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Norwich Northern Distributor Road Traffic and Economic Assessment Report

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List of Contents	Page
Chapters and Appendices	
1	Introduction
2	Traffic Modelling
2.1	The 2002 NATS Traffic Model Overview
2.2	Model Periods and Units
2.3	The Modelled Area
2.4	Network Coding
2.4.1	Roads (Links)
2.4.2	Traffic Signals
2.4.3	Roundabouts
2.4.4	Priority Junctions
2.4.5	Centroid Connectors
2.4.6	Bus Priority
2.5	Trip Matrix Data
2.5.1	Observed Data
2.5.2	Unobserved Data
2.6	Base Matrix Desire Lines
2.7	Assignment Method
2.8	Base Model Validation
3	Forecasting
3.1	Trip Growth Assumptions
3.2	Do Minimum Networks
4	Effects of Scheme Options
4.1	Predicted Traffic Flows
4.2	Predicted Journey Times
4.3	Effects on Accidents
5	Economic Performance of Options
5.1	Methodology
5.1.1	Capital Costs
5.2	Results
Appendix A: Projected Traffic Flows	
Appendix B: TUBA Outputs Showing Economic Benefits	

Figures

Figure 2.1: RSI Site Traffic Flow Profile	3
Figure 2.2: Extent of Simulation Detail Coding	5
Figure 2.3: NATS RSI Survey Sites 2001/2002	8
Figure 2.4: 2002 NATS Model Desire Lines (Derived AADTs)	10
Figure 4.1: Illustrative Journey Time Route	16
Figure A.1: Modelled Norwich Area 2025 AADT Flows for Western Options	A-3
Figure A.2: Modelled Norwich Area 2025 AADT Flows for Western Options	A-4
Figure A.3: Modelled Northern Distributor Route 2025 AADT Flows for Western Options	A-5
Figure A.4: Modelled Northern Distributor Route 2025 AADT Flows for Eastern Options	A-6

Tables

Table 2.1 Base Year Sector Matrices (AADT)	9
Table 2.2: Generalised Cost Assignment Parameters	11
Table 3.1: TEMPRO Reference Growth Including Fuel Price and Income Factors	13
Table 4.1: Predicted Journey Times on A1074/A1042 East/West Route Including Outer Ring Road Northern Sector, 2010	17
Table 4.2: Predicted Journey Times on A1074/A1042 East/West Route Including Outer Ring Road Northern Sector, 2025	17
Table 4.3: Predicted Journey Times Between A47 and Norwich Airport With and Without NNDR, 2025	19
Table 4.4: Predicted Journey Times Between A11 and Norwich Airport With and Without NNDR, 2025	20
Table 4.5: Summary of Changes in Accidents per annum	21
Table 5.1 Economic Appraisal Assumptions	22
Table 5.2: Option Costs (£000's, September 2004 Prices, 15% Contingencies)	23
Table 5.3: Assumed Phasing of Costs	24
Table 5.4: Assumed Profile of Maintenance Costs	24
Table 5.5: TUBA Economic Assessment Summary	24

1 Introduction

A Norwich Northern Distributor Road (NNDR) is proposed as part of the proposed revised Norwich Area Transport Strategy (NATS). The existing NATS traffic model, originally built in 1990, has been fully updated to be capable of assessment of major elements of the proposed Strategy, including the proposed NNDR.

The comprehensive update of the model involved building new demand matrices from some 63 Roadside Interview Survey (RIS) sites and a complete review of the network coding.

The updated traffic model has been built using the latest version of the SATURN suite of programs.

The building, calibration and subsequent validation of the traffic model has been undertaken in accordance with the Design Manual for Roads and Bridges (DMRB) Volume 12 "Traffic Appraisal of Road Schemes".

This Traffic and Economic Assessment Report has been prepared with reference to DMRB Volume 5 Section 1 Part 2 TD37/93 'Scheme Assessment Reporting'. It provides the traffic and economic assessment information required at Stage 2 of scheme assessment reporting which identifies the factors to be taken into account in choosing alternative routes.

This report provides an overview of the base model and a description of the modelling undertaken in relation to assessment of the NNDR. The predicted effects of the scheme options on traffic flows and journey times are reported and a summary provided of the economic performance of the options.

2 Traffic Modelling

2.1 The 2002 NATS Traffic Model Overview

The SATURN Norwich Area Transport Strategy Model was originally built in 1990, based on 1989 survey data. Since this time there have been numerous updates to the model using then-current traffic count data to recalibrate the matrices and changes to the network coding to reflect changes to the highway network.

The 2002 NATS model has been fully updated. It is based on some 63 roadside interview sites undertaken during Autumn 2001 and Spring 2002. The network coding has been fully updated, incorporating the latest available signal data from the Urban Traffic Control Unit and the then-current bus routings and frequencies.

The SATURN model currently comprises two validated AM and PM peak period models and includes two user-classes, Light and Heavy vehicles. The model includes the whole of the urban area of Norwich in simulation level of detail, extending as far as, and including, the A47 Norwich Southern Bypass to the south of the city. The remainder of the county of Norfolk is included in buffer detail, using speed-flow curves based on the COBA relationships.

Full details of the model building and validation processes are contained within the **Norwich Area Transport Strategy 2002 Traffic Model Local Model Validation Report (LMVR)**, with details of the traffic counts, interviews and journey time surveys contained within the **Norwich Area Transportation Strategy Survey Report (Survey Report)**.

2.2 Model Periods and Units

12-hour (07:00 to 19:00) origin-destination surveys were undertaken in order to build traffic models representing the morning and evening peak periods and the interpeak period (see section 2.5 for further details).

Figure 2.1 shows the traffic flow profile for each half hour of the survey period based on the Manual Classified Counts undertaken at the RIS sites.

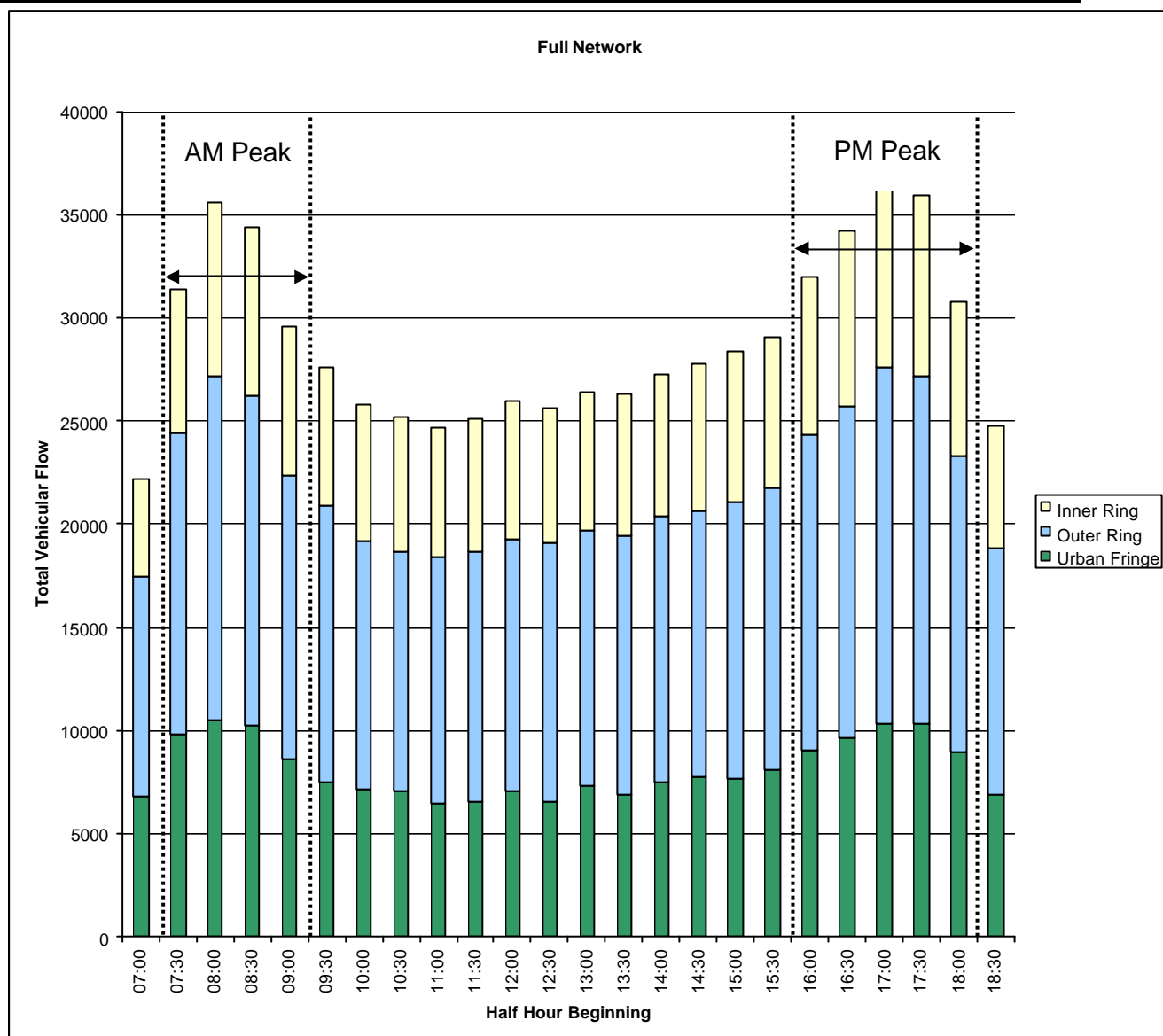


Figure 2.1: RSI Site Traffic Flow Profile

Based on this information and with reference to DMRB Volume 12, Section 2, Part 1, Appendix D, the following model periods were selected:

- AM Peak 07:30 to 09:30
- PM peak 16:00 to 18:30

Matrices for each of the above periods have been built and assigned separately. Assessment of the NNDR has been based on the AM and PM peak period models, representing a total of 4.5 hours of the day.

The traffic model assignments are average hour assignments for the peak periods.

Origin-destination and count data has been collected using detailed categories, for use in economic and environmental appraisals. However, for the purposes of matrix

building and assignment, vehicles have been classified as either light vehicles (cars, taxis, minibuses or Light Goods Vehicles) or heavy vehicles (Other Goods Vehicles classes one and two and coaches).

Service buses are preloaded onto the modelled network and therefore do not feature in the matrices of trips to be assigned.

The matrices and fixed flows were converted to Passenger Car Units (PCUs) for consistency with the unit of measurement of saturation flows used in the calculation of junction capacities. Light vehicle matrices used a factor of 1.0 whilst heavy vehicle matrices and bus flows used a factor of 2.0 to convert from vehicles to PCUs.

DMRB advice is to use locally derived factors to convert peak flows to Annual Average Daily Traffic (AADT). Projected future year AM and PM peak period flows on the highway network have been converted to AADT figures using factors derived from a permanent traffic count site on the A146 Trowse Bypass, a principal arterial route into the city. This indicates that the AADT is equal to 5.70 times the sum of the AM and PM peak period average hourly flows (in vehicles). It is assumed that this factor is representative of flows in the modelled area.

2.3 The Modelled Area

Geometric data defining the road network exists in two formats; “simulation” format for the built up area and “buffer” format for the remainder of the county. Simulation data includes detailed junction data such as number of lanes, traffic signal stagings and timing, roundabout and give-way parameters, whilst buffer data is based on link modelling using speed/flow curves. The simulation data has been verified and updated through on-street observations of all roads and junctions on modelled traffic routes within the urban area. **Figure 2.2** shows the extent of the detailed simulation network coding.

