OPUS INTERNATIONAL CONSULTANTS AND ARUP

WELLINGTON TRANSPORT MODELS

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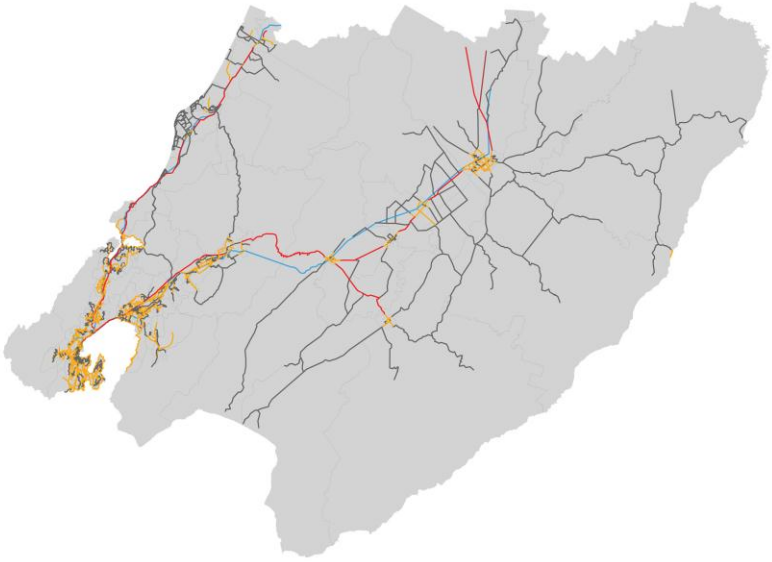

TN5B – Rail Intercept Survey Analysis

Date: December 2012

ARUP OPUS

Wellington Transport Models

TN5B : Rail Intercept Survey Analysis

prepared for

Greater Wellington Regional Council

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This report takes into account the particular instructions and requirements of our client. It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

John Bolland:
(Peer Reviewer) _____

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Contents

1 Introduction

This technical note describes the cleaning and analysis of the rail intercept surveys that were carried out by TDG and Research NZ as part of the Wellington Public Transport Model (WPTM) development project.

2 Survey Description

Details regarding the development of the survey methodology, sampling framework and survey administration have been reported in other documents prepared for GWRC, including:

- TN4 - Bus and Rail Intercept Survey Methodology, which describes survey development and testing by TDG;
- TN2 - Survey Sampling Methodology, prepared by Opus and Arup, which describes the approach used to select routes for survey; and
- Survey reports prepared by TDG and Research NZ.

The data collected in the surveys was coded (including the geo-coding of address details) by the survey firms and supplied to Opus and Arup in spreadsheet files. A consolidated spreadsheet based survey dataset was created for the analysis presented in this technical note.

There are 4 rail lines within the Greater Wellington Region on which rail intercept surveys were undertaken. The lines and dates between which the surveys were undertaken are as follows:

- Hutt Valley Line – 18 stations, surveyed between Wednesday 26th and Thursday 27th October 2011;
- Kapiti Line – 15 stations, surveyed between Wednesday 26th and Thursday 27th October 2011;
- Melling Line – 6 stations, surveyed between 15th – 19th August 2011; and
- Johnsonville Line – 9 stations, AM peak services surveyed in June 2011, Inter peak services surveyed between 15th and 19th August 2011.

With the exception of the Johnsonville Line, which was surveyed in June 2011 (in the AM peak only), all lines were originally surveyed between the 15th and 19th August 2011. There was, however, severe inclement weather (a snow storm) during the survey period which affected both reliability and patronage. Analysis of the data collected during this period showed that whilst the Johnsonville and Melling lines remained relatively unaffected by the snow, the Kapiti and Hutt Valley lines were significantly affected. As a result both the Hutt Valley and Kapiti lines were re-surveyed on the 26th and 27th October 2011.

The abortive Kapiti and Hutt Valley surveys undertaken in August have been retained but are not presented in this piece of analysis. A possible future task, outside the scope of this piece of work, would be to compare these surveys against the October surveys to determine whether there is any useful data that can be used. For example, whilst the distribution of trips by access mode in August might be unrealistic (more people would probably walk to the station than might normally be expected), other elements of the data, such as the distribution of trips in Wellington CBD, could be valid and of use.

In total 4,420 completed survey records were returned. The breakdown of trips by line and time period is shown in Table 2-1 below.

Table 2-1: Returned Rail Surveys by Time Period and Line

Line	AM Peak Completed Surveys	Inter Peak Completed Surveys
Hutt Valley	1024	458
Melling	231	14
Kapiti	1507	285
Johnsonville	772	129
Total	**3534**	**886**

Table 2-2 lists the questions that were asked in the surveys. A copy of the full survey questionnaire is included in Appendix A.

The majority of survey questions were the same regardless of whether the survey was undertaken in June, August or October. The main difference relates to route and arrival time. Data for both fields was not collected during the June (Johnsonville Line) surveys. Whilst the arrival time was not recorded, the time period during which the survey was handed out was recorded.

Table 2-2: Questions on the Rail Intercept Survey Form

No.	Question
1	Where did you come from before catching the train?
2	Where is that place? - please provide an address OR intersection nearby
3	What time did you start your trip from that place?
4	How did you get to the train station where you got on this train?
5	At which station will you get off this train?
6	This train trip is part of your journey to what destination?
7	Where is that place? - please provide an address OR intersection nearby
8	How will you finish your journey when you get off this train?
9	How long will it take you to reach your final destination after getting off this train?
10	What ticket are you using for this train trip today?
11	Gender?
13	Which age category are you in?
14	Do you have a drivers licence?
15	Was a car available to you as an alternative to taking the train for this trip?
16	Will this train take you to your final destination? (Pilot only)

Whilst most stations in the network are unique to a particular line, there are a number of stations (not including Wellington) that are served by services on more than one line. These stations are as follows:

- Kaiwharawhara / Ngauranga / Petone – served by Melling and Hutt Valley Line trains as well as Kapiti Line (Ngauranga) trains; and
- Waterloo / Upper Hutt – served by Hutt Valley and Wairarapa line trains.

The majority of completed survey forms associated with Kaiwharawhara, Ngauranga and Petone had the line recorded (Melling or Hutt Valley). For a small number of trips for which the line was not recorded it was possible to work out whether the service was a Melling or

Hutt Valley service by cross referencing the arrival time in Wellington against timetabled Melling and Hutt Valley Line arrivals.

Waterloo and Upper Hutt are two of the busiest stations on the network and are both served by Hutt Valley Line trains and the limited stop Wairarapa line trains. It is assumed that survey forms were handed out to passengers boarding both Hutt Valley and Wairarapa line trains. As it is hard to distinguish between whether a Hutt Valley service or Wairarapa service was taken from just looking at the completed survey forms, both lines are treated as one line, referred to as the Hutt Valley Line, for the purpose of this note.

Survey data was collected in order to coincide as neatly as possible with the modelled time periods:

- AM peak period – 7am to 9am; and
- Inter peak period – 11am to 1pm.

Before undertaking the data collection exercise it was necessary to determine how the time period would be allocated. For example, a passenger leaving Upper Hutt at 8.59 and arriving at Wellington at 9.40am could be defined as travelling in the AM peak should the departure time be used to define the time period. Conversely, someone departing at 6.20am and arriving into Wellington at 7.01am could be defined as travelling in the AM peak should the arrival time be used to define the time period.

For the purpose of this survey the following definitions were employed to determine the time period:

- For inbound trips towards Wellington, the time period was allocated according to the scheduled arrival time of the train at Wellington Station; and
- For outbound trips, the time period was allocated according to the departure time of the train from Wellington.

Using this method the majority of passengers using rail services during both modelled time periods should be recorded. Analysis undertaken by TDG and Research NZ suggested that this was the case.

3 Data Cleaning and Analysis of Survey Responses

3.1 Introduction

This section documents the cleaning and subsequent analysis of the rail intercept data.

The analysis is broadly grouped as follows:

- Origin – destination analysis
    - Reports the percentage of records where the origin and / or destination end cannot be accurately geo-coded.
- Access / egress time
    - Access / egress time is analysed, with trips exhibiting unusual access / egress times highlighted;
    - The distance between the actual origin / origin station and destination station / actual destination is also calculated. Records with long access / egress distances are identified and analysed;
    - Total journey distance is also calculated, with seemingly long journeys assessed for plausibility; and
    - Journey speed is also calculated, with fast journeys analysed.
- Access / egress mode
    - Access / egress mode by line and time period is presented, to determine whether the patterns exhibited by the data appear realistic.
- Cross referencing between access and egress mode, distance and time
    - Designed to assess the plausibility of responses – for example, are there any walk access legs over 10km in length; and
    - Bus-rail and rail-rail transfer trips are also identified and commented upon.
- Trip purpose
    - Trip purpose (child, work, education and other) is determined, by line and time period; and
    - Those records where trip purpose cannot be determined are highlighted, enabling the user to decide how these records should be used.
- Gender, drivers licence, car availability
    - All three categories are analysed, with trends within the dataset identified and commented upon.
- Ticket Type
    - Analysis of ticket type is undertaken, identifying any apparent trends and anomalies.

The analysis is broken down according to each of the headings listed above; anomalous records are identified at the end of each section, along with information regarding how these records are currently being dealt with (i.e. **discarded** or **flagged and retained**). Note that if a record is identified as not being geo-coded correctly, it would not be flagged again should another error be found. It should be pointed out that all analysis presented in this section uses the full **cleaned** dataset with discarded records omitted.

In Section 4 the dataset is summarised, detailing how many records have either been discarded or have been identified as having data missing at each stage of the process.

In Section 5 sample rates are calculated using the **cleaned** data by matching the intercept surveys with rail boarding and alighting surveys.

3.2 Origin and Destination

The survey captures several pieces of information regarding the origin and destination address – street number, building name, street name, suburb and nearest landmark. The geo-coding process (undertaken by TDG and Research NZ) returns a latitude and longitude based on these locations, using assumptions where some information is missing.

Of the 4,358 records, 25 are missing both origin and destination coordinates, 27 are just missing origin coordinates whilst 66 are missing destination coordinates. Therefore, approximately 2.5% of all records will have to be omitted as either one or both ends of the journey is not accurately geo-coded. Of these records the majority relate to survey records collected on the Johnsonville Line in June, and are confined only to the AM peak. This factor should be borne in mind when this data is being used to inform the WPTM matrix building process.

In the summary spreadsheet these records are coded with a **flag value of '1'**.

3.3 Time Period

All records are categorised into either the AM peak (AM) or Inter peak (IP). The method used to define the time period was outlined in Section 2.

Figure 3-1 below shows all records, segmented by departure time from their initial origin (the place they are at before they make their way to the train station). It shows that the distribution of trips by departure hour is skewed to the left in both the AM peak and Inter peak; this is unsurprising as whilst survey forms were only handed out to those passengers boarding trains within the defined time period, many passengers will leave their initial origin before the start of the modelled time period in order to catch a train that departs within the modelled time period.

Despite the fact that a number of journeys are shown departing before 5am in the morning, overall there are relatively few outliers within the dataset. As a rule of thumb, any journey where the departure time from the initial origin is more than 90 minutes before the modelled time period begins (i.e before 5.30am or 9.30am) has been **flagged with a '2'**.

Figure 3-2 shows all journeys again, this time categorised by arrival hour. As is to be expected, the majority of arrivals are within the modelled time period. Those arrivals that lie outside of the modelled time period occur after 9am (AM peak) and after 1pm (Inter peak). These records were checked for plausibility; any anomalous records have been **flagged with a '2'** whilst all remaining records are deemed suitable.

Neither the arrival nor departure time was recorded for many of the Johnsonville surveys undertaken in June. The time period during which the survey was handed out was recorded and used to allocate records to the correct time period.

