Extract from the Initial Specification Report for the Auckland Regional Transport Models

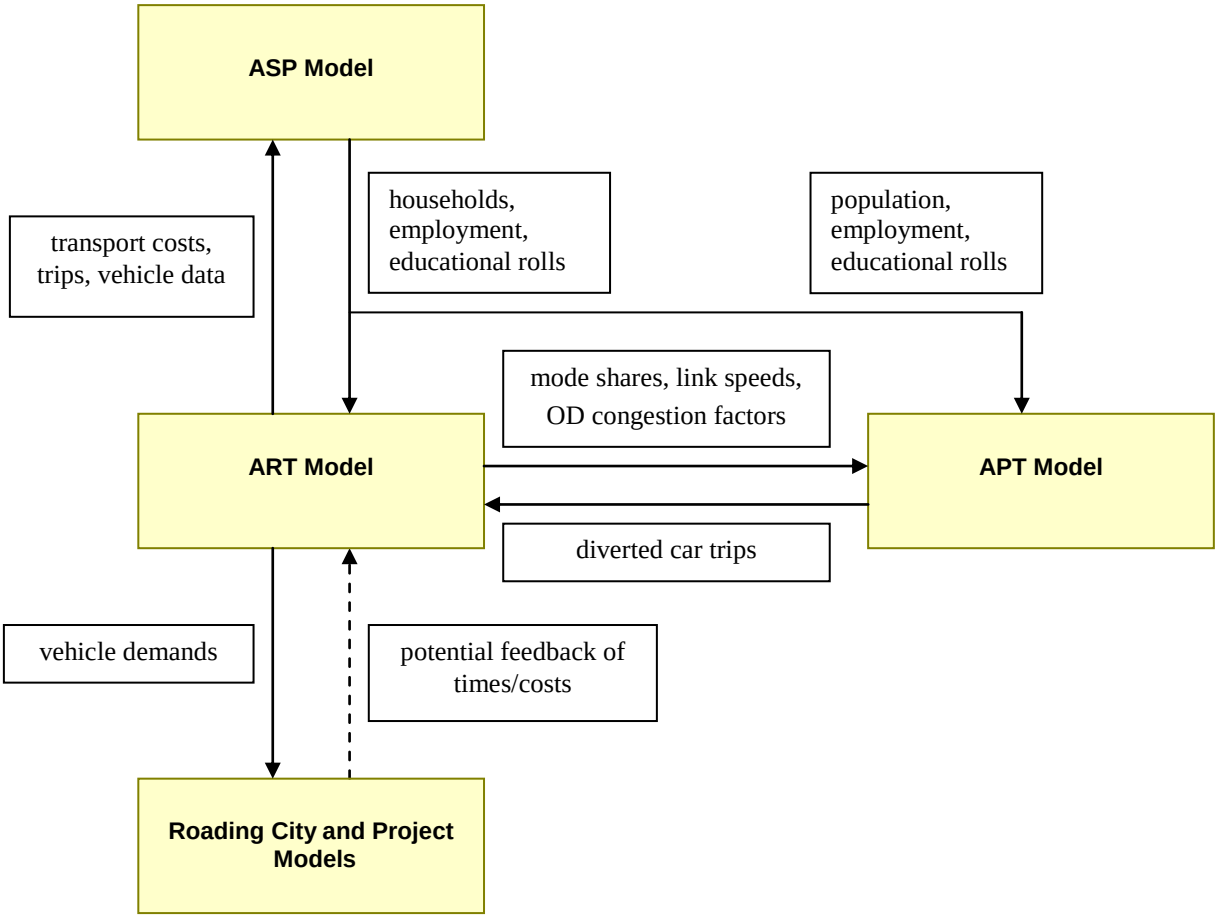
(the equivalent of the Functional Specification)

1. Overall Modelling Structure

The overall structure of the Auckland modelling system would be retained as shown in Figure 1. In addition, a separate walking and cycling database will be developed to assist with specific projects for these modes.

The ATM2 project includes the development of the ASP and ART models and the interface procedures with the APT model and with roading city and project models.

- **Figure 1 Auckland Modelling System**



2. Extent of Models and Zoning Systems

2.1 Introduction

The extent of the models and their zoning systems are presently being finalised following a process of review and development and the final outcomes are to be reported elsewhere.

