Suffolk County Council

Ipswich - Transport fit for the 21st Century

Major Scheme Business Case

May 2009

AECOM

Prepared by: .... Approved by: ....

Bil Harrison
Regional Director

Rory Poole
Director

Ipswich Major Scheme Business Case

Rev No	Comments	Date
1	First formatted structure	19/03/2009
2	Partial draft for review	25/03/2009
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4	Working draft for Project Board review	24/04/2009
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Job No Reference Date Created March 2009

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Preface

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Preface

IPSWICH – TRANSPORT FIT FOR THE 21st CENTURY

PREFACE

We are proud to submit this Major Scheme Business Case Bid to the Department for Transport. As the County Town of Suffolk, and a major growth point within the Haven Gateway sub region, Ipswich needs and deserves a sustainable transport system. "Ipswich – Transport Fit for the 21st Century" is an integrated scheme designed to achieve a step change in travel behaviour and provide the foundation for Ipswich to thrive in the decades ahead.

Ipswich has grown fast over recent years. Exciting developments such as those along the Waterfront - where the new University Campus Suffolk is now established – are transforming Ipswich. But Ipswich must maintain a vibrant economy to match its housing growth. Investment in a sustainable transport system will prevent growing congestion. This investment is essential if we are to attract employers into the town and enhance Ipswich's position in delivering services to the wider county and sub-region.

The scheme has been prepared by Suffolk County Council, in consultation with Ipswich Borough Council and other stakeholders. It has been under development for over five years during which time we have refined the scheme, weeded out elements that would provide insufficient value for money, and tested the proposals through the newly developed suite of transport models of the wider Ipswich area – ITAMS – the Ipswich Transport Analysis Modelling Suite. In the interim we have also taken forward some complementary investments in the town centre. One such project – the remodelling of the south eastern approach to the town centre adjacent to the increasingly busy Education Quarter - has been the subject of a successful bid to the Community Infrastructure Fund, and will be implemented in 2010/11.

Ipswich – Transport Fit for the 21st Century represents a complete fit with recent DfT thinking as set out in "Towards a Sustainable Transport System" and "Delivering a Sustainable Transport System". It is fully supported by the East of England Region, the Haven Gateway Partnership and other key stakeholders. We are confident that the investment proposed will deliver the outputs set out in this Business Case and represents very good value for money. We commend the scheme to you.

Guy McGregor
Portfolio Holder for Roads and Transport

Lucy Robinson
Director of Environment and Transport

May 2009

Application Form

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Application Form

Local Authority Major Schemes: Initial Application for Funding Approval

Lead Scheme Promoter: Suffolk County Council	**Region:** East of England

Other Scheme Promoter:
None

Scheme Name:
'Ipswich – Transport Fit for the 21st Century'

Has an application for DfT funding been previously submitted for this Scheme or any variant of it? If so, please provide details including Scheme Name.
Yes, full MSBC submitted in July 2005, but consideration suspended pending the Regional Funding Allocation process. Scheme development has continued.

Type of Funding (e.g. LTP Major, TIF, CIF etc.). If other, please specify:
LTP Major Scheme, from Regional Funding Allocation

Scheme Description (no more than 100 words):
The Scheme consists of an integrated package of measures to achieve a 'step-change' in travel towards more sustainable patterns. It comprises landmark changes to the town centre bus interchanges; expansion and improvement of other bus facilities; an Urban Traffic Management and Control system; a Real Time Passenger Information system; and a detailed programme of improvements to walk/cycle routes and crossings in and around the town centre. It is supported by programmes of 'Smarter Choices' personalised travel plans and town centre wayfinding.

Has an Economic Impact Report been included? (Y/N): No

Approval sought: Conditional Approval

Name and contact details of LA officer responsible for submitting bid:

Dave Watson – Transport Strategy Manager, Environment and Transport, Suffolk County Council, Endeavour House, 8 Russell Road, Ipswich, Suffolk, IP1 2BX
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Dave.Watson@ suffolk.gov.uk

Name and contact details of the Senior Responsible Officer:
Andrew Guttridge – Strategic Commissioner, Environment and Transport, Suffolk County Council, Endeavour House, 8 Russell Road, Ipswich, Suffolk, IP1 2BX
01473 264994
Andrew.Guttridge@suffolk.gov.uk

Year	Preparatory Costs (£m)	Please select the year from the drop-down lists						Total (£m)
		2009/10 (£m)	2010/11 (£m)	2011/12 (£m)	2012/13 (£m)	(£m)	(£m)	
Dft Contribution requested (see note below)	1,232,500	0	100,000	1,167,500	21,200,000	0	0	23,700,000
LA Contribution	1,232,500	0	320,000	800,000	916,500	0	0	3,269,000
Developer Contribution	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0
Total funding requirement	2,465,000	0	420,000	1,967,500	22,116,500	0	0	26,969,000

The Dft contribution should **exclude** VAT and optimism bias but should **include** costs estimated from a QRA.	
All figures should **include** inflation. Please state what inflation assumption(s) have been used:	4% inflation rate has been used

Please provide an estimated timescale in months (giving a range if necessary). (If prices are expected to be known by the time powers are in place e.g. in the case of Early Contractor Involvement, please leave the middle question blank). Please ensure these timescales are consistent with the spending profile supplied above.	
Between Programme Entry being granted and all necessary powers being in place (as necessary for Conditional approval):	No further powers needed – applying for Conditional approval
Between Full Approval and completion of the Scheme:	Eighteen to twenty seven months depending on delivery option chosen

1 Executive Summary

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1 Executive Summary

Ipswich is the county town of Suffolk, and has an important regional role as a Haven Gateway Growth Point. It is undergoing rapid regeneration and development to meet challenging East of England Plan targets, while preserving and enhancing its unique character. The proposed Major Scheme 'Ipswich - Transport Fit for the 21st Century' has been developed over recent years to support and facilitate the development objectives through an integrated package of sustainable transport measures. These cover the full range of travel patterns – in and around the town centre, between the town centre and the suburbs, and to and from the rural hinterland and neighbouring towns.

It comprises landmark changes to the town centre bus interchanges; expansion and improvement of other bus facilities; an Urban Traffic Management and Control system; a Real Time Passenger Information system; and a detailed programme of improvements to walk/cycle routes and crossings in and around the town centre. It is supported by programmes of 'Smarter Choices' including household, school and workplace travel plans, and town centre wayfinding.

The Scheme is responding to local and sub-regional transport problems, and is closely in line with local, regional and national policies – indeed it is considered to be essential if the regional development targets for the wider Ipswich area are to be achieved. It is in tune with current DfT policy, and seeks to achieve local development objectives in a way that anticipates future sustainable transport trends. This Bid has been prepared in strict accordance with the guidance for regionally supported Major Schemes.

The cost of the Scheme is estimated to total £25.7M (including contingency and preparation, but excluding estimated inflation to the time of expenditure). The costs are estimated for a series of outline design exercises. While the Scheme as a whole is innovative, its individual components are low risk in terms of cost control and deliverability as they largely comprise conventional public realm improvements, or well established technology costed on the basis of existing supply contracts.

The monetised benefits of the Scheme have been built up from a wide range of analyses, drawing on the latest Guidance and best practice advice. Directly monetised benefits include accident prevention savings; improvements to active mode public realm ambience, physical fitness, bus passengers' comfort and convenience; and time and operational cost savings from improved management of buses and parking. A significant part of the monetised benefits has been estimated using the ITAMS multi-modal variable demand transport model, newly developed with this Scheme in mind for its first application. The combined impact of the Scheme's traffic, bus system, and active mode interventions have been predicted to provide net benefits to existing users and new or mode changing users of all modes. After integrating over a Scheme life of some 15 years, and discounting back to 2008 values, monetised benefits (including TUBA derived travel time savings, and various ambience, accident and comfort related benefits) of approximately £78M have been predicted. Using the formal methodology in WebTAG 3.5.9, a benefit to cost ratio of 2.42 (after full consideration of lifetime discounting, and including Optimism Bias) has been calculated. This classifies the Scheme as High value for money.

A full NATA assessment summary table (AST) has been prepared, in consultation with relevant environmental and economic development interests. The AST does not contain any ‘Adverse’ impacts.

The Scheme comprises established processes and technology, and has been developed over a period of years. A firm delivery programme is in place, minimising disruption, and maximising the initial impact of implementation, with the involvement of an established stakeholder community. Some opportunities for early completion are available, if early funding is available. A detailed risk assessment and management plan has been developed; none of the risks are severe; and the Scheme is capable of rapid delivery.

Thus this Bid document describes a mature Scheme, developed in increasing detail over the years to meet established problems, fully supported in its regional context, well aligned with DfT policy aims, and overdue for implementation.

2 Appendix B Checklist

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2 Appendix B Checklist

2.1 Checklist of items to be provided in a Major Scheme business case for programme entry

Please indicate next to each item a reference to the location of the information in the Major Scheme Business Case document.

Scheme Description

Item	Section/Page
A detailed physical description of the Scheme, and the other appraised option(s), including maps, scale diagrams and a written commentary.	**Chapter 4 and Appendices A, B and D to G**

Strategic Case

Item	Section/Page
A clear indication of the problems	**3.2, 3.6**
The objectives of the Scheme	**3.8, 5.2**
A description of the process by which the Scheme came to be identified as the preferred option for meeting those objectives	**3.5, 4.1**
How the objectives of the Scheme align with wider local objectives, particularly those of the relevant Local Transport Plan.	**5.6 & 5.7**
How the objectives of the Scheme align with sub-regional and regional objectives, (except for Schemes of predominantly local significance)	**5.5, 5.8**
Written endorsement from regional bodies	**Appendix N**

Value for Money
Cost Benefit Analysis

Item	Section/Page
A clear explanation of the underlying assumptions used in the Cost Benefit Analysis.	**Chapter 6**
Information on local factors used. For example the derivation of growth factors, M factors in COBA and annualisation factors in TUBA (to include full details of any calculations).	**Appendices L and O**
A diagram of the network (if COBA used).	**Appendix I**
Information on the number of junctions modelled (if COBA used), for both the do-minimum and the do-something.	**Appendix I**
Details of assumptions about operating costs and commercial viability (e.g. public transport, park and ride, etc.).	**Appendices I & K**
Full appraisal inputs/outputs (when used, COBA and/or TUBA input and output files should be supplied).	**Appendix O**
Details of the maintenance delay costs/savings.	**n/a**
Details of the delays during construction.	**n/a**

NATA Assessment

Item		Section/Page
Evidence of consultation with key stakeholders (including any NGOs consulted and responses).		**Appendix N**
Assessment of Environmental impacts, to include an environmental constraints map.		**Chapter 7, Appendix M**
Assessment of Safety impacts and the assumed accident rates presented (COBA output should be provided if an accident only COBA has been run).		**Appendix F**
Assessment of Economic impacts.		**Appendix M**
Assessment of Accessibility impacts.		**Appendix M**
Assessment of Integration impacts.		**Appendix M**
A comprehensive Appraisal Summary Table.		**Appendix M**
The following supporting analyses:		**Appendix M**
	Distribution and Equity.	**Appendix M**
	Affordability and Financial Sustainability.	**Appendix M**
	Practicality and Public Acceptability (Evidence of public consultation supplied).	**Appendix N**
	Contribution to 10 year plan targets.	**Appendix M**
NATA worksheets.		**Appendix M**

Modelling

Item		Section/Page
An Existing Data and Traffic Surveys Report to include:		**Appendix H**
	Details of the sources, locations (illustrated on a map), methods of collection, dates, days of week, durations, sample factors, estimation of accuracy, etc.	
	Details of any specialist surveys (e.g. stated preference).	
	Traffic and passenger flows; including daily, hourly and seasonal profiles, including details by vehicle class where appropriate.	
	Journey times by mode, including variability if appropriate.	
	Details of the pattern and scale of traffic delays and queues.	
	Desire line diagrams for important parts of the network.	
	Diagrams of existing traffic flows, both in the immediate corridor and other relevant corridors.	
An Assignment Model Validation Report to include:		**Appendices I & J**
	Description of the road traffic and public transport passenger assignment model development, including model network and zone plans, details of treatment of congestion on the road system and crowding on the public transport system.	
	Description of the data used in model building and validation with a clear distinction made for any independent validation data.	
	Evidence of the validity of the networks employed, including range checks, link length checks, and route choice evidence.	
	Details of the segmentation used, including the rationale for that chosen.	
	Validation of the trip matrices, including estimation of measurement and sample errors.	
	Details of any 'matrix estimation' techniques used and evidence of the effect of the estimation process on the scale and pattern of the base travel matrices.	
	Validation of the trip assignment, including comparisons of flows (on links and across screenlines/cordons) and, for road traffic models, turning movements at key junctions.	
	Journey time validation, including, for road traffic models, checks on queue pattern and magnitudes of delays/queues.	
	Detail of the assignment convergence.	
	Present year validation if the model is more than 5 years old.	
	A diagram of modelled traffic flows, both in the immediate corridor and other relevant corridors.	

A Demand Model Report to include:	**Appendix K**
Where no Variable Demand Model has been developed evidence should be provided to support this decision (e.g. follow guidance in WebTAG Unit 3.10.1 Variable Demand Modelling - Preliminary Assessment Procedures).	
Description of the demand model.	
Description of the data used in the model building and validation.	
Details of the segmentation used, including the rationale for that chosen. This should include justification for any segments remaining fixed.	
Evidence of model calibration and validation and details of any sensitivity tests.	
Details of any imported model components and rationale for their use. Validation of the supply model sensitivity in cases where the detailed assignment models do not iterate directly with the demand model.	
Details of the realism testing, including outturn elasticities of demand with respect to fuel cost and public transport fares.	
Details of the demand/supply convergence.	
A Forecasting Report to include:	**Appendix L**
Description of the methods used in forecasting future traffic demand.	
Description of the future year demand assumptions (e.g. land use and economic growth - for the do minimum, core and variant scenarios).	
Description of the future year transport supply assumptions (i.e. networks examined for the do minimum, core scenario and variant scenarios).	
Description of the travel cost assumptions (e.g. fuel costs, PT fares, parking).	
Comparison of the local forecast results to national forecasts, at an overall and sectoral level.	
Presentation of the forecast travel demand and conditions for the core scenario and variant scenarios including a diagram of forecast flows for the do-minimum and the Scheme options for affected corridors.	
If the model includes very slow speeds or high junction delays evidence of their plausibility.	
An explanation of any forecasts of flows above capacity, especially for the do-minimum, and an explanation of how these are accounted for in the modelling/appraisal.	
Presentation of the sensitivity tests carried out (to include optimistic and pessimistic tests).	

Delivery

Item	**Section/Page**
Governance	**Section 9.1**
Named Senior Responsible Owner (SRO)	
Proposed Governance Structure	
Composition of Project Board	
Details of resourcing level for the Scheme	
Project Planning	**Section 9.2**
Project Plan (e.g. in GANNT chart form)	
List of key milestones and dates	
Clear critical path and dependencies	
Risk Management	**Section 9.3**
Risk Register with likelihood, probability and mitigation measures, including Quantified Risk Assessment.	
Description of proposed Risk Management process and escalation procedures.	
Stakeholder Management	**Section 9.4**
Identification and analysis of key stakeholders and their interests.	**Appendix N**
Description of public consultation already carried out.	
Plans for future consultation and stakeholder management.	

	Evidence of consultation with Statutory Bodies (Natural England, English Heritage and Enviroment Agency) and their responses.	**Appendix N**
Evaluation		
	Statement of core evaluation objectives.	**Section 9.5**
Assurance (Schemes with gross cost of £50m or more)		**n/a**
	Confirmation of date Gateway Review carried out (or planned).	

Commercial

Item	**Section/Page**
Preferred procurement route with rationale for choice.	**Section 10.1**
For ECI proposals, contract type and risk sharing arrangement.	**n/a**
Details of proposed risk sharing approach (for other than traditional procurement).	**Section 10.3**

Financial

Item	**Section/Page**
Detailed cost breakdown.	**Section 11.1**
Evidence of how cost estimates have been derived.	**Appendices A, B & D to G**
Independent surveyor's report veryfying cost estimates.	**Appendix P**
Details of and justification for inflation assumption used.	**Appendix O**
Costing for risk based on QRA.	**Section 9.3**
Estimate of eligible preparatory costs.	**Section 11.3**
Details of measures to secure necessary third party contributions, if applicable.	**n/a**
Description and estimate of any ongoing revenue liability (other than routine maintenance) and proposals to meet it.	**Appendix O**
Section 151 Officer sign-off for cost estimates.	

3 Context and Policy

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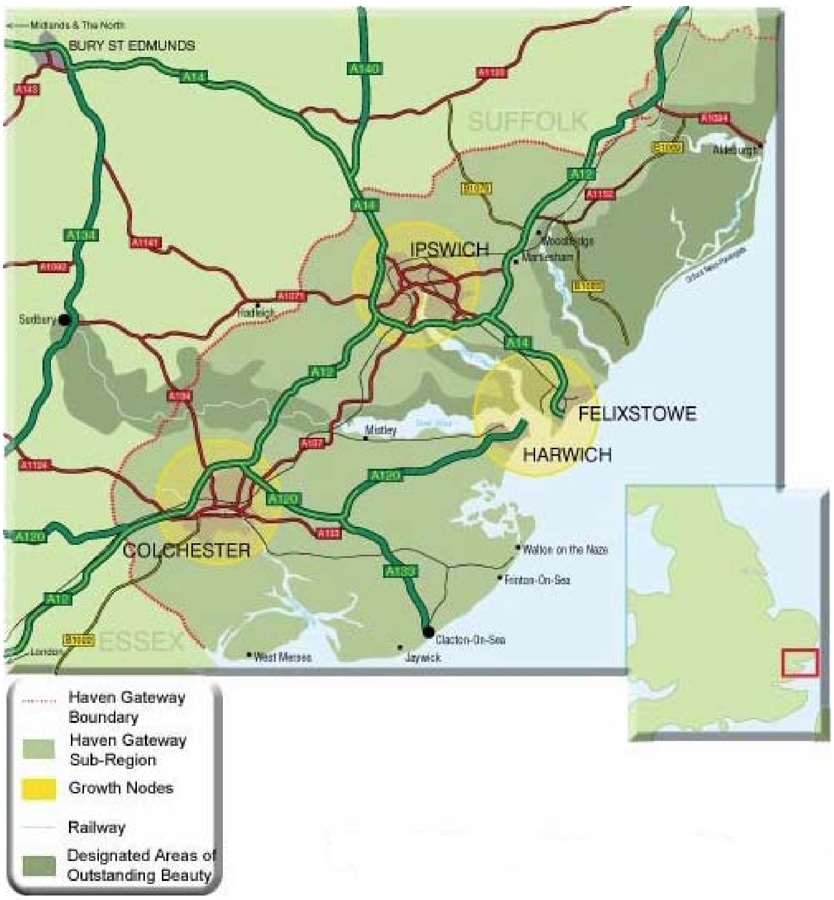
3 Context and Policy

3.1 Ipswich and its Regional Context

3.1.1 Ipswich is part of the Haven Gateway – one of the key engines for growth for the East of England. It is formally designated as a New Growth Point by the Government. Figure 3.1 shows Ipswich in its context at the cross roads of the A12 London to Lowestoft route, and the nationally important A14 trunk route linking Felixstowe Port (and Ipswich's own port facilities) with the Midlands. Ipswich is an important rail interchange on the London to Norwich main line.

Figure 3.1 Ipswich in the Haven Gateway



3.1.2 As a regional centre and the county town of Suffolk it has above average cultural, sporting and retail environments. Ipswich also has the great asset of being a diverse and multi-cultural community, which helps it to achieve its reputation for being one of the fastest growing urban centres in the UK. The town is home to world-class industries, a skilled workforce and high levels of entrepreneurship. As a university, maritime, telecoms and financial industries centre, Ipswich is developing dynamically and prosperously.

3.1.3 The population of Ipswich itself is about 120,000. The town also provides services and employment for suburban communities in neighbouring districts. A further 30,000 people live in these communities. The town supports a working population of about 67,000, including about 30,000 people who travel in from the outlying suburbs and rural hinterland. The principal employment sectors are public administration, distribution and finance. Just under half the number of children in school year 13 go on to higher education.

3.1.4 Ipswich has a strong urban heritage including over 600 listed buildings, 10 scheduled monuments, 14 conservation areas and three historic parks.

3.2 Growth, regeneration, and recession

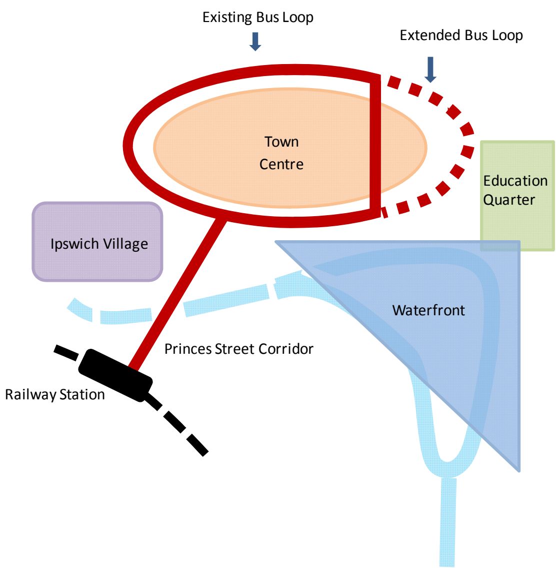
3.2.1 Ipswich has experienced rapid growth in recent years, and has been designated by the East of England Plan to deliver further growth in the Plan period. The opportunities arising from this growth are welcomed by the local authorities but, without investment to deliver more sustainable transport patterns, congestion could increase to unacceptable levels which could constrain further economic development and employment to support the housing growth.

3.2.2 The average home build from 2001 to 2008 in Ipswich has been 762 per year. In 2007/2008 home completions reached a peak of 1413. In 2006/2007 some 99 percent of housing was built on previously developed land, primarily in the central area of the town. There has also been significant growth around the fringes of the town in the neighbouring districts of Suffolk Coastal and Babergh.

3.2.3 The current economic downturn has resulted in some reduction in the rate of house completions in Ipswich as with most parts of the country. There have also been some impacts on employment in the town and its surroundings. The number of people claiming Job Seekers Allowance in the town increased from 2,539 to 3,984 in the second half of 2008/9. Sectors affected by the downturn have included the motor trade, finance and Information and Communication Technologies (ICT). In this period there have been also some new employment opportunities in the town with new retail and office developments. The impact of the recession on employment in Ipswich has been less than in other parts of Suffolk. The average increase in unemployment in Suffolk districts has been about 80% against a 57% increase in Ipswich. Notwithstanding this temporary downturn, from which recovery may take some years, our expectation is that Ipswich will continue to grow broadly in line with the East of England Plan forecasts. Implementation of this Scheme in the context of the current slowdown gives us a great opportunity to put in place the kind of measures necessary to support and facilitate future sustainable growth. Early implementation of the Scheme would also provide an opportunity to compete for work for construction and civil engineering and technology companies in a currently depressed market.

3.2.4 Ipswich has been successful in stimulating considerable regeneration in recent years. Notable recent successful examples of significant development and regeneration within the town are described in the following paragraphs, and shown schematically in Figure 3.2.

Figure 3.2 Ipswich town centre structure



Ipswich Waterfront

3.2.5 Ipswich Waterfront was once well known as the biggest wet dock in Europe. Today it is the largest single regeneration project in the East of England. The once industrial dock area, just a short distance from the town centre, is now the focus of huge investment, aiding growth in both jobs and housing.

3.2.6 A vibrant new cultural, residential, business and leisure area is taking shape, complementing the marina facilities already available. All along the Waterfront, once decaying port warehouses and giant mill silos are being replaced with a blend of brand new designs. These impressive new buildings have been planned to integrate with much of the historic architecture that is being preserved and so the Waterfront retains much of its special character. The Waterfront developments combine high quality accommodation with leisure and recreation. New cultural assets, provided within these developments include a regional centre for Dance East and the Witchbottle Theatre. Significant improvements to the quality of the urban realm have also been secured through the planning process.

3.2.7 The large-scale regeneration of Ipswich Waterfront has also encouraged increased interest from businesses. On the western bank of the river, Felaw Maltings and the hi-tech business incubator IP-City Centre are both now in high demand for their top quality business space, whilst on the Waterfront itself, a top Ipswich law firm recently led the way, relocating its offices to pride of place in Waterfront House

3.2.8 Considerable further scope exists for more development on adjacent dock areas, but this is constrained by transport links.

Ipswich Education Quarter

3.2.9 The exciting new Education Quarter begins at the Waterfront. An innovative partnership between the University of Essex and University of East Anglia, supported by Ipswich Borough Council and Suffolk County Council, has enabled the creation of University Campus Suffolk, which opened in September 2007. This project represents an investment of more than £150m with its main campus in the heart of Ipswich. University Campus Suffolk's landmark headquarters building opened on the Waterfront in 2008. University Campus Suffolk will help to deliver the Suffolk Community Strategy aim to transform the quality of higher education through its distributed learning centres in towns throughout Suffolk.

3.2.10 To the north of University Campus Suffolk in the Education Quarter is Suffolk New College. Land transfers from the county council have facilitated the complete rebuilding of this further education college which serves the south east of the county. This £70m development will open in 2009. These new education facilities will change the opportunities and choices for Ipswich residents, sparking further developments in commerce, culture and academic research.

University Campus Suffolk

Ipswich Village

3.2.11 Just to the west of the Waterfront, and between the railway station and the town centre, the Ipswich Village area offers a further choice of employment and residential sites. This area is a key employment area, and is already home to the headquarters of Suffolk County Council, Ipswich Borough Council, Suffolk Life, and Ipswich Town Football Club among others.

3.2.12 Ipswich Village has further sites designated for a mixture of high density residential and high quality office developments.

Ipswich Town Centre

3.2.13 Ipswich town centre itself has experienced big changes recently. April 2007 saw the introduction of Ipswich Central, the company that has been created to run the town centre Business Improvement District (BID). This new way of managing the town centre will being an additional concentrated £3.2m investment into the retail heart of Ipswich benefit businesses, residents and visitors alike. The BID improvement projects are grouped under 6 themes: Safe and Secure, Clean and Bright, Out and About, Target and Tell, Look and Feel, and Aims and Ambitions.

3.2.14 The continued commercial health of the town centre is central to the growth of the wider Ipswich area, and the Scheme is a vital part of ensuring that continued health.

Sustainable suburban development.

3.2.15 In addition to town centre growth there has been significant housing development on the brownfield site at Ravenswood in the south-east of the town, where over 1000 of the 1250 new homes planned have been completed. Extensive further housing growth has taken place and more is planned for Kesgrave and Martlesham, communities to the east of Ipswich in Suffolk Coastal district. Extensive employment growth is also planned for BT's research site at Martlesham.

3.2.16 To deliver the longer term goals of the East of England Plan, further areas of regeneration, brownfield re-development, and infill will be required.

3.3 The Regional Spatial Strategy

3.3.1 The planning of developments in Ipswich is taking place in the context of the East of England Regional Spatial Strategy, adopted by the Government in 2008.

3.3.2 Ipswich is one of the main areas targeted for growth in the region. The figure for the Borough of at least 15,400 new homes represented a 93% increase on previous Structure Plan levels. Setting this level against the 20% threshold that was required to achieve New Growth Point status just demonstrates the level of growth anticipated and being planned for the town between 2001 and 2021.

It is perhaps not surprising therefore that the town features in the top tier of most of the regional lists. The East of England Plan identifies Ipswich as:

- a key centre where development and change will be focussed
- a regional town centre
- a regional transport interchange centre
- The Haven Gateway, of which Ipswich is part, is identified as one of only four formal sub-regions in the East of England
- 30,000 new jobs to be provided for in the Borough of Ipswich and the neighbouring districts of Suffolk Coastal and Babergh.

3.3.3 Strategic employment sites are identified in the Haven Gateway sub region to support growth and regeneration – including in ICT in Ipswich.

3.3.4 The East of England Regional Assembly are working with the Government Office for the East of England to produce a new Regional Spatial Strategy covering the period 2011 to 2031. Whilst this is at its earliest stages Suffolk County Council have recently confirmed to the Regional Assembly (in their role as 'Section 4(4) authority') that they would see the Ipswich area remaining as a focus for growth up to 2031.

3.4 Ipswich Local Development Framework

3.4.1 The Ipswich Local Development Framework completed its ‘Preferred Options’ stage in 2008. It is anticipated that documents will be submitted to Government during 2009 and adopted in 2010. The *Ipswich Local Development Framework Core Strategy Preferred Options: 2008* included support for this Scheme. A letter of support for the Scheme from Ipswich Borough Council is included at Appendix N.

3.5 Scheme History and Regional Transport Funding Allocation Support

3.5.1 The Major Scheme – ‘Ipswich – Transport Fit for the 21st Century’ – has been under development for over five years. It is designed as a integrated Scheme to achieve a ‘step change’ in travel behaviour, challenging and changing existing patterns of travel, and establishing new sustainable transport norms for new developments. This step change will be essential if transport is to facilitate and support the future growth of Ipswich. A full MSBC Bid was prepared and submitted in July 2005, and underwent detailed discussion with the DfT, culminating in a letter in May 2007 listing the remaining technical comments on the Bid. The Scheme was accepted as a high priority for the East of England in the Regional Funding Allocation process. The most recent advice to Government from the region in March 2009 confirmed the Scheme’s priority, with funding for its delivery profiled for 2010/11 – 2012/13. This funding profile, which was constrained by the funding available within the RFA, is sub-optimal. Alternative funding and delivery profiles are discussed in Chapter 9.

3.5.2 In the intervening years since the first Scheme definition and outline design, work has continued on defining the Scheme. A rigorous value engineering process in February 2007 informed a recasting of emphasis, with some elements being simplified and others being made more extensive and effective. Some urgent detailed aspects have already been carried forward by the county council. One such project – the remodelling of the south eastern approach to the town centre adjacent to the increasingly busy Education Quarter - has been approved under the CIF2 Bid process, and will be implemented in 2010/11.

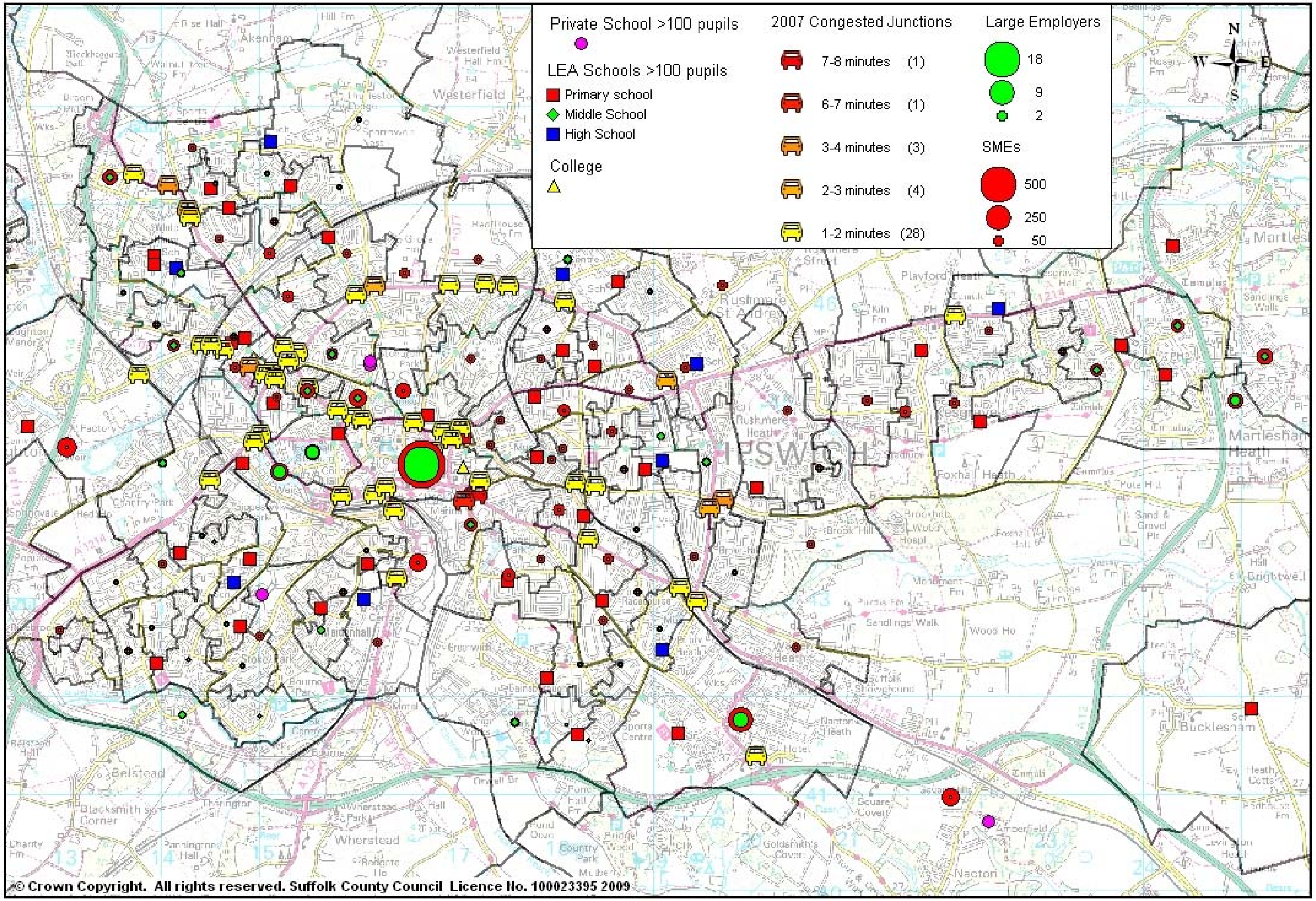
3.6 Current transport problems in Ipswich

Development pressures

3.6.1 The wider Ipswich area is facing enormous growth in housing and employment over the next 15 years. The East of England Plan has allocated around 20,000 new homes and a similar number of new jobs to the wider Ipswich area.

3.6.2 Figure 3.3 shows the location of the current large employment sites, large schools and congested junctions in the Ipswich area. There are clusters of employment sites at several sites close to A14 and A12 junctions, and in a few other peripheral locations such as Ipswich Hospital. The greatest concentration of employment activity is in central Ipswich. Central Ipswich is the destination for almost 50% of journeys to work within the greater Ipswich area. Ipswich also serves as an employment and service centre for outlying areas and around 27,000 people travel into the town to work, a large proportion by car.

Figure 3.3: Employment centre, schools, and congestion

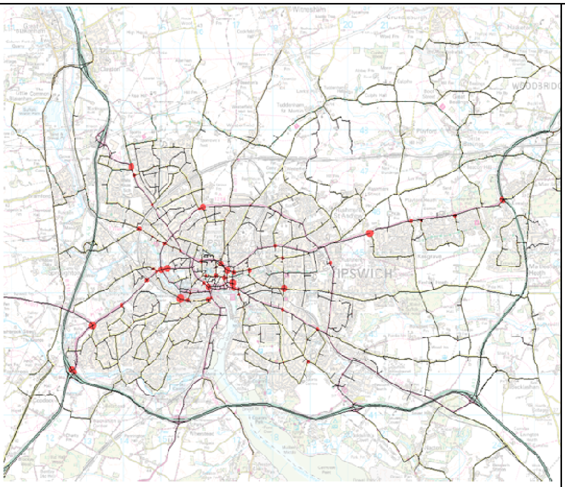


The impact of traffic growth

3.6.3 Congestion problems are largely related to peak hour travel, which is strongly influenced by journeys to work and school. Many of the journeys within the town, including relatively short trips, are made by car, which leads to congestion on roads in and around the town centre and on radial routes leading to it. There are already air quality problems which have resulted in the declaration of three Air Quality Management Areas around the central area of Ipswich, two covering the important routes round the town centre. In addition, further AQMAs are being investigated heading away from the centre, as congestion spreads further outwards.

3.6.4 Our traffic modelling has shown that if the current patterns of travel are maintained into the future, the additional car trips brought about by background growth and new developments will lead to much greater congestion, which is also likely to spread beyond the morning and evening peak periods. Our model forecasts a 17% increase in the number of peak hour trips into the central area between 2011 and 2021, and an increase of 22% of trips within the central area. Figure 3.4 shows the predicted levels of congestion on the highway network in 2011 and 2021.

Figure 3.4: Congestion levels on the highway network in 2011 and 2021

	
2011	**2021**

A declining quality of public realm ambience and safety.

3.6.5 The principal focus for future planned growth in jobs and housing is in and around the town centre – the Ipswich Village employment area; town centre retail area; the waterfront brownfield residential development area; and the Education Quarter encompassing the new university and new further education college.

3.6.6 There is already significant pedestrian and cyclist activity around the waterfront and education quarter areas and this is likely to increase. These areas are bounded by traffic dominated streets presenting barriers to sustainable travel to the town centre. Transport system improvements have failed to match closely with the regeneration projects in this area. There is an urgent need to enhance the public realm to provide convenient and safe walk and cycle links between the existing town centre attractions and these new developments.

An increasing concern that the accessibility of the town centre facilities is being reduced, affecting the viability of new housing developments

3.6.7 The forecast increase in congestion will cause increased delays in the transport networks and will have negative impacts on business, air quality, accessibility, bus punctuality and reliability. These forecast problems could in themselves threaten the viability of some future developments, both directly in these congested areas, and more widely.

A continuing dependence on the private car, unnecessary given the layout of the town, and unsustainable in the longer term

3.6.8 Ipswich is a compact town. All of the central development areas are close to the retail centre and lie within a mile of each other. There are also significant residential areas close to the centre. Residential suburbs are well connected with a comprehensive local bus network, which operates commercially. There is, however, a relatively high use of private cars for peak hour trips into the town centre, a pattern that is unnecessary and in the longer term will be increasingly unsustainable.

3.7 Reducing Demand

3.7.1 The capital improvements proposed within the Scheme need to be considered alongside other initiatives by the county council and Ipswich Borough Council as the local planning authority, which will help to reduce the future demand for car travel:

- Some of the land currently used for long stay car parking in the central area is proposed to be allocated for development in the local development framework.
- Significant new developments are now subject to planning requirements for travel plans, which seek to minimise car based trips. SCC now employs two workplace travel planners who provide advice within the development control process and are also working with existing employers in Ipswich to encourage the take up of voluntary travel plans with robust targets.
- School travel plans are being promoted in all the town's schools, with priority given to those where school travel affects busy traffic corridors.
- Personalised travel planning.

3.7.2 The personalised travel planning we will undertake in support of the capital improvements proposed in the Major Scheme will be a town wide approach to personal travel planning, also known as individualised travel marketing. Our intention is to include 17,000 households (about one third of the total) in Ipswich in a project similar to those funded by DfT within its Sustainable Travel Towns project in Peterborough, Darlington and Worcester. Gillian Merron, then Parliamentary Under Secretary of State, wrote to council chief executives in May 2007 to report on the results of this work, in which traffic reductions of up to 13% were reported alongside significant increases in the use of walking, cycling and public transport. We would expect similar effects to be achievable in Ipswich. Suffolk County Council is currently working in partnership with Sustrans to deliver TravelSmart individual travel planning to every household in Lowestoft and preliminary results are very promising. The Lowestoft project is currently the largest project of this type in the UK. For appraisal purposes the personal travel planning has been considered as an essential element in achieving the modal shift objectives of the Major Scheme.

3.7.3 Our personalised travel planning project work is being promoted as part of a wider project – Ipswich Smiles - aimed also at schools and workplaces. This project uses social marketing techniques to understand and influence travel behaviours. Further information about the Smiles project is included in Appendix C.

3.7.4 Taken together all of our demand management strands are expected to bring about a 15% reduction in car trips into and around central Ipswich. The infrastructure improvements of the Major Scheme will provide the additional capacity required on the sustainable transport networks to accommodate the reduction in car trips and the improvement in quality and reliability will further strengthen the change.

3.8 The proposed Scheme 'Ipswich – Transport fit for the 21st Century'

3.8.1 Our preferred approach is to influence patterns of travel in the Ipswich area, to reduce reliance on the car, particularly for peak hour travel. We can then begin to tackle congestion and associated air quality problems and our transport networks will be better placed to support development growth. Achieving this outcome, which will require much better accessibility of employment and housing sites for people without cars, is the principal focus of our transport strategy for Ipswich, of which this Major Scheme is a key element. The Draft Ipswich Air Quality Action Plan supports our approach by identifying this proposal as being a key contributor to achieving the required improvements in air quality and also in achieving reductions in greenhouse gas emissions.

3.8.2 Achieving a significant and sustained modal shift requires that we are able to convince people to leave the car at home and also that the sustainable transport networks have the necessary capacity and quality to support change. The level of change that is required if the transport system is to adequately support and facilitate future development is far greater than could be achieved with incremental improvements, such as could be afforded from integrated transport block funding. Investment at the level proposed for this Major Scheme will be necessary if we are to achieve the step change that we need.

3.8.3 The proposed infrastructure improvements will provide better quality and more capacity for journeys by bus, including park and ride, for people entering central Ipswich from outlying residential areas and from its hinterland. For trips within the central area we have identified a network of routes for active travel connecting the main development areas and the town's transport interchanges. Our Scheme will upgrade this network to provide high quality routes for walking and cycling between the principal development and transport nodes.

3.8.4 The Scheme is fully described and illustrated in Chapter 4. A brief summary is given here.

3.8.5 Ipswich has a compact central area. All of the key development and regeneration areas – Ipswich Village, waterfront, education quarter and retail centre are all situated within a mile of each other. Large numbers of people live within easy walking and cycling distances of these areas of economic activity. Many of these trips are currently undertaken by car.

3.8.6 Within this Scheme we want to increase the levels of sustainable transport in and around the central area and reduce the demand for car travel. We would achieve this by providing infrastructure of a quality that can make walking and cycling natural choices for shorter trips within this area and for trips into the centre from the fringe residential areas. The key development sites around the central area are all well placed to support active travel modes. Whilst travel distances are short the existing town centre boundary traffic routes present substantial barriers to pedestrian and cycle movements. Routes will be continuous and connected, with no break in the facilities, to ensure that people can travel to all parts of the enlarged town centre without impediment and are given as much priority as possible when coming into conflict with vehicular traffic. The Scheme includes new crossing facilities, some of which will be incorporated into new traffic signals provided as part of the intelligent transport system package. The Scheme also includes a programme of waymarking and signing with associated mapping to make the network of routes easier to follow. A new town centre shuttle bus service will connect the principal development nodes, providing a convenient alternative to the car.

3.8.7 We also want to achieve a reduction in the use of private cars for trips into the central area from the suburbs and from the wider hinterland. For trips over 3 miles there will still be significant scope for cycling but bus is likely to be the main alternative to the car. Our aim is to provide additional passenger capacity, better efficiency of the bus networks, and to raise the quality of public transport provision in Ipswich.

3.8.8 Ipswich has two central bus stations, Tower Ramparts at the northern edge of the retail centre and Old Cattle Market, at the southern edge. Previous evaluation work has indicated that, whilst benefits would arise from combining the operations at a single bus station, there is no suitable alternative site. Our intention is therefore to improve the operational efficiency of the existing bus stations and to rebuild the passenger waiting and information facilities. This will effectively provide two brand new bus stations equipped with excellent passenger waiting facilities. Information screens will display real time passenger information (RTPI) throughout the bus stations and at most stops within the central area, using technology that has been successfully trialled in Lowestoft.

3.8.9 Investment will also be directed at improving some on-street bus waiting areas to improve capacity and quality. We will achieve this by widening pavements, providing better shelters and installing real time information screens.

3.8.10 We have secured agreement with the principal operators of bus services in Ipswich to the principle of a multi operator bus quality partnership, utilising the new powers conferred by the

2008 Local Transport Act. Letters of support for the Scheme from the principal bus operators, First and Ipswich Buses, and from National Express East Anglia, are included in Appendix N.

3.8.11 We have identified a network of strategic cycle routes linking residential areas of Ipswich to the town centre and to other employment sites. The Ipswich cycle map is included in Appendix F. We have been improving this network using LTP funding. These routes connect to the proposed walking and cycling network for the central area forming part of this Scheme.

3.8.12 A major element in the proposed Scheme is an Urban Traffic Management and Control (UTMC) system which will help to deliver better efficiency of the highway network. The system will also work with our proposed bus RTPI system to provide dynamic bus priority at junctions. Another feature of the system will be variable message signing (VMS). This will be able to display messages about traffic congestion, air quality and parking availability, and to manage reroutings and diversions. Real time air quality monitors are already in place at one junction in the town centre. Additional monitors will be provided and these will be linked into the UTMC system. A threshold pollution level can be set such that when it is exceeded, either a VMS is activated warning of poor air quality or an alternative traffic light control plan is invoked to reduce queuing and emission levels. Grant funding has been obtained from Defra to support air quality modelling for testing and optimisation purposes. As well as resulting in improvements in air quality this system should also achieve a reduction in greenhouse gas emissions.

4 Scheme Description

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4 Scheme Description

4.1 Scheme concept

4.1.1 Ipswich is an important and vibrant county town, performing a wide range of roles for its residents, hinterland, and business and cultural communities. It has a long and rich history. In recent decades, it has adapted to the dominance of the car mode. The concept of the 'Ipswich – Transport Fit for the 21st Century' Major Scheme is to implement a coherent and concerted package of measures covering all aspects of travel in the wider Ipswich area. The objective is to achieve a significant shift to more sustainable travel – from car to bus and active modes, while responding to the Regional Spatial Strategy targets for supporting residential and employment growth. Integral to the Scheme itself are information components to inform and encourage this shift in travel habits. Growth and development changes also provide an opportunity to start new more sustainable travel patterns. The Major Scheme addresses all aspects of achieving this shift – creating attractive alternatives, shifting the balance of priorities, and providing information and encouragement to change behaviour.

4.1.2 By its nature, the Major Scheme will need to be smart and adaptive. In providing the Scheme description, we have grouped the components under three headings, addressing three types of trip making:

4.1.3 Town centre travel – as the town centre develops and expands, the challenge is to offer safe, attractive and convenient walk and cycle links to minimize cross town centre car traffic, and to achieve an increasing proportion of travel by active modes around and within the town centre. Experience elsewhere has shown that this is a 'quick win' – there is considerable scope for cost effective Schemes to change mode for short distance trips.

4.1.4 Suburban travel – Ipswich has a dense and constrained radial suburban development pattern, both suitable for serving by bus, and unsuitable for the car. New developments are served almost exclusively by car transport, and there is a challenge to redesign and expand the bus service capacity to serve both the town centre, the new residential developments, and the edge of town concentrations of employment and commerce.

4.1.5 Hinterland travel – Ipswich is a county town providing vital employment, commercial, cultural, and administrative services to the surrounding area. The railway services, the inter-urban bus services, and the Park and Ride sites all perform important but limited roles in making the county town centre accessible to surrounding communities. The challenge is to expand these roles in an attractive and cost effective way.

4.1.6 While Major Scheme components often span these categories to provide attractive integrated travel options, the following three Sections use them to provide a framework for the Scheme description.

4.2 Town centre travel

4.2.1 At present, Ipswich town centre has partial and patchy walk and cycle facilities, neither well integrated, nor well matched to the current demands, or the town centre development plans. Some older parts of the town already have an attractive and high standard public realm. Other parts will be subject to comprehensive integrated development, with public realm treatment an integral part of the development. At the heart of the Major Scheme is a co-ordinated infrastructure programme to address the need for wider and more attractive linkages, with the following elements (illustrated in Figure 4.1).

4.2.2 The creation of a major new traffic free pedestrianised shopping street - Upper Brook Street, running north – south through the town centre, is currently a congested corridor for pedestrians, buses, and traffic, with a poor accident record, particularly at its junction with the main pedestrianised shopping street (Westgate Street/ Tavern Street/ Carr Street, running east-west).

4.2.3 The comprehensive enhancement of the Princes Street corridor linking the railway station and the town centre, providing a clear, safe and inviting route for visitors accessing the town centre.

4.2.4 The improvement to the links between the town centre and important peripheral activity areas – the public service buildings, the football stadium, the 'Mint Quarter' potential commercial development area, the expanding education quarter, and the already re-generated Wet Dock Waterfront.

4.2.5 The connecting and strengthening of the fragmented and partial network of cycle routes into and through the town centre – with a programme of new links, partial segregation, and signalised crossings of trafficked roads.

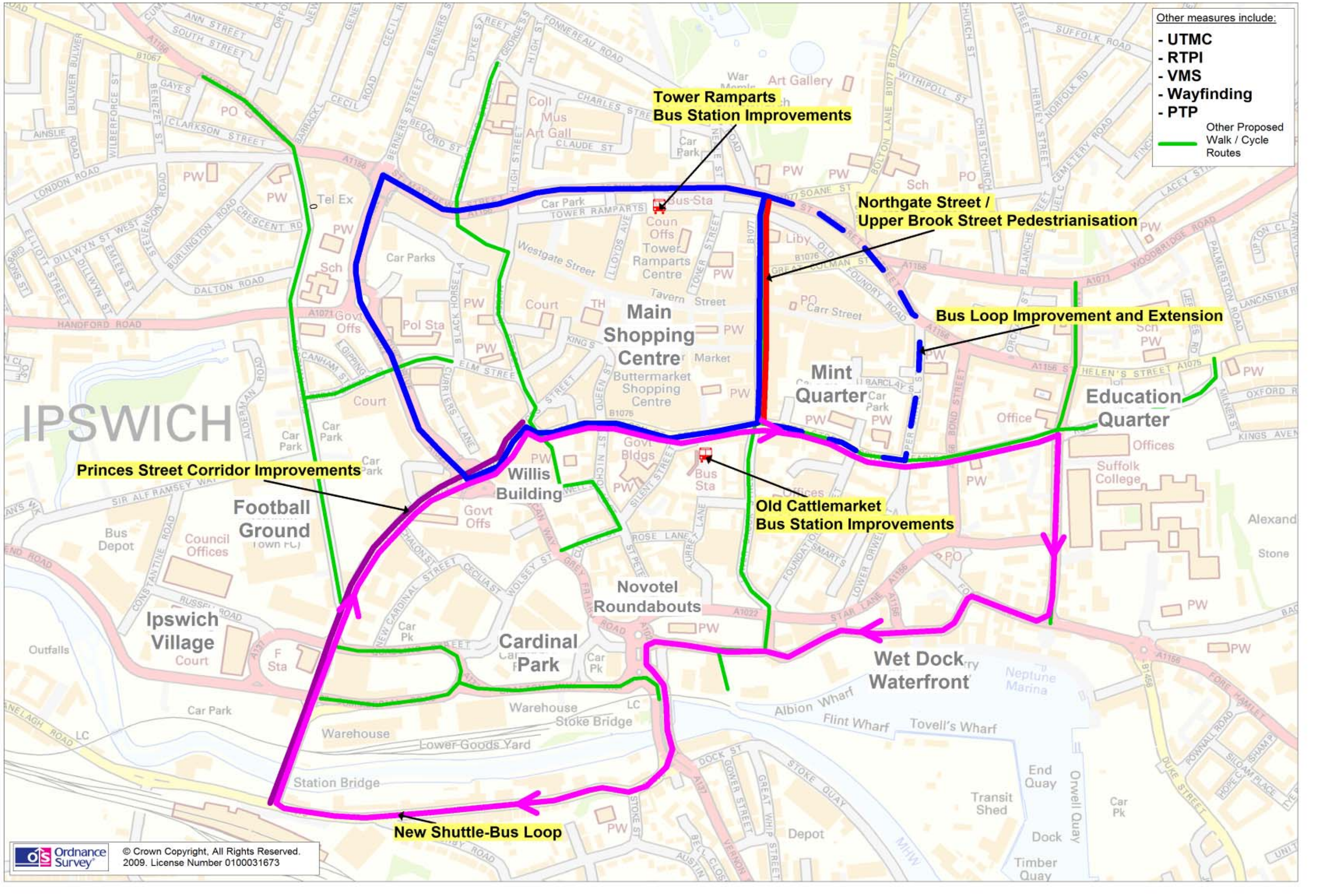
4.2.6 The addition of a second high frequency shuttle bus linking the town centre and important peripheral activity areas, building on the existing cross town service, and encouraging a culture of non-car use in the town centre.

4.2.7 The implementation of a travel way finding service, providing information on travel choices and routes in the town centre, through static and dynamic on-street displays, and internet and paper based media.

4.2.8 This concerted programme, implemented in close cooperation with Ipswich Borough Council conservation interests, will deliver an attractive, safe, and convenient circulation environment in the town centre, building on the existing best examples of public realm. The components aimed at town centre travel are considered to be 'easy wins' where an attractive alternative to the car can be provided at low cost, and with environmental benefits.

4.2.9 The programme also links to the 'Smarter Choices' proposals for incentivising sustainable suburban travel to the town centre.

Figure 4.1: Scheme Components



4.3 Suburban travel

4.3.1 Ipswich has a dense and historic pattern of inner suburbs, surrounded by later and lower density areas. On the edge, particularly near A12 and A14 junctions, recent further residential communities have developed, often heavily dependent on the car for convenient travel. Regeneration of the town centre is proceeding with some mixed land uses – with student and higher density residential developments along the waterfront within easy walking distance of shopping and work for example. Some in-fill residential development potential has been designated in the Ipswich Borough Council Local Development Framework, but increasingly the targets of the East of England Plan will need to be met by residential development further from the town centre.

4.3.2 The objective of this part of the Scheme is to offer attractive and convenient bus travel to residents of the inner and outer suburbs, to halt and reverse the growth in car traffic, particularly in the commuter and education peak travel times. The Scheme includes the following components:

4.3.3 The refurbishment of the Tower Ramparts Bus Station (mainly used by Ipswich Buses suburban services) to provide a better and safer circulation and waiting environment for passengers, and to provide more active bus service stops and throughput capacity, with modern boarding facilities, and signalised entry and exit to the Station.

4.3.4 The enlargement of the existing ‘bus loop’ (whereby buses approaching the town centre circulate counter-clockwise to prove a series of alighting and boarding points on the edge of the main shopping and commercial centre) to provide an increased number of more convenient and comfortable bus stops.

4.3.5 The comprehensive introduction of an Urban Traffic Management and Control (UTMC) system, to improve and integrate the monitoring and control of traffic and air quality in the town centre, both for normal conditions and to enable incidents and breakdowns to be dealt with swiftly. This system will enable bus reliability on the main bus routes to be improved, through links to the Automatic Vehicle Location (AVL) module of the RTPI system. This will enable selective targeted priority to be given to delayed buses, within the constrained network which has limited opportunities for physical bus priority.

4.3.6 The Real Time Passenger Information System (RTPI) has three main aspects. First the AVL module already referred to – fitted to each bus regularly using the main services within Ipswich, allowing the bus position to be regularly reported to the central server. Secondly, a series of bus information display panels, generally located in the town centre and along the main inbound radials at the main boarding points, which provide real time bus arrival information. Thirdly, and internet and mobile phone interface to allow individual access to the real time information.

4.3.7 These improvements will be complemented by a concerted programme of ‘Smarter Choices’ information dissemination and personalised travel plan delivery, to ensure the early testing and take up of the bus service improvements.

4.3.8 The bus operators have been involved in the development of these proposals, and are expected to respond to these improvements to their operating environment by tightening schedules, providing newer and higher capacity vehicles, and improving the penetration of suburban routes. Public investment in the RTPI and UTMC components of the Scheme will provide a firm base for the development of a multi-operator Quality Bus Partnership.

4.3.9 Ipswich already has a number of suburban cycle routes, largely focused on existing relevant attractors, such as schools, as shown in the plan included in Appendix F. The cycle route component of the Scheme will establish several new cross-town links, providing a safe and convenient network to attract a more diffuse pattern of suburban trips from car to cycle.

4.3.10 The suburban travel components are seen as tackling the largest and fastest growing travel market segment. The measures will be concentrated in the denser corridors where bus services can offer a markedly better alternative to the car.

4.4 Hinterland travel

4.4.1 As a county town, Ipswich is dependent on its hinterland for much of its shopping footfall and commercial activity, and the hinterland depends on the services provided. Most of the travel will continue to be dominated by the private car in the medium term. There are, however, two important aspects to the Scheme which seek to enhance the sustainability of this travel market.

4.4.2 The refurbishment of the Old Cattle Market Bus Station (mainly used by First Eastern Counties and rural sponsored independent services) to provide a better and safer circulation and waiting environment for passengers, and to improve the layout for circulating and passing buses. This will provide benefit to those dependent on the bus services for access to Ipswich.

4.4.3 The implementation (integrated with the UTMC system) of a comprehensive Variable Message System. This will link to Highways Agency systems on the A14 and A12, and allow information to be provided to road users in real time. It will include a Parking Guidance System, with monitoring of the entries and exits from particularly sensitive car parks, and the relaying of appropriate messages to drivers on the main inbound radial routes. This will enable the car parking demand to be managed, minimising parking search distance around the town centre, and enabling messages about the Park and Ride service to be delivered.

4.4.4 Ipswich already has a well developed Park and Ride system, with three sites located at major A12 and A14 junctions. The system is currently mainly aimed at, and used by, shopping groups and personal business users. In parallel with this Scheme, it is planned that the system will be adapted to also appeal to longer distance commuters, and extended to cover further approaches to Ipswich.

4.5 Combining the elements

4.5.1 The proposed Scheme is a multi-modal package of infrastructure improvements that will provide better management of road traffic, better facilities for public transport and better networks for walking and cycling. The infrastructure improvements will be supported by demand management measures within our wider transport strategy for Ipswich.

4.5.2 The Major Scheme will enable linked investment by town centre developers improving access and public realm, and will work with the public transport operators in improving their services. It will also work with developers of brownfield and infill sites in the suburban areas, to ensure that new residential developments are provided with convenient ‘first choice’ active mode and bus service options

4.5.3 The Scheme has been developed by SCC over the last five years, in close consultation with stakeholders, after the consideration of other transport infrastructure and policy interventions:

- The redevelopment of areas of the town centre has not provided the opportunity to build new road capacity - there have been no appropriate opportunities in part due to the constraints of the radial approaches coupled with no realistic likelihood of any Schemes being delivered in the short term and a lack of clarity about how any local new capacity would fit in with the strategic network.
- Charging car users – through entry charges or parking levies and charges – was also rejected. This was politically and commercially unacceptable without major investment in transport alternatives. Given the diffuse and complex mix of motives and the widespread availability of non-residential private parking, this was seen as a blunt, and insufficient, solution.
- High capacity public transport – in one or two of the main radial corridors, was rejected. Ipswich has some seven radial corridors, connected by the bus loop, which work reasonably well. No one corridor dominates or provides an easy opportunity to introduce a new exclusive public transport right of way. This issue may need to be reassessed in the future depending on the scale and location of further development beyond 2021.

4.5.4 There are several other major transport infrastructure ideas which continue to be considered in the long term. They, however, will depend on longer term development trends, and would need to build on good sustainable travel patterns established by this Scheme.

4.5.5 The iterative design work in the last five years has examined lower and higher cost variants of some of the Scheme components. The current proposed Scheme builds on this design work:

- At one stage, higher cost enhancements to the bus stations were considered, with ambitious land acquisition and iconic bus station structures and elaborate facilities. During the 2007 value engineering exercise, however, these were considered to be poor value for money.
- In the original July 2005 Bid, a lower cost approach to the walk and cycle route enhancements was considered. During the more detailed recent design work, this approach has been refined. The public realm enhancements are now closely aligned with their context. High standards have been adopted in busy and environmentally sensitive parts of the network, such as conservation areas. On the other hand, simpler materials and solutions have been adopted in less sensitive areas, where the objective is to provide continuity and connectivity in the network.

4.5.6 While the Scheme has been developed as an integrated package aimed at changing car users' habits at all levels, the components have been the subject of individual design and costing studies. These are described in Appendices:

Appendix A Bus station improvements – describes the objectives of providing increased capacity, safety and comfort at the two main bus stations – Tower Ramparts and Old Cattle Market.

Appendix B Bus loop expansion and shuttle bus service – describes the proposed changes to the anti-clockwise bus service loop, the increased stop capacity, safety and comfort, and the addition of a second shuttle bus service to the town centre travel options.

Appendix C 'Smarter choices' travel plans – this describes the proposals to engage for individuals and organisations in reassessing their travel choices with the implementation of the Scheme.

Appendix D Urban Traffic Management Control and Parking Guidance Information systems – this describes the specification and location of the comprehensive implementation of the linked traffic signal, bus recognition and priority, and parking guidance information systems.

Appendix E Real Time Passengers Information system – this describes the specification and location of the RTPI system.

Appendix F Walk and cycle route improvements – this describes the proposed improvements to the active mode facilities, their links to the existing facilities, and their integration with the existing public realm.

Appendix G Wayfinding – this describes the approach, elements and costs of an initial wayfinding system, replacing some elements and integrating with other elements of the existing town centre public information systems.

5 Strategic Case

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5 Strategic Case

5.1 Introduction

5.1.1 In this Chapter we present the strategic case for the Scheme described in Chapter 4. This case is built up using four strands:

- A good understanding of the existing problems, development aspirations, and local political concerns, built up from the close and ongoing engagement with the stakeholders;
- A detailed evidence base, built up over the years from a series of studies, notably the major transport and travel survey and modelling exercises undertaken in 2008;
- The overlapping hierarchy of national, regional, and local policies, plans, and targets for the coming decades; and
- The specific recent reassessment of the Regional Funding Allocation priorities.

5.1.2 These strategic case strands have been developing over the last decade, with a strong local partnership between the Borough and the County; a programme of investigations; and an increasing alignment of the Scheme with relevant policies and funding programme objectives. This Chapter complements Chapter 3, and summarises the strategic case for the Scheme.

5.2 Perceived Problems and Potential Solutions

5.2.1 Chapter 3 included a discussion of the existing and predicted pressures and problems affecting transport in Ipswich. In summary:

- Chronic peak hour delays, increasing in severity and extending over a longer peak period, both in the junctions around the town centre, and also near the developing employment concentrations such as Adastral Park and Ransomes Europark;
- A declining quality of public realm ambience and safety in the town centre, as transport system improvements have failed to match closely with welcomed re-development, such as the Education Quarter and the Wet dock Waterfront;
- An increasing concern that the accessibility of the town centre facilities is being reduced, affecting the viability of new housing developments; and
- A continuing dependence on the private car, unnecessary given the layout of the town, and unsustainable in the longer term.

5.2.2 Potential solutions were considered at the end of Chapter 4. While ambitious ideas for new infrastructure have been suggested, they are not well aligned with general public policy (and hence funding possibilities) and are unlikely to attract sufficient developer funding in the current economic climate. While larger scale new transport facilities and infrastructure may comprise a future part of the way forward for Ipswich, the current Scheme is considered to provide a firm basis for moving forward.

5.3 The Evidence Base

5.3.1 The evidence base underpinning the analysis, design and appraisal of this Scheme has been built up over the last six years:

- Suffolk County Council conducts a series of routine monitoring and specific targeted traffic surveys to support the Council's work, and inform the LTP process;
- Ipswich Borough Council has extensive inventories of the town centre public realm condition, existing land use, and development sites;
- The bus operators have operational management systems, including 'Wayfarer' ticketing information;
- As described below, a series of detailed sectorial studies have been carried out to inform particular aspects of transport in Ipswich;
- As major developments have been submitted for planning permission, detailed Transport Assessments have been used to provided detailed local additions to the evidence base;
- Work in 2005 as part of the original Scheme Bid process started the detailed design and appraisal of the Scheme elements; and
- The Ipswich Transport Analysis Modelling Suite, and its associated transport surveys (designed with the Scheme Bid process partly in mind) provides a closely tailored body of information for the Scheme development and appraisal.

5.3.2 Recent sectorial studies which have contributed to the evolution of the Scheme have included:

- IBC IP-One Area Action Plan (Ipswich LDF) Preferred Options;
- Waterfront Transport Study;
- Ipswich Town Centre Bus Infrastructure Study; and
- Education Quarter Transport Assessment.

5.3.3 The Town Centre Bus Infrastructure Study showed that the bus networks currently cope with the current level of demand, but there are some capacity pressures on some routes and at some passenger waiting areas in the town centre. This study also considered the impact on the networks of future growth in demand, which is likely to occur if we are successful in our plans to achieve modal shift. The likely impacts on the public transport network have been tested against a range of increased demand.

5.4 National Policy

5.4.1 The Government has set out its five goals for transport in the documents Towards a Sustainable Transport System (2007) and Delivering a Sustainable Transport System (2008). These are:

- to support national economic competitiveness and growth, by delivering reliable and efficient transport networks;
- to reduce transport's emissions of carbon dioxide and other greenhouse gases, with the desired outcome of tackling climate change;
- to contribute to better safety, security and health and longer life-expectancy by reducing the risk of death, injury or illness arising from transport and by promoting travel modes that are beneficial to health;
- to promote greater equality of opportunity for all citizens, with the desired outcome of achieving a fairer society;
- to improve quality of life for transport users and non-transport users, and to promote a healthy natural environment.

As the Scheme has developed, it has been deliberately aligned with these goals. Indeed, recent discussions with DfT Regional and Local Major Projects Division have indicated the Scheme is ' …potentially hitting all objectives'.

Tackling climate change

5.4.2 The overriding ambition of the Ipswich transport strategy which underpins this Scheme is to see a 15 percent reduction in the forecast levels of traffic in Ipswich by 2021 through achieving a significant modal change towards more sustainable modes of travel, providing a local contribution to national targets.

Support economic growth

5.4.3 The Scheme is based around supporting the significant growth that is required within the East of England plan for the wider Ipswich area, with its role of a key centre for development and a regional transport interchange within the Haven Gateway growth area. With the high level of development growth that has been allocated, reducing the demand on the road transport network resulting from the use of single occupancy car trips is essential to control congestion and environmental damage. Continued business health requires a vibrant and efficient town centre, with convenient and safe travel mode choices. To continue to perform its wider Haven Gateway role, reliable journey times on key local, regional and national network routes are essential.

Promote equality of opportunity

5.4.4 As a result of the facilities provided by the project, a greater, more effective, sustainable transport network will be available to help enable those who currently have difficulty in travelling make better, informed travel choices. Combining elements such as RTPI and wayfinding with softer measures alongside ‘Smarter Choices’ principles will inform and allow people to easily understand and plan their journeys. Improved facilities at the bus stations and bus stops will encourage access by all sections of the community. While aimed at persuading car users to change their travel habits, the Scheme will deliver significant benefits to the existing bus users without access to a car.

Contribute to better safety, security and health

5.4.5 Through the introduction of infrastructure to link and extend key active mode transport corridors into and around the town, these networks will become more attractive and real alternatives to car use allowing users to walk and cycle in safe, secure environments. By achieving a modal shift on to these more sustainable modes, this will improve the health of those switching to more active travel. Improved air quality will have both local benefits, and contribute to reductions in greenhouse gas emissions.

Improve quality of life

5.4.6 The modal shift generated through the Scheme will result in a reduction in traffic from what would otherwise be the case. This will reduce the level of noise, severance, and pollution that impacts local communities in Ipswich. The improved public realm environment, interchanges, waiting environments, information availability and services will also improve the quality of life not only of transport system users, but also of residents and visitors to Ipswich.

5.4.7 The close alignment of the Scheme with National Objectives is discussed and demonstrated in detail in Chapter 7 which presents the Assessment Summary Table.

5.5 Regional Policy Context

5.5.1 The proposed Scheme has been developed alongside the proposals for future housing and employment growth in Ipswich and the wider Haven Gateway sub region within the East of England Plan. Ipswich is designated as both a key centre of development and change and as a regional transport interchange in the plan. This reflects the very high growth that has been identified for the Ipswich area within the East of England Plan. By reducing the demand for car travel into central Ipswich and providing viable better alternatives, this Scheme will reduce existing congestion problems and help facilitate more sustainable patterns of growth in the town and the wider Haven Gateway sub region.

5.5.2 The regional transport strategy is embedded within the East of England Plan and contains a set of policies supporting the spatial strategy. The Plan is published on the Government Office for the East of England website:

www.go-east.gov.uk/goeast/planning/regional_planning

Our proposed Scheme for Ipswich fits well with the policy framework of the regional transport strategy. The relationship of the proposed Scheme to the strategy can be summarised as follows:

- **Policy T1: Regional Transport Strategy Objectives and Outcomes**. The Scheme directly supports the policy objective to manage travel behaviour and the demand for transport to reduce the rate of road traffic growth, contributing to reducing greenhouse gas emissions. It also directly supports the objectives to encourage efficient use of transport infrastructure; to provide infrastructure and services to support existing communities and proposed developments; and to improve access to jobs and services.
- **Policy T2: Changing Travel Behaviour.** The proposed Scheme strongly supports this objective to bring about significant change in travel behaviour, a reduction in distance travelled and a shift towards sustainable modes.
- **Policy T3: Managing Travel Demand.** The Scheme and the wider Ipswich transport strategy strongly support the regional objective to pursue demand management measures to tackle congestion and thereby provide more reliable journeys.
- **Policy T4: Urban Transport.** The Scheme is completely aligned with the regional objective for urban areas to bring about a shift away from car use to walking, cycling and public transport by providing better linkages for sustainable transport; by area wide improvements to public transport and walk/cycle networks; by negotiating for better bus services, providing improved accessibility, information and interchange; and by improving local networks for walking and cycling.
- **Policy T5: Inter Urban Public Transport.** The Scheme will improve the quality of bus/rail interchange in Ipswich, defined as a regional transport node, and will significantly improve the level of service at the Old Cattle Market bus station, which is used for inter urban bus and coach services.
- The Scheme is also fully consistent with Policy T8 (Local Roads), Policy T9 (Walking, cycling and other non-motorised transport), Policy T13 (Public Transport Accessibility) and Policy T14 (Parking).

5.5.3 The proposed Scheme is fully supported by the Haven Gateway Partnership, the sub-regional economic partnership, and is a key element in its Integrated Development Programme submitted to the East of England Development Agency in December 2008. Regional support is demonstrated in Appendix N.

5.6 Suffolk County Council Policy

5.6.1 The 'Ipswich – Transport Fit for the 21st Century' Scheme has been a closely integrated part of Suffolk County Council's policy for five years. It is an important component of the Local Transport Plan 2006-11, and provides support to the Suffolk Community Strategy.

Suffolk Community Strategy

5.6.2 'Transforming Suffolk, the Suffolk Community Strategy to 2028' sets out the long term ambition and priorities for the county over the next twenty years. It has four themes:

- Prosperous and vibrant economy
- Creating the greenest county
- Learning and Skills for the Future
- Safe, healthy and Inclusive Communities

Transport has a particularly important role to play in achieving the desired outcomes for Suffolk to achieve the greatest reduction in carbon emissions; to become the most innovative and diverse economy in the East of England; and to be the healthiest county.

5.6.3 By changing the way that people travel into and around Ipswich, our proposed Scheme '*Ipswich – Transport fit for the 21st Century'* will help us to achieve these aims. It will directly support and facilitate more sustainable economic growth. The Scheme will reduce the climate change impact of local transport. The existing commute to and from work within Ipswich is estimated to produce around 42,000 tonnes of CO2 every year. A 15 percent traffic reduction could reduce this by around 6,000 tonnes of CO2. By increasing the use of active travel modes, our Scheme will improve health outcomes. Adult and child obesity levels in Suffolk are currently reaching epidemic level, which is consistent with the rest of England. The strategy identifies walking and cycling activities in everyday life as '…*an effective way to obtain regular physical activity'* and that '*journeys to and from work or school provide excellent opportunities for this…'.*

5.6.4 'Transforming Suffolk' can be found at:

www.transformingsuffolk.co.uk/vision-and-priorities/community-strategy

Suffolk Local Transport Plan 2006 – 2011

5.6.5 The Local Transport Plan for 2006-11 provides the policy context for this Major Scheme bid. It foucuses on countywide themes to improve accessibility, tackle safety and congestion problems, and address air quality and quality of life improvements. It provides the framework for both new initiatives and routine maintenance for the transport infrastructure in the county.

5.6.6 The local transport plan contains the County Council's plans to meet central and local government's shared transport priorities of improving access to key services, improving safety for road users, alleviating congestion and managing the impacts of transport on air quality model. These transport problems are acute in Ipswich and likely to get worse because of the extensive economic growth planned for the town. *Ipswich – Transport fit for the 21st Century* is at the heart of our plans to tackle congestion and improve accessibility in the county town, supporting and facilitating its growth…'.

5.6.7 The Suffolk Local transport Plan can be found at:

www.suffolk.gov.uk/NR/rdonlyres/CD2B4C34-11A5-4F28-8330-8DD1D0B1E208/0/20062011FullLTP.pdf

5.7 Ipswich Borough Council Policy

5.7.1 Ipswich Borough Council has completed a round of public consultation on the Core Strategy and associated policies. These have informed the development of the Major Scheme in a number of detailed ways. The Core Strategy and associated documents can be found at:

http://ldf.ipswich.gov.uk/Info_page_two_pic_2_det.asp?art_id=9231&sec_id=4081

5.7.2 The detailed site allocation Preferred Options documents from November 2007 have formed the basis of the travel growth assumptions.

5.8 The Regional Funding Allocation Process

5.8.1 The Scheme is now recognised by the East of England regional bodies as a priority Scheme for implementation in the period up to 2013/14 with a profiled start date of 2010/11. A copy of the region's advice to the Secretary of State is attached in Appendix N, together with a letter from the East of England Regional assembly confirming regional support for the Scheme

5.8.2 Phasing of funding is discussed in Chapter 11.

6 Cost Benefit Analysis

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6 Cost Benefit Analysis

6.1 Major Scheme Costs

6.1.1 The scope and integration of the Scheme has been introduced in Chapter 4. The detailed build up of the Scheme component costs are provided in a series of Appendices. This Section brings together and summarises the main Scheme costs, discussing the maturity of their development, and describing the main factors of quantity and unit costs. For this Section, all costs are presented in 2008 prices, including engineering margins, contingencies and allowances for minor items, rounded to the nearest £10,000. Most of the costs are based on current unit prices.

6.1.2 Issues of cost inflation and phasing are discussed in Chapter 11. Issues of differential construction cost factors and optimism bias adjustments for input to the TUBA standard economic appraisal process are discussed in Section 6.5 and Appendix O. The costs presented here have been subject to a review by an independent surveyor, as introduced in Chapter 11, and reported in Appendix P.

Town centre travel

6.1.3 The town centre travel components consist primarily of improvements to the public realm, to enhance and connect elements of the walk and cycle networks. The route improvements have been developed in close collaboration between the SCC walk and cycle officer and the IBC public realm interests. The Schemes have been targeted at building on and connecting the existing elements, and removing barriers impeding pedestrian and cyclist movement.

6.1.4 The improvements will be co-ordinated with existing (separately funded) programmes being carried forward by IBC, and with the SCC plans to implement the Duke Street Roundabout remodelling Scheme, recently approved for CIF2 funding.

6.1.5 The route improvements included in the MSBC Bid, individually costed with bills of quantities in Appendix F, can be drawn into three groups:

- Pedestrianisation of Upper Brook Street, including remodelling the street layout (£1.34M)
- Improvements to the walk cycle network and connections crossing, accessing, and skirting the town centre, including some important new Toucan crossings (£6.05M)
- Comprehensive corridor improvement of the Princes Street corridor linking the railway, football stadium, and the Ipswich Village with the town centre, crossing the Civic Drive Franciscan Way traffic route (£3.47M)

6.1.6 To further strengthen the non-car choice for travel between areas of the town centre, the second shuttle bus service will require two new vehicles to provide a short headway service on a one-way circular route.

6.1.7 Linking these improvements together and adding to the existing IBC and transport operator public information, there will be a comprehensive wayfinding project. This is described in Appendix G, and comprises a range of electronic, paper, and public realm signing media, delivering a range of travel and destination choice information. This item has been costed based on the use of ‘off-the-shelf’ components, linked by a strong branding, and using a budget of £1.00 M. That is, the extent and quality of the wayfinding component included in the MSBC Bid will be limited to the budget ceiling.

The items grouped under the ‘town centre travel’ total some £11.86M.

Suburban travel

6.1.8 The four suburban travel components are different in nature, but all support the objective of making the bus service more attractive and convenient:

- Enhancements to the Tower Ramparts bus station, involving complete remodelling of the bus and passenger circulation areas, and the introduction of pedestrian crossing signals. The layout and logic of this component are discussed in Appendix A, which also details the costs summing to £1.56M;
- Extension and improvement to the town centre 'bus loop', extending eastwards using Tacket Street, Upper Orwell Street, and St Margaret's Street. This will involve reconstruction of Upper Orwell Street, replacement and new bus shelters, and pavement build outs, with a total cost of £0.61M. (The costs of re-organising the signalised traffic junctions is included in the UTMC component);
- The most important, but least visible, components of the suburban travel improvement will be the UTMC system. This component is described in Appendix D, and includes a wide range of interventions, including new signalised junctions, upgrading and linking in existing junctions, providing communications and monitoring facilities, and linking in the existing SCC UTMC control centre. Based on a complete review of the facilities required, and using the existing UTMC contract costs being used for the current Lowestoft related work, results in a cost of £7.66M in total (which should be split with two thirds £5.10M for suburban, and one third allocated to hinterland travel); and
- The highly visible RTPI system has been costed on a similar basis to the UTMC – a comprehensive review of the required facilities (on-bus, around the town centre, and at important suburban bus boarding points) a total cost of £2.13M has been built up, using current price quotes.

6.1.9 Household, school, and workplace travel plans and comprehensive targeted information campaigns will be important in communicating new choices, and encouraging a rethinking of old choices. This supporting work is being separately funded, and does not form part of the Major Scheme bid.

6.1.10 The items grouped under the 'suburban travel' total some £9.40M.

Hinterland travel

6.1.11 Two components in the Scheme provide specifically for the longer distance traveller although other Scheme elements also provide benefits for these people and the wayfinding element will assist less frequent occasional visitors):

- Enhancements to the Old Cattle Market bus station, involving complete remodelling of the bus and passenger circulation areas, the re-organisation of the pick-up/drop-off/ taxi area, and improvements to the safety of the bus station through the control of the essential through service traffic. The layout and logic of this component are discussed in Appendix A, which also details the costs summing to £1.84M.
- As part of the overall UTMC system discussed in Appendix D there is a Parking Guidance Information system, using variable message signing, aimed at infrequent car borne visitors. This information subsystem, which needs to provide information on a wide range of approach roads, includes links to the Highways Agency information system. The allocation of UTMC costs to hinterland travel is £2.56M.

6.1.12 The items grouped under the 'hinterland travel' total some £4.40M.

6.1.13 The overall total, in 2009 prices with appropriate allowances for contingencies and preliminaries, but excluding optimism bias, is £25.7M. The cost estimates are either well founded on recent investigations, outline designs, and current unit prices, or are fixed budget sums for defining open ended items. There is considerable scope for change in the quality and specification of materials.

6.2 Approach to Benefit Assessment

6.2.1 Three approaches have been used to assess the benefits of the Major Scheme:

- The main method used the full multi-modal variable demand ITAMS, and the TUBA software and guidance, to quantify and value in money terms the travel time savings, summed over the road traffic, bus passenger, and walk/cycle travellers (this is introduced in Section 6.3);
- Several of the clearly identifiable benefits can be quantified and valued, covering such issues as accident reduction, comfort and ambience improvements, and health benefits (these are discussed in Section 6.4); and
- These are many other qualitative and quantifiable benefits included in the NATA, and these are discussed in Chapter 7.

6.2.2 Care has been taken to avoid double counting – several important effects of the Scheme (such as the impact of RTPI) are represented in the modelling, and quantified in the direct travel time benefits; others influence the travel behaviour, but need to be quantified and valued outside the model. Some provide real benefits to existing users, but do not influence their behaviour. Many categories of positive benefits are acknowledged to exist, but have not been quantified. At all stages, conservative and precautionary approaches have been taken to benefit assessment

6.2.3 The benefit measures do not link directly to the Scheme cost components – the Scheme is designed as an integrated package, with elements supporting each other. Chapter 11 does, however, undertake an approximate analysis to demonstrate the broadly similar benefit to cost ratios across the package components, and to highlight particularly beneficial elements.

6.3 Use of the Ipswich Transport Modelling Analysis Suite (ITAMS)

6.3.1 The ITAMS has been developed over the last year for a wide range of purposes, and the appraisal of the 'Ipswich Transport Fit for the 21st Century' Major Scheme Business Case has been one of the important early applications. The early stages of the model development were guided by a Model Specification Report, which was drawn up to exceed the WebTAG guidance, and was discussed with DfT ITEA in autumn 2008.

6.3.2 Chapter 8 of this Bid document summarises the background, development, and performance of the ITAMS, and outlines the approach to the forecasts used to undertake the appraisal for the Major Scheme Bid. These summaries are expanded in Appendices I, J, K, and L which provide the information required to respond to the DfT Guidance Appendix B Checklist.

6.3.3 A single set of forecasts have been predicted, taking the calibrated 2008 base situation forward to a 2021 reference horizon. This future demand has been iterated through the model, assuming no change in the transport supply provision, to develop a Do-Minimum situation, reflecting the worsened travel conditions.

6.3.4 The 'Do Something', with Major Scheme, changes represented in the modelling comprised the following effects:

- Journey time improvements in and around the town centre from walk and cycle route improvements, particularly new road crossings;
- Walk time weight changes (that is the factor applied to reflect the greater perception of time spent walking, compare to in vehicle time) in the town centre, to represent the effect of public realm improvement and wayfinding Schemes;
- Addition of the town centre shuttle bus to the bus network;
- Bus wait time weight changes (that is reducing the perception of time spent waiting, compared to in vehicle time) to represent the effect of RTPI;

- Bus real wait time reductions for infrequent services, to reflect home internet and mobile phone access to real time bus arrival information;
- Improvement to the reliability (and hence wait time and scheduled run time) of the bus services as a result of the UTMC bus priority measures;
- Reduced boarding penalties (used in the model to minimise very short bus journeys, or unlikely interchanges) for bus passengers using the improved bus stations; and
- Improved capacity at all signalised junctions to represent the UTMC efficiency gains.

Some of these effects are directly measured within the model and TUBA assessment process, others are used in the models only to represent behavioural change influences. In the latter case, the benefits are estimated outside the model process.

6.3.5 Four model runs are used in the TUBA appraisal process – with and without the Major Scheme improvements, using the base 2008 and future 2021 horizons. Benefits are then interpolated and extrapolated from 2013 to 2027 to accumulate benefits over a 15 year appraisal period.

6.3.6 The output from the TUBA analysis presented in Appendix O predicts lifetime benefits of £32.5M in 2002 prices and values from the directly modelled travel time savings, integrated and discounted over the appraisal period.

6.4 Other Monetised Benefits

6.4.1 In addition, many of the benefits not captured in the formal modelling can be quantified, using a mix of approaches and guidance. In summary, the following seven additional analyses were undertaken to quantify benefit valuations. These are brought to 2008 net present benefit valuations assuming a 15 year project life, no change in numbers of beneficiaries, and a discount rate of 3.5 percent using a factor of 11.52. (Sums in brackets represent net present value of the anticipated benefits, expressed in 2008 prices and values):

- A detailed formal accident analysis was undertaken of all recent accidents within the zone of influence of the walk, cycle and shared space public realm improvements, and judgements reached as to their accident prevention potential. These were then valued using standard methods (£12.0M);
- An estimate has been made of the pedestrian and cyclists' valuation of the ambience improvements to the public realm, using values suggested in WebTAG factored by estimates of the current use (£8.5M);
- In line with the latest April 2009 NATA Refresh Guidance, an estimate has been made of the health benefits of increased physical activity [about £3.7M);
- The value of the proposed wayfinding system was analysed using imputed values from elsewhere, factored by anticipated users (£0.7M);
- An estimate has been made of the existing bus passengers' valuation of the reassurance and information from the RTPI systems (£11.5M);
- An estimate has been made of the bus passengers' valuation of the increased comfort and convenience of the facilities at the remodelled bus stations and improved bus stops (£6.8M);
- A notional allowance has been made for the valuation by approaching occasional car drivers of the variable message and parking guidance information (£0.7M).

These seven analyses are described in turn in the following paragraphs, which also refer to the Appendices where further information can be found. Possible sources of benefits which have not been quantified are also mentioned.

Accident Savings

6.4.2 It is expected that the Scheme will have four main impacts on pedestrian and traffic accidents:

- The UTMC system will provide a comprehensive smoothing of the traffic flows, and so reduce the likelihood of minor vehicle damage accidents;
- The overall effect of the Scheme will be to divert future travel growth to sustainable and safer modes;
- The bus station layout changes are designed to improve circulation and reduce vehicle passenger conflicts; and
- The network of walk and cycle route improvements are designed to provide safer routes for vulnerable road users, directly avoiding certain types of accident.

The first two of these are difficult to quantify, but expected to produce savings; the third is difficult to assess quantitatively, since the accident reporting on the private land of the bus stations is not obligatory or consistent; while the forth impact has been studied in detail.

6.4.3 Appendix F dealing with the design of the walk and cycle network improvements includes the detail of the accident benefit estimation. For each of the Schemes, the following analysis was undertaken:

- All accident data in the walk/cycle route corridor in the three years 2005 to 2007 inclusive was examined, and accidents involving conflicts between pedestrians/cyclist and vehicles identified;
- Accidents which are judged would have been avoided if the Scheme had been implemented are identified; and
- WebTAG Guidance is used to value the annual savings which would have occurred.

Walk and cycle users ambience valuation

6.4.4 The approach suggested in the April 2009 WebTAG Guidance 3.14.1 has been used. This provides some values (in pence per pedestrian km) for various streetscape improvements. The walk/cycle Schemes include a mixture of public realm improvements, mainly kerb drops and level pavements, but also some street lighting improvements in pavement crowding levels. As detailed in Appendix F, these values have been factored by distance and current pedestrian flow levels, to suggest an annual monetised benefit.

Physical fitness health benefits

6.4.5 The Guidance in WebTAG 3.14.1 was followed. This is based on estimating the number of travellers caused to switch to active modes by the Scheme; applying research on reduced morbidity; and then valuing the monetised benefits using the valuation of deaths avoided. The calculations are given in Appendix F.

Wayfinding

6.4.6 The introduction of comprehensive wayfinding across on-street boards, paper maps, and internet websites is a growing area. An outline specification for the wayfinding Scheme is provided in Appendix G. This has been prepared by the specialist company CityID

6.4.7 There are strong indications, backed up by limited research findings, that these facilities provide benefits to users. As yet, there is no comprehensive Guidance in WebTAG. (Unit 3.14.1 includes some suggested valuation). The provision of information boards is valued at 8 pence per trip kilometre, and comprehensive directional signage is valued at 5 pence per trip kilometre. Given the size of Ipswich town centre, it is assumed that visitors will undertake an outward exploratory trip of some 1.5 kilometres, suggesting a per trip benefit of 20 pence.

6.4.8 Limited walk and cycle flow counts suggest there are some 5,000 active mode visitors accessing the town centre per day; the parking surveys suggest about 5,000 arrivals to the main town centre car parks per day; and, in addition, there are perhaps some 2,000 arrivals at the railway station accessing the town. While most of these will be routine visitors making only occasional use of the wayfinding facilities, perhaps 10 percent (1,200 per day, 0.3M per year) would benefit from the wayfinding. This suggests an annual benefit of £60,000 per annum, or £0.7M net present benefit.

Real Time Passenger Information

6.4.9 As discussed in Appendix E, the RTPI system has a number of benefits to passengers, operators, and the transport authorities, arising from the improvements in communication and control. For the passenger there are some direct time savings, from bus system operational control improvements, and from the ability to schedule departure from home for infrequent services; these direct time benefits are included in the transport modelling.

6.4.10 The reassurance and reduced anxiety when waiting or transferring between services is reflected in the travel demand modelling, but not measured in the TUBA analysis. 'The demand for public transport: a practical guide' TRL 593 guidance suggests a benefit of 23 pence (2000 prices) for this – say 27 pence in 2008 prices and values. Almost all passengers will have access to the information, either through a display, or mobile phone messaging. Daily bus boardings by existing passengers are estimated at about 30,000. If half of these receive and use the RTPI information, valued at 27 pence, this suggests and annual benefit of about £1M, or £11.5 M over the project life.

Bus station comfort improvements

6.4.11 As with the RTPI, the bus station improvements will have pervasive benefits for passengers and operators, and the increased attractiveness of the facilities is represented in the transport model, but there are no direct time savings. As detailed in Appendix A, TRL 593 guidance has been used to ascribe benefits to bus station users, which when factored by the estimated beneficiaries suggests benefits to existing users of some £4.6M at Tower Ramparts, and £2.2M at Old Cattle Market, a total of £6.8M over the 15 year project life.

6.4.12 The bus station enhancements, and the changes to the bus loop, are also designed to provide the capacity increases required to reduce or at least retain existing level of crowding at peak times.

Variable message signing

6.4.13 As part of the UTMC system, a network of variable message signs is proposed, as described in Appendix D. These will be linked to Highways Agency signing system, and to a parking guidance system. They will be able to display routine and non-routine messages giving route and parking guidance, as well as information on air quality, traffic incidents and special events.

6.4.14 One specific advantage will be to assist in advising on congestion and parking availability. If 10 percent of the 5,000 public parking arrivals per day find the information of use, at perhaps a time saving of 50 pence, this equates to an annual saving of £62,500, or a project lifetime benefit of £0.7M.

6.5 Benefit Cost Ratio

6.5.1 The following provides the cost benefit analysis as per webTAG guidance. All costs and benefits are provided in 2002 prices and discounted to 2002. To the scheme costs have been added a 15% Optimism Bias plus operating and maintenance costs. This results in a present value cost (PVC) of £25.4M in discounted 2002 prices.

6.5.2 The Transport Economic Efficiency (TEE) table is shown below. This replicates the output from TUBA and indicates that Consumer and Business benefits of £32.536 millions in 2002 prices discounted to 2002. Total highway benefits are calculated to be £16.510 millions whilst bus passenger benefits are estimated to be £16.026 millions.

Economic Efficiency of the Transport System (TEE)

	ALL MODES		ROAD		BUS & COACH	RAIL		OTHER
Consumers								
User benefits	TOTAL		Private Cars and LGVs		Passengers	Passengers		
Travel time	23,431		9,957		13,474	0		0
Vehicle operating costs	1,370		1,370					0
User charges	0				0	0		0
During Construction & Maintenance	0				0	0		0
NET CONSUMER BENEFITS	24,801	(1)	11,327		13,474	0		0
Business								
User benefits			Goods Vehicles	Business Cars & LGVs	Passengers	Freight	Passengers	
Travel time	7,514		538	4,424	2,552	0	0	0
Vehicle operating costs	221		1	220				0
User charges	0				0	0	0	0
During Construction & Maintenance	0				0	0	0	0
Subtotal	7,735	(2)	539	4,644	2,552	0	0	0
Private sector provider impacts						Freight	Passengers	
Revenue	0				0	0	0	0
Operating costs	0				0	0	0	0
Investment costs	0				0	0	0	0
Grant/subsidy	0				0	0	0	0
Subtotal	0	(3)			0	0	0	0
Other business impacts								
Developer contributions	0	(4)	0		0	0		0
NET BUSINESS IMPACT	7,735	(5) = (2) + (3) + (4)						
TOTAL								
Present Value of Transport Economic Efficiency Benefits	32,536	(6) = (1) + (5)						

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All values in £,000's in 2002 prices and values

6.5.3 To this are added the non consumer and business benefits accruing from improved ambience, security and physical fitness benefits. These equate to £28.8 millions in 2002 prices discounted to 2002.

6.5.4 The Analysis of Monetised Costs and Benefits Table below combines the benefits and the costs. The result is a total Present Value of Benefits of £61.419 millions, a PVC of £25.401 millions and Net Present Value (NPV) of £36.018 millions. This gives a Benefit Cost Ratio (BCR) of 2.42 indicating good value for money for this Scheme.

Analysis of Monetised Costs and Benefits

Noise	0	
Local Air Quality	0	
Greenhouse Gases	83	
Journey Ambience	20,800	
Accidents	8,000	
Consumer Users	24,801	
Business Users and Providers	7,735	
Reliability	0	
Option Values	0	
Present Value of Benefits (see notes) (PVB)	61,419	
Public Accounts	0	
Present Value of Costs (see notes) (PVC)	25,401	
OVERALL IMPACTS		
Net Present Value (NPV)	36,018	*NPV=PVB-PVC*
Benefit to Cost Ratio (BCR)	2.42	*BCR+PVB/PVC*

Notes: All values in £,000's in 2002 prices and values

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.

7 NATA Assessment

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7 NATA Assessment

7.1 Discussion of the NATA and NATA Refresh

7.1.1 The original 'New' Approach to Transport Appraisal is now some ten years old, and has changed little in that time. The current guidance is understood to be as follows:

- The approach continues to require consideration of some 23 'sub-objectives';
- Consideration involves a mix of analyses – estimation of monetised costs and benefits for important sub-objectives, quantified assessments of other sensitive and important sub-objectives where this is possible, rigorous application standardised 'worksheets' for sensitive but subjective sub-objectives, particularly where impacts are negative, and brief comments on sub-objectives considered non-material or arguably neutral; and
- Transport network benefits should be demonstrated using fit for purpose models, developed to DfT standards, and assembled using the TUBA software.

This Chapter adds to the quantified results presented in Chapter 6, and discusses the broad NATA sub-objectives, including evidence of consultation; assessment comments; supporting analyses. Appendix M contains the details.

7.1.2 Following a review in 2007, and consultation in early 2008, the DfT has initiated a rolling programme of change to the NATA approach, to refine the process, and adapt to changing priorities and concerns. This is done as a two stage process; first introducing draft guidance, and then incorporating the guidance into the submission requirements.

7.1.3 Draft guidance published in July 2008 has now been made part of the submission requirements as from April 2009; this Bid seeks to meet these requirements. Further guidance, particularly on future growth and economic conditions, is planned for later in 2009.

7.1.4 The nature of the components of the 'Ipswich – Transport fit for the 21st Century' Scheme have changed in detail during the years of development, but the broad scope and general impact of the Scheme have not. The AST results presented in this Chapter are informed by the previous work, particularly as regards the scale of impacts, and hence the proportionate level of assessment of each sub-objective measure.

7.1.5 In responding to the April 2009 'NATA Refresh: Appraisal for a Sustainable Transport System' we have taken particular note of the following:

- Updated carbon emissions valuations (these are part of the TUBA software application);
- Recognising journey time reliability (this is a significant impact in the Ipswich Scheme, and its recognition enhances the benefits);
- Guidance on health benefits of increased physical activity (this is a significant impact in the Ipswich Scheme, and its recognition enhances the benefits);
- Updated forecasts of long term trends (these are of limited impact for the Ipswich Scheme, which is focussed on changing travel patterns in the medium term); and
- Minor changes to guidance and values for appraisal parameters.

These changes uniformly improve the assessment – the Ipswich Scheme was designed as a sustainable transport Scheme, and its benefits are more fully captured by the NATA changes.

7.1.6 Other draft guidance planned for later in 2009 is also expected to result in changes which would improve the assessment:

- Appraisal of housing benefits – the Ipswich Scheme is designed to enable and support the targeted increases in housing development in the wider Ipswich area, and would score well under this criterion (as evidenced by the success of the recent CIF2 bid);
- Appraisal of packages of Schemes – although the Ipswich Scheme is designed as a single, integrated Scheme, it does contain components which could have formed part of a TIF bid;
- Proportionate appraisal – the Ipswich Scheme cost is just above the suggested threshold of £20M for a 'lighter touch' appraisal, and so the level of detail which would be required in future is expected to be lower than that provided in this Bid.

7.2 Engagement with stakeholders

7.2.1 As described in Appendix N and referred to in Chapter 9, engagement with stakeholders has been a continuous aspect of the Scheme development. By its nature, the sustainable transport Scheme involves the close collaboration of County and Borough agencies, business interests, education providers and transport operators.

7.2.2 In the early stages of the Scheme development, there were a series of public and stakeholder consultation exercises and workshops, including, as noted in Appendix N. Since these early contacts, work has continued on specific initiative, such as the Education Quarter, the town centre management group, and the commercial interests in the town centre.

7.3 AST Commentary

7.3.1 The AST comprises 23 sub-objectives, shown in full in Appendix N and included here as Figure 7.1. Their distribution is as follows:

- 6 neutral or not relevant;
- 2 slight beneficial
- 9 moderately beneficial; and
- 6 large beneficial effects.

Thus the Scheme has no reported negative or adverse impacts. Throughout the analyses, a conservative and precautionary approach has been adopted. Several un-quantified or non-assessed benefits are considered positive, but have not been considered.