The time period that was allocated to several records appeared to be erroneous, with the arrival time at the destination station not corresponding to allocated time period. There was a specific problem with the 11.45am 'Hutt Valley Line' arrival at Wellington Station – this

service was coded as being in the AM peak. The survey company indicated that this service was busy with people heading to the Rugby World Cup Parade. Further commentary regarding the impact that the Rugby World Cup Parade had upon Hutt Valley Line patronage on the day of the surveys can be found in Section 6.

Records where the time period has been manually changed have been **flagged with a '5'.**

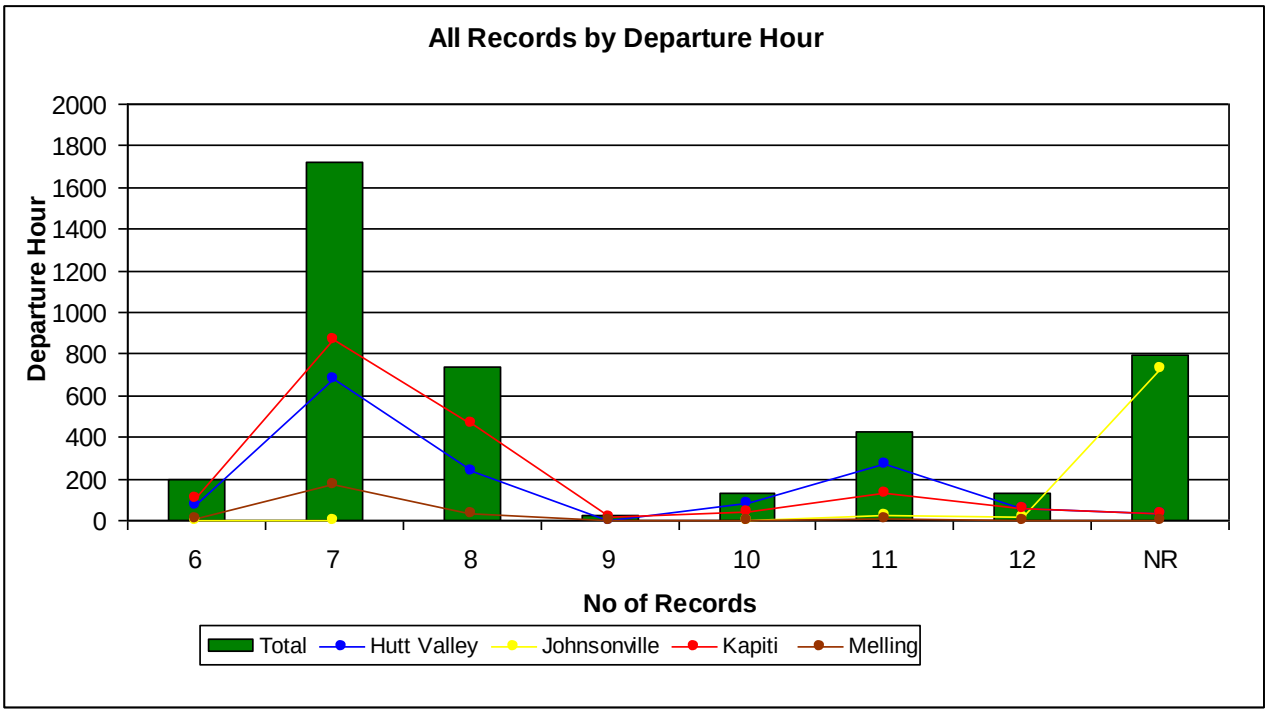

Figure 3-1: All Records by Departure Hour

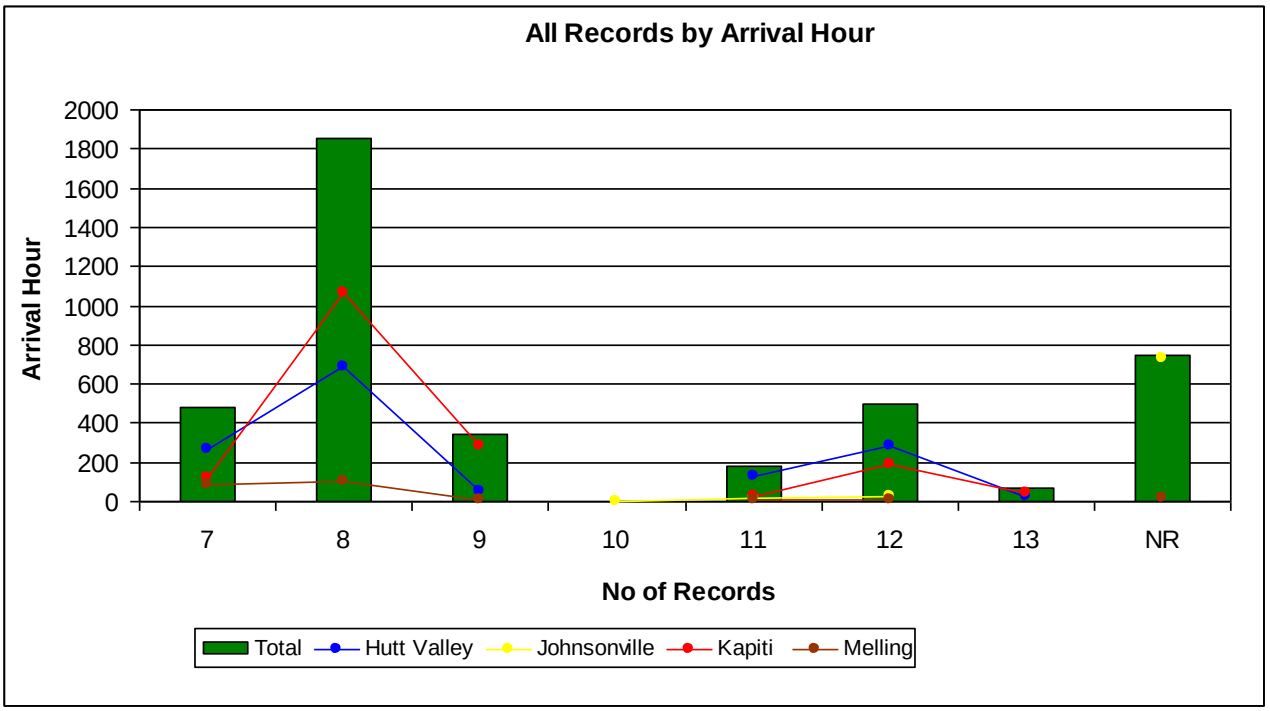

Figure 3-2: All Records by Arrival Hour

3.4 Journey Time and Journey Speed

Given that the access and egress leg of each journey has been geo-coded, combined with the fact that departure times (from initial origin), arrival times (at destination station) and approximate egress time (from destination station to final destination) are known, an estimate of both journey time and distance can be made.

A view can then be taken regarding the reasonableness of journey times and journey speeds. In order to do this the following guidelines have been employed:

- Most journeys will have a duration of less than 2.5 hours (given that the rail leg will last a maximum of 1 hour); and
- The overall journey speed will be less than 60 kilometre per hour (kph).

Any journey with characteristics outside of these bounds were identified and analysed. Those journeys where the geo-coded origin and destination (and journey distance) appeared reasonable were left in the dataset. Journeys where either the origin or destination appeared incorrect, or where either the origin or destination was overseas (there were a number of respondents who either used the plane or the ferry to head to their final destination) **have been flagged with a '3'.**

Figure 3-3 shows journey times after data cleaning. It shows that the majority of journeys are between 15 to 75 minutes in length. Journeys greater than 150 minutes in duration have been checked during the cleaning process. In some cases the journeys may have some erroneous geo-coding (these have been removed from the dataset), whilst in other cases it is the arrival or departure time that is incorrect. In most of these instances the record has been retained, provided it is geo-coded correctly and allocated to the correct time period.

Those records classified as having 'no response' comprise around 20% of all responses and are mainly due to egress time not being recorded for most journeys on the Johnsonville Line.

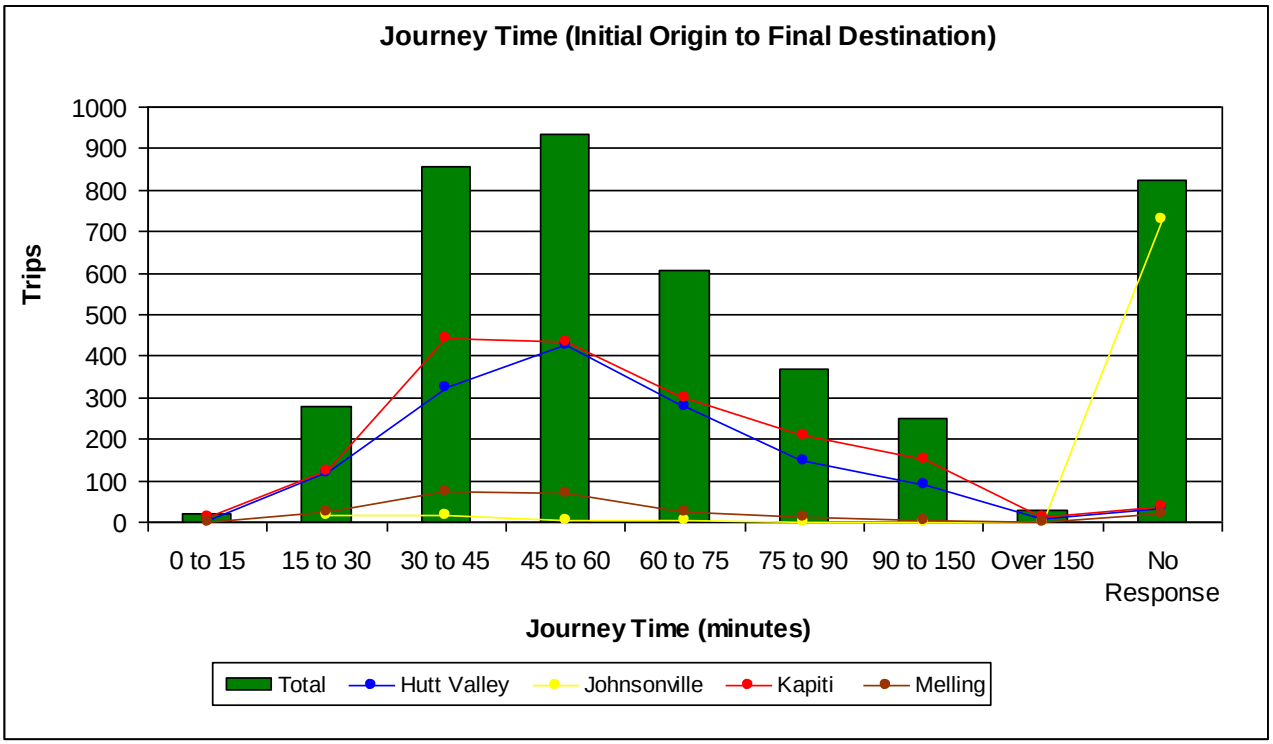

Figure 3-3: Journey Time

Figure 3-4 below shows the journey speed aggregated across routes and presented both in total and for each of the individual rail lines. It shows that the majority of journeys have an average speed of between 10kph and 40kph. Those journeys with average speeds in excess of 60kph (including those deemed out of range) have been analysed. Using the same method as was employed to look at records with anomalous journey times (as speed is a function of both distance and time), if the record was geo-coded correctly and only the time attribute appeared erroneous then the record was retained, provided it was allocated to the correct time period.