A series of workshops have been held with individual Cities and Districts within the region, and with regional agencies (ARC, ARTA, Transit). From these, information on the draft model extent and set of zones was distributed to stakeholders for further comment before finalisation.

Appendix A provides the most recent information from this process.

2.2 Extent of Models

ASP3 will cover the whole Auckland region at least, and the need for extension beyond the region into Waikato to include Tuakau and Pokeno, in order to be able to test growth scenarios related to them, is presently being considered.

The extent of the ART3 modelled area has been reviewed in the light of new and planned peripheral development and transport planning and policy needs. It is presently proposed that the coverage of ART3 be considered in terms of an internal area, in which travel is represented fully, and an external area, in which travel is represented only partially.

The internal area would:

- extend to Waiwera in the North (slightly north of the current model which ends at Hatfields Beach);
- include Coatsville and Riverhead (Coatsville is currently not included);
- extend to Waimauaku in the North West (the same as the current model);
- extend part-way between Papakura and Clevedon in the South East (as at present);
- in the South, extend to the Bombay Interchange and Pukekohe (beyond the current area), and Hingaia (as at present).

The external area would cover the rest of the area modelled by ASP3 and would be represented by the same zone structure. Vehicle and PT travel between these external zones and the internal area would be included in ART3, but not trips within or between the external zones.

At the boundaries of ASP3 with Northland and Waikato would be external links with vehicle trips between these links and the internal ART3 area represented.

The travel associated with the external zones and links will be derived from the External Cordon Surveys rather than the Household Travel Survey.

2.3 Zoning System

The zone structure for ASP3 and ART3 will be more detailed than the current models. Currently there are 203 zones internal to ART and the intention at the start of the zoning review was that ART3 would have between 400 and 600 zones. The draft zoning system developed to date has some 500 zones for the whole of the ASP3 modelled area.

The criteria and constraints considered in the zone re-design include:

- Existing geographical boundaries with which consistency is desirable. Adherence to Territory Authority boundaries and Census meshblocks is considered essential. Compatibility with current zoning systems is considered desirable but should not constrain the new zoning system. Fitting with the current ART zones would be useful given the development of the 2001-based ASP3 to interface with the current ART model. Compatibility with APT zones would be desirable given the interface requirements, but as a result of the re-design work to date it has been determined that this constraint should be broken to meet other objectives, such as fitting with Growth Strategy intensification areas. Fitting with current city model zones is also a consideration.
- The amount and nature of the activity in each zone, there being benefits, for the transport model at least, in having uniformly-sized zones with the range of different land uses within a zone being as small as practically possible; identification of zones with high levels of activity, now or in the future, together with any areas considered particularly sensitive for forecasting, including:
  - Auckland CBD and sub-regional centres,
  - Auckland Regional Growth Strategy growth centres,
  - developing areas,
  - other activity centres (shopping, recreation etc),
- Accessibility to the road and public transport networks generally and to key areas, such as rail stations, bottlenecks on motorways and major arterials;
- Future projects and project corridors,
- Model output requirements such as the deprivation index;
- Operational factors, such as model running time, precision, staff resources required to set up runs and maintain the databases.

3. ART3 Specification and Model Developments

3.1 Introduction

ART3 will be a new multi-modal transport model which will be developed from new surveys and current data sources. It will replace the existing model (ART2). This chapter sets out the specification for ART3 largely in terms of specific developments from the existing model in order to highlight them.

The specification provided at this stage is based on the outcomes of the scoping exercise that preceded the ATM2 project, our proposal, subsequent discussions with the ARC and the stakeholder workshop. Aspects of the detailed technical design will follow analysis of the data, and, as such, decisions on these are not possible until that time. Hence the enhancements that are described in the following sections are subject to demonstrating their feasibility and practicability in the development of the detailed Technical Specification, following the Preliminary Data Analyses, and in the subsequent Model Estimation.

ART3 will be an multi-modal transport model with a greater level of segmentation and level of detail than the current model, with all aspects generally updated and improved. Trip distribution, mode choice and time of day will be on an aggregated basis, while trip generation will be disaggregate.

Trip generation will be a 24-hrour model for an average weekday, while decisions on the time periods for the distribution/mode choice and retiming models and on the specific demand segments retained through the model will made as part of the detailed design. The distribution/mode choice hierarchy will be theoretically consistent and generally the specification of this model and the process of estimation will incorporate latest practices. The demand models will deal with production-attraction matrices which will be transformed into origin-destination matrices for assignment.

