



Maidstone VISUM Model

Modelling Background Note

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1 VISUM MODELLING BACKGROUND

1.1 Transport modelling has moved on from simple assignment models to multi modal demand models, following current DfT guidelines and requirements. Multi modal demand models provide the opportunity to model travel behaviour and sustainable policies.

1.2 VISUM is one of the most sophisticated and robust Travel Demand Modelling tools which utilise the computer software environment to replicate the “real world” transportation system around us (roads, junctions, congestion delays, use of a public transport system, etc.). This state of the art analysis tool has been widely used in the transport planning field in the UK.

1.3 VISUM models are developed to simulate actual travel patterns and existing demand conditions. Networks are constructed using detailed data for each road within the network. Travel demand is generated using land use data and socioeconomic data such as household size, car availability, census and employment data.

1.4 Once a VISUM model has been developed to replicate the existing conditions of a study area, it can then be used to predict future travel patterns and demands based on changes in the transportation system (e.g., new roads, wider roads with more capacity, bus lanes, closed roads); changes in the land use (e.g., more residential development, a new rail-freight site, etc.); and changing demographics (changing population in a specific area, access to a vehicle, etc.).

1.5 Future-year traffic projections are based on numerous assumptions about how population, employment, vehicle operating costs, and other factors will change over time. Using these inputs, the model is able to show where there will be future capacity limitations, relative to the current road and transport networks. Once these issues are identified, potential improvements are evaluated by rerunning the model with an “improved or modified” transportation system. A range of different road networks and different land use patterns can be tested this way.

2 MAIDSTONE VISUM MODEL

2.1 In the case of Maidstone VISUM Travel Demand Model, the base year VISUM model has been satisfactorily validated to the WebTAG guidelines and DMRB criteria, as detailed in the LMVR (as agreed by PB August 2009). The model is shown to pass all validation criteria, convergence criteria and realism tests.

2.2 We are confident that the VISUM model remains the best tool to model accurately the impact of a significant development proposal such as KIG on the local and strategic road

network in the context of the emerging Maidstone Local Development Framework. We consider that the likely wide scale impacts of KIG merit a commensurate modelling approach analysing the impact over a wider area taking into account, redistribution and reassignment of traffic associated with development and infrastructure improvements such as the South East Maidstone Strategic Link.

2.3 Overall the multi modal VISUM model provides a much more appropriate reflection of the wider distribution impacts of development than isolated junction capacity calculations.

2.4 A simple manual assignment or reassignment of traffic cannot adequately reflect the impact of mode choice and traffic issues across the wider network which will affect travel patterns in Maidstone and connected network.

2.5 The forecast VISUM model is based on future forecast travel demand that is expected to arise from growth around existing land use and LDF development across the town as well as at the Urban Extension.

2.6 In August Parsons Brinkerhoff acknowledged (section 4.7.3 HA Technical Note 4, 21/8/09) that the model converged for 2017 and provides a reasonable estimation of the likely travel patterns across the network for that year. They also suggested that the model may be appropriate for assessing the impact of KIG across the network in 2017 when compared to the first principles approach.

2.7 Both the 2017 and 2026 models have now been established as a stable and converged base which can be used to assess alternative scenarios for the LDF and for significant developments such as KIG.

2.8 Finally the Maidstone model is robustly calibrated and validated for the multi-modal traffic and variable demand, and is not only fit for purpose but the best available tool to test any forecasting scenario in Maidstone including KIG and the LDF.

3 DEMAND MODELS

3.1 The traffic that moves through the network is constrained by capacity at junctions.

3.2 The demand model assigns traffic to the network based on the shortest, quickest and cheapest route options between origins and destinations, taking on board the level of delay and congestion at junctions across the whole network.

3.3 It is the junction and link delays on the network, together with other user costs, which makes a particular route more attractive (shortest/quickest) over its alternatives. When the

number of vehicles on a link (or at a junction) exceeds its capacity, the congestion delays increase the cost on a route and vehicles are re-assigned to an alternative route whose cost eventually becomes smaller than the previous best route and the process continuous until the whole network is balanced such that at the 'Equilibrium' state the average journey time on the network has reached a minimum.

3.4 As the first choice routes through the network become congested with excessive delay the model seeks out the next best alternative route for each pair of trip origins and destinations. It may happen that delays and congestion on the main routes are such that the only alternative for the model is to send traffic via less suitable routes since these effectively become quicker.

3.5 In some instances the resulting demand flow shown on links may exceed the actual network capacity and these indicate the problem areas of the network.

3.6 The most important aspect which results from the analysis of the demand flows is degree of saturation or volume over capacity. In other words demand flows allow the modeller to identify the bottlenecks in the network and also the extent of the problem, in the form of the network performance indicators such as junction and link delays etc.