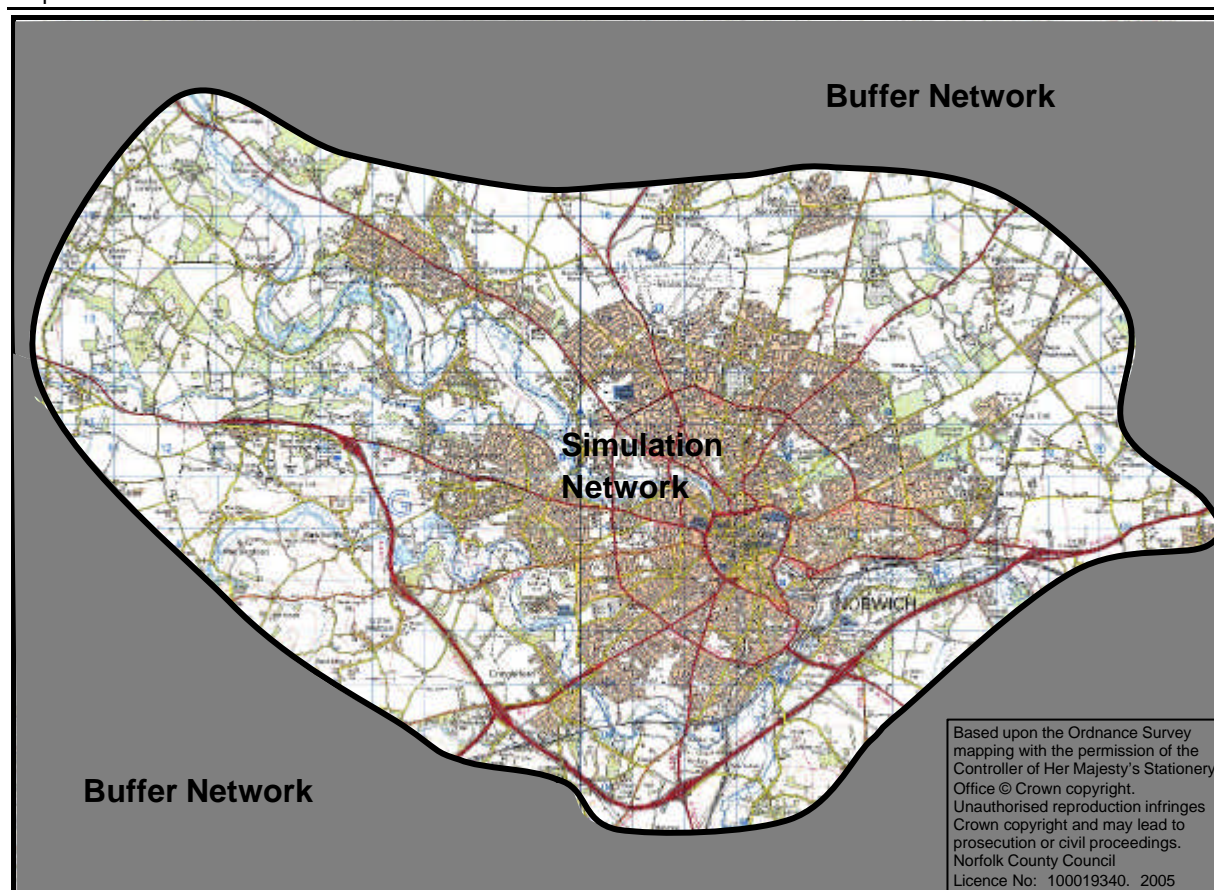


Figure 2.2: Extent of Simulation Detail Coding

2.4 Network Coding

2.4.1 Roads (Links)

In the buffer area of the model, all roads have been assigned speed-flow curves based on the COBA10 default speed-flow curves for the appropriate class of road. Within the simulation area, journey times are governed principally by delays at junctions. As such, simulation links have been assigned average journey speeds based on free-flow conditions, though speed-flow curves have been applied to some of the arterial routes on the urban fringes and to the A47 Southern Bypass.

2.4.2 Traffic Signals

Current maintenance plans were obtained from NCC's UTC (Urban Traffic Control) unit to ensure modelled signal layouts and staging arrangements are correct. Current signal timings have also been obtained, where possible, though the UTC. The data has been processed to ensure monitored green times correctly relate to on-street green times for coding into SATURN.

2.4.3 Roundabouts

Roundabouts have been coded to be consistent with the capacity formulae used in the TRL's junction modelling software ARCADY, using the process outlined within the SATURN manual.

2.4.4 Priority Junctions

SATURN uses gap acceptance formulae to predict the operation of priority junctions, unlike the standard UK junction assessment tool PICADY which uses a simple empirically derived linear relationship between capacity and the opposing flow. Saturation flows and critical gaps for priority junctions have therefore been based on values quoted within the American Highway Capacity Manual.

2.4.5 Centroid Connectors

Centroid connectors provide the link between the model zones and the coded highway network. The centroid connectors are coded to represent representative speeds and distances between the centre of the zone and the point at where the traffic from the zones enter or leave the physical network. Some zones have several zone connectors, representing the fact that vehicles may enter or leave the physical network at different locations, depending on the origin or destination of the trip.

2.4.6 Bus Priority

Bus lanes have been coded as additional links, available only to buses. As discussed in Chapter 5, buses are not assigned to the network, but are pre-loaded fixed route trips, based on current published routings and frequencies. The specified routings of the buses reflect the bus link coding. Bus gates and bus only turns are also specified within the model.

2.5 Trip Matrix Data

2.5.1 Observed Data

Origin-destination surveys were undertaken during autumn 2001 and spring 2002 at the locations shown in **Figure 2.3**. Some 62 sites were planned, with an additional site on the A47 made available through the Highways Agency. The majority of surveys were located on three cordons:

1. the urban fringe
2. the outer ring road
3. the inner ring road

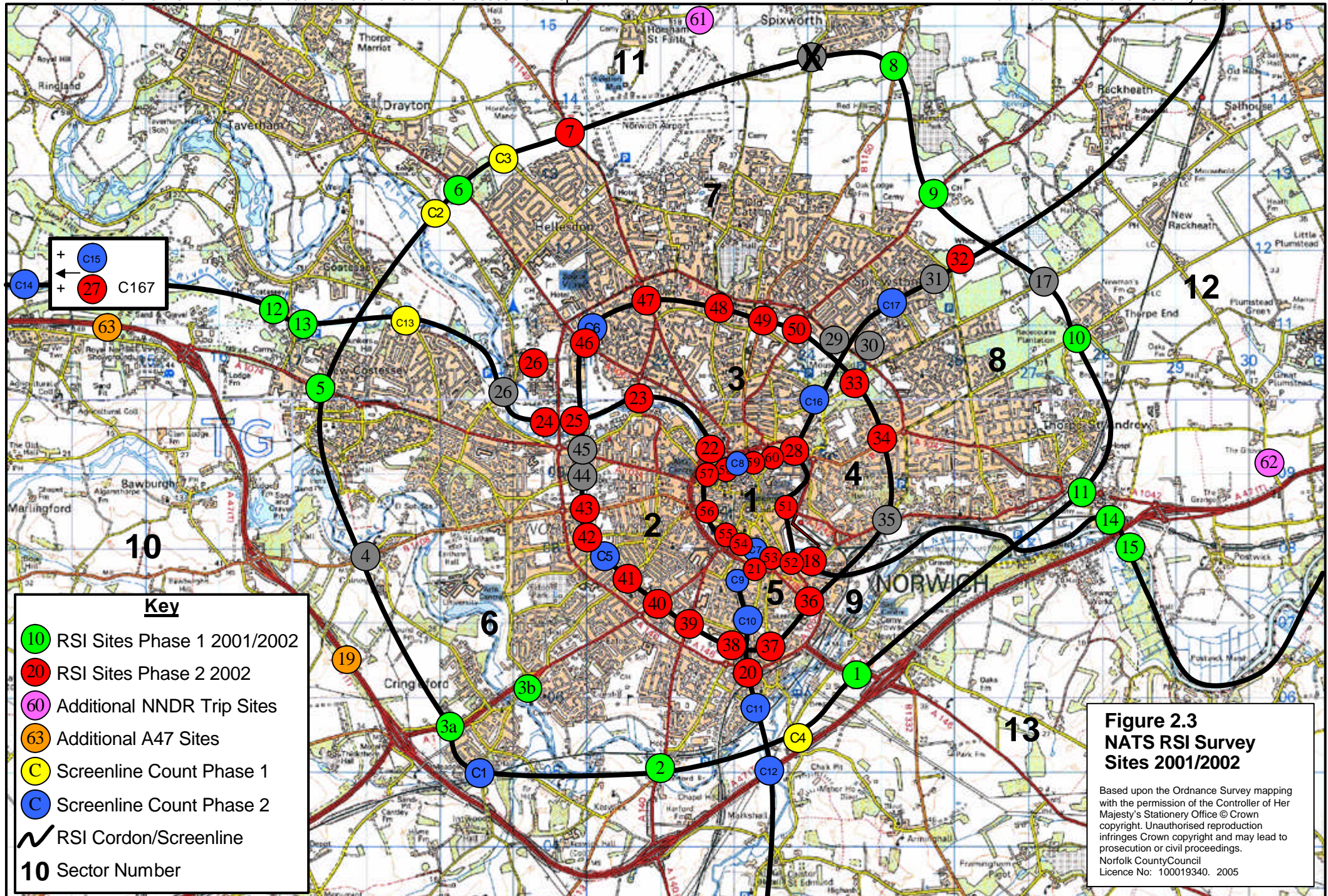
In addition, surveys took place on two arterial screenlines (north-south and east-west), which divided the model up into 13 sectors. The majority of surveys were undertaken in the outbound direction only, which allowed respondents to identify where in the city they had parked. In accordance with DMRB guidance, sites on routes for which the proposed NNDR is likely to have the biggest impact in terms of traffic flows, were interviewed in both directions.

A total of five surveys did not form part of the cordons. Three of the sites were located so as to capture traffic outside of the formally validated model area which may switch to a new NNDR. The remaining two sites were located on the A47 to capture the majority of traffic using the southern bypass, which lies outside of the formally validated area.

The origin and destination surveys were undertaken during the neutral survey days in October 2001 and Summer 2002. The first phase during October 2001 involved surveying the majority of the urban fringe sites, with the remaining sites undertaken during summer 2002. **Figure 2.3** indicates during which phase the surveys took place.

Wherever possible, origin and destination data was gathered by directly interviewing a sample of the traffic passing through the site. However, at some survey locations, such as near traffic lights, or in areas where interviews were not feasible, self-completion postcards were handed to motorists to complete. Some survey sites used a mixture of interviews and postcards to either increase the sample rate or to avoid congestion during peak periods.

The Survey Report of May 2003 details the site locations, the dates of the sites, the method of interview and the sample rate achieved.



2.5.2 Unobserved Data

The observed OD data do not include short trips occurring within the sectors bounded by the screenlines. Initial estimates of these intrasector flows were based on the 2001 NATS model flow predictions for the current year. These in turn were based initially on a gravity model and subsequently updated using ME² matrix manipulation. The intrasector trips form a relatively small proportion (approximately 13% of the final matrices) of the overall matrices but are important because they greatly effect the levels of congestion on the road network and hence the assignment of traffic.

Due to the nature of the highway network in Norwich, the level of congestion in the urban areas can actually affect the total flows across the screenlines due to the available choice for many sector to sector movements of either driving through the city or taking one of a number of orbital routes. Therefore, in order to provide an updated estimate of the intrasector trips, Matrix Estimation (ME²) has been undertaken using a series of Manual Classified Turning Counts (MCTCs) specifically located to intercept the majority of likely intrasector movements.

The **Survey Report** of May 2003 details the Matrix Estimation site locations and the **LMVR** provides further details of the methodology and the results of Matrix Estimation undertaken.

2.6 Base Matrix Desire Lines

The full base year AADT Sector matrices are provided in **Table 2.1**, below. The table indicates the numbers of trips between the 13 numbered sectors enclosed between survey cordons and screenlines as shown on Figure 2.3. It should be noted that only those trips passing through the survey cordons and sites are represented. Those trips within the County not to, from or through the Norwich area are not represented.

Table 2.1 Base Year Sector Matrices (AADT)

	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	12,700	2,600	4,300	2,800	1,400	3,700	2,800	2,000	200	6,900	6,000	2,300	2,800	50,500
2	4,700	9,400	2,100	1,900	4,400	7,000	3,200	1,900	300	6,000	4,700	1,800	1,800	49,200
3	2,700	2,200	9,600	2,200	400	2,800	4,300	2,200	200	2,800	4,900	1,200	800	36,300
4	2,100	1,600	2,300	2,500	300	1,500	1,100	1,400	100	2,300	2,300	1,300	600	19,400
5	1,400	2,900	600	400	500	1,100	1,400	1,000	100	1,200	1,500	800	700	13,600
6	4,000	7,200	2,800	1,800	1,100	22,600	4,400	2,700	400	12,600	4,700	2,100	2,000	68,400
7	2,800	3,400	4,500	1,200	1,200	4,300	14,800	11,000	300	4,800	9,900	1,700	900	60,800
8	2,300	2,200	2,600	1,600	900	2,600	9,100	4,500	700	2,400	3,600	4,000	800	37,300
9	200	400	200	200	200	800	300	700	100	800	400	300	100	4,700
10	7,400	7,000	3,200	2,700	1,400	13,500	5,500	2,800	800	4,500	6,900	4,200	2,900	62,800
11	7,400	5,700	5,900	2,900	1,900	5,400	11,900	4,400	400	6,600	3,300	1,600	1,300	58,700
12	3,000	2,200	1,600	1,700	1,000	2,200	2,200	5,100	400	5,900	1,300	500	700	27,800
13	3,400	2,200	900	800	900	2,000	1,000	1,000	100	2,700	1,300	1,000	-	17,300
Tot.	54,100	49,000	40,600	22,700	15,600	69,500	62,000	40,700	4,100	59,500	50,800	22,800	15,400	506,800

Figure 2.4 shows the above information graphically as 'desire lines' for the base year matrix. Trips to, from and through Sectors 1 to 5 (the city centre within the Outer Ring Road) have been omitted for clarity, as it is not these sector movements that the NNDR will directly serve.