The transport modes will include:

- car driver,
- car passenger,
- passenger transport,
- walking and
- cycling

Heavy commercial vehicles will be modelled separately and the treatment of light commercial vehicles will be considered.

The separation of the different components of passenger transport in each aspect of the model will be decided through detailed design. At present our emphasis is on recording the objectives and making sure we assemble the data that is needed. Nonetheless, it is likely that all passenger transport modes (bus, rail, ferry, park-and-ride) will be treated as a single public transport mode for distribution/mode choice because of the multi-leg/mode nature of these trips. The capability for separation into each passenger transport mode would then be through assignment.

The detailed design will consider what can be achieved with park-&-ride and the slow modes, in the context of the final zoning system and average trip lengths.

The HOV component will be a separate module available for use when required. It is proposed that this will consist of multi-user assignment plus an add-on procedure along the lines of that developed previously.

Aspects of some of these are described further in the following sections.

3.2 Overview of the Main Developments

Figure 2 provides a diagrammatical summary of the main proposed developments from the existing model, which are itemised in Table 3-1 and detailed in the ensuing sections. As noted in the preceding section all developments are conditional on analysis of the data.

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Figure 2 Summary of Main Developments for ART3

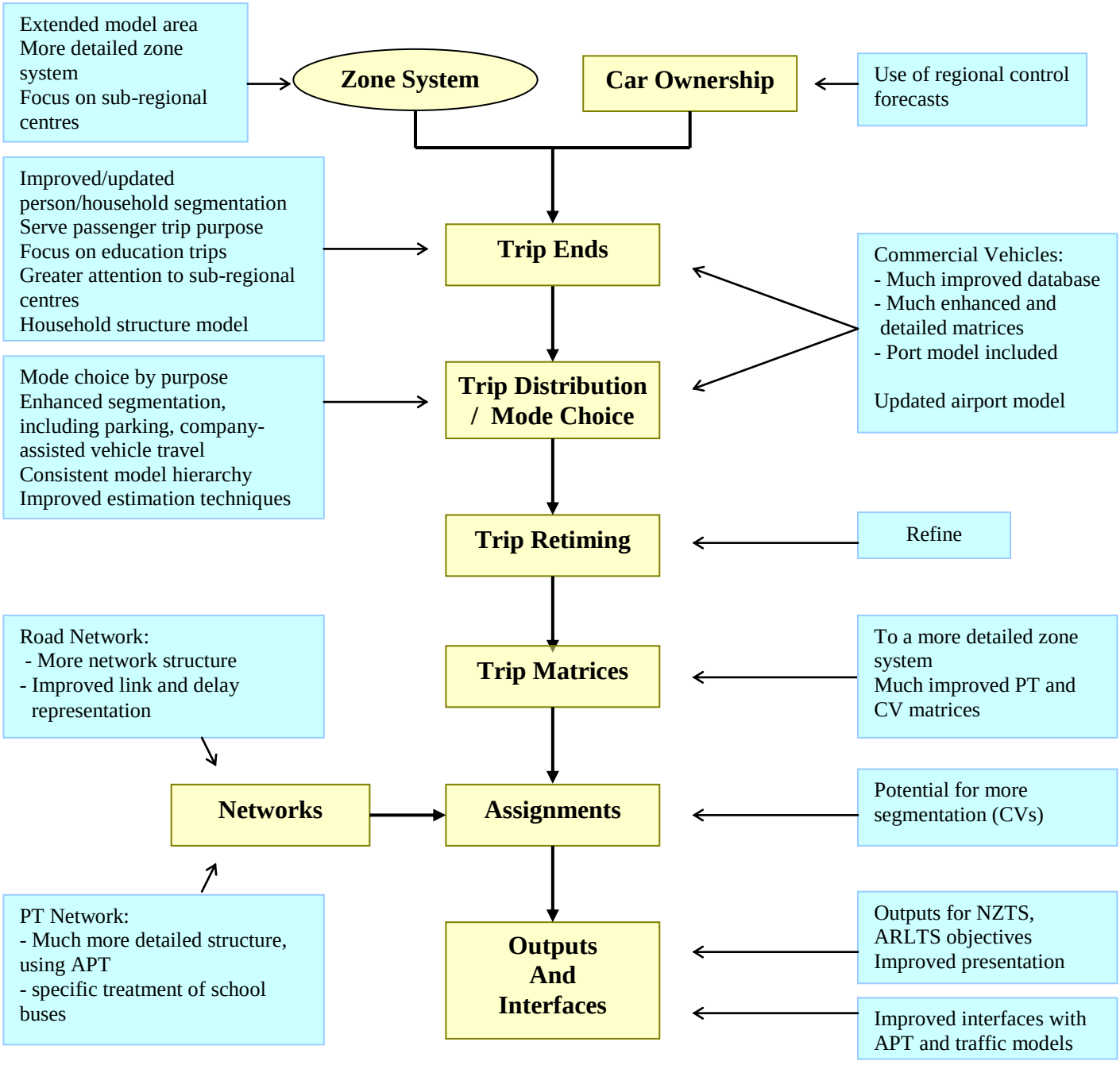

Table 3-1 ART3 Model Enhancements

Issue	Action
Study area	Review new and planned peripheral development and the Growth Strategy.
Zone system	Design greater detail (up to 600 zones). Extra detail in regional centres.
Segmentations	Updated/extended to include a business trip purpose, a person lifecycle and a 'captive-to-car' category. Person/household segmentations will be forecast by ASP.
Road network	Greater detail and improved delay representation.
Public transport network	The source will be an interface with the APT network. P&R to be considered.
Distribution/mode choice	Public transport passenger intercept surveys, and a better model structure and segmentation
Active modes	Walk and cycle modes separated; investigate role of the APT zone system; consider a one week HIS cycling diary; set up a GIS-based walk and cycle database.
Time Periods and Re-timing	Three time periods, as now; investigate pm pre-peak, peak shoulders and weekend HIS; update re-timing module, consider tours.
Parking	Include the average cost of parking, and adjust to reflect future supply scenarios; investigate parking/workplace links in the CBD; consider tours.
Tours	Review allowing the time of day choice model to operate on tours rather than single direction trips. This approach may lend itself to the modelling of parking. Investigate relating NHB trip generation and mode to HB trips.
