Rail Services Performance

GLOSSARY

Auckland Council	(AC)
Auckland Transport	(AT)
Development of the Auckland Rail neTwork	(DART)
Electric Multiple Unit	(EMU)
KiwiRail	(KR)
Long Term Plan	(LTP)
Regional Land Transport Programme	(RLTP)
Statement of Intent	(SOI)
Veolia Transport Auckland Ltd	(Veolia)

EXECUTIVE SUMMARY

The purpose of this paper is to respond to a request at the November 2011 meeting to provide the Board with a more detailed overview of rail service performance measurement and contributors to performance in the Auckland rail environment and to provide a context for performance comparison to Wellington passenger rail.

RECOMMENDATION

It is recommended that the Board:

i). Receive this report

STRATEGIC CONTEXT

AT has a strategic objective to deliver rail passenger services in the Auckland region and to continuously improve the quality and performance of those services. Measures comprise rail patronage growth within the AT SOI and return on investment within the LTP and RLTP; public transport customer satisfaction within the AT SOI. A key contributor to both patronage growth and customer satisfaction is the reliability and punctuality of the public transport services provided.

Key contributors to the reliability and punctuality of rail services are:

- operations management provided by Veolia
- the performance and maintenance of the rail track and signalling infrastructure and the provision of train movement control, all performed by KR through the Track Access Agreement; the rail track and signalling infrastructure is owned by KR
- rolling stock maintenance and performance is provided by KR through a Rolling Stock Maintenance Agreement
- accidents and incidents on the rail network

Rail service reliability and punctuality is monitored and measured on a continuous basis and reported publicly on a monthly basis through the AT Public Transport Statistics Report. Performance contributors are measured and analysed to identify continuous improvement and development opportunities for Auckland rail service performance improvement.

BACKGROUND

Basis of Measurement

The Auckland rail performance measurement is calculated as the proportion of services that were not cancelled (reliability measure) that arrived at their destination station within five minutes of the time shown in the published timetable (punctuality). The measures are made irrespective of the cause of any cancellation or delay and represent the experience of customers. The five-minute threshold was selected as it represented the baseline used in the measurement of on-time performance for many international suburban railway systems, for example, Melbourne.

Auckland Transport has been advised by the Greater Wellington Regional Council that the basis of the measurement used for the Wellington rail system is:

> "*In terms of the contract, on time performance is measured against departures from the originating station within 3 minutes of the advertised time, or arrivals at Wellington Station within 3 minutes of the same. Failures that are attributed to non-operator causes such as network faults are not included in this measure.*"

The two measures are not comparable as, using the Wellington measure, a train that departs Wellington station "on-time" but is subsequently delayed en-route is not recorded as being delayed. Trains that are delayed because of a non-operator fault such as a network infrastructure fault or rolling stock maintenance are excluded. The proportion of trains that are cancelled also appear not to be reported.

Factors Influencing Performance

Rail service punctuality has varied in Auckland over the last two years (November 2009 to October 2011) between 65% and 85% of services arriving at the destination station within 5 minutes as illustrated below in Figure 1.

