urgent	901	38%
Totals	2,372	100%
Utility Works	2,206	93%
Highway Works	166	7%

The volumes with costings are based upon statutory maximum charges outlined in Table 5.

Lane Rental Charges are excluded from Public Accounts reporting in line with the DfT guidance.

SCHEME COSTS

There are two elements to the Lane Rental Scheme costs:

- Start-up costs
- Ongoing costs

START-UP COSTS

There are no one-off costs required to establish the Lane Rental Scheme.

ONGOING COSTS

The ongoing costs throughout the Lane Rental Scheme duration are set out on Table 50 below.

Table 50 Scheme Ongoing costs

Ongoing Costs	
Start-up Cost Centre	**Year 1 +**
Totals	**£150,000**

The operational policy outlined in Table 6 that proposed that no costs associated with the implementation of the Scheme will be carried on to future years and that that all set up costs are incurred in the month before the Lane Rental Scheme becomes operational.

OPERATIONAL COSTS

The activities and functions of the North Yorkshire Permit Scheme staff will continue to be applied to the activities undertaken on lane rental streets, such as coordination and application assessments.

The DfT state that 'The permit scheme will continue to play a crucial role alongside lane rental charges, not least because of the need to ensure that activities taking place on the busiest streets and properly co-ordinated.'

However, the cost of the staff time will be met from lane rental charges instead of permit fees.

There will also be a slight increase as Section 50 works are included in the Lane Rental Scheme. Section 50 works not Utility or Highway works but usually housing or industrial developer works.

To ensure consistency of approach the cost of staff time relative to the anticipated volume of activities on lane rental streets has been identified using the same DfT methodology employed by the North Yorkshire Permit Scheme.

The overall staffing costs of Lane Rental Scheme operation are based on information from North Yorkshire County Council and statutory rates and are outlined in Table 51.

Table 51 Staff Costing

Staff Costing			
Personnel Type	**Annual Salary**	**Final Hourly Rate**	**Total Annual Cost**
Street Works Officer	£24,000	£34.06	£55,728
Street Works Coordinator	£35,000	£49.68	£81,270.00
Traffic Manager	£55,000	£80.48	£131,670.00

National Insurance (%)	10
Pension (superannuation) (%)	19
Working hours/annum	1636
Employee Overhead Rate	1.8

The breakdown of costing per task for each of the three grades of Lane Rental Scheme workers is shown in Table 52 below.

Table 52 Breakdown of Employer Costing per Lane Rental Task

Employee Costing per Permit Task						
Street Works Officers						
	PAA	**Major**	**Standard**	**Minor**	**Immediate**	**TOTAL**
Hours per Permit	1.23	1.65	0.91	0.52	0.46	4.78
Total Permits	179.23	179.23	307.68	984.07	901.03	2551.23
Total Hours	221.05	295.73	281.01	513.35	415.07	12192.35
No. of Posts Required	0.14	0.18	0.17	0.31	0.25	1.06
Employee Costs	£ 7,530	£ 10,074	£ 9,572	£ 17,487	£ 14,139	£ 58,801
Street Works Coordinators						
	PAA	**Major**	**Standard**	**Minor**	**Immediate**	**TOTAL**
Hours per Permit	3.15	0.95	1.98	0.65	0.17	3.71
Total Permits	179.23	179.23	307.68	984.07	901.03	2551.23
Total Hours	565.18	170.27	608.69	634.72	150.17	9469.33
No. of Posts Required	0.35	0.10	0.37	0.39	0.09	0.82
Employee Costs	£ 28,076	£ 32,409	£ 30,237	£ 31,531	£ 28,870	£ 108,251
Traffic Managers						
	PAA	**Major**	**Standard**	**Minor**	**Immediate**	**TOTAL**
Hours per Permit	1.49	0.95	0.49	0.62	0.17	3.71
Total Permits	179.23	179.23	307.68	984.07	901.03	2551.23
Total Hours	266.46	170.27	151.28	606.84	150.17	9469.33
No. of Posts Required	0.16	0.10	0.09	0.37	0.09	0.82
Employee Costs	£ 21,445	£ 13,704	£ 12,175	£ 48,840	£ 12,086	£ 108,251

The overall costs associated with the operation of the Lane Rental Scheme are summarised in Table 53 below.

Table 53 Staff costing summary

Total Number of Employees and Costs		
Personnel Type	**No.**	**Salaries**
Street Works Officers	1.06	£58,801
Street Works Co-ordinators	1.86	£151,122
Traffic Managers	0.82	£108,251
TOTAL	**3.74**	**£318,174**

The final Lane Rental Scheme cost is shown in Table 54.