Commercial vehicles	Current travel patterns for medium and heavy vehicles from screenline and major generator count data and operator surveys; growth factors based on the distribution of employment and economic growth; light commercial vehicles may be combined with car.
Sensitivity of trip rates by location	Separate commercial area and sub-regional centre attraction trip rates, informed by the traffic count cordon surveys. The airport model will be updated (as a vehicle-only model) based on available data and classified traffic counts. The sensitivity of travel behaviour to intensification and mixed-use development will be investigated using international research and, possibly, the census journey-to work data.
Serve passenger	Serve passenger trips will be associated with the passenger's trip purpose.
HOV	A separate HOV module will be designed on the basis of current research to establish its feasibility and a suitable design (the complication is cost-feedback to the matrices, but multi-user assignment will deal with the re-routeing aspects).
School children, school buses and students	Segmentation of education trips into primary, secondary and tertiary levels will be explored. Supplementary data collection for foreign students and institutional accommodation will be considered; other data sources will be reviewed. School buses have been coded in the APT networks, and an ability to make use of this within ART3 to assign school trips to these buses will be sought.
Car ownership	The assumed regional car ownership total will be based on an update of the review of car ownership trends in NZ by BAH for Transit NZ (1997). Within this total local density and PT accessibility effects will be considered.
TDM	Pricing: will need to consider socio-economic segmentations within aggregate modelling constraints. Non-Pricing TDM: will mainly require what-if tests or other external inputs.
Technology	Consider what vehicle technology data might be included in the HIS.
Interfaces	ART to traffic models: these will be reviewed and updated. ASP/ART and ASP/APT: these will be designed within the new modelling system. ART/APT: Existing ARC improvements will be retained and the interface will be adjusted for the increased detail proposed for ART and the common public transport networks.
Outputs	A comprehensive range of outputs will be included.

3.3 Segmentations in the Model

The model segmentations will be re-designed to be consistent with current international practice. These include the trip purposes, measures of car availability and classifications of persons and households, such as:

- a business trip purpose, for improved road pricing sensitivity in the model;
- inclusion of an age/stage in lifecycle person classification and a more efficient household/person segmentation structure;
- the importance of company cars, free car parking and other company–provided assistance in the CBDs as an influence on commuting travel patterns, is believed to be such that a 'captive-to-car' category would be investigated. The forecasting of these will need to be considered the detailed design, recognising the difficulties of predicting future changes to, for example, company-assisted parking.