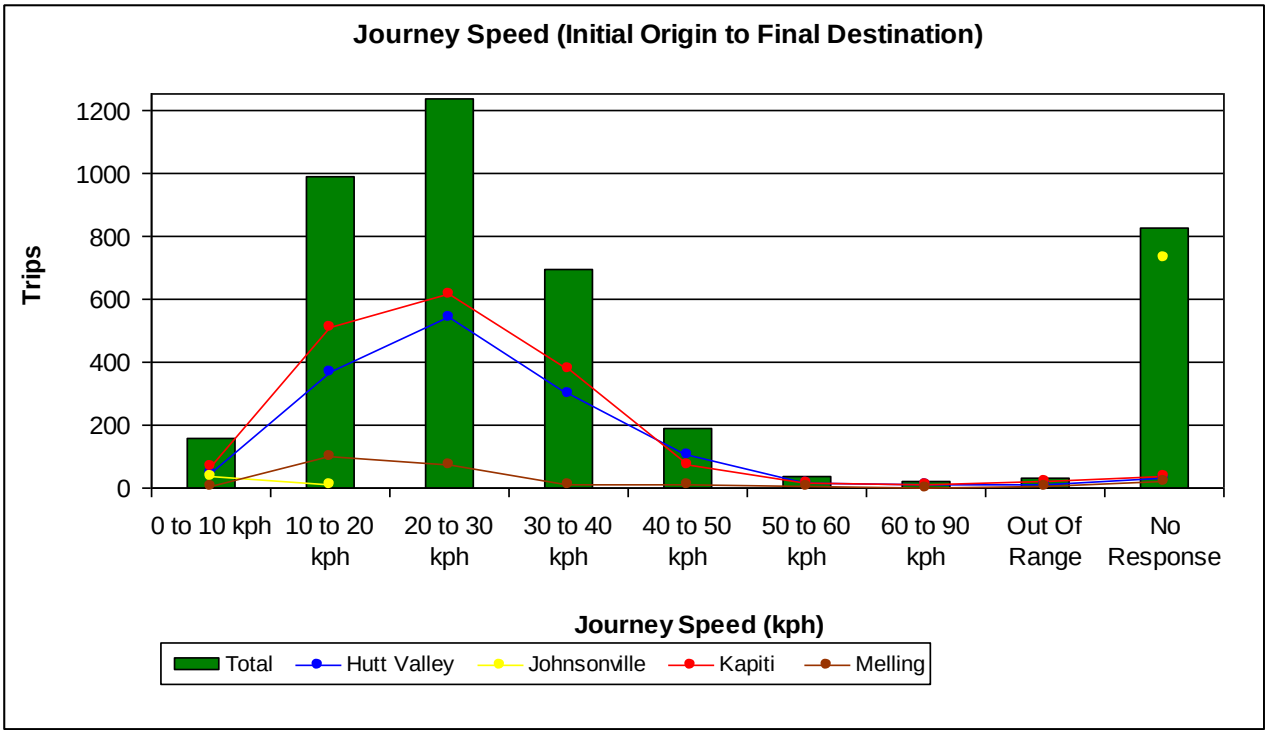

Figure 3-4: Journey Speed

3.5 Journey Distance

As the initial origin and final destination have been geo-coded, the journey distance (as the crow flies) can be calculated by combining the distances for each of the separate legs that comprise one journey:

- Initial origin to origin station;
- Origin station to destination station; and
- Destination station to final destination.

As this geo-coded data will be used during the matrix building process it is important the records are geo-coded correctly and that any outliers are identified and removed from the dataset. In order to clean this data, the following assumptions have been used:

- No journey should be greater than 100 kilometres (km) in length; and
- Any access / egress leg greater than 25km should be checked for plausibility.

Following this process any anomalous records that should be removed from the dataset have been **flagged with '4'**. In total it is recommended that 98 records, comprising around 2% of the total, be discarded due to errors with one or more component of the overall journey distance.

A further 346 records either have zero access distance or zero egress distance. Analysis of these records showed that in most cases the final destination had been geo-coded as the destination station (or the initial origin has been coded as the initial station). These records have been **assigned flag 4a**. As in most cases, one leg of the journey (access or egress) still contains accurate and useful information these records have not been removed from

the dataset. It is recommended, however, that care be taken during the matrix building process when using such records.

Figure 3-5 shows the journey distance (after data cleaning).

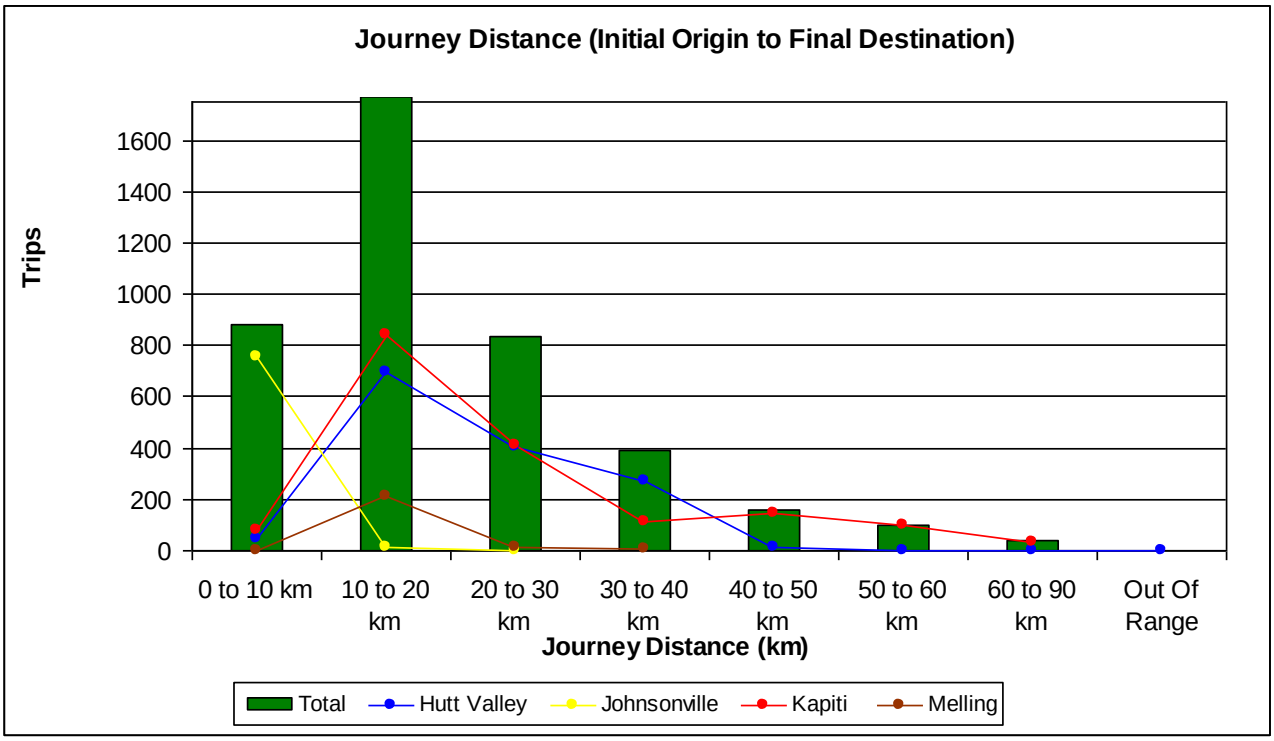

Figure 3-5: Total Journey Distance (Initial Origin to Final Destination)

3.6 Egress Time

The time that each passenger boarded the train was not recorded (in theory this could be inferred for trips that terminate in Wellington given knowledge of the boarding station, arrival time in Wellington and timetabled journey time between station pairs).

In reality it would be complicated to infer the access time from the dataset; therefore only egress time has been analysed and is presented in Figure 3-6. The data shows that for over 50% of trips it takes less than 15 minutes to reach their final destination from the destination station. Given that the majority of trips terminate in Wellington and will be commuter trips in the AM peak, thus walking or taking the bus onwards towards their final destination, it is understandable that most egress legs are fairly short. Those journeys where the egress time is greater than 1 hour were scrutinised – if the records in question appeared to have been incorrectly geo-coded they were **assigned flag '6'**. Otherwise if the origin and destination appeared to have been coded correctly then the record was retained (implying that the recorded egress time may be erroneous). The rationale behind this is that, whilst egress time is important, it is not in itself explicitly required for the construction and verification of the WPTM rail matrices.

Not including those records that have previously been discarded, an additional 840 have been flagged as having no egress time. The majority of these (673) are associated with the Johnsonville Line as egress time was generally not recorded for these surveys. These have

been **assigned flag '6a'.** The remaining records (not covering the Johnsonville Line) have been **assigned flag '6b'.**

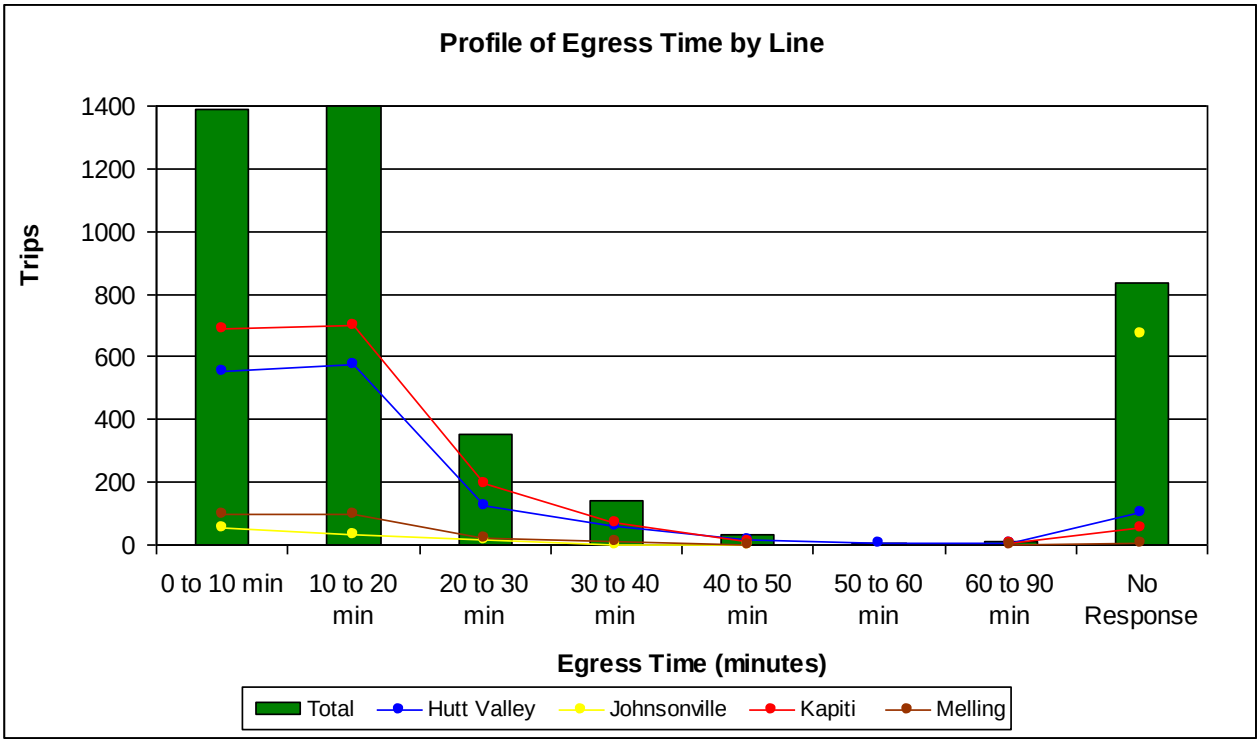

Figure 3-6: Egress Time by Line

Figure 3-7 shows that the egress distance is generally less than 5km. This is to be expected as the majority of trips end at Wellington Station and will involve a short walk / bus ride to their final destination.