7.3.2 Under current guidelines, the Scheme is firmly in the 'High' value for money category.

Figure 7.1. Appraisal Summary Table

Option		Description	Problems	Present Value of Costs to Public Accounts £m
Ipswich - Transport Fit for the 21st Century				
OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE ASSESSMENT	ASSESSMENT
ENVIRONMENT	Noise	Reduced traffic levels and improved public realm will result in slightly reduced noise, and reduced sensitive exposure to traffic noise	Not assessed	Neutral
	Local Air Quality	The air quality monitoring, together with the UTMC, will enable local air quality improvements to be implemented	Not assessed	Slight Beneficial
	Greenhouse Gases	Reductions in vehicular traffic and junction delays will reduce fuel consumption and greenhouse gasses.	PVB = £0.083M over 15 year assessment period.	Slight Beneficial
	Landscape	Not relevant - predominantly an urban Scheme	Not relevant	Neutral
	Townscape	The public realm and bus station improvements, traffic reductions, and increases in active mode circulation will improve the townscape, and its appreciation	Not assessed	Moderate Beneficial
	Heritage of Historic Resources	The proposals, including interpretive way finding, improve the appreciation of several historic areas of Ipswich	Some 600 historic buildings and historic monuments in the area with increased active mode circulation	Moderate Beneficial
	Biodiversity	No impact expected	No impact expected	Neutral
	Water Environment	No impact expected, and known flood paths not affected	No impact expected	Neutral
	Physical Fitness	The Scheme includes a range of measures to encourage increases in active mode trips resulting in individuals engaging of over 30 minutes exercise per day	Initial estimate PVB of £2.5M	Moderate Beneficial
	Journey Ambience	The walk/cycle improvements include better public realm, and improved way finding. Improved comfort at bus stations and through RTPI	Initial estimate PVB of £5.7M for walk cycle ambience; £7.7M for RTPI; and £4.5M from bus station improvements	Moderate Beneficial
SAFETY	Accidents	Assessed quantitatively	Initial estimate NPB of £8M from pedestrian and bus station safety measures. Reductions in traffic flows should reduce the volume of traffic accidents	Moderate Beneficial
	Security	The public realm and bus station improvements, including CCTV and the elimination of underpasses will improve the perceived security	Some 0.25M pedestrians no longer use subways	Slight Beneficial

Option		Description	Problems	Present Value of Costs to Public Accounts £m
Ipswich - Transport Fit for the 21st Century				
OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE ASSESSMENT	ASSESSMENT
ECONOMY	Public Accounts	Assessed quantitatively	PVC = £25.4M	Large Beneficial
	Transport Economic Efficiency: Business Users & Transport Providers	Assessed quantitatively	PVB = £24.8M	Large Beneficial
	Transport Economic Efficiency: Consumers	Assessed quantitatively	PVB = £7.7M	Large Beneficial
	Reliability	Reduced delays and improved travel information, particularly RTPI, will improve journey reliability for both private and public transport users.		Moderate Beneficial
	Wider Economic Impacts	Will enhance the viability of the town centre, and support the delivery of housing developments	Not assessed	Neutral
ACCESSIBILITY	Option values	The Scheme is aimed at increasing the travel choices for a wide variety of trips, and providing information about the choices	Not assessed	Large Beneficial
	Severance	The Scheme includes a range of new road crossings to reduce severance, and way finding to provide information on route choice	Some 12 new signalised pedestrian crossings are included, used by over 5,000 active mode trips per day	Large Beneficial
	Access to the Transport System	A range of improvements to the bus service and access to the railway station, and improved information about them, will enhance access	Not assessed	Moderate Beneficial
INTEGRATION	Transport Interchange	The Scheme is designed to improve transport interchange at all points	Improved bus station facilities assessed as part of Journey Ambience.	Large Beneficial
	Land-Use Policy	The Scheme is designed to fit closely with national, regional, and local objectives, and support deliver of East of England Plan targets		Beneficial
	Other Government Policies	The Scheme is designed to be closely aligned with the 'Delivering a Sustainable Transport System' objectives, and support other economic and health related policies.		Beneficial

All monetised values in £,000's in 2002 prices and values

8 Modelling

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8 Modelling

8.1 The development of the Ipswich Transport Analysis Modelling Suite

8.1.1 The wider Ipswich area has been studied with a highway traffic model for over a decade. The model - the Ipswich Traffic Model (ITM) - using the SATURN software, was last re-calibrated using 1999 survey information. It was then used in 2004 to produce traffic forecasts for 2011 and 2021, testing a range of highway improvements. The July 2005 previous Scheme bid used a simple set of conservative forecasts to suggest the scale of traffic benefits likely to result from the Scheme proposals related to highway traffic. The conservative, and precautionary, tests showed significant travel time benefits.

8.1.2 The ITM, however, was considered both old (at the limit of its validity) in need of considerable empirical strengthening (having been updated with just limited matrix estimating, rather than new origin-destination information) and unsuitable for testing the multi-modal Scheme (since it is simply a highway traffic assignment model).

8.1.3 Thus, while the previous Scheme Bid was never fully examined and pronounced upon by the DfT, detailed concerns were raised about the quantification of the traffic benefits.

8.1.4 In April 2008 Suffolk County Council commissioned Faber Maunsell | AECOM to develop a new, WebTAG compliant multi-modal variable demand transport model for the wider Ipswich area. The commission started with an extensive programme of transport surveys in June/early July and October 2008, with work starting in parallel on the defining and developing of zoning and transport network definition. The model is called ITAMS – Ipswich Transport Analysis Modelling System.

8.1.5 The commission included the preparation of a Model Specification Report, to guide the work, and provide a framework for decision making as the work proceeded. This document was submitted to DfT ITEA in November 2008, and comments in response received in late January 2009.

8.1.6 Elements of the ITAMS are already in use for local studies, and work is ongoing on the wider ITAMS finalisation and forecasts, for a series of future purposes. For the Major Scheme Business Case work, the following tasks have been completed:

- Summary documentation of the surveys, including checking and headline results;
- Successful calibration and validation of the two assignment models – for the highway and bus/active mode networks;
- Successful calibration and validation of the variable demand model;
- Discussion and development of an initial set of forecasts for a 2021 horizon, predicting transport condition for Reference, Do Minimum, and 'with Scheme' options.

These four aspects were introduced previously in Section 6.3; are summarised in the rest of this Chapter; and documented in Appendices H to L.

8.2 Existing Data and Travel Survey Report

8.2.1 As documented in Appendix H, the following surveys were undertaken:

- Automatic Number Plate Recognition;
- roadside interviews;
- automatic and manual traffic count surveys;
- journey time surveys;
- bus passenger interviews; and
- car park user interviews.

8.2.2 The ANPR survey was an ambitious (and successful) one, covering all entries to and exits from the A12 and A14 routes round Ipswich, plus an extra site to record the vehicle plates crossing the Orwell Bridge. The survey was conducted on a single day, Thursday 3rd July 2008, and data was captured for three 2.5 hour periods. This provides a firm picture of the strategic turning movements onto and off the strategic network

8.2.3 The roadside interview surveys were conducted in the period 23rd June to 10th July 2008 on Mondays to Thursdays, with simultaneous classified link counts on the day, and automatic traffic counting for two weeks including the survey day. 36 sites were surveyed, forming two cordons with radial screenlines. The inner cordon was surveyed mainly inbound, and the outer cordon mainly outbound. An average sample rate of 14 percent in the survey direction was obtained, with a minimum rate (at a very busy site) of 7 percent.

8.2.4 To provide additional calibration and validation data, further traffic flow surveys were undertaken, including eight ATC sites, and manual classified turning counts at 35 important junctions.

8.2.5 Six routes, covering a range of orbital and radial routes, were surveyed for journey times. The routes totalled some 47 kilometres in each direction.

8.2.6 Bus origin and destination surveys were conducted by interviewers travelling on buses, first on 8th to 10th July, with further surveys on 16th and 18th September. Some 1,825 usable interviews were obtained. Bus boarding and alighting counts were undertaken in March 2009 to provide additional validation for the bus model in the town centre.

8.2.7 The roadside interviews were complemented by car park interviews at 11 car parks (including the three park and ride sites) in October 2008. A total of 1,647 interviews were obtained, and arrival, departure and turnover surveys were conducted in parallel.

8.2.8 These surveys provided a comprehensive and up to date evidence base for the new modelling work.

8.3 Highway Traffic Assignment Model Validation Report

8.3.1 As documented in Appendix I, a new SATURN based highway assignment model was developed as part of the ITAMS. The highway model comprised some 250 zones within the wider Ipswich area, and used detailed simulation coding of junctions around and within the A12 and A14. The zoning system, while broadly similar to the previous ITM, used the 2001 Output Areas as the building blocks, and had slightly more detail.

8.3.2 The model development was conventional, with the network build up from inventory work, internet aerial photography, signalised junction information, and GIS databases. The base traffic demand was built up from the several surveys, some external information from the East of England Regional Model, and synthetic infilling. Matrix estimation was used to improve the fit between non- or partially observed movements and roadside link counts.

8.3.3 The model was calibrated and validated well at the strategic level for the purposes of the Major Scheme assessment, within DMRB and WebTAG guidance. Morning and evening peak hour models were validated; the interpeak model has not been subject to formal validation, but is used in the demand modelling of time of day effects. Sensitivity tests showed that the model responses to changes in demand level were reasonable. Work continues on local calibration for more detailed studies.

8.4 Bus and Active Mode Assignment Model Validation Report

8.4.1 As documented in Appendix J, a new bus and active mode assignment model was developed using the EMME software. Bur travel demand matrices were built from the on-bus surveys, expanded using operator provided Wayfarer ticket data. The full network of routes operated by Ipswich Buses and First Eastern Counties were coded, using the highway network as a basis (and with a link to between highway delays and bus speeds).

8.4.2 The model calibrated well, within guidelines. Validation of central area modelled and actual boardings and alightings by corridor for the morning and evening peak hour models was also satisfactory, with total morning peak modelled alightings some 5 percent higher than observed, and evening peak modelled boardings agreeing almost exactly with the counted passengers.

8.4.3 The bus model is fit for use in the MSBC assessment, and is also being used for a corridor bus study.

8.5 Demand Model Report

8.5.1 As documented in Appendix K, the variable demand model has been implemented using the EMME software, and has been developed broadly as in the Model Specification Report. It has been developed following WebTAG guidance. It is an incremental hierarchical logit model, representing trip frequency, active mode choice; time period choice; motorised mode choice, trip distribution, and route choice (including parking choice for car travel).

8.5.2 The model iteration and convergence process is automated. Four time periods are represented, over a 16 hour day. Private trip travel is categorised into commuting, education, other non-work, and employers' business, for car available and non-car available travellers. Freight demand is included for light and heavy commercial vehicles.

8.5.3 Clibration has been based on using parameters suggested by guidance, with overall model sensitivity producing sensible fuel-cost and bus-fare elasticities. While the model represents a geographically wide range of movements, the calibration investigations have focussed on the trips produced in the wider Ipswich area. Satisfactory convergence of the demand supply equilibrium has been achieved for this part of the matrix.

8.5.4 Car fuel and bus fare elasticities are realistic, vary between segments in plausible ways, and are well within WebTAG guidance. The model overall is considered fit for purpose.

8.6 Forecasting Report

8.6.1 As documented in Appendix L, forecast reference demand to 2021 was developed to reflect the zone by zone land use change assumptions embodied in the Ipswich Borough Council Area Action Plan proposals, controlled to TEMPRO growth. This results in about 20 percent travel growth between 2008 and 2021.

8.6.2 The expected effects of the sustainable travel Scheme have been implemented in the supply networks, as outlined in Section 6.3 of this Bid document. The effects of the Scheme as reflected in the model are to cause a small decline in car and overall active mode travel, with a large increase in bus travel. The effects are more marked in the peak hours in the town centre where the Scheme is mainly targeted.

9 Delivery

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9 Delivery

9.1 Overall Governance of the Scheme Delivery

Roles and responsibilities

9.1.1 Suffolk County Council, as lead authority for this project, have been governing the Scheme using modified PRINCE 2 techniques. The Council's own project and programme management team have created a version of PRINCE2 specifically modified for use by Suffolk County Council, called PRINCESS (Prince 2 Suffolk Style). PRINCESS helps to apply best practice to the project and supports good decision making on the project.

9.1.2 A Project Board has been set up for the Scheme and has met regularly for five years. It is chaired by the Director for Environment and Transport, and includes a Corporate Director from Ipswich Borough Council together with staff from both authorities including Assistant Directors and Heads of Service. The project board will continue to meet throughout the life of the project. It is likely that some of the individual members will change as the project changes from design to implementation.

9.1.3 PRINCESS identifies roles for specific individuals who sit on the board. The Senior Responsible Owner is Andrew Guttridge, Strategic Commissioner for Sustainable Transport. The Project Manager is Clive Wilkinson, Team Leader for Intermediate Capital Projects. The Project Manager makes day to day decisions on the Scheme guided by strategic decisions agreed at Board meetings.

9.1.4 There are a number of workstreams associated with the project, and the project manager meets regularly with the workstream managers to ensure that their workstreams are progressing to time and budget. These meetings are also used as a conduit for information to and from the Project Board.

9.1.5 The design of the Scheme is to be undertaken by members of a partnership in a long term arrangement with the County Council. The specialist expertise of these consultants will be vital for the successful implementation of the design.

Local Government Review

9.1.6 The County of Suffolk is part way through a local government review to decide on a unitary authority structure for the county. The current timescale is for a decision by the Secretary of State on the form of unitary councils in September 2009. The new councils could then be formed in April 2011. There are two scenarios being evaluated by the Boundary Committee: a Suffolk unitary authority; and a unitary authority combining Ipswich with Felixstowe, with the rest of Suffolk forming a second unitary.

9.1.7 For this project the effect would be that in one scenario it would be governed by the Suffolk unitary and in the other scenario by the North Haven unitary. The current board is composed of officers of both Suffolk County Council and Ipswich Borough Council and it would be likely that some board members would transfer to the new authority in charge of the Scheme to aid continuity. Suffolk and Ipswich councillors are both in favour of the Scheme so we are confident that the new authorities would continue to support the Scheme.

9.2 Project Planning and Programme

9.2.1 The chart contained in Figure 9.1 illustrates the proposed Project delivery plan and identifies milestones for full approval and Scheme completion. It has been set to reflect the RFA settlement. It also identifies when detailed design, procurement and delivery of the Scheme and its constituent elements will be complete. It seeks to minimise disruption during implementation, while deliberately aiming for completion of a large number of elements at the same time. This should result in a step change in public transport in Ipswich to influence travel behaviour.

9.2.2 The RFA profile has the majority of the money allocated to 2012/13. This is reflected in the delivery of most of the elements of the Scheme in that financial year with substantial completion at the end of the 2012/13 financial year. However because of the small element of the settlement in 2010/11 full approval of the Scheme is shown for the end of the third quarter of 2010/11, and delivery of a small proportion of the walk/cycle network has also been programmed for that year. There will be an inevitable lull in construction in 2011/12 before major construction the next year. This is therefore not an optimal funding profile.

9.2.3 Following preliminary discussions with the Department for Transport we have discussed alternative funding profiles. Two alternative profiles have been included in this business case for further discussion. Figure 9.2 describes a potential fast tracking of the Scheme. Design and procurement would be accelerated by three months to achieve full approval at the end of the second quarter of 2010/11. The delivery of the Scheme would be programmed for eighteen months so that substantial completion was at the end of the 2011/12 financial year. Agreement on earlier funding from the Department for Transport or borrowing from County Council reserves would be required to allow this fast tracking to proceed. Chapter 11 describes what changes to funding would be required.

9.2.4 In both these programmes the majority of the works will be undertaken simultaneously throughout central Ipswich. This could lead to increased congestion and delays to traffic in the town centre. Figure 9.3 describes a programme that spreads the work over a longer period to minimise delays. One bus station would be constructed at a time, and work on surrounding walk /cycle routes would be phased to allow buses to stop at alternative locations whilst the bus station was being constructed. Agreement on earlier funding from the Department for Transport or borrowing from County Council reserves would also be required to allow this option to proceed. Chapter 11 describes what changes to funding would be required.

Figure 9.1 Project Plan (programmed to fit RFA settlement)

Full approval | Substantial completion

Element	Task	2009/10				2010/11				2011/12				2012/13			
		Qtr1	Qtr2	Qtr3	Qtr4	Qtr1	Qtr2	Qtr3	Qtr4	Qtr1	Qtr2	Qtr3	Qtr4	Qtr1	Qtr2	Qtr3	Qtr4
Overall Scheme	Design/ Consultation																
	Procurement																
	Delivery																
Tower Ramparts Bus station Improvements	Design/ Consultation																
	Procurement																
	Delivery																
Old Cattle Market Bus Station Improvements	Design/ Consultation																
	Procurement																
	Delivery																
Bus Loop extension	Design/ Consultation																
	Procurement																
	Delivery																
Shuttle Buses	Finalise routes																
	Procurement																
	Purchase of vehicles																
UTMC	Design/ Consultation																
	Procurement																
	Delivery																
VMS	Design/ Consultation																
	Procurement																
	Delivery																
RTPI	Design/ Consultation																
	Procurement																
	Delivery																
Walk/Cycle Network	Design/ Consultation																
	Procurement																
	Delivery																
Wayfinding	Design/ Consultation																
	Procurement																
	Delivery																
Personal Travel Planning	Design/ Consultation																
	Procurement																
	Delivery																

Figure 9.2 Project Plan (fast track programme)

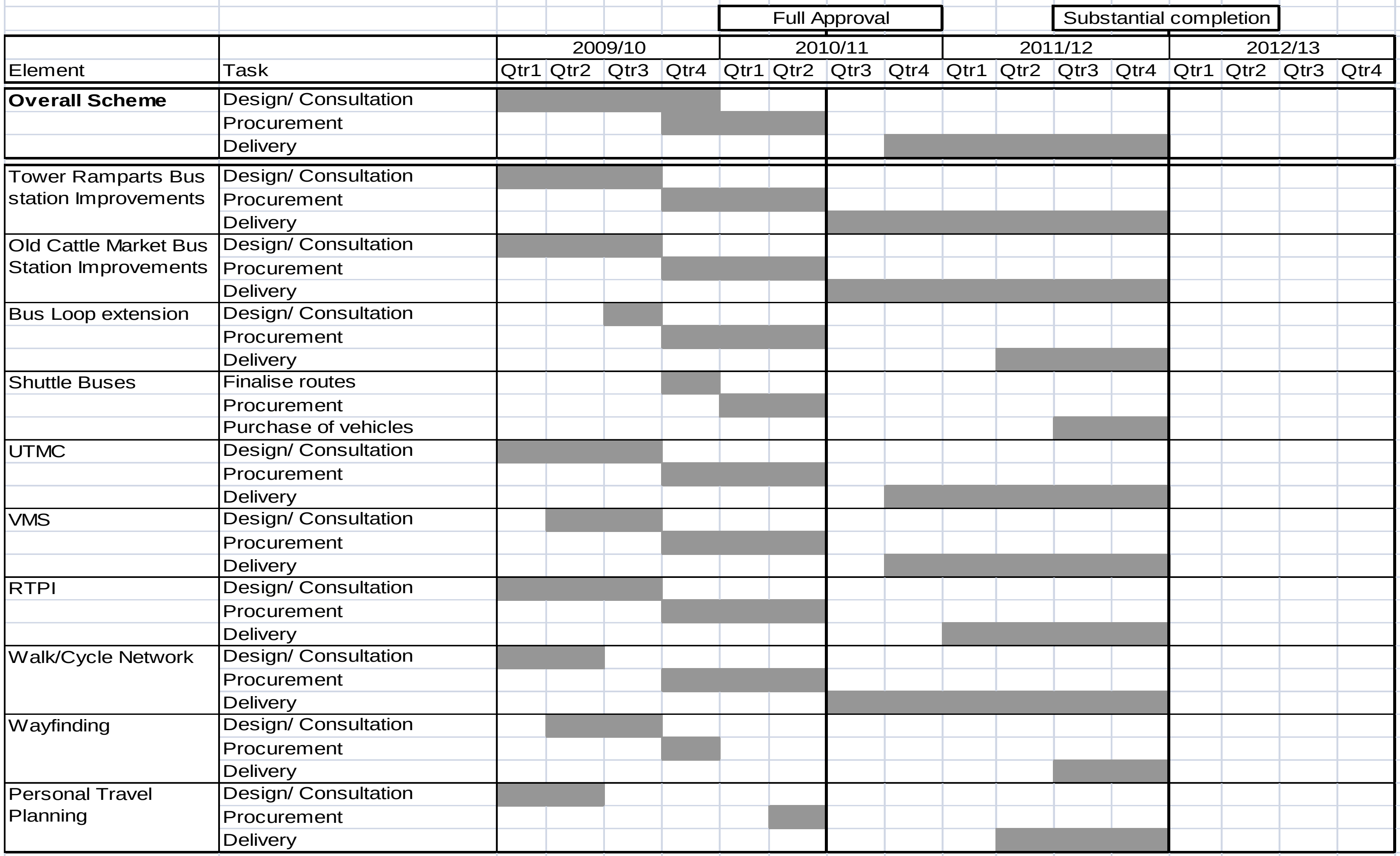
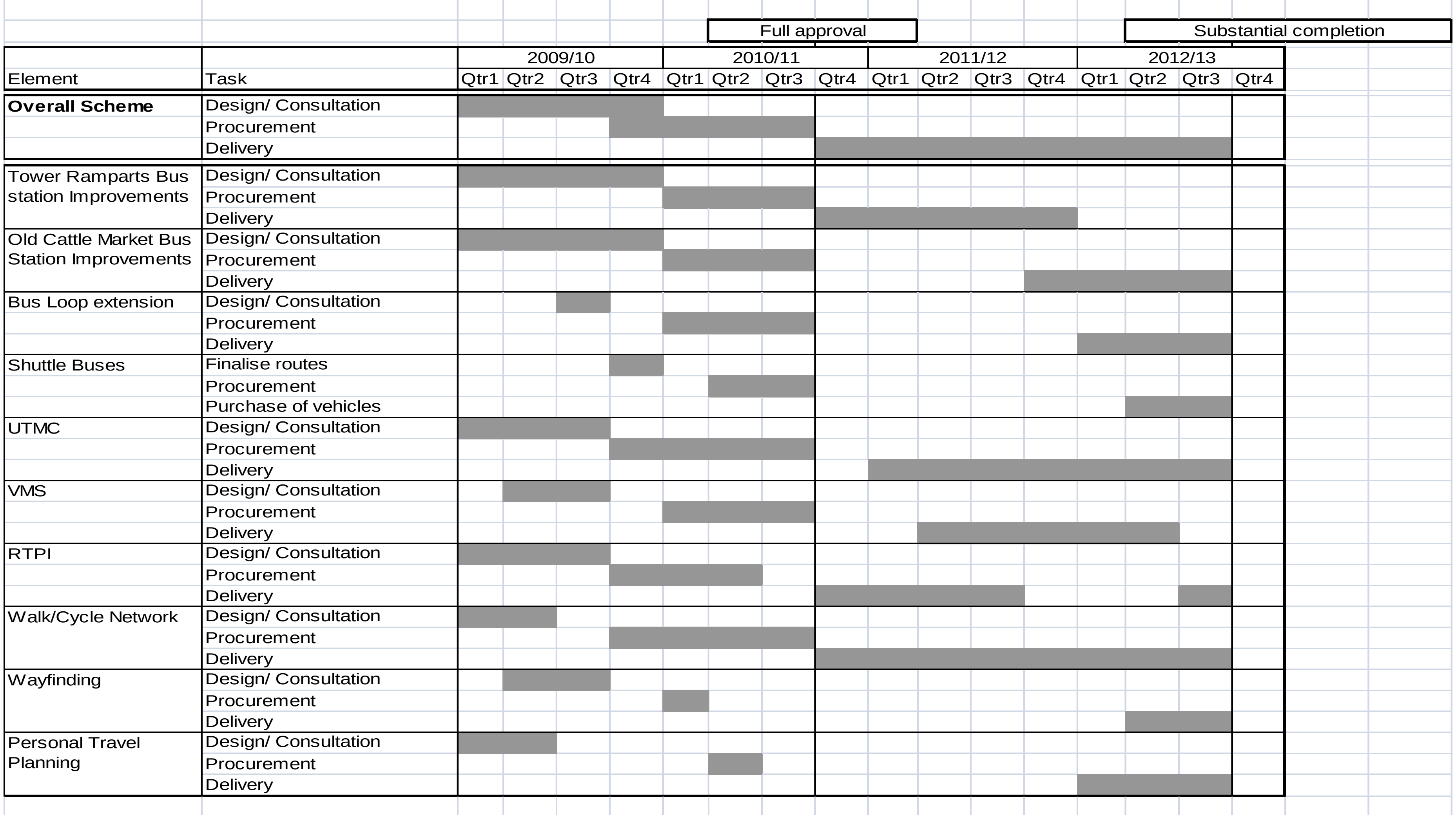


Figure 9.3 Project Plan (programmed to avoid delays throughout town centre)



9.3 Risk Management

9.3.1 A risk assessment has been carried out of the Major Scheme in accordance with WebTAG Guidance. This has involved the Project Board steering the bid preparation; the consultant team preparing the bid; stakeholders involved in operation; and advice from specialist advisors within Faber Maunsell | AECOM with prior experience of delivery of similar Schemes.

9.3.2 It has been an important Scheme development principle to minimise risk. Wherever possible, the Scheme has been developed to comprise conventional, well tried components, benchmarked against success elsewhere, enjoying broadly based public and stakeholder support, with clearly defined implementation paths, existing operating agencies, and no reliance on third parties not already involved. Two of the major components of the Scheme – the RTPI and UTMC technology delivery, are planned as continuations of existing contractual relationships developed during the delivery of Schemes in Lowestoft. None of the components require compulsory powers and there are not any legal processes which would stop the project.

9.3.3 The following Table 9.1 identifies the risks, assesses their impact and likelihood, and then puts forward mitigation proposals. This register is reviewed by the Project Board monthly and mitigation measures initiated as required.

9.3.4 On all Scheme cost estimates, apart from Wayfinder, we have made an allowance of 10% contingency, which gives a total of approximately 1.6M. At this current stage of the project, we envisage this estimate to be sufficient to qualify the items listed in the quantified risk register Table 9.2.

Table 9.1 Risk Register

Source of Risk	**Impact** **A slight** **B moderate** **C severe**	**Likelihood** **A very unlikely** **B moderately unlikely** **C unlikely**	**Mitigation**
Engineering and Design development			
Bus Station design constraints	A - Site limitations result in lower quality or passenger capacity than assumed	B – Developments at existing well used sites	Designs will be limited to estimated costs and based on land ownership to avoid protracted land negotiations
Extended bus loop design constraints	A – Constraints on bus swept paths at junctions and bus stop locations	A – bus route feasibility tested and areas of redevelopment will allow expanded bus stop waiting areas at some locations	Minor further reorganisation of bus routes can be used to spread the passenger alighting and boarding patterns. Minor junction engineering within highway boundaries will permit loop to work effectively
Traffic Orders delayed	A – There are delays in implementation of TROs.	A – Previous TROs in Ipswich town centre have been implemented without delays	Ensure timing of TRO publication is adequate to absorb any overruns
Walking/cycling design integration with new developments	A – Site specific proposals may be lost, or be made less direct	A – Most crossing improvements will be built on existing desire lines	Continued liaison with site developers
Engagement with stakeholders and the public			
Bus operators commercial concerns limit their engagement	A – Operators do not respond to new facilities. Operators respond to specific free shuttle bus routes with service changes	A – bus operators involved in Scheme design, limited changes being proposed	Continued liaison with operators with a view to establishing Quality Bus partnerships prior to Scheme implementation.
Developers parking and access plans may conflict	B – There could be some local over parking. Site specific proposals may lose or minimise ability to provide walking/cycling corridors	B – Several high profile developments underway, at various stages of negotiation	Ensure continued liaison with developers. Adjust on street and local authority off-street provision and pricing
Political, retailer or public objections	A – Some specific local components may prove unpopular	A – components have been screened for acceptability and avoidance of local controversy	Local redesign can be undertaken without prejudicing the overall impact of the Scheme.

Source of Risk	Impact A slight B moderate C severe	Likelihood A very unlikely B moderately unlikely C unlikely	Mitigation
Procurement and Construction			
Procurement delays	B – Scheme depends on a 'step change' impact with all components in place	A – all components are conventional technology on identified sites with no statutory procedures that will stop the Scheme	Majority of Scheme will be implemented using one main contractor to ensure coordination of all parts of the Scheme
Operation			
Delays in delivering bus route changes	B – Scheme depends on coordinated support of bus operators	A – Bus operators already involved, and have a continuous programme of network improvements. Other major revisions of the bus network have been introduced successfully in a coordinated manner	A bus operation working group will be established to coordinate work across infrastructure, equipment, routes and timetable information
Planned 'step change' does not occur	B – congestion will increase, and planned developments will be in doubt	A – there is scope for demand management and additional public information initiatives to adjust the travel responses.	The evaluation programme will alert to target shortfalls and further public information or parking tariff adjustments can be initiated by the Project Board
Governance			
Unitary authorities created by Local Government Review change priority of Scheme	B – Could have major effect on Scheme timing	A – Unitary authority will not be created until April 2011. Scheme will have started construction so ability for new authority to change priority will be minimal	Project Board composed of officers from both Suffolk County Council and Ipswich Borough Council. This will ensure that both councils and therefore new unitary authorities will have ownership of the Scheme

Table 9.2. Quantified Risk Analysis

Management Action/Mitigation Measures	Expected Impact	Min	Most Likely	Max	Weighted Average (a)	Likelihood	Rating (%) (b)	Total (a) x (b)	Cost substantiation
Continuous liaison with DfT to ensure Scheme is of the right size and justification	L	£0.00	100,000	500,000	175,000	VU	25	£43,750	Assumed cost of aborted design at Conditional Approval
Detailed Plan to meet DfT timescales has been produced and is regularly updated	M	£20,000	£50,000	£100,000	£55,000	VU	25	£13,750	Assumed level of figures for procurement delays
Willingness to provide peak resource once funding approved	S	£0	£50,000	£200,000	£75,000	L	85	£63,750	Max based on the extra funds required in a year to meet programme
Continued funding of design through DfT approval period	L	£20,000	£200,00	£400,000	£205,000	U	45	£92,250	
Continued liaison with operators with a view to establishing QBPs prior to Scheme implementation	M	£20,000	£50,000	£100,000	£55,000	L	85	£46,750	Likely redesign and abortive procurement costs
Local re-design or rephrasing can be undertaken, without prejudicing the overall impact of the Scheme	N	£20,000	£50,000	£100,000	£55,000	HL	95	£52,250	abortive design costs
A bus operations working group will be established to co-ordinate work across infrastructure, equipment, routes, and timetable information	M	£20,000	£50,000	£100,000	£55,000	VU	25	£13,750	
Continued management of stakeholders to ensure all are aware of others requirements									

Table 9.2. Quantified Risk Analysis

Management Action/Mitigation Measures	Expected Impact	Min	Most Likely	Max	Weighted Average (a)	Likelihood	Ratin g (%) (b)	Total (a) x (b)	Cost substantiation
The monitoring programme will alert to target shortfalls, and further public information or parking tariff adjustments can be initiated by the Reference Group.	M	£20,000	£50,000	£100,000	£55,000	VU	25	£13,750	
Designs will be limited to estimated costs; some bus services can be diverted to on-street stops	N	£50,000	£80,000	£120,000	£82,500	U	45	£37,125	
Minor further re-organisation of bus routes and junction engineering can be used to spread the passenger alighting and boarding patterns	N	£20,000	£50,000	£100,000	£55,000	VU	25	£13,750	
None – some local Schemes can be lost without significant impact	N	£20,000	£50,000	£100,000	£55,000	VU	25	£13,750	
Continued liaison with site developers	N	£20,000	£50,000	£100,000	£55,000	VU	25	£13,750	
Await outcome of revised environmental assessment. Mitigate Possible impacts	M	£20,000	£40,000	£200,000	£75,000	VU	25	£18,750	
Adjust on-street and local authority off-street provision and pricing Liaise with developers	M	£50,000	£80,000	£120,000	£82,500	U	45	£37,125	
Extensive Preliminary design is being undertaken, but requires Reference Group decision to establish the intended budget	S	£75,000	£125,000	£200,000	£131,250	HL	95	£124,688	
FM formal design change process	S	£10,000	£20,000	£80,000	£32,500	U	45	£14,625	
FM formal design change process and single Client approver of changes	S	£50,000	£100,000	£250,000	£125,000	L	85	£106,250	
Advise local residents of the extent of the works, highlight positives and resist claims due to little change in traffic numbers	M	£0	£10,000	£100,000	£30,000	L	85	£25,500	Assumes there will be requests but that these can be deflected. Costs for defence.

Table 9.2. Quantified Risk Analysis

Management Action/Mitigation Measures	Expected Impact	Min	Most Likely	Max	Weighted Average (a)	Likelihood	Rating (%) (b)	Total (a) x (b)	Cost substantiation
Early contractor involvement in detail design process	M	£10,000	£30,000	£70,000	£35,000	U	45	£15,750	
Early contractor involvement in detail design process	L	£50,000	£150,000	£250,000	£150,000	FI	75	£112,500	
Early contractor involvement in stats negotiations	M	£10,000	£50,000	£200,000	£77,500	VU	25	£19,375	
All parties recognise need to adhere to design process	L	£50,000	£150,000	£250,000	£150,000	L	85	£127,500	
		555,000	**1,585,000**	**3,740,000**	**1,866,250**			**1,020,438**	

Please note all costs used are indicative

Key to Likelihood:		
Highly likely	HL	95%
Likely	L	85%
Fairly likely	FL	75%
Unlikely	U	45%
Very unlikely	VU	25%
Extremely unlikely	EU	10%

Impact	
Disastrous	D
Severe	S
Large	L
Marginal	M
Negligible	N

9.4 Stakeholder Engagement

9.4.1 Table 9.2 lists the main stakeholders already engaged and involved in the consultation process. It also summarises their contribution to the Scheme, and their expectations of it.

Table 9.2 Stakeholder engagement

Stakeholder	Contribution to:	Expectations of:
Ipswich Borough Council Local planning authority	Negotiating developer contributions; Detailed land access issues Construction phase planning; Bus stop and interchange layout; Detailed walk and cycle route planning, town centre enhancements and physical access controls	Enhancement to town centre public realm; improvements to site access arrangements
Highways Agency	Highway authority for trunk roads A14 Ipswich Bypass and A12.	Changes to local travel behaviour with benefits for trunk road congestion levels.
Bus Operators including Ipswich Buses First Eastern Counties	All aspects of bus provision	Better interchange, RTPI, bus priority, SVD
National Express East Anglia	Improved transport information at the station	Improved transport information at the station
Town Centre Management Team	Planning construction sequence	Tools to assist future town centre management coordination
Education Bodies University Campus Suffolk Suffolk New College	Coordination and planning of bus/cycle/walk access	Coordination and planning of bus/cycle/walk access
Individual site developers	Coordination and planning of bus/cycle/walk access	Coordination and planning of bus/cycle/walk access
Bus Users Representatives	Ensuring detailed design is passenger friendly	Better passenger service
Walk/ Cycle Interests	Ensuring detailed design is pedestrian and cyclist friendly	Better cycle and walking facilities
Local business community including retailers and Leisure Operators	Coordination and planning of bus/. Cycle and pedestrian access	Improvement of quality of public realm and footfall

9.4.2 All the above stakeholders were involved in a workshop during the formation of the preliminary design of the Scheme. This took place on 17th March 2005 in order to discuss ideas and issues for the project. For part of the consultation stakeholders were split into three groups and each discussed the following three issues:

- Pedestrian /cyclist provision
- Bus based components; and
- Traffic management.

Appendix N summarises the results of this consultation. Additional events for stakeholders took place in Ipswich on 4 September and 18 November 2008. More detailed discussions with individual stakeholders have also taken place. This appendix also contains the letters of support from a wide range of stakeholders.

9.4.3 It is proposed to establish two operational stakeholder working parties, which will meet regularly during the Scheme preparation, delivery, and early operation:

- One will deal with issues related to the improvement to the bus facilities (Interchanges, stops, RTPI, bus priority, bus loop, shuttle buses and routes, and related matters); and
- The other will deal with town centre infrastructure changes (Walk and cycle routes, UTMC, CCTV, new pedestrian and cyclist crossings).

In addition, contact will be maintained with other interested parties, and a Scheme Newsletter used to provide information to the public.

9.4.4 Careful management of the public information campaign, both generally and as part of the targeted ‘Smarter Choices’ work, will be important in achieving the planned ‘step-change’. This will require both stakeholder representatives, and campaigns aimed at the wider travelling public.

9.5 Post Project Evaluation

9.5.1 The existing evidence base and the ITAMS modelling framework provide a clear baseline, and predictions of the expected outcome of the Scheme. In preparation for implementation, as part of the detailed design process, local more detailed usage surveys are envisaged, for example for the design of pedestrian crossings and wayfinding infrastructure.

9.5.2 These baseline sources will provide a large palette of indicators, from which post project evaluation criteria will be defined. This is particularly important given the Scheme emphasis on enabling and encouraging changes to behaviour. It is planned that the following post project indicators will be monitored on an annual basis for the first five years of the Scheme:

- Person trip mode split on the inner Ipswich cordon;
- Signalised traffic signal system performance, and indices of vehicle flows at important junction approaches, from the UTMC operational monitoring;
- Bus service operating statistics on patronage, reliability and journey times, forming part of the evidence base for the development of a Multi-Operator QBP; and
- Local walk and cycle flow counts.

9.5.3 Costs of the Scheme will be monitored during the design development and throughout the implementation process. This will include updates of forward costs projections to assess impact of changes on overall project costs. This will utilise the recently installed Oracle 12 financial management suite programme and bespoke spreadsheets. These will be routinely monitored monthly and at any milestones or changes of design.

10 Commercial

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10 Commercial

10.1 Procurement Objectives

10.1.1 The following objectives for the project have been identified:

- To ensure this complex and interlinked Scheme is delivered to the funding profile
- Certainty of implementation costs
- To optimise whole-life cost
- To award a contract at a competitive price
- To price flexibility to enable the council to react to unforeseen changes in policy or from other stakeholders
- Control of sustainability issues
- Reduction in disputes and in house costs through single point responsibility
- Control over health and safety issues
- Control over detailed design and design quality
- Public perception of project
- To optimise risk transfer to those best able to minimise and mitigate the risks
- To achieve wider LTP2 objectives within the procurement strategy
- To achieve value for money

10.1.2 Table 10.1 details the importance to this project of each of these objectives and a weighting has been assessed for each of these objectives.

Table 10.1: Procurement criteria weighting

Evaluation criteria (appropriate to the client and project)	Importance to the council for this project	Criteria weight
Public perception of project	Due to nature of Scheme within the town centre it will be in the public eye so control of Scheme will be essential	8
Certainty of implementation costs	The council needs to be confident that proposals can be funded to ensure budget availability	15
Flexibility for future changes in client requirements and post completion change	Scheme will be completed within a short time scale so future changes in client requirements unlikely to occur	0
To ensure that the Scheme is delivered to the funding profile	The delivery of the Scheme has been analysed using three funding profiles. This will ensure flexibility in DfT and council funding of the project	12
Control over detailed design and design quality	The Scheme is in an urban area and will be in close proximity to major statutory undertakers and therefore design will be critical.	10
Control over health and safety issues	The Scheme is in an urban area, heath & safety issues will be in relation to general public and operatives, and should be the responsibility of the contractor and designer	10
Reduction in disputes and in-house costs through single point responsibility	There is a single point of contact at the council and this will continue	0
Control of sustainability issues	The Scheme will deliver a sustainable solution to the council in line with County Environmental initiatives	10
To optimise whole-life costs	The council wishes to ensure whole life costs are within existing budgets	7
To award a contract at a competitive price	The grant allocation is set for the project and the council wishes to obtain the best price available within the grant allocation	5
To optimise risk transfer	Due to the risks from the close proximity to statutory undertakers and the urban terrain the cost of risk transfer could be prohibitive and therefore most risks will remain with the council	0
To achieve wider LTP2 objectives within the procurement strategy	LTP2 includes reference to the timely completion of this Scheme	10
To achieve value for money	There is a fixed maximum grant allocation available for this project and the council wishes to obtain the best quality available within the grant allocation (to reduce long term costs)	15
Total scores		100

10.2 Procurement Options

10.2.1 The procurement options have been measured against the objectives shown in table 10.1. The following Procurement Options have been considered:

- Traditional procurement – separately procured design and construction contracts
- Design & build (D&B)
- A mix of traditional and term contracts – Suffolk County Council already has term contracts for the supply of RTPI and UTMC for the county
- Early Contractor Involvement (ECI)

10.2.2 No assessment of DBFO and similar options has been undertaken, as this project would not be suitable for those types of contract. It would be impractical for roads effected by this Scheme to be operated by others and the UTMC and RTPI sections are already part of term contracts

10.2.3 Table 10.2 compares the objectives of the Scheme against the procurement options. Objectives that had a zero weighting in Table 10.1 have not been included as they are not important objectives for this project.

Table 10.2 Procurement Criteria: Procurement Method Comments

Evaluation criteria (appropriate to the client and project)	Traditional Comments	Design and Build Comments	Mix of Traditional and term contracts	Early Contractor Involvement Comments
Public perception of project	Separate points of contact for design and construction.	One point of contact for Scheme from design through construction	Will need single lead point of contact to work effectively	Greater planning of buildability possible hence improved perception
Certainty of implementation costs	There is certainty for construction phase.	Majority of design will be complete at procurement so certainty of construction phase slightly less than traditional	There will be certainty earlier for term contract elements with certainty for other elements after tender	There is certainty for construction phase. But incentive to innovate.
To ensure that the Scheme is delivered to the funding profile	Programme for delivery set at award of contract	Milestones/ Programme fixed for delivery at award of contract	Programme for delivery set at award of contract	Greater incentives for contractor to deliver project to profile
Control over detailed design and design quality)	Council has greater control over detailed design and design quality.	Outline specification set at contract award with less control subsequent of changes to design and increased cost to Council.	Council has greater control over detailed design and design quality.	Council works in partnership with principal contractor approving detail and quality of design at all stages.
Control over health and safety issues	Council has control of design and health & safety will be built into the specification.	Council has more control at preliminary stages. Control partly passes to designer after contract award	Council has control of design and health & safety will be built into the specification.	Contractor can influence design to improve health and safety without council losing control of design.
Control of sustainability issues	Council has control of design and sustainability will be built into the specification.	Council has more control at preliminary stages. Control partly passes to designer after contract award	Council has control of design and sustainability will be built into the specification.	Council will work in partnership with contractor with incentives to provide sustainable solutions

Evaluation criteria (appropriate to the client and project)	Traditional Comments	Design and Build Comments	Mix of Traditional and term contracts	Early Contractor Involvement Comments
To optimise whole-life costs	There is certainty for construction phase.	There is no certainty as it is just for construction phase only	There is certainty for construction phase with additional benefits of term contractors who maintain the project will be involved in the construction	There is no certainty as it is just for construction phase only. But incentive to innovate.
To award a contract at a competitive price	Tender process will ensure price is competitive	Tender process will ensure price is competitive although tendering design and construct at same time could mean that best price for construct not achieved if prices change	Tender process will ensure that price is competitive although term contract prices set and will not reflect potential price changes at time of tender	Tender process will ensure price is competitive. Value engineering could lower price
To achieve wider LTP2 objectives within the procurement strategy	Council has control over the wider objectives during the delivery of the project.	Council sets objectives at early stage but potential restricted as project progresses.	Council has control over the wider objectives during the delivery of the project.	Council works in partnership with the contractor to achieve wider objectives.
To achieve value for money	Council has more control over budget decisions relating to project.	More scope for variants in costs	Council has more control over budget decisions relating to project. Term contract prices already set so can't be reduced by tender	Scope for savings through value engineering process.

10.3 Procurement Recommendation

10.3.1 The options considered for procuring the Scheme have been assessed using the comments in Table 10.2 and the weightings shown in Table 10.1. The comments have enabled a ranking of each type of procurement against each objective. Table 10.3 details the evaluation scores for each procurement method and gives a preferred order for the options assessed.

10.3.2 It can be seen that traditional works contract with the term contracts will fit the project requirements better than early contractor involvement, design and build or traditional contracts.

10.3.3 It is therefore recommended that a traditional works contract using the existing term contracts is used for this project. Early Contractor Involvement was second and it would be prudent to allow a short value engineering period after the tender process to allow some of the benefits of early contractor involvement in the final design to be used. The term contractors will also be used in finalising the design of their sections of the project.

Table 10.3: Procurement Evaluation scores

		Traditional		Design and Build		Traditional and Term		Early Contractor Involvement	
Evaluation criteria (appropriate to the client and project)	**Criteria weight**	**Score**	**Weighted score**	**Score**	**Weighted score**	**Score**	**Weighted score**	**Score**	**Weighted score**
Public perception of project	8	4	32	1	8	3	24	2	16
Certainty of implementation costs	15	3	45	4	60	1	15	2	30
To ensure that the Scheme is delivered to the funding profile	12	4	48	2	24	3	36	1	12
Control over detailed design and design quality	10	2	20	4	40	1	10	3	30
Control over health and safety issues	10	3	30	4	40	1	10	2	20
Control of sustainability issues	10	3	30	4	40	2	20	1	10
To optimise whole-life costs	7	2	14	4	28	1	7	3	21
To award a contract at a competitive price	5	2	10	4	40	3	30	1	10
To achieve wider LTP2 objectives within the procurement strategy	10	2	20	4	40	1	10	3	30
To achieve value for money	13	3	39	4	52	1	13	2	26
Total scores			288		372		175		205
Preferred order (score and rank combined)			**3**		**4**		**1**		**2**

11 Financial

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11 Financial

11.1 Scheme elements

11.1.1 The various Scheme elements have been costed and Table 11.1 below summarises the overall costs split into its constituent elements. The preparatory costs have been derived from the other Scheme costs. The last two lines shows the value of the request for funding that will be put to the Department for Transport and the local contribution.

Table 11.1 Overall Scheme costs (at 2008 prices)

Scheme Element	Scheme costs		Preparation costs
walk/cycle: red route	1,234,867		103,868
walk/cycle: purple route	3,218,371		249,656
other walk/cycle routes	5,564,276		481,826
Cattlemarket	1,702,224		132,832
Tower Rampart	1,446,184		112,852
Bus stops and shuttle loop	571,320		42,482
RTPI	1,882,816		244,766
UTMC and VMS	6,990,999		671,733
Wayfinding	950,000		50,000
Total	**23,561,057**		**2,090,015**

11.1.2 The costs estimates have been built up using the rates of the term contracts for the UTMC and RTPI elements and elsewhere using the rates of the Suffolk Highways Partnership term contract for general civil engineering in Suffolk. Appendix P gives details of the independent cost audit undertaken by Mouchel. Mouchel have not been involved in any part of the design of this scheme and have provided an independent analysis of costs to ensure the robustness of the estimates.

11.1.3 Mouchel Ltd has been commissioned by Suffolk County Council to produce a Surveyors Report to review and verify the bid submission costs produced by Faber Maunsell/ AECOM in an independent capacity.

The Level 1 Costing Report has assessed the individual elements of the integrated transport proposals identified within the submission. The Level 1 Costs, taking off calculations and submission plans detailing the extent and nature of work included within the Bid has been rigorously analysed for each of the elements listed below:

- Eight walking and cycling route improvement schemes including Civic Drive/ Princes Street Junction Improvements
- Two bus station improvements (Tower Ramparts and Old Cattle Market)
- Urban Traffic Management Control (UTMC) systems on strategic routes into Ipswich
- Real Time Passenger Information (RTPI) on strategic routes into Ipswich
- A Variable Message Sign system on strategic routes into Ipswich
- Bus Stop and Shuttle Bus Loop on strategic routes into Ipswich
- Ipswich Wayfinding System

All design information provided by Suffolk County Council and Faber Maunsell/ AECOM to improve sustainable transport within Ipswich Town Centre as detailed within the Bid documentation has been reviewed, and it is concluded by Mouchel Ltd that the scheme costs identified within the Major Scheme Business Case are an accurate reflection of the improvement works identified within the Bid Submission.

A full copy of the Major Scheme Business Case (MSBC) Independent Surveyors Report is included within the Submission as Appendix P.

11.2 Regional Funding Allocation and Local Authorities contribution

11.2.1 Regional Funding has been agreed with the East of England Development Agency in January 2009. This funds the Scheme using the profile set out in Table 11.2 and is the funding profile that has been used to produce the project plan in figure 9.1 that delivers the project using this funding profile.

Table 11.2: Regional Funding Allocation

Financial Year	Scheme Cost Funding/£
2010/11	500,000
2011/12	2,000,000
2012/13	21,200,000
Total	**23,700,000**

11.2.2 The local contribution for the Scheme is £2,036,500. This will be funded from Suffolk County Council's resources.

11.3 Preparatory Costs

11.3.1 The preparatory costs for the Scheme have been estimated to be £2,090,000 from the submission of the business case. This business case is for conditional approval and preparatory costs have already been used from the equivalent of programme entry up to conditional approval. It has been assumed in the cost profiles that follow that reimbursement part of the preparatory costs from 2006/07 to 2008/09 will be reclaimed in 2010/11. Table 11.3 below shows the years in which costs have and will occur and the division between local authority and Department for Transport funding. The county council will contribute 50% of the preparatory costs.

Table 11.3: Preparatory Costs

Financial Year	Department for Transport Funding/£	Local Authority Funding/£
2006/07	22,500	22,500
2007/08	70,000	70,000
2008/09	95,000	95,000
2009/10	445,000	445,000
2010/11	400,000	400,000
2011/12	200,000	200,000
Total	**1,232,500**	**1,232,500**

11.4 Overall Funding Profiles

11.4.1 Table 11.4 below details the funding cost profile to fit the RFA Settlement. Scheme costs have been increased by inflation by 4% from £25.7M to £26.9M. As the tender for the contract will be awarded in the financial year 2010/11 only the effect of one year's inflation has been included in the cost profile. Overall budget for the Scheme is 2.5% higher than that used when agreeing the RFA settlement.

Table 11.4: Funding Cost Profile to fit RFA Settlement

Annual Profile	Total Scheme Cost	DfT Scheme Cost Funding	DfT Prep Costs Funding	Local Authorities intended Contribution	Local Authorities Prep Cost Contribution
2006/07	45,000		22,500		22,500
2007/08	140,000		70,000		70,000
2008/09	190,000		95,000		95,000
2009/10	890,000	0	445,000	0	445,000
2010/11	1,220,000	100,000	400,000	320,000	400,000
2011/12	2,367,500	1,167,500	200,000	800,000	200,000
2012/13	22,116,500	21,200,000	0	916,500	0
Total Scheme costs	**26,969,000**	**22,467,500**	**1,232,500**	**2,036,500**	**1,232,500**

11.4.2 Section 9 shows that the programme associated with this profile would create a lull in the construction of the project which may be adversely reflected in the tender price. It has also been suggested in discussions with the Department for Transport that alternative scenarios accelerating spend should be included in the business case. Table 11.5 details the funding cost profile related to the fast track programme shown in Figure 9.2 in section 9.

Table 11.5: Funding Cost Profile to fit Fast Track Programme

Annual Profile	Total Scheme Cost	DfT Scheme Cost Funding	DfT Prep Costs Funding	Local Authorities intended Contribution	Local Authorities Prep Cost Contribution
2006/07	45,000		22,500		22,500
2007/08	140,000		70,000		70,000
2008/09	190,000		95,000		95,000
2009/10	890,000	0	445,000	0	445,000
2010/11	8,440,400	7,320,400	400,000	320,000	400,000
2011/12	17,263,600	15,147,100	200,000	1,716,500	200,000
Total Scheme costs	**26,696,000**	**22,467,500**	**1,232,500**	**2,036,500**	**1,232,500**

11.4.3 The other alternative scenario is to leave the length of the construction contract similar to the RFA settlement scenario but programme the works throughout the two year period. This programme was shown in Figure 9.3 and gives the funding cost profile in Table 11.6.

Table 11.6: Funding Cost Profile to spread construction throughout RFA Settlement period

Annual Profile	Total Scheme Cost	DfT Scheme Cost Funding	DfT Prep Costs Funding	Local Authorities intended Contribution	Local Authorities Prep Cost Contribution
2006/07	45,000		22,500		22,500
2007/08	140,000		70,000		70,000
2008/09	190,000		95,000		95,000
2009/10	890,000	0	445,000	0	445,000
2010/11	2,794,700	1,674,700	400,000	320,000	400,000
2011/12	12,792,200	11,392,200	200,000	1,000,000	200,000
2012/13	10,117,100	9,400,600	0	716,500	0
Total Scheme costs	**26,969,000**	**22,467,500**	**1,232,500**	**2,036,500**	**1,232,500**

11.5 Discussion of dis-aggregation of benefit and cost assessment by Scheme component

11.5.1 The Scheme has been developed as an integrated whole, with many of the elements supporting several objectives of the Scheme, and each other. None the less, with some assumptions, a more dis-aggregate view can be taken. Indeed, the Scheme underwent an element by element rigorous value engineering exercise in November 2007, which guided this second Scheme design.

11.5.2 Table 11.7 presents a breakdown of the costs and benefits, broadly categorised by the cost components, and allocating the quantified financial benefits between them. This has been done on an approximate basis, in 2008 prices and values, and does not use the formal TUBA process reported in Chapter 6. This clearly shows two important conclusions:

- The three area based components of the Scheme – town centre, suburban and hinterland – all have similar benefit cost ratios; and
- The UTMC and RTPI components show Very High value for money in isolation.

Table 11.7 Broad comparison of costs and benefits by category

Cost Item		Cost	Benefit Item	Benefit	BCR
Town centre travel	Pedestrianisation of Upper Brook Street	1.3	Accident savings	8.0	
	Improvements to the Prices Street Corridor	3.5	Ambience benefits	5.7	
	Other walk/cycle	6.0	Physical fitness benefits	2.5	
			Security improvements		
	Wayfinding	1.0	Comfort benefits	0.5	
			Part model time savings	10.0	
	Subtotal town centre	**11.8**		**26.6**	2.1
Suburban travel	Tower Ramparts bus station	1.6	Comfort benefits	3.1	
	RTPI	2.2		7.7	3.5
	UTMC/VMS (part)	5.1	Part model time savings	12.5	2.5
	Bus loops and shuttle bus	0.6			
	Subtotal suburban travel	**9.5**		**23.2**	2.6
Hinterland travel	Old Cattle Market bus station	1.8	Comfort benefits	1.5	
	UTMC/VMS (part)	2.6	Part model time savings	10.0	3.8
	Subtotal hinterland travel	**4.4**		**11.5**	2.4
Overall total		**25.7**		**61.3**	2.4

Note – items are not all in the same price basis, and are quoted for the purposes of broad comparison and exclude inflation. Optimism bias is not included. Reference should be made to Section 6.5 for the formal economic cost benefit analysis, with TEE and PA tables, in accordance with WebTAG 3.5.9.

11.5.3 While there is always scope for further value engineering, and Scheme optimisation during the final design, the overall Scheme is robust. The UTMC and RTPI are both Very High value for money, and capable of early implementation, using existing contractual arrangements.

12 Appendices

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12 Appendices

12.1 List of Appendices

(Appendices are provided as a separate volume. Complex and detailed graphics have been compressed in quality, but are available separately in electronic form)

A Bus station improvements

B Bus loop expansion and improvement and shuttle bus service

C Personalised travel plans

D UTMC (VMS) and signalisation

E RTPI

F Walk/cycle route improvements and integration with the public realm

G Wayfinding

H Existing Data and Travel Survey Report

I Highway Traffic Assignment Model Validation Report

J Bus and Active Model Assignment Model Validation Report

K Demand Model Report

L Forecasting Report

M NATA AST and supporting information

N Stakeholder Consultations

O TUBA Cost Benefit Analysis and TEE Tables

P Independent Cost Audit

Suffolk County Council

Ipswich - Transport fit for the 21st Century

Major Scheme Business Case

Appendices

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Contents

Appendix A

Project:	**Ipswich – Transport Fit for the 21st Century**	Job No:	**60050323**
Subject;	**Bus Station Improvements**		
Prepared by:	**Justin Pooley**	Date:	**12 April 2009**
Checked by:	**Chris Creed**	Date:	**24 April 2009**
Approved by::	**Bil Harrison**	Date:	**15 May 2009**

1 Introduction

1.1 This Technical Appendix describes the outline design of improvements to the Tower Ramparts and Old Cattle Market bus stations in Ipswich, the locations of which are shown in Figure 1. These improvements are proposed as an important and high visibility component of the 'Ipswich – Transport Fit for the 21st Century' Major Scheme. This component has been developed to support the bus service RTPI components of the Major Scheme, and to complement the UTMC components. This self-contained Technical Appendix deals with physical improvements to the layout and facilities of the two stations.

1.2 This Technical Appendix covers the following aspects in turn, separately for the two stations:

- An overview of principles for improving the station layouts – taking into account passenger safety, operational capacity and efficiency, and passenger comfort.
- An overview of the principles of improving the station facilities – taking into account the requirement to improve the general ambience and to accommodate the RTPI facilities.
- Discussion of the links to other aspects of traffic control and interchange arrangements.
- Presentation and discussion of a layout plan.
- The costs of the improvements.

1.3 The improvements at the two main bus stations are complemented by changes to the bus loop surrounding the town centre and connecting the stations, discussed in Appendix B. Another important bus station and interchange is located at the Railway Station forecourt, but this is considered to be operating well at present, but changes may be considered later.

1.4 The schemes have been developed in dialogue with the operators. The costs are based on recent civil construction prices, with a large allowance for the need for temporary traffic management of the live bus station during works.

1.5 This Technical Appendix has four following Chapters:

- Chapter 2 discusses the background and design considerations in general;
- Chapter 3 describes the proposed layout and costed proposals for Tower Ramparts bus station; and
- Chapter 4 describes the proposed layout and costed proposals for the Old Cattle Market bus station; and
- Chapter 5 presents the estimates of the passenger benefits of the bus station improvements.

Figure 1: The Bus Station Locations in Ipswich

2 Background and design considerations

2.1 Ipswich currently has two separate bus stations on either side of the town centre. The local bus services (predominantly operated by Ipswich Buses) which operate within the town generally run to, from and through Tower Ramparts Bus Station, situated off Crown Street on the northern edge of the town centre. Routes serving the rural areas surrounding Ipswich, and interurban services to and from other towns, generally use Old Cattle Market Bus Station, located off Dogs Head Street just to the south of the town centre. Both of these interchanges are characterised by poor waiting facilities, overcrowding, poor standards of operational safety and are generally not of the quality likely to attract increased patronage.

2.2 A central bus station in a new location was considered to replace the two existing bus stations. However, it was decided that the only site identified (the Mint Quarter) could not deliver the required capacity and accessibility, and was better used for the expansion of the retail core, with the potential to include a new shopping centre. Proposals to build a shopping centre with a bus station beneath have not been forthcoming. Therefore, it has been decided that the two existing town centre bus stations will be retained and improved in their existing locations, broadly continuing to serve their existing markets.

2.3 Both interchanges are proposed to have improved entrance and egress arrangements for buses, upgraded passenger waiting facilities, better interchange and drop off facilities, real time passenger information, much reduced conflicts between vehicles and pedestrians, and high quality cycle storage. All this will offer a more pleasant environment for passengers, and an improved operating environment for the bus company staff.

2.4 Discussions have been held with the two main bus operators in the town, Ipswich Buses and First (Eastern Counties) and with Ipswich Borough Council on the number of stands required for the town and how each of the stations should be laid out. This also took into account the passenger use of the bus stops round the 'bus loop'. The stakeholder discussions were taken into account when developing the layouts.

2.5 Discussions have been held with Suffolk County Council and Ipswich Borough Council on the style and specification of the new bus shelters required for both bus stations and how these should be laid out. A site meeting was carried out by FaberMaunsell AECOM and the bus shelter manufacturer, Garricks, who successfully installed the Lowestoft bus station improvements. The purpose of this site meeting was to obtain specialist advice on the proposed layouts and budget estimates for inclusion into the MSBC. Further meetings will be held in due course with all parties to agree on the actual shelter style and specification.

3 Tower Ramparts

3.1 Tower Ramparts is extremely busy in the peak periods of the day, with both bus and passenger congestion. Expansion of the number of bus bays available for through services is a priority. There is some scope to reduce the use of the bus station for extended layover. The Tower Ramparts site is owned by Ipswich Borough Council, with stands allocated by Ipswich Buses Ltd.

3.2 The bus station would be rebuilt on its existing site to higher standards with enhanced features, including:

- Upgraded waiting facilities;
- Real time passenger information displays;
- Improved layout for bus manoeuvring and passenger level boarding;
- Reduced conflicts between buses and pedestrians; and
- Traffic signal control of the entry and exit junctions with Crown Street.

3.3 The broad principle of the bus station layout for through services works reasonably well. It is proposed, however, that the 'bus islands' will be lengthened and widened to accommodate extra bus stands. This will also enhance the safety of waiting and alighting passengers. Formal zebra crossings will be positioned at either end of the 'bus islands' to minimise the pedestrian/bus vehicle conflicts, and to improve the access to the nearby shopping centre.

3.4 There are currently some 13 operational stands, and it is expected to increase this number to 16 (a 25 percent increase) with the changed layout.

3.5 In addition, new traffic signals will provide a bus priority system for the entrance and exit to help improve bus journey times and reliability. Tower Street will be included within the signal control layout to help regulate unauthorised access by private vehicles driving through the bus station.

3.6 The existing pedestrian crossing of the main Crown Street serving Crown Pools swimming pool and Charles Street multi-storey car park will be incorporated into the new traffic signal layout at the western end of Tower Ramparts. The existing pedestrian crossing to the east of the bus station will also be linked into the entry signalised junction.

3.7 Ipswich Borough Council is concurrently proposing to restrict vehicular access into Tower Ramparts at the eastern end of the site, near its junction with Tower Street. The purpose of this is to improve walk and cycle access to the bus station, linking to the walk / cycle route improvements forming part of this Scheme, and restricting use of the narrow street.

3.8 Figure 2 shows the proposed layout. In outline, the improvements include:

- New 4m wide passenger waiting areas;
- New Cantilevered Shelters with RTPI displays;
- Additional bus stands;
- Controlled access into bus station, thereby improving road safety;
- New Block Paving footways;
- New Zebra Crossings inside bus station layout;
- New street furniture.

3.9 Table 1 presents the cost breakdown. These are mainly concerned with the repaving of the road and footways, and the construction of the shelters, with a substantial allowance for traffic management. The entry and exit traffic signals are allowed for elsewhere.

Table 1: Tower Ramparts improvements costs (£, 2008/09 prices)

Item	Description	Unit	Quantity	Rate	Amount
200	**Site Clearance**				
					105,747
300	**Fencing and Barriers**				
400	**Safety Fences / Barriers and Pedestrain Guard Rails**				
	New pedestrian guard railling				
500	**Drainage and Service Ducts**				62,402
600	**Earthworks**				
	Excavation of hard material	m3	824	21.51	17,724
	Excavation of unacceptable material	m3	824	4.16	3,428
	Deposition of fill	m3	824	4.54	3,741
700	**Pavements and Surfacing**				
	Planning, planing, moving paving equipment				267,340
	High Friction Surfacing				
1100	**Kerbs, Footways and Paved Areas**				
	Kerbing				17,375
	Footways				94,794
1200	**Traffic Signs, Markings, Traffic Signals**				
	Road Markings	item	1	2,500.00	2,500
	Pedestrian / Toucan Crossings (inc modifications to existing)	no			
1300	**Road Lighting and Electrical**				20,000
2500	**Structures**				
2700.01	**Utilities**	Sum			20,000
2700.02	**Miscellaneous**				
	Street furnitureStreet furniture				219,893
3000	**Landscaping**				
	Turfing of verges and batters incl. topsoiling/planters etc.	Sum			1,000
	Sub Total				**835,944**
100.00	**Preliminaries**				
	Site Establishment / Disestablishment	Sum		10%	83,594
100.01	**Contingencies**	Sum		10%	83,594
100.02	**Traffic Management**	Sum		30.0%	250,783
100.03	**Restricted working**	Sum		12.5%	104,493
100.04	**Environmental management**	Sum		0.5%	4,180
100.05	**Laboratory Costs**	Sum		2.5%	20,899
100.06	**Design & Preparation**	Sum		12.5%	104,493
100.07	**Supervision costs**	Sum		7.5%	62,696
100.08	**Administration**	Sum		1.0%	8,359
100.09	**Other costs**				0
	Estimated Overhead Costs			**£**	**723,092**
	Total Estimated Cost of Works			**£**	**1,559,036**

4 Old Cattle Market

4.1 The Old Cattle Market bus station occupies a site off Dogs Head Street, south of the Buttermarket shopping complex, conveniently situated as a terminus for long distance services and routes converging on Ipswich from outlying areas. It has a public highway running between the two stand layouts, regularly used by service delivery vehicles and occasionally, taxis and private vehicles. The stands are a drive-in and reverse out style.

4.2 Several layout options were examined, particularly to allow through travel by buses without reversing. It was concluded that it was best that the bus station would continue to operate on the current basis. Some of the bus parking area would, however, be rearranged to allow for a car drop off area, and a mini-roundabout entrance, in place of the current give way junction with Old Cattle Market/Dogs Head Street. The bus bay at the north western end of the bus station will be converted into providing additional footway space by reallocating layover bays and improving the bay alignment.

4.3 The existing taxi rank in Dogs Head Street, outside the bus station, would be incorporated into a designated taxi layby, and an additional layby for 'drop off and pick up' area for motorists dropping off bus passengers, thus removing the need for private vehicles to enter the bus station. Traffic would enter Dogs Head Street by amending the current traffic regulation order at the junction with Silent Street, thereby allowing vehicles to turn around at the new mini-roundabout outside the bus station. This arrangement would also allow two bus stops to be retained on Dogs Heads Street outside the Pals café. Bus operators will change some services which currently use this on-street stop, and amend their routings and use the newly improved bus station instead.

4.4 A new bus gating system will be installed at the southern end of the bus station, either in a rising bollards, vehicle detection/transponder or code entry gate form, at the interface with Turret Lane. This will enable controlled access into the bus station by approved vehicles only, including service delivery HGV's for the nearby high street stores which require this access to be maintained. The controlled system will prevent the unauthorised use of the bus station as a through route.

4.5 There are currently 15 stands and approximately three layover parking bays in Old Cattle Market Station. The new proposals retain the same number of stands, but improve the safety and convenience of the layout.

4.6 The outer pedestrian walkway linking the bays will be expanded to allow more space for alighting passengers, especially on the western side of the station. As with Tower Ramparts, the bus station will be upgraded to have much improved waiting facilities built with new shelter architecture. The real time information system will be introduced. The surrounding footway will be improved to facilitate the new bus shelters and enhance the passenger waiting environment.

4.7 A contra-flow cycle lane would be installed for cyclists entering the bus station from the east end of Dogs Head Street. The existing zebra crossing outside The Plough PH will be converted to a 'Toucan' crossing.

4.8 Figure 3 shows the proposed layout. In outline, the improvements include:

- New Enclosed Shelters with RTPI;
- Dedicated layby for taxis;
- Dedicated layby for drop-off passengers;
- Controlled access into bus station, thereby improving road safety;

- Providing a new Cantilevered shelter for Park & Ride and other services in Dogs Head Street outside PALS;
- New Block Paving footways;
- New street furniture, including seating and cycle stands.

4.9 Table 2 presents the cost breakdown. These are mainly concerned with the repaving of the road and footways, and the construction of the shelters, with a substantial allowance for traffic management during the works..

Table 2 Old Cattle Market improvements costs (£ 2008/09 prices)

Item	Description	Unit	Quantity	Rate	Amount
200	**Site Clearance**				87,600
300	**Fencing and Barriers**				14,607
400	**Safety Fences / Barriers and Pedestrain Guard Rails**				
	New pedestrian guard railling				26,506
500	**Drainage and Service Ducts**				61,158
600	**Earthworks**				
	Excavation of hard material	m3	676	21.51	14,541
	Excavation of unacceptable material	m3	676	4.16	2,812
	Deposition of fill	m3	676	4.54	3,069
700	**Pavements and Surfacing**				
	Planning, planing, moving paving equipment				204,688
	High Friction Surfacing				
1100	**Kerbs, Footways and Paved Areas**				
	Kerbing				17,243
	Footways				261,944
1200	**Traffic Signs, Markings, Traffic Signals**				
	Road Markings	item	1	2,500.00	2,500
	Pedestrian / Toucan Crossings (inc modifications to existing)	no			
1300	**Road Lighting and Electrical**				20,000
2500	**Structures**				
2700.01	**Utilities**	Sum			75,000
2700.02	**Miscellaneous**				
	Street furnitureStreet furniture				191,276
3000	**Landscaping**				
	Turfing of verges and batters incl. topsoiling/planters etc.	Sum			1,000
	Sub Total				**983,944**
100.00	**Preliminaries**				
	Site Establishment / Disestablishment	Sum		10%	98,394
100.01	**Contingencies**	Sum		10%	98,394
100.02	**Traffic Management**	Sum		30.0%	295,183
100.03	**Restricted working**	Sum		12.5%	122,993
100.04	**Environmental management**	Sum		0.5%	4,920
100.05	**Laboratory Costs**	Sum		2.5%	24,599
100.06	**Design & Preparation**	Sum		12.5%	122,993
100.07	**Supervision costs**	Sum		7.5%	73,796
100.08	**Administration**	Sum		1.0%	9,839
100.09	**Other costs**				0
	Estimated Overhead Costs			**£**	**851,112**
	Total Estimated Cost of Works			**£**	**1,835,055**

5 Benefits of Bus Station Improvements

5.1 The bus station improvements generally are reflected in the bus network model as reduced wait time weightings – this in turn influences the demand for bus travel. The improvements are not, however, measured in the modelled benefit estimation, since they are not true time actual savings.

5.2 In this Chapter, an estimate is made of the comfort and convenience benefits perceived and valued by existing bus passengers. The valuations are based on TRL Report 593 'The Demand for Public Transport: A Practical Guide' which provides estimates as follows:

- Waiting room facilities £0.05
- Seats at stops £0.17
- Lighting £0.03

These valuations are for commuters – other higher values are suggested for other purposes, but the lowest values have been used here. The quoted values are in 2000 prices, and have been factored by 1.2 to represent 2009 estimates. For Tower Ramparts a value of 24 pence has been assumed, with 30 pence assumed at Old Cattle Market. Not all passengers will perceive a benefit – for example arriving passengers are less likely to use the facilities.

5.3 Table 3 brings together the values and assumptions. Annual benefits are taken to be 250 times the daily benefits. Growth in patronage has not been taken into account here. The annual benefits are introduced into the formal TUBA and TEE processes. For the purposes of initial comparisons of costs and benefits here, a factor of 11.52 has been used to convert from annual benefits to the Net Present Value over a 15 year project life, at a discount rate of 3.5 percent.

5.4 This simple comparison suggests that without considering other supporting reasons for bus station improvements and capacity increases, based solely on the comfort of existing passengers, that Tower Ramparts and benefits some 2.9 times the capital cost, while Old Cattle Market, with more complex works and fewer passengers has benefits some 1.2 times the costs.

Table 3: Comfort benefits to existing bus station users (£ 2009 prices)

	Tower Ramparts	Old Cattle Market	TOTAL
Daily boardings	7,949	2,533	10,482
Daily alightings	6,607	465	7,072
Boarders benefiting	75%	90%	
Alighters benefiting	10%	50%	
Daily benefiting passengers	6,622	2,512	
Benefit per passenger	£ 0.24	£ 0.30	
Annual benefits	£ 397,347	£ 188,415	£ 585,762
NPV over 15 years at 3.5%	£ 4,577,437	£ 2,170,541	£ 6,747,978

Figure 2: Proposed Tower Ramparts Layout

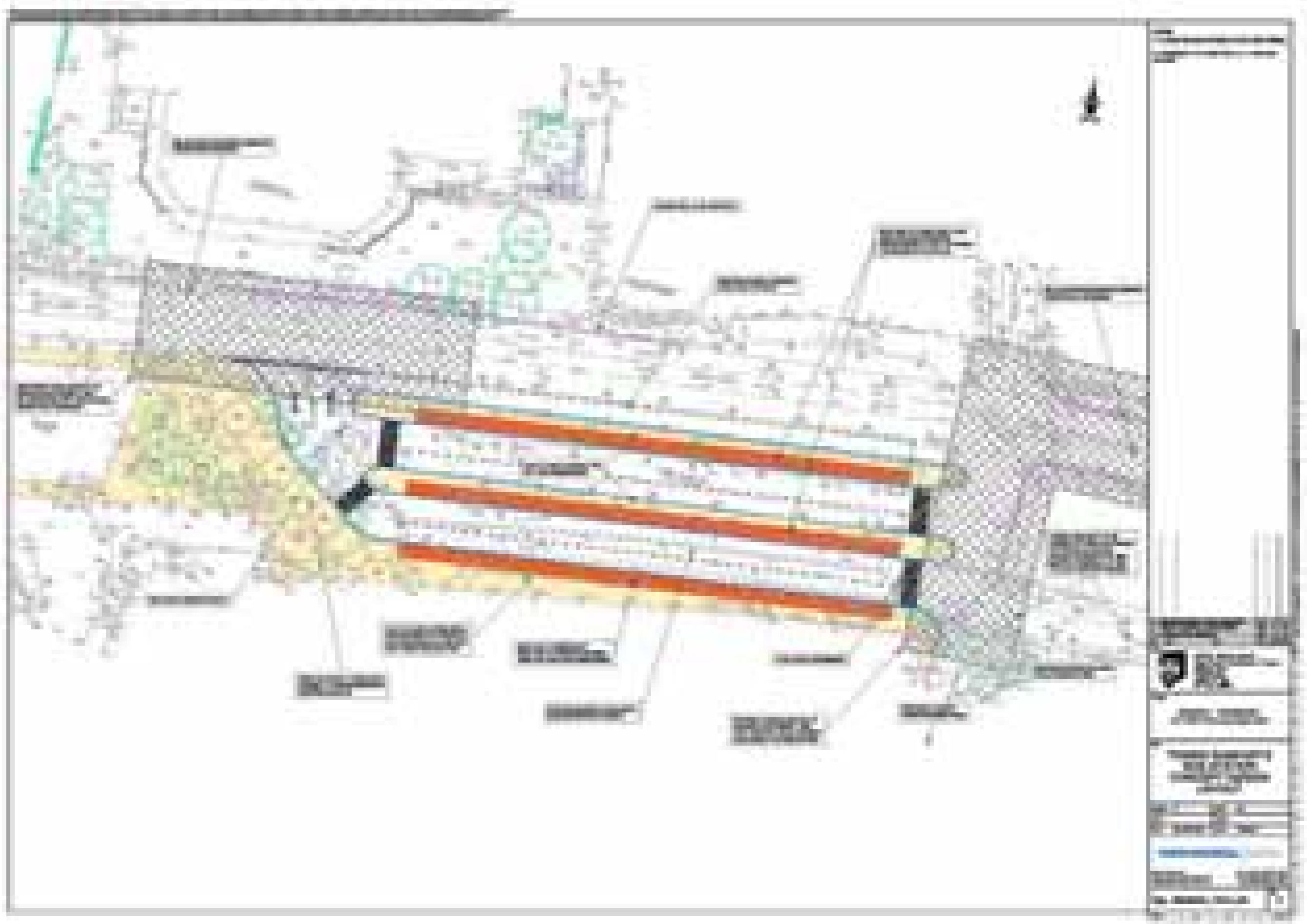
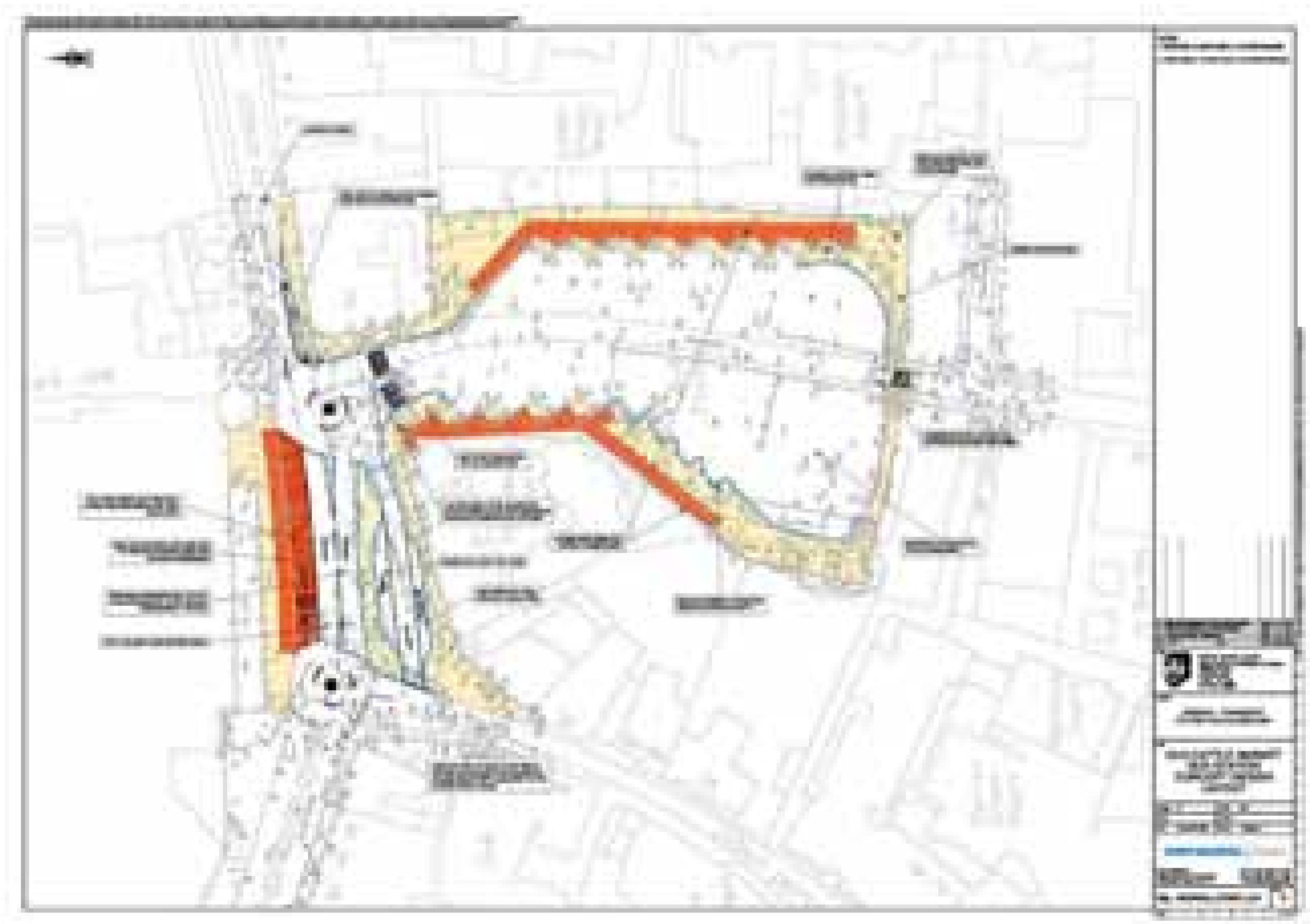


Figure 3: Proposed Old Cattle Market Layout



Appendix B

Suffolk County Council | AECOM

Project:	**Ipswich – Transport Fit for the 21st Century**	Job No:	**60050323**
Subject;	**Bus loop expansion and improvement**		
Prepared by:	**Justin Pooley**	Date:	**14 April 2009**
Checked by:	**Chris Creed**	Date:	**10 May 2009**
Approved by::	**Bil Harrison**	Date:	**15 May 2009**

1 Introduction

1.1 Context

This Technical Appendix B forms a supporting part of the 'Ipswich – Transport Fit for the 21st Century' Major Scheme Bid. It describes the outline design of a revision to the 'bus loop' route used by buses in the centre of Ipswich. The bus loop involves buses arriving at the edge of town circulating anti-clockwise round the town centre, allowing passengers to alight and board on the town centre side at a stop most convenient for their destination. The buses can still call at the bus station, or layover, but then continue round the loop to rejoin their radial route.

The bus loop was introduced in October 2002, and has proved popular with bus passengers and operators. Several of the bus stops used, however, are crowded for waiting and alighting passengers, and congested for the bus vehicles. In particular, the use of Upper Brook Street causes crowding and conflicts. As part of the Scheme, it is proposed that Upper Brook Street be pedestrianised, and the bus loop changed to extend eastwards to Upper Orwell Street, which is now the more appropriate eastern edge of the town centre.

1.2 System Objectives

Ipswich has a complex and expanding town centre. The proposed expansion of the bus loop has the following objectives:

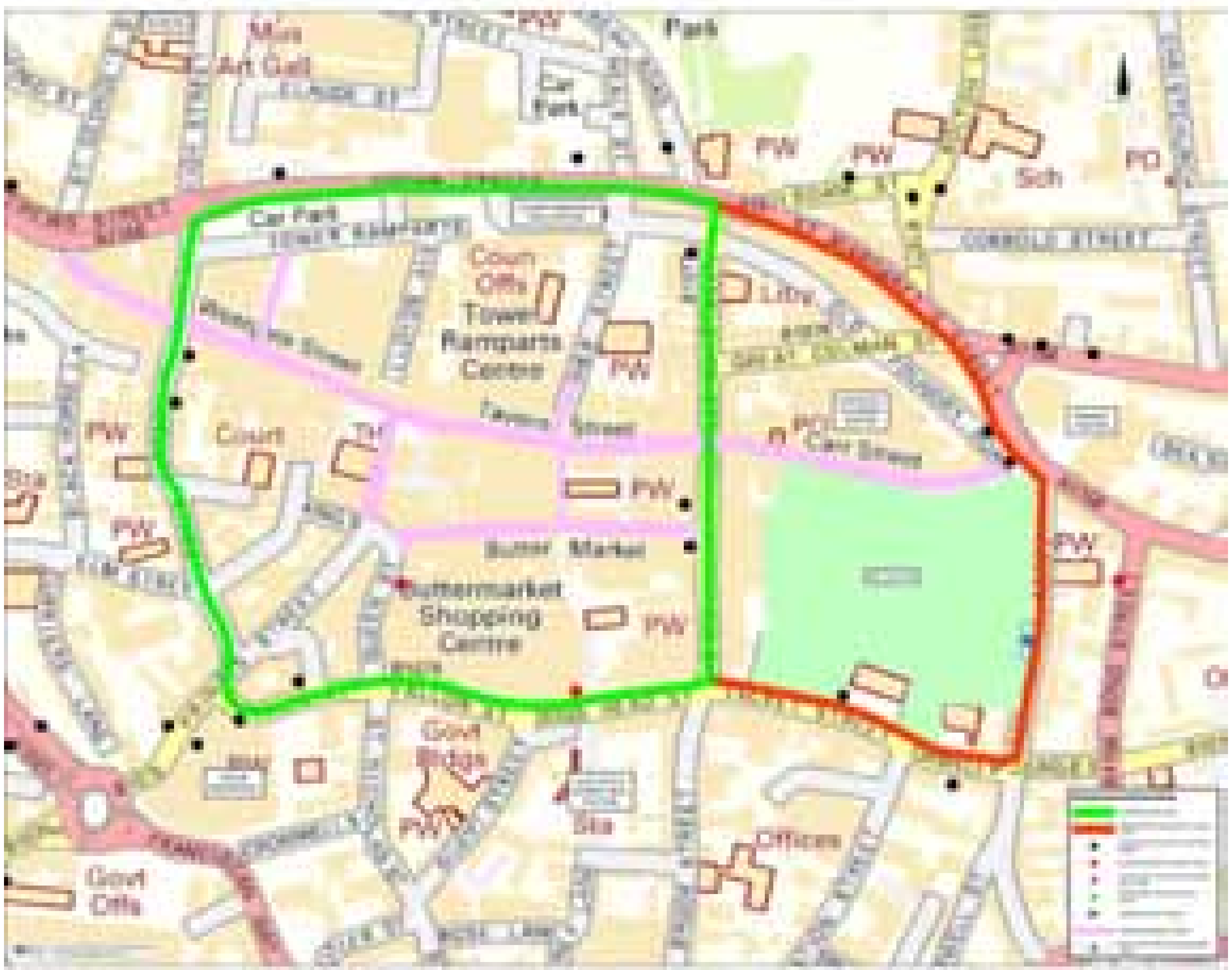
- Enable the pedestrianisation of Upper Brook Street;
- Widen the bus access to the town centre to include the proposed redevelopment of the 'Mint Quarter';
- Enable a new shuttle bus service to be incorporated in the southern part of the loop, then linking the Education Quarter and the Waterfront to the railway station; and
- Increase the length of the bus loop, and hence the number of bus stop stands.

1.3 Structure of this Appendix

Following this introductory Chapter, this Appendix is structured round three following Chapters:

- Chapter 2 describes the existing bus stop facilities on the bus loop, and the existing shuttle bus route;
- Chapter 3 discusses the works needed to extend the bus loop and accommodate the proposed second shuttle bus service; and
- Chapter 4 presents the costs.

Figure 1: The existing bus loop, and proposed eastern extension



2 Inventory of existing facilities

2.1 The bus shelters and waiting areas

Photo 1: Princes St NB Bus Stop

Princes Street Bus Stop NB

Existing conditions

Princes Street is two way, with one lane in each direction (see photograph 1). Each traffic lane measures approximately 3.3m wide and is a primary route into the town centre. Bus stops are located on either side. This bus stop contains a flag and timetable only, no shelter is present and the footway measures 1.8m wide behind the bus flag. A bus stop clearway is also present. This area falls within the conservation area.

Proposals

The future of this bus stop is dependent on the Ipswich Borough Councils (IBC) aspirations for Queens Street bus stop. If the proposals go through (detailed on Queens St Bus stop), then this stop would be removed.

However, this bus stop will be upgraded to include raised kerbs during the short term, and these will be paid for by the developer.

Photo 2: Princes St SB Bus Stop

Princes Street Bus Stop SB

Existing Conditions

This bus stop is located east of the access point to Willis Insurance building (see photograph 2). The bus stop contains only a flag, with an attached timetable, no bus cage or clearway is present. Parking restrictions are double yellow lines. The footway width at the bus flag is approximately 4.9m wide. This area falls within the boundaries of the conservation area.

Proposals

As with the northbound bus stop, raised kerbs will be installed at the bus stop and will be paid for by a private developer.

Photo 3: Friars St EB Bus Stop

Friars Street WB

Existing Conditions

This stop is located outside the Willis Insurance building on Friars Street (see photograph 3) and falls within the conservation area. It is an inset bay measuring approximately 2m wide and is located on the corner. The adjacent westbound carriageway width is approximately 3m wide. Footway width is moderately wide, however it only measures 2.3m up to the highway boundary, where it changes ownership to the Willis building. The boundary is indicated by small studs on the footway.

The bus stop consists of a cage, with a partial bus stop clearway, measuring half the stop, when it changes to double yellow lines. Site observations concluded, vehicles used the end of the bus cage (where double yellow lines are present) to wait/drop people off. A bus stop flag is present with an attached timetable and street lighting is also present. There is no shelter, seating or litterbin in the vicinity.

Proposals

There is limited space on the footway and carriageway to propose a kerb build out and provide a shelter. The proposals include providing raised kerbs and extending the bus stop clearway to the end of the bus cage and lay by. The extension of the clearway will require a change in the Traffic Regulation Order (TRO). The raised kerbs will be provided by the private developer.

Photo 4: Friars St WB Bus Stop

Friars Street EB Bus Stop

Existing Conditions

This stop is located outside UKi Partnerships building west of Queens Street (see photograph 4) and falls within the conservation area. Friars Street is one lane in each direction measuring approximately 3.3m wide. The footway measures 2.6m wide.

This bus stop only consists of a standard cantilever shelter with seating and a bus cage. There is currently no bus flag, timetable, litter bin, RTPI or clearway.

Proposals

The proposals for this stop include providing raised kerbs, erecting a flag east of the bus stop and providing the correct clearway plate for this stop. In addition the sign post to the east of the shelter will be removed. All these options are currently in motion and need no attention from Faber Maunsell.

Queens Street Bus Stop

Photo 5: Queens St SB Bus Stop

Existing Conditions

Queens Street is a one way street with two lanes travelling southbound and falls within the conservation area (see photograph 5). Lane width is approximately 3m wide and the footway width at the flag measures approximately 1.9m. A taxi rank is located north of the bus stop on the corner of Queens Street

This bus stop has a flag, with attached timetable. No shelter is present and a litter bin is located at the northern end of the bus cage.

Proposals

IBC have aspirations to relocate Queens Street Bus Stop round the corner onto Princes Street and provide approximate two or three bus shelters, to enable separate services serving each stop. This idea will ease congestion along this busy bus route. This relocation will require the relocation of parking bays from the right side of Princes Street onto the bend of Queens Street with the possible relocation of the taxi rank into the existing bus stop. However, this aspiration has political implications and could lose revenue from the loss of parking bays. If this option goes ahead then the Princes Street NB bus stop (outside Willis Insurance building) would be removed.

Photo 6: Tacket St EB Bus Stop

Tacket Street

Existing Conditions

Tacket Street is a two way street with one lane in each direction, measuring approximately 3m wide and falls within the conservation area (see photograph 6). The bus stop has a high frequency of bus services and is located between the pedestrian crossing to the west and the taxi rank to the east. Due to this high level of services, congestion along this road is very common.

This location has the bus stop sign located on a lighting column with a timetable and the cantilever shelter with two end panels is present with seating. The footway is quite wide and measures 3.8m. Two small trees are located on the footway west of the bus shelter. Two benches are located at the back of the footway in close proximity to the bus shelter. These were observed to be occupied by people, who were waiting for their bus.

Proposals

Ideally this stop should have two separate bus stops to help reduce congestion and waiting times. However space is a limiting factor, with the pedestrian crossing to the west and Cox Lane junction to the east. It could be possible to provide partial or full inset bus bays, reducing the footway width from 3.8m and maintaining general traffic lanes.

Photo 7: Orwell St WB Bus Stop

Orwell Place WB

Existing Conditions
Orwell Place bus stop is located approximately 30m west of Fore Street and situated in a conservation area (see photograph 7). Orwell Place is a two way street with one lane in each direction each measuring approximately 3m wide. An advisory cycle lane is located on the eastbound carriageway with an ASL. Central hatching exits between Fore Street and the pedestrian crossing west of the bus stop.

This bus stop is considered not busy and consists of a bus stop sign located on a lighting column. There is no bus cage, shelter, timetable or litterbin. The footway measures 2.0m and the parking restrictions are double yellow lines.

Proposals
As this site is not very busy and footway is very narrow, the only proposals required are to provide raised kerbs and a bus stop clearway.

Photo 8: Bond St Shuttle Bus Stop

Bond Street

Existing Conditions
This shuttle bus stop is located midway up Bond Street on the western footway and is considered extremely busy during peak times (see photograph 8).
Bond Street is a one way street with two lanes with a carriageway width of 7.4m. This road is congested during the PM peak. The bus stop consists of a flag and timetable, but there is no bus cage, shelter or seating, however raised kerbs are present. The footway measures 1.9m wide and a disused car park owned by IBC is located west of the bus stop.

Proposals
Ideally this location should have a shelter and seating. An initial idea was to take some land from the car park, which is currently owned by IBC, in order to provide enough space for a shelter. However, IBC will not sell the land, as this land may be sold for future developments. Another option is to reduce the

carriageway width to 6m, but still maintaining two general traffic lanes. With the extra 1.4m kerb build out, the total footway width would be 3.3m. This would be enough to provide a narrow cantilever bus shelter. In addition a bus stop clearway will be provided.

Photo 9: Upper Orwell St Satellite Bus Stop

Photo 10: Majors Corner Bus Stop

Mint Quarter Satellite Bus Stop (Upper Orwell Street)

Existing Conditions

Upper Orwell Street is a two way street measuring 7m in width. Currently this street is run down and a proposed Mint Quarter development will be built to the west of Upper Orwell Street. The proposed bus stop location can be seen in photograph 9 and the western footway is 1.3m wide.

Proposals

See Mint Quarter Development for proposals.

Majors Corner

Existing Conditions

Majors Corner consists of two bus stops and is located on St Margaret's Street, west of the Upper Orwell Street (see photograph 10). The bus stops are inset and contain a taxi stand at the beginning of the inset bay. An advisory cycle lane and general traffic lane runs adjacent to the bus stop. This road is one way northwest bound, with another general traffic lane travelling around the corner onto Woodbridge Road to travel eastbound.

The first bus stop has a shelter, timetable, seating and a litterbin, but no flag. The second bus stop has a flag, shelter, timetable, seating but no litterbin. Both stops have raised kerbs, cages and bus stop clearways. The width of the footways from the shelter to the kerb is 3.5m and 3.7m respectively.

Proposals

These bus stops have already been upgraded and only require RTPI. These will be provided within the shelter.

Photo 11: Woodbridge Rd Bus Stop

Woodbridge Road

Existing Conditions

All three of these bus stops are highly used. The first bus stop is located northeast of the triangular island on entry to Woodbridge Road (see photograph 11). Woodbridge Road is one way with two general traffic lanes, with an advisory cycle lane running from the start of Woodbridge Road until 50m west of Christchurch Street. The cycle markings run through the bus cage markings. The bus stop has a flag, timetable, a standard cantilever bus shelter and seating. The footway measures 2.4m wide and already has raised kerbs. Bus stop clearways are present at all three buses stops, but there is a small section between bus stop 1 and 2, where restrictions revert back to double yellow lines.


Photo 12: Woodbridge Rd Bus Stop Number 2

The second bus stop is located west of Cobden Place (see photograph 12) and consists of a flag, timetable, a standard cantilever bus shelter and a litterbin. No seating is present. The footway measures 2.4m wide.

The third bus stop is located east of Cobden Place (see photograph 13) and consists of a standard cantilever bus shelter with seating, timetable and a litterbin. The footway measures 2.4m wide.

Proposals

The bus stop clearway will need to be extended to cover the entire length of the first two bus cages.

RTPI will be required on these stops and place in the shelter.

Photo 13: Woodbridge Rd Bus Stop Number 3

Photo 14: St Margaret's Green Stop

St Margaret's Green SB

Existing Conditions

This bus stop is located opposite Soane Street, which falls within the conservation area and has a very low passenger frequency (see photograph 14). The footway measures 1.8m wide, the bus flag is located at the back of the footway. No shelter or timetable is present. Parking restrictions are double yellow lines through the bus cage.

Proposals

IBC would like to provide raised kerbs and remove the bus cage and upgrade the restrictions to a clearway.

Photo 15 St Margaret's Green Stop

St Margaret's Green NB

Existing Conditions

This stop is located south of Soane Street and falls within the conservation area (see photograph 15). The stop is located on a triangular island, which has benches close to the bus flag. A bus cage and flag are present, but has no timetable or shelter.

Proposals

IBC propose to provide raised kerbs at this location and upgrade restrictions to a clearway.

Photo 16: Soane Street inactive Stop

Soane Street

Existing Conditions

There is currently an inactive bus stop located east of the entrance to Christchurch Mansions and falls within the conservation area (see photograph 16). No bus markings exist, except for a worn out bus stop sign. This road is one way eastbound measuring approximately 6m wide and the northern footway where the bus stop is located, measures 1.9m wide. Parking occurs along the northern footway along the entire street.

Proposals

Potentially if Upper Brook Street is closed, then this stop could be used as a service stop. However, at the moment IBC have aspirations to allow this to become a coach stop for services for Christchurch Mansions. This stop would require a new flag and a bus stand clearway.

Photo 17: Fonnereau Street Stop

Fonnereau Street

Existing Conditions

This stop is located on the periphery of the town centre approximately 30m north of the junction with Crown Street and is deemed not an important bus stop but falls within the conservation area (see photograph 17). The bus stop consists of a bus flag and timetable. There is no shelter, bus cage or litter bin. The parking restrictions are double yellow lines and no clearway is present. The footway measures 2.4m and surfacing is poor.

Proposals

As this isn't a main bus stop, the proposals are low key, which involve providing raised kerbs and possible clearway. The assessment for RTPI can be carried out at a later date if it is deemed necessary for this stop.

Photo 18: Tower Ramparts Bus Stop

Tower Ramparts Bus Station EB

Existing Conditions

The bus stop is located opposite Tower Ramparts Bus Station, travelling eastbound (see photograph 18). This bus stop is inset and has two general traffic lanes travelling eastbound and one travelling westbound. The footway width is approximately 3.8m.

This stop is not normally used as a service stop, but can be used as a reserve stop if required. This location is generally used for buses to park and wait, but ideally only one bus should park, just in case one service is running and requires the inset bay.

Proposals

IBC treat this stop as part of the Bus Station, but it can be upgraded to a bus stand clearway. The shelters could be replaced with two double cantilever styled shelters put together.

Photo 19: Crown St Coach Lay by

Crown Street Coach Lay by

Existing Conditions

The coach lay by is situated outside Crown House (see photograph 19) and the bus stop is owned by them. This is not used as a bus service stop, but is used by coaches to drop/pick up people. Many coaches use this area to wait for many hours at a time. The carriageway lay by measures 7.6m wide and is owned by a mixture of IBC and SCC and the footway is owned by Crown House.

The bus stop only has a shelter and a litterbin. No timetable or seating is present, as mentioned before it is only a coach point. The footway measures 2.4m wide and has a line of trees located either side of the stop on the footway. The actual bus stop has a clearway along the majority of the length of the lay by, with double yellow lines either side at the ends to allow loading and deliveries. It was observed many vehicles used this area as a drop of and pick up point.

Proposals

The future of the bus shelter is currently in control of Crown House. However, IBC have aspirations to provide raised kerbs at the stop and relocate the shelter slightly east, closer to the main entrance of Crown House. The TRO needs to be changed to tighten up on coaches parking and waiting here to a maximum of 2 hours and to reduce the number of drop offs by private vehicles.

Photo 20: Museum St/High St Bus Stop

Museum St/High Street Bus Stop

Existing Conditions

This is located on the corner of Museum Street and High Street travelling southbound as Museum Street is one way (see photograph 20). This area is located in a conservation area.

The bus stop is located on the east side, with an adjacent general traffic lane measuring approximately 4.0m wide with a 1.2m wide contra flow cycle lane.

The footway measures 2.3m wide and this is seen as a busy bus stop. A bus flag is present, along with a timetable and bus cage. The cage has a clearway and the restrictions of double yellow lines exists up and downstream of the bus stop. It was observed the bus cage had recently been re painted and raised kerbs are already present.

Proposals

This bus stop does have a space issue, but a kerb build out is possible which would generate an extra 1m width of footway, reducing the adjacent traffic lane to 3m wide. The footway would then be 3.3m wide and a narrow cantilever with short ends could be provided.
RTPI would also be required and would be provided in the shelter.

Photo 21: Museum St/High St Bus Stop No. 2

Museum Street bus stop No. 2

Existing Conditions

This stop is located south of Westgate street and falls within the conservation area (see photograph 21).
The bus stop consists of a flag post, litter bin and timetable. A bus cage is present with a clearway. Restrictions up and down stream consist of double yellow lines and a contra flow cycle lane is also present.

The footway width is very narrow at 1.8m and causes pedestrian conflict when busy. However, there is no scope to provide a build out due to insufficient space.

Proposals

Ideally a shelter would be provided, however due to the lack of carriageway width it is not possible. The only realistic improvements that can be provided are raised kerbs and RTPI.

Photo 22: Museum St/High St Bus Stop No.3

Museum Street Bus Stop No.3

Existing Conditions

This bus stop is located approximately 40m south of the previous bus stop and falls within the conservation area (see photograph 22). This bus stop contains a flag and timetable. The bus cage has a clearway and restrictions downstream are double yellow lines, and parking bays occur upstream. The footway width is narrow at 1.9m, which like the previous bus stop can cause congestion during peak times.

Proposals

Ideally a shelter would be provided, however due to the lack of carriageway width it is not possible. The only realistic improvements that can be provided are raised kerbs and RTPI.

2.2 The existing free shuttle bus service

The current free shuttle runs from 0715 to 1930 on Mondays-Fridays. As shown in Figure 2, it utilises a loop serving Endeavour House in Ipswich Village, calling at eight additional stops: Princes Street, Queen Street by Buttermarket, Dogs Head Street outside the Buttermarket shopping centre/Old Cattle Market bus station, Bond Street near Suffolk College, Major's Corner at Carr Street, Tower Ramparts bus station, Civic Drive, by the Wolsey Theatre and Portman Road, near the football ground. The route takes just over 15 minutes, and runs every 20 minutes with a single vehicle or every 10 minutes from 1200 to 1400 with two buses.