The land use model will be the source of the required person/household segmentations.

3.4 Road Network Model

A more refined network compatible with that in the ARC's GIS database will be developed in terms of both the roads in the model and the detail in which delays are represented. In particular, the existing link delay functions will be updated, including reviews of:

- the current functions for weaving and merging situations on the motorway system, and the bottleneck functions;
- motorway functions to ensure that overall travel times are reproduced sufficiently;
- responses to changes in traffic patterns may be compared with existing more detailed models, such as microsimulation models of the motorway system;
- selective approach-based intersection modelling.

It is currently anticipated that Akcelik delay functions will be used on road networks. It is recognised that speed-flow relationships using typical capacity parameters in static models do not adequately account for highly congested conditions where significant weaving/merging and blocking-back queues significantly reduce the link capacity. This is especially the case on the motorway network and we intend to use the existing micro-simulation models of the motorway corridors to calibrate the capacity parameters in the motorway speed-flow curves.

Updated road network information will be collected including alignment, lanes, free-flow speed, side-friction information, and time-of-day variations for parking, bus lanes etc. This also applies to intersection data such as intersection types, specific signalised intersection information and geometry.

3.5 Public Transport Network Model

It is intended to use the APT model network to obtain the public transport costs, originally in conjunction with the APT zone system. However, the new zone system will not be consistent with APT zones giving rise to several possible options for using the APT networks:

- Developing the ART3 to APT interface (requiring more complex disaggregation/ aggregation procedures that envisaged) and using the APT zone system;
- Combining the new ART3 zoning system with the APT network;
- Modifying the present APT zone system into an interim one, which removes the incompatibilities and the need for a complex zonal interface, and use of this with the APT network.

The final decision on which option to implement will be made following the completion of the zone redesign and in discussion with the ARC.

Crowding would not be included in ART3, and the inclusion of park-&-ride will be considered, particularly in light of the use of APT.

3.6 Distribution and Mode Choice Modelling

The public transport passenger intercept surveys are intended to facilitate the improvement of the current aggregated mode choice model and the poor public transport model validation. Otherwise, an improved model structure, with a theoretically consistent hierarchy, and segmentation is planned.

These models will be estimated from the HIS and PT surveys in combination, implying that some limited tour information may need to be collected in the PT surveys. This approach was used in the development of the Wellington model.

The following is in response to points raised by the Peer Reviewer and the ARC about the development of matrices from intercept surveys versus the use of gravity models.

We understand that the UK approach for project models is to develop matrices from OD surveys. Undertaking major intercept surveys, from which matrices are developed, is not the practise in Australia and NZ. The development of matrices would require the interception of a significant proportion of vehicle movements implying many survey sites in congested situations. There is no precedent for this in NZ and hence there is considerable risk involved. It is highly unlikely that the permission and support would be gained from relevant agencies such as LTNZ, the police, Transit and TAs. The public, politicians and media are not used to such surveys and there would be significant adverse exposure because of the delays caused. Survey professionals in NZ do not have the experience, so the risk of problems on the ground and resultant disruption etc are high.

In the UK, it has long been practice to collect interview data for highway (project) models to get the most accurate matrices for appraisal. Following on from this, the LTS model for London has started to use intercept data too, but again the collected data is for multiple uses and would be used in highway models. In our view the most important use of such matrices is in project appraisal rather than in strategic models. It makes no sense to collect such data for a strategic model, if the project models are not required to have this sort of data (which is the case in NZ).

There is no question that roadside intercept surveys which intercepted a large proportion of vehicle movements with high sampling rates would provide a more accurate vehicle matrix. This becomes largely irrelevant given the lack of precedent for this in NZ and the associated risks. It is also not relevant how accurate the matrices are without intercept surveys as the NZ profession adapts and has adapted to the quality of the matrices that can be provided within these constraints.

While we are investigating the feasibility of some OD surveys for use in model validation (which may possibly be sampled from number plates), we are firmly of the view that the real difficulties in NZ of intercept surveys, particularly large scale surveys necessary to collect sufficient data for the development of matrices, preclude this approach.

3.7 Active Modes: Walk and Cycle

Active modes will be represented in the main model structure (distribution/mode choice) and in terms of model outputs the resulting trips will be considered largely at the global level, that is to provide an indication of the change in total active mode trips. This said, it must be acknowledged that in practice the inclusion of these modes can cause estimation difficulties.

