TECHNICAL NOTE

Job Name: Warwickshire CITEware

Job No: 28810

Note No: 001

Date: 11/09/13

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Subject: **Overview of CITEware**

Item	Subject
1.	**Introduction** The conceptual basis of the strategic modelling technique used in CITEware was developed for Warwickshire County Council and the Highways Agency in order to provide a robust strategic modelling tool to allow WCC to measure the impact of planned developments on the strategic road network. The concept of a model utilising journey time and distance to predict strategic journey routing has evolved over time to incorporate a number of routing behaviour rules, and a finer grade of initial distribution has been achieved, however the basis remains the same; A distribution of likely trips to and from a destination using census data, and route choice determined by a combination of travel time and distance to the destination. The current model is based in Microsoft Access, and runs using data taken from GIS and other sources. For displaying the results it is best to use a GIS to match up the output results (in spreadsheet format) with a GIS representation of the road network. The GIS network used is based on the Ordnance Survey's StrateGI layer, licensed under the opendata system. The network does have a significant difference from a truly geographically accurate map, due to its focus on clarity and legibility as a schematic mapping layer. However, the most important factors for our modelling is the length and accurate joining points for the modelling links and the marginal differences from a more accurate layer are outweighed by the benefits of it's consistency and accurate bridging data, and goes down to a minor road level which is more than sufficient for a strategic model. The model uses Tempro growth factors to estimate background traffic growth in future years, and road capacities are calculated on the basis of DMRB formulae where volume over capacity calculations are done.

DOCUMENT ISSUE RECORD

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2.	**Trip distribution** Trip distribution is based on 2001 census journey-to-work information. A given site has its trip generation allocated to wards in the proportions found in census data, and this is then allocated across the road network, so that all roads where it is feasible that trips may load onto are given a 'packet' of trips which will then be routed to their destination (in the case of inbound trips – for outbound trips the packet travels in the opposite direction). Any other planning assumptions (other potential sites which will produce trips to/from a modelled development) are compared on a distance and size basis to the existing travel patterns and inserted as equivalent gravity-draws to the existing wards. In effect this estimates what the travel pattern would be if the planning assumptions were in place by treating them as being in competition with the wards already present for a proportion of trips. The potential pitfall using this methodology is that when a planning assumption is both large and very close to a modelled development, it could potentially be estimated to have an even larger proportion of trips than in reality. Although the large size and proximity of a planning assumption might well make journeys between it and a modelled development desirable, clearly in reality the number of jobs available and other considerations would not allow an overwhelming proportion of trips to travel a very short distance to another site, even if it were very large. There is also a facility to cap the maximum draw to an individual planning assumption to avoid this. Large sites in proximity to one another can also be treated as part of a single development (from a modelling point of view), or not used as planning assumptions for each other so as not to distort the travel patterns. For the purposes of the model any sites that are closer than 1km to one another will sometimes model better if treated as a single development unless the draw is capped.
3.	**Decision-making at junctions** Once a development location has been determined, the destinations are taken as the wards that the census data indicates people will travel from/to. The model splits the population travelling to/from the development in the proportions taken from the census data, modified by any planning assumptions that are present in the modelled scenario. Each destination is given a proportional draw, and the population is loaded onto a simplified version of the road network; Junctions are simplified to a t-junction or crossroads. This enables every junction to have a calculated probability of journeys heading down the possible routes leading from it. The probability is based on distance and time values calculated from known and estimated average road speeds and distances taken from the OS data, and both distance and time are taken into account: Originally, the probability of using a link was determined by the ratio between the values of: $\frac{1}{\text{Distance}^2}$ However, after consideration and testing another factor was tried: $\frac{1}{\text{Average Speed}^2}$

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	This has some advantages, as it considered other factors than the shortest route, but we were unconvinced that this was a satisfactory methodology, as sometimes it would favour a faster route that nonetheless was longer and unlikely to be favoured in reality. Having time be a factor was, however, something that was a sound idea that made the model reflect reality more closely, so after trying various factors, we arrived at: $\frac{1}{\text{Distance x Time}}$ This is an effective predictor of travel as it factors in both the time taken for a given route as well as the distance involved, as it was considered that both the speed of a given route, as well as the perceived distance of travel would be factors in choosing a particular route. At every possible junction, available routes are evaluated. Routes that are “time-negative” I.E they take you further away from the destination, are discounted. All other routes are compared and trips are allocated proportionately. Dead ends are treated as only useful if a destination is located on them – otherwise the routing simply avoids them.
4.	**Datasets used** • The datasets that were used in the model development are as follows: • Strategi road network (Ordnance survey) • Journey-to-Work dataset from 2001 census • Ward boundaries • DfT Congestion Indicator data to inform road speed • WCC Centre Line Flow project to inform on base traffic flows across county network.