Figure 2: The existing and proposed shuttle bus routes

3 Scope and costs of new bus loop facilities

3.1 Enhanced bus stop proposals

RTPI display costs are not included here, but are covered in Appendix E.

Generally there are 29 new or modified bus stops to be considered, and each bus stop needs to be developed on its own merit, based on projected usage and existing site conditions. For the purposes of establishing a robust overall cost, four styles of bus stop have been defined:

Category A – minor bus stop improvement including renewal of paved surface, new raised bus stop kerbing (Kassel or similar dependant on location), litter bin, road markings and new flag sign. No shelter or RTPI provision. . Estimated cost £2,136 per stop.

Category B – low cost shelter bus stop improvement including renewal of paved surface, new raised bus stop kerbing (Kassel or similar dependant on location), litter bin, road markings and new flag sign and new standard bus shelter with information case and perch seating. Estimated cost £7,092 per stop.

Category C – standard 'Lowestoft Style' cost shelter bus stop improvement including renewal of paved surface, new raised bus stop kerbing (Kassel or similar dependant on location), litter bin, road markings and new flag sign and new 'Lowestoft style' standard bus shelter with information case and perch seating. Estimated cost £9,237 per stop.

Category D – premium cost shelter bus stop improvement including renewal of paved surface, new raised bus stop kerbing (Kassel or similar dependant on location), litter bin, road markings and new flag sign and new 'Premium Style' bus shelter with information case and perch seating. Estimated cost £15,796 per stop.

Minor traffic management costs are included within these estimates. Based on the four styles of upgrade, the proposals are summarised in Table 1.

3.2 The second shuttle service

It is suggested the new shuttle bus service would have an approximate headway of 15 minutes, starting from the railway station to the town centre and linking Ipswich Village, the town centre and Old Cattle Market / Pals bus interchange, the Education Quarter and the Waterfront, as shown in Figure 2. The approximate length of the proposed route is 3.6 km. The shuttle bus will operate in one direction clockwise running with the one-way system along Grimwade Street, Fore Street and College Street. The return route could use Bridge Street and Burrell Road, or link to Cardinal Park using Commercial Road and Princes Street.

In detail, the preferred route will utilise the existing bus corridor from the railway station on Princes Street which includes the existing short section of dedicated bus lane between Commercial Road and Grafton Way. Travelling northbound over the Princes Street/Civic Drive junction, past Willis Insurance and stopping at Queen Street to serve the main retail shopping streets. On towards to the Old Cattle Market bus station, eastwards to the Mint Quarter proposed retail redevelopment, on Eagle Street from where the shuttle bus will travel southwards on Grimwade Street, Fore Street and College Street, with a stop serving both the college and university in the Education Quarter. A further stop on Key Street or College Street will be established to serve the Waterfront. Finally, the route crosses the River Orwell at Stoke Bridge and runs westwards along Burrell Road before returning into the railway station forecourt. The number of shuttle buses operating on the new route will be determined, currently, it is anticipated that two vehicles will be required to ensure the 15-minute frequency.

Table 1 Bus stop enhancement proposals

Location	Existing bus stop	Proposals
Princes St NB	Dependant on Queens St stop	May be removed
Princes St SB	As with the NB stop	May be removed or modified alongside development proposals
Friars St WB	Limited space for improvements	Category B
Friars St EB	Limited space for improvements	Category C (currently in progress)
Queen St	May be relocated to Princes St	Category C (dependant on consultation currently in progress)
Tacket St EB	Requires extending to improve capacity	Category C or possible D
Orwell Place WB	Limited capacity and not busy	Category A
Bond St	Requires extending to improve capacity	Category C or possible D
Upper Orwell St	To be developed with Mint Quarter proposals	Likely Category D
Majors Corner (2 stops)	Have already received some modifications	Category D plus RTPI
Woodbridge Rd (3 stops)	Very busy with limited pedestrian platform areas.	Category D plus RTPI
St Margaret's Green SB	Limited capacity and not busy	Category A or B
St Margaret's Green NB	Within conservation area	Category A or B
Soane St	Currently a redundant stop.	Dependant on Upper Brook St proposals but likely to be converted to a service stop. Category A
Fonnereau St	Outer peripheral of loop and not busy	Category A with re-assessment of RTPI
Tower Ramparts	Can be busy and is often used as reserve stop for bus station. Needs to be extended.	Category D plus RTPI
Crown St (coach stop)	Currently under the control of Crown Hse.	Following dialogue with Crown Hse category C.
Museum St/High St	Limited space but requires widening and improving.	Category C or D plus RTPI
Museum St/High St (No.3)	Limited space but requires widening and improving.	Category B or C plus RTPI
Proposed second shuttle service route	Locations to be determined in consultation with SCC and IBC Public Transport	1 no. category B and 3 no. category D shelters with RTPI

3.3 Summary of Bills of Quantity

Electrical connections and general street lighting enhancement has been estimated at an additional overall one off lump sum of £25,000 including statutory plant modifications. There are also likely to be additional civils work required to tie in or bring up to or improve the standard of the adjacent footway areas. This has been costed as an additional overall one off lump sum cost of £20,000. Beyond these minor making good allowances, any roadway repairs and maintenance are not considered.

The total estimated cost of extending the bus loop, and introducing the second shuttle route, including the provision of enhanced bus stops and two new shuttle buses, is some £614,000.

Table 2: Summary of bus loop costs

Item	Description	Unit	Quantity	Rate	Amount
	Category A – minor bus stop improvement including renewal of paved surface, new raised bus stop kerbing (Kassel or similar dependant on location), litter bin, road markings and new flag sign. No shelter or RTPI.	Item	9	2,136	19,224
	Category B – low cost shelter bus stop improvement including renewal of paved surface, new raised bus stop kerbing (Kassel or similar dependant on location), litter bin, road markings and new flag sign and new standard bus shelter with information case and perch seating.	Item	3	7,092	21,276
	Category C – standard 'Lowestoft Style' cost shelter bus stop improvement including renewal of paved surface, new raised bus stop kerbing (Kassel or similar dependant on location), litter bin, road markings and new flag sign and new 'Lowestoft style' standard bus shelter with information case and perch seating.	Item	6	9,237	55,422
	Category D – premium cost shelter bus stop improvement including renewal of paved surface, new raised bus stop kerbing (Kassel or similar dependant on location), litter bin, road markings and new flag sign and new 'Premium Style' bus shelter with information case and perch seating.	Item	11	15,796	173,756
	Civils works address tie ins and adjacent footways etc.	LS	1	20,000	20,000
	Road Lighting and Electrical	LS	1	20,000	20,000
	Utilities	Sum			5,000
	Sub Total				**314,678**
100.00	**Preliminaries**				
	Site Establishment / Disestablishment	Sum		0%	0
100.01	**Contingencies**	Sum		10%	31,468
100.02	**Traffic Management (included in unit costs)**	Sum		0.0%	0
100.03	**Restricted working (included in unit costs)**	Sum		0.0%	0
100.04	**Environmental management**	Sum		0.5%	1,573
100.05	**Laboratory Costs**	Sum		0.0%	0
100.06	**Design & Preparation**	Sum		12.5%	39,335
100.07	**Supervision costs**	Sum		7.5%	23,601
100.08	**Administration**	Sum		1.0%	3,147
100.09	**Bus purchase**	Sum	2		200,000
	Estimated Overhead Costs			**£**	**299,124**
	Total Estimated Cost of Works			**£**	**613,802**

Appendix C

Suffolk County Council | AECOM

'Ipswich – Transport fit for the 21st Century' Major Scheme Bid

Appendix C - Ipswich Transport Strategy – Smarter Choices Plan
Workplace, school and personal travel planning

(This Appendix describes the planned work on promoting Smarter Choices travel planning to support the Major Scheme. It does not form part of the Major Scheme Bid, but is expected to provide considerable support to informing the public regarding transport changes, and hasten changes in behavior)

Introduction

Suffolk County Council's transport strategy for Ipswich seeks to achieve a 15% reduction in 2021 forecast levels of traffic. The major scheme *Ipswich – Transport fit for the 21st Century* will deliver the improved infrastructure we need to support this change. Alongside the major scheme we are promoting a range of behavioural change techniques which we have combined into an innovative package called Ipswich Smiles.

The Department for Transport advises that good travel plans can cut the number of people driving to work by 15%. When applied to the wider Ipswich area this modest figure could translate into 18,600 fewer people driving into and around the town.

The 2001 Census identified that 66,000 people travel to work in Ipswich each day, and that 39,000 of these journeys are made by people who live in the Ipswich borough. 56% of people living in Ipswich itself drive to work even though about 67% of these journeys are less than 5km in length. This is a comfortable cycling distance. Ipswich also has a strong local bus network.

Over the next twelve years, these travel figures are set to rise as a result of economic growth with 18,000 jobs and 20,000 homes planned for the wider Ipswich area (of which 15,400 are to be located in the Ipswich borough). Housing growth will result in increased demand for education services in the area. Currently 18,300 pupils who travel each day to the 52 schools in the wider Ipswich area. Three new education institutions catering for sixth form, further and higher education: Suffolk New College, University Campus Suffolk and the Swiss Centre will contribute a further 10,420 students and 1,250 employees to Ipswich.

At Great Blakenham on the outskirts of the town, Snoasis, a new winter sports resort is planned for completion in 2012. The £350 million development is expected to attract 650,000 visitors each year and provide over 3,000 jobs.

Proposals for extensive housing and employment growth at BT's Adastral Park site at Martlesham to the east of Ipswich are the subject of a current planning application. If approved this development will have significant transport impacts.

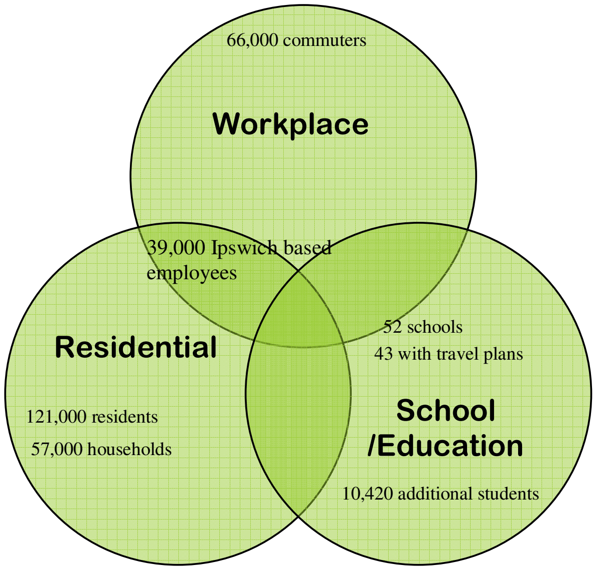
The forecast future growth is expected to impact on Ipswich's already strained transport system, exacerbating some of the issues associated with high car use in the area, for example: poor accessibility, traffic domination of local roads, climate change impacts, poor air quality, and poor health. Congestion is already a significant cost to Ipswich's businesses. This is evidenced by a Transport Economic Evidence Study published for the East of England Development Agency in September 2008. The study shows that by 2021, if congestion at peak hours were reduced to lower levels, it would save the Ipswich economy £16.9 million per annum. Findings from national research also show the implications of congestion on business growth. In particular, the 2006 Eddington Transport Study shows that good access to markets and transport within urban areas is one of the key factors influencing investment in businesses.

Over reliance on the car also has a bearing on health, and this link is apparent in Ipswich's population of 121,000. The correlation between limited exercise and obesity is highlighted in the Suffolk Strategic Partnership's Community Strategy: *Transforming Suffolk*. It claims that adult and child obesity levels in Suffolk are currently reaching epidemic level, which is consistent with the rest of England. The strategy also identifies that walking and cycling activities in everyday life are '…an effective way to obtain regular physical activity' and that 'journeys to and from work or school provide excellent opportunities for this…' Obesity and its associated illnesses are one of five priority areas to be tackled by the strategic partnership and Suffolk County Council.

In addressing these transport issues now and in the medium term, the expansion of road capacity in Ipswich to meet future forecast demand is neither financially nor environmentally viable. Increasing road capacity to resolve congestion issues would also not solve the problems with obesity, CO2 emissions, poor air quality and dangerous roads. A more sustainable long term solution is to change the travel behaviour of people, encouraging the adoption of green travel alternatives. This can be achieved through travel planning in workplaces, at home and in places of education.

A travel plan is a package of measures that reduces the need to travel by car; discourages business and commuter trips; and encourages the use of walking, cycling and public transportation. The three types of travel plan: workplace, residential and school/education differ slightly in their target audience, but have common goals. There is a degree of interrelationship between mode choices for travel purpose, for example the family choice of travel mode from home to work will have an impact on the transport choice for school travel. All three types of travel planning are identified in the Suffolk Community Strategy as having *'a role in reducing demand for peak-time road capacity, particularly in main towns…'*

Figure 1 Travel plan genres



Travel planning in the Ipswich area

Suffolk County Council's recognition of the importance of workplace travel planning is highlighted in the Suffolk Local Transport Plan 2006-2011 (LTP2). The LTP2 sets a countywide target to achieve a 29.3% shift from single occupancy car use to car sharing and use of sustainable transport modes by 2010/11. Travel planning will also play a significant role in helping to achieve the 15% reduction in congestion over 2021 levels, as identified by the Ipswich Transport Strategy.

The Suffolk economy is characterised by a high proportion of small businesses, however, within the wider Ipswich area there are eight large employers that employ between 1,000 and 4,000 members of staff. The table below lists the organisations and the number of employees.

Organisation	Number of employees
Adastral Park/BT Technologies	4,000
Ipswich Hospital NHS Trust	3,500
Axa Insurance	1,400
Willis Ltd	1,250
Ipswich Borough Council	1,126
P & O Ferrymasters	1,095
Suffolk County Council	2,000
Suffolk Police	1,382

We are working with the large employers in the area to influence the take up of travel plans, as well as to assess our own work practices. The council's two travel plan coordinators target the 6,181 businesses that employ over 100 employees. Figure 2 shows the location of the large and small businesses in greater Ipswich, alongside schools and congestion hot spots.

Our travel planning work has resulted in half of the large employers in the Ipswich area developing workplace travel plans; this includes BT, Ipswich Hospital, Ipswich Borough Council and Suffolk County Council. A total of 15 businesses in greater Ipswich have a workplace travel plan. Collectively they include around 14,000 employees. The implementation of the Suffolk County Council travel plan in 2002 has achieved a 42% decrease in the number of staff driving to the Ipswich based headquarters.

Businesses, schools and developers are encouraged to take-up and implement travel plans through the free travel planning consultancy service we offer. Travel plan coordinators and advisers employed by the county council directly target organisations to promote the benefits of travel planning. For businesses, coordinators meet with employers to understand their travel needs and demonstrate how travel planning can assist.

Regular contact is made with employers to check the progress of their travel plan, provide information and raise awareness about incentives, ideas and events. Business/council relationships are maintained with those organisations unconvinced by travel plans; this is achieved through travel planning events, which also facilitate business-to-business contact.

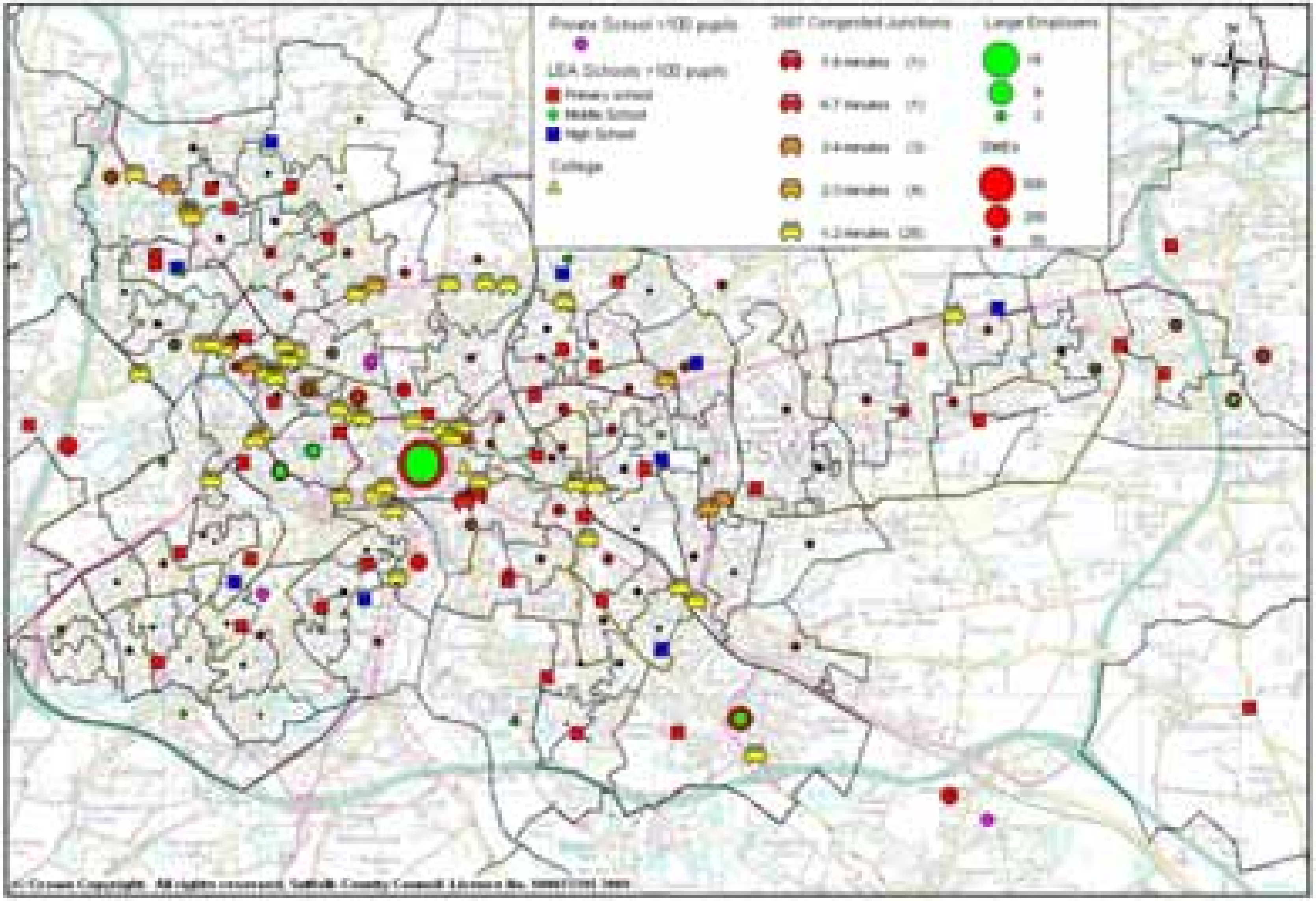
The planning and development services provided by the council to quality check travel plans for new development ensures that all new builds have a robust plan, as well as the necessary infrastructure to support sustainable modes of transport.

A Suffolk travel plan website has been created to provide information and advice on developing travel plans for the workplace, as well as a travel plan template. The website also links to the Department for Transport web pages, other sustainable travel organisations and the Suffolk car share website, which currently has 1,300 members.

In addition to the web based resource, we also use a variety of methods to promote and assist in the development of travel planning. This includes:

- A travel plan information pack which includes a step-by-step guide on producing travel plans; information on the health benefits of a travel plan; and workplace schemes for encouraging the use of public transport and cycling.
- Linking to the 'Suffolk - creating the greenest county' initiative, a priority of the Suffolk Strategic Partnership's community strategy to become the greenest county in England by 2028. The initiative, led by a group of representatives from the public, private and voluntary sector, supports the implementation of green initiatives in businesses, schools and communities. Green initiatives are judged each year at an awards ceremony, with the participating organisations winning recognition and free publicity for their efforts.
- A Sustainable Transport Forum, created by the county council to bring together representatives from local authorities, transport operators and major employers. The forum is held every three/four months and provides an opportunity for representatives to discuss the issues associated with travel planning, share best practices and identify opportunities for collaboration. For example: service developments, public transport ticketing, behaviour change, marketing, journey planning and information.

Our partnership work is important in a business realm. It extends to the IP City Network, a forum for over 300 high-tech businesses operating in the wider Ipswich area; and the Ipswich Central Business Improvement District, an area including 700 businesses working together to improve their trading environments.


Primary school
Middle School
High School
College
Large Employers

Future focus: Sustainable miles = Smiles

Promoting sustainable transport will be essential to maximising the use of the new travel facilities being delivered by the Ipswich Transport Fit for the 21st Century major scheme. To achieve this, we have developed a behaviour change project as part of the transport scheme to help provide a 15% modal shift from cars to sustainable transport.

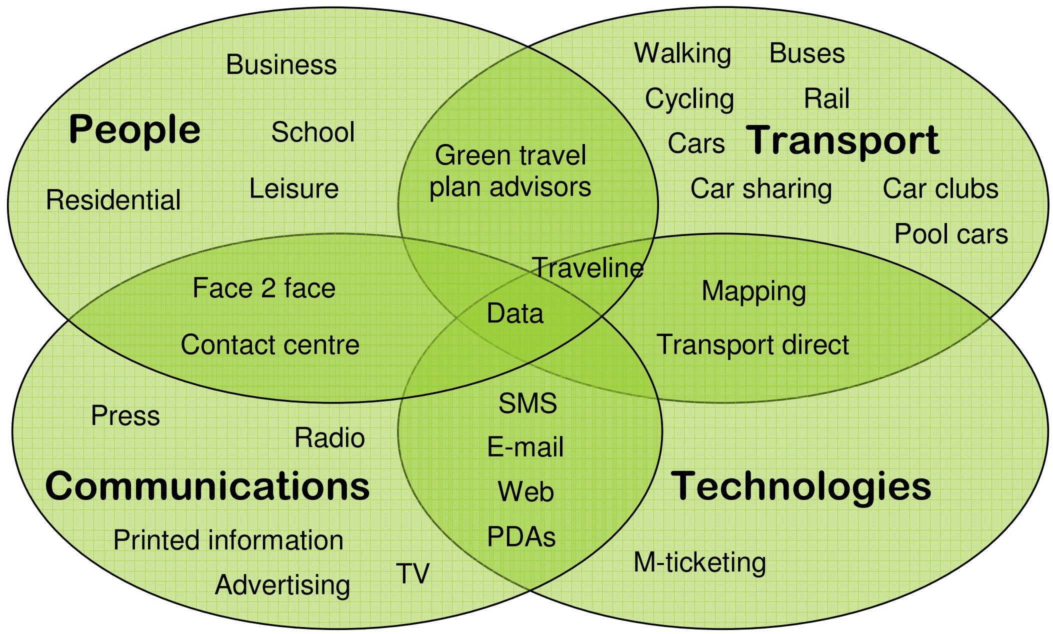
The £2.7 million Smiles project integrates business, residential and school/education travel planning. The integrated approach shares resources for the different markets and provides economies of scale. It also allows innovations to be tested, refined and delivered.

The project's aspirations for integrated resources include:

- Social marketing techniques to research travel needs and behaviours of different market segments, and to aid the development of appropriate messages to encourage behaviour change. An integrated campaign will be developed with messages and materials targeted at different market segments. Figure 3 shows the types of media and channels that could be used to target businesses, schools/further education centres and residents.
- A range of material about sustainable transport options will be produced using different media and communications channels to deliver it to different audiences. From printed maps and timetables to digital equivalents including interactive journey planners available via the internet, kiosks and mobile phones. This access to the real time passenger information included within the major scheme.
- An innovative mobile phone ticketing service, compatible with 95% of existing mobile handsets, which will allow people to purchase a range of bus tickets using their mobiles. For the local transport operators, mobile ticketing will reduce fraud, increase revenue and provide a more efficient way to collate and access data.
- A range of new bus tickets including an integrated zonal ticket for use on multiple bus services. This will support the transfer between bus routes and be offered in a variety of time and duration formats. Other tickets might include group and off-peak discounts.
- An innovative extension to the Suffolk Car Share service allowing people to seek and receive lifts for ad-hoc journeys via mobile phone.
- An innovative loyalty discount and incentive scheme, linked to the mobile phone ticket service and the tracking of mobile phones and other smart chipped items including bicycles. This will be used to encourage and reward sustainable transport, especially during the peak congestion hours. The scheme will be run in partnership with the Ipswich Central Business Improvement District. Loyalty points and special offers can be collected and redeemed at participating outlets including the theatres, cinemas, swimming pools, gyms, restaurants, shops, etc.

Each of the travel plan genres will use the integrated resources depending on their market needs.

Figure 3 Types and channels of communication for targeting audiences



Workplace = Business Smiles

The existing commute to and from work within Ipswich is estimated to produce around 42,000 tonnes of CO2 P/A. At today's rates a 15% modal shift away from cars has the potential to save around 6,000 tonnes of CO2 P/A.

To achieve a significant workplace shift in Ipswich, a travel planning service will be offered to around 80 small and medium sized businesses (SMEs). This will be done in addition to the work we are doing with large businesses, some of whom already have travel plans.

To achieve this we will work with Exemplas (an organisation providing advisory services to public, private and community sectors), local business groups and government agencies. We have applied for over £800,000 of European Regional Development Funds to support the Business Smiles project to encourage low-carbon economic development for SMEs in the region. The regional perspective allows us to partner with a similar pilot in St. Albans and share our collective learning across the region via local authorities and the Association of Transport Coordinating Officers.

A core component of Business Smiles support includes the innovative large-scale promotion and adoption of salary sacrifice schemes for bus season tickets and bicycles. This offers around 31% discount to employees and up to 12.8% discount to employers. Furthermore we aim to broker bulk purchase discounts on behalf of businesses joining the scheme, to deliver an overall 50% saving for employees. Achieving this level of discount should be realistic; Suffolk County Council currently has an existing 25% discount with a large national bus company for its own staff. As part of the Business Smiles project, a compelling business case will be developed to demonstrate to local bus operators the increased patronage and business that a 15% modal shift away from cars can provide them, as shown by the Department for Transport's own sustainable transport demonstration towns.

In addition to businesses saving up to 12.8% on National Insurance through salary sacrifices schemes, Business Smiles also aims to help them reduce business mileage and other low-carbon efficiency savings.

A partnership of businesses and local agencies will be established in Ipswich to work with the St Albans Quality Network Partnership (a public transport group consisting of local authorities, transport operators and the University of Hertfordshire) to understand travel behaviour. The research will be used to supplement the integrated social marketing activities with insight into local needs and behaviours.

As part of the project, two pilot travel planning schemes will be undertaken in Ipswich and St Albans. Developed by Exemplas, and delivered through Business Link East, a workplace travel plan consultancy service will be offered to 80 SMEs in these two locations. Both areas are good examples of large urban centres which have varying geographical differences, due to the extensive rural catchment in Ipswich and the close proximity of other market towns to St Albans.

The pilot project will provide five days consultancy support for each SME. It will identify their travel needs; inform about the benefits of sustainable transport; assist in the development of travel plans; and connect SMEs with agencies and business groups.

For employers, the free travel planning consultancy service will demonstrate how travel plans can create efficiency savings and make the workplace more accessible, helping the business to grow in a low-carbon way. It will also enable businesses to interface through travel forums and events. An online monitoring application will be offered free of charge to businesses. The iTRACE facility will allow businesses to track travel behaviour to identify the effectiveness of the travel plan. iTRACE systems offer a standardised approach to the whole travel plan process, allowing like for like comparisons on travel plan data – from one year to the next and from one organisation to the next. This information will be collated by the county council to identify what changes are being made and whether further interventions are required.

A brokering service will be established to advise businesses about salary sacrifice schemes, mobile ticketing and incentives. The use of mobile ticketing will be key to the Business Smiles project. It will present an innovative and convenient way to purchase and use bus tickets, utilising GPRS and SMS technologies to access tickets, real time passenger information, discounts and incentives.

This new service will be tried and tested on three bus routes in Ipswich and the Uno bus network in St Albans, linked to local business promotions and potentially extended to include integrated zonal tickets. These two different approaches will enable data comparison, a deeper understanding of mobile ticketing take up and passenger growth in the two locations.

We also plan to offer businesses with customised internet/intranet portal access for their staff which brings together the journey planning, real time information, ticketing, discounts, incentives and iTRACE survey services. Key staff will have access to the full iTRACE tool and reports, plus a special interest support group, consisting of similar people in local businesses, Exemplas and expert travel plan advisers in their local county council.

Residential = Home Smiles

In addition to the Business Smiles activity we aim to offer a residential travel plan service to 17,000 homes in Ipswich in partnership with Sustrans. The aim is to deploy an enhanced version of their TravelSmart programme by using the integrated Smiles resources.

Suffolk County Council is currently delivering a TravelSmart programme with Sustrans to 25,000 households in Lowestoft, almost the whole town and the largest project of its type ever carried out in Britain. This follows the successful results from the DfT's sustainable travel demonstration towns, in particular the work in Peterborough.

During the second of a three phased roll-out in Lowestoft the county council and Sustrans has introduced a website where maps and leaflets can be accessed. We are encouraging people to register on the website to receive e-mail and/or SMS alerts when services, timetables and fares change.

In Ipswich we plan to target households along key bus corridors and close to key cycling routes. Furthermore we aim to identify households that are unlikely to be reached through Business Smiles, by analysing postcodes supplied by businesses of where their staff live and comparing this to MOSAIC market segmentation.

The integrated Smiles resources will provide the overall marketing campaign that can be localised for areas of the town and personalised for individuals and household types. The resources include access to digital information, should people prefer these channels. Digital information, in addition to being kept up to date more easily is potentially more environmentally friendly. Moreover there is huge potential to use TravelSmart to promote the trial of the innovative mobile ticketing, discounts and incentive scheme along bus corridors.

We envisage that households will have access to a range of mobile tickets including season tickets, group travel and off-peak discounts. We are particularly keen to understand the residential market reaction to mobile ticketing and related discounts and incentives. There is potential for bus companies to improve their understanding of peak loading and journey patterns. The Ipswich Central Business Improvement District will also have the opportunity to test reactions to offers and improve targeting to stimulate local economy.

The wayfinding proposals in the major scheme proposals will be used to support residential travel planning in encouraging the use of walking for shorter local trips. The key central development areas around the town centre, waterfront and education quarter are all within easy cycling and comfortable walking distances of each other.

Education = School/Education Smiles

The Ipswich Transport Fit for the 21st Century scheme will bring important improvements to help encourage staff, parents and school children to travel sustainably to school.

DfT guidance advises that just over 10% of cars on urban roads between 08.50 and 09.00 in term time is on the ‘school run’. It also advises that successful travel planning intervention can achieve dramatic reductions in the proportion of children coming to school by car by more than 50%. Using alternative transport modes also has other added benefits such as improving the health of parents and children. Tackling child obesity is a high priority for the NHS in Suffolk.

As part of the Government’s national ambition that all schools have travel plans by 2010, five school travel plan advisers are employed by the county council to engage Suffolk schools in the development of travel plans. We are making good progress towards this target; in greater Ipswich 43 schools out of a total of 52 have travel plans.

Ipswich’s education quarter has grown significantly over the past couple of years; in the southeast of the town centre the new University Campus Suffolk has been constructed and the Suffolk New College redeveloped. In the southwest of Ipswich, the Swiss Centre - a new centre providing education for 2,000 14-19 year olds - is due to open in summer 2010.

As part of the overarching Smiles project, primary and secondary schools, colleges and the new University Campus Suffolk will be targeted. The School/Education Smiles branch of the project seeks to collate information to understand the travel behaviours and distances children and students travel for education in the town. This information will be gathered through a mapping service called Knowledge Mappers. The service will show the distances that pupils live from the school/college, the routes and mode of travel they are using, and the distances travelled.

Through this geo-mapping service, four different areas of Ipswich showing the travel behaviours of children, their parents and students in those locations can be developed to create one town wide map. These maps will enable understanding of what interventions will be required to influence travel behaviours and to overcome road safety issues. Due to the nature of the information being used it will be possible to deliver interventions on a school or cluster specific basis, thus enabling the best use of resources.

By coordinating the education travel plans with the business and residential travel plans we can share the resources, for example comprehensive sustainable travel maps and bus timetables will include schools and colleges along with places that parents/carers and staff may wish to access outside of the school day.

From the research collated, schools and higher education centres will be targeted using the Smiles resources; this could be directly by school travel plan advisers or through promotional material, such as literature, websites, competitions and events. A calendar of monthly competitions, campaigns and events will be established to engage schools, parents and colleges. All promotional work will be closely aligned to the school curriculum or will have an educational purpose to enable schools to embrace a 'whole school approach' to sustainable travel.

To encourage more school children and young adults to use public transport, the county council offers discounted travel through the Explore card. The Card is supplied free of charge to individuals between the ages of 5 - 20 years old, and provides 50% discount on all bus services and some train services in the county. It also enables the user to receive discounts on local goods and services. The innovative scheme, which has 70,000 users, costs Suffolk County Council £1 million per year to administer. Its annual value to the Suffolk economy is about £2 million. The Explore card will continue to be offered to school children and young adults through the school travel plan advisers and public transport promotions. University Campus Suffolk is keen to extend the Explore card discount to their students as part of their travel plan. They are considering contributing towards the discount and benefitting from the bulk-purchase discount secured for businesses.

For education staff at primary/secondary schools and colleges, the established Business Smiles salary sacrifice scheme will be promoted to enable staff to purchase public transport tickets or bicycles at a discount. We will also more generally promote the wider benefits to all that come from regularly walking or cycling to work.

The incentive and mobile ticketing facilities contained in the Smiles project will also be promoted to staff and pupils at schools and colleges.

The digital information technologies, also set out in Smiles, will be made available to enable school children, parents and students to plan their journeys sustainably and access transport information. This will include the use of internet and intranets, mobile phones and Real Time Passenger Information systems. All of these will make using sustainable transport more convenient and attractive. Digital technologies will also be used to capture information through the iTRACE travel plan monitoring system.

The role of the school travel plan adviser will evolve from quality checking travel plans to progressing them through the National Accreditation Scheme; gathering intelligence on travel behaviours; and engaging pupils, staff and parents with sustainable travel outside of school. With support from the schools, we aim to enhance the school travel plans, as well as encourage and reward pupils for increasing their sustainable travel behaviour, plus where possible influencing families and friends.

A strong focus will also be applied to personalised travel planning, ensuring that pupils have the necessary training to travel sustainably to school, for example cycle training and pedestrian training. Alongside this, Independent travel training could take place as part of the transition programme for children moving from primary to secondary education, and for young people with specific learning needs.

Another area of focus will be to link into the child obesity agenda in Suffolk. Combating childhood obesity is a high priority for the authority and health service. Studies have shown that active travel modes are an easily accessible way to include physical activity in everyday habits. In particular, the work of the school travel plan advisers will be closely linked to the

Healthy Ambitions Suffolk Challenge, a project using the 2012 London Olympics to inspire 50,000 children to get active, and the wider Healthy Ambitions Suffolk agenda, a scheme to make Suffolk the healthiest county by 2028.

There is potential for the mobile discount and incentive scheme to be used to target and reward particular groups with health activities and options such as free or reduced access to sports facilities and healthy snacks. These concepts will be explored and developed with partners and stakeholders to demonstrate the huge benefits of combining travel planning with the health agenda.

New developments

Quality checking of travel plans for new development will help to support the major transport scheme. Both travel plan coordinators and school travel plan advisers will work with developers to ensure that funding for infrastructure is secured through the planning process and that all new infrastructure enhances and links into the new transport facilities. In areas where there is more than one new development, developers will be encouraged to work together to ensure that any new infrastructure is joined-up.

Alongside the travel planning support offered by the county council, a travel plan guide will be published for developers and local authority planning officers. The guide will provide information on the types of infrastructure that could be included to make the development sustainable, the types of components necessary to the development of a travel plan as well as information about the Ipswich Transport Fit for the 21st Century Scheme. All of this information will also be digitally available, with downloadable templates, good practice examples and advice and support pages.

Delivery

In addition to ongoing work within schools and workplaces, the project will be delivered using a mixture of funding streams, including European, LTP, performance reward grants and SCC monies. The scheme will also be delivered through in kind contributions from delivery and strategic partners, this includes:

- Department for environment, food and rural affairs
- East of England Development Agency
- East of England Regional Assembly
- Suffolk County Council
- Suffolk PCT
- Ipswich Borough Council
- CRed climate change partnership for Suffolk
- Sustrans
- Association of transport coordinating officers (ATCO) Eastern region
- Exemplas
- Business Link East
- Suffolk Chamber of Commerce
- Ipswich Central Business Improvement District
- IP-City Network sustainable transport forum
- Ipswich Buses
- First
- National Express East Anglia
- East Anglian passenger transport information services (EAPTIS)
- University Campus Suffolk
- University of Hertfordshire.

Appendix D

Suffolk County Council | AECOM

Project:	**Ipswich – Transport Fit for the 21st Century**	Job No:	**60050323**
Subject;	**UTMC and VM System Components and Costs**		
Prepared by:	**Kambiz Porooshasp**	Date:	**2 April 2009**
Checked by:	**John Pattinson**	Date:	**2 April 2009**
Approved by::	**Bil Harrison**	Date:	**7 May 2009**

1 Introduction

1.1 Context

This Technical Appendix D forms a supporting part of the 'Ipswich – Transport Fit for the 21st Century' Major Scheme Bid. It describes the outline design of a comprehensive urban traffic management and control (UTMC) system and a variable message system (VMS) together with associated facilities. .This outline design builds on three major sources:

- The previous outline design undertaken in 2005 to inform the previous Scheme Bid;
- An inventory of the existing traffic control equipment in the wider Ipswich area; and
- The design and cost experience from the recent work installing UTMC in Lowestoft, and VMS in Bury St Edmunds.

Thus, while this outline design is completely new, it is based a previous ideas; is building firmly and economically on the existing equipment; and is able to be accurately costed based on firm current contractual prices for the latest proven equipment and installation experience. This Technical Appendix is in three main parts following this Introduction:

- Chapter 2 provides a description of the UTMC, VMS and associated systems;
- Chapter 3 outlines the benefits and impacts of the systems; and
- Chapter 4 calculates the costs.

1.2 System Objectives

Ipswich has a complex mix of traffic control systems, some linked, some isolated; some vehicle or user activated, some fixed; some fully functioning, some with partial disablement. The systems are in many cases old, and the mix of equipment makes it un-economic to enhance the links. The road system in Ipswich is generally fairly narrow single carriageway, often through environmentally sensitive and residential areas, with limited opportunities for physical bus priority. Towards the centre, there is an increasing need to provide safe and convenient pedestrian and cycle crossings, with priority shared equitably with vehicular traffic.

The objectives of the UTMC/VMS systems within the Major Scheme were identified as follows:

- Provide a town wide linked system to improve the management of movement of all road users, both for regular use, and under unusual circumstances or incidents;
- Assist in the management of traffic in environmentally sensitive areas, managing queuing traffic, and monitoring air quality;
- Provide a system for enabling bus priority within the traffic mix, identifying late running buses and adapting the traffic signal timings to assist in their clearing junctions, and thus improving reliability;

- Provide increased facilities for crossing pedestrians and cyclists, without un-necessarily causing vehicular delays; and
- Provide links to associated control systems, parking management, incident management, Highways Agency information systems, and the bus operators and RTPI systems.

2 System Description

2.1 System Overview and Components

At the heart of a UTMC system is the Common Database, which stores and exchanges information from the various systems it connects. The Common Database includes an intelligent strategy tool that allows information to be used from multiple sources to develop and select the most effective traffic management strategies for a specific set of circumstances.

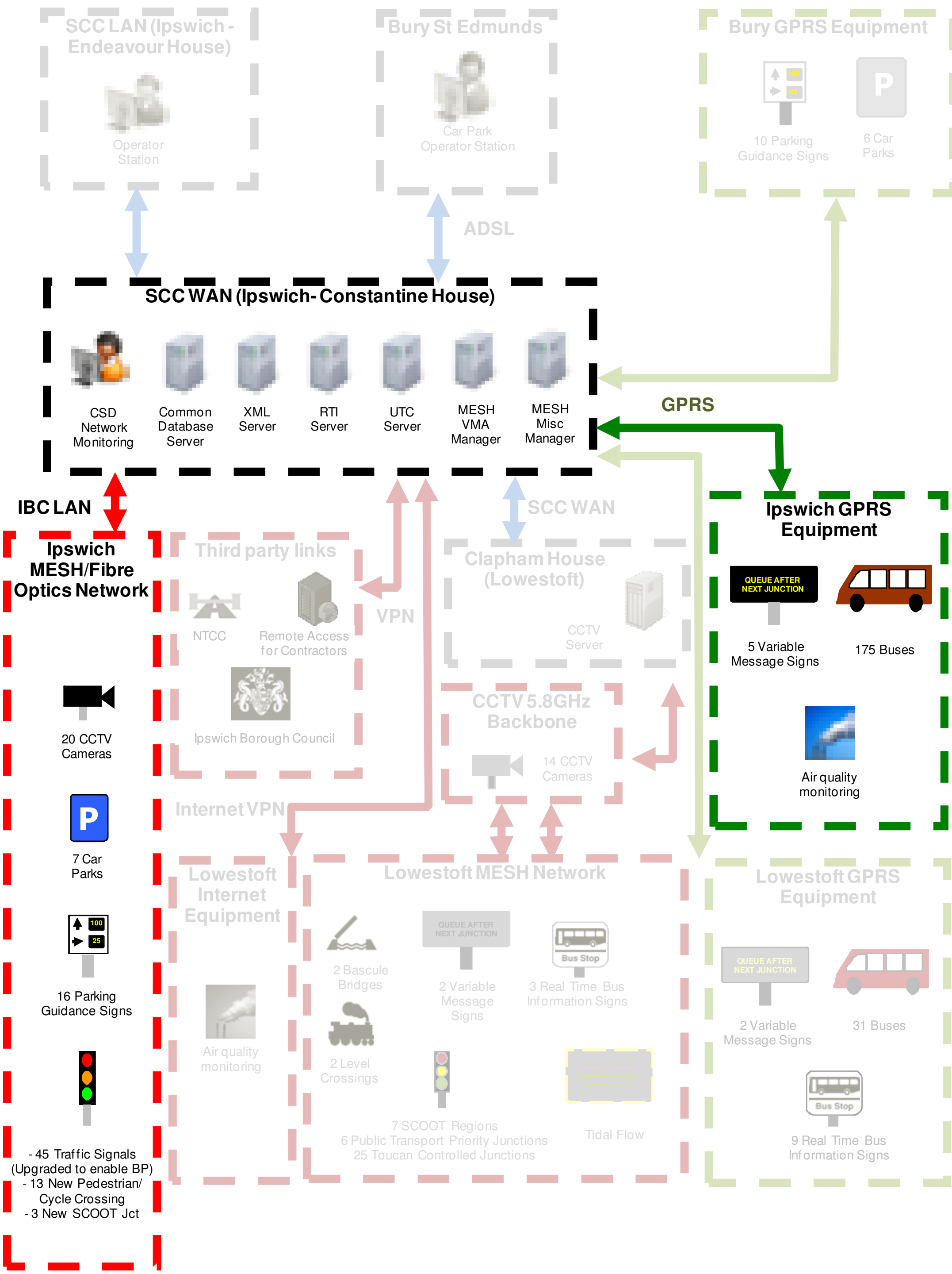
The main objective of the UTMC system is to improve management of the road network. However, the UTMC also allows improved information to be provided to the public; the Common Database allows easy extraction of information (in XML format) for use on websites. We envisage this information will be used to provide information both to the public and internal stakeholders. The information on the public website shall show in real time information such as public transport information, journey times, car park availability and congestion information. The database will also contain static information such as cycle paths, walkways, and Wayfinder information.

Suffolk County Council has recently implemented a UTMC System as part of Traffic Management Scheme in Lowestoft, which has the capacity to expand to the rest of the County. The main Common Database server resides in the data room at Constantine House in Ipswich. The UTMC Operators currently manage the system from the Suffolk County Council office in Endeavour House in an open office environment. Currently the system is connected to the Common Database which controls a Parking Guidance Information system in Bury St Edmunds and a Traffic Management System for Lowestoft as well as the existing legacy SCOOT UTC Traffic Signals in Ipswich.

The components of the new Ipswich UTMC system will be connected to the appropriate UTMC servers. Figure 1 shows the existing applications of the overall Suffolk County Council UTMC system including new Traffic Management components for Ipswich which will be linked to and operated from the existing UTMC User Interfaces. The Ipswich specific components are highlighted

Each of the major components is described in the following sections.

Figure 1: Ipswich UTMC Components (Components for Ipswich are highlighted)



2.2 SCOOT UTC and Bus Priority

Currently Ipswich has a number of legacy traffic signals on SCOOT (Split Cycle Offset Optimisation Technique Urban Traffic Control). These signals are at present connected to the existing Siemens UTC instation (that was transferred as part of the Lowestoft UTMC scheme) using BT leased analogue lines. As part of the 'Ipswich Transport Fit for the 21st Century' Scheme, we propose to enhance the majority of the legacy on-street signals (at approximately 45 sites, as detailed later) to SCOOT UTC; install 3 new junctions; and link in 13 new Puffin or Toucan crossings included in the Cycle and Pedestrian routes proposals. These sites would connect directly to the existing Siemens UTC instation via IP communication network, which is explained later in Section 2.7.

SCOOT UTC aims to reduce congestion by coordinating traffic signals in groups to maximise throughput through junctions. Within this upgrade the traffic signals equipment will be replaced using ELV controllers and LED heads. Communications will be provided by wireless links. This will improve reliability, and reduce power usage and communication costs.

The upgrade will also allow running of Bus Priority on key bus routes using a server to server link from the Real Time Passenger Information (RTPI) system to the UTC system. This will replace the current transponder technology which is expensive, difficult to manage and maintain, and is also becoming obsolete. There are around 53 sets of traffic signals which will be upgraded to UTC to enable priority to the busses. Out of 45 traffic signals, an estimated 25% (approximately 13 sites) will require reconfiguration of the controllers to meet the site specific requirement.

2.3 Closed Circuit TeleVision (CCTV)

The provision of a closed circuit television system for traffic monitoring purposes allows operators to verify the state of the road network, identify congestion, roadworks and accidents. Currently Suffolk County Council do not have access to their own CCTV to view the network in Ipswich. By installing cameras the Traffic Management team will have the ability to quickly respond to incidents by taking appropriate actions such as modifying the signal plans to accommodate for the change in traffic, setting VMS signage etc. The CCTV images can also be shared with key stakeholders such as Police, if required.

To monitor key junctions and routes will require around 20 cameras. Camera will have incident detection functionality, allowing easier identification of camera by the operator. The cameras can be programme to revert to preset views by the Common Database when congestion is detected on SCOOT UTC or other detectors. The CCTV System will require a new server, since the existing Suffolk UTMC CCTV mass storage server is located in Lowestoft and it would not be practical or cost-effective to use this server. The existing workstation and client software which currently controls the Lowestoft cameras, however, is located in Ipswich, and was sized to have sufficient spare capacity to accommodate the Ipswich camera control.

2.4 Variable Message Signs (VMS)

We are proposing installation of 5 Strategic Variable Message Signs on the main routes in Ipswich. Two of these five signs are proposed to be installed on the A12 and A14, where the speed of traffic is 70mph, these signs will be MS3 type. All the signs will be in accordance with TR2156B. The UTMC Operators will provide information to the road users, for instance to warning of roadworks, congestion or messages about the nearest Park and Ride via these signs. The existing UTMC Common Database allows operators to either set messages manually on signs or devise strategies that take input from other systems to automatically set messages (for example triggering signs when congestion is detected or during periods of poor air quality).

The VMS procured as part of this project will be UTMC compliant and therefore can connect directly to the existing UTMC Common Database without the need for an additional or dedicated control application.

2.5 Parking Guidance Information (PGI)

The objective of a Parking Guidance Information System is to direct drivers to available parking spaces. Such a system helps drivers to make the shortest and most efficient journey to the car park by directing them to the most suitable car park for their destination. This results in reduced congestion on the surrounding network.

A parking guidance system consists of two key components: car park counters which measure occupancy, and car park signs which advise drivers of occupancy of each car park. A Parking Guidance Information system will be implemented for seven car parks. These seven car parks were chosen based on their size, importance for occasional users, and their sensitivity in causing congestion when busy. Our initial signing strategy has identified 16 Parking Guidance Information signs and 17 associated static direction signs to be positioned at key decision points, directing drivers to car parks.

Within our initial signing strategy we have identified four major routes approaching the following seven Town Centre car parks, which form part of the PGI system:

- Buttermarket shopping centre;
- Cox Lane;
- Crown Street NCP;
- Foundation Street;
- Tacket Street;
- Tower Rampart; and,
- Civic Centre.

The car park detectors and counters and PGI signs that will be procured as part of this project will be UTMC Compliant and therefore can connect directly to the existing UTMC server without the need for an additional or dedicated server. The most efficient means of communication between the car park detectors and the PGI signs will be wireless MESH, which forms part of the traffic signal control communications.

The occupancy of each car park will be obtained via counters, or an interface to the car park barrier system. Each PGI sign will be set via the UTMC Common Database; the sign will then be instructed to change the displayed legend by one of two means:

1. Each car park is given a threshold level when the car park is deemed to be full. Normally this will be set below the actual capacity to take account of the traffic currently in the car park and past the initial decision points; or,
2. The controller logic could be asked to estimate the level of traffic around the car park based on the current occupancy and the rate of entry.

Other management strategies for parking management will be possible, including special arrangements for football matches.

2.6 Air Quality Monitoring

There are currently three Air Quality Management Areas declared in Ipswich: Norwich Road; Valley Road; St Margaret's Street; St Helens Street, and the Star Lane/ College Street gyratory. One air quality monitoring site is already installed, on Star Lane near the Novotel roundabouts. Further air quality monitoring sites are proposed to take advantage of the more sophisticated traffic control opportunities provided by the overall system, at Upper Orwell Street. St Margaret's Street; Crown Street..

2.7 UTMC IP Communications Network

Currently the traffic signals are connected to the UTC instation via BT Lease analogue lines. These lines may be removed by BT, and therefore as part of this project it is planned to upgrade the communication lines to these signals. There are several digital line options, such as ADSL, SDSL, RS1000, and KiloStream lines available from the network operators on lease. These are suitable lines to provide links to and from all the on-street applications, but there are both capital and revenue implications. As part of the Lowestoft UTMC project, we have carried out a detailed assessment of the communication available and identified the most efficient and cost effective communication system for Suffolk County Council. The new communication has reduced the on going operating cost for the Council.

For this scheme, we recommend that the majority of equipment located within the centre of Ipswich to be connected using MESHG4 wireless network. This is a military developed application and has robust security system. As well as being secure, which is essential for on-street application, it is also easy to install, flexible and has minimum ongoing operating costs. This application has been used on all the SCOOT UTC Signal and majority of all other on-street equipment in Lowestoft, and is in widespread use with other authorities across the UK. The wireless system will be supported by a fibre optic backbone which will give added robustness and resilience to this communication network.

Where the on-street applications fall outside the wireless coverage area, we recommend using GPRS communications, as providing a MESH link or fixed communications to these sites may not be cost-effective. The exact communication will be addressed at the detailed design stage of the project.

2.8 Real Time Passenger Information (RTPI)

Technical Appendix E discusses the RTPI system proposed as part of the Major Scheme. That RTPI system will link to the Common Database. This will allow real time bus stop information to be provided on the website. In addition, bus location and journey time information will be shown in the Common Database, adding to the information available to Operators.

2.9 UTMC Control Room

Currently there are no dedicated SCC staff for UTMC; this role is undertaken by staff from the traffic signal team, who combine UTMC operations with their existing role. This does not make best use of existing systems capability, and will be even less appropriate with the increased functionality proposed. For the 'Ipswich - Transport Fit for the 21st Century' Scheme SCC a small control room is proposed, which would be staffed by two operators twelve hours a day (6:00am – 7:00pm), five days a week. This will provide better response to incidents and also give sufficient resource expand the UTMC system at a later date into other towns in the County.

3 Benefits

3.1 Operational benefits

The key benefits of the UTMC System for the transport system authorities and operators in Ipswich will be to:

- Improve the quality and timeliness of information on the road network conditions, under both normal and exceptional circumstances;
- Allow more efficient and timely control and intervention;
- Enhance the monitoring and management of air quality;
- Enhance the monitoring and management of parking facilities;

In addition, the proposed Systems will include a control room with dedicated staff, with the following benefits:

- Dedicated control room staff will be able to better manage the network as they will not have any other responsibilities;
- The control room will be able to absorb future control function extensions – to other areas, or to include more functions;;
- Isolated control room will ensure that only control room staff will be able to see CCTV cameras, meeting CCTV Code of Conduct requirements; and,
- The public will be able to contact the control room directly to report problems on the network.

The provision of the MESH wireless network will:

- Ensure that Suffolk County Council manage and control their own communications network and not be liable for communication costs charged by third parties; and
- Provide a secure, flexible network that allows additional equipment to be easily added to in the future.

These considerable benefits, improving both the quality and ongoing costs of the transport system control, have not been quantified or includ explicitly in the Scheme assessment.

3.2 User benefits

The proposed UTMC and associated facilities will have large and pervasive benefits for the road system users, under both routine and exceptional circumstances. These include:

- Improvements in journey times at key locations on the Ipswich network, through more efficient linking between junctions;
- More predictable journey time reliability both for general road users, through reduced congestion;
- Major improvements to bus system reliability, resulting in the opportunity to decrease scheduled journey times; and
- Considerable improvements in safety and convenience to pedestrians and cyclists, through the introduction of more crossing facilities.

These four sources of specific user benefits have been estimated and monetised in the Scheme assessment.

4 System Costs

4.1 System Definition

The proposed System, comprises the following elements:

- 45 traffic signal locations fitted with SCOOT UTC (combination of replacement of existing SCOOT UTC legacy equipment / upgrading of other local traffic signals to provide Bus Priority)
- 13 new Puffin or Toucan Signal Crossings to be installed (costs are allowed for in the walk and cycle facilities work) and connected to UTC
- 3 New SCOOT Junctions to be installed and connected to UTC

Closed Circuit Television

- 20 CCTV Cameras
- New server to feed these cameras

Parking Guidance Information System

- 7 Car Parks fitted with detectors
- 16 PGI signs (compliant with TSRGD and TR2516B)
- 17 associated static Direction Signs (compliant with TSRGD)

Variable Message Signs

- Three 4 lines of15 character Variable Message Signs (compliant with TR2516B)
- Two 3 lines of 18 character Variable Message Sign (compliant with TR2516B)

Air quality monitoring

- Two sites

UTMC Communication Network

- Provision of five Fibre Optic links from Constantine House (estimated length 3.2km for each link) plus repeaters and access points to provide links from the fibre optic network to the MESH network

Software Updates / Development

- Support and updates from the Common Database supplier to incorporate the additional equipment for Ipswich

CSD Support Costs

- IT support services from CSD (Suffolk County Council’s outsourced IT support company)

The elements located in the town centre are illustrated in Figure 1.

4.2 Costs for the Ipswich System

The outline design undertaken so far has taken a realistic view of the usefulness of the existing facilities, a consistent quantified approach to deployment of new and enhanced equipment, and applied recent firm prices, to arrive at an estimated system cost. We have made the following detailed assumptions:

- *Car park counters* - Costs includes all design, install, testing and commissioning costs. Costs are based on costs of equipment in Bury St Edmunds and include counters, communication equipment and outstation equipment;
- *Parking Guidance Information* - Sign costs includes all design, install, testing and commissioning costs, including associated communication and control equipment. Costs are based on costs of equipment in Bury St Edmunds;
- *Variable Message* System - Sign costs includes all design, install, testing and commissioning costs, including associated communication and control equipment. Costs of 3, 4x15 VMS are based on costs of equipment in Lowestoft, and the cost of 2, 3x18 signs is estimated based on general HA scheme;
- *GPRS* - Annual costs for Variable Message Sign and remote traffic signals are assumed to be £150 a year (based on RTIG 100mb Vodafone Tariff);
- *CCTV* - Costs are based on costs for existing equipment in Lowestoft;
- *MESH access points and repeaters* – Costs are based on existing costs for equipment in Lowestoft;
- *Maintenance and renewal of the communications network* – Costs are based on equipment in Lowestoft;
- *Fibre optic costs include ducting, fibre and termination costs*. - These have been estimated based on costs provided by the current Suffolk wireless communications and from Suffolk's highway maintenance contractor. These costs have been uplifted by 40% due to the uncertainty in these costs;
- *CSD support* - Costs are estimated based on costs for setting up the Lowestoft UTMC scheme;
- We have assumed that Local Authority staff will operate the system in a control room for 12 hours a day five days a week. We have therefore allowed for two additional full time posts at £25,000 salary (£37,500 costs) per year; and,
- Control room computer equipment is assumed to costs £1500 per computer. These are assumed to be replaced every three years and therefore annual costs are assumed to be one third of unit costs

As detailed design progresses, there will clearly be cost variations, both up and down, and the identification of minor items and omissions, for which a contingency allowance has been made.

The outline design costing is presented in Table 1.

The total estimate for the proposed Ipswich UTMC scheme is estimated at £7.66 million and an annual cost of about £0.18M.

Table 1: Estimated Costs for the UTMC and associated Systems in Ipswich

Ipswich UTMC System Components and Costs (Inc VMS signing)

Price Base

Item	Description	Unit	Quantity	Rate	Amount
	SCOOT UTC Traffic Signals including BP				
	Upgrade traffic signal equipment to enable BP		10	20,000	200,000
	Replacement of obsolete signal at simple jct		10	35,000	350,000
	Replacement of obsolete signal at major jct		15	57,000	855,000
	Reconfiguration of controllers to accommodate BP		13	3,000	39,000
	New Traffic signal JCT		1	87,000	87,000
	Communications (MESH)		61	1,700	103,700
	Sub-Total SCOOT UTC				**£ 1,634,700**
					0
	Closed Circuit Television (CCTV)				0
	Camera (inc lens, encoder)		20	1,500	30,000
	Camera Pole		20	4,000	80,000
	Pan-Tilt-Zoom unit		20	2,500	50,000
	Communications (MESH)		10	1,700	17,000
	Communications (Fibre Optic Connections)		10	2,000	20,000
	Power supply		20	1,200	24,000
	Civil (Design and construction)		20	4,000	80,000
	Server for new cameras		1	35,000	35,000
	Provision of a feed to and from 3rd party		1	10,000	10,000
	Maintenance and Renewal	pa	1	20,000	
	Sub-Total Closed Circuit Television (CCTV)				**£ 346,000**
					0
	Parking Guidance Information System				
	Car Park Detectors		7	8,500	59,500
	Pole for MESH		7	500	3,500
	PGI signs (inc posts and installation)		16	10,000	160,000
	Associated Static Signs (inc posts and installation)		17	3,000	51,000
	Communications (MESH)		23	1,700	39,100
	Power supply		16	1,200	19,200
	Civil (Design and construction)		33	2,000	66,000
	Maintenance and Renewal	pa	1	12,930	
	Sub-Total Parking Guidance Information System				**£ 398,300**
	Variable Message Signs				
	4x15 160mm character height VMS		3	30,000	90,000
	MS3 VMS (including design, installation, TM)		2	175,000	350,000
	Post supply and install		5	included	
	Communications (GPRS)		5	1,000	5,000
	Power Supply		3	1,200	3,600
	Civil (Design and construction)		3	3,000	9,000
	Maintenance and Renewal	pa	1	33,000	
	Sub-Total Variable Message Signs				**£ 457,600**
	Air quality monitoring				
	Air quality monitoring unit		1	50,000	50,000
	Communications (GPRS)		1	1,000	1,000
	Power Supply		1	1,200	1,200
	Maintenance and Renewal	pa	1	5,000	
	Sub-Total Air quality monitoring				**£ 52,200**
	UTMC Communication Network (MESH Backbone)				
	Detailed design of Comms network		1	50,000	50,000
	MESH Repeaters		50	2,600	130,000
	Fibre cost (per 100m)		160	9,900	1,584,000
	Access point between Fibre and MESH		20	3,100	62,000
	Switches at Endeavour House		1	5,000	5,000
	Maintenance and Renewal of Comms network	pa	1	30,070	
	Sub-Total UTMC Communication Network (MESH Backbone)				**£ 1,831,000**
					0
	Control Room				
	Staff	pa	2	37,500	
	Control Room		1	100,000	100,000
	Computer Equipment, 17" screens, telephone etc		4	1,500	6,000
	Sub-Total Control Room				**£ 106,000**
					0
	Software Upgrades / Development				0
	Public Website		1	50,000	50,000
	CDB Software updates / development		1	50,000	50,000
	Sub-Total Software Upgrades / Development				**£ 100,000**
					0
	CSD Support				
	Support		1	50,000	50,000
	Sub-Total CSD Support				**£ 50,000**
					0
	Sub Total				**4,975,800**
100.00	**Preliminaries**	Sum			
	Site Establishment / Disestablishment	Sum		0.00	0
100.01	**Contingencies**	Sum		0.10	497,580
100.02	**Traffic Management**	Sum		0.10	497,580
100.03	**Restricted working**	Sum		0.13	621,975
100.04	**Environmental management**	Sum		0.01	24,879
100.05	**Laboratory Costs**	Sum		0.00	0
100.06	**Design & Preparation**	Sum		0.13	621,975
100.07	**Supervision costs**	Sum		0.08	373,185
100.08	**Administration**	Sum		0.01	49,758
100.09	**Other costs**				
	Estimated Overhead Costs			**£**	**2,686,932**
	Total Estimated Cost of Works			**£**	**7,662,732**

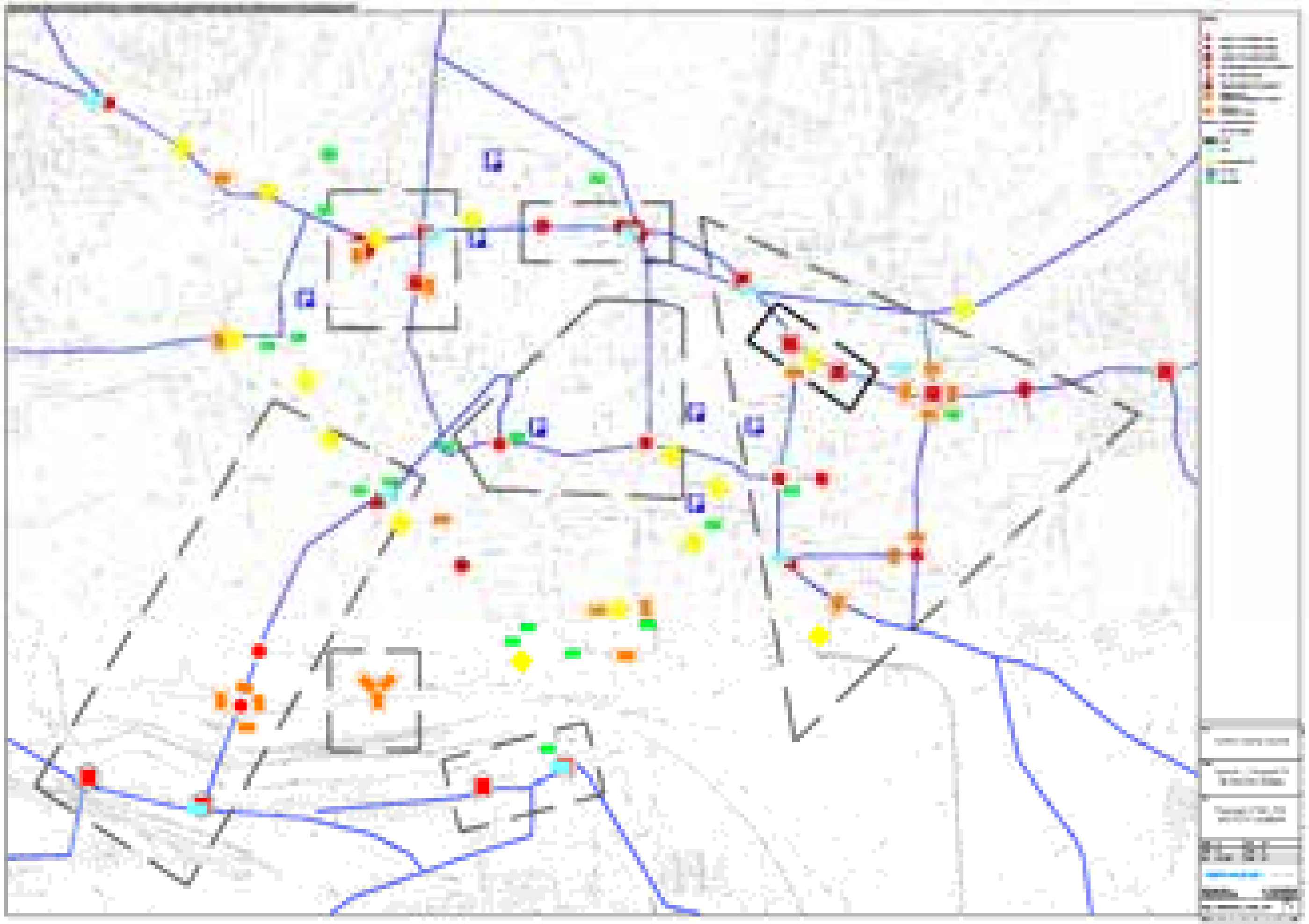


Figure 1 Town centre UTMC Components

Appendix E

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Technical Appendix E

AECOM

Project:	**Ipswich – Transport Fit for the 21st Century Schemes**	Job No:	**60050323**
Subject:	**Real Time Passenger Information**		
Prepared by:	**Svenja Trettin, Jack Ettinger**	Date:	**18 February 2009**
Approved by:	**Bil Harrison**	Date:	**15 May 2009**

1 Introduction

1.1 This Technical Appendix E describes the development of the Real Time Passenger Information (RTPI) system component of the 'Ipswich – Transport Fit for the 21st Century' Major Scheme. This component has been developed to support the bus service improvement components of the Major Scheme, and to complement the UTMC components. This self-contained Technical Appendix deals with the RTPI system in isolation.

1.2 This Technical Appendix covers the following aspects in turn:

- An overview of the system, the background to its design, the expected sources of benefits, and the links to other objectives of the Major Scheme;
- A description of the electronic engineering design decisions and the scheme components;
- A description of the inventory work and system geography, both for the town centre and for the main radial bus routes connecting to the town centre;
- The RTPI system specification, including the unit costs and quantities;
- The estimation of benefits to the users and operators; and
- Concluding comments on the status of the design.

1.3 The main parameters of the RTPI scheme are well defined, and based on recent unit costs and site investigations. As the scheme moves to detailed design, there will be scope for adjustment of the siting and nature of individual elements, and the further integration of the RTPI system with other Major Scheme components, such as wayfinding and personalised travel planning.

1.4 Much of the systems thinking and unit costing information has been based on existing experience with the recently installed RTPI system in Lowestoft. The Lowestoft central control station has been dimensioned with the capacity to include the proposed Ipswich system, and is already operational (based in council offices in Ipswich).

2 System Overview

2.1 Improved real time information is seen as an important element in delivering a step change in public transport use. An RTPI system provides benefits to the three groups involved:

- For the potential traveller, the RTPI system provides information about the choices available, and enhances the comfort and convenience of the system;
- For the operator, the system widens choices for operational flexibility, and enables faster incident response; and
- For the traffic authorities, the system links to the UTMC system to deliver more reliable bus journey times through selective signal priority.

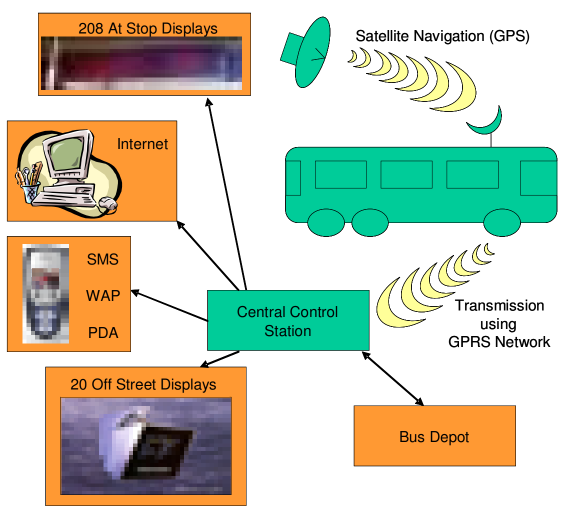
Realising these benefits will require close co-operation between the agencies involved.

2.2 The system comprises three main components:

- On bus equipment providing automatic vehicle location (AVL) and communicating the location to the central control station;
- The central control station, linking to the UTMC Common Database and bus operations operators, and providing a database of real time service status; and
- A series of display media, communicating relevant information to the bus system users.

These components are shown in Figure 1.

Figure 1 RTPI system components



3 System Components

3.1 The proposed on-bus Automatic Vehicle Location equipment includes the following:

- A Global Positioning System (GPS) receiver on each bus, providing location information;
- A dead reckoning system to extend the accuracy of the GPS;
- Public mobile radio GPRS (General Packet Radio Services) bus to control centre communications, allowing the bus to keep the central control unit informed as to the bus location in real time; and
- Elements of the Common Database.

3.2 The central control station is described in more detail in Technical Appendix D, and includes the following facilities:

- Links with the other subsystems (UTMC, CCTV, VMS);
- Operator consoles to monitor and control the systems;
- The Common Database and associated software; and
- Static information input to the system.

For the central control based calculations, each bus AVL unit sends its identity and location through the communications network to the central RTPI control server. At the same time the AVL system sends location data of each bus to the Traffic Lights Controller and the data is exchanged and verified between the UTMC and the Traffic Lights Controller. The plan is to provide traffic light priority using only the indirect server-to-server link between the RTPI system and the UTMC server. This solution would require less equipment on the bus, as well as less at the traffic light controllers, because this solution does not require a direct link between the AVL system and the traffic light controllers. The potential issues are timing delays between the systems, which can only be confirmed during detailed design. The current costs therefore assume the purchase of on-bus and traffic light controller equipment for a direct link.

3.3 The information media include the following:

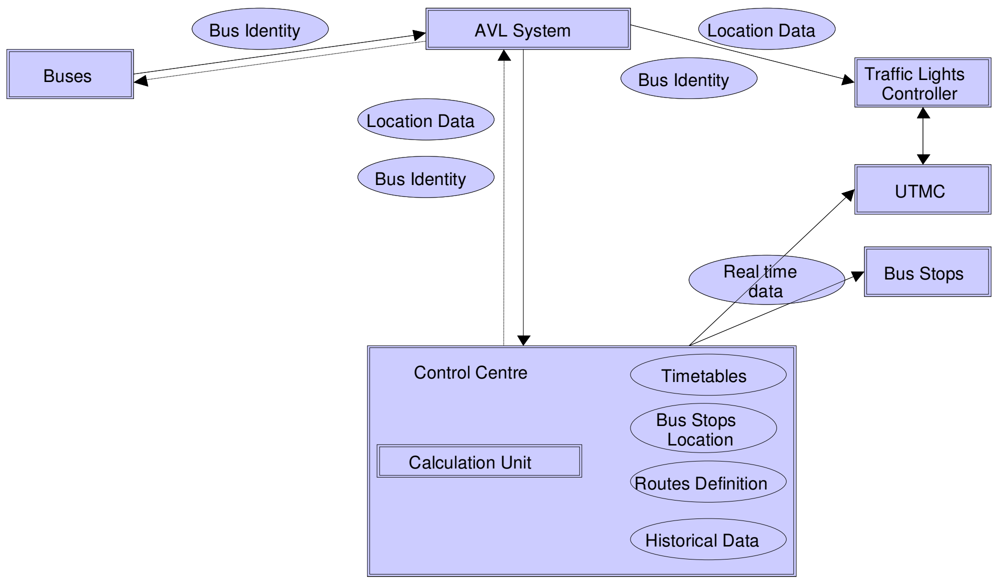
- Large displays off street at bus stations;
- Medium sized displays at busy central on street bus stop groups;
- Small and robust displays at busy remote bus stops;
- SMS mobile phone text messaging for bus arrival information; and
- Internet based interface with the real time passenger information.

These real time facilities will build on static roadside information, and various elements of the ‘Smarter Choices’ personalised travel planning and the central area Wayfinding initiatives.

3.4 Static information required for the system includes such items as:

- Bus service timetables;
- Bus route definitions;
- Location of bus stops and information displays; and
- Bus vehicle identification.

Figure 1: Graphical Representation of the Proposed Architecture



RTPI Communications Network

3.5 Static information required for the communication network is the link between the AVL components. It is necessary for data transmission between buses, bus stops and the control centre. The choice of communication system depends on its requirements, the frequency of communication needed, the duration of contact of AVL units, the speed of data transferred, the coverage area and the effective cost of the system. The technology employed for the communications system varies and each has its advantages and disadvantages. The options available include:

- MESH technology;
- Analogue private mobile radio;
- Digital private radio, Terrestrial Trunked Radio) and some WiFi (wireless Fidelity) related systems; and
- Public mobile radio such as GPRS (General Packet Radio Services) and 3G (third generation wireless communications).

Table 1 summarises the advantages and disadvantages of each radio option. For the outline Ipswich specification, a communications network solution based on GPRS has been assumed.

Table 1: Comparison of different Radio Technologies

Radio System	Advantages	Disadvantages
MESH technology	➢ Uses industry standard wireless IP technology; ➢ Cheap, easily available equipment; ➢ Works well in combination with wired or wireless Local Area Networks;	➢ Short range transmission can be affected by buildings and trees; ➢ Not suitable to cover entire cities or wider areas;
Private analogue mobile radio	➢ Equipment is more abundantly available; ➢ Follows extremely well established standards;	➢ More susceptible to interference; ➢ Will become obsolete in 2012;
Private digital radio	➢ Greater flexibility in both voice and data applications; ➢ High level of security; ➢ More reliable; ➢ Sole use of the owner, so levels of service, reliability and availability can be agreed to owner's requirements;	➢ Generally the most expensive solution; ➢ Equipment may become redundant and unsupportable;
Public (digital) mobile radio	➢ Greater flexibility in both voice and data applications; ➢ High level of security; ➢ More reliable; ➢ Generally better value than private digital radio; ➢ Insurance may be available against equipment becoming redundant and unsupportable; ➢ Little or no capital costs;	➢ Difficult to specify levels of service, reliability and availability; ➢ High data costs

4 Information display locations

4.1 The outline design of the siting of information displays used three investigations:

- Roadside counts of passengers boarding buses at the important town centre bus stops (mainly around the 'bus loop') and at the two bus stations (these were full 12 hour counts, conducted on Tuesday 3rd March 2009 – results summarised in Table 2);
- A site survey and inventory of the bus stop locations, standards of bus shelter facilities, and opportunities for siting displays (this survey is documented in Technical Appendix B, concerned with the improvement of bus facilities on the bus loop); and
- Results of the ITAMS bus network assignment model to identify important boarding points in suburban Ipswich.

While these three investigations guided the work, the design also took into account plans for future bus interchange points, and the views of the bus system stakeholders. The proposed locations are a flexible target, to be refined as implementation is planned, and to be extended as growth in demand occurs. The displays are, of course, complemented by the internet and SMS text messaging information delivery services.

4.2 A guideline threshold of 30 passengers per hour boarding was established, and applied flexibly. For the town centre, the guideline was examined for the evening peak, while for the suburban sites the bus assignment model results for the morning peak were examined. Above this nominal threshold, the outline design has allowed for fixed RTPI displays. At most bus stops these will be 'small' three line displays. Some 54 of these have been defined in the initial design to demonstrate the system coverage. At some 10 more important bus stops, and where there are significant passenger interchanges, 'medium' displays allowing for six lines have been assumed. At the main bus stations, a total of five large displays have been assumed. Tables 3 and 4 list the initial display schedule, and give references to the following five sector Maps.

4.3 These allocations include all the Park and Ride stops, but not the P&R sites themselves (where it is assumed that there will be a waiting bus, or a bespoke scheduling message). These allocations exclude providing information at the very high frequency shuttle bus services, although this will be reconsidered in the final design. These initial allocations are intended to illustrate the proposed scale of the system; the final locations, and mix of information delivery channels, will be refined as part of the final design.

Table 2 – Summary of bus boarding and alighting counts, Tuesday 3rd March 2009

Boardings

Bus Stop	Location	AM 8-9		PM 5-6		AM 7-10		IP 10am - 4pm		PM 4-7		All Day 7am - 7pm	
		Buses	Pax	Buses	Pax	Buses	Pax	Buses	Pax	Buses	Pax	Buses	Pax
1	Willis Building	8	0	21	42	22	5	47	53	42	68	111	126
2	Buttermarket/Queen's Street	19	0	9	28	40	3	85	247	29	68	154	318
3	Westgate Street	13	13	28	62	35	32	158	423	65	165	258	620
4	Tower Ramparts	69	484	67	774	211	1185	442	4805	188	1959	841	7949
6	Cobden Place	15	45	17	39	34	87	85	203	44	92	163	382
7	Major's Corner	37	15	29	7	91	35	206	96	72	22	369	153
9	Fore St/ Grimwade St	6	6	1	1	14	8	24	25	9	12	47	45
10	Post Office	8	1	2	0	14	1	19	5	11	3	44	9
11	Café Nero	6	0	14	29	24	7	110	202	35	64	169	273
12	Old Cattle Market	27	170	29	331	67	278	149	1480	74	775	290	2533
13A	PALS	44	130	35	151	117	249	235	728	96	332	448	1309
14	Great Colman Street	9	19	18	53	20	38	59	148	37	101	116	287
15	St Pancras Church	6	9	14	38	20	27	92	312	34	93	146	432
16	High Street	25	6	24	15	55	14	119	69	49	25	223	108
	Total	**292**	**898**	**308**	**1570**	**764**	**1969**	**1830**	**8796**	**785**	**3779**	**3379**	**14544**

Alightings

Bus Stop	Location	AM 8-9		PM 5-6		AM 7-10		IP 10am - 4pm		PM 4-7		All Day 7am - 7pm	
		Buses	Pax	Buses	Pax	Buses	Pax	Buses	Pax	Buses	Pax	Buses	Pax
1	Willis Building	8	21	21	7	22	33	47	14	42	15	111	62
2	Buttermarket/Queen's Street	19	74	9	16	40	154	85	342	29	48	154	544
3	Westgate Street	13	31	28	5	35	93	158	268	65	11	258	372
4	Tower Ramparts	69	880	67	252	211	2270	442	3494	188	843	841	6607
6	Cobden Place	15	0	17	2	34	2	85	16	44	7	163	25
7	Major's Corner	37	146	29	53	91	480	206	1021	72	151	369	1652
9	Fore St/ Grimwade St	6	5	1	0	14	13	24	8	9	0	47	21
10	Post Office	8	16	2	2	14	22	19	18	11	11	44	51
11	Café Nero	6	48	14	11	24	160	110	304	35	41	169	505
12	Old Cattle Market	27	102	29	22	67	150	149	250	74	65	290	465
13A	PALS	44	164	35	29	117	321	235	440	96	73	448	834
14	Great Colman Street	9	0	18	2	20	1	59	8	37	7	116	16
15	St Pancras Church	6	0	14	0	20	1	92	8	34	7	146	16
16	High Street	25	112	24	30	55	259	119	408	49	86	223	753
	Total	**292**	**1599**	**308**	**431**	**764**	**3959**	**1830**	**6599**	**785**	**1365**	**3379**	**11923**

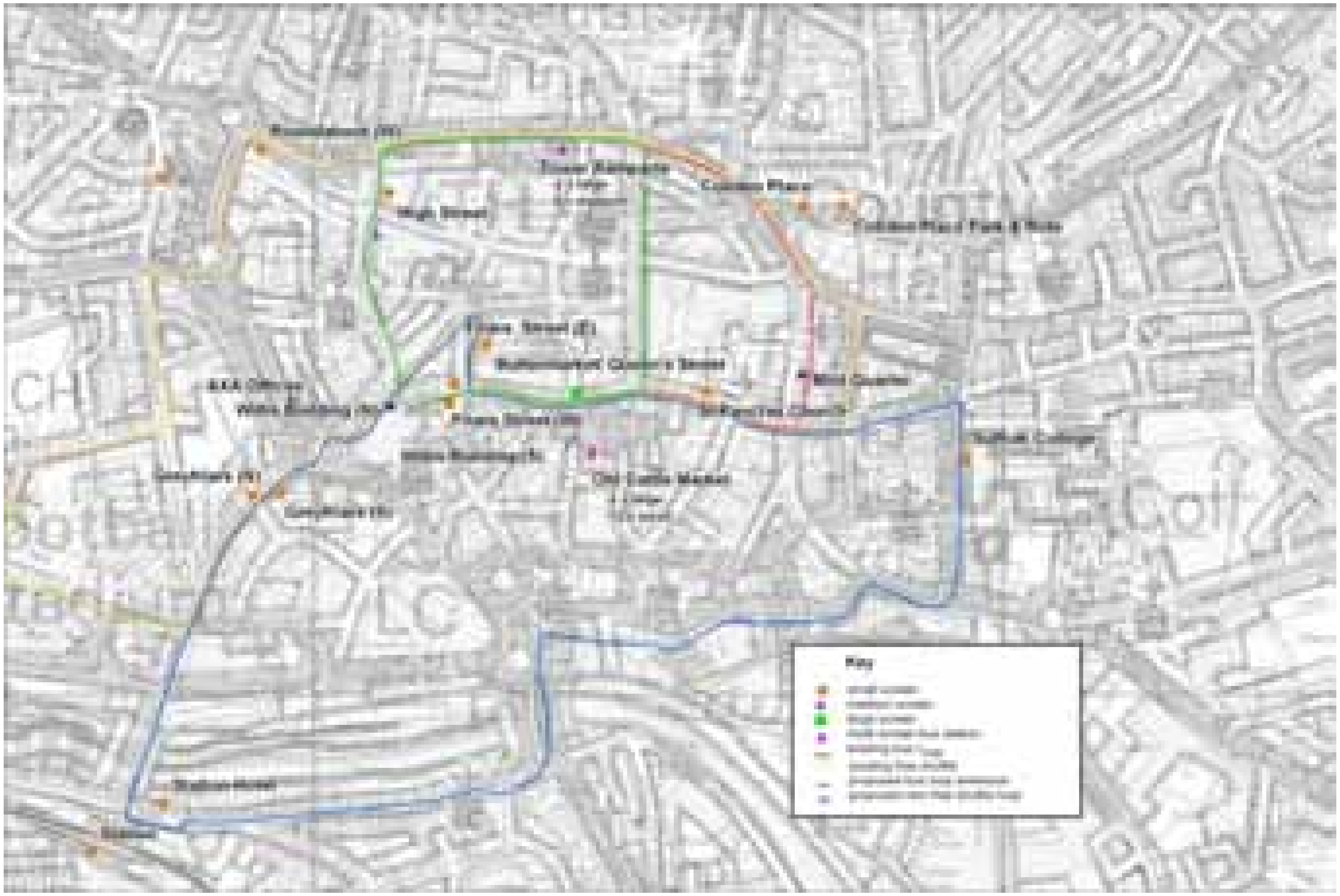
Table 3 - Town centre RTPI display schedule

Stop Location	Map	RPTI Screens Required	Justification
Tower Ramparts	1	2 x large 6 x medium	Bus station and terminus for most town services. Bus stop surveys recorded around 775 passengers boarding here in the PM peak.
Cobden Place	1	2 x small	Bus stop surveys recorded around 40 passengers boarding here in the PM peak. One screen required for dedication park and ride stand.
Old Cattle Market	1	2 x large 12 x small	Bus station and terminus for many county services. Bus stop surveys recorded around 330 passengers boarding here in the PM peak. Large screens to be placed near passenger entrance, one small screen for each individual stand.
PALS	1	1 x large	Bus stop surveys recorded 150 passengers boarding here in the PM peak.
St Pancras Church	1	1 x small	Bus stop surveys recorded around 40 passengers boarding here in the PM peak.
High Street	1	1 x small	Bus stop surveys recorded 15 passengers boarding here in the PM peak.
Westgate Street	1	1 x medium	Bus stop surveys recorded 60 passengers boarding here in the PM peak and was served by 28 buses.
Willis Building (S)	1	1 x medium	Bus stop surveys recorded around 40 passengers boarding here in the PM peak.
Buttermarket/Queen's Street	1	1 x small	Served by park & ride buses.
AXA Offices (S)	1	1 x small	On board bus surveys counts suggest this stop is well used and is served by outbound buses.
Friars Street (W)	1	1 x small	Served by park & ride buses.
Friars Street (E)	1	1 x small	Served by park & ride buses.
Greyfriars (N)	1	1 x small	Served by park & ride buses.
Greyfriars (S)	1	1 x small	Served by park & ride buses.
Roundabout	1	1 x small	On board bus surveys counts suggest this stop is well used and is served by outbound buses.
Willis Building (N)	1	1 x small	On board bus surveys counts suggest this stop is well used and is served by outbound buses.
Station Hotel	1	1 x small	On board bus surveys counts suggest this stop is well used and is served by outbound buses.
Station	1	2 x small	On board bus surveys counts suggest this stop is well used and is served by outbound buses.
Mint Quarter	1	1 x medium	Proposed new stop on eastern extension of bus loop.
Suffolk College	1	1 x medium	Proposed new stop.
Town centre		**5 x large**	
		10 x medium	
		27 x small	

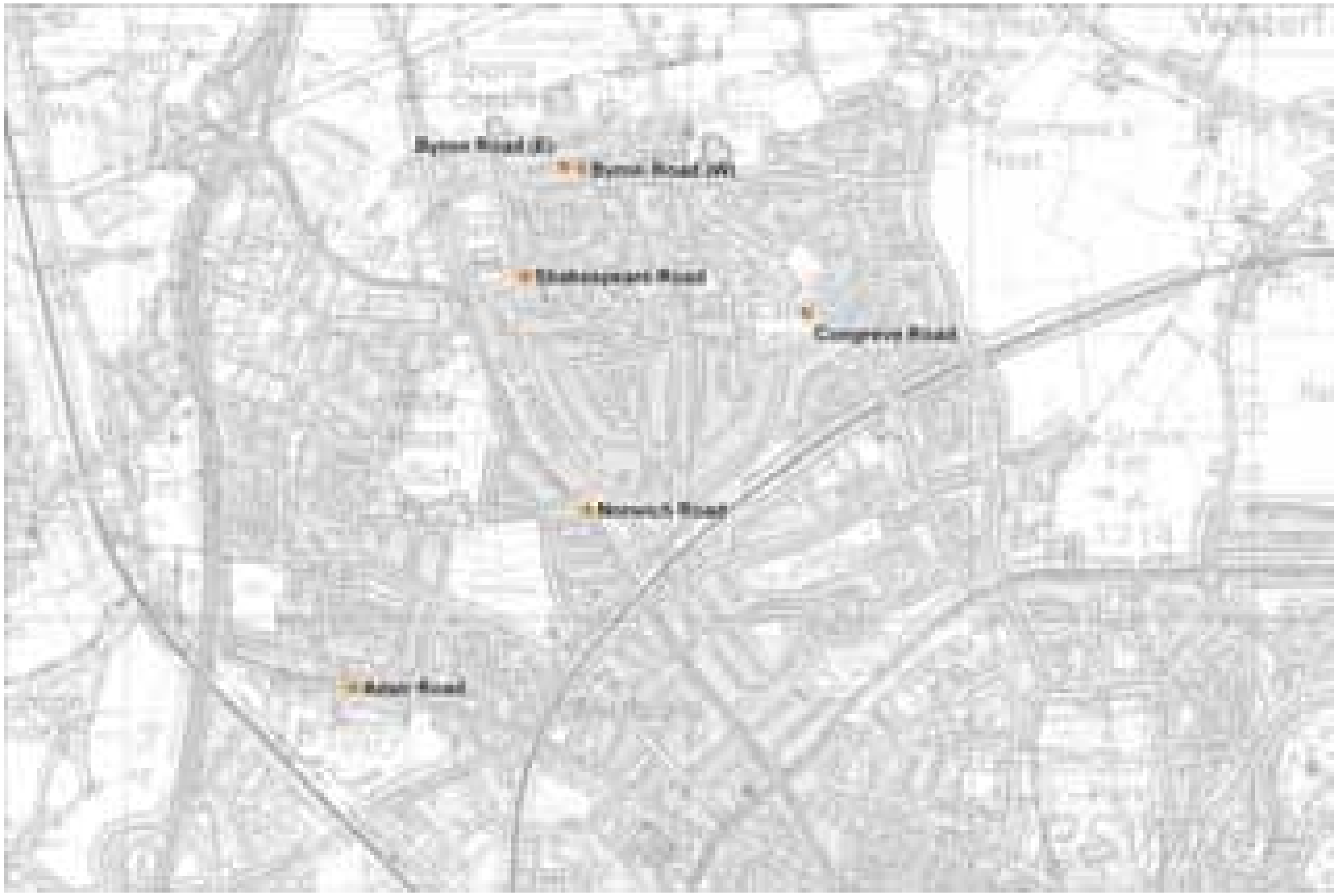
Table 4 - Suburban RTPI bus stop display schedule

Stop Location	Map	RPTI Screens Required	Justification
Stoke Park Drive (East and West)	2	2 x small	Circular routes 7/15, therefore RTPI on both sides of road.
Byron Road (East and West)	3	2 x small	Byron Road runs parallel with town centre, i.e. services in each direction (9 & 10) roughly equidistant from centre.
Clapgate Lane 1 & Nacton Road 1	4	2 x small	Site on Clapgate Lane for inbound Route 6 services and on Nacton Road/Benacre Road for inbound 2, 61, 76 and 77 services.
Shakespeare Road	3	1 x small	Southbound for route 9 near schools.
Prince of Wales Drive	2	1 x small	Prince of Wales Dr-only point served by 15 and 16 in same direction. Outside school.
Hawthorn Drive	2	1 x small	Hawthorn Dr for 12/13 into town.
Turner Road	4	1 x small	Stop on Turner road is only inbound stop in locality to be served by 2 and 6
Ravenswood	4	1 x small	Ravenswood Av outside school served by inbound 1 and 3 services.
Belmont Road (S)	2	1 x small	Stop on Belmont Road for frequent inbound 13 buses.
Nacton Road 2	4	1 x small	Nacton Road inbound has high level of service-61, 62, 76, 77(all First Services). Route 6.
Foxhall Road 1	5	1 x small	Survey data shows approx half demand in locality is for outbound with the majority of the inbound demand using the nearby 5 service.
Landseer Road/ Holbrook Road	4	1 x small	Landseer Road, has 1,3 and 61 serving the stop chosen as well as a well sized shelter.
Adair Road	3	1 x small	Cnr of Adair Road and Bramford Road, stop is served by inbound 8 and 8b services
Arundel Way	4	1 x small	Outside Penhurst Road shops, in centre of residential area
Congreve Road	3	1 x small	Congreve Road, served by 10 inbound and 19 outbound. Survey data shows demand is for 10 inbound.
Cambridge Drive 2	2	1 x small	Cambridge Dr/Birkfield Dr. Route 'terminus' more likely to be holding point to regulate to timetable
Foxhall Road 2	5	1 x small	Survey data suggests approx half demand from area north of this stop uses route 5 serving Foxhall Road.
Norwich Road	3	1 x small	Norwich Road/Highfield Approach served by 9 and 87 and 88 inbound services
Clapgate Lane 2	4	1 x small	Survey data suggests majority of inbound demand is for 1 and 3 services. Therefore inbound stop at Clapgate Lane/Cotman Road chosen.
Felixstowe Road	4	1 x small	Felixstowe Road/Howe Road served by 62 service.
Cambridge Drive 1	2	1 x small	Cambridge Dr/Fitzwilliam Close stop served by Route 12 buses. Close to school.
Albion Hill	5	1 x small	Stop on Albion Mills served by 11 and inbound 63, 64, 65, 66 and 66a services.
Hospital - two sites	5	2 x small	For passengers waiting at the hosptial.
Outer total		27 x small	

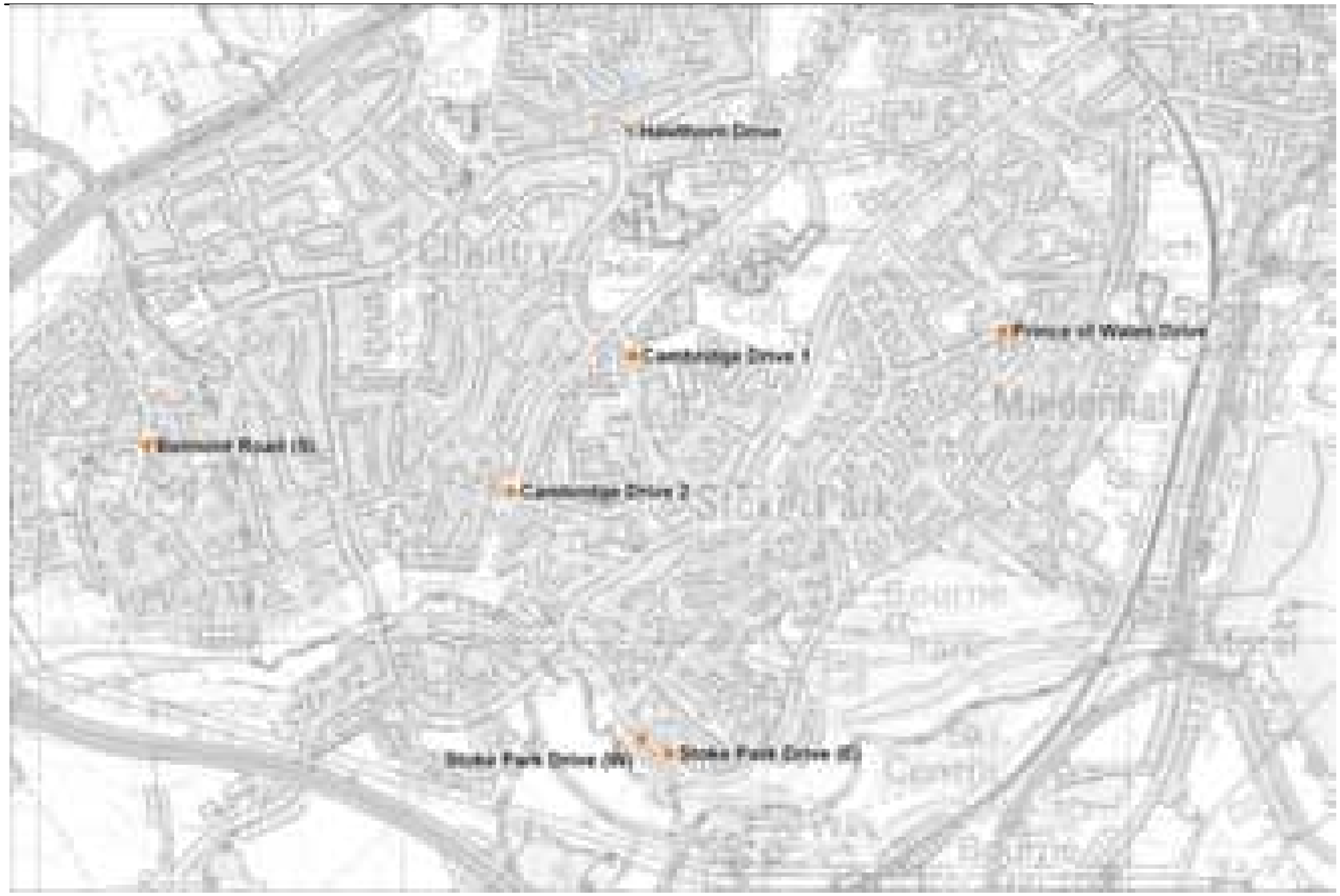
Map 1: Town centre RTPI display locations



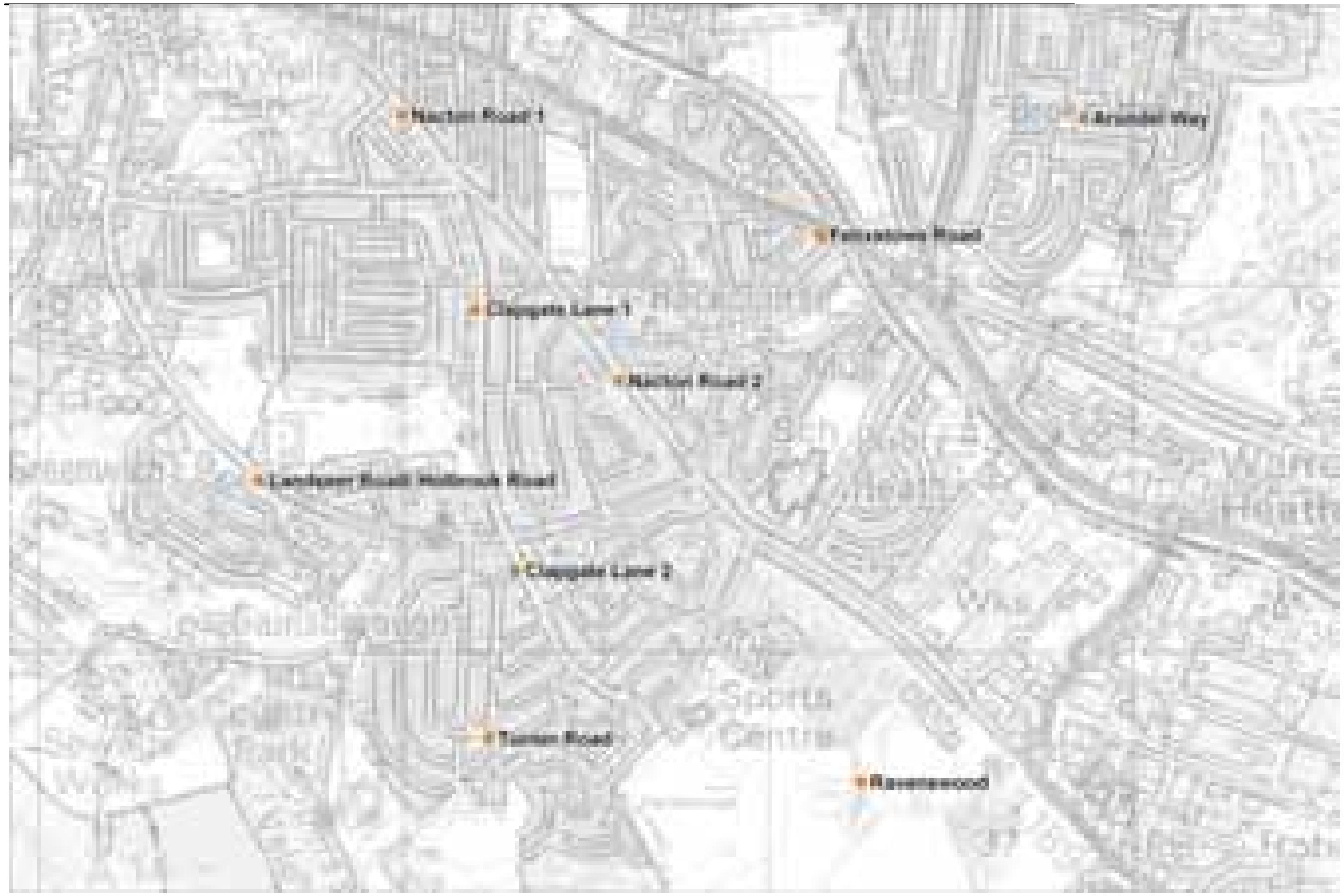
Map 2: NW Quadrant suburban RTPI display locations



Map 3: SW Quadrant suburban RTPI display locations



Map 4: SE Quadrant suburban RTPI display locations



Map 5: NE Quadrant RTPI display locations


Rushmere St Andrew
California
Foxhall Road 1
Foxhall Road 2

5 Benefits

5.1 The benefits of RTPI systems, while dependent of the detailed design, nature of the patronage, and the enthusiasm of the bus operators to apply them, are well documented. For the bus operator, the benefits include:

- The locations of the operators' vehicles are known, within a flexible control system;
- The link between the AVL and the UTMC permits flexible and adaptable bus priority measures to be implemented, notably ones which provide reliability improvements by selectively giving priority to late running buses;
- Passenger satisfaction and convenience is increased, reducing customer complaints;
- Schedule consistency and service efficiency are improved, resulting in potential fleet savings for a given level of service;
- Better command and control of the system is achieved;
- System integration is made easier;
- Information provided to users is more accurate;
- Consistent data throughout all public service and bus operator's systems;
- Number of street supervisors is reduced so better operations support is provided;
- More complete and accurate data provide a better management of services especially in scheduling and planning; and
- Savings in both planning and staff.

