Illustration of a Detailed Survey Specification

This is an extract from the Auckland specification, for a selection of the surveys.

1. Household Survey Sample

1.1 Cluster Sampling

Household interviews will be clustered for cost-efficiency (in "meshblocks") in an unbiased sampling procedure. We consider here whether the clustering has consequences for model estimation and whether or not there is a preferred degree of clustering. This has used the initial zone system defined to date (it is anticipated that there will be changes to this, but that they will not materially affect the following analysis) and 2001 population data (2006 data is not yet available).

We anticipate approximately 500 zones inside the study area. There are around 8,000 'meshblocks' in Auckland, typically containing about 150 people in 50 households.

Our first concern was zonal coverage. For a reasonable degree of interview clustering, a process of randomly sampling meshblocks in the study area would lead to significant variations in the interviews/zone, with many zones not being covered by the survey. Tests showed that clusters of zones covering significant areas might not be surveyed. There being concern over the implications of such gaps for model development, it was decided that, in principle, the sampling of meshblocks should be stratified by zone, so that all zones would be encompassed by the survey.

Given the size of the zones (average diameter 1.4 km, smaller in the urban areas, larger outside), the advantages of sampling more than one of the 18 meshblocks in each zone was not judged to outweigh the greater cost of only one per zone.

There was however concern that, for zones containing railway stations, estimates of accessibility derived from the networks would not be representative if the surveyed meshblock was located on the periphery of the zone, away from its nominated centroid. A similar concern does not arise with the much denser bus network, and nor with ferries where the catchments are much larger (with access by both bus and car common). The solution we propose to adopt is that in that small minority of zones with stations, the interviews will not be clustered, but randomly distributed across the zone[1].

In the following paragraphs we review how interview clustering impacts on model estimation.

Car ownership and trip productions
These are essentially disaggregate person/household-based calibrations and should be unaffected by the distribution of meshblocks as the sample will be representative. For car ownership, and a remote possibility for trip productions, the issue of incorporating aggregate accessibility terms may

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[1] We will identify the affected zones for TUTI.

arise, particularly accessibility to public transport but, with the sampling strategy adopted, the aggregate accessibilities should not be significantly biased when applied to the meshblock samples.

Trip attractions, mode choice and distribution

These are aggregate calibrations in which the models will generally be calibrated on trip matrices in which the trip data from the household, external cordon and public transport surveys have been merged. It is expected that these will be expanded trip matrices, the calibration statistics being modified to reflect the average sampling rate across the surveys. With the sampling strategy adopted, there appear to be no significant issues arising from the HTS clustering.

1.2 Stratified sampling

In the survey brief, we observed that we would expect the household sampling rates to be stratified across the study area, to maintain adequate sample sizes in lower density areas. We suggested the following 10 sub-areas:

- Rodney and Franklin Districts;
- North Shore City:
  - North of Constellation;
  - South of Constellation;
- Auckland City;
- Waitakere City:
  - North of Henderson;
  - South of Henderson;
- Manukau City:
  - Howick/Pakuranga;
  - East Tamaki/Flat Bush;
  - Mangere / Papatoetoe / Manurewa; and
- Papakura District.

Table 1 to Table 3 illustrate three different sampling strategies: a uniform rate per household, a uniform rate / land area (excluding any largely rural areas), a uniform rate per district (Rodney and Franklin being treated as one district). Respectively these represent a simple proportionate household sample, a sample which recognises the importance of geographic coverage and, thirdly, a sample which equalises the data between TLA's.

Because the accuracy of survey estimates is mainly a function of sample size (rather than sample rate) area, the uniform household rate would lead to much higher levels of precision associated with Auckland city travel because of its high population, although it relates only to just over one

fifth of the study area. In designing the targets in Table 4 we have averaged these different samples so that the targets reflect the relative population, land area and TLA's (in the ratios 2:1:1)[2].

The survey samples will in practice be drawn by sampling a random meshblock inside each zone. The consequences of this approach, assuming a uniform sample of 12 households/meshblock (6,000 households over 500 meshblocks), is also shown in Table 4. While this process tends to move the sample away from a uniform household rate towards the targets, there remains some adjustment to the sampling required to achieve them. It is for the TUTI to advise on how best this is to be done.