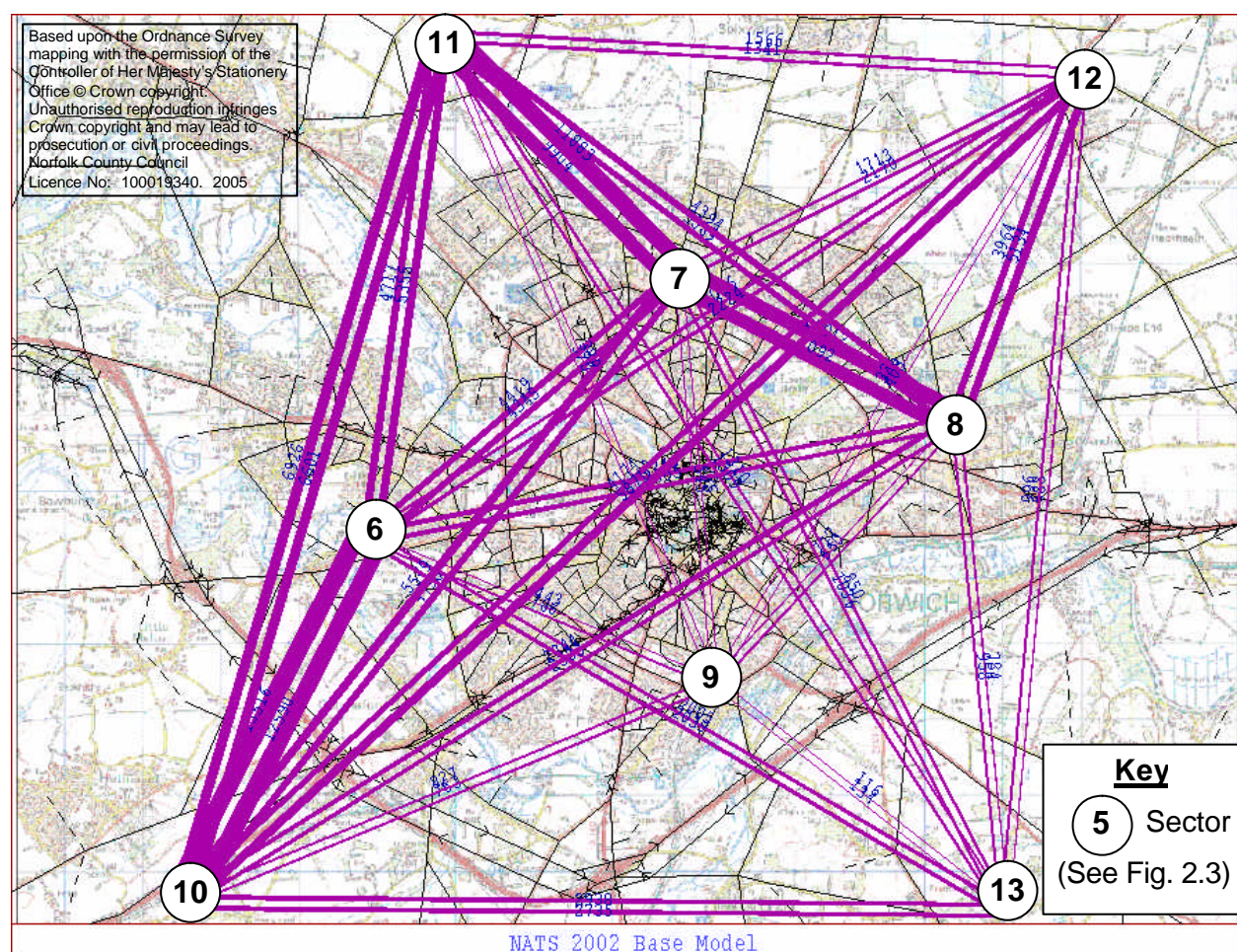


Figure 2.4: 2002 NATS Model Desire Lines (Derived AADTs)

2.7 Assignment Method

Assignment has been based on Wardrop's Principle of traffic equilibrium. SATURN's capability to model junction delays in the simulation network means that the model is sometimes described as a 'congested assignment' model.

Travel 'costs' are calculated as the sum of the monetary values of travel time, travel distance and any other 'costs'. The choice of the relative importance of the cost of time or distance can affect the assignment of flows within the model.

Equilibrium assignment is based on arranging traffic on the network such that the travel 'costs' on each route used between each origin and destination are equal to the minimum 'cost' of travel and all unused routes have equal or greater cost.

Suggested values for the cost of time or distance were initially based on information within the TEN (Transport Economics Note April 2001 Version).

However, it became apparent from the assignments that traffic in the model was choosing to route through the city on direct arterial routes rather than use the orbital routes, such as the southern bypass. This effect was also exhibited to an even greater degree in the previous version of the NATS model, which used a 'pure cost' (travel time only cost) in order to achieve a more realistic balance of flows on the road network.

Sensitivity tests were undertaken to examine the effects of pure cost assignments, but it was found that the assignments best matching DMRB validation criteria were achieved by halving the calculated values of travel cost for both vehicle classes, as shown in **Table 2.2**, below.

Table 2.2: Generalised Cost Assignment Parameters

User Class	Calculated Cost of Time (Pence Per Minute)	Calculated Cost of Distance (Pence per Kilometre)	Adopted Cost of Distance (Pence per Kilometre)
1 – Light Vehicles	16.99	9.20	4.60
2 – Heavy Vehicles	12.45	28.23	14.11

2.8 Base Model Validation

The LMVR provides full details of the validation of the base model. DMRB Volume 12 sets out various criteria for acceptable traffic flow and journey time validation. The criteria are based on:

- Total screenline flows - the model meets these criteria in both AM and PM peaks
- Correlation of counts to modelled flows - the model meets the regression line slope criteria and the correlation criteria in the AM peak, and in the PM the regression line slope criteria are met and the correlation criteria is 0.94 (this is considered acceptable for a large urban model, the target value being 0.95)
- Comparison of modelled flows against count confidence ranges - the model meets the criteria in the AM peak. In the PM peak, for independent counts of less than 700 vph, 85% of the modelled flows are within 121 vph of the count (this is considered acceptable for a large urban model, the target value being 100 vph)
- Comparison of independent counts and modelled flows using the GEH statistic - 85% of comparisons in the AM peak achieve a GEH of <7. In the pm peak, 83% of comparisons achieve a GEH of <7 (this is considered acceptable for a large urban model, the target value being GEH of <5)
- Journey time validation criteria are achieved in both AM and PM peaks

For links with relatively low flows, the presence of zone connections from relatively large zones can mean that it is difficult to achieve the target GEH. However, it is clear from the comparison of modelled flows against count confidence ranges that the model provides a good representation of traffic flows and journey times in and around Norwich in both AM and PM peak periods.

3 Forecasting

3.1 Trip Growth Assumptions

The assumed opening year of the NNDR is 2010, with a design year of 15 years thereafter, 2025. Forecasting has been based on applying growth factors from the TEMPRO database, reflecting the government's National Trip End Model (NTEM) of traffic growth. TEMPRO growth factors are a 'Reference Case' for use in elastic assignment models which have the ability to adjust the actual number of trips between different locations within the modelled area based on the predicted travel times and distances in the future year assignments.

The TEMPRO reference case growth adopted for the model, based on the Norwich Area (Norwich, Broadland and South Norfolk), and including fuel price and income adjustment factors, are shown in **Table 3.1**.

Table 3.1: TEMPRO Reference Growth Including Fuel Price and Income Factors

Period	2002 to 2010	2002 to 2025
AM Peak Period	1.22	1.52
PM Peak Period	1.21	1.50

Consistent with adopting NTEM TEMPRO growth factors, with appropriate fuel price and income adjustment factors, elastic assignments have been undertaken for the future year Do Minimum and Do Something assessments. This provides an assessment of trip suppression due to congestion and induced, or additional, traffic due to travel time and distance improvements associated with the NNDR scheme.

The simple elasticity model has been based on Generalised Cost model specific elasticities calculated with reference to DMRB Volume, 12 Section 2, Part 2, Annex C, Paragraph C16. An elasticity of -0.24 has been adopted for the peak period modelling.

With reference to DMRB, 'Base Year Pivots' have been used, with future year Do Minimum and Do Something networks 'pivoting' off the base year costs and reference case trip matrices.

3.2 Do Minimum Networks

The future year Do-Minimum model includes the following changes to the 2002 base year model:

- Committed or likely major network improvements in the Norwich Area including:

-
- Completion of the dualling of the A47 between Dereham and Acle;
 - Dualling of the A11 Attleborough bypass;
 - The Cringleford Housing Link Road between a new roundabout on the A11 east of Thickthorn and the Hospital Roundabout on Colney Lane;
 - The signalisation scheme for Thickthorn (A11/A47) interchange agreed with the Highways Agency;
- Completion of the Public Transport Major Scheme in the city centre;
 - The programmed improvements to the Inner and Outer Ring Road junctions;
 - Additional Park and Ride site at Thickthorn (Sprowston and Harford already implemented since 2002);
 - Some form of city centre restraint, representing a Ring and Loop scheme, deterring through-traffic from routing through the city centre (within the Inner Ring Road);
 - Other access proposals to developments identified within the Norwich, South Norfolk and Broadland Local Plans.

4 Effects of Scheme Options

4.1 Predicted Traffic Flows

The new road is predicted to attract a significant volume of traffic under all options, with predicted traffic flows generally within the economic design range of a dual carriageway. All options attract orbital traffic that would otherwise route via the northern suburbs. All options provide an alternative north-south Norwich city centre bypass to routing through the city centre. The projected traffic flows on the western side of the NNDR, across the Wensum Valley, vary significantly depending on the option modelled, as the more western options are less attractive to north-south trips.

Figures A.1 and A.2 in Appendix A show the projected two-way Annual Average Daily Traffic (AADT) flows on key roads on the highway network in the do-minimum and do-something scenarios. **Figures A.3 and A.4** in Appendix A show the projected flows on the NNDR itself for the different alignments. The flows on the western options are shown with the eastern yellow route with the eastern options shown with the western red route. The choice of the red and yellow routes is purely for illustrative purposes to allow a comparison of traffic flows between the different eastern and western options.

4.2 Predicted Journey Times

The NNDR is predicted to have wide-reaching effects on traffic flows around the city, with associated changes in travel times. The NNDR scheme will enable traffic calming to be introduced in some form on the residential streets of the northern suburbs and on the minor roads crossing the Wensum Valley. The provision of a high quality orbital route will provide an attractive alternative to the orbital residential and minor roads, relieving them of undesirable through-traffic, with the traffic calming 'locking in' the benefits of the NNDR. This has been reflected in the model for the do-something scenarios by reducing speeds on these streets, which increases travel times on these roads.

The predicted travel time savings as a result of the NNDR are predicted to be widespread. The east/west route across the city, including the Outer Ring Road, has been illustrated as a key route the NNDR will relieve. This route is shown in **Figure 4.1**. The predicted Do Minimum journey times are shown in **Table 4.1** and **4.2**, together with the predicted journey times under the various schemes modelled.

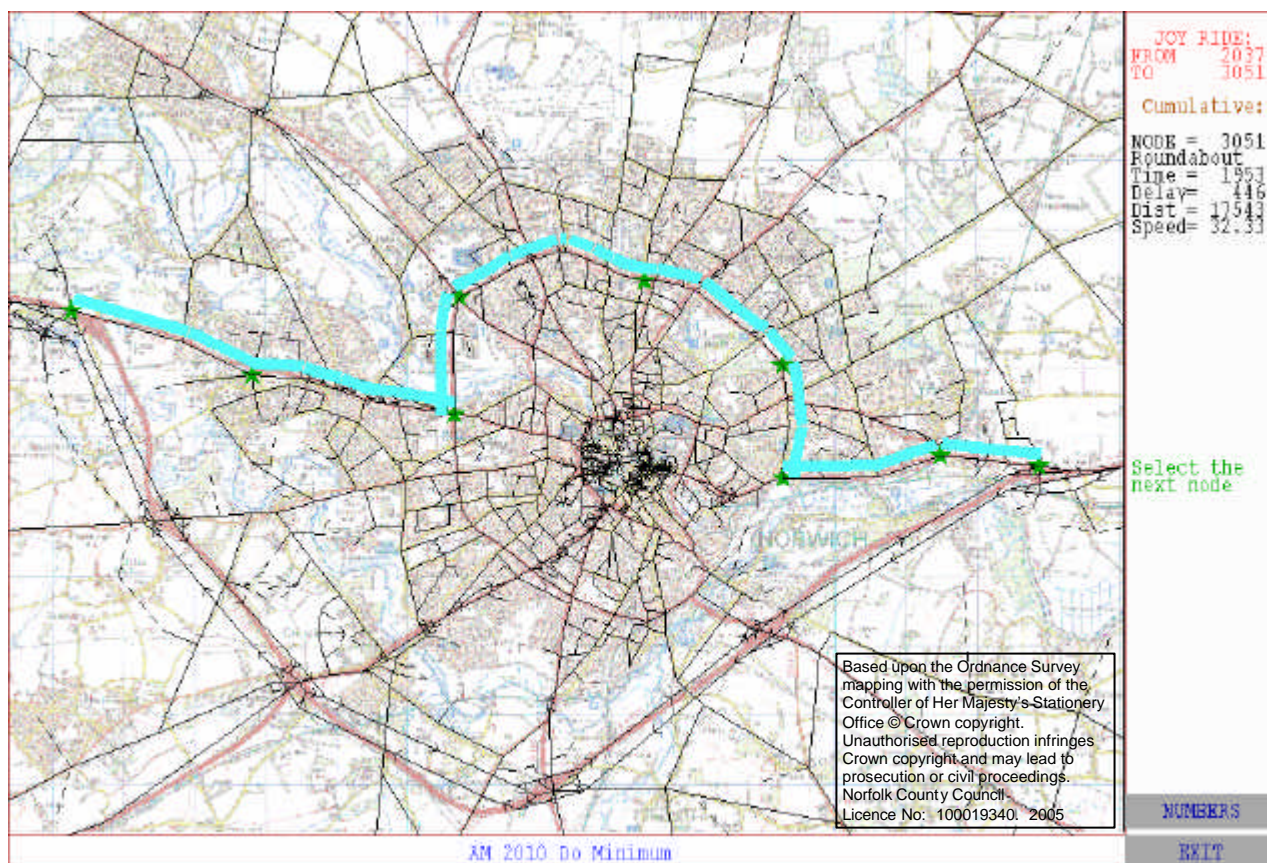


Figure 4.1: Illustrative Journey Time Route

Tables 4.1 and 4.2, below, show for illustration the predicted journey times on an east/west route across the city via the northern part of the existing outer ring road, as indicated in **Figure 4.1**. The predicted journey times are in hours : minutes : seconds.