These considerable potential benefits to operators have not been explicitly included in the Major Scheme appraisal. The public investment in bus system infrastructure, however, will form an important aspect of negotiating a Multi-Operator Quality Bus Partnership.

5.2 The benefits of RTPI to the bus passengers are clear and considerable

- Departure from home can be scheduled using internet access;
- Wait time at bus stops is perceived as less stressful;
- Interchange and route choices can be better informed;
- A more consistent and comprehensive passenger information provision can be co-ordinated, with actual bus arrival times can be provided through several media types, visually and audio information at bus stops, over the Internet, on mobile phones and handheld PDAs; and
- General confidence and comfort levels are improved, to the benefit of existing passengers, and helping to attract new patronage.

These user benefits have been assessed and quantified as part of the benefit assessment.

6 Costs

6.1 Drawing on the system design discussion, the location investigations, discussions with stakeholders, and on the recent Lowestoft contract prices, a firm estimate for the notional proposed system has been prepared.

6.2 The quantities assumed are collated and summarised for convenience here:

Automatic Vehicle Location	➢ 175 vehicles to be fitted.
On-Street Real Time Passenger Information	➢ 5 ‘large’ 40” TFT display screens for large bus interchanges and multi-modal interchanges; ➢ 10 ‘medium TFT display screens for busy bus stops and bus/bus interchanges; ➢ 54 ‘small’ 20” TFT display as used in Lowestoft; costs for pole and installation are included; ➢ Audio functionality for the blind included.
Real Time Passenger Information	➢ Available citywide through the Internet. ➢ SMS text messaging to receive real time bus arrival times for any bus stop, available citywide.
Selective Vehicle Detection	➢ all buses are equipped for Selective Vehicle Detection.
AVL data available at operator’s bus depots	➢ 3 workstations for bus operators enabling more efficient bus operations.

The traffic signal controller equipment to enable the bus priority is included in the UTMC costings.

6.3 At this stage, all capital costs are assumed to be included in the Major Scheme Bid. It is expected that some items of capital cost (for example the equipment installed at the bus garages) and most of the marginal running costs, will be funded by the bus operators, driven by operating savings. The involvement of significant operators, beyond the two dominant providers, will be encouraged. It is expected that there will be a framework agreement involving all stakeholders to define data ownership, funding of the scheme and the responsibilities of all involved.

6.4 All prices assume that the current Lowestoft RTPI system, recently installed and provided by the RTPI supplier SLE, will be expanded to cover bus routes in Ipswich. The current contract allows for the purchasing of further equipment.

6.5 The following main assumptions have been made to estimate the costs:

- the cost for three new servers to provide additional hardware capacity is included;
- the current RTPI supplier does not charge annual licence fees for the software. Annual costs though will be a RTPI supplier project manager which is currently being negotiated for Lowestoft. We assumed that one full time person (PM level) can maintain both Lowestoft and Ipswich systems;

- the initial configuration of bus routes will be provided by the RTPI supplier, whilst further updates will be carried out by Suffolk CC. Costs are included for both;
- three bus operator bus depots will be equipped with each one AVL console. Annual maintenance costs have been estimated at 10 percent of the initial investment costs;
- GPRS costs are estimates, based on the 100Mb RTIG tariff and assume SLE's data volumes are similar to the ones measured in the Lowestoft RTPI;
- no voice function is provided by the on-bus RTPI unit. If the bus operators wish to include the voice function, we assume that they will pay for it separately;
- the bus stop displays include an audio function approved by the RNIB;
- we assumed worst case scenario to provide for Traffic Light Priority (TLP) and included a low power radio in the on-bus unit. This may not be required if TLP is realised through direct server-to-server link between the UTMC and the RTPI server. The detailed design phase would confirm whether this cost saving can be realised;
- the Ipswich RTPI web service will make use of the existing Internet set-up for Lowestoft. No additional costs for an Internet service specific for Ipswich have been included;
- two-way links to Cambridgeshire, Essex and Norfolk already exist as part of the Lowestoft RTPI delivery. No additional links were included in the costs;
- SMS provided through Kyzoom. Lowestoft provides free of charge SMS, where the region pays for the SMS. Prices vary depending on the volume. We assumed 20,000 message per year at 8.8p each;
- prices provided are based on firm 2009 prices; no adjustment has been made to allow for prices at the actual time of purchase;

6.6 The capital and revenue costs presented in Table 4 have been grouped as follows:
:

- On-street information display equipment, including an allowance for the replacement, repair and installation of bus shelters, where appropriate as part of the display installation;
- Equipment fitted on the vehicles;
- GPRS radio communications network;
- Real time data processing, distribution through the Internet and SMS and interfacing to the UTMC server and three neighbouring counties; and
- Overall project management during design and implementation.

Where applicable, costs include supply, installation, testing and maintenance of equipment and project management.

The total estimate for the proposed Ipswich RTPI scheme is estimated at £1.9 million and an annual cost of about £0.28M.

Table 4: Estimated Costs for RTPI System in Ipswich

Item	Number of Units	Unit Cost*	Capital Costs	Annual Costs*	Comment
On-Street Information Display					
Large and medium TFT display	15	£7,691	£115,364		Unit cost drawn from Lowestoft contract
20" TFT out of shelter mounted display	54	£7,052	£380,808		Unit cost drawn from Lowestoft contract
Annual Software Licences for displays	69	£0		£0	Included in maintenance price
One-off recording + processing of audio files	1	£0	£0		included
Vandalism, sign knockdown and sign power	69			£10,000	Allowance based on experience
Maintenance costs per display (excluding comms)	69	£200		£13,800	Allowance based on experience
Suburban bus stop and shelter upgrades	27	£7,000	£189,000		Judgement based on site visits
Sub-Total On-Street Information Display			**£685,172**	**£23,800**	
On-bus Equipment					
On-bus AVL Unit	175	£3,285	£574,875		
Software for bus units	175	£0	£0		included in AVL unit price
On-bus low power radio unit for traffic light priority	175	£0	£0		included in AVL unit price (£97.14)
On-bus voice function	175				Not included, would be £354 per bus.
Annual Software Licences for bus units	175	£0		£0	Included in maintenance price
Maintenance costs for on-bus units	175	£225		£39,375	
Sub-Total On-bus Equipment			**£574,875**	**£39,375**	
Radio Communications (GPRS)					
Radio Communications Units for Displays	69	£0	£0		included in display costs
Radio Communications Units for Buses	175	£0	£0		included in on-bus equipment costs
Radio unit Maintenance	244	£0		£0	Included in maintenance price
GPRS data & line costs (for displays)	69	£150		£10,350	
GPRS data & line costs (for buses)	175	£150		£26,250	
Sub-Total Radio Communications			**£0**	**£36,600**	
AVL Data Processing and Software					
Central Server & Control Station software	1		£0	£0	Already available through Lowestoft RTPI
Central Server Hardware	1	£32,000	£32,000		Assume increased server space necessary
System Configuration / Bus route reconfigurations	1	£65,000	£65,000	£65,000	Capital costs RTPI supplier; annual costs Suffolk CC assumes one person full time to update routes.
Central server Licences				£0	SLE doesn't charge licence fees
RTPI Supplier Project Management + Maintenance	1	£130,000	£130,000	£65,000	Assumes that it's shared between Lowestoft and Ipswich
Bus Operator's Workstation	3	£18,000	£54,000	£5,400	Capital costs RTPI supplier; annual costs Suffolk CC
Annual licence and maintenance costs for bus operators	3			£5,400	Assumption as SLE costs for this not fully understood.
Server-to-server interface (UTMC - AVL)	1		£0	£0	Already provided as part of Lowestoft RTPI
Interfaces to neighbouring counties	3		£0	£0	Two-way link to Cambridgeshire, Essex and Norfolk already in place
Internet Access Set-up	1		£0	£0	Already provided as part of Lowestoft RTPI
SMS set-up by RTPI supplier			£0	£0	included in system / bus route configuration costs
SMS configuration and software by SMS provider			£0		Already provided as part of Lowestoft RTPI using Kyzoom
Annual SMS software maintenance				£7,760	Depends on volume of SMS
Audit of Bus stops	1	£15,000	£15,000		Detailed site visit
CSD (Suffolk IT department) costs				£6,000	
Sub- Total AVL data processing and Software			**£296,000**	**£154,560**	
Overall Project Management	**10%**		**£155,605**		
TOTAL			£1,711,651	£254,335	
Contingency	**10%**		£171,165	£25,434	
TOTAL with Contingency			**£1,882,816**	**£279,769**	
Design and Preparation costs	**13%**		£244,766		
Total			**£2,127,582**		

7 Concluding remarks

7.1 This Technical Appendix has described the outline design of an RTPI system for the wider Ipswich area. The design decisions and assumptions made to permit the costing exercise to be comprehensive and realistic have been noted through the text. The crucial technical issues are:

- To optimise data manipulation and network management a central control system (rather than a bus or at bus stop based one) is proposed;
- the AVL system can operate most efficiently with a simple and widely available GPS based technology. In order to mitigate any discrepancies or inaccuracies, it will need to be combined with another tracking technology, such as dead reckoning;
- the communications system is proposed with a digital radio solution. Analogue mobile radio will become obsolete in 2012, and is more susceptible to interference particularly in the harsh bus environment. In addition a public mobile technology such as GPRS can offer a more flexible, reliable and expandable network.
- the current Lowestoft RTPI software can be used to provide RTPI for Ipswich, expanding the system recently installed and provided by the RTPI supplier SLE. The current contract allows purchasing further equipment. We think that the costs saved by not having to re-tender and making use of the existing software, outweighs potential cost savings for a cheaper system from a different supplier. The SLE contract has been purchased through competitive tender process and their RTPI system cost is at the low to mid-range costs of these type of systems.

7.2 While many of the details will be fine tuned during detailed design and in negotiation with stakeholders, the system as designed and costed provides a realistic and appropriate component of the overall Major Scheme.

Appendix F

Suffolk County Council | AECOM

Project:	**Ipswich – Transport Fit for the 21st Century**	Job No:	**60050323**
Subject;	**Walk cycle and public realm improvements**		
Prepared by:	**Justin Pooley**	Date:	**20 April 2009**
Checked by:	**Chris Creed**	Date:	**18 May 2009**
Approved by::	**Bil Harrison**	Date:	**17 May 2009**

1 Introduction

1.1 Context

This Technical Appendix F forms a supporting part of the 'Ipswich – Transport Fit for the 21st Century' Major Scheme Bid. It describes the outline design of a series of walk and cycle route improvements, to integrate with and improve the public realm, and to link existing elements of the walk and cycle route network. The work builds on and updates a comprehensive previous survey and design effort, undertaken in 2005 as part of the previous Major Scheme bid. The proposed work is predominantly infrastructure changes to the street layout; taking advantage and linking existing routes. The work is integrated with a major programme of new signalised crossings, providing opportunities for pedestrians and cyclists to cross the main traffic routes around the town centre. Eight individual routes have been developed, designed to serve specific travel demand markets and areas.

The work has been taken forward in the context of the existing facilities; the plans of Ipswich Borough Council plans for improvements to the public realm of the town centre; specific developer initiatives to provide public routes; and with the SCC scheme for the Duke Street roundabout south east approach improvement (recently approved for funding under the CIF2 bid process). The existing walk and cycle network is shown in Figure 1 as green dashed lines, with the proposed new routes shown in red solid lines. Figure 2 identifies the eight individual coloured routes.

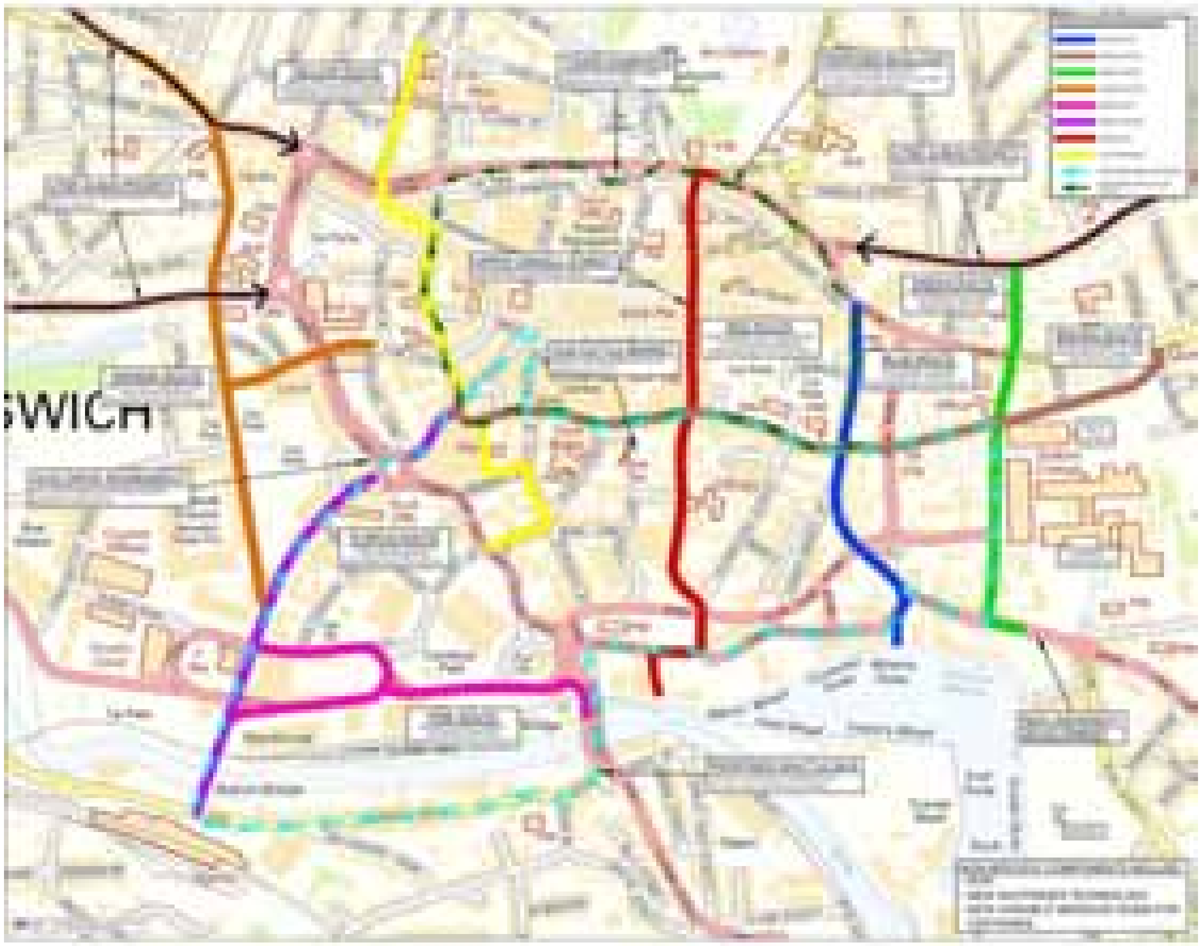
1.2 System Objectives

Ipswich has a complex and expanding town centre. The proposed walk/cycle route improvements were designed to meet the following objectives:

- Provide a series of radial links between the inner suburbs and the town centre, building on the existing route sections, and so supporting the shift to more sustainable modes;
- Support the eastwards expansion of the town centre shopping area, and so supporting the retail vitality of the town;
- Contribute to the enhancement of the public realm and setting of the built environment;
- Provide safe and convenient links between the town centre core and the developing areas around it – the Waterfront, Education Quarter, and Ipswich Village – and so support the development of sustainable travel patterns to these important developing areas; and
- Provide safe and convenient links for visitors, integrating with the Wayfinding component, and in particular delivering a comprehensive improvement to the Princes Street corridor linking the railway station to the town centre.

Figure 1: The existing walk cycle network and proposed extensions and additions

Figure 2: The eight proposed route sections



1.3 Structure of this Appendix

Following this introductory Chapter, this Appendix is structured round three following Chapters:

- Chapter 2 provides a description of eight route sections and their outline design;
- Chapter 3 describes the three sources of quantified benefits which were analysed; and
- Chapter 4 presents the costs.

2 Route Sections

2.1 Enhancing the Walk and Cycle network

The eight defined routes will form the high quality network and will be sign posted as the main routes for pedestrians and cyclists to enter and cross the town centre. In order to give each route a separate identity, they have been coloured coded.

Improvements planned include:

- Widening footways to incorporate both pedestrian and cycle facilities and so reducing the conflicts with other road users;
- Creating some areas of shared road space and thereby reducing the impact of cars;
- Improving or putting in new crossing facilities to eliminate the barriers to movement;
- Upgrading existing pedestrian crossings to toucan crossings;
- Raised surface ‘table-top’ at crossings to make pedestrians feel safer and to slow traffic; and
- Coloured surface cycle lanes.

A palette of suitable materials, appropriate to the particular built environment setting, has been established, and applied to the design and costings for each of the eight separate routes.

2.2 The Route Designs

The eight route sections are introduced in summary in this section, followed by detailed discussion in the following Chapters. Each route discussion refers to multi-sheet detailed plans. While in general they form new or connecting links on radial or tangential sections of the active modes network, two have particular functions. The Red Route 1 includes the pedestrianisation of Northgate Street (Upper Brook Street) to extend the core town centre shopping area pedestrianisation. The Purple Route 4 comprises the comprehensive improvement of the corridor between the railway station and the town centre, including the setting for the Grade 1 listed Willis building, and the removal of a complex of subways..

Where relevant to the routes, the costs of additional traffic signal control have been included here. This comprises several new toucan crossings, and the signalisation of the Princes Street / Civic Drive junction.

Route 1 - Blue

The Blue route provides an important extra link between the town centre at Major’s Corner down Upper Orwell Street and Fore Street to the Waterfront. It enhances the existing links with the southeast of the town. . Along the route, there are plans for measures to change kerb levels and improve pavement evenness.

Route 2 - Red

The Red route runs from the top of Northgate Street, east of Tower Ramparts bus station through commercial and retail developments and down to the Waterfront via Upper Brook Street, Lower Brook Street and College Street. The proposals will allow for the route to be fully pedestrianised during the shopping day, and enhance the attractiveness of this shopping street. Along the route, there are plans for measures to alleviate crowding, change kerb levels and improve pavement evenness.

Route 3 - Green

The Green route runs from Woodbridge Road through the Education Quarter to the Waterfront via Grimwade Street. It will integrate with the Duke Street roundabout CIF2 Scheme. Along the route, there are plans for measures to change kerb levels and improve pavement evenness.

Route 4 - Purple

The Purple route runs from Ipswich Railway Station to the town centre along the Princes Street corridor via Ipswich Village and the Willis Building. This is an important corridor, which is shared by walk cycle and bus traffic. A key element of the route is the creation of at grade crossings at the Civic Drive junction, and the elimination of the little used underpasses. Along the route, there are plans for measures to alleviate crowding, change kerb levels and improve pavement evenness.

Route 5 - Pink

The Pink route runs from Ipswich railway Station to the Waterfront, heading eastwards from the Princes Street junction past Cardinal Park to Bridge Street. It links the Waterfront and Ipswich Village. Along the route, there are plans for measures to change kerb levels and improve pavement evenness.

Route 6 - Orange

The Orange route runs from Norwich Road to Princes Street via Portman Road, with a section branching off along Great Gipping Street and over Civic Drive to Elm Street. Along the route, there are plans for measures to introduce street lighting, change kerb levels and improve pavement evenness.

Route 7 - Brown

The Brown route runs from the Buttermarket shopping centre eastwards along Dogs Head Street, Tacket Street and Rope Walk to St. Helen's Street, crossing the Red Blue and Green routes. It enhances and extends the existing eastern approach to the town centre. Along the route, there are plans for measures to change kerb levels and improve pavement evenness.

Route 8 - Yellow

The Yellow route runs from the junction between Henley Road and Fonnereau Road north of the town centre, down St. George's Street and Museum Street and over Princes Street to Cutler Street via the Willis Building. It provides an important extra route through the west of the town centre. Along the route, there are plans for measures to change kerb levels and improve pavement evenness.

3 Route Sections

3.1 Blue Route 1 (Town Centre to Ipswich Waterfront)

The Blue Route, from the town centre to the Ipswich Waterfront, is a major route both for pedestrians who access the town from the east and for cyclists commuting to and from their residences on the waterfront. The route passes close to a major shopping precinct on and around Carr Street. The route currently is in need of development and upgrading as far as its facilities and provisions for pedestrians and cyclists are concerned.

The route runs from Major's Corner in the north to Orwell Place. The Blue Route then heads towards the waterfront and away from the town centre all the while only crossing one other route, the Brown Route.

The route path is subject to change if and when any developments involving the Mint Quarter take place which would therefore require improvements to take place on Cox Lane.

Major's Corner – Sheet 1 of 2

The Blue Route starts at the Great Colman Street / Old Foundry Road junction, continues down Old Foundry Road and meets Carr Street at the Major's Corner junction.

Photograph 1 – Old Foundry Road looking north west

It then continues along Upper Orwell Street, where the existing cycle route will be maintained and all lining and road markings will be refreshed. Enforcement of this route can also be aided by the use of cycle signing to be placed on existing posts and lamp columns.

As mentioned previously, any improvements involving Cox Lane will be in regards to walking and cycling will be dealt with as part of any future developments around and including the Mint Quarter.

The existing cycle route north of Major's Corner will be refreshed. The existing shared use facility on the St. Margaret's Street footway will be refreshed, in terms of surfacing and lining.

The existing Pelican crossing at Major's Corner is intended to be converted into a Toucan crossing to allow greater ease of use to cyclists around Major's Corner.

These measures will allow cyclists to travel from Major's Corner through to Orwell Place.

Photograph 2 – Majors Corner Pelican Crossing looking westbound towards Carr Street

Orwell Place (including the northern end of Lower Orwell Street)

– Sheet 2 of 2

At the Orwell Place junction with Fore Street the existing raised entry treatment across Fore Street will be planed off and re-laid to the level of the footways to enable easier movement for pedestrians.

The northern end of Lower Orwell Streets' road surface will be improved to ensure safety and comfort for cyclists, especially as at this point cyclists are to be allowed to cycle through the pedestrian area effectively resulting in a shared use area. It is suggested to use smooth Marshalls Tegular Heritage Setts or similar, to improve conditions while not negatively affecting the style of the street. These changes would have to be checked and approved according to the conservation area materials pallet.

Fore Street

Along the entirety of Fore Street it is proposed to improve cycling by implementing a southbound marked advisory contra-flow cycle lane. Motorists are also to be made aware of cycle presence by the use of back to back cycle signs on existing posts, alongside on-carriageway cycle logos to TSRGD 1057. Both these measures would alert drivers and pedestrians to the presence of cyclists in both directions. Due to Fore Street's conservation area status all proposals are subject to discussion and agreement with Conservation specialists.

Fore Street / Star Lane Junction

Travelling along Fore Street, cyclists and pedestrians are to be aided when they arrive at the junction with Star Lane by the signalisation of the junction and also by new road markings. The signalisation will allow cyclists movement north to south along Fore Street, whilst also providing pedestrians with safer conditions to manoeuvre the junction either along Fore Street or Star Lane.

There will be a new Advanced Stop Line (ASL) marked on the northern arm of the junction. This too will provide cyclists safer travel north south along Fore Street by providing a holding position from which they can travel south onto the southern section of Fore Street when the signals permit.

Once again it is suggested to use smooth Marshalls Tegular Heritage Setts, at the junction mouth to replace the rough granite sets currently employed there.

Fore Street / Salthouse Street Junction

The Salthouse Street / Fore Street junction is often subject to high speeding vehicles, especially into Fore Street. In an attempt to reduce vehicle speeds around the junction, the entrance to Fore Street will be raised as an entry treatment to reduce vehicle speeds and provide easier cyclist and pedestrian movement.

Photograph 3 – Existing Toucan crossing on Salthouse Street

The crossing will be updated at this junction as well as relined, new tactiles will be laid to highlight the crossing point and to better make motorists aware of its presence, and in turn aware of the presence of all cyclists in the area, who will be using this crossing to continue along the cycle route down Wherry Lane. The southern side of the junction will be improved, which will include taking up the bollards that are there currently to widen the path for pedestrians.

A segregated cycle facility will be provided from the crossing to the northern end of Wherry Lane by widening the footpath into the carriageway, this again provides cyclists with an unobstructed route.

The cycle route shall finally be continued south via Wherry Lane, the designation of which is to be determined.

3.2 Red Route 2 (Northgate Street / Upper Brook Street to College Street)

The Red Route starts to the east of Tower Ramparts Bus Station and runs between Northgate Street and College Street. This corridor consists of a mixture of commercial and retail developments and is a primary route to the waterfront. This corridor crosses the brown route at Upper Brook Street and Dogs Head Street junction.

Northgate to Lower Brook Street junction (Sheet 1 of 1)

This section has had extensive enhancement works completed in 2008 by Ipswich Borough Council (IBC), which has included resurfacing, and a contra flow cycle lane, and no further work is not to be carried out on this section.

Lower Brook Street

Lower Brook Street is situated in a conservation area. Suffolk County Council (SCC) proposes to make this road shared space to discourage erratic driving speeds. The carriageway and footways will be differentiated by coloured block paving. However, Lower Brook Street is located on a floodplain and as such the drainage issues will have to be carefully designed in conjunction with any conservation requirements. Faber Maunsell, working with SCC has aspirations for Lower Brook Street to become a one way street travelling southbound thereby reducing vehicle speeds and providing pedestrians and cyclists with a much safer environment. (see photograph 1).

Photograph 1 – Showing Lower Brook Street

Star Street

A toucan crossing will be provided on the west side of Foundation Street. This is to ensure cyclists travelling down Lower Brook Street will be able to gain easy access to the water front via College Street and Foundry Lane (see photograph 2).

Photograph 2 – Junction with Star Street and Foundation Street

Foundation Street

This area currently has a planning application and may provide a shared use with restricted vehicle access from Star Street.

College Street

The existing zebra crossing located east of Foundry Lane will be upgraded to a toucan crossing. IBC have proposals for Foundry Lane. (see photograph 3).

Photograph 3 – Junction with Foundation Street and College Street

3.3 Green Route 3 (Woodbridge Road to Waterfront)

The Green Route links Woodbridge Road in the north with the Waterfront, passing by the Education Quarter.

Argyle Street forms the top section of the Green Route between Woodbridge Road and St Helens Street. It is proposed to provide a cycle lane on the western side of the carriageway and an advanced cycle stop line at the signalised junction of St Helens Street.

Pedestrian crossing facilities are proposed at the junction of Argyle Street and St Helens Street. An all red stage will need to be included within the controller to allow this operation, at present the only crossing that can operate in stage would be the one across Argyle Street. This could have some capacity implications on the surrounding network and therefore it would be necessary to optimise the current signals and consider the implementation of a MOVA unit. Advanced cycle stopline will be installed on the two approaches to the junction to allow progression of cyclists.

Photograph 1

Grimwade Street between St Helens Street and Rope Walk

The existing footway is approximately 3.0 metres wide and it is proposed to provide a shared use facility along this section. A cycle lane has also been proposed on the eastern side of the carriageway which will link on road cyclists between Argyle Street and Rope Walk.

Grimwade Street junction with Rope Walk

Rope walk forms part of the Brown Route. For details of the proposals for the Grimwade Street/ Rope Walk junction can be found within the Brown Route proposals.

Grimwade Street between Rope Walk and Star Lane

A shared use facility has been proposed on the eastern footway and an on road cycle lane has been proposed on the eastern side of the carriageway. In order to provide a continuous shared use facility, a raised entry treatment has been proposed at the access to the College/University Buildings.

Grimwade Street /Star Lane Junction

Advanced Stop Lines (ASLs) for cyclists on both approaches are proposed at this location.

Grimwade Street to Fore Street

The eastern frontage on this section of the Grimwade Street is residential/ commercial whilst University Campus Suffolk is located on the western frontage. The eastern footway is currently 3.0m wide; it is proposed to widen this to 4.0m and provide a two-way segregated cycle facility. It is proposed to provide a raised entry treatment at the junction of New Street Which will make crossing at this location easier for cyclists and pedestrians.

There are two existing zebra crossings on Grimwade Street at the junction with Fore Street; these will be maintained as part of the scheme.

There is an existing Toucan crossing facility in Fore Street, east of Grimwade Street. It is proposed that the shared use footway will tie in with this and link into the Education Quarter development

Photograph 2

3.4 Purple Route 4 (Railway Station to Town Centre)

The Princes Street corridor, from the railway station to Ipswich Village and the retail core, is for many, the gateway to the town centre and is in great need of upgraded facilities. The Purple Route heads northwards along Princes Street from its junction with Burrell Road and Ranelagh Road into the town centre and connects with three other routes, the Pink Route and Orange Route, terminating at the Yellow Route.

The Purple Route is perhaps the most important of all of the walking and cycling routes, as many people walk from/to the railway station to the town centre offices, such as major insurance companies, Ipswich Town Football Club and the retail core, such as the Buttermarket shopping centre, as well as main high street stores situated in Westgate Street.

The Purple Route starts on Princes Street opposite the railway station forecourt, at the junction with Ranelagh Road and Burrell Road. However, no works are proposed within this project, as future development may contribute funding in providing an improved highway network. Therefore, for this bid, the starting point is south of the Commercial Road junction. The Purple Route then continues northwards over the Chancery Lane signal junction, which is being developed by Ipswich Borough Council, past the junction with Portman Road (Ipswich Town Football Club), across the Civic Drive roundabout and ends at the Museum Street junction, next to the Grade 1 Listed Willis Insurance building.

Princes Street (Opposite Railway Station)

Pedestrians walking from the railway station currently use the footways on either side of Princes Street to cross the River Orwell by using Princes Street bridge. However, during peak periods, the eastern footway is particularly well used and frequently there are people walking three abreast. There is no cycle lane or shared use for cyclists to use until the bus lane section near Commercial Road. It is unlikely, that removal of a traffic lane to accommodate extra footway width or separate cycle lanes will be possible. However, there may be potential for a separate footway and cycleway bridge to be funded by private development at this location.

Princes Street/Commercial Road

At the junction with Commercial Road, the existing pedestrian crossing is located some 20m eastwards off the desire line. Therefore, it is proposed to relocate this crossing nearer to Princes Street, so it will be closer to the desire line.

Photograph 1 – Princes Street/Commercial Road Junction

Photograph 2 – Princes Street/Commercial Road, looking south towards railway station

At the signalised junction with Commercial Road, the kerb line on the western side to West End road will be realigned and the island on Commercial Road altered to extend the footway width and to accommodate pedestrians waiting to cross the road, as currently, pedestrians have to stand on the traffic island which is not suitable. A new controlled crossing facility is planned as part of these improvements at Commercial Road on the western side in a much safer environment, including Princes Street in a west/east direction and vice-versa.

Princes Street (Between Commercial Road and Chancery Road)

This section of the Purple Route would continue to be restricted to bus, taxi and cycle traffic only. The bus bays outside the Fire Station and on the opposite side of Princes Street should be considered for footway widening works and in-filling the lay-bys, to increase the footway width to accommodate pedestrians and bus passengers. New bus stop cages could be marked out on the carriageway surface in thermoplastic paint.

Photograph 3 – Princes Street, looking north towards Chancery Road junction

Princes Street (Commercial Road and Chancery Road/Grafton Way)

Once crossed over the Chancery Road/Grafton Way junction, on the west side, large numbers of pedestrians frequently walk westwards towards Ipswich Village, to the offices of Suffolk County Council and Ipswich Borough Council or the Crown Court. In addition, there is a small retail park next to this junction, containing 'Staples' and a 'Fitness First'. On the east side of the Chancery Road/Grafton Way junction, pedestrians frequently walk towards Cardinal Park and, in addition, when walking from Ipswich Village, they cross from west to east and vice-versa. However, there are no controlled crossings at this junction in which to undertake these manoeuvres. This scheme is being undertaken by Ipswich Borough Council.

Princes Street to Portman Road

On the western side of Princes Street, between Chancery Road and Portman Road there is a 2.5m wide footway. On the eastern side of Princes Street, going north, there is an existing segregated footway/cycleway.

The Purple Route continues north along Princes Street. At the junction with Portman Road, the Orange Route branches off northwest at this junction. A new 20mph and raised entry treatment with junction realignment is proposed at the Portman Road junction. These measures are to reduce vehicle entry speeds and reduce the crossing width from 10m existing to 6m proposed. There is an existing shared footway/cycleway and segregated facility in Portman Road linking up with the toucan crossing near Riley's Snooker Club on Princes Street.

Photograph 4 – Princes Street/Portman Road junction looking south towards railway station

Princes Street (Between Portman Road and Civic Drive)

The western and eastern footways both have small sections of shared use, connecting with the toucan crossing near Riley's Snooker Club which would be retained.

Photograph 5 – Existing toucan crossing outside 'Riley's snooker club', looking North

There is an advisory cycle lane for northbound cyclists until the Friars Bridge Road. For southbound cyclists, an advisory cycle lane starts approximately 50m south of Civic Drive and ends opposite the Portman Road junction. No alterations to this existing cycle network are planned in this bid submission.

Recent footway works have been completed by Ipswich Borough Council on the western side of Princes Street between The Drum and Monkey PH and Friars Bridge Road.

Entry treatments forming a 'raised table' are proposed at the junctions of Chalon Street and Friars Bridge Road, in order to slow traffic on approach and provide a safe and visible crossing.

Princes Street (Between Civic Drive and Museum Street)

Major improvements to the Princes Street/Civic Drive junction are proposed as part of this comprehensive corridor improvement. This will radically change the Princes Street/Civic Drive roundabout into a signalised junction, catering fully for at grade pedestrian crossings, and with large areas of public realm. Currently, this junction is a four arm roundabout with two circulating lanes, with all pedestrian movements catered for by sub-standard subways. The need is for a junction treatment which will be impressive in concept and will therefore require high quality paving materials, landscape treatment and modern street furniture.

There are risks associated with constructing over the existing subway and roundabout structures. The detail drawings of this area, dating back to the 1960's, have been obtained by Faber Maunsell AECOM from the original designer. Furthermore, a structures review has been carried out to ascertain the feasibility of constructing a carriageway over the existing structure.

Two options have been considered and these are:

- Construct the new junction over the existing structure; or
- Partial demolition of the structure and infill

The estimated construction costs also include the major diversion of Anglian Water sewer and underground pumping station which is currently located in the centre of the roundabout. Diversionary costs have been obtained from Anglian Water and they have provided an estimated cost of £400,000. In addition, a further £100,000 has been allocated for other Statutory Undertaker's diversions such as British Telecom.

The construction costs have been based on the second option, which includes substantial demolition and infilling of the existing structure, but removes the need for future maintenance of the Anglian Water equipment and enables drainage and other services to be located in the carriageway construction, which would not be possible with the first option, due to the position of the roof slab of the existing structure.

Granite kerbing and yorkstone paving are proposed and an allowance of extra costs such as temporary traffic management and restricted working overheads have been included as part of the construction estimate.

To compliment the new junction style, it may be appropriate to introduce highway changes in Princes Street/Friars Street/Queen Street by making use of shared space concepts and traffic calming in this area, as part of the Purple, Brown and Yellow walking and cycling routes. Pedestrian facilities through the junction will be greatly improved, as illustrated in the following 'before' and 'after' images.

Current view of the Princes Street / Civic Drive junction, looking south

Computer simulation of proposed Princes Street / Civic Drive junction layout

Detailed local traffic signal capacity calculations have been undertaken on the proposed layout, and show acceptable reserve capacity. The junction will enhance the capability of the UTMC system to manage traffic on the inner ring road, and enable bus priority to be provided as required in the important Princes Street corridor.

Beyond the Princes Street / Civic Drive junction, no major walking and cycling improvements are planned between Civic Drive and Museum Street.

Photograph 6 – Princes Street, looking North, next to Grade 1 Listed Willis Building

3.5 Pink Route 5 ((Railway Station to Ipswich Waterfront)

The Pink Route, from the Princes Street junction, close to the Railway Station, runs eastwards onto Ipswich Waterfront. This route is an important corridor for pedestrians and cyclists visiting Cardinal Park for the bars, restaurants, health club and multi-screen cinema, using the railway station and the various bus stops around the local area to travel into this entertainment complex.

Furthermore, the historic waterfront, with its listed buildings and conservation area and new university complex is situated within a short walk/cycle journey of Cardinal Park. The railway station route is also used by commuters and students who live in the numerous existing residences and future accommodation alongside Ipswich Waterfront.

The Pink Route starts at the junction of Commercial Road and Princes Street, linking with the Purple Route. The Pink Route provides an east/west link along Commercial Road, onto Grafton Way ending at the roundabout at Bridge Street and the start of Ipswich Waterfront. The frontage of the waterfront has been completed, in parts, as a result of recent development and is currently part of a significant redevelopment site.

Commercial Road/Princes Street

Commercial Road is a very busy road (westbound) which is part of the one-way gyratory. The existing ‘dog-legged’ pedestrian crossing in Commercial Road would be realigned and relocated nearer to the desire line in Princes Street and upgraded to a toucan crossing, as part of the Purple Route.

Photograph 1 – Existing diagonal pedestrian crossing near Princes Street junction

However, as part of the Pink Route, the redundant pedestrian crossing would then have the verge reinstated with imported topsoil and grass seeded or landscaped with low covering shrubs to prevent vegetation restricting visibility. Street furniture would also be decommissioned and removed from this landscaped area.

Commercial Road/Princes Street/West End Road

A new mandatory advance cycle lane and reservoir will be provided on Commercial Road to replace the existing cycle lane next to the fire station for right turning cycle movements into Princes Street. The existing cycle lane is less than 10m in length. In addition, a new lead-in cycle lane would be provided by reconstructing the existing verge on the south western side of Commercial Road into carriageway and providing a new length of mandatory 2m wide cycle lane for approximately 70m.

Photograph 2 – Existing cycle lane in Commercial Road, looking west

On the southern side of Commercial Road, travelling towards the railway station, the carriageway is currently marked as hatched markings and one traffic lane. This road space will be re-marked to accommodate a new length of advance cycle lane and a reservoir from Commercial Road to Princes Street. The mandatory 2m wide cycle lane will be coloured in green surfacing to highlight this facility to motorists. The existing lay-by will be retained.

Photograph 3 – Commercial Road, opposite Post Office, looking west

Footway improvements are planned in this section of the Pink Route, in the form of replacing the existing footway surface with new material, adjacent to the new cycle lane, to show a general upgrade to the highway network for both pedestrians and cyclists.

Commercial Road

The existing traffic lanes in Commercial Road will be remarked to accommodate the new mandatory 2m wide cycle lane. The new cycle lane will be resurfaced with green coloured surfacing along this section.

Photograph 4 – Commercial Road, proposed 2m wide cycle lane, adjacent to kerb line

The new cycle lane would then continue on the southern side of Commercial Road up to the junction with Grafton Way, where this meets with the existing cycle lane.

Photograph 5 – Grafton Way, end of existing cycle route at the Commercial Road junction

Footway improvements are planned in this section of the Pink Route, in the form of replacing the existing footway surface with new material, adjacent to the new cycle lane, to show a general upgrade to the highway network for both pedestrians and cyclists.

Grafton Way

Between Chancery Road/Princes Street and Quadling Street (Cardinal Park)

Grafton Way also forms the one-way gyratory with Commercial Road. Ipswich Borough Council is undertaking improvements to the junction of New Cardinal Street. The existing road markings will be renewed in Grafton Way as part of the new High Friction Surfacing being applied for the new crossings at Cardinal Park.

Grafton Way

Between Commercial Road and Bridge Street

Currently, there are no controlled facilities for pedestrians or cyclists to cross Grafton Way. A new toucan crossing is proposed on the north-west side of Commercial Road/Grafton Way serving, in particular, the large numbers of Post Office cyclists and commuters using the railway station. High Friction Surfacing will be applied on the approach to the crossing.

Photograph 6 – Location of proposed northwest toucan crossing on Commercial Road

In Grafton Way, the existing uncontrolled crossings near Cardinal Park are to be improved and upgraded to toucan crossings. New High Friction Surfacing will be applied on the approach to the crossings. By upgrading the existing uncontrolled pedestrian crossings serving Cardinal Park, this will greatly improve access from the railway station, Cardinal Park and onto Ipswich waterfront. These new facilities will also link up with the existing footway and cycle network to provide a safer, more pleasant journey.

Photograph 7 – Location of existing uncontrolled pedestrian crossings to Cardinal Park

Grafton Way

Between Commercial Road and Bridge Street - continued

The existing road markings denoting the segregated footway/cycle lane on the north side of Grafton Way and the cycle lane on the southern side will be remarked. No footway improvements are planned in this section.

Photograph 8 – Grafton Way, Cardinal Park showing the existing cycle facilities

The existing cycle lane on the southern side of Grafton Way where it crosses the car park entrance will be surfaced in green coloured surfacing.

Photograph 9 – Grafton Way, next to car park showing the existing westbound cycle lane

The existing segregated cycle lane/footway continues on the northern side of Grafton Way to Bridge Street. On the southern side, the cycle lane continues to be provided on the carriageway. Both sections will have the road markings renewed.

Grafton Way

Between Commercial Road and Bridge Street - continued

On the northern side of Grafton Way at the entrance and exit of Cardinal Park, cyclists can either leave the segregated cycle lane/footway and rejoin the road across the access or keep on the footway into Cardinal Park. The section of cycle lane immediately outside the Cardinal Park access will be surfaced in green coloured surfacing.

Photograph 10 – Grafton Way, looking eastwards towards Ipswich Waterfront

The existing toucan crossing outside the Punch and Judy PH is to be retained. No footway improvements are planned in this section.

In addition, the existing toucan crossing on Bridge Street is to remain unchanged which is frequently used by pedestrians and cyclists for Ipswich Waterfront and university.

3.6 Orange Route 6 (Princes Street to Norwich Road)

Area 1 Barrack Corner – Sheet 1 of 3

Historically, the western end of the town centre has suffered from a lack of investment and maintenance. In order to overcome this, the current proposals are to enhance the aesthetics of Barrack Corner, which falls into a conservation area, and improve facilities for pedestrians and cyclists.

The proposals include closing Barrack Lane to vehicular traffic, which will allow a new Toucan Crossing to be built at this junction. Cyclists travelling southbound from Barrack lane will be able to access the crossing directly and not have to dismount and walk to the existing crossing facility outside the Co-op shop. It is likely that this existing crossing will be removed as part of the works.

Photograph 1

The carriageway on Norwich Road and London Road would be raised to create a shared use environment which at present can feel intimidating with the high volume of traffic entering the town centre. Improved seating, finger post signing, lighting and landscaping is also proposed at this location.

The existing raised seating area will be removed and the footway and carriageway materials will be upgrade to York stone and Kerbs will be replaced with conservation kerbs.

Area 2 London Road to Handford Road – Sheet 2 of 3

The section between London Road and Handford Road is poorly maintained with cracked slabs, which does not provide a nice walking and cycling environment. It is proposed to upgrade the footways along this length and create a 20mph zone.

There are two junctions on Portman Road along this section; Crescent Road and Dalton Road on which raised tables have been proposed to enable a self controlling 20 mph zone to be created. These raised tables will also act as the start of the 20 mph zone on the side roads. These raised tables will also allow easier pedestrians movements to and from St Mathews School.

The parking opposite Crescent Road will have to be part suspended due to the raised table.

St Mathews Church Lane forms part of the cycle network, however it has been noted that the current street lighting is poor and can feel intimidating to users during the hours of darkness. It is proposed to enhance the street lighting in this area.

Photograph 2

St. Matthew’s Church Lane would be improved with better lighting and security.

Photograph 3

Area 3 Handford Road junction with Portman Road

There are possibly at least two design options for this junction:

The first option is to provide a signalised junction; this will allow new crossings for pedestrians and cyclists to be incorporated closer to the desire line. At present pedestrians and cyclists risk crossing at potentially unsafe locations.

In order to get pedestrians and cyclists across the junction an all red stage would need to be included. Cyclist travelling in a southbound direction would wait in a cut out of the existing island and during the all red stage can exit onto Portman Road. Cyclists travelling northbound would be taken off the carriageway via a ramp to a Toucan Crossing on the western side of the junction. This new crossing would make the existing crossing superfluous and therefore could be removed.

Photograph 4

The south eastern corner radius of the junction is very tight and this makes it difficult for southbound buses turning left into Portman Road. It is therefore proposed to realign the south eastern footway to allow for a smoother turning radius for the buses.

The second option is to provide a raised table across the Handford Road/ Portman Road junction. This will slow traffic and pedestrians and cyclists will be able to cross using a series of uncontrolled crossing points. Cyclists travelling in a northbound and south bound direction will use a gap in the existing island to wait or cross into.

Both options are subject to consultation at the present time.

Area 4 Handford Road to Portman Road

It is proposed to make this section of Portman Road a 20 mph zone, which by definition must be self controlling. A series of features will need to be implemented along its length to control the speed. Raised tables at the junction of Great Gipping Street and Canham Street will provide a continuous level for pedestrians and help slow speeds. A raised area matching the existing materials used on Sir Alfred Ramsey Way is proposed across the junction of Portman Road and Sir Alfred Ramsey Way.

Photograph 5

Portman Road terminates at its junction with Princes Street (Purple Route). At this location it is proposed to realign the south western kerb to narrow the carriageway width. A raised entry treatment will form the start of the 20mph zone. This will also allow commuters from the train station to cross Portman Road easier at one level. A vehicle swept path analysis would be undertaken to ensure football coaches, refuse and removal vehicles and HGV's unloading/loading sound equipment for concerts, would still be able to perform this turning movement.

The setting of the Sir Bobby Robson and Sir Alf Ramsey statues and surrounding areas will be improved with high quality paving such as York stone and new seating provided.

Photograph 6

It is anticipated that these improvements would make Portman Road appear less 'industrial' and therefore more pleasant for residents, commuters who walk or cycle to the Council offices and visitors to the football stadium and its environs.

Photograph 7

Area 5 Portman Road to Civic Drive (Sheet 2 of 3)

This section of the Orange Route spurs off Portman Road, in a west to east direction, at its junction with Great Gipping Street across civic drive terminating at Black Horse Lane.

Great Gipping Street

This part of the Orange Route is bordered by the adjacent AXA Insurance building and car park, as well as being close to Ipswich Town Football Club's stadium. The existing footpaths are narrow, unattractive and with little facilities for the visually impaired.

Photograph 8

A raised table is proposed at the junction of Canham Street, which will create a safe location for pedestrians to cross the road. The existing poor quality surfacing should be reviewed and potentially upgraded to the same standard as Sir Alfred Ramsey Way.

The cycleway leading to the ramp up to Civic Drive will remain however the signing and lining for this is to be reviewed.

Civic Drive/Elm Street to Black Horse Lane

Faber Maunsell feel there is benefit in keeping the existing layout of the toucan crossing and emergency access layout in Civic Drive. This has been successful in providing improvements to cyclists and pedestrians wishing to cross Civic Drive. More importantly, this facility gives the police easy access to the north of the town centre, without carrying out a ‘U-Turn’ at Civic Drive roundabout.

Elm Street terminating at Black Horse Lane

It is proposed to provide a 20 mph gateway feature on Elm Street. This section will then tie in with the existing 20 mph network.

3.7 Brown Route 7 (Museum Street to Rope Walk east)

The Brown route runs between Princes Street through to Rope Walk (east) and measures approximately 0.7 mile in length. This corridor consists of a mixture of commercial and retail development until Eagle Street, then changes to residential development along Rope Walk. Rope Walk (east) has a mixture of commercial and university buildings. The majority of this route falls within the conservation area from Museum Street up until the junction with Rope Walk and Bond Street. This corridor crosses five other walking and cycling routes, indicating this route is extremely important, especially at the junctions.

The scheme has provision for high quality improvements along Rope Walk, with minor alterations along the length of the scheme

Museum Street (Sheet 1 of 3)

The Brown Route starts on the southern end of Museum Street with Princes Street junction. Suffolk County Council (SCC) recommended a zebra crossing at the southern end of Museum Street to improve the pedestrian crossing situation. Site observations concluded this option may have implications on inter visibility between vehicles and pedestrians and vice versa. This visibility problem may have resulted in shunt collisions from cars approaching from Princes Street, unaware of the close proximity of the proposed zebra crossing (see photograph 1). Faber Maunsell (FM) proposes to change the layout of the junction to create a raised platform. This is to enable slower entry speeds to the junction to allow pedestrians to cross safely. The slower speeds will help to increase inter visibility between vehicle and pedestrians.

Photograph 1 – View of Museum Street at existing uncontrolled crossing and proposed location of zebra crossing

St Nicholas Street/ Falcon Street

SCC has aspirations to remove the granite setts, to allow a smoother ride for cyclists along St Nicholas Street. The granite sets are aesthetically pleasing, so any remedial measures will need to be in keeping with the surrounding area. (see photograph 2).

Photograph 2 – Granite setts which disrupt cyclists

Silent Street

SCC has aspirations to continue the cycle route from Silent Street to Dogs Head Street. They have suggested a contra flow cycle lane running southbound along Silent Street. Site observations concluded this scheme would not be viable due to the narrow lane width. In addition the eastern footway is 1.5m wide, which forces people to use the road to pass other pedestrians.

Dogs Head Street

Opposite the entrance to Old Cattle Market Bus Station, it is proposed to highlight the presence of cyclists to bus drivers turning from the bus station. The installation of “THINK BIKE” signs should be considered.

Tacket Street (Sheet 2 of 3)

The current extents of cycle measures along this length are already suitable.

Orwell Place

It is proposed to relocate the crossing island approximately 6m west of its existing location in order to improve the pedestrian desire line between Foundation Street and Cox Lane.

Orwell Place Junction

Currently buses turning left from Fore Street onto Orwell Place over ride the centre line and part of the advanced stop line (ASL), which may conflict with cyclists. It is proposed to move the ASL and feeder lane by approximately 3m west of the junction. This will provide adequate clearance for turning buses (see photograph 3).

Photograph 3 – ASL on Orwell Place Junction, which is proposed to be moved back 3m

Eagle Street

SCC has proposed to make Eagle Street shared use. However, this scheme may not be implemented as there are plans to provide a new bus corridor at this location. The traffic signals at the junction with Orwell Place and Fore Street and Eagle Street with Bond Street, have the same green phase timing, which doesn't allow cyclists enough time to cross both junctions when arriving at the end of a phase. Site observations concluded some vehicles and cyclists were racing to beat the lights. Proposals include reviewing the signal timings and lengthening the green phase to allow cyclists to pass through both junctions during the same cycle.

Rope Walk (Sheet 3 of 3)

Rope Walk between Bond Street and Grimwade Street, has a high volume of pedestrian movement along the southern footway, due to the college located south of the junction with Grimwade Street. The northern footway is less busy and measures 2.4m wide (see photograph 4).

Photograph 4 – The northern footway on Rope Walk

It is proposed to accommodate a 1.2m advisory cycle lane on the carriageway along this section, by removing 0.6m of the northern footway, leaving a 1.8m wide footway. Parking bays are located along the southern side of Rope Walk. The width of the road will stay the same which allows a 1.2m eastbound advisory cycle lane, with 2.6m wide general traffic lane. The parking bays will remain at 1.9m wide but the southern footway will be reduced to 2.0m wide. The proposed cycle lane will be provided and work in conjunction with proposals for the junction with Grimwade Street, designed by IBC. IBC have also produced designs for Rope Walk east.

Rope Walk / Grimwade Street Junction and Rope Walk (east)

This junction forms part of the proposals designed by IBC, which have been reviewed and incorporated with the Faber Maunsell design proposals for Rope Walk.

3.8 Yellow Route 8 (Henley Road j/w Fonnereau Road to the Ipswich Waterfront)

The Yellow Route runs from the Henley Road/ Fonnereau Road junction down St. Georges Street, until the crossing at St. Matthews Street. The route then goes through a pedestrian precinct and around the main retail core hence keeping cyclists away from the main areas of pedestrian activity and preventing as many collisions as possible, without completely detracting them from possible places of interest if desired.

The Yellow Route is quite a central route and connects with one other route along its length, the Brown route, though it passes quite close to the Purple Route.

Henley Road / Fonnereau Junction – Sheet 1 of 4

The Yellow Route starts at the top of St. George's Street in the midst of a highly residential area. It is proposed to change the existing visibility stance at the junction.

This junction is easy to highlight and bring to the attention of all potential users. Wholesale changes however are neither desirable nor viable. Improvements to be considered in order to improve visibility for right turning cyclists range from using colour contrasting surfacing to highlight the junction, installing 'Think Bike' signs on approach to the junction, or by removal of the existing parking facilities to improve potential turning area.

Photograph 1 shows the existent turning situation.

Photograph 1 – Fonnereau Junction looking south

St. Georges Street / St Matthews Street Junction – Sheet 2 of 4

On leaving the junction the route continues down St. George's Street, where any worn carriageway markings need to refreshed. Across St. Matthews Street, the two existing staggered pelican crossing will be changed to two straight across Toucan crossings with a central island, both of which will be aligned to the current crossing points. All new road markings and tactiles are to be newly laid.

The proposed development behind the British Heart Foundation building on St. George's Street may affect the walking and cycling proposals along and into St. George's Street and as a further consequence may affect the proposals for the St. Matthews Street crossing.

Photograph 2 shows the existent staggered crossing.

Photograph 2 – Existing staggered crossing across St. Matthews Street

Westgate Street

Along Westgate Street it was desired to allow 24 hour two way cycling. Since the street is a pedestrian area, lined on both sides by shops, a segregated cycle path, though desired, was not viable. It was however viable to change the type of paving used along the centre of the street to accomplish a similar effect. The use of concrete demarcation paving to denote a two way cycle route was seen as a method of allowing shared use in a potentially conflict prone area. The use also of cycle signing on existing posts would help to enhance the awareness of pedestrians and the few loading vehicles on the street to the presence of cyclists in the street, while also providing a defined space for cyclists.

This new paving could be continued along the entirety of Westgate Street, where cycling is already permitted. Until the larger areas of the pedestrian precinct, where signing would be sufficient to make the shared use space apparent to all.

Due to the new 24 hour cycling in Westgate Street the existing pelican crossing across Westgate Street / Museum Street junction would need to be changed to a Toucan crossing.

Museum Street – Sheet 3 of 4

Museum Street was seen as a preferred route for cyclists travelling both north and south along the yellow route as it travelled around the busy business district, rather than directly through it to allow cyclists an easier route on which to travel, while still allowing them easy access to the shopping precinct if required.

Museum Street already had an advisory contra-flow cycle lane heading northwards; this cycle lane was seen as adequate though an observation that vehicles, especially buses, overrun the cycle lane was cause for concern.

To overcome this problem, colour contrasting surfacing and relining of the advisory cycle lane is proposed to raise awareness of the use of the street by cyclists, to motorists. These measures would have to be discussed with and agreed to by a conservation specialist due to Museum Street being within a conservation area. To back up this measure, implementation of extra cycle route signs on existing posts is also suggested. This aids cyclist movement to the High Street junction if required or east / west along Westgate Street.

An additional measure to reduce the problem of overrun of the buses into the cycle lane would be to reduce the number of disabled parking bays by one. It is suggested to remove the parking bay directly in front of the second bus cage as its presence requires bus drivers to have to swing out wide into the cycle lane when exiting the bus cage. Removing it would greatly reduce the number of cycle bus conflicts that could arise otherwise.

The refreshing of the cycle route should continue along the entirety of Museum Street, north up to the High Street junction and south through the Arcade Street junction and down to the Elm Street junction. Not only should the lining and surfacing be refreshed there should also be an implementation of TSRGD 1057's on the carriageway along the cycle route making motorists further alert to cyclist presence within the area.

Arcade Street / Museum Street Junction

At the Arcade Street / Museum Street junction cyclists can choose to take one of two routes.
Either they can continue south along Museum Street or the can travel eastbound along Arcade Street.

Arcade Street/Princes Street/Queen Street

Arcade Street is seen as an alternative route for cyclists in order to avoid higher traffic volumes on Museum Street. To aid cyclist movement eastbound, it is proposed to install a dropped kerb access point outside the County Court where the road ends and becomes a pedestrian area, to allow access to King Street. This would also require a change in the TRO's on both King Street and Arcade Street.

Here is an opportunity for making Princes Street much more attractive to pedestrians and cyclists from the railway station into the retail centre by linking up with King Street and the south of the existing pedestrian zone, (Westgate Street and Buttermarket), the proposals for Princes Street and Queen Street include the whole of Princes Street north of the junction with Museum Street to be shared space, continuing past Giles Square, where additional cycle stands will be provided and terminating at the junction with Friars Street. The market is located in Princes Street outside The Corn Exchange and in Cornhill.

The existing on-street parking in Princes Street will be rationalised to accommodate disabled parking and motorcycle parking. The footway area outside the bus stop in Queen Street will be extended as currently, pedestrians have to walk into the road in order to walk past waiting passengers.

In addition, by turning Queen Street into a shared space area, pedestrians will be further encouraged to walk towards St Nicholas Street which is an expanding bar and restaurant area, which in turn, leads on towards the historic waterfront and University. The choice of footway and kerbing materials will be determined in consultation with Ipswich Borough Council.

Museum Street – From Arcade Street Junction to Elm Street Junction

The footways along this area of Museum Street are in need of upgrading as they are unattractive and in a state of repair that could be potentially dangerous to pedestrians. It is proposed to use Heritage Stone along the length or material of a similar nature as agreed with the conservation specialist due to the fact Museum Street is in a conservation area.

Elm Street /Museum Street Junction

The Brown Route runs alongside the Yellow Route from this junction and along Friars Street and Falcon Street therefore all proposals for this area are included in the Brown Route proposals.

Willis Building to Cutler Street – Sheet 4 of 4

For cyclists travelling south via Museum Street the route continues around the Willis Building then eastbound around Cromwell Square, and southbound along St. Nicholas Street until it turns westbound along Cutler Street.

For cyclists that travelled west along King Street, the route continues southbound along Queen Street and then St. Nicholas Street, until it turns westbound along Cutler Street.

Travel alongside the Willis Building would require some work to be done to remove a few of the bollards either end of the pedestrian area.

As the southern section of St. Nicholas Street is already a cycle route no actual work is necessary other than to renew any road markings along its length.

A second option for cyclists travelling along the footway by the Willis Building is to continue south alongside the Willis Building and then south via Franciscan Way towards the Toucan crossing.

Photograph 3 shows the footway to be used by cyclists alongside the Willis building.

Photograph 3 – Route alongside Willis Building

Cutler Street

Cyclists would then head west along Cutler Street using the existing carriageway cycle lane.
This cycle lane should be refreshed with new lining and also with new colour contrasted surfacing or new, colour contrasting block paving, on both the on-carriageway and off-carriageway sections, to make pedestrians aware of cyclist presence and to make cyclists aware of the appropriate route to take. This surfacing will need to be agreed with the conservation officer.

Grey Friars Road / Franciscan Way Toucan Crossing

The response rate of the signals of the Toucan crossing at the Greyfriars Road / Franciscan Way should also be improved to better aid cyclists across the junction and onward down Wolsey Street.

Photograph 4 – Toucan crossing at Grey friars Way

4 Benefits

4.1 Accident analysis

The proposed route improvements are designed to improve the safety of pedestrians and cyclists with a direct effect on the number of accidents on the routes and surrounding area. Based on a complete review of the accident details over the last three years, the accident reductions have been predicted, and translated into economic monetised benefits using standard valuations from current Guidance.

The latest accident data for a period of 36 months between 2005 and 2007 has been analysed to determine the number of accidents that have occurred on each route. These have been categorised by severity, and separately identifying those involving pedestrians or cyclists.

Numbers of pedestrian accidents occurring along routes

Route	No: of Accidents 2005 - 2007	No: of Slight Accidents	No: of Serious Accidents	No: of Fatal Accidents
Brown	2	2	0	0
Blue	2	2	0	0
Green	1	1	0	0
Orange	1	0	1	0
Pink	5	2	3	0
Purple	4	2	2	0
Red	5	5	0	0
Yellow	4	4	0	0
Total	**24**	**18**	**6**	**0**

Numbers of cyclist accidents occurring along routes

Route	No: of Accidents 2005 - 2007	No: of Slight Accidents	No: of Serious Accidents	No: of Fatal Accidents
Brown	1	1	0	0
Blue	2	2	0	0
Green	3	3	0	0
Orange	4	3	1	0
Pink	1	1	0	0
Purple	7	6	1	0
Red	3	3	0	0
Yellow	4	3	1	0
Total	**25**	**22**	**3**	**0**

Total number of accidents occurring along routes

Route	No: of Accidents 2005 - 2007	No: of Slight Accidents	No: of Serious Accidents	No: of Fatal Accidents
Brown	6	6	0	0
Blue	8	8	0	0
Green	13	13	0	0
Orange	6	5	1	0
Pink	11	8	3	0
Purple	18	15	3	0
Red	15	14	1	0
Yellow	9	8	1	0
Total	**86**	**77**	**9**	**0**

To provide the overall context, the total accidents in the overall core town centre area were abstracted. There were a total of 255 accidents, of which 231 were designated as being slight and 24 serious with no fatal accidents within this data set. The split of these accidents can be seen below;

Total number of accidents occurring in the Town Centre (core area).

	No: of Accidents 2005 - 2007	No: of Slight Accidents	No: of Serious Accidents	No: of Fatal Accidents
Cycle	41	35	6	0
Pedestrian	60	49	11	0
Other	154	147	7	0
Total	**255**	**231**	**24**	**0**

The accident saving or benefit was assessed by individually analysing the causation factors within the accidents and making the assumption that the accident could be saved by introducing a remedial measure or mitigating factor and incorporating the percentage trend shift within Suffolk County Councils own casualty reduction targets. This was done for each route section.

As an example, on the ‘Pink Route’, there are currently 11 accidents involving 8 slight and 3 serious designations. Of these 3 serious accidents involved pedestrians, 3 slight accidents involved pedestrians and 1 slight accident involved cyclists. The pedestrians were being knocked down whilst crossing the road and cyclists in conflict with cars. The proposals include designating cycle lanes and routes as well as the installation of ‘Toucan’ crossings on desire lines. The cycle lanes will be enhanced and widened where possible with footways being improved and crossing points designated. High friction surfacing will be installed at pertinent locations and road markings refreshed or modified to improve lane discipline. This in turn should reduce pedestrian accidents in this location by 50% and all accidents by a further 10%.

These route improvement impacts need to be considered in the context of general accident and traffic trends. In addition to this there is a 15% modal shift reduction in traffic plus the downwards trend in SCC’s own accident record. The SCC Road Safety and Accident Casualty report 2007 documents a recent rise in slight type accidents by 3.9% but overall a reduction of overall accidents by 36.4%. In total therefore there should be an accident reduction of as much as 55% on the Pink route by implementing the measures as shown.

This analysis process was undertaken for each route; the results are summarised in the following Table:

Expected reductions in total accidents (over three year period)

Route	No: of Accidents 2005 - 2007	Expected saved accidents
Brown	6	2
Blue	8	3
Green	13	6
Orange	6	3
Pink	11	6
Purple	18	7
Red	15	9
Yellow	9	4
Total	**86**	**40**

The Department for Transport estimates of the values for prevention of road casualties and road accidents for use in the appraisal of road schemes. These values are updated annually and have previously been published in Highways Economic Note No.1.

After April 2008, the Transport Analysis Guidance (TAG) Unit 3.4.1 'The Accidents Sub Objective' for the latest values for prevention of road casualties and road accidents should be used. This has now been updated using values taken in 2007 and published in April 2009.

Therefore in order to quantify the accident savings, monetary values for accidents were taken from the Highways Economic Note 1 (2007) Table 4a. These values are expressed as a cost per accident for different classes of road and in this case with a speed limit of less than 40 mph, 'Class Built-Up 1', should be used. The values for this class can be seen below:

Table 4a: Average value of prevention per road accident by severity and class of road: all hours

2007	**Road Class**			**£ June 2007**
Accident severity	**Built-up[1]**	**Non Built-up[2]**	**Motorway**	**All**
Fatal	1,769,900	1,930,740	2,145,280	1,876,830
Serious	207,120	231,110	235,690	215,170
Slight	21,000	24,750	29,490	22,230
All injury	59,240	121,420	91,930	75,610
Damage only	1,840	2,720	2,620	1,970
Average cost per injury accident including an allowance for damage on accidents	91,810	142,640	111,810	104,900
[1] Built-up roads are those roads other than motorways with speed limits of 40pmh or less				
[2] Non Built-up roads are those roads other than motorways with speed limits greater than 40mph				

Accident Severity	Built-up 1 (£)
Fatal	1,769,900
Serious	207,120
Slight	21,00
All Injury	59,240
Damage Only	1,840
Average cost per injury accident including an allowance for damage only	91,810

An approximate annual saving, including an allowance for 'damage only' within table 4a (Hen 1) valuation 2007 (published April 2009). The discount factor of 3.5% has been set using the current national figure.

The results of the accident savings analysis are summarised in the following table:

Route	Annual saving (£K)	Estimated lifetime saving (£M 2009)
Brown	54,095	605,864
Blue	95,730	1,072,176
Green	191,461	2,144,363
Orange	95,730	1,072,176
Pink	191,461	2,144,363
Purple	223,371	2,501,755
Red	95,730	1,072,176
Yellow	95,730	1,072,176
Total	**1,043,308**	**11,685,050**

This shows a lifetime (15 year) net present value of the accident savings benefits in 2009 of some £11.7M

4.2 Public realm ambience benefits

The public realm ambience benefits have been calculated using the April 2009 WebTAG Guidance section 3.14.1. The valuation of improvements are given as:

Improvement	Value (pence/km – 2005 prices and values)
Street lighting	34
Reduction in crowding	17
Kerb drops	24
Level pavements	8

Based on the treatment of each route, the benefits shown on the following page were estimated.

The annual benefits total some £717,000 in 2005 prices, say £760,000 in 2009 prices and values. This suggests a lifetime net present value of benefits of some **£8.8 M** for the combined routes.

Walk cycle route ambience improvement benefits

Route	Street Lighting?	Crowding?	Kerb Level?	Pavements?	Total Value (p/km)	Distance (km)	Benefit per user (p)	Benefit per user (£)	Daily Trips (both directions)	Annual Trip Days	Annual Ambience Benefit (£)
1 - Blue	✗	✗	✓	✓	32	0.678	21.696	0.217	500	250	27,120
2 - Red	✗	✓	✓	✓	40	0.867	34.68	0.347	1,000	250	86,700
3 - Green	✗	✗	✓	✓	32	0.665	21.280	0.213	500	250	26,600
4 - Purple	✗	✓	✓	✓	40	0.907	36.280	0.363	1,000	250	90,700
5 - Pink	✗	✗	✓	✓	32	1.170	37.440	0.374	500	250	46,800
6 - Orange	✓	✗	✓	✓	40	1.505	60.200	0.602	1,000	250	150,500
7 - Brown	✗	✗	✓	✓	32	0.642	20.544	0.205	2,000	250	102,720
8 - Yellow	✗	✗	✓	✓	32	1.163	37.216	0.372	2,000	250	186,080
				Weighted Average	**35**	**0.950**	**33.667**	**0.337**		**250**	
				Total					**8,500**		**717,220**

Notes:
Red route crowding reduction over half the length; Orange route lighting improvements over a quarter of the length.
Daily trips estimated from short duration count surveys
The nominal annual total ambience benefit is some £0.72M in 2005 values.

4.3 Physical fitness benefits

In the Department for Transport's latest Transport Analysis Guidance on the Appraisal of Walking and Cycling Schemes (TAG Unit 3.14.1) from April 2009, details are given on estimating the health benefits of new cycling and walking facilities. The value of improvements in health as a result of increased physical activity due to a walking or cycling scheme can be estimated. This is given by the economic benefit arising through reduced mortality rates due to an increase in physical activity.

In terms of the methodology for calculating this benefit, the World Health Organisation conducted a project in 2007 on *Quantifying the health effects of cycling and walking* which featured the Health Economic Assessment Tool (HEAT) for cycling. The Copenhagen Centre for Prospective population Studies found that individuals that cycle for three hours per week reduce their relative risk of all-cause mortality to 72% compared with those who do not cycle. This equates to 36 minutes per weekday.

For the Ipswich MSBC, it has been assumed that the mean distance travelled per year per cyclist is similar to the result from the Copenhagen study. The relative risk is therefore the same too, such that for every four cyclists that would have died previously, one would now survive through cycling 3 hours per week. The mean proportion of the England and Wales population aged 15-64 who die each year from all causes is obtainable from the Office of National Statistics. In 2007 this proportion was 0.00235. Given that there are currently 1,300 cyclists on Ipswich's cycle network, growth of around 20% would lead to a further 300 regular cyclists . The same result would be reached with a modal shift from cars of approximately 8%. Multiplying 0.00235 by 300 gives the expected number of deaths in the scheme population (0.705). The number of lives saved in a given year can then be calculated by multiplying 0.705 by 0.28 (the complement of 0.72) that is 0.1974 lives per annum.

WebTAG 3.14.1 (April 2009) quotes the value of a saved death at £1.215M in 2002 prices and values; in WebTAG Unit 3.4.1 The Accidents Sub-objective, the value is quoted as £1.64M in 2007 prices.

Based on the 2007 value, the annual savings in a base year are some £0.323M per annum, based on encouraging 300 more regular cyclists. Converted to 2009 prices and values, and integrated over a 15 year project life, suggests a total net present value of the physical fitness improvements of some **£3.9M**.

5 System Costs

5.1 Costing approach

Costs of walk cycle works have been taken from the current 2008/09 contractor rates.
Quantities have been estimated from the outline design drawings. Clearly there is some scope for varying the standard and quality of finishes.

Overheads have been calculated based on past experience, and include allowances for traffic management during works, restricted working overheads, and a contingency for unforeseen items.

5.2 Summary of Bills of Quantity

The following sheets itemise the route by route cost estimates. In summary:

Route	Cost £ 2008/09 prices
Brown	367,883
Blue	834,063
Green	1,137,189
Orange	1,265,697
Pink	531,124
Purple (including Princes Street / Civic Drive works)	3,468,027
Red	1,338,735
Yellow	1,910,146
Total	**10,852,864**

Blue Route - Town Centre to Ipswich Waterfront

Price Base: Suffolk Carrillion 2008/09

Item	Description	Unit	Quantity	Rate	Amount
200	**Site Clearance**				
	Take up to tip existing PCC kerbing	m	3,920	7.14	27,989
	Take up to tip footway paving, tip gully				1,509
300	**Fencing and Barriers**				
400	**Safety Fences / Barriers and Pedestrain Guard Rails**				
	New pedestrian guard railling	m	20	45.70	914
500	**Drainage and Service Ducts**				
	New gully cover & frame	nr	20	84.48	1,690
600	**Earthworks**				
	Excavation of hard material	m3	66	21.51	1,420
700	**Pavements and Surfacing**				
	Planning, planing, moving paving equipment				4,743
	Thin surface course				47,556
	High Friction surfacing				7,583
1100	**Kerbs, Footways and Paved Areas**				
	New 'conservation', granite kerbing				19,461
	Footways				193,003
1200	**Traffic Signs, Markings, Traffic Signals**				
	MOVA				
	Pedestrian / Toucan Crossings (inc modifications to existing)	no	2	70,000.00	140,000
	Road Markings		1	7,500.00	7,500
1300	**Road Lighting and Electrical**				
2500	**Structures**				
2700.01	**Utilities**	Sum			25,000
2700.02	**Miscellaneous**				
	Street FurnitureStreet Furniture				7,967
3000	**Landscaping**				
	Turfing of verges and batters incl. topsoiling				
	Sub Total				**486,334**
100.00	**Preliminaries**	Sum			
	Site Establishment / Disestablishment	Sum		10%	48,633
100.01	**Contingencies**	Sum		10%	48,633
100.02	**Traffic Management**	Sum		15%	72,950
100.03	**Restricted working**	Sum		12.5%	60,792
100.04	**Environmental management**	Sum		0.5%	2,432
100.05	**Laboratory Costs**	Sum		2.5%	12,158
100.06	**Design & Preparation**	Sum		12.5%	60,792
100.07	**Supervision costs**	Sum		7.5%	36,475
100.08	**Administration**	Sum		1.0%	4,863
100.09	**Other costs**				0
	Estimated Overhead Costs			**£**	**347,729**
	Total Estimated Cost of Works			**£**	**834,064**

Red Route - Lower Brook Street to College Street

Price Base: Suffolk Carrillion 2008/09

Item	Description	Unit	Quantity	Rate	Amount
200	**Site Clearance**				39,603
300	**Fencing and Barriers**				
400	**Safety Fences / Barriers and Pedestrain Guard Rails**				
	New pedestrian guard railling				
500	**Drainage and Service Ducts**				
	New drainage works				21,266
	Reinstatement after drainage works	m2	80	90.31	7,225
600	**Earthworks**				
	Excavation of hard material				0
700	**Pavements and Surfacing**				
	Planning, planing, moving paving equipment				1,990
	High Friction Surfacing	m2	402	13.53	5,439
1100	**Kerbs, Footways and Paved Areas**				
	Kerbing	m	925	30.46	28,176
	Footways				488,728
1200	**Traffic Signs, Markings, Traffic Signals**				
	Pedestrian / Toucan Crossings (inc modifications to existing)	no	2	70,000.00	140,000
	Road Markings	item	1	7,500.00	7,500
1300	**Road Lighting and Electrical**				
2500	**Structures**				
2700.01	**Utilities**				25,000
2700.02	**Miscellaneous**				
	Street furnitureStreet furniture				4,462
3000	**Landscaping**				
	Turfing of verges and batters incl. topsoiling				
	Sub Total				**769,388**
100.00	**Preliminaries**	Sum			
	Site Establishment / Disestablishment	Sum		15%	115,408
100.01	**Contingencies**	Sum		10%	76,939
100.02	**Traffic Management**	Sum		12.5%	96,174
100.03	**Restricted working**	Sum		12.5%	96,174
100.04	**Environmental management**	Sum		0.5%	3,847
100.05	**Laboratory Costs**	Sum		2.5%	19,235
100.06	**Design & Preparation**	Sum		12.5%	96,174
100.07	**Supervision costs**	Sum		7.5%	57,704
100.08	**Administration**	Sum		1.0%	7,694
100.09	**Other costs**				0
	Estimated Overhead Costs			£	**569,347**
	Total Estimated Cost of Works			£	**1,338,735**

Green Route, Woodbridge Road to Waterfront

Price Base: Suffolk Carrillion 2008/09

Item	Description	Unit	Quantity	Rate	Amount
200	**Site Clearance**				
	Take up to tip existing PCC kerbing	m	360	7.14	2,570
	Take up and to tip 76mm dia sign post	nr	20	70.41	1,408
300	**Fencing and Barriers**				
	Erection of highway boundary fence				
400	**Safety Fences / Barriers and Pedestrain Guard Rails**				
	Double sided open box beam in central reserve				
500	**Drainage and Service Ducts**				
	New 150mm dia pipe	m	20	71.94	1,439
	New gully	nr	6	266.00	1,596
	Reinstatement after drainage works	m2	10	90.31	903
600	**Earthworks**				
	Excavation of unacceptable material	m3	50	4.16	208
700	**Pavements and Surfacing**				
	Carriageway construction, drainage and auxiliary works				
	High Friction surfacing	m2	200	14.20	2,840
1100	**Kerbs, Footways and Paved Areas**				
	New 'conservation' kerbing	m	360	30.46	10,966
	Footways				187,173
1200	**Traffic Signs, Markings, Traffic Signals**				
	Pedestrian / Toucan Crossings (inc modifications to existing)	no	6	70,000.00	420,000
	New and refresh all road markings	item	1	7,500.00	7,500
1300	**Road Lighting and Electrical**				
2500	**Structures**				
2700.01	**Utilities**				
	Statutory Undertakers Services				25,000
2700.02	**Miscellaneous**				
	Street FurnitureStreet Furniture				6,290
3000	**Landscaping**				
	Turfing of verges and batters incl. topsoiling and Planters etc.	item	1	5,000.00	5,000
	Sub Total				**672,893**
100.00	**Preliminaries**	Sum			
	Site Establishment / Disestablishment	Sum		10%	67,289
100.01	**Contingencies**	Sum		10%	67,289
100.02	**Traffic Management**	Sum		12.5%	84,112
100.03	**Restricted working**	Sum		12.5%	84,112
100.04	**Environmental management**	Sum		0.5%	3,364
100.05	**Laboratory Costs**	Sum		2.5%	16,822
100.06	**Design & Preparation**	Sum		12.5%	84,112
100.07	**Supervision costs**	Sum		7.5%	50,467
100.08	**Administration**	Sum		1.0%	6,729
100.09	**Other costs**				0
	Estimated Overhead Costs			£	**464,296**
	Total Estimated Cost of Works			£	**1,137,189**

Purple Route - Railway Station to Ipswich Town Centre

Price Base: Suffolk Carrillion 2008/09

Item	Description	Unit	Quantity	Rate	Amount
200	**Site Clearance**				
					4,773
300	**Fencing and Barriers**				
400	**Safety Fences / Barriers and Pedestrain Guard Rails**				
	New pedestrian guard railling				
500	**Drainage and Service Ducts**				
	New drainage works				5,449
	Reinstatement after drainage works	m2	22	90.31	1,987
600	**Earthworks**				
	Excavation of hard material				1,738
700	**Pavements and Surfacing**				
	Planning, planing, moving paving equipment				3,574
	Thin surface course				3,184
	High Friction Surfacing				2,368
	Bus Lane in red carriageway surfacing				15,375
1100	**Kerbs, Footways and Paved Areas**				
	Kerbing				5,729
	Footways				75,553
1200	**Traffic Signs, Markings, Traffic Signals**				
	MOVA				
	Pedestrian / Toucan Crossings (inc modifications to existing)	no	4	70,000.00	280,000
	Road Markings		1	7,500.00	7,500
1300	**Road Lighting and Electrical**				
2500	**Structures**				
2700.01	**Utilities**				75,000
2700.02	**Miscellaneous**				
	Street furnitureStreet furniture				7,078
3000	**Landscaping**				
	Turfing of verges and batters incl. topsoiling				
	Sub Total				**489,307**
100.00	**Preliminaries**	Sum			
	Site Establishment / Disestablishment	Sum		15%	73,396
100.01	**Contingencies**	Sum		10%	48,931
100.02	**Traffic Management**	Sum		15%	73,396
100.03	**Restricted working**	Sum		12.5%	61,163
100.04	**Environmental management**	Sum		0.5%	2,447
100.05	**Laboratory Costs**	Sum		2.5%	12,233
100.06	**Design & Preparation**	Sum		12.5%	61,163
100.07	**Supervision costs**	Sum		7.5%	36,698
100.08	**Administration**	Sum		1.0%	4,893
100.09	**Other costs**				0
	Estimated Overhead Costs			£	**374,320**
	Total Estimated Cost of Works			£	**863,627**

Princes Street/Civic Drive junction				Price Base	Suffolk Carrillion 2008/09
Item	**Description**	**Unit**	**Quantity**	**Rate**	**Amount**
200	**Site Clearance**				75,000.0
300	**Fencing and Barriers**				
400	**Safety Fences / Barriers and Pedestrain Guard Rails**				
	New pedestrian guard railling				15,000.0
500	**Drainage and Service Ducts**				50,000.0
600	**Earthworks**				
	Excavation of hard material	m3		21.51	
	Excavation of unacceptable material	m3		4.16	
	Deposition of fill	m3		4.54	
700	**Pavements and Surfacing**				
	Planning, planing, moving paving equipment				175,000.0
	High Friction Surfacing				10,000.0
1100	**Kerbs, Footways and Paved Areas**				
	Kerbing				75,000.0
	Footways				260,000.0
1200	**Traffic Signs, Markings, Traffic Signals**				
	Road Markings	item	1	10,000.00	10,000.0
	Pedestrian / Toucan Crossings (inc modifications to existing)	no			
1300	**Road Lighting and Electrical**				50,000.0
2500	**Structures**				100,000.0
2700.01	**Utilities**	Sum			500,000.0
2700.02	**Miscellaneous**				
	Street furniture				30,000.0
3000	**Landscaping**				
	Turfing of verges and batters incl. topsoiling/planters etc.	Sum			10,000.0
	Sub Total				**1,360,000.0**
100.00	**Preliminaries**				
	Site Establishment / Disestablishment	Sum		10%	136,000.0
100.01	**Contingencies**	Sum		10%	136,000.0
100.02	**Traffic Management**	Sum		35.0%	476,000.0
100.03	**Restricted working**	Sum		12.5%	170,000.0
100.04	**Environmental management**	Sum		0.5%	6,800.0
100.05	**Laboratory Costs**	Sum		2.5%	34,000.0
100.06	**Design & Preparation**	Sum		12.5%	170,000.0
100.07	**Supervision costs**	Sum		7.5%	102,000.0
100.08	**Administration**	Sum		1.0%	13,600.0
100.09	**Other costs**				0.0
	Estimated Overhead Costs			**£**	**1,244,400.0**
	Total Estimated Cost of Works			**£**	**2,604,400.0**

Pink Route - Railway Station to Ipswich Waterfront

Price Base: Suffolk Carrillion 2008/09

Item	Description	Unit	Quantity	Rate	Amount
200	**Site Clearance**				
300	**Fencing and Barriers**				
400	**Safety Fences / Barriers and Pedestrain Guard Rails**				
	New pedestrian guard railling				
500	**Drainage and Service Ducts**				
	New drainage works				4,468
	Reinstatement after drainage works	m2	5	90.31	452
600	**Earthworks**				
	Excavation of hard material				1,211
700	**Pavements and Surfacing**				
	Planning, planing, moving paving equipment				2,465
	Thin surface course				6,063
	High Friction Surfacing				21,344
	Reinstatement after c/way widening works				5,419
1100	**Kerbs, Footways and Paved Areas**				
	Kerbing				2,851
	Footways				39,494
1200	**Traffic Signs, Markings, Traffic Signals**				
	Pedestrian / Toucan Crossings (inc modifications to existing)	no	3	70,000.00	210,000
	Road Markings		1	7,500.00	7,500
1300	**Road Lighting and Electrical**				
2500	**Structures**				
2700.01	**Utilities**				5,000
2700.02	**Miscellaneous**				
	Street furnitureStreet furniture				3,427
3000	**Landscaping**				
	Turfing of verges and batters incl. topsoiling				
	Sub Total				**309,693**
100.00	**Preliminaries**	Sum			
	Site Establishment / Disestablishment	Sum		10%	30,969
100.01	**Contingencies**	Sum		10%	30,969
100.02	**Traffic Management**	Sum		15%	46,454
100.03	**Restricted working**	Sum		12.5%	38,712
100.04	**Environmental management**	Sum		0.5%	1,548
100.05	**Laboratory Costs**	Sum		2.5%	7,742
100.06	**Design & Preparation**	Sum		12.5%	38,712
100.07	**Supervision costs**	Sum		7.5%	23,227
100.08	**Administration**	Sum		1.0%	3,097
100.09	**Other costs**				0
	Estimated Overhead Costs			£	**221,431**
	Total Estimated Cost of Works			£	**531,124**

Orange Route, Portman Road between Princes Street to Norwich Road

Price Base: Suffolk Carrillion 2008/09

Item	Description	Unit	Quantity	Rate	Amount
200	**Site Clearance**				27,002
300	**Fencing and Barriers**				
400	**Safety Fences / Barriers and Pedestrain Guard Rails**				
	New pedestrian guard railling				
500	**Drainage and Service Ducts**				
	New drainage works				17,679
	Reinstatement after drainage works	m2	50	90.31	4,516
600	**Earthworks**				
	Excavation of unacceptable material	m3	500	4.16	2,080
	Excavation of hard material	m3	100	21.51	2,151
700	**Pavements and Surfacing**				
	High Friction Surfacing	m2	100	14.20	1,420
1100	**Kerbs, Footways and Paved Areas**				
	Kerbing	m	700	30.46	21,322
	Footways				489,849
1200	**Traffic Signs, Markings, Traffic Signals**				
	Pedestrian / Toucan Crossings (inc modifications to existing)	no	2	70,000.00	140,000
	Road Markings	item	1	7,500.00	7,500
1300	**Road Lighting and Electrical**				
2500	**Structures**				
2700.01	**Utilities**				25,000
2700.02	**Miscellaneous**				
	Street FurnitureStreet Furniture				10,415
3000	**Landscaping**				
	Turfing of verges and batters incl. topsoiling				
	Sub Total				**748,933**
100.00	**Preliminaries**	Sum			
	Site Establishment / Disestablishment	Sum		10%	74,893
100.01	**Contingencies**	Sum		10%	74,893
100.02	**Traffic Management**	Sum		12.5%	93,617
100.03	**Restricted working**	Sum		12.5%	93,617
100.04	**Environmental management**	Sum		0.5%	3,745
100.05	**Laboratory Costs**	Sum		2.5%	18,723
100.06	**Design & Preparation**	Sum		12.5%	93,617
100.07	**Supervision costs**	Sum		7.5%	56,170
100.08	**Administration**	Sum		1.0%	7,489
100.09	**Other costs**				0
	Estimated Overhead Costs			£	**516,764**
	Total Estimated Cost of Works			£	**1,265,697**

Brown Route - Museum Street to Rope Walk

Price Base: Suffolk Carrillion 2008/09

Item	Description	Unit	Quantity	Rate	Amount
200	**Site Clearance**				8,150
300	**Fencing and Barriers**				
400	**Safety Fences / Barriers and Pedestrain Guard Rails**				
	New pedestrian guard railling				
500	**Drainage and Service Ducts**				
	New drainage works				10,893
	Reinstatement after drainage works	m2	40	90.31	3,612
600	**Earthworks**				
	Excavation of hard material				0
700	**Pavements and Surfacing**				
	Planning, planing, moving paving equipment				2,230
	Thin surface course				1,338
	High Friction Surfacing				4,686
1100	**Kerbs, Footways and Paved Areas**				
	Kerbing				31,719
	Footways				120,499
1200	**Traffic Signs, Markings, Traffic Signals**				
	Pedestrian / Toucan Crossings (inc modifications to existing)				
	Road Markings				
			1	7,500.00	7,500
1300	**Road Lighting and Electrical**				
2500	**Structures**				
2700.01	**Utilities**				25,000
2700.02	**Miscellaneous**				
	Street furnitureStreet furniture				5,322
3000	**Landscaping**				
	Turfing of verges and batters incl. topsoiling				
	Sub Total				**220,951**
100.00	**Preliminaries**	Sum			
	Site Establishment / Disestablishment	Sum		10%	22,095
100.01	**Contingencies**	Sum		10%	22,095
100.02	**Traffic Management**	Sum		10%	22,095
100.03	**Restricted working**	Sum		12.5%	27,619
100.04	**Environmental management**	Sum		0.5%	1,105
100.05	**Laboratory Costs**	Sum		2.5%	5,524
100.06	**Design & Preparation**	Sum		12.5%	27,619
100.07	**Supervision costs**	Sum		7.5%	16,571
100.08	**Administration**	Sum		1.0%	2,210
100.09	**Other costs**				0
	Estimated Overhead Costs			£	**146,932**
	Total Estimated Cost of Works			£	**367,883**

Yellow Route - High Street to Cardinal Park and Waterfront

Price Base: Suffolk Carrillion 2008/09

Item	Description	Unit	Quantity	Rate	Amount
200	**Site Clearance**				
					24,640
300	**Fencing and Barriers**				
400	**Safety Fences / Barriers and Pedestrain Guard Rails**				
	New pedestrian guard railling				
500	**Drainage and Service Ducts**				1,402
600	**Earthworks**				
	Excavation of hard material	m3	2,550	21.51	54,851
	Excavation of unacceptable material	m3	517	4.16	2,151
	Deposition of fill	m3	517	4.54	2,347
700	**Pavements and Surfacing**				
	Planning, planing, moving paving equipment				1,990
	High Friction Surfacing				8,278
1100	**Kerbs, Footways and Paved Areas**				
	Kerbing				16,767
	Footways				703,278
1200	**Traffic Signs, Markings, Traffic Signals**				
	Road Markings	item	1	7,500.00	7,500
	Pedestrian / Toucan Crossings (inc modifications to existing)	no	4	70,000.00	280,000
1300	**Road Lighting and Electrical**				
2500	**Structures**				
2700.01	**Utilities**	Sum			5,000
2700.02	**Miscellaneous**				
	Street furnitureStreet furniture				21,060
3000	**Landscaping**				
	Turfing of verges and batters incl. topsoiling/planters etc.	Sum			1,000
	Sub Total				**1,130,264**
100.00	**Preliminaries**				
	Site Establishment / Disestablishment	Sum		10%	113,026
100.01	**Contingencies**	Sum		10%	113,026
100.02	**Traffic Management**	Sum		12.5%	141,283
100.03	**Restricted working**	Sum		12.5%	141,283
100.04	**Environmental management**	Sum		0.5%	5,651
100.05	**Laboratory Costs**	Sum		2.5%	28,257
100.06	**Design & Preparation**	Sum		12.5%	141,283
100.07	**Supervision costs**	Sum		7.5%	84,770
100.08	**Administration**	Sum		1.0%	11,303
100.09	**Other costs**				0
	Estimated Overhead Costs			£	**779,882**
	Total Estimated Cost of Works			£	**1,910,146**

Appendix G

Suffolk County Council | AECOM

Suffolk County Council
Local Transport Plan

City ID

Ipswich wayfinding system
May 2009

Contents

Introduction

1.0 Introduction
This document has been prepared by City ID and Faber Maunsell | AECOM in support of the Major Scheme Business Case on behalf of Suffolk County Council to develop a new wayfinding and public transport information system for Ipswich Town Centre. The Town Centre encompasses the Central Area, Ipswich Waterfront and the emerging University Quarter. The objective is to develop a genuinely World Class multi-modal information system to help transform the experience of walking, cycling and using public transport services in Ipswich Town Centre.

The costs outlined in the note allow for the development of:
1. A unique graphic identity for communicating transport products and services
2. A unique wayfinding and interpretation system
3. Ancillary print services to aid visitor's/residents understanding and experience of Ipswich

The document summarises:
– Aims
– Benefits to Ipswich
– Overall project scope
– Proposed project development stages
– Proposed programme and timescale
– Estimated development and implementation costs
– Recommended next steps

Aims & Benefits to Ipswich

2.0 Aims
The wayfinding and information system aims to improve the experience of Ipswich Town Centre for all users by radically transforming the quality of information across all modes of transport at every stage in the journey experience – from arrival to departure.

The project will provide the vision and design direction to coordinate information, communication and movement projects across media including web, mobile, digital, print and on-street wayfinding products within the public realm.

The wayfinding system will make Ipswich easier to understand and navigate by all modes of travel, whilst promoting a public realm of outstanding quality that is coherent and welcoming to residents and visitors alike. In particular, by prioritising the development of a new on-street wayfinding system, the project will give people more confidence to explore and travel around the Town Centre by walking, cycling and public transport.

3.0 Benefits to Ipswich
The project will deliver 5 principal benefits:

1. Promote walking, cycling and the use of public transport
2. Make Ipswich more competitive and maximise economic potential
3. Target specific needs of residents and visitors and increase visitor spend
4. Deliver modal integration
5. Promote healthy, lifestyle choices and reinforce civic and cultural pride

Overall project scope and description

4.0 Overall project scope
The project scope will include improving every facet of the whole transport journey experience spanning:
– Pre-arrival and journey planning information
– Welcome/arrival, network and onward journey information
– On-street orientation, navigation, direction and finding services
– Interface with rail, taxi and public transport services

A combination of web, mobile, print and sign media will be developed to provide information services and products, bound by a consistent visual identity, design resources and content management system. Throughout the user experience, information will be tailored to provide the right information at the right time in the journey and support modal integration.

4.1 Pre-arrival and journey planning information
Meeting transport information needs for visitors before arriving in the city provides the most significant opportunity to influence a visitors choices of how to travel to and move around Ipswich. Whether it is choosing what mode of transport to travel to Ipswich, to understanding which arrival point will provide easy access to your destination – one of the Park & Ride sites or preferred choice of town centre car parks.

In support of other visitor information, pre-arrival and journey planning information also provides an important opportunity to communicate transport policy and sustainable active travel modes promoting walking, cycling and the use of public transport.

4.2 Welcome/arrival, network and onward journey information
Providing high quality visitor information on arrival in Ipswich will have a significant impact on a visitors ability to locate and find destinations and attractions, improving their knowledge and experience of the town. The arrival products will provide an overview of the town centre, providing an opportunity to reveal the multi-modal transport network, to help visitors connect destination choices, plan their route and make decisions about modes of travel to reach their destination.

Overall project scope and description

4.3 On-street wayfinding products
The on-street network of wayfinding products will provide a continual point of reference for orientation and navigation, reinforcing the route networks and providing confidence to the user. The provision of map based information at key nodal/ decision points will help users to locate and learn about the city, it's geography and what it has to offer – providing the means for exploration and revealing nearest transport connections throughout their journey.

The on-street wayfinding products primary function is to provide location specific information for orientation, navigation, direction and finding services. The cycle network will be supported with relevant signs complying with the Traffic Signs Regulations and General Directions (TSRGD) 2002, when on the public highway. When routes are shared by pedestrians and cycles only, cycle information will be combined with the pedestrian wayfinding products to reduce sign clutter.

4.4 Interface with rail, taxi and public transport services
The on street wayfinding system is fundamental to the integration of a multi-modal transport system that will provide the interface between the different transport modes.

This is not the design of a system for one mode, or one aspect of the journey, as is the case in many town and city centre pedestrian sign systems. The information system will be designed to provide a connected and seamless whole journey experience across all modes, that is intuitive and tailored to user needs at any particular point in their journey. It will also be designed to ensure it is able to grow, reveal and communicate new destinations, facilities and services in the future.