Table 54 Lane Rental Scheme costing summary

Lane Rental Scheme Cost Breakdown	
Cost Type	**Cost**
LR Application Employee Costs	£318,174

LR Application Operational Factor Costs	£150,000
Total LR Application Costs	£468,174

FINANCIAL CALCULATIONS

INTRODUCTION

This section will present the calculation of financial benefits for the statutory outputs:

- Public Accounts - Local Government Funding
- Public Accounts - Central Government Funding
- Transport Economic Efficiency
- Monetized Costs and Benefits

The calculations will be presented for the opening year and for the 25-year Scheme horizon and will be discounted where required.

PUBLIC ACCOUNTS - LOCAL GOVERNMENT FUNDING

The Local Government public account reporting has the following categories:

- Revenue
- Operating Costs
- Investment Costs
- Developer and other contributions
- Grant / subsidy payments

REVENUE

For the purposes of this Cost Benefit Analysis, the Lane Rental charge income is calculated by the multiplication of the estimated Lane Rental works volume and the maximum charge as shown on Table 6.

OPERATING COSTS

The operating costs for the Scheme are comprised of:

- Staff and operation costs
- Asset maintenance costs
- Unrecoverable fees
- Income

No provision has been made for on-going asset maintenance of the Lane Rental Scheme.

Estimated Volumes and Charges is shown below on Tables 55 and potential behavioural changes in Table 56 below. Table 55 calculates the number of chargeable days based on the assumption of the increase in duration of works due to reduced efficiency for Major, Standard and Minor work categories and the assumption of a decrease in duration of works to avoid charge periods for Immediate works.

A calculation is then made on the revenue generated from the daily lane rental charge and with assumptions of waivers and discounts to give a final anticipated annual revenue of the Lane Rental Scheme. The Lane Rental Implementation Outputs are shown on Table 57 below.

The Operational Costs for Year 1-10 are shown on Table 58 below.

Financial calculations for year 2 to 25 are shown on Table 60 to 63 below.

Table 55 North Yorkshire Lane Rental Scheme Anticipated Volumes, Impacts and Revenue

Current Permit Regime Volumes (7.27% of Network)		Estimated Lane Rental Volumes per Year						
Works Category	Volume of Works Anticipated to be on Lane Rental Streets	Proposed Charge per day	Ave Durations of Works Before Lane Rental	Total Pre Lane Rental Works Days	Anticipated additional days due to reduced efficiency. Extra out of hours working	Total Immediate + Urgent Work Days Completed without Charge	Total Immediate + Urgent Work Days Charged	Total Work Days Moved Outside Charge Periods
Major	179	2,500	17	3,047	305	-	-	1,523
Standard	308	2,500	9	2,769	277	-	-	1,385
Minor	984	2,500	3	2,952	295	-	-	1,476
Urgent	901	2,500	5	4,505	-	3,829	676	-
Sub Total	**2372**			**13,273**		**3,829**	**676**	**4,384**

Works Category	Estimated Lane Rental Revenue per Year						
	Total Work Days Potentially Charged	Total Days Triggering a Waiver	Revenue cost of waivers	Total Work Days triggering a discount (min 50%)	Revenue cost of discounts	Final Anticipated Chargeable Days	Final Anticipated Revenue
Major	1,523	762	£ 1,904,335	305	£ 380,867	457	£ 1,142,601
Standard	1,385	692	£ 1,730,698	277	£ 346,140	415	£ 1,038,419
Minor	1,476	738	£ 1,845,124	295	£ 369,025	443	£ 1,107,074
Urgent	676	-	-	-	-	676	£ 1,689,422
Sub Total	**5,060**	**2,192**	**5,480,157**	**877**	**1,096,031**	**1,991**	**4,977,516**

Table 56 Potential Behavioural Changes

Potential Behavioural Changes	Assumptions / Anticipated Behavioural Changes	Assumption Source
Anticipated additional days due to reduced efficiency (shorter days etc)	10%	West Sussex
Percentage of Immediate works being completed before charge periods apply	85%	West Sussex
Works being undertaken outside the Lane Rental Charge periods, such as out of hours (not charged)	50%	West Sussex
Works being undertaken in a way that triggers a waiver, such as the use of new technology	50%	Estimate
Works being undertaken in a way that triggers a discount, such as collaborative working	20%	Estimate

Table 57 Lane Rental Implementation Outputs

Lane Rental Scheme Implementation Outputs	
Total Works Days on Lane Rental Streets	**14,150**
Total Works Days Charged After Behavioural Change	**1,991**
Percentage of Works on Lane Rental Streets Charged	**15%**
Potential Volume of Works on Lane Rental Streets (A)	**2,372**
Percentage of Network Lane Rental (B)	**7.27%**
Pre Behavioural Change Immediate Days Worked (C)	**4,505**
Post Behavioural Change Days Worked on Lane Rental Streets (D)	**14,150**
Increase in Days Worked (reduced efficiency)	**877**
Total Number of Days Worked at Lane Rental Times (F)	**5,060**