Table 4.1: Predicted Journey Times on A1074/A1042 East/West Route Including Outer Ring Road Northern Sector, 2010

Scheme	AM Peak		PM Peak		Average	Change vs. Do Min	% Change vs. Do Min
	E'bound	W'bound	E'bound	W'bound			
Do Minimum	0:32:33	0:31:15	0:33:37	0:31:16	0:32:10	-	-
Orange/Yellow	0:29:20	0:28:37	0:31:06	0:27:57	0:29:15	0:02:55	9%
Blue/Yellow	0:28:55	0:28:41	0:30:55	0:27:56	0:29:07	0:03:04	11%
Green/Yellow	0:27:55	0:27:50	0:30:08	0:26:42	0:28:09	0:04:01	14%
Purple/Yellow	0:29:36	0:28:38	0:31:24	0:28:05	0:29:26	0:02:45	9%
Purple Alternative /Yellow	0:29:33	0:28:32	0:31:03	0:28:00	0:29:17	0:02:53	10%
Brown/Yellow	0:30:06	0:28:54	0:31:24	0:28:05	0:29:37	0:02:33	9%
Brown Alternative / Yellow	0:29:46	0:28:38	0:31:18	0:27:57	0:29:25	0:02:46	9%
Red/Yellow	0:29:27	0:28:37	0:30:59	0:28:02	0:29:16	0:02:54	10%
Red/Blue	0:29:31	0:28:49	0:31:07	0:28:26	0:29:28	0:02:42	9%
Red/Pink	0:29:35	0:26:53	0:30:11	0:27:41	0:28:35	0:03:35	12%

Table 4.2: Predicted Journey Times on A1074/A1042 East/West Route Including Outer Ring Road Northern Sector, 2025

Scheme	AM Peak		PM Peak		Average	Change vs. Do Min	% Change vs. Do Min
	E'bound	W'bound	E'bound	W'bound			
Do Minimum	0:39:10	0:35:21	0:40:56	0:37:25	0:38:13	-	-
Orange/Yellow	0:34:18	0:32:27	0:36:03	0:33:24	0:34:03	0:04:10	11%
Blue/Yellow	0:33:29	0:32:31	0:35:55	0:33:11	0:33:47	0:04:26	13%
Green/Yellow	0:31:31	0:31:41	0:35:04	0:31:37	0:32:28	0:05:45	17%
Purple/Yellow	0:34:43	0:32:52	0:36:49	0:33:42	0:34:32	0:03:41	11%
Purple Alternative /Yellow	0:34:14	0:32:57	0:36:41	0:33:47	0:34:25	0:03:48	11%
Brown/Yellow	0:35:28	0:32:59	0:36:56	0:33:33	0:34:44	0:03:29	10%
Brown Alternative / Yellow	0:34:47	0:33:00	0:36:50	0:33:39	0:34:34	0:03:39	11%
Red/Yellow	0:33:51	0:32:54	0:36:12	0:33:32	0:34:07	0:04:06	12%
Red/Blue	0:34:37	0:32:59	0:36:25	0:33:48	0:34:27	0:03:46	11%
Red/Pink	0:33:48	0:31:37	0:34:31	0:33:08	0:33:16	0:04:57	15%

These tables indicate that the NNDR will reduce the average travel time compared with the Do Minimum case for an east-west journey in peak periods across the city on the illustrative main road route by around 10% in 2010, and 13% in 2025. This represents travel time savings of up to 5 minutes, whilst at the same time, through traffic is deterred from using residential roads in the northern suburbs and minor roads in the Wensum Valley.

Examples of other travel time savings that could result from switching from existing routes to using the NNDR have been provided for trips between the A47 east and west of Norwich, and the airport. **Figure 4.2**, below, shows the assumed routings of these trips with and without an NNDR assumed to be in place. The illustrative example used is the Red-Yellow route.

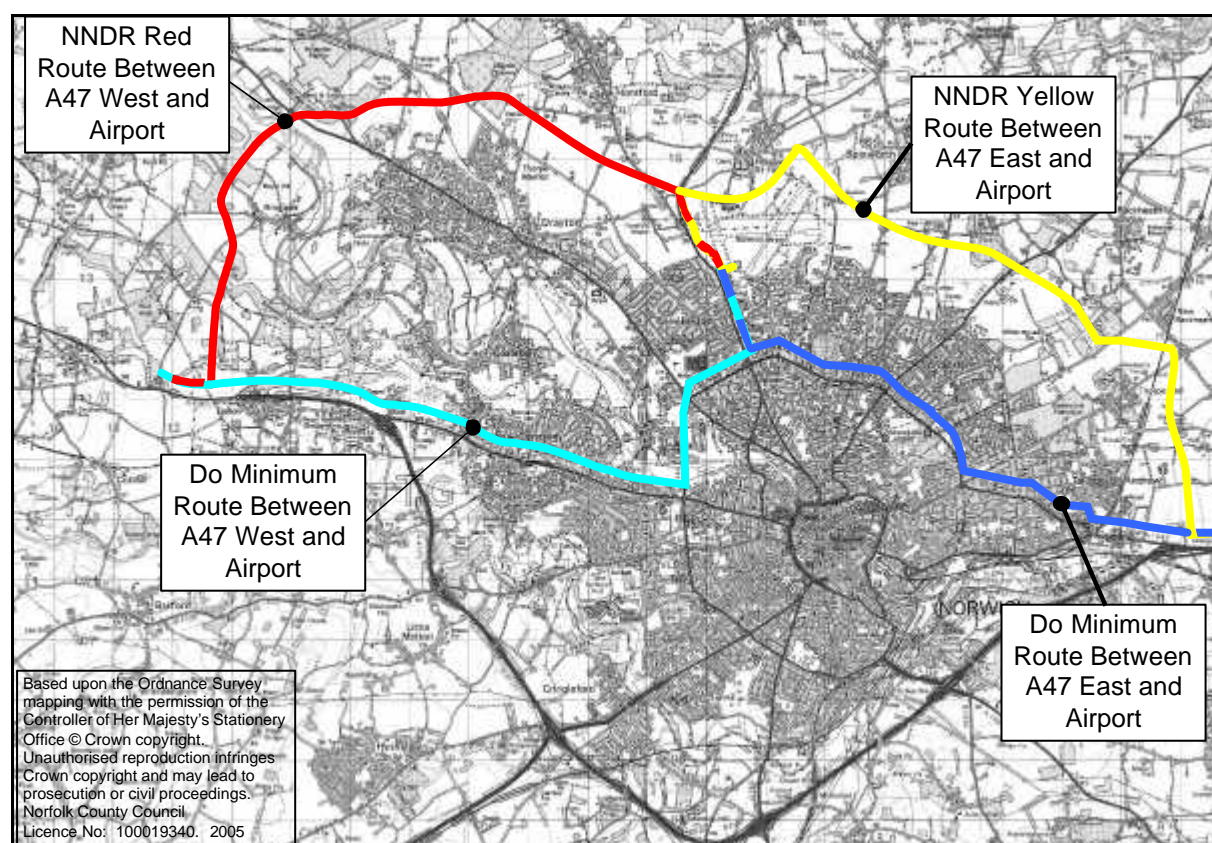


Figure 4.2: Assumed Routes Between A47 and Norwich Airport With and Without NNDR for Journey Time Analysis

Table 4.3, below, provides a comparison of modelled journey times for the above routes, with and without the NNDR for the AM peak period in the design year of 2025.

Table 4.3: Predicted Journey Times Between A47 and Norwich Airport With and Without NNDR, 2025

Scheme	AM Peak		PM Peak		Average	Change vs. Do Min	% Change vs. Do Min
	E'bound	W'bound	E'bound	W'bound			
Between A47 East and Airport							
Do Minimum	0:28:36	0:30:05	0:32:18	0:34:12	0:31:18	-	-
Eastern Yellow	0:13:08	0:16:53	0:22:44	0:16:31	0:17:19	0:13:59	45%
Between A47 West and Airport							
Do Minimum	0:28:13	0:29:49	0:27:03	0:25:22	0:27:37	-	-
Western Red	0:13:27	0:16:21	0:21:33	0:14:26	0:16:27	0:11:10	40%

The analysis indicates that the NNDR could provide large travel time savings for trips between the A47 and the airport in excess of 10 minutes.

Further analysis has been undertaken of the range of journey time savings that the NNDR could provide for north-south trips between the A11 and the airport.

Figure 4.3, below, shows the assumed routings of these trips with and without a western section of the NNDR assumed to be in place. The illustrative examples that indicate the range of journey time savings are for the western Purple, Red and Green Routes, modelled with the eastern Yellow route.

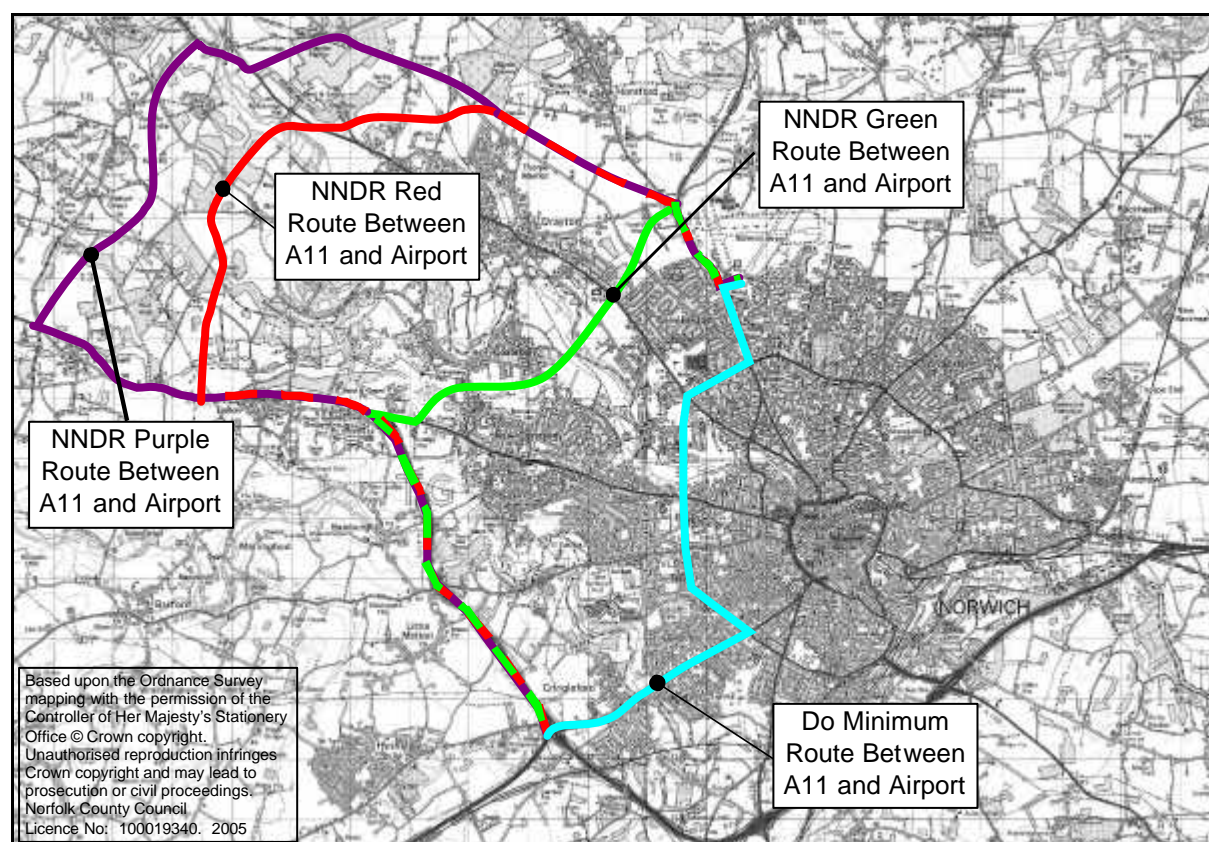


Figure 4.3: Assumed Routes Between the A11 and Norwich Airport With and Without NNDR for Journey Time Analysis

Table 4.4, below, provides a comparison of modelled journey times for the above routes, with and without the NNDR for the design year of 2025.