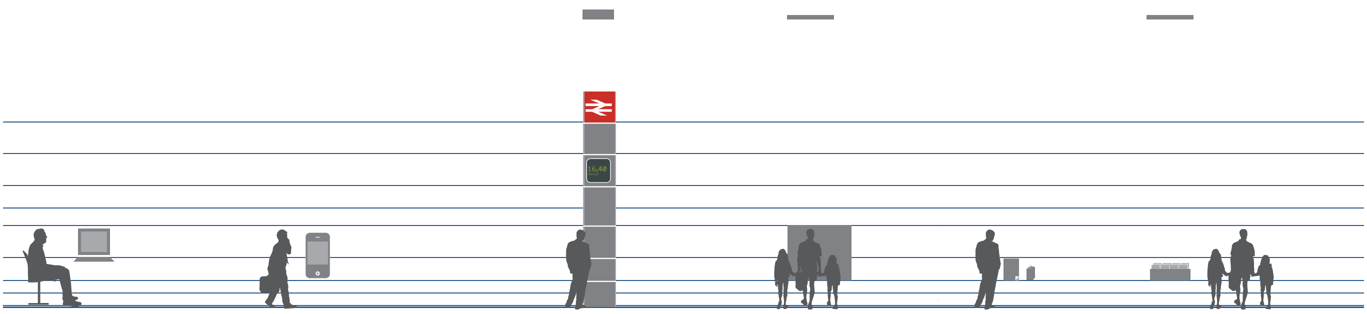
Ipswich project scope
Multimodel Information system

Pre arrival

At home online, on the phone and mobile technology on the move
Finding
Planning

Arrival & departure

Entrances and exits of Stations, Car Parks
Locating Orientation
Overview Connections



Visitor website
_welcome
_visitor information
_travel information
_network map
_city centre map
_visitor guides
_customisable map suite
_printable maps
_downloadable PDFs

Mobile technology
_welcome
_visitor information
_travel information
_network map
_city centre map
_visitor guides
_customisable map suite
_printable maps
_downloadable PDFs

Arrival information point
_network icon/logo
_clock
_locator
_interpretation
_panorarma
_direction legend
_area map
_city centre diagram

Display Board
_welcome
_visitor information
_travel information
_marketing & promotion
_network map
_route diagram
_onward journey map
_destination finder
_route finder
_network frequency table
_first/last buses
_operator details
_regulatory information
_service information
_price & ticketing
_where to buy your ticket
_traveline information
_complaints procedure
_www.address
_reporting faults

Types of locations displayed
_hotels, guest houses, B&B's hostels
_universities, colleges
_tourist & travel information centres & kiosks
_ train & bus stations car parks
_shopping centres

Printed material
_maps
_timetables
_destination finders

Information dispenser
_maps
_travel timetables
_marketing & promotion material

Types of locations displayed
_hotels, guest houses, B&B's hostels
_universities, colleges
_tourist & travel information centres & kiosks
_airport, ferry terminals, train & bus stations stations, car parks
_shopping centres

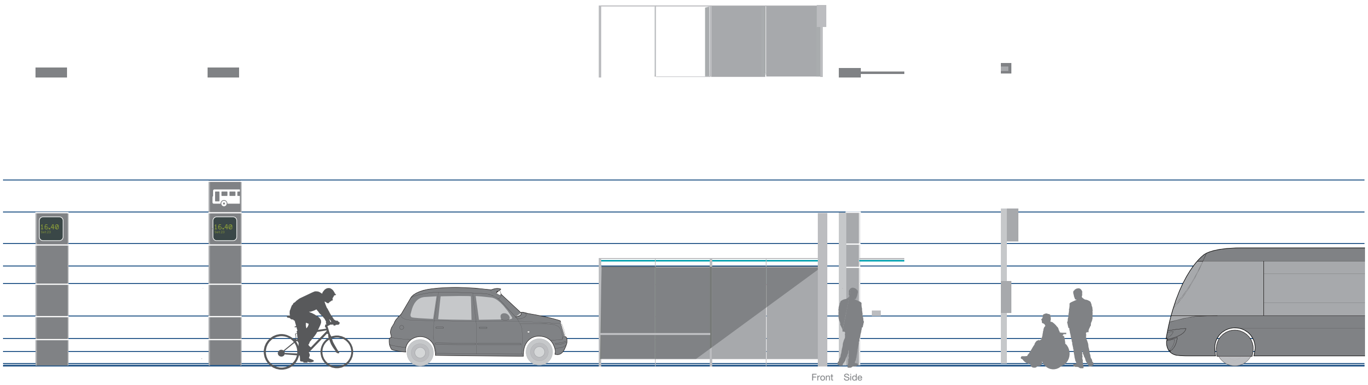
Ipswich project scope
Multimodel Information system

On route & on board

Taxi

On street
Interchange
Wayfinding

Navigation
Direction



Pedestrian/cycle information point
_clock
_locator
_interpretation
_panorarma
_direction legend
_area map
_city centre diagram

Interchange information point
_network icon/logo
_mode indicators
_clock
_locator network map
_key
_route finder/key to services
_destination finder/ index of places served
_Plus Bus logo
_Traveline information
_www.address

Taxi
_livery
_operational information
_on board literature
_maps and guides

Bus shelter – 4 bay with integral flag – shelter
_manifestation to glass
_network icon/logo
_mode indicator
_stop name
stop number/reference
_'bus stop'
_operator logo
_organisation logo
_direction of travel
_stop plates
_bus numbers
_corridor/route diagram
_timetables/frequency indicator
_RTI
_first/last bus
_operator details
_how the 24 clock works
_locator
_onward journey map
_regulatory information
_service information
_price & ticketing
_where to buy your ticket
_traveline information
_complaints procedure
_www.address
_reporting faults
_marketing & promotion

Tickets & passes
_smart cards
_passes

Pole mounted Transport flag
_network icon/logo
_mode indicator
_stop name
_stop number/ reference
_'bus stop'
_operator logo
_organisation logo
_direction of travel
_stop plates
_bus numbers
_timetables/frequency indicator
_first/last bus
_operator details

Bus
_livery
_operational information
_route diagrams
_network maps
_seat fabric
_uniforms

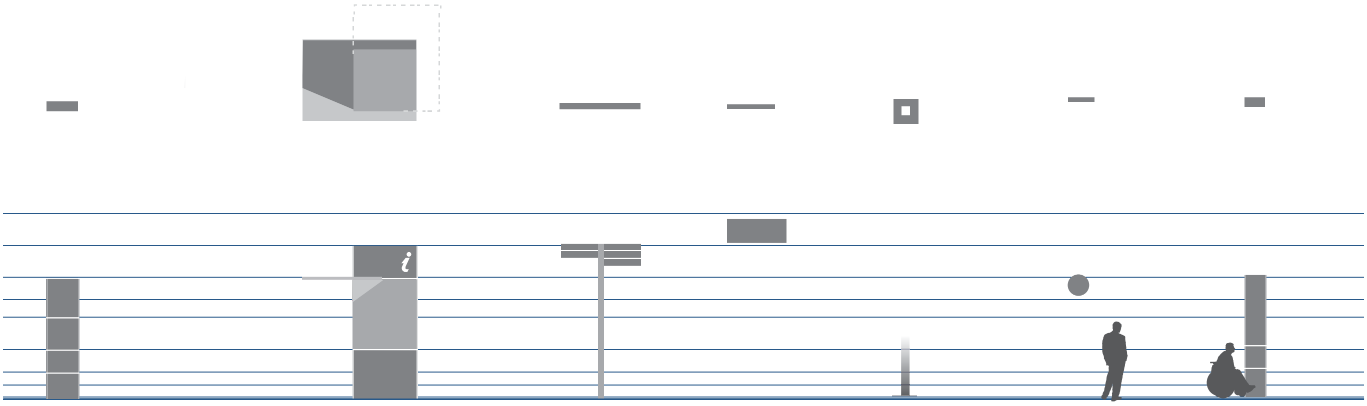
Ipswich project scope
Multimodel Information system

At your destination/area

Within key spaces and destinations

Finding
Search

Interpretation
Explore



Destination information point
_welcome
_locator
_interpretation
_destination detail map
_nearest & dearest
_direction legend

Information kiosk
_clock
_locator
_vending
_retail
_information
_bookings
_toilets

Finger post
_directions

Street nameplate
_street name
_named area
_postal district

Route light marker

Plaque
_name
_description
_date

Interpretation
_locator
_interpretation

Project development stages, tasks and outputs

5.0 Brief description of the proposed project development stages and key tasks
The following project development stages and tasks are proposed:

Stage 1. Project development, stakeholder engagement and initial project management – including project development, partnership development, project advocacy, brief development, procurement, commissioning and communications.

Development and stakeholder engagement
– Appointment of an interim full time project manager on behalf of the project partners'
– Stakeholder engagement
– Partnership development – establishment of a Project Board (partnership group)
– Terms of reference

Project management and coordination
– Project management and coordination
– Communications and stakeholder engagement
– Project market briefs and full briefs
– Procurement contracts advice and legal services
– Tendering legal documentation and contracts
– Approvals
– Procurement
– Selection
– Appointment

Concept design and projects framework
– Concept development
– Framework development (agreement to project scope, defining roles and responsibilities, funding sources, cost planning, project deliverables/projects framework etc.)

Indicative timescale: March 2009 to July 2009
Estimated concept and project development cost: £15,000–£20,000
Estimated concept design and project framework cost: £30,000–£35,000
Funding sources: SCC

Project development stages, tasks and outputs

Stage 2. Design development including pilot wayfinding and information products
Focusing on the implementation of an on-street pilot pedestrian signing project and supporting information projects to promote walking and improve modal integration in Ipswich Town Centre. This stage will include the development of a series of 'enabling' tasks and resources to guide the development and delivery of improved information and transport services including:

1. Network planning and development – analysis of the town's urban structure including its land use function, spatial structure and movement systems including arrival points, public transport interchanges, public transport and definition of core walking network
2. Nomenclature, information architecture and content – a naming and content strategy to enable the consistent use of agreed nomenclature, across the structure of information delivery and content hierarchy relating to attractions, destinations and services that will appear within the information system. Including real-time passenger information systems and variable message sign systems.
3. Graphic identity – a graphic kit of parts including typography, colour set, pictograms, illustration and cartography to be used within the system
4. Product identity – development of a suite or family of street furniture types focusing on wayfinding, information products to promote and assist walking, cycling and use of public transport services
5. User testing – on-street testing of design solutions to inform the design development process at key stages and to record results for consultation and evaluation purposes

The project development stages for task 3 and 4 will include concept, design, artworking and prototyping. The resources that are developed through these stages could then be used in the development of other services such as print guides, maps, personalised travel plans, web information and journey planning products.

Indicative timescale: Sept 2009 to July 2010
Estimated cost: £170,000 – £230,000 (dependent on numbers of prototype products to be developed)
Funding sources: DfT, SCC and IBC

Project development stages, tasks and outputs

Stage 3. Full project development of the system and implementation
To link and integrate the following services to form a wayfinding and information system that would serve the needs of residents and visitors consisting of:

1. Pre-arrival and journey planning information – web based visitor information and journey planning tools.
   - digital maps and travel instructions that are downloadable and printable
   - transport information content that promotes local transport policy
   - web based journey planning tools - accessible by mobile technology

   Total cost estimate: £25,000

2. Welcome/arrival information points – integrated visitor information and transport network and onward journey information services at arrival, enabling destination finding, orientation, modal choice and route planning. Estimated product quantities to be manufactured and installed include:
   - 1 x Railway Station, 1 x £10,000
   - 2 x Bus Stations (Tower Ramparts & Old Cattle Market), 2 x £7,500 = £15,000
   - 3 x Park and Ride car parking sites, 3 x £7,500 = £22,500
   - 8 x Town Centre car parks, 8 x £6,500 = £52,000
   - 20 x Display board information points (internal environments) for location at hotels, university buildings, shopping centres and other prominent destinations and attractions, 20 x £750 = £15,000
   - 50 x Information dispensers for printed walk-cycle-bus maps - distribution as above 50 x £250 = £12,500

   Total cost estimate: £130,000

3. Town Centre on-street wayfinding system – a comprehensive on-street wayfinding and information system for pedestrians include a range of new street furniture, a combination of bespoke and off the shelf products:
   - 20 x Pedestrian/cycle information points, 20 x £7,500 = £150,000
   - 10 x Interchange information points, 10 x £7,500 = £75,000
   - 25 x Finger post products, 25 x £2,500 = £62,500
   - 10 x Destination information points, 10 x £4,500 = £45,000

   Total cost estimate: £332,500

Project development stages, tasks and outputs

4. Mutil-modal mapping system – a complimentary range of print and web maps to support modal integration:
   – free walk-cycle-bus printed maps (100,000 copies), to be distributed at arrival points, on public transport, taxis, public service receptions, businesses, hotels and accommodation providers, tourist information centre.
   Design cost £25,000, (one off cost), Printing cost £10,000
   – about the network, printed maps to support modal shift initiatives and encourage behavioural change (25,000 copies)
   Design cost £7,500, Printing cost £2,500
   – active travel leaflets targeting specific modes including walking, cycling and running routes (25,000 copies)
   Design cost £7,500, Printing cost £2,500

   Total cost estimate: £55,000

5. Town Centre bus transit integration – integration of bus priority schemes, bus transit or loop system and extended free shuttle bus, linking points of arrival, bus stations (Tower Ramparts and Old Cattle Market) new midi interchanges and key destinations in Ipswich Town Centre. To include selected shelter and stop infrastructure, network information, timetables and onward journey information, internal information and possibly vehicle livery and design of other service elements.

   Total cost estimate: £400,000

Appointment of a lead designer and design team responsible for the complete range of wayfinding, information and related public transport products and services including ancillary web and print based services, followed by appointment of a lead manufacturer for the supply and installation of the product range.

Indicative timescale: from March 2010 to March 2012. Installation of a comprehensive on-street wayfinding and information system will commence towards the end of 2010 onwards.

Estimated total cost: approx £837, 500

Funding sources: DfT, SCC, IBC, the University, Section 106, others TBD

Project development stages, tasks and outputs


Online map suite


Printable PDFs

Vehicular sign systems


Arrival/gateways


Nodal Information point

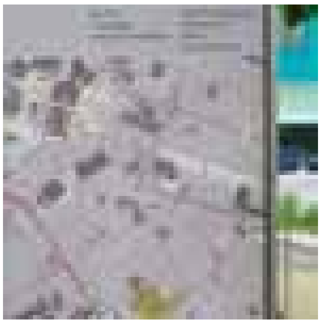

Network maps

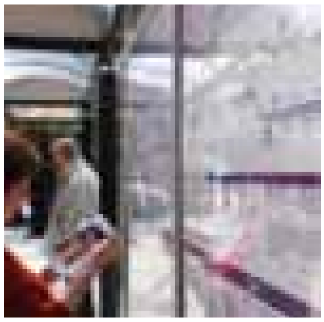

Free print maps


Pedestrian walking information

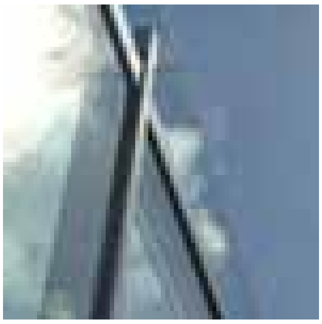

Onward journey information


Direction information


Pedestrian wayfinding sign system


Timetables and route maps

Project development stages, tasks and outputs


Bus shelters

Bus liveries


Bus flags

Taxi shelters

On-board information

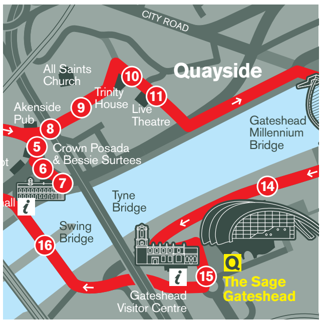

Transport information displays


Pedestrian information point

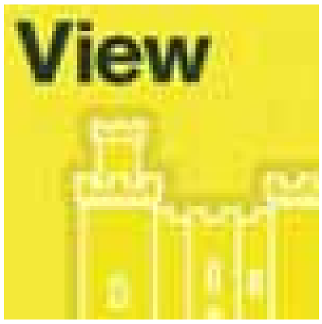

Interpretation


Walk and cycle guides


Transport flags



Trails and guides



Marketing

Project development stages, tasks and outputs

Stage 4. Design management, updating and maintenance
In developing the project, from the outset, a robust rationale must be developed for ongoing design management and updating of the wayfinding system.

A model and forecast analysing whole life costs of the system must be developed, working closely with the Client project team, product designers and manufacturers to ensure a comprehensive whole life analysis is established which is robust for objective review and scrutiny. Considerations to capture whole life costs include, but are not limited to:
– Product materials and properties
– Environmental impact
– Ease of manufacture and installation
– Ease of updating, maintenance and refurbishment
– In service performance
– Ease of disassembly/recycling/disposal costs
– Asset value as scrap (e.g. stainless steel)

This must be translated into a service design specification for wayfinding system to ensure its investment is protected, managed and maintained throughout its lifespan.

Indicative timescale: Through development phase and annual maintenance schedule.
Estimated cost: TBD
Funding sources: Section 106, others TBD

Stage 5. Evaluation
It is proposed that distinct measurable objectives are used to evaluate the project. It should be noted that many of the benefits are expected to build up over time for example, many of the health and environmental benefits rely on a gradual mode shift to walking. Therefore the evaluation framework should focus on factors that can be reliably measured locally and in a short time frame.

Project development stages, tasks and outputs

The objectives of evaluation is to:

1. Evaluate the benefits of an integrated multi-modal way-finding system in Ipswich compared to Ipswich's existing baseline walking environment;
2. Ascertain the value of different types of products to users (eg. whether to invest in more or less print, web, other digital or sign products as the project moves forward.
3. Develop criteria for the evaluation of the benefits that could be used elsewhere - a best practice modal for adoption in other town and city environments; and
4. To evaluate the comparative integration of modes and walkability before and after the implementation.

Areas for evaluation would include:
– Time savings and connectivity
– Quality of environment
– Understanding of the transport network
– User confidence
– User perception and satisfaction
– Modal shift

The following method of work is proposed for the evaluation framework:
– Full area-wide signage audit
– Questionnaire survey (sample 1,000)
– Pedestrian tracking survey (sample 300)
– Mystery shopper survey
– Pedestrian Environment Review System (PERS) audits commissioned

Indicative timescale:
Pre evaluation July to Sept 2009
Post evaluation: March 2012 to June 2012
Estimated cost: approx £20,000 – £25,000 - realistic
Funding sources: DfT, SCC

Total cost range: £935,000 – £1,160,000 excluding contingency (rec. 10-15%) and revenue costs associated with Stage 5.

Estimated Year 1 spend from March/April 2009 to March 2010
£195,000 – £255,000
Estimated Year 2 spend from April 2010 to March 2011
£390,000 – £470,000
Estimated Year 3 spend from April 2011 to March 2012
£350,000 – £435,000

Project development stages, tasks and outputs

6.0 Recommended next steps
The following tasks need to be undertaken prior to commencing the design stages:

1. Initial consultation on Project Development Report
2. Appoint Lead Authority and interim Project Manager/ Coordinator and confirm initial partnership arrangements, terms of reference and initial funding arrangements
3. Establish a Project Board to manage and oversee the project and a Project Working Group to develop and deliver the project
4. Develop a detailed cost plan showing potential income and expenditure by project stage covering the period March 2009 – March 2012. Sources to include LTP, IBC Cap Prog and Section 106. Agree funding costs and milestones between the key partners, initially for Stage 1. Project development and Stage 2. Design development and pilot products.
5. Agree first phase deliverables
6. Agree procurement route
   Approach and process
   - Project management support
   - Creative direction
   - Design services for pilot and full projects
   - Supply of manufacturing services & implementation
   - Maintenance and future information management
7. Produce final brief(s) including:
   - Study context and location plan (preparation of supporting material required)
   - Collate background material (previous studies/relevant studies)
   - Market brief development (prior to full brief)
   - Prepare final brief
   - Approvals and sign off
8. Commission legal/procurement services
9. Commissioning design services through agreed procurement route
10. Appointment

Contact Information

Suffolk County Council
Local Transport Plan

Major scheme business case
Ipswich – Fit for the 21st Century
A sustainable transport major scheme

Ipswich wayfinding framework
Project development discussion note
Prepared for Suffolk County Council in partnership with Faber Maunsell by City ID Limited. February 2009. Version 2.

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Appendix H

Suffolk County Council | AECOM

Ipswich Transport Model
Travel Survey Report

Suffolk County Council
February 2009

Prepared by: .... Approved by: ....
Sarah Briffett/ David Taylor — Ian Burrows
Graduate Consultant/ Senior Consultant — Associate Director

Ipswich Transport Model
Model Scope and Specification

Rev No	Comments	Date
1.0	First draft for client comment.	05/12/2008
2.0	Revised for circulation	28/01/2009
3.3	Approved for circulation	27/02/2009

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Job No 60044295 Date Created December 2008

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1 Introduction

1 Introduction

1.1 Context

1.1.1 Faber Maunsell has been working with Suffolk County Council since 2004 on the development of an integrated town-centre transport systems upgrade, including bus station and interchange improvements, traffic and bus priority systems, and public realm improvements for walking and cycling. This formed a Major Scheme Business Case (MSBC) submission to the DfT in 2005.

1.1.2 The latest phase of work is the development of the 'Ipswich Transport Analysis and Modelling Suite' or 'ITAMS'. The model building will be based on a major programme of new surveys, which was undertaken during 2008 and is detailed in this report. This has involved a variety of techniques, as detailed in Section 1.2.1 below.

1.1.3 The surveys were undertaken successfully in two phases, in the spring and autumn of 2008. Details of the methodology and the data produced are outlined in this report; the area covered by the programme is shown within Section 1.2.2 below. The resulting data will be used to build highway, bus, active mode (walk/cycle) and demand models. The development of these models will draw on Faber Maunsell's knowledge and experience in developing similar models for applications in the east of England.

1.1.4 This Travel Survey Report is intended to provide an outline of the programme of surveys to users and potential users of the data sources. This Revision 3.3 has been finalised in February 2009 for wider issue.

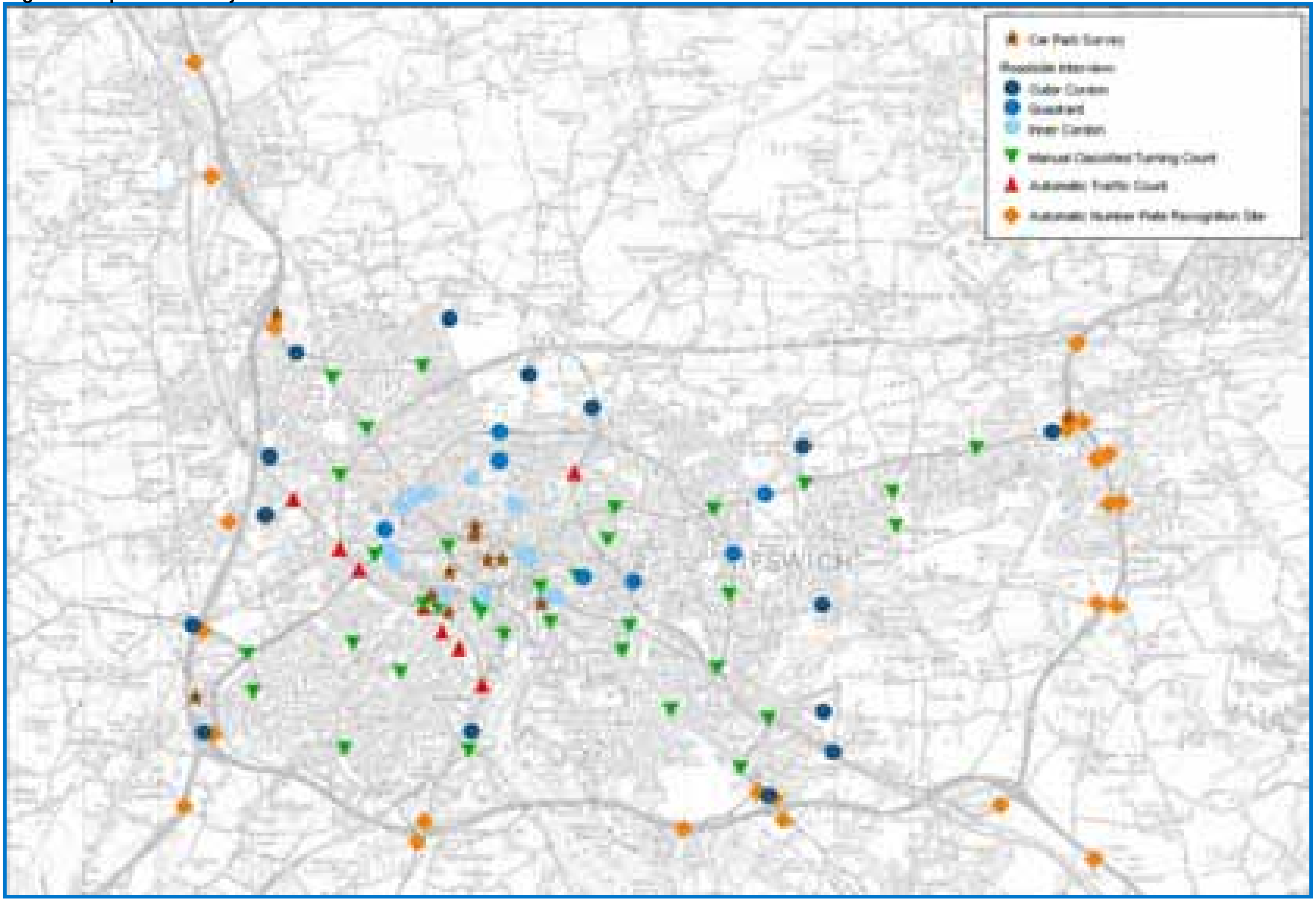
1.2 Survey Programme Scope

1.2.1 The comprehensive and complicated nature of the modelling work to be undertaken necessitates a wide range of empirical inputs. While several existing data sources were of value, an extensive programme of survey work was required to complement previous sources. The scope of the new surveys outlined here comprises:

- Automatic Number Plate Recognition;
- roadside interviews;
- automatic and manual traffic count surveys;
- journey time surveys;
- bus passenger interviews; and
- car park user interviews.

1.2.2 The area covered by the survey sites relates to the scope for ITAMS and is indicated in **Figure 1.1**, which shows the locations of the sites for each type of survey.

Figure 1.1: Ipswich Survey Site Locations



1.2.3 For clarity, journey time, bus and cycle surveys are not included in **Figure 1.1**. Those locations are discussed and shown under Sections 5 (bus surveys) and 7 (journey time surveys).

1.2.4 The survey results are to be used variously in the development, calibration and validation of the ITAMS components.

1.3 Report Structure

1.3.1 This report describes the different survey work, including site locations and dates; field and desk methodology; and data quality. In addition to documenting the field work and preliminary data analysis, it is intended to act as a reference for the survey work for both the client and third parties.

1.3.2 Chapter 2 provides an overview of the major automatic number plate recognition survey of the A12 and A14 trunk roads in the Ipswich area. Some further number plate recognition was used in the context of the car park interview surveys but that is considered with the rest of the detail of those surveys in Chapter 4.

1.3.3 Chapters 3, 4 and 5 cover the interview surveys. Chapter 3 outlines the large programme of roadside interview surveys that was undertaken, producing origin and destination trip data from motorists passing through sites that form two cordons, and further quadrants, throughout Ipswich. This is followed by detail of the car park interviews, together with entry/exit vehicle counts using number plate recognition, in Chapter 4. Chapter 5 covers the last of the trip origin and destination interview surveys, namely for bus passengers on key radial routes across Ipswich.

1.3.4 Chapter 6 discusses the various traffic counts that were undertaken, including manual and automatic link counts, manual turning counts, bus occupancy counts and pedal cycle counts. Finally, Chapter 7 describes the car journey time surveys undertaken on a series of key routes in Ipswich.

1.3.5 This report gives a summary of the type, location and dates of data collected. Many of the graphics provided in this electronic document are relatively low resolution; higher quality is available for larger scale reproduction if required.

1.3.6 A CD accompanies this report which contains all of the survey data collected.

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2 Automatic Number Plate Recognition Surveys

2 Automatic Number Plate Recognition Surveys

2.1 Introduction

2.1.1 An important component of the ITAMS survey works is a major Automatic Number Plate Recognition (ANPR) survey, which aims to provide understanding of the movements around the A14 and A12 routes in the vicinity of Ipswich, including traffic across the Orwell Bridge.

2.1.2 This type of survey uses cameras mounted by the roadside to pick up video footage of the traffic, with the camera focussed on the registration plate. This footage is automatically translated into images of each registration plate, together with an automated recognition of the characters of the plate.

2.1.3 The ANPR survey was based upon a cordon of camera locations defined closely around the A14 and A12, as discussed in Section 2.2. The survey was conducted on Thursday 3 July 2008, and data has been captured for 2.5 hours in each of three time periods:

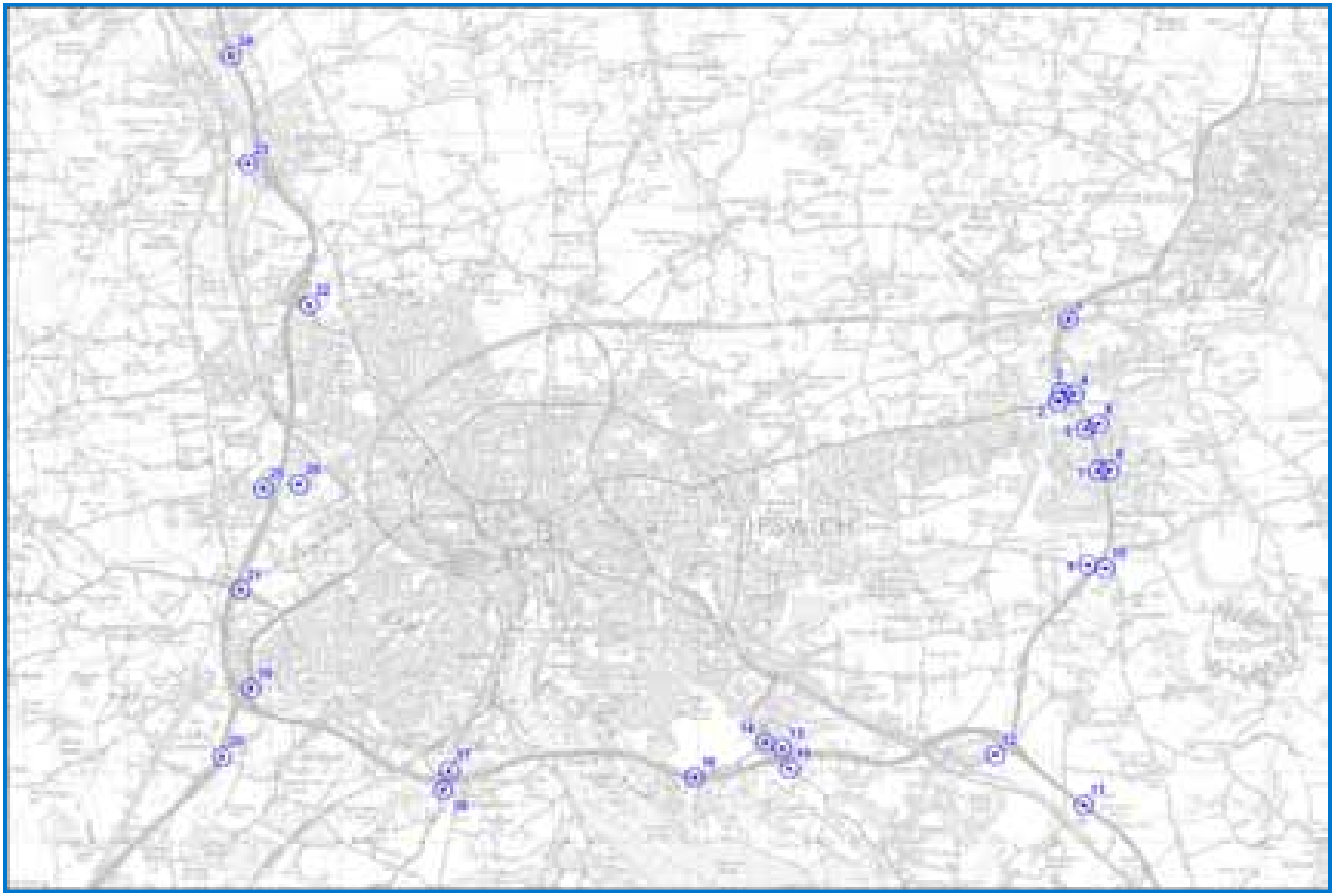
- Morning Peak (07:30 - 10:00)
- Off Peak (10:30 – 13:00)
- Evening Peak (16:30 – 19:00)

2.1.4 A stand-alone report has been prepared in order to describe the ANPR methodology and results in detail, but an overview is given in this Chapter.

2.2 Cordon Definition

2.2.1 The ANPR survey was based upon a cordon of camera locations defined closely around the A14 and A12 junctions, as shown in **Figure 2.1**. The objective was to produce a 'watertight' cordon of locations that captured every movement onto and away from the A12/A14 corridor around Ipswich. In theory, for every vehicle joining the identified stretch of the A12 or A14, the point of entry and associated point of exit would be recorded. Site 16 is an additional location used to provide views of the traffic using the Orwell Bridge.

Figure 2.1: Automatic Number Plate Recognition (ANPR) Survey Camera Site Locations



2.3 Field Methodology and Staffing

One camera was used per lane of traffic, in order to avoid oblique lines of sight and ensure the clearest images possible were recorded. The aim was to provide the highest possible rate of matched number plates. The cameras covered 52 ‘views’ at 26 different sites (two views per site, one in each direction), as shown in **Figure 2.2**.

Figure 2.2: ANPR Survey Camera View Locations and Directions

2.3.1 Staff from the appointed survey company, were on site throughout the 12-hour survey in order to check that the equipment was not damaged, tampered with or obscured. Any problems were dealt with as quickly as possible by the team, thus minimising any loss of data.

2.3.2 There were a relatively small number of on-site problems on the day of the survey (see **Table 2.1**), but there is one location (View 028) where the analysis is significantly impacted by a camera failure. For this view, traffic patterns has been inferred from the part of the day when the camera was recording successfully.

Table 2.1: ANPR Fieldwork Issues Summary

Site*	View	Issue
3	Westbound (Ref: View 003)	Missing approximately 15 minutes of data (1030 to 1045) because of children moving camera equipment.
3	Eastbound (Ref: View 004)	Missing approximately 15 minutes of data (1030 to 1045) because of children moving camera equipment.
6	Eastbound (Ref: View 011)	Started late (0800) because of a blown fuse.
11	Westbound (Ref: View 022)	Missing approximately 10 minutes (between 1630 and 1700) because of battery failure.
14	Southbound (Ref: View 028)	Missing approximately two and a half hours of data (1030 to 1130 and 1630 to 1750) because of camera failure.
25	Eastbound (Ref: View 050)	Missing approximately 15 minutes of data (0745 to 0800) because of a blown fuse.

*See Figure 2.1 for site locations

2.4 Desk Methodology: Coding and Matrix Building

2.4.1 The survey company have undertaken the automated number plate recognition process, along with appropriate manual checking, based on the video recorded on the survey day. The checking process included monitoring of sample rates and manual intervention (review of video to record number plates manually) to attempt to increase any rates below the threshold of 90%. After checking and adjustment, all but two sites achieved full number plate recording for 95% or more of the vehicles.

2.4.2 Finally, once the number plates had been transcribed, the number plates (and the times they were recorded) were matched between sites. This process created a matrix of trips with the various ANPR cordon sites as origins and destinations, thus describing the flows of traffic. For this, survey company staff have used the software ‘MicroMatch’ for the overall cordon. Faber Maunsell has supplemented this analysis with further checks, including matrix development relating to flows observed across the Orwell Bridge. This work is presented in the separate ANPR report.

2.4.3 The journeys between each pair of sites have been factored up to take account of the incomplete capture of full number plates from each camera. For example, if 100 journeys from View 002 to View 032 have been identified, with a transcription rate of 95% at View 002 and of 96% at View 032, the number of journeys would be expanded as follows:

$$100 / (0.95 * 0.96) = 109.6 \text{ journeys}$$

2.4.4 It is recognised that inaccurately recorded plates (i.e. those which were recorded, but that do not match with a ‘paired’ movement) form a sub-set of the captured plates. The resulting discrepancies will be taken into account when processing the data for final use.

2.4.5 Each site has been classified as either ‘Inside’ (i.e. entering or leaving the Ipswich urban area) or ‘Outside’ (i.e. entering or leaving the rural hinterland), with the exception of traffic from the A12 or the A14, made up of Views 001, 002, 021, 022, 039, 040, 047 and 048. Details of the results breakdown on this basis have been provided in the separate ANPR Technical Note.

2.4.6 The proportion of traffic taking each route does not vary significantly by time of day. About 13% of the journeys are from through traffic just using the A12/A14. About 40% of journeys are through traffic to inside the cordon and vice versa.

2.4.7 Within each time period the journeys are very balanced, with (for example) the proportion of journeys from the A12 South to inside the cordon being very similar to the proportion of journeys from inside the cordon to the A12 South.

2.5 Data Quality

2.5.1 From the number plate matching process, after both automated matching and manual improvement of any poor sample rates, the minimum sample rate (successfully matched plates against manual vehicle count over the entire day) is 93%, with a maximum of 100% and a mean of 96%.

2.5.2 These figures are calculated based on the available number plate matches and manual count data. Therefore, where manual counts exist but number plate counting was not possible due to a problem, the sample rate has dropped accordingly.

2.5.3 However, the results exclude two periods where both manual count and number plate matches are missing. This is the case for the issues at Sites 6 and 14 as recorded in **Table 2.1**. Based on estimates of the missing flow data, the sample rates are likely to be of the order of 89% at Site 6 (assuming a flow of 200 in each missing 15-minute period) and 75% at Site 14 (assuming a flow of 150 in each missing 15-minute period). Thus Site 14 is clearly the site with weakest data, and the only site to drop substantially below the 90% threshold.

2.5.4 The missing manual counts for View 011 (Site 6) occurred during the morning peak warm-up period. Therefore full data capture for the two hours does exist. This still leaves a problem in the off peak and evening peak at View 028 (Site 14). There the camera failed between 1030 to 1130 and 1630 to 1750. For the affected time periods, data has been patched from another time period. The proportion of traffic at View 028 compared to traffic at all other sites has been assumed to be the same in the missing hour as it was one hour later.

2.5.5 Overall, the survey progressed very well and the results are in line with expectations.

2.5.6 **Table 2.2** shows the morning peak ANPR data; the inter-peak and PM peak data will be made available on a data CD. The AM data broadly reflects the quality of the data across all the time periods surveyed.

Table 2.2: ANPR Morning Peak Data Quality Summary

View No.	Site No.	ANPR camera Locations	Direction	Manual Traffic Counts	ANPR Traffic Count	% of recognised plates
1	1	A12 Beacon Hill from overbridge	NE-bound	2,487	2,428	98%
2	1	A12 Beacon Hill from overbridge	SW-bound	2,892	2,781	96%
3	3	A1214 near Martlesham Park and Ride from A12	W-bound	1,766	1,755	99%
4	3	A1214 near Martlesham Park and Ride from A12	E-bound	2,518	2,415	96%
5	2	Entrance to Martlesham Park and Ride from A12	W-bound	164	164	100%
6	2	Entrance to Martlesham Park and Ride from A12	E-bound	20	20	100%
7	4	Main Road into Martlesham from A12	E-bound	274	270	99%
8	4	Main Road into Martlesham from A12	W-bound	310	300	97%
9	5	Eagle Way (North) into Martlesham from A12	SW-bound	284	272	96%
10	5	Eagle Way (North) into Martlesham from A12	NE-bound	534	511	96%
11	6	Anson Road into Martlesham Retail Park from A12	E-bound	1,648	1,589	96%
12	6	Anson Road into Martlesham Retail Park from A12	W-bound	927	884	95%
13	7	Eagle Way (South) into Martlesham residential area from A12	N-bound	233	230	99%
14	7	Eagle Way (South) into Martlesham residential area from A12	S-bound	496	484	98%
15	8	Barrack Square into Adastral Park from A12	N-bound	1,820	1,742	96%
16	8	Barrack Square into Adastral Park from A12	S-bound	491	475	97%
17	9	Foxhall Road to Pole Hill from A12	E-bound	872	836	96%
18	9	Foxhall Road to Pole Hill from A12	W-bound	1,314	1,264	96%
19	10	Newbourne Road to Brightwell from A12	E-bound	475	453	95%
20	10	Newbourne Road to Brightwell from A12	W-bound	489	472	97%
21	11	A14 to Felixstowe east of Junction 58	SE-bound	3,070	2,987	97%
22	11	A14 to Felixstowe east of Junction 58	NW-bound	2,884	2,758	96%
23	12	A1156 near A14 at Junction 58	SW-bound	1,155	1,101	95%
24	12	A1156 near A14 at Junction 58	NE-bound	941	911	97%
25	13	Entrance to Ransomes Industrial Estate of A14	NE-bound	1,474	1,413	96%
26	13	Entrance to Ransomes Industrial Estate of A14	SW-bound	675	644	95%
27	14	A1189 Nacton Road into Ipswich	NW-bound	2,489	2,440	98%
28	14	A1189 Nacton Road into Ipswich	SE-bound	2,369	2,317	98%
29	15	Nacton Road near A1214	SE-bound	234	225	96%
30	15	Nacton Road near A1214	NW-bound	270	270	100%
31	16	Orwell Bridge near the old Airport	E-bound	6,061	5,823	96%
32	16	Orwell Bridge near the old Airport	W-bound	5,343	5,113	96%
33	17	A137 into Ipswich from A14 south of Bourne Hill junction	N-bound	1,808	1,742	96%
34	17	A137 into Ipswich from A14 south of Bourne Hill junction	S-bound	1,965	1,888	96%
35	18	A137 south of A14, near Wherstead	S-bound	839	801	95%
36	18	A137 south of A14, near Wherstead	N-bound	1,371	1,312	96%
37	19	A1214 near London Road Park & Ride	N-bound	2,936	2,806	96%
38	19	A1214 near London Road Park & Ride	S-bound	2,709	2,616	97%
39	20	A12 South at Copdock overbridge	S-bound	4,708	4,572	97%
40	20	A12 South at Copdock overbridge	N-bound	4,667	4,490	96%
41	21	A1071 into Ipswich west of Hadleigh Road Junction	W-bound	1,011	994	98%
42	21	A1071 into Ipswich west of Hadleigh Road Junction	E-bound	2,226	2,164	97%
43	22	A1156 into Ipswich near Bury Road Park & Ride	N-bound	2,561	2,498	98%
44	22	A1156 into Ipswich near Bury Road Park & Ride	S-bound	2,896	2,835	98%
45	23	B1113 on approach to A14 at Claydon	W-bound	1,558	1,501	96%
46	23	B1113 on approach to A14 at Claydon	E-bound	1,482	1,429	96%
47	24	A14 north of Junction 52 (Claydon)	N-bound	4,843	4,651	96%
48	24	A14 north of Junction 52 (Claydon)	S-bound	5,106	4,735	93%
49	25	Sproughton Road west of A14	NW-bound	498	484	97%
50	25	Sproughton Road west of A14	SE-bound	834	748	90%
51	26	Sproughton Road east of A14	NE-bound	1,623	1,557	96%
52	26	Sproughton Road east of A14	SW-bound	1,144	1,131	99%

3 Roadside Origin and Destination Surveys

3 Roadside Origin and Destination Surveys

3.1 Introduction

3.1.1 A comprehensive programme of continuous 12-hour roadside interviews has been conducted; the sites are shown in **Figure 3.1** and **Figure 3.2**. These surveys were designed to provide origin and destination information on people's trips, as well as trip purpose, vehicle type, vehicle occupancy and an indication of car parking use.

3.1.2 Running concurrently at each of the survey locations, for both directions, were automatic traffic counts for a continuous two week period as well as manual classified traffic counts on the day of the survey; these are discussed in Sections 6.2 and 6.3 respectively.

3.1.3 In order to take into account any survey bias when controlling the traffic patterns to an average weekday in June 2008, automatic traffic counts are required to run over a two-week period at each site, during which the RSI would be undertaken. In addition, manual classified counts on the day of the survey are required.

3.2 Site Selection and Survey Design

3.2.1 **Figure 3.1** and **Figure 3.2** show the definition of the survey sites that comprise the cordons and quadrants that are necessary in order to provide inputs to the demand matrix development process. Counts were undertaken in both directions; interviews were conducted in a single direction, as described in Table 3.1. Broadly, the Inner Cordon was surveyed inbound to the town centre, and the Outer Cordon outbound from the town centre.

Figure 3.1: Roadside Interview Surveys Outer Cordon (green) and Quadrant (purple) Site Locations (Inner Cordon (red) Also Shown for Reference)

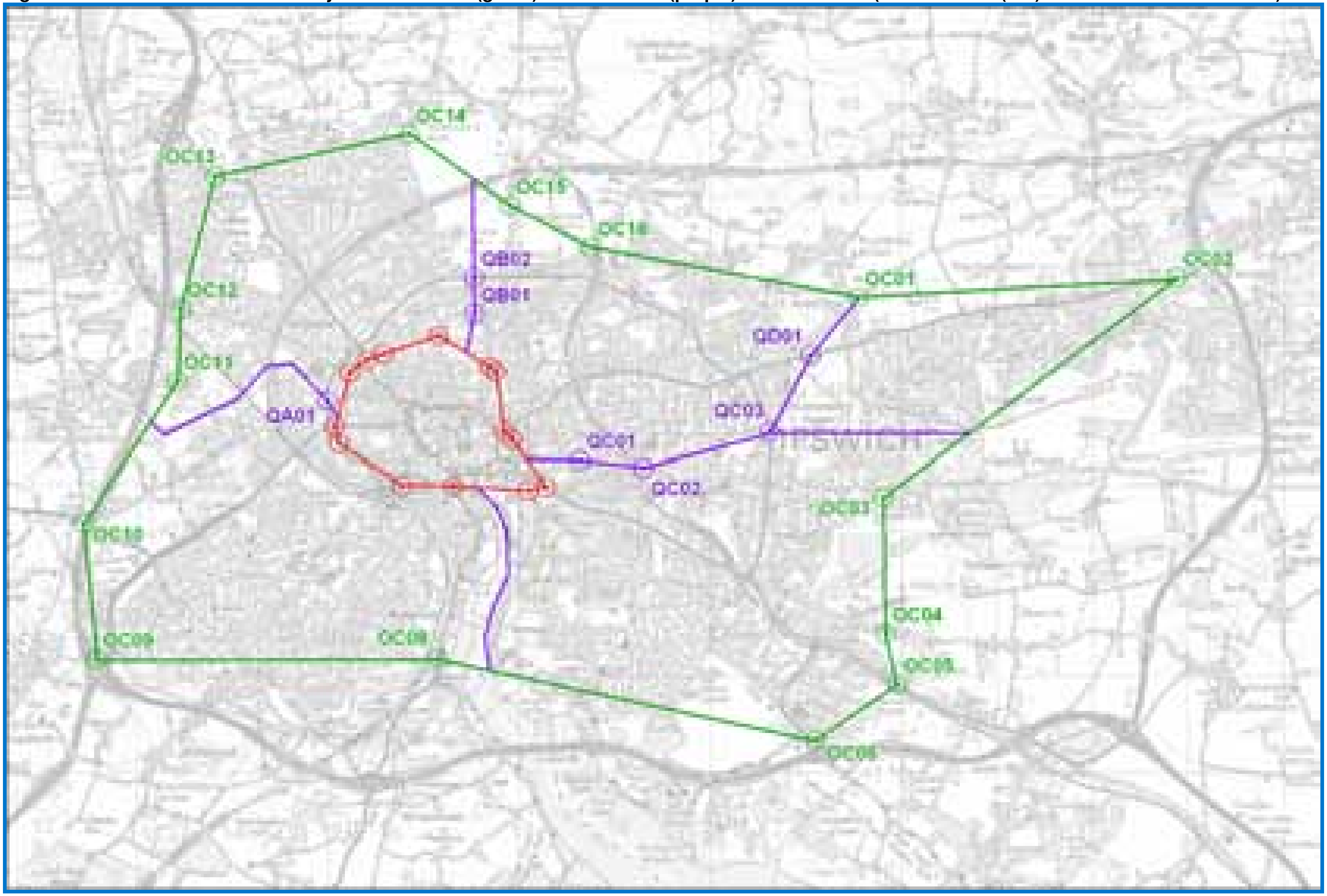
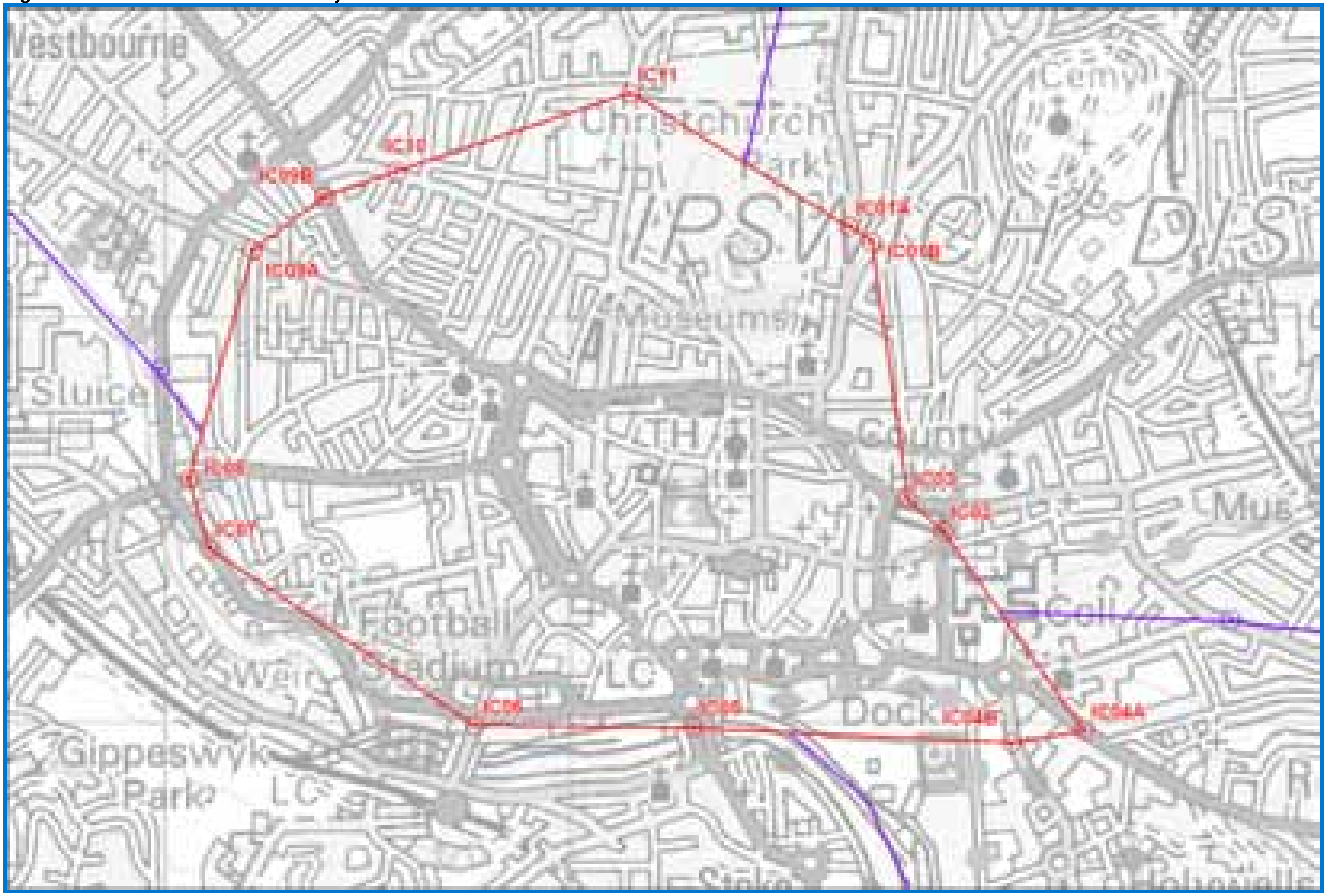


Figure 3.2: Roadside Interview Surveys Inner Cordon Site Locations



3.2.2 **Figure 3.3** shows the form design used for the self-completion questionnaires to be filled in by members of the public and put in the post (the reverse of the form included freepost address). The form was designed to fit all necessary questions on a single side of A4-size paper, while being presented in a format that is easy to follow. The same questions were used for face-to-face interviews, although the form for recording the interview data was designed to fit three records on a single A4 page, as the interviewers did not need the same space and intuitive form design required for self-completion.

Figure 3.3: Roadside Interview Survey Self-Completion Form Design

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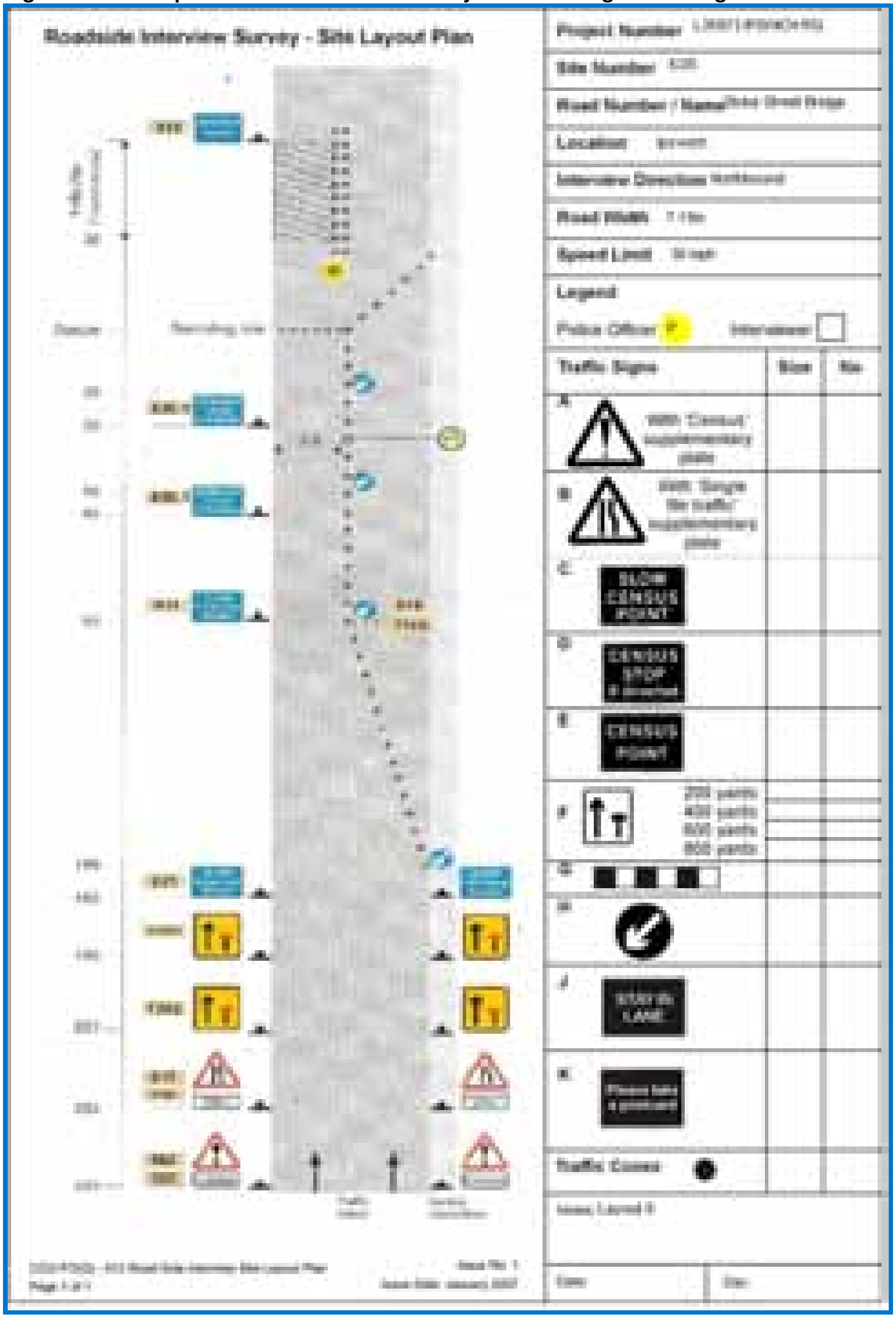
3.3 Field Methodology and Staffing

3.3.1 The RSI surveys were undertaken at the rate of three per day on Monday to Thursday each week from 23rd June to 10th July. The dates were chosen to be during 'neutral' times avoiding school and public holidays. The work was checked on site by visits from Faber Maunsell staff to review progress in the context of full understanding of the data requirements.

3.3.2 The traffic counts (manual and automatic) were undertaken successfully at all sites, with the exception of three ATCs where faulty or missing equipment resulted in missing data to the extent where repeat counts were needed. These repeats could not be undertaken over the summer holiday period, but were repeated in the autumn (i.e. at the next available 'neutral' time).

3.3.3 In order to perform the surveys safely and efficiently, detailed planning of each site was undertaken. Preliminary site visits by Faber Maunsell staff, together with stakeholders (including Suffolk Police), were followed by more in depth visits by the survey company that enabled the production of traffic management plans for each site. Plans were agreed with Suffolk Police and traffic management diagrams were drawn up, forming a key part of this planning; an example is given in **Figure 3.4**.

Figure 3.4: Example roadside interview survey traffic management diagram



3.3.4 On the survey days, Suffolk Police were present on site at all times in order to pull over and stop vehicles for interview, as well as overseeing the safe operation of the site. Appropriate actions (including the temporary suspension of interviews) were led by the police in the case of incidents such as bad weather.

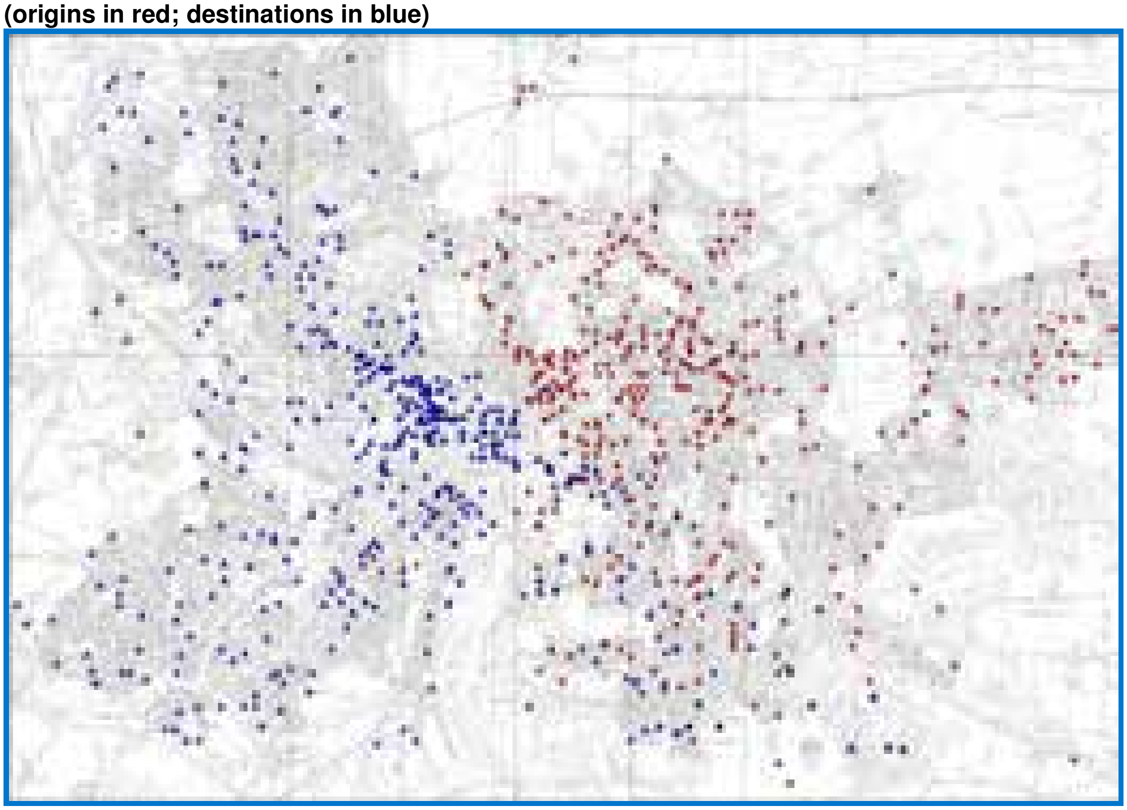
3.4 Desk Methodology: Coding and Checking

3.4.1 Survey company staff carried out the coding of both face-to-face and self-completion interview forms. The address information recorded on the forms was coded, with postcodes obtained using address management software QAS for those cases where only partial address information existed. Consistency in the treatment of hard-to-find and commonly unknown (e.g. shop) addresses was achieved using a common list of the postcodes of such partial addresses, referred to and updated throughout the coding process.

3.4.2 The coding process was subject to inherent checking through the data entry process, as a database was used that restricted entries to appropriate values only. These restrictions included appropriate vehicle occupancy levels only (e.g. HGV's carrying 3 people or fewer); origin and destination postcodes being different (i.e. no round trips); and only feasible origin and destination reasons (and parking locations) in relation to each other (e.g. if the origin was identified as home, the parking could not be a retail parking space).

3.4.3 Additional data cleaning was undertaken after the initial coding process, based on the logic of trip origins and destinations. A geographical information system (GIS) was used to plot the origin and destination locations for each trip, in order that any illogical routes could easily be identified (see **Figure 3.5**). As opposed to a static map, the GIS allows the exploration of the plotted points and querying of which records they relate to. Survey company staff undertook this analysis in the first instance and provided their data with trips considered to be illogical split out into a separate data sheet.

Figure 3.5: Example Geographical Information System (GIS) Based Logic Check Map (origins in red; destinations in blue)



3.4.4 On receipt of the coded RSI data, Faber Maunsell undertook further checks in order to validate the initial checks performed by the survey company as well as provide some further logic checks. This involved both a degree of repetition of the GIS logic checks (i.e. with the added expertise of traffic modellers, given the intended use for the data) and further spreadsheet-based checking. Records were examined in order to ensure that values were in the appropriate ranges for each question. In addition, the HGV trips were investigated to highlight instances of non-work trip purposes; and origin and destination trip purposes were looked at to find instances of the same purpose for both. As a result of the additional checks carried out by Faber Maunsell, some further records were necessarily discarded, but in addition some previously discarded records were recovered where possible (i.e. where a record had been *unnecessarily* rejected by the survey company) to enhance the sample rate. The accompanying CD includes both original and checked data.

3.5 Data Quality

3.5.1 **Table 3.1** summarises the results of the RSI surveys. The manual count from the day is given, together with the number of interviews conducted and postcards handed out (where necessary). The number of usable records is provided, based on the preliminary analysis by the survey company, removing records considered void (missing data) or illogical (inexplicable origin and destination relative to the site).

3.5.2 The results following Faber Maunsell's further checks are also presented, highlighting any changes based on the checking and discarding of records considered valid by the survey company, as well as those records that could be restored that had previously been incorrectly discarded.

3.5.3 Overall, these preliminary results indicate that good sample rates have been achieved throughout the sites, with a minimum of 7%.

Table 3.1: Roadside interview survey sample rates

Site	Location and direction	Manual vehicle count	Inter views conduct ed	Post cards issued	Post cards returned	Usable records based on COU analysis	Usable records based on Faber Maunsell analysis	Overall sample rate
IC01A	Westfield Road, Southbound IB	1220	790	N/A	N/A	688	706	58%
IC01B	Tuddenham Road, Southbound IB	929	642	N/A	N/A	588	575	62%
IC02	St Helens Street, Westbound	5870	1078	N/A	N/A	855	924	16%
IC03	Grimwade Street, Southbound IB	5716	971	N/A	N/A	855	807	14%
IC04A	Fore Hamlet Road, Westbound	4287	832	N/A	N/A	791	755	18%
IC04B	Duke Street, Northbound IB	4213	798	N/A	N/A	734	716	17%
IC05	Stoke Street Bridge, Northbound IB	10028	991	N/A	N/A	875	827	8%
IC06	Princes Street, Northbound IB	4513	675	N/A	N/A	556	537	12%
IC07	West End Road, NWbound IB	6088	769	N/A	N/A	729	701	12%
IC08	Yarmouth Road, Westbound OB	4676	889	N/A	N/A	731	748	16%
IC09A	Bramford Road, SE Bound IB	2498	884	N/A	N/A	748	743	30%
IC09B	Norwich Road, Southbound IB	3338	535	N/A	N/A	418	394	12%
IC10	Anglesea Road, Eastbound IB	1614	627	N/A	N/A	531	522	32%
IC11	Henley Road, Southbound IB	3180	846	N/A	N/A	795	785	25%
OC01	Playford Road, Eastbound OB	1800	584	35	13	538	541	30%
OC02	Main Road, Eastbound OB	8106	1156	N/A	N/A	1082	1062	13%

Site	Location and direction	Manual vehicle count	Inter views conduct ed	Post cards issued	Post cards returned	Usable records based on COU analysis	Usable records based on Faber Maunsell analysis	Overall sample rate
OC03	Foxhall Road, Eastbound OB	4690	840	N/A	N/A	773	758	16%
OC04	Bucklesham Road, Eastbound OB	589	287	N/A	N/A	274	270	46%
OC05	A1156 Felixstowe Road, SE bound OB	4761	37	3951	956	873	790	17%
OC06	Nacton Road, SE bound OB	8384	N/A	3438	656	636	570	7%
OC08	Wherstead Road, Northbound IB	7718	629	238	N/A	541	566	7%
OC09	Copdock Roundabout, SE bound off slip and NE bound IB	8430	N/A	4787	777	654	641	8%
OC10	A1071, Westbound OB	5963	747	N/A	N/A	677	677	11%
OC11	Sproughton Road, Westbound OB	5238	164	2223	356	444	417	8%
OC12	Bramford Road, Westbound	2490	181	1812	357	468	439	18%
OC13	Bury Road, SE bound IB	7054	197	3795	630	691	653	9%
OC14	Henley Road, Northbound	1971	587	N/A	N/A	546	541	27%
OC15	Westerfield Road (B1077), Northbound OB	1680	675	N/A	N/A	619	617	37%
OC16	Tuddenham Road, Northbound OB	1673	843	N/A	N/A	833	798	48%
QA01	Yarmouth Road, Southbound	7251	666	N/A	N/A	595	596	8%
QB01	Park Road, Eastbound	3058	640	N/A	N/A	553	538	18%
QB02	Valley Road, Eastbound	8328	789	N/A	N/A	700	672	8%

Site	Location and direction	Manual vehicle count	Inter views conducted	Post cards issued	Post cards returned	Usable records based on COU analysis	Usable records based on Faber Maunsell analysis	Overall sample rate
QC01	Foxhall Road, Westbound	3688	684	N/A	N/A	590	568	15%
QC02	Cauldwell Hall Road, Southbound	2888	N/A	1989	286	256	250	9%
QC03	Heath Road, Southbound	8369	1033	N/A	N/A	1011	985	12%
QD01	Woodbridge Road, Westbound	6400	810	N/A	N/A	761	758	12%

4 Car Park Origin and Destination Surveys

4 Car Park Origin and Destination Surveys

4.1 Introduction

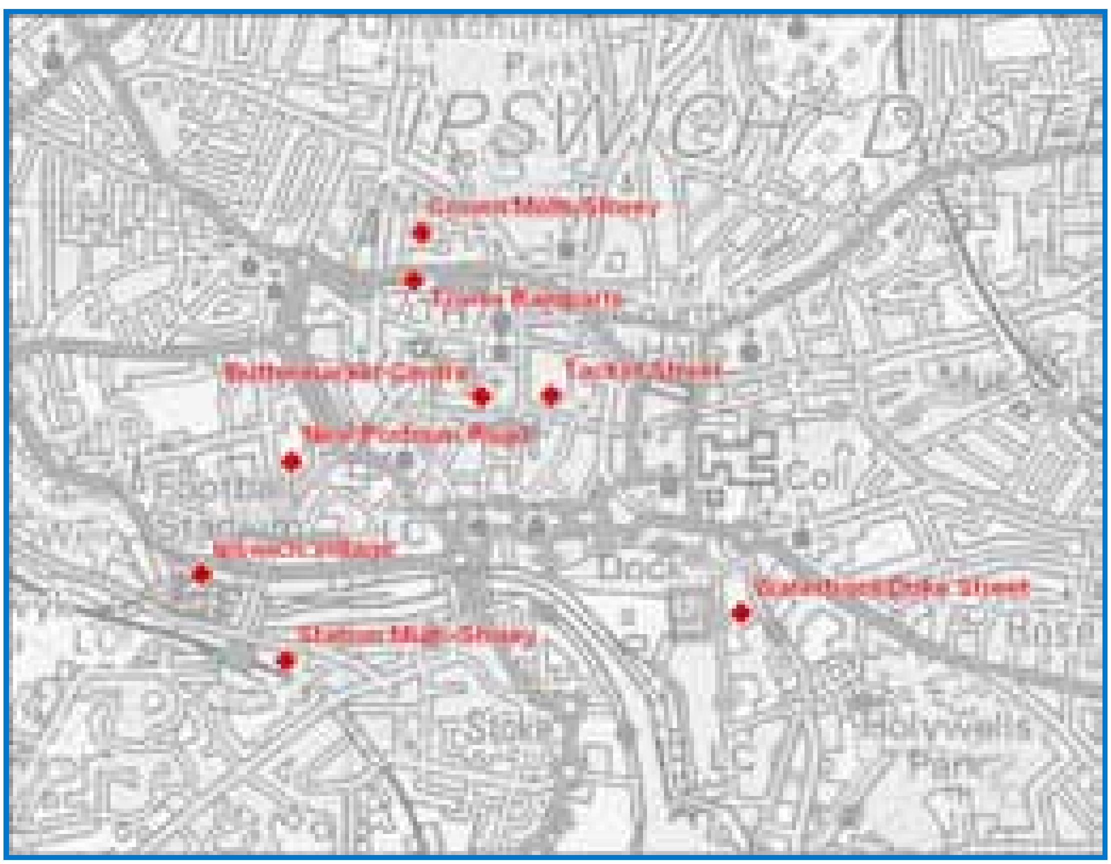
4.1.1 Sample driver interviews were required to establish original origin, final destination, purpose, duration, charge and payee. A mix of methods was used, including interviews at pay and display machines and the supplementary handing out of post-back questionnaires during busy periods. The data were required for a period of 0700-1900 for each of 11 sites.

4.1.2 Simultaneous vehicle arrival, departure and duration information, using registration number matching, was also required. The recording of number plates was a combination of manual recording on site (with video backup) and automatic recognition from video.

4.2 Site Selection and Survey Design

4.2.1 The 11 sites are made up of 8 town centre sites as shown in **Figure 4.1**, together with the three Ipswich Park and Ride sites. The town centre car parks chosen represent a sample of the largest and/or most used within Ipswich in relation to a range of functions including commuting to the centre of town, commuting to the train station, shopping and leisure.

Figure 4.1: Town Centre Car Park Survey Locations



4.2.2 **Figure 4.2** shows the form design used for the face-to-face interviews at the car parks. This example was used for the town centre car parks; slightly different wording was used for the Park and Ride sites to reflect the fact that people would be getting on the bus before finally walking to their ultimate destination.

Figure 4.2: Car Park Survey Face-to-Face Interview Form Design

4.3 Field Methodology and Staffing

4.3.1 Detailed site visits were undertaken to plan for both the number plate recording and interview elements of the survey. Entry and exit locations were examined with regard to the number plate counts, with appropriate camera locations identified. In addition, key sites for pedestrian congregation and movement were noted, including ticket machines and key pedestrian routes in and out of the car parks, in order to guide where interviewers were to be stationed.

4.3.2 The surveys were carried out by the survey company on 7-9 and 14-16 October 2008.

4.3.3 Site visits were carried out by Faber Maunsell throughout the survey period to ensure surveys were being carried out in accordance with the brief and to meet the data requirements. In addition to the face-to-face interviews undertaken by the survey company, postcard-style forms were handed out during busy periods at the following car parks in order to supplement the sample: Railway Station, Ipswich Village and all Park and Ride car parks. These were either handed back to survey staff on return to the car park, or returned by freepost.

4.3.4 For the number plate matching, survey company staff were on-site throughout the 12-hour survey period at each site in order to record number plates ‘on the fly’. Full plates were recorded where possible, with the last three digits recorded during busy periods, and a simple count performed if necessary during extremely busy times. Cameras were also set up on the entry and exit lanes of each site in order to provide backup for any missed plates during busy periods.

4.4 Desk Methodology: Coding and Checking

4.4.1 Coding of the face-to-face interviews was undertaken by survey company staff. Searches were performed in order to use partial address information as far as possible. This was especially pertinent to town-centre shopping destinations for instance. To complement the searching process, consistency was achieved using a common list of the postcodes of such partial addresses, referred to and updated throughout the coding process.

4.4.2 Coding of the postcard-based self-completion questionnaires followed a similar process of that for the face-to-face interviews, but was carried out by Faber Maunsell. The same common list of postcodes for partial addresses was adopted in order to improve the consistency of the approach.

4.4.3 Data checking for the interviews largely mirrors the approach used for the roadside interview data, with logic checks performed on the data to highlight erroneous entries as well as identifying records with an illogical origin/destination.

4.4.4 For the number plate recognition, instances where only the last three digits were recorded, and these were not unique, were checked against the video in order to obtain the full number plate and therefore give a match.

4.5 Data Quality

4.5.1 The car park interview data has been coded and checked by the survey company. It is likely that a further small proportion will be discarded as a result of the more stringent checking of trip logic.

4.5.2 **Table 4.1** shows a summary of the number of responses and the resulting valid records. The final quality of the data is pending further analysis (including use of GIS) by Faber Maunsell concerning the accuracy and appropriateness of postcodes recorded. It is likely that a further small proportion will be discarded as a result of the more stringent checking of trip logic.

Table 4.1: Car Park Interview Survey Summary Data Following Initial Checks

	Site	Number of interviews conducted	Number of valid records from interviews	Number of postcards coded	Number of records overall as % of vehicles
Town Centre	Buttermarket Centre	162	146	N/A	13%
	Crown Multi-Storey	152	131	N/A	12%
	Ipswich Village	67	63	11	22%
	New Portman Road	109	98	N/A	19%
	Station Multi-Storey	100	80	4	17%
	Tacket Street	159	140	N/A	22%
	Tower Ramparts	114	106	N/A	24%
	Waterfront/Duke Street	141	126	N/A	16%
	Town Centre total	1,004	890	15	
Park & Ride	Bury Road	216	203	41	61%
	London Road	204	191	67	56%
	Martlesham	235	212	28	63%
	Park & Ride	657	606	136	

4.5.3 **Table 4.2** gives a summary of the number plate recognition data from the eleven car parks. These results highlight the variations in turnover and duration of stay between the different car parks. For instance, average length of stay at the Buttermarket Centre was just 1 hour and 48 minutes, given its use predominantly by shoppers. This contrasts with the Station car park, where people typically park for an entire day (an average of 10 hours 24 minutes) before continuing their journey by train. The detail of the data (not shown here) also describes the arrival and departure profiles of the car parks throughout the day from 0700 to 1900.

Table 4.2: Car Park Number Plate Recognition Data Summary

	Site	Overall vehicle count	Vehicles matched for both entry and exit: Using full plate	Vehicles matched for both entry and exit: Using last three digits only	Vehicles matched for both entry and exit: Total	Mean duration
Town Centre	Buttermarket Centre	1,122	506	518	1,024	1h 48m
	Crown Multi-Storey	1,124	950	96	1,046	2h 31m
	Ipswich Village	338	306	1	307	6h 53m
	New Portman Road	508	353	1	354	6h 3m
	Station Multi-Storey	487	467	0	467	10h 24m
	Tacket Street	630	573	1	574	2h 0m
	Tower Ramparts	443	417	0	417	1h 17m
	Waterfront/Duke Street	768	657	37	694	5h 21m
Park & Ride	Bury Road	397	218	148	366	5h 7m
	London Road	464	418	1	419	5h 17m
	Martlesham	379	341	0	341	4h 41m

5 Bus Origin and Destination Surveys

5 Bus Origin and Destination Surveys

5.1 Introduction and Site Selection

5.1.1 On-board interviews and boarding and alighting counts on the 11 most important radial bus services around Ipswich have been undertaken. **Figure 5.1** shows these routes, and the definition of the cordon that was established to cover them; this approach ensured the key services (operated by 'Ipswich Buses' and 'First Eastern Counties') were covered. The on-board surveys are supported by roadside bus occupancy counts.

Figure 5.1: Bus Survey Site Locations. Occupancy counts were undertaken at the sites marked; self-completion surveys were carried out on the routes that run through the sites.

5.2 Field Methodology and Staffing

5.2.1 An initial round of roadside occupancy count and on-board surveys was completed by the survey company on 8th and 10th July 2008. Survey staff travelled on buses in both directions on each route, noting boardings and alightings and handing out self-completion questionnaires.

5.2.2 The design of the questionnaires is given in **Figure 5.2**. The questions include the ultimate origin and destination of each passenger; where they boarded and alighted from the bus; their origin and destination purpose; and the time they boarded the bus.

Figure 5.2: Bus Survey Questionnaire Design

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5.3 Desk Methodology: Coding and Checking

5.3.1 Once coded data was received and logged, relevant checks were undertaken. This included reviewing the data that had been rejected from the data set by the survey company themselves to ensure the appropriate actions had been taken. For instance on a route by route basis, the location of origin and destination data coded from interviews were analysed in GIS to identify any illogical trips relative to the route that the interview was carried out on.

5.3.2 The data for four of the bus routes (6, 8, 9 and 10 as listed in **Table 5.1**) were considered to have lower than anticipated sample rates (response rate against on-board count). Therefore, a further round of survey work was organised in-house by Faber Maunsell, and carried out on 16th and 18th September 2008.

5.3.3 Throughout the surveys, the focus was on local Ipswich bus services, as the intention is to build the demand matrices directly from these data. Longer-distance regional services were not included in this survey.

5.4 Data Quality

5.4.1 A summary of the bus interview data is given in **Table 5.1**. The data shown includes all records (excluding Park & Ride buses) that were ultimately accepted as valid from the survey company's work, as well as supplementary records resulting from in-house survey work by Faber Maunsell. The detail of this is discussed below.

5.4.2 Preliminary analysis of the July results received from the survey company revealed approximately 1,265 usable interviews. Following analysis by Faber Maunsell, around 45 of these were removed as they appeared illogical.

5.4.3 Initially approximately 570 records were discarded by the survey company, but further analysis by Faber Maunsell allowed 325 of those to be saved, with just approximately 250 ultimately discarded.

5.4.4 In addition to this, approximately 280 useable responses were collected during the surveys carried out by Faber Maunsell. Thus, approximately 1,575 usable interviews were obtained, as well as a further 250 on Park & Ride routes (overall 1,825 in total).

Table 5.1: Bus Survey Data Summary (Excluding Park & Ride Routes)

Corridor Number	Route Number	Boarders Observed	Surveys Returned	Response Rate
4	1	89	46	52%
2	2	175	49	28%
4	3	132	49	37%
2,3,6,7	5/7/11/15	1121	261	23%
4	6	503	173	34%
8	8/8B	463	109	24%
8	9	356	75	21%
8	10	324	77	24%
6	12	227	56	25%
6	13	331	84	25%
6	14/14A	111	8	8%
6	16	203	33	17%
8,9	19	306	140	46%
1	22	46	23	54%
11	31	49	26	53%
4	62	128	24	20%
2	75	207	71	34%
4	76/77	230	49	22%
4	6161A	151	29	20%
2,3	63-66A	332	115	36%
8	87/88	205	77	39%
	Total	5689	1574	28%

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6 Flow Counts

6 Flow Counts

6.1 Introduction

6.1.1 In order to provide traffic count information for highway model calibration and validation purposes, a series of two-week Automatic Traffic Counts (ATCs) and continuous 12-hour (0700-1900) Manual Classified Turning Counts (MCTCs) were required at key junctions throughout Ipswich.

6.1.2 A further programme of 8 ATC sites (**Figure 6.1**) and 31 MCTC sites (**Figure 6.2**) was developed in order to give appropriate coverage across Ipswich. The coverage is not complete; other survey sources were relied on in some areas.

6.1.3 In addition, further ATCs and Manual Classified Link Counts (MCLCs) were carried out at each of the RSI sites.

6.2 Automatic Traffic Counts

6.2.1 ATC data covering a period of at least two full weeks were required at key sites to supplement the counts performed at the roadside interviews. The data were to be produced using pneumatic tubes laid across the road. Eight sites were required (in addition to the RSI sites), as shown in **Figure 6.1**. Checking of the sites twice per week was required to limit any loss of data from equipment that was faulty or had been tampered with.

6.2.2 The additional ATC sites were located on screenlines for validation purposes. They therefore follow barriers to movements (e.g. railway line), so that typical traffic flows between different sectors can be recorded. ATC data produced for other projects in 2008 exists at various sites within Ipswich; Faber Maunsell located further ATCs to complete the required coverage of sites.

6.2.3 It should be noted that in addition to the ATCs shown in Figure 6.1, further ATCs have also been undertaken at each of the RSI sites.

Figure 6.1: Automatic Traffic Count Locations

Methodology

6.2.4 The ATCs at RSI sites were laid by the survey company for (at least) a two-week period, with the day of the RSI survey falling within that two-week period. The additional ATCs were laid on 26th June 2008 and taken up again on 18th July 2008. All sites were checked at each weekend and also mid-week throughout the period they were laid, in order to rectify any problems and limit any loss of data.

Data Quality

6.2.5 **Table 6.1** shows the number of days data collected at each additional ATC site along with the corresponding mean (average) and standard deviation, giving a broad assessment of the variability of the observed data. Similarly, Table 6.2gives the same breakdown for the RSI-related ATC data.

6.2.6 Detailed examination of the raw data has revealed that high relative standard deviations (e.g. >10%) at some of the sites are the result of depressed data on isolated days (for the RSI sites, typically on the day of interview). This is a common and largely expected phenomenon that occurs with this method of data collection, and is the reason that the ATC data is produced over two weeks in order to provide a volumetric control to which the data on the day of the roadside interview for each site can be factored. Where this was considered to occur, the days with outlying data were removed, and the number of days sampled reduced. The figures included in Tables 6.1 and 6.2 reflect these adjustments.

Table 6.1: Additional (Non-RSI Related) Automatic Traffic Count Data Summary

Site Number	Direction	Number of days counter was deployed	Number of days of valid data	Weekday 12 hour average (0700-1900)	Relative standard deviation (%)
ATC1	Eastbound	24	15	5,711	5.0%
	Westbound	24	16	5,628	4.7%
ATC2	Eastbound	24	15	4,605	4.0%
	Westbound	24	15	3,848	3.1%
ATC3	Eastbound	24	16	8,472	2.1%
	Westbound	24	15	8,878	3.4%
ATC4	Northbound	24	16	4,185	2.5%
	Southbound	24	16	4,004	3.3%
ATC5	Northbound	24	12	4,609	3.3%
	Southbound	24	14	3,967	9.1%
ATC6	Northbound	24	11	1,671	4.1%
	Southbound	24	14	1,678	3.0%
ATC7	Northbound	24	16	7,073	3.1%
	Southbound	24	16	7,363	3.7%
ATC8	Eastbound	24	16	825	5.2%
	Westbound	24	16	1,298	4.9%

N.B Flow and standard deviation are based on valid days of data.

Table 6.2: RSI-Related Automatic Traffic Count Data Summary

Site Number	Direction	Number of days Counter was deployed	Number of days of valid data	Average Total Flow	Relative standard deviation (%)	Relative standard deviation, excluding day of RSI (%)
IC01A	Southbound	11	9	1312	11.6%	3.6%
	Northbound	11	9	893	5.1%	5.3%
IC01B	Southbound	11	8	1311	12.2%	4.1%
	Northbound	11	8	1201	5.0%	2.8%
IC02	Southbound	14	7	6404	1.6%	8.9%
	Northbound	Not Applicable: One-Way Street				N/A
IC03	Westbound	14	9	5995	2.4%	1.8%
	Eastbound	Not Applicable: One-Way Street				N/A
IC04A	Northwestbound	14	10	5391	9.1%	4.9%
	Southeastbound	14	10	6402	4.2%	3.4%
IC04B	Northwestbound	14	10	4649	4.8%	2.2%
	Southeastbound	14	10	4534	3.8%	3.2%
IC05	Northbound	15	11	10465	2.1%	N/A
	Southbound	14	10	10027	9.6%	N/A
IC06	Northbound	14	10	4449	2.3%	0.9%
	Southbound	14	10	4210	4.9%	4.7%
IC07	Northwestbound	22	10	8256	1.8%	1.6%
	Southeastbound	22	11	6545	4.0%	1.9%
IC08	Westbound	22	15	6454	8.2%	2.4%
	Eastbound	22	15	7445	6.3%	2.2%

Site Number	Direction	Number of days Counter was deployed	Number of days of valid data	Average Total Flow	Relative standard deviation (%)	Relative standard deviation, excluding day of RSI (%)
IC09A	Southeastbound	14	10	3407	10.6%	3.0%
	Northwestbound	14	10	2914	5.0%	2.4%
IC09B	Southeastbound	14	10	4887	12.4%	2.4%
	Northwestbound	14	10	5046	5.5%	2.7%
IC10	Eastbound	29	21	1457	8.2%	8.4%
	Westbound	29	21	1252	6.7%	6.1%
IC11	Southbound	22	15	4889	9.9%	2.5%
	Northbound	22	15	5177	4.4%	3.6%
OC01	Eastbound (outbound)	22	15	1977	5.5%	5.5%
	Westbound	22	15	1755	6.5%	6.4%
OC02	Eastbound (outbound)	22	15	8830	3.2%	2.9%
	Westbound	22	15	8758	2.1%	2.0%
OC03	Eastbound (outbound)	22	15	5093	5.0%	5.1%
	Westbound	22	15	5166	4.8%	4.2%
OC04	Eastbound (outbound)	22	13	699	5.5%	5.4%
	Westbound	22	15	696	7.1%	7.1%
OC05	Eastbound (outbound)	10	5	4812	3.1%	3.5%
	Westbound	10	5	5207	5.8%	2.3%
OC06	Eastbound (oubound)	22	15	11291	4.3%	2.4%
	Westbound	22	15	10871	6.0%	2.7%
OC08	Northbound (inbound)	18	12	8101	3.1%	N/A
	Southbound	18	12	7348	3.9%	N/A
OC09	Northbound (inbound)	20	12	9601	2.3%	N/A
	Southbound	20	9	12371	3.6%	N/A
OC10	Westbound (outbound)	22	15	6793	4.2%	2.7%
	Eastbound	22	14	7230	3.1%	2.7%
OC11	Westbound (outbound)	22	14	5604	4.3%	3.7%
	Eastbound	22	14	5691	3.8%	3.9%
OC12	Westbound (outbound)	22	13	2456	1.5%	1.6%
	Eastbound	22	13	2329	2.5%	2.1%
OC13	Eastbound (inbound)	15	11	8620	2.2%	N/A
	Westbound	15	11	9117	1.7%	N/A
OC14	Northbound (outbound)	22	15	2315	4.0%	3.4%
	Southbound	22	15	2528	3.0%	3.0%
OC15	Northbound (outbound)	21	15	1667	4.7%	4.9%
	Southbound	21	15	1854	2.9%	3.0%
OC16	Northbound (outbound)	22	15	2564	4.0%	4.1%
	Southbound	22	15	2869	3.6%	3.7%

Site Number	Direction	Number of days Counter was deployed	Number of days of valid data	Average Total Flow	Relative standard deviation (%)	Relative standard deviation, excluding day of RSI (%)
QA01	Southbound	18	14	8626	5.1%	1.3%
	Northbound	18	14	9374	4.0%	1.9%
QB01	Eastbound	14	10	3546	8.6%	5.0%
	Westbound	14	9	2990	3.8%	3.4%
QB02	Eastbound	14	10	8836	3.3%	2.6%
	Westbound	14	10	9424	2.6%	1.7%
QC01	Westbound	12	3	4834.67	1.0%	3.6%
	Eastbound	12	3	4835	1.0%	3.9%
QC02	Southbound	22	15	3252	2.9%	2.5%
	Northbound	22	15	3467	5.1%	4.2%
QC03	Southbound	21	15	8777	2.7%	2.2%
	Northbound	21	15	9361	2.0%	2.1%
QD01	Westbound	11	5	8450	13.1%	1.4%
	Eastbound	11	5	8037	3.4%	2.2%

N.B Flow and standard deviation are based on valid days of data.

6.3 Manual Classified Link Counts

6.3.1 MCLCs were required at each RSI site (see **Figure 3.1** and **Figure 3.2**), in order to provide a count to factor up the interview results.

Methodology

6.3.2 The MCLCs were undertaken by recording video of the site from a pole-mounted camera. The video was later transcribed by the survey company, with vehicles counted and classified.

Data Quality

6.3.3 **Table 6.3** gives an overview of the MCLC data produced, with an indication of the variability against an average of the ATC weekday totals for each site.

6.3.4 It should be noted that the comparison for OC09 is not directly relevant, as the MCLCs were performed on the Copdock Interchange gyratory while the ATC was carried out on the A1214 just north of the junction, where the ATC tubes could feasibly be laid.

Table 6.3: Manual Classified Link Counts Data Summary

Site Number	Direction	Weekday 12 hour average (0700-1900)
IC01A	Southbound	1,220
	Northbound	897
IC01B	Southbound	929
	Northbound	1,094
IC02	Southbound	5,870
	Northbound	
IC03	Westbound	5,716
	Eastbound	

Site Number	Direction	Weekday 12 hour average (0700-1900)
IC04A	Northwestbound	4,287
	Southeastbound	6,768
IC04B	Northwestbound	4,213
	Southeastbound	4,418
IC05	Northbound	10,028
	Southbound	11,500
IC06	Northbound	4,513
	Southbound	4,153
IC07	Northwestbound	6,088
	Southeastbound	4,790
IC08	Westbound	4,676
	Eastbound	6,758
IC09A	Southeastbound	2,498
	Northwestbound	2,539
IC09B	Southeastbound	3,338
	Northwestbound	4,870
IC10	Eastbound	1,614
	Westbound	1,069
IC11	Southbound	3,180
	Northbound	4,696
OC01	Eastbound (outbound)	1,800
	Westbound	1,670
OC02	Eastbound (outbound)	8,106
	Westbound	7,734
OC03	Eastbound (outbound)	4,690
	Westbound	5,171
OC04	Eastbound (outbound)	589
	Westbound	506
OC05	Eastbound (outbound)	4,761
	Westbound	5,076
OC06	Eastbound (oubound)	8,384
	Westbound	10,572
OC08	Northbound (inbound)	7,718
	Southbound	8,344
OC09	Northbound (inbound)	8,430
	Southbound	3,655
OC10	Westbound (outbound)	5,963
	Eastbound	7,544
OC11	Westbound (outbound)	5,238
	Eastbound	5,571
OC12	Westbound (outbound)	2,490
	Eastbound	2,237
OC13	Eastbound (inbound)	7,054
	Westbound	9,196
OC14	Northbound (outbound)	1,971
	Southbound	2,506
OC15	Northbound (outbound)	1,680
	Southbound	2,000
OC16	Northbound (outbound)	1,673
	Southbound	2,343

Site Number	Direction	Weekday 12 hour average (0700-1900)
QA01	Southbound	7,251
	Northbound	8,302
QB01	Eastbound	3,058
	Westbound	2,871
QB02	Eastbound	8,328
	Westbound	9,678
QC01	Westbound	3,688
	Eastbound	4,449
QC02	Southbound	2,888
	Northbound	3,079
QC03	Southbound	8,369
	Northbound	9,908
QD01	Westbound	6,400
	Eastbound	7,720

6.4 Manual Classified Turning Counts

6.4.1 In order to provide traffic count information for highway model calibration and validation purposes, continuous 12-hour (0700-1900) turning counts were required at key junctions throughout Ipswich.

6.4.2 New counts were completed by transcribing pole-mounted video at the sites shown in **Figure 6.2**. The data was cleaned and provided as totals for 15-minute intervals by the survey company.

Figure 6.2: Manual classified turning counts site locations

Methodology

6.4.3 The fieldwork for the counts was undertaken on 1st, 7th, 8th, 9th and 10th July 2008 at a rate of between 5 and 8 sites per day. Transcription of the video was undertaken by the survey company, with counts subsequently supplied during August and September 2008.

Data Summary

6.4.4 The counts have been classified into the following categories (based on DMRB classifications):

- Car - Saloons, Estates, People Carriers, Car Towing Caravan/Trailer.
- Light Goods Vehicle – Vans up to 3.5 tonnes (2 axles with 4 tyres), pick ups.
- Other Goods Vehicle 1 – Vans over 3.5 tonnes (2 axles with 6 tyres), Rigid Heavy Goods Vehicles (2 and 3 axles).
- Other Goods Vehicle 2 – Rigid Heavy Goods Vehicles (4+ axles), Articulated Heavy Goods Vehicles (3+ axles), Rigid Heavy Goods Vehicle (2+ axles) with Trailer.
- Public Service Vehicle – Single Deck Bus or Coach, Double Deck Bus.
- Motorcycle - Motorcycles, Motorcycles with Sidecars and Scooters
- Pedal cycle (to include tricycles)

6.4.5 Initial checks have shown the data to be complete, capturing every movement from each arm of each junction surveyed.

6.5 Bus Occupancy and Bicycle Counts

6.5.1 To supplement the on-board surveying and to ensure bus services were running according to timetables, roadside bus occupancy counts were undertaken at the cordon locations given in **Figure 5.1**. The survey data will be used to establish the numbers of people using the buses, for validation of the bus model.

6.5.2 Cycle count data was also collected to help with validation for active modes.

Methodology

6.5.3 The purpose of these surveys was to obtain information on the number of bus and cycle trips in to and out of Ipswich town centre. For each bus that passed, the route number, vehicle type, registration number, time, and an estimate of how full the bus was (as a percentage of seated capacity) was recorded. Counts were carried out on 8th and 10th July 2008 between 0700 and 1900 at sites on each of 11 corridors (see **Figure 5.1**).

6.5.4 In addition, pedal cycle counts have also been undertaken. The sites for these counts coincided with the bus occupancy count locations, with a further three locations decided upon through discussion with the Suffolk County Council cycling officer Lucy Williams, as follows:

- Corridor 12 - Civic Drive toucan crossing between Elm Street and Great Gipping Street; and
- Corridor 13 - Star Lane toucan crossing
- Corridor 14 - Hospital cycle track (southern route between Newbury Road and Heath Road)

6.6 Data Quality

Preliminary checks have shown the data to be complete; a summary of the bus occupancy counts is given in

6.6.1 **Table 6.4**, with bicycle counts shown in **Table 6.5**. Data has been used to calculate the distribution of trips between different time periods. It should be noted that the cost-efficient methodology used for estimating bus occupancy does have inherent inaccuracy. However, this method was considered to be the most appropriate balance between cost and data quality in this case.

Table 6.4: Bus Occupancy Cordon Count Summary

Corridor Number	Direction	Time Period	Buses Per time period	Total passengers on all buses per time period
1	Inbound	AM (0700-1000)	3	29
		IP (1000-1600)	11	87
		PM (1600-1900)	4	25
		Total	**18**	**141**
	Outbound	AM (0700-1000)	1	4
		IP (1000-1600)	1	4
		PM (1600-1900)	0	0
		Total	**2**	**8**
2	Inbound	AM (0700-1000)	One-way street	One-way street
		IP (1000-1600)		
		PM (1600-1900)		
		Total		
	Outbound	AM (0700-1000)	48	865
		IP (1000-1600)	96	2,277
		PM (1600-1900)	54	1,221
		Total	**198**	**4,363**
3	Inbound	AM (0700-1000)	3	29
		IP (1000-1600)	136	1,431
		PM (1600-1900)	72	543
		Total	**211**	**2,003**
	Outbound	AM (0700-1000)	31	438
		IP (1000-1600)	46	483
		PM (1600-1900)	18	212
		Total	**95**	**1,133**
4	Inbound	AM (0700-1000)	36	544
		IP (1000-1600)	109	1,075
		PM (1600-1900)	56	405
		Total	**201**	**2,024**
	Outbound	AM (0700-1000)	39	184
		IP (1000-1600)	115	1,010
		PM (1600-1900)	47	604
		Total	**201**	**1,798**
5	Inbound	AM (0700-1000)	27	461
		IP (1000-1600)	62	1,020
		PM (1600-1900)	28	160
		Total	**117**	**1,641**
	Outbound	AM (0700-1000)	29	138
		IP (1000-1600)	60	901
		PM (1600-1900)	26	657
		Total	**115**	**1,696**
6	Inbound	AM (0700-1000)	0	0
		IP (1000-1600)	77	1,065
		PM (1600-1900)	19	107
		Total	**96**	**1,172**
	Outbound	AM (0700-1000)	0	0
		IP (1000-1600)	124	2,071
		PM (1600-1900)	17	123
		Total	**141**	**2,194**

Corridor Number	Direction	Time Period	Buses Per time period	Total passengers on all buses per time period
7	Inbound	AM (0700-1000)	23	251
		IP (1000-1600)	29	355
		PM (1600-1900)	10	91
		Total	**62**	**697**
	Outbound	AM (0700-1000)	27	346
		IP (1000-1600)	27	346
		PM (1600-1900)	26	411
		Total	**80**	**1,103**
8	Inbound	AM (0700-1000)	63	1,301
		IP (1000-1600)	130	1,849
		PM (1600-1900)	62	486
		Total	**255**	**3,636**
	Outbound	AM (0700-1000)	67	593
		IP (1000-1600)	135	2,917
		PM (1600-1900)	61	1,527
		Total	**263**	**5,037**
9	Inbound	AM (0700-1000)	8	124
		IP (1000-1600)	12	192
		PM (1600-1900)	6	31
		Total	**26**	**347**
	Outbound	AM (0700-1000)	1	0
		IP (1000-1600)	1	10
		PM (1600-1900)	1	4
		Total	**3**	**14**
10	Inbound	AM (0700-1000)	5	28
		IP (1000-1600)	3	12
		PM (1600-1900)	2	9
		Total	**10**	**49**
	Outbound	AM (0700-1000)	1	4
		IP (1000-1600)	3	21
		PM (1600-1900)	3	30
		Total	**7**	**55**
11	Inbound	AM (0700-1000)	8	104
		IP (1000-1600)	18	193
		PM (1600-1900)	7	40
		Total	**33**	**337**
	Outbound	AM (0700-1000)	6	28
		IP (1000-1600)	16	233
		PM (1600-1900)	6	92
		Total	**28**	**353**
Total	Inbound	AM (0700-1000)	218	3,879
		IP (1000-1600)	587	7,279
		PM (1600-1900)	266	1,897
		Total	**1,071**	**13,055**
	Outbound	AM (0700-1000)	250	2,600
		IP (1000-1600)	643	10,652
		PM (1600-1900)	259	4,881
		Total	**1,152**	**18,133**

Table 6.5: Bicycle Count Data Summary

Corridor Number	Direction	Total (over 12 hour period)
1	Towards Town Centre	32
	Away from Town Centre	34
2	Towards Town Centre	One-way street
	Away from Town Centre	89
3	Towards Town Centre	72
	Away from Town Centre	41
4	Towards Town Centre	114
	Away from Town Centre	221
5	Towards Town Centre	76
	Away from Town Centre	52
6	Towards Town Centre	104
	Away from Town Centre	110
7	Towards Town Centre	29
	Away from Town Centre	41
8	Towards Town Centre	206
	Away from Town Centre	225
9	Towards Town Centre	16
	Away from Town Centre	15
10	Towards Town Centre	53
	Away from Town Centre	52
11	Towards Town Centre	50
	Away from Town Centre	28
12	Towards Town Centre	161
	Away from Town Centre	152
13	Towards Town Centre	368
	Away from Town Centre	116
14	Towards Town Centre	120
	Away from Town Centre	124

7 Journey Time Surveys

7 Journey Time Surveys

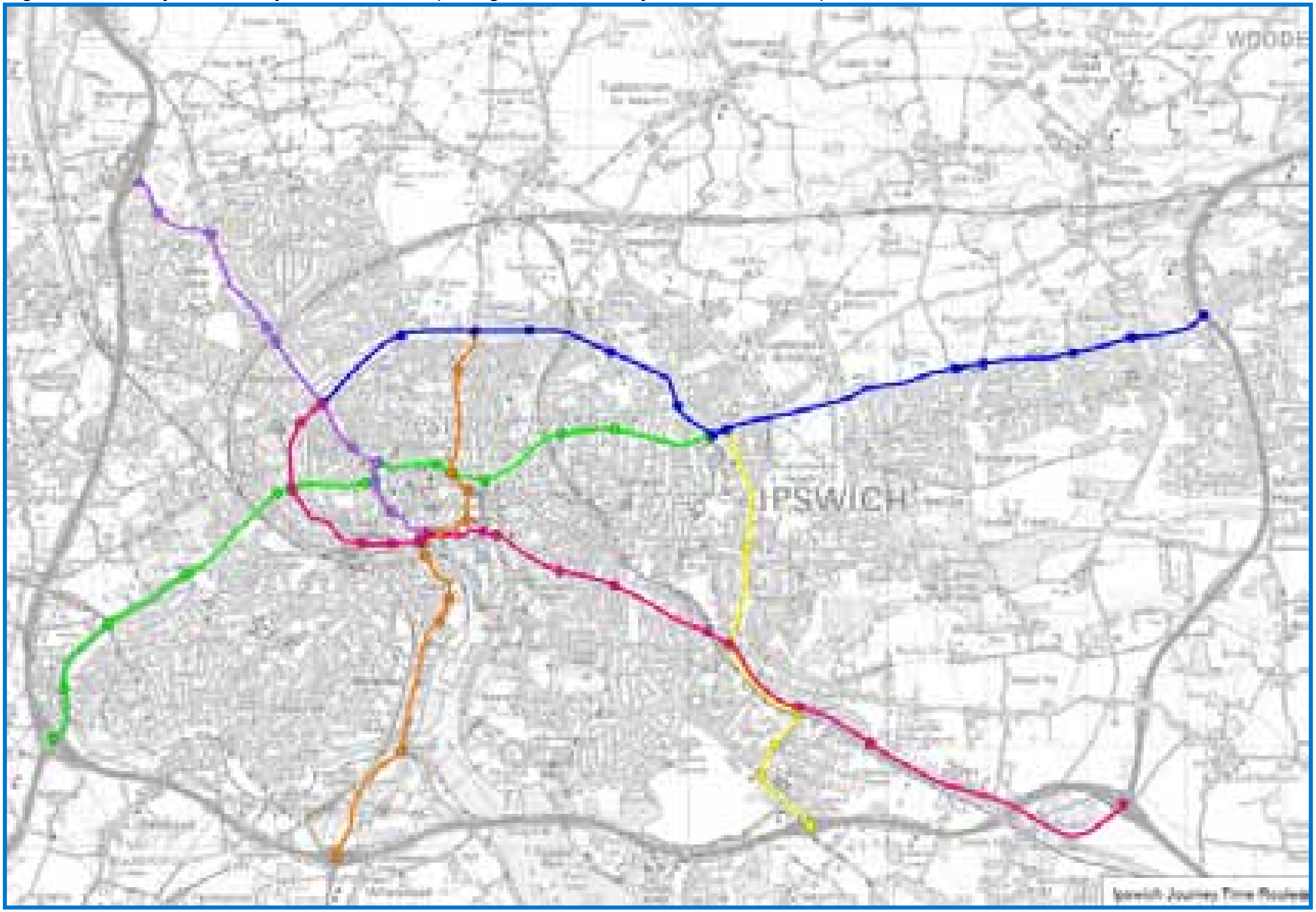
7.1 Introduction

7.1.1 Given that the existing information dates back to 2005, a new programme of journey time surveys was undertaken on 7th - 9th and 14th - 16th October 2008. The surveys were planned to cover important routes through and around Ipswich, most relevant to model validation.