Potential Pre waiver / discount work days (G)	**4,384**
Potential Cost of Waivers issued (H)	**£5,480,157**
Potential Cost of Discounts issued (I)	**£1,096,031**
Anticipated Total Revenue (J)	**£4,977,516**
Anticipated Net Revenue after Operational Costs (K)	**£4,509,342**
Operational Costs as a % of Revenue (L)	**9.41%**
Total Operational Costs (M)	**£468,174**
Total Additional Staff Required (N)	**4**
Total Staff Costs (Inc internal operating factors) (O)	**£318,174**
Total Operating Factors (External Cost (Evaluation)) (P)	**£150,000**
Set-up Costs including Consultancy, Analysis and internal time	**£150,000**
Optimism Bias. Estimate from Management	**30%**

Authority Volume and Costs	
Works done by Utilities	**2,206**
Works done by Authority	**166**
Potential Revenue from Utilities	**£4,629,090**
Potential Revenue (cost) from the Authority	**£348,426**

Optimism Bias	**30%**
Reduction	**£1,493,254.92**
Management Figure	**£3,484,261.49**

Table 58 Financial Calculations Annual Cost

North Yorkshire Financial Calculations											
	Opening	Closing Values									
Annual Cost of Lane Rental Scheme - Closing Values	**Year-0**	**Year-1**	**Year-2**	**Year-3**	**Year-4**	**Year-5**	**Year-6**	**Year-7**	**Year-8**	**Year-9**	**Year-10**
Lane Rental Costs	468,174	608,627	588,045	568,159	548,946	530,383	512,447	495,118	478,375	462,198	446,568
Set-up Costs	150,000	150,000	-	-	-	-	-	-	-	-	-
Lane Rental Fee Charges for Highway Authorities	348,426	452,954	437,637	422,837	408,539	394,723	381,375	368,478	356,018	343,978	332,346
Annual Cost For Recovery		1,211,581	1,025,682	990,997	957,485	925,106	893,822	863,597	834,393	806,177	778,915
Cost Recovery Price Lane Rental charge		5,008,429	694,795	588,045	568,159	548,946	530,383	512,447	495,118	478,375	462,198
Cost Recovery Price Lane Rental charge (prior year data)		212	-135	40	42	41	39	38	37	36	34
(Over) / under-recovery £		-3,796,849	330,887	402,952	389,325	376,160	363,439	351,149	339,275	327,802	316,716
(Over) / under-recovery £ (prior year)	-	-3,796,849	330,887	402,952	389,325	376,160	363,439	351,149	339,275	327,802	316,716
Annual Income Max Charges	4,629,090	4,629,090	4,472,551	4,321,305	4,175,174	4,033,985	3,897,570	3,765,768	3,638,423	3,515,385	3,396,507
Overall Scheme Cost	468,174	-3,188,222	918,932	971,111	938,272	906,543	875,887	846,267	817,650	790,000	763,285
Profit/Loss	4,160,916	7,817,312	3,553,619	3,350,194	3,236,902	3,127,442	3,021,683	2,919,501	2,820,773	2,725,385	2,633,222

Table 59 Financial Calculations First Year Cost

Financial Calculations	Year	Year-1											
Annual Cost of Lane Rental Scheme - Closing Values	Month	Month-1	Month-2	Month-3	Month-4	Month-5	Month-6	Month-7	Month-8	Month-9	Month-10	Month-11	Month-12
Lane Rental Costs	50,719	50,719	50,719	50,719	50,719	50,719	50,719	50,719	50,719	50,719	50,719	50,719	50,719
Lane Rental Volumes	-	2,551	1,913	1,913	1,913	1,913	1,913	1,913	1,913	1,913	1,913	1,913	1,913
Cost Recovery Price Lane Rental income	-	212.23	212.23	212.23	212.23	212.23	212.23	212.23	212.23	212.23	212.23	212.23	212.23
Multiplied by number of Works	-	541,452	406,089	406,089	406,089	406,089	406,089	406,089	406,089	406,089	406,089	406,089	406,089
Income derived on Cost recovery basis	-	541,452	406,089	406,089	406,089	406,089	406,089	406,089	406,089	406,089	406,089	406,089	406,089
Income derived from Max Charges	385,758	385,758	385,758	385,758	385,758	385,758	385,758	385,758	385,758	385,758	385,758	385,758	385,758
Lane Rental Scheme - Operational Costs		-50,719	-50,719	-50,719	-50,719	-50,719	-50,719	-50,719	-50,719	-50,719	-50,719	-50,719	-50,719