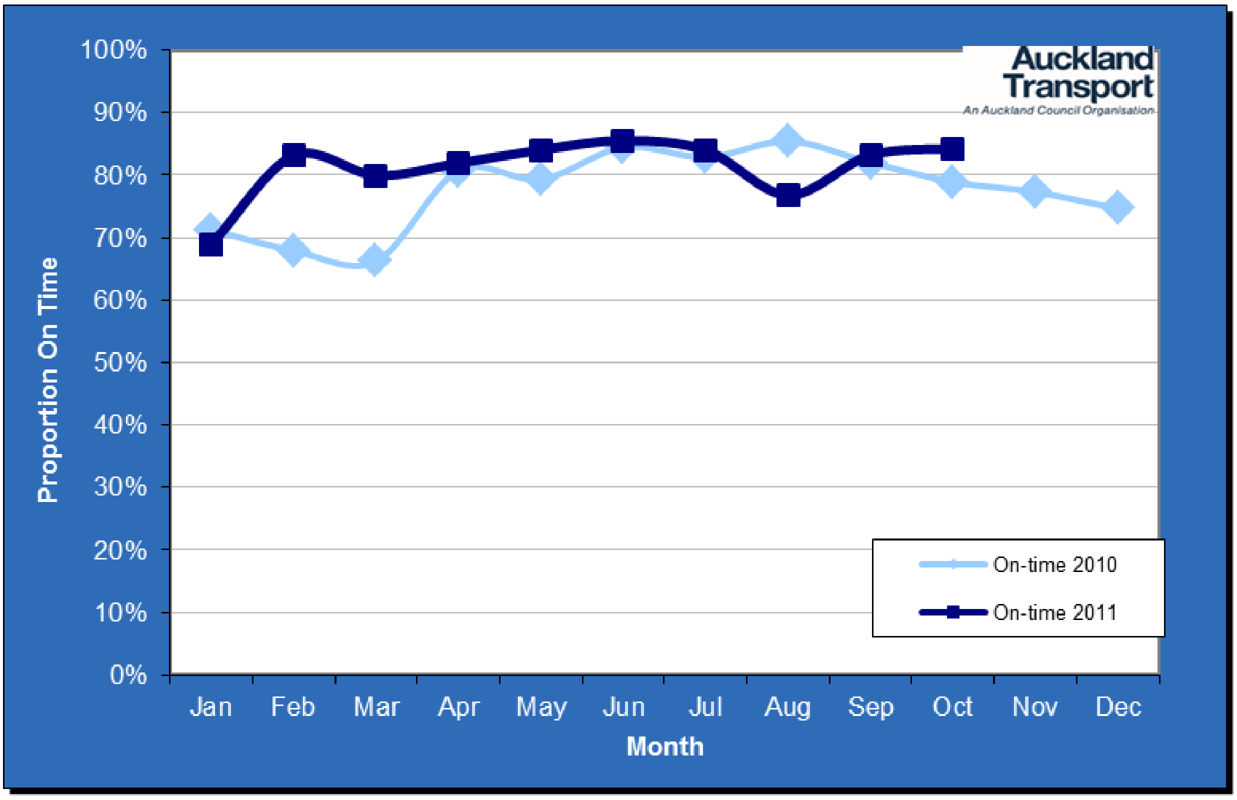

Figure 1: *Rail Punctuality Trends for 2010 and 2011*

There are many factors that can cause train delays which can broadly fall into four categories:

1) **Operations** which are mainly human factors (staff and passenger, including passenger loadings)
2) **Network** (track, signals and train control, including upgrades)
3) **Faulty Trains,** and
4) **Other** factors (accidents or incidents not involving train staff or passengers, trackside fires, weather events or incidents that cause delays that arise from the actions of a third party such as a freight or charter train failure).

Over the last two years, the apportionment of delay causes analysed as train delay minutes across these four categories is presented at Figure 2.

