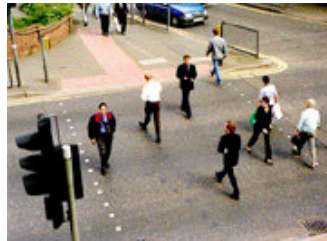


## 4. THE TRAFFIC MODEL



## 4. THE TRAFFIC MODEL

### 4.1. Introduction

This chapter presents an overview of the modelling approach used to develop the traffic forecasts for the Study area for the period up to 2020. The traffic forecasts allow a good understanding of potential traffic flows and patterns throughout the network over the future years, thereby allowing particular solutions to be developed and assessed in terms of their impact in addressing expected demands.

### 4.2. Forecasting Approach

A comprehensive transportation demand forecasting model has been developed by the Dublin Transport Office (DTO) to provide a useful planning tool for the Greater Dublin Area. The model was developed from an extensive survey of travel behaviour conducted across the Greater Dublin Area, and has been successfully validated as a forecasting tool. The model was developed as part of the development of the 'Platform for Change' Strategy, extending from Drogheda in the north to Arklow in the South, and Kildare in the west, with an increasing level of detail and accuracy as one travels further into Dublin City Centre. For the Bray area, the model has been constructed at a reasonable level of detail, although some further work was necessary to improve the model as a forecasting tool for use in the current study.

The basic structure of the DTO Model is as follows:

- Trip Generation:** Estimates the number of trips that will be made within the study time period (i.e. AM Peak Hour).
- Trip Distribution:** Links the trip productions and attractions to determine origin to destination travel flows.
- Mode Split:** Determines the travel mode for each origin to destination flow. A multinomial logit model is used to determine the breakdown by mode.
- Trip Assignment:** Determines the trip route through the given transportation system for each origin to destination flow.

In recognition of the interaction between the four components of travel behaviour, equilibration is achieved by iterating through the three stages of trip distribution, modal split and trip assignment until a reasonable level of conformity is achieved between assumed and actual highway travel speeds.

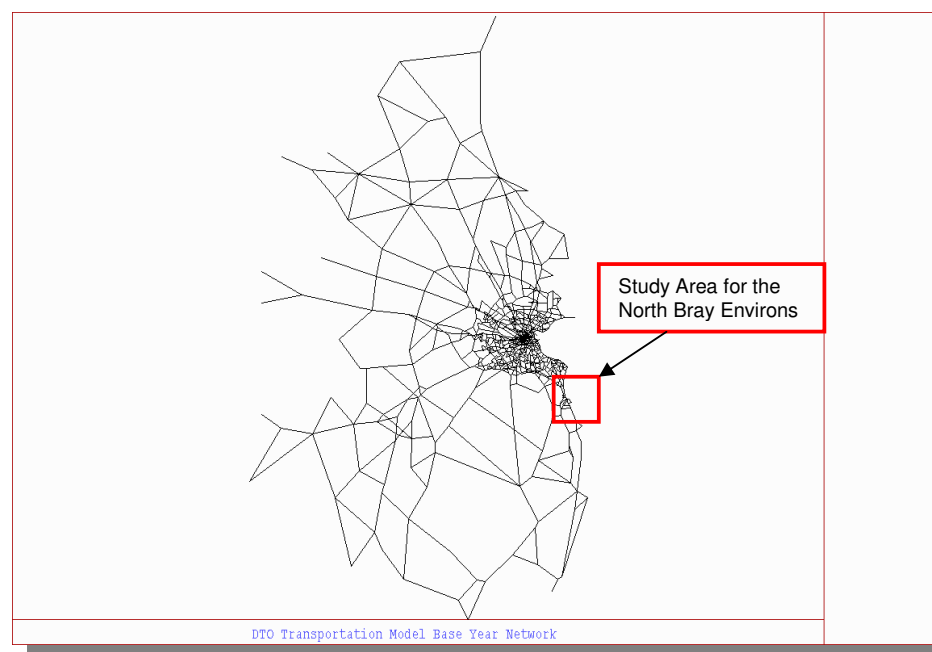


Figure 5-1: DTO Transportation Model Extent of Network

f:\projects\40203\_north bray luts\reports\draft final 151105\final report\_rev4\_v0.doc

### 4.3. Local Area Modelling

As already stated, the level of detail of the DTO Model in the Bray area is not sufficiently refined for use as part of the current study, and hence some further enhancement was necessary to improve the quality of the model. Given the strategic nature of this network and the nature of the proposed developments in and around Bray, it was concluded that the most effective means of assessing the impacts of these developments would be to develop a Local Area Model (LAM), using the broader DTO model as a donor. The process by which this was achieved is known as *Cordoning*, and this process is undertaken within the SATURN software suite. Essentially, the cordoning process is used to extract the relevant network and zone definitions from a Full Area Model (FAM), by cutting a continuous screenline across the defined study area of interest. This achieves a number of purposes:

- Model run times are significantly reduced given a smaller network definition.
- The risk of assignment 'quirks' or 'model noise' can be minimised within a smaller analysis area.
- The local area network and zoning system can be improved to reflect more local conditions that would normally be appropriate for a strategic model.