Table 4.4: Predicted Journey Times Between A11 and Norwich Airport With and Without NNDR, 2025

Scheme	AM Peak		PM Peak		Average	Change vs. Do Min	% Change vs. Do Min
	N'bound	S'bound	N'bound	S'bound			
Do Minimum	0:27:13	0:26:23	0:28:01	0:25:01	0:26:40	-	-
Western Purple	0:24:28	0:22:58	0:22:08	0:28:20	0:24:28	0:02:11	8%
Western Red	0:20:11	0:17:36	0:18:37	0:24:57	0:20:20	0:06:19	26%
Western Green	0:16:51	0:15:56	0:19:05	0:20:58	0:18:12	0:08:27	42%

The analysis indicates that the choice of western option could have a significant bearing on the journey time saving for this illustrative north-south route. The western options are predicted to provide savings ranging from approximately two minutes for the least direct, Purple route, through to over eight minutes for the most direct, Green route.

The journey times in this section are not intended to illustrate all possible journeys or to suggest choosing on this basis between routes.

Overall travel time savings across the Norwich Area are predicted to yield significant economic benefits as shown in the economic assessment reported in **Chapter 5**.

4.3 Effects on Accidents

A preliminary assessment has been made of the overall safety impact of the NNDR over an area including the existing outer ring road and outwards towards Attlebridge/Felthorpe/Horstead/Salhouse/Plumstead. Within the area the effect on accidents of preliminary model flows has been assessed. All major radial and orbital routes and all other links and junctions subject to flow changes of more than 25% and more than 5 personal injury accidents in the 5 years to 2002 (average 1 pia/annum) have been included.

Accident calculation is based on COBA methodology in DMRB and recent studies by TRL in report TRL335 of accident rates on modern dual carriageway roads. Traffic flows (AADT) are factored from peak model flows using the locally derived factor as in section 2.2. In the Reepham Road Drayton/Horsford, Felthorpe and Salhouse/Plumstead areas a more specific detailed assessment of access strategy and traffic management is included. The method used does not account for accident savings on the remaining minor roads which cannot be readily assessed, and 15% has been added to accident savings to allow for this.

Accident figures can be converted to casualties by multiplication by 1.4, the current casualty to accident ratio for Norfolk.

Table 4.5: Summary of Changes in Accidents per annum

Category	Change in accidents
Change in link accidents over 5 yrs (sites >1 pia/annum and $\geq \pm 25\%$ flow change)	-214.4
Change in junction accidents over 5 yrs (sites >1 pia/annum and $\geq \pm 25\%$ flow change)	-106.9
Allow 15% for change in accidents on other minor roads over 5 yrs	-48.2
Total change in accidents on existing roads over 5 yrs (a)	-369.5
NNDR accidents over 5 yrs (b)	149.9
Change in accidents over 5 yrs (a-b)	-219.6
Annual change in accidents (a-b)/5	-43.9
<i>Annual change in casualties 1.4x (a-b)/5</i>	-61.5

The NNDR is predicted to bring about a reduction in accidents.

Subject partly to the effect of accidents on minor roads, a reduction in up to 44 personal injury accidents per year or, in terms of casualties, 62 casualties per year is estimated to be achieved.

Accident reduction benefits are subject to proportions of traffic transferred from existing roads to alternative NNDR route options. Differences in accident savings between alternative NNDR route options are likely to be small in comparison with the Transport Economic Efficiency benefits.

5 Economic Performance of Options

5.1 Methodology

The Department for Transport's Transport User Benefit Appraisal (TUBA) software has been used to calculate impacts on Consumer Users, Business Users and Providers and Public Accounts. TUBA outputs are provided as **Appendix B**.

Table 5.1 outlines the assumptions used in the appraisal. The economics data used in the appraisal is that from the standard economic parameters file in TUBA version 1.6a (16th June 2004).

Table 5.1 Economic Appraisal Assumptions

Assumption	Value
Price Base	2002
Current Year	2004
Discount Factor Years 1 to 30 (% p.a.)	3.5%
Discount Factor Years 31 to 60 (% p.a.)	3.0%
Scheme Opening Year	2010
Scheme Design Year	2025
Evaluation period (years)	60 years

The appraisal was carried out by analysis of scheme costs and predicted effects on travel times and distances in the area covered by the NATS traffic model for the average hours during the AM (0730-0930) and PM (1600-1830) peak periods. Annualisation factors of 506 (2 hours x 253 days) and 632 (2.5 hours x 253) were used for the AM and PM peak periods to calculate benefits for each period.

Given the results for the peak hours it is likely that there will be some positive benefits for interpeak period, and the appraisal therefore provides a conservatively low estimate of total benefits.

Trip, time and distance skim matrices for light and heavy vehicles for the do-minimum and do-something scenarios were generated using SATLOOK for 2010, the scheme opening year, and the design year 2025, and input into TUBA. Benefits for the other years of the appraisal period have been derived in TUBA by interpolation and extrapolation of the benefits for the modelled years

Light and Heavy vehicle trip matrices were further disaggregated into the five user classes input in to TUBA using data from the 2002 NATS traffic surveys and the 'factor' option in the TUBA input matrices table.

No public transport benefits have been included in the economic analysis. However, the traffic model indicates a net reduction in travel times for buses in the Norwich area of approximately 5% with the NDR assumed to be in place. It is likely that wider

opportunities will be created by the NNDR to provide further bus priority measures for the core bus network without introducing delays for other traffic.

5.1.1 Capital Costs

The capital works costs (2002 prices) and land costs (2004 prices) of scheme options including a 15% allowance for contingencies are as follows in **Table 5.2**.

Maintenance costs in this table are based on a 40 year period.

Table 5.2: Option Costs (£000's, 15% Contingencies)

Scheme	Works	Land	Maintenance
Western options			
Orange	58,552	7,675	4,861
Blue	51,795	9,939	4,805
Green	63,003	10,706	3,190
Purple	69,669	5,773	7,240
Purple Alternative	69,116	5,773	7,274
Brown	73,092	6,439	7,665
Brown Alternative	72,540	6,439	7,699
Red	61,085	4,597	6,355
Eastern options			
Yellow	43,594	8,526	5,621
Blue	43,504	6,702	5,994
Pink	43,181	13,041	5,086

In accordance with Government Transport Appraisal Guidance and Design Manual for Roads and Bridges (DMRB) scheme assessment requirements, the above costs have been converted for economic assessment purposes.

The costs in **Table 5.2** have been converted for use in the TUBA economic assessment, as contained within the TUBA files presented in **Appendix B**, as follows:

- Costs discounted to 2002
- Preparation fees of 9% of the costs of works and land added
- Supervision fees of 5% of the costs of works and land added
- Maintenance costs factored from 40 years to 60 years, for consistency with the appraisal period
- In accordance with the latest Government advice on economic appraisal, an additional 22% uplift in capital costs has been added to allow for Optimism Bias

It should be noted that Transport Assessment Guidance (TAG) requires Optimism Bias to be included in costs for economic assessment but offers of approval for schemes exclude Optimism Bias as an incentive to tight budget control.

The following assumptions have been made regarding the phasing of costs for the purpose of economic assessment using TUBA:

Table 5.3: Assumed Phasing of Costs

	2004	2005	2006	2007	2008	2009	2010	2011
Land						25%	75%	
Preparation	10%	20%	20%	20%	25%	5%		
Supervision						45%	45%	10%
Construction						35%	60%	5%

This phasing is simplified for economic assessment purposes based on DMRB advice. In practice, later compensation payments will slightly reduce discounted costs. Maintenance costs are assumed to be incurred in stages over the 60 years following opening of the road in 2010 as follows:

Table 5.4: Assumed Profile of Maintenance Costs

	2021	2033	2044	2056	2067
Maintenance	10%	35%	10%	35%	10%

5.2 Results

Table 5.5, below, provides a summary of the economic performance of the Options tested. The TUBA outputs forming **Appendix B** provide full details of the calculated costs and benefits.

Table 5.5: TUBA Economic Assessment Summary

	Scheme	PVB	PVC	NPV	BCR
Western Options	Orange/Yellow	634.1	164.5	469.5	3.9
	Blue/Yellow	621.9	157.8	464.1	3.9
	Green/Yellow	670.9	174.7	496.2	3.8
	Purple/Yellow	490.2	172.8	317.4	2.8
	Purple Alternative/Yellow	482.3	171.7	310.6	2.8
	Brown/Yellow	517.0	179.0	338.0	2.9
	Brown Alternative/Yellow	519.9	178.1	341.8	2.9
Eastern Options	Red/Yellow	579.2	162.4	416.8	3.6
	Red/Blue	557.8	160.0	397.9	3.5
	Red/Pink	688.9	170.2	518.7	4.0

All monetary values are in £ Millions discounted to 2002, at 2002 prices

Note that the yellow and red routes have been selected to be modelled in combination with other options purely as examples, in order that a comparison between competing eastern and western options may be made.

The benefits calculated are based on travel time and vehicle operating cost savings and do not take account of any change in benefits associated with accidents.

Appendix A: Projected Traffic Flows

Figure A.1: Modelled Norwich Area 2025 AADT Flows for Western Options

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Figure A.2: Modelled Norwich Area 2025 AADT Flows for Western Options

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Figure A.3: Modelled Northern Distributor Route 2025 AADT Flows for Western Options

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Figure A.4: Modelled Northern Distributor Route 2025 AADT Flows for Eastern

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Appendix B: TUBA Outputs Showing Economic Benefits

Norwich Northern Distributor Road Traffic and Economic Assessment Report

SCHEME SPECIFIC PARAMETERS

PARAMETERS

TUBA_version 1.6
run_name NDR DUAL OY01Q4
do_min_name Do Minimum Rev J9
do_som_name **DUAL ORANGE-YELLOW** REV Q
first_yr 2010
horizon_yr 2069
modelled_yrs 2010 2025
detail Yes
current_yr 2004
print_warn All
P&R_CAR_SPEED 65.0

TIME_SLICES

*no.	duration(min)	annualisation	period	description
1	60	506	1	0730-0930
2	60	632	2	1600-1830

SCHEMES_DM

*Mode	1st Construction year	Opening_yr	Stage
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DO_MIN_COSTS

*Type	Mode	Funding	Cost	Price	RPI	RPF
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DO_MIN_PROFILE

*Year	Mode	%Const	%Land	%Prep	%Super	%Maint	%Op	%Grant	%Dev
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DO_MIN_DELAY_COSTS

*	Year	Mode	Construction		Freight	Maintenance	
			Consumer	Business		Consumer	Business

Freight

SCHEMES_DS

*Mode	1st Construction year	Opening_yr	Stage
1	2009	2010	PC

DO_SOM_COSTS

*Type	Mode	Funding	Cost	Price	RPI	RPF
C	1	cen	124352.0	F	176.60	0.97
L	1	cen	19723.0	F	187.40	1.00
P	1	cen	12967.0	F	176.60	0.97
S	1	cen	7204.0	F	176.60	0.97
M	1	cen	15722.0	F	176.60	0.97

DO_SOM_PROFILE

*Year	Mode	%Const	%Land	%Prep	%Super	%Maint	%Op	%Grant	%Dev
2004	1	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0
2005	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2006	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2007	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2008	1	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0
2009	1	35.0	25.0	5.0	45.0	0.0	0.0	0.0	0.0
2010	1	60.0	75.0	0.0	45.0	0.0	0.0	0.0	0.0
2011	1	5.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0
2021	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
2033	1	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0
2044	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
2056	1	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0
2067	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0

Economy:Economic Efficiency of the Transport System(TEE)

Consumers	ALL MODES	Road
User benefits	TOTAL	
Travel Time	262045	262045
Vehicle operating costs	3661	3661
User charges	0	0
During Construction & Maintenance	0	0
NET CONSUMER BENEFITS	265706	265706

Business	Personal	Freight
User benefits		
Travel Time	342730	239204
Vehicle operating costs	25682	7378
		18304

Norwich Northern Distributor Road
Traffic and Economic Assessment
Report

User charges	0	0	0
During Construction & Maintenance	0	0	0
Subtotal	368412	246582	121830
Private Sector Provider Impacts			
Revenue	0		0
Operating costs	0		0
Investment costs	0		0
Grant/subsidy	0		0
Subtotal	0		0
Other business Impacts			
Developer contributions	0		0
NET BUSINESS IMPACT	368412		
TOTAL			
Present Value of Transport Economic Efficiency Benefits (PVB)	634118		

Note: Benefits appear as positive numbers, while costs appear as negative numbers.
Note: All entries are present values discounted to 2002, in 2002 prices

Public Accounts		
	ALL MODES	Road
Local Government Funding	TOTAL	
Revenue	0	0
Operating costs	0	0
Investment costs	0	0
Developer Contributions	0	0
Grant/Subsidy Payments	0	0
NET IMPACT	0	0
Central Government Funding		
Revenue	0	0
Operating costs	4985	4985
Investment costs	148352	148352
Developer Contributions	0	0
Grant/Subsidy Payments	0	0
Indirect Tax Revenues	11327	11327
NET IMPACT	164664	164664
TOTAL		
TOTAL Present Value of Costs (PVC)	164664	

Note: Costs appear as positive numbers, while revenues and developer contributions appear as negative numbers.
Note: All entries are present values discounted to 2002, in 2002 prices

Analysis of Monetised Costs and Benefits

Non-Exchequer Impacts	
Consumer User Benefits	265706
Business User Benefits	368412
Private Sector Provider Impacts	0
Other Business Impacts	0
Accident Benefits	Not assessed by TUBA
Net present Value of Benefits (PVB)	634118
Local Government Funding	0
Central Government Funding	164664
Net present Value Costs (PVC)	164664
Overall Impact	
Net present Value (NPV)	469454
Benefit to Cost Ratio (BCR)	3.851
Appraisal Period	2010 to 2069

Note: 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.