4 INSPECTORS QUERIES

4.1 Comparison of changes in demand flows on links

4.1.1 A query was raised about the differences in forecast demand flows on a number of links. A number of key points should be noted when considering link demand flows and comparing different scenarios.

- i. It should be noted that the 2017 model includes development, including some LDF growth, forecast to that year but does not include the SEMSL. Differences in link flows between 2007 and 2017 are therefore a function of growth and development.
- ii. The 2026 model includes additional development (from 2017 to 2026) across the whole of Maidstone as well as at the Urban Extension and also includes the SEMSL. Differences in flows between 2017 and 2026 therefore reflect two elements;
 - additional capacity provided by the SEMSL,
 - significant increase in demand across the town and at the Urban Extension.
- iii. The AM and PM peak models each have very different traffic composition with different trip purposes and distributions. For example the AM peak model has a high

proportion of trips between 'home based work' trips, many of which will have destinations outside the Maidstone area. The returning longer distance work trips in the evening will not all appear in the Maidstone area until after the modelled PM peak.

- iv. The PM peak model is not a simple transposition of the AM trip movements. The PM peak model has a higher proportion of 'home based other' trips (eg shopping, leisure etc) of which a high proportion has a destination within the Maidstone area.
- v. It is also important to consider the overall impact of travel demand on the efficiency of all alternative routes rather than isolated links, which may be affected by a serious level of delay upstream or downstream which will influence route choice.

4.1.3 Forecast flows on links taken in isolation may suggest unexpected increases or decreases in flows. However individual link demand flows are affected by;

- changes in demand,
- potential capacity provided by the SEMSL,
- characteristics of the peak period travel pattern,
- delays and congestion across the network affecting the optimum route choices,
- zone loading onto the network.

4.2 Flows on Willington Street

4.2.1 A query was raised about the modelled flows on Willington Street in the Base Year Model. Modelled flows and observed flows have been extracted in the table below for the A20 west of the New Cut junction, the A20 east of Willington Street junction and for Willington Street itself. All the links except the Willington Street southbound movement meet the GEH criteria as set out in the Design Manual for Roads and Bridges (DMRB). The modelled flows through the Willington Street are an acceptable representation of observed flows.

4.2.2 In line with DMRB guidelines over 85% of all the link flows validated meet the required acceptance criteria.

Link	Dir	Observed Flow	Modelled Flow	Diff	% Diff	GEH	GEH Criteria
A20 W of New Cut	WB	1093	1233	140	13	4	Pass
A20 W of New Cut	EB	384	369	-15	-4	1	Pass
A20 E of Wellington St	WB	520	517	-3	-1	0	Pass
A20 E of Wellington St	EB	511	616	105	21	4	Pass
Wellington St	SB	763	536	-227	-30	9	Fail
Wellington St	NB	849	737	-112	-13	4	Pass

4.3 Forecast Flows on Wellington Street

4.3.1 A query was raised about the demand flows shown for Wellington Street (link 5) in Tables A-1 and A-2 of the Forecast Model Summary Report (ref KCC 4.4).

4.3.2 2017 forecast demand flows northbound on Wellington Street are contributed to by a large proportion of outbound commuter traffic demand in the AM peak. The trip composition in the southbound direction will not necessarily mirror the northbound flow and the increase in travel demand in 2017 in the southbound direction is less marked.

4.3.3 The 2026 AM peak demand flows northbound on the same link increase by a small amount, despite the major increase in development across the town and at the Urban Extension. SEMSL provides an alternative route for much of the additional demand northbound, a large proportion of which will be outbound commuter traffic.

4.3.4 SEMSL caters for fewer of the trips making the southbound movement. Consequently there is a bigger increase in traffic demand by 2026 on Wellington Street southbound, despite the provision of the SEMSL.

4.4 Modelling of the SEMSL

4.4.1 The modelling assumptions for the SEMSL were queried.

4.4.2 SEMSL is modelled as a single carriageway route linking A274 to the A20 with a speed limit of 60mph and capacity of 2000 vehicles per hour in each direction. Junctions on the A274 are assumed to be roundabouts. The junction with A20/M20 link is assumed to be signalised roundabout. This junction is assumed to be the maximum size that can be accommodated within highway limitations.

4.5 KIG HGV

4.5.1 The KIG HGV distribution was queried.

4.5.2 The HGV assignment is based on limited information provided by DWP about routing. HGV movements identified as originating from outside the modelled area were assigned to external model zones to reflect this. The destinations of HGVs within the region were not specified and these were assigned using the Maidstone gravity model. This distribution was in error and these vehicles, some of which appeared on the A20 and in the Bearsted area, have since been rerouted to the M20 and to meet the aspirations of the routing arrangement.

4.5.3 The removal of these HGVs from the A20 does not affect the flows recorded on the screenline south of the A20 or the screenline capturing east west movements on the A20 and Bearsted Road.