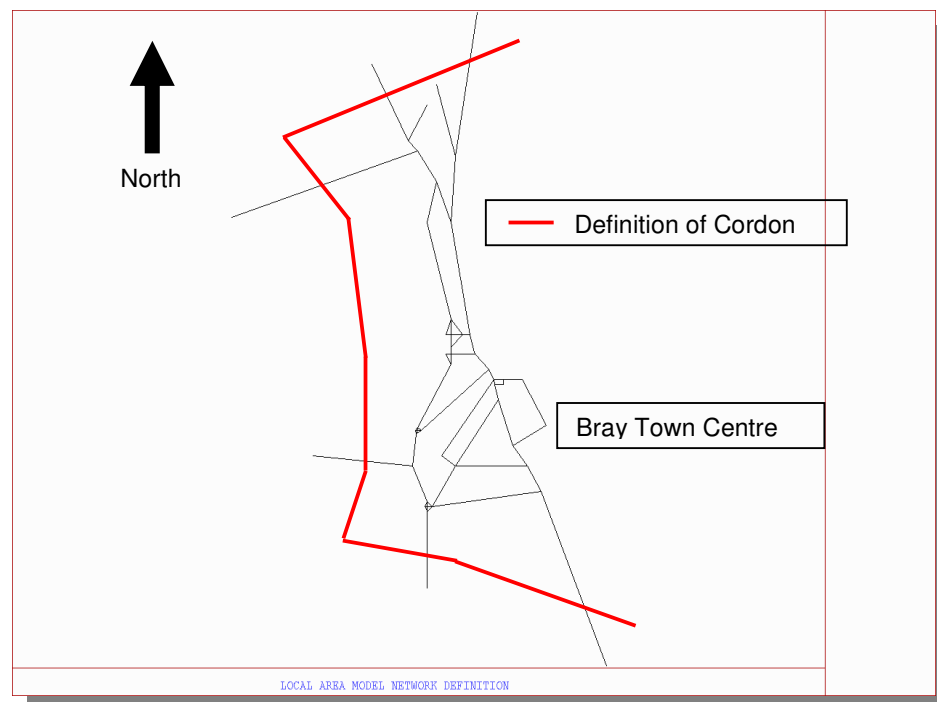


Figure 5-2: LAM Network Cordon

### 4.4. Refinement of the Zone System

The DTO Model incorporates some 542 zones across the Greater Dublin area. These zones define the demand for travel in terms of origins and destinations within the model trip matrices. The cordoning process described above resulted in a set of trip matrices for Heavy Vehicles and Light Vehicles comprising 57 zones, of these:

- 8 are External Zones, and;
- 14 are Internal Zones.

It will be noted that the external zones include all trips into and out of the cordoned area from the remainder of the Greater Dublin Area.

In analysing the internal zones within the LAM, it was concluded that specific zones could be further disaggregated into smaller zones to more accurately reflect current and future local conditions. In cases where new zones were created, the trip distribution characteristics of adjacent zones of a similar land-use was applied to the new zone trip generation and attractions. The revised zone system definition and percentage contribution to the relevant DTO model zone is detailed in Table 5-1.

Table 5-1: Recoded LAM Zone System & Numbering

Old Zones	New Zones	%	Old Zones	New Zones	%	
50458	50458	100%	51566	5661	50%	
				5662	50%	
50459	4591	75%	51567	5671	17%	
	4592	25%		5672	18%	
50519	50519	100%		5673	25%	
				5674	20%	
51561	561	100%		5675	20%	
51563	5631	10%	81235	9351	5%	
	5632	30%		93511	5%	
	5633	15%		93512	5%	
	5634	5%		93513	5%	
	5635	15%		93514	5%	
	5636	25%		9352	25%	
51564	564	85%		9353	20%	
	5641	15%		9355	10%	
				9354	20%	
51565	5651	35%		81103	803	60%
	56531	4%			8031	40%
	56532	4%				
	56561	15%		81104	804	100%
	56562	15%				
	56563	3%	81105	805	100%	
	5654	5%				
	5657	4%	81106	806	100%	
	56521	3%				
	56522	3%	81232	932	100%	
	56551	3%				
	56523	3%				
	56552	3%				

\* A dummy zone 9991 has also been added but set to zero

The result of this process is that the LAM incorporates 57 zones, of which 8 are external zones, and 49 are internal zones.