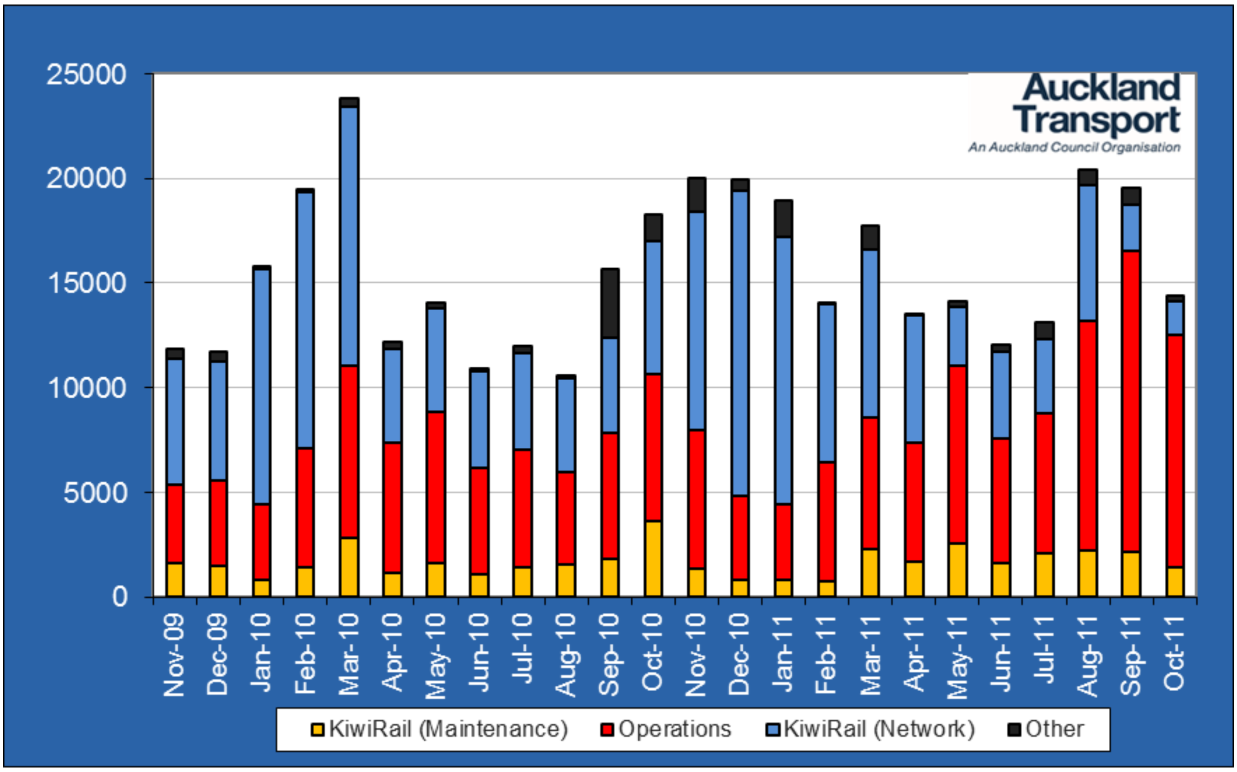

Figure 2: *Train Delay Minutes by Cause*

A further analysis shows that on average 20.1% of scheduled trains were delayed by five minutes or more over the two year period. On the basis of the delay minutes attribution, this can be apportioned as follows:

Operations	8.4%	*- Passenger factors* *- Staff*	*6.8%* *1.6%*
Network	8.6%	*- Network Control* *- Track & Signal Faults* *- Speed Restrictions* *- Track Protection*	*1.1%* *2.7%* *2.0%* *2.8%*
Train Faults	2.2%	*- Engine faults* *- Door faults* *- Other faults*	*1.0%* *0.4%* *0.8%*
All Other Causes	0.8%		

With regard to delays arising from passenger loadings these can be compounded by delays caused by one or more of the other factors, especially during peaks.

The period that this analysis covers includes two Christmas/New Year periods during which the network was closed for major upgrades following which there was a significant increase in network-related failures. Specifically these included the Newmarket station works, that caused disruptions for an extended period from January 2010 through to March 2010, and the electrification clearance works that caused disruptions from December 2010 and January 2011. Train delays caused by network issues are highly variable and are a direct consequence of the network upgrades to complete the DART Project and preparations for electrification that have been on-going since 2004.

The delays from train faults is relatively small and does not vary significantly by month. However the highest proportion of service cancellations are caused by train faults (53% of the cancellations in the sample period). Over this period, 2.2% of scheduled services were cancelled in part or in full. This includes services that commenced their scheduled trip but did not reach their scheduled destination because of a fault that developed during the course of the trip. The following table shows an apportionment of train cancellations:

	Actual	Proportion	
Operations	0.3%	12.4%	*Mainly as a result of staff error or crew unavailability due to a previous delay*
Network	0.5%	22.9%	*Mainly as a result of track or signal faults*
Train Faults	1.2%	53.9%	*Faults with trains that result in their removal from service*
All Other Causes	0.2%	10.9%	

Network Differences and Pinch-Points

When comparing performance between networks, consideration must be given to the network operational characteristics including age of infrastructure and rolling stock, rolling stock performance, timetable complexity and journey time contingency, traction performance (electric versus diesel) and network configuration.

The Auckland infrastructure has undergone significant recent upgrade through the DART Project and will continue to be prone to service failures and disruptions resulting from infrastructure faults as a new signalling system and electric traction infrastructure are installed compared to other more stable networks including Wellington.

While Auckland passenger carriages have been refurbished over recent years, the diesel rolling stock is aging which results in higher service failures and disruptions relative to other networks with newer rolling stock.

Recovery from disruptions is also influenced by several factors, not least network configuration. Network configuration includes network pinch-points where several lines may converge to place frequency restrictions on services, closeness of stations to each other which impact on acceleration and deceleration time, bi-directional rail operations and frequency of cross-over points between tracks (to avoid track obstructions in the path of a service if required) and availability of automatic train protection which allows closer service headways and is currently not available in Auckland.