- **Table 1 Uniform Household Sample**

Sector	Urban Area (ha)	Hholds	Uniform Household Rate	
			Inter-views	% Hholds
Rodney/Franklin	**8,466**	**23,289**	**370**	**1.59%**
North Shore	**12,605**	**62,886**	**1000**	**1.59%**
North of Constellation	6,995	19,630	312	1.59%
South of Constellation	5,610	43,256	688	1.59%
Auckland City	**15,352**	**126,335**	**2009**	**1.59%**
Waitakere City	**12,159**	**57,372**	**913**	**1.59%**
North of Henderson	6,790	26,380	420	1.59%
South of Henderson	5,369	30,993	493	1.59%
Manukau City	**20,252**	**93,614**	**1489**	**1.59%**
Howick/Pakuranga	3,424	28,211	449	1.59%
East Tamaki/Flat Bush	7,168	18,228	290	1.59%
Mangere/Papatoetoe/Manurewa	9,661	47,176	750	1.59%
Papakura	**2,681**	**13,728**	**218**	**1.59%**
OUTSIDE STUDY AREA	1,886,950	30,258		
INTERNAL	**71,515**	**377,223**		
TOTAL	**1,958,464**	**407,482**	**6,000**	**1.59%**

Notes:
%Hholds is the implied household sampling rate.
Household numbers are derived from 2001 Census populations assuming average household size of 2.94.

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[2] The 2001 populations on which this is based will be underestimates for high growth areas like Rodney and East Tamaki, for which this process has helpfully increased the samples above that achieved by a uniform rate.

■ **Table 2 Uniform Sample per Unit Area**

Sector	Urban Area (ha)	Hholds	Uniform Area Rate		
			% Area	Inter-views	% Hholds
Rodney/Franklin	**8,466**	**23,289**	**12%**	**710**	**3.05%**
North Shore	**12,605**	**62,886**	**18%**	**1058**	**1.68%**
North of Constellation	6,995	19,630	10%	587	2.99%
South of Constellation	5,610	43,256	8%	471	1.09%
Auckland City	**15,352**	**126,335**	**21%**	**1288**	**1.02%**
Waitakere City	**12,159**	**57,372**	**17%**	**1020**	**1.78%**
North of Henderson	6,790	26,380	9%	570	2.16%
South of Henderson	5,369	30,993	8%	450	1.45%
Manukau City	**20,252**	**93,614**	**28%**	**1699**	**1.82%**
Howick/Pakuranga	3,424	28,211	5%	287	1.02%
East Tamaki/Flat Bush	7,168	18,228	10%	601	3.30%
Mangere/Papatoetoe/Manurewa	9,661	47,176	14%	811	1.72%
Papakura	**2,681**	**13,728**	**4%**	**225**	**1.64%**
OUTSIDE STUDY AREA	1,886,950	30,258			
INTERNAL	71,515	377,223			
TOTAL	1,958,464	407,482	100%	6,000	1.59%

■ **Table 3 Uniform Sample per District**

Sector	Urban Area (ha)	Hholds	Uniform District Rate	
			Inter-views	% Hholds
Rodney/Franklin	**8,466**	**23,289**	**600**	**2.58%**
North Shore	**12,605**	**62,886**	**1200**	**1.91%**
North of Constellation	6,995	19,630	600	3.06%
South of Constellation	5,610	43,256	600	1.39%
Auckland City	**15,352**	**126,335**	**1200**	**0.95%**
Waitakere City	**12,159**	**57,372**	**1200**	**2.09%**
North of Henderson	6,790	26,380	600	2.27%
South of Henderson	5,369	30,993	600	1.94%
Manukau City	**20,252**	**93,614**	**1200**	**1.28%**
Howick/Pakuranga	3,424	28,211	400	1.42%
East Tamaki/Flat Bush	7,168	18,228	400	2.19%
Mangere/Papatoetoe/Manurewa	9,661	47,176	400	0.85%
Papakura	**2,681**	**13,728**	**600**	**4.37%**
OUTSIDE STUDY AREA	1,886,950	30,258		
INTERNAL	71,515	377,223		
TOTAL	1,958,464	407,482	6,000	1.59%