#### 4.5. Changes to the Highway Network

In analysing the cordon model network, it was concluded that a number of additional road links would need to be added to the LAM to more accurately reflect local conditions, these are:

- M50 Interchange at Cherrywood (Note that this facility opened in August 2005, and was excluded from the base year model calibration)
- Cherrywood Road, Falls Road and Stonebridge Road in Loughlinstown
- Ballybride Road, Crinken Lane and Ferndale Road in Rathmichael
- Old Connaught Avenue, Ballyman Road and Thornhill Road in Old Connaught/Fassaroe
- Lower Dargle Road and various local distributor roads in Bray.

The inclusion of these links ensured that the impact of the development proposals on the general area could be fully understood as part of the Traffic Forecasting process. Figure 5-3 highlights where these additional links have been incorporated into the LAM network.

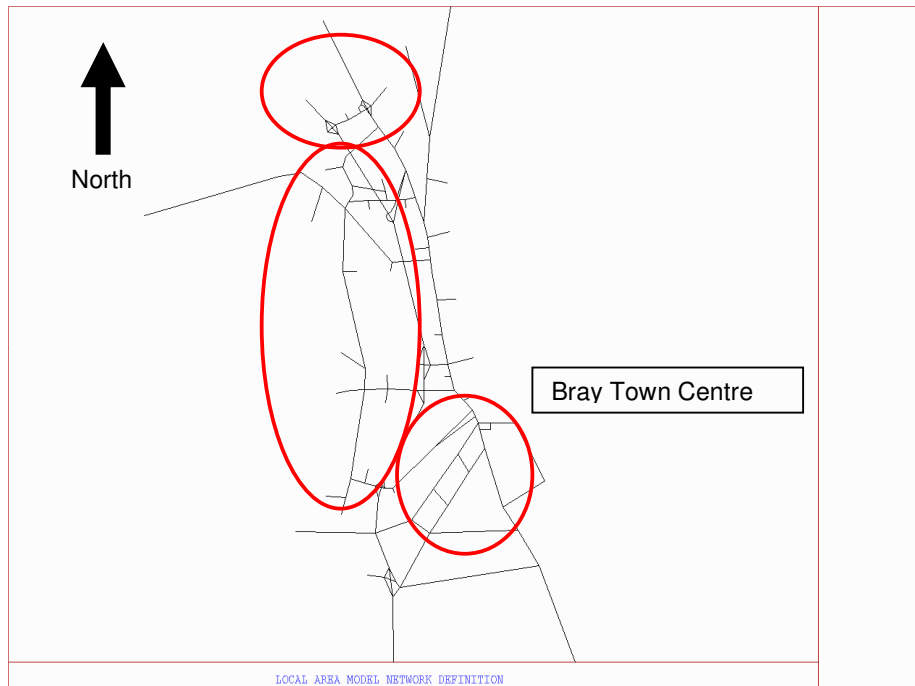


Figure 5-3: Routes added to the LAM Highway Network

#### 4.6. Adopted Traffic Assignment Method

The SATURN suite of programs contains a number of assignment techniques that can be used within the modelling process. The DTO SATURN model assigns traffic according to a Stochastic Equilibrium Assignment, which is the default assignment traffic technique within SATURN. This assignment method is based on Wardrop's Principle of Traffic Equilibrium, which states:

*"Traffic arranges itself on congested networks such that the cost of travel on all routes used between each O-D pair is equal to the minimum cost of travel and all unused routes have equal or greater cost"*

The stochastic element of the assignment process allows for a degree of variability in route choice, in that not all assigned vehicles will necessarily pick the shortest or lowest cost route between origin and destination zone. This technique is believed to more accurately reflect driver behaviour in reality, and is considered appropriate for the purposes of this study.

For consistency with the DTO model, this Stochastic Equilibrium Assignment Method was also adopted for the Local Area Model.