Table 60 Financial Calculations Second Year Cost (Year 2)

Financial Calculations	Year	Year-2											
Annual Cost of Lane Rental Scheme - Closing Values	Month	Month-1	Month-2	Month-3	Month-4	Month-5	Month-6	Month-7	Month-8	Month-9	Month-10	Month-11	Month-12
Lane Rental Costs	49,004	49,004	49,004	49,004	49,004	49,004	49,004	49,004	49,004	49,004	49,004	49,004	49,004
Lane Rental Volumes	-	1,913	1,913	1,913	1,913	1,913	1,913	1,913	1,913	1,913	1,913	1,913	1,913
Cost Recovery Price Lane Rental income	-	(135.10)	(135.10)	(135.10)	(135.10)	(135.10)	(135.10)	(135.10)	(135.10)	(135.10)	(135.10)	(135.10)	(135.10)
Multiplied by number of Works	-	258,504	258,504	-258,504	-258,504	-258,504	-258,504	-258,504	-258,504	-258,504	-258,504	-258,504	258,504
Income derived on Cost recovery basis	-	258,504	258,504	258,504	258,504	258,504	258,504	258,504	258,504	258,504	258,504	258,504	258,504
Income derived from Max Charges	372,713	372,713	372,713	372,713	372,713	372,713	372,713	372,713	372,713	372,713	372,713	372,713	372,713
Lane Rental Scheme - Operational Costs	-	-49,004	-49,004	-49,004	-49,004	-49,004	-49,004	-49,004	-49,004	-49,004	-49,004	-49,004	-49,004

Table 61 Financial Calculations Third Year Cost (Year 3)

Financial Calculations 25% Reduction in Durations	Year	Year-3											
Annual Cost of Lane Rental Scheme - Closing Values	Month	Month-1	Month-2	Month-3	Month-4	Month-5	Month-6	Month-7	Month-8	Month-9	Month-10	Month-11	Month-12
Lane Rental Costs	36,420	36,420	36,420	36,420	36,420	36,420	36,420	36,420	36,420	36,420	36,420	36,420	36,420
Lane Rental Volumes	-	1,913	1,913	1,913	1,913	1,913	1,913	1,913	1,913	1,913	1,913	1,913	1,913
Cost Recovery Price Lane Rental income	-	14.63	14.63	14.63	14.63	14.63	14.63	14.63	14.63	14.63	14.63	14.63	14.63
Multiplied by number of Works	-	27,994	27,994	27,994	27,994	27,994	27,994	27,994	27,994	27,994	27,994	27,994	27,994
Income derived on Cost recovery basis	-	27,994	27,994	27,994	27,994	27,994	27,994	27,994	27,994	27,994	27,994	27,994	27,994
Income derived from Max Charges	387,214	387,214	387,214	387,214	387,214	387,214	387,214	387,214	387,214	387,214	387,214	387,214	387,214
Lane Rental Scheme - Operational Costs	-	-36,420	-36,420	-36,420	-36,420	-36,420	-36,420	-36,420	-36,420	-36,420	-36,420	-36,420	-36,420

Financial Calculations	Year	Year-3											
Annual Cost of Lane Rental Scheme - Closing Values	Month	Month-1	Month-2	Month-3	Month-4	Month-5	Month-6	Month-7	Month-8	Month-9	Month-10	Month-11	Month-12
Lane Rental Costs	47,347	47,347	47,347	47,347	47,347	47,347	47,347	47,347	47,347	47,347	47,347	47,347	47,347
Lane Rental Volumes	-	1,913	1,913	1,913	1,913	1,913	1,913	1,913	1,913	1,913	1,913	1,913	1,913
Cost Recovery Price Lane Rental income	-	40.02	40.02	40.02	40.02	40.02	40.02	40.02	40.02	40.02	40.02	40.02	40.02
Multiplied by number of Works	-	76,578	76,578	76,578	76,578	76,578	76,578	76,578	76,578	76,578	76,578	76,578	76,578
Income derived on Cost recovery basis	-	76,578	76,578	76,578	76,578	76,578	76,578	76,578	76,578	76,578	76,578	76,578	76,578
Income derived from Max Charges	360,109	360,109	360,109	360,109	360,109	360,109	360,109	360,109	360,109	360,109	360,109	360,109	360,109
Lane Rental Scheme - Operational Costs	-	-47,347	-47,347	-47,347	-47,347	-47,347	-47,347	-47,347	-47,347	-47,347	-47,347	-47,347	-47,347