7.2 Route Selection

7.2.1 Six routes, covering a range of key radial and orbital roads, were chosen for the surveys, as shown in **Figure 7.1**. These routes cover the main radial approaches to the town centre, and two orbital routes, including the inner town centre route used by buses. Various intermediate timing points were used throughout each of the routes.

Figure 7.1: Journey Time Survey Route Locations (Timing Points Shown by Dots on the Routes)



7.3 Field Methodology and Staffing

7.3.1 The journey time surveys covered three distinct time periods:

- Morning peak hour (08:00 to 09:00);
- Inter-peak period (10:00 to 16:00); and
- Evening peak hour (17:00 to 18:00).

7.3.2 Survey company staff produced ‘floating car’ data by travelling the routes at least six times in each direction for each time period, noting the time taken to reach each timing point (see **Figure 7.1**).

7.3.3 In addition to the agreed timing points, delays times were recorded, including whether they were at the timing point (e.g. traffic lights), as part of a queue or some other incident. Additional notes were made as necessary at the time in order to describe particular incidents.

7.4 Desk Methodology: Coding and Checking

7.4.1 Variability of the data has been checked against DMRB guidance. The data will then be used in calibration of the SATURN highway model.

7.5 Data Quality

7.5.1 **Table 7.1** gives a summary of the journey time data collected.

7.5.2 For each direction of the routes, at least six runs were obtained per time period. This allowed sufficient confidence to be obtained within the data, ensuring a robust dataset that meets guidelines set out in the Design Manual for Roads and Bridges (DMRB).

7.5.3 The morning and evening time periods surveyed coincide with the modelled hours for the morning and evening peaks. The inter-peak surveys were collected to act as a point of comparison with the two peak hours, and to ‘future-proof’ the dataset to provide the data needed to build a validated inter-peak highway model, if required in the future.

7.5.4 Final checks examining the variability of the data will be undertaken prior to use of the data.

Table 7.1: Journey Time Survey Data Summary

Route	Direction	Time Period	Average Times		Distance (metres)	Average Speed (kph)
			Total Time (secs)	Delay Time (secs)		
Blue	Eastbound (TP1 to TP13)	AM	1143	228	9760	30.7
		IP	879	100	9760	40
		PM	1039	162	9760	33.8
	Westbound (TP13 to TP1)	AM	1446	601	9920	24.7
		IP	937	103	9920	38.1
		PM	1075	91	9920	33.2
Green	Eastbound (TP1 to TP13)	AM	1668	346	8680	18.7
		IP	1029	245	8680	30.4
		PM	1454	691	8680	21.5
	Westbound (TP13 to TP1)	AM	1750	395	9420	19.4
		IP	1123	275	9420	34.3
		PM	1638	396	9420	20.7
Orange	Eastbound (TP1 to TP13)	AM	947	238	6520	24.8
		IP	716	95	6520	32.8
		PM	1350	489	6520	17.8
	Westbound (TP13 to TP1)	AM	831	124	6910	28.8
		IP	688	56	6910	36.5
		PM	803	121	6910	29.9
Pink	Eastbound (TP1 to TP13)	AM	1247	253	11340	32.7
		IP	1237	281	11340	33
		PM	1897	667	11340	21.5
	Westbound (TP13 to TP1)	AM	1943	875	10820	20
		IP	1251	308	10820	31.1
		PM	1319	297	10820	29.5
Purple	Eastbound (TP1 to TP13)	AM	1063	303	5260	17.8
		IP	627	116	5260	30.2
		PM	1015	373	5260	18.7
	Westbound (TP13 to TP1)	AM	779	250	5300	24.5
		IP	638	87	5300	29.9
		PM	744	174	5300	25.6
Yellow	Eastbound (TP1 to TP13)	AM	669	270	4540	24.4
		IP	398	28	4540	41.1
		PM	556	142	4540	29.4
	Westbound (TP13 to TP1)	AM	625	222	4540	25.1
		IP	448	65	4540	36.9
		PM	686	232	4540	23.8

Appendix I

Suffolk County Council | AECOM

Project:	**Ipswich – Transport Fit for the 21st Century Schemes**	Job No:	**60050323**
Subject:	**Highway Assignment Model Validation Report**		
Prepared by:	**Nik Bowyer, Mark Chadwick**	Date:	**1 May 2009**
Approved by:	**Bil Harrison**	Date:	**15 May 2009**

1 Introduction

1.1 This Technical Appendix describes the development of the highway element of the Ipswich Transport Assessment Model (ITAMS). This model has been developed for a 2008 base year and validated for the AM (0800-0900) and PM (1700-1800) peak hours. An interpeak model exists for use in the demand modelling, but has not yet been formally calibrated or validated.

1.2 The objectives of the Highway Traffic Model are to inform the local Highway Authority of the impacts of proposed development and transport infrastructure interventions in the vicinity of Ipswich in the coming years. One of its first uses has been to assess the impacts of the Major Scheme Business Case (MSBC) being put forward by SCC.

1.3 This Technical Appendix covers the following aspects in turn:

- Model Overview
- Data Sources
- Zoning
- Network Development
- Matrix Development
- Matrix Estimation
- Calibration
- Validation
- Fitness for Purpose

1.4 There was a previous SATURN based model highway model of Ipswich that was last re-validated in 1999. Due to the age of the data used in developing the Ipswich Traffic Model (ITM) it was considered that a new multi-modal variable demand model should be developed that also included public transport and active modes as well as highway.

1.5 The separate Model Specification Report (November 2008) details the (proposed) specifications of the ITAMS suite of models. It is formed of a SATURN highway model, an EMME bus model and EMME based demand model.

1.6 The SATURN version 10.8 modelling software has been used to build the highway model. This software is appropriate for modelling of urban road networks as it is capable of assessing junction capacities relatively well.

1.7 In developing ITAMS a series of transport surveys were undertaken in the summer of 2008 comprising;

- Roadside Interviews (36 sites)
- Automatic Traffic Counts (44 sites)

- Manual Classified Link Counts (36 sites)
- Manual Classified Turning Counts (31 sites)
- Automatic Number Plate Recognition (25 sites)
- Car Park Counts and Origin & Destination (11 sites)
- Journey Time Surveys (6 routes)
- Bus passenger surveys (11 sites)

The location of these surveys in indicated in Figure I.1. To supplement these current and historical data were also obtained from other sources.

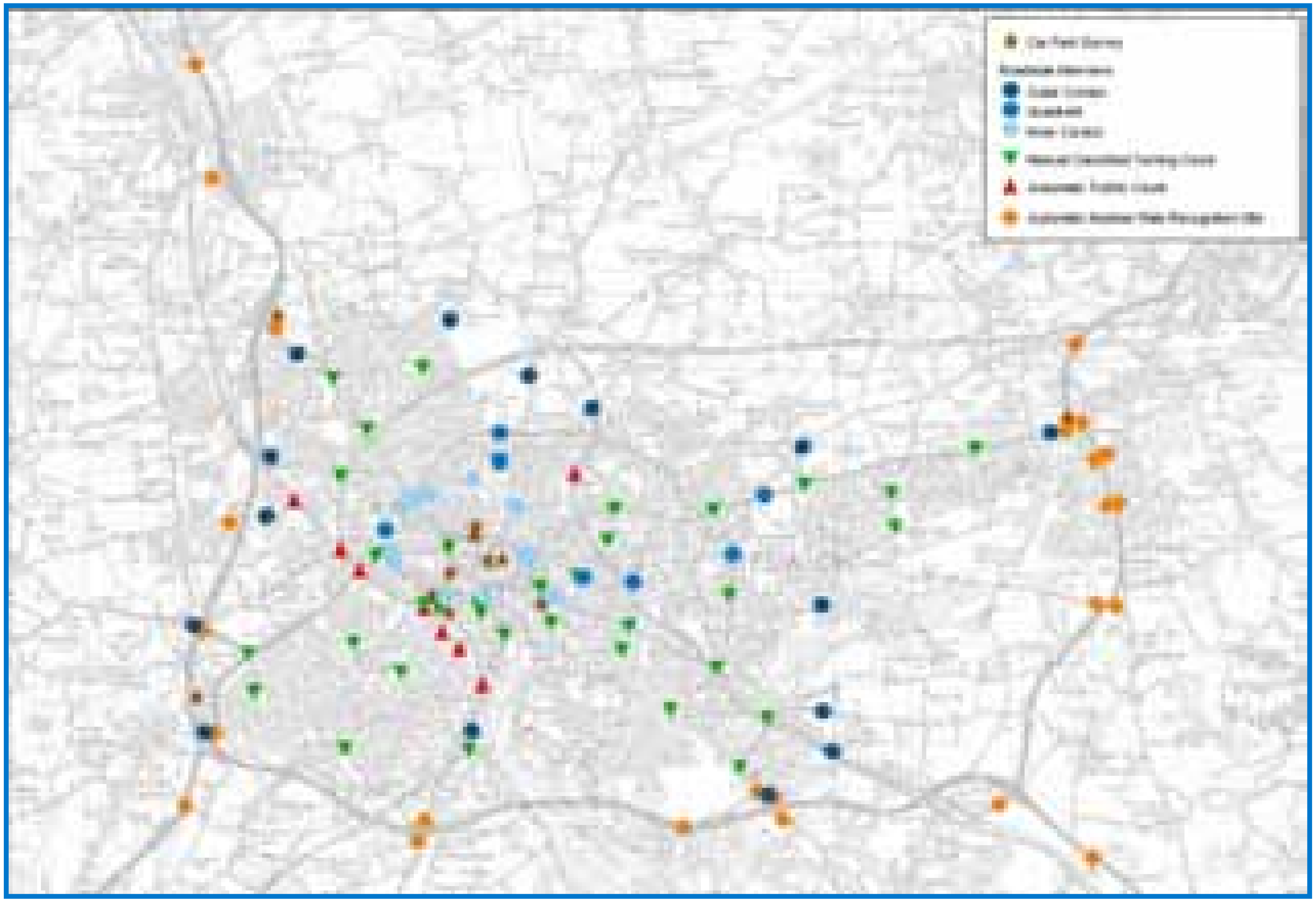


Figure I.1 : Location of ITAMS travel surveys undertaken in 2008

2 Network Data Sources

2.1 The network development drew on the following sources:

- Previous traffic model
- Inventory work
- Traffic signal information
- Bus timetables

2.2 The previous model was used as an initial starting point for constructing the SATURN model network. This model included the major routes through and around Ipswich. Some additional local roads were considered necessary to include to ensure that traffic would be assigned appropriately and also to reflect the more disaggregate zoning system in the new model. GIS databases and mapping were used to determine distances between network nodes.

2.3 Aerial photography and site visits were used to ensure that network coding followed actual network layouts. From these reviews the following information was obtained;

- Lanes and turn markers
- Posted speed limits
- Banned turns
- Weight restrictions
- One-way streets
- Bus priority measures
- Local access points
- Car park locations

2.4 For those junctions which are currently signalised, signal setting information has been obtained from Peek Traffic and Suffolk County Council. The phasing, stages, and timings have been included in the network coding. As a number of signals within Ipswich have motion detection sensors, vehicle actuation or bus priority measures, the maximum green times for each stage have been used with the total cycle time adjusted as appropriate. Where signal timings vary across the day, the appropriate timings for the AM peak (0800-0900) and the PM peak (1700-1800) have been extracted and input into the relevant models. For the complex signal controlled gyratories on the strategic trunk highway network, signal timings have been obtained from the Highways Agency. Junctions with high signal cycles, exceeding two and a half minutes were visited and manual data collected and input into the model network.

2.5 The highway and bus models have identical networks which enables bus flows to be extracted from the bus model and used directly within the highway model, whilst highway speeds and delays are able to be passed in the opposite direction.

2.6 A number of ‘sensibility’ checks were undertaken on the network to ensure that coding was robust. These checks included;

- Distance checks, carried out through the ‘joy ride’ process within SATURN, and checks that the distances were coded as the same in each direction;
- An assessment of link distances compared to the ‘crow fly’ distance was also undertaken by exporting the highway network into MapInfo along with the distances from the SATURN model and a difference between the ‘crow fly’ – as calculated by MapInfo – was

calculated. All links with a coded distance differing from the crow fly by more than 50 metres were then manually checked and corrected where required; and

- Review of errors and warnings in the SATURN network build output files;

2.7 Following these checks, the coded information was used for network construction.

3 Zoning

3.1 The ITAMS zoning system was developed from that used in the previous models. This was to enable use of the existing matrices in undertaking some preliminary assignments in the new model prior to new demand matrices being available.

3.2 The previous zoning system had been built prior to the availability of output area definitions used in the 2001 Census. About 165 zones within the immediate Ipswich area were redefined to generally follow 2001 output area boundaries. Some disaggregation of zones was undertaken in areas outside the town centre. Boundaries were also re-drawn with consideration of land-use to attempt to separate residential and employment areas. Disaggregation and the addition of car park zones has resulted in an increase to around 250 zones within the wider Ipswich area in ITAMS.

3.3 Ipswich and the surrounding area is located within 4 National Trip End Model (NTEM) Zones. This zone system is used within the TEMPRO software which is the control used in developing trip ends and land-use planning data. ITAMS zones lie wholly within NTEM zones.

3.4 Beyond the Ipswich area the zoning system has also been developed to match NTEM boundaries. Beyond the immediate Ipswich area zones tend to follow district boundaries, whilst beyond this they follow county boundaries. Some major towns (Colchester, Cambridge, Norwich) are represented as separate zones as it was considered that they were significant generators of longer distance traffic around Ipswich.

3.5 Car parks and park and ride sites were also given individual zones. To enable assessment of future development proposals a number of 'spare' zones were included to allow representation of these developments. There are 8 zones representing public car parks, 4 zones for park and ride sites and 26 zones available for future development sites or park & ride sites. (or further disaggregation)

3.6 To ease the analysis process zone numbering has been based on distance from the centre of Ipswich with zone 101 being closest to the centre. The zones within the inner ring road were numbered 100 upwards, the zones up to the outer ring road 200 upwards, the zones up to the A12 and A14 300 upwards and the remaining external zones 500 upwards. The node numbers in each zone section corresponded to the zone numbers in that section. For example, the node numbers within the inner ring road are five digits long, beginning at 10001, while those within the outer ring road begin at 20001.

3.7 Figures I.2, I.3, and I.4 show the ITAMS zone system in the Ipswich area and the rest of the U.K.

Figure I.2 : ITAMS Zone system – central Ipswich

Figure I.3 : ITAMS Zone system – wider Ipswich area

Figure I.4 : ITAMS Zone system across U.K.

4 Network Construction

4.1 The network was developed using the following applications;

- Internet aerial photography
- Site visits
- Local authority data
- GIS database

4.2 The highway network is separated into two main parts. Within the wider Ipswich area the road network is defined in simulation mode where junctions are modelled in detail. To accommodate the demand model there is a 'buffer' network beyond this, in which only links are defined, without junction representation. These buffer links are used for the east and west A14 regional approaches to Ipswich, and the north and south A12 approaches.

4.3 Figure I.5 shows the extent of the simulation area within which there are the following number of junction types;

- 772 Priority Junctions (including centroid connector junctions, and cosmetic bends in links)
- 62 Roundabouts
- 66 Traffic Signals

4.4 As well as junction type at each node the number of arms, lanes, lane marking, saturation flow and where applicable signal timings are coded. Speed-flow curves have been applied to the two major routes in the Ipswich area, the A14 and A12. On other roads a cruise speed has been coded which remains constant across links with the same posted speed limit.

4.5 Signal data coding, based on timing data from the highway authorities, differs between time periods. There are no other coded differences between time periods.

4.6 Coding of junction (node) saturation flows is consistent with that used in the East of England Regional Model.

4.7 To assist in the calibration and analysis stages zones connectors have been attached to spigots rather than links. This also assists in providing a better representation of inter-zonal costs in the demand model.

4.8 Models have been built for the AM and PM peak hours. For urban areas it is possible in SATURN to establish the level of queuing at the beginning of the modelled hours. This is done using the PASSQ facility and for Ipswich assigning the equivalent demand in the hour prior to that being modelled. From traffic count data available it has been established that the 0700-0800 flow is 81% of that in the hour beginning 0800. For the PM peak the PASSQ flow is 96% of the peak hour flow. It is assumed that trip distribution and vehicle proportions is unchanged between the peak and pre-peak hours.

4.9 In the SATURN assignment there are five user classes as follows;

- Heavy Goods Vehicles
- Light Goods Vehicle
- Car Commute
- Car Other (including Education)
- Car Employer's Business

For each of these user classes average economic costs have been calculated for the time and distance elements of each trip. These have been based on WebTAG value of time and vehicle operating costs as issued in April 2009. From these data the following generalised costs have been calculated;

- Heavy Goods Vehicles, 37.49 pence per minute (ppm), 36.67 pence per kilometre (ppk)
- Light Goods Vehicle, 18.70 ppm 12.04 ppk
- Car Commute, 10.78 ppm, 5.73 ppk
- Car Other, 12.97 ppm, 5.73 ppk
- Car Employer's Business, 47.99 ppm, 10.34 ppk

Figure I.5 : Extent of Simulation Network

5 Matrix Building

5.1 The development of the demand matrices is described in detail elsewhere. This section gives a brief summary of the process and how input data to the matrix building was used in the calibration process.

5.2 Origin and destination data matrices were developed from roadside interview surveys undertaken at 36 Locations around Ipswich in July 2008. There were two distinct cordons, an inner one and outer one, as indicated on Figure I.6 As a rule surveys were conducted inbound to the town centre at the Inner cordon sites and outbound at the outer cordon sites. Due to constraints at some sites it was not possible to follow the inbound/outbound rule and hence some surveys were undertaken in the reverse direction. Further sites were used to define radial screenlines.

5.3 As well as interviews conducted over a 12 hour period (0700-1900) at each RSI site a manual classified count (MCC) and automatic traffic count (ATC) survey were undertaken. The MCC was undertaken for the same 12 hour period as the RSI whereas the ATC was undertaken for 2 weeks.

5.4 Following data checking and cleaning the observed (prior) matrices were built with the MCC and ATC data used to expand the sample interviews to equivalent vehicle and hourly volumes. Screenlines and sectors were defined such that 'fully' observed inter-zonal and inter-sector movements could be identified. As interviews were only conducted in one direction at each RSI site, this process includes the synthesis of the non-interview direction, travel patterns, and accounting for differences in flow and purpose.

5.5 For unobserved movements a synthetic gravity model was built and calibrated. Inputs to the gravity model include trip ends, zone to zone distances taken from the initial SATURN model and journey to work data from the 2001 census.

5.6 The gravity model has been calibrated using a three dimensional matrix balancing approach whereby as well as constraining to productions and attractions from trip ends, there is a third constraint of absolute trips for each sector to sector movement.

5.7 The final stage of the 'prior' matrix building process is the merging of the observed and synthetic matrices. This is done for each purpose and for each sector to sector movement. Firstly, the intra sector movements are in-filled using purely synthetic data. For inter sector movements, a variance weighting is used to determine whether the observed or synthetic matrix elements are used.

5.8 As three dimensional gravity modelling is used in the synthetic matrix build, the synthetic matrices are constrained to observed sector to sector totals. When the merge process is carried out this sector to sector constraint is lost. Therefore, the last step in the process was to re-constrain the final merged matrix to the observed sector to sector totals. This is done by calculating the sum of the binomial constraint matrix using a sub matrix for the particular sector to sector movement that is being calculated. If this sum is zero then no merging has taken place and that particular movement is purely synthetic, and hence is still constrained to the observed sector to sector total. If it is non-zero some merging has taken place, and so that movement is re-constrained to the observed sector to sector total.

5.9 Longer distance through trips were taken from the East of England Regional Model (EERM) as it was not possible to undertake surveys on the A14 and A12. This affected zones in sectors 7 to 13 (Figure I.7) with demand between and within these sectors being replaced with demand data from EERM.

5.10 The outcome of the matrix building process are a set of six matrices as follows;

- Car Commute
- Car Other
- Car Education
- Car Employer’s Business
- Light Goods Vehicles
- Heavy Goods Vehicles

These categories are used within the demand model, whereas in the assignment model education trips are combined with other car trips.

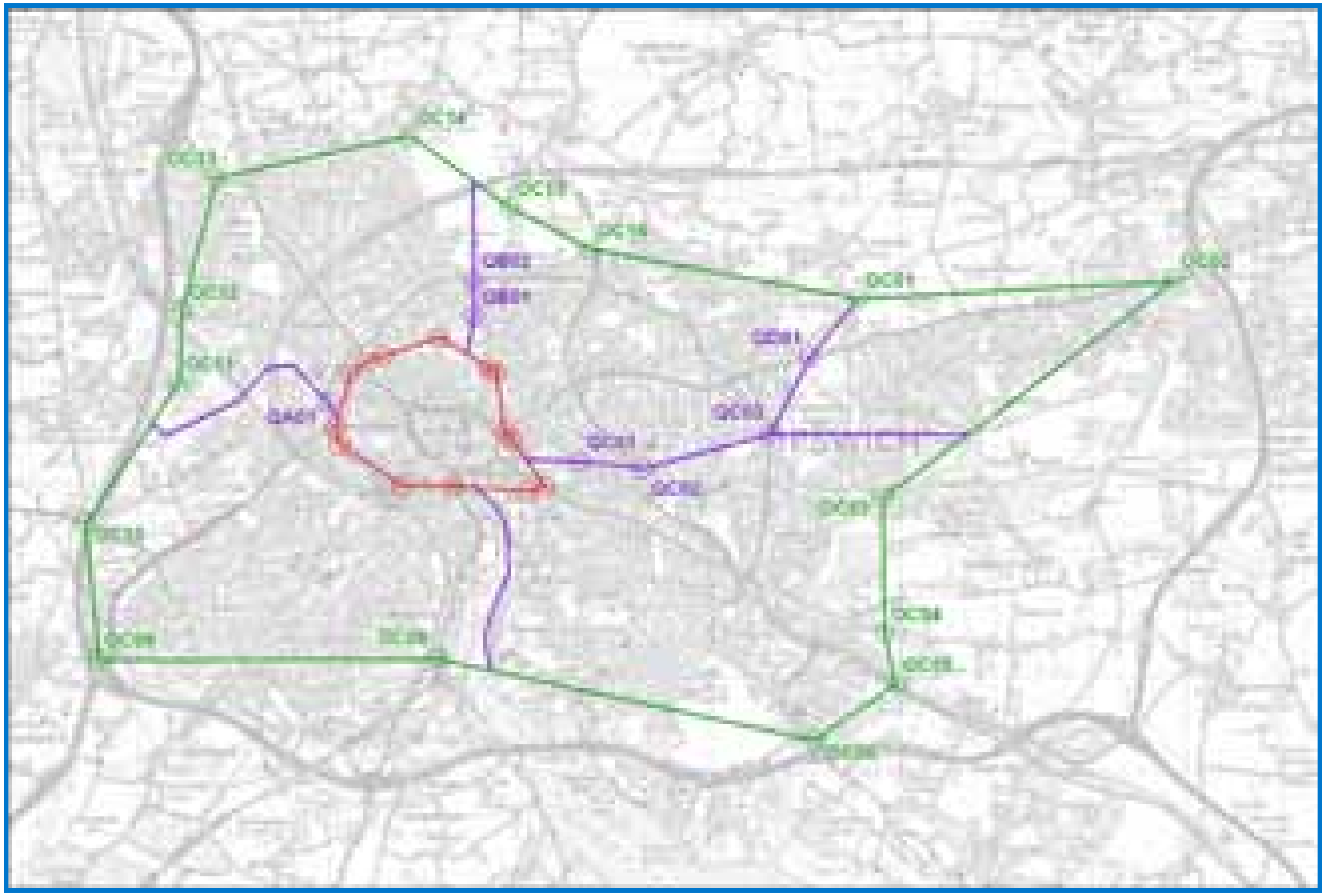


Figure I.6: Location of Screenlines formed from RSI sites

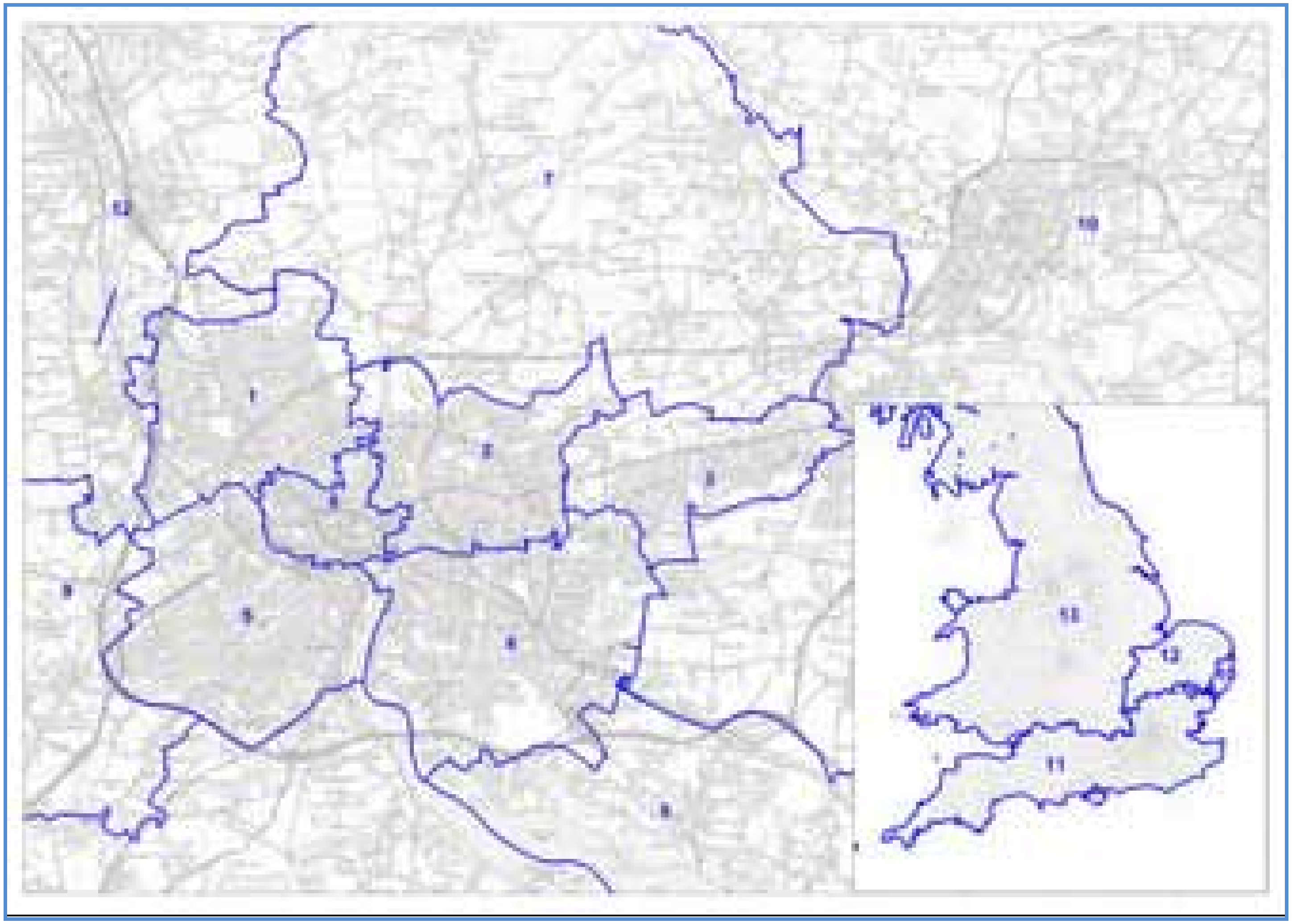


Figure I.7: ITAMS sector definitions

6 Matrix Estimation

6.1 The prior matrices should contain a good representation of all of the observed movements passing through the surveyed RSI sites. Other O-D data contained within the matrices has not been derived from observed movements and therefore may not accurately represent some movements particularly well. Matrix estimation was used to improve the matrices to obtain a closer fit to observed flows. The process of estimation assumes that any difference between observed and modelled flows is entirely as a result of matrix issues, assuming that network routeings are correct. It is therefore important that the network construction and parameters are thoroughly checked before undertaking estimation.

6.2 Matrix estimation should only be undertaken when any errors in the network coding have been remedied as far as possible. Three main steps were undertaken to ensure that the network was coded as correctly as possible prior to estimation being carried out:

- Logic checks on the built network;
- Review of initial assignment screenline calibration; and
- Checks on individual RSI site matrices.

These main checks are described in more detail in the following paragraphs.

6.3 Initially, a number of logic checks were carried out on the initially constructed network, involving tree-building between a number of zones. Tree-building was carried out between key O-D zone pairs to assess the minimum-cost routes between them. This provided a check of any spurious input distances or free-flow speeds in the highway network.

6.4 The prior matrix was then assigned to the highway network in order to assess the level of model validation without matrix estimation. All calibration/validation screenlines were analysed at both a total screenline flow level and then at an individual site level. This allowed for any particularly poor performing screenlines or sites to be analysed in detail for network coding errors. This was an iterative procedure, resulting in several re-assignments.

6.5 Individual RSI site matrices were also assigned to the network using the SATURN assignment procedure SATRAP; SATRAP allows for a different trip matrix (such as a single RSI site) to be assigned to the paths undertaken in a previous assignment. This allowed for analyses of the paths undertaken by trips passing through a particular RSI site, in order that any network connectivity issues or trip matrix build errors could be identified. Use of SATRAP was preferable to the simple unconstrained assignment procedure as it takes account of the effects of congestion caused by other trips on the highway network (not observed at the RSI site in question).

6.6 For the process of matrix estimation, the following count sources were used:

- ATC derived link counts on the calibration screenlines;
- RSI ATC link counts on the calibration cordons; and
- MCTCs at key junctions in the central and wider-Ipswich urban and residential areas

Count data from these sources were introduced into the matrix estimation process as constraints in the relevant control files. These constraints are used by the process in order to factor trips for each individual zone pair using the link, as such the quality of the data to be used is of great importance. ATC data was used as it provides a 2 week (or longer) profile of traffic across the site, as such it is possible to have much greater confidence in ATC data than a manual classified link count for example. Additionally, the use of the RSI ATC data as an independent validation check was precluded by their use in the matrix building process; given the quality of the data and the strategic location of these sites, their inclusion in the estimation process was significant. The use of MCTC data provided another type of constraint, meaning that not only would there be confidence in the resultant link flows, but that key junctions would have more accurate turning flows. The dimension that this added to the estimation process is that realistic turning movements were less likely to lead to the infilling of unrealistic short distance trips.

6.7 Matrix estimation was undertaken for HGVs and light vehicles separately. The four light vehicle user-classes within ITAMS have been combined to compare with the counted light vehicle totals.

6.8 The calculated set of path factors and prior matrices are then input to the matrix estimation process, which uses an iterative procedure to update the trip matrix in order that assigned flows match the counts as closely as possible within a defined set of parameters. An updated trip matrix is then output and assigned to the network. For the ITAMS highway model, this process undergoes four iterations, allowing for a well converged solution to be reached.

6.9 Several parameters within the matrix estimation control files can be set in order to determine the degree to which the prior matrix may be changed. The balancing factor for counts for instance, has been set to less than the default value, this placed further restrictions on the matrix than usual, preventing the matrix becoming overly-distorted by the estimation process when trying to satisfy all constraint values introduced. The maximum number of iterations allowed by the process has been significantly increased over the default values allowing for a well-converged estimation solution to be reached.

6.10 Certain checks have been carried out post-matrix estimation, however, to show the degree to which the prior matrix has been updated by the estimation process. These checks involve:

- A comparison of sector-to-sector movements; and
- An analysis of the trip length distributions of the two matrices.

6.11 The sector-to-sector analysis is important in that it provides an understanding of how the estimated matrices are producing similar trip patterns to the respective prior matrices. Given that the prior matrices contain observed data, it is essential that as much of the underlying trip data gathered remains intact. For the purposes of matrix estimation analysis, the sectors used are the same as those used defining the RSI screenlines, and in the observed matrix build – this enables consistency and allows for a meaningful comparison of observed trip end patterns. Tables I.1 and I.2 demonstrate the change in sector-to-sector trip ends between the prior and estimated matrices for the AM and PM peak hours respectively.

6.12 The following Tables are based on the results of Run G.

Table I.1 – 2008 AM Peak hour; change in sector-to-sector movements (Estimated – Prior)

Prior v4

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	1,347	56	30	182	231	674	71	123	108	111	283	400	28	3,645
2	293	1,761	125	373	173	384	24	194	64	486	5	219	16	4,115
3	91	202	302	85	57	169	24	71	17	398	49	94	0	1,559
4	222	489	51	1,390	256	492	29	309	50	491	360	325	14	4,478
5	215	176	10	382	1,487	604	17	192	123	348	415	353	8	4,333
6	304	160	40	214	261	577	28	203	53	205	121	199	5	2,370
7	127	49	7	38	24	124	29	72	20	48	181	72	7	798
8	79	221	34	202	152	111	54	1,337	44	720	435	750	188	4,329
9	78	54	15	48	203	221	28	83	4,313	127	106	77	1	5,354
10	86	257	231	262	92	433	34	307	48	16,278	544	160	22	18,754
11	174	192	31	288	361	690	203	511	218	839	2,550,388	777	36	2,554,708
12	400	143	40	341	454	477	72	723	55	180	830	294,418	1	298,133
13	12	0	0	5	17	24	7	149	1	13	38	1	4,272,259	4,272,526
Total	3,428	3,761	917	3,811	3,769	4,980	621	4,274	5,115	20,244	2,553,755	297,845	4,272,584	7,175,103

ME2 Run G

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	1,253	79	47	154	435	543	94	98	100	100	332	494	37	3,763
2	156	1,584	194	557	177	558	17	151	71	472	6	142	10	4,094
3	63	376	408	255	95	229	31	86	23	431	64	84	0	2,145
4	138	604	151	1,618	223	558	56	295	71	474	377	335	14	4,914
5	250	266	11	427	1,483	857	34	172	162	306	428	527	11	4,935
6	297	185	53	326	347	655	30	234	93	174	130	195	6	2,726
7	156	73	12	77	45	191	30	55	19	46	252	69	7	1,031
8	56	155	23	186	194	66	48	1,335	38	519	342	569	144	3,675
9	95	110	12	74	181	321	40	57	4,313	81	114	99	1	5,497
10	83	264	426	262	126	407	35	307	56	16,266	524	167	22	18,945
11	193	273	34	275	384	704	231	319	209	521	2,550,332	724	29	2,554,227
12	511	165	67	341	629	427	94	574	62	159	1,049	294,419	1	298,497
13	16	0	0	5	24	33	9	115	1	11	44	1	4,272,260	4,272,518
Total	3,267	4,132	1,437	4,557	4,343	5,550	748	3,797	5,218	19,558	2,553,996	297,825	4,272,542	7,176,968

Difference

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	-94	23	17	-29	204	-132	23	-25	-9	-12	49	94	9	119
2	-136	-178	69	184	5	174	-6	-44	7	-14	1	-77	-5	-21
3	-28	174	106	170	38	61	7	15	6	33	16	-10	0	587
4	-84	115	100	228	-34	66	26	-14	21	-17	17	10	0	436
5	35	89	1	45	-5	253	17	-20	39	-42	13	174	4	602
6	-7	25	13	112	86	78	2	31	40	-30	9	-4	1	357
7	29	24	5	39	21	67	0	-17	-1	-2	71	-3	-0	233
8	-23	-66	-11	-16	41	-44	-7	-2	-6	-202	-93	-181	-44	-654
9	16	56	-3	25	-22	100	12	-27	0	-46	8	22	0	143
10	-2	7	195	-1	35	-26	1	-0	7	-12	-19	7	-0	191
11	19	81	2	-13	23	14	28	-192	-9	-319	-56	-53	-7	-481
12	111	22	27	-0	175	-49	22	-149	7	-21	219	1	0	364
13	4	0	0	0	6	9	2	-34	0	-2	6	-0	1	-8
Total	-161	371	520	745	574	570	127	-477	103	-686	241	-20	-42	1,865

Table I.2 – 2008 PM peak hour; change in sector-to-sector movements (Estimated – Prior)

Prior

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	1,262	247	90	245	209	345	103	88	75	74	193	360	10	3,300
2	292	1,812	169	430	156	162	37	224	48	240	16	154	4	3,743
3	35	135	292	61	18	25	4	34	15	243	30	39	0	931
4	216	394	86	1,256	368	283	48	203	47	279	325	315	7	3,828
5	236	197	71	287	1,335	334	28	121	176	95	329	408	17	3,635
6	577	356	231	596	565	633	94	318	218	362	687	544	4	5,187
7	127	29	23	37	16	35	22	109	44	56	227	78	8	810
8	111	208	65	294	217	67	27	1,263	48	380	394	660	473	4,206
9	91	73	18	74	138	47	11	89	4,294	83	134	99	5	5,153
10	117	401	379	493	325	153	35	331	57	16,127	617	181	24	19,240
11	295	201	34	365	435	126	127	568	216	474	2,574,056	822	48	2,577,765
12	338	220	91	277	338	216	49	739	44	146	774	292,290	1	295,521
13	0	23	0	17	8	6	6	321	2	29	52	1	4,276,126	4,276,589
Total	3,696	4,293	1,549	4,432	4,128	2,432	591	4,407	5,282	18,588	2,577,834	295,950	4,276,726	7,199,908

ME2 Run G

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	1,326	314	96	285	328	383	153	78	90	87	305	380	10	3,834
2	276	1,591	257	610	127	311	48	171	68	315	15	108	2	3,899
3	55	296	425	193	25	84	6	31	21	251	60	51	0	1,496
4	171	636	234	1,501	299	356	125	292	62	412	427	367	4	4,886
5	389	262	38	276	1,366	560	29	137	177	143	345	435	16	4,173
6	592	494	160	623	625	831	124	231	385	301	569	338	2	5,276
7	164	17	45	38	22	48	22	63	39	46	276	60	5	844
8	108	146	93	274	302	41	25	1,262	57	288	353	461	406	3,814
9	184	222	14	86	84	117	30	61	4,294	40	120	109	5	5,365
10	115	433	966	486	295	136	35	331	58	16,124	516	143	12	19,647
11	414	195	50	391	428	229	266	424	197	353	2,573,988	638	38	2,577,611
12	396	187	106	335	417	196	66	617	38	127	875	292,290	1	295,652
13	0	29	0	22	11	2	9	267	2	27	45	1	4,276,126	4,276,539
Total	4,188	4,820	2,483	5,121	4,330	3,294	937	3,963	5,488	18,514	2,577,894	295,380	4,276,625	7,203,038

Difference

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	64	67	6	41	119	37	50	-10	16	13	112	20	-0	534
2	-16	-221	88	180	-29	150	12	-53	20	74	-1	-46	-2	156
3	20	161	132	132	7	59	2	-3	6	8	30	12	0	566
4	-45	241	148	245	-69	72	76	90	15	133	102	52	-3	1,058
5	153	65	-33	-11	31	226	1	16	1	48	16	27	-1	538
6	16	138	-72	27	60	198	30	-87	167	-61	-118	-206	-2	89
7	36	-12	22	1	7	13	0	-46	-5	-9	49	-17	-3	35
8	-4	-62	28	-20	85	-26	-1	-1	8	-93	-40	-199	-67	-392
9	94	149	-4	11	-54	70	19	-28	0	-42	-14	10	0	212
10	-2	32	586	-6	-30	-17	-1	-0	2	-4	-101	-39	-12	407
11	119	-6	16	27	-7	103	139	-144	-18	-121	-68	-184	-10	-154
12	59	-32	16	58	79	-20	17	-123	-6	-19	101	-0	0	131
13	0	6	0	5	3	-3	2	-54	-0	-3	-6	0	0	-50
Total	492	527	934	690	202	862	346	-444	205	-74	61	-570	-101	3,130

6.13 For both time periods, it is possible to see that the effect of matrix estimation has been to increase the number of trip ends in the internal area, especially movements between sectors 1-6. Also demonstrated for both time periods is that intra-sector movements within sectors 1-6 generally increase as a result of matrix estimation, suggesting that there were insufficient short distance trips within the prior matrix.

6.14 Overall, the total trip ends in both the AM and PM peak hours are shown to vary only slightly as a result of matrix estimation, providing confidence in both the matrix building process and the use of matrix estimation as a tool for re-calibrating demand. Any increases in trips as a result of estimation are generally due to increases within the internal area.

6.15 Figures I.8 and I.9 show the change in trip length profiles for both the prior and estimated AM and PM peak hour matrices. These are presented for all inter-zonal movements with trip lengths of less than 100 kilometres. A brief comparison shows that the matrix estimation process has had little effect on the trip length profile, maintaining the integrity of the original observed data.

6.16 For the AM peak hour, it can be seen that short distance trips have increased slightly, with the largest increases appearing in the 5-8 kilometre movements. There are slight decreases in trip lengths of around 18 and 40 kilometres although these are minimal. These slight increases in short distance trips in the AM peak hour confirm the increases observed in the internal sector-to-sector movements.

6.17 In the PM peak hour the increase in short distance trips is slightly more marked than that of the AM peak hour, with the largest increase occurring in trip lengths of between 3-5 kilometres. Slight decreases are observed in the trip lengths of around 13 kilometres and similar to the AM peak for trips of around 40 kilometres in length. Overall the impact of matrix estimation has been minimal on trip length distribution.

Figure I.8: - Comparison of AM Peak hour trip length profiles

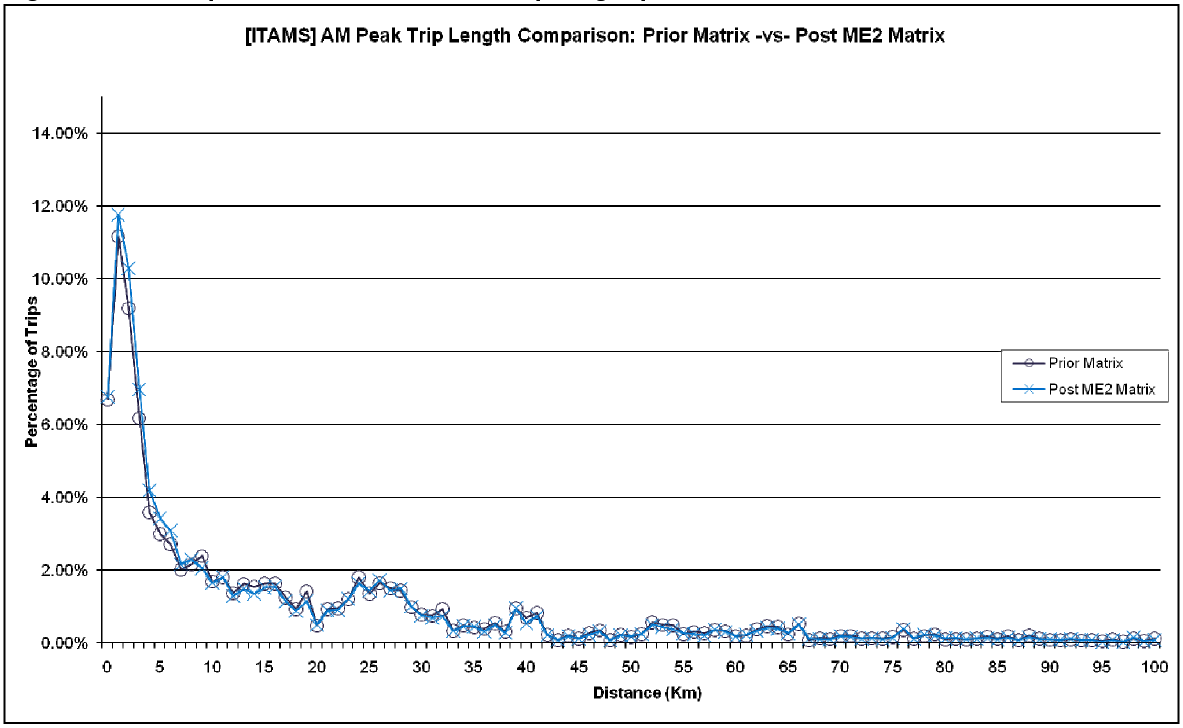
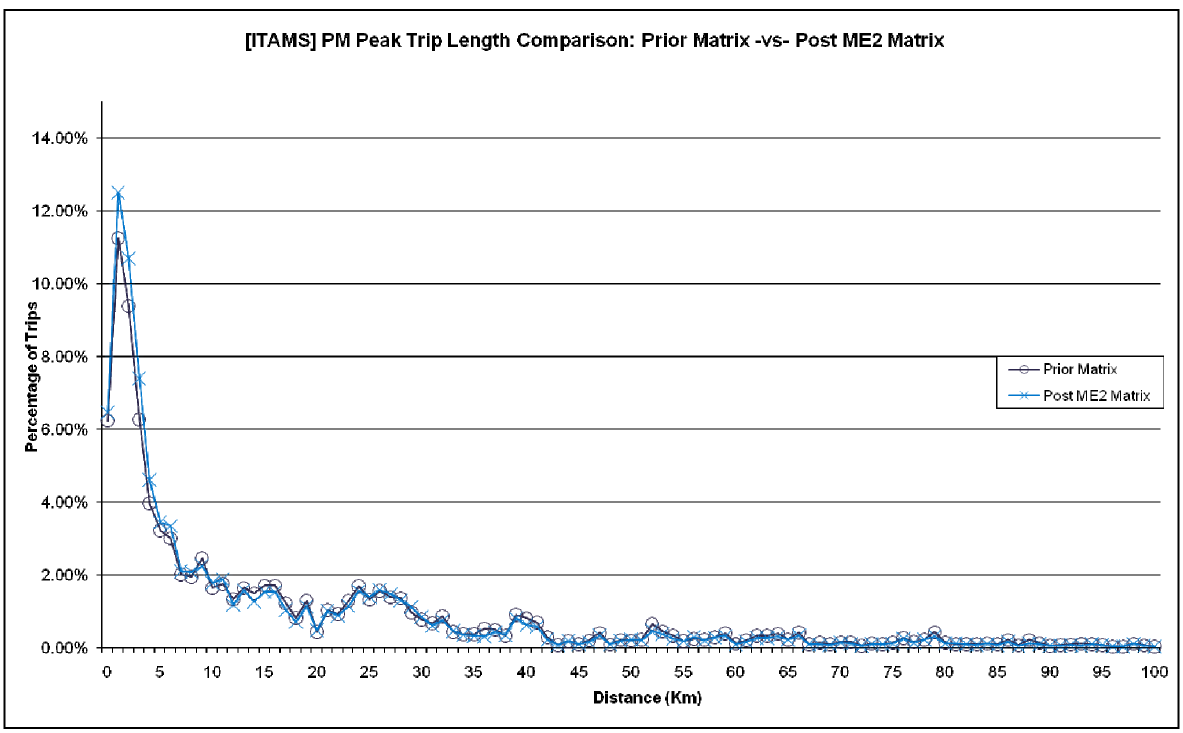


Figure I.9: – Comparison of PM Peak hour trip length profiles



7 Assignment Calibration

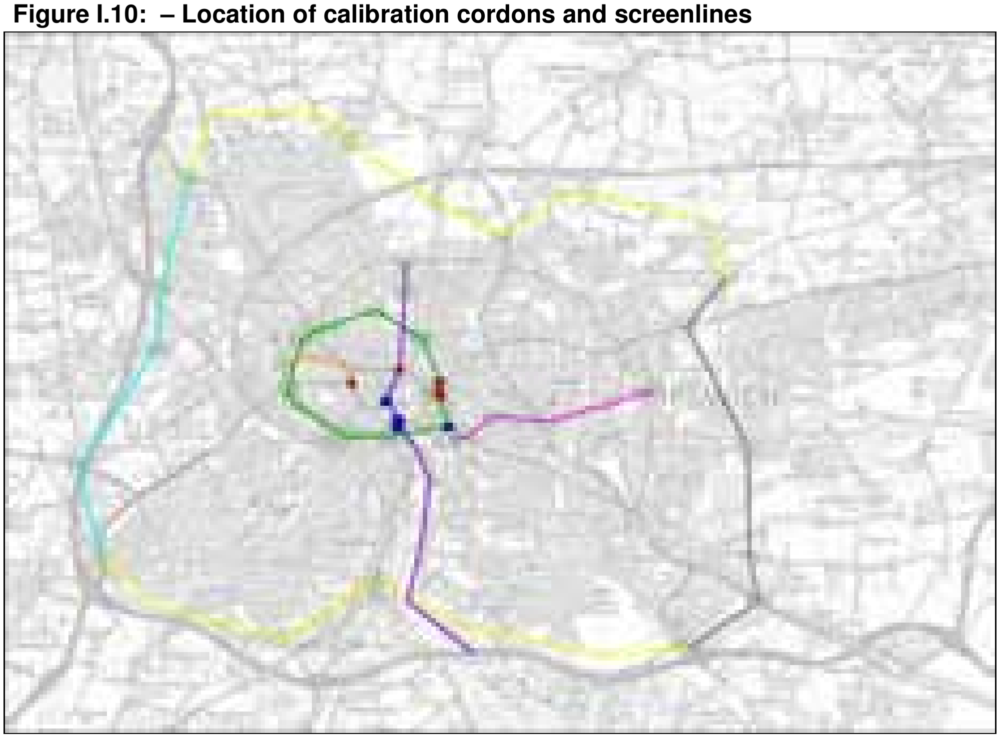
7.1 The principle taken for the calibration of the ITAMS highway component is to calibrate traffic flows to observed traffic counts across a series of screenlines and two cordons covering the town centre and environs of Ipswich. Given the importance of the A14 as a strategic route in the area and the key role it plays for both local and strategic traffic, modelled flows have also been calibrated to a corridor of observed traffic data from the HA's TRADS 2 database.

7.2 Initial matrix estimation runs led to the comparison of traffic flows across whole screenlines, corridors or cordons. Once it was satisfied that total flows across these were statistically close to the observed traffic flows, comparison of individual sites was undertaken; otherwise matrix estimation was re-run with some changes to the network having been made where appropriate. The process was iterative as in some cases it was necessary to examine the performance of individual sites to assess why total screenline flow calibration may or may not have been statistically close to the observed counts.

7.3 For calibration purposes, the statistical fit of modelled flows and observed counts used two separate measures. The first, DMRB flow criteria, sets out the amount to which the modelled and observed flow difference may vary based on relative and absolute differences dependent upon the observed count. The second (also endorsed by the DMRB) is the GEH index, which takes into account in a single index both the relative and absolute magnitude of the differences. It was necessary to monitor the performance of the model against both indicators, as it is possible for flows to satisfy one criteria and not the other.

7.4 Tables I.3 and I.4 show the calibration statistics for the screenlines and cordons used for the AM and PM peak hours respectively. Figure I.10 indicates the location of the screenlines.

Figure I.10: – Location of calibration cordons and screenlines



7.5 The Ipswich model demonstrates good calibration for both the AM and PM peak hours. For the AM peak hour, 85% of sites calibrate against observed data using the DMRB flow criteria, demonstrating that they meet the DMRB guidance. In particular, screenline 6 (westbound), screenline 7 (both directions) and the A14 TRADS corridor pass at 100% of all sites. Both the outer and inner cordons also show good calibration, achieving a 93% and 85% pass rate in the inbound direction and 87% and 92% in the outbound direction respectively. The PM peak demonstrates slightly better calibration with 86% of all sites calibrating against the same criteria; both screenlines 6 and 7 demonstrate 100% of individual sites passing in both directions, whilst the outer cordon demonstrates 100% of all traffic at inbound sites is in-line with the observed data with 93% (only 1 site failing) at all outbound sites.

Table I.3 – AM peak calibration tables

Cordon 1: RSI Outer Cordon sites | INBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
3056430318	30564	30318	OC site 01: Playford Road, east of Rushmere Street	337	354	17	5%	0.9	PASS	PASS
3030130298	30301	30298	QD site 01: A1214 Woodbridge Road, east of Playford Road	907	860	-47	-5%	1.6	PASS	PASS
3037230277	30372	30277	OC site 03: Foxhall Road, east of Broadlands Way	581	591	9	2%	0.4	PASS	PASS
3026630374	30266	30374	OC site 04: Bucklesham Road, east of Purdis Farm Lane	69	35	-34	-49%	4.7	PASS	PASS
3063830496	30638	30496	OC site 05: A1156 Felixstowe Road, outside Suffolk showground	518	535	16	3%	0.7	PASS	PASS
3007830778	30078	30778	OC site 06: A1189 Nacton Road, west of A14 junction 57	999	938	-61	-6%	2.0	PASS	PASS
3022030219	30220	30219	OC site 08: A137 Wherstead Road, north of B1456	1,078	1,070	-8	-1%	0.2	PASS	PASS
3083230152	30832	30152	OC site 09: A1214 London Road, north of A14 junction 55	1,171	1,041	-130	-11%	3.9	PASS	PASS
5003430150	50034	30150	OC site 10: A1071, east of B1113	963	1,059	96	10%	3.0	PASS	PASS
3002930739	30029	30739	OC site 11: Sproughton Road, west of Farthing Road	583	502	-81	-14%	3.5	PASS	PASS
3074430780	30744	30780	OC site 12: B1067 Bramford Road, west of Weaver Close	242	338	96	39%	5.6	FAIL	PASS
3011930124	30119	30124	OC site 13: A1156 Bury Road, east of Anglia Parkway	691	672	-19	-3%	0.7	PASS	PASS
3034130340	30341	30340	OC site 14: Henley Road, north of Defoe Road	406	405	-1	-0%	0.0	PASS	PASS
3033330807	30333	30807	OC site 15: B1077 Westerfield Road, south of Westerfield Rail station	313	344	31	10%	1.7	PASS	PASS
3044730790	30447	30790	OC site 16: Tuddenham Road, east of Dorset Close	673	527	-146	-22%	6.0	FAIL	FAIL
									87%	93%
			TOTAL Outer Cordon Traffic Flow | INBOUND	9,532	9,270	-262	-3%	2.7	PASS	PASS

Cordon 1: RSI Outer Cordon sites | OUTBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
3031830564	30318	30564	OC site 01: Playford Road, east of Rushmere Street	240	332	92	38%	5.4	FAIL	PASS
3029830301	30298	30301	QD site 01: A1214 Woodbridge Road, east of Playford Road	639	522	-117	-18%	4.9	PASS	FAIL
3027730372	30277	30372	OC site 03: Foxhall Road, east of Broadlands Way	504	500	-4	-1%	0.2	PASS	PASS
3037430266	30374	30266	OC site 04: Bucklesham Road, east of Purdis Farm Lane	64	43	-21	-32%	2.8	PASS	PASS
3049630638	30496	30638	OC site 05: A1156 Felixstowe Road, outside Suffolk showground	551	576	26	5%	1.1	PASS	PASS
3077830078	30778	30078	OC site 06: A1189 Nacton Road, west of A14 junction 57	1,072	1,018	-54	-5%	1.7	PASS	PASS
3021930220	30219	30220	OC site 08: A137 Wherstead Road, north of B1456	817	796	-21	-3%	0.7	PASS	PASS
3015230832	30152	30832	OC site 09: A1214 London Road, north of A14 junction 55	1,241	975	-266	-21%	8.0	FAIL	FAIL
3015050034	30150	50034	OC site 10: A1071, east of B1113	592	642	50	9%	2.0	PASS	PASS
3073930029	30739	30029	OC site 11: Sproughton Road, west of Farthing Road	580	567	-13	-2%	0.5	PASS	PASS
3078030744	30780	30744	OC site 12: B1067 Bramford Road, west of Weaver Close	248	276	28	11%	1.7	PASS	PASS
3012430119	30124	30119	OC site 13: A1156 Bury Road, east of Anglia Parkway	877	949	71	8%	2.4	PASS	PASS
3034030341	30340	30341	OC site 14: Henley Road, north of Defoe Road	237	261	23	10%	1.5	PASS	PASS
3080730333	30807	30333	OC site 15: B1077 Westerfield Road, south of Westerfield Rail station	157	203	46	29%	3.4	PASS	PASS
3079030447	30790	30447	OC site 16: Tuddenham Road, east of Dorset Close	277	338	61	22%	3.5	PASS	PASS
									87%	87%
			TOTAL Outer Cordon Traffic Flow | OUTBOUND	8,097	8,000	-97	-1%	1.1	PASS	PASS

Screenline 2: RSI Inner Cordon sites | INBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
2003920037	20039	20037	IC site 01A: B1077 Westerfield Road, north of Tuddenham Road	170	177	7	4%	0.5	PASS	PASS
2003820037	20038	20037	IC site 01B: Tuddenham Road, north of Westerfield Road	275	279	5	2%	0.3	PASS	PASS
2005410021	20054	10021	MCTC 19 (IBC): Woodbridge Road and Argyle Street	203	196	-7	-4%	0.5	PASS	PASS
2007010020	20070	10020	MCTC 20 (IBC): St Helens Street and Grimwade Street	797	485	-312	-39%	12.3	FAIL	FAIL
2007210062	20072	10062	MCTC15 (NID): Duke Street, Fore street	1,175	1,084	-91	-8%	2.7	PASS	PASS
3021410009	30214	10009	IC site 05: A137 Bridge Street, north of B1073 Burrell Road	1,168	1,208	40	3%	1.2	PASS	PASS
2031820005	20318	20005	IC site 06: B1075 Princes Street, south of West End Road	610	552	-58	-9%	2.4	PASS	PASS
2001420013	20014	20013	IC site 07: A137 West End Road, south of A1071 Handford Road	547	543	-4	-1%	0.2	PASS	PASS
2001420015	20014	20015	IC site 08: A1071 Handford Road, east of A137 West End Road	743	515	-228	-31%	9.1	FAIL	FAIL
2002530427	20025	30427	IC site 09A: B1067 Bramford Road, east of A1214 Yarmouth Road	282	284	2	1%	0.1	PASS	PASS
2002820023	20028	20023	IC site 09B: A1156 Norwich Road, south of Anglesea Road	607	600	-7	-1%	0.3	PASS	PASS
2002920304	20029	20304	IC site 10: Anglesea Road, east of Graham Road	209	222	14	7%	0.9	PASS	PASS
2004120031	20041	20031	IC site 11: Henley Road, south of St Edmund's Road	859	776	-83	-10%	2.9	PASS	PASS
									85%	85%
			TOTAL Inner Cordon Traffic Flow | INBOUND	7,644	6,921	-723	-9%	8.5	FAIL	FAIL

Screenline 2: RSI Inner Cordon sites | OUTBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
2003720039	20037	20039	IC site 01A: B1077 Westerfield Road, north of Tuddenham Road	55	56	1	2%	0.1	PASS	PASS
2003720038	20037	20038	IC site 01B: Tuddenham Road, north of Westerfield Road	77	81	3	4%	0.4	PASS	PASS
1011310021	10113	10021	MCTC 19 (IBC): Woodbridge Road and Argyle Street	899	942	43	5%	0.9	PASS	PASS
1002020070	10020	20070	MCTC 20 (IBC): St Helens Street and Grimwade Street	102	88	-14	-13%	1.4	PASS	PASS
1006220072	10062	20072	MCTC15 (NID): Duke Street, Fore street	897	916	20	2%	0.2	PASS	PASS
1000930214	10009	30214	IC site 05: A137 Bridge Street, north of B1073 Burrell Road	783	782	-1	-0%	0.0	PASS	PASS
2000520318	20005	20318	IC site 06: B1075 Princes Street, south of West End Road	242	124	-117	-48%	8.7	FAIL	FAIL
2001320014	20013	20014	IC site 07: A137 West End Road, south of A1071 Handford Road	291	255	-35	-12%	2.1	PASS	PASS
2001520014	20015	20014	IC site 08: A1071 Handford Road, east of A137 West End Road	359	328	-31	-9%	1.7	PASS	PASS
3042720025	30427	20025	IC site 09A: B1067 Bramford Road, east of A1214 Yarmouth Road	216	217	1	0%	0.0	PASS	PASS
2002320028	20023	20028	IC site 09B: A1156 Norwich Road, south of Anglesea Road	321	323	2	1%	0.1	PASS	PASS
2030420029	20304	20029	IC site 10: Anglesea Road, east of Graham Road	106	112	6	6%	0.6	PASS	PASS
2003120041	20031	20041	IC site 11: Henley Road, south of St Edmund's Road	288	291	3	1%	0.2	PASS	PASS
									92%	92%
			TOTAL Inner Cordon Traffic Flow | OUTBOUND	4,636	4,516	-120	-3%	1.8	PASS	PASS

Screenline 3 | NORTHBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
2008020024	20080	20024	QA site 01: A1214 Yarmouth Road, north of A1071 London Road	659	672	13	2%	0.5	PASS	PASS
1000110002	10001	10002	MCTC 11: Civic Drive (A1022), Handford Road	728	1,109	381	52%	12.6	FAIL	FAIL
									50%	50%
			TOTAL Screenline 3 | NORTHBOUND	1,387	1,780	394	28%	9.9	FAIL	FAIL

Screenline 3 | SOUTHBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
2002420080	20024	20080	QA site 01: A1214 Yarmouth Road, north of A1071 London Road	853	596	-257	-30%	9.6	FAIL	FAIL
1000210001	10002	10001	MCTC 11: Civic Drive (A1022), Handford Road	957	960	3	0%	0.1	PASS	PASS
									50%	50%
			TOTAL Screenline 3 | SOUTHBOUND	1,810	1,555	-255	-14%	6.2	FAIL	FAIL

Screenline 4 | EASTBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
2026420047	20264	20047	QB site 02: A1214 Valley Road, east of The Avenue	1,178	822	-356	-30%	11.3	FAIL	FAIL
2026320040	20263	20040	QB site 01: Park Road, east of The Avenue	296	313	17	6%	1.0	PASS	PASS
1006610028	10066	10028	MCTC 16 (IBC): Crown Street, Northgate Street	446	438	-9	-2%	0.4	PASS	PASS
1007410038	10074	10038	NID 33 ATC: Falcon Street	69	146	77	113%	7.5	FAIL	PASS
1008410042	10084	10042	NID 34 ATC (SCC) Star Lane	1,578	1,504	-74	-5%	1.9	PASS	PASS
									60%	80%
			TOTAL Screenline 4 | EASTBOUND	3,566	3,222	-344	-10%	5.9	FAIL	FAIL

Screenline 4 | EASTBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
2004720264	20047	20264	QB site 02: A1214 Valley Road, east of The Avenue	846	1,049	203	24%	6.6	FAIL	FAIL
2004020263	20040	20263	QB site 01: Park Road, east of The Avenue	564	248	-316	-56%	15.7	FAIL	FAIL
1002710028	10027	10028	MCTC 16 (IBC): Crown Street, Northgate Street	742	819	78	10%	2.8	PASS	PASS
1003810074	10038	10074	NID 33 ATC: Falcon Street	91	120	29	32%	2.8	PASS	PASS
1011510010	10115	10010	NID 35 ATC: College Street	1,130	1,087	-43	-4%	1.3	PASS	PASS
									60%	60%
			TOTAL Screenline 4 | WESTBOUND	3,373	3,324	-49	-1%	0.8	PASS	PASS

Screenline 5 | EASTBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
3011930124	30119	30124	OC site 13: A1156 Bury Road, east of Anglia Parkway	691	672	-19	-3%	0.7	PASS	PASS
3074430780	30744	30780	OC site 12: B1067 Bramford Road, west of Weaver Close	242	338	96	39%	5.6	FAIL	PASS
3002930739	30029	30739	OC site 11: Sproughton Road, west of Farthing Road	583	502	-81	-14%	3.5	PASS	PASS
5003430150	50034	30150	OC site 10: A1071, east of B1113	963	1,059	96	10%	3.0	PASS	PASS
3083230152	30832	30152	OC site 09: A1214 London Road, north of A14 junction 55	1,171	1,041	-130	-11%	3.9	PASS	PASS
									80%	100%
			TOTAL Screenline 5 Traffic Flow | EASTBOUND	3,651	3,612	-39	-1%	0.6	PASS	PASS

Screenline 5 | WESTBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
3015230832	30152	30832	OC site 09: A1214 London Road, north of A14 junction 55	1,241	975	-266	-21%	8.0	FAIL	FAIL
3015050034	30150	50034	OC site 10: A1071, east of B1113	592	642	50	9%	2.0	PASS	PASS
3073930029	30739	30029	OC site 11: Sproughton Road, west of Farthing Road	580	567	-13	-2%	0.5	PASS	PASS
3078030744	30780	30744	OC site 12: B1067 Bramford Road, west of Weaver Close	248	276	28	11%	1.7	PASS	PASS
3012430119	30124	30119	OC site 13: A1156 Bury Road, east of Anglia Parkway	877	949	71	8%	2.4	PASS	PASS
									80%	80%
			TOTAL Screenline 5 Traffic Flow | WESTBOUND	3,538	3,409	-129	-4%	2.2	PASS	PASS

Screenline 6 | EASTBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
3077830078	30778	30078	OC site 06: A1189 Nacton Road, west of A14 junction 57	1,072	1,018	-54	-5%	1.7	PASS	PASS
3049630638	30496	30638	OC site 05: A1156 Felixstowe Road, outside Suffolk showground	551	576	26	5%	1.1	PASS	PASS
3037430266	30374	30266	OC site 04: Bucklesham Road, east of Purdis Farm Lane	64	43	-21	-32%	2.8	PASS	PASS
3027730372	30277	30372	OC site 03: Foxhall Road, east of Broadlands Way	504	500	-4	-1%	0.2	PASS	PASS
3029830301	30298	30301	QD site 01: A1214 Woodbridge Road, east of Playford Road	639	522	-117	-18%	4.9	PASS	FAIL
3031830564	30318	30564	OC site 01: Playford Road, east of Rushmere Street	240	332	92	38%	5.4	FAIL	PASS
									83%	83%
			TOTAL Screenline 6 Traffic Flow | EASTBOUND	3,070	2,993	-78	-3%	1.4	PASS	PASS

Screenline 6 | WESTBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	AGEH Statistic	GEH Result	DMRB
3007830778	30078	30778	OC site 06: A1189 Nacton Road, west of A14 junction 57	999	938	-61	-6%	2.0	PASS	PASS
3063830496	30638	30496	OC site 05: A1156 Felixstowe Road, outside Suffolk showground	518	535	16	3%	0.7	PASS	PASS
3026630374	30266	30374	OC site 04: Bucklesham Road, east of Purdis Farm Lane	69	35	-34	-49%	4.7	PASS	PASS
3037230277	30372	30277	OC site 03: Foxhall Road, east of Broadlands Way	581	591	9	2%	0.4	PASS	PASS
3030130298	30301	30298	QD site 01: A1214 Woodbridge Road, east of Playford Road	907	860	-47	-5%	1.6	PASS	PASS
3056430318	30564	30318	OC site 01: Playford Road, east of Rushmere Street	337	354	17	5%	0.9	PASS	PASS
									100%	100%
			TOTAL Screenline 6 Traffic Flow | WESTBOUND	3,412	3,312	-99	-3%	1.7	PASS	PASS

Screenline 7 | NORTHBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	AGEH Statistic	GEH Result	DMRB
2025620072	20256	20072	IC site 04B: Duke Street, south of A1156 Fore Street	310	341	30	10%	1.7	PASS	PASS
3043130760	30431	30760	IC site 04A: A1156 Fore Hamlet, north of Cavendish Street	239	217	-22	-9%	1.4	PASS	PASS
2028220074	20282	20074	QC site 01: B1075 Foxhall Road, south of Back Hamlet	796	804	7	1%	0.3	PASS	PASS
2007720280	20077	20280	QC site 02: Cauldwell Hall Road, north of Foxhall Road	290	284	-6	-2%	0.4	PASS	PASS
3029330644	30293	30644	QC site 03: A1189 Heath Road, north of Heath Lane	961	965	4	0%	0.1	PASS	PASS
									100%	100%
			TOTAL Screenline 9 Traffic Flow | NORTHBOUND	2,596	2,611	15	1%	0.3	PASS	PASS

Screenline 7 | SOUTHBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	AGEH Statistic	GEH Result	DMRB
2007220256	20072	20256	IC site 04B: Duke Street, south of A1156 Fore Street	299	326	27	9%	1.5	PASS	PASS
3076030431	30760	30431	IC site 04A: A1156 Fore Hamlet, north of Cavendish Street	353	367	14	4%	0.7	PASS	PASS
2007420282	20074	20282	QC site 01: B1075 Foxhall Road, south of Back Hamlet	339	344	6	2%	0.3	PASS	PASS
2028020077	20280	20077	QC site 02: Cauldwell Hall Road, north of Foxhall Road	304	279	-24	-8%	1.4	PASS	PASS
3064430293	30644	30293	QC site 03: A1189 Heath Road, north of Heath Lane	853	855	2	0%	0.1	PASS	PASS
									100%	100%
			TOTAL Screenline 9 Traffic Flow | SOUTHBOUND	2,147	2,172	24	1%	0.5	PASS	PASS

TRADS corridor | A14 EASTBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
5002330003	50023	30003	TRADS: A14 Junction 52 -53, 6-30013412 and 6-30013413	3,316	3,196	-120	-4%	2.1	PASS	PASS
3001530017	30015	30017	TRADS: A14 Junction 53- 54, 6-9923	2,684	2,525	-159	-6%	3.1	PASS	PASS
3003630038	30036	30038	TRADS: A14 Junction 54-55, 6-30013408 and 6-30013409	2,694	2,574	-120	-4%	2.3	PASS	PASS
3005530057	30055	30057	TRADS: A14 Junction 55-56, 6-30013396 and 6-30013397	2,852	2,751	-101	-4%	1.9	PASS	PASS
3008730089	30087	30089	TRADS: A14 Junction 57-58, 6-30013404 and 6-30013405	2,200	2,103	-97	-4%	2.1	PASS	PASS
									100%	100%
			TOTAL TRADS A14 Traffic Flow | EASTBOUND	13,746	13,149	-597	-4%	5.1	FAIL	PASS

TRADS corridor | A14 WESTBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
3001630012	30016	30012	TRADS: A14 Junction 52 -53, 6-30013412 and 6-30013413	2,317	2,134	-183	-8%	3.9	PASS	PASS
3005430052	30054	30052	TRADS: A14 Junction 54-55, 6-30013408 and 6-30013409	2,525	2,422	-103	-4%	2.1	PASS	PASS
3007030068	30070	30068	TRADS: A14 Junction 55-56, 6-30013396 and 6-30013397	2,616	2,498	-118	-5%	2.3	PASS	PASS
3035330104	30353	30104	TRADS: A14 Junction 57-58, 6-30013404 and 6-30013405	1,603	1,495	-108	-7%	2.8	PASS	PASS
									100%	100%
			TOTAL TRADS A14 Traffic Flow | EASTBOUND	9,061	8,548	-513	-6%	5.5	FAIL	FAIL

TRADS corridor | A12 NORTHBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
5004030798	50040	30798	TRADS: A12 Towards Copdock, 6-30013374	2,053	2,009	-44	-2%	1.0	PASS	PASS
									100%	100%
			TOTAL TRADS A12 Traffic Flow | NORTHBOUND	2,053	2,009	-44	-2%	1.0	PASS	PASS

TRADS corridor | A12 SOUTHBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
5004150045	50041	50045	TRADS: A12 Away from Copdock, 6-30013375	2,036	1,924	-112	-5%	2.5	PASS	PASS
									100%	100%
			TOTAL TRADS A12 Traffic Flow | SOUTHBOUND	2,036	1,924	-112	-5%	2.5	PASS	FAIL

Table I.4 – PM peak calibration tables

Cordon 1: RSI Outer Cordon sites | INBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
3056430318	30564	30318	OC site 01: Playford Road, east of Rushmere Street	199	204	4	2%	0.3	PASS	PASS
3030130298	30301	30298	QD site 01: A1214 Woodbridge Road, east of Playford Road	726	698	-29	-4%	1.1	PASS	PASS
3037230277	30372	30277	OC site 03: Foxhall Road, east of Broadlands Way	532	565	33	6%	1.4	PASS	PASS
3026630374	30266	30374	OC site 04: Bucklesham Road, east of Purdis Farm Lane	60	56	-4	-7%	0.5	PASS	PASS
3063830496	30638	30496	OC site 05: A1156 Felixstowe Road, outside Suffolk showground	620	653	33	5%	1.3	PASS	PASS
3007830778	30078	30778	OC site 06: A1189 Nacton Road, west of A14 junction 57	1,201	1,146	-55	-5%	1.6	PASS	PASS
3022030219	30220	30219	OC site 08: A137 Wherstead Road, north of B1456	932	853	-79	-9%	2.7	PASS	PASS
3083230152	30832	30152	OC site 09: A1214 London Road, north of A14 junction 55	1,255	1,112	-144	-11%	4.2	PASS	PASS
5003430150	50034	30150	OC site 10: A1071, east of B1113	690	736	46	7%	1.7	PASS	PASS
3002930739	30029	30739	OC site 11: Sproughton Road, west of Farthing Road	612	549	-63	-10%	2.6	PASS	PASS
3074430780	30744	30780	OC site 12: B1067 Bramford Road, west of Weaver Close	273	289	16	6%	1.0	PASS	PASS
3011930124	30119	30124	OC site 13: A1156 Bury Road, east of Anglia Parkway	871	843	-28	-3%	0.9	PASS	PASS
3034130340	30341	30340	OC site 14: Henley Road, north of Defoe Road	312	315	3	1%	0.2	PASS	PASS
3033330807	30333	30807	OC site 15: B1077 Westerfield Road, south of Westerfield Rail station	173	209	37	21%	2.6	PASS	PASS
3044730790	30447	30790	OC site 16: Tuddenham Road, east of Dorset Close	309	354	45	15%	2.5	PASS	PASS
									100%	100%
			TOTAL Outer Cordon Traffic Flow | INBOUND	8,765	8,581	-184	-2%	2.0	PASS	PASS

Cordon 1: RSI Outer Cordon sites | OUTBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
3031830564	30318	30564	OC site 01: Playford Road, east of Rushmere Street	288	260	-28	-10%	1.7	PASS	PASS
3029830301	30298	30301	QD site 01: A1214 Woodbridge Road, east of Playford Road	854	905	51	6%	1.7	PASS	PASS
3027730372	30277	30372	OC site 03: Foxhall Road, east of Broadlands Way	602	585	-18	-3%	0.7	PASS	PASS
3037430266	30374	30266	OC site 04: Bucklesham Road, east of Purdis Farm Lane	64	45	-20	-31%	2.7	PASS	PASS
3049630638	30496	30638	OC site 05: A1156 Felixstowe Road, outside Suffolk showground	473	492	20	4%	0.9	PASS	PASS
3077830078	30778	30078	OC site 06: A1189 Nacton Road, west of A14 junction 57	1,180	1,281	101	9%	2.9	PASS	PASS
3021930220	30219	30220	OC site 08: A137 Wherstead Road, north of B1456	1,032	999	-33	-3%	1.0	PASS	PASS
3015230832	30152	30832	OC site 09: A1214 London Road, north of A14 junction 55	1,154	963	-192	-17%	5.9	FAIL	FAIL
3015050034	30150	50034	OC site 10: A1071, east of B1113	915	931	16	2%	0.5	PASS	PASS
3073930029	30739	30029	OC site 11: Sproughton Road, west of Farthing Road	587	560	-26	-5%	1.1	PASS	PASS
3078030744	30780	30744	OC site 12: B1067 Bramford Road, west of Weaver Close	297	315	18	6%	1.0	PASS	PASS
3012430119	30124	30119	OC site 13: A1156 Bury Road, east of Anglia Parkway	779	818	39	5%	1.4	PASS	PASS
3034030341	30340	30341	OC site 14: Henley Road, north of Defoe Road	356	393	37	10%	1.9	PASS	PASS
3080730333	30807	30333	OC site 15: B1077 Westerfield Road, south of Westerfield Rail station	248	259	11	4%	0.7	PASS	PASS
3079030447	30790	30447	OC site 16: Tuddenham Road, east of Dorset Close	404	413	9	2%	0.5	PASS	PASS
									93%	93%
			TOTAL Outer Cordon Traffic Flow | OUTBOUND	9,234	9,219	-15	-0%	0.2	PASS	PASS

Cordon 2: RSI Inner Cordon sites | INBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
2003920037	20039	20037	IC site 01A: B1077 Westerfield Road, north of Tuddenham Road	148	174	26	17%	2.0	PASS	PASS
2003820037	20038	20037	IC site 01B: Tuddenham Road, north of Westerfield Road	119	125	6	5%	0.5	PASS	PASS
2005410021	20054	10021	MCTC 19 (IBC): Woodbridge Road and Argyle Street	178	186	8	4%	0.6	PASS	PASS
1002110020	10021	10020	MCTC 20 (IBC): St Helens Street and Grimwade Street	609	365	-244	-40%	11.1	FAIL	FAIL
2007210062	20072	10062	MCTC15 (NID): Duke Street, Fore street	1,036	1,057	21	2%	0.7	PASS	PASS
3021410009	30214	10009	IC site 05: A137 Bridge Street, north of B1073 Burrell Road	786	832	46	6%	1.6	PASS	PASS
2031820005	20318	20005	IC site 06: B1075 Princes Street, south of West End Road	303	309	7	2%	0.4	PASS	PASS
2001420013	20014	20013	IC site 07: A137 West End Road, south of A1071 Handford Road	457	507	50	11%	2.3	PASS	PASS
2001420015	20014	20015	IC site 08: A1071 Handford Road, east of A137 West End Road	520	467	-53	-10%	2.4	PASS	PASS
2002530427	20025	30427	IC site 09A: B1067 Bramford Road, east of A1214 Yarmouth Road	333	309	-24	-7%	1.4	PASS	PASS
2002820023	20028	20023	IC site 09B: A1156 Norwich Road, south of Anglesea Road	314	310	-4	-1%	0.2	PASS	PASS
2002920304	20029	20304	IC site 10: Anglesea Road, east of Graham Road	170	270	100	59%	6.8	FAIL	FAIL
2004120031	20041	20031	IC site 11: Henley Road, south of St Edmund's Road	326	362	36	11%	1.9	PASS	PASS
									85%	85%
			TOTAL Inner Cordon Traffic Flow | INBOUND	5,301	5,274	-27	-1%	0.4	PASS	PASS

Cordon 2: RSI Inner Cordon sites | OUTBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
2003720039	20037	20039	IC site 01A: B1077 Westerfield Road, north of Tuddenham Road	111	111	-1	-1%	0.1	PASS	PASS
2003720038	20037	20038	IC site 01B: Tuddenham Road, north of Westerfield Road	235	325	90	38%	5.4	FAIL	PASS
1011310021	10113	10021	MCTC 19 (IBC): Woodbridge Road and Argyle Street	1,252	1,350	98	8%	2.7	PASS	PASS
1002020070	10020	20070	MCTC 20 (IBC): St Helens Street and Grimwade Street	520	353	-167	-32%	8.0	FAIL	FAIL
1006220072	10062	20072	MCTC15 (NID): Duke Street, Fore street	1,220	1,265	45	4%	1.3	PASS	PASS
1000930214	10009	30214	IC site 05: A137 Bridge Street, north of B1073 Burrell Road	1,043	1,157	114	11%	3.4	PASS	PASS
2000520318	20005	20318	IC site 06: B1075 Princes Street, south of West End Road	554	146	-407	-74%	21.8	FAIL	FAIL
2001320014	20013	20014	IC site 07: A137 West End Road, south of A1071 Handford Road	855	821	-35	-4%	1.2	PASS	PASS
2001520014	20015	20014	IC site 08: A1071 Handford Road, east of A137 West End Road	689	492	-197	-29%	8.1	FAIL	FAIL
3042720025	30427	20025	IC site 09A: B1067 Bramford Road, east of A1214 Yarmouth Road	249	230	-19	-7%	1.2	PASS	PASS
2002320028	20023	20028	IC site 09B: A1156 Norwich Road, south of Anglesea Road	527	611	84	16%	3.5	PASS	PASS
2030420029	20304	20029	IC site 10: Anglesea Road, east of Graham Road	173	136	-37	-21%	3.0	PASS	PASS
2003120041	20031	20041	IC site 11: Henley Road, south of St Edmund's Road	924	689	-236	-26%	8.3	FAIL	FAIL
									62%	69%
			TOTAL Inner Cordon Traffic Flow | OUTBOUND	8,353	7,684	-668	-8%	7.5	FAIL	FAIL

Screenline 3 | NORTHBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
2008020024	20080	20024	QA site 01: A1214 Yarmouth Road, north of A1071 London Road	1,014	936	-78	-8%	2.5	PASS	PASS
1000110002	10001	10002	QA site 01: A1214 Yarmouth Road, north of A1071 London Road	1,192	1,213	21	2%	0.6	PASS	PASS
									100%	100%
			TOTAL Screenline 3 Traffic Flow | NORTHBOUND	2,206	2,148	-58	-3%	1.2	PASS	PASS

Screenline 3 | SOUTHBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
2002420080	20024	20080	QA site 01: A1214 Yarmouth Road, north of A1071 London Road	694	677	-17	-2%	0.7	PASS	PASS
1000210001	10002	10001	MCTC 11: Civic Drive (A1022), Handford Road	676	1,262	586	87%	18.8	FAIL	FAIL
									50%	50%
			TOTAL Screenline 3 Traffic Flow | SOUTHBOUND	1,370	1,938	569	42%	14.0	FAIL	FAIL

Screenline 4 | EASTBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
2026420047	20264	20047	QB site 02: A1214 Valley Road, east of The Avenue	1,023	1,000	-23	-2%	0.7	PASS	PASS
2026320040	20263	20040	QB site 01: Park Road, east of The Avenue	753	587	-165	-22%	6.4	FAIL	FAIL
1006610028	10066	10028	MCTC 16 (IBC): Crown Street, Northgate Street	665	754	89	13%	3.3	PASS	PASS
1007410038	10074	10038	NID 33 ATC: Falcon Street	64	108	44	70%	4.8	PASS	PASS
1008410042	10084	10042	NID 34 ATC (SCC) Star Lane	1,371	1,249	-122	-9%	3.4	PASS	PASS
									80%	80%
			TOTAL Screenline 4 Traffic Flow | EASTBOUND	3,875	3,698	-177	-5%	2.9	PASS	PASS

Screenline 4 | WESTBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
2004720264	20047	20264	QB site 02: A1214 Valley Road, east of The Avenue	995	1,058	63	6%	2.0	PASS	PASS
2004020263	20040	20263	QB site 01: Park Road, east of The Avenue	227	155	-72	-32%	5.2	FAIL	PASS
1002710028	10027	10028	MCTC 16 (IBC): Crown Street, Northgate Street	609	664	55	9%	2.2	PASS	PASS
1003810074	10038	10074	NID 33 ATC: Falcon Street	134	124	-10	-8%	0.9	PASS	PASS
1011510010	10115	10010	NID 35 ATC: College Street	862	1,047	185	22%	6.0	FAIL	FAIL
									60%	80%
			TOTAL Screenline 4 Traffic Flow | WESTBOUND	2,827	3,048	222	8%	4.1	FAIL	FAIL

Screenline 5 | EASTBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
3011930124	30119	30124	OC site 13: A1156 Bury Road, east of Anglia Parkway	871	843	-28	-3%	0.9	PASS	PASS
3074430780	30744	30780	OC site 12: B1067 Bramford Road, west of Weaver Close	273	289	16	6%	1.0	PASS	PASS
3002930739	30029	30739	OC site 11: Sproughton Road, west of Farthing Road	612	549	-63	-10%	2.6	PASS	PASS
5003430150	50034	30150	OC site 10: A1071, east of B1113	690	736	46	7%	1.7	PASS	PASS
3083230152	30832	30152	OC site 09: A1214 London Road, north of A14 junction 55	1,255	1,112	-144	-11%	4.2	PASS	PASS
									100%	100%
			TOTAL Screenline 5 Traffic Flow | EASTBOUND	3,701	3,528	-172	-5%	2.9	PASS	PASS

Screenline 5 | WESTBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
3015230832	30152	30832	OC site 09: A1214 London Road, north of A14 junction 55	1,154	963	-192	-17%	5.9	FAIL	FAIL
3015050034	30150	50034	OC site 10: A1071, east of B1113	915	931	16	2%	0.5	PASS	PASS
3073930029	30739	30029	OC site 11: Sproughton Road, west of Farthing Road	587	560	-26	-5%	1.1	PASS	PASS
3078030744	30780	30744	OC site 12: B1067 Bramford Road, west of Weaver Close	297	315	18	6%	1.0	PASS	PASS
3012430119	30124	30119	OC site 13: A1156 Bury Road, east of Anglia Parkway	779	818	39	5%	1.4	PASS	PASS
									80%	80%
			TOTAL Screenline 5 Traffic Flow | WESTBOUND	3,732	3,586	-146	-4%	2.4	PASS	PASS

Screenline 6 | EASTBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
3077830078	30778	30078	OC site 06: A1189 Nacton Road, west of A14 junction 57	1,180	1,281	101	9%	2.9	PASS	PASS
3049630638	30496	30638	OC site 05: A1156 Felixstowe Road, outside Suffolk showground	473	492	20	4%	0.9	PASS	PASS
3037430266	30374	30266	OC site 04: Bucklesham Road, east of Purdis Farm Lane	64	45	-20	-31%	2.7	PASS	PASS
3027730372	30277	30372	OC site 03: Foxhall Road, east of Broadlands Way	602	585	-18	-3%	0.7	PASS	PASS
3029830301	30298	30301	QD site 01: A1214 Woodbridge Road, east of Playford Road	854	905	51	6%	1.7	PASS	PASS
3031830564	30318	30564	OC site 01: Playford Road, east of Rushmere Street	288	260	-28	-10%	1.7	PASS	PASS
									100%	100%
			TOTAL Screenline 6 Traffic Flow | EASTBOUND	3,462	3,568	106	3%	1.8	PASS	PASS

Screenline 6 | WESTBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
3007830778	30078	30778	OC site 06: A1189 Nacton Road, west of A14 junction 57	1,201	1,146	-55	-5%	1.6	PASS	PASS
3063830496	30638	30496	OC site 05: A1156 Felixstowe Road, outside Suffolk showground	620	653	33	5%	1.3	PASS	PASS
3026630374	30266	30374	OC site 04: Bucklesham Road, east of Purdis Farm Lane	60	56	-4	-7%	0.5	PASS	PASS
3037230277	30372	30277	OC site 03: Foxhall Road, east of Broadlands Way	532	565	33	6%	1.4	PASS	PASS
3030130298	30301	30298	QD site 01: A1214 Woodbridge Road, east of Playford Road	726	698	-29	-4%	1.1	PASS	PASS
3056430318	30564	30318	OC site 01: Playford Road, east of Rushmere Street	199	204	4	2%	0.3	PASS	PASS
									100%	100%
			TOTAL Screenline 6 Traffic Flow | WESTBOUND	3,338	3,321	-17	-1%	0.3	PASS	PASS

Screenline 7 | NORTHBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
2025620072	20256	20072	IC site 04B: Duke Street, south of A1156 Fore Street	409	430	21	5%	1.0	PASS	PASS
3043130760	30431	30760	IC site 04A: A1156 Fore Hamlet, north of Cavendish Street	392	452	60	15%	2.9	PASS	PASS
2028220074	20282	20074	QC site 01: B1075 Foxhall Road, south of Back Hamlet	381	397	16	4%	0.8	PASS	PASS
2007720280	20077	20280	QC site 02: Cauldwell Hall Road, north of Foxhall Road	393	381	-12	-3%	0.6	PASS	PASS
3029330644	30293	30644	QC site 03: A1189 Heath Road, north of Heath Lane	908	940	32	4%	1.1	PASS	PASS
									100%	100%
			TOTAL Screenline 9 Traffic Flow | NORTHBOUND	2,483	2,599	116	5%	2.3	PASS	PASS

Screenline 7 | SOUTHBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
2007220256	20072	20256	IC site 04B: Duke Street, south of A1156 Fore Street	384	402	18	5%	0.9	PASS	PASS
3076030431	30760	30431	IC site 04A: A1156 Fore Hamlet, north of Cavendish Street	660	680	20	3%	0.8	PASS	PASS
2007420282	20074	20282	QC site 01: B1075 Foxhall Road, south of Back Hamlet	546	527	-19	-3%	0.8	PASS	PASS
2028020077	20280	20077	QC site 02: Cauldwell Hall Road, north of Foxhall Road	280	264	-16	-6%	1.0	PASS	PASS
3064430293	30644	30293	QC site 03: A1189 Heath Road, north of Heath Lane	836	785	-51	-6%	1.8	PASS	PASS
									100%	100%
			TOTAL Screenline 9 Traffic Flow | SOUTHBOUND	2,705	2,657	-48	-2%	0.9	PASS	PASS

TRADS corridor | A14 EASTBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
5002330003	50023	30003	TRADS: A14 Junction 52 -53, 6-30013412 and 6-30013413	2,983	3,196	213	7%	3.8	PASS	PASS
3001530017	30015	30017	TRADS: A14 Junction 53- 54, 6-9923	2,638	2,525	-113	-4%	2.2	PASS	PASS
3003630038	30036	30038	TRADS: A14 Junction 54-55, 6-30013408 and 6-30013409	2,808	2,574	-234	-8%	4.5	PASS	PASS
3005530057	30055	30057	TRADS: A14 Junction 55-56, 6-30013396 and 6-30013397	2,679	2,751	72	3%	1.4	PASS	PASS
3008730089	30087	30089	TRADS: A14 Junction 57-58, 6-30013404 and 6-30013405	2,421	2,103	-318	-13%	6.7	FAIL	PASS
									80%	100%
			TOTAL TRADS A14 Traffic Flow | EASTBOUND	13,529	13,149	-380	-3%	3.3	PASS	PASS

TRADS corridor | A14 WESTBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
3001630012	30016	30012	TRADS: A14 Junction 52 -53, 6-30013412 and 6-30013413	2,327	2,134	-193	-8%	4.1	PASS	PASS
3005430052	30054	30052	TRADS: A14 Junction 54-55, 6-30013408 and 6-30013409	2,765	2,422	-343	-12%	6.7	FAIL	PASS
3007030068	30070	30068	TRADS: A14 Junction 55-56, 6-30013396 and 6-30013397	3,139	2,498	-641	-20%	12.1	FAIL	FAIL
3035330104	30353	30104	TRADS: A14 Junction 57-58, 6-30013404 and 6-30013405	1,694	1,495	-199	-12%	5.0	PASS	PASS
									50%	75%
			TOTAL TRADS A14 Traffic Flow | EASTBOUND	9,925	8,548	-1,377	-14%	14.3	FAIL	FAIL

TRADS corridor | A12 NORTHBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
5004030798	50040	30798	TRADS: A12 Towards Copdock, 6-30013374	1,975	2,009	34	2%	0.8	PASS	PASS
									100%	100%
			TOTAL TRADS A12 Traffic Flow | NORTHBOUND	1,975	2,009	34	2%	0.8	PASS	PASS

TRADS corridor | A12 SOUTHBOUND

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
5004150045	50041	50045	TRADS: A12 Away from Copdock, 6-30013375	2,290	1,924	-366	-16%	8.0	FAIL	FAIL
									0%	0%
			TOTAL TRADS A12 Traffic Flow | SOUTHBOUND	2,290	1,924	-366	-16%	8.0	FAIL	FAIL

8 Assignment Validation

8.1 The purpose of model validation is to ensure that the network coding, trip matrix and assignment method are robust enough to replicate accurately the observed trip patterns in the base year (2008). This in turn provides confidence in the application of the model for forecasting purposes. Where possible, validation should use independent data, not used for the purposes of either matrix building or matrix estimation. ITAMS validation consisted of observed link flow validation, network delay validation and journey time validation.

8.2 To provide independent validation of link flows within Ipswich, two urban screenlines composed of independent ATC count data on key highway network links were devised to validate east-west movements across the town centre. The western screenline follows the route of the East Suffolk railway line at Norwich Road and heading south along the route of the East Suffolk and then the Great Eastern mainline to A137 Wherstead Road. Similarly, the eastern screenline broadly follows the route of the Felixstowe Branch Line, running from Tuddenham Road in the north and heading south to Fore Street. Both screenlines are indicated in Figure I.11.