#### 4.7. Local Area Model Specification

The LAM derived from the donor DTO Transportation Model incorporates the following:

- 53 Priority Junctions
- 10 Traffic Signal Controlled Junctions
- 20 Roundabouts
- 22 Bus Routes
- 657 Assignment Nodes
- 987 Assignment Links
- 57 Zones

An overview of the zone connections to and from the highway network is presented below in Figure 5-4.

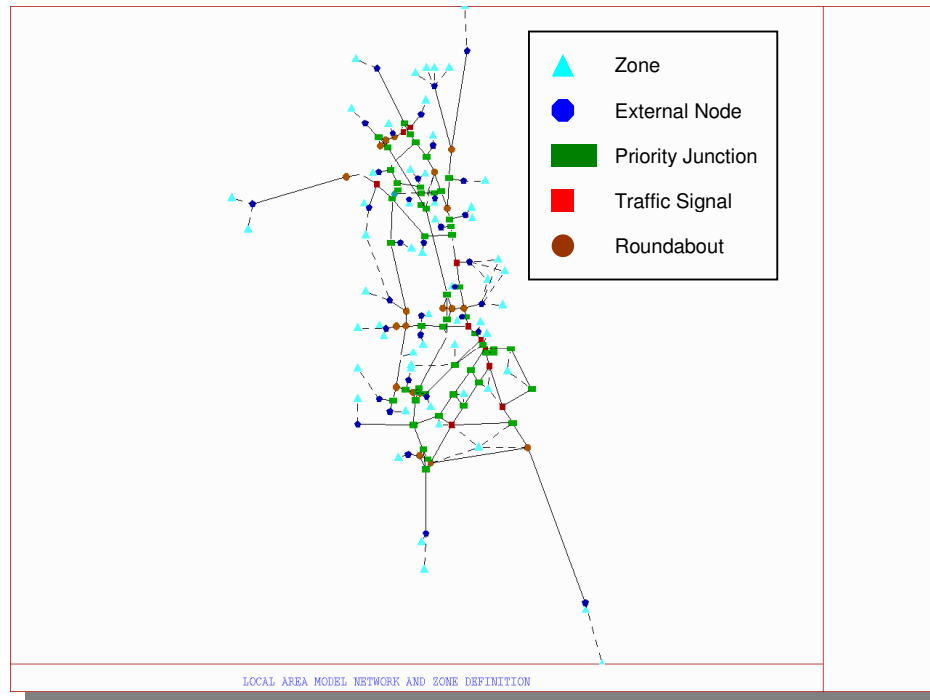


Figure 5-4: Local Area Model Network and Zone Definition

The trip matrices derived from the DTO Transportation Model reflect 2001 AM peak conditions. Separate matrices are available for Heavy Vehicles and Light Vehicles, with summary information for each outlined in Table 5-2.

Table 5-2: 2001 Cordon Matrix Demand

Vehicle Class	2001 AM
Heavies	956
Lights	10607
% HGV	8%

#### 4.8. Data Collection

The DTO Transportation Model used as a basis for this study was developed to reflect a Base Year of 2001. For the purposes of this assessment, it was necessary to update the Local Area Model to reflect operating conditions for the year 2005 and which would represent the starting point for subsequent analysis. In order to do this, it was necessary to collate a database of available traffic count information for the area, review the data, and factor the information to reflect a typical AM and PM peak hour for the year 2005.

This data collection programme required two tasks. Firstly, to establish the extent of useful existing traffic data in the area held within the databases of the Dun Laoghaire / Rathdown County Council, the NRA and Bray Local Council, and secondly to supplement this data with new surveys where appropriate. This process is described below.

#### 4.9. Available Traffic data

Traffic data was available for a number of locations within the study area, from local sources, as listed below:

- Dublin Road/ Crinken Lane
- Dublin Road/ Wilford Interchange Roundabout
- Dublin Road/ Old Connaught Avenue
- Dublin Road/ Upper Dargle Road
- Dublin Road/ Lower Dargle Road
- Vevay Road/ Killarney Road
- King Edward Road/ Killarney Road

- R117 Enniskerry Road/ M11

#### 4.10. New Traffic Surveys

In order to supplement the existing traffic information in the area, some additional traffic surveys were undertaken at the following locations:

- Loughlinstown Roundabout – Dublin Road/ M11/ N11/ Parknasilla Rise
- SEM overbridge/ Rathmichael Road/ Ferndale Road/ Ballybride Road
- Lordello Road/ Ferndale Road
- Wilford M11 Interchange
- Slip off M11 onto Old Connaught Avenue
- Fassaroe M11 Interchange
- Dublin Road/ Shanganagh Road/ Corbawn Road
- Old Connaught Avenue/ Ballyman Road/ Ferndale Road/ Thornhill Road
- Herbert Road/ Main Street/ Castle Street/ Quinsborough Road
- Killarney Road/ Boghall Road
- Killarney Road – M11 Interchange

These supplementary surveys were undertaken during February 2005, and a summary of the traffic count locations is shown in Figure 5-5.