Table 4 Meshblock Sampling and Target Samples

Sector	Urban Area (ha)	Hholds	1 meshblock / zone			Target Rate	
			Zones	Inter-views	% Hholds	Inter-views	% Hholds
Rodney/Franklin	**8,466**	**23,289**	**15**	**190**	**0.82%**	**510**	**2.19%**
North Shore	**12,605**	**62,886**	**83**	**1080**	**1.72%**	**1060**	**1.69%**
North of Constellation	6,995	19,630	33	430	2.19%	450	2.29%
South of Constellation	5,610	43,256	50	650	1.50%	610	1.41%
Auckland City	**15,352**	**126,335**	**162**	**2100**	**1.66%**	**1630**	**1.29%**
Waitakere City	**12,159**	**57,372**	**68**	**880**	**1.53%**	**1010**	**1.76%**
North of Henderson	6,790	26,380	35	450	1.71%	500	1.90%
South of Henderson	5,369	30,993	33	430	1.39%	510	1.65%
Manukau City	**20,252**	**93,614**	**118**	**1530**	**1.63%**	**1470**	**1.57%**
Howick/Pakuranga	3,424	28,211	23	300	1.06%	400	1.42%
East Tamaki/Flat Bush	7,168	18,228	32	410	2.25%	400	2.19%
Mangere/Papatoetoe/Manurewa	9,661	47,176	63	820	1.74%	680	1.44%
Papakura	**2,681**	**13,728**	**17**	**220**	**1.60%**	**320**	**2.33%**
OUTSIDE STUDY AREA	1,886,950	30,258					
INTERNAL	**71,515**	**377,223**					
TOTAL	**1,958,464**	**407,482**	**463**	**6,000**	**1.59%**	**6,000**	**1.59%**

2. Public Transport Intercept Survey

2.1 Introduction

This section considers the sample size for the PT Intercept Survey and provides a list of the information that will be collected in the survey.

Some criteria need to be set for the sample size we want out of the public transport surveys – at least the broad order of magnitudes. This is quite difficult to do, so the following sections set down where we stand.

2.2 Background Information

All statistics on raw survey samples quoted below are rough orders-of-magnitude.

Auckland is ca. 4 times the size of Wellington region, has a far more complex structure but a much lower public transport mode share.

Wellington Model raw survey samples:

- 1,900 PT trips from the 2,500 interview household survey
- 5,000 trips from the rail survey
- 1,000 PT trips from the school survey
- thus the model estimation PT data comprised ca. 8,000 PT observations.

The surveys used in developing the observed PT matrices for the Auckland public transport model (APT) collected:

- 24,000 bus trips
- 2,000 ferry trips
- 7,000 rail trips
- in all 33,000 PT observations.

We might expect a 6,000 Auckland household survey to generate 2-2,500 public transport trips.

2.3 Objectives

The original PT surveys for the APT model were designed to establish a comprehensive and accurate PT trip matrix from which the model would apply incremental techniques in forecasting.

For ART, the aim is to obtain sufficient public transport data that there is some realistic chance of estimating the multimodal component, the distribution and mode choice models. There is not the same requirement to get accurate PT flows on individual routes/corridors; rather the aim is to

establish the mode choice and distribution model parameters (which would be expected to include some geographic segmentation).

2.4   Survey Tender

The following is an edited extract from the draft survey tender indicating what has been requested.

Target samples

The sample targets for train and ferry are based on what is need for the modelling and also what we believe can be realistically achieved with one full day's passenger interception in one direction on each route. Additional days of interviews would inevitably risk extra respondent burden and consequent response bias as regular travellers experienced multiple interception.

Evidence of recent surveys suggests that reasonably high response rates of 60-80% can be achieved if questionnaires are collected during the survey (as distinct from leaving the respondent to return it by post). If all passengers are handed a questionnaire in the survey period, then we assume that 40-50% of the total passengers would return questionnaires, the difference being due to passengers not intercepted at times outside the survey period or because of their age (i.e. schoolchildren).

For all the intercept surveys, a specific systematic sampling rule must be used (i.e. select every nth passenger entering the platform or boarding the bus). This may be varied by time of day etc to allow for congested times.

Successful questionnaires

Successful questionnaires are returned questionnaires which meet the minimum information criteria.

Ferries

Interviews:

- We are advised that ca. 10,000 passengers use the Auckland ferry services on a typical weekday (that is, 5,000 boardings in each direction). Interviewing in one direction, the achieved questionnaire sample would be ca. 2,000 successful questionnaires (40% of 5,000 passengers). The minimum sample requirement is 1,000 questionnaires, covering am and pm peaks and the inter peak, and we would also like estimates for 2,000 and 3,000 samples.

- In all time periods, it is assumed that most passengers will be intercepted and handed a questionnaire such that an even sampling rate by time of day and service is obtained. Some systematic reduction in the sampling rate during periods of peak loading would be acceptable if significant survey economies were achieved, and the overall interview target maintained. Normally we would expect 100% of passengers to be intercepted but at congested periods 50% interception rates would be acceptable. We are however also keen to maximise the sample

achieved, and seek the survey agency's views on what could be achieved and how it would be done.

Counts:

- full 15 minute passenger counts will be taken during the survey period of passengers boarding each ferry in the survey direction.