Figure I.11: – Location of independent validation screenlines

Table I.5 – AM Peak Validation tables

Screenline 1 - Western urban Screenline | Eastbound

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
3078530218	30785	30218	A137 Wherstead Road, south of Cowell Street	917	917	-0	-0%	0.0	PASS	PASS
3019430206	30194	30206	Maidenhall Approach, between Pembroke Close & Belstead Avenue	249	167	-82	-33%	5.7	FAIL	PASS
3070330193	30703	30193	Belstead Road, north of Ancaster Road	659	738	79	12%	3.0	PASS	PASS
3017130167	30171	30167	Ancaster Road, north of Gippeswyk Avenue	522	786	264	51%	10.3	FAIL	FAIL
3038130148	30381	30148	A1214 London Road, south of Dickens Road	908	837	-71	-8%	2.4	PASS	PASS
3014630782	30146	30782	Hadleigh Road, north of Dickens Road	625	763	138	22%	5.3	FAIL	FAIL
3044930142	30449	30142	Bramford Road over Railway	565	429	-136	-24%	6.1	FAIL	FAIL
2026630829	20266	30829	Bramford Lane over Railway	64	246	183	288%	14.7	FAIL	FAIL
3042630138	30426	30138	Norwich Road (A1156) over Railway	862	730	-132	-15%	4.7	PASS	FAIL
									44%	44%
			Total	**5,370**	**5,614**	**243**	**5%**	**3.3**	**PASS**	**PASS**

Screenline 1 - Western urban Screenline | Westbound

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
3021830785	30218	30785	A137 Wherstead Road, south of Cowell Street	697	749	52	7%	1.9	PASS	PASS
3020630194	30206	30194	Maidenhall Approach, between Pembroke Close & Belstead Avenue	164	154	-10	-6%	0.8	PASS	PASS
3019330703	30193	30703	Belstead Road, north of Ancaster Road	260	262	2	1%	0.1	PASS	PASS
3016730171	30167	30171	Ancaster Road, north of Gippeswyk Avenue	241	187	-54	-23%	3.7	PASS	PASS
3014830381	30148	30381	A1214 London Road, south of Dickens Road	557	640	83	15%	3.4	PASS	PASS
3078230146	30782	30146	Hadleigh Road, north of Dickens Road	245	99	-146	-59%	11.1	FAIL	FAIL
3014230449	30142	30449	Bramford Road over Railway	522	561	39	8%	1.7	PASS	PASS
3082920266	30829	20266	Bramford Lane over Railway	337	191	-146	-43%	9.0	FAIL	FAIL
3013830426	30138	30426	Norwich Road (A1156) over Railway	854	750	-103	-12%	3.6	PASS	PASS
									78%	78%
			Total	**3,877**	**3,593**	**-284**	**-7%**	**4.6**	**FAIL**	**FAIL**

Screenline 2 - Eastern urban Screenline | Eastbound

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
1006210111	10062	10111	A1156 Fore Street, east of Grimwade Street	904	916	12	1%	0.4	PASS	PASS
2006920073	20069	20073	B1075 Grove Lane,	164	214	50	31%	3.7	PASS	PASS
2006920067	20069	20067	Spring Road, east of Bartholomew Street	164	47	-117	-71%	11.4	FAIL	FAIL
2005520056	20055	20056	A1071 Woodbridge Road, east of Belle Vue Road	370	326	-44	-12%	2.3	PASS	PASS
2033020052	20330	20052	Belvedere Road, west of Moat Farm Close	83	73	-10	-12%	1.1	PASS	PASS
2004820050	20048	20050	A1214 Colchester Road, east of Cemetery Lane	1,009	962	-47	-5%	1.5	PASS	PASS
3054130790	30541	30790	Tuddenham Road, north of Chelsworth Avenue	135	345	210	155%	13.5	FAIL	FAIL
									71%	71%
			Total	**2,829**	**2,884**	**55**	**2%**	**1.0**	**PASS**	**PASS**

Screenline 2 - Eastern urban Screenline | Westbound

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
1011110062	10111	10062	A1156 Fore Street, east of Grimwade Street	1,175	1,084	-91	-8%	2.7	PASS	PASS
2007320069	20073	20069	B1075 Grove Lane,	306	360	54	18%	3.0	PASS	PASS
2006720069	20067	20069	Spring Road, east of Bartholomew Street	531	383	-148	-28%	6.9	FAIL	FAIL
2005620055	20056	20055	A1071 Woodbridge Road, east of Belle Vue Road	466	249	-218	-47%	11.5	FAIL	FAIL
2005220330	20052	20330	Belvedere Road, west of Moat Farm Close	240	139	-101	-42%	7.3	FAIL	FAIL
2005020048	20050	20048	A1214 Colchester Road, east of Cemetery Lane	993	968	-25	-3%	0.8	PASS	PASS
3079030541	30790	30541	Tuddenham Road, north of Chelsworth Avenue	483	526	43	9%	1.9	PASS	PASS
									57%	57%
			Total	**4,194**	**3,709**	**-485**	**-12%**	**7.7**	**FAIL**	**FAIL**

Table I.6 – PM Peak Validation tables

Screenline 1 - Western urban Screenline | Eastbound

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
3078530218	30785	30218	A137 Wherstead Road, south of Cowell Street	686	728	42	6%	1.6	PASS	PASS
3019430206	30194	30206	Maidenhall Approach, between Pembroke Close & Belstead Avenue	122	181	59	49%	4.8	PASS	PASS
3070330193	30703	30193	Belstead Road, north of Ancaster Road	362	450	88	24%	4.4	PASS	PASS
3017130167	30171	30167	Ancaster Road, north of Gippeswyk Avenue	300	514	214	71%	10.6	FAIL	FAIL
3038130148	30381	30148	A1214 London Road, north of Dickens Road	626	782	156	25%	5.9	FAIL	FAIL
3014630782	30146	30782	Hadleigh Road, north of Dickens Road	340	558	218	64%	10.3	FAIL	FAIL
3044930142	30449	30142	Bramford Road over Railway	700	547	-154	-22%	6.2	FAIL	FAIL
2026630829	20266	30829	Bramford Lane over Railway	148	407	259	175%	15.6	FAIL	FAIL
3042630138	30426	30138	Norwich Road (A1156) over Railway	910	909	-1	-0%	0.0	PASS	PASS
									44%	44%
			Total	4,194	5,075	882	21%	13.0	FAIL	FAIL

Screenline 1 - Western urban Screenline | Westbound

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
3021830785	30218	30785	A137 Wherstead Road, south of Cowell Street	1,008	942	-66	-7%	2.1	PASS	PASS
3020630194	30206	30194	Maidenhall Approach, between Pembroke Close & Belstead Avenue	218	165	-53	-24%	3.8	PASS	PASS
3019330703	30193	30703	Belstead Road, north of Ancaster Road	583	456	-127	-22%	5.6	FAIL	FAIL
3016730171	30167	30171	Ancaster Road, north of Gippeswyk Avenue	540	240	-300	-55%	15.2	FAIL	FAIL
3014830381	30148	30381	A1214 London Road, north of Dickens Road	1,011	1,404	393	39%	11.3	FAIL	FAIL
3078230146	30782	30146	Hadleigh Road, north of Dickens Road	523	114	-409	-78%	22.9	FAIL	FAIL
3014230449	30142	30449	Bramford Road over Railway	524	591	67	13%	2.8	PASS	PASS
3082920266	30829	20266	Bramford Lane over Railway	255	201	-54	-21%	3.5	PASS	PASS
3013830426	30138	30426	Norwich Road (A1156) over Railway	617	699	82	13%	3.2	PASS	PASS
									56%	56%
			Total	5,279	4,813	-466	-9%	6.6	FAIL	FAIL

Screenline 2 - Eastern urban Screenline | Eastbound

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
1006210111	10062	10111	A1156 Fore Street, east of Grimwade Street	1,220	1,265	45	4%	1.3	PASS	PASS
2006920073	20069	20073	B1075 Grove Lane,	292	310	18	6%	1.0	PASS	PASS
2006920067	20069	20067	Spring Road, east of Bartholomew Street	291	170	-121	-41%	7.9	FAIL	FAIL
2005520056	20055	20056	A1071 Woodbridge Road, east of Belle Vue Road	543	522	-21	-4%	0.9	PASS	PASS
2033020052	20330	20052	Belvedere Road, west of Moat Farm Close	132	110	-22	-17%	2.0	PASS	PASS
2004820050	20048	20050	A1214 Colchester Road, east of Cemetery Lane	1,153	1,160	7	1%	0.2	PASS	PASS
3054130790	30541	30790	Tuddenham Road, north of Chelsworth Avenue	315	434	119	38%	6.1	FAIL	FAIL
									71%	71%
			Total	3,946	3,970	24	1%	0.4	PASS	PASS

Screenline 2 - Eastern urban Screenline | Westbound

Link ID	A-Node	B-Node	Description	Observed	Modelled	Abs Difference	% Difference	GEH Statistic	GEH Result	DMRB
1011110062	10111	10062	A1156 Fore Street, east of Grimwade Street	1,036	1,057	21	2%	0.7	PASS	PASS
2007320069	20073	20069	B1075 Grove Lane,	344	202	-142	-41%	8.6	FAIL	FAIL
2006720069	20067	20069	Spring Road, east of Bartholomew Street	291	257	-34	-12%	2.1	PASS	PASS
2005620055	20056	20055	A1071 Woodbridge Road, east of Belle Vue Road	316	185	-131	-41%	8.3	FAIL	FAIL
2005220330	20052	20330	Belvedere Road, west of Moat Farm Close	136	117	-19	-14%	1.7	PASS	PASS
2005020048	20050	20048	A1214 Colchester Road, east of Cemetery Lane	995	1,008	13	1%	0.4	PASS	PASS
3079030541	30790	30541	Tuddenham Road, north of Chelsworth Avenue	171	372	201	118%	12.2	FAIL	FAIL
									57%	57%
			Total	3,289	3,199	-90	-3%	1.6	PASS	PASS

8.3 Table I.5 and I.6 show the validation statistics for the Eastern and Western urban screenlines for both the AM and PM peak respectively. For the AM peak hour, the model demonstrates good validation at a total screenline level for both the Eastern and Western screenlines in the eastbound direction, with the GEH value for the Eastern screenline being just 1.0. For the westbound direction, the Western screenline demonstrates seven out of nine of the individual sites exceeding DMRB requirements, with GEH values of less than 4.0; the Eastern screenline demonstrates GEH values of 3.0 or less for those sites that exceed DMRB requirements in the westbound direction.

8.4 For the PM peak hour, the Eastern screenline demonstrates good validation at a total screenline level, with both the west- and east-bound directions exceeding DMRB criteria with very low GEH values of 1.6 and 0.4 respectively.

8.5 Figures I.12 and I.13 show the main areas of delay in the AM and PM peak hour models respectively, represented by proportionately sized circles. Whilst no delay profile surveys were undertaken as part of the survey collection, checks of delays at junctions against journey time surveys where appropriate, along with our knowledge of the key problems within the urban area of Ipswich indicate that the model is representing delays well within the urban area.

Figure I.12: – 2008 AM Peak hour; key junction delays across Ipswich

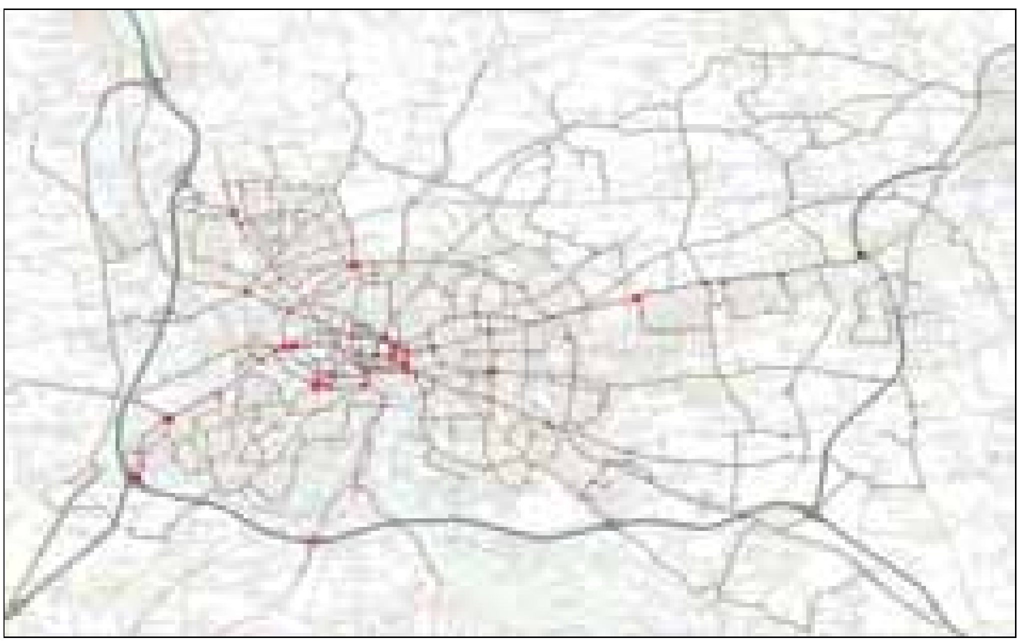


Figure I.13: – 2008 PM Peak hour; key junction delays across Ipswich

8.6 Journey time surveys were undertaken along six routes, on key corridors within the town centre. Further information was obtained from the Highways Agency's HATRIS database in order to provide corridor journey time data for the A14. Validation of these journey time routes was undertaken with regard to criteria set out in DMRB; DMRB validation guidelines suggest that 85% of all modelled routes should be within 15% of the observed times. Tables I.5 and I.6 demonstrate the results achieved in the ITAMS model.

8.7 Tables I.5 and I.6 show that for both the AM and PM peak hours, ten out of fourteen routes pass the DMRB criteria. Whilst DMRB suggests that at least 12 routes (85%) should be within 15% of the modelled time, certain modelled times are only just outside of this criteria. In the AM peak hour, the yellow route southbound only falls outside of the 15% tolerance levels on the last section of the route; similarly, the pink route westbound falls well within the tolerances for most sections of the route other than at a single junction where observed delays are in excess of 9 minutes – these delays could be the result of short duration traffic peaks. In the PM peak, both the blue and green routes in the eastbound direction are only just outside of the tolerance levels by a further 2%. Additionally, the variation of modelled and observed journey times show no distinct pattern of the model being either too fast or too slow generally, suggesting that the model is sufficiently robust.

8.8 Whilst the journey time validation does not demonstrate a complete compliance with the DMRB targets, it should be recognised that - of a number of the routes that fail to meet the guidance criteria – that for the majority of the routes, the modelled times are within the DMRB tolerances for most sections.

Table I.5 – 2008 AM Peak hour; Journey time validation

Route	Direction	Mean Observed Time	Modelled Time	Abs Difference	% Difference	Pass DMRB?
Blue	Eastbound	18.73	19.34	0.60	3%	✓
	Westbound	23.94	21.54	-2.40	-10%	✓
Pink	Eastbound	19.53	23.47	3.94	20%	✗
	Westbound	32.39	22.67	-9.72	-30%	✗
Green	Eastbound	21.57	20.82	-0.75	-3%	✓
	Westbound	24.91	21.83	-3.07	-12%	✓
Orange	Northbound	16.62	14.81	-1.81	-11%	✓
	Southbound	13.70	15.07	1.37	10%	✓
Purple	Northbound	13.79	12.79	-1.00	-7%	✓
	Southbound	18.45	14.45	-4.00	-22%	✗
Yellow	Northbound	8.84	8.13	-0.71	-8%	✓
	Southbound	9.77	7.73	-2.04	-21%	✗
A14 (HATRIS)	Eastbound	12.17	12.91	0.74	6%	✓
	Westbound	11.70	12.65	0.95	8%	✓

Table I.6 – 2008 AM Peak hour; Journey time validation

Route	Direction	Mean Observed Time	Modelled Time	Abs Difference	% Difference	Pass DMRB?
Blue	Eastbound	17.17	20.16	2.99	17%	✗
	Westbound	18.16	20.46	2.31	13%	✓
Pink	Eastbound	29.65	23.00	-6.66	-22%	✗
	Westbound	21.10	21.58	0.49	2%	✓
Green	Eastbound	25.63	21.24	-4.38	-17%	✗
	Westbound	20.62	22.98	2.36	11%	✓
Orange	Northbound	24.76	13.99	-10.77	-44%	✗
	Southbound	13.89	15.79	1.90	14%	✓
Purple	Northbound	12.40	11.93	-0.47	-4%	✓
	Southbound	12.77	13.70	0.93	7%	✓
Yellow	Northbound	9.27	8.25	-1.03	-11%	✓
	Southbound	7.88	7.73	-0.15	-2%	✓
A14 (HATRIS)	Eastbound	11.68	12.98	1.30	11%	✓
	Westbound	11.55	12.97	1.43	12%	✓

8.9 Whilst good validation of the base year model relies on its ability to replicate observed base-year traffic conditions, it is important to stress-test the network, to assess its readiness for forecasting. As such a demand increase test was carried out whereby the trip matrix was adjusted globally to represent a 30% increase in trips. This test should be adequate for assessing the readiness of a model for forecasting as it is unlikely that global growth factors will exceed 30%.

8.10 Figure I.14 shows the increase in modelled traffic flows for the AM peak hour as a result of the 30% increase in demand whilst Figure I.15 shows the level of junction delay. As can be seen traffic flows increase on most roads across the network, with only some reductions caused by small-scale re-routeing resulting from increased junction delays in the network. Overall, the

30 percent increase in trips resulted in a 41 percent increase in vehicle hours, and a 30 percent increase in vehicle kilometres. Figure I.14 demonstrates that delays across the highway network appear occur at the same locations, although to a greater degree, as those in the base year. There are particularly large increases at the A12/A14 Copdock Interchange, junction of Grimwade Street and Fore Street, junction of Handford Road and Yarmouth Road and a number of junctions along the A1214 Main Road in Kesgrave. All of these junctions are currently operating close to capacity or at capacity and hence the results appear sensible. Delays also become apparent along the A14 at junction merges, being especially apparent at the interchanges either side of the Orwell Bridge.

Figure I.14: – 2008(+30% demand) AM Peak hour; flow change over base-year model

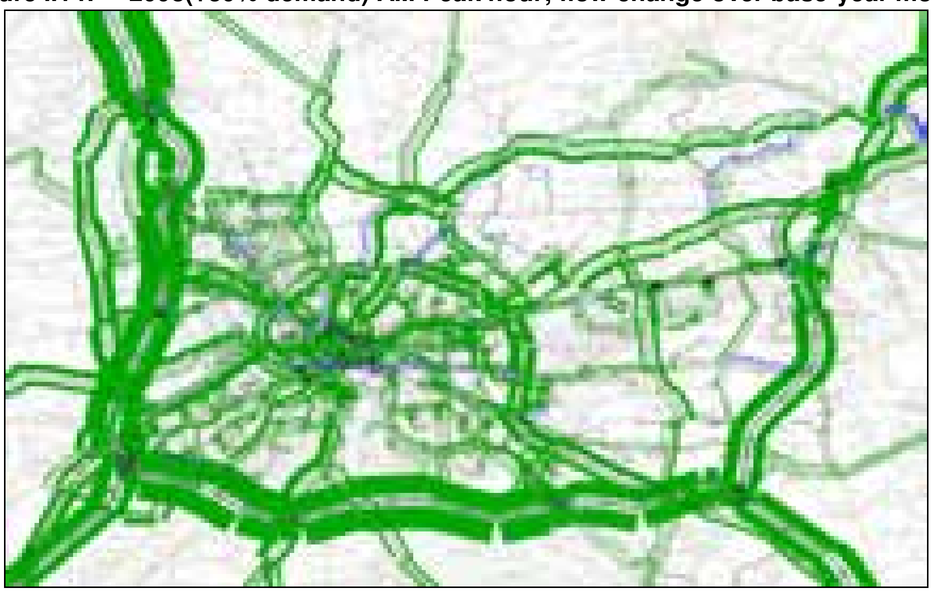
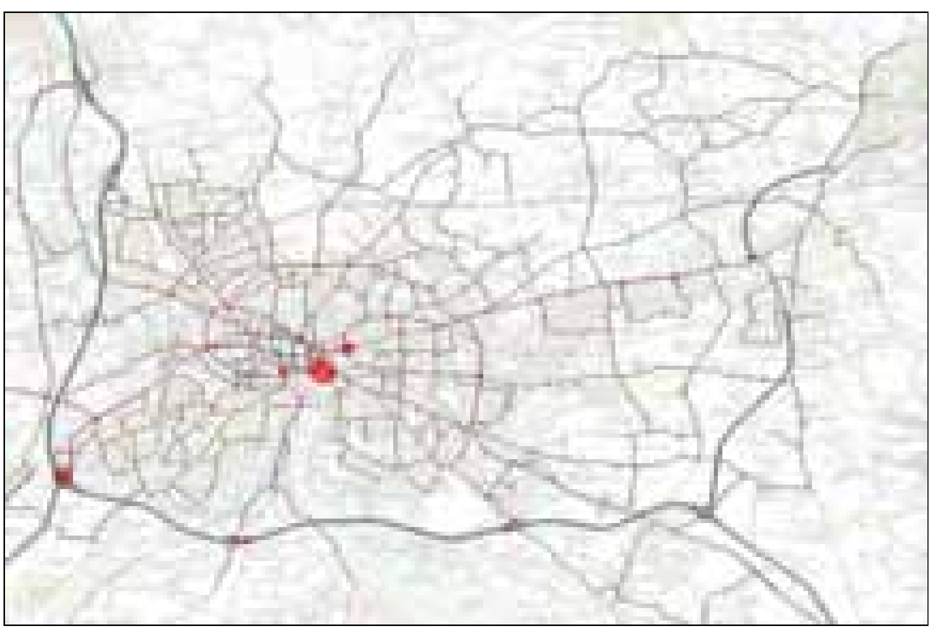


Figure I.15: – 2008(+30% demand) AM Peak hour; change in delays across Ipswich



9 Fitness for Purpose

9.1 The calibration process did not reveal any significant problems or gaps in the base information. The strategic validation reported here shows good results for the overall model. This suggests that is it fit for the purpose of representing the broad highway traffic patterns in the base year.

9.2 The journey time validation and the patterns of junction delay appear consistent and plausible, and the flow delay sensitivity test shows plausible elasticity. Thus the model is considered fit for the purpose of representing changes in delay and journey times in inner Ipswich. It is thus considered suitable for the TUBA testing of the Major Scheme sustainable transport interventions.

9.3 For future local application in detail, local validation checks and possibly re-calibration may be required.

Appendix J

Suffolk County Council | AECOM

Bus Model LMVR – Technical Appendix J
Ipswich Transport Analysis Modelling Suite

Suffolk County Council
May 2009

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Ipswich Transport Model
Bus Model LMVR

Rev No	Comments	Date
1	Early results tables for review	24/02/2009
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4	Final version for MSBC Appendix	14/05/2009

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Table of Contents

FABER MAUNSELL | AECOM

1 Introduction

1 Introduction

1.1 Context

This Technical Appendix J forms part of the supporting documentation for the 'Ipswich – Transport Fit for the 21st Century' Major Scheme Business Case Bid submission to the DfT.

It describes the evidence base, model development, calibration and validation of the bus model component of the Ipswich Transport Analysis Modelling Suite (ITAMS). It refers to the model as calibrated in February 2009, for use in the MSBC work; the model will be developed further for other local applications in Ipswich.

The separate Model Specification Report (November 2008) details the (proposed) specifications of the ITAMS suite of multi-modal, variable demand, models. The bus and the variable demand models were implemented using the EMME software. The highway model used the SATURN software.

Related details on zoning and mode split modelling can be found in Appendices I and K. This model represents the bus and active mode elements of the travel patterns in the wider Ipswich area. Assignments have been calibrated for the morning (8am to 9am) and evening peak (5pm to 6pm) hours within the context of demand through the 12 hour day.

1.2 Structure and Contents

Following this introduction, the remainder of the report is structured as follows:

Chapter 2 describes the data inputs to the model including the data collection programme that was carried out;

Chapter 3 described the process used to develop the bus demand matrices;

Chapter 4 gives details of the bus assignment model including the network and assignment parameters;

Chapter 5 describes the model calibration; and

Chapter 6 describes the validation of the model.

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2 Data Sources & Data Collection

2 Data Sources & Data Collection

2.1 Existing Data Sources

2.1.1 Model Network Development

Information on bus routes and stops has been obtained from the two principal operators within Ipswich: Ipswich Buses and First Group. Additional information has also been downloaded from the Traveline website. The coding of the routes and stops is tied directly to the modelled highway network, with provision made to include additional bus stops where needed between coded junctions.

2.1.2 Bus Operator Data

Existing patronage data were obtained from the operators. 'Wayfarer' fare data was obtained from Ipswich Buses, First Eastern Counties, and other operators for the majority of the routes within Ipswich. This contained information on the number of passengers boarding and alighting either at fare stages along each route, or along the routes as a whole. Most of the data were for the last week in June 2008. This was averaged to produce weekday data.

In addition, bus fleet data was provided by Ipswich Buses and First Eastern Counties, giving the type and capacity of buses in service, together with the routes they serve.

2.2 Data Collection Programme

Having reviewed the potential of the different sources of existing data, a significant programme of data collection was developed. Bus Origin/Destination Surveys and roadside bus occupancy counts were carried out in July 2008 using a survey contractor and September 2008 by Faber Maunsell | AECOM staff. Town centre boardings/alightings surveys were also carried out in March 2009 using a survey contractor. The elements of this programme are outlined below. Full details of the surveys and their results are documented in the "Ipswich Transport Model Travel Surveys" report.

2.2.1 Bus Origin/Destination Surveys

To supplement the bus operator data, a series of 12-hour on-bus interviews and boardings/alightings counts were undertaken, comprising routes that form key arterial corridors within Ipswich. Pairs of survey staff travelled backwards and forwards on buses on each route noting boardings and alightings at every stop and handing out self completion questionnaires. These included questions on the ultimate origin and destination of each passenger, where they boarded the bus, their origin and destination purpose, and the time they boarded the bus. The purpose of these surveys was to obtain a representative sample of all bus movements within Ipswich. The survey responses have been used to produce a picture of bus demand across Ipswich. The sample has been expanded using the boarding and alighting counts done as part of the survey.

The on-bus surveys were supported by bus occupancy counts, which make use of the fleet data provided by operators to estimate passenger volumes from percentages of vehicle capacities.

Figure 2.1 shows the routes on which the on board surveys were undertaken. In addition, the 11 marked sites are where the occupancy counts were done. It was chosen to focus the surveys on the radial routes in to the Ipswich town centre as these routes are most relevant to the study. These routes will also carry the majority of the bus demand within Ipswich with very little demand on orbital routes.

2.2.2 Town centre bus boarding/alighting counts

Town centre bus boarding and alighting counts were carried out in March 2009 at the stops shown in Figure 2.2. Survey staff noted all buses stopping at each location between 7am and 7pm and counted the number of passengers boarding and alighting.

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Figure 2.1: Bus Survey Site Locations. Occupancy counts were undertaken at the sites marked; self-completion surveys were carried out on the routes that run through the sites.

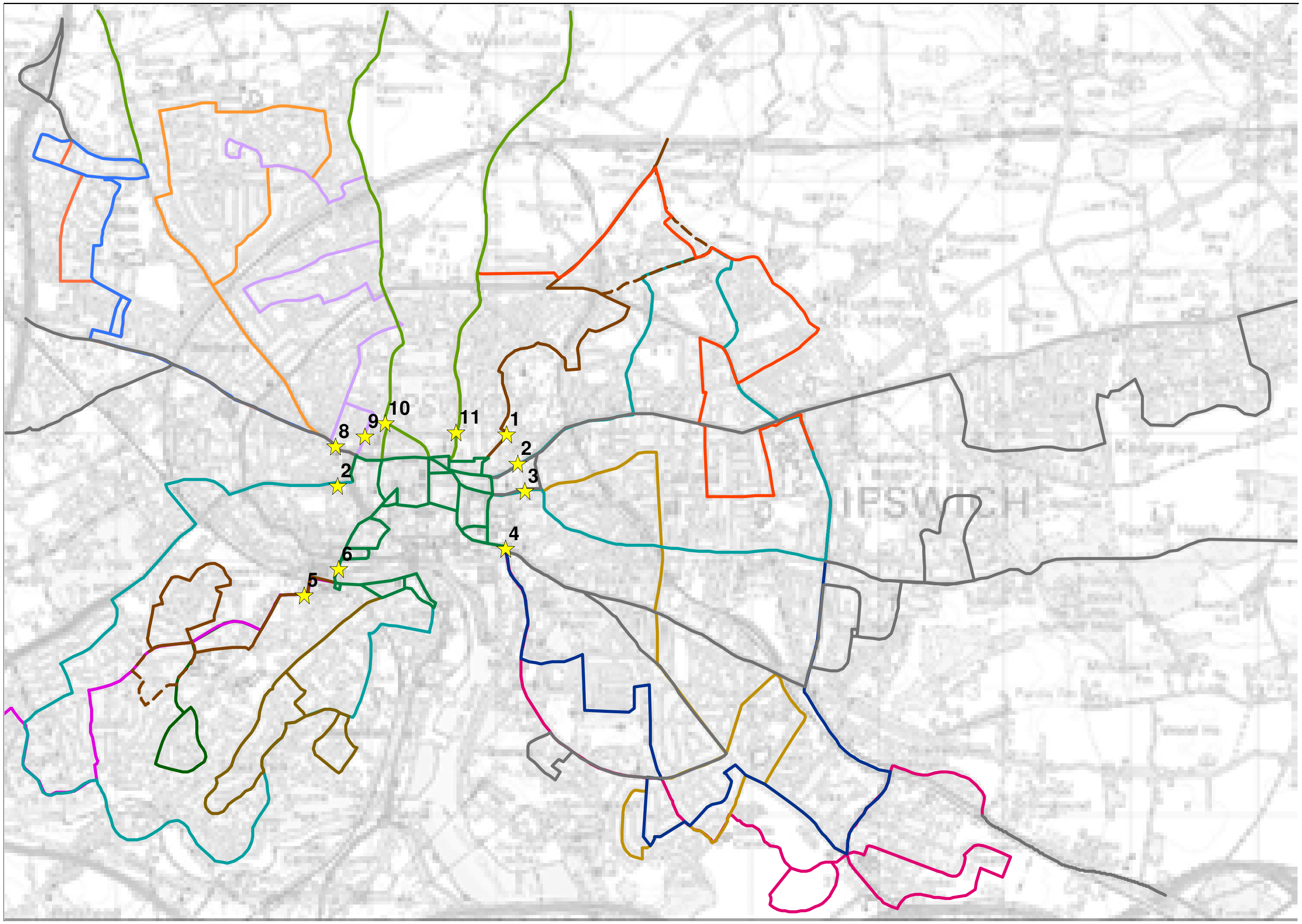
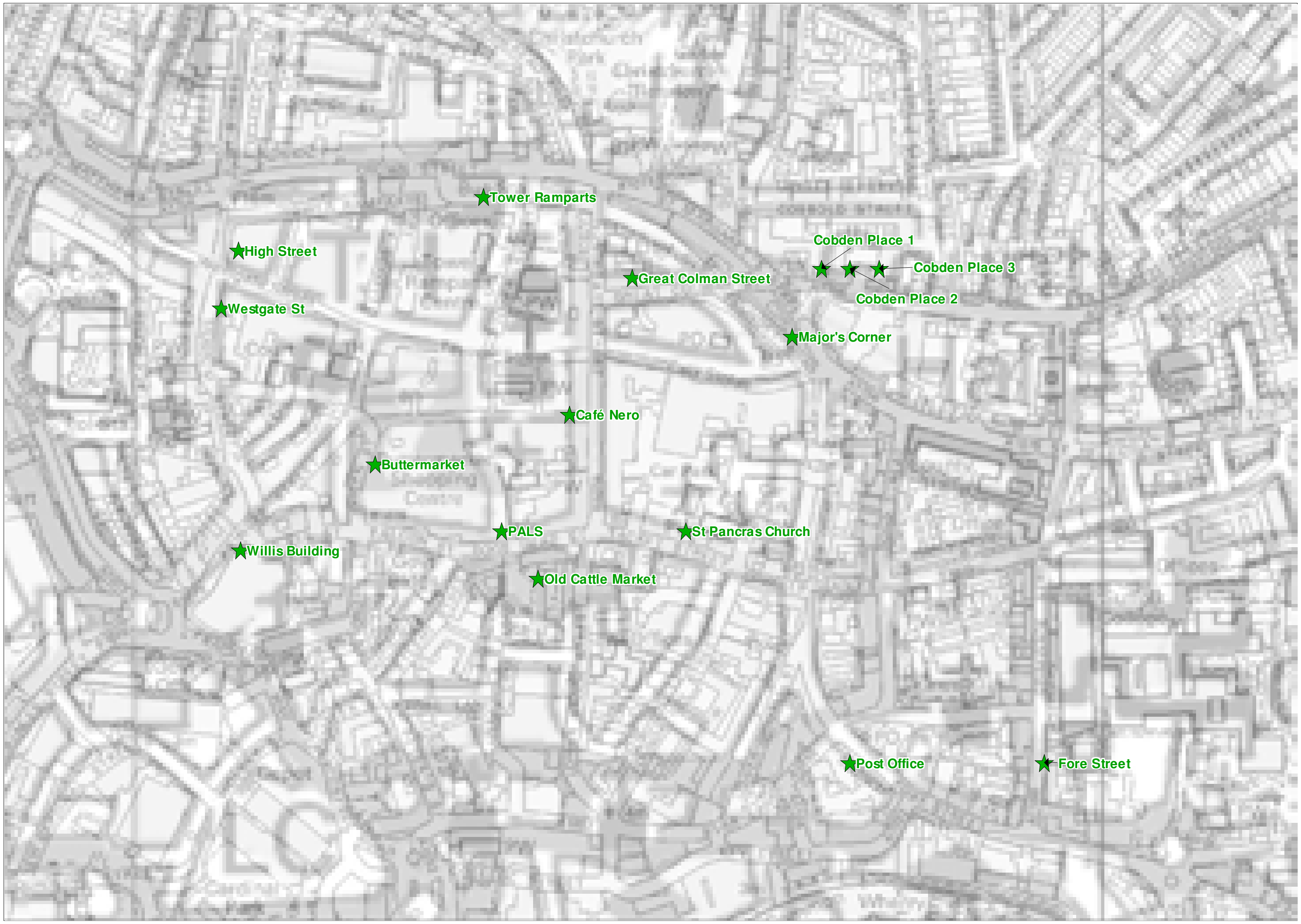


Figure 2.2: Locations of Bus boarding/alightings counts



2.3 Data Checks

Robust checking and subsequent cleaning of new data was essential to ensure the appropriateness, precision and accuracy of the inputs to the model. The checks covered three key areas, which are described below.

2.3.1 On-Site Checks

The first stage of checking was performed on-site, monitoring the survey contractors' work to ensure consistency and quality of approach. For the bus counts, checks were carried out of the interviewer attendance and the approach used to distribute and collect the questionnaires, together with a preliminary on-site view of the data quality. Where issues were identified, these were rectified on site to ensure that the data collection process went as smoothly as possible.

It was identified on the first day of surveys that the on-bus survey staff were having problems recording boarding and alightings at each stop. Before the remaining surveys were carried out, the recording form was amended to make the process easier. However, it was still quite difficult for the survey staff to tell the exact locations of bus stops. Several stops on each route are close together, and the buses will not always stop at each one. Therefore, the boarding and alighting data will be more robust when looking at groupings of stops rather than specific stop locations.

2.3.2 Coding Inspection

During the geo-coding of data, visits were made to the coding office as appropriate in order to observe the methodology of the survey contractors in practice, including treatment of (partial) addresses in origin/destination information. As for the field inspections, appropriate feedback was given to the contractors to ensure the appropriateness of the outputs and the accuracy with which field data was recorded.

2.3.3 Review and Cleaning of Received Data

Once coded data were received and logged, relevant checks were undertaken and any sub-standard data not already picked up was returned to the contractor for investigation and correction where possible. In addition, those data that had been rejected from datasets by the contractors themselves were reviewed to ensure the appropriate action had been taken. Following that appraisal, remaining sub-standard data were cleaned out to leave final datasets ready for use in the model development process. This cleaning included examining the sense and logic of the data. For example, the location of origin and destination data coded from interviews of individuals' trips was looked at within a GIS to identify any illogical trips relative to the bus that the interview was carried out on. Any illogical trips were removed. Also, it was noticed that some of the boarding and alightings counts had double-counted passengers already on the bus when the survey staff boarded. Counts on each bus were reviewed to eliminate this double counting.

2.4 Data Quality

A summary of the bus interview data is given in Table 2.1. The data shown includes all records (excluding Park & Ride buses) that were ultimately accepted as valid from the survey company's work, as well as supplementary records resulting from in-house survey work by Faber Maunsell. The detail of this is discussed below.

Preliminary analysis of the July results received from the survey company revealed approximately 1,265 usable interviews. Following analysis by Faber Maunsell | AECOM, around 45 of these were removed as they appeared illogical.

Initially approximately 570 records were discarded by the survey company, but further analysis by Faber Maunsell | AECOM allowed 325 of those to be saved, with approximately 250 ultimately discarded.

In addition to this approximately 280 responses were collected during the surveys carried out by Faber Maunsell | AECOM. Thus, approximately 1,575 usable interviews were obtained, as well as a further 250 on Park & Ride routes (overall 1,825 in total).

Table 2.1: Bus Survey Data Summary (Excluding Park & Ride Routes)

Route Number	Boarders Observed	Surveys Returned	Response Rate on buses surveyed	Number of buses surveyed	Total buses running (7am – 7pm)
1	89	46	52%	5	36
2	175	49	28%	6	32
3	132	49	37%	5	33
5/7/11/15	1,121	261	23%	27	182
6	503	173	34%	13	36
8/8B	463	109	24%	12	58
9	356	75	21%	8	35
10	324	77	24%	8	36
12	227	56	25%	7	35
13	331	84	25%	7	68
14/14A	111	8	8%	5	11
16	203	33	17%	8	34
19	306	140	46%	11	23
22	46	23	54%	4	12
31	49	26	53%	3	10
62	128	24	20%	3	34
75	207	71	34%	9	47
76/77	230	49	22%	11	40
6161A	151	29	20%	4	45
63-66A	332	115	36%	18	177
87/88	205	77	39%	12	54
Total	5,689	1,574	28%	**186**	**1038**

Note: All numbers are accumulated over the survey days, covering both directions of travel, except for the ‘total buses running’ which relates to a single day

3 Bus Demand Matrices

3.1 Overview of method

This Chapter describes the development of the bus demand matrices. The method for developing the Park and Ride matrices is described in a separate report.

The questionnaire responses collected during the survey work were used to produce time period matrices of bus demand within Ipswich. They were initially processed on a route by route basis. Each route was broken down into a series of bus stop groupings based on the boardings information from the surveys, and the zoning within the model. For each of these groupings, the numbers of passengers boarding in the counts were compared with the boarding locations noted in the returned questionnaire responses to determine the response rate within the following time periods:

- Morning peak period (0700-1000)
- Inter peak period (1000-1600)
- Evening peak period (1600-1900)

The survey responses were factored up to the boarding counts to get complete estimates for the buses that were surveyed. These were then factored up to the number of buses on each route within each time period. The information for each individual route were then added together to get total bus demand across Ipswich.

The information was converted in to the zone system of the model based on the geographical location of the origin and destination given within each survey response. For each time period, the demand matrices were converted to the hours to be modelled using factors obtained from the town centre boarding/alighting surveys.

We did not have any survey data available for a limited number of minor interurban routes within Ipswich. Where possible, demand for these routes has been created using Wayfarer data obtained from the operators. This has then been added to the demand created from the survey data.

3.2 Infilling of responses

Where the response rate for a particular bus stop grouping was less than 10% we boosted the survey response rate by imputing questionnaire responses. This was done by looking at the origin and destination distributions in:

- The same bus stop grouping in alternate time periods (the case for the majority of responses);
- Geographically adjacent bus stop groupings in the same time period; and
- Adjacent routes in the same time period.

These were used to infer the distribution of demand in the bus stop groupings with poor response rates. Table 3.1 gives the implied response rates from the buses that were surveyed once the imputed responses have been included. Table 3.2 takes account of the fact that we did not survey all buses and gives the rates used to factor the survey responses up to a full sample.

Table 3.1: Implied response rates by route with imputed responses included

Route	Implied Response Rates		
	Morning Peak (0700-1000)	Inter peak (1000-1600)	Evening peak (1600-1900)
1	83%	71%	56%
2	46%	24%	47%
3	47%	53%	40%
5/7/11/15	37%	26%	39%
6	47%	32%	38%
8/8B	50%	30%	27%
9	39%	23%	31%
10	47%	24%	55%
12	*	29%	50%
13	41%	26%	73%
14/14A	24%	18%	20%
16	29%	30%	38%
19	*	50%	45%
22	*	48%	100%
31	92%	65%	67%
62	*	35%	30%
75	32%	42%	63%
76/77	44%	19%	100%
6161A	*	32%	100%
63-66A	43%	41%	64%
87/88	63%	44%	69%
Total	**44%**	**32%**	**47%**

* no buses were surveyed in these time periods

Table 3.2: Implied response rates for expansion factors

Route	Implied response rate
1	10%
2	7%
3	7%
5/7/11/15	5%
6	14%
8/8B	7%
9	7%
10	7%
12	7%
13	4%
14/14A	9%
16	7%
19	24%
22	24%
31	22%
62	3%
75	8%
76/77	8%
6161A	5%
63-66A	5%
87/88	12%
Total	**7%**

3.3 Interchanging passengers

Some of the passengers that were surveyed used more than one bus. To account for this, before factoring up the survey responses each origin-destination response was analysed to determine whether they would require interchange to complete their journey. For all passengers that did need to interchange, the other routes on which they would need to travel was determined.

Each response was then added to all of the other routes which would need to be travelled on to complete the journey. Once the responses had been fully expanded, all of the origin-destination responses which involved interchange were divided by the number of routes that were travelled on for each individual journey. Table 3.3 shows the percentage of interchanging passengers by time period.

Table 3.3: Percentage of interchanging passengers by time period from survey responses.

Time Period	Survey responses where transfer required	Total Survey Responses	Interchanging Pax (%)
Morning Peak	85	573	15%
Inter Peak	70	738	9%
Evening Peak	39	263	15%

3.4 Conversion to model zoning and modelled hour

The origin-destination postcodes were converted to the zone system of the model based on the geographical location of the origin and destination given within each survey response. In some of the survey responses, an origin or destination postcode had not been given, but information on the bus boarding or alighting location was available. This was used to infer the origin/destination zone.

Factors to convert from peak period to peak hour were calculated from the town centre boardings and alightings counts. The relationship between peak hour and peak period flows was found to be different for flows in to and out of town. Therefore, two different factors were calculated for each time period – one for trips originating within the town centre, and one for trips originating outside of the town centre. These factors are given below.

Time Period	Town centre factor	Non town centre factor
Morning Peak	0.46	0.40
Evening Peak	0.42	0.32

3.5 Addition of Wayfarer data

For a limited number of routes demand was developed from Wayfarer data. Before using this data it has been compared against the survey data collected to check its accuracy. Passengers that are not paying cash are sometimes not recorded properly in Wayfarer. We have therefore checked the proportion of non cash paying customers in the Wayfarer data against the proportion of passengers in the survey responses using concessionary or multi-leg tickets. From Wayfarer data for Ipswich Buses, the proportion of non cash-paying passengers is 68%. The proportion of passengers by ticket type from the survey data is shown in Table 3.4. If we assume that a significant proportion of passengers using multi-leg tickets are non-cash paying (as they will buy their tickets before getting on the bus), the proportions of non-cash paying passengers are similar in the survey data and Wayfarer.

Table 3.4: proportion of passengers by ticket type from survey data

Ticket Type	Proportion
Single	29%
Return	6%
Concessions	40%
Multi journey and PlusBus	25%

The routes for which demand has been created from Wayfarer are listed below:

- 76
- 77
- 91
- 110
- 116
- 118
- 119
- 66B

All of these routes except for the 66B are regional inter-urban routes. The 110, 116, 118, and 119 take passengers to the north of Ipswich. The 76/77 and 66B are to the east, and the 91 is to the west. The routes are around 8% of the demand within the model.

This Wayfarer data was provided as a matrix of origins and destinations of all passengers boarding buses at fare stage level. Each of the fare stage locations was assigned to the ITAMS zone in which it fell with the exceptions of the routes 91 and 110. On these routes fare stage data was not available and thus trips were allocated to zones based on distributions from services using similar itineraries.

For some of the buses the Wayfarer data was provided at an all day level. This was broken down to period data using the distribution seen in routes with similar characteristics for which the split by time period was available.

3.6 Constrain to Wayfarer totals by route

The expanded survey data will be limited by the buses which were surveyed. The method assumes that these were a representative sample of the whole time period. If a particularly busy bus had been surveyed, this will lead to an over estimation of demand and vice versa. Also, the demand on bus routes will vary daily. Wayfarer for the five weekdays show a daily variation of plus or minus 4 percent (lowest on Mondays, highest on Fridays)

To overcome the potential for day to day variation in boardings, the final demand totals have been constrained to match boardings from the average weekday two-way Wayfarer data. This has been done on a route by route basis, and the matrices have been constrained at a 12-hour level.

3.7 Final demand totals

Table 3.5 shows the totals of the final demand matrices, normalised to an average weekday over the whole wider Ipswich area. Figure 3.1 shows the 13 sector summary areas used for the model, and Tables 3.6 and 3.7 present the base bus matrices as assigned in the two modelled peak hours.

Table 3.5: Demand totals (7am – 7pm)

Time Period	Time period total	1-hour total
Morning Peak	6,670	2,709
Inter Peak	15,768	2,628
Evening Peak	6,058	2,227
Total 12 hour	**28,496**	

Figure 3.1: Map of Ipswich showing the sectoring system used in Tables 6.6 and 6.7.

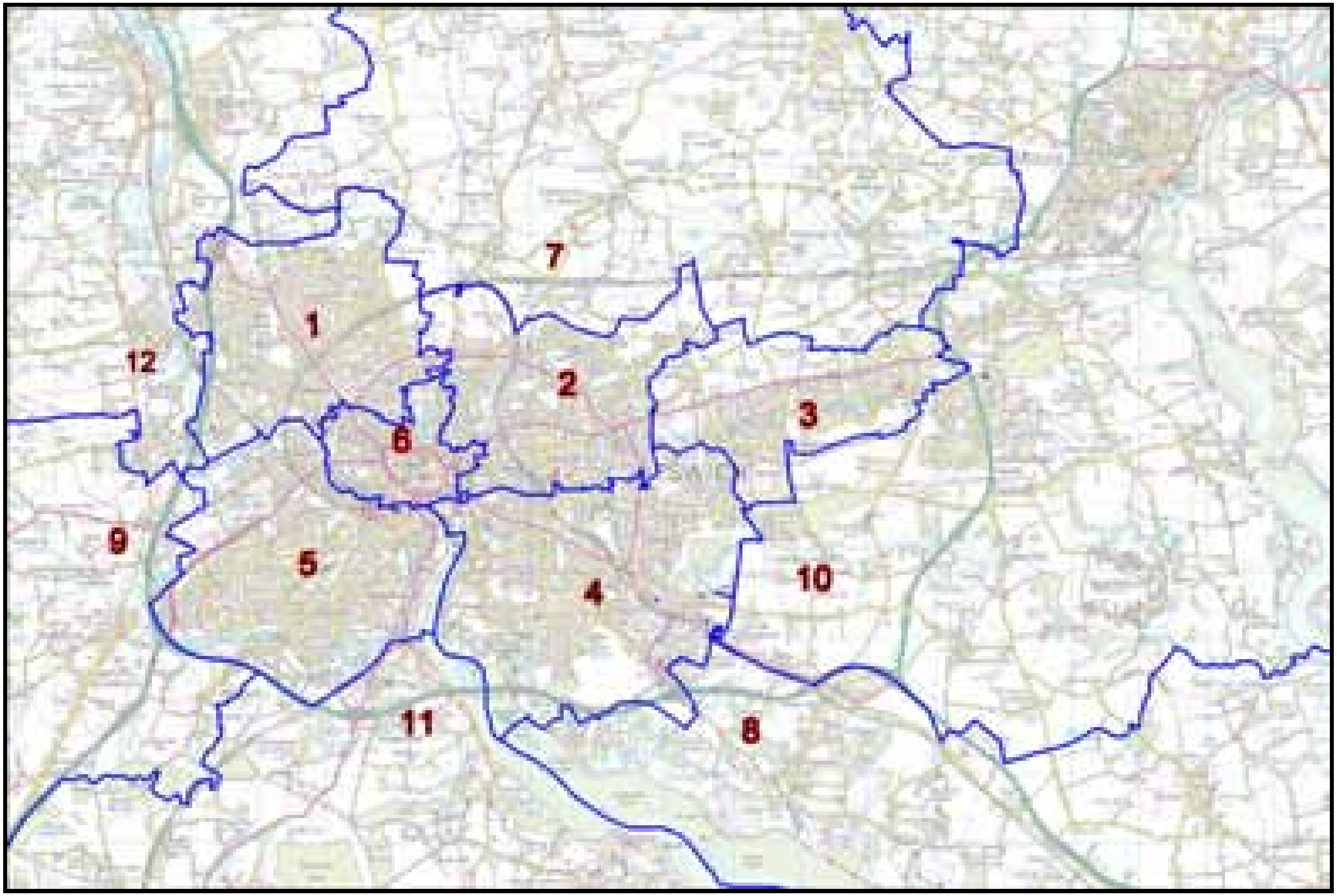


Table 3.6: Sectored bus passenger demand, 8 -9 am morning peak hour

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	Total	
1	40	26	6	33	21	274	0	25	0	5	0	9	0	**439**	**16%**
2	7	17	12	12	18	132	0	3	0	49	0	12	0	**261**	**10%**
3	0	0	0	0	0	0	0	12	0	21	0	11	0	**44**	**2%**
4	25	26	8	156	32	422	0	15	0	0	0	19	0	**704**	**26%**
5	19	66	7	41	148	324	0	0	0	64	7	6	0	**683**	**25%**
6	52	32	0	68	70	45	6	30	17	30	0	14	0	**363**	**13%**
7	0	3	0	0	0	2	11	0	0	0	0	0	0	**16**	**1%**
8	0	6	0	1	0	40	0	21	0	0	0	1	0	**69**	**3%**
9	0	0	0	0	0	35	0	0	0	0	0	0	0	**36**	**1%**
10	0	0	0	0	0	15	0	0	0	0	0	0	0	**15**	**1%**
11	0	0	0	2	5	0	0	0	0	0	0	0	0	**7**	**0%**
12	4	5	0	2	0	44	0	0	0	13	0	6	0	**74**	**3%**
13	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0%**
Total	**147**	**181**	**33**	**315**	**295**	**1333**	**17**	**106**	**17**	**181**	**7**	**79**	**0**	**2709**	**100%**
	5%	**7%**	**1%**	**12%**	**11%**	**49%**	**1%**	**4%**	**1%**	**7%**	**0%**	**3%**	**0%**	**100%**	

Table 3.7: Sectored demand, 5 -6 pm evening peak hour

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	Total	
1	85	13	0	20	28	42	0	0	0	4	0	5	0	**197**	**9%**
2	22	30	1	23	16	36	0	6	0	2	8	5	0	**150**	**7%**
3	9	17	0	19	0	0	0	0	0	0	0	0	0	**44**	**2%**
4	15	7	4	65	18	49	0	2	0	8	1	8	0	**175**	**8%**
5	4	12	0	53	57	55	0	4	0	0	0	0	0	**185**	**8%**
6	234	203	10	195	310	54	10	51	39	20	0	107	0	**1234**	**55%**
7	0	0	0	0	0	1	4	0	0	0	0	0	0	**4**	**0%**
8	3	2	5	4	0	19	0	17	0	4	0	0	0	**55**	**2%**
9	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0%**
10	0	75	17	0	38	9	0	0	0	0	0	9	0	**149**	**7%**
11	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0%**
12	0	1	0	1	12	7	0	2	0	0	0	11	0	**35**	**2%**
13	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0%**
Total	**372**	**361**	**36**	**380**	**479**	**273**	**14**	**82**	**40**	**38**	**9**	**145**	**0**	**2227**	**100%**
	17%	**16%**	**2%**	**17%**	**21%**	**12%**	**1%**	**4%**	**2%**	**2%**	**0%**	**7%**	**0%**	**100%**	

4 ITAMS_B: Bus Assignment Model

4.1 Context

The bus assignment model has been implemented using EMME software. It assigns both bus and park-and-ride demand. This Chapter discusses how we have developed this network model.

4.2 Networks

4.2.1 Nodes, Links & Modes

The nodes and links used in the bus network were derived from those used in the development of the highway model. This increases the options available in relation to multi-modal analysis and enables the important introduction of a highway congestion effect on bus journey times, discussed in Section 4.4. All bus stops within the Ipswich town centre and the majority of bus stops throughout the rest of Ipswich have been coded in to the model.

Additional walk links were also coded to connect the bus network to zone centroids. The length of these walk links was determined through GIS analysis, and a walking speed of 4.5kph was assumed.

Bus and Park-and-ride services were assigned separate modes.

4.2.2 Transit Lines

A list of all of the bus routes coded is given in Table 4.1.

Table 4.1 Bus routes coded

Route	Operator/ Route Description	Buses per hour		Journey Time	
		AM	PM	AM	PM
	Ipswich Buses				
1	Station-Town Centre-Ravenswood	3	3	55	55
2	Town Centre-Priory Heath-Gainsborough	3	3	54	54
3	Station-Town Centre-Ravenswood	3	3	55	55
5	Town Centre-Hospital-Northgate-Town Centre	4	4	38	38
6	Town Centre-Warren Heath-Hospital	3	3	64	64
7	Town Centre-Thorington Park-Maidenhall-Town Centre	4	4	46	46
8	Town Centre-Bramford Road-ASDA	3	3	43	43
8b	Town Centre-Bramford Road-ASDA	3	3	44	44
9	Town Centre-Norwich Road-Castle Hill-Town Centre	3	3	38	38
10	Town Centre-Castle Hill-Norwich Road-Town Centre	3	3	38	38
11	Town Centre-Northgate-Hospital-Town Centre	4	4	39	39
12	Town Centre-Station-Cambridge Drive-Station-Town Centre	3	3	37	37
13	Town Centre-Station-Chantry(Tesco)	6	6	47	47
14	Town Centre-Wallers Grove-Town Centre	0	0	34	34
14a	Town Centre-Wallers Grove-Town Centre	1	1	34	34
15	Town Centre-Maidenhall-Thorington Park-Town Centre	4	4	46	46
16	Town Centre- Halifax-Belstead Road-Town Centre	3	3	36	36
19	Town Centre-Dale Hall-Castle Hill	2	2	53	53
22	Town Centre-Brunswick Road-Tuddenham Village-	1	1	25	25
31	Town Centre-Inverness Road-Hospital	1	1	53	53
38	Endeavour House-Town Centre-Endeavour House	4	4	17	17
116	Town Centre-Henley Road	1	1	42	42
118*	Town Centre-Westerfield Road	1	1	24	24
119	Town Centre-Westerfield Road	1	1	24	24
	First Eastern Counties				
61	Town Centre-Gainsborough-Greenwich	4	4	39	39
61a	Town Centre-Gainsborough-Greenwich	0	3	36	36
62	Town Centre-Broke Hall-Bixley	3	3	53	53
63	Town Centre-Kesgrave-Woodbridge	1	1	58	58
64	Town Centre-Kesgrave-Woodbridge	1	1	58	58
65	Town Centre-Kesgrave-Martlesham(Tesco)	1	1	57	57
66	Bourne Bridge-Town Centre-Kesgrave-	4	4	100	100

	Martlesham Heath				
66a	Station-Town Centre-Kesgrave-Martlesham Heath	1	1	91	91
66b	Station-Town Centre-Adastral Park	4	2	34	33
75	Town Centre-Hosptial-Suffolk Showground-Felixstowe	2	2	48	48
76	Town Centre-Nacton Road-Suffolk Showground-Felixstowe	1	1	44	44
77	Town Centre-Nacton Road-Suffolk Showground-Felixstowe	1	1	44	44
87	Town Centre-Norwich Road-Claydon	1	1	32	32
88	Town Centre-Norwich Road-Claydon	1	1	32	32
88a	Town Centre-Norwich Road-Claydon	1	1	22	21
	Beestons				
91	Town Centre-Hadleigh Road-Hadleigh-Sudbury	1	1	24	24
	Galloway European Coachlines				
110	Town Centre-Bramford-Claydon	1	1	49	49
	Park & Ride				
800	Town Centre -Park and Ride London Road	6	6	27	27
801	Town Centre-Park and Ride Bury Road	5	5	33	33
802	Town Centre-Hospital-Park and Ride Martlesham	6	6	27	27

*Ipswich Buses service only.

4.2.3 *Routes Not Coded*

The majority of the coded services are run by Ipswich Buses or First Eastern Counties. All of the main local bus routes within Ipswich have been coded. We initially planned to also include all regional bus routes within the model. However, we were unable to get any robust demand information for the following routes, and these have therefore not been included:

- 92
- 93
- 111
- 113
- 114
- 118 (Far Eastern Travel services)

These routes carry regional passengers to the north and east of Ipswich.

The town centre bus boarding counts indicate that, of all services, services that are not included in the model account for around 10% of boardings in the town centre during the peak periods (around half demand for the 118 Far Eastern Travel service, and half for other services).

The aim when coding the services was to represent the normal pattern of service in terms of buses per hour. The bus timings have been input in to the model as a user defined attribute, based on the timetable.

4.2.4 *Vehicle Types*

To differentiate between the various types of bus used, three vehicle types have been used. These are described in Table 4.2.

Table 4.2 Vehicle Types

Vehicle Type	Seated Capacity	Standing Capacity
Midi	33	0
Single Decker	41	10
Double Decker	80	10

The vehicle types are needed to provide an indication of the amount of available seating, which could, for example, be used to assess bus performance by corridor.

4.3 Assignment Methodology

4.3.1 *Segmentation*

The development of the ITAMS_B demand matrices was discussed in Section 3. The ITAMS_B assignment model uses origin-destination matrices derived from time period matrices for the following hours:

- morning peak hour (0800 to 0900); and
- evening peak hour (1700 to 1800)

Whilst the ITAMS demand model segmentation is based on different trip purposes, car ownership, and income segmentation, the bus and park-and-ride assignment is based on two user-classes only; bus, and park-and-ride.

4.4 Journey Time Feedback Effects

Initial ‘transit’ travel times were based on published bus timetables. Congestion on the highway network will affect bus journey times if buses are not segregated from other highway traffic, for example, via bus lanes. Thus, delay occurring in the ITAMS_C highway assignments is introduced into the ITAMS_B bus assignment model by applying a ‘*congestion change*’ attribute, derived from the highway assignment, to the bus in-vehicle time before performing the bus assignments.

4.5 Assignment Parameters

The following parameters were used as an input to each assignment; each is discussed below:

- weightings associated with the travel time components;
- boarding times; and
- wait time factor.

The **travel time component weightings** which are used to factor the components of travel time are shown in Table 4.3.

Table 4.3: Generalised Cost Time Component Weightings

Component	Initial Weighting
In vehicle time	1.00
Wait/interchange time	2.00
Walk time	2.00
Boarding time	1.00

The **boarding time** is a penalty that is associated with the inconvenience of each boarding. A value of 8 minutes has been applied to all boardings.

The **wait time relationship** is a function of service frequency. A value of 0.5 for this parameter has been applied to the service frequency.

4.6 Fares

Although bus fares will affect whether people will travel by bus, they are unlikely to affect route choice. Ipswich has a simple fares structure with the majority of trips costing the same fare. Fares have therefore been included as part of the generalised cost calculations in the overall demand model, but are not included as part of the bus assignment model.

4.7 Crowding

Crowding has not been included in the model. Accordingly, load factors will need to be monitored in any future modelling work. Crowding is not currently an issue on Ipswich Buses. The base year model assignments show maximum load factors to be less than 80% on almost all services. This is confirmed by work carried out for Suffolk County Council on the Ipswich Bus Infrastructure Study, which demonstrated low load factors on the majority of bus services within Ipswich.

5 ITAMS_B: Bus Assignment Model Calibration

5.1 Introduction

The bus assignment has been checked and calibrated against Wayfarer boardings by route. This has involved checks on the model network and zone connections as well as the service representation within the model.

For undertaking calibration and validation, the bus routes have been grouped into 7 corridors that form a cordon around the town centre as shown in Figure 5.1. Tables 5.1 to 5.2 show the calibration results. The flow calibration is close in overall cordon total. Corridor 1 (NW) has modelled flows higher than observed in the morning, but lower in the evening. Corridor 2 (SW) has low modelled flows in both time periods, while Corridor 3 (SE) has higher than observed in both time periods. Corridor 4 (E) shows good agreement.

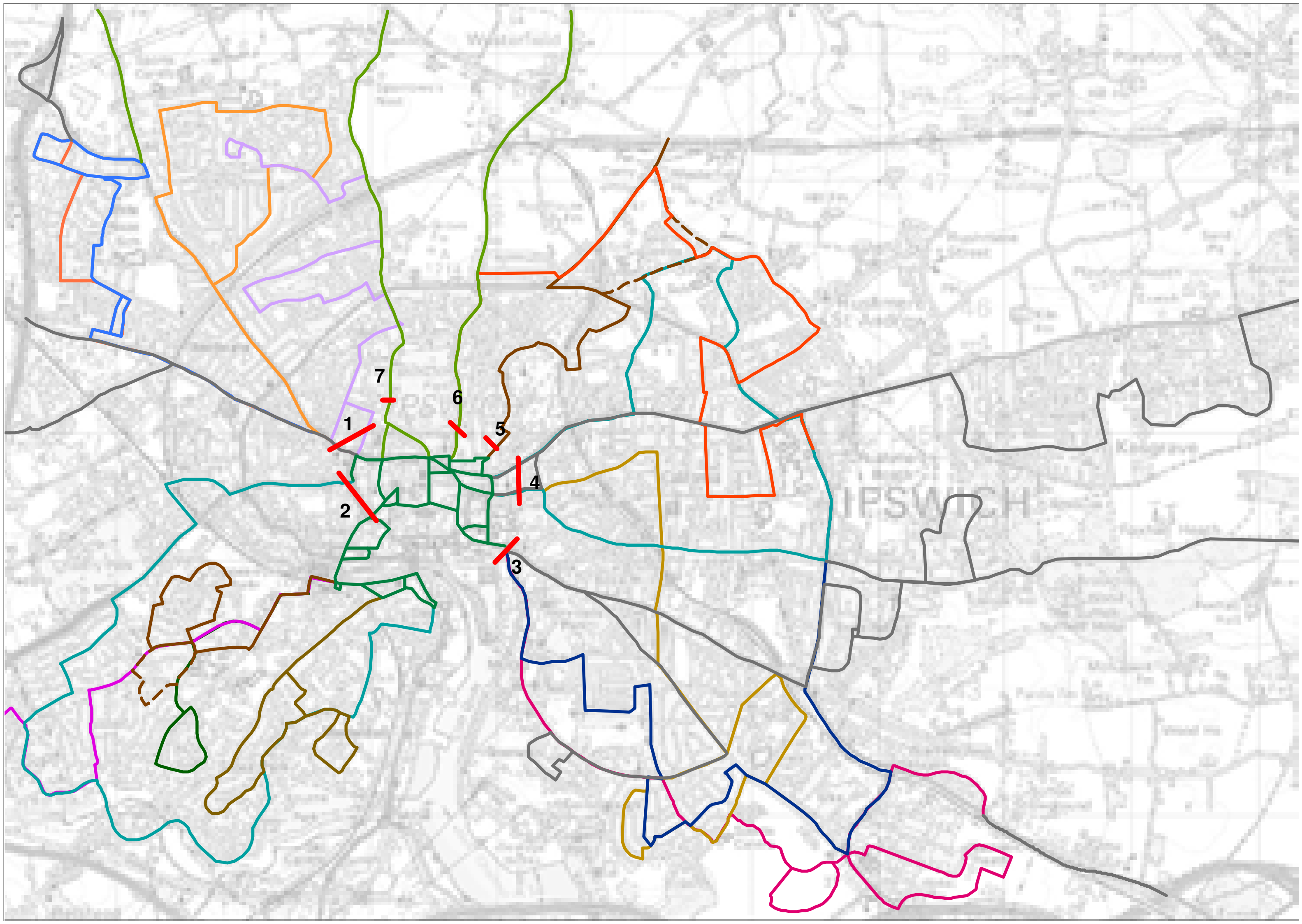
Table 5.1: Comparison of two-way observed and assigned boardings by route (Morning peak)

Corridor	Wayfarer boardings	Assigned Boardings	Difference	% Difference
1	559	653	94	17%
2	804	755	-49	-6%
3	630	658	28	4%
4	970	932	-38	-4%
5	5	3	-2	-44%
6	17	16	-1	-5%
7	16	13	-3	-19%
Total	**3,002**	**3,030**	**28**	**1%**

Table 5.2: Comparison of two-way observed and assigned boardings by route (Evening peak)

Corridor	Wayfarer boardings	Assigned Boardings	Difference	% Difference
1	634	591	-43	-7%
2	562	506	-56	-10%
3	418	456	38	9%
4	740	743	3	0%
5	4	6	2	40%
6	14	17	3	20%
7	14	16	2	14%
Total	**2,387**	**2,335**	**-52**	**-2%**

Figure 5.1 Grouping of bus routes for calibration and validation.



Note: some of the key links into the Town Centre have been grouped together as for some of the circular bus routes the same route travels along more than one link.

6 ITAMS_B: Bus Assignment Model Validation

6.1 Validation

Model validation has been undertaken to ensure that the detailed network description, trip matrix and methods of assignment are sufficiently robust to facilitate replication of observed patterns for the base year (2008).

ITAMS_B has been validated using three types of validation:

- validation of the trip matrices;
- network and service validation; and
- assignment validation.

These are described in turn in the following sections.

6.1.1 Matrix validation

The final bus demand matrices were built from trips constrained to Wayfarer totals on a route by route basis. To ensure that this is robust, we have checked the validation of the trip matrices prior to this constraint against Wayfarer boardings. This is shown in the table below. As can be seen, the prior demand totals are similar to the Wayfarer totals.

Table 6.1 validation of matrix against Wayfarer totals by route

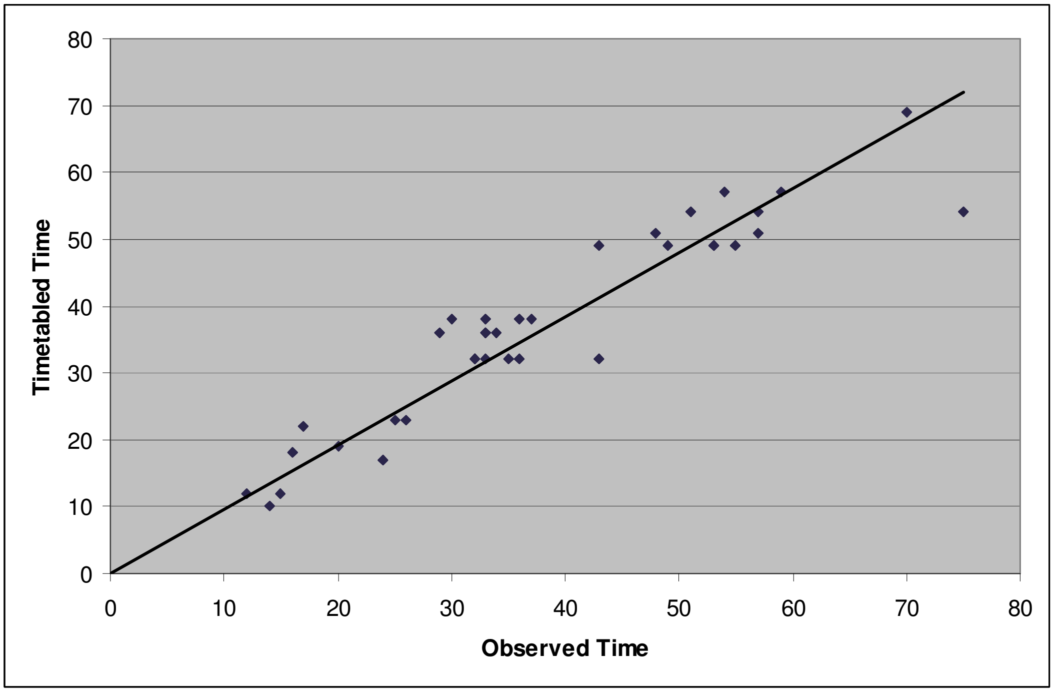
Corridor	Wayfarer boardings	Expanded Survey Boardings	Difference	% Difference
1	6,697	6,943	246	4%
2	7,423	8,706	1,283	17%
3	4,938	4,977	38	1%
4	9,397	9,190	-208	-2%
5	113	108	-5	-4%
6	221	168	-53	-24%
7	N/A	N/A	N/A	N/A
Total	28,789	30,091	1,302	5%

Note: The demand for corridor 7 was built entirely from Wayfarer data.

6.1.2 *Network and Services*

Validation of the network has been achieved by comparing the coded network to a GIS map of Ipswich. Journey times within the model have been coded to timetable. To indicate whether this is an accurate representation of bus journey times within Ipswich, timetabled times for morning peak buses within Ipswich have been compared with journey times recorded during the survey work. This comparison is shown in Figure 6.1. As can be seen, although there is significant variability in the results, observed bus journey times within Ipswich do not appear to be systematically different to the timetabled times.

Figure 6.1 Journey time validation



6.1.3 *Assignment*

Validation of the assignment is based on Ipswich town centre boardings and alightings surveys. We have chosen to focus the model validation on town centre boardings and alightings for two reasons:

- The majority of the bus demand within Ipswich travels through the town centre
- The schemes which we are using the model to assess are focussed around the town centre and arterial routes in to the town centre.

WebTAG Unit 3.11.2 states that:

> *"Across modelled screenlines, modelled flows should, in total, be within 15% of the observed values. On individual links in the network, modelled flows should be within 25% of the counts, except where observed flows are particularly low (less than 150)."*

The validation results are shown in Tables 6.2 and 6.3. All the WebTAG requirements are exceeded for the boarding and alighting data.

Table 6.2: Comparison of observed and modelled Ipswich town centre boardings and alightings (Morning Peak)

Location	Stops Covered	Boardings				Alightings			
		Observed	Modelled	Absolute Difference	% Difference	Observed	Modelled	Absolute Difference	% Difference
Town Centre 1	**Tower Ramparts, High St, Westgate St**	**495**	**424**	**-71**	**-14%**	**968**	**1100**	**132**	**14%**
Town Centre 2	Buttermarket, Willis Building	0	29	29	#DIV/0!	55	37	-18	-33%
Town Centre 3	**Cattle Market, PALS, St Pancras Church**	**178**	**163**	**-15**	**-8%**	**127**	**138**	**11**	**9%**
Town Centre 4	Café Nero, Gt Colman St, Majors Corner, Cobden Place	77	34	-43	-56%	110	61	-49	-45%
Town Centre 5	Post Office, Fore St	7	1	-6	-86%	20	7	-13	-65%
Total		**757**	**651**	**-106**	**-14%**	**1280**	**1343**	**63**	**5%**

Table 6.3: Comparison of observed and modelled Ipswich town centre boardings and alightings (Evening Peak)

		Boardings				Alightings			
Location	Stops Covered	Observed	Modelled	Absolute Difference	% Difference	Observed	Modelled	Absolute Difference	% Difference
Town Centre 1	**Tower Ramparts, High St, Westgate St**	**828**	**878**	**50**	**6%**	**277**	**302**	**25**	**9%**
Town Centre 2	Buttermarket, Willis Building	43	60	17	40%	18	23	5	28%
Town Centre 3	**Cattle Market, PALS, St Pancras Church**	**396**	**371**	**-25**	**-6%**	**47**	**52**	**5**	**11%**
Town Centre 4	Café Nero, Gt Colman St, Majors Corner, Cobden Place	86	37	-49	-57%	65	41	-24	-37%
Town Centre 5	Post Office, Fore St	1	2	1	100%	2	0	-2	-100%
Total		**1354**	**1348**	**-6**	**0%**	**409**	**418**	**9**	**2%**

6.2 Assignment Results

The plots below show passenger flows in both the morning and evening peak models. In both time periods, the passengers are distributed throughout the bus network. However, the highest flows are seen on the main radial routes into and out of town including on the A1071 and A1156 to the east of town, and the A1156 to the west of town. As expected, the main direction of flow in the morning peak period is in to town, and in the evening peak period is away from town.

Figure 6.2 Morning peak passenger flows

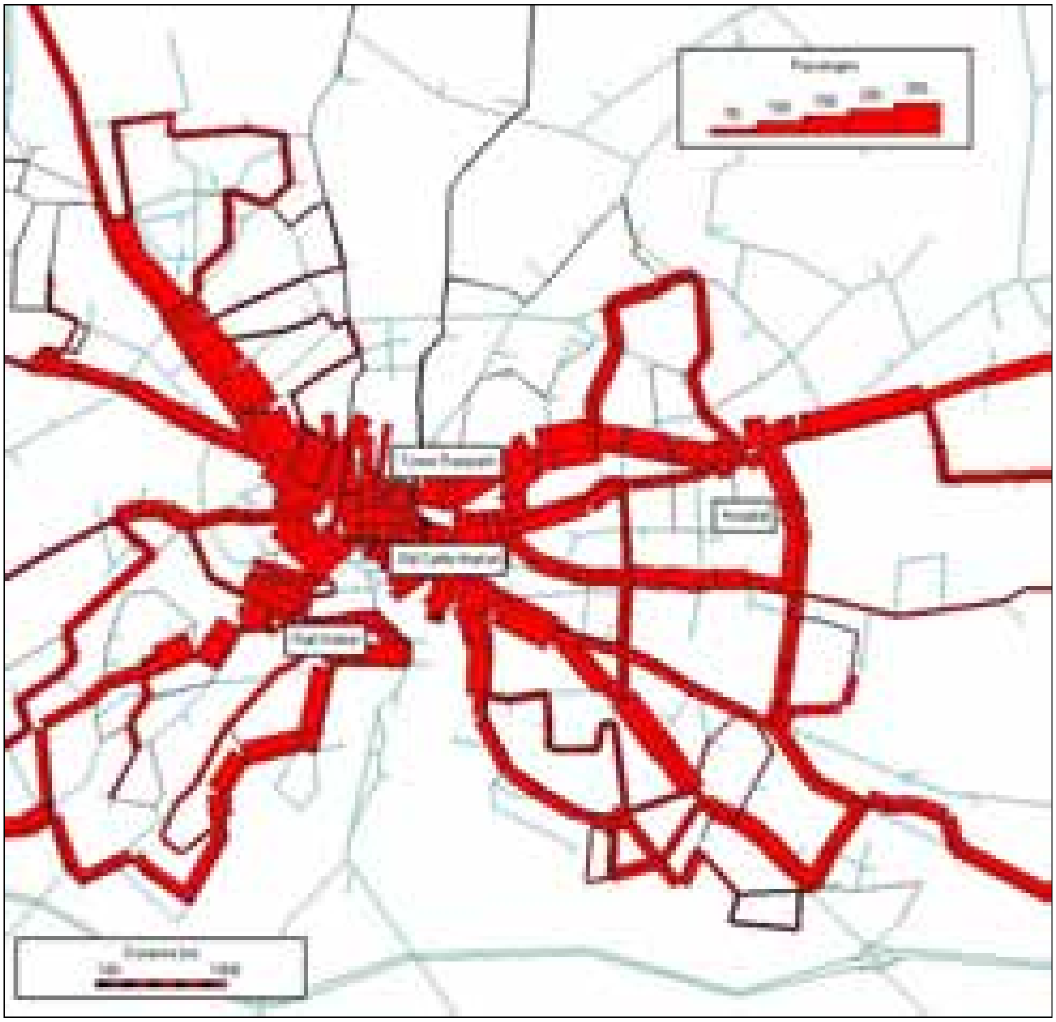
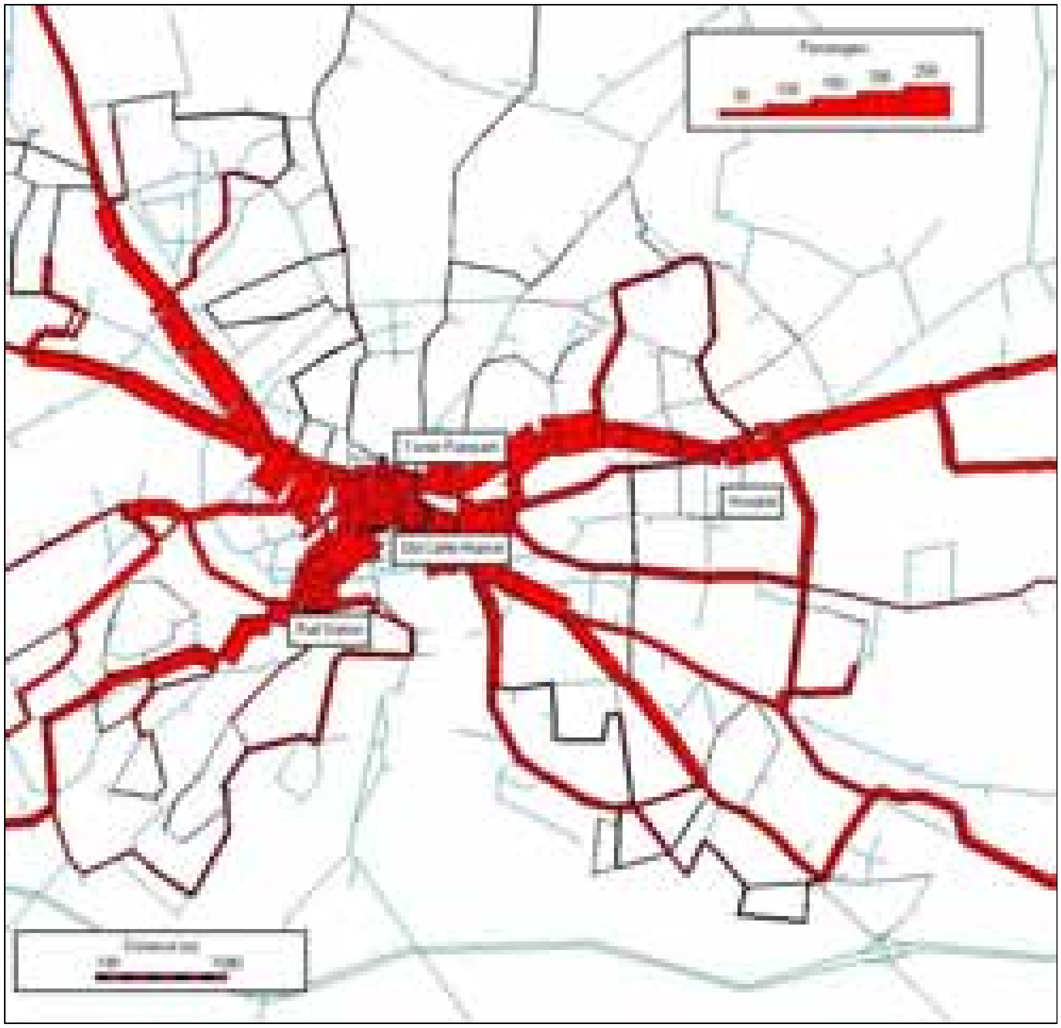


Figure 6.3 Evening peak passenger flows



Appendix K

Suffolk County Council | AECOM

Project:	**Ipswich – Transport Fit for the 21st Century Schemes**	Job No:	**60050323**
Subject:	**Demand Model Report**		
Prepared by:	**Currall, A; Tolouei, R; Dazeley, M**	Date:	**1 May 2009**
Approved by:	**Harrison, B**	Date:	**15 May 2009**

1 Introduction

1.1 This Technical Appendix describes the development of the variable demand element of the Ipswich Transport Assessment Modelling Suite (ITAMS).

1.2 The Model Specification Report detailed the (proposed) specifications of the ITAMS suite of models. It is formed of a SATURN highway model (ITAMS_C), an EMME bus and active modes model (ITAMS_B), and an EMME demand model (ITAMS_D), the subject of this Appendix K.

1.3 The objective of the ITAMS_D demand model is to forecast changes in patterns and level of demand by all modes in response to changes in the transport infrastructure and cost of travel, such as may be introduced by a transport scheme. The demand model does not forecast base demand; this is an input to ITAMS_D. Instead, it takes base demand and costs, and adjusts demand in response to the costs in a test scenario.

1.4 This Technical Appendix contains the following sections:

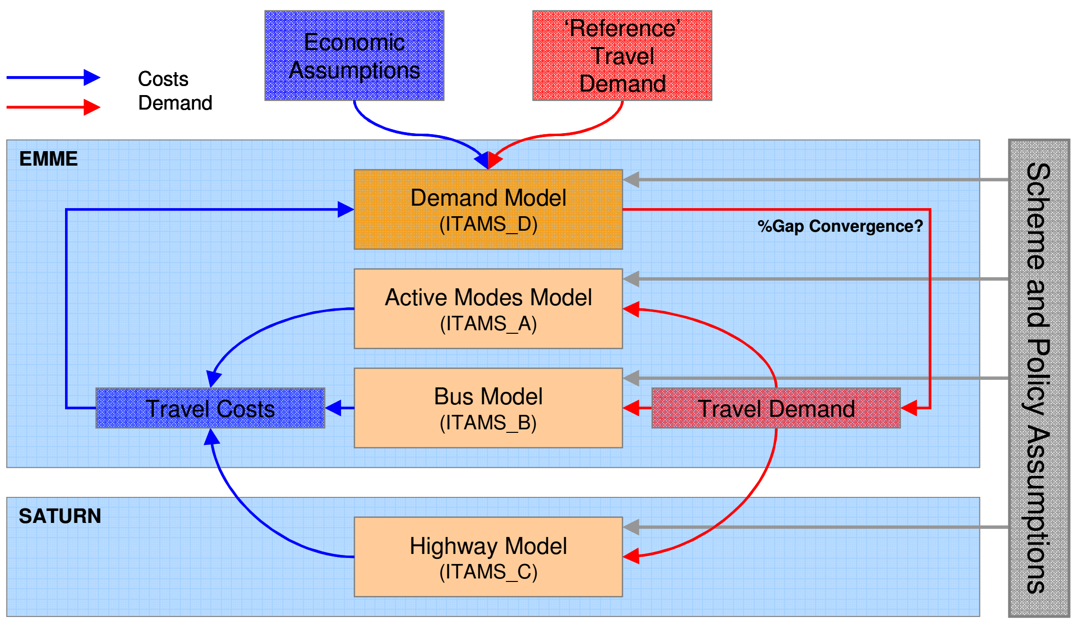
1. Introduction (this section)
2. Model Structure
3. Segmentation
4. Choice Models
5. Data Sources
6. Calibration
7. Convergence
8. Realism Testing and Implied Elasticities
9. Fitness for Purpose

2 Model Structure

2.1 ITAMS_D is an incremental hierarchical logit model. This means that it does not attempt to forecast absolute demand directly in total, rather to adjust existing demand matrices in response to changes in cost. It therefore derives demand as a function of cost. Because two of the three ITAMS supply models (B and C, for bus and car) derive cost as a function of demand; in particular, travel times increase with increasing highway congestion, it is necessary to iterate between the demand model and the supply models until the demand and costs are in equilibrium.

2.2 The complete ITAMS model suite therefore, in operation, consists of a number of successive executions of the demand model, followed by the supply models. The operation of the complete model suite is illustrated in Figure 1.

Figure 1: ITAMS Model Structure



2.3 An automated process has been developed to allow the EMME and SATURN models to interface with one another: therefore, once a model-run has been specified, no further user input is required until the demand and costs have fully converged. "Reference" demand refers to the base matrix growthed to the appropriate future year to account for changes in population and land-use, but not the effect of any changes in transport infrastructure, the inclusion of which is the purpose of ITAMS_D.

2.4 ITAMS_D operates exclusively at the production-attraction level of demand representation. A conversion to origin-destination demand matrices, which is required by the supply models, is performed prior to assignment.

3 Segmentation

3.1 ITAMS_D considers demand in four time-periods.

- AM / morning peak period (0700-1000);
- PM / evening peak period (1600-1900);
- IP / interpeak period (1000-1600); and
- OP / off peak period (all other hours of the 24-hour day).

3.2 Supply models for the two peak periods have been developed and validated and reported separately. Base demand matrices for the interpeak and off-peak periods have also been created, and we have assumed that the highway transport networks will not differ radically between the interpeak and off-peak periods, and also that the bus service frequency in the interpeak are similar to those in the peak. Separate bus transit lines for the off-peak, have, however, been produced.

3.3 The interpeak and off-peak models are intended solely to represent travel costs for these periods to enable time-period choice to and from the peaks; these models have not been formally validated. Reported results, therefore, will be strictly concerned with the peak periods.

3.4 ITAMS_D considers the following trip purposes:

- commuting;
- education;
- other non-work; and
- business.

3.5 There is no explicit division of ITAMS_D demand into home-based and non-home-based trips, on the grounds that WebTAG illustrative model sensitivities do not vary by home/non-home based status. However, factors allocating trips into home-based and non-home-based have been used as part of the transformation from OD to PA demand. In forecasting mode, care will be taken to ensure that the differentials in home and non-home-based growth are considered.

3.6 Each of the four purposes is split by car availability, creating eight car demand segments. This is important for the purpose of modelling mode-choice.

- car available; and
- no car available.

3.7 No income-segmentation is included within the model. No schemes involving tolls or pricing are proposed to be tested within ITAMS.

3.8 Freight demand is included for ITAMS_C; this is divided into light goods vehicles (LGV) and heavy goods vehicles (HGV). There are therefore ten segments in total.

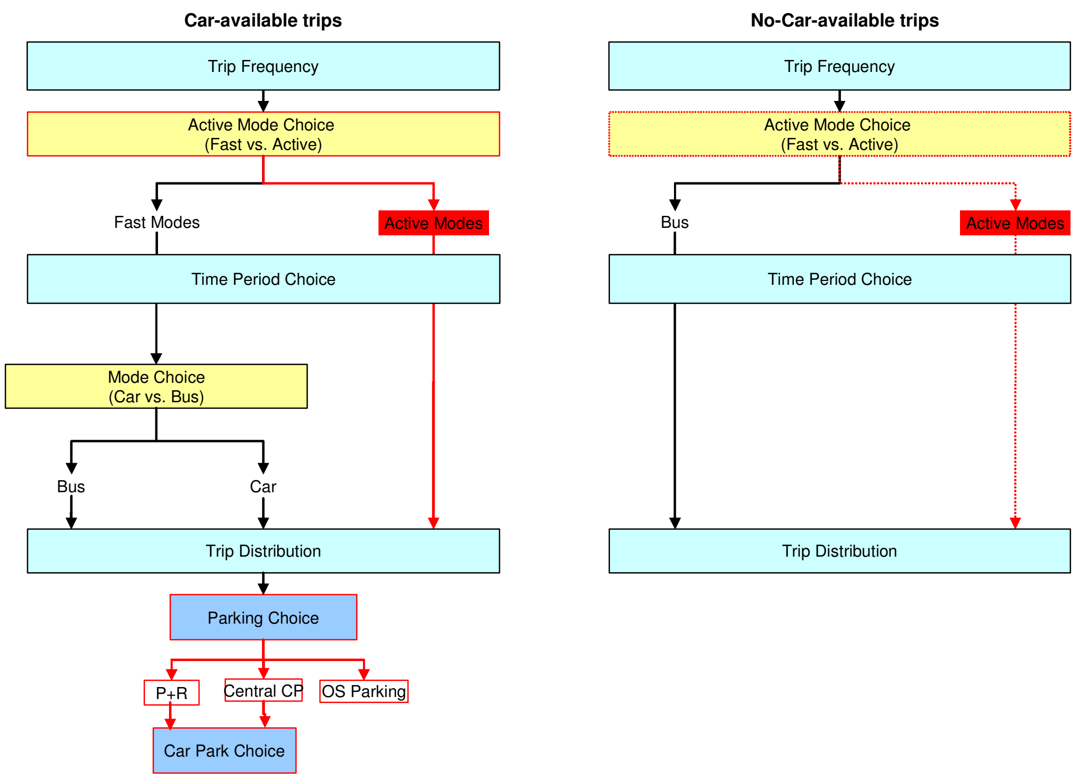
3.9 Assignment within the bus and active-mode models is on the basis of a single user-class; fares are not considered within the bus assignment. The assignment of ITAMS_C is by five user-classes, derived from ITAMS_D segments by aggregating “other non-work” and “education” demand into a single assignment user-class.

4 Choice Models

4.1 As noted above, ITAMS_D is a hierarchical logit model. It therefore has a number of choice processes that allocate demand variously, ordered from least-sensitive to most-sensitive as follows:

- trip frequency;
- active mode choice;
- time period choice;
- mode choice;
- trip distribution; and
- parking choice.

Figure 2: ITAMS_D Choice Structure



4.2 Therefore, for a car-available demand segment, the model first adjusts total demand by production zone (trip frequency), then allocates demand between motorised and active modes (active-mode choice), then allocates demand between time periods (time-period choice), then, for motorised trips, allocated demand between car and bus, then allocates demand among attraction zones, and finally, for car trips, chooses a type of parking (park-and-ride, central car park, on-street parking) and a parking zone to use.

5 Data Sources

5.1 Most of the input demand data for ITAMS_D is taken from the base matrix development, discussed elsewhere. The parking model (which is an absolute formulation, not an incremental once like the rest of the model), uses data for calibration taken from car-park and park-and-ride surveys carried out specifically for use in the model. All cost data is taken directly from the three supply models.

5.2 Sensitivities for the choice processes are largely derived from WebTAG advice, discussed further in the calibration section below.

5.3 Economic parameters, such as values of time, fuel prices and vehicle operating costs, are all taken directly from WebTAG 3.5.6 (December 2008). Base year values are reported in the tables below, all in 2002 prices.

Table 1: Values of Time

Segment	Value of Time (ppm)
HBW	9.46
HBEd	8.37
HBEB	40.36
HBO	8.37
HNBEB	40.36
NHBO	8.37
LGV	15.23
HGV	37.49

Table 2: Vehicle Operating Cost Parameters

Value	**VOC Parameters**		
	Car	**HGV**	**LGV**
Work Fuel Cost, pence per litre	72.18	73.88	73.88
Non-Work Fuel Cost, pence per litre	84.81	n/a	n/a
Fuel VOC A-Factor	0.168	0.881	0.196
Fuel VOC B-Factor	-0.00372	-0.02595	-0.00301
Fuel VOC C-Factor	0.0000412	0.0003729	0.0000166
Fuel VOC D-Factor	-0.00000013	-0.00000164	-0.00000006
Non-Fuel Cost A-Factor	4.069	7.796	5.91
Non-Fuel Cost B-Factor	111.391	304.657	33.97
Fuel Efficiency Improvement Factor	0.947	0.965	0.932

5.4 Fuel and non-fuel operating costs are derived using the equations in WebTAG 3.5.6 (December 2008).

5.5 Ipswich bus fares are derived from local data collected for the model. These are reported in the table below, in 2008 prices, assumed constant in real terms over time.

Table 3: Bus Fare Assumptions

Segment From	Segment To	Average Fare (single journey)
Ipswich Buses	Ipswich Buses	£0.85
Ipswich Buses	First Zone 1	£0.85
Ipswich Buses	First Zone 2	£1.15
First Zone 1	Ipswich Buses	£0.85
First Zone 1	First Zone 1	£0.85
First Zone 1	First Zone 2	£1.15

5.6 Fares are charged on the basis of origin and destination zone and which of the three sectors above they fall into. Fares for external trips use a simple function of distance; this was derived for another model, the East of England Regional Model (EERM), based upon bus fare data collected for that project. The function is given by:

$$F = (d < 100) * (8.14d + 93) + (d \geq 100) * (0.002d^2 + 4.07d + 522)$$

where:

- F = fare in pence, 2002 prices; and
- d = point-to-point ('crow-fly') distance in kilometres.

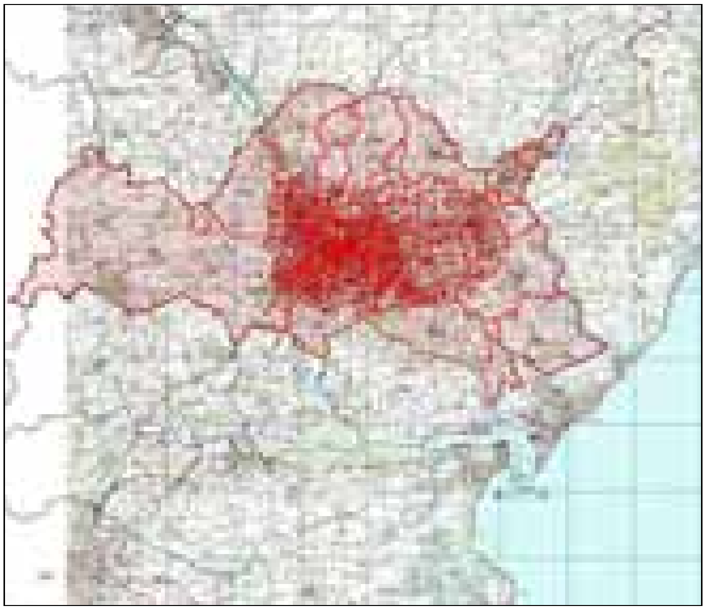
6 Calibration

6.1 There are two principal calibration exercises required for ITAMS_D:

- calibrate the overall model sensitivity to produce sensible fuel-cost and bus-fare elasticities; and
- calibrate the alternative-specific constants in the parking model to reproduce observed usage of car-parks.

6.2 All calibration was performed using as analysis all trips produced in the Ipswich 'internal area', illustrated below. This method includes a complete range of trip-lengths, without considering wholly external trips that are of no direct interest to the model.

Figure 3: Ipswich Internal Area



6.3 The calibrated sensitivity parameters in ITAMS are provided in the table below. These parameter values are consistent with WebTAG guidance where available. Lambdas are in inverse-minutes. For choice processes above distribution, relative 'theta' parameters have been quoted: these represent the sensitivity of the choice process relative to the process below, for example, they imply that time-period sensitivities are the same as those for main mode, as the theta values are equal to 1.

Table 4: ITAMS_D Choice Model Sensitivity Parameters

Purpose	Thetas				Distribution Lambdas	
	Frequency	Active Mode	Time Period	Main Mode	Car	Bus and Active
Source	EERM	-	WebTAG	WebTAG		
Commuting	0.28	1.00	1.00	0.68	-0.065	-0.033
Other	0.28	1.00	1.00	0.53	-0.090	-0.036
Education	0.28	1.00	1.00	0.68	-0.065	-0.033
Business	0.00	0.00	1.00	0.45	-0.067	-0.036
HGV	0.00	n/a	1.00	n/a	-0.030	n/a
LGV	0.00	n/a	1.00	n/a	-0.030	n/a

6.4 Distribution lambdas have been taken directly from WebTAG 3.10.3, paragraph 1.11.12. Main mode and time-period sensitivities have been taken directly from paragraph 1.11.15 of the same WebTAG Unit.

6.5 The frequency parameter used in EERM has been retained; due to a lack of current guidance, we have not sought to calibrate these precisely; furthermore, their effect is very small when compared with the sensitivity of other choice processes.

6.6 Active-mode parameters have been calibrated to ensure reasonable bus fare and car fuel cost elasticities, whilst maintaining increasing sensitivity from top to bottom in the choice hierarchy. Theta values of 1, so as sensitive as time-period choice, produced the best relative difference between the two elasticities- lower values produced bus fare elasticities that were unreasonably low by comparison with car fuel cost elasticities.

6.7 The actual level of the elasticities was calibrated using a "cost-dampening function", designed to reduce model sensitivity for long-distance trips. This is a function of the following form:

$$Cost\ Dampening\ Factor = \min\left(\sqrt{\frac{d_0}{distance}}, 1\right)$$

6.8 All cost-changes input to the demand model are weighted by this factor, thus reducing the impact of cost changes for long-distance movements. The parameter in the above expression, d_0, is the calibration tool used. A value of 20km has been found to produce appropriate output elasticities.

6.9 Calibration of car-park usage required adjustment of alternative-specific constants. These are require by an absolute demand model; i.e. one which forecasts actual patterns of demand directly rather than relative to a base-matrix, and essentially represent extra costs (positive or negative) applied to certain options to properly represent actual behaviour.

6.10 Ipswich includes three park-and-ride zones and eight car parks in the central area. The parking model, which includes a choice between different park-and-ride and car parks, estimates the usage of each parking zone by segment and time period. The parking model was calibrated by comparing the modelled usage of each parking zone with its observed usage.

6.11 The following table shows calibrated cost constant, in generalised minutes, associated with parking options by purpose.

Table 5: Parking Option Cost Constants

Purpose	Park-and-ride	Central car-park
Commuting	-3	-5
Other	-3	-5
Education	-3	-5
Business	-3	-5

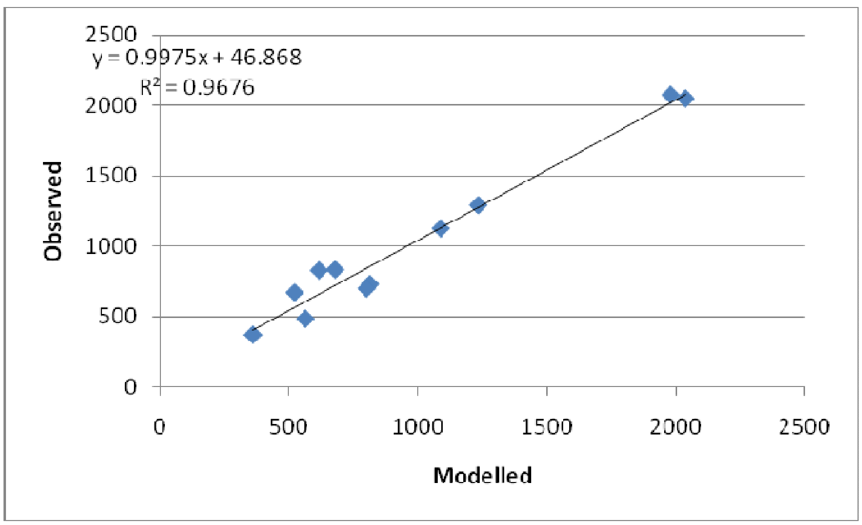
6.12 Specific park-and-ride and central car-park site constants calibrated for each parking site are shown in the following Table 6, again in minutes.

Table 6: Car Park Cost Constants

Parking	Zone	Description	Constan t
park-and-ride	901	London Road	2
	902	Bury Road	-3
	903	Martlesham	-6
Central car-park	911	Crown Multistory	-5
	912	Tower Ramparts	15
	913	Buttermarket Centre	0
	914	New Portman Road	0
	915	Tacket Street	-3
	916	Waterfront	-7
	917	Ipwich Village	2
	918	Station Multistory	-7

6.13 The following figure compares total 12-hour (AM, IP, and PM) usage of parking sites estimated by the model with the relevant observed values. As the figure shows, there is a good fit between observed and modelled values over the modelled period.

Figure 4: Modelled versus Observed Car Park Usage



7 Convergence

7.1 As previously discussed, it is necessary to run demand and supply model iteratively until an equilibrium between costs and demand is obtained. For this purpose, it is essential to be able to evaluate how close the model is to such an equilibrium; that is, to evaluate the model convergence level. We use the WebTAG-recommended measure of demand-supply gap, given as follows:

$$\%Gap = \frac{\sum_{ijtcm} C(D_{ijtcm}).\left|D_{ijtcm} - D(C(D_{ijtcm}))\right|}{\sum_{ijtcm} C(D_{ijtcm}).D_{ijtcm}} * 100$$

where:

- D_{ijtcm} = OD demand;
- $C(D_{ijtcm})$ = generalised OD cost generated by the assignment of D_{ijtcm} on the network;
-
- $D(C(D_{ijtcm}))$ = OD demand generated by the demand model in response to cost changes created from $C(D_{ijtcm})$; and
- i = origin, j = destination, t = time period, c = purpose, m = mode.

7.2 The %Gap is therefore summed across all modes, time-periods and segments.

7.3 On the level of the whole demand matrix, the model converges extremely well (to %Gaps of less than 0.01% within between 6 and 12 iterations); however this is mainly because of large amounts of external (and mostly irrelevant) demand for which the model generates no cost changes, because the Ipswich highway matrices represent the whole country. A %Gap of 0.2 is considered by WebTAG to be on the borderline of acceptability for overall models, and is well exceeded by our overall model.

7.4 We have in addition measured the %Gap only for trips produced in the Ipswich internal area – a much more stringent (and relevant) measure than that recommend by WebTAG. At this level we are able to obtain %Gap of 0.2%, still within the WebTAG guidance, as the convergence threshold for the model.

8 Realism Testing and Implied Elasticities

8.1 Where elasticities are discussed below, these are (except where otherwise specified) based on changes in vehicle kilometres with respect to changes in some element of cost, and are calculated via the arc-elasticity formula given below:

$$elasticity = \frac{\log_e\left(\frac{km_t}{km_b}\right)}{\log_e\left(\frac{v_t}{v_b}\right)}$$

Where:

- km_t is the vehicle or passenger kilometres in the test case;
- km_b is the vehicle or passenger kilometres in the base case;
- v_b is the base value of the variable for which the elasticity is being calculated for (fuel cost, bus fares, journey time, etc.); and
- v_t is the test value of that variable.

8.2 It should be recalled that these statistics are calculated only for trips produced in the Ipswich internal area, as discussed above.

8.3 Tables 7 and 8 show the ITAMS car use elasticities with respect to fuel cost calculated separately for fuel cost increase and decrease tests. The elasticities are distance elasticities rather than trip elasticities and all data are derived from matrix calculations including only trips with internal origins.