Other specific aspects are as follows:

- Development of a model which represents walk and cycle modes separately, making best use of data in the HIS;
- investigation of a possible role for the APT zone system in improving the representation of the active modes (walk and cycle) in ART3;
- a one week cycling diary to improve the HIS sample size; this may focus on the main cycling segments, commuting and school trips;
- setting up a GIS-based walk and cycle database for analyses external to the model.

3.8 Model Periods and Re-Timing

The weekday AM and PM peaks and an interpeak period will be modelled, the time period definition being done on the basis of initial survey data.

Consideration will also be given to:

- a late afternoon (3-4pm) pre-peak, followed by the usual commuter peak (typically 4-7pm);

- the possibility of consideration of the peak shoulders in relation to time shift forecasting;
- the feasibility of extending the household survey to the weekend.

In determining the length of the modelled periods, consideration can also be given to time-series count data, but at the same time we will need to consider how the trip re-timing model will be developed and incorporated into the overall structure.

The trip re-timing model will be developed along the lines of the new Wellington regional model, in which the change in proportion of peak trips is estimated as a function of the change in peak to interpeak cost differential; the sensitivity of this would be based on relativity with distribution model, from latest research and experience, plus reasonableness of results. We will need to establish whether there is any recent evidence or studies available in NZ on which we can draw; we will also check whether recent international experience offers assistance.

We are aware that some retiming models have been developed with SP data (eg West Midlands), but are of the view that SP is not yet a well-established and secure means of addressing this issue or used as 'standard' and therefore remains, in our view, a research topic in this context.

As to shoulder periods, we are not aware of models of this type giving explicit consideration to shoulder periods and are concerned about the implications of increased complexity and run times (and also trip time identification). Because of its relevance, we have proposed to look into this issue again, but if we are to achieve anything it will require innovation and an implementation procedure compatible with the aggregate model specification.

See also the discussion of tours below.

3.9 Parking

Basic improvements are expected to include:

- the use of forecasts or 'what if' scenarios of long term parking supply (capacity and price), making use of existing databases. Who pays will be established in the surveys and from the average parking cost experienced by commuters determined. The model would not forecast future long term private and paid parking supply nor the pricing of each, but is intended to be able to estimate the impacts of reducing capacity and changing the price levels.
- inclusion of the average cost of parking in ART3, separately for private and company-assisted car travel, which would be adjusted to reflect future supply constraints/availability;
- analysis of the HIS to determine whether, for the Auckland CBD, the zone of parking differs significantly from the ultimate destination zone, and from this a decision can be made on whether a set of simple re-distribution factors is required to improve the vehicle assignment.

As part of the model development it would be helpful to assemble information on the historic trends in company-assisted vehicle travel and long term parking supply in the CBDs. See also tours, below.

3.10 Tours (Trip Chaining)

City multi-modal models have some limitations in their representation of responses to TDM and particularly road user charging and parking. These relate to the use of coarse time periods (not for example distinguishing peak shoulder periods) and a lack of explicit recognition of the implications of linked trips (or tours) leading to interactions of travel behaviour effects between time periods. We will review an innovatory approach allowing the time of day choice model to operate on combinations of outward and return periods ("tours") rather than single direction trips.

Such an approach also lends itself to the modelling of parking, since the departures and arrivals in the different periods are explicitly modelled, allowing the total number of parked vehicles to be determined in each period and compared with available capacity.

In addition to the tours analyses related to peak spreading, we would investigate the possibility of including some key inter-relationships, such as:

- generating the number of related non-home-based trips as a function of the number of home-based trips;
- attributing the mode of the non-home based trip as the mode of the related home-based trip.

The above is a significant innovation and complication in an aggregate model which will take considerable effort to design. This will not be attempted until later in the project, but in the meantime, we have identified that we will need to ensure that tours can be identified (which of course is normal in HTS's) and are comfortable that the HTS sample size will provide sufficient data.

3.11 Commercial Vehicle Model

Current travel patterns for medium and heavy commercial vehicles will be obtained through developing a prior matrix using a synthetic gravity model followed by matrix estimation. The key is the reliability of the gravity model.

No reliable prior matrix exists for Auckland. A trip generation model was used in Wellington based on a Transfund international review and we may draw on this. It will be important to seek to validate on key generation areas and also to try and get good count cordons around key CV generation areas as a way of controlling key areas of the matrix. This is all a part of the survey programme.

