

5. BASE MODEL DEVELOPMENT

5.1 INTRODUCTION

The reference case analysis was carried out for four time periods:

- Average working day (24hours),
- AM peak period
- Inter-peak period
- PM peak period

The average working day is defined as the mean of the days from Monday to Friday and assignments were prepared for representative hours as follows: -

- AM Peak : 60% of travel demand between 0700 and 0900 hrs
- Interpeak : 33% of travel demand between 1100 and 1400 hrs
- PM Peak : 60% of travel demand between 1600 and 1800 hrs

5.2 INCLUDING DATA INTO THE NETWORK MODEL

Data from traffic counts and surveys have to be included to the network model to allow for validation. So-called *Census points* have to be defined in the relevant links, for which count data can be stored. The census points have been classified into different types according to the source of their data (A453 MMS, M1 Corridor MMS, NCC Surveys, Bus passenger surveys) and whether the information has been used in model calibration or can be considered as an independent validation. The classifications are summarised in Table 5.1. Each location is attributed with values for the 24-hour-flows, the AM peak, the interpeak, and the PM peak flows, each by direction of travel.

Table 5.1: Census Point Types in the Network Model

Census Point Type	Definition
1	Used for through traffic calibration
2	A453 MMS RSI sites
3	Nottingham City Council RSI sites
4	M1 MMS RSI sites
5	M1 MMS – unused for validation
6	Bus and passenger count sites A453 MMS
7	Passenger count sites NCT
8	Rail survey sites

Type 1 consists of census points that would otherwise fall into categories 2 or 4. In section 2 previously, figure 2.3 shows the location of the roadside census sites and figure 2.6 shows the location of the public transport (bus) census sites.

5.3 PROCESSING OF THE STRUCTURAL DATA

Structural data were available from the DTLR national database associated with NTEM and consultations with Local Planning Authorities.

5.3.1 Behavioural Groups by Zone

NTEM planning data contain figures for eleven behavioural homogenous person groups at ward level for the year 1998; and at district/NTEM zone level for 2000.

In a first approach the data from 1998 have been used. The ward level information was transferred to transport model zone level by preparing a ward to zone equivalence list. In areas, where zones are smaller than wards, for example city centres, a split factor was used to bring the ward information to the zone level. Also where the ward and zone boundaries did not coincide, split factors were used to get more appropriate results.

During the course of work NTEM data at zone/district level for 2000 became available. Unfortunately there were some inconsistencies between these data and the 1998 data. Data from local authorities have been used to overcome this problem.

The following procedure has been applied:

- i) NTEM data for 2000 at district and NTEM zone level have been used as basis
- ii) For Rushcliffe District the population/household figures have been rebalanced between NTEM zones PN1 and PN2 to match Local Authority data; all other NTEM zone totals have remained unchanged
- iii) Disaggregation to A453 zones. For Nottingham, Gedling, Broxtowe, Rushcliffe, Erewash and North West Leicestershire disaggregation is based on proportions of NTEM totals calculated from Local Authority data. For other districts 1998 NTEM data or Local Authority data as available have been used. For disaggregation below Ward Level the proportions based upon local knowledge have been used.
- iv) Disaggregation of population totals to behavioural homogenous person groups is based on NTEM proportions.

Data preparation is described in more detail in Working Paper No. 15

5.3.2 Working Places per Zone

Total employment at ward level was known from the NTEM planning data. To bring this data to the A453 zone level the same procedure was adopted as for the behavioural homogenous person groups. This information is dated from 1991 except for the City of Nottingham, where more up to date information was available (1997; Source : Office for National Statistics Annual Employment Survey).

5.3.3 Analysis of Shopping Attraction Determinants

A zonal measure representing shopping attraction has been allocated based on the number of employees in shopping facilities. Additional to this statistical data local information was also gathered and included.

In order to enhance the modelling of shopping behaviour, separate activities were reflected for daily shopping and for purchase of longer term goods.

5.3.4 School Places per Zone

Three school categories are used in the model:

- Primary schools
- Secondary schools
- College/University

For each zone of the transport model, primary school pupils, secondary school pupils and university/college students have been determined.

5.4 MODELLING COMMERCIAL TRAFFIC

Similarly to general private transport, commercial traffic was modelled separately as traffic within the inner modelling area and external traffic. To allow for production of indicators for later use in the TUBA process the travel demand has been estimated for the three vehicle categories passenger cars, light goods vehicles and other goods vehicles.

5.4.1 Commercial Traffic in the Inner Modelling Area

Modelling is similar to the approach for the other private transport segments. There are two zonal characteristics, potential for generation and potential for attraction. Generation is determined through the number of working places, attraction is based on a weighted combination of numbers of working places (70%), working places in shopping facilities (25%) and residents (5%).

In analogy to person groups trade sectors with similar characteristics have been selected. Based on local knowledge and on data from the Nottingham Car Parking Survey (October 2000) numbers of working places have been aggregated on the A453 zone level into eight sectors and further into the three groups of sale, transport, and other. Each group has specific values for the rate of employees who are driving, the number of daily tours per driver, the number of destinations per tour, and the shares of tours with the different vehicle categories.