Trains

Interviews:

- We are advised that ca.12,000 passengers use the Auckland rail network on a typical weekday (that is, 6,000 boardings in each direction). Interviewing in one direction, the achieved questionnaire sample would be 2,500 successful questionnaires. The minimum sample requirement is 2,000 questionnaires, covering am and pm peaks and the inter peak, and we would also like estimates for 3,000 and 4,000 samples.
- In all time periods it is assumed that most passengers will be intercepted such that an even sampling rate by time of day, service and station is obtained. Some systematic reduction in the sampling rate during periods of peak loading would be acceptable if significant survey economies were achieved, and the overall interview target maintained. Normally we would expect 100% of passengers to be intercepted but at congested periods 50% interception rates would be acceptable. We are however also keen to maximise the sample achieved, and seek the survey agency's views on what could be achieved and how it would be done.

Counts:

- full 15 minute passenger counts of passengers entering the station platform to board a train will be taken during the survey period in the survey direction; procedures for associating these counts with individual train services are required.

Buses

The survey and its design are considerably more complex for bus services.

We are advised that ca. 120,000 passengers use the Auckland bus services on a typical day (i.e. total passenger boardings). There are ca. 250 major bus services which with minor services we believe could be combined into ca. 100 service corridors, in each of which all services broadly serve the same areas, distinguishing express from stopping services. SKM will develop a draft specification of this grouping, which will form the basis of the survey, but which the agency will be

required to comment on and modify if necessary, with SKM's approval, to facilitate an efficient survey programme.

Within the survey time period on each weekday, we are advised that the buses make about 6,000 trips (1-way) each day, corresponding to an average daily frequency of 12.5 trips in each direction.

Interviews:

■ As for the other modes, we wish to receive cost estimates for 3 levels of sampling, as described below.

■ We assume a sampling strategy which would typically allocate an interviewing team to a bus route and that team would usually accompany a bus route from end-to-end and the journey return; thus each survey 'unit' would be the full length of a bus route in both directions (for scheduling reasons it may be appropriate to vary this in practice, but this does not affect the overall sampling concept).

■ We assume that the interviewing team would hand out and collect the questionnaires on the bus.

■ Three levels of sampling in each route corridor are to be considered as summarised in the table below. Overall, the 3 sampling levels A, B and C would involve surveying 500, 800 and 1100 service units respectively. Given the agreed sampling targets, the survey agency will be expected to devise individual service samples which are spread across the survey time periods and across the individual services with each grouping, insofar as this is feasible.

■ These sampling rates are given as a guide only and, while remaining broadly consistent with this concept, the sampling may be designed to achieve survey efficiency.

Sample Option	Number of service 'units' to be sampled in each route corridor				
	AM Peak	Inter peak	PM School Peak	PM peak	Total
A	1	2	1	1	5
B	2	3	1	2	8
C	3	4	1	3	11

■ Normally we would expect 100% of the passengers on each service unit to be intercepted but at congested periods 50% interception rates or less would be acceptable. We are however also keen to maximise the sample achieved, and seek the survey agency's views on what could be achieved and how it would be done.

■ Assuming a 50% overall response rate, the achieved sample for the 3 sampling levels A, B and C could be ca. 10,000, 15,000 and 20,000 successful questionnaires respectively. In fact, with

questionnaires issued and collected on the buses higher response rates are believed to be achievable. Therefore these should be taken as the target samples.

- Refinement of these statistics is expected to follow during detailed design and we will consider varying the sampling options and/or apply different levels in different corridors, depending on passenger volumes and the service complexity within each corridor; option C is clearly most relevant to very frequent services. In particular, the design of the school peak survey will need further consideration in regard to its practicality and the locations where it is most relevant.

- Suggestions as to variants to the survey strategy which would maximise survey efficiency and the achieved questionnaires while achieving reasonable representation by corridor and time period would be welcomed.

Counts:

- full counts of passengers boarding will be taken at each bus stop and the time should be recorded at each bus stop.

2.5   Summary of Tender Requirements

We have thus asked for the following samples:

Sample	Ferry	Rail	Bus	Total
Low	1,000	2,000	10,000	13,000
Medium	2,000	3,000	15,000	20,000
High	3,000	4,000	20,000	27,000

Thus, compared with the Wellington sample of 8,000 PT trips and the APT sample of 33,000 PT trips, combining say 2,000 HTS public transport trips, we could achieve samples of 15,000, 22,000 and 29,000 trips.

The smallest sample is twice that used for Wellington and the largest 3.5 times WTSM.