Table 62 Financial Calculations 4-14 Year Cost

Financial Calculations	Year	Year-4	Year-5	Year-6	Year-7	Year-8	Year-9	Year-10	Year-11	Year-12	Year-13	Year-14
Annual Cost of Lane Rental Scheme - Closing Values												
Lane Rental Costs	-	548,946	530,383	512,447	495,118	478,375	462,198	446,568	431,467	416,876	402,779	389,158
Lane Rental Volumes	-	22,961	22,961	22,961	22,961	22,961	22,961	22,961	22,961	22,961	22,961	22,961
Cost Recovery Price Lane Rental income	-	42.29	40.86	39.48	38.15	36.86	35.61	34.41	34.41	34.41	34.41	34.41
Multiplied by number of Works	-	971,111	938,272	906,543	875,887	846,267	817,650	790,000	790,000	790,000	790,000	790,000
Income derived on Cost recovery basis	-	971,111	938,272	906,543	875,887	846,267	817,650	790,000	790,000	790,000	790,000	790,000
Income derived from Max Charges	-	4,175,174	4,033,985	3,897,570	3,765,768	3,638,423	3,515,385	3,396,507	3,396,507	3,396,507	3,396,507	3,396,507
Lane Rental Scheme - Operational Costs		-548,946	-530,383	-512,447	-495,118	-478,375	-462,198	-446,568	-431,467	-416,876	-402,779	-389,158

Table 63 Financial Calculations 15-25 Year Cost

Financial Calculations	Year	Year-15	Year-16	Year-17	Year-18	Year-19	Year-20	Year-21	Year-22	Year-23	Year-24	Year-25
Annual Cost of Lane Rental Scheme - Closing Values												
Lane Rental Costs	-	289,230	279,449	269,999	260,869	252,047	243,524	235,288	227,332	219,644	212,217	205,040
Lane Rental Volumes		22,961	22,961	22,961	22,961	22,961	22,961	22,961	22,961	22,961	22,961	22,961
Cost Recovery Price Lane Rental income		14.94	14.94	14.94	14.94	14.94	14.94	14.94	14.94	14.94	14.94	14.94
Multiplied by number of Works		343,093	343,093	343,093	343,093	343,093	343,093	343,093	343,093	343,093	343,093	343,093
Income derived on Cost recovery basis		343,093	343,093	343,093	343,093	343,093	343,093	343,093	343,093	343,093	343,093	343,093
Income derived from Max Charges		3,075,019	2,971,033	2,870,563	2,773,491	2,679,701	2,589,083	2,501,530	2,416,937	2,335,205	2,256,237	2,179,939
Lane Rental Scheme - Operational Costs		-289,230	-279,449	-269,999	-260,869	-252,047	-243,524	-235,288	-227,332	-219,644	-212,217	-205,040

Financial Calculations	Year	Year-15	Year-16	Year-17	Year-18	Year-19	Year-20	Year-21	Year-22	Year-23	Year-24	Year-25
Annual Cost of Lane Rental Scheme - Closing Values												
Lane Rental Costs	-	375,998	363,284	350,999	339,129	327,661	316,581	305,875	295,531	285,538	275,882	266,552
Lane Rental Volumes		22,961	22,961	22,961	22,961	22,961	22,961	22,961	22,961	22,961	22,961	22,961
Cost Recovery Price Lane Rental income		34.41	34.41	34.41	34.41	34.41	34.41	34.41	34.41	34.41	34.41	34.41
Multiplied by number of Works		790,000	790,000	790,000	790,000	790,000	790,000	790,000	790,000	790,000	790,000	790,000
Income derived on Cost recovery basis		790,000	790,000	790,000	790,000	790,000	790,000	790,000	790,000	790,000	790,000	790,000
Income derived from Max Charges		2,859,768	2,763,061	2,669,624	2,579,347	2,492,122	2,407,848	2,326,423	2,247,752	2,171,741	2,098,300	2,027,343
Lane Rental Scheme - Operational Costs		-375,998	-363,284	-350,999	-339,129	-327,661	-316,581	-305,875	-295,531	-285,538	-275,882	-266,552

INVESTMENT COSTS

There are no investment costs incurred.

DEVELOPER AND OTHER CONTRIBUTIONS

There are no developer or other contributions in the Local Government Public accounts reporting.

GRANT / SUBSIDY PAYMENTS

There are no grant or subsidy payments in the Local Government Public accounts reporting.

PUBLIC ACCOUNTS - CENTRAL GOVERNMENT FUNDING

The Central Government public account reporting has the following categories:

- Revenue
- Operating costs
- Investment costs
- Developer and other contributions
- Grant / subsidy payments
- Indirect tax revenues

REVENUE

There is no revenue in the Central Government Public accounts reporting.