Table 7: Car Fuel Cost Elasticities: 10% Increase

Segment	10% Fuel Cost Increase Elasticities, Matrix: Internal Origin				
	AM	IP	PM	OP	16 hr
Commuting	-0.19	-0.27	-0.19	-0.23	-0.22
Other	-0.37	-0.35	-0.30	-0.27	-0.31
Education	-0.32	-0.51	-0.31	-0.46	-0.41
Business	-0.16	-0.11	-0.20	0.01	-0.13
All car	**-0.28**	**-0.32**	**-0.25**	**-0.25**	**-0.28**
HGV	0.01	0.00	0.00	0.02	0.01
LGV	0.01	0.00	0.00	0.02	0.01
Overall	**-0.21**	**-0.23**	**-0.21**	**-0.22**	**-0.22**

Table 8: Car Fuel Cost Elasticities: 10% Decrease

Segment	10% Fuel Cost Decrease Elasticities, Matrix: Internal Origin				
	AM	**IP**	**PM**	**OP**	**16 hr**
Commuting	-0.19	-0.25	-0.17	-0.37	-0.26
Other	-0.34	-0.32	-0.27	-0.38	-0.34
Education	-0.29	-0.48	-0.28	-0.51	-0.38
Business	-0.14	-0.10	-0.18	-0.15	-0.14
All car	**-0.26**	**-0.30**	**-0.22**	**-0.37**	**-0.30**
HGV	0.00	0.00	0.00	-0.02	0.00
LGV	0.00	0.00	0.00	-0.03	-0.01
Overall	**-0.20**	**-0.22**	**-0.19**	**-0.34**	**-0.25**

8.4 These elasticities all show consistency for both fuel cost increase and fuel cost decrease tests and are well within the WebTAG guidance that suggests car use elasticities with respect to fuel cost in the range of -0.1 to -0.4, dependant on trip purpose, with business trips having values close to -0.1. The relative sensitivity between time periods is also plausible, with sensitivity inversely related to levels of highway congestion.

8.5 The table below displays the ITAMS car use elasticities with respect to journey time.

Table 9: Car Journey Time Elasticities: 10% Decrease

Segment	Car Journey Time Elasticities, Matrix: Internal Origin				
	AM	**IP**	**PM**	**OP**	**16 hr**
Commuting	-0.59	-0.79	-0.71	-1.51	-1.00
Other	-1.17	-1.16	-0.87	-1.41	-1.23
Education	-1.42	-1.96	-1.82	-2.00	-1.78
Business	-0.72	-0.60	-1.14	-0.94	-0.80
All car	**-0.96**	**-1.15**	**-0.94**	**-1.43**	**-1.17**
HGV	-0.01	0.01	-0.01	-0.04	-0.01
LGV	-0.01	-0.01	-0.01	-0.08	-0.02
Overall	**-0.74**	**-0.84**	**-0.82**	**-1.30**	**-0.97**

8.6 Note that the values of the journey time elasticities are within the broad WebTAG guidance that suggests values of between 0 and -2 as being acceptable; this measure is to some extent dependent on the structure and characteristics of the assignment model, and an outturn sensitivity that has less scope for calibration, compared with, for example, car fuel cost elasticity.

8.7 Bus passenger kilometre elasticities with respect to bus fare are reflected in the following table.

Table 10: Bus Fare Elasticities: 10% Decrease

Segment	Bus fare Elasticities, Matrix: Internal Origin				
	AM	IP	PM	OP	16 hr
Commuting	-0.22	-0.31	-0.34	-0.26	-0.28
Other	-0.33	-0.33	-0.34	-0.31	-0.33
Education	-0.26	-0.32	-0.48	-0.32	-0.35
Business	-0.02	-0.02	-0.03	-0.02	-0.02
Overall	**-0.25**	**-0.30**	**-0.32**	**-0.29**	**-0.29**

8.8 WebTAG guidance suggests elasticities of public transport trips with respect to public transport fares to lie typically in the range of -0.2 to -0.4. As the results show, the calculated elasticities from the model are within the WebTAG range.

9 Fitness for purpose

9.1 The usual model assumptions of equilibrium and user information apply. Thus the effects of workplace, school, and personalised travel planning are not included in the model impacts.

9.2 At the local level of Ipswich produced trips, the model uses recommended and calibrated parameters, and results in plausible sensitivities within ranges suggested in guidance. While more detailed examination should be undertaken when applying the model in specific corridors, the overall performance is considered fit for the MSBC evaluation purpose.

Appendix L

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Project:	**Ipswich – Transport Fit for the 21st Century**	Job No:	**60050323**
Subject;	**Travel Demand Forecasting Report**		
Prepared by:	**Mark Chadwick**	Date:	**15 May 2009**
Checked by:	**Bil Harrison**	Date:	**18 May 2009**
Approved by::	**Bil Harrison**	Date:	**18 May 2009**

1 Introduction

1.1 Context

This Technical Appendix L forms a supporting part of the 'Ipswich – Transport Fit for the 21st Century' Major Scheme Bid. It describes the travel demand projections and transport changes impact modelling using the Ipswich Transport Analysis Modelling Suite. Associated Appendices deal with the transport survey inputs, and model calibration.

The model results from the forecasting work described here have been input to the TUBA software, together with estimates of other benefits and costs, to undertake a full cost benefit analysis, as described in Appendix O.

The work described here represents the first application of the ITAMS. Further applications are already underway, concerned with developing more detailed forecasting procedures, and undertaking more local model recalibration.

1.2 The forecasting process

The forecasting work comprises three parts:

- Projection of the 'reference' travel demand patterns from the model calibration base year of 2008 to a future year horizon of 2021 – the current principal horizon for local land use development assumptions and allocations;
- Definition of a series of adjustments to the 2008 calibrated transport network descriptions to represent the effects of the Major Scheme sustainable transport plan proposals; and
- Running of the variable demand model to represent the three changes – the impact of the plan proposals if implemented in 2008, the 'Reference' demand in 2021 with no changes to the transport supply, and the 2021 conditions with the plan proposals.

This enables the changes in travel conditions to be interpolated between 2008 and 20021 to represent the plan impact in the first full year (taken to be 2013) and intermediate years to 2021. Beyond 2021, conditions are assumed to be constant to the 15 year life horizon of 2028.

The following Chapters of this Appendix deal with these three parts in turn.

2 Demand growth predictions

2.1 Ipswich Borough Council Area

Within the IBC area, the travel demand forecasts were guided by the November 2007 Preferred Options reports on the Ipswich Local Development Framework (IP-One Area Action Plan, and Site Allocations and Policies). After adjustment for recent developments, these allocations are planned to achieve the East of England Plan target of 15,400 dwellings and 18,000 new jobs within the Borough between 2001 and 2021.

A site by site review of the allocations was undertaken, and some adjustments made to exclude some unlikely changes in use, and to reflect the expected future pressures for development at other potential sites. These changes in households and employment were used at the zonal level to reflect relative changes in travel patterns. Absolute changes in travel trip levels were controlled to regional growth assumptions.

Within the Ipswich area production and attraction trip ends were controlled to TEMPRO growth between 2008 and 2021. For a weekday this averaged 21% for car in the TEMPRO zone encompassing Ipswich. Bus growth over this period is 11% and for 'active' modes is 15%. Goods vehicle growth has been taken from the National Transport Model (NTM) which gives a growth rate of 11% for HGV's and 40% for LGV's between 2008 and 2021.

2.2 Regional growth assumptions

Beyond the Ipswich area growth has been applied such that the overall growth for Suffolk is equivalent to that in TEMPRO. As part of the main study area includes the Suffolk Coastal District the zones within this area are controlled to the growth for this district which is some 8% for car, 3% for bus and 5% for active modes.

Beyond the Suffolk area we have assumed East of England region growth for all other model zones. This is about 15% for car trips and 6% for bus and 9% for active modes.

3 The Sustainable Transport Scheme as modelled

3.1 Highway network changes

The introduction of UTMC at all signals in the wider Ipswich area will have a series of impacts: decreased fault time, improved throughput capacity and decreased delays, and more effective linking where signals are closely spaced (particularly adjacent to pedestrian and toucan crossings). This was represented in the highway network by decreasing the signal intergreen periods by about 50% and this is carried through to the travel time saving results.

For some zones close to the town centre, where commuters make high use of public car parks on currently vacant sites due for development, a 15 minute penalty has been applied to limit growth in car commuting as redevelopment takes place.

3.2 Bus network changes

Reduced delays at traffic signals are reflected automatically in the bus network. In addition, the possibility of improving journey times and reducing delay by using the RTPI and UTMC equipment to prioritise late running buses, and allow the operators to run a tighter time schedule has been represented by factoring in bus times by 0.95, carried forward to travel time saving results.

The RTPI has a direct effect on bus waiting time for infrequent services, in that intending passengers can schedule their departure from home to minimise the bus stop wait. This has been represented in the network by subtracting two minutes from longer calculated bus wait times, which is carried forward to travel time savings after factoring by the weight on wait time.

The new shuttle bus route has been added to the network, with a reduced boarding penalty to reflect the free nature of the service. Boarding penalties have also been reduced for passengers using the improved bus stations. These ‘penalties’ are not reflected in the travel time savings in the model.

The weighting given to bus wait time has been generally reduced, from 2.0 to 1.5, to reflect the availability of the RTPI and the improved bus waiting facilities. Following WebTAG guidance, these weights are used in calculating the travel time savings.

3.3 Active mode network changes

Two effects were introduced in the active mode network. First, specific new crossings were added to the walk / cycle network as new links – this was directly carried forward to travel time savings. Secondly, a number of walk links in the town centre area had higher speeds applied. This encourages walk and cycle use in these areas.

4 Model results

4.1 Demand changes

The following table presents the overall demand changes for the four tests, for trips based in the wider Ipswich area, for the four time periods making up the 16 hour day:

Table O-1a : Comparison of Highway Trips

	AM	IP	PM	OP	Total
Highway trips					
2008 Base	96,738	151,544	104,920	66,942	420,145
2008 MSBC	95,705	150,980	104,408	66,815	417,903
(% 2008 Base)	*-1.1%*	*-0.4%*	*-0.5%*	*-0.2%*	*-0.5%*
2021 Ref	118,214	185,206	128,208	83,187	514,815
(% 2008 Base)	*22%*	*22%*	*22%*	*24%*	*23%*
2021 MSBC	116,947	184,550	127,990	82,948	512,436
(%2021 Ref)	*-1.1%*	*-0.4%*	*-0.2%*	*-0.3%*	*-0.5%*

Table O-1b : Comparison of Bus Trips

	AM	IP	PM	OP	Total
Bus trips					
2008 Base	6,374	14,895	5,605	3,241	30,114
2008 MSBC	7,713	18,049	7,184	3,981	36,926
(% 2008 Base)	*21%*	*21%*	*28%*	*23%*	*23%*
2021 Ref	7,459	17,882	6,549	3,782	35,672
(% 2008 Base)	*17%*	*20%*	*17%*	*17%*	*18%*
2021 MSBC	9,041	21,744	8,415	4,671	43,871
(%2021 Ref)	*21%*	*22%*	*29%*	*23%*	*23%*

Table O-1a : Comparison of Active Mode Trips

	AM	IP	PM	OP	Total
Active mode trips					
2008 Base	24,854	43,696	10,403	10,072	89,025
2008 MSBC	24,679	43,085	10,236	9,914	87,915
(% 2008 Base)	*-0.7%*	*-1.4%*	*-1.6%*	*-1.6%*	*-1.2%*
2021 Ref	28,382	51,373	12,044	11,539	103,338
(% 2008 Base)	*14%*	*18%*	*16%*	*15%*	*16%*
2021 MSBC	28,154	50,631	11,846	11,352	101,983
(%2021 Ref)	*-0.8%*	*-1.4%*	*-1.6%*	*-1.6%*	*-1.3%*

The overall growth between 2008 and 2021 is about 23% for highway travel, 18% for bus travel, and 16% for active mode travel. The impact of the sustainable travel measures is to reduce overall highway trips by -0.5%, more in the morning peak. Bus travel increases by 23%, more in the evening peak period. Active modes, balancing the improvements in active modes in the centre, with general improvements in the bus system, decline by -1.3%, more in the evening peak.

These results are for all trips based in the wider Ipswich area. The following tables show the trips as assigned in the Reference and MSBC 2021 tests, for the morning and evening peak hours, for total highway pcu trips, and for bus passenger trips. These are shown as 13 x 13 sectors, with the sectors shown in the following plan.

Table O-2a : MSBC impact - Highway trips morning peak hour, pcus

60044295 - Ipswich Transport Model

Summary worksheet - Comparison of Sector-Sector movements from 2021 DoMinimum and 2021 MSBC matrices - AM peak

2021 DM

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	1,434	90	54	220	533	619	113	131	123	126	411	626	51	4,532
2	183	1,739	214	761	209	596	22	198	83	568	7	159	8	4,746
3	66	395	429	326	103	237	33	106	24	516	75	103	1	2,414
4	168	731	230	2,354	288	650	78	389	83	598	455	438	15	6,476
5	303	303	12	618	1,946	961	40	262	208	371	529	649	2	6,207
6	366	209	65	461	436	816	40	291	123	228	127	211	8	3,379
7	186	89	14	97	47	218	34	68	23	59	304	90	9	1,238
8	93	198	29	250	234	84	56	1,347	51	723	433	681	166	4,344
9	122	122	16	102	228	367	46	65	4,937	116	159	137	23	6,441
10	103	327	534	399	174	504	45	436	80	18,764	721	268	36	22,391
11	239	295	47	396	489	759	283	368	271	769	3,062,398	880	37	3,067,231
12	627	181	91	465	801	469	128	699	90	244	1,259	348,476	1	353,532
13	27	0	0	12	34	37	14	151	3	20	62	1	5,132,644	5,133,005
Total	3,917	4,680	1,735	6,460	5,522	6,318	932	4,511	6,100	23,102	3,066,940	352,721	5,133,001	8,615,937

2021 MSBC

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	1,402	90	55	216	535	610	112	129	122	123	412	632	51	4,488
2	183	1,705	215	749	211	592	22	194	81	553	7	155	8	4,673
3	67	398	418	320	107	242	33	106	25	514	76	106	1	2,411
4	168	732	228	2,313	287	648	78	383	82	589	448	433	14	6,403
5	306	311	12	617	1,889	971	41	254	206	366	512	634	2	6,121
6	366	209	66	456	433	769	39	285	123	219	122	202	8	3,298
7	184	88	13	95	47	217	33	67	23	58	306	89	9	1,230
8	94	196	30	247	231	85	56	1,337	55	720	431	680	166	4,328
9	122	126	17	99	229	372	46	68	4,914	118	165	128	23	6,427
10	102	321	551	389	169	493	45	432	81	18,733	719	266	36	22,336
11	239	299	50	388	484	762	286	366	291	764	3,061,958	877	37	3,066,802
12	633	180	92	462	794	465	128	697	92	242	1,259	348,511	1	353,557
13	28	0	0	12	33	37	14	151	3	20	62	1	5,132,898	5,133,259
Total	3,895	4,653	1,749	6,362	5,449	6,262	933	4,468	6,097	23,020	3,066,475	352,716	5,133,253	8,615,332

Change

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	-33	-1	1	-4	2	-9	-2	-2	-1	-2	1	6	0	-44
2	-0	-34	1	-11	2	-5	-0	-5	-1	-16	0	-4	-0	-72
3	1	3	-11	-6	5	5	-1	-1	0	-2	0	2	0	-3
4	-0	1	-2	-41	-1	-2	-0	-5	-1	-9	-8	-4	-0	-73
5	3	7	0	-1	-57	9	1	-8	-2	-6	-16	-15	-0	-86
6	0	0	1	-4	-3	-47	-0	-6	0	-8	-5	-9	-0	-81
7	-2	-1	-0	-2	0	-1	-0	-1	0	-1	2	-1	-0	-8
8	1	-2	1	-3	-3	1	0	-10	4	-2	-2	-2	-0	-16
9	0	4	1	-4	1	5	1	3	-23	1	7	-9	0	-15
10	-1	-6	18	-9	-6	-10	-0	-4	1	-32	-3	-2	-0	-55
11	-0	4	3	-8	-5	3	3	-2	19	-4	-441	-3	-0	-430
12	7	-1	1	-4	-7	-4	-0	-2	2	-1	0	35	-0	24
13	1	-0	0	-0	-0	-1	-0	-0	0	-0	0	-0	254	254
Total	-23	-26	14	-97	-73	-56	1	-43	-3	-82	-465	-6	253	-605

% Change

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	-2%	-1%	2%	-2%	0%	-1%	-1%	-2%	-1%	-2%	0%	1%	0%	-1%
2	-0%	-2%	0%	-1%	1%	-1%	-1%	-2%	-1%	-3%	3%	-2%	-0%	-2%
3	2%	1%	-3%	-2%	4%	2%	-2%	-1%	1%	-0%	0%	2%	0%	-0%
4	-0%	0%	-1%	-2%	-0%	-0%	-1%	-1%	-1%	-2%	-2%	-1%	-2%	-1%
5	1%	2%	1%	-0%	-3%	1%	2%	-3%	-1%	-1%	-3%	-2%	-1%	-1%
6	0%	0%	2%	-1%	-1%	-6%	-0%	-2%	0%	-4%	-4%	-4%	-2%	-2%
7	-1%	-2%	-2%	-2%	1%	-1%	-1%	-1%	1%	-1%	1%	-1%	-0%	-1%
8	1%	-1%	5%	-1%	-1%	1%	0%	-1%	7%	-0%	-0%	-0%	-0%	-0%
9	0%	3%	4%	-4%	0%	1%	1%	4%	-0%	1%	4%	-7%	1%	-0%
10	-1%	-2%	3%	-2%	-3%	-2%	-0%	-1%	1%	-0%	-0%	-1%	-1%	-0%
11	-0%	1%	6%	-2%	-1%	0%	1%	-0%	7%	-1%	-0%	-0%	-0%	-0%
12	1%	-1%	2%	-1%	-1%	-1%	-0%	-0%	2%	-1%	0%	0%	-1%	0%
13	3%	0%	0%	-1%	-1%	-2%	-0%	-0%	4%	-0%	0%	-0%	0%	0%
Total	-1%	-1%	1%	-2%	-1%	-1%	0%	-1%	-0%	-0%	-0%	-0%	0%	-0%

Table O-2b : MSBC impact - Highway trips evening peak hour, pcus

60044295 - Ipswich Transport Model

Summary worksheet - Comparison of Sector-Sector movements from 2021 DoMinimum and 2021 MSBC matrices - PM peak

2021 DM

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	1,493	356	102	351	421	442	178	106	112	109	382	527	19	4,599
2	315	1,753	271	789	158	344	57	219	81	379	17	122	4	4,510
3	61	336	449	244	31	85	7	45	29	355	83	68	1	1,795
4	219	835	297	2,095	406	457	149	383	73	590	539	465	7	6,515
5	476	347	44	386	1,822	706	34	160	235	185	416	506	14	5,330
6	670	521	164	719	745	1,043	142	274	408	377	556	356	1	5,975
7	196	21	45	53	29	55	25	76	43	62	322	78	6	1,013
8	146	185	118	372	469	50	31	1,271	67	371	429	546	481	4,538
9	223	243	15	102	113	151	35	83	4,899	50	222	172	16	6,323
10	137	524	1,160	628	354	178	45	462	75	18,435	703	240	20	22,962
11	506	230	60	483	573	256	324	495	282	490	3,081,505	777	55	3,086,036
12	503	212	123	432	507	220	87	734	59	187	1,066	344,486	1	348,616
13	1	48	2	33	1	4	11	304	22	40	54	1	5,115,566	5,116,088
Total	4,946	5,612	2,850	6,687	5,630	3,990	1,127	4,610	6,386	21,630	3,086,294	348,346	5,116,191	8,614,301

2021 MSBC

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	1,465	359	104	359	429	446	176	106	110	109	382	555	19	4,619
2	314	1,735	271	787	163	346	57	215	84	374	17	121	4	4,488
3	61	335	446	243	32	85	7	53	31	384	86	70	1	1,835
4	220	831	295	2,066	410	458	152	377	71	586	537	459	7	6,469
5	484	355	44	392	1,796	712	36	154	230	182	401	494	13	5,293
6	668	524	168	739	758	1,036	142	270	410	368	535	342	1	5,960
7	192	21	44	53	30	55	25	76	44	61	326	78	6	1,012
8	146	182	120	368	466	51	31	1,254	70	373	429	547	481	4,517
9	221	246	15	107	113	153	36	92	4,913	52	276	170	16	6,410
10	135	516	1,183	620	348	176	45	462	76	18,446	705	238	20	22,970
11	513	231	63	479	557	252	328	494	297	491	3,081,191	777	55	3,085,727
12	511	211	121	429	503	217	87	733	57	186	1,070	344,560	1	348,686
13	1	48	2	33	1	3	11	304	23	40	54	1	5,115,793	5,116,315
Total	4,934	5,594	2,876	6,675	5,605	3,989	1,132	4,589	6,415	21,652	3,086,011	348,413	5,116,417	8,614,302

Change

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	-28	2	2	8	8	4	-2	0	-2	-1	0	28	0	20
2	-0	-18	-1	-2	5	2	-0	-4	3	-5	0	-1	0	-22
3	1	-1	-3	-1	1	0	-0	8	1	29	3	2	0	40
4	1	-5	-1	-29	5	1	2	-6	-1	-4	-2	-7	-0	-46
5	8	9	0	6	-27	6	2	-6	-5	-3	-15	-13	-0	-37
6	-2	4	4	19	13	-7	-0	-3	2	-9	-20	-14	-0	-14
7	-4	-0	-1	0	0	-0	-0	0	1	-0	4	-0	-0	-1
8	1	-3	1	-4	-4	0	-0	-16	3	2	0	0	0	-20
9	-2	3	0	5	-1	2	1	9	14	2	54	-2	0	87
10	-1	-8	23	-9	-7	-2	-0	-1	1	11	2	-1	-0	8
11	6	0	3	-4	-16	-4	3	-1	15	1	-314	-0	0	-309
12	9	-1	-2	-3	-4	-3	-0	-2	-2	-1	4	74	-0	70
13	0	-0	0	-0	0	-0	0	-0	0	-0	-0	-0	227	226
Total	-13	-18	25	-12	-25	-1	5	-21	29	22	-284	67	226	1

% Change

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	-2%	1%	2%	2%	2%	1%	-1%	0%	-2%	-1%	0%	5%	2%	0%
2	-0%	-1%	-0%	-0%	3%	0%	-0%	-2%	4%	-1%	1%	-1%	1%	-0%
3	1%	-0%	-1%	-0%	4%	0%	-1%	17%	5%	8%	3%	3%	0%	2%
4	0%	-1%	-0%	-1%	1%	0%	2%	-2%	-2%	-1%	-0%	-1%	-1%	-1%
5	2%	3%	1%	2%	-1%	1%	5%	-4%	-2%	-2%	-4%	-3%	-2%	-1%
6	-0%	1%	2%	3%	2%	-1%	-0%	-1%	0%	-2%	-4%	-4%	-38%	-0%
7	-2%	-1%	-3%	0%	0%	-1%	-1%	0%	2%	-0%	1%	-0%	-0%	-0%
8	0%	-2%	1%	-1%	-1%	1%	-0%	-1%	4%	0%	0%	0%	0%	-0%
9	-1%	1%	2%	5%	-1%	2%	2%	11%	0%	4%	24%	-1%	0%	1%
10	-1%	-1%	2%	-1%	-2%	-1%	-1%	-0%	1%	0%	0%	-1%	-1%	0%
11	1%	0%	5%	-1%	-3%	-2%	1%	-0%	5%	0%	-0%	-0%	0%	-0%
12	2%	-0%	-1%	-1%	-1%	-2%	-0%	-0%	-3%	-1%	0%	0%	-0%	0%
13	0%	0%	0%	-0%	9%	-9%	0%	-0%	1%	-0%	-0%	-0%	0%	0%
Total	-0%	-0%	1%	-0%	-0%	-0%	0%	-0%	0%	0%	-0%	0%	0%	0%

Table O-2c : MSBC impact – Bus passenger trips morning peak hour, pcus

60044295 - Ipswich Transport Model

Summary worksheet - Comparison of Sector-Sector movements from 2021 DoMinimum and 2021 MSBC matrices - AM peak

2021 DM

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	60	38	5	41	33	346	0	33	0	7	0	12	0	575
2	31	21	38	13	26	156	0	6	0	70	0	14	0	375
3	0	19	54	0	2	13	0	22	0	38	0	20	0	170
4	35	40	15	243	58	529	0	26	0	0	0	25	0	970
5	22	69	7	39	177	400	0	0	70	56	14	10	0	862
6	73	20	3	58	49	35	5	25	32	24	0	8	0	331
7	0	5	0	0	0	4	20	0	0	0	0	0	0	29
8	0	10	0	2	0	54	0	28	0	0	0	2	0	95
9	0	1	0	0	43	71	0	0	0	0	0	0	0	115
10	0	0	3	0	0	27	0	0	0	0	0	0	0	29
11	0	0	0	3	7	0	0	0	0	0	0	0	0	10
12	6	9	0	3	0	68	0	0	0	16	0	10	0	113
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	225	232	125	402	394	1,702	26	140	101	212	14	101	0	3,675

2021 MSBC

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	69	51	6	54	45	405	0	43	0	11	0	15	0	701
2	35	20	48	17	32	181	0	7	0	78	0	18	0	436
3	0	25	63	2	5	25	0	28	0	48	0	23	0	218
4	46	51	23	270	72	602	0	33	0	0	0	35	0	1,131
5	28	85	11	54	189	462	0	0	80	66	14	13	0	1,001
6	101	25	5	65	58	36	7	30	32	27	0	11	0	395
7	0	6	0	0	0	6	20	0	0	0	0	0	0	32
8	0	10	0	2	0	63	0	26	0	0	0	3	0	104
9	0	3	0	1	54	103	0	0	0	0	0	0	0	161
10	0	0	4	0	0	35	0	0	0	0	0	0	0	39
11	0	0	0	3	7	0	0	0	0	0	0	0	0	10
12	8	13	0	4	0	85	0	0	0	22	0	13	0	145
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	286	290	159	472	462	2,003	27	167	112	251	14	130	0	4,374

Change

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	9	13	1	14	12	59	-0	10	0	4	0	3	0	126
2	4	-0	9	3	6	25	0	2	0	7	0	4	0	62
3	0	7	9	1	2	11	0	6	0	9	0	2	0	48
4	11	11	8	27	14	73	0	7	0	0	0	10	0	161
5	6	16	4	15	12	62	0	0	11	9	-0	3	0	138
6	28	5	2	7	9	2	1	5	0	3	0	3	0	64
7	0	1	0	0	0	2	-0	0	0	0	0	0	0	3
8	0	0	0	0	0	10	0	-2	0	0	0	1	0	9
9	0	2	0	1	12	32	0	0	0	0	0	0	0	46
10	0	0	1	0	0	8	0	0	0	0	0	0	0	9
11	0	0	0	1	-0	0	0	0	0	0	0	0	0	1
12	2	3	0	1	0	17	0	0	0	6	0	3	0	32
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	61	58	34	69	68	301	1	27	11	39	-0	29	0	699

Table O-2d : MSBC impact – Bus passenger trips evening peak hour, pcus

60044295 - Ipswich Transport Model

Summary worksheet - Comparison of Sector-Sector movements from 2021 DoMinimum and 2021 MSBC matrices - PM peak

2021 DM

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	192	22	0	47	42	83	0	0	0	6	0	11	0	402
2	30	31	31	35	19	57	0	7	0	3	14	9	0	236
3	13	40	70	34	21	4	0	0	0	6	0	0	0	188
4	80	13	16	93	25	85	0	3	20	8	1	15	0	358
5	8	19	7	103	77	82	0	4	102	0	0	0	0	401
6	259	206	44	275	290	21	15	43	104	10	0	147	0	1,415
7	0	0	0	0	0	1	7	0	0	0	0	0	0	9
8	5	5	6	9	0	28	0	25	0	9	0	0	0	86
9	0	5	0	3	81	21	0	0	0	0	0	0	0	110
10	0	138	45	0	43	9	0	0	0	0	0	15	0	249
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	2	0	2	21	13	0	3	0	0	0	21	0	62
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	588	481	218	600	620	402	22	85	227	41	15	218	0	3,517

2021 MSBC

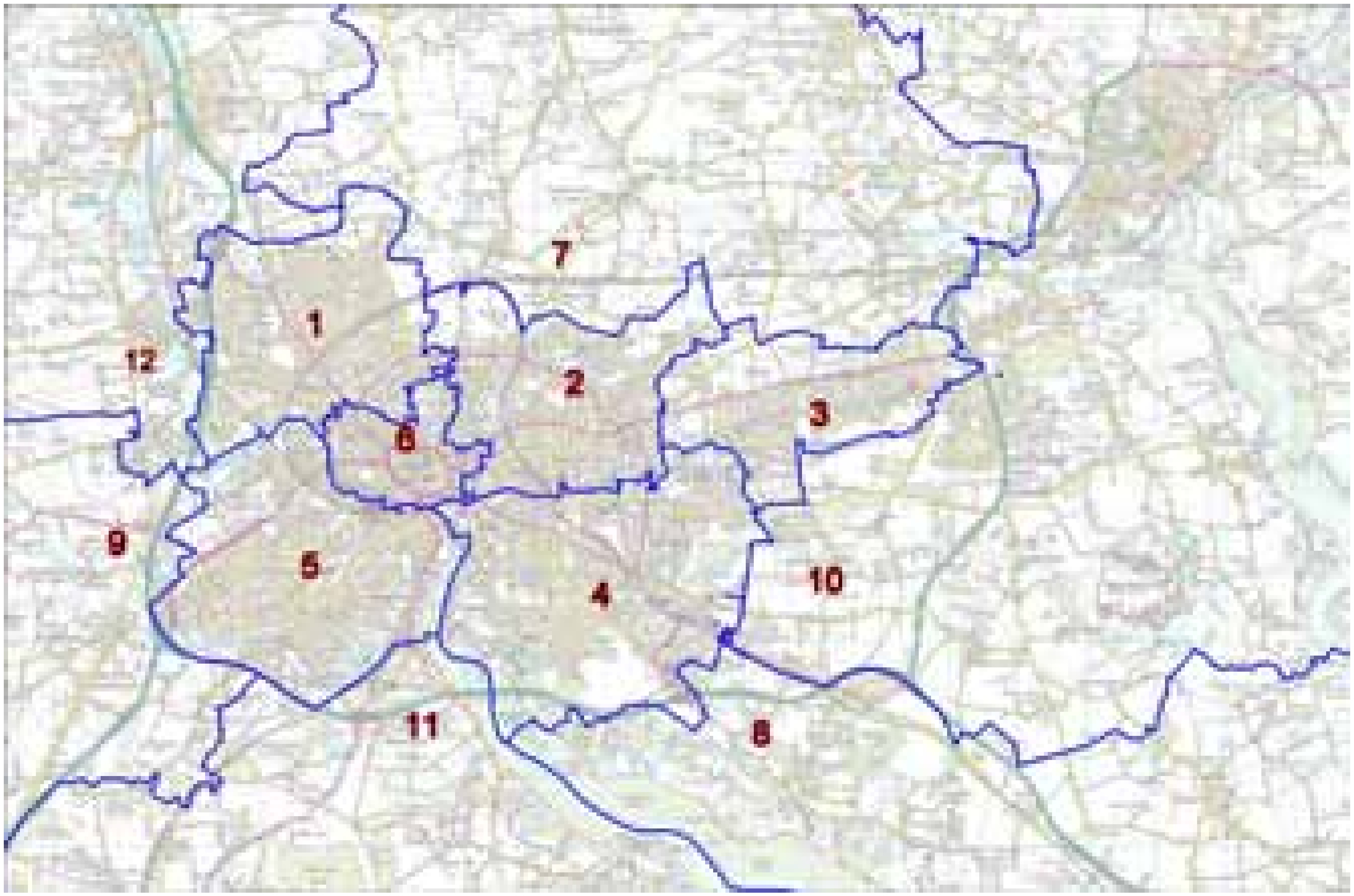
Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	228	32	0	73	73	107	0	0	0	9	0	16	0	539
2	57	32	42	46	30	68	0	12	1	3	19	13	0	323
3	15	61	82	77	32	6	0	0	0	8	0	0	0	280
4	103	20	40	103	33	93	0	3	27	11	1	26	0	460
5	24	26	11	142	86	92	0	5	120	0	0	0	0	508
6	317	256	65	352	381	22	19	59	191	12	0	239	0	1,913
7	0	0	0	0	0	2	16	0	0	0	0	0	0	18
8	7	6	7	11	0	32	0	23	0	10	0	0	0	96
9	0	11	0	5	97	27	0	0	0	0	0	0	0	141
10	0	177	56	0	55	13	0	0	0	0	0	17	0	319
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	3	0	4	27	16	0	4	0	0	0	24	0	77
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	752	625	304	814	815	478	35	105	339	52	21	334	0	4,673

Change

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	37	10	0	26	31	24	0	0	0	3	0	5	0	136
2	27	1	11	11	12	11	0	5	1	0	5	3	0	87
3	3	20	12	43	10	2	-0	0	0	2	0	0	0	92
4	23	7	24	10	7	8	0	0	7	3	0	11	0	102
5	16	7	4	40	9	11	0	2	19	0	0	0	0	107
6	58	50	21	77	91	1	4	16	86	2	0	92	0	498
7	0	0	-0	0	0	0	9	0	0	0	0	0	0	9
8	1	1	2	3	0	4	0	-3	0	1	0	0	0	10
9	0	6	0	2	16	6	0	0	0	0	0	0	0	31
10	0	39	12	0	13	4	0	0	0	0	0	2	0	70
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	1	0	2	6	3	0	1	0	0	0	2	0	15
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	164	144	85	214	195	75	13	20	112	11	6	116	0	1,157

AECOM

Sectoring system for matrices



4.2 Network performance results

The impacts of increased travel demand between 2008 and 2021 has been assessed using the AM and PM peak hour models. Figure O-1a show the change in traffic flow between 2008 and 2021 for the AM peak. This indicate that growth is fairly consistent although generally lower in the central urban areas due to increasing congestion.

Figure O-1 : AM Peak flow change 2021 less 2008

The increase in congestion can be observed from Figures ??? and ??? which indicate the change in average junction delay across the network. The increase in traffic results in notable increases in delay at;

- Fore Street / Grimwade Street
- Star Lane / Grimwade Street
- A12/A14 Copdock Interchange
- Novotel Roundabout
- Tuddenham Road / Valley Road
- Friars Street / Falcon Street / Queen's Street

Figure O-2 : AM Peak junction delay change 2021 less 2008

The increase in delay causes traffic to re-assign to less congested routes. This re-assignment tends to increase traffic on the peripheral routes and the A12/A14 bypass and can be observed by the change to average trip length which increases at a greater rate than the increase in trips. The increase in delay also impacts on the total vehicle-hours which also show an increase in excess of the general increase in traffic.

Table O-3 compares the total PCU distance and travel times in the 2008 and 2021 models for both time periods. This shows that trips are forecast to increase by 25% & 24% in the AM and PM respectively with travel distance increasing by a similar amount however total travel time is forecast to increase by around 40% in both peak periods.

Table O-3 : MSBC impact - Highway trips morning peak hour, pcus

2008 to 2021 Change	AM	PM
Trips	9,457	9,410
	25%	24%
PCU-KM	90,900	90,459
	25%	24%
PCU-Hours	3,256	3,440
	40%	42%

4.3 TUBA inputs

Outputs of the change in demand, time and distance have been extracted from the highway and bus models and assessed in TUBA.

The outputs are extracted in matrix format for the three sets of data for both assigned modelled time periods. From the highway model matrices are extracted for five vehicle groups, HGV's, LGV's, car commute, car other and car employer's business.

Bus users are not split by purpose and hence only a single purpose matrix is extracted for buses.

Appendix M

Suffolk County Council | AECOM

Project:	**Ipswich – Transport Fit for the 21st Century**	Job No:	**60050323**
Subject;	**NATA AST and supporting information**		
Prepared by:	**Simon Statham / Bil Harrison**	Date:	**15 March 2009**
Checked by:	**Bil Harrison**	Date:	**18 May 2009**
Approved by::	**Bil Harrison**	Date:	**18 May 2009**

1 Introduction

1.1 Context

This Technical Appendix M forms a supporting part of the 'Ipswich – Transport Fit for the 21st Century' Major Scheme Bid. It describes the background supporting work to bring together the Assessment Summary Table (AST) in the format required by the Major Scheme Business Case and WebTAG guidance.

The assessment work has benefited from consultation with and input from stakeholders. The description of the scope and content of the stakeholder discussions, and the letters of comment and support, are contained in Appendix N.

While all of the important quantified sub-objective measures have been re-assessed as part of this Bid submission, several of the less critical qualitative assessments have referred back to the July 2005 submission, reviewed for their continued relevance to the current Scheme scope, and re-presented. Where relevant, assessments reflect the 'NATA Refresh' guidance for Schemes submitted after April 2009.

Specific further inputs to the AST have been discussed in other Appendices, particularly Appendix F for the accident savings analysis, and Appendix O for the TUBA analyses.

1.2 The sub-objectives

In brief, the extent and detail of assessment of each sub-objective was as follows:

Environment objective

Noise – the Scheme is considered to be broadly slightly beneficial, with town centre traffic near sensitive receptors reducing, and improved public realm providing better separation between traffic and roadside receptors. No specific new studies were undertaken, and a Neutral Noise assessment made.

Air quality – similarly, air quality in sensitive areas is expected to improve slightly, and in addition the implementation of air quality monitoring in the AQMAs will enable the UTMC system to mitigate conditions on particularly bad episodes. No specific new studies were undertaken, but a Slight Beneficial is claimed.

Greenhouse gases – now form part of the TUBA assessment, and a Slight beneficial claimed.

Landscape – not considered relevant to this Scheme, although the overall objective of supporting sustainable travel is intended to reduce pressure for new housing developments on Greenfield land. A Neutral assessment has been made.

Townscape – the Scheme contains several components specifically aimed at improving the public realm and the setting of the built environment. This aspect of the Scheme is largely unchanged from the July 2005 submission, and so a Moderate Beneficial has been claimed.

Heritage of Historic Resources – the Scheme aims to preserve the setting of the historic resources, provide wayfinding guidance and interpretation, and improve access to them, as analysed in the 2005 submission. A Moderate Beneficial is claimed.

Biodiversity – no impact expected.

Water environment – no impact expected.

Physical fitness – this has been re-assessed in line with the WebTAG 3.14.1, as described in Appendix F, a quantitative value calculated, and a Moderate Beneficial claimed.

Journey ambience – this has been re-assessed using guidance from WebTAG 3.14.1, as described in Appendix F, a quantitative value calculated, and a Moderate Beneficial claimed

Safety objective

Accident savings – These have been assessed for the walk and cycle schemes using the latest WebTAG guidance, and a quantitative money value assessed. A Moderate Beneficial has been claimed.

Security – Many aspects of the Scheme will have positive security aspects, including CCTV, RTPI, lighting at bus stops, and lighting along walk routes. The elimination of the Princes Street Civic Drive subways will be beneficial. A Slight Beneficial is claimed, and some aspects are quantified elsewhere.

Economy

Public accounts – Large Beneficial
Transport Economic Efficiency (Business Users and Transport providers) – Large Beneficial
Transport Economic Efficiency (Consumers) – Large Beneficial
Reliability – Moderate Beneficial
These three sub-objectives have been assessed in detail with the transport models, supplemented by some monetised benefits not captured in the travel time savings. TUBA has been used to assemble these.

Wider economic benefits – qualitative expectations are that the Scheme will be important in supporting the wider economic aims of the region, but this has not been formally assessed, and a Neutral assessment entered.

Accessibility

Option values – the fundamental aim of the Scheme is to enhance option values, and so a Large Beneficial claimed

Severance – the walk and cycle components, and the UTMC are aimed at reducing traffic route severance, with increased crossing facilities, and so a Large beneficial is claimed.

Accessibility to Transport System - a range of improvements to the bus service and access to the railway station, and improved information about them, will enhance access, and so a Moderate Beneficial is claimed.

Integration

Transport interchange – the scheme is designed to improve transport interchange at all points, and to increase interchange capacity to avoid future crowding. Most of the effects are included in the TUBA assessment, and a Large Beneficial claimed.

The Scheme is specifically designed to support regional and national policies, and a beneficial assessment has been claimed.

Appraisal Summary Table

Option	Description	Problems	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Appendix N

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Technical Appendix N

Project:	**Ipswich – Transport Fit for the 21st Century**	Job No:	**60050323**
Subject:	**Summary of consultation and stakeholder engagement**		
Prepared by:	**Jacky Brookfield**	Date:	**19 May 2009**
Checked by:	**Bil Harrison**	Date:	**19 May 2009**
Approved by::	**Bil Harrison**	Date:	**19 May 2009**

1 Introduction

The Scheme has been developed drawing on ongoing public and stakeholder consultation, and already enjoys wide support.

1.1 Stakeholder engagement and consultation

The Major Scheme details have been developed against a background of continuing consultation between the local authorities and local interests. The consultation has included:

- June 2003 – a major public consultation on the 'IP1 Area Action Plan' including 55,000 questionnaires to residents of inner Ipswich, and a week long public exhibition, resulting on 1,800 responses concerning travel and development;
- July 2004 – a consultation workshop was held with elected members to discuss the broad transport strategy for Ipswich, and to identify the new development issues, and transport initiatives, which could contribute to an update;
- March 2005 – a presentation and series of workshops was held with invited participants representing a broad cross section of interests – elected councillors, environmental and other special interest groups, developers (including those progressing the Education Quarter) and public transport operators; and
- To May 2009 – ongoing consultation with stakeholders on an individual basis to discuss aspects of the scheme. This has included transport operators, education providers and the business community
- September 2008 – an LTP stakeholder event was held in Ipswich
- November 2008 a waterfront community consultation iwas held in Ipswich
- March 2009 a presentation and discussion was carried out for the Sustrans Board
- April 2009 a joint seminar was held for councillors of Suffolk County and Ipswich Borough Councils

The following provides information on the on the consultation workshops held in March 2005 in Section 2 and the subsequent responses, ongoing stakeholder involvement and main issues (Section 3) and lastly letters of support are shown in Section 4.

2 Workshop March 2005

The main themes achieving wide endorsement at the March 2005 workshops were as follows:

- Significant and wide ranging improvements to the bus services (including the bus stations, the town centre 'bus-loop' and stops, and especially RTPI and general bus service information); and

- Improved connectivity and attractiveness of walk/cycle links (including better links to the Waterfront and the Education Quarter, and much better pedestrian/cyclist priority crossing the town centre boundary traffic routes.

These consultation response themes have contributed to the development of the Major Scheme, consistent with the Guidance.

2.1 Workshop background

A stakeholder consultation took place on the 17th of March 2005 in Ipswich in order to allow stakeholders to discuss ideas and issues for a major transport project for Ipswich. As part of the consultation the stakeholders were split into three groups and each discussed the following three issues:

- Pedestrian/cyclist provision;
- Bus based components; and
- Traffic management.

The following points below provide a summary of the three themes discussed in each of the groups.

2.2 Pedestrians / Cycling provision

It was agreed by stakeholders that pedestrians should not be competing for space with cars. New and existing routes should be continuous, and provide routes between key developments and in and out of the town centre. Emphasis was placed upon providing links from the town centre to the Waterfront - at present Star Lane was viewed as a divide between the two areas. Future developments and the expansion of the Education Quarter were also discussed as important in the planning of new pedestrian and cycle routes. Detailed points are listed as follows:

Cycle Routes and Pedestrian areas

- Extend the cycle routes into parks.
- Allow cycling in pedestrian streets but clarity where streets are pedestrian only and where traffic is allowed needs to be improved upon.
- Cycle routes need to be continuous.
- Possible restriction of cycling in pedestrian areas to certain times favoured by one group.
- Suggestion of St Georges Street as a cycle route in preference to High Street.
- Lower Brook Street would provide a good route for cyclists and pedestrians.

Facilities

- Need to provide cycle facilities for those that want it, as will encourage cycling as a mode of transport.
- Need a cultural mode shift such as Oxford or Cambridge.
- Crown Street Crossings all work so should replicate this type of crossing on other streets.
- Subways are not favoured by any of the groups.

Priority

- Agreement that the pedestrian areas should expand and be well defined even if this does mean reducing traffic capacity.

- Cars are slow moving - pedestrian and cycle crossings should be possible to encourage sustainable transport.
- Need to stop cars before they get into the town.
- Large car parks in the centre need to be constricted, as these only encourage car usage.
-

Linking Development areas

- There needs to be at least one link, preferably more, to the Waterfront from the town centre
- Fore Street seen as a good link option for the waterfront and education quarter. Agreement from a bus operator that buses do not need to go down the street.
- Crossing Star Lane needs to be more pedestrian friendly. Star Lane should not be seen as a barrier between the town centre and the Waterfront.
- Pedestrian links from the railway station to the centre needs to be improved.
- Surface crossways rather than subways should be considered although a bridge or sub way may be needed for students as this may be a continuous flow at some times of the day.
- Crossings for pedestrians are needed on all routes in and out of town.
- Reduction in the volume of traffic was identified as a barrier to pedestrian crossings, although opposing comments that as the roads are congested a pedestrian crossing may not have an impact.
- Princes Street lacks a pedestrian crossing - current capacity in the Commercial Road gyratory crossing Princes Street could be allocated to pedestran priority.
- Link across Burrell Road /Ranlelagh Road required when railway station investment occurs.

2.3 Bus Components

Agreement was shown from all three groups that bus usage needs to be promoted, and with this increase in passenger numbers improvements and expansion to the current system would need to be implemented. Agreement was also shown that links between developments would need to be improved, with emphasis placed upon a direct shuttle bus from the railway station to the town centre and university. Conflicting views occurred as to whether a single bus station was needed. The need for a bus station must be established. Further detail of the views and opinions expressed by the three groups can be seen below.

Links

- The Education Quarter will need high quality bus links to the railway station and the town centre.
- Continuous shuttle from the railway to the centre is needed.
- The railway station could be a possible interchange?
- • Is there a possibility of having a bus that runs from the railway station to the waterfront and university.

The 'bus loop'

- Agreement that the current bus loop works well especially now it is serving Buttermarket and Ramparts.

- Could move east or west when development happens.
- Could move further east to service the Education Quarter.

Improvement of the system

- Urgent need for real time bus information as it creates confidence and will therefore increase patronage.
- Can better management reduce the need for bus stops?
- For all new suburban residential developments bus services need to be provided from the beginning, as with the Ravenswood development.
- Whole package of the bus system is needed.
- Much of the roadside infrastructure is missing – more and better stops, shelters and information is needed.
- All services need to be cohesive and continuous

A single bus station?

- Possibility of remodelling two existing sites?
- Suggestions that could close the old Cattle Market and move it to Tower Ramparts with town buses moving on street.
- Bus station should not be enclosed – needs to be open air.
- A waiting facility for interchange between urban and rural services is needed.
- A bus lay over will still be needed.
- At a bus station there will be a need for a bus, taxi and car interchange for the coach passengers.
- Possibility of having a long distance coach pick up and drop off point for passengers.
- If a station is put in the Mint Quarter the west side of the town will be disadvantaged. But may be better since it will allow a completely new, dramatic single station.
- Two existing bus stations are convenient for pedestrian routes into the town centre.
- If an enquiry office to support the public was provided a bus station may not be required.
- The existing locations of the bus stations are good for the retail area.
- Possible advantages of a bus station are:
- In evening it is better to go somewhere enclosed for security and warmth;
- If not sure where to go, the bus station will provide a centre for bus services; and
- May attract people to use the bus
- 'Bus loop' is viewed like a bus station, so question as to whether a new bus station is really needed.

2.4 Traffic Management

Much of the discussion centred on Star Lane Gyratory separating the centre from the Waterfront as a key area that needs improvement. Several different options were discussed for improving the route, but there was not a general consensus from all three groups of a chosen option. Instead many suggestions, including keeping it as it is were discussed and agreement that different options would need to be studied further. However there was agreement that at least one more crossing across the road was needed. Princes and St Matthews Street were also seen as key areas where improvement was needed.

Star Lane Gyratory

- Possibility of combining options so that only part of the route is one way? There is capacity at one end for this to take place.
- Some of the exits along Star Lane could be closed so that traffic flows more freely, although the consequences for pedestrian safety would have to be examined.
- The poor zebra crossing at Custom House deters pedestrian movement.
- No need for a bus lane on Star Lane and College Street each way as not convinced that bus movement is great enough to support bus priority scheme.
- Star Lane widening options are closing down due to development.
- Star Lane gyratory should be kept as it is, apart from additional crossings.
- Reduction in capacity by 40% is not acceptable.
- Bus Lane – reduce capacity – will not be a high frequency bus route, therefore not needed buses will benefit from improved flow.

St Matthews – Handford

- Subway constraints include issues of visibility, signage and personal safety.
- Crossing of Civic Drive opposite Black Horse Lane could become more important
- Some roundabouts are not safe for cyclists, therefore need to improve this to promote cycling.
- Concerns were expressed that existing crossings are too close to the roundabout.
- Cyclists from Norwich Road are safer to use the zebra crossing.
- Civic Drive development –allow crossing with road behind Iceland.
- Bus lane Civic Drive – too short links to do anything significant.
- The Civic Drive, St Matthews Street roundabout should be removed.

Novotel Roundabout

- Positive feedback that crossings work so far.
- Missing Cardinal Park crossing - it is becoming more important for night entertainment.
- Recent improvements are appreciated and toucan crossing help cyclists.
-

Princes Street and Franciscan Way

- No continuity from rail station.
- Princes Bridge needs widening.
- Potential to close bridge to car traffic but would put additional strain on surrounding bridges.
- Princess Street and Franciscan way are a deterrent to people walking.
- Links form Princes Street need to be clearer.

- Junction of Princes Street and Franciscan way need to be improved with pedestrians and cyclists in mind.

Other

- Speed control at on College Street/Key Street needed. Narrow footways here are a problem.
-

3 Ongoing stakeholder involvement and main issues

The Scheme is a straightforward one, with an encouraging degree of stakeholder support, relative low risks, and easily delivered through existing design, procurement and delivery mechanisms. Through the Reference Group, the stakeholder consultation, and on-going discussions, the interests of stakeholders are well understood. Operational stakeholder working parties, have been convened and contact maintained with other interested parties, and information provided to the public. Considerable interest and enthusiasm has already been shown by all stakeholders as demonstrated in Section 4.

3.1 EERA Comments - Consistency with Draft East of England Plan

The Ipswich Major Sustainable Transport Scheme, Ipswich – Transport fit for the 21st Century is listed in Appendix A of the East of England Plan. The Scheme is a regional priority for implementation in the period to 2013/14. Regional support is confirmed in a letter from the Chair of the East of England Regional Assembly's Regional Planning Panel. It is a proposal which is wholly consistent with the objectives and policies of the draft Plan. The draft Plan emphasises the high priority that should be given to small local Schemes and soft measures. This includes small schemes designed to improve the environment for walking and cycling, give bus priority, provide good interchange, develop park-and-ride, improve local railway stations, provide access for the disabled, achieve integrated ticketing, and improve security. It is quite clear that the cumulative effect of these small schemes will do much to deliver many of the objectives of the Regional Transport Strategy and so they are therefore given top priority for investment. The draft Plan also emphasises the importance of larger local schemes of sub-regional significance, including packages for all the Regional Interchange Centres (which include Ipswich). This Scheme clearly fits into this category.

In particular, the Ipswich Major Sustainable Transport Scheme is consistent with the following East of England Plan policies:

Policy T1 (regional transport strategy) whose objectives are

- to manage travel behaviour and the demand for transport to reduce the rate of road traffic growth and ensure the transport sector makes an appropriate contribution to reducing greenhouse gas emissions
- to encourage efficient use of existing transport infrastructure;
- to enable the provision of the infrastructure and transport services necessary to support existing communities and development proposed in the spatial strategy;
- to improve access to jobs, services and leisure facilities
- reducing the need, and hence demand, for travel
- an improved range of public transport provision to, from and within Regional Interchange Centres, which include Ipswich,
- small scale local improvements designed to encourage walking and cycling, improve public transport services and ease movement to and within local centres.

Policy T2 (Changing Travel Behaviour) which seeks to bring about a significant change in travel behaviour, a reduction in distances travelled and a shift towards greater use of sustainable modes.

Policy T4 (Urban Transport) which seeks to bring about a shift away from car use towards to public transport, walking promoting public transport through quality partnerships or other agreements to deliver enhanced services, improved interchange, increased access, higher levels of public visibility, better travel information, and appropriate traffic management measures; and improvements to local networks for walking and cycling, including the attractiveness and safety of the public realm.

The Plan also makes it clear that, in order to meet objectives for increasing the proportion of journeys made by walking, cycling or public transport, it is important to improve the quality of the experience. The environment for walking and cycling can be greatly improved and there needs to be a step change in the quality of public transport provision. This would include greater emphasis given to providing easy interchange, including the provision of information, through ticketing and interchangeability.

Ongoing stakeholder involvement is illustrated through the following emails and through the letters of support found in Section 4.

4 Letters of support

Letters of support received include the following from:

- ERRA
- Environment Agency
- First
- Highways Agency
- Ipswich Buses
- Ipswich Borough Council
- Ipswich Central - the Business Improvement District
- Ipswich Society
- National Express
- NHS Suffolk
- Suffolk Chamber of Commerce
- Suffolk New College
- Sustrans
- UCS

EERA

Chairman: John Reynolds

Chief Executive: Brian Stewart

east of england
www.eera.gov.uk

Mrs A Hill
Chief Executive
Suffolk County Council
Endeavour House
8 Russell Road
Ipswich
Suffolk
IP1 2BX

Please ask for: Tim Bellamy
Direct Dial: 01284 729430
Fax: 01284 729429
Email: tim.bellamy@eera.gov.uk
Date: 1 May 2009
Ref:

Dear Mrs Hill,

IPSWICH FIT FOR THE 21ST CENTURY

Further to the debate at the Regional Planning Panel meeting on 29th January I am delighted to be able to write in support of the submission of the Business Case for the Ipswich: Fit for the 21st Century Scheme. The meeting was particularly pleased to note the progress that has been made on this regional priority scheme.

In common with all other priority schemes, the region is keen to see work to ensure delivery of this scheme to the quickest possible timetable. Therefore the Region welcomes the County Council's early submission of its Major Scheme Business Case to the Department for Transport. Due to the strict funding parameters within which the Region is working it is essential that progress is continued to ensure that this scheme is delivered as soon as funding will allow.

Yours sincerely

Derrick Ashley
Chairman of Regional Planning Panel

[illegible]

[illegible]

Environment Agency

creating a better place

Environment Agency

Jacky Brookfield
AECOM
AECOM House
63-77 Victoria Street
St Albans
Herts AL1 3ER

Our ref: AE/SUFFOLK
Your ref:

Date: 18 May 2009

Dear Madam

Ipswich Sustainable Transport Major Scheme Business Case Submission

We refer to your email dated 11th May 2009 and the attached draft revised Suffolk County Council Local Transport Plan Major Scheme Business Case bid document. It would have been useful to see the NATA assessment summary table (AST) referred to in the Executive Summary, but having perused the bid document and on the basis that the AST does not contain any 'Adverse' comments, we have no comments on the effects on the revised scheme on the environment.

Yours faithfully

Andrew Hunter
Planning Liaison Officer
Planning Liaison Team

Direct dial 01473 706749

Ipswich Office: Iceni House, Cobham Road, Ipswich, Suffolk, IP3 9JD
Customer services line: 08708 506 506
Email: enquiries@environment-agency.gov.uk
www.environment-agency.gov.uk

First

First
transforming travel

Rouen House
Rouen Road
Norwich NR1 1RB
Tel: [illegible]
Fax: [illegible]

Mr M Bradshaw
Public transport Strategy & Commissioning Manager
Environment & Transport Service Office
Suffolk County Council
Endeavour House
8 Russell Road
Ipswich
IP1 2BX

9th March 2008

Dear Mr Bradshaw,

Following our recent conversations regarding your proposals to achieve a reduction in the use of car based trips in Ipswich, I confirm that First Eastern Counties would be very interested in working alongside yourselves, and other operators, to help develop your strategy to achieve the best possible solution for the residents of Ipswich, through a voluntary partnership.

The development of infrastructure, along with key improvements to the way information is provided, will I am sure, make the prospect of travelling by public transport a more attractive proposition, and any capital funding that would help facilitate this, and any other public transport orientated initiatives suggested would be welcomed.

Yours sincerely

Alan Pilbeam
Managing Director
First Eastern Counties Buses Ltd.

ATOC

Highways Agency

HIGHWAYS AGENCY

Our ref:
Your ref: [illegible]

Lucy Robinson
Director of Environment and Transport
Suffolk County Council
Endeavour House
8 Russell Road
Ipswich
IP1 2BX

Alan Kirkdale
Network Operations - East

Woodlands
Manton Lane
Bedford MK41 7LW

Direct Line: [illegible]
Fax: [illegible]

[illegible] May 2008

Dear Lucy

IPSWICH - TRANSPORT FIT FOR THE 21ST CENTURY
MAJOR SCHEME BUSINESS CASE

I am writing to confirm that the Highways Agency is pleased to be working closely with Suffolk County Council on measures to improve the sustainability of travel demand in and around Ipswich.

The A14 is strategic trunk road of international importance linking the Midlands and the rest of the country to the Port of Felixstowe, a key gateway to the continent and further afield. The trunk road however also provides a local function for Ipswich with significant number of trips accessing different parts of the town via the A14. This local movement is a major contribution to congestion on the A14 at peak times and at times when the road is closed due to unforeseen incidents has a knock on effect to movements in the town.

Whilst the scheme is based largely around the town centre as it is being developed in parallel with major changes in the policy, control, and practical arrangements for all types of parking in and around Ipswich town centre, it does provide the opportunity to encourage a behavioural change in the way people move around and it is hoped that this will have a knock on effect on the trunk road.

The Highways Agency recognises the importance of this scheme in contributing to unlocking residential and employment land which cannot be developed unless transport impacts on the adjoining local and trunk road network are addressed and believe that the scheme you are seeking funding for will not only contribute to these aims but also provide an essential first step in infrastructure required to facilitate the future growth of Ipswich as set out in the East of England Plan.

The Highways Agency is keen to support measures which have the potential to reduce traffic levels on the trunk and local highway network and encourage the use of sustainable modes of transport. To that end I can confirm we are in discussions on the potential joint working on area wide travel plans for businesses in the A14 corridor around Ipswich.

Yours sincerely

Alan Kirkdale

Alan Kirkdale
Regional Manager

Page 1 of 1

Department for Transport

FABER MAUNSELL | AECOM

Ipswich Borough Council

our ref: RW/ic
your ref:
please ask for: Russell Williams
direct dial: 01473 433501
email: russell.williams@ipswich.gov.uk

IPSWICH BOROUGH COUNCIL

Lucy Robinson
Suffolk County Council
Endeavour House
8 Russell Road
Ipswich
IP1 2BX

13th May 2009

Dear Lucy

Ipswich Major Transport Scheme - Fit for the 21st Century

Having considered the latest draft received on 12th May 2009 I am writing to confirm the Borough Council's support for the above scheme.

As you know Ipswich is a key regional centre that has experienced considerable growth in recent years. Considerable further growth is planned for the town within the East of England Regional Spatial Strategy.

Whilst the Borough Council is generally supportive of this growth the Council has long had concerns about the ability of the town's infrastructure to deal with the pressures that growth inevitably brings. This is not exclusively about transport but inevitably transport is one of our key areas of focus.

As a Council we have a strong track record of working with partners to bring forward major infrastructure projects - be they enhanced flood defences with the Environment Agency or Building Schools for the Future with the County Council. We look forward to working with you to deliver the major transport scheme.

Unfortunately Ipswich has suffered from a lack of major investment in transport projects in recent years. Whilst the introduction of park and ride over the last decade has been positive there has been very little transport related investment in the centre of our town. One only has to visit other parts of the region and country to see a vast array of flag-ship transport schemes that have led to major improvements in many towns and cities. It is encouraging that the Regional Assembly has recognised that, with this scheme, it should now be Ipswich's turn.

This is clearly not just about what the Department for Transport and the County Council can do for our town but what other key partners also do. The Borough Council has itself decided to invest millions of pounds in improving the centre of the town. This has now started with major improvements to Upper Brook Street and Northgate Street and will continue into other areas. The Haven Gateway Partnership has allocated substantial funds to complement this Borough led approach and Ipswich Central, the town's Business Improvement District, are investing substantial sums in the urban fabric of the town centre.

We look forward to continue to work with you to ensure this all complements the proposed major scheme. Equally we look forward to working with you at both officer and political levels to work up the detailed elements of the major scheme.

Having discussed this matter with Councillor Paul West, the Borough's Portfolio Holder for Transport, I will be preparing a report to our next available Executive Committee meeting (scheduled for mid June) recommending that the Borough Council expresses formally its full and continuing commitment to the scheme.

Yours sincerely

Russell Williams

Russell Williams
Corporate Director

Ipswich Central - the Business Improvement District

IPSWICHCENTRAL

Mr D Watson
Transport Strategy Manager
Suffolk County Council
Endeavour House
8 Russell Road
Ipswich
Suffolk
IP1 2BX

19 May 2008

Dear Dave

'Ipswich – Transport fit for the 21st century' major scheme

Ipswich Central, the town centre Business Improvement District (BID), has considered the merits of the 'Ipswich Transport fit for the 21st century' scheme and are pleased to support the proposals.

Ipswich Central believes that the scheme and the associated 'Business Shuttle' [illegible] will provide significant benefits to the town centre going forward.

The scheme addresses the range of accessibility issues that Ipswich faces and contains measures that will ensure a 'step-change' towards more sustainable travel. The suggested measures will help strengthen the position of Ipswich town centre, as a thriving retail and business venue.

To reiterate, Ipswich Central is in full support of the scheme and hopes to be given the opportunity to engage with partner agencies where appropriate, to ensure the maximum benefits are realised for the businesses and residents of both Ipswich and the surrounding area.

Yours sincerely

Paul Clement
Executive Director

Ipswich Buses

IPSWICH BUSES

[illegible]

Mr M Bradshaw
Public Strategy & Commissioning Manager
Environment & Transport Service Office
Suffolk County Council
Endeavour House
8 Russell Road
IPSWICH IP1 2BX

[illegible] MAR/MB 4.7

[illegible] 3 March 2009

Dear Mr Bradshaw

IPSWICH MAJOR SCHEME BID

Our company fully supports Suffolk County Council in their bid for substantial capital investment in sustainable transport options for Ipswich. We support the overall aim of a significant reduction in the growth of car based trips through modal shift to walking, cycling and public transport, and look forward to working in partnership with Suffolk County Council and other sustainable transport providers to make significant investments in new vehicles and services, where these can be financially justified as we experience a step change in attitudes to modes of transport in the area.

Our company strongly believe in sustainable transport and wish to join together in partnership with Local Authorities and other operators to promote sustainable transport to see a shift away from car based travel to other sustainable modes, which we believe will be to the overall benefit of everyone.

Yours sincerely

[illegible]
Managing Director

Ipswich Society

Ipswich New Transport Proposals — Page 1 of 1

Dave Watson

From: John Norman [johnnorman@suffolk.ac.uk]
Sent: 14 May 2009 13:08
To: Dave Watson
Cc: Jack Chapman (E-mail); Mike Bone; CAROLINE MARKHAM
Subject: Ipswich New Transport Proposals

The Ipswich Society have read with interest the proposals by Suffolk County Council for improvements to the transport infrastructure in Ipswich and are pleased to support the bid.

The Ipswich Society have some 1,200 members with a diversity of views but from feedback received from members at Executive Committee meetings, at open meetings and in general conversation with members (in particular after the AGM on April 2009) there is firm support for the proposals.

We are happy to endorse your bid.

Yours

John Norman
Vice Chairman
The Ipswich Society

National Express East Anglia

national express

Lucy Robinson
Director of Environment & Transport
Suffolk County Council
Endeavour House
8 Russell Road
IPSWICH IP1 2BX

Geraint Hughes
Stakeholder Manager
National Express East
Anglia & c2c Rail

Oliver's Yard
55 City Road
London
EC1Y 1HQ
Tel: 0207 549 5984
Mob: 07766 858367

8th May 2009

Dear Ms Robinson,

Ipswich – Transport fit for the 21st Century

I am writing to confirm National Express East Anglia's support for your major scheme bid for Ipswich.

As the region's main provider of rail services, we take an active interest in the way that the pressures of growth are accommodated and the impacts that they have on the development of our business. Our work in the development of Station Travel Plans has demonstrated the necessity of taking a sustainable view of access to the rail network and to our services, so we are pleased to see Suffolk County Council developing a package of measures to promote modal shift and sustainable access in one of our major centres.

Further to our recent dialogue with the County Council on the recently announced capacity enhancements for the Great Eastern Main Line, we are expecting to deliver a package of service enhancements over the next 3 years that will provide additional seats between Ipswich and London, as well as benefits for the users of rural services in the county. We believe that the proposed major scheme for Ipswich complements that commitment perfectly.

Whilst we appreciate that the programme bid does not include specific projects to improve station facilities, it is worth noting that we expect Network Rail to deliver the lifts project for Ipswich station during your programme period, which will improve the facilities at the station for our customers. We would also be keen to work with you to promote access by sustainable modes and ensure that mode shift for the journey to the station is an integral part of your programme. A station travel plan may be one way of achieving that goal.

If you require any further information from us, please contact me. We look forward to working with you.

Yours sincerely,

Geraint Hughes
Stakeholder Manager

www.nationalexpress.com

NHS Suffolk

NHS Suffolk

Direct dial: 01473 770000
Email: peter.bradley@suffolkpct.nhs.uk
Date: 13 May 2009

Mr Dave Watson
Suffolk County Council
Endeavour House
8 Russell Road
Ipswich
Suffolk
IP1 2BX

Suffolk Primary Care Trust
Rushbrook House
Paper Mill Lane
Bramford
Ipswich
Suffolk
IP8 4DE

Tel: 01473 770000
Fax: 01473 770201
Website: www.suffolk.nhs.uk

Dear Mr Watson

As Director of public health for Suffolk I particularly welcome the proposed improvements to walking and cycling facilities in Ipswich. Presently, physical activity levels in Ipswich are low and Ipswich is the most deprived area in Suffolk with correspondingly poor health statistics. We are working in partnership to deliver a joint strategy, Healthy Ambitions Suffolk, which aims to make Suffolk the healthiest county by 2028 and to reduce health inequalities in our county. Healthy Ambitions Suffolk strategy already has considerable support from commercial, statutory and voluntary sectors in Suffolk and more information is available on http://www.healthyambitionssuffolk.nhs.uk/

Alongside the major changes to infrastructure, the county council is promoting a complementary "smarter choices" programme designed to promote behavioural change making active travel more attractive. Combining these two elements, we anticipate that there will be a sustained rise in cycling and walking in the area. Promoting active travel such as walking and cycling to increase physical activity is a crucial element of the Healthy Ambitions Suffolk strategy to combat obesity and other health risks.

Yours sincerely

Dr Peter Bradley
Director of Public Health

NHS Suffolk represents Suffolk Primary Care Trust

Suffolk Chamber of Commerce

Dave Watson,
Suffolk County Council,
Endeavour House,
8, Russell Road,
IPSWICH
Suffolk
IP1 2BX

24th April 2009

Dear Dave,

'Ipswich – transport fit for the 21st Century'.

You may be aware that members of Suffolk Chamber of Commerce and Industry have been considering the merits of the 'Ipswich – transport fit for the 21st Century' scheme and that, at the beginning of April, the chamber's 'Transport and Infrastructure' group received a very useful presentation from your colleague, Graeme Mateer.

Whilst there were concerns raised about some of the specific details of the scheme, chamber members and, we are certain, companies in the broader business community, recognise the challenging set of issues that the scheme seeks to address. The growth of both Ipswich's population and, once the recession is over, its economy, provides tremendous opportunities for creating wealth and improving quality of life but it also creates challenges that have to be addressed i.e. the pressure upon transport networks, specifically in central Ipswich and the difficulty of meeting the environmental / climate change issues that all of us face. Our members acknowledge that something bold and robust needs to be done.

We wish to support the scheme and will work hard with partner agencies to both introduce it and make it work effectively for both the people and the businesses of Ipswich and the wider hinterland.

Yours sincerely,

John Dugmore
Chief Executive

Suffolk New College

Ipswich - Transport fit for the 21st century — Page 1 of 1

Dave Watson

From: John Norman [johnnorman@suffolk.ac.uk]
Sent: 14 May 2009 13:00
To: Dave Watson
Subject: Ipswich - Transport fit for the 21st century

Suffolk New College are pleased to support Suffolk County Council with their proposals for improvements to sustainable transport in and around Ipswich. Travel Plans developed by the college are designed to encourage staffs nd students to travel by sustainable means and the proposals will help Suffolk New College move towards these goals.

We particularly like, given that it is relevant to the student population, proposals to improve walking and cycling into the town centre.

Suffolk New College wish you success with the bid and if we can be of any further assistance please contact the undersigned.

Regards

John

John Norman
Director of Campus and Community Development
Suffolk New College
Ipswich, Suffolk, IP4 1LT
01473 343600

Sustrans

sustrans

Dave Watson
Transport Strategy Manager
Suffolk County Council
Endeavour House
8 Russell Road
Ipswich
Suffolk
IP1 2BX

SUFFOLK C.C.
[illegible]
ENDEAVOUR HOUSE

Dear Dave

Ipswich – transport fit for the 21st Century

Further to our discussions about the major scheme proposals I can confirm our support for the proposals and in particular the planned major investment in walking and cycling. The scheme is clearly based around the need for significant modal shift, if Ipswich is to continue to prosper and be a pleasant and attractive place to live and this is something that Sustrans advocates on a far wider scale and we congratulate you on the proposals.

We have been pleased to also work with you on the plans to bring Personal Travel Planning to Ipswich through our bid to DEFRA's Greener Living Fund. This would help fund a TravelSmart project in Ipswich, which we believe would go well with the major scheme, as would other behaviour change programmes that we have been discussing.

If there is anything further that we can do to support the bid please let me know.

Yours sincerely

Nigel Brigham
Regional Director

Cc James Ryle, Projects and Innovations Director, Sustrans

University Campus Suffolk

UNIVERSITY CAMPUS SUFFOLK

Date: 8 May 2009

Our Ref: RJA307

Mr D Watson
Transport Strategy Manager
Suffolk County Council
Endeavour House
Grafton Way
Ipswich
IP1 2DE

Dear Dave,

Ipswich Transport Major Scheme

University Campus Suffolk welcomes and supports the Ipswich Transport Major Scheme.

With approximately 3000 students and staff making almost half a million local journeys a year, the quality and efficiency of travel in Ipswich is vital to the success of our organisation. Difficulties and disruptions in travel are tangible obstacles to student recruitment, retention and academic performance - having deep, long term effects in the economy and cultural texture of the town.

Perhaps more importantly, the Major Scheme seeks to look robustly to the future in facilitating sustainable modes of transport.

The Major Scheme begins to prepare us for a time when different patterns of travel will become the norm, and in doing so it will leave Ipswich – and its commercial and educational institutions - better placed to accommodate and exploit those changes.

From UCS' perspective this scheme will not only improve and reduce existing vehicle traffic flow, but will also address the growing demand for more effective public transport options and safer, easier pedestrian and cycle travel.

If implemented the Ipswich Major Scheme will make the town a better place in which to work and study, and it has our full support.

Yours sincerely,

Prof Bob Anderson
Pro Vice Chancellor and Chief Executive Officer

University Campus Suffolk
Waterfront Building, Neptune Quay, Ipswich IP4 1QJ
T: [illegible] F: [illegible]
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Appendix O

Suffolk County Council | AECOM

Project:	**Ipswich – Transport Fit for the 21st Century**	Job No:	**60050323**
Subject;	**Cost Benefit Analysis and TEE Tables**		
Prepared by:	**Mark Chadwick**	Date:	**18 May 2009**
Checked by:	**Bil Harrison**	Date:	**18 May 2009**
Approved by::	**Bil Harrison**	Date:	**18 May 2009**

1 Introduction

1.1 Context

This Technical Appendix O forms a supporting part of the 'Ipswich – Transport Fit for the 21st Century' Major Scheme Bid. It describes the method by how the economic appraisal was undertaken and the outcomes of that appraisal.

The economic appraisal has been undertaken using TUBA to estimate travel time and vehicle operating cost changes between the Do Minimum and MSBC scenarios. Other processes have been used to calculate accident benefits and benefits that are not calculated directly from the transport models.

1.2 Components of Economic Appraisal

The benefits for the proposed MSBC are derived from a number of sources.

- Travel Time
- Vehicle Operating Costs (Fuel and Non-Fuel)
- Accidents
- Noise
- Air Quality
- Journey Ambience
- Reliability

Travel Time and Vehicle Operating Costs are formed into Consumer User and Business User benefits. The version of TUBA used uses the latest webTAG guidance which accounts for recent changes in the calculation of vehicle operating costs.

There are usually costs associated with the implementation of a scheme and these are also included. These costs generally include preparation, construction, supervision, maintenance and operations.

2 INPUTS

2.1 Assumptions

The economic appraisal has assumed a design life of 15 years, with an opening year of 2013 and last appraisal year (horizon year) of 2027. The 2013 forecasts have been obtained from the 2008 model and an intermediate model year of 2021. Beyond 2021 a flat profile has been assumed in which travel times and distances are assumed to remain unchanged from those in 2021. However benefits will differ beyond this year due to the effects of discounting and real increases in the values of time.

The ITAMS assignment models provide data that represents an average weekday in June. To determine the equivalent benefits for a year it has been assumed that there are 250 equivalent AM and PM peak hours per year. The economic appraisal has ignored benefits that may be applicable in other hours during weekdays and weekends.

In applying TUBA the standard webTAG assumptions have been applied with respect to values of time, vehicle operating costs and changes over time. TUBA assumes that HGV's are either OGV1 or OGV2. For the purposes of this assessment all HGV's have been classified as OGV1.

To calculate the consumer and business user benefits, demand, travel time and travel distance matrices are extracted from the highway and bus models for the AM and PM peak hours.

2.2 Costs

The MSBC scheme costs are formed of the following elements;

- RTPI
- UTMC/VMS
- Pedestrianisation of Upper Brook Street
- Improvements to the Princes Street corridor
- Other walk cycle
- Bus loop and shuttle bus
- Wayfinding
- Tower Ramparts bus station
- Old Cattle Market bus station

These have been costed as follows in financial year 2008 prices. These are then inflated at 4% per annum to reflect the current rate of inflation in road construction prices. The forecast increase in RPI is taken to be 2.7% p.a. and hence the real increase in construction costs is 1.3% p.a.

- RTPI £2.2M
- UTMC/VMS £7.7M
- Pedestrianisation of Upper Brook Street £1.3M
- Improvements to the Princes Street corridor £3.5M
- Other walk cycle £6.0M
- Bus loop and shuttle bus £0.6M
- Wayfinding £1.0M
- Tower Ramparts bus station £1.6M
- Old Cattle Market bus station £1.8M

These costs include preparation and supervision costs and are estimated to be spent by the following amount during the period up to 2013;

2006/7	£45,000
2007/8	£140,000
2008/9	£190,000
2009/10	£921,000
2010/11	£1,820,000
2011/12	£3,200,000

2012/13 £21,523,300

These costs equate to a Present Value Cost (PVC) of £25.402 millions in 2002 prices discounted to 2002 with any costs incurred before 2009 excluded from the assessment. The breakdown of these costs in provided in the Public Accounts Table below.

Also included in the final costs are a 15% Optimism Bias and operating and maintenance costs of £300,000 per annum or a total of £4.5M over the 15 year assessment period.

2.3 Benefits

The benefits due to time savings and changes in vehicle operating costs form only part of the total benefits that the MSBC schemes are predicted to provide. Benefits are also predicted due to fewer accidents, ambience benefits from improved physical surroundings and improved security and benefits due to improved physical fitness.

2.4 Cost Benefit Analysis

The Transport Economic Efficiency (TEE) table is shown below. This replicates the output from TUBA and indicates that Consumer and Business benefits of £32.536 millions in 2002 prices discounted to 2002. Total highway benefits are calculated to be £16.510 millions whilst bus passenger benefits are estimated to be £16.026 millions.

To this are added the non consumer and business benefits accruing from improved ambience, security and physical fitness benefits. These equate to £28.8 millions in 2002 prices discounted to 2002.

The Analysis of Monetised Costs and Benefits Table below combines the benefits and the costs. The result is a total Present Value of Benefits of £61.419 millions, a PVC of £25.401 millions and Net Present Value (NPV) of £36.018 millions. This gives a Benefit Cost Ratio (BCR) of 2.42 indicating good value for money for this scheme.

Public Accounts

	ALL MODES TOTAL		ROAD INFRASTRUCTURE	BUS & COACH	RAIL	OTHER
Local Government Funding						
Revenue	0		0			0
Operating Costs	2,408		2,408			0
Investment Costs	2,103		2,103			0
Developer and Other Contributions	0		0	0	0	0
Grant/Subsidy Payments	0		0	0	0	0
NET IMPACT	4,511	*(7)*	4,511	0	0	0
Central Government Funding						
Revenue	0		0			0
Operating Costs	0		0			0
Investment Costs	20,236		20,236			0
Developer and Other Contributions	0		0	0	0	0
Grant/Subsidy Payments	0		0	0	0	0
Indirect Tax Revenues	655		655	0	0	0
NET IMPACT	20,891	*(8)*	20,891	0	0	0
TOTAL Present Value of Costs (PVC)	25,402	*(9) = (7) + (8)*				

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All values in £,000's in 2002 prices and values

Economic Efficiency of the Transport System (TEE)

	ALL MODES		ROAD		BUS & COACH	RAIL		OTHER
Consumers								
User benefits	TOTAL		Private Cars and LGVs		Passengers	Passengers		
Travel time	23,431		9,957		13,474	0		0
Vehicle operating costs	1,370		1,370					0
User charges	0				0	0		0
During Construction & Maintenance	0				0	0		0
NET CONSUMER BENEFITS	24,801	*(1)*	11,327		13,474	0		0
Business								
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	
Travel time	7,514		538	4,424	2,552	0	0	0
Vehicle operating costs	221		1	220				0
User charges	0				0	0	0	0
During Construction & Maintenance	0				0	0	0	0
Subtotal	7,735	*(2)*	539	4,644	2,552	0	0	0
Private sector provider impacts						**Freight**	**Passengers**	
Revenue	0				0	0	0	0
Operating costs	0				0	0	0	0
Investment costs	0				0	0	0	0
Grant/subsidy	0				0	0	0	0
Subtotal	0	*(3)*			0	0	0	0
Other business impacts								
Developer contributions	0	*(4)*	0		0	0		0
NET BUSINESS IMPACT	7,735	*(5) = (2) + (3) + (4)*						
TOTAL								
Present Value of Transport Economic Efficiency Benefits	32,536	*(6) = (1) + (5)*						

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All values in £,000's in 2002 prices and values

Analysis of Monetised Costs and Benefits

Noise	0	
Local Air Quality	0	
Greenhouse Gases	83	
Journey Ambience	20,800	
Accidents	8,000	
Consumer Users	24,801	
Business Users and Providers	7,735	
Reliability	0	
Option Values	0	
Present Value of Benefits (see notes) (PVB)	61,419	
Public Accounts	0	
Present Value of Costs (see notes) (PVC)	25,401	
OVERALL IMPACTS		
Net Present Value (NPV)	36,018	*NPV=PVB-PVC*
Benefit to Cost Ratio (BCR)	2.42	*BCR=PVB/PVC*

Notes : All values in £,000's in 2002 prices and values

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.

Appendix P

Suffolk County Council | AECOM

Major Scheme Business Case (MSBC)

Independent Surveyors Report

Ipswich

Transport Fit for the 21st Century

21 May 2009

Produced for
Suffolk County Council

Prepared by
Elliot Smith
Project Manager

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Document Control Sheet

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Report Title Major Scheme Business Case (MSBC)

Independent Surveyors Report

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Distribution

Organisation	Contact	Copies
Suffolk County Council	Clive Wilkinson – Team Leader	1

Contents

1 Introduction

1.1 Project Background

1.1.1 Scope of the Report

The purpose of the Major Scheme Business Case (MSBC) bid is to provide Local Transport Plan (LTP) authorities with the necessary capital funding to take forward worthwhile highway and public transport schemes that support the objectives of their LTP. Consultants Faber Maunsell/ AECOM have produced a MSBC bid submission for Suffolk County Council, focused upon major improvements around Ipswich Town.

As a requirement for the bid an independent surveyors report is required. Mouchel Ltd has been tasked by Suffolk County Council to write this report to assess the costs produced by Faber Maunsell/ AECOM in an independent capacity.

This report aims to validate the costs as part of the bid submission, based upon a number of Level1 Cost Estimates and associated design documentation supplied by FaberMaunsell I AECOM.

The bid focuses upon:

- Eight walking and cycling route improvement schemes and a Junction Improvement (Princes Street / Civic Drive)
- Two bus station improvements (Tower Ramparts and Old Cattle Market)
- Bus stops and bus shuttle loop
- Real Time Passenger Information (RTPI)
- Urban Traffic Management Control (UTMC) systems and Variable Message Signage (VMS)on strategic routes into Ipswich
- Wayfinding Systems

2 Cost Evaluations

2.1 Walking and Cycling Routes and Junction Improvements

The Cycling and Walking routes are made up of eight 'colour coded' routes around Ipswich Town Centre.

2.1.1 ***Pink Route*** *-Railway Station to Ipswich Waterfront*

- Level 1 Cost Estimate of Works = £309,693
- Percentage increase for Overhead Costs = £221,431
- Grand Total = **£531,124**

Mouchel Ltd has carried out a robust review of the Level 1 Cost Summary, the design submission plans, and supporting evidence provided for the proposed Pink Route. The independent assessment has also checked the percentage increase costs applied to the construction cost estimates. It is confirmed that the Level 1 Cost Estimate included within the MSBC Bid accurately reflects the anticipated outturn cost for the extent of cycling and waking improvement works identified within the Pink Route – Railway Station to Ipswich Waterfront.

2.1.2 ***Purple Route*** *- Railway Station to Town Centre.*

- Level 1 Cost Estimate of Works = £489,307
- Percentage increase for Overhead Costs = £374,320
- Grand Total = **£863,627**

Mouchel Ltd has carried out a robust review of the Level 1 Cost Summary, the design submission plans, and supporting evidence provided for the proposed Purple Route. The independent assessment has also checked the percentage increase costs applied to the construction cost estimates. It is confirmed that the Level 1 Cost Estimate included within the MSBC Bid accurately reflects the anticipated outturn cost for the extent of cycling and waking improvement works identified within the Purple Route – Railway Station to Town Centre.

2.1.3 ***Orange Route*** *- Norwich Road / Portman Road / Town Centre.*

- Level 1 Cost Estimate of Works = £748,933
- Percentage increase for Overhead Costs = £516,764
- Grand Total = **£1,265,697**

Mouchel Ltd has carried out a robust review of the Level 1 Cost Summary, the design submission plans, and supporting evidence provided for the proposed Orange Route. The independent assessment has also checked the percentage increase costs applied to the construction cost estimates. It is confirmed that the Level 1 Cost Estimate included within the MSBC Bid accurately reflects the anticipated outturn cost for the extent of cycling and waking improvement works identified within the Orange Route – Norwich Road/ Portman Road/ Town Centre.

2.1.4 ***Brown Route*** *- Education Quarter to Town Centre.*

- Level 1 Cost Estimate of Works = £220,951
- Percentage increase for Overhead Costs = £146,932
- Grand Total = **£367,883**

Mouchel Ltd has carried out a robust review of the Level 1 Cost Summary, the design submission plans, and supporting evidence provided for the proposed Brown Route. The independent assessment has also checked the percentage increase costs applied to the construction cost estimates. It is confirmed that the Level 1 Cost Estimate included within the MSBC Bid accurately reflects the anticipated outturn cost for the extent of cycling and waking improvement works identified within the Brown Route – Education Quarter to Town Centre.

2.1.5 ***Yellow Route*** *- Henley Road to Cardinal Park and Ipswich Waterfront.*

- Level 1 Cost Estimate of Works = £1,130,264
- Percentage increase for Overhead Costs = £779,882
- Grand Total = **£1,910,146**

Mouchel Ltd has carried out a robust review of the Level 1 Cost Summary, the design submission plans, and supporting evidence provided for the proposed Yellow Route. The independent assessment has also checked the percentage increase costs applied to the construction cost estimates. It is confirmed that the Level 1 Cost Estimate included within the MSBC Bid accurately reflects the anticipated outturn cost for the extent of cycling and waking improvement works identified within the Yellow Route – Henley Road to Cardinal Park and Ipswich Waterfront.

2.1.6 ***Green Route*** *- Woodbridge Road to Ipswich Waterfront.*

- Level 1 Cost Estimate of Works = £672,893
- Percentage increase for Overhead Costs = £464,296
- Grand Total = **£1,137,189**

Mouchel Ltd has carried out a robust review of the Level 1 Cost Summary, the design submission plans, and supporting evidence provided for the proposed Green Route. The independent assessment has also checked the percentage increase costs applied to the construction cost estimates. It is confirmed that the Level 1 Cost Estimate included within the MSBC Bid accurately reflects the anticipated outturn cost for the extent of cycling and waking improvement works identified within the Green Route – Woodbridge Road to Ipswich Waterfront.

2.1.7 ***Blue Route*** *- Town Centre to Ipswich Waterfront.*

- Level 1 Cost Estimate of Works = £486,334
- Percentage increase for Overhead Costs = £347,729

- Grand Total = **£834,064**

Mouchel Ltd has carried out a robust review of the Level 1 Cost Summary, the design submission plans, and supporting evidence provided for the proposed Blue Route. The independent assessment has also checked the percentage increase costs applied to the construction cost estimates. It is confirmed that the Level 1 Cost Estimate included within the MSBC Bid accurately reflects the anticipated outturn cost for the extent of cycling and waking improvement works identified within the Blue Route – Town Centre to Ipswich Waterfront.

2.1.8 ***Red Route*** *– Christchurch Park / Town Centre / St Peters Wharf*

- Level 1 Cost Estimate of Works = £769,388
- Percentage increase for Overhead Costs = £569,347
- Grand Total = £1,338,735

Mouchel Ltd has carried out a robust review of the Level 1 Cost Summary, the design submission plans, and supporting evidence provided for the proposed Red Route. The independent assessment has also checked the percentage increase costs applied to the construction cost estimates. It is confirmed that the Level 1 Cost Estimate included within the MSBC Bid accurately reflects the anticipated outturn cost for the extent of cycling and waking improvement works identified within the Red Route – Christchurch Park/ Town Centre/ St Peters Wharf.

It should be noted that the Level 1 Cost Estimate for all coloured Walking and Cycling Routes with exception to the Red Route and the Purple Route has been shown as a single item within the Financial Summary Table included within Section 11 clause 11.1.1 of the MSBC Bid. It is believed that the individual Walking and Cycling elements have been combined within the Level 1 cost summary within the Bid to best demonstrate the benefits of an integrated approach to walking and cycling enhancements within Ipswich. As each of the routes represents an individual and strategic link into the town, each walking and cycling element has been assessed individually within the Independent Surveyors Report. It is noted that cost benefits may be achieved particularly with respect to preparation costs by packaging up the improvement measures during the design/ implementation phase.

2.1.9 ***Junction Improvements*** *- Princes Street / Civic Drive*

- Level 1 Cost Estimate of Works = £1,360,000
- Percentage increase for Overhead Costs = £1,244,400
- Grand Total = **£2,604,400**

Mouchel Ltd has carried out a robust review of the Level 1 Cost Summary, the design submission plans, and supporting evidence provided for the proposed Junction Improvements at Princes Street/ Civic Drive. The independent assessment has also checked the percentage increase costs applied to the construction cost estimates. It is confirmed that the Level 1 Cost Estimate included within the MSBC Bid accurately reflects the anticipated outturn cost for the Princes Street/ Civic Drive Junction Improvements.

It should be noted that the Level 1 Cost Estimate for Princes Street / Civic Drive Junction Improvements has been include within the Walking and Cycling Purple Route Estimate within Section 11 Financial Element clause 11.1.1 of the MSBC Bid. It is acknowledged that both elements of the Bid fall within the same strategic route for both motorised and non-motorised users into the centre of Ipswich and would potentially be implemented as a single construction package. It is noted that cost benefits may be achieved particularly with respect to preparation costs by packaging up the improvement measures during the design/ implementation phase.

2.2 Bus Station Improvements

2.2.1 *Tower Ramparts Bus Station*

Remodelling and Refurbishment of Tower Ramparts Bus Station

- Level 1 Cost Estimate of Works = £983,944
- Percentage increase for Overhead Costs = £851,112
- Grand Total = **£1,835,055**

Mouchel Ltd has carried out a robust review of the Level 1 Cost Summary, the design submission plans, and supporting evidence provided for the proposed Remodelling and Refurbishment of Tower Ramparts Bus Station. The independent assessment has also checked the percentage increase costs applied to the construction cost estimates. It is confirmed that the Level 1 Cost Estimate included within the MSBC Bid accurately reflects the anticipated outturn cost for the Tower Ramparts Bus Station improvements.

2.2.2 *Old Cattle Market Bus Station*

Remodelling and Refurbishment of Old Cattle Market Bus Station

- Level 1 Cost Estimate of Works = £835,944
- Percentage increase for Overhead Costs = £723,092
- Grand Total = **£1,559,036**

Mouchel Ltd has carried out a robust review of the Level 1 Cost Summary, the design submission plans, and supporting evidence provided for the proposed Remodelling and Refurbishment of Old Cattle Market Bus Station. The independent assessment has also checked the percentage increase costs applied to the construction cost. It is confirmed that the Level 1 Cost Estimate included within the MSBC Bid accurately reflects the anticipated outturn cost for the Old Cattle Market Bus Station improvements.

2.3 Bus Stops and Bus Shuttle Loop

2.3.1 *Category A*

Minor bus stop improvements

- Level 1 Cost Estimate Sub-Total = £19,224

2.3.2 *Category B*

Low cost shelter and bus stop improvements

- Level 1 Cost Estimate Sub-Total = £21,276

2.3.3 *Category C*

Standard cost shelter and bus stop improvements

- Level 1 Cost Estimate Sub-Total = £55,422

2.3.4 *Category D*

Premium cost shelter and bus stop improvements

- Level 1 Cost Estimate Sub-Total = £173,756

- Total Level 1 Costs for Bus Stops and Shuttle Bus Loop (as detailed within categories A – D above) = £269,678
- Lump sum costs for Associated Works = £45,000
- Percentage increase for Overhead Costs = £99,124
- Purchase of 2No. Shuttle Buses = £200,000
- Grand Total = **£613,802**

Mouchel Ltd has carried out a robust review of the Level 1 Cost Summary, the design submission plans, and supporting evidence provided for the proposed Bus Stops and Bus Shuttle Loop. The independent assessment has also checked the percentage increase costs applied to the construction cost estimates. It is confirmed that the Level 1 Cost Estimate included within the MSBC Bid accurately reflects the anticipated outturn cost for the Bus Stops and Bus Shuttle Loop.

2.4 Real Time Passenger Information (RTPI)

2.4.1 On-Street Information Display

- Level 1 Cost Estimate Sub-Total = £685,172

2.4.2 On-Bus Equipment

- Level 1 Cost Estimate Sub-Total = £574,875

2.4.3 AVL Data Processing and Software

Level 1 Cost Estimate Sub-Total = £296,000

Total Level 1 Costs for Real Time Passenger Information (RTPI)

= £1,556,047

Percentage increase for Project Management and Contingencies for RTPI

= £326,770

Design and Preparation costs

= £244,766

Grand Total = £2,127,582

Mouchel Ltd has carried out a robust review of the Level 1 Cost Summary, the design submission plans, and supporting evidence provided for the proposed Real Time Passenger Information System. It is noted the an element of Capital Costs included within the Summary Estimates have been taken from a recent RTPI project established within Lowestoft. It is also noted that a number of AVL Data Processing and Software elements have been allocated with zero capital costs as a result of systems and processes implemented as part of the Lowestoft Project. Having reviewed the costs for RTPI provided within Lowestoft and assessed the element costs included within the Summary Estimate, it is considered that the costs included within the MSBC Bid accurately reflects the anticipated outturn cost for the Real Time Passenger Information.

2.5 Urban Traffic Management and Control (UTMC) System Components and Variable Message Signage (VMS)

2.5.1 SCOOT UTC Traffic Signals including Bus Priority

- Level 1 Cost Estimate Sub-Total = £1,634,700

2.5.2 Closed Circuit Television (CCTV)

- Level 1 Cost Estimate Sub-Total = £366,000

2.5.3 Parking Guidance Information System

- Level 1 Cost Estimate Sub-Total = £411,230

2.5.4 Variable Message Signage

- Level 1 Cost Estimate Sub-Total = £490,600

2.5.5 Air Quality Monitoring

- Level 1 Cost Estimate Sub-Total = £57,200

2.5.6 UTMC Communications Network

- Level 1 Cost Estimate Sub-Total = £1,861,070

2.5.7 Control Room

- Level 1 Cost Estimate Sub-Total = £181,000

2.5.8 Software Development

- Level 1 Cost Estimate Sub-Total = £100,000

CSD Support

Level 1 Cost Estimate Sub-Total = £50,000

Total Level 1 Costs for UTMC System Components and VMS = £5,151,800

Percentage increase for Overhead Costs = £2,781,972

Grand Total = £7,933,722

Mouchel Ltd has carried out a robust review of the Level 1 Cost Summary, the design submission plans, and supporting evidence provided for the Urban Traffic Management Control System. The independent assessment has also checked the percentage increase costs applied to the construction cost estimates. It is noted that the Level 1 Cost Estimate Summary Sheet provided by Faber Maunsell/ AECOM records a total estimated cost of the works to be £ 7,933,722, however the total cost for works included within Section 11 is recorded as £ 7,662,732. It would appear that the summary cost schedule within the Bid does not include revenue costs. It is confirmed that the total costs for UTMC included within the MSBC financial summary are appropriate and it is suggested that the Summary Sheet within the appendices should be amended to reflect the correct capital costs for clarity.

2.6 Wayfinding Systems

2.6.1 Design Development and pilot Wayfinding

- Level 1 Cost Estimate Sub-Total = £170,000

2.6.2 Project Development and Implementation

- Level 1 Cost Estimate Sub-Total = £25,000

2.6.3 Integrated Visitor Information

- Level 1 Cost Estimate Sub-Total = £130,000

2.6.4 On-Street Wayfinding

- Level 1 Cost Estimate Sub-Total = £332,500

2.6.5 Multi-modal Mapping

- Level 1 Cost Estimate Sub-Total = £55,000

2.6.6 Bus Transit Integration

- Level 1 Cost Estimate Sub-Total = £400,000

Total Level 1 Costs for Wayfinding systems = **£1,007,500**

Mouchel Ltd has carried out a review of the Ipswich Wayfinding System report produced by City ID in May 2008. The report includes a project scope together with estimated costs for various work stages to provide a new wayfinding and public transport information system for Ipswich Town Centre. It is understood that the report was based upon an initial proposals to provide a public and transformation system with a funding limit of £ 1 million. Mouchel Ltd have reviewed estimated costs within the report and it is generally considered that the costs identified are appropriate. The assessment assumes that £ 195,000 will be allocated to preparation costs and construction costs of £ 812,500.

3 Conclusions

In conclusion, Mouchel Ltd has undertaken an Independent Check of the Level 1 costs produced by Faber Maunsell/ AECOM for a number of walking and cycling enhancements, junction improvements and integrated transport measures aimed at improving strategic routes for all modes of sustainable transport into the centre of Ipswich. These schemes are to form part of a Major Schemes Business Case to be submitted by Suffolk County Council.

Following a site visit, and a review of the detailed design information including take off sheets, Level 1 cost estimates and associated design plans for each of the improvement measures, Mouchel Group Ltd consider that the implementation costs detailed within the Bid are accurate. As a result of the integrated nature of some of the improvement measures included within the Bid, clarification was required during the initial assessment to determine where implementation costs were allocated. For clarity some design elements such as pedestrian crossing facilities were reallocated to Walking and Cycling Routes to conform with details included within the route plans.

It is noted that the estimated construction costs for highway improvements have been taken from Suffolk County Council Term Contractors Schedule of Works. Mouchel Ltd have checked the Level 1 cost estimates provided using a comparable pricing system and whilst it is noted that there are differences between rates identified for individual work elements, the total out-turn costs for elements of work identified within the Bid document are comparable. It is therefore considered that the costs identified within the Bid document for highway improvement measures are appropriate.

3.1.1 Bus Stops and Bus Shuttle Loop

Level 1 cost estimates were supplied and an independent checking process was undertaken by Mouchel Group Ltd, using a comparable pricing system.
It was confirmed that the Level 1 cost estimates supplied by FaberMaunsell I AECOM which are to be included within the MSBC Bid, accurately reflected the anticipated Level 1 Cost Estimate.

3.1.2 *Real time Passenger Information (RTPI)*

The RTPI costings were drawn from the Lowestoft contract, based on the unit rates for a number of components. These appear to be realistic and complete, to operate an effective RTPI system across the town.

3.1.3 *UTMC System Components and Variable Message Signing*

The costing for the UTMC system was presented as a number of unit costs to make up a complete system. These costing were drawn from the Lowestoft contract. It was agreed that all aspects of the UTMC system had been incorporated to enable a complete system to be operated.

3.1.4 *Wayfinding Systems*

Level 1 cost estimates and the associated Local Transport Plan document was supplied by Suffolk County Council and an independent checking process was undertaken by Mouchel Group Ltd, however, no comparable pricing system was available.

It was agreed that the Level 1 cost estimates within the Transport Plan document supplied by Suffolk County Council, which is to be included within the MSBC Bid, accurately reflected the anticipated expenditure of Suffolk County Council.

4 Appendices

List of all drawings including date received.

Route	**Drawing No.**	**Date Received**
Red	RED-001	27-03-2009
Brown	BRO-001 / 002	27-03-2009
Green	GRE-001	27-03-2009
Orange	ORA-001 / 002 / 003	27-03-2009
Blue	BLU-001 / 002	27-03-2009
Purple	PUR-001	27-03-2009
Yellow	YEL-001 /002 / 003 / 004	27-03-2009
Pink	60050323-PIN-001	27-03-2009
Tower Ramparts	60050323-TRCD-004	27-03-2009
Old Cattle Market	60050303-OCMCD-001	27-03-2009
Princes Street / Civic Drive	PRIN/OPTION/2	27-03-2009

5 References

Reference is made to the Department for Transport WebTAG (Web Transport Analysis Guide) following guidance on the estimation of scheme costs before submission of the MSBC.