The question is: what do we "need" for the ART3 model estimation, what would be acceptable, as distinct from say refreshing the APT model observed matrices (for which the 33,000 trip sample was the base)? For comparison purposes, we might expect to get over 65,000 car driver and passenger trips in the survey.

Our position is that increasing the Wellington sample by a factor of 2 and increasing the household survey observations of public transport trips by a factor of 7.5 should provide a suitable base for model estimation (mode choice and distribution). So the minimum sample would be sufficient, but we would be happy to collect more if the budget could afford this.

For matrix development, the largest sample clearly would be preferred, but again we would expect to get reasonable matrices from a 15,000 trip sample. [Suppose we argue that there are around 50-100 major public transport corridors, which seems consistent with the statistics above, if they carry even flows then we would have 150-300 observations for each ensuring 95% confidence limits on these major flows of greater than 10-15% (Poisson), which seems reasonable in aggregate (i.e. ignoring times of day and segments). If we divided each major flow into 3 distance bands the confidence limits would rise to 20-30%.]

There being a large element of experience/judgement in these views, we note John Bates' response to this section:

"I support these views. I feel that these sample sizes MUST be sufficient. They should permit reasonable matrix development - clearly to get very good matrices you would need an unfeasibly large sample, and practicalities will prevail.

I'm not sure what you're proposing in terms of estimation of mode choice and distribution (this is something which we should discuss, though I suspect we have in the past anyway!). However, even though using intercept surveys for estimation raises some problems, the samples you are proposing are still well in excess of what is the minimum requirement.

So my view is that this is OK. As you say in the last paragraph, it would be nice to go for broke, but I think the lowest level you propose is adequate if budget is constrained."

2.6   Information Collected

The information to be collected in the PT Intercept Survey is expected to be as follows and a draft set of questions is given in Appendix A:

- origin and destination;
- access and egress mode;
- trip purpose;
- time of trip;
- type of ticket;
- household car ownership;
- drivers licence-holding status;
- age and gender;
- employer-subsidised car travel (company car, running costs, parking);
- employment status.

3. ART3 External Surveys and Model

3.1 Introduction

This chapter sets out the characteristics of ART3 in regard to its treatment of external travel, that is travel across the study area cordon (Section 8.2), followed by an outline of the external cordon roadside interview survey specification (Section 8.3).

The study area is the area within which all travel will be represented (the area of the HTS) and is bounded by:

- Waiwera, ALPURT B2, SH17, Coatsville, Riverhead, and Waimaukau in the north, and
- Hingaia Rd bridge, Pukekohe, SH1 (Bombay to Ramarama), the Papakura boundary, west of Clevedon, and Maraetai in the south.

3.2 External Model

3.2.1 Introduction

For the external area outside the study area, but within the Auckland Region plus Pokeno and Tuakau, travel by mode between this and the internal area will be represented. There is specific interest in the travel between the study area and some key towns (zones) in the external area (e.g. Helensville and Warkworth). Sections 3.2, 3.2.3 & 3.2.4 describe how these external trips will be modelled.

Trips into and out of the Auckland Region will modelled using simplified procedures (Section 3.2.5 below).

3.2.2 Zoning and Data

Outside the study area and within the region (plus Pokeno and Tuakau), there will be a coarse zoning system.

The survey programme involves:

- most surveys being inside the study area (including the HTS);
- OD surveys on the study area boundary intercepting road and public transport trips;
- and road OD surveys on screenlines in the external area (generally devised for other studies/purposes);
- addresses outside the study area obtained in the surveys will be coded to the external zones.

The model will thus include matrices by mode of travel to and from the study area and networks providing for these journeys.

3.2.3 The Demand Model

This comprises trip ends, mode choice, distribution and peak factors.

Growth

Because we represent only those trips generated by residents of the external zones which are attracted to the Auckland study area (and vice versa for Auckland residents trips to the external zones), the trip end models are not strictly of relevance. We therefore have the choice of using some broad indicators of development (population, employment) or simply using the trip end models to achieve the same end[3].

Whichever approach is adopted, it is likely that there will be additional economic and accessibility influences on travel growth and we shall seek evidence for this from historic counts. It is likely that some additional factors will need to be included in the growth model to allow for this[4].

A further refinement may also be possible for HBW travel, which would seek to reflect the effects on trips between the study and external areas of changes in the balance of employment and workforce inside and outside the study area[5].

Mode Choice and Distribution

The external data/zones will be included in the calibration of the distribution/mode choice models. Distribution will be constrained to trips between the study area and the external area but, for these journeys, mode choice will be under no constraint. Insofar as the data supports it, the estimation procedures will be sensitive to the mode choices made to/from the external areas and will reproduce the mode shares.