The final aspect is the further constraint on a gravity model – the average trip length. This is where we shall need to try and get limited OD data by direct contact with operators; a design for this survey has yet to be considered.

Hence a comprehensive set of classified count data on screenlines, at key points in the network, and at cordons around major generators (including the sea and inland ports) is required both for the development of the prior matrix and for matrix estimation of it.

Clearly we could do better with more data, but we do not accept that a large scale CV OD survey is practicable here, although we have initiated such approaches in London for example, nor are we confident that substantial resources should be directed at operators or premises CV surveys given their past mixed history.

In forecasting, growth factors would be applied based on the synthetic trip-end models which reflect the distribution of employment and best estimates of the relationship of commercial vehicle travel with economic growth (and, if available, evidence from historic trends). This approach would also allow forecasting for new developments.

For pricing policy response, we have the benefit of the Transfund work on values of time. Multi-class assignment would enable commercial vehicle reaction to tolls to be distinguished from other traffic.

Ideally, in this approach, light commercial vehicles, which are significantly more numerous than heavy commercial vehicles, will be distinguished from others. This will only be possible in practice to a limited extent and may require additional special manual classified counts on a sample of roads. Unless there is the reasonable prospect of obtaining good data on light commercial vehicles, it is most likely that these vehicle types will be best combined with car, albeit making some limited allowance for their different travel patterns and growth trajectory.

3.12 Sensitivity of Trip Rates to Location

Commercial and Sub-Regional Centres

We will seek to distinguish attraction trip rates to some types of commercial area and sub-regional centre in model estimation. Possible examples include: Takapuna, Albany, Henderson, New Lynn, Onehunga, Manukau City Centre, Glen Innes, St Lukes, Botany, Westgate and Papakura. Traffic count cordon surveys around these areas will be carried out for flow comparisons and then matrix estimation if required, so ensuring an improved representation of travel patterns in ART3.

Special Generators

The specific generators considered here are the airports (domestic and international) and the port (both sea and inland).

The airport model will be updated (as a vehicle-only model) based on air passenger interview data (if currently available), a classified traffic count cordon and other available airport statistics are required (possibly including a numberplate survey of the two airport access roads to estimate the proportion of through non-airport trips). If air passenger data were available, it would also be feasible to include a separate external process of manually modifying the air passenger mode-specific matrices in response to policy initiatives.

With respect to heavy goods vehicle generation from the ports, a component of the commercial vehicle model, cordon counts will be undertaken (and interviews may be included as part of the proposed operator surveys). The recent surveys of Port traffic undertaken by ACC may be of use.

Sensitivity to Changes in ARGS Growth Centres

The Scoping Report judged it likely to be infeasible to obtain data on the sensitivity of travel behaviour to intensification and mixed-use development. Other possibilities which will be investigated are to:

- draw on international research and consider trip generation accessibility and car ownership density effects;
- analyse census journey-to work data, contrasting the mixed use areas with others in regard to car use and commuting trip lengths;
- analyse census data for differences in car ownership in the mixed-use areas compared to other areas.

3.13 Serve Passenger and HOV

As the existence and nature of serve passenger trips is determined by the needs of the passenger, the key issue with an improved model will be to reflect in the forecasts the effect of changes in the passengers' travel behaviour. This will be done by associating the driver's trip with the passenger's trip purpose.

We recognise that this is an approximation, in that often a journey that starts out as a serve passenger trip does not necessarily continue as such, but also that this is difficult to better. In some cases there may be a related issue design issue; where a driver delivers a passenger for some purpose and then proceeds to satisfy their own, these are likely to be treated as separate trips and modelled separately. We will use the preliminary studies to identify the extent of the approximation and fully understand the issues.

ART3 should be capable of modelling of high occupancy vehicles (HOV) and facilities at a strategic level for general policy testing, possibly including pricing policies that impact on car occupancy. The key requirements are that the HOV costs can be calculated separately from general

traffic costs and that these costs impact on travel demand and route choices, as distinct from a model which impacts on route choice only.

There is established practice for dealing with the effects of HOV lanes on travel demands using multi-user assignment and we shall seek to ensure that methods of doing this are available in the model. We know of no established and reliable methods of predicting changes in vehicle occupancy except by a major re-structure of these models (and would move the work towards a research activity). This is outside the scope of the project.