OPERATING COSTS

There are no operating costs in the Central Government Public accounts reporting.

INVESTMENT COSTS

There are no investment costs in the Central Government Public accounts reporting.

DEVELOPER AND OTHER CONTRIBUTIONS

There are no developer or other contributions in the Central Government Public accounts reporting.

GRANT / SUBSIDY PAYMENTS

There are no developer or other contributions in the Central Government Public accounts reporting.

INDIRECT TAX REVENUES

The indirect tax revenue calculation is based upon the loss of fuel taxation revenues to Central Government from the more efficient functioning of the highway network from the reduction in road works.

TRANSPORT ECONOMIC EFFICIENCY

The Transport Economic Efficiency (TEE) table reports on user benefits by consumer and business sections for time, fuel and non-fuel vehicle operating impacts.

CONSUMER USER BENEFITS

The consumer user benefit consists of private car and bus travel time, and vehicle operating costs.

BUSINESS USER BENEFITS

The business user benefits are for commercial car travel and private sector providers for Travel time and vehicle operating costs.

STATUTORY OUTPUTS

INTRODUCTION

This section presents the statutory outputs required for the North Yorkshire Lane Rental Scheme Cost Benefit analysis.

The results are presented in the opening year and over the 25-year horizon in 2010 prices as advised in WebTAG.

The discounted totals are presented at the bottom of each table. The calculation basis of each category has been presented in Sections 5, 6 and 0.

The statutory outputs consist of three categories:

- Transport Economic Efficiency (TEE)
- Public Accounts
- Cost Benefit Analysis

TRANSPORT ECONOMIC EFFICIENCY (TEE)

The TEE table presents the net user benefits of travel time, fuel and non-fuel vehicle operating costs disaggregated by trip purpose between non-business consumers and business users, including transport operators and are below on Tables 64 and 65.

PUBLIC ACCOUNTS

The Public Accounts tables show the net impact to Local and Central Government and are below on Tables 66 and 67.

COST BENEFIT ANALYSIS

The items for inclusion in the central case Cost Benefit Analysis BCR and NPV are based upon the guidance specified in Annex C of TMA 2004 Decision-making and development (2nd edition) for permit schemes which specifies:

- Permit Fees are excluded from the Public Accounts table;
- Indirect Taxation is excluded from the Public Accounts table; and
- Permit Fees are not treated as a dis-benefit to business.

Revenue received from Lane Rental has been assumed to be reinvested in the authority and therefore offset in the economic appraisal as a capital cost. Tables 68 and 69 are below.

STATUTORY COST BENEFIT ANALYSIS

This study has addressed all aspects of the implementation of the North Yorkshire Lane Rental Scheme through both the direct financial and socio-economic criteria to quantify the overall economic merit of the Scheme.

The Scheme has a Benefit Cost Ratio of 3.16 and Net Present Value of £18,087,730 in current prices which are 2010 prices.

The appraisal results demonstrate that the introduction of the Lane Rental Scheme will have a net positive economic benefit.

Table 64 TEE Table Year 1

Transport Economic Efficiency (TEE) Table Year 1

Consumers	**ALL MODES**		**ROAD**	**Bus & Coach**	**RAIL**	**Other**
User benefits	**TOTAL**		**Private Cars and LGVs**	**Passengers**	**Passengers**	
Travel time	746,824		718,431	28,393	-	-
Vehicle operating costs	79,678		79,678			-
User charges	-		-	-	-	-
During Construction & Maintenance	-		-	-	-	-
NET CONSUMER BENEFITS	826,502	*-1*	798,110	28,393	-	-
Business						
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	
Travel time	520,408		285,147	234,758	502	-	-	-
Vehicle operating costs	62,237		54,408	7,829				-
User charges	-		-	-	-	-	-	-
During Construction & Maintenance	-		-	-	-	-	-	-
Subtotal	582,644	*-2*	339,555	242,587	502	-	-	-
Private sector provider impacts						**Freight**	**Passengers**	
Revenue	-				-	-	-	-
Operating costs	51,103				51,103	-	-	-
Investment costs	-				-	-	-	-
Grant/subsidy	-				-	-	-	-
Subtotal	51,103	*-3*			51,103	-		-
Other business impacts								
Developer contributions	-	*-4*	-	-	-	-	-	-

NET BUSINESS IMPACT	633,748	*(5) = (2) + (3) + (4)*
TOTAL		
Present Value of Transport Economic Efficiency Benefits	1,460,250	*(6) = (1) + (5)*

Notes: Benefits appear as positive numbers, while costs appear as negative numbers. All entries are discounted present values, in 2010 prices and values. All values £s.