Norwich Northern Distributor Road Traffic and Economic Assessment Report

SCHEME SPECIFIC PARAMETERS

PARAMETERS

TUBA_version 1.6
run_name NDR DUAL BY01K2
do_min_name Do Minimum Rev J9
do_som_name **DUAL BLUE-YELLOW** REV K
first_yr 2010
horizon_yr 2069
modelled_yrs 2010 2025
detail Yes
current_yr 2004
print_warn All
P&R_CAR_SPEED 65.0

TIME_SLICES

*no.	duration(min)	annualisation	period	description
1	60	506	1	0730-0930
2	60	632	2	1600-1830

SCHEMES_DM

*Mode	1st Construction year	Opening_yr	Stage
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DO_MIN_COSTS

*Type	Mode	Funding	Cost	Price	RPI	RPF
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DO_MIN_PROFILE

*Year	Mode	%Const	%Land	%Prep	%Super	%Maint	%Op	%Grant	%Dev
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DO_MIN_DELAY_COSTS

*	Year	Mode	Construction		Freight	Maintenance	
			Consumer	Business		Consumer	Business

Freight

SCHEMES_DS

*Mode	1st Construction year	Opening_yr	Stage
1	2009	2010	PC

DO_SOM_COSTS

*Type	Mode	Funding	Cost	Price	RPI	RPF
C	1	cen	116125.0	F	176.60	0.97
L	1	cen	22479.0	F	187.40	1.00
P	1	cen	12474.0	F	176.60	0.97
S	1	cen	6930.0	F	176.60	0.97
M	1	cen	15639.0	F	176.60	0.97

DO_SOM_PROFILE

*Year	Mode	%Const	%Land	%Prep	%Super	%Maint	%Op	%Grant	%Dev
2004	1	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0
2005	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2006	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2007	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2008	1	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0
2009	1	35.0	25.0	5.0	45.0	0.0	0.0	0.0	0.0
2010	1	60.0	75.0	0.0	45.0	0.0	0.0	0.0	0.0
2011	1	5.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0
2021	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
2033	1	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0
2044	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
2056	1	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0
2067	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0

Economy:Economic Efficiency of the Transport System(TEE)

Consumers	ALL MODES	Road
User benefits	TOTAL	
Travel Time	259172	259172
Vehicle operating costs	-494	-494
User charges	0	0
During Construction & Maintenance	0	0
NET CONSUMER BENEFITS	258678	258678

Business	Personal	Freight
User benefits		
Travel Time	339214	235279
Vehicle operating costs	24039	6325
		17714

Norwich Northern Distributor Road
Traffic and Economic Assessment
Report

User charges	0	0	0
During Construction & Maintenance	0	0	0
Subtotal	363253	241604	121649
Private Sector Provider Impacts			
Revenue	0		0
Operating costs	0		0
Investment costs	0		0
Grant/subsidy	0		0
Subtotal	0		0
Other business Impacts			
Developer contributions	0		0
NET BUSINESS IMPACT	363253		
TOTAL			
Present Value of Transport Economic Efficiency Benefits (PVB)	621931		

Note: Benefits appear as positive numbers, while costs appear as negative numbers.
Note: All entries are present values discounted to 2002, in 2002 prices

Public Accounts

	ALL MODES	Road
Local Government Funding	TOTAL	
Revenue	0	0
Operating costs	0	0
Investment costs	0	0
Developer Contributions	0	0
Grant/Subsidy Payments	0	0
NET IMPACT	0	0
Central Government Funding		
Revenue	0	0
Operating costs	4959	4959
Investment costs	142622	142622
Developer Contributions	0	0
Grant/Subsidy Payments	0	0
Indirect Tax Revenues	10226	10226
NET IMPACT	157807	157807
TOTAL		
TOTAL Present Value of Costs (PVC)	157807	

Note: Costs appear as positive numbers, while revenues and developer contributions appear as negative numbers.

Note: All entries are present values discounted to 2002, in 2002 prices

Analysis of Monetised Costs and Benefits

Non-Exchequer Impacts	
Consumer User Benefits	258678
Business User Benefits	363253
Private Sector Provider Impacts	0
Other Business Impacts	0
Accident Benefits	Not assessed by TUBA
Net present Value of Benefits (PVB)	621931
Local Government Funding	0
Central Government Funding	157807
Net present Value Costs (PVC)	157807
Overall Impact	
Net present Value (NPV)	464124
Benefit to Cost Ratio (BCR)	3.941
Appraisal Period	2010 to 2069

Note: 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.

Norwich Northern Distributor Road Traffic and Economic Assessment Report

SCHEME SPECIFIC PARAMETERS

PARAMETERS

TUBA_version 1.6
run_name NDR DUAL GY01M2
do_min_name Do Minimum Rev J9
do_som_name **DUAL GREEN-YELLOW** REV M
first_yr 2010
horizon_yr 2069
modelled_yrs 2010 2025
detail Yes
current_yr 2004
print_warn All
P&R_CAR_SPEED 65.0

TIME_SLICES

*no.	duration(min)	annualisation	period	description
1	60	506	1	0730-0930
2	60	632	2	1600-1830

SCHEMES_DM

*Mode	1st Construction year	Opening_yr	Stage
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DO_MIN_COSTS

*Type	Mode	Funding	Cost	Price	RPI	RPF
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DO_MIN_PROFILE

*Year	Mode	%Const	%Land	%Prep	%Super	%Maint	%Op	%Grant	%Dev
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DO_MIN_DELAY_COSTS

*	Year	Mode	Construction		Freight	Maintenance	
			Consumer	Business		Consumer	Business
Freight							

SCHEMES_DS

*Mode	1st Construction year	Opening_yr	Stage
1	2009	2010	PC

DO_SOM_COSTS

*Type	Mode	Funding	Cost	Price	RPI	RPF
C	1	cen	129771.0	F	176.60	0.97
L	1	cen	23412.0	F	187.40	1.00
P	1	cen	13786.0	F	176.60	0.97
S	1	cen	7659.0	F	176.60	0.97
M	1	cen	13216.0	F	176.60	0.97

DO_SOM_PROFILE

*Year	Mode	%Const	%Land	%Prep	%Super	%Maint	%Op	%Grant	%Dev
2004	1	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0
2005	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2006	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2007	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2008	1	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0
2009	1	35.0	25.0	5.0	45.0	0.0	0.0	0.0	0.0
2010	1	60.0	75.0	0.0	45.0	0.0	0.0	0.0	0.0
2011	1	5.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0
2021	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
2033	1	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0
2044	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
2056	1	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0
2067	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0

Economy:Economic Efficiency of the Transport System(TEE)

Consumers	ALL MODES	Road
User benefits	TOTAL	
Travel Time	276608	276608
Vehicle operating costs	6896	6896
User charges	0	0
During Construction & Maintenance	0	0
NET CONSUMER BENEFITS	283504	283504

Business	Personal	Freight
User benefits		
Travel Time	358082	108350
Vehicle operating costs	29342	21014

Norwich Northern Distributor Road
Traffic and Economic Assessment
Report

User charges	0	0	0
During Construction & Maintenance	0	0	0
Subtotal	387424	258060	129364
Private Sector Provider Impacts			
Revenue	0		0
Operating costs	0		0
Investment costs	0		0
Grant/subsidy	0		0
Subtotal	0		0
Other business Impacts			
Developer contributions	0		0
NET BUSINESS IMPACT	387424		
TOTAL			
Present Value of Transport Economic Efficiency Benefits (PVB)	670928		

Note: Benefits appear as positive numbers, while costs appear as negative numbers.
Note: All entries are present values discounted to 2002, in 2002 prices

Public Accounts

	ALL MODES	Road
Local Government Funding	TOTAL	
Revenue	0	0
Operating costs	0	0
Investment costs	0	0
Developer Contributions	0	0
Grant/Subsidy Payments	0	0
NET IMPACT	0	0
Central Government Funding		
Revenue	0	0
Operating costs	4191	4191
Investment costs	157663	157663
Developer Contributions	0	0
Grant/Subsidy Payments	0	0
Indirect Tax Revenues	12892	12892
NET IMPACT	174746	174746
TOTAL		
TOTAL Present Value of Costs (PVC)	174746	

Note: Costs appear as positive numbers, while revenues and developer contributions appear as negative numbers.

Note: All entries are present values discounted to 2002, in 2002 prices

Analysis of Monetised Costs and Benefits

Non-Exchequer Impacts	
Consumer User Benefits	283504
Business User Benefits	387424
Private Sector Provider Impacts	0
Other Business Impacts	0
Accident Benefits	Not assessed by TUBA
Net present Value of Benefits (PVB)	670928
Local Government Funding	0
Central Government Funding	174746
Net present Value Costs (PVC)	174746
Overall Impact	
Net present Value (NPV)	496182
Benefit to Cost Ratio (BCR)	3.839
Appraisal Period	2010 to 2069

Note: 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.

Norwich Northern Distributor Road Traffic and Economic Assessment Report

SCHEME SPECIFIC PARAMETERS

PARAMETERS

TUBA_version 1.6
run_name NDR DUAL FGY02H2
do_min_name Do Minimum Rev J9
do_som_name **DUAL PURPLE-YELLOW** REV H
first_yr 2010
horizon_yr 2069
modelled_yrs 2010 2025
detail Yes
current_yr 2004
print_warn All
P&R_CAR_SPEED 65.0

TIME_SLICES

*no.	duration(min)	annualisation	period	description
1	60	506	1	0730-0930
2	60	632	2	1600-1830

SCHEMES_DM

*Mode	1st Construction year	Opening_yr	Stage
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DO_MIN_COSTS

*Type	Mode	Funding	Cost	Price	RPI	RPF
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DO_MIN_PROFILE

*Year	Mode	%Const	%Land	%Prep	%Super	%Maint	%Op	%Grant	%Dev
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DO_MIN_DELAY_COSTS

*	Year	Mode	Construction		Freight	Maintenance	
			Consumer	Business		Consumer	Business
Freight							

SCHEMES_DS

*Mode	1st Construction year	Opening_yr	Stage
1	2009	2010	PC

DO_SOM_COSTS

*Type	Mode	Funding	Cost	Price	RPI	RPF
C	1	cen	137885.0	F	176.60	0.97
L	1	cen	17407.0	F	187.40	1.00
P	1	cen	13976.0	F	176.60	0.97
S	1	cen	7765.0	F	176.60	0.97
M	1	cen	19291.0	F	176.60	0.97

DO_SOM_PROFILE

*Year	Mode	%Const	%Land	%Prep	%Super	%Maint	%Op	%Grant	%Dev
2004	1	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0
2005	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2006	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2007	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2008	1	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0
2009	1	35.0	25.0	5.0	45.0	0.0	0.0	0.0	0.0
2010	1	60.0	75.0	0.0	45.0	0.0	0.0	0.0	0.0
2011	1	5.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0
2021	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
2033	1	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0
2044	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
2056	1	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0
2067	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0

Economy:Economic Efficiency of the Transport System(TEE)

Consumers	ALL MODES	Road
User benefits	TOTAL	
Travel Time	203496	203496
Vehicle operating costs	-2848	-2848
User charges	0	0
During Construction & Maintenance	0	0
NET CONSUMER BENEFITS	200647	200647

Business	Personal	Freight
User benefits		
Travel Time	272231	187247
Vehicle operating costs	17331	4528
		12804

Norwich Northern Distributor Road
Traffic and Economic Assessment
Report

User charges	0	0	0
During Construction & Maintenance	0	0	0
Subtotal	289562	191774	97788
Private Sector Provider Impacts			
Revenue	0		0
Operating costs	0		0
Investment costs	0		0
Grant/subsidy	0		0
Subtotal	0		0
Other business Impacts			
Developer contributions	0		0
NET BUSINESS IMPACT	289562		
TOTAL			
Present Value of Transport Economic Efficiency Benefits (PVB)	490209		

Note: Benefits appear as positive numbers, while costs appear as negative numbers.
Note: All entries are present values discounted to 2002, in 2002 prices

Public Accounts		
	ALL MODES	Road
Local Government Funding	TOTAL	
Revenue	0	0
Operating costs	0	0
Investment costs	0	0
Developer Contributions	0	0
Grant/Subsidy Payments	0	0
NET IMPACT	0	0
Central Government Funding		
Revenue	0	0
Operating costs	6117	6117
Investment costs	160006	160006
Developer Contributions	0	0
Grant/Subsidy Payments	0	0
Indirect Tax Revenues	6724	6724
NET IMPACT	172847	172847
TOTAL		
TOTAL Present Value of Costs (PVC)	172847	

Note: Costs appear as positive numbers, while revenues and developer contributions appear as negative numbers.
Note: All entries are present values discounted to 2002, in 2002 prices

Analysis of Monetised Costs and Benefits

Non-Exchequer Impacts	
Consumer User Benefits	200647
Business User Benefits	289562
Private Sector Provider Impacts	0
Other Business Impacts	0
Accident Benefits	Not assessed by TUBA
Net present Value of Benefits (PVB)	490209
Local Government Funding	0
Central Government Funding	172847
Net present Value Costs (PVC)	172847
Overall Impact	
Net present Value (NPV)	317362
Benefit to Cost Ratio (BCR)	2.836
Appraisal Period	2010 to 2069

Note: 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.