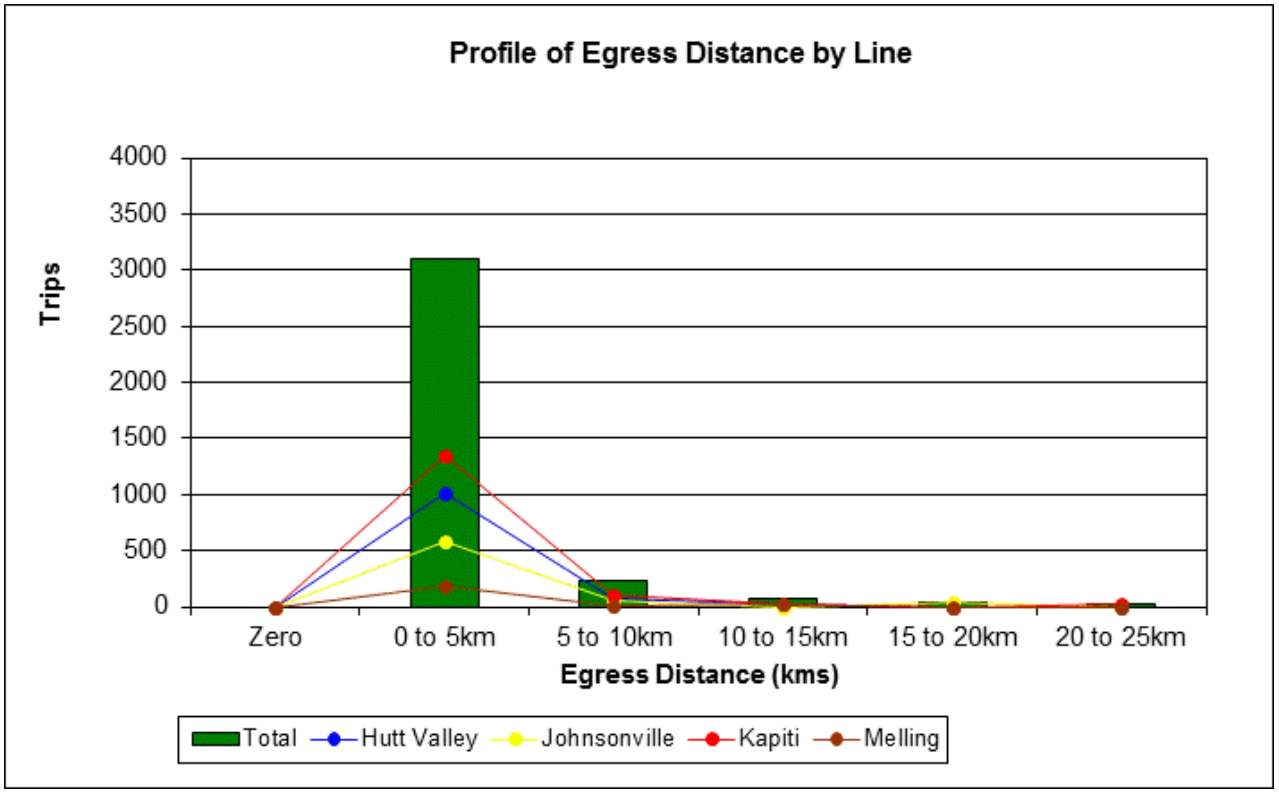

Figure 3-7: Egress Distance by Line

3.7 Access / Egress Mode

Figure 3-8 and Figure 3-9 below show access and egress mode by line and time period. The following points can be drawn from this data:

- In the AM peak there is a broadly even split between car and walk access to rail station, both comprising 45% of all rail access trips;
- The percentage of trips with walk as the access mode is slightly higher for the Johnsonville Line compared with the other lines. This is due to the urban nature of this line, with stations very close together. In effect this line has characteristics similar to those of an urban express bus service;
- A small percentage of trips in the AM peak access rail stations by bus, although bus access is mostly confined to the Kapiti and Melling lines;
- The percentage of trips accessing their departure station by foot is greater in the Inter peak compared with the AM peak. The reasons for this are as follows:
    - A smaller percentage of Inter peak users have access to a car in order to travel to their origin station (compared with AM peak users);
    - Inter peak users will often travel shorter distances to the origin station (compared with AM peak users); and
    - Station car parks may well be full at the start of the Inter peak.
- Walking is the predominant egress mode in the AM peak. This is because over 90% of all trips terminate in Wellington CBD, with people walking (or in a few instances taking the bus) onwards to their final destination. Most passengers arriving at Wellington Station will not have access to a car, hence the car modal share is fairly low (there will possibly be some pick-up trips from Wellington Station);
- In the Inter peak walking is still the dominant egress mode, although not to the same extent as in the AM peak. This is because roughly 50% of trips will terminate at

Wellington and the remainder will be return trips from Wellington, terminating at other stations in the network. Trips terminating in Wellington will have roughly the same egress mode characteristics as AM peak trips that terminate in Wellington, whilst the egress mode distribution for trips terminating elsewhere in the network in the Inter peak will more closely resemble the access mode distribution in the Inter peak;

- Bus comprises a greater share of the overall modal split of access / egress legs in the Inter peak compared with the AM peak; and
- Data on the Melling Line is affected because of a very low sample rate.

Those trips without an access or egress mode defined have been **assigned flag '7'.** Around 2% of all records fall into this category.

In summary, analysis of both the access and egress mode by time period and line shows plausible patterns and trends.

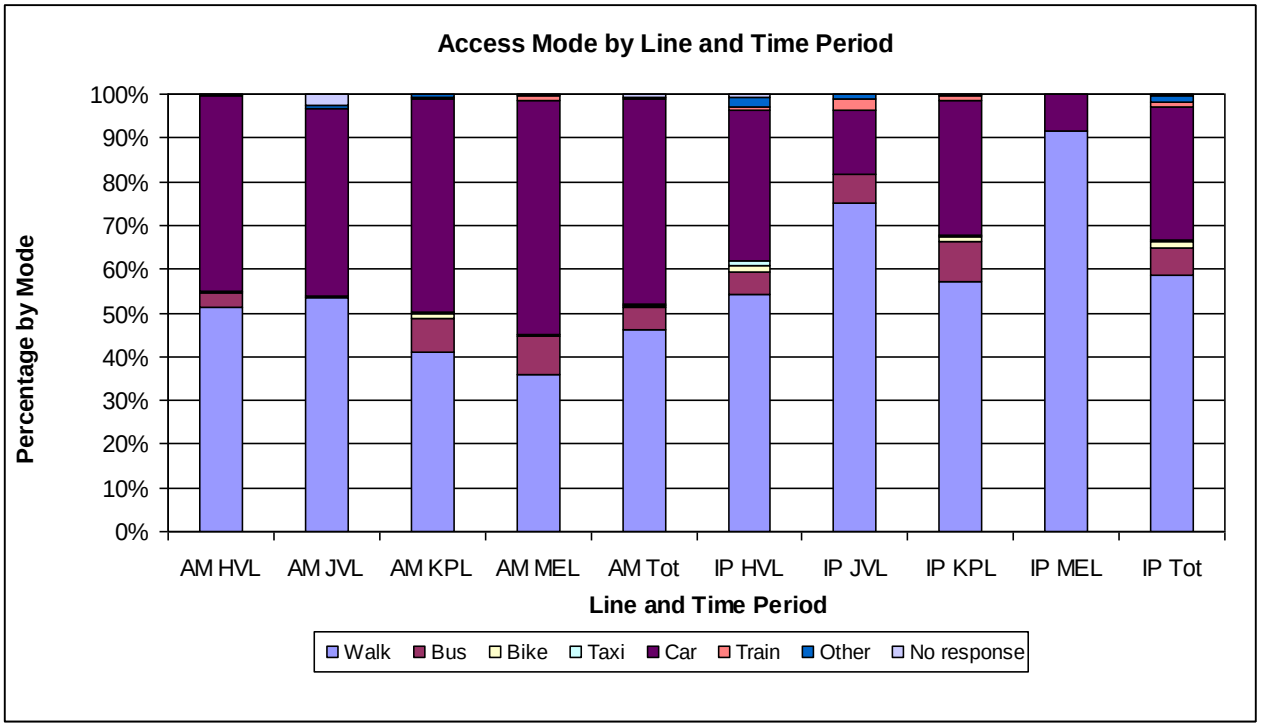

Figure 3-8: Access Mode by Time Period

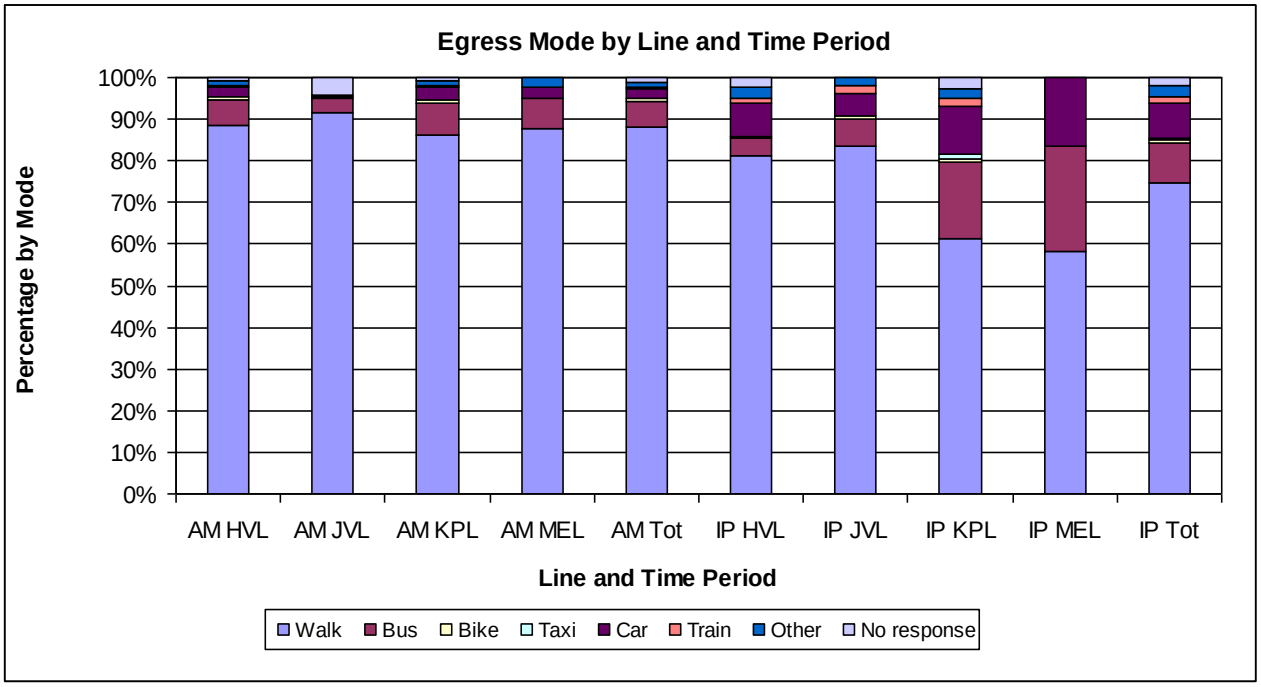

Figure 3-9: Egress Model by Time Period

3.8 Cross Referencing of Access / Egress Mode, Time and Distance

In order to determine the validity of the survey responses, access and egress mode have separately been cross-referenced against time (egress mode only) and distance (access and egress mode). The purpose of this analysis is to identify any anomalous results i.e. walk access / egress trips greater than, for example, 5km.