An HOV model of this nature would likely be a separate module which can be implemented as required rather than a core part of the overall model. We shall design the approach on the basis of current research, and thus establish its feasibility and a suitable design (the complication is cost-feedback to the matrices, but multi-user assignment will deal with the re-routeing aspects), and also see whether we can find any evidence for car occupancy sensitivity in NZ (this may be feasible using before and after data for planned HOV facilities).

3.14 School Children, School Buses and Students

Some possible partial model segmentation of education trips into primary, secondary and tertiary levels will be explored.

Despite their local importance, tertiary students in the city centre and other campuses are a small component of Auckland's population. Supplementary data collection for foreign language students and institutional accommodation and the use of existing data could provide the basis for improving the representation of their travel patterns in the model.

School buses have been coded into the APT networks, and an ability to make use of this within ART3 to assign school trips to these buses is sought. We have suggested that this might be done using fixed mode share factors which are manually manipulated in future years as policies and/or networks change. Such an approach requires ART3 to synthesise a matrix which includes school bus use, which in turn may require that there are scheduled public bus services presently duplicating the school bus routes. Other data sources to be considered include:

- comprehensive geo-coded data available from the Ministry of Education on schoolchildren's addresses,
- ART and TA surveys of schools which also give the mode of travel to school.

3.15 Car Ownership

The assumed regional car ownership total will be based on an adaptation of the review of car ownership trends in NZ by BAH for Transit NZ (1997). The inclusion of the effects of density and public transport accessibility on car ownership will also be considered.

3.16 Travel Demand Management

The appropriate model segmentation needed to model pricing measures will be considered, although additional segmentations are limited by the performance requirements of these models. The need for additional segmentations is seen as being more relevant for road project models in some contexts, and rather like the HOV multi-user option, we see no problem in principle of having this as an assignment option. The need for any additional survey data in this regard has been considered and incorporated in the HTS specification and design.

Non-infrastructure measures, such as travel plans, in most cases will be incorporated into the modelling by way of "what-if" tests using inputs that have been prepared prior. For some measures it may be possible to represent their impacts as a change in generalised costs based on experience elsewhere.

The ways in which non-pricing measure associated with infrastructure might be dealt with in the model will depend on the actual measure. Ramp-metering requires a detailed modelling tool with simulation or micro-simulation capability and is not appropriate for ART3. However consideration could be given to using outputs from such models to inform changes to coding in ART3 in an attempt to represent both the ramp delays and mainline capacity effects.

3.17 Technology Changes

The extent to which vehicle technology data is collected in the HIS and linked to ART3 output routines is being considered in the design of the household survey.

3.18 Outputs

The model will have reporting functions which enable model outputs to be formatted to a high quality. It will be capable of interfacing easily with GIS-type software or similar for both reporting of model outputs and, if required, preparation of model inputs.

The outputs requirements that are understood at this time are noted in Table 3-2. These requirements arise from the recent Auckland RLTS review and the need to measure various strategies against objectives.

Table 3-2 ART3 Model Outputs

Accessibility measures (eg travel costs, speeds, times) – by mode (vehicle and public transport) – global, between/to specific sectors, areas – possibly segmented by purpose, commercial vehicles and car availability – can be related to zonal socio-economic indicators such as the deprivation index at the level of the transport zone by drawing on external socio-economic data Reliability Network resilience (measures to be identified)
Data for estimates of vehicle crashes (eg vkt): current procedures and crash rates require updating, if possible, linking with safety improvements and walk and cycle trip numbers
Transport choice, public transport coverage (precision related to zone size) Connectivity of transport system (depends on the exact definition)
Trips by active modes, possibly segmented by age and trip purpose Data for regional estimates of vehicle emissions (eg vkt by congestion levels and road types); dependent on emissions factors Link traffic volume data by vehicle type for use as proxies for noise and vibration
Data for estimates of vehicle emissions Vehicle kilometer data for estimates of impacts on water quality (possibly segmented by water catchments, treated/ untreated roads) Lane kilometer data for estimates of land used by transport Traffic flow data for community severance measure Data for estimates of CO2 emissions and fuel use (eg vkt)
Transport costs for ASP model Accessibility measures associated with growth centres Frequency of fixed passenger transport in growth centres
Data for calculating benefits of transport packages Travel costs and demands by mode