Table 65 TEE Table 25 Years

Transport Economic Efficiency (TEE) Table 25 Years

Consumers	ALL MODES		ROAD	Bus & Coach	RAIL	Other
User benefits	TOTAL		Private Cars and LGVs	Passengers	Passengers	
Travel time	12,739,601		12,255,268	484,333	-	-
Vehicle operating costs	1,359,180		1,359,180			-
User charges	-		-	-	-	-
During Construction & Maintenance	-		-	-	-	-
NET CONSUMER BENEFITS	14,098,781	*-1*	13,614,449	484,333	-	-

Business							
User benefits			Goods Vehicles	Business Cars & LGVs	Passengers	Freight	Passengers
Travel time	8,877,305		4,864,149	4,004,585	8,572	-	-
Vehicle operating costs	1,061,657		928,108	133,549			-
User charges	-		-	-	-	-	-
During Construction & Maintenance	-		-	-	-	-	-
Subtotal	9,938,963	*-2*	5,792,257	4,138,134	8,572	-	-

			Freight	Passengers	
Revenue	-		-	-	-
Operating costs	871,737		871,737	-	-
Investment costs			-	-	-
Grant/subsidy			-	-	-
Subtotal	871,737	*-3*	871,737	-	-

Developer contributions	-	*-4*	-	-	-	-	-
NET BUSINESS IMPACT	10,810,699	*(5) = (2) + (3) + (4)*					

TOTAL

Present Value of Transport Economic Efficiency Benefits	24,909,480	*(6) = (1) + (5)*

Notes: Benefits appear as positive numbers, while costs appear as negative numbers. All entries are discounted present values, in 2010 prices and values. All values in £s.

Table 66 PA Table Year 1

Public Accounts (PA) Table Year 1

	ALL MODES		ROAD	BUS and COACH	RAIL	OTHER
Local Government Funding	**TOTAL**		**INFRASTRUCTURE**			
Revenue	-3,675,655		-			-3,675,655
Operating Costs	483,270		-			483,270
Investment Costs	3,794,761		-			3,794,761
Developer and Other Contributions	-		-	-	-	-
Grant/Subsidy Payments	-		-	-	-	-
NET IMPACT	602,375	*-7*	-	-	-	602,375
Central Government Funding: Transport						
Revenue	-		-			-
Operating costs	-		-			-
Investment Costs	-		-			-
Developer and Other Contributions	-		-	-	-	-
Grant/Subsidy Payments	-		-	-	-	-
NET IMPACT	-	*-8*	-	-	-	-
Central Government Funding: Non-Transport						
Indirect Tax Revenues	0	*-9*	0	-	-	-
TOTALS						
Broad Transport Budget	602,375	*(10) = (7) + (8)*				
Wider Public Finances	0	*(11) = (9)*				

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values. All values in £s.

Table 67 PA Table 25 Years

Public Accounts (PA) Table 25 Year

	ALL MODES		ROAD	BUS and COACH	RAIL	OTHER
Local Government Funding	**TOTAL**		**INFRASTRUCTURE**			
Revenue	-63,582,369		-			-63,582,369
Operating Costs	8,243,803		-			8,243,803
Investment Costs	63,701,474		-			63,701,474
Developer and Other Contributions	-		-	-	-	-
Grant/Subsidy Payments	-		-	-	-	-
NET IMPACT	8,362,908	*-7*	-	-	-	8,362,908
Central Government Funding: Transport						
Revenue	-		-			-
Operating costs	-		-			-
Investment Costs	-		-			-
Developer and Other Contributions	-		-	-	-	-
Grant/Subsidy Payments	-		-	-	-	-
NET IMPACT	-	*-8*	-	-	-	-
Central Government Funding: Non-Transport						
Indirect Tax Revenues	0	*-9*	0	-	-	-
TOTALS						
Broad Transport Budget	8,362,908	*(10) = (7) + (8)*				
Wider Public Finances	0	*(11) = (9)*				

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values. All values in £s.

Table 68 AMCB Year 1

Analysis of Monetised Costs and Benefits Year 1

Noise	-		*-12*
Local Air Quality	-		*-13*
Greenhouse Gases	115,224		*-14*
Journey Quality	-		*-15*
Physical Activity	-		*-16*
Accidents	-205		*-17*
Economic Efficiency: Consumer Users (Commuting)	826,502	*(1a)*	
Economic Efficiency: Consumer Users (Other)	-	*(1b)*	
Economic Efficiency: Business Users and Providers	633,748		*-5*
Wider Public Finances (Indirect Taxation Revenues)	21,504	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*	
Present Value of Benefits (see notes) (PVB)	1,553,765	*(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)*	
Broad Transport Budget	602,375		
Present Value of Costs (see notes) (PVC)	602,375		
OVERALL IMPACTS			
Net Present Value (NPV)	951,390		
Benefit to Cost Ratio (BCR)	2.58		

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions. All values in £s.