The following tables have been produced:

- **Table 3-1** - Access Mode vs.. Access Distance;
- **Table 3-2** - Egress Mode vs.. Egress Time; and

Table 3-3- Egress Mode vs.. Egress Distance.

-

The analysis shows that in most instances there is a reasonable correlation between the two variables in question. When comparing access mode against access distance, there are only a handful of instances where people are walking in excess of 10km from their initial origin to origin station. As expected there are some longer distance car access trips; this withstanding, the majority of car access trips are of less than 5km in length. There are around 150 instances where people walk zero distance from their initial origin to origin station. These records have been checked and it appears that the initial origin is identical to the origin station.

A similar pattern is evident when cross-referencing egress mode against egress distance. A relatively small number of walk egress trips exceed 5km in length – however, there are around 300 egress trips where the final destination is identical to the destination station (in most instances this is Wellington).

When analysing egress mode and egress time the relationship appears to be reasonable, with the egress time for the vast majority of trips being less than 40 minutes.

Trips highlighted in red in all tables below have been **assigned flag 12 as follows:**

- **Table 3-1 (12a);**
- **Table 3-2 (12b); and**
- **Table 3-3 (12c).**

It is possible records that have one or more leg flagged as being incorrectly geo-coded could be amended, provided the original error is traceable and rectifiable. For example, as the same street name may exist in one or more districts, this could explain a number of the geo-coding anomalies. This re-coding would only be undertaken, however, if the cleaned dataset present in the note is perhaps not sufficient for a number of stations on the network.

Table 3-1: Access Mode vs. Access Distance

Access Mode	0 km	0 to 5 km	5 to 10 km	10 to 15 km	15 to 20 km	20 to 25 km	25 to 30 km	30 to 120 km	Total
Walk	105	1882	19	12	4	1		1	2024
Bus	7	187	16	5	3	3			221
Bike	3	22	4	1					30
Taxi		14							14
Car	31	1514	178	49	18	12	4	10	1816
Train	1	10	3	1	1				16
Other	1	23			2				26
No response	2	22							24
Total	**150**	**3674**	**220**	**68**	**28**	**16**	**4**	**11**	**4171**

Table 3-2: Egress Mode vs. Egress Time

Egress Mode	0 - 10 min	10 to 20 min	20 to 30 min	30 to 40 min	40 to 50 min	50 to 60 min	60 to 120 min	No Resp	Total
Walk	1314	1169	259	73	12	2	5	733	3567
Bus	12	122	60	47	8		4	33	286

Bike	3	11	7		2			1	24
Taxi	4	3					1	3	11
Car	45	68	12	7	3	1	1	7	144
Train	4	7	3	3	1		1	4	23
Other	7	16	12	12	3		1	4	55
No response	1	5	1		2			52	61
Total	**1390**	**1401**	**354**	**142**	**31**	**3**	**13**	**837**	**4171**

Table 3-3: Egress Mode vs. Egress Distance

Egress Mode	0 km	0 to 5 km	5 to 10 km	10 to 15 km	15 to 20 km	20 to 25 km	Total
Walk	239	3307	15	5	1		3567
Bus	20	254	11		1		286
Bike	4	16	4				24
Taxi	1	10					11
Car	35	104	3	1		1	144
Train	2	19	2				23
Other	4	50	1				55
No response	24	37					61
Total	**329**	**3797**	**36**	**6**	**2**	**1**	**4171**

The following observations can be made regarding public transport transfer trips (i.e. bus to rail or rail to rail):

- 214 (~5%) of trips access the origin rail station by bus;
- 15 (~0.25%) of trips access the origin rail station by rail;
- 283 (~6%) of trips use bus in order to access their final destination from their destination rail station; and
- 23 (~6%) of trips use rail in order to access their final destination from their destination rail station.

There are very few rail to rail transfer trips. As the Wellington rail network is linear in nature, focussing on Wellington Station, in order to transfer between lines passengers would have to head into Wellington and then back out again towards their desired destination. Not only would there not be much demand for movements between, for example, Upper Hutt and Paraparaumu, but rail journey times would be so slow that car (or bus) would be the dominant mode for making such journeys.

For a small number of trips, bus is the access or egress mode. There is a good bus network in the Hutt Valley (focussed around the Waterloo transit hub), enabling people to catch a feeder bus service in order to access their origin station. A similar bus feeder network exists in Porirua and (to a limited extent) in Paraparaumu.

The Johnsonvillle rail line competes for patronage with bus services running between Johnsonville, Newlands and Wellington CBD. Therefore, whilst there are a small number of bus to rail transfer trips along this line, as most bus services radiate to / from Wellington CBD it is likely that if someone heading towards Wellington CBD boards a bus they would stay on the bus until alighting in Wellington. Furthermore, as no integrated ticketing system exists in Wellington any bus to rail transfers involve purchasing separate tickets for both legs – this generally works out considerably more expensive, therefore explaining why there are relatively few bus to rail transfer trips across the whole network.

As mentioned earlier, the close proximately of stations along the Johnsonville Line to each other means that the line has operating characteristics that more closely resemble light rail / rapid transit than a conventional rail line. Competition between bus and rail should be borne in mind when calibrating and validating WPTM along this corridor.

From Wellington Rail Station it is a short walk to the bus station and Lambton Quay, where rail passengers can catch a bus to access destinations such as Courtenay Place, Adelaide Road and farther afield towards Hataitai and the airport.

Rail and bus transfer trips will be analysed using a GIS package, as this data will be in the construction of both the WPTM rail and bus matrices.

3.9 Trip Purpose

The combination of origin and destination purpose was used to classify overall trip purpose (see Table **3-4**). The trip purpose categories correspond to those used in WTSM, as does the classification system (based on Figure 3-1 in Technical Note 9 from the original model reports, BECA SKM October 2002).

1. Home
2. Usual workplace
3. On employer business
4. School
5. Polytechnic / university
6. Shopping
7. Social, sport, recreational
8. On personal business
9. Other
10. No response

Table 3-4: Classification of Records into Trip Purposes

		Destination Purpose									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Origin Purpose	**1**	-	HBW	BU	HBEd	HBEd	HBSh	HBO	HBSh	HBO	-
	2	HBW	BU	BU	NHBO	NHBO	NHBO	NHBO	NHBO	NHBO	-
	3	BU	BU	BU	NHBO	NHBO	NHBO	NHBO	NHBO	NHBO	-
	4	HBEd	NHBO	NHBO	NHBO	NHBO	NHBO	NHBO	NHBO	NHBO	-
	5	HBEd	NHBO	NHBO	NHBO	NHBO	NHBO	NHBO	NHBO	NHBO	-
	6	HBSh	NHBO	NHBO	NHBO	NHBO	NHBO	NHBO	NHBO	NHBO	-
	7	HBO	NHBO	NHBO	NHBO	NHBO	NHBO	NHBO	NHBO	NHBO	-
	8	HBSh	NHBO	NHBO	NHBO	NHBO	NHBO	NHBO	NHBO	NHBO	-
	9	HBO	NHBO	NHBO	NHBO	NHBO	NHBO	NHBO	NHBO	NHBO	-
	10	-	-	-	-	-	-	-	-	-	-

Where,

NHBO = Non home-based other
HBW = Home-based work
HBEd = Home-based education
HBSh = Home-based shopping
HBO = Home-based other
BU = Business

Table 3-5 and Table 3-6 show the number of trips by purpose and line for both the AM and IP, respectively. The figures in brackets show the percentage of trips for each line that fall into the respective trip purposes.

Table 3-5: AM Peak Trip Purpose

Line	HBW	HBEd	HBSh	HBO	NHBO	BU	No Purpose	Total
Hutt Valley	749 (74)	145 (14)	6 (1)	33 (3)	25 (2)	46 (5)	4 (0)	1008
Johnsonville	424 (64)	159 (24)	7 (1)	1 (0)	8 (1)	14 (2)	53 (8)	666
Kapiti	1117 (76)	197 (13)	22 (1)	31 (2)	39 (3)	53 (4)	11 (1)	1470
Melling	181 (82)	20 (9)	0 (0)	2 (1)	9 (4)	7 (3)	1 (0)	220
Total	**2471 (73)**	**521 (15)**	**35 (1)**	**67 (2)**	**81 (2)**	**120 (4)**	**69 (2)**	**3364**

Table 3-6: Inter Peak Trip Purpose

Line	HBW	HBEd	HBSh	HBO	NHBO	BU	No Purpose	Total
Hutt Valley	25 (6)	27 (6)	21 (5)	183 (43)	156 (36)	7 (2)	10 (2)	429
Johnsonville	34 (31)	29 (27)	23 (21)	10 (9)	9 (8)	3 (3)	1 (1)	109
Kapiti	44 (17)	48 (19)	75 (29)	40 (16)	33 (13)	9 (4)	8 (3)	257
Melling	1 (8)	2 (17)	2 (17)	2 (17)	5 (42)	0 (0)	0 (0)	12
Total	**104 (13)**	**106 (13)**	**121 (15)**	**235 (29)**	**203 (25)**	**19 (2)**	**19 (2)**	**807**

The data shows that in the AM peak approximately 73% of trips are work related trips. This is to be expected as the majority of trips heading to Wellington CBD between 7am and 9am will be work related. Many non-work related trips (educational, shopping) are more likely to be undertaken by car / bus rather than by rail. The Johnsonville Line has a smaller percentage of work trips (64% of total trips in the AM peak) than the other lines. This is primarily due to a high percentage (24%) of trips heading in the counter-peak direction towards educational establishment's in the vicinity of Raroa station and a higher proportion of No Purpose trips.

In the Inter peak, 'other' trips are the most common with 29% of the total, with work and education related trips comprising around 13% each. Again there is a small degree of variability between lines.

Although not shown in the tables, Child trips account for approximately 8% of all trips in the AM peak period with the majority (90%) being home-based education trips. In the Inter peak, child trips account for around 11% of all trips with the majority being home-based other and non home-based other trips (34% and 54% respectively).

In both the AM peak and Inter peak, around 2% of all trips do not have a purpose assigned to them. These records have been retained as the missing data does not preclude the use of these records in the construction of the WPTM matrices.

Such records with no recorded journey purpose could be synthesised in order to allocate a journey purpose, taking the journey purpose distribution from the remaining trips and applying it to those trips currently without a journey purpose. These records have been **assigned flag '8'.**

3.10 Gender, Drivers Licence and Car Availability

Overall 43% of those surveyed were male and 57% female. This is a similar ratio to what was observed when processing the bus intercept data. Looking more closely at the data there are a number of possible explanations for the observed trends and patterns:

- In the 0 to 25 yr old age bracket nearly twice as many women than men have been surveyed (719 vs. 428); and
- In the working age bracket (26-59 yr old), 250 more females than males have been surveyed (1351 vs. 1098);

Table 3-7 and Table 3-8 below show the number of males and females who have a drivers licence, segmented by age. The general trend is similar between males and females and shows the following:

- Nearly all respondents under 15 years of age do not have a drivers licence. Any respondents who are under the age of 15 and do appear to have a drivers licence have been **assigned flag '9';**
- The majority of respondents, most of whom have a drivers licence, are between 26 and 59 years of age; and
- The percentage of women holding a drivers licence (75%) is slightly lower than the percentage of men (83%) holding a drivers licence. This could be one possible explanation for there being more females surveyed than males (this was discussed above).