5.4.2 External Commercial Traffic

The total external travel demand is split into three segments: passenger cars, LGV and OGV. This implies that commercial traffic with passenger cars is handled together with the other trip purposes. The share of demand for the three vehicle categories has been derived from the road side surveys for this project and the M1 study and is as given in Table 5.2.

Table 5.2: Shares of Vehicle categories in External Traffic

Time	Passenger cars	LGV	OGV
AM Peak	78%	12%	10%
Inter-Peak	68%	14%	18%
PM Peak	81%	11%	9%
24 hours	75%	12%	13%

5.5 ADDING EXTERNAL MOVEMENTS TO THE MODEL

External travel demand from several sources is included in the model. As mentioned above, external demand consists of trips which cross the border of the Inner Modelling Area.

In private transport the main source are the road side surveys carried out for this study and the M1 MMS. However, these data do not include information about through traffic on the M1 and the A42. These data have to be modelled during the calibration process, which is described in section 6.2.1.

Additionally a separate model has been developed for travel demand caused by East Midlands Airport. Data for this model have been made available by the operator. EMA travel demand is modelled for the three categories air passengers, employees, and goods transport (90% LGV, 10% OGV).

In public transport data have been prepared separately for the regional demand, based on a train passenger survey, and long-distance-through movements, based on data from the M1 MMS. No data have been available for regional bus services.

5.6 FINAL MATRIX ASSEMBLY

This section outlines the steps followed to rationalise the number of matrices from those produced initially and the process followed to ensure compatibility between matrices produced from the different sources listed previously.

The steps can be summarised as follows:-

- Matrices for private and public transport for the Inner Modelling Area are reduced in coverage from the Greater Modelling Area, (the three counties of Nottinghamshire, Derbyshire and Leicestershire), to the Inner Modelling Area only (as referred to in section 2.1).
- In a parallel stage the EMA demand is added to the general external private transport.
- Mode shares are adjusted by modelling of Park+Ride.
- Finally the matrices for public transport are merged.

The resulting OD matrices for the following demand segments are used as input to the assignment process:

Public Transport

B = Public transport (including bus, heavy rail and light rail for forecasting)

Private Transport – Internal demand segments

D = Passenger car, trip purpose *employer’s business*(commercial traffic)

C = Light goods vehicles

O = Other goods vehicles

H = Passenger cars, trip purpose *Home*

M = Passenger cars, trip purpose *Commuting to work*

P = Passenger cars, remaining trip purposes

Private Transport – External demand segments

(Private transport crossing the borders of the inner modelling area):

E = Passenger cars

X = Light goods vehicles

T = Other goods vehicles

As there are four time periods modelled, a total of forty matrices were prepared for the base year model .

The *unit* in the public transport matrix is *person trips*, and in the private transport matrices it is *vehicle trips*. However, the demand model for the inner modelling area provides also data about car passenger trips, so that totals of person trips can be determined as well as vehicle occupancy rates.

Figure 5.1 schematically illustrates the sequential process outlined above.

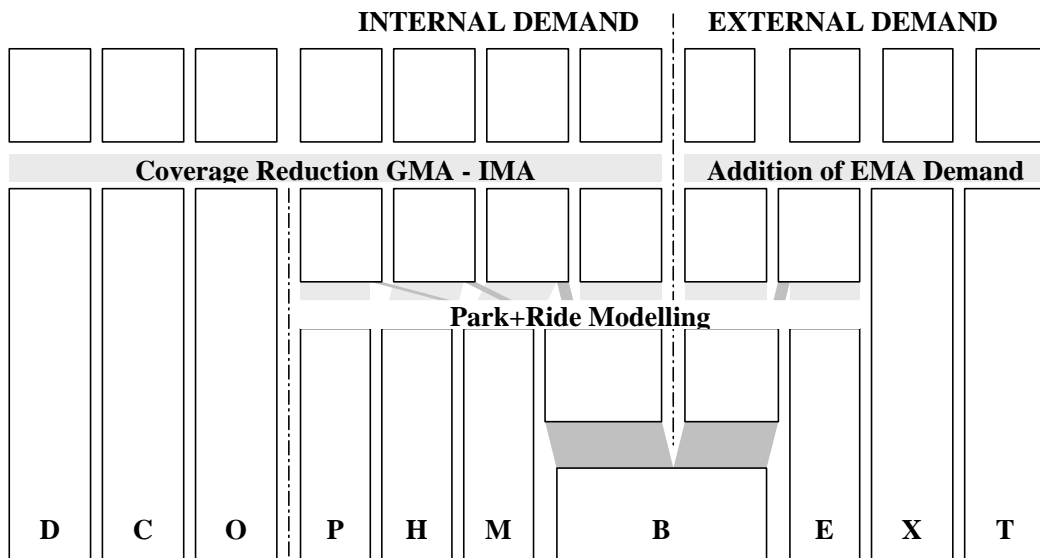


Figure 5.1: Schematic matrix composition

The demand modelling outlined in section 5.6 generated matrices of movements. The following summarises the sources of data for the demand segments listed above.

		To	
		Internal	External
From	Internal	B,D,C,O, H,M,P	E,X,T
	External	E,X,T	E,X,T

Shaded area = from observed (roadside surveys, public transport surveys)

Unshaded = from the synthetic demand model

For the purposes of this table the Inner Modelling Area=Internal, and the Greater and Remote Modelling Areas = External.