4.6 M20

In terms of knowledge gained from of the modelling process, the A20 link road capacity is affected by queues resulting from delays to traffic merging onto the M20. This results in a proportion of car traffic from KIG rerouting through Bearsted.

APPENDIX

Roger Ferreira

Technical Director - Jacobs

Experience Summary

Roger is a Technical Director in Jacobs and is responsible for transport planning and modelling of vehicles and pedestrians. He has worked on many prestigious transport studies over a 20-year period and includes St Pancras International Rail Station and the Channel Tunnel Rail Project, London Heathrow Terminal 5, the new Athens International Airport and the proposed Thames Gateway Crossing in East London.

In 2005 Roger became the Technical Director responsible for leading transport planning and modelling in the Kent area for Jacobs based in the Maidstone office. He is responsible for managing a team of around 15 people and is currently responsible for the technical transport modelling work provided to Kent County Council under a framework alliance contract.

In Kent he was the project director for the Maidstone VISUM transport model developed to assess transport impacts from the Local Development Framework developments promoted by Maidstone Borough Council. This model is now being used to assess the Kent International Gateway (KIG) project a rail freight interchange proposal in Maidstone, Kent. He is also the Project Director for the transport modelling studies being undertaken to support the developments in Kent Thameside near London and he was the team leader that successfully led the transport modelling to support the major scheme bid by Kent County Council for the East Kent Access Phase 2 study. In Kent he is also leading the development of the transport VISUM model for Canterbury City and Tunbridge Wells and Tonbridge.

Other projects of relevance include being the project manager in 2004/05 responsible for developing a 20-year plan for the passenger and freight railways in Kent and the South East Sub Region of England sponsored by the Strategic Railway Authority. A multi-modal study looking at both the road and railway developments, and it involved consultations with the stakeholders in the region and scheme appraisal.

In 2001 / 02 he was seconded to TfL over an 18 month period to help project manage the transport modelling studies to support the London Congestion Charging project. In 2002 the Local Authorities led by the Royal Borough of Kensington and Chelsea and the London Borough of Westminster mounted a legal challenge against the congestion-charging scheme. Roger helped in the preparation of rebuttal evidence and preparatory reports for the TfL Legal team and Expert Witness.

Roger was the project manager responsible for terminal planning and modal interchange studies at the proposed St Pancras international railway terminal in London as part of the Channel Tunnel Rail Link development. He provided technical support to the Expert Witness and Legal Counsel on road traffic issues both at the House of Commons and House of Lords Select Committees for the Channel Tunnel Rail Link Bill.

Qualifications

MSc, Transportation Planning and Management, University of Westminster, 1987
Postgraduate Diploma in Transport Studies, London College of Advanced Transport Studies, 1986

Diploma in Road Transport Engineering, East Ham College of Technology, 1984

Member of the Chartered Institute of Logistics and Transport

Member of the Institute of Road Transport Engineers

Shaleen Srivastava**Technical Director – Jacobs**

Bachelor of Science (Major: Civil Engineering) and Master of Science (Major: Transportation)

Profile and Key Skills:

Shaleen is a Technical Director and head of transport modelling and transport data integration and fusion team in Jacobs Local Government Services in the UK. His experience includes multi modal demand and micro simulation transport modelling and development of a unique transport data fusion platform (J-lem/TDI). Shaleen is experienced in using VISUM, SATURN, CONTRAM, DIADEM, VISSIM, PARAMICS, TRANSYT, LINSIG, ARCADY, PICADY, OSCADY, SYNCHRO, SIMTRANS, HIVEW, TUBA, COBA, QUADRO and PROBS.

Shaleen's mathematical, computing and modelling ability has enabled him to develop, almost single handed, J-lem/TDI, a data led approach to network management, using real-time data from various ground data sources (cameras and loops) and wireless data from GPS, GPRS and GSM. To achieve this Shaleen has developed the system architecture and written the software to sort, process and integrate large volumes of real-time data (speed, journey times, classified volumes and OD trips by purpose and modes) to provide network management and real-time multi modal transport models for future traffic predictions. Shaleen has also developed an innovative Cost-Benefit approach to support Kent's Permit Scheme Application to the DfT which integrates CBA with MCA. Shaleen has also developed various software programmes for both macro and micro simulation modelling important of which are VISUM-SATURN interface, Parametric Calibration of microsimulation models and a combined 4-stage multimodal travel demand model. Shaleen is currently working on a universal SCOOT and macro-micro coupling simulation technique which may bring a major breakthrough in testing adaptive control and managing congestion more efficiently. Shaleen has written various research papers and articles and has presented in various ITS and modelling conferences.

Shaleen is also a visiting lecturer in University of Surrey where he teaches Mathematics/Statistics and Discrete Choice Modelling in MSc transport course.