Table 3-7: Drivers Licence, By Age, Males

	0-15 years	16-25 years	26-35 years	36-45 years	46-60 years	60 years or over	No Response	Total
Licence	1%	11%	16%	22%	24%	10%	0%	84%
No Licence	7%	5%	2%	1%	1%	1%	0%	16%
Total	**8%**	**16%**	**17%**	**23%**	**25%**	**10%**	**0%**	**100%**

Table 3-8: Drivers Licence, By Age, Females

	0-15 years	16-25 years	26-35 years	36-45 years	46-60 years	60 years or over	No Response	Total
Licence	1%	13%	15%	18%	20%	7%	0%	75%
No Licence	8%	8%	3%	2%	2%	1%	1%	25%
Total	**9%**	**21%**	**18%**	**20%**	**22%**	**8%**	**1%**	**100%**

Table 3-9 and Table 3-10 show car availability, segmented by age, for males and females. The trends are very similar to those presented when analysing those who hold drivers licences (Table 3-7 and Table 3-8), namely that a greater percentage of females than males do not have access to a car as an alternative mode for the rail journey that they were making.

Table 3-9: Car Availability, By Age, Males

	0-15 years	16-25 years	26-35 years	36-45 years	46-60 years	60 years or over	No Response	Total
Car	2%	7%	10%	16%	19%	8%	0%	63%
No Car	6%	9%	7%	7%	6%	2%	0%	37%

Total	**8%**	**16%**	**17%**	**23%**	**25%**	**10%**	**0%**	**100%**

Table 3-10: Car Availability, By Age, Females

	0-15 years	16-25 years	26-35 years	36-45 years	46-60 years	60 years or over	No Response	Total
Car	3%	8%	12%	15%	17%	6%	0%	61%
No Car	6%	14%	6%	5%	6%	3%	1%	39%
Total	**9%**	**21%**	**18%**	**20%**	**22%**	**8%**	**1%**	**100%**

3.11 Car Availability vs.. Drivers Licence

Table 3-11 below cross-references car availability against people holding a drivers licence. It can be seen that whilst nearly 80% of respondents have a drivers licence, only 57% have access to a car i.e. of those holding a licence over ¼ do not have the option of driving as an alternative mode of transport for the rail journey they were taking.

Of those respondents who do not have a licence, 5% do have a car available for their journey. From this we can infer that they could potentially have got a lift with someone instead of taking the train for the journey in question, or that they misunderstood the question. These records have been **assigned flag '10'.**

Table 3-11: Drivers Licence vs.. Car Availability

	Car Available	No Car	Total
Licence	57%	22%	79%
No Licence	5%	17%	21%
Total	**62%**	**38%**	**100%**

3.12 Ticket Type

The ticket types used to pay for rail fares are categorised as follows:

1. Cash
2. 10-trip
3. Monthly Pass
4. School Term Pass
5. Concession
6. Super Gold
7. Other

Of all the recorded trips, 8% are taken by those under the age of 16 and can therefore be categorised as child trips.

Figure 3-10 shows the various ticket types, categorised by age (adult, child) and time period (AM peak, Inter peak, Combined). The data shows that in the AM peak, monthly passes and 10-trip tickets are used for the majority of fares – this is unsurprising as the majority of AM peak users will be regular travellers, for whom a monthly pass or 10-trip ticket represents the best value for money. In the Inter peak, cash is the most popular method used for purchasing fares. Super Gold card usage, restricted to over 65's and the Inter peak, comprises around 15% of all fares in the Inter peak. There is 1 record, with serial

number 1637, that is (presumably erroneously) categorised as both 'aged 0-15 yr old' and 'Super Gold' ticket type.

Given that there are many more trips made in the AM peak than the Inter peak, when data from both time periods is combined it shows that monthly passes and 10-trip tickets are used to purchase the majority of rail fares within the Greater Wellington region.

The totals show that the majority of fares purchased are AM peak, adult fares.

Figure 3-11 shows a breakdown of ticket type by age. Generally the usage of each ticket type is fairly even across all age categories, the exception being Super Gold card usage which is exclusively available to over 65's. The data also shows that the majority of rail users are between 15 and 60 years of age.

Records for which no ticket type has been recorded have been **assigned flag 11.**

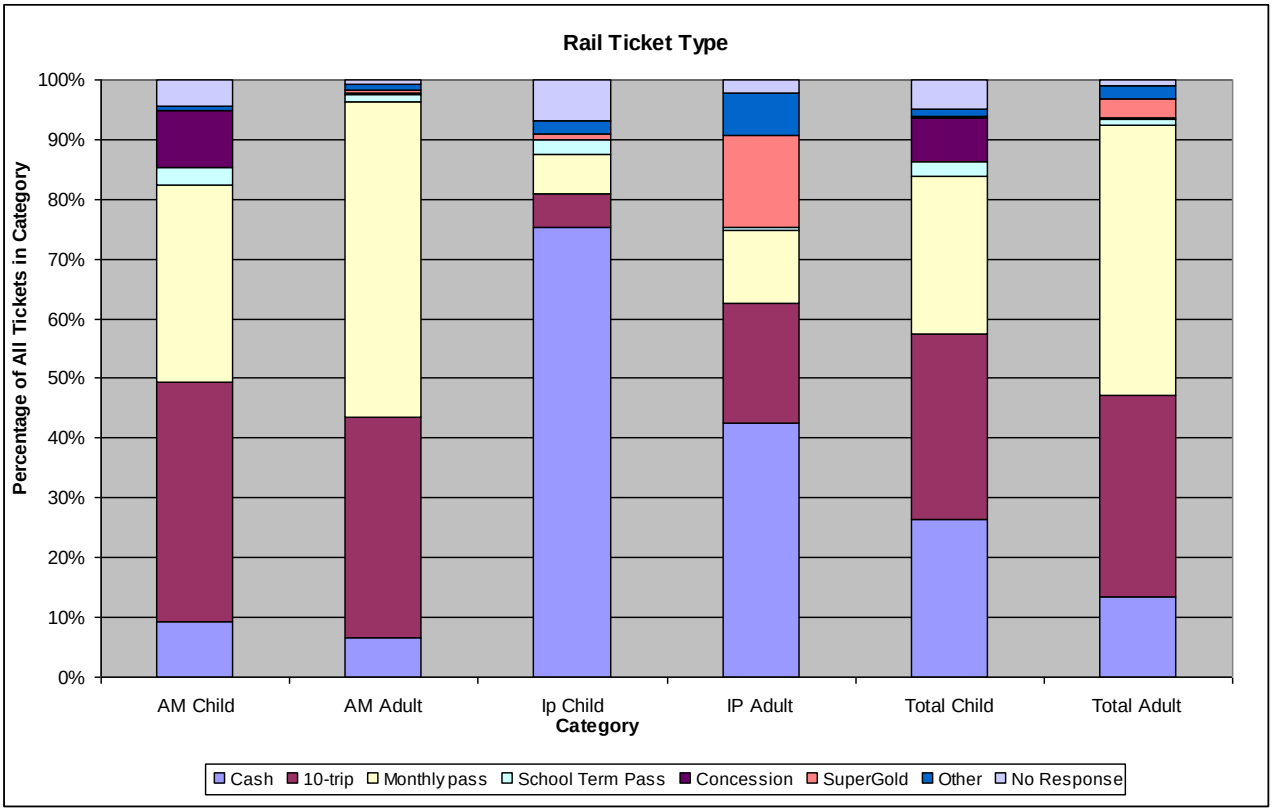

Figure 3-10: Rail Ticket Type, By Category and Time Period

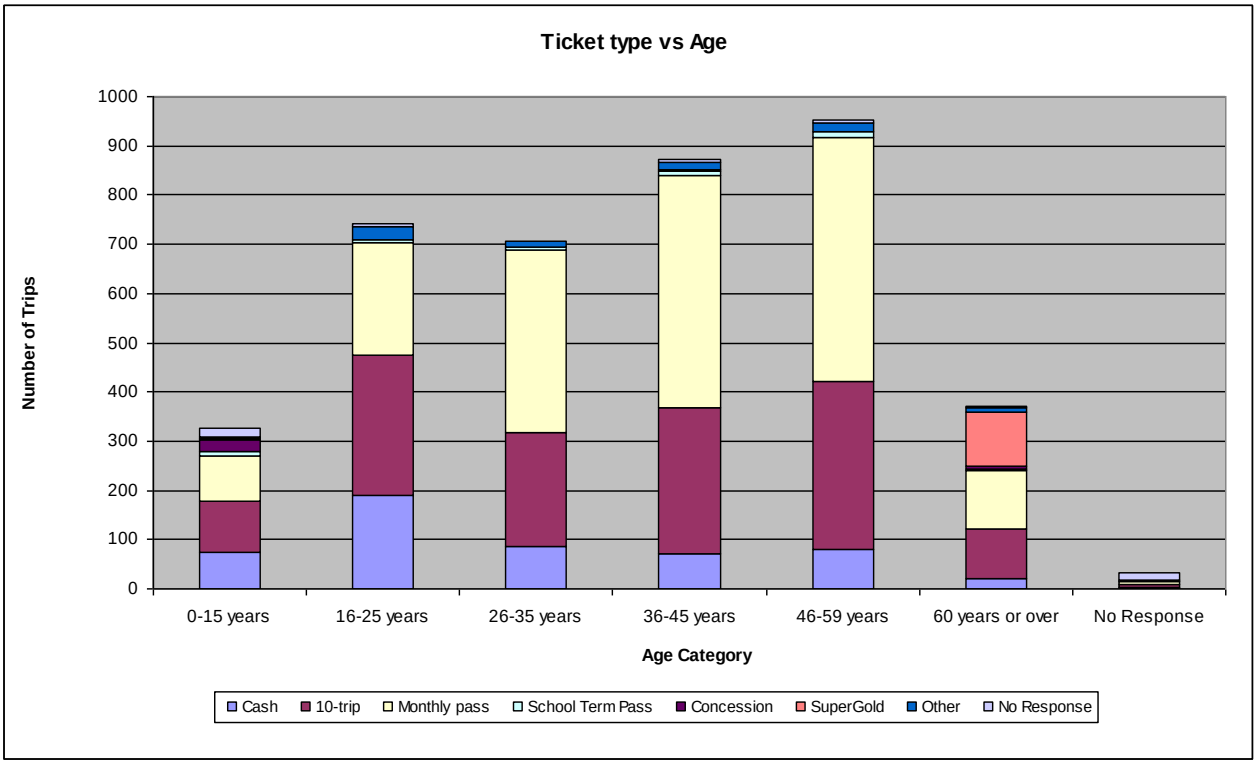

Figure 3-11: Ticket Type vs. Age

4 Discarded Records

During the analysis and cleaning process detailed above, erroneous records and those records missing certain data have been flagged, so that they can either be removed from the dataset or so that missed data can be synthesised.

Data with the following flags have been removed from the dataset, primarily due to errors with the geo-coding of origin and / or destination coordinates:

- Flag 1 – origin and / or destination not geo-coded;
- Flag 2 – journey start time (from initial origin) in excess of 90 minutes before start of time period;
- Flag 3 – journey time greater than 2.5 hours / journey speed greater than 60kph; and
- Flag 4 – journey distance greater than 100km.

Other records have been flagged because, whilst they are either missing certain fields or have contradictory field (i.e drivers licence but under 15 years old), they are still geo-coded correctly and therefore of use to the PT matrix building process. These records have been categorised as follows:

- Flag 4a – no access / egress distance;
- Flag 5 – time period modified;
- Flag 6 – egress time greater than 1 hour (or zero);
- Flag 6a – egress time zero (Johnsonville Line);
- Flag 6b – egress time zero (other lines);
- Flag 7 – no access / egress mode;
- Flag 8 – no purpose allocated to trip;
- Flag 9 – hold drivers licence, but less than 15 years old;
- Flag 10 – no drivers licence but car available;
- Flag 11 – no ticket type allocated;
- Flag 12a - access mode vs.. access distance anomalies;
- Flag 12b - egress mode vs.. egress time anomalies; and
- Flag 12c - egress mode vs.. egress distance anomalies.