Norwich Northern Distributor Road
Traffic and Economic Assessment
Report

SCHEME SPECIFIC PARAMETERS

PARAMETERS

TUBA_version 1.6
run_name NDR DUAL FGY01H2
do_min_name Do Minimum Rev J9
do_som_name **DUAL PURPLE-YELLOW ALTERNATIVE** REV H
first_yr 2010
horizon_yr 2069
modelled_yrs 2010 2025
detail Yes
current_yr 2004
print_warn All
P&R_CAR_SPEED 65.0

TIME_SLICES

*no.	duration(min)	annualisation	period	description
1	60	506	1	0730-0930
2	60	632	2	1600-1830

SCHEMES_DM

*Mode	1st Construction year	Opening_yr	Stage
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DO_MIN_COSTS

*Type	Mode	Funding	Cost	Price	RPI	RPF
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DO_MIN_PROFILE

*Year	Mode	%Const	%Land	%Prep	%Super	%Maint	%Op	%Grant	%Dev
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DO_MIN_DELAY_COSTS

*	Year	Mode	Construction		Freight	Maintenance	
			Consumer	Business		Consumer	Business
Freight							

SCHEMES_DS

*Mode	1st Construction year	Opening_yr	Stage
1	2009	2010	PC

DO_SOM_COSTS

*Type	Mode	Funding	Cost	Price	RPI	RPF
C	1	cen	137212.0	F	176.60	0.97
L	1	cen	17407.0	F	187.40	1.00
P	1	cen	13916.0	F	176.60	0.97
S	1	cen	7731.0	F	176.60	0.97
M	1	cen	19342.0	F	176.60	0.97

DO_SOM_PROFILE

*Year	Mode	%Const	%Land	%Prep	%Super	%Maint	%Op	%Grant	%Dev
2004	1	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0
2005	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2006	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2007	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2008	1	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0
2009	1	35.0	25.0	5.0	45.0	0.0	0.0	0.0	0.0
2010	1	60.0	75.0	0.0	45.0	0.0	0.0	0.0	0.0
2011	1	5.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0
2021	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
2033	1	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0
2044	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
2056	1	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0
2067	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0

Economy:Economic Efficiency of the Transport System(TEE)

Consumers	ALL MODES	Road
User benefits	TOTAL	
Travel Time	201089	201089
Vehicle operating costs	-3796	-3796
User charges	0	0
During Construction & Maintenance	0	0
NET CONSUMER BENEFITS	197292	197292

Business	Personal	Freight
User benefits		
Travel Time	268509	185392
Vehicle operating costs	16507	4318
		83117
		12189

Norwich Northern Distributor Road
Traffic and Economic Assessment
Report

User charges	0	0	0
During Construction & Maintenance	0	0	0
Subtotal	285016	189710	95306
Private Sector Provider Impacts			
Revenue	0		0
Operating costs	0		0
Investment costs	0		0
Grant/subsidy	0		0
Subtotal	0		0
Other business Impacts			
Developer contributions	0		0
NET BUSINESS IMPACT	285016		
TOTAL			
Present Value of Transport Economic Efficiency Benefits (PVB)	482308		

Note: Benefits appear as positive numbers, while costs appear as negative numbers.
Note: All entries are present values discounted to 2002, in 2002 prices

Public Accounts		
	ALL MODES	Road
Local Government Funding	TOTAL	
Revenue	0	0
Operating costs	0	0
Investment costs	0	0
Developer Contributions	0	0
Grant/Subsidy Payments	0	0
NET IMPACT	0	0
Central Government Funding		
Revenue	0	0
Operating costs	6133	6133
Investment costs	159311	159311
Developer Contributions	0	0
Grant/Subsidy Payments	0	0
Indirect Tax Revenues	6232	6232
NET IMPACT	171676	171676
TOTAL		
TOTAL Present Value of Costs (PVC)	171676	

Note: Costs appear as positive numbers, while revenues and developer contributions appear as negative numbers.
Note: All entries are present values discounted to 2002, in 2002 prices

Analysis of Monetised Costs and Benefits

Non-Exchequer Impacts	
Consumer User Benefits	197292
Business User Benefits	285016
Private Sector Provider Impacts	0
Other Business Impacts	0
Accident Benefits	Not assessed by TUBA
Net present Value of Benefits (PVB)	482308
Local Government Funding	0
Central Government Funding	171676
Net present Value Costs (PVC)	171676
Overall Impact	
Net present Value (NPV)	310632
Benefit to Cost Ratio (BCR)	2.809
Appraisal Period	2010 to 2069

Note: 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.

Norwich Northern Distributor Road
Traffic and Economic Assessment
Report

SCHEME SPECIFIC PARAMETERS

PARAMETERS

TUBA_version 1.6
run_name NDR DUAL PYY02F2
do_min_name Do Minimum Rev J9
do_som_name **DUAL BROWN-YELLOW** REV F
first_yr 2010
horizon_yr 2069
modelled_yrs 2010 2025
detail Yes
current_yr 2004
print_warn All
P&R_CAR_SPEED 65.0

TIME_SLICES

*no.	duration(min)	annualisation	period	description
1	60	506	1	0730-0930
2	60	632	2	1600-1830

SCHEMES_DM

*Mode	1st Construction year	Opening_yr	Stage

DO_MIN_COSTS

*Type	Mode	Funding	Cost	Price	RPI	RPF

DO_MIN_PROFILE

*Year	Mode	%Const	%Land	%Prep	%Super	%Maint	%Op	%Grant	%Dev

DO_MIN_DELAY_COSTS

*	Year	Mode	Construction		Freight	Maintenance	
			Consumer	Business		Consumer	Business

SCHEMES_DS

*Mode	1st Construction year	Opening_yr	Stage
1	2009	2010	PC

DO_SOM_COSTS

*Type	Mode	Funding	Cost	Price	RPI	RPF
C	1	cen	142053.0	F	176.60	0.97
L	1	cen	18218.0	F	187.40	1.00
P	1	cen	14424.0	F	176.60	0.97
S	1	cen	8014.0	F	176.60	0.97
M	1	cen	19928.0	F	176.60	0.97

DO_SOM_PROFILE

*Year	Mode	%Const	%Land	%Prep	%Super	%Maint	%Op	%Grant	%Dev
2004	1	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0
2005	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2006	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2007	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2008	1	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0
2009	1	35.0	25.0	5.0	45.0	0.0	0.0	0.0	0.0
2010	1	60.0	75.0	0.0	45.0	0.0	0.0	0.0	0.0
2011	1	5.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0
2021	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
2033	1	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0
2044	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
2056	1	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0
2067	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0

Economy:Economic Efficiency of the Transport System(TEE)

Consumers	ALL MODES	Road
User benefits	TOTAL	
Travel Time	214710	214710
Vehicle operating costs	-1584	-1584
User charges	0	0
During Construction & Maintenance	0	0
NET CONSUMER BENEFITS	213126	213126

Business	Personal	Freight
User benefits		
Travel Time	284945	87315
Vehicle operating costs	18927	13861

Norwich Northern Distributor Road
Traffic and Economic Assessment
Report

User charges	0	0	0
During Construction & Maintenance	0	0	0
Subtotal	303873	202697	101175
Private Sector Provider Impacts			
Revenue	0		0
Operating costs	0		0
Investment costs	0		0
Grant/subsidy	0		0
Subtotal	0		0
Other business Impacts			
Developer contributions	0		0
NET BUSINESS IMPACT	303873		
TOTAL			
Present Value of Transport Economic Efficiency Benefits (PVB)	516999		

Note: Benefits appear as positive numbers, while costs appear as negative numbers.
Note: All entries are present values discounted to 2002, in 2002 prices

Public Accounts

	ALL MODES	Road
Local Government Funding	TOTAL	
Revenue	0	0
Operating costs	0	0
Investment costs	0	0
Developer Contributions	0	0
Grant/Subsidy Payments	0	0
NET IMPACT	0	0
Central Government Funding		
Revenue	0	0
Operating costs	6319	6319
Investment costs	165129	165129
Developer Contributions	0	0
Grant/Subsidy Payments	0	0
Indirect Tax Revenues	7595	7595
NET IMPACT	179044	179044
TOTAL		
TOTAL Present Value of Costs (PVC)	179044	

Note: Costs appear as positive numbers, while revenues and developer contributions appear as negative numbers.

Note: All entries are present values discounted to 2002, in 2002 prices

Analysis of Monetised Costs and Benefits

Non-Exchequer Impacts	
Consumer User Benefits	213126
Business User Benefits	303873
Private Sector Provider Impacts	0
Other Business Impacts	0
Accident Benefits	Not assessed by TUBA
Net present Value of Benefits (PVB)	516999
Local Government Funding	0
Central Government Funding	179044
Net present Value Costs (PVC)	179044
Overall Impact	
Net present Value (NPV)	337955
Benefit to Cost Ratio (BCR)	2.888
Appraisal Period	2010 to 2069

Note: 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.

Norwich Northern Distributor Road
Traffic and Economic Assessment
Report

SCHEME SPECIFIC PARAMETERS

PARAMETERS

TUBA_version 1.6
run_name NDR DUAL PYY01F2
do_min_name Do Minimum Rev J9
do_som_name **DUAL BROWN-YELLOW ALTERNATIVE** REV F
first_yr 2010
horizon_yr 2069
modelled_yrs 2010 2025
detail Yes
current_yr 2004
print_warn All
P&R_CAR_SPEED 65.0

TIME_SLICES

*no.	duration(min)	annualisation	period	description
1	60	506	1	0730-0930
2	60	632	2	1600-1830

SCHEMES_DM

*Mode	1st Construction year	Opening_yr	Stage
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DO_MIN_COSTS

*Type	Mode	Funding	Cost	Price	RPI	RPF
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DO_MIN_PROFILE

*Year	Mode	%Const	%Land	%Prep	%Super	%Maint	%Op	%Grant	%Dev
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DO_MIN_DELAY_COSTS

*	Year	Mode	Construction		Freight	Maintenance	
			Consumer	Business		Consumer	Business
Freight							

SCHEMES_DS

*Mode	1st Construction year	Opening_yr	Stage
1	2009	2010	PC

DO_SOM_COSTS

*Type	Mode	Funding	Cost	Price	RPI	RPF
C	1	cen	141380.0	F	176.60	0.97
L	1	cen	18218.0	F	187.40	1.00
P	1	cen	14364.0	F	176.60	0.97
S	1	cen	7980.0	F	176.60	0.97
M	1	cen	19979.0	F	176.60	0.97

DO_SOM_PROFILE

*Year	Mode	%Const	%Land	%Prep	%Super	%Maint	%Op	%Grant	%Dev
2004	1	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0
2005	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2006	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2007	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2008	1	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0
2009	1	35.0	25.0	5.0	45.0	0.0	0.0	0.0	0.0
2010	1	60.0	75.0	0.0	45.0	0.0	0.0	0.0	0.0
2011	1	5.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0
2021	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
2033	1	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0
2044	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
2056	1	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0
2067	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0

Economy:Economic Efficiency of the Transport System(TEE)

Consumers	ALL MODES	Road
User benefits	TOTAL	
Travel Time	216851	216851
Vehicle operating costs	-2170	-2170
User charges	0	0
During Construction & Maintenance	0	0
NET CONSUMER BENEFITS	214681	214681
Business		
User benefits	Personal	Freight
Travel Time	286666	198947
Vehicle operating costs	18563	5008
		13555

Norwich Northern Distributor Road
Traffic and Economic Assessment
Report

User charges	0	0	0
During Construction & Maintenance	0	0	0
Subtotal	305229	203956	101274
Private Sector Provider Impacts			
Revenue	0		0
Operating costs	0		0
Investment costs	0		0
Grant/subsidy	0		0
Subtotal	0		0
Other business Impacts			
Developer contributions	0		0
NET BUSINESS IMPACT	305229		
TOTAL			
Present Value of Transport Economic Efficiency Benefits (PVB)	519910		

Note: Benefits appear as positive numbers, while costs appear as negative numbers.
Note: All entries are present values discounted to 2002, in 2002 prices

Public Accounts		
	ALL MODES	Road
Local Government Funding	TOTAL	
Revenue	0	0
Operating costs	0	0
Investment costs	0	0
Developer Contributions	0	0
Grant/Subsidy Payments	0	0
NET IMPACT	0	0
Central Government Funding		
Revenue	0	0
Operating costs	6335	6335
Investment costs	164434	164434
Developer Contributions	0	0
Grant/Subsidy Payments	0	0
Indirect Tax Revenues	7319	7319
NET IMPACT	178089	178089
TOTAL		
TOTAL Present Value of Costs (PVC)	178089	

Note: Costs appear as positive numbers, while revenues and developer contributions appear as negative numbers.
Note: All entries are present values discounted to 2002, in 2002 prices

Analysis of Monetised Costs and Benefits

Non-Exchequer Impacts	
Consumer User Benefits	214681
Business User Benefits	305229
Private Sector Provider Impacts	0
Other Business Impacts	0
Accident Benefits	Not assessed by TUBA
Net present Value of Benefits (PVB)	519910
Local Government Funding	0
Central Government Funding	178089
Net present Value Costs (PVC)	178089
Overall Impact	
Net present Value (NPV)	341821
Benefit to Cost Ratio (BCR)	2.919
Appraisal Period	2010 to 2069

Note: 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.