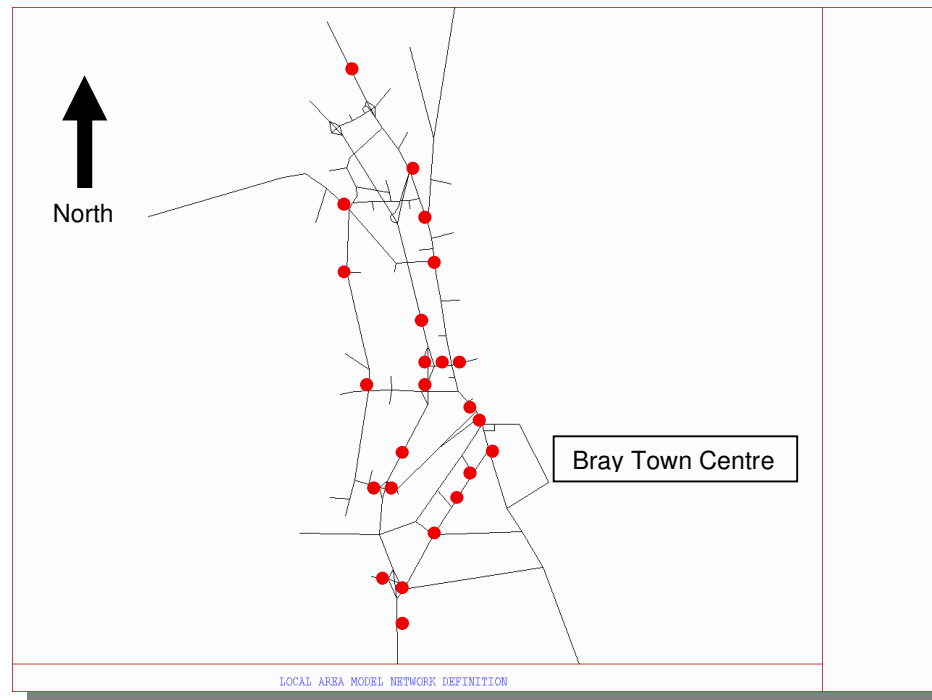


Figure 5-5: Location of Traffic Counts

#### 4.11. Calibration & Validation

The methodology adopted in calibrating and validating the LAM has been undertaken in line with the guidelines presented in the DMRB (Design Manual for Roads and Bridges) Volume 12. This is an internationally recognised standard for traffic model development, and is in line with the protocols of the Dublin Transport Office (DTO).

#### 4.12. Future Year Traffic Models

In order that any strategies can be adequately evaluated, it was necessary to prepare traffic models that would reflect the relevant future years. The two years selected for the current study were 2020 as the study horizon, and 2010 as an interim year. Future year traffic models were developed for both these years that reflected the expected level of development that would be expected to occur over the relevant periods. The future year traffic models were developed as follows:

- Expected future development within each zone in the study area was compiled from zoning maps, planning information, and assumptions regarding the pace of development in the different localities throughout the study area. This process was undertaken for both 2010 and 2020. This development was translated into a set of Trip ends using appropriate trip generation rates;
- The additional trips were distributed throughout the study area and the external zones based on existing trip distribution patterns in adjacent zones. Where such information was not available or realistic, trips were distributed based on a gravity model technique. This process produced a single matrix comprising internal - internal trips and internal – external trips;
- External – external trip growth for the future year models was established by growing existing external trip ends according to an annualised growth rate that was interpolated from observed growth across the screenlines in the DTO model from 2006 to 2016. These additional external – external trips were also compiled into a matrix.
- Both matrices were added to the base year matrix to reflect 2010 and 2020. The result was a future year matrix that reflected both growth in traffic within the study area, and recognised the growth in traffic travelling through the study area.

In addition, the M50 opening also needed to be incorporated in to the future year models. This was undertaken by a manual redistribution of trips between the M11 and M50. .

#### **4.13. Conclusion**

The above process has therefore led to the development of a base and future year Local Area Highway Model that has been adequately calibrated and validated, and is therefore a robust tool upon which to develop a Transportation Strategy for the Bray Environs.