While Wellington currently operates a higher number of scheduled services per week than Auckland, the track infrastructure provided in Wellington has fewer network pinch-points and provides for greater resilience to recover from delays. There are four (soon to be five) major junctions on the Auckland network where conflicts can occur between train movements on different lines compared to two junctions on the Wellington network (following table).

AM Peak (7:00am to 9:00am) Train Movements*

Auckland			Wellington		
Junction	**Tracks from/to**	**AM Peak Train Movements**	**Junction**	**Tracks from/to**	**AM Peak Train Movements**
Quay Park	4/2	57	Kaiwharawhara	4/3	56
Newmarket	4/4	36	Petone	3/2	35
Penrose	3/2	21			
Westfield	4/4	31			
Wiri	3/2				

** Passenger trains including Tranz Scenic but excluding freight.*

Critically for the Auckland network, the major junction (Quay Park) is less than 1 kilometre from the main station Britomart and has two tracks in a tunnel linking five platforms. Due to emergency evacuation requirements, the approach tunnel limits the number of trains that can be “stacked” between Quay Park Junction and the Britomart platforms. In Wellington, the main junction at Kaiwharawhara where the Kapiti and Wairarapa lines converge is 2.6 kilometres from the main Wellington Station and provides three tracks linking nine platforms (note: the Johnsonville Line operates in and out of Wellington Station on its own dedicated track). Train movements through the junctions on the Wellington network also minimise the requirement for trains to cross tracks ahead of another train travelling in the opposite direction. In addition, in the Wellington operation the maintenance depot and the main daytime stabling facility are both in close proximity to Wellington Station which means empty stock movements that increase the total number of train movements on the network are limited.

Other Operational Differences

Wellington has a mature and stable system with low patronage growth. That allows the operator to make better informed decisions about the allocation of rolling stock to meet the demand based on known historic loading profiles.

The mixed fleet operated in Auckland can also lead to delays as the different train types have different operating characteristics and door configurations. The diesel-multiple units accelerate and brake quicker than the locomotive-hauled trains, and there are operational performance differences between various configurations of locomotive-hauled trains. All of these factors can lead to a variation in the station dwell times and/or sectional run times.

There are differences in timetabling concepts between the two operations reflecting the geographical and travel demand differences:

- The Wellington rail network was designed for the operation of a high frequency suburban service while Auckland’s network was designed primarily to meet the needs of the freight operations. A freight network does not require the same signalling or track crossings and the locations of these can constrain commuter operation flexibility.

- Wellington has a lower frequency of operation at the extremities of the network compared to Auckland.

- During peak travel, Wellington trains operate a layered stopping pattern meaning that the longer trains originating from the stations furthest from the CBD operate as express over the inner part of the network leaving these stations to be serviced by short running services. This type of operation leads to uneven headways (intervals between services) at intermediate stations and at the terminal stations. With the constraints at Britomart, arrivals need to be evenly spaced in order to maximise the use of the tracks and platforms which is best managed by having even headway services with standardised stopping (all stations).

The net effect of these factors means that the Wellington system is operationally less complex than Auckland's. However, the benefit is that travel choices offered to Auckland rail commuters during the morning peak is structured to optimise customer frequency as shown in the comparative table below.

Travel Choices to CBD in the AM Peak (7:00am to 9:00am arrivals)

to **Wellington** Station from	Distance	Departures	to **Britomart** from	Distance	Departures
Waikanae/Paparaumu*	55.4	5	Pukekohe	52.9	6
Plimmerton	24.5	8	Papakura	34.7	13
Porirua	17.7	8	Otahuhu	17.6	20
Upper Hutt	32.4	6	Waitakere	31.9	4
Taita	20.6	6	Swanson	28.0	8
Petone	10.5	11	Onehunga	13.6	4
Melling	13.5	5	Glen Innes	9.4	12
Johnsonville	10.5	7	Ellerslie	8.5	12
Masterton	91.0	3			

** includes Capital Connection*

Due to the above differences in performance measurement methodology and exclusion of non-operator faults, and other differences including the age and performance of infrastructure and rolling stock, network stability and upgrade activities, timetable stability and change, passenger volume change and network configuration and characteristics it is difficult to compare Auckland and Wellington performance statistically.

Auckland rail performance will improve as network upgrades are completed including electrification over the next two to three years and the transition from older diesel to new electric rolling stock is complete.

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