Table 69 AMCB 25 Years

Analysis of Monetised Costs and Benefits 25 Years

Noise	-	*-12*
Local Air Quality	-	*-13*
Greenhouse Gases	1,911,479	*-14*
Journey Quality	-	*-15*
Physical Activity	-	*-16*
Accidents	-3,500	*-17*
Economic Efficiency: Consumer Users (Commuting)	14,098,781	*(1a)*
Economic Efficiency: Consumer Users (Other)	-	*(1b)*
Economic Efficiency: Business Users and Providers	10,810,699	*-5*
Wider Public Finances (Indirect Taxation Revenues)	366,821	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Present Value of Benefits (see notes) (PVB)	26,450,638	*(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)*
Broad Transport Budget	8,362,908	*-10*
Present Value of Costs (see notes) (PVC)	8,362,908	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	18,087,730	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	3.16	BCR=PVB/PVC

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions. All values in £s.

NORTH YORKSHIRE LANE RENTAL SCHEME CBA RESULTS

INTRODUCTION

This section summarises the findings of the North Yorkshire Lane Rental Scheme Cost Benefit Analysis and consider the impact on the Highway Authority.

NORTH YORKSHIRE HIGHWAY AUTHORITY COST BENEFIT ANALYSIS

In addition to the statutory results presentation, an additional BCR and NPV is presented from the perspective of the Highways Authority (Table 70), which includes the cost recovery from Lane Rental charges and includes the effect of indirect taxation. The summary of benefits is presented in Table 71

Table 70 Highway Authority North Yorkshire Cost Benefit results

Highway Authority Assessment	Opening Year	25 Year
Net Present Value of Benefits	£1,553,765	£26,450,638
Net Present Value of Costs	£602,375	£8,362,908
Net Present Value of Permit Scheme	£951,390	£18,087,730
Benefit to Cost Ratio	**2.58**	**3.16**

Table 71 Benefits Summary Values and Percentage impact 25 Years

Benefits	Value	Percentage of Total Benefit
Consumer Travel Time	£12,739,601	48%
Consumer Vehicle Operating Costs	£1,359,180	5%
Business Travel Time	£8,877,305	34%
Business Vehicle Operating Costs	£1,061,657	4%
Private Sector Provider Operating Costs	£871,737	3%
Reduction in Fuel Revenue	£366,821	1%
Greenhouse Gases	£1,911,479	7%
Accidents	-£3,500	0%
Net Present Value of Benefits	**£26,450,638**	

The Scheme has a Benefit Cost Ratio of 3.16 and Net Present Value of £18.0m 2010 prices which suggest the North Yorkshire Lane Rental Scheme would be both viable and beneficial for the Highway Authority and the population of North Yorkshire.

The higher BCR and NPV are attributable to the net benefit of adding Lane Rental charges and indirect taxation to the assessment and the difference in opening year.

The projected discounted benefits in the opening year of £1.55m includes a reliability adjustment of 20% for urban roads and has been assessed at a local level. This is an increase in the estimated suggested benefit in the DfT report in Section 3.7 however this is using local not national data.

SENSITIVITY ANALYSIS

A series of sensitivity tests have been performed on the 25-year appraisal to further understand the economic performance of the Scheme and its effects at different policy levels.

Table 72 Works Moving Off-Peak Sensitivity

Works Off-peak Sensitivity	
Works Off-peak	**BCR**
5% Off-peak	-0.31
10% Off-peak	0.07
15% Off-peak	0.46
20% Off-peak	0.85
25% Off-peak	1.23
30% Off-peak	1.62
35% Off-peak	2
40% Off-peak	2.39
45% Off-peak	2.78
50% Off-peak	3.16

Table 73 below presents the Present Value of Benefits (PVB) and Present Value of Costs (PVC) achieved based the % of Lane Rental to the network.

Table 73 % Lane Rental Sensitivity

% Lane Rental Sensitivity		
%	**PVB**	**PVC**
1	3,642,445	3,531,517
2	7,284,889	4,302,669
3	10,927,334	5,073,821
4	14,569,778	5,844,973
5	18,212,223	6,616,124
6	21,854,667	7,387,276
7	25,497,112	8,158,428
8	29,139,557	8,929,580
9	32,782,001	9,700,732
10	36,424,446	10,471,883

APPENDIX A

Traffic Sensitive Network. See attached.

APPENDIX B

Lane Rental 7.27% Congested Streets. See attached.

APPENDIX C

QUADRO outputs. See attached.

APPENDIX D

Sample Sites QUADRO Results Summary. See attached.

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