Peak Period Factors

These will simply follow the approaches developed for the study area. If there is any complication, it is that the definition of the peak becomes ambiguous for long journeys which are on the outer reaches of the network.

3.2.4 Networks and Assignment

Skeletal transport networks will connect the external zones to the study area. Because travel data for the external area will be (mainly) limited to travel to and from Auckland, not all traffic on the

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[3] As not all the data need may be available for the external zones, the feasibility of this will be reviewed in the development of the final Technical Specification.

[4] In principle, these might take the form of mode-specific income/GDP and accessibility elasticities but the feasibility of this will depend on the historic traffic and public passenger data, and there is therefore some doubt about how much can be achieved.

[5] For example, an increased concentration of employment in the study area might be expected to lead to more in-commuting.

road network will be represented, and link speeds will consequently be fixed and insensitive to traffic volume changes[6].

The assignment procedures will otherwise not differ from those used in the internal area.

3.2.5   Trips External to the Region

The various surveys (household and roadside study area cordon[7]) will intercept travel to destinations outside the region, which will be coded to a community level. For modelling purposes these trips will be allocated to region boundary crossing links (ie regional cordon zones) and an average regional growth factor applied.

3.3   External Cordon Roadside Interview Surveys

3.3.1   Introduction

This section outlines the specification of external cordon surveys.

Roadside interviews surveys (RSIs) are proposed around the external cordon to estimate travel patterns. It is also proposed to include additional surveys between peripheral internal areas and the main urban areas. This will provide greater confidence in the origin-destination information for the calibration and validation of the model demand.

This specification is to assist with initial consultation with appropriate authorities and organisations (Auckland Regional Council, Land Transport New Zealand, Transit New Zealand, Rodney District Council, Auckland City Council, Manukau City Council, Papakura District Council, Franklin District Council and the Police) regarding the proposed locations and general form of the proposed surveys. Detailed site traffic management plans will be prepared and issued for approval once the proposed locations are agreed.

3.3.2   Site Locations

Surveys are required at 12 sites around the external cordon and an additional six locations are also proposed around the external cordon, which could have potential benefits if RSIs are achievable. Six sites have been proposed within the internal area, which could be potential RSIs.

There currently exists some external survey data, which will only be used for comparison purposes.

The 12 proposed sites around the external cordon area are:

- **Site 1**: SH1, north of Waiwera;

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[6] In forecasting this will not prevent the testing of scenarios in which changes to external link speeds are input to the model.

[7] It is expected that there will be little or no public transport travel, but the procedure will be designed to include such trips if necessary.

- **Site 2**: Wainui Road, west of SH1A;
- **Site 3**: Kahikatea Flat Road, west of SH17;
- **Site 4**: SH16, north of Woodhill;
- **Site 5**: Papakura Clevedon Road, north of Clevedon Takanini Road;
- **Site 6**: SH2, east of SH1;
- **Site 7**: SH1, south of Pokeno Interchange;
- **Site 8**: West of Pokeno Interchange (ramp only);
- **Site 9**: Buckland Road, north of Tuakau;
- **Site 10**: Waiuku Road, east of Puni;
- **Site 11**: Glenbrook Road, west of SH22; and
- **Site 12**: Hingaia Road, east of Karaka.

The additional six sites around the external cordon area could be:

- **Site 13**: Pine Valley Road, west of SH17;
- **Site 14**: Maraetai Coast Road, east of Maraetai township;
- **Site 15**: Twlight Road, east of Brookby;
- **Site 16**: East of Bombay Interchange;
- **Site 17**: Harrisville Road, north of Harrisville; and
- **Site 18**: Patumahoe Road, west of Pukekohe.

The six proposed internal sites are:

- **Site 19**: East Coast Road, north of Bawden Road;
- **Site 20**: SH1, north of Bawden Road overbridge;
- **Site 21**: SH17, south of Kahikatea Flat Road;
- **Site 22**: SH22, west of Drury Interchange;
- **Site 23**: West of Ramarama Interchange; and
- **Site 24**: Mill Road, west of Bombay Interchange.

3.3.3   Survey Direction

It is proposed that the surveys will be carried out in one direction only so as to minimise the impact on traffic. The survey will include questions on travel in the reverse direction, which along with

classified traffic counts in both directions will enable the reverse direction trip patterns to be established.

3.3.4   Data Requirements

The surveys are required to collect information on a sample of individual vehicle trips and classified count data of all vehicles. The data collected is required to be compatible with that collected in other surveys, for example the vehicle classification definitions and car ownership and subsidy information. This will enable this survey information to be used in the main model estimations as well as in the CV model development.