Table 4-1 below summarises the number of records that have been flagged 'to be discarded' during the analysis and cleaning process. At the start of the process there were 4,420 records; it is recommended that 249 of these be removed from the dataset set. This represents approximately 6% of the completed records.

Table 4-1: Discarded Records

Flag	Number of Records	% of Completed Records
Completed Records	4,420	100%
Discarded - Flag 1	122	3%
Discarded - Flag 2	10	0%
Discarded - Flag 3	18	0%
Discarded - Flag 4	99	2%
Total Number of Records Discarded	249	6%
Cleaned Records	**4,171**	**94%**

Table 4-2 below shows how many of the remaining 4,171 records have been flagged as missing certain pieces of data. Note that the overall number of records flagged as missing some data (1693) is less than the sum of all the flags – this is because several records are missing more one piece of data. In summary, 42% of the remaining records are either missing fields or contain contradictory / potentially anomalous data.

Table 4-2: Incomplete Records

Flag	Number of Records	% of Cleaned Records
Cleaned Records	4,171	94%
Flagged - Flag 4a	350	8%
Flagged - Flag 5	447	11%
Flagged - Flag 6	840	20%
Flagged - Flag 7	83	2%
Flagged - Flag 8	76	2%
Flagged - Flag 9	36	1%
Flagged - Flag 10	188	5%
Flagged - Flag 11	53	1%
Flagged - Flag 12a	168	4%
Flagged - Flag 12b	33	1%
Flagged - Flag 12c	378	9%
Total Number of Records Flagged	1,752	42%
Records with No Missing Fields	**2,419**	**58%**

5 Sample Rates

Rail boarding and alighting counts were undertaken at all stations on the Greater Wellington rail network between 5th and 7th September.

As the following common data is present (or can be determined) it is possible to determine sample rates for the rail intercept surveys and boarding / alighting surveys (i.e the proportion of rail users that have been surveyed):

- Boarding station;
- Direction of travel (inbound or outbound); and
- Time period.

The data is summarised by line. Most stations are only served by one particular line; there are a number of stations, however, that are served by more than one rail line. These are listed below:

- Upper Hutt
- Waterloo
- Petone
- Ngauranga
- Kaiwharawhara
- Wellington

Whilst data for these stations is tabulated for each specific line (and highlighted in blue), the combined figures presented at the bottom of the table should be taken forward for use in the matrix building process.

Table 5-1 and

Table 5-2 below show the AM peak and Inter peak sample rates.

Table 5-1: AM Peak Sample Rates

	AM Inbound						AM Outbound					
	Boarding			Alighting			Boarding			Alighting		
	Survey	Count	%	Survey	Count	%	Survey	Count	%	Survey	Count	%
Johnsonville Line												
Johnsonville	105	374	28%		0		2	0		14	28	50%
Raroa	44	53	83%		3		3	16	19%	107	284	38%
Khandallah	72	164	44%		3		11	24	46%	1	1	100%
Box Hill	23	46	50%	1	5	20%	2	19	11%	1	4	25%
Simla Crescent	52	146	36%	1	1	100%	17	65	26%	1	1	100%
Awarua Street	92	114	81%		2		35	55	64%		1	
Ngaio	58	140	41%	1	1	100%	31	68	46%	2	1	200%

	AM Inbound						AM Outbound					
	Boarding			Alighting			Boarding			Alighting		
	Survey	Count	%	Survey	Count	%	Survey	Count	%	Survey	Count	%
Crofton Downs	89	169	53%		4		25	37	68%	5	7	71%
Wellington		0		532	1187	45%	5	43	12%		0	
Total	535	1206	44%	535	1206	44%	131	327	40%	131	327	40%
Hutt Valley Line												
Upper Hutt	123	175	70%		0			0		7	36	19%
Wallaceville	36	153	24%	2	1	200%		1		5	23	22%
Trentham	36	174	21%		12		3	7	43%	14	101	14%
Heretaunga	25	77	32%		0			1		1	12	8%
Silverstream	76	286	27%	3	17	18%	1	19	5%	12	92	13%
Manor Park	27	34	79%		0		5	7	71%	2	1	200%
Pomare	11	71	15%	1	4	25%		2			4	
Taita	72	268	27%	8	11	73%	3	3	100%	5	21	24%
Wingate	23	51	45%	1	0		1	0		3	5	60%
Naenae	71	152	47%	3	14	21%	8	44	18%	1	11	9%
Epuni	50	73	68%		4		5	21	24%		5	
Waterloo	188	1149	16%	9	34	26%		96		2	27	7%
Woburn	77	246	31%	1	3	33%	7	31	23%		8	
Ava	97	223	43%	4	15	27%	4	26	15%		11	
Petone	44	233	19%	6	17	35%	9	8	113%		13	
Ngauranga		0		1	0			2			5	
Kaiwharawhara		0		2	0			1			7	
Wellington		0		915	3233	28%	6	122	5%		0	
Total	956	3365	28%	956	3365	28%	52	391	13%	52	382	14%
Kapiti Line												
Waikanae	122	243	50%		0			0		1	24	4%
Paraparaumu	116	453	26%	9	6	150%		20		6	45	13%
Paekakariki	94	123	76%	1	0		2	24	8%		3	
Pukerua Bay	47	111	42%		3			15			1	
Plimmerton	66	232	28%	1	5	20%		3		2	15	13%
Mana	36	150	24%		4			1		2	0	
Paremata	147	330	45%	2	27	7%	1	15	7%	7	19	37%
Porirua	218	896	24%	34	104	33%	9	14	64%	51	89	57%
Kenepuru	14	18	78%	4	9	44%	2	13	15%	5	4	125%
Linden	120	211	57%	2	18	11%	6	10	60%		6	
Tawa	178	191	93%	5	21	24%	9	16	56%	3	7	43%
Redwood	107	242	44%		1		10	12	83%	1	1	100%
Takapu Road	126	163	77%	1	6	17%	1	4	25%	1	2	50%
Kaiwharawhara		0		1	2	50%		1			0	
Wellington		0		1331	3157	42%	39	70	56%		0	
Total	1391	3363	41%	1391	3363	41%	79	218	36%	79	216	37%

	AM Inbound						AM Outbound					
	Boarding			Alighting			Boarding			Alighting		
	Survey	Count	%	Survey	Count	%	Survey	Count	%	Survey	Count	%
Melling Line												
Melling	60	245	24%		0			0		7	19	37%
Western Hutt	54	50	108%		0		1	22	5%	4	3	133%
Petone	92	151	61%		4			9		1	28	4%
Ngauranga		0		2	16	13%		0			0	
Kaiwharwhara		0		1	1	100%		1			1	
Wellington		0		203	425	48%	12	39	31%	1	0	
Total	206	446	46%	206	446	46%	13	71	18%	13	51	25%
Multi-line Stations												
Upper Hutt	123	232	53%	0	46	0%	0	6	0%	7	36	19%
Waterloo	188	1382	14%	9	92	10%	0	100	0%	2	27	7%
Petone	136	406	33%	6	45	13%	9	18	50%	1	41	2%
Ngauranga	0	0		3	16	19%	0	2	0%	0	5	0%
Kaiwharwhara	0	0		4	1	400%	0	1	0%	0	1	0%
Wellington	0	0		2981	9021	33%	62	285	22%	1	0	

Table 5-2: Inter Peak Sample Rates

	IP Inbound						IP Outbound					
	Boarding			Alighting			Boarding			Alighting		
	Survey	Count	%	Survey	Count	%	Survey	Count	%	Survey	Count	%
Johnsonville Line												
Johnsonville	23	66	35%		0			0		10	125	8%
Raroa	4	5	80%	1	2	50%		3		4	8	50%
Khandallah	7	3	233%	3	4	75%	1	2	50%	4	3	133%
Box Hill		5			1		1	4	25%	2	5	40%
Simla Crescent	3	18	17%		0		3	7	43%	9	7	129%
Awarua Street	3	7	43%	2	2	100%	1	3	33%	5	4	125%
Ngaio	12	18	67%		5		2	4	50%	10	8	125%
Crofton Downs	9	10	90%	2	1	200%	1	5	20%	4	8	50%
Wellington		0		53	117	45%	39	76	51%		0	
Total	61	132	46%	61	132	46%	48	104	46%	48	168	29%

	IP Inbound						IP Outbound					
	Boarding			Alighting			Boarding			Alighting		
	Survey	Count	%	Survey	Count	%	Survey	Count	%	Survey	Count	%
Hutt Valley Line												
Upper Hutt	39	39	100%		0			0		3	21	14%
Wallaceville	14	11	127%		1		1	2	50%		6	
Trentham	13	20	65%	4	1	400%		8			10	
Heretaunga	27	3	900%	2	0			1		2	3	67%
Silverstream	26	13	200%		2		2	4	50%		11	
Manor Park	3	5	60%		2			1			0	
Pomare	8	9	89%		2			1			9	
Taita	33	15	220%		1			1		1	19	5%
Wingate	4	6	67%		0			0			5	
Naenae	45	19	237%		15			17			14	
Epuni	10	9	111%	1	3	33%	1	3	33%	1	9	11%
Waterloo	72	84	86%	2	8	25%		19		2	43	5%
Woburn	71	32	222%		5			4		3	18	17%
Ava	17	8	213%	3	4	75%	2	4	50%	1	4	25%
Petone	34	25	136%		18		1	21	5%		32	
Ngauranga		1		1	0			0			0	
Kaiwharawhara		0		1	3	33%		2			1	
Wellington		0		402	234	172%	6	117	5%		0	
Total	416	299	139%	416	299	139%	13	205	6%	13	205	6%
Kapiti Line												
Waikanae	22	62	35%		0			0		9	42	21%
Paraparaumu	33	70	47%	6	19	32%	5	25	20%	15	32	47%
Paekakariki	7	7	100%	1	1	100%	6	8	75%	1	9	11%
Pukerua Bay	5	14	36%		1			2		1	9	11%
Plimmerton	9	17	53%	2	9	22%		2		4	9	44%
Mana	2	9	22%	1	4	25%		3		1	4	25%
Paremata	13	12	108%	1	5	20%	3	0		1	8	13%
Porirua	28	100	28%	15	42	36%	5	24	21%	38	66	58%
Kenepuru		6		2	8	25%	1	4	25%	1	3	33%
Linden	13	23	57%		11		4	5	80%	7	4	175%
Tawa	12	19	63%	4	7	57%	9	16	56%	6	13	46%
Redwood	11	18	61%	2	3	67%	1	2	50%	1	6	17%
Takapu Road	16	5	320%		3		1	5	20%	1	2	50%
Kaiwharawhara		0			1							
Wellington		0		137	248	55%						
Total	171	362	47%	171	362	47%	35	96	36%	86	207	42%

	IP Inbound						IP Outbound					
	Boarding			Alighting			Boarding			Alighting		
	Survey	Count	%	Survey	Count	%	Survey	Count	%	Survey	Count	%
Melling Line												
Melling	3	17	18%		0			0		5	6	83%
Western Hutt	2	0			0			2			1	
Petone		3			4							
Ngauranga		0			0							
Kaiwharwhara		0			0							
Wellington		0		5	16	31%						
Total	5	20	25%	5	20	25%	0	2	0%	5	7	71%
Multi-line Stations												
Upper Hutt	39	39	100%	0	0		0	0		3	21	14%
Waterloo	72	84	86%	2	8	25%	0	19	0%	2	43	5%
Petone	34	28	121%	0	22	0%	2	21	10%	1	39	3%
Ngauranga	0	1	0%	1	0							
Kaiwharwhara	0	0		1	0							
Wellington	0	0		597	615	97%						

Table 5-3 compares the results of the survey samples reported above against the ideally required sample size reported in Technical Note 2. At an aggregate level, the results show that the surveyed samples exceed the required for the AM peak period but fall short in the Inter-peak period.