Norwich Northern Distributor Road Traffic and Economic Assessment Report

SCHEME SPECIFIC PARAMETERS

PARAMETERS

TUBA_version 1.6
run_name NDR DUAL RY01R2
do_min_name Do Minimum Rev J9
do_som_name **DUAL RED-YELLOW** REV R
first_yr 2010
horizon_yr 2069
modelled_yrs 2010 2025
detail Yes
current_yr 2004
print_warn All
P&R_CAR_SPEED 65.0

TIME_SLICES

*no.	duration(min)	annualisation	period	description
1	60	506	1	0730-0930
2	60	632	2	1600-1830

SCHEMES_DM

*Mode	1st Construction year	Opening_yr	Stage
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DO_MIN_COSTS

*Type	Mode	Funding	Cost	Price	RPI	RPF
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DO_MIN_PROFILE

*Year	Mode	%Const	%Land	%Prep	%Super	%Maint	%Op	%Grant	%Dev
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DO_MIN_DELAY_COSTS

*	Year	Mode	Construction		Freight	Maintenance	
			Consumer	Business		Consumer	Business

Freight

SCHEMES_DS

*Mode	1st Construction year	Opening_yr	Stage
1	2009	2010	PC

DO_SOM_COSTS

*Type	Mode	Funding	Cost	Price	RPI	RPF
C	1	cen	127435.0	F	176.60	0.97
L	1	cen	15976.0	F	187.40	1.00
P	1	cen	12907.0	F	176.60	0.97
S	1	cen	7171.0	F	176.60	0.97
M	1	cen	17963.0	F	176.60	0.97

DO_SOM_PROFILE

*Year	Mode	%Const	%Land	%Prep	%Super	%Maint	%Op	%Grant	%Dev
2004	1	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0
2005	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2006	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2007	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2008	1	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0
2009	1	35.0	25.0	5.0	45.0	0.0	0.0	0.0	0.0
2010	1	60.0	75.0	0.0	45.0	0.0	0.0	0.0	0.0
2011	1	5.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0
2021	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
2033	1	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0
2044	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
2056	1	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0
2067	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0

Economy:Economic Efficiency of the Transport System(TEE)

Consumers	ALL MODES	Road
User benefits	TOTAL	
Travel Time	242853	242853
Vehicle operating costs	-1807	-1807
User charges	0	0
During Construction & Maintenance	0	0
NET CONSUMER BENEFITS	241046	241046
Business		
User benefits	Personal	Freight
Travel Time	316634	220490
Vehicle operating costs	21517	5661
		15856

Norwich Northern Distributor Road
Traffic and Economic Assessment
Report

User charges	0	0	0
During Construction & Maintenance	0	0	0
Subtotal	338151	226151	112000
Private Sector Provider Impacts			
Revenue	0		0
Operating costs	0		0
Investment costs	0		0
Grant/subsidy	0		0
Subtotal	0		0
Other business Impacts			
Developer contributions	0		0
NET BUSINESS IMPACT	338151		
TOTAL			
Present Value of Transport Economic Efficiency Benefits (PVB)	579197		

Note: Benefits appear as positive numbers, while costs appear as negative numbers.
Note: All entries are present values discounted to 2002, in 2002 prices

Public Accounts		
	ALL MODES	Road
Local Government Funding	TOTAL	
Revenue	0	0
Operating costs	0	0
Investment costs	0	0
Developer Contributions	0	0
Grant/Subsidy Payments	0	0
NET IMPACT	0	0
Central Government Funding		
Revenue	0	0
Operating costs	5696	5696
Investment costs	147767	147767
Developer Contributions	0	0
Grant/Subsidy Payments	0	0
Indirect Tax Revenues	8887	8887
NET IMPACT	162350	162350
TOTAL		
TOTAL Present Value of Costs (PVC)	162350	

Note: Costs appear as positive numbers, while revenues and developer contributions appear as negative numbers.
Note: All entries are present values discounted to 2002, in 2002 prices

Analysis of Monetised Costs and Benefits

Non-Exchequer Impacts	
Consumer User Benefits	241046
Business User Benefits	338151
Private Sector Provider Impacts	0
Other Business Impacts	0
Accident Benefits	Not assessed by TUBA
Net present Value of Benefits (PVB)	579197
Local Government Funding	0
Central Government Funding	162350
Net present Value Costs (PVC)	162350
Overall Impact	
Net present Value (NPV)	416847
Benefit to Cost Ratio (BCR)	3.568
Appraisal Period	2010 to 2069

Note: 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.

Norwich Northern Distributor Road Traffic and Economic Assessment Report

SCHEME SPECIFIC PARAMETERS

PARAMETERS

TUBA_version 1.6
run_name NDR DUAL RB01L2
do_min_name Do Minimum Rev J9
do_som_name **DUAL RED-BLUE** REV L
first_yr 2010
horizon_yr 2069
modelled_yrs 2010 2025
detail Yes
current_yr 2004
print_warn All
P&R_CAR_SPEED 65.0

TIME_SLICES

*no.	duration(min)	annualisation	period	description
1	60	506	1	0730-0930
2	60	632	2	1600-1830

SCHEMES_DM

*Mode	1st Construction year	Opening_yr	Stage
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DO_MIN_COSTS

*Type	Mode	Funding	Cost	Price	RPI	RPF
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DO_MIN_PROFILE

*Year	Mode	%Const	%Land	%Prep	%Super	%Maint	%Op	%Grant	%Dev
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DO_MIN_DELAY_COSTS

*	Year	Mode	Construction		Freight	Maintenance	
			Consumer	Business		Consumer	Business

Freight

SCHEMES_DS

*Mode	1st Construction year	Opening_yr	Stage
1	2009	2010	PC

DO_SOM_COSTS

*Type	Mode	Funding	Cost	Price	RPI	RPF
C	1	cen	127326.0	F	176.60	0.97
L	1	cen	13756.0	F	187.40	1.00
P	1	cen	12697.0	F	176.60	0.97
S	1	cen	7054.0	F	176.60	0.97
M	1	cen	18523.0	F	176.60	0.97

DO_SOM_PROFILE

*Year	Mode	%Const	%Land	%Prep	%Super	%Maint	%Op	%Grant	%Dev
2004	1	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0
2005	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2006	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2007	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2008	1	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0
2009	1	35.0	25.0	5.0	45.0	0.0	0.0	0.0	0.0
2010	1	60.0	75.0	0.0	45.0	0.0	0.0	0.0	0.0
2011	1	5.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0
2021	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
2033	1	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0
2044	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
2056	1	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0
2067	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0

Economy:Economic Efficiency of the Transport System(TEE)

Consumers	ALL MODES	Road
User benefits	TOTAL	
Travel Time	232466	232466
Vehicle operating costs	-2245	-2245
User charges	0	0
During Construction & Maintenance	0	0
NET CONSUMER BENEFITS	230221	230221
Business		
User benefits	Personal	Freight
Travel Time	306405	211780
Vehicle operating costs	21220	5368
		94624
		15852

Norwich Northern Distributor Road
Traffic and Economic Assessment
Report

User charges	0	0	0
During Construction & Maintenance	0	0	0
Subtotal	327625	217149	110477
Private Sector Provider Impacts			
Revenue	0		0
Operating costs	0		0
Investment costs	0		0
Grant/subsidy	0		0
Subtotal	0		0
Other business Impacts			
Developer contributions	0		0
NET BUSINESS IMPACT	327625		
TOTAL			
Present Value of Transport Economic Efficiency Benefits (PVB)	557846		

Note: Benefits appear as positive numbers, while costs appear as negative numbers.
Note: All entries are present values discounted to 2002, in 2002 prices

Public Accounts		
	ALL MODES	Road
Local Government Funding	TOTAL	
Revenue	0	0
Operating costs	0	0
Investment costs	0	0
Developer Contributions	0	0
Grant/Subsidy Payments	0	0
NET IMPACT	0	0
Central Government Funding		
Revenue	0	0
Operating costs	5874	5874
Investment costs	145420	145420
Developer Contributions	0	0
Grant/Subsidy Payments	0	0
Indirect Tax Revenues	8658	8658
NET IMPACT	159952	159952
TOTAL		
TOTAL Present Value of Costs (PVC)	159952	

Note: Costs appear as positive numbers, while revenues and developer contributions appear as negative numbers.
Note: All entries are present values discounted to 2002, in 2002 prices

Analysis of Monetised Costs and Benefits

Non-Exchequer Impacts	
Consumer User Benefits	230221
Business User Benefits	327625
Private Sector Provider Impacts	0
Other Business Impacts	0
Accident Benefits	Not assessed by TUBA
Net present Value of Benefits (PVB)	557846
Local Government Funding	0
Central Government Funding	159952
Net present Value Costs (PVC)	159952
Overall Impact	
Net present Value (NPV)	397894
Benefit to Cost Ratio (BCR)	3.488
Appraisal Period	2010 to 2069

Note: 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.

Norwich Northern Distributor Road Traffic and Economic Assessment Report

SCHEME SPECIFIC PARAMETERS

PARAMETERS

TUBA_version 1.6
run_name NDR DUAL RP01M2
do_min_name Do Minimum Rev J9
do_som_name **DUAL RED-PINK** REV M
first_yr 2010
horizon_yr 2069
modelled_yrs 2010 2025
detail Yes
current_yr 2004
print_warn All
P&R_CAR_SPEED 65.0

TIME_SLICES

*no.	duration(min)	annualisation	period	description
1	60	506	1	0730-0930
2	60	632	2	1600-1830

SCHEMES_DM

*Mode	1st Construction year	Opening_yr	Stage
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DO_MIN_COSTS

*Type	Mode	Funding	Cost	Price	RPI	RPF
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DO_MIN_PROFILE

*Year	Mode	%Const	%Land	%Prep	%Super	%Maint	%Op	%Grant	%Dev
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DO_MIN_DELAY_COSTS

*	Year	Mode	Construction		Freight	Maintenance	
			Consumer	Business		Consumer	Business

Freight

SCHEMES_DS

*Mode	1st Construction year	Opening_yr	Stage
1	2009	2010	PC

DO_SOM_COSTS

*Type	Mode	Funding	Cost	Price	RPI	RPF
C	1	cen	126932.0	F	176.60	0.97
L	1	cen	21472.0	F	187.40	1.00
P	1	cen	13356.0	F	176.60	0.97
S	1	cen	7420.0	F	176.60	0.97
M	1	cen	17161.0	F	176.60	0.97

DO_SOM_PROFILE

*Year	Mode	%Const	%Land	%Prep	%Super	%Maint	%Op	%Grant	%Dev
2004	1	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0
2005	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2006	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2007	1	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
2008	1	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0
2009	1	35.0	25.0	5.0	45.0	0.0	0.0	0.0	0.0
2010	1	60.0	75.0	0.0	45.0	0.0	0.0	0.0	0.0
2011	1	5.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0
2021	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
2033	1	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0
2044	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
2056	1	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0
2067	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0

Economy:Economic Efficiency of the Transport System(TEE)

Consumers	ALL MODES	Road
User benefits	TOTAL	
Travel Time	286862	286862
Vehicle operating costs	3755	3755
User charges	0	0
During Construction & Maintenance	0	0
NET CONSUMER BENEFITS	290617	290617
Business		
User benefits	Personal	Freight
Travel Time	371643	261539
Vehicle operating costs	26601	7984
		18617

Norwich Northern Distributor Road
Traffic and Economic Assessment
Report

User charges	0	0	0
During Construction & Maintenance	0	0	0
Subtotal	398244	269523	128721
Private Sector Provider Impacts			
Revenue	0		0
Operating costs	0		0
Investment costs	0		0
Grant/subsidy	0		0
Subtotal	0		0
Other business Impacts			
Developer contributions	0		0
NET BUSINESS IMPACT	398244		
TOTAL			
Present Value of Transport Economic Efficiency Benefits (PVB)	688861		

Note: Benefits appear as positive numbers, while costs appear as negative numbers.
Note: All entries are present values discounted to 2002, in 2002 prices

Public Accounts		
	ALL MODES	Road
Local Government Funding	TOTAL	
Revenue	0	0
Operating costs	0	0
Investment costs	0	0
Developer Contributions	0	0
Grant/Subsidy Payments	0	0
NET IMPACT	0	0
Central Government Funding		
Revenue	0	0
Operating costs	5442	5442
Investment costs	152777	152777
Developer Contributions	0	0
Grant/Subsidy Payments	0	0
Indirect Tax Revenues	11991	11991
NET IMPACT	170209	170209
TOTAL		
TOTAL Present Value of Costs (PVC)	170209	

Note: Costs appear as positive numbers, while revenues and developer contributions appear as negative numbers.
Note: All entries are present values discounted to 2002, in 2002 prices

Analysis of Monetised Costs and Benefits

Non-Exchequer Impacts	
Consumer User Benefits	290617
Business User Benefits	398244
Private Sector Provider Impacts	0
Other Business Impacts	0
Accident Benefits	Not assessed by TUBA
Net present Value of Benefits (PVB)	688861
Local Government Funding	0
Central Government Funding	170209
Net present Value Costs (PVC)	170209
Overall Impact	
Net present Value (NPV)	518652
Benefit to Cost Ratio (BCR)	4.047
Appraisal Period	2010 to 2069

Note: 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.