Survey Questionnaire

A questionnaire will be designed by the project team that covers information such as:

- Vehicle Classification (car, motorcycle, commercial – light, medium and heavy);
- Car ownership and operating subsidies;
- Origins and destinations;
- Trip purpose;
- Trip/person type segmentation;
- Direction and time of trip;
- Occupancy;
- Employment status and occupation;
- Information on travel in the reverse direction

A sample survey form is attached in Appendix B.

Classified Tube and Manual Counts

Vehicle numbers for each vehicle type will be required at each site in both directions. Tubes will be placed over a 7-day period for classified counts in both directions during week of the survey and manual counts with the same classifications undertaken on the day of the survey.

3.3.5   Survey Preparation

Site Selection

The selection of appropriate interview locations will be based on the principals set out in Land Transport New Zealand Traffic Note 46: Voluntary traffic surveys - Guidelines, December 2004. The site will be located with appropriate road safety considerations of factors such as visibility, proximity of intersections, and provision for queuing traffic.

The site will have sufficient space and appropriate layout so drivers at the designated survey area will not impede normal traffic and those drivers who do not wish to participate in the survey can

leave the site without being held up by those being surveyed ahead of them. Emergency vehicles will also be able to travel unimpeded past the site at any time.

Wherever possible, off-road survey locations will be identified. On-road survey locations are only identified when there is no off-road area available and there is sufficient road width to provide a by-pass lane.

As sites are proposed to be surveyed for one direction only no central interview bays will be required.

Site visits will be made to determine the precise preferred locations and any other alternative locations of RSIs.

Road Controlling Authorities

Approval will be sought from all road controlling authorities to undertake the survey upon confirmation of the proposed survey locations.

Traffic Management Plans

Traffic will be controlled and guided with suitable signs, traffic control devices and trained personnel to ensure the highest possible safety is provided. Traffic Management Plans (TMP's) will be prepared in accordance with Transit New Zealand's Code of Practice for Temporary Traffic Management.

Police Involvement

Police assistance will be sought to direct motorists to enter and leave the survey site. Liaison with the Police will commence upon confirmation of the survey locations and TMP's. Letter of notification will be sent one month before the survey to give adequate warning.

Land Transport NZ (LTNZ) Involvement

Assistance will be required from a person authorised by Land Transport NZ to direct motorists in and out of the survey site should the Police unable to provide required resources. Copies of the TMP will be forwarded to LTNZ for approval together with the application. Application will be submitted in writing 15 working days prior to the date of the proposed survey and the submission will include:

- Details of the survey purpose and reasons why the survey is necessary, and why other survey methods are deemed inappropriate;
- Approval from the appropriate road controlling authorities to undertake the survey;
- Traffic management plans with detailed and dimensioned plan of the survey site layout including signs proposed;

- Copy of the proposed survey questionnaire together with a description of the proposed sampling method; and
- Estimates of the likely delays to traffic, including vehicles not interviewed.

Traffic Surveyors

Instruction manuals will be given out to each surveyor, outlining full details of the survey process. A training session will be held with all surveyors on the day before the first survey takes place, which will include the procedures of conducting the survey, dealing with public and a heath and safety briefing.

3.3.6   Survey Implementation

Survey Dates and Weather Conditions

A pilot survey will be carried out in July to identify any deficiencies and issues in the survey design and aid setting up the data processing process. The actual survey will be scheduled during the month of August and in the case of any unforeseen or severe weather conditions, the survey will be deferred to another date. Each site will be surveyed for one day during the hours of 7am to 7pm on either a Tuesday, Wednesday and Thursday on a normal weekday.

Traffic Management

The survey will be designed to avoid, or cause minimal, delay to the passing traffic. The survey will be ceased if individual vehicle delays of up to one minute for up to 10 vehicles, or a queue length of up to 10 vehicles is exceeded. Survey will resume until the queue has dissipated.

A clearly identified person in charge of the survey site will be present at all times. This person will ensure the survey conditions comply with the approved conditions and have authority to delay, interrupt or discontinue the survey.

Surveyors on Site

All survey personnel on site will be easily and clearly identified in high-visibility vests and will be wearing a name and organisation tag. Vehicles used to transport surveyors to site will be parked such that they will be obstruct the carriageway or on shoulder outside 100m of the survey site.

Address checks

During the survey, each questionnaire will be checked for completeness and correct address coding, to enable geo-coding to meshblocks to be completed efficiently and accurately. This will also identify any problems so that these could be corrected and a drop in performance of a surveyor could be identified and addressed early.