Table 5-3: Inter Peak Sample Rates

	AM			IP		
Line	**Surveyed**	**Required**	**Difference**	**Surveyed**	**Required**	**Difference**
Johnsonville	-	-	-	109	210	-48%
Hutt Valley	1008	942	7%	257	331	-22%
Kapiti	1470	883	66%	206	352	-41%
Melling	219	199	10%	5	26	-81%

At a high-level, achieveing recorded sample rates equal to or higher than the target sample rate implies that we can have confidence in the recorded data for trips originating from the areas/routes that the sample was collected on. Conversely, sample rates lower than the target implies that the travel patterns / data should be used with more caution.

This is a generalisaiton as the ‘completeness’ of the questionnaires is an important factor that has not been captured in the tables above and will differ depending on the surveyed data in question.

6 Inter Peak

Some of the Inter peak sample rates look quite high on the Hutt Valley Line, particularly in the inbound direction. Whilst sample rates for most lines are around 25% to 40%, the Hutt Valley Line (inbound) in the Inter peak has sample rates over 100%. As the surveys and boarding and alighting counts were undertaken on different days, we might expect the Inter peak demand to vary by a maximum of perhaps 20% from one day to the next, unless there were exceptional circumstances on any one day which might lead to this being classified as an 'atypical' Inter peak period. As the remit for this project is to build AM and Inter peak public transport models covering an 'average' day, if patronage levels and travel patterns can be deemed 'atypical' for a particular time period then consideration should be given to not using this data or at the very least documenting these limitations.

The reason for these high sample rates is that the Rugby World Cup (RWC) celebration parade, which drew large crowds to central Wellington, occurred around 1pm on the 26th October, the day that the surveys were undertaken.

Observations by the survey company suggest that the first Inter peak train of the day, the 11.45 arrival into Wellington, was most severely affected by RWC parade traffic. Apparently the train was full, with limited standing room capacity, from around Waterloo onwards.

Further analysis of the Inter peak Hutt Valley Line data shows that for the 4 services surveyed between 11am and 1pm a substantial number of passengers had their purpose of travel recorded as 'Rugby World Cup Parade':

- 11.45am arrival in Wellington – 119 passengers, 49 RWC related (41%);
- 12:15pm arrival in Wellington – 226 passengers, 85 RWC related (38%);
- 12:45pm arrival in Wellington – 78 passengers, 32 RWC related (41%); and
- 1.15pm arrival in Wellington – 20 passengers, 8 RWC related (40%).

Overall approximately 40% of surveyed passengers were heading to the parade. This figure is likely to be an underestimate as it is possible people who did not specifically record the purpose of their trip might also have been attending the parade.

Table 6-1 below shows the percentage of trips for each access and egress mode in the Inter peak for the Hutt Valley Line, broken down as follows:

- Non-RWC related trips;
- RWC related trips only; and
- All trips.

The data shows that egress mode does not really change when looking separately at RWC trips, non-RWC and all trips. This is because walking is the most suitable egress mode from Wellington Station for most trips, regardless of their purpose (work, education, other).

Looking at the access mode, the only difference between RWC and non-RWC trips is that car trips comprise a slightly greater share of RWC trips (42%) compared to non-RWC trips (35%).

Overall, however, access and egress mode characteristics are similar between both sub-sets of the data.

Table 6-1: Access and Egress Mode By Line, Inter Peak

Access / Egress Mode	Hutt IP Egress - Non RWC Trips	Hutt IP Egress - RWC Trips Only	Hutt IP Egress - All	Hutt IP Access - Non RWC	Hutt IP Access - RWC Trips Only	Hutt IP Access – All Trips
Walk	78%	82%	80%	53%	51%	52%
Bus	5%	3%	4%	4%	2%	4%
Bike	1%	0%	1%	2%	1%	1%
Taxi	0%	1%	0%	1%	2%	2%
Car	9%	8%	9%	35%	42%	38%
Train	1%	2%	1%	1%	1%	1%
Other	3%	3%	3%	2%	2%	2%
No response	3%	2%	2%	1%	0%	1%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table 6-2 shows the Inter peak trips on the Hutt Valley Line, again reported for 'RWC', 'non-RWC' and 'All' trips.

The main differences between datasets relates to the number of child passengers. 29% of RWC related trips are categorised as 'child' trips, compared to only 11% of non-RWC trips. For comparison, on the Kapiti Line in the Inter peak child trips comprise only 1% of all total trips.

The data shows that child trips due to the RWC parade comprise a much greater percentage of trips in the Inter peak than might be expected on a normal Inter peak day. Comparing the Kapiti and Hutt Valley line data also suggests that some of the trips categorised as non-RWC trips could in fact be heading to the parade, given the high percentage (11%) of child trips on the Hutt Valley Line compared to the Kapiti Line.

Table 6-2: Trip Purpose by Line, Inter Peak

	Education	Other	Work	No Purpose	Child	Total Trips
Hutt IP - Non RWC	20%	47%	19%	4%	11%	100%
Hutt IP - RWC Trips	13%	44%	13%	0%	29%	100%
Hutt IP - ALL	17%	46%	16%	2%	18%	100%
Kapiti IP - ALL	21%	49%	26%	3%	1%	100%

Passengers categorised as attending the parade have been **assigned flag 13**.

It is our recommendation that consideration be given to removing some or all of the RWC related trips in the Inter peak from the final cleaned dataset, as the characteristics of these trips lead us to believe that the surveyed time period cannot be considered a 'normal' Inter peak period.

Whilst inbound sample rates on the Hutt Valley Line are very high (

Table 5-2), outbound sample rates (

Table 5-2) are very low. We believe this is also a direct result of the RWC parade, as people who might normally take an outbound train service in the Inter peak will have either delayed their trip, been unable to reach the station (due to the parade blocking their access routes) or cancelled their trip altogether, attending the parade instead.

There is little that can be done to rectify this situation. Data from the abortive August surveys could be used instead; another option would be to assume that every inbound trip in the Inter peak has an equal and opposite outbound trip – therefore the inbound dataset could be taken and transposed to determine the outbound distribution of trips.

Table 6-3 below shows the new sample rates for the Hutt Valley Line in the Inter peak, calculated by omitting those trips that are known to be related to the RWC parade. When compared against

Table 5-2, where sample rates (in the inbound direction) were around 140%, the revised sample rates, around 80%, are considerably lower. Compared to other lines and time periods (

Table 5-2), these sample rates are still a little on the high side, confirming our suspicions that a number of RWC related trips might still be amongst those trips categorised as 'non-RWC' trips.

Table 6-3: Revised Inter Peak Sample Rates

	IP Inbound						IP Outbound					
	Boarding			Alighting			Boarding			Alighting		
	Survey	Count	%	Survey	Count	%	Survey	Count	%	Survey	Count	%
Hutt Valley Line												
Upper Hutt	27	39	69%		0			0		3	21	14%
Wallaceville	9	11	82%		1		1	2	50%		6	
Trentham	4	20	20%	4	1	400%		8			10	
Heretaunga	19	3	633%	2	0			1		2	3	67%
Silverstream	15	13	115%		2		2	4	50%		11	
Manor Park	3	5	60%		2			1			0	
Pomare	1	9	11%		2			1			9	
Taita	26	15	173%		1			1		1	19	5%
Wingate	3	6	50%		0			0			5	

Naenae	19	19	100%		15			17			14	
Epuni	8	9	89%	1	3	33%	1	3	33%	1	9	11%
Waterloo	34	84	40%	2	8	25%		19		2	43	5%
Woburn	43	32	134%		5			4		3	18	17%
Ava	12	8	150%	3	4	75%	2	4	50%	1	4	25%
Petone	21	25	84%		18		1	21	5%		32	
Ngauranga		1		1	0			0			0	
Kaiwharawhara		0		1	3	33%		2			1	
Wellington		0		230	234	98%	6	117	5%		0	
Total	244	299	82%	244	299	82%	13	205	6%	13	205	6%

7 Conclusions and Recommendations

The cleaning and analysis of the rail intercept data has shown that the results appear reasonable and reliable.

Trends relating to access / egress mode, access / egress times, ticket type and car availability have been assessed, either across the whole dataset or by time period and line. Whilst the apparent trends and patterns are both reasonable and explainable, the analysis has highlighted a number of issues with the data that should be borne in mind when using the data to create the WPTM rail matrices:

- Approximately 2.5% of records have been discarded as the origin and / or destination was not geo-coded;
- A further 2.5% of records have been discarded due to erroneous geo-coding that was identified during the cleaning process;
- Several field attributes, such as arrival time and egress time, are missing from surveys collected on the Johnsonville Line;
- For a number of records the final origin / destination is identical to the origin / destination station. This is particularly a problem for services terminating at Wellington Station;
- Thought should be given to how the Inter peak Hutt Valley Line data should be used, given that the RWC parade in Wellington CBD resulted in journey characteristics and a demand profile that possibly differ from those of a typical Inter peak day; and
- Serial numbers have been retained during the processing, such that any records that have been discarded / flagged during this analysis can be readily identified by Arup.

Appendix A – Question Responses Summary

Question & Answers	AM	IP	Total
Q1 Where did you come from before catching this train?			
Home	3366	521	3887
Usual workplace	24	76	100
On Employer Business	1	13	14
School	14	118	132
Polytechnic or University	3	32	35
Shopping	3	25	28
Social, sport, recreational	5	16	21
On personal business (visit to doctor, bank etc)	7	36	43
Other	59	46	105
No response	52	3	55
Q4 How did you get to the train station where you got on this train?			
Longer walk	670	185	855
Short walk (less than 5 min)	959	324	1283
By bus	180	61	241
By bike	21	13	34
By taxi	9	7	16
By car picked up	0	0	0
By car, as a passenger	563	102	665
By car, as the driver	850	134	984
By car, picked up	0	0	0
By car, dropped off	223	33	256
By train	11	9	20
Other	19	12	31
No Response	29	6	35
Q6 This train trip is part of your journey to what destination?			
Home	26	140	166
Usual workplace	2627	101	2728
On Employer Business	117	14	131
School	448	19	467
Polytechnic or University	149	61	210
Shopping	13	67	80
Social, sport, recreational	19	185	204
On personal business (visit to doctor, bank etc)	30	69	99
Other	67	218	285
No response	38	12	50

Question & Answers	AM	IP	Total
Q8 How will you finish your journey when you get off this train?			
Longer walk	1621	347	1968
Short walk (less than 5 min)	1462	301	1763
By bus	222	79	301
By bike	19	8	27
By taxi	11	7	18
By car picked up	2	0	2
By car, as a passenger	41	40	81
By car, as the driver	26	34	60
By car, picked up	14	6	20
By car, dropped off	0	0	0
By train	15	19	34
Other	40	24	64
No Response	61	21	82
Q10 What ticket are you using for this train trip today?			
Cash	256	406	662
10-trip	1286	160	1446
Monthly pass	1808	96	1904
School Term Pass	39	7	46
Concession	43	0	43
Super Gold	16	127	143
Other	38	65	103
No Response	48	25	73
Q11 Gender?			
Male	1544	352	1896
Female	1990	534	2524
No Response	0	0	0
Q13 Which age category are you in?			
0-15 years	291	97	388
16-25 years	554	279	833
26-35 years	658	104	762
36-45 years	834	94	928
46-59 years	904	127	1031
60 years or over	256	168	424
No response	37	17	54

Question & Answers	AM	IP	Total
Q14 Do you have a driver's licence?			
Yes	2838	607	3445
No	696	279	975
No Response	0	0	0
Q15 Was a car available to you as an alternative to taking the train for this trip?			
Yes	2238	452	2690
No	1296	434	1730
No Response	0	0	