Appendix A   PTIS Questions (draft)

		JOURNEY TO THIS BUS / TRAIN	
1	Where have you just come from, before boarding THIS bus/train today?	Home	
		Work	
		On Work Business	
		On Personal Business	
		School	
		University or Technical Institute	
		Shopping / Social / Recreation	
		Picking Up / Dropping Off Someone or Something	
		Other (please specify)	
2	What is the address of that place (please write in or give nearest intersection or place name)	No	
		Street / Place Name	
		Suburb / Town / District / RD no	
3	How did you get to the station / stop? (please tick one box)	Walk	
		Bicycle	
		Car / motorcycle - passenger	
		Car / motorcycle - driver	
		Another train / bus / ferry	
		Other (please specify)	
4	Where are you going to on THIS trip? (please tick one box)	Home	
		Work	
		On Work Business	
		On Personal Business	
		School	
		University or Technical Institute	
		Shopping / Social / Recreation	
		Picking Up / Dropping Off Someone or Something	
		Other (please specify)	
5	What is the address of the place you are GOING TO? (Please write in address or give the nearest intersection or place name)	No	
		Street / Place Name	
		Suburb / Town / District / RD no	
6	At which station / stop are you getting off THIS train / bus?		Optional - Probably not include for train. Can't include for bus.
7	How will you get from the stop / station to your destination? (please tick one box)	Walk	
		Bicycle	
		Car / motorcycle – passenger	
		Car / motorcycle – driver	
		Another train / bus / ferry	
		Other (please specify)	
8	What type of ticket are you using for this trip? (please tick one box)	Single	Optional - Probably include but not imperative.
		Return	
		Daily	
		Multiple trip (e.g. 10 trip, 40 trip)	
		Multiple day (e.g. weekly, monthly)	
		Other (please specify)	
9	Was this ticket:	Adult	

		Child	
		Tertiary Student	
		Senior Citizen	
		Other	
10	How many vehicles are owned by people in your household?		
11	What gender are you?		Optional - Probably include
12	How old are you?		Optional - Probably include
13	Have you made, or do you plan to make a return trip on this route today?	If yes, at what time did you make / do you plan to make this trip?	
14	Do you have a drivers licence, if yes, what type?		Optional - Probably include
15	I am:	Employed full time	Optional - Probably include
		Employed part time	
		Homemaker	
		Student	
		Unemployed	
		Other	
16	Does your employer subsidise your vehicle usage? (e.g. fuel card, free parking, company car)		Optional - Probably include

Appendix B   External Cordon Survey Questions (draft)

1.   Site No. _____

2.   Direction _____

3.   Survey Time _____

4.   Vehicle Classification

☐ Car
☐ Light Commercial Vehicle
☐ Medium Commercial Vehicle
☐ Heavy Commercial Vehicle I
☐ Heavy Commercial Vehicle II
☐ Motorcycle

5.   Number of people in the vehicle (including driver) _____

6.   Gender of Driver (optional)

☐ Male
☐ Female

7.   Where did you start from on this trip?

☐ Home / holiday home
☐ Workplace
☐ School / polytech / university
☐ Shop / malls / retail
☐ Sport / leisure / entertainment /recreation / eating venue
☐ Medical / dental / personal business
☐ Collecting / delivering goods
☐ Elsewhere _____

8.   What is the address of the place you started from?

Street No. _____
Building Name: _____
Street Name: _____
Suburb or Area: _____

9.   Where are you going on this trip?

☐ Home / holiday home
☐ Work / personal business place
☐ School / polytech / university
☐ Shopping centre / retail
☐ Sports/ leisure / recreation facilities / eating venue
☐ Medical / dental facilities
☐ Collecting / delivering goods
☐ Elsewhere _____

10.   What is the address of the place you started from?

Street No. _____
Building Name: _____
Street Name: _____
Suburb or Area: _____

11.   What type of vehicle are you driving?

☐ Private Vehicle
☐ Company Vehicle
☐ Hired Vehicle
☐ Other _____

12.   Are the running costs of this vehicle subsidised?

☐ Yes
☐ No

13.   What is the age of the driver? (optional)

☐ 15 - 19
☐ 20 - 29
☐ 30 - 39
☐ 40 - 49
☐ 50 - 59
☐ over 60

14.   What is your current employment status? (optional)

☐ Employed Full Time
☐ Employed Part Time
☐ Housewife
☐ Student
☐ Unemployed
☐ Other _____

15.